

2

THE SITE

CHAPTER 2

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2. THE SITE

2.1 SITE LOCATION AND LAYOUT

2.1.1 Maps and Description

The location of the proposed site is illustrated in Figures 2.1-1 through 2.1-3. The site occupies approximately 1656 acres of land located in Duval County contiguous to the existing Jacksonville Electric Authority's (JEA) Northside Generating Station (NGS). The existing generating station encompasses approximately 410 acres for three oil-fired generating units. Site boundaries include New Berlin Road to the west, the City landfill to the north and marshes to the east and south. The St. Johns River is located approximately 1/2 mile to the southeast of the site.

Trees, shrubs and grasses comprise the majority of the site, totaling approximately 1,307 acres (Figure 2.1-4 and Table 2.1-1). The trees are fairly young and are scattered on the site except by the marsh areas where their density and size increase. Wetlands comprise approximately another 289 acres. A sand drag racing track with grandstands occupies approximately 60 open acres within the site boundaries at the intersection of New Berlin Road and Island Drive. The site is crossed by transmission lines from the NGS as well as by the Seaboard Coast Line Railroad, which services Blount Island.

A discussion of transmission corridors is provided in Section 2.11.

The site property is currently privately owned with an option for purchase being negotiated by the JEA.

Blount Island

The location of the proposed coal unloading facility is illustrated in Figure 2.1-3. The coal unloading site occupies approximately 55 acres of land in Duval County. This site is contiguous to the St. Johns River

Fulton-Dame Point Cutoff to the the south, salt marsh and Offshore Power Systems Corporation to the east, Undine Street to the north and the Jacksonville Port Authority to the west.

The site has been severely disturbed over the past 10 to 15 years. As a result, land cover is mostly open. Section 2.9 discusses types of vegetation found on the coal unloading site.

2.1.2 Site Modifications

The proposed site layout is shown in Figure 2.1-5. The proposed plant will consist of two 600 MW coal-fired units and is basically aligned along an axis running from northwest to southeast. The plant island will be enclosed by the service rail running northwest to southeast, which will form an oval loop around the plant structures. The stack, utilized by both units, will be just south of the center of the oval. Cooling towers will be located at the north end of the plant island.

Coal handling facilities to accommodate delivery of coal by rail and for coal storage will be located to the south of the plant island. Scrubber wastes and ash disposal areas will be located in the north and northeast sections of the site. Major facilities within the plant area include the turbine-generator, boiler, and flue gas desulfurization facilities. None of the plant facilities at the proposed site will be constructed on or below the mean high water (MHW) line (Figure 2.1-6).

The site will be developed as follows:

- 28 acres for plant area
- 9 acres for switchyard and transmission line
- 90 acres for coal handling facilities and coal storage
- 650 acres for protected, undisturbed land
- 551 acres for waste disposal
- 328 acres not presently designated for use or protection
- 1656 acres total

Blount Island

The proposed site layout for the coal handling facility on Blount Island is shown in Figure 2.1-7. Major facilities at the site are the ocean vessel coal unloading wharf, the stacker-reclaimer and coal storage pile, the railcar loading area, emergency coal stackout and the runoff holding basin with a capacity of 2.75 million gallons. Figure 2.1-8 shows the surveyed MHW, referenced to the Florida State Plane Grid. The coal unloader and wharf will be the only structures on or outside MHW.

The site will be developed as follows:

- 13 acres for coal storage
- 4 acres for holding basin
- 3 acres for the ocean vessel coal unloading wharf
- 1 acre for the rail car loading area
- 2 acres undisturbed salt marsh
- 1 acre for emergency stackout
- 31 acres not presently designated for use or protection
- 55 acres total

2.1.3 Existing and Proposed Uses

The proposed site, the majority of which is vacant land, consists of fairly young trees and palmetto. Trees, a mixture of hardwoods and pine, increase with size and density near the salt marsh, which occupies the area along the northern, eastern and southern boundaries of the site. The site has recently had large portions of the northern section harvested of pine. The site is currently used for indiscriminate dumping as well as target shooting. Trails on the site are used for off road driving by people with four wheel drive vehicles or motorcycles. A sand drag racing track within the site boundaries was previously used for organized drag racing.

A portion of the site has been proposed as a municipal landfill. No other land uses are currently proposed.

Blount Island

The proposed coal unloading site is presently made up of grasses and scrub or open water. The site is used only for occasional storage of imported automobiles from the adjacent port facility.

Table 2.1-1

LAND COVER OF PROPOSED SITE AND COAL UNLOADING FACILITY

<u>Land Cover</u>	<u>Number of Acres</u>	<u>Percentage of Total Land Area</u>
<u>PROPOSED SITE:</u>		
Wooded Land	1282	77
Grassy Scrub	25	2
Wetlands	289	17
Race Track	60 ^a	4
Total	1656	100
<u>COAL UNLOADING FACILITY:</u>		
Baccaharis Shrub	13	24
Grassy Scrub	30	54
Myrica Shrub	2	4
Wetlands	2	4
Open (water/beach)	2	4
Other	6	11
Total	55	101 ^b

a Race track has 60 open acres which is used as the racing area, the property boundary actually includes 80 acres. The difference of 20 acres is included in the vegetation cover figures.

b Due to rounding percentages do not total exactly.

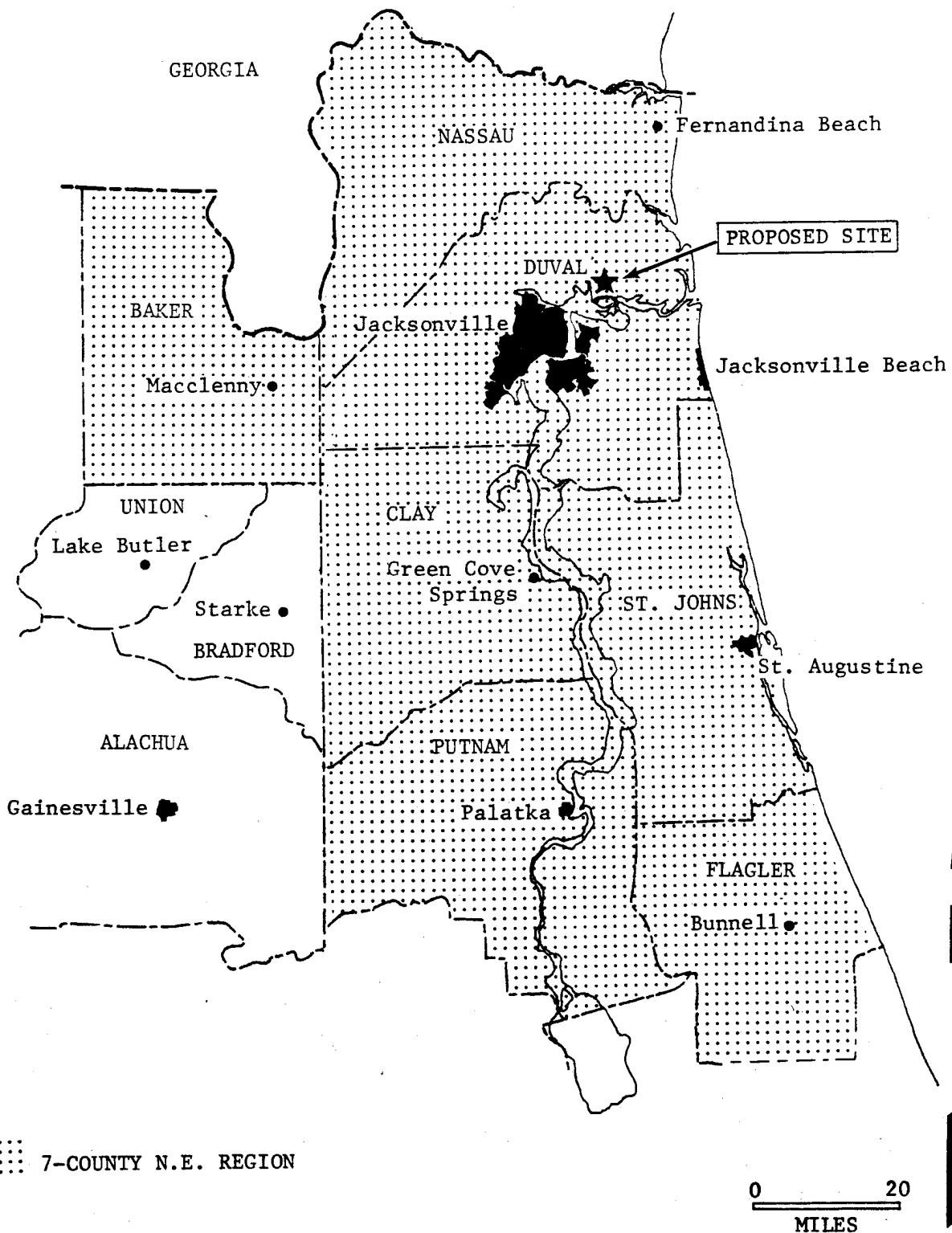


Figure 2.1-1

Regional Location Map

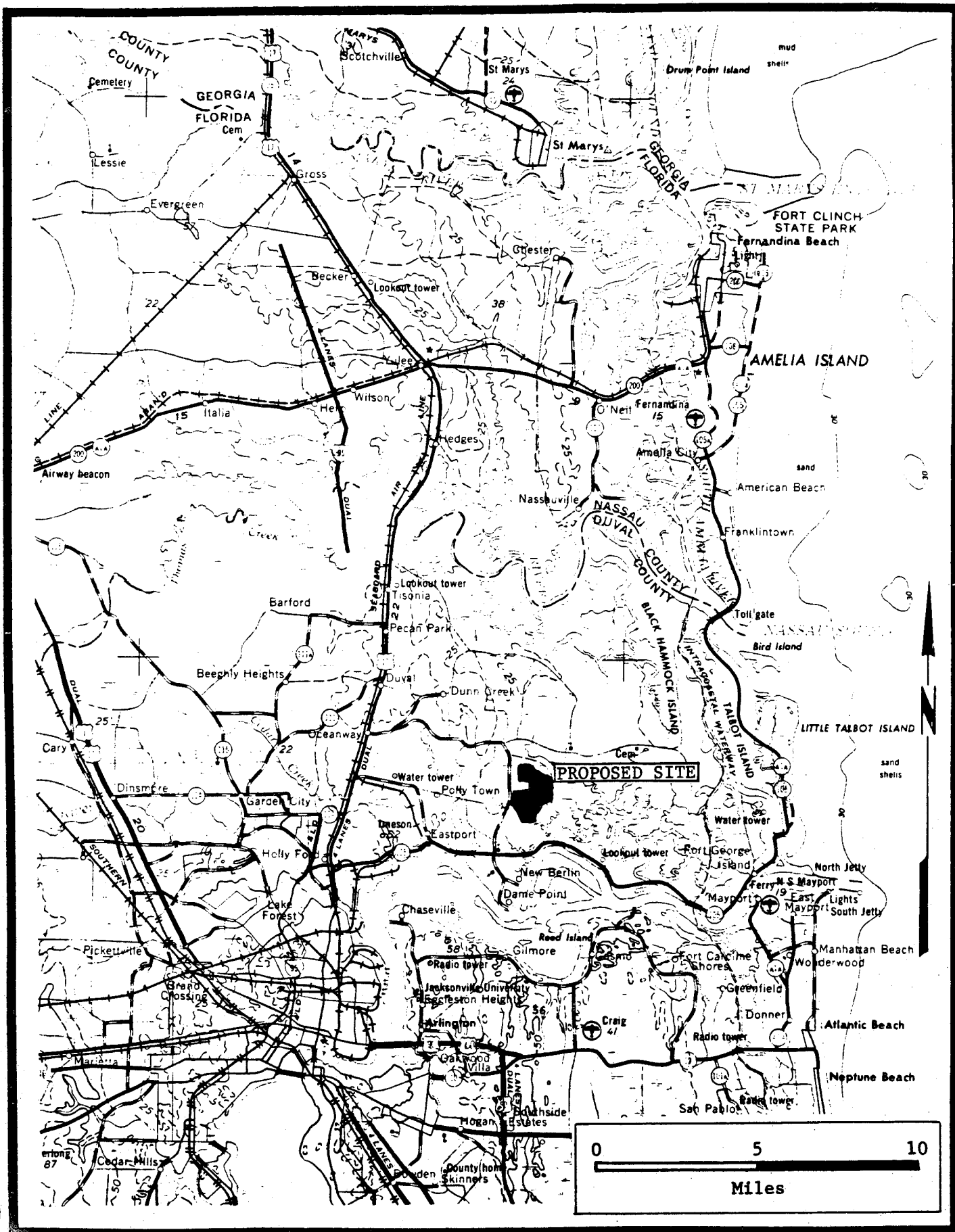


Figure 2.1-2 General Site Location

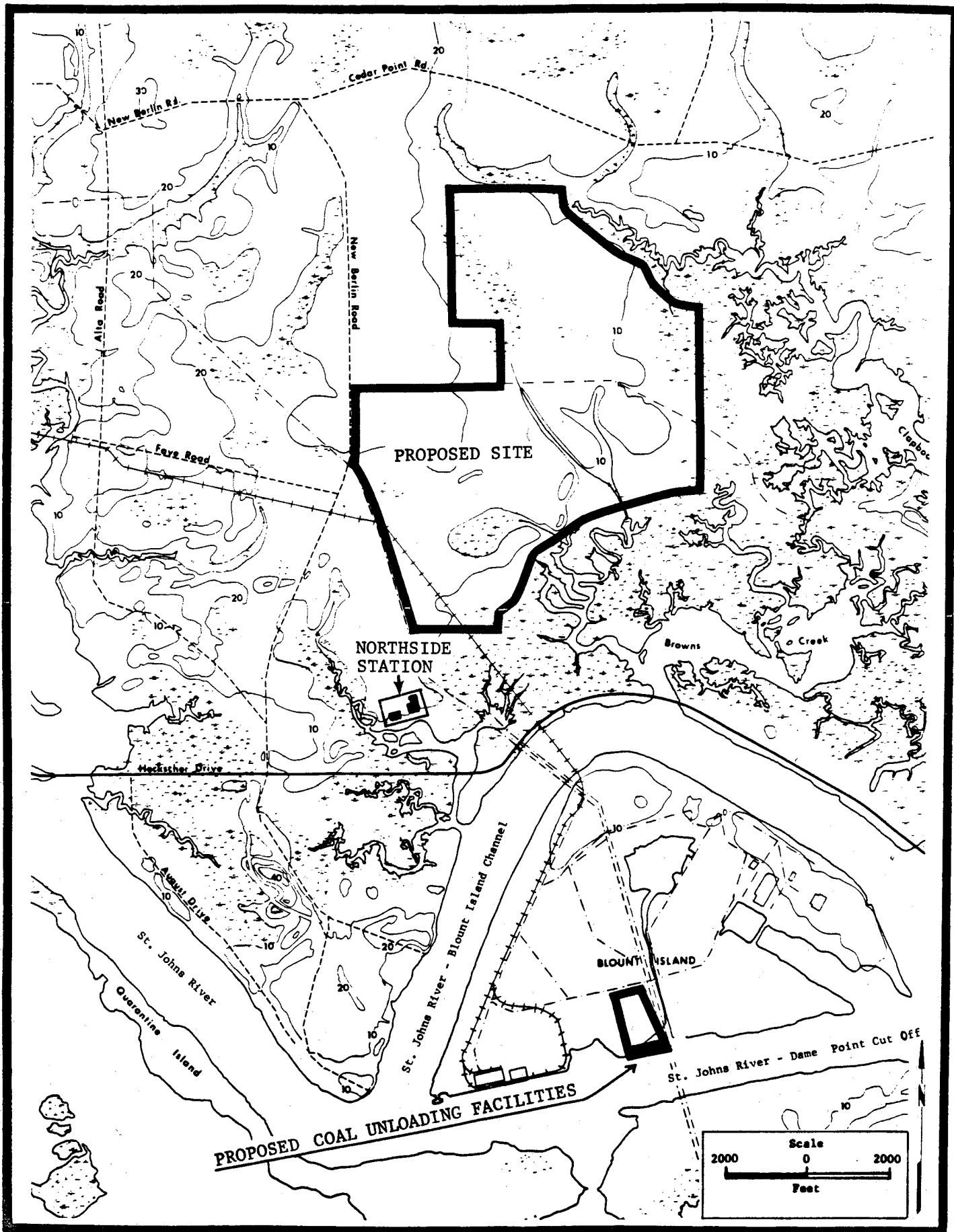


Figure 2.1-3 Location of Site in Relation to Coal Unloading Facilities

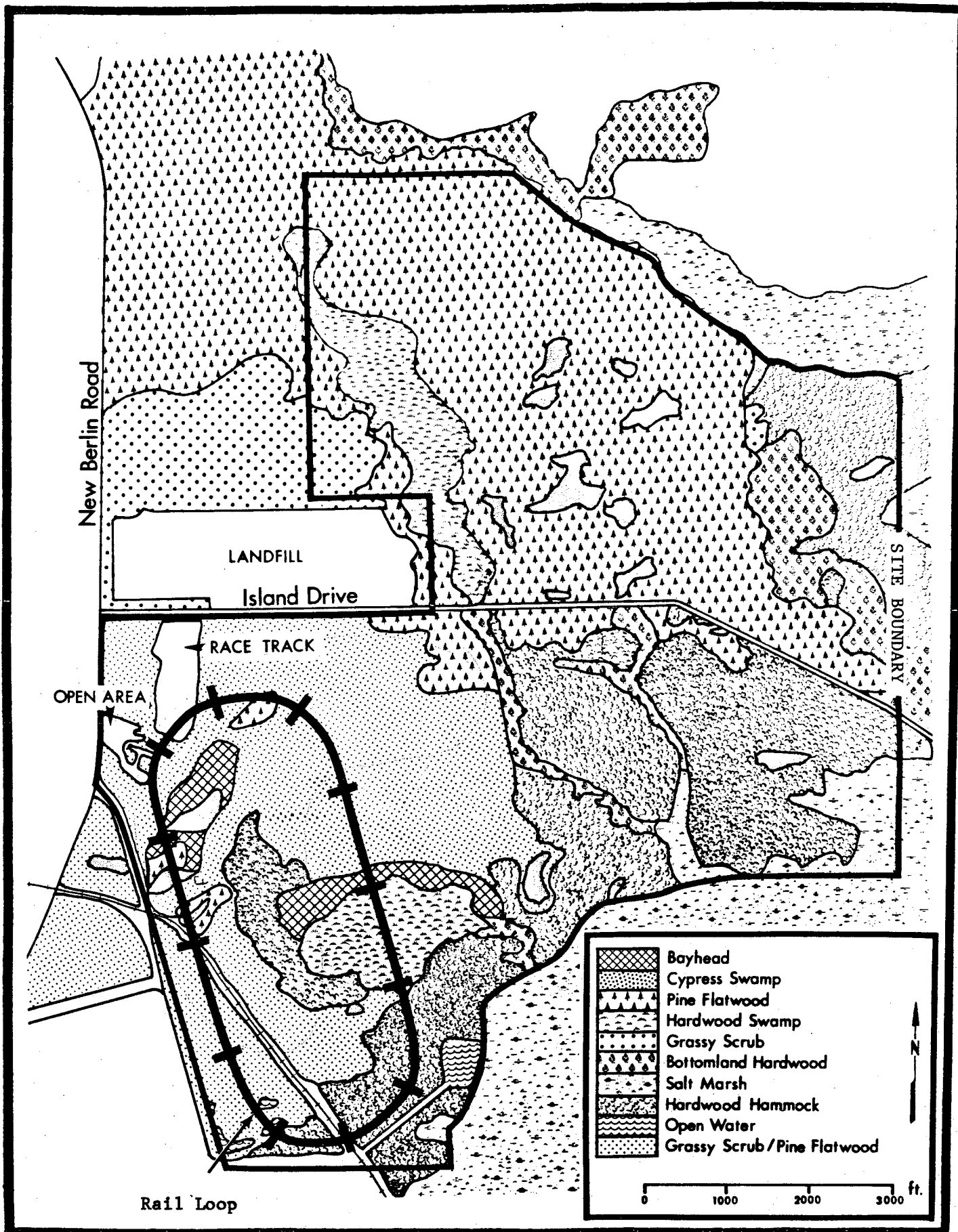


Figure 2.1-4 Site Land Use

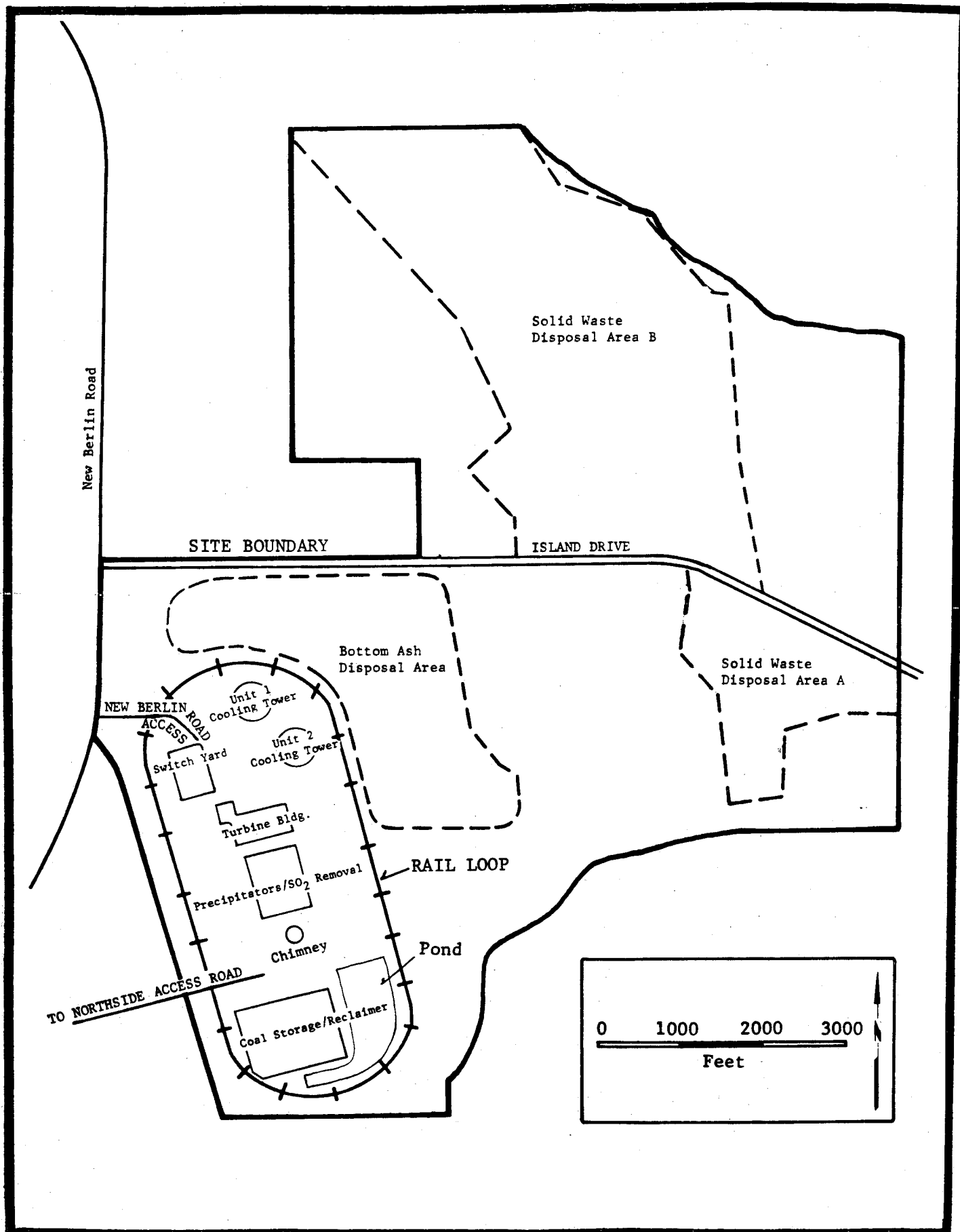


Figure 2.1-5 Layout of Plant and Other Facilities

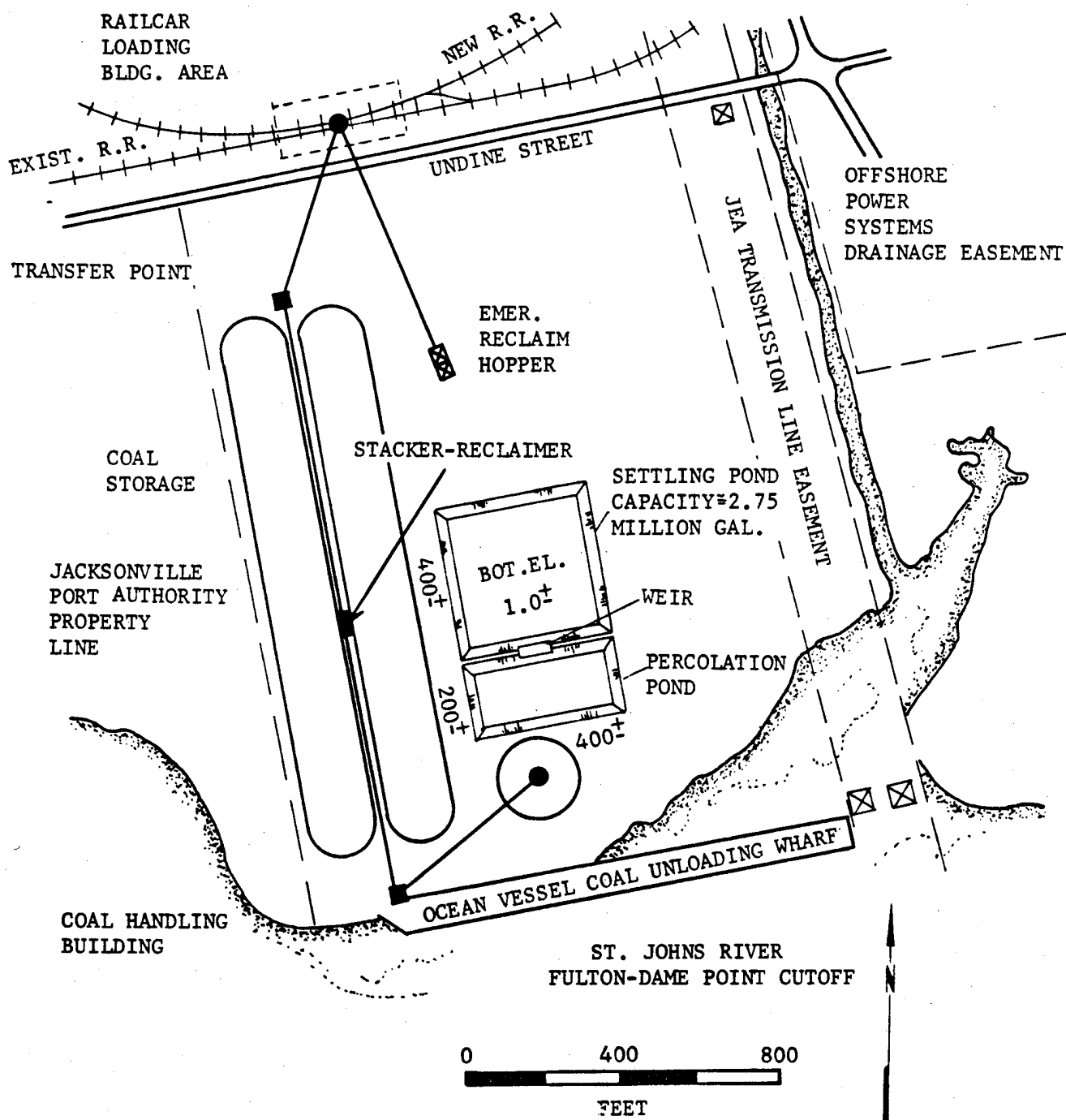


Figure 2.1-7 Coal Unloading Facility

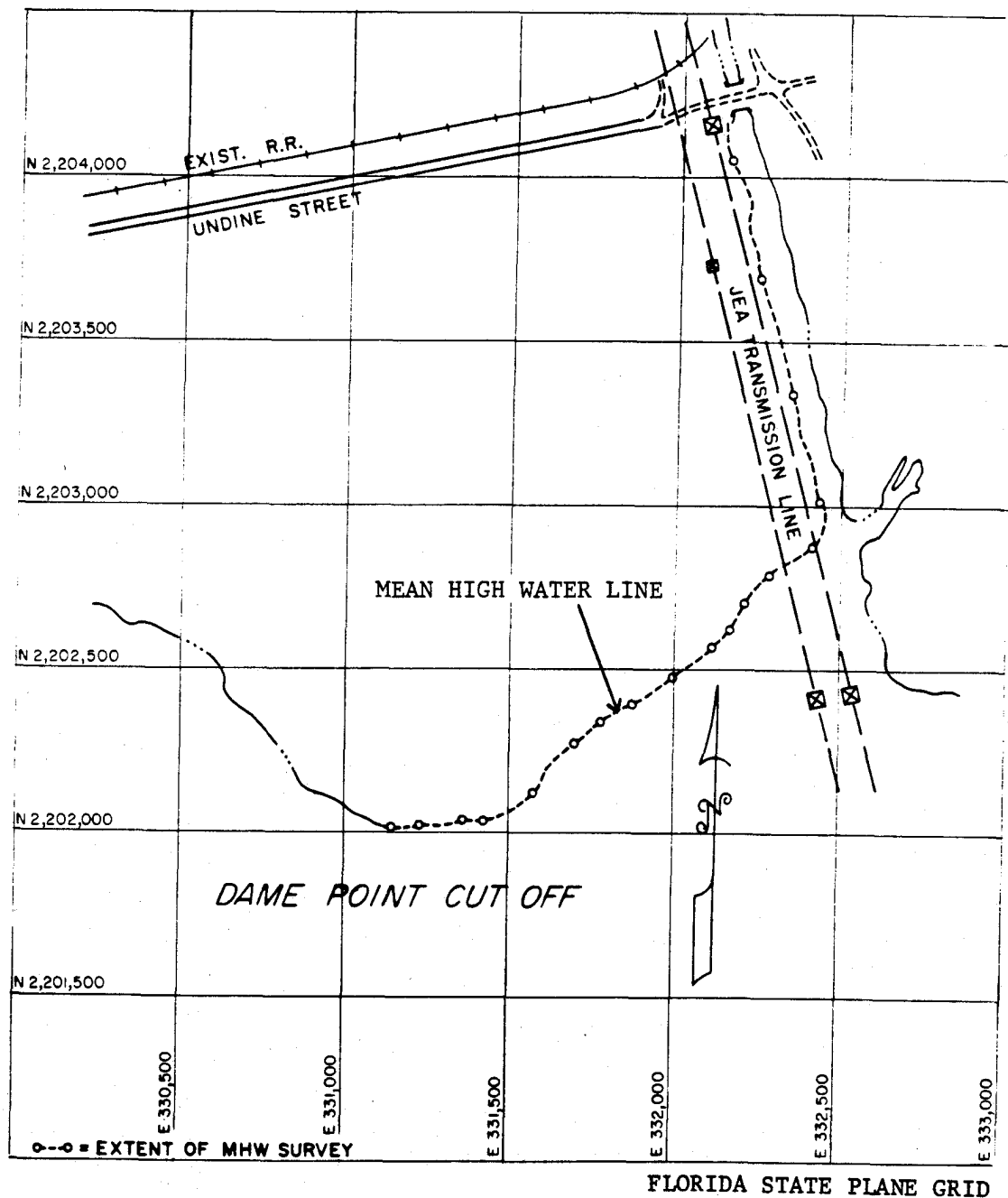


Figure 2.1-8 Surveyed Mean High Water (MHW) Line at Proposed Coal Unloading Facility on Blount Island

2.2 LAND AND WATER USE

2.2.1 Land Use

Land use patterns for the region focus on the seven counties that make up Region IV, the Northeast Florida Planning Region, including Baker, Clay, Duval, Flagler, Nassau, Putnam and St. Johns Counties. For the region, 11 types of land uses and cover are inventoried (Florida Resources Analysis Center, 1980). The 11 categories include: open and recreation; residential; industrial, commercial, and institutional; transportation and utility; agricultural; upland natural; wet natural; open water and coastal; marine; mixed urban and transitional; and strip mines and quarries. Regional information for present and future land uses is found in Appendix G.

The description of land use patterns within 5 miles of the proposed site contained in this chapter concentrates on an area in the northern half of Duval County located near the St. Johns River and Blount Island. In this area, 18 types of land uses are discussed including: cropland; pasture; wooded; wet wooded; wet natural; open water; coastal; marine; open; recreation; historical sites; institutional; industrial; commercial; utility; transportation; single family residential; and multifamily residential.

The 5-mile analysis employs four basic sources of information. Land cover data in Duval County was obtained from the Jacksonville Area Planning Board in their 1977 Land Cover and Selected Characteristics Study. Also, aerial photographs taken in January of 1980 as well as maps from the United States Geological Survey (USGS) were used. Field inspection supplemented and confirmed the above listed data. Land use figures were tabulated (using a polar planimeter) from a map compiled from the USGS maps, aerial photos, a Jacksonville Area Planning Board land cover map and field inspection notes. Information concerning future land use developments was taken primarily from the Jacksonville Area Planning Board 2005 Comprehensive Plan.

2.2.1.1 Land Use Characterizations

Present Land Cover and Use (5-Mile Radius)

Land cover within a 5-mile radius of the proposed plant location is shown in Figures 2.2-1 to 2.2-5. As indicated by Table 2.2-1, this 5-mile radius area is predominantly wooded forest. When including wet wooded areas, which are made up of hardwood swamps and cypress, the wooded land category comprises 16,680 acres or 33 percent of total land area. Primarily all of the wooded land in the 5-mile area is natural. There is some commercial forest in the western section of the 5-mile radius owned by St. Regis Paper Company. Commercial forest activity is on the decrease in Duval County due to urban expansion. However, Duval County does have the majority of wood using industries in the Northeast Region, the paper industry being the third largest industry in Duval County. Some of these industries are located within the 5-mile radius.

Open water constitutes the second largest land cover in the 5-mile radius (Figure 2.2-3). Approximately 10,570 acres, or 21 percent of the total area, fall within this category. The St. Johns River and Mill Cove make up most of this classification. The river is of vital importance to shipping and port activities in this area and influences land uses located along its shores. The shoreline is conducive to port related industry, as well as residential, commercial and recreational land uses and often finds competition among users. All four of these uses can be found in the 5-mile radius.

Coastal lands which are made up of tidal flats, beaches, dunes, salt marsh, mangroves and coastal hammocks comprise the third largest land cover category (Figure 2.2-3). This land cover, located primarily in the eastern half of the 5-mile area, comprises approximately 6,780 acres or 13.5 percent of the total land area. Tidal marshes make up the majority of this classification and serve as hurricane buffers, wildlife refuges, retention

areas for runoff and propagation grounds for marine life. Marshes also afford scenic and recreational benefits. The proposed site is located on the western boundary of the salt marshes.

Land use categories playing a large role within the 5-mile radius area are industry and single family residential. Existing industrial land use (Figure 2.2-4) is approximately 1,880 acres or 3.7 percent of the total land area. Industries are locating to the west of the proposed site due to the close proximity of interstate highways, ports, and the Jacksonville International Airport. Land to the south and west of the site is zoned for industrial uses.

Recreation facilities comprise a very small amount of the land use within the 5-mile radius. There are no regional parks in the 5-mile area. However, between 7 and 8 miles to the east from the proposed plant site there are two regional parks. Kingsley Plantation is a state historic site located on Fort George Island along with Rollins Bird and Plant Sanctuary (see Figure 2.2-1). Just to the east, on Little Talbot Island, is the 2,500 acre Little Talbot Island State Park. This park provides a portion of the beach recreation in Duval County with 35,000 annual visitors according to the Jacksonville Area Planning Board (1979a).

Inside the 5-mile radius and just across the river from the plant site is the Fort Caroline National Memorial. It is a 120 acre reconstruction of a French fort built in 1564. According to the Jacksonville Area Planning Board (1979a), visitations average 400,000 per year.

Located north of the St. Johns River near Dames Point just over 2 miles south of the site is Yellow Bluff Fort. This is an undeveloped state park preserving what is left of the Confederate Army's gun placements which were used in 1862 to protect Jacksonville from Union gunboats. The state has future plans to develop this park.

Within the 5-mile radius, there are a number of school playgrounds. There is one community park on Fort Caroline Road just over 4 miles from the site to the southeast which is comprised primarily of baseball fields. Two other ball fields to the west of the proposed site are owned and operated by St. Regis Paper Company.

Some other important spots being used for recreation are the bridges along Heckscher Drive which are popular spots for fishing. The marshes provide various types of recreation. The old bridge to Blount Island, just south of the site, is now closed to traffic but is heavily used as a fishing pier.

Residential land use makes up 11.2 percent of the total land area in the 5-mile radius (Table 2.2-1). There are two major residential districts in the 5-mile area. One is between 2 and 4 miles to the northwest of the site. Most of this residential area is a mixture of house trailers and houses of varying conditions and ages. This residential area is entering into a transitional period as businesses and industry start to move into the area. The other residential area is south of the river about 4 miles from the site. Most of the homes in this area are well maintained and are occupied by middle to upper middle income residents. The homes in this area are separated from the commercial districts.

Future Land Uses (5-Mile Radius)

Future land use within a 5-mile radius of the proposed plant will be related closely to the St. Johns River. Heavy demands are expected to be made on the shores of the river by industry, residential, commercial and recreational land uses. Reflecting this development potential, the Jacksonville Area Planning Board developed in its Comprehensive Plan for 2005, a plan for various land uses along the St. Johns River. Within the 5-mile radius of the proposed site, the plan calls for port and water related industry as well as protected wetlands and marshes. Port and water related industry are planned for those areas where there will be no adverse

effects on the environment. This includes Blount Island, most of the site area and a majority of the land west of the proposed site. The wetlands and marshes are located primarily to the east of the proposed site.

According to the Comprehensive Plan of the Jacksonville Area Planning Board (1979) water related industry can include the full range of industries, from light to heavy. Offices and supporting commercial uses as well as warehouses and storage facilities can also be included as water related industry. They should, however, be located so that those uses requiring port facilities are located closest to the river.

Development of industrial and storage facilities along Heckscher Drive from Interstate 95 east to just north of Blount Island is expected to continue, especially since Heckscher Drive (Figure 2.2-1) is the connecting link between trucking routes and shipping ports. Based on the Comprehensive Plan and current growth patterns, it appears reasonable to assume that by the year 2005 the study area will have experienced major industrial growth, even in the absence of the proposed plant.

Wetlands and tidal marshes to the east of the proposed site are to be protected according to the comprehensive plan. The tidal marshes, which are covered by grassy, salt tolerant vegetation, serve as a buffer to storms and floods and as settling basins for silt. Marshes also play a major role in the propagation of marine life.

Residential areas will experience future growth, with the largest amount occurring in neighborhoods on the south side of the St. Johns River. Other growth areas in Duval County are south of the city near the river and to the east between the city and the beaches.

The two most predominant land uses projected for the 5-mile radius are industrial in the western portion of the study area, and marshes in the eastern portion (Jacksonville Area Planning Board, 1979).

Zoning

The site is presently zoned by the City of Jacksonville as IH - Heavy Industry. Power plants are permissible uses by exception in IH zones (Jacksonville Area Planning Board, 1979b). A zoning exception or rezoning to GU - Government Use is required for the site. Such an exception or rezoning would be compatible with both present and planned future land uses. A variance will have to be obtained for the 640 foot stack height which would otherwise be limited to 519 feet by Jacksonville Ordinance 78-256-271 for land situated in the airspace zones or accident zones of nearby airports. The stack location is approximately 3,500 feet inside the boundary of this zone for Mayport Naval Air Station air space. The site will comply with all other zoning requirements.

Blount Island is presently zoned IW - Industrial Waterfront for which a coal unloading facility is a permitted use.

Transmission Lines

The transmission line corridor passes through predominantly open rural land. See Section 4.3.5 for more detail.

2.2.1.2 Cultural and Historical Resources

There are presently no areas on, nominated to, or declared eligible for the National Register of Historic Places or the National Registry of Natural Landmarks within the boundaries of the proposed plant site, the proposed Blount Island coal facilities, or the preferred transmission line corridor. These same locations contain neither lands specially designated under state programs, nor known areas valued as natural landmarks or for their historic (excluding archeological), scenic or cultural significance.

2.2.1.3 Archeological Sites

A cultural resources reconnaissance of the proposed plant site identified eleven archeological locations which have been tentatively dated from 700-1500 AD. Preliminary analysis suggests that some or all of these locations may be potentially eligible for the National Register, and that a portion of the plant site may meet the requirements for an archeological district. Most of these sites are located outside the proposed fenceline of the plant as shown in Figure 4.1-7.

An intensive archeological survey of the eleven locations was conducted to gather data necessary to assess site significance in terms of National Register criteria and to request a formal determination of National Register eligibility from the Secretary of the Interior. Detailed reports of the survey have been submitted to the Division of Archives History and Records Management (State Historic Preservation Officer) and a formal opinion on significance requested. Overall, the eleven archeological sites tested in the project area were disturbed to varying degrees. One large site has been severely disturbed. Four other large sites contain some mixture of cultural material but retain intact cultural levels and/or features. A detailed discussion of archeological locations on the site is contained in Appendix J.

2.2.1.4 Viewshed Descriptions

A ground and aerial survey was conducted within a 5-mile radius of the proposed site to identify areas and land uses which are normally considered sensitive to visual impacts. In general, the types of areas examined were residential developments, recreational areas, and highways. Figure 2.2-6 identifies ten major viewpoints in the vicinity of the proposed site. Table 2.2-2 presents a description of the existing view from each of these points in the general direction of the proposed site.

In general, the existing view toward the proposed site is characterized by the buildings, water tower and stacks of the NGS; transmission towers and lines associated with the NGS; the Offshore Power Systems crane and shipping cranes on Blount Island; and structures of the St. Regis paper mill. These existing structures are the dominant elements in the viewshed and are visible from most of the viewpoints, although the impact varies from insignificant to very significant. Section 2.10.2 presents a discussion of the aesthetic impacts on the viewshed (area from which proposed plant would be visible) due to the presence of these existing structures.

2.2.2 Water Use

Total freshwater use in the Lower St. Johns River Basin in 1975 was estimated to be 398.8 MGD (St. Johns River Water Management District, 1977). Of this, groundwater use was estimated at 213.2 MGD and surface water use was estimated at 185.6 MGD (Table 2.2-3). In 1975, nearly all freshwater consumption for rural water use, irrigation, and public drinking water supply was developed from groundwater sources, principally the Floridan Aquifer. A significant proportion of water use by industry and power generation was developed from surface water sources, principally the St. Johns River.

Estimates of total freshwater use (groundwater and surface water) for the period 1980 through 2020 are summarized in Table 2.2-3. The distribution of water use between surface water and groundwater sources is shown in Table 2.2-3.

Locations of major water uses in the 5-mile radial area surrounding the proposed site are indicated on Figure 2.2-7 and are described in Table 2.2-4. The NGS and the St. Regis Paper Company Eastport plant are the primary surface water (St. Johns River) users. Groundwater uses are substantially less than surface water uses within the 5-mile radius, although groundwater consumption provides a significant portion of total water use at the St. Regis plant.

There are actually no consumptive uses of either ground or surface water other than evaporation.

2.2.2.1 Groundwater

If the proportions of surface water and groundwater use remain the same as in 1975, total groundwater use in the Lower St. Johns River Basin is projected to double by the year 2020, increasing from approximately 213 MGD in 1975 to approximately 417 MGD in 2020 (St. Johns River Water Management District, 1977). Major increases in groundwater use are projected in public supply (up 225 percent), industrial supply (up 49 percent) and irrigation (up 50 percent). No significant increases in groundwater use are projected for power generation and rural water use through 2020. Rural water use includes livestock demands and rural domestic demands other than that of populations served by water utilities.

In the Jacksonville area, all public groundwater supplies are developed from the Floridan Aquifer, including municipal supplies, privately and corporately owned water utilities, and military water systems (Leve and Goolsby, 1969). In rural areas not served by water utilities, groundwater is developed from privately owned wells. Most of these wells are completed in shallow aquifers although some wells penetrate the Floridan Aquifer. Leve and Goolsby (1969) estimate that between 10 and 25 MGD is produced from the shallow aquifers (principally the limestone, shell and sand aquifer) and about 5 MGD is produced from the Floridan Aquifer for rural water use.

Industrial and commercial groundwater supplies are obtained primarily from the Floridan Aquifer, although some supplies are obtained from the shallow aquifers. High volume industrial and commercial supplies are generally obtained from the Floridan Aquifer (Leve and Goolsby, 1969).

2.2.2.2 Surface Water

Surface water in the vicinity of the proposed site is under the jurisdiction of the St. Johns River Water Management District. The St. Johns River Water Management District has formulated policies to ensure continued adequate supply of surface water for various uses including public, industrial and power generation, irrigation, rural, and recreation - (St. Johns River Water Management District, 1977).

Primary surface water uses in the site vicinity include recreation and navigation. Population growth in the region, as well as increased leisure time, has resulted in a high demand for recreational uses. The St. Johns River is a prime recreational resource. Boating, water skiing, and fishing are enjoyed by both residents and tourists in the area. The St. Johns River is also maintained for commercial navigation serving domestic and foreign cargo lines at the Port of Jacksonville including Blount Island, just south of the proposed site.

In the Lower St. Johns River Basin, groundwater accounted for all of the public water use in 1975 (Table 2.2-3). Only a portion of the total population in the Lower St. Johns River Basin as well as the Water Management District is served by public water utilities. No significant increase in surface freshwater use for public supply is expected through 2020.

The Lower St. Johns River Basin provided 98 percent of the total District surface freshwater demands for industrial use in 1975. The Lower St. Johns River Basin is the only basin in the District in which a significant amount of the freshwater used by industries is derived from surface water (29 percent). Most of this water used is by the pulp and paper industry. The Lower St. Johns River Basin total surface freshwater demands for industrial use are expected to increase from 25.3 MGD in 1980 to 38 MGD by the year 2020, an increase of approximately 50 percent (Table 2.2-3).

Withdrawals of water for cooling constitute the primary demands for surface water imposed by power generating utilities. Saline water accounted for approximately 80 percent of the Lower St. Johns River Basin surface waters required for cooling in 1975. Excluding water purchased from water utilities, power generation surface freshwater use in the Lower St. Johns Basin totaled 160 MGD in 1975 (Table 2.2-3). The 160 MGD constitutes approximately 29 percent of the total surface freshwater demand for power generation in the District. The St. Johns River Water Management District does not forecast an increased demand for surface freshwater for power generation by the year 2020 in the Lower St. Johns River Basin. This forecast assumes that there will be a balance between the gradual phasing out of the existing facilities which use a relatively large amount of withdrawn water and new plants which are expected to use water more efficiently.

Irrigation water is demanded mostly during the relatively dry spring and autumn seasons to supplement rainfall for crop production. The number of irrigation surface freshwater users in the District that are not metered make quantities withdrawn difficult to estimate accurately. Current estimates, however, indicate that less than 2 percent of all irrigation water withdrawn is from surface waters. Although the use of irrigation methods is expected to increase steadily in order to increase productivity, more efficient methods should result in a moderate increase in demand for irrigation surface water by the year 2020 (St Johns River Water Management District, 1977).

Rural water use includes livestock demands and rural domestic demands other than that of populations served by water utilities. Total rural surface freshwater use for the Lower St. Johns Basin in 1975 was only 0.3 MGD (Table 2.2-3), representing 19 percent of total rural surface water use in the District. Rural water demand in the Lower St. Johns River Basin is expected to increase gradually through the year 2000. After that year, the rural demand is expected to decline due to increased service by water

utilities. Projected total rural freshwater demand in the Lower St. Johns River Basin is therefore not expected to increase between the years 1980 and 2020 (Table 2.2-3).

2.2.3 References

Florida Resource Analysis Center, August, 1980. Printout from Computer Graphics File System. Tallahassee, Florida.

Jacksonville Area Planning Board, June, 1979. Land Use Element - 2005 Comprehensive Plan. 330 East Bay Street, Room 401, Courthouse, Jacksonville, Florida 32202

Jacksonville Area Planning Board, June, 1979a (Draft Copy). Regional Recreation and Open Space Plan. Northeast Florida Regional Planning Council, Jacksonville, Florida 32202.

Jacksonville Area Planning Board, 1979b. Land Use - Zoning Code - City of Jacksonville. Jacksonville, Florida.

Leve, G.W. and D.A. Goolsby, 1969. Production and Utilization of Water in the Metropolitan Area of Jacksonville, Florida: Florida State Board of Conservation, Division of Geology Information Circular No. 58, 37p.

St. Johns River Water Management District, November, 1977, "Water Resource Management Plan, Phase 1". Palatka, Florida.

Table 2.2-1

PRESENT LAND USE ACREAGE WITHIN 5-MILE RADIUS
OF PROPOSED SITE

<u>Land Usage</u>	<u>Approximate Number of Acres</u>	<u>Percentage of Total Land Area</u>
Cropland	170	0.3
Pasture	1270	2.5
Agriculture Subtotal	1440	2.8
Wooded Lands	13580	27.0
Commercial	70	0.1
Industry	1880	3.7
Institutional	40	0.1
Single Family	5530	11.0
Multi-Family Residential	120	0.2
Residential Subtotal	5650	11.2
Utility	210	0.4
Transportation	130	0.3
Wetlands	2860	5.7
Open Water	10,570	21.0
Coastal	6780	13.5
Marine	610	1.2
Recreation	260	0.5
Historical Sites	120	0.2
Wet Wooded	3100	6.2
Other	2960	5.9
Total	50,260 ac.	99.8 ^a

^a Due to rounding, percentages do not total to 100 percent

Table 2.2-2

VIEWSHED OF PROPOSED PLANT VICINITY

<u>Direction</u>	<u>Key^a</u>	<u>Area</u>	<u>Distance From Site (miles)</u>	<u>Daily Average No. Viewers</u>	<u>Existing View of Structures in Proposed Site Vicinity</u>
East	A	Heckscher Drive at Browns Creek	1.5	16,136 ^b	The Northside Station stands in the foreground as a dominant element. The transmission towers and OPS crane appear to the south of Northside and are also dominant elements.
	B	Heckscher Drive at Cedar Point Creek	4.5	16,136 ^b	The Northside Station is in the distant background on the horizon and is noticeable but not a dominant element.
	C	Kingsley Plantation	6.5	100 ^c	The Northside Station is mostly screened and blends in with sky haze. It is therefore insignificant.
	D	St. Johns River	1-2		The Northside Station is partially screened and views are intermittent. The other structures in the area such as the OPS crane, transmission towers, dredging barges and shipping cranes are more dominant than the Northside Station.
South	E	Residences along southern shores of Mills Cove and St. Johns River	4	d	The Northside Station is mostly screened. The St. Regis plant to the west has more of a visual impact on residences.
	F	Fort Caroline Road	5	d	The Northside Station is only visible for one interval at typical highway speeds and even then is not a dominant element since the OPS crane, transmission towers, water towers and shipping cranes on Blount Island are visible in the same view.
	G	Fort Caroline Memorial	5	1,100 ^c	The Northside Station is visible in the background, but in the middle and foreground are transmission towers, water towers, and the OPS crane which are more dominant elements.
	H	Residences on southern shores of St. Johns River and Dames Point Cutoff	3.5	d	The Northside Station is visible in the background, but the transmission towers and water towers are also visible and in the immediate foreground is the OPS crane.
	I	Heckscher Drive at Nichols Creek	0.5	16,136 ^b	The Northside Station is visible in the foreground and is a very dominant element in the view.

Table 2.2-2 (Continued)

VIEWSHED OF PROPOSED PLANT VICINITY

<u>Direction</u>	<u>Key^a</u>	<u>Area</u>	<u>Distance From Site (miles)</u>	<u>Daily Average No. Viewers</u>	<u>Existing View of Structures in Proposed Site Vicinity</u>
West	J	Heckscher Drive at Dunn Creek	2.5	16,136 ^b	The Northside Station is intermittently visible along with the OPS crane and other structures on Blount Island. The view as a whole is significant.
North	K	Boney Road at Cedar Creek Road	2.5	d	The area is basically open and serves as a pasture. The Northside Station is only partially visible due to some screening by trees. Trees in the foreground as well as cattle become the dominant elements.

- ^a See Figure 2.2-6 for locations
^b Number at viewers based on projected 1985 average daily traffic
^c Based on park visitation according to the Jacksonville Area Planning Board, 1979
^d No information available on these points

Table 2.2-3

FRESHWATER USE AND PROJECTIONS FOR THE LOWER ST. JOHNS RIVER BASIN^a
1975-2020

Water Use Category	Groundwater Withdrawn (MGD)				Surface Water (MGD)			
	1975	1980	2000	2020	1975	1980	2000	2020
Public	65.9	82	145	214	-	-	-	-
Industrial	62.1	64	77	92	25.3	26	31	38
Irrigation	49.3	54	68	74	-	-	-	-
Power Generation	2.3	2	2	2	160.0	160	160	160
Rural	33.6	35	38	35	0.3	0.3	0.3	0.3
Basin Total	213.2	237	330	417	185.6	186.3	191.3	198.3

Source: St. Johns River Water Management District, 1977

^a River mouth to Lake St. George

Table 2.2-4

MAJOR WATER USE WITHIN 5-MILE RADIUS OF PROPOSED SITE^a

<u>Location^b</u>	<u>Owner and Location</u>	<u>Water Source^c</u>	<u>No. of Wells</u>	<u>Average Daily Use (MGD)</u>
1	Jacksonville Electric Authority Northside Station ^d	Surface water Groundwater	- 6	216 1.1 ^e
2	City of Jacksonville North Landfill ^f	Groundwater	1	<0.1
3	Capitol Concrete- New Berlin Rd.8	Groundwater	1	<0.1 (inactive)
4	Southern Materials ^h	Groundwater	5	0.2
5	St. Regis Paper Co. ^h Eastport	Surface water Groundwater	- 7	60 19
6	Imeson Airport ^h	Groundwater	2	0.3
7	Duval County Schools ^h	Groundwater	1	<0.1 ⁱ
8	Offshore Power System ^j	Groundwater	5	<0.1
9	Jacksonville Port Authority ^j	Groundwater	3	<0.1
10	Liquid Carbonic ^h	Groundwater	3	1.5

a Both fresh and non-fresh water use within 5-mile radius from location proposed for plant water supply wells

b See Figure 2.2-7

c All major groundwater use is from the Floridan Aquifer.

d Jacksonville Electric Authority, 1980.

e Estimate, 1982 projection.

f Sheffield, 1980.

g Hayes, 1980.

h Leve and Goolsby, 1969.

i Average daily water use calculated from data in Leve and Goolsby, 1969. Assumes total water use of 0.5 MGD equally apportioned among 25 wells owned by Duval County Schools.

j Department of Health, Welfare, and Bio-Environmental Services, City of Jacksonville; Temporary Water Use Permits.



Figure 2.2-5 Land Use within 5-Mile Radius of Proposed Site - Single Family, Multi Family, Commercial, Recreational and Historical Sites

Figure 2.2-1 Land Use within 5-Mile Radius of Proposed Site - Wooded, Wet Natural, Open

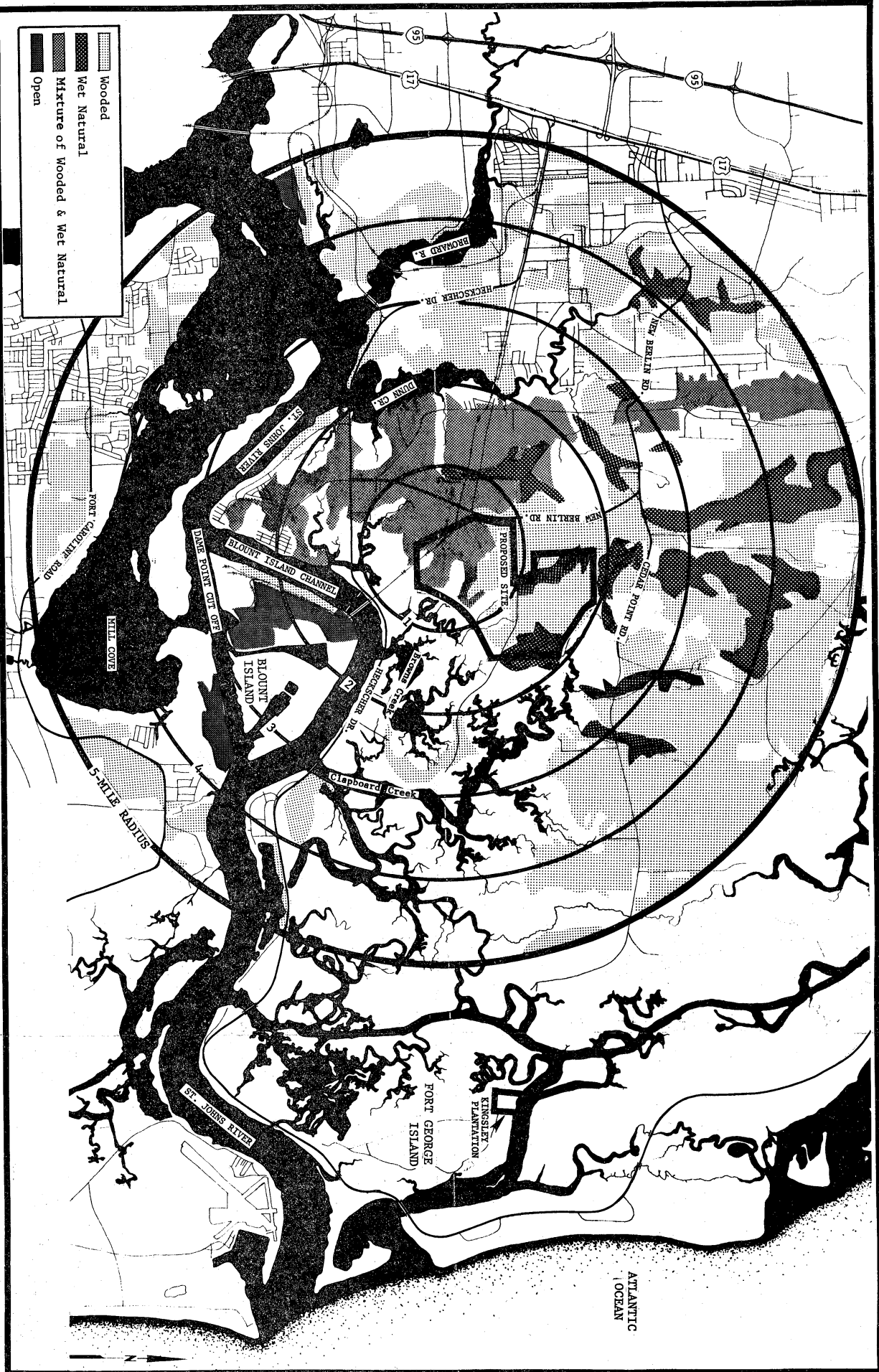




Figure 2.2-2 Land Use within 5-Mile Radius of Proposed Site - Pasture, Cropland

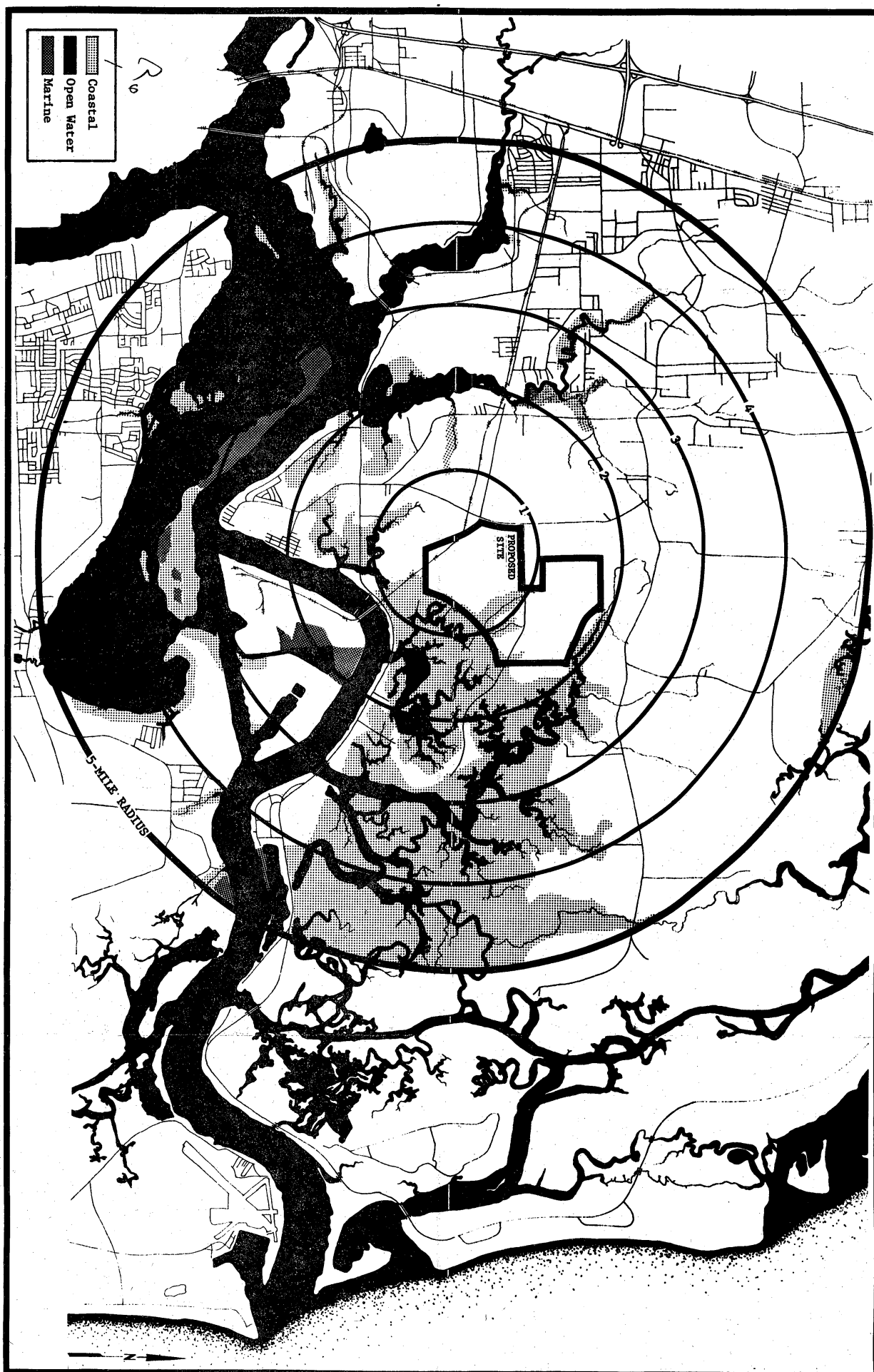
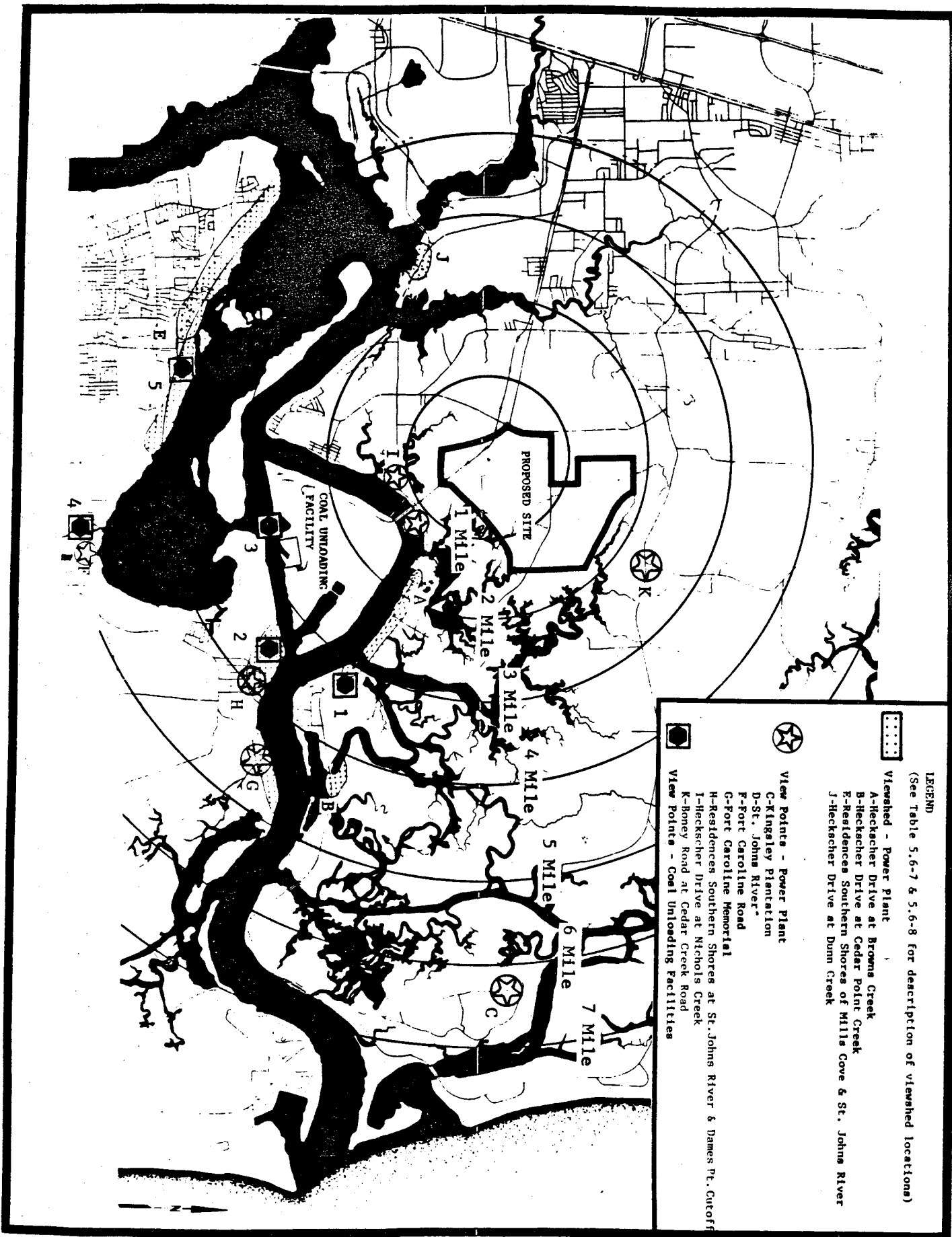


Figure 2.2-3 Land Use within 5-Mile Radius of Proposed Site - Coastal, Open Water, Marine



Figure 2.2-4 Land Use within 5-Mile Radius of Proposed Site - Industry, Institutional, Utility

Figure 2.2-6 Viewshed and Point Locations



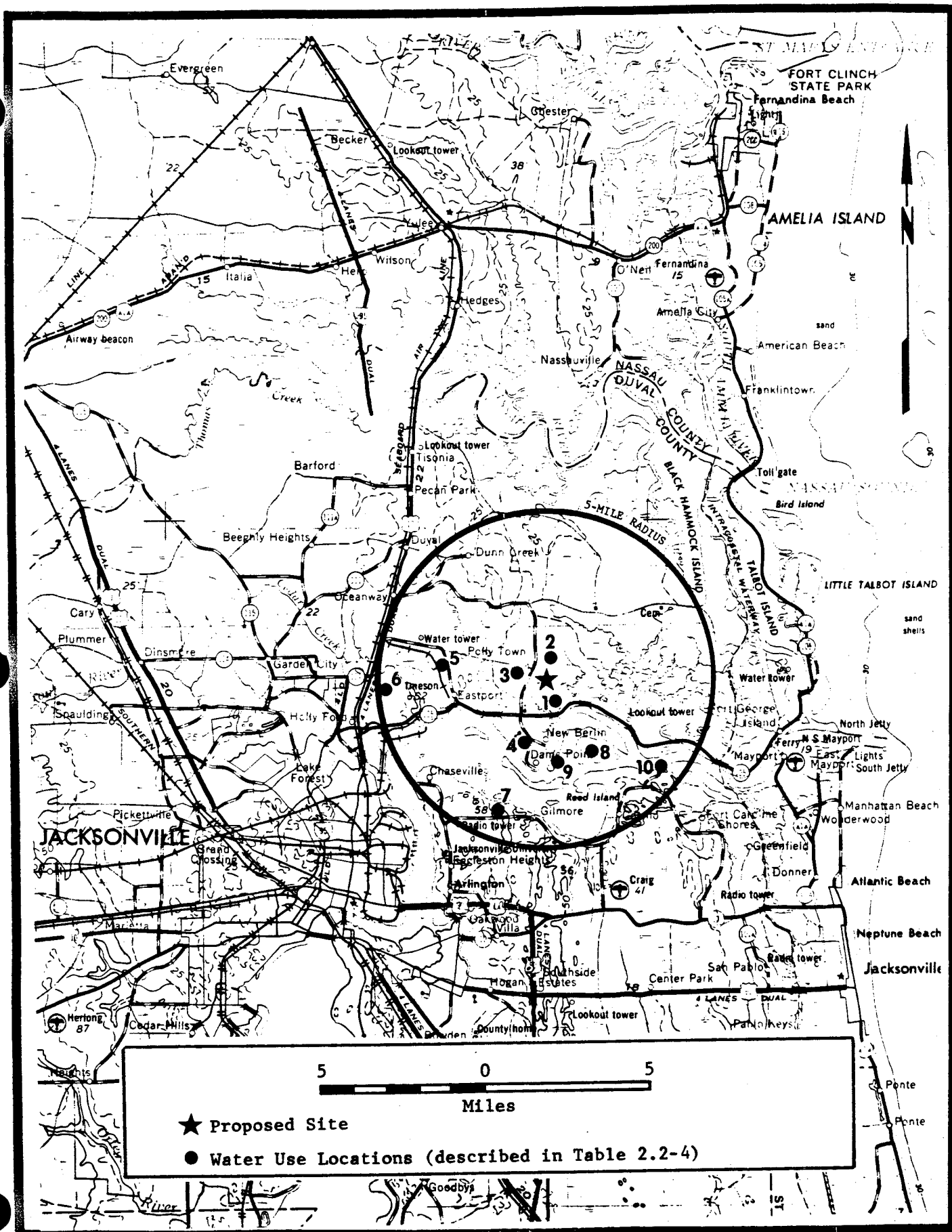


Figure 2.2-7 Major Water Use Within 5-Mile Radius of Proposed Site

2.3 SOCIOECONOMICS

This section summarizes the demography and economy of the seven county study region in northeast Florida. Due to the presence of activities involving construction and operation of the proposed plant, Duval County is considered as the primary impact area. The six surrounding counties of Baker, Clay, Flagler, Nassau, Putnam and St. Johns are considered a secondary impact area. Approximately 80-85 percent of the construction and operational work force is expected to come from Jacksonville/Duval County.

2.3.1 Demographic Profile

For the past three decades, Florida has been one of the fastest growing states in the nation. The primary source of this growth has been state-wide in-migration. Although the study region is expected to experience growth in population, the rate of change is not expected to be quite as rapid as that of the state (Northeast Florida Regional Planning Council, 1979).

A summary discussion of population, employment and income is presented in the following sections. Additional and supporting details and references are provided in Appendix H, Section H.1.

2.3.1.1 Population Description

As shown in Table 2.3-1, the seven counties which make up the study region had a total population of approximately 781,000 in 1978, an increase of about 18 percent from 1970. Regional population is expected to increase to approximately 1,175,000 residents by the year 2000. In 1978, the counties within the region varied in size from Duval County's population of about 584,000 to Flagler County's population of approximately 8,400. Although Duval County is by far the most densely populated county in the

region, Clay County experienced the most rapid growth between 1968 and 1978, attaining an annual growth rate of about 12 percent. During the same period, Duval County experienced an average annual growth rate of only approximately 1 percent (Northeast Florida Regional Planning Council, 1979).

The estimated total population within a 5-mile radius of the proposed site is 20,800. The estimated current population density within a 5-mile radius of the site is shown in Figure 2.3-1. The most densely populated areas within five miles of the proposed site are south of the St. Johns River. The majority of the area within the 5-mile radius is relatively sparsely populated and lies north of the St. Johns River, allowing the river (Figure 2.3-1) to serve as a buffer between the proposed plant and the more densely populated areas.

2.3.1.2 Employment and Income Statistics

As a whole, Florida has a relatively narrow economic base. The state is generally weak in manufacturing, but strong in tourism, trade and services, and construction. The agricultural sector is strong in certain regions of Florida, but is of limited importance to the study region. The construction sector has contributed a great deal of income to the state of Florida, but employment in this sector has fluctuated widely from year to year (Northeast Florida Regional Planning Council, 1979).

Employment

The study region had a total employment level of approximately 221,000 in 1970. By 1978, total employment had reached a level of about 273,000. For 1970 and 1978 (Tables 2.3-2 and 2.3-3), Duval County had the highest concentration of employment in the region. In 1970, employment in Duval County accounted for about 88 percent of total regional employment. By 1978, the level had increased in total numbers, but the county's overall share of regional employment declined to about 83 percent. During this period, every county in the region (excluding Duval) increased its

share of total regional employment by a small percentage with Clay County's share increasing the most. St. Johns and Putnam Counties had the second and third highest levels of employment in the region by 1978. Flagler County had the highest rate of change during the 1970-1978 period, but due to the relatively small employment base in this county, its share of total regional employment in 1978 was only 0.6 percent (Northeast Florida Regional Planning Council, 1979).

The size of the civilian labor force in the study region in 1970 varied from a high of 220,000 in Duval County to a low of about 1,500 in Flagler County. By 1978, the civilian labor force of Duval County had increased to an estimated 232,630. Although the civilian labor force of Flagler County more than doubled by 1978, it was still the lowest in the seven county region. Table 2.3-4 presents the current estimate and projected civilian labor force of the study region for the years 1970-2005 (Northeast Florida Regional Planning Council, 1979).

The national unemployment rate increased from 4.9 percent in 1973 to 8.5 percent in 1975 and dropped to 5.8 percent in 1979 (U.S. Department of Labor, 1980). With the exception of 1973, the unemployment rate for the state of Florida was consistently higher than the national rate during this period. However, the study region had unemployment rates below national levels for the same period (Florida Department of Commerce, 1980). Data presented in Table 2.3-5 indicate the unemployment rate of the study region is tied quite closely to the unemployment rate of Jacksonville/Duval County.

Sector Analysis

The overall economic base of the study region was evaluated based on an analysis of the employment levels within the major industrial and commercial sectors. The sector analysis entailed comparing employment levels of specific employment sectors within the study region to state and

national employment levels for those same employment sectors. In this way, a determination was made as to the importance of a specific employment sector within the overall economy of the study region.

The sectors which comprise the employment base of the study region are as follows: agriculture; construction; manufacturing; transportation, communications, and public utilities; wholesale and retail trade; finance, insurance and real estate; service; and government. Each of these sectors is briefly characterized below.

Agriculture

Agricultural employment does not constitute a large percentage of the study region's total employment. This sector's share of total regional employment only increased from 0.3 percent in 1970 to 1 percent in 1978. This increase was due primarily to fisheries and forestry. Employment in production agriculture (crops and livestock) has declined steadily from 1970 to 1978.

Construction

Construction's share of total employment declined within the study region, state and nation during the period 1970 to 1978, although a growth in total numbers was displayed during this period. In 1970, 6.7 percent of the regional employment was construction. This sector's share of regional employment declined to 5.5 percent by 1978.

Manufacturing

Although Florida is generally weak in manufacturing when compared to national levels, manufacturing is one of the more dominant employment sectors within the study region. This sector comprised 14.8 percent of

total regional employment in 1970 and 12.7 percent in 1978. Manufacturing in the study region is concentrated in four industries: food and kindred products, fabricated metal, paper and allied products, and printing and publishing.

Transportation, Communication, and Public Utilities

Transportation, communication and public utilities (TCPU) employment trends for the period 1970 to 1978 reflect those shown by the construction sector. The TCPU sector's share of total regional employment declined from 7.1 to 6.4 percent over the period 1970 to 1978.

Wholesale and Retail Trade

The wholesale and retail trade sector is the most dominant employment sector in the region. It comprised 27.1 percent of total regional employment in 1970. A slight decrease of 1 percent occurred over the period of 1970 to 1978, although this sector's share was still above the national level.

Finance, Insurance, and Real Estate

Finance, insurance, and real estate (FIRE) accounted for 9.9 percent of the total regional employment in 1978. This share is above the national level of 5.2 percent, which is indicative of the importance of the FIRE sector to the regional economy.

Services

The services sector accounted for 17.5 percent of the regional employment in 1978. This share reflects a 1.5 percent increase from 1970. The national service sector employment exhibited a very similar pattern over the same period.

Government

Regional government accounted for 20.9 percent of the total regional employment in 1978. This reflects a modest increase of 2.0 percent from 1970 to 1978.

Basic/Non-Basic Sector Analysis

The purpose of this analysis is to identify the basic and non-basic employment sectors within the regional economy, along with the multiplier effects which occur as a result of an increase in basic employment.

For purposes of this analysis, basic industries are defined as those industries having the potential for generating revenue from sources outside the study region as well as within the study region. That is, the particular employment sector is capable of producing more goods or providing more services than can be consumed within the study region. Therefore, the excess goods and/or services are marketed outside the study region. Non-basic industries are defined as those industries producing goods and/or services for local (within the study region) consumption only. There are also certain employment sectors, such as government (local, state and federal), which are not traditionally classified as basic. However, these employment sectors (i.e., government) often exhibit exogenous revenue generating properties (state and/or federal grants and assistance programs) and are therefore classified as basic employment.

Basic and non-basic employment levels were determined through the use of location quotients. A location quotient is the ratio of an industry's share of total local (study region) employment to the industry's share of total national employment. If the location quotient for an industry is greater than one, the industry is classified as basic. If the location quotient for an industry is less than one, the industry is classified as

non-basic. Table 2.3-6 illustrates the levels of basic and non-basic employment within the study region for 1978. These employment levels represent very broad employment divisions. In 1978, the region had a total employment base of approximately 273,000. Of this total, about 187,800 were engaged in basic employment and 85,700 were involved in non-basic employment.

For more refined analysis the multiplier effect involved in the study region is 1.879 based upon a detailed sector analysis (U.S. Army Corps of Engineers, 1980). This means for every one, new, basic job in the region, there will be approximately 1.879 additional non-basic (indirect and income induced) jobs generated, over a period of time, in support of that basic job.

Examination of the data presented in Table 2.3-6 reveals a basic employment sector quite different than might be expected. As mentioned earlier, Florida and the study region have a relatively narrow economic base when compared to national levels. In general, the state is weak in manufacturing, but strong in tourism and related services, trade, construction, and general service functions such as finance, insurance and real estate. Although the study region is represented by a diverse array of manufacturing firms, this employment sector does not exhibit as strong an influence in the overall economic base of the Jacksonville area as it does in many other cities of similar size. Employment in the study region is dominated by wholesale and retail trade and tourism and service oriented positions.

Income

The study region had a total personal income level of approximately \$1.9 billion in 1970 (Table 2.3-7). By 1978, total personal income had reached an estimated \$3.7 billion, as presented in Table 2.3-8. Duval County accounted for approximately 87 percent of regional personal income in 1970 and 86 percent in 1978. Government, wholesale and retail trade,

and services were the primary contributing sectors, accounting for about 67 percent and 61 percent of personal income in Duval County in 1970 and 1978, respectively. It is projected that the study region will have a total personal income level of approximately \$5.1 billion by 1985 (Northeast Florida Regional Planning Council, 1979).

Duval County also had the highest per capita income in the study region. County per capita income for 1970 was \$2,853 and increased to \$6,560 by 1978. Although per capita income increased in every county in the region from 1970 to 1978, each county was still below the national average by 1978 (see Appendix H).

2.3.2 Public Services, Housing and Infrastructure Profile

This section provides a summary discussion of the public service, housing and infrastructure profile within Jacksonville/Duval County. Chapter 7 and Appendix H, Section H.1 provide additional and supporting details and references.

2.3.2.1 Public Service

Results of the Ebasco/Envirosphere Construction Worker Model indicated that any major population increases caused by the proposed plant would be in Jacksonville/Duval County. Therefore, only the current (1980) public services and capabilities of specific public services provided by Jacksonville/Duval County are presented. Table 2.3-9 illustrates the service functions examined, the governmental jurisdiction of each service function and the desired service standard for each.

The general administrative service function for the City of Jacksonville needs an additional 122 employees to meet the demand for these services, based on U.S. Department of Commerce standards (U.S. Department of Commerce, 1978). The police and fire protection components of the public safety service function currently (1980) have adequate capacity to

meet public demand and are currently operating within the standards for a city the size of Jacksonville. All three components, sewage, water, and sanitation, of the public works service function for the City of Jacksonville are operating with excess capacity. The public health service function of Jacksonville/Duval County is deficient in number of personnel. Recreation, primarily city and community parks, is as with most metropolitan areas deficient. The library service function of Jacksonville/Duval County is currently operating at a deficit in terms of total book holdings. Other items such as audio visual aids, etc., are adequate to meet current demand. The public school system of Jacksonville/Duval County is currently able to accommodate an extra 4,400 pupils. Duval County also has approximately 60 private and parochial schools throughout the county. Five colleges and/or universities and four trade or technical schools are located within the Jacksonville area.

2.3.2.2 Private Services and Facilities

The current (1980) status of two non-public services, hospitals and housing, in Jacksonville/Duval County, was evaluated. At present (1980), both the hospitals facilities and number of housing units are capable of meeting resident demand. Hospitals in Jacksonville are currently operating at approximately 73 percent capacity (Health Systems Agency of Northeast Florida, 1980). Based on estimates by the Jacksonville Area Planning Board (1978), there are approximately 11,000 housing units currently vacant in Jacksonville.

2.3.2.3 Transportation Facilities

Transportation systems of importance to the study region are highways, airports and ship facilities. Major highways include Interstates 10 and 95, and U.S. Highways 1, 17, 23 and 90. Major airports include Jacksonville International Airport, Craig Airport, Herlong Airport, and the

Mayport Naval Air Field. Major port facilities include Blount Island and the Talleyrand Docks and Terminals. Locations of these facilities are identified on Figure 2.3-2.

Roads expected to provide access to the proposed site are Heckscher Drive, New Berlin Road, Eastport Road, and Main Street (Figure 2.3-3). Since current highway department traffic counts for these roads are not available, traffic counts were made during the pre-operational monitoring program. Manual turning movement counts were also performed at the intersections of Main Street - Heckscher Drive, Heckscher Drive - Eastport Road, and Eastport Road - Main Street. From this information, average daily traffic and peak hour traffic were calculated for those points and compared to the existing capacity.

Figure 2.3-3 indicates the locations at which the traffic counts were taken. These counts varied from several hours to several days in order to validate the turning movement counts and also to give a good estimate of the average daily traffic on these facilities. Table 2.3-10 shows an hourly tabulation of the average daily traffic for the four streets surveyed. Four hour manual counts were made at the intersections to determine the turning movements during the peak hours. Results of these counts are presented in Appendix H, Figures H-3, H-4, H-5 and H-6.

Traffic counts indicate that, under existing conditions, all signalized locations and roadways are operating at level of service C with additional capacity available. Level of service C is defined as stable traffic flow where most drivers are restricted in selecting their speed, but where all stopped traffic will clear a signalized intersection. The intersection of the I-95 spur to Heckscher Road and its intersection with Heckscher Drive going toward Main Street is, however, presently creating some congestion during peak periods.

2.3.3 References

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Table 2.3-1

REGIONAL POPULATION ESTIMATES AND PROJECTIONS, 1970-2020

<u>County</u>	<u>1970</u>	<u>1978</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2010</u>	<u>2020</u>
Baker	9,242	13,045	14,200	16,800	19,100	21,100	23,200	27,700	32,200
Clay	32,059	54,339	61,100	76,600	87,000	96,200	105,300	127,400	149,500
Duval	528,865	584,252	630,600	680,000	726,000	772,600	817,000	897,500	978,400
Flagler	4,454	8,405	9,600	12,400	14,000	15,500	17,000	20,700	24,400
Nassau	20,626	31,686	35,000	42,700	48,500	53,700	58,800	69,500	81,000
Putnam	36,424	45,045	47,700	53,700	60,900	67,400	73,800	86,850	99,900
St. Johns	31,035	44,550	48,700	58,100	65,900	72,900	79,800	95,350	110,900
Total	662,705	781,322	846,900	940,300	1,021,400	1,099,400	1,174,900	1,325,000	1,476,300

Source: Northeast Florida Regional Planning Council, 1979; Ebasco/Envirosphere Company

Table 2.3-2
REGIONAL EMPLOYMENT BY PLACE OF EMPLOYMENT, 1970

Sector	County							Total
	Baker	Clay	Duval	Flagler	Nassau	Putnam	St. Johns	
Agriculture	49	14	592	1	54	33	1	742 (.003)
Mining	-	-	-	-	-	-	-	-
Construction	1	153	13,219	16	683	282	378	14,731 (.067)
Manufacturing	138	625	25,036	124	2,273	3,231	1,148	32,575 (.148)
TCPU	37	1	15,008	1	78	309	267	15,699 (.071)
W/R Trade	337	830	54,369	108	997	1,625	1,710	59,976 (.271)
FIRE	1	172	19,402	22	68	198	232	20,094 (.091)
Services	28	672	31,575	149	308	679	1,980	35,391 (.160)
Government	1,120	1,360	34,200	200	1,440	1,700	1,700	41,720 (.189)
Total	1,709 (.008)	3,826 (.017)	193,401 (.875)	619 (.003)	5,901 (.027)	8,057 (.036)	7,415 (.034)	220,928 (1.000)

Notes: 1. Numbers in parenthesis represent proportions of the total and may not total 1.000 due to rounding.

2. Definitions - TCPU is for Transportation, Communication and Public Utilities
 - W/R Trade is for Wholesale and Retail Trade
 - FIRE is for Finance, Insurance and Real Estate
 - "1" signifies no data available

Source: Northeast Florida Regional Planning Council, 1979

Table 2.3-3
REGIONAL EMPLOYMENT BY PLACE OF EMPLOYMENT, 1978

Sector	County							Total
	Baker	Clay	Duval	Flagler	Nassau	Putnam	St. Johns	
Agriculture	182	I	1,890	I	194	273	288	2,827 (.010)
Mining	-	-	-	-	-	-	-	-
Construction	34	610	12,607	96	224	969	515	15,055 (.055)
Manufacturing	174	696	26,260	164	2,505	3,234	1,893	34,926 (.127)
TCPU	50	534	16,087	90	123	277	205	17,366 (.064)
W/R Trade	330	3,226	60,541	271	1,310	2,310	3,262	71,250 (.261)
FIRE	56	524	25,222	131	319	321	445	27,018 (.099)
Services	70	1,985	40,374	502	515	1,178	3,272	47,896 (.175)
Government	1,780	2,676	44,136	464	2,321	2,978	2,743	57,098 (.209)
Total	2,676 (.010)	10,251 (.037)	227,117 (.831)	1,718 (.006)	7,511 (.028)	11,540 (.042)	12,623 (.046)	273,436 (1.000)

Notes: 1. Numbers in parenthesis represent proportions of the total and may not total 1.000 due to rounding.

2. Definitions - TCPU is for Transportation, Communication and Public Utilities
 - W/R Trade is for Wholesale and Retail Trade
 - FIRE is for Finance, Insurance and Real Estate
 - "I" signifies no data available

Source: Northeast Florida Regional Planning Council, 1979

Table 2.3-4

REGIONAL CIVILIAN LABOR FORCE: BY PLACE OF RESIDENCE, 1970-2005

<u>Year</u>	<u>Baker</u>	<u>Clay</u>	<u>Duval</u>	<u>County</u>			<u>St. Johns</u>	<u>Total</u>
				<u>Flagler</u>	<u>Nassau</u>	<u>Putnam</u>		
1970	3,092	9,531	220,070	1,470	7,143	13,091	11,058	265,455
1978	5,220	21,540	232,630	3,450	12,500	16,590	15,620	307,550
1980	5,950	25,520	254,060	4,290	14,050	17,260	18,120	339,250
1985	7,590	34,030	275,910	6,020	17,640	19,930	22,450	383,570
1990	9,050	39,700	296,250	7,010	20,550	23,130	26,390	422,080
1995	10,300	44,750	316,880	7,910	22,770	25,955	29,310	457,875
2000	11,630	49,740	336,530	8,840	25,150	28,820	32,490	493,200
2005	12,660	53,850	356,753	9,580	27,090	31,210	35,120	526,263

Source: Northeast Florida Regional Planning Council, 1979.

Table 2.3-5
REGIONAL, STATE AND NATIONAL UNEMPLOYMENT TRENDS, 1973-1979

<u>Area</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
National	4.9	5.6	8.5	7.7	7.0	6.0	5.8
Florida	4.3	6.2	10.7	9.0	8.2	6.6	6.0
Region - 7 Counties	4.8	5.1	6.7	6.3	6.8	6.1	5.7
Baker	3.0	3.9	6.3	5.7	5.4	5.1	3.7
Clay	3.7	3.6	5.1	4.4	4.2	4.7	4.3
Duval	4.9	5.0	6.6	6.4	6.9	6.1	5.6
Flagler	2.0	5.9	8.8	9.1	7.9	5.8	5.5
Nassau	3.9	3.6	5.9	5.4	6.0	5.6	5.3
Putnam	3.3	6.2	8.1	6.7	8.4	7.1	7.6
St. Johns	6.9	8.1	9.6	7.0	8.8	7.7	7.4

Source: U.S. Department of Labor, 1980

Table 2.3-6
BASIC AND NON-BASIC EMPLOYMENT IN THE STUDY REGION^a, 1978

<u>Employment Division</u>	<u>Basic Employment</u>	<u>Non-Basic Employment</u>
Agriculture	-	2827
Mining	-	-
Construction	15,055	-
Manufacturing		34,926
TCPU	17,366	-
W/R Trade	71,250	-
FIRE	27,017	-
Services	-	47,896
Government	<u>57,098</u>	<u> </u>
Total	187,787	85,649

^a Baker, Clay, Duval, Flagler, Nassau, Putnam and St. Johns Counties

Notes: 1. The identification of basic/non-basic employment was done with the use of location quotients.

2. Definitions - TCPU is for Transportation, Communication and Public Utilities

- W/R Trade is for Wholesale and Retail Trade

- FIRE is for Finance, Insurance and Real Estate

Source: Northeast Florida Regional Planning Council, 1979.

Table 2.3-7
TOTAL PERSONAL INCOME (\$000) EARNED BY INDUSTRY IN THE STUDY REGION, 1970-1985
CURRENT \$

Year	Industry							Total
	Manufac- turing	Construc- tion	W/R Trade	FIRE	TCPU	Services	Agricul- ture	Govern- ment
1970	264,480 (.141)	16,647 ^b (.009)	398,773 (.213)	170,485 ^a (.091)	174,940 (.093)	276,219 (.147)	21,750 (.012)	553,433 (.295)
1978	451,500 (.122)	291,200 (.078)	711,100 (.192)	349,200 (.094)	331,700 (.089)	602,700 (.162)	54,600 (.015)	920,300 (.248)
1980	493,400 (.120)	325,100 (.079)	781,300 (.190)	388,300 (.094)	366,200 (.089)	674,400 (.164)	60,800 (.015)	1,032,500 (.250)
1985	598,000 (.116)	409,600 (.080)	952,900 (.185)	486,300 (.095)	452,300 (.088)	853,600 (.166)	76,400 (.015)	1,313,300 (.255)
								5,142,400 (1.000)

a signifies no data were disclosed for this sector in Duval County for this year.

b signifies no data were disclosed for this sector in Clay County for this year

Notes: 1. Numbers in parenthesis represent proportions of the total and may not equal totals exactly due to rounding.

2. Definitions - TCPU is for Transportation, Communication and Public Utilities

- W/R Trade is for Wholesale and Retail Trade

- FIRE is for Finance, Insurance and Real Estate

Source: Northeast Florida Regional Planning Council, 1979

Table 2.3-8
TOTAL PERSONAL INCOME IN THE STUDY REGION, 1970-1978
CURRENT \$

County	Total Personal Income 1970 (\$000)	% Total	Total Personal Income 1978 (\$000)	% Total	% Change 1970-1978
Baker	\$ 11,410	.61	\$ 35,300	.95	+209
Clay	40,022	2.31	92,300	2.49	+130
Duval	1,626,849	86.69	3,199,300	86.18	+ 97
Flagler	7,685	.41	20,100	.54	+162
Nassau	56,615	3.02	108,600	2.93	+ 92
Putnam	71,035	3.79	122,900	3.31	+ 73
St. Johns	63,111	3.36	133,800	3.60	+112

Source: Northeast Florida Regional Planning Council, 1979

Table 2.3-9
SERVICE STANDARDS UTILIZED TO DETERMINE THE IMMIGRANT
INDUCED DEMAND FOR PUBLIC SERVICES

<u>Service Function</u>	<u>Jurisdiction</u>	<u>Standard Utilized</u>	<u>Source</u>
<u>General Administration</u> Financial Administration General Control	City/County City/County	.0005 Full Time Employees/Person .0013 Full Time Employees/Person	U.S. Dept. of Commerce, 1978 U.S. Dept. of Commerce, 1979
<u>Public Safety</u> Police Fire	City/County City/County	.0021 Full Time Employees/Person 1 Engine - 2 Mile Service Radius 1 Ladder - 4 Mile Service Radius 500-1500 gpm Pumping Capacity	U.S. Dept. of Commerce, 1978 Insurance Service Office, 1974 American Insurance Association, 1975
<u>Public Works</u> Sewage	City/County	Resident Demand - 80.44 Gallons/Person/Day Includes Residential, Commercial and Industrial Usage	Jacksonville/Duval County Dept. of Public Works, 1979
		Immigrant Demand - 1975-1984; 23.91 Gallons/Person/Day 1985-1999; 24.96 Gallons/Person/Day 2000+; 26.02 Gallons/Person/Day Includes Residential Usage Only	Water Resources Council, 1978
Water	City/County	Resident Demand - 90.62 Gallons/Person/Day Includes Residential, Commercial and Industrial Usage	Jacksonville/Duval County Dept. of Public Works, 1979
		Immigrant Demand - 1975-1984; 33.63 Gallons/Person/Day 1985-1999; 35.11 Gallons/Person/Day 2000+; 36.59 Gallons/Person/Day Includes Residential Usage Only	U.S. Water Resources Council, 1978

Table 2.3-9 (Continued)
SERVICE STANDARDS UTILIZED TO DETERMINE THE IMMIGRANT
INDUCED DEMAND FOR PUBLIC SERVICES

<u>Service Function</u>	<u>Jurisdiction</u>	<u>Standard Utilized</u>	<u>Source</u>
Sanitation	City/County	Resident Demand - 1.37 Pounds/Person/Day	Jacksonville/Duval County Dept. of Public Works, 1979
		Immigrant Demand - 2.44 Pounds/Person/Day	U.S. Environmental Protection Agency, 1980
<u>Health and Welfare</u> <u>Public Health</u>	City/County	.0012 Health Personnel/Person	U.S. Dept. of Commerce, 1978
<u>Recreation/Library</u> <u>Parks</u>	City/County	2.5 Acre/1,000 Population	Jacksonville Area Planning Board, 1979
Library	City/County	2.5 Books/Person 1 Film/1,000 Population 1 Record/50 Population 1 Periodical/250 Population under 250,000 and 1 Periodical/500 Population over 250,000	Florida Library Association, 1974
<u>Education</u>			
Elementary (Grades K-6)	City/County	22.4:1 Student/Teacher Ratio	Jacksonville/Duval County
Middle (Grades 7-9)	City/County	24.1:1 Student/Teacher Ratio	School Board, 1980
High (Grades 10-12)	City/County	18.4:1 Student/Teacher Ratio	

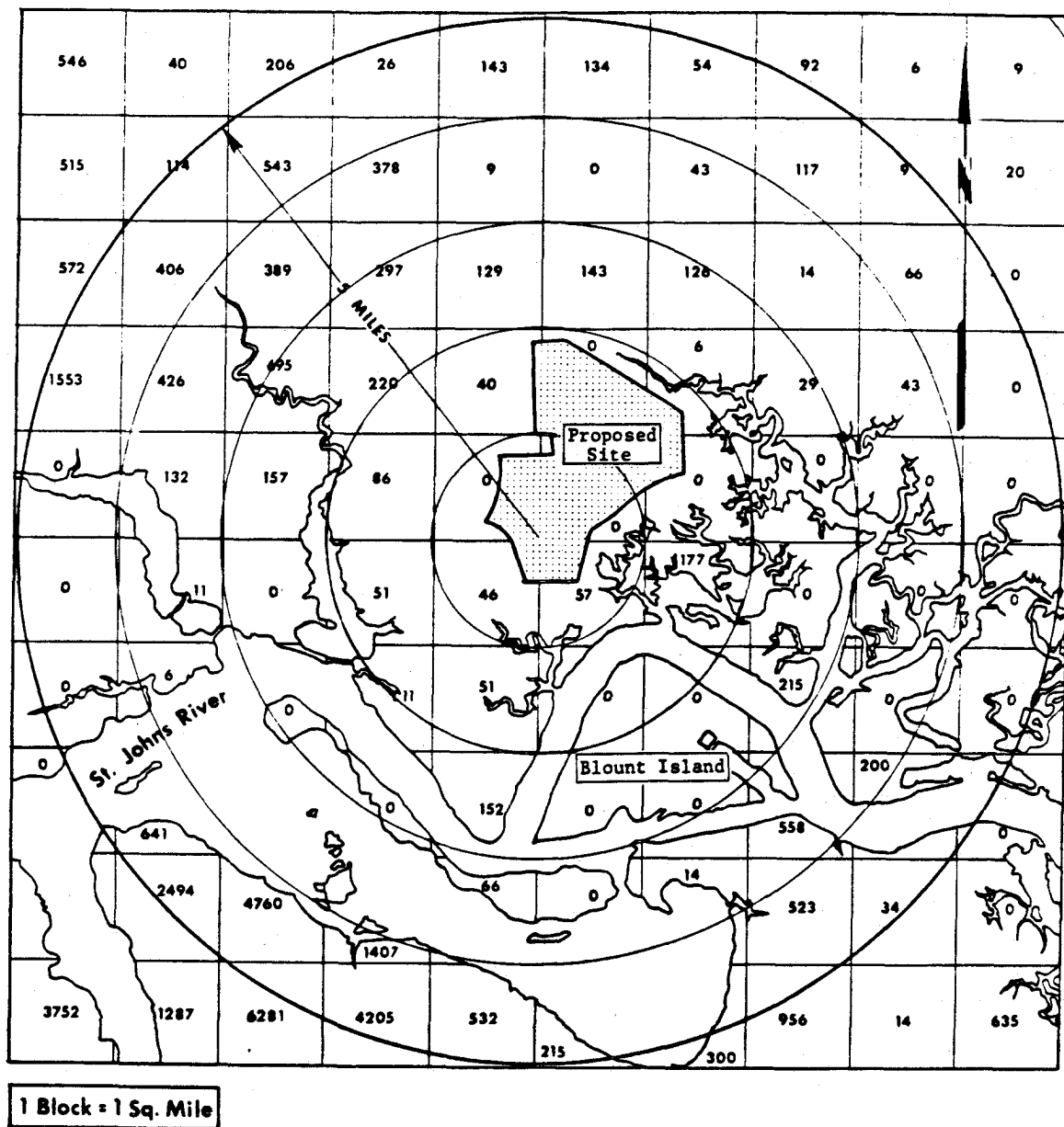
Note: Resident demand reflects current local conditions. Immigrant demand reflects national averages and projections.

Table 2.3-10

1980 AVERAGE DAILY TRAFFIC, BY HOUR, ON ROADS PROVIDING
ACCESS TO THE PROPOSED SITE

	<u>Heckscher Drive</u>	<u>New Berlin Road</u>	<u>Eastport Road</u>	<u>Main Street</u>
6-7 a.m.	602	61	615	1,041
7-8	825	119	567	1,386
8-9	544	63	405	839
9-10	591	85	403	813
10-11	665	127	369	856
11-12	642	112	412	827
12-1 p.m.	633	91	394	909
1-2	626	100	416	950
2-3	791	102	495	1,059
3-4	741	120	528	1,261
4-5	810	159	565	1,292
5-6	708	130	515	1,228
6-7	451	89	400	868
7-8	271	69	282	696
8-9	267	51	266	542
9-10	243	47	216	519
10-11	278	38	228	244
11-12	168	15	136	318
12-1 a.m.	120	16	115	234
1-2	60	4	63	99
2-3	44	7	36	98
3-4	55	6	41	59
4-5	46	10	47	81
5-6	<u>84</u>	<u>15</u>	<u>77</u>	<u>227</u>
TOTAL (ADT)	10,265	1,636	7,591	16,446

Source: Harland Bartholomew and Associates, 1980



NOTE: 5-Mile radius centered on proposed plant stack location
 SOURCE: Aerial Photography 1980
 Jacksonville Area Planning Board, 1978

Figure 2.3-1 Estimated Population Density Within 5 Miles of the Proposed Site

Figure 2.3-2 Major Transportation Facilities in the Jacksonville Area

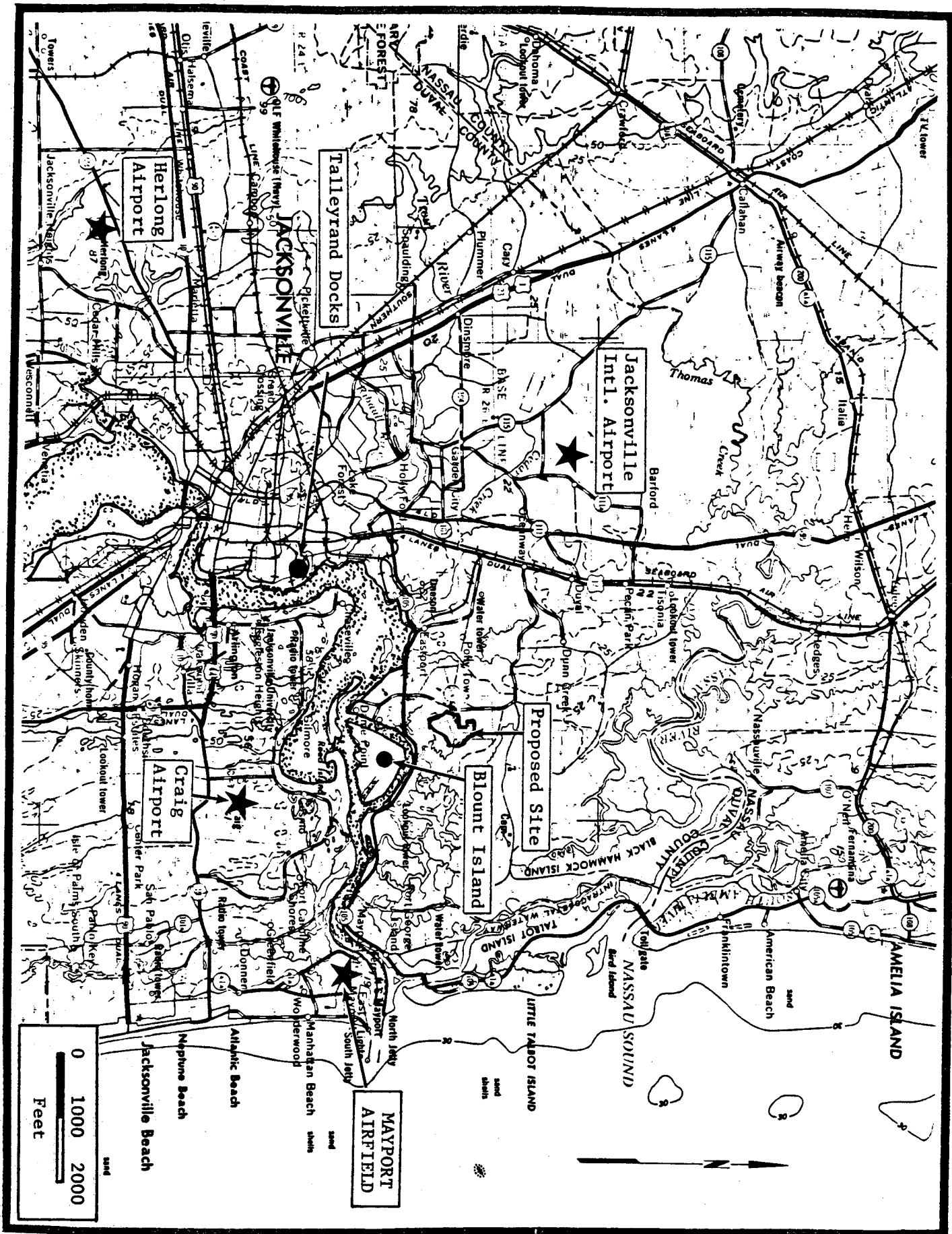
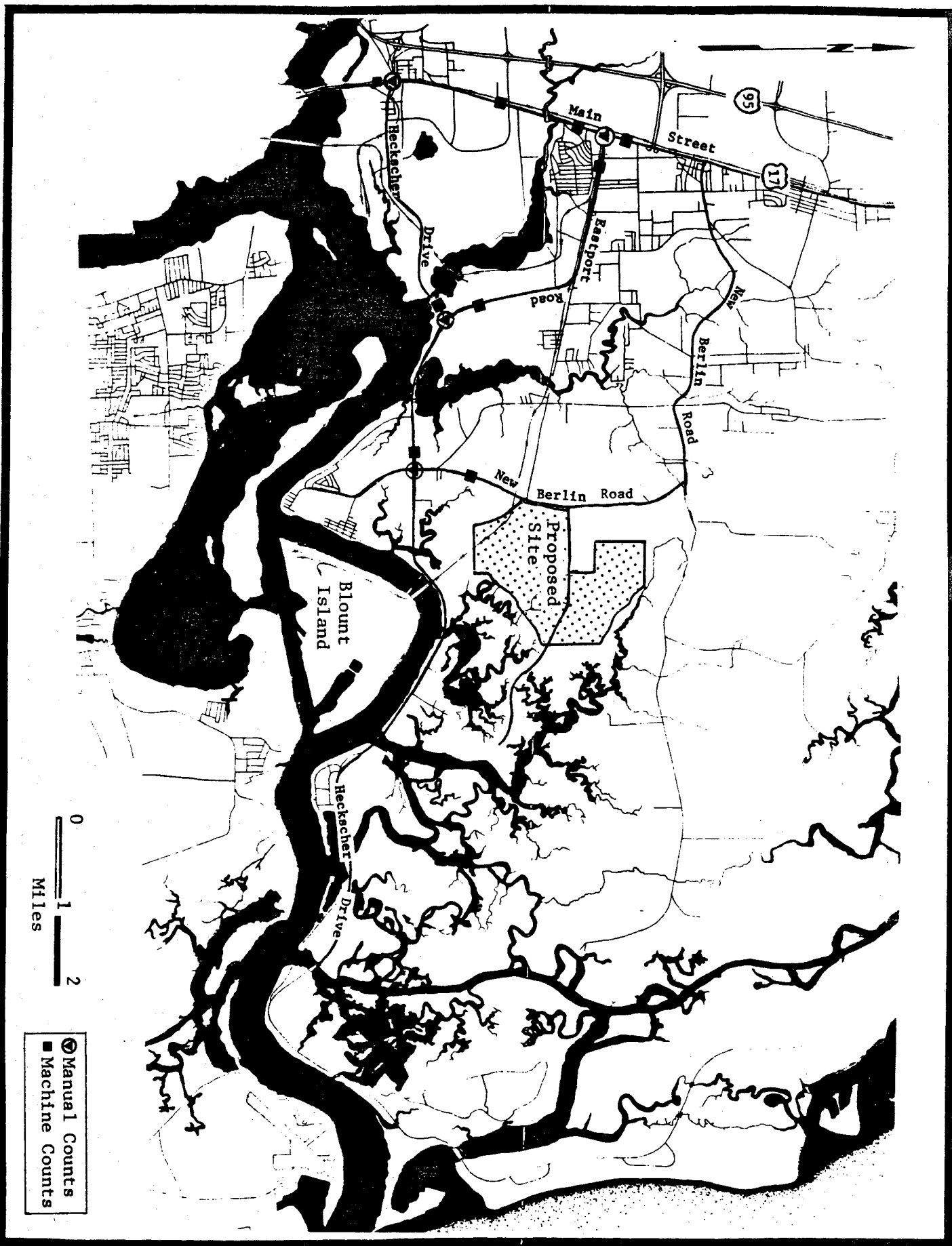


Figure 2.3-3
 Primary Access Routes to the Proposed Site and Traffic Count
 Survey Locations



2.4 GEOLOGY AND SOILS

2.4.1 Physiography

Florida can be divided into three major transpeninsular physiographic zones: the Northern or Proximal Zone, the Central or Mid-Peninsular Zone, and the Southern or Distal Zone (Appendix E, Figure E-1). The proposed site is located within the Northern or Proximal Zone, an area typified by continuous high ground.

Major physiographic divisions within the St. Johns River watershed are shown in Figure 2.4-1. The proposed site lies within this region, in a transitional zone between the northern end of the Eastern Valley and the southern edge of the St. Mary's meander plain. The St. Johns River, which occupies the entire length of the valley, flows eastward along the southern boundary of the site area toward the Atlantic Ocean. The St. Johns River, where it passes the proposed site, is a broad estuary subject to tidal fluctuations.

The topography of the area is controlled by a series of marine terraces which have been modified by fluvial processes. The extent of the marine terrace deposits in the site vicinity is illustrated in Figure 2.4-2. The proposed site ranges in elevation from 5 to 28 feet above mean sea level (MSL). The northwestern part of the property, lying at elevations generally greater than 10 feet above MSL, is underlain by the Pamlico Marine Terrace. Those portions of the property lying at elevations less than about 10 feet MSL are underlain by the Silver Bluff Marine Terrace (Figure 2.4-2). Most of the area below the 10-foot contour along the southeastern edge of the site property is wetlands bordering the St. Johns River. Another large wet area occurs in the northwestern corner of the site. An elliptical hill, rising to a height of 28 feet above MSL, occurs adjacent to the river in the southeastern part of the site. This may be a remnant of an ancient beach ridge or sand dune.

Additional discussion of regional and site physiography may be found in Appendix E.

2.4.2 Regional Geology

Peninsular Florida is part of the Eastern Gulf Coast sedimentary basin. The dominant structural feature of Florida is the Peninsular Arch which is underlain by Paleozoic sandstones and shales in northern peninsular Florida and igneous, metamorphic and metavolcanic rocks to the south (Applin, 1951). Figure 2.4-3 is a generalized regional geological map of northeast Florida.

A sedimentary province of primarily non-clastic deposition persisted from the end of the Mesozoic Era through the Tertiary. The resultant sedimentary sequence of limestones, dolomites and evaporites ranges in depth from 8,000 feet in northern Florida to 18,000 feet in the south Florida Basin.

The present day land surface is covered with unconsolidated sediments of Pliocene to Recent age. Much of the region's geomorphology is influenced by Pleistocene to Recent marine terraces. A more complete discussion of the regional geologic framework may be found in Appendix E, Geology and Appendix D, Groundwater.

2.4.2.1 Stratigraphy

This study focuses on the Eocene and younger material as they comprise all of the rocks which are encountered at the surface and are penetrated by water wells within the site region. The pre-Eocene stratigraphy is summarized in Appendix E. A summary of Cenozoic stratigraphy is presented in Table 2.4-1.

The shallow marine carbonate deposition, which began in the Cretaceous, continued throughout the Cenozoic Era. Occasional periods of restricted circulation caused precipitation of anhydrite, especially during the Paleocene. Periods of uplift (resulting in regression) caused mud deposition in near-shore environments. Uplift during middle Miocene time caused an influx of terrigenous sediment throughout Florida. Deltaic and lagoonal units were deposited along a southward prograding shoreline. Marine transgression and carbonate deposition resumed in late Miocene time, followed by renewed uplift and erosion in the Pliocene (Rainwater, 1970).

The following discussion of Eocene and younger stratigraphy refers specifically to the area around the site in Duval County.

Eocene

The oldest Eocene formation is the Oldsmar Limestone, a fragmental marine, dolomitic limestone. It underlies all of Duval County and is penetrated by a few water wells in the area. It is overlain by the Lake City Limestone.

The Lake City Limestone of early middle Eocene age is lithologically similar to the Oldsmar Limestone. It consists of alternating beds of limestone and porous dolomite. The Lake City varies in thickness from 425 to greater than 500 feet and lies approximately 800-1000 feet below the surface at Jacksonville (Leve, 1966).

The Lake City Limestone is unconformably overlain by the Avon Park Limestone of late middle Eocene age. The Avon Park Limestone is a predominately cream-colored, chalky, porous limestone interbedded with hard, impermeable dolomitic limestone and dolomite. It ranges in thickness from 50 to 260 feet (Fairchild, 1972) and lies 600 to 800 feet below sea level in northeastern Florida (Chen, 1965).

The Ocala Group of late Eocene age has been subdivided into three formations: the Inglis, Williston and Crystal River (Table 2.4-1). The three formations have similar lithologies and will be treated as a single unit in this report. The Ocala Group is exposed at the surface in the western part of northern Florida. In Duval County, the Ocala Group lies 350 to 600 feet below the surface (Figure 2.4-4). The Ocala Group is characterized by interbedded tan to brown, hard crystalline limestone, dolomitic limestone and soft, white to cream colored, chalky coquina limestone. The upper surface is highly irregular, and sinks, cavities and solution pipes are common in some parts of the Ocala Group. At the proposed site, the top of the Ocala Group is approximately 450 feet below MSL.

Oligocene

Deposits of Oligocene age are absent in the site region although they are present as a relatively thin unit in the western Florida panhandle and in the southern one-half of the peninsula (Applin and Applin, 1944).

Miocene

The Hawthorn Formation, of middle Miocene age, unconformably overlies the Ocala Group. In Duval County, the formation ranges in thickness from 250 to 500 feet with irregular upper and lower surfaces. It lies at depths ranging from 50 to 200 feet below the surface (Fairchild, 1972). At the proposed site, the top of the Hawthorn lies about 90 feet below the surface.

The Hawthorn Formation is characterized by phosphate-bearing dark gray and green sandy to silty clay, clayey sand, clay and sandy limestone. Puri and Vernon (1964) consider the Hawthorn Formation to be a deltaic deposit.

2.4.2.2 Structure

The Peninsular Arch and Ocala Uplift are dominant regional features trending south-southeast from southeastern Georgia into central Florida. Movements associated with the Ocala Uplift led to regional fracturing and the formation of normal dip-slip shear faults such as those shown in Figure 2.4-5. These faults are of interest because they apparently control, in part, the course of the St. Johns River (Pirkle, 1971).

A pair of faults at and next to the proposed site are postulated by Leve (1966 and 1978) to explain large vertical (50 to 200 feet) variations in the surface of the Ocala Limestone of Eocene Age. The vertical anomalies are inferred from geological and geophysical logs of area water wells. The fault traces trend in a general north-south direction, one crossing the site, the other several miles to the west. These two postulated faults are blanketed by about 250 to 600 feet of post Eocene deposits and do not extend to the surface (Figure 2.4-6).

No evidence of faulting was found in the subsurface boring program. In fact, the elevation of the top of the Hawthorn Formation of Miocene age did not vary more than 20 feet vertically in any of the bore holes at the proposed site.

2.4.3 Regional Seismic History

The proposed site is in one of the most seismically stable areas in the United States (see seismic risk map in Figure 2.4-7). All of the earthquakes that have occurred in Florida and Georgia have had a Modified Mercalli (MM) intensity of VI or less and have caused very minor damage. (The Modified Mercalli damage scale is presented as Appendix E, Table E-3.) The closest earthquake to the site was an MM V event near Jacksonville, October 31, 1900 (Appendix E, Figure E-11). An earthquake such as this would be felt at the site. However, damage would be minor and confined to old, unrepaired, poorly built structures. Recent earthquakes

include an intensity MM III to IV near Daytona Beach, on December 4, 1975, and an MM V event near Orlando on October 27, 1973 (Appendix E, Figure E-11). The former had an extremely localized "felt" area and the latter would have had an intensity of MM I at the site area as illustrated in Appendix E, Figure E-12. The strongest earthquake noted to date in Florida occurred near Gainesville in 1879 with MM VI intensity. The "felt" area of this earthquake included Tallahassee; Savannah, Georgia; and Daytona Beach. However, the only damage reported was plaster falls in a few older houses in St. Augustine.

The strongest earthquakes to affect the site region were the 1886 Charleston, South Carolina series of MM intensity IX-X, and the 1811-1812 New Madrid, Missouri series of magnitude XII which are 200 and 650 miles from the site, respectively. Although they each had a felt area of 2 million square miles, the effect of their projected shock waves on the site area was slight. Appendix E, Figure E-13, presents an isoseismal map of the Charleston 1886 earthquake, projects an MM VI shock into the site area. Recent earthquakes in Georgia include an MM VI event northwest of Augusta on August 2, 1974, and an MM V event near Swainsboro, 250 and 150 miles, respectively, from the proposed site.

Another potential source of seismic activity is the Caribbean seismic belt. The strongest earthquakes from this region were located in Cuba, +1000 miles from the site with a maximum intensity of MM VIII, and would not be a threat to the proposed site.

In conclusion, the potential for seismic damage at the proposed site is minimal. Within historically recorded times, the Florida peninsula has been a seismically stable area. All of the earthquakes originating within Florida have been minor, and the major earthquakes outside of Florida have been too distant to induce significant ground motions.

2.4.4 Site Geology

As discussed in Chapter 6, Section 6.2.7, a two phase boring investigation of the proposed site was conducted. Boring locations and results as well as a detailed geologic site characterization are presented in Appendix E.

2.4.4.1 Surficial Deposits

The sediments that overlie the Ocala Group in Duval County range in age from Miocene to Holocene. The Hawthorn Formation of Miocene age lies unconformably upon the Ocala Group. Overlying the Hawthorn Formation are unnamed upper Miocene or Pliocene deposits which are in turn overlain by Pleistocene and Holocene deposits (Leve, 1966). In the site area, the thickness of the sediments overlying the Ocala Group is approximately 470 feet.

The Hawthorn Formation consists mainly of light to medium green-gray sandy silty clay and clayey sand which contain a trace to moderate amounts of black phosphate sand and gravel. In most places, the upper surface of the Hawthorn is marked by the presence of phosphate.

The Hawthorn Formation ranges in thickness from about 250 to 500 feet in Duval County (Leve, 1966). Although the formation generally thickens to the northeast, it varies in thickness locally due to irregular upper and lower surfaces (Fairchild, 1972). Although many of the site borings did penetrate the upper surface of the Hawthorn Formation, no borings were deep enough to penetrate its lower surface at the site. A contour map of the depth of the Hawthorn Formation from MSL (Appendix E, Figure E-15B) shows that the upper surface of the Hawthorn is only slightly irregular. In the site area, the Hawthorn generally occurs at depths of about 85 to 95 feet from the ground surface.

In the site area, the Hawthorn Formation is overlain by about 30 to 45 feet of upper Miocene or Pliocene deposits. These deposits occur at depths of 40 to 65 feet below the ground surface and consist from top to bottom of

an upper tan-gray sandy fossiliferous limestone, a partially cemented sand and shell layer, or sand with some shell, a light gray slightly to partially cemented fine sand with traces of silt, and a lower tan-gray fossiliferous limestone, or partially cemented sand and shell. All of the upper Miocene or Pliocene deposits can be distinguished from the Hawthorn Formation by their tan-gray (limestone) or light gray (cemented sand) color, by their lack of phosphate, and by their high blow counts.

Overlying the upper Miocene or Pliocene site deposits are 40 to 65 feet of uncemented sediments of Pleistocene and Holocene age. According to Fairchild (1972), these sediments were deposited during the formation of marine terraces and beach ridges. The Pleistocene and Holocene deposits in the site area (from top to bottom) consist primarily of yellow-tan or tan-gray very fine to fine-grained quartz sand locally containing thin green-gray silty clay seams or pockets and traces of silt. These deposits have been reworked on Blount Island, resulting in a northward prograding sequence of sand, silt and clay. The finer grained sediments, particularly silts, predominate.

2.4.4.2 Bedrock

The rock formations that immediately underlie the surficial deposits are described in Section 2.4.2.1. These formations are Eocene in age and include from oldest to youngest the Oldsmar Limestone, the Lake City Limestone, the Avon Park Limestone, and the Inglis, Williston, and Crystal River Formations of the Ocala Group (Leve, 1966).

2.4.4.3 Subsurface Soils and Rock Conditions

The subsurface soil conditions at the proposed site were investigated to a depth of 150 feet below the ground surface. Lithified rock was encountered at a depth of approximately 500 feet while drilling a deep water well at the site. The condition of the rock was not evaluated since the depth was considered beyond the influence of the proposed plant construction.

From the ground surface to a depth of approximately 15 to 30 feet, the soil is a very loose to loose fine sand. This sequence is poorly defined on Blount Island where lateral gradational changes are more common. From approximately 15 to 55 feet, the soil is generally a medium dense to dense fine to medium sand. A very dense fine sand layer exists from approximately 55 to 90 feet. The sand in this stratum varies from slightly to totally cemented. Some limestone was also logged in this cemented stratum. Weakly cemented calcareous sands and sandy limestones were encountered between 40 and 70 feet in depth on Blount Island. At approximately 90 feet (both inland and on Blount Island) there is a gradual transition into a strata of fine sand, clay and silt. These soils have been identified as the upper portion of the Hawthorn Formation. Engineering and other properties of soils are discussed in Appendix E.

2.4.5 References

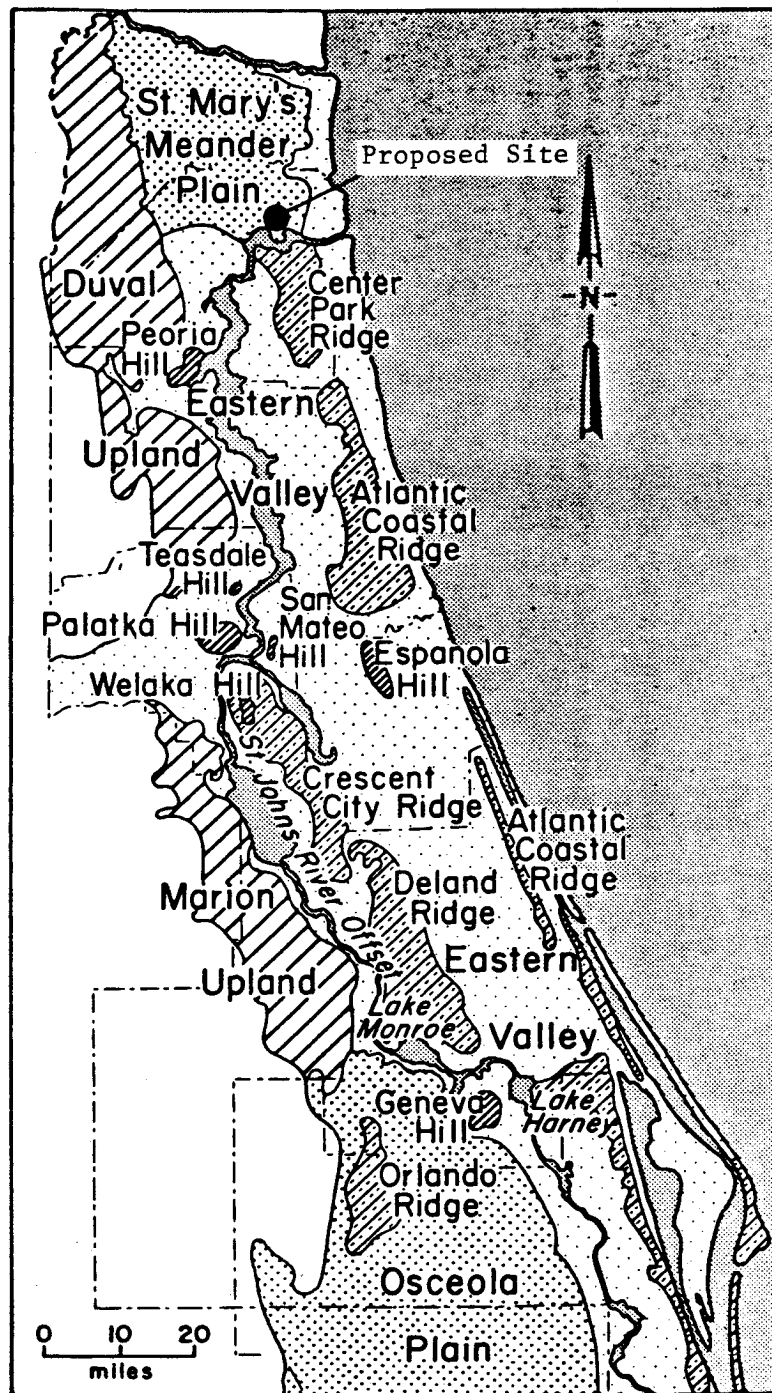
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Table 2.4-1
STRATIGRAPHY OF THE CENOZOIC FORMATIONS
OF DUVAL COUNTY

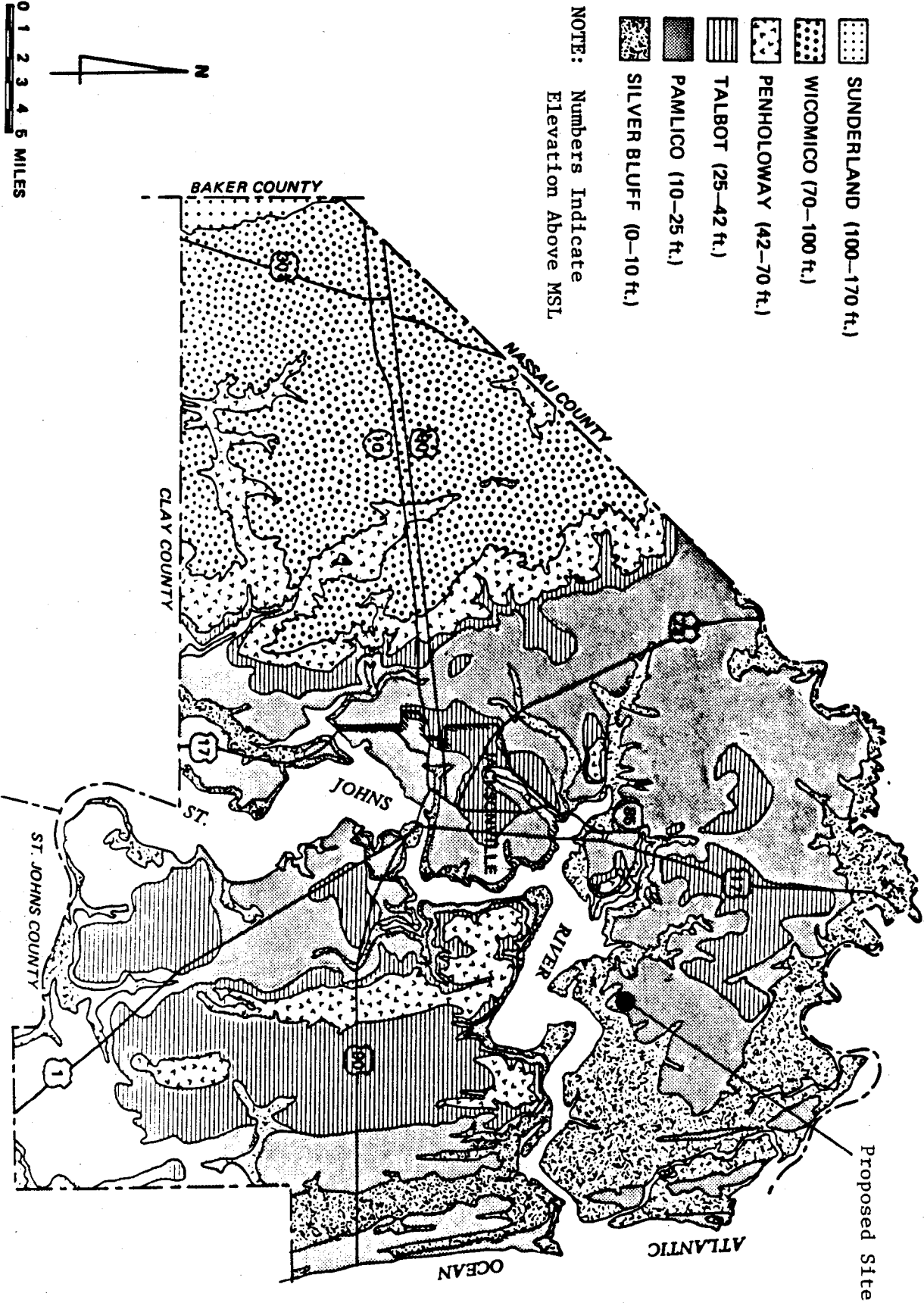
<u>Geologic Age</u>	<u>Stratigraphic Unit</u>	<u>Approximate Thickness (feet)</u>	<u>Lithologic Character</u>
Recent and Pleistocene	Recent and Pleistocene deposits	0-150	Soil, muck, coarse to fine sand, shell, and some clayey sand
Pliocene?	Pliocene or Upper Miocene deposits	20-110	Gray-green calcareous, silty clay and clayey sand; contains shell beds and white soft, friable limestone beds
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
	Ocala Group		
	Crystal River River Formation	50-300	White to cream chalk, massive fossiliferous marine limestone
	Williston Formation	20-100	Tan to buff granular, marine limestone
	Inglis Formation	40-100	Tan to buff granular, calcitic, marine limestone; contains thin dolomite lenses and zones of Miliolidae foraminiferal coquina
Eocene	Avon Park Limestone	50-250	Alternating beds of brown to tan hard, massive dolomite, brown finely crystalline dolomite, and granular calcitic limestone
	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
	Oldsmar Limestone	846	Cream to brown massive to chalky granular limestone and tan to brown massive to finely crystalline dolomite

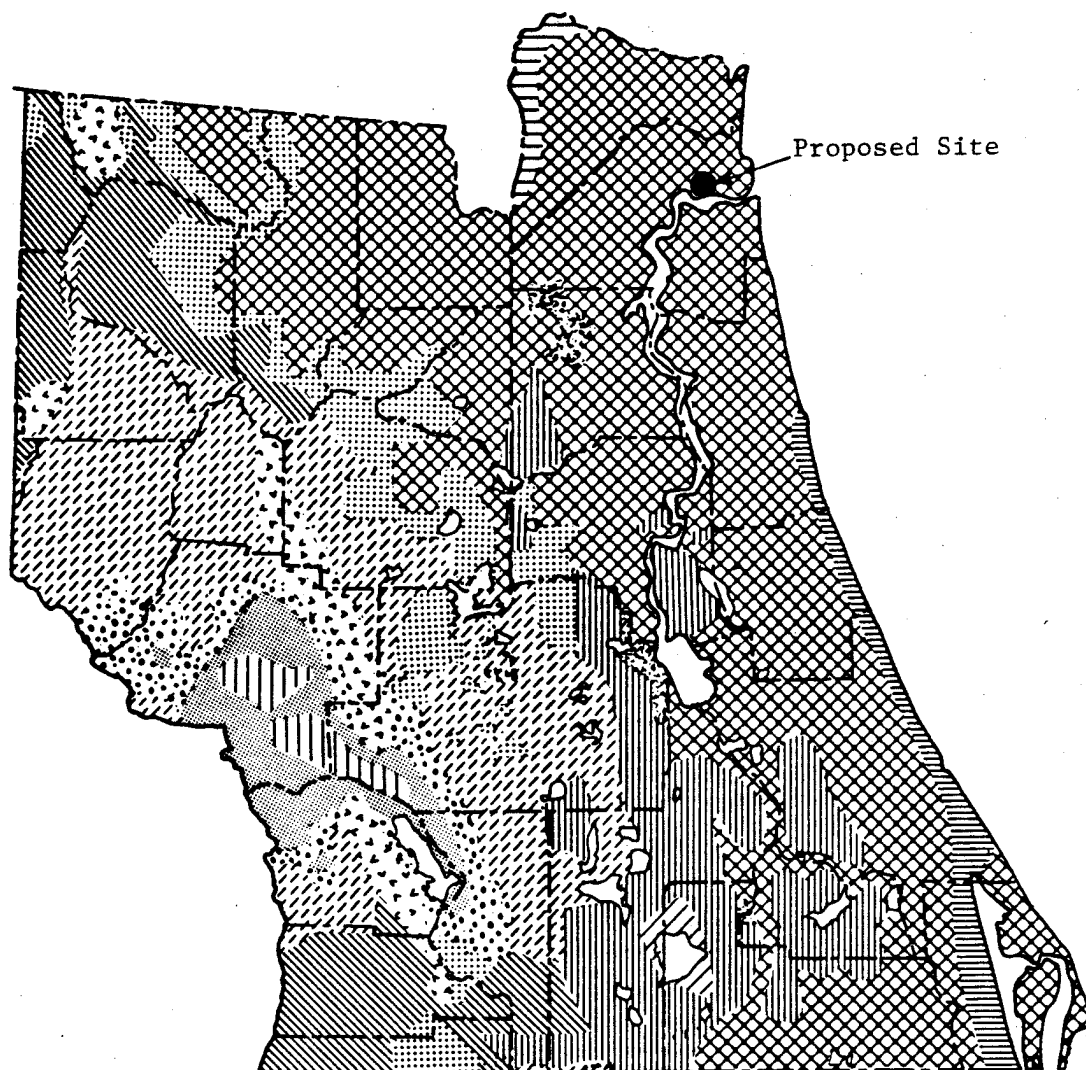


after Pirkle, 1971

Figure 2.4-1 Major Physiographic Features Within the St. Johns Water Management District

Figure 2.4-2 Pleistocene Marine Terraces





0 10 20 30 40 50 MILES

SERIES	STAGE	FORMATION & MEMBER	
RECENT AND PLEISTOCENE		SEVERAL LOWER MARINE AND ESTUARINE TERRACE DEPOSITS	
		LAKE FLIRT MARL	
PLEISTOCENE		ANASTASIA FORMATION	
		FORT THOMPSON FORMATION	
MIOCENE	CHOCTA-WHATCHEE	"CHARLTON" FORMATION	
		JACKSON BLUFF FORMATION	
		ALACHUA FORMATION	
		FORT PRESTON FORMATION	
		HAWTHORN FORMATION	
OLIGOCENE		SUWANNEE LIMESTONE	
EOCENE	JACKSON	OCALA GROUP CRYSTAL RIVER FM.	
		WILLISTON FM.	
		INGLIS FM.	
	CLAIBORNE	AVON PARK LIMESTONE	

after Puri & Vernon, 1964

Figure 2.4-3 Generalized Regional Geologic Map

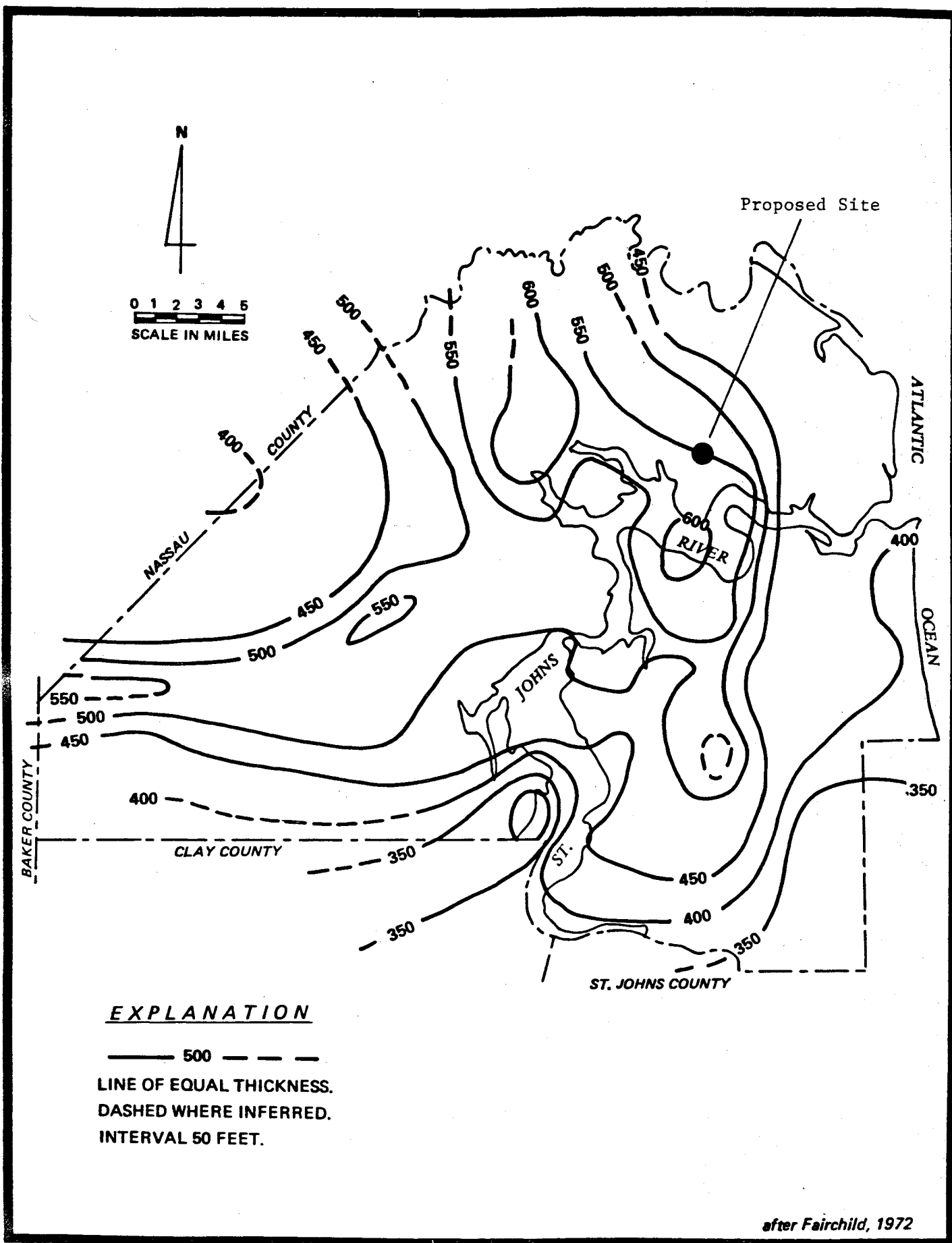
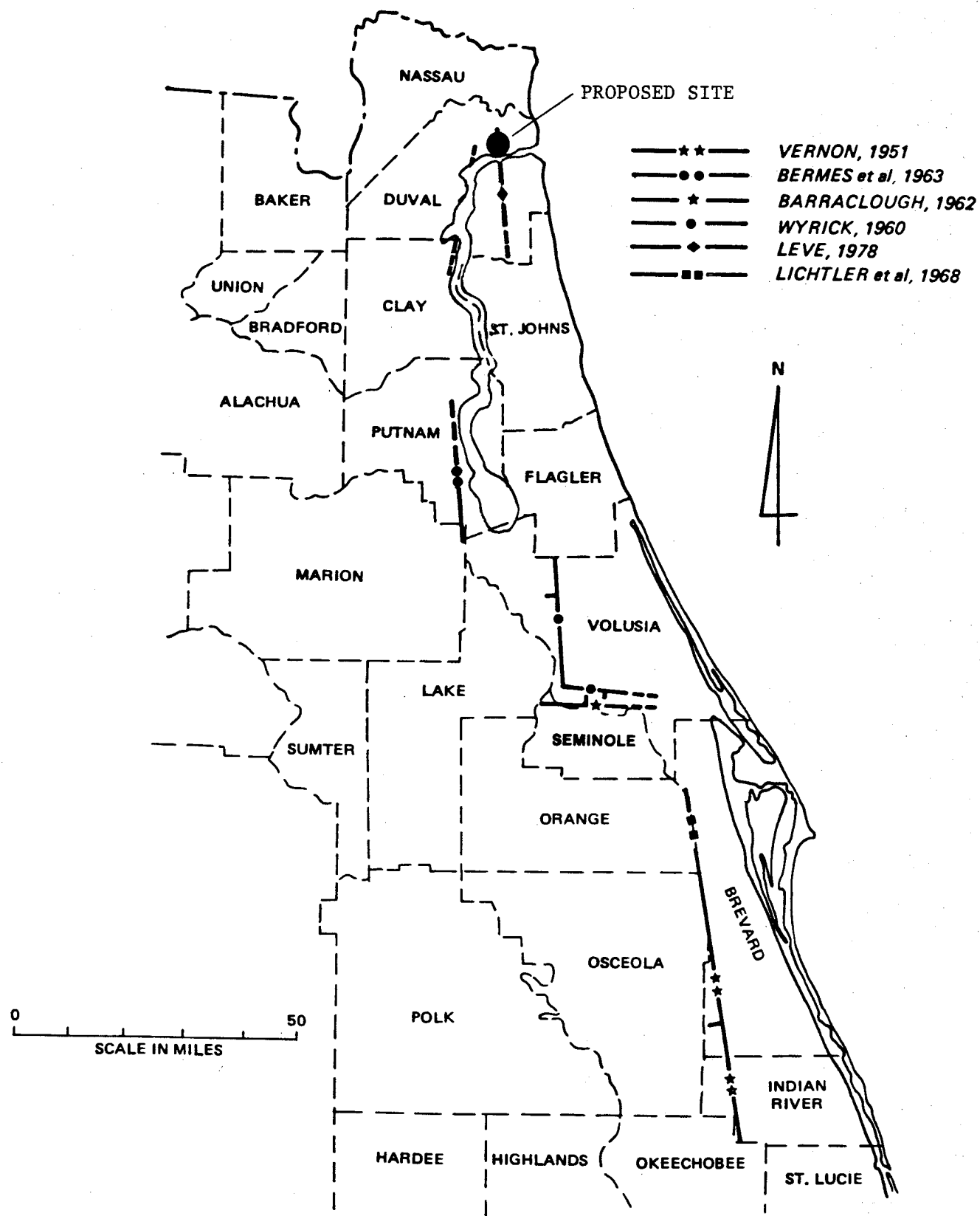
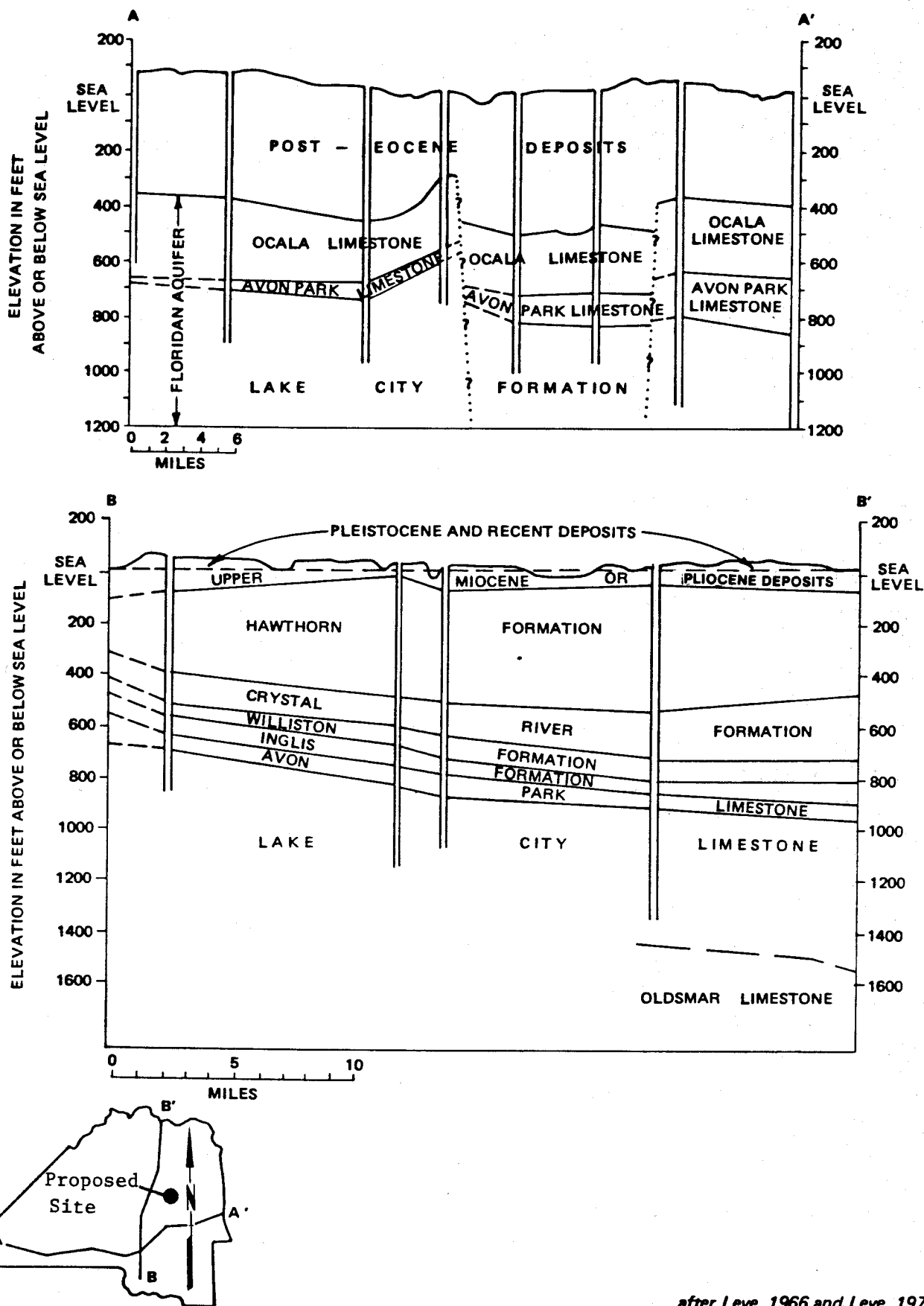


Figure 2.4-4 Map of Duval County Showing the Thickness of the Sediments Overlying the Ocala Group



after Vernon, 1951; Bermes et al, 1963; Barracough, 1962;
Wyrick, 1960; Lichtler et al, 1968; Leve, 1978

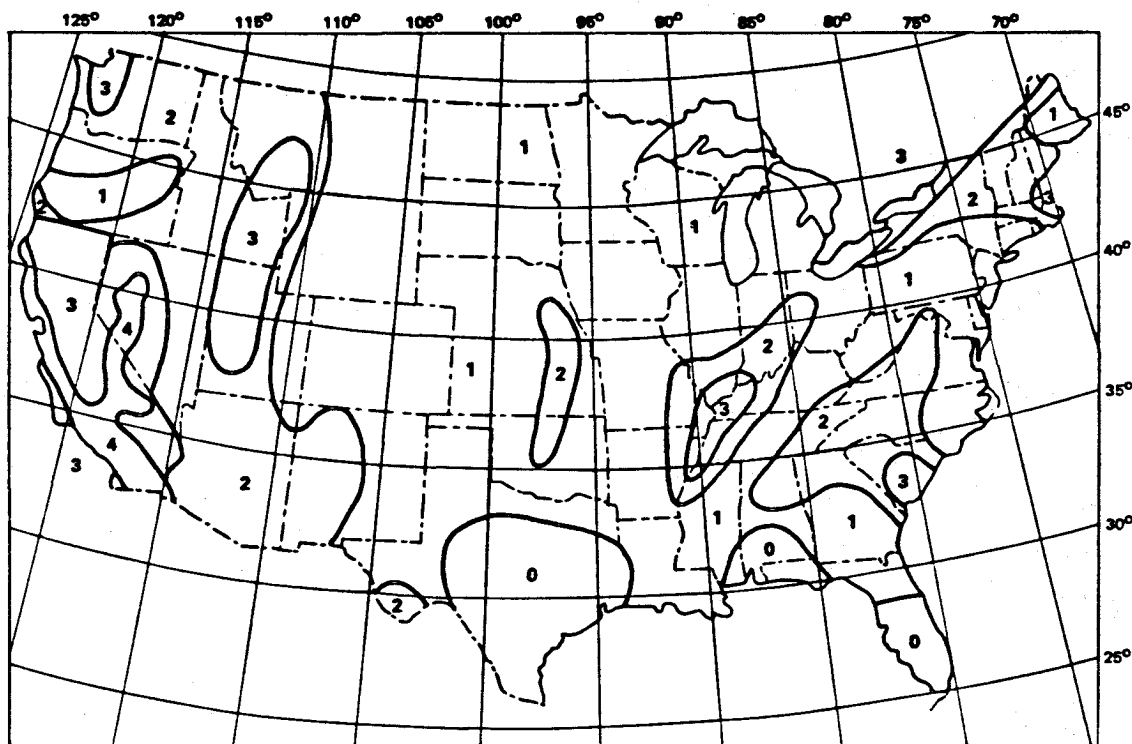
Figure 2.4-5 Faults along the St. Johns River



after Leve, 1966 and Leve, 1978

Figure 2.4-6

Geologic Cross-Sections, Duval County



- ZONE 0 No damage.
- ZONE 1 Minor damage; distant earthquakes may cause damage to structures with fundamental periods greater than 1.0 second; corresponds to intensities V and VI of the M.M. Scale.
- ZONE 2 Moderate damage; corresponds to intensity VII of the M.M. Scale.
- ZONE 3 Major damage; corresponds to intensity VIII and higher of the M.M. Scale.
- ZONE 4 Those areas within Zone No. 3 determined by the proximity to certain major fault systems.

Modified Mercalli Intensity Scale of 1931

after Algermissen, 1969

2.5 HYDROLOGY AND WATER QUALITY

2.5.1 Surface Water

2.5.1.1 General Description

The proposed plant site is located within the estuarine portion of the St. Johns River basin, about 10 miles upstream of the mouth of the River. The surface waters in this vicinity are classified as Class III waters, to be used for recreation and fish and wildlife propagation and management, in Chapter 17-3 of the Florida Administrative Code (FAC). In addition, these waters are considered "predominantly marine", as defined in Section 17-3.021(19), F.A.C, because the specific conductance of the water at the surface is greater than 5,000 micromhos per centimeter. Also, data presented in Appendix C, Section C.5 demonstrate the presence of salt water in that segment of the St. Johns River adjacent to the proposed site, with the concentration of chlorides increasing from 5,114 mg/l at river mile 13.0 to 13,678 mg/l at river mile 4.0. Water quality standards applicable to Class III, predominately marine waters are presented in Table 2.5-1.

The majority of the site is drained by two unnamed creeks which flow southeast into Browns Creek (Figure 2.5-1). The northern portion of the site is adjacent to the headwaters of Clapboard Creek. Most of the western edge of the site ranges from about 2,000 to 4,000 feet from Terrapin Creek, which lies west of the site and drains into Dunn Creek. The southwestern and southern edges of the proposed site are about 1,000 to 2,000 feet from San Carlos Creek. Clapboard Creek, Browns Creek, and San Carlos Creek are all tidally affected and enter the St. Johns River in the old channel (Blount Island Channel) of the River which passes to the north of Blount Island. Dunn Creek is also tidally affected, and enters the main channel of the St. Johns River about two miles west of Blount Island. The Fulton-Dame Point Cutoff, passing to the south of Blount Island, presently contains the main channel of the St. Johns River.

2.5.1.2 Bathymetry and Tidal Stages

In 1980, bathymetric surveys were performed in the Blount Island Channel, in the vicinity of the NGS thermal plume, and in the Fulton-Dame Point Cutoff, in the vicinity of the proposed coal unloading facility. Contour maps indicating elevations below mean sea level are presented in Figures 2.5-2 and 2.5-3 for these areas. Comparison of the 1980 survey with a bathymetric survey performed in 1973 (Appendix C, Section C.9) indicates there was little change in bathymetry in the vicinity of the predicted NGS thermal plume during that seven year time period.

The nearest stage and flow recording station is maintained by the USGS in Jacksonville, approximately 23 miles upstream of the mouth of the River, or about 13 miles upstream of the site area. There are no other published records of stage and/or flow in the site vicinity. The period of record for water levels at this station is from February, 1954, to the present. The maximum gage height over the period of record is 5.21 feet above mean sea level (MSL), and the minimum gage height over the period of record is -1.97 feet (MSL).

Tidal stages were recorded at a location near the mouth of San Carlos Creek near monitoring site SCC (Figure 2.5-4). Analysis of the data collected from November 8, 1979 until November 8, 1980, was performed with respect to mean high water, mean low water, and mean tidal level. These mean levels for the period of record were calculated to be 2.24, -1.28, and 0.00 feet (MSL), respectively. Plots of heights recorded at the proposed site versus time are presented as Figure 2.5-5.

Reasonable predictions for the tidal stage at the proposed site can be made based on the Department of Commerce tide predictions for Mayport, Florida. The time of occurrence of low tide at the site follows that at Mayport by an average of 1 hour 18 minutes, with a range between 52 minutes and 2 hours 13 minutes. Similarly, high tide at the site follows that at Mayport by an average of 45 minutes, with a range between 24 minutes and 1 hour 13 minutes.

2.5.1.3 Currents and Flow

Continuous current speed and direction data were recorded from September, 1979 to October, 1980, at the station locations shown on Figure 2.5-4. Appendix C, Section C.7 contains a sample of the detailed analysis of these data.

Figure 2.5-6 shows the difference in speed during flood and ebb periods for monthly mean and maximum currents. Current speed was greater during the period of flood tide than during the period of ebb tide at stations PKL, PKU and SCC (Figure 2.5-4). On an average, the current speed was about 60 percent greater during flood period than during ebb period. On the other hand, at stations NBL and NBU, the current speed during ebb period was almost equal to or slightly greater than that during flood period. The maximum speed recorded in the River from September, 1979, through September, 1980, was 4.1 ft/sec, occurring at station NBL during March, 1980.

Current profiles were measured in the NGS thermal plume area on October 16 and 17, 1980. These measurements indicate a fairly uniform current velocity across the River on flood tide, with an average of 1.69 ft/sec, a maximum of 1.76 ft/sec, and a minimum of 1.40 ft/sec. The higher velocities were recorded on the western side of the channel and the lower velocities on the eastern side. These compare with in situ recordings of 0.45 ft/sec and 1.18 ft/sec at stations PKU and PKL, respectively, at that time.

During ebb tide, a greater range was observed. The average velocity was 1.31 ft/sec, with a maximum of 1.79 ft/sec and a minimum of 0.43 ft/sec. These compare with in situ recordings of 0.46 ft/sec and 0.65 ft/sec at stations PKU and PKL, respectively, at that time.

Similarly, velocity measurements were taken near shore and in the navigation channel of the Fulton-Dame Point Cutoff. These measurements indicate a flood current of about 1.0 ft/sec (ranging from 0.9 to 1.2 ft/sec) and an ebb current of about 1.5 ft/sec (ranging from 1.0 to 1.75 ft/sec) in the channel. Readings near shore were somewhat lower. These readings were taken primarily in the area of the proposed coal unloading facility.

Calculated flow values, based on the recorded velocities and tidal stages, were 40,000 cfs on the flood and 29,000 cfs on the ebb. The results of the profiling indicate that about 50 percent of the total River flow passes through the Fulton-Dame Point Cutoff during flood, and about 66 percent during ebb, while the remainder passes through the Blount Island Channel.

2.5.1.4 Temperature

Continuous water temperature data were recorded from September, 1979, to October, 1980, at the station locations shown on Figure 2.5-4. Figure 2.5-7 shows the monthly mean water temperature and the range of extremes for each station. Months with a data recovery rate of less than 50 percent are excluded from analysis. There is no significant difference in temperature among the different stations except at station DIS, which recorded temperature at the discharge location of the NGS. On the average, the temperature at the discharge location was 10-15°F higher than other areas. The month with the coldest recorded water temperatures was February, 1980. The average February water temperature in the Blount Island Channel near the NGS was 55°F, while the discharge water temperature ranged from 82°F to 61°F with a mean value of 68°F.

Figure 2.5-8 shows the frequency of occurrence of specific temperature groups, in terms of the ratio of hours of occurrence to the total hours of the corresponding month, in percent. For example, from Figure 2.5-8(a), it

Table 5.1-14
COMPARISON OF PREDICTED ALUMINUM, IRON, COPPER, CYANIDE, MERCURY AND SILVER CONCENTRATIONS IN THE BLOUNT ISLAND CHANNEL
DURING PROPOSED PLANT OPERATION TO TOXICITY LEVELS REPORTED FOR SIGNIFICANT INDIGENOUS SPECIES
OF THE BLOUNT ISLAND CHANNEL

Parameter	Ambient Concentration ^a		Class III Standard ^b	Estimated POD Concentration ^c		Estimated Concentration at Edge of 31 Acre Mixing Zone ^e		Toxicity Levels for Significant Indigenous Species ^f		
	Avg	Max		Avg ^c	Max ^d	Avg ^c	Max ^d	96 hrLC50 R	Acute ^h	Chronic ⁱ
Cyanide (mg/l)	<0.01	0.09	0.005	0.01	0.11	0.01	0.09	0.05-0.07	0.016-0.022	j
Iron (mg/l)	0.80	2.7	0.30	0.84	6.5	0.81	3.0	25	8.5	1.3
Silver (ug/l)	0.16	0.35	0.05	0.17	0.43	0.16	0.36	~5.8k	~1.9	~0.3
Copper (ug/l)	69	275	15	73	344	69.8	281	80	27	j
Aluminum (mg/l)	0.49	3.63	1.5	j	4.41	j	3.70	8.9-17.8	3.0-5.9	j
Mercury (ug/l)	0.24	0.6	0.1	0.28	0.86	0.24	0.62	~5.6k	~1.9	~0.28

- a See Table 5.1-9.
b See Table 2.5-1.
c Footnote b, Table 5.1-9.
d Footnote c, Table 5.1-9.
e See Appendix C, Section C.6 for estimated concentrations. As discussed in Section 5.1.1, Section 17-4.244(1)(g), FAC, allows maximum chemical mixing zones of 125,600 square meters (31 acres) for estuaries.
f Significant indigenous species is defined as an important species of the Blount Island Channel as determined through recent studies including the preoperational monitoring program (see Table 5.1-15).
g The concentration of the pollutant lethal to 50 percent of the test organisms in 96 hours (96 hrLC50) where the 96 hrLC50 is the lowest value which has been determined for a species significant to the indigenous aquatic community, i.e., Blount Island Channel; or may reasonably be expected, based upon evaluation by generally accepted scientific methods, to produce effects equal to those of the concentration of the substance specified above.
h Defined as one-third of the 96 hrLC50.
i Defined as one-twentieth of the 96 hrLC50.
j Concentration below Class III standard.
k 48 hrLC50.

Table 5.1-15
INDICATOR SPECIES AND SENSITIVITIES USED IN COMPUTING ACUTE AND CHRONIC TOXICITY CONCENTRATIONS
FOR CYANIDE, IRON, SILVER, COPPER, ALUMINUM AND MERCURY^a

Parameter	Indicator Species	Reported 96 hrLC ₅₀ Concentration	Reason for Selection
Cyanide	Pinfish <u>Lagodon rhomboides</u>	0.048-0.066 mg/l HCN as CN (Daugherty and Garrett, 1951)	Significant Indigenous Species ^b
Iron	Mosquitofish <u>Gambusia affinis</u>	25 mg/l FeCl ₃ as Fe (Wallen <u>et al.</u> , 1957)	Substitute for Significant Indigenous Species ^c
Silver	American oyster-embryo ^d <u>Crassostrea virginica</u>	5.8 ug/l AgNO ₃ as Ag ^e (Calabrese <u>et al.</u> , 1973)	Significant Indigenous Species ^f
Copper	Polychaete worm - trochophore ^d <u>Capitella capitata</u>	80 ug/l CuSO ₄ as Cu (Reish and Martin, 1976)	Significant Indigenous Species ^f
Aluminum	White shrimp <u>Penaeus setiferus</u>	8.9-17.8 mg/l AlCl ₃ as Al ^g (Pulley, 1950)	Significant Indigenous Species ^f
Mercury	American oyster-embryo ^d <u>Crassostrea virginica</u>	5.6 ug/l HgCl ₂ as Hg ^e (Calabrese <u>et al.</u> , 1973)	Significant Indigenous Species ^f

- ^a For a comparative summary of toxicities for other significant indigenous species, refer to Appendix B, Tables B-22 through B-27.
- ^b Only significant indigenous species reported in the available literature.
- ^c There was no report of iron toxicity for a significant indigenous species; therefore, the mosquitofish was used since it occurs in the tidal creeks of the study area and may reasonably be expected to produce effects equal to those of significant indigenous species, i.e., those that commonly occur in Blount Island Channel.
- ^d Planktonic stage.
- ^e Based on the 48 hrLC₅₀ since 96 hrLC₅₀ was not reported; concentration of pollutant for 96 hrLC₅₀ expected to be slightly lower than at the 48 hrLC₅₀.
- ^f Most sensitive of several significant indigenous species reported in the available literature.
- ^g Three other significant indigenous species of nekton within this toxicity range include red drum (Sciaenops ocellata), spotted seatrout (Cynoscion nebulosus), and striped mullet (Mugil cephalus).

Table 5.1-16

COMPARISON OF PREDICTED ALUMINUM, IRON, COPPER, CYANIDE, MERCURY AND SILVER CONCENTRATIONS
IN THE NORTHSIDE STATION INTAKE BASIN DURING PROPOSED PLANT OPERATION TO TOXICITY LEVELS REPORTED
FOR SIGNIFICANT INDIGENOUS NEKTON (IMPINGEABLE ORGANISMS) OF THE BLOUNT ISLAND CHANNEL

Parameter	Estimated Average Concentrations ^a		Estimated Worst Case Concentrations ^a		Toxicity Levels for Significant Indigenous Nekton ^c	
	Ambient	Intake Basin	Ambient	Intake Basin	96 hrLC ₅₀ ^d	Acute ^e Chronic ^f
Cyanide (mg/l)	<0.01	0.01	0.09	0.11	0.05-0.06	0.015-0.021 i
Iron (mg/l)	0.80	0.84	2.7	6.5	25	8.5 1.3
Silver (ug/l)	0.16	0.17	0.35	0.43	40 ^g	13 2
Copper (ug/l)	69	73	275	344	150 ^h	5.0 i
Aluminum (mg/l)	0.49	b	3.63	4.41	8.9-17.8	3.0-5.9 1.5
Mercury (ug/l)	0.24	0.28	0.6	0.86	591	197 30

a See Table 5.1-9. Northside Station intake basin concentrations equal to concentrations at POD to Blount Island Channel.

b Below water quality standard of 1.5 mg/l (see Table 5.1-9).

c Significant indigenous nekton defined as an important nekton of the Blount Island Channel as determined through recent studies including the pre-operational monitoring program.

d The concentration of the pollutant lethal to 50 percent of the test organisms in 96 hours (96 hrLC₅₀) where the 96 hrLC₅₀ is the lowest value which has been determined for a species significant to the indigenous aquatic community, i.e., Blount Island Channel; or may reasonably be expected, based upon evaluation by generally accepted scientific methods, to produce effects equal to those of the concentration of the substance specified above. Refer to Appendix B, Tables B-19 to B-24 for nekton considered to be significant indigenous species or may be considered a substitute species. Species selected for toxicity computations are: cyanide - pinfish (*Lagodon rhomboides*); iron - Mosquitofish (*Gambusia affinis*); silver - Mummichog (*Fundulus heteroclitus*); copper - Pinfish; aluminum - White Shrimp (*Penaeus setiferus*); mercury - Mummichog.

e Defined as as one-third of the 96 hrLC₅₀.

f Defined as one-twentieth of the 96 hrLC₅₀.

g Based on 48 hrLC₅₀ since 96 hrLC₅₀ was not reported; concentration of pollutant for 96 hrLC₅₀ expected to be slightly lower than at the 48 hrLC₅₀.

h Based on 14 dLC₅₀ since 96 hrLC₅₀ was not reported; concentration of pollutant for 96 hrLC₅₀ expected to be slightly lower than at the 14 dLC₅₀.

is seen that in October, 1979, at station SCC, temperatures greater than 75°F occurred during 20 percent of the month, or 6.2 days. A sample of the detailed temperature data analysis is presented in Appendix C, Section C.8.

The NGS thermal mixing zone is defined by a National Pollution Discharge Elimination System (NPDES) permit (Appendix C, Section C.3) with respect to the 2°F and 4°F above ambient isotherms, measured at a depth of one meter. Thermal mapping surveys were performed on September 3 and 4, 1980, to document the existing NGS thermal plume. Figure 2.5-9 displays the maximum extent of the plume, during the survey period, for flood tide conditions. The maximum flood tide velocity coincident with this survey was 0.93 ft/sec., as measured at station NB. Similarly, Figure 2.5-10 displays the maximum extent of the plume, during the survey period, for ebb tide conditions. The maximum ebb tide velocity coincident with this survey was 0.68 ft/sec., as measured at station PK. Figure 2.5-11 illustrates a plume of intermediate extent, during start of flood conditions with tidal velocity of 0.19 ft/sec. These three figures portray the isotherms in increments of 1°F above ambient, at a depth of one meter. The areas enclosed by the 2°F isotherm for each of these three surveys, as well as the permitted areas, are shown in Table 2.5-2. Also shown in Table 2.5-2 are the measured and permitted width and length of the 2°F and 4°F isotherms for each survey.

Discussion of the utilization of temperature data for mathematical modelling of the NGS discharge is presented in Section 2.5.1.6.

2.5.1.5 Water Quality

Table 2.5-3 and Tables C-30 through C-32 (in Appendix C, Section C.5) are summaries of results obtained during the pre-application water quality monitoring program conducted on the St. Johns River (November, 1979 - October, 1980). Locations of stations indicated in these tables are shown in Figure 2.5-12.

Table 2.5-3 and Appendix C, Table C-30 show that variations in tide composite concentrations do exist in the river segment studied. Tide composites (average of high and low stage values), at both the surface and the bottom, show this variation, indicating the degree of interaction between fresh and salt water as well as identifying a vertical saline gradient. For example, chloride concentrations at transect G show a 60 percent increase from the mean to the maximum values observed at the surface. An approximate 5 percent gradient is observed in the mean chloride concentration from the surface to the bottom. In terms of generic classification, the data show conditions typical of a partially mixed, as opposed to a highly stratified, estuary.

Appendix C, Table C-30 also shows that a saline gradient is present along the River in the area studied. Downstream stations had an increased percentage of salt water at both the surface and bottom sample locations in comparison to upstream stations. Using 19.8 parts per thousand (ppt) chloride for standard sea water, approximate contents of salt water present at stations F-2, G and H-2 were 58, 64 and 66 percent for mean values, respectively. With station H-2 nearly 3 miles closer to the mouth of the St. Johns River than station F-2, this longitudinal gradient appears reasonable.

Data collected during the pre-application survey were compared to the Florida water quality standards presented in Table 2.5-1. In this comparison, ambient concentrations of aluminum, total residual chlorine, copper, total coliform, cyanide, iron, mercury, oil and grease, and silver were found to exceed the standards for predominantly marine Class III waters. A comparison between observed values for these parameters and water quality standards is presented in Table 2.5-3 for transect G and stations F-2 and H-2. With respect to minimum values, neither pH nor dissolved oxygen had minimum values below the Class III standards. For pH and dissolved oxygen, the minimum values at Transects F, G, and H were 7.0, 7.6, and 7.4, and 4.0, 4.1, and 4.2, respectively. Transect G is located at the NGS point of discharge. Water quality for this transect

approximates the characteristics of the makeup to the proposed plant. Both stations F-2 and H-2 are located beyond the present permitted mixing zone for NGS (NPDES Permit, Appendix C, Section C.3). Thus, these two stations, which are outside of the chemical influence of NGS operation, represent background ambient conditions. Also, these two stations are predicted to remain beyond the influence of the proposed plant impacts (Chapter 5, Section 5.1.3.1).

At transect G, mean values of total residual chlorine, copper, cyanide, iron, mercury, and silver were found to exceed Class III water quality standards. On several occurrences, aluminum, total coliform, and oil and grease concentrations at transect G were found to exceed Class III standards. However, the mean concentrations of these parameters were within standards. Of these same nine parameters, all exceeded standards at station H-2, and all but total residual chlorine and silver exceeded standards at station F-2. Of the total sample population, the number of occurrences where these nine parameters exceeded standards were as follows: 3 of 186 for total residual chlorine; 174 of 175 for copper; 6 of 181 for total coliform; 28 of 76 for cyanide; 171 of 175 for iron; 49 of 136 for mercury; 2 of 136 for silver; 25 of 175 for aluminum; and, 8 of 175 for oil and grease.

A limited amount of historical water quality data is available for the main channel of the St. Johns River immediately upstream and downstream of the proposed site, from river mile 4.0 to river mile 13.3 (see Figure 2.5-13 and Appendix C, Section C.4). These data were collected and tabulated from 1972 through 1979, at eleven different points on the river, by the U.S. Environmental Protection Agency (USEPA), the U.S. Army Corps of Engineers (COE), and two private consulting engineering companies. Although eleven sites were covered in these programs, no consistency in the parameters measured by the different agencies and private firms is evident. Also, no historical trends are observed since the sampling frequency is neither continuous nor periodic.

An analysis of these historical water quality data showed ambient conditions above water quality standards for copper, mercury, lead, iron, cadmium and chromium (COE, 1973; Reynolds, Smith and Hill, Inc., 1974; and USEPA, 1980). Measurements of the ambient levels of copper ranged from twice the standard value of 0.015 mg/l at river mile 10.7 to seven times the standard at river mile 7.1. Mercury levels were high and ranged from fourteen times the standard of 0.1 ug/l at river mile 7.7 to fifty times the standard at river mile 10.8. Lead was measured at twelve times the standard of 0.05 mg/l at river mile 7.1. Measurements of iron concentration ranged from one and a half times the standard of 0.3 mg/l at river mile 10.7 to about twenty times the standard at river mile 7.1. Cadmium was measured at eighteen times the standard of 5 ug/l at river mile 7.1, and chromium exceeded its standard of 0.05 mg/l by a factor of seven at river mile 7.1.

In addition to the historical water quality data available on the main channel of the St. Johns River, data are also available on the Blount Island Channel and several of its tributaries in the vicinity of the proposed site. These data are also tabulated and discussed in Appendix C, Section C.4. In summary, a total of nine parameters were observed in ambient concentrations above their water quality standard. Locations of these sampling sites are shown in Figure 2.5-14.

Other historical water quality data, as reported for USEPA STORET monitoring stations over a longer upstream and downstream reach of the St. Johns River from the NGS, indicate several water quality parameters at levels in excess of the Class III standards. These parameters are the same as for those historical data noted above except that nickel was also found to exceed its water quality standard. The extent of this longer reach is from Plummers Point (STORET Station No. 20030037) upstream of Jacksonville, to Buoy No. 11 (STORET Station No. 20030053) downstream at the mouth of the St. Johns River (river mile 0.0). Copies of the tabulated STORET data for those stations reporting parameters in excess of their standard are included in Appendix C, Section C.4.

2.5.1.6 Northside Station Effects

The Blount Island Channel is presently affected by the once-through cooling system of the NGS, which consists of three units with the following design conditions at full load:

<u>Unit</u>	<u>Flow (gpm)</u>	<u>Temperature Rise (deg.F)</u>	<u>Heat Rejection Rate - 10⁹ Btu/hr</u>
1	140,000	19	1.3
2	140,000	19	1.3
3	280,000	19	2.7
All	560,000	19	5.3

The NGS operates in one of the following five modes with the annual frequency based on plant records from November, 1978, through October, 1979:

<u>Mode</u>	<u>Units Operating</u>	<u>Annual Frequency (%)</u>
1	(1, 2 and 3)	21.4
2	(1 and 3) or (2 and 3)	35.8
3	(1 and 2) or (3)	23.7
4	(1) or (2)	18.8
5	None	0.3

Figure 2.5-15 graphically presents NGS flow rates plotted against frequency of occurrence, associated with the five operating modes. Since the circulating water pumps may be throttled to 70 percent of rated capacity, Figure 2.5-15 presents both design flow rates (maximum) and flow rates with 70 percent pump throttling (minimum).

A site plan of the NGS is shown on Figure 2.5-16, including a profile of the subsurface discharge point. Circulating water enters the intake flume between elevations (-)9.3 and (-)20.0 feet MSL, and is conveyed by

the 25 feet wide and approximately 16 feet deep flume to the intake basin. The circulating water pumps for each unit take suction from this basin, pump the water through each unit's condenser, and discharge it to the discharge channel. The heated water flows from the discharge channel by gravity, through the 196-inch diameter discharge pipe, from which it branches to the two 120-inch diameter discharge openings in the Blount Island Channel.

The NGS NPDES Permit limits both the maximum centerline length and area enclosed within the 2 degree F (above ambient) isotherm of the thermal plume at a depth of one meter. These limits are 5,400 feet and 102 acres, respectively. The extent of the thermal plume was predicted using a mathematical model (discussed in detail in Appendix C, Section C.1). The results of this modelling are that the actual extent of the plume, as defined by the 2 degree F (above ambient) isotherm, is much smaller than that allowed by the NPDES Permit.

The model was run for two sets of conditions of meteorology, ambient water temperatures, and NGS circulating water temperature rise. The first case, average conditions, was based on meteorology and Northside Station intake and discharge temperatures as presented in Chapter 3, Table 3.4-2. The maximum length of the 2 degree F (above ambient) isotherm for each month, for each of the station operating modes (assuming throttled pumps), is presented in Figure 2.5-17. Similarly, the area enclosed within that isotherm is presented, on a monthly basis, in Figure 2.5-18. The maximum length and area under average conditions are predicted to occur in September and are about 2,100 feet and 8.3 acres, respectively.

The second case, extreme conditions, is based on parameters presented in Chapter 3, Table 3.4-4. These are the conditions under which the proposed plant operating in conjunction with the NGS, can be expected to have the maximum impact on the Blount Island Channel. They do not, as such, represent extreme impact conditions for NGS operating alone. The maximum extent and area of the 2 degree F (above ambient) isotherm for each

month under each of the station operating modes (assuming throttled pumps), are presented in Figures 2.5-19 and 2.5-20. The maximum length and area under extreme conditions are also predicted to occur in September, and are about 1,700 feet and 5 acres, respectively.

The modelling results, indicating a thermal plume well within NPDES Permit limits, are supported by the ambient temperature analyses shown in Figures 2.5-7 and 2.5-8. Comparing ambient temperatures at monitoring locations PK and NB (Figure 2.5-4), which are within the limits of the permitted mixing zone, with monitoring location BCB, outside the mixing zone, there is no significant difference in temperature between the three locations. This indicates that the thermal plume does not significantly influence temperatures at locations PK and NB.

2.5.1.7 On-Site Water Bodies

Figure 2.5-21 shows the locations of the waterbodies in the area of the proposed site that were sampled during the pre-application monitoring program. The two unnamed on-site streams were monitored for flow (locations BB and CC) and for water quality (locations E-2, F-3, 4 and C-5). In addition, water quality samples were taken at location B-1, in a waterbody draining to San Carlos Creek, and at location D-6, the drainage ditch from the City of Jacksonville's North Landfill that drains to on-site streams. Water, soil and sediment samples were taken at the locations indicated in Figure 2.5-21 for polychlorinated biphenyls (PCB) analyses (see Chapter 6, Section 6.2.4). Results of the sampling program conducted in the proposed site area are tabulated in Appendix C, Tables C-33 and C-34.

At location BB, flow rates for the period February to September, 1980, ranged from zero to 4.28 cfs. Flow rates at location CC for the period February to November, 1980 ranged from zero to 2.53 cfs.

All of the on-site waterbodies sampled met the "predominately freshwater" classification contained in Section 17-3.021(18), F.A.C. Data in Appendix C, Table C-33 show that the conductivity at all on-site sampling stations was less than 5000 umhos. In addition, chloride concentrations were about 20 mg/l, suggesting no salt water influence on water quality.

At sampling location D-6, some impacts on water quality from another source were observed. Increases in ammonia (e.g., 0.03 mg/l at location B-1 versus 2.3 mg/l at location D-6) and total dissolved solids show a possible influence on water quality at D-6 by drainage from the North Landfill. With regard to coliform bacteria, levels observed at location D-6 were similar to those at the other five monitoring locations, all of which had ambient fecal and total coliform levels near or above Florida Class III water quality standards.

As shown in Table C-34, concentrations in all water samples analyzed for PCBs were less than 0.001 ppm as Aroclor 1016. The soil samples were found to have pH values of 4.6 to 5.4 and PCB concentrations less than 0.01 parts per million (ppm) as Aroclor 1016. The sediment samples had similar concentration levels for PCBs and pH values of 6.5 to 7.9.

2.5.2 Groundwater

2.5.2.1 Regional Hydrogeologic Framework

The proposed site is situated in the Atlantic Coastal Plain physiographic province, and is underlain to depths of 2100 feet and greater by rocks and sediments ranging in age from Eocene to Recent. General stratigraphic and hydrologic conditions in Duval County are shown in Table 2.5-4.

Floridan Aquifer

Groundwater in the Floridan Aquifer occurs under artesian conditions. The aquifer comprises a 1,600 foot sequence of alternating layers of soft, highly permeable limestones, and hard crystalline limestones and dolomites of Eocene age (Franks and Phelps, 1979). Franks and Phelps subdivide the aquifer into an upper and lower permeable zone. The upper permeable zone includes limestones of the Ocala Group, the Avon Park Limestone, and the Lake City Limestone, and averages approximately 1,000 feet in thickness. Within the upper permeable zone, at least two water bearing intervals can be recognized. Limestones of the Ocala group constitute the first water-bearing interval and generally comprise the upper 200-400 feet of the Floridan Aquifer. These are separated from a second, deeper water-bearing interval by dense, relatively impermeable dolomites of the Avon Park Limestone. The second water-bearing interval occurs primarily in a 400-500 foot thick interval of the Lake City Limestone, but may also include permeable limestones of the overlying Avon Park Limestone and underlying Oldsmar Limestone (Franks and Phelps, 1979).

The upper permeable zone is the principal source of groundwater for municipal, industrial and domestic supplies in Duval County. Yields of wells completed in the upper permeable zone vary as a function of well construction, depth of penetration, water transmitting properties of the rock penetrated by the well bore, and piezometric head. Wells penetrating the full thickness of the upper permeable zone typically yield in excess of 1,000-2,000 gallons per minute (gpm) by artesian flow (Leve, 1966).

The lower permeable zone of the Floridan Aquifer includes porous limestones and dolomites in the lower portion of the Oldsmar Limestone (Franks and Phelps, 1979). Very little hydrologic data is available for the lower permeable zone. Since adequate well yields are usually obtained by wells penetrating the upper permeable zone, development of the lower permeable zone for water supply in the Duval County area has been limited. A water-exploration well drilled in the Jacksonville area in 1966

penetrated the full thickness of the lower permeable zone (Leve and Goolsby, 1967). Fluid velocity logging indicated a highly permeable zone between depths of 1,900 and 2,050 feet below land surface. This interval was estimated to be contributing in excess of 400 gpm to the well's free-flow discharge of 1,000 gpm. Well-head pressures were measured during the construction of the well and increased abruptly when the lower permeable zone was penetrated (Leve and Goolsby, 1967).

The potentiometric surface for the Floridan Aquifer in the Jacksonville area is illustrated in Figure 2.5-22. Increasing water use from the Floridan Aquifer has resulted in declines in the potentiometric surface averaging 0.5 to 2.0 feet per year over a period of 20-25 years ending in 1962 (Leve, 1966). In addition, high volume pumping in areas such as Eastport and Jacksonville has resulted in local depressions in the potentiometric surface.

Water from the Floridan Aquifer in the Duval County area is suitable for domestic and most industrial uses (Leve, 1966). The quality of water varies primarily as a function of sampling location, sampling depth, and date of sampling. Results of water analyses of 43 wells penetrating the Floridan Aquifer in Duval County (Leve, 1966) yielded an average total dissolved solids content of 355 milligrams per liter (mg/l), and an average conductivity of 446 micromhos per centimeter. Carbonate hardness averaged 242 mg/l, indicating very hard water. Dissolved iron averaged 0.21 mg/l. Hydrogen sulfide gas is frequently reported in wells in the Floridan Aquifer, and ranged from 1.0 to 3.0 mg/l in analyses of samples from 60 wells in Duval County (Leve and Goolsby, 1969).

Chloride content of water from the Floridan Aquifer is generally less than 30 mg/l (Leve, 1966). Increases in salinity have been documented in a number of wells in the Duval County area, where these increases in chloride content have been correlated with a decline in artesian pressure. The correlation is most apparent in areas of excessively high water use, e.g. Jacksonville and Eastport, where high rates of pumping from the aquifer

have caused the formation of distinct cones of depression. In general, the incidence of high chlorides appears greatest for wells penetrating permeable zones deeper than the Ocala, where there is less hydrologic separation from the inferior quality water within the Cedar Keys limestone and underlying formations (Leve, 1966).

The progressive increase in salinity in several wells in the area appears to be the result of an excessive lowering of potentiometric levels in fresh water zones, allowing invasion of saline water from deeper sources. Lateral intrusion of saline waters is apparently not significant in the Jacksonville area. Confining beds separating the lower permeable zone from the deeper, saline sources, and the semi-confining bed separating the lower and upper permeable zones, appear to have retarded the upward migration of inferior quality water in many areas. Increased production from the Floridan Aquifer, particularly in those areas where production has already caused a significant lowering of the potentiometric surface, is likely to be accompanied by further increases in salinity (Franks and Phelps, 1979).

Structural anomalies, such as faulting and solution phenomena (sinkholes), may provide a natural mechanism for upward migration of saline waters by allowing hydraulic communication between permeable zones within the Floridan Aquifer or between permeable zones of the Floridan and underlying zones containing mineralized water. At present, however, there is no known evidence establishing this as a significant factor in the increase of chlorides observed in Duval County. Additional discussion of water quality in the Floridan Aquifer may be found in Appendix D.

The Floridan Aquifer serves as the principal supply of fresh water in the Jacksonville/northeast Duval County area. In 1966, an estimated total of 162 million gallons per day (MGD) was being withdrawn from the aquifer (Leve and Goolsby, 1969).

Shallow Aquifers

Several shallow aquifers underlie the Duval County area to depths of 150 to 200 feet, and are an important source of water for domestic supply, heat exchange, and industrial and agricultural uses (Fairchild, 1972).

The shallow aquifer system consists of limestone and sand aquifers in the upper part of the Hawthorn Formation; shell, limestone, and sand aquifers in Pliocene or upper Miocene deposits; and sand and shell aquifers in the Pleistocene and Holocene deposits. In many areas, the shallow aquifer system may consist of a single, relatively thick aquifer extending downward from the water table to the Hawthorn Formation. In central and eastern Duval County, the system consists of a series of relatively thin permeable zones separated locally by a number of thin confining beds (Leve, 1966). General stratigraphic and hydrologic relationships of the shallow aquifer system are indicated in Table 2.5-5.

Most wells in the Jacksonville area producing water from the shallow aquifer system have been completed in an interval referred to as the "shallow-rock zone", consisting of porous, sandy limestone in the Upper Miocene or Pliocene deposits, lying at depths of between 40 and 100 feet below land surface (Fairchild, 1972). Several wells have been drilled to penetrate deeper sands and limestones within the Hawthorn. The Hawthorn is not considered to be a good source of water due to an abundance of clay and silt, and the restricted geometry of the water bearing sands and limestone.

A second, although less important, aquifer, referred to as the shallow water table aquifer, is formed by the loose, unconsolidated sands and shell beds of Pleistocene and Holocene age, overlying the shallow-rock zone. These surface sediments form an aquifer ranging up to 90 feet in thickness and are typically developed with shallow, sand point type wells. Where saturated, the shallow sediments frequently require dewatering in cases where they are to be exposed by excavations.

The shallow rock aquifer occurs in conditions ranging from full artesian to water table, whereas water in the shallow, surficial sands occurs under water table (phreatic) conditions. Water in the shallow aquifers generally is acceptable for most domestic, commercial and industrial uses (Causey and Phelps, 1978).

2.5.2.2 Site Hydrogeologic Framework

Floridan Aquifer

Historical water level records for selected wells in the vicinity of the proposed site are summarized in Appendix D. A comparison of water levels in selected Floridan wells versus time (Appendix D, Figure D-6) suggests an average decline of approximately 0.4-0.5 feet per year in potentiometric levels of the Floridan Aquifer in the vicinity of the proposed site.

Water quality data for selected wells in the vicinity of the site are reproduced in Appendix D, Table D-7. The data indicate the water is generally of the calcium bicarbonate type where calcium is the major cation and bicarbonate is the major anion when expressed in millequivalents per liter. Average concentrations of major cations and anions are shown in Table 2.5-6. With the exception of anomalous chloride concentrations (approximately 210 mg/l) reported for well D-360, there is no indication of chloride contamination in the Floridan Aquifer in the area of investigation. Well D-1908 on Blount Island had a chloride concentration of 71 mg/l in 1980. While this chloride concentration is about 2.5 times the average for all wells in the study area, the water from this well appears to be generally of the same quality as that from most other wells in the area.

On the basis of test drilling results (Section 6.2.5), the top of the Floridan Aquifer lies at a depth of 450 feet on the site. The top of the Ocala limestone, identified by a sudden abundance of the microfossil

On the basis of test drilling results (Section 6.2.5), the top of the Floridan Aquifer lies at a depth of 450 feet on the site. The top of the Ocala limestone, identified by a sudden abundance of the microfossil Lepidocyclina ocalana, was placed at a depth of 470 feet by U.S. Geological Survey personnel. The test well penetrated friable, white to gray colored limestone and shell in the interval 450 to 738 feet. Alternating layers of limestone and hard, light to dark brown dolomite were encountered at 738 feet, and dense, dark brown colored dolomite was penetrated at approximately 750 feet. The top of the Avon Park Formation is placed at 738 feet.

Pumping test results indicate a transmissivity of approximately 1.0×10^5 gallons per day per foot and a storage coefficient of 2.8×10^{-4} . Applying non-steady state, leaky artesian type curves to time-drawdown and time recovery data from the observation well yielded a value of 4×10^{-4} per day for leakance, where leakance is expressed as the ratio of vertical hydraulic conductivity to vertical thickness of the confining bed. Results of these analyses are presented in Appendix D, Table D-9. Franks and Phelps (1979) estimate a leakance value of 2.5×10^{-6} per day for the "Upper Confining Unit" or Hawthorn formation, approximately 100 times lower than that determined in testing of F-1. It is likely that the major component of leakage to the Ocala aquifer during the test was derived from permeable zones within and underlying the dolomite of the Avon Park Formation, rather than leakage through the Hawthorn Formation.

Static water levels measured in wells F-1 and D-1255 (see Figure 2.5-23) were 19.7 and 20.1 feet above land surface, respectively. These water level elevations (approximately 36 feet above mean sea level) are consistent with those reported by the U.S. Geological Survey for this area in 1979.

Water quality samples were collected from well F-1 in August and November of 1980, and April and July of 1981. Results of the analyses are reported in Appendix D, Table D-10, and are summarized in Table 2.5-7. Water quality of the Floridan Aquifer at the site compares favorably with

Florida water quality criteria for Class I-B waters and U.S. Environmental Protection Agency Primary and Secondary Drinking Water Standards (Appendix D, Table D-11). In general, the groundwater is suitable for most uses with minimum treatment. Chloride concentrations for the four samples ranged from 10.8 to 21 mg/l, and averaged 15 mg/l. These concentrations are generally consistent with, and generally slightly lower than chloride concentrations in surrounding Floridan wells.

Shallow Aquifers

The proposed site is underlain to a depth of approximately 100 feet by unconsolidated to partially consolidated sands, silts, clays, and limestones. These sediments are saturated to within a few feet of land surface. Phosphatic silts and clays with occasional lenses of sand and limestone belonging to the Hawthorn Formation extend from a depth of approximately 100 feet to about 470 feet, the top of the Ocala Formation.

Two aquifers are recognized in the sediments extending to a depth of approximately 100 feet. The sands, shell, and limestone deposits lying between depths of about 60 feet and 90 feet constitute an aquifer referred to locally as the "shallow-rock" aquifer. Water in this aquifer occurs under confined conditions. Permeability is afforded by a combination of interconnected pore spaces within the unconsolidated sands (primary permeability) and solutioning of the more calcareous zones in the limestones, shell beds and cemented sands (secondary permeability). Unconsolidated sands extending from the surface to a depth of 20 to 30 feet form a second aquifer, locally referred to as the "water table" aquifer. Water in these sands occurs under water table conditions.

The shallow-rock aquifer is confined below by phosphatic silts and clays tentatively assigned to the Hawthorn Formation. The water table aquifer appears to have a lower boundary in the interval of 20-30 feet. Increasing proportions of clay, silt, and silty sand in this interval may restrict hydrologic communication with underlying sands, although there is

little evidence for lateral continuity of these lower-permeability deposits. Sediments in the interval separating the water-table aquifer from the shallow-rock aquifer include permeable sands and occasional silts and clays. Hydrologic testing indicates that these "intermediate sands" are in direct hydrologic communication with the shallow rock aquifer.

The results of the aquifer testing indicate that the shallow water - table aquifer is unconfined, behaves as a phreatic aquifer, and readily responds to infiltration of water discharged at the surface. The shallow-rock aquifer and overlying intermediate-zone sands are both artesian, and are in direct hydraulic communication with each other. The intermediate-zone sands appear to be hydraulically separated from the water-table aquifer, probably by finer-grained sediments which may be limited in areal extent and only locally effective as a confining unit for the intermediate-zone sands.

The hydrologic properties of the three tested aquifer zones are summarized on Table 2.5-8. Note that all three zones have essentially the same hydraulic conductivity. The water-table and intermediate zones have essentially the same storage coefficient, while the storage coefficient of the shallow-rock aquifer is an order of magnitude smaller. The apparent specific yield of the water-table aquifer is low, but consistent with specific yield values generally determined for water-table aquifers.

A potentiometric surface map has been constructed for the shallow aquifers from water levels measured in November, 1980 (Appendix D, Figure D-17). Water levels in wells and piezometers completed in the intermediate sands and the shallow-rock aquifer were included in measurements used to construct the potentiometric surface for the shallow-rock aquifer, on the basis that the two intervals are in hydrologic communication. As shown in Appendix D, Figure D-17, prevailing groundwater gradients in both the shallow-rock aquifer and the water table aquifer are to the southeast, toward the inland tidal areas of the St. Johns River.

Selected wells/piezometers were sampled for water quality analyses. The results of these analyses are summarized in Appendix D, Table D-20. In general, water quality compares favorably with both state criteria for Class I-B waters and with U.S. Environmental Protection Agency Primary Drinking Water Standards (Appendix D, Table D-11). The State of Florida Class I-B standard for lead of 0.05 mg/l was exceeded in one instance: a concentration of 0.196 mg/l of lead was detected in well DA-41 in August of 1980. Environmental Protection Agency secondary standards for iron, manganese, pH, and color are exceeded in several wells (see Appendix D, Tables D-11 and D-20).

Adjacent Facilities

Existing facilities adjacent to the proposed site include the North Landfill located north of Island Drive and east of New Berlin Road (Figure 2.5-24); the NGS which adjoins the southern and western boundaries of the proposed site (Figure 2.5-24); and the Offshore Power Systems and Jacksonville Port Authority facilities on Blount Island. The relationship of these facilities to the site groundwater regime are discussed in Appendix D, Section D.4.2.3.

2.5.3 References

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- Leve, G.W. and Goolsby, D.A., 1969, Production and Utilization of Water in the Metropolitan Area of Jacksonville, Florida: Florida State Board of Conservation, Division of Geology Information Circular No. 58. 37 p.
- Reynolds, Smith and Hills, Inc., 1974. Thermal Energy Release Studies, Interim Reports No. 1, 2 and 3.
- U.S. Army Engineers District, 1973. Final Environmental Statement - Blount Island Development Permit. Jacksonville, Florida. p. 24-25.
- U.S. Environmental Protection Agency, May, 1972 to January, 1979. STORET Data.

Table 2.5-1 (Revision 1)

FLORIDA WATER QUALITY CRITERIA FOR CLASS III,
PREDOMINANTLY MARINE WATERS

Parameter	Allowable Level
Aluminum	1.5 mg/l
Antimony	0.2 mg/l
Arsenic	0.05 mg/l
BOD	Appropriate D.O. must be maintained
Bromine (molecular)	0.1 mg/l
Bromates (as bromides)	100 mg/l
Cadmium	5.0 ug/l
Chlorine (total residual)	0.01 mg/l
Chlorides	10% increase above background levels
Chromium, hexavalent: total:	0.5 mg/l in effluent 1.0 mg/l in effluent 0.05 mg/l after mixing
Coliform, fecal	200 MPN/100 ml (monthly avg.) 800 MPN/100 ml (daily max.)
Coliform, total	1000/100 ml (monthly avg.) 2400/100 ml (max.)
Copper	0.015 mg/l
Cyanide	5.0 ug/l
Detergents	0.5 mg/l
Dissolved gases	110% of saturation value at the existing atmospheric and hydrostatic pressures

Table 2.5-1 (Revision 1) (Continued)

FLORIDA WATER QUALITY CRITERIA FOR CLASS III,
PREDOMINANTLY MARINE WATERS

Parameter	Allowable Level
Dissolved oxygen	minimum, 4 mg/l; 24 hr. avg., 5 mg/l
Fluorides	5.0 mg/l
Iron	0.3 mg/l
Lead	0.05 mg/l
Mercury	0.1 ug/l
Nickel	0.1 mg/l
Nutrients	Nutrient concentrations shall not be altered so as to cause an imbalance in natural populations of aquatic flora and fauna
Oil and grease (dissolved)	5.0 mg/l
Pesticides and herbicides	Detailed in 17-3.121(21), FAC
pH	6.5 - 8.5, st'd units ^a
Phosphorus (elemental)	0.1 ug/l
Polychlorinated biphenyls	0.001 ug/l
Radioactive substances	
radium 226 and 228:	5 picocuries/l
gross alpha particle	
activity (including	
Ra 226, but excluding	
radon and uranium):	15 picocuries
Selenium	0.025 mg/l
Silver	0.05 ug/l

Table 2.5-1 (Continued)

FLORIDA WATER QUALITY CRITERIA FOR CLASS III,
PREDOMINANTLY MARINE WATERS

<u>Parameter</u>	<u>Allowable Level</u>
Turbidity	50 Jackson units above background levels
Transparency	Depth of compensation point for photosynthetic activity shall not be reduced by more than 10% of natural background value
Zinc	1 mg/l

a Not to be caused to vary by more than one (1.0) unit above or below normal pH, within the stated range.

Source: Florida Administrative Code, 17-3, 1979

Table 2.5-2

MEASURED^a AND ALLOWED^b EXTENT OF NORTHSIDE STATION THERMAL DISCHARGE

Isotherm	Surveys		
	1 ^c	2 ^d	3 ^e
20F Area - Allowed	102.27	102.27	102.27
(Acres) - Measured	1.9 acres	6.9 acres	5.4 acres
20F Width - Allowed	825	825	825
(feet) - Measured	400	300	240
20F Length - Allowed	5400	5400	5400
(feet) - Measured	640	2250	2300
40F Width - Allowed	399	399	399
(feet) - Measured	50	24	190
40F Length - Allowed	3900	3900	3900
(feet) - Measured	300	440	530

a Measured during thermal surveys of September 3-4, 1980

b Allowed by existing Northside Station NPDES permit

c Flood tide

d Ebb tide

e Start of flood tide

Table 2.5-3 (Revision 1)
TIDE COMPOSITE VALUES FOR PARAMETERS
EXCEEDING CLASS III STANDARDS - ST. JOHNS RIVER AT THE PROPOSED SITE

Parameter, Units	Transect and Station ^a						Water Quality Standard ^b
	F-2		H-2		G		
	Mean	Maximum	Mean	Maximum	Mean	Maximum	
Aluminum, mg/l	0.61	3.34	0.47	3.85	0.49	3.6	1.5
Chlorine, Total Residual, mg/l	0.034	0.09	0.038	0.1	0.039	0.20	0.01
Coliform, Total (MPN)	572	3000	450	2650	755	6750	2400/100 ml (max)
Copper, mg/l	0.075	0.270	0.074	0.245	0.069	0.275	0.015
Cyanide, mg/l	0.007	0.031	0.008	0.026	0.011	0.09	0.005
Iron, mg/l	0.77	2.20	0.576	1.61	0.801	2.7	0.3
Mercury, ug/l	0.22	0.4	0.22	0.4	0.24	0.60	0.1
Oil and Grease, mg/l	1.7	3.2	2.6	11.3	2.0	9.0	5.0
Silver, ug/l	0.16	0.25	0.15	0.6	0.16	0.35	0.05

a See Figure 2.5-12

b See Table 2.5-1

Source: 1979-80 Pre-operational Monitoring Program

Table 2.5-4 (Revision 1)

GENERALIZED GEOLOGIC UNITS IN DUVAL COUNTY AND THEIR HYDROLOGIC PROPERTIES

Geologic Age	Stratigraphy	Approximate Thickness (ft)	Lithology	Hydrogeologic Unit	Hydrologic Properties
Holocene to Pliocene	Surficial Deposits	100	Discontinuous sand, clay, and shell beds	Surficial aquifer	Sand and shell deposits provide local limited water supplies
Miocene	Hawthorn Formation	400	Interbedded phosphatic sand, clay, marl, and limestone	Upper confining unit	Sand, shell, and limestone deposits provide local limited water supplies, both artesian and non-artesian. Low permeability clays serve as the principal confining beds for the Floridan Aquifer below
Eocene	Ocala Limestone	500	Massive fossiliferous chalky to granular marine limestone sequence	Upper permeable zone of Floridan Aquifer (pumping zone)	Principal source of groundwater in Duval County. High permeability overall
	Avon Park Limestone				Water bearing layers separated by low permeability limestone and dolomite
	Lake City Limestone		Alternating beds of massive granular and chalky limestones, and dense dolomites		
	Upper Unit of Oldsmar Limestone			Semiconfining zone of Floridan Aquifer	Low permeability limestone and dolomite
Paleocene	Lower Unit of Oldsmar Limestone	150		Lower permeable zone of Floridan Aquifer	Highly permeable, increases in salinity noted
	Cedar Keys Limestone	?	Uppermost appearance of evaporites; dense limestones	Lower confining unit	Highly mineralized water, very low permeability

Source: Franks and Phelps, 1979.

Table 2.5-5

STRATIGRAPHIC AND HYDROLOGIC RELATIONSHIPS
OF THE SHALLOW AQUIFER SYSTEM IN DUVAL COUNTY

<u>Series</u>	<u>Formation</u>	<u>Lithologic Description</u>
Holocene Pleistocene	Holocene and Pleistocene Deposits	Sand, tan to yellow, loose, medium to fine quartz, sometimes with shells and/or minor clay content -- often has hardpan layer of iron oxide-cemented, rusty red to dark brown medium to fine sand in upper part of section --source of water to shallow sandpoint wells.
Pliocene or Miocene	Pliocene or Upper Miocene Deposits	Upper part-tan to buff, fine to coarse sand and gray to light gray sandy clay, clayey sand, and shell beds; clay often contains abundant mollusk shell. Lower part-limestone, tan to yellow, often highly sandy, porous, and cavernous--also few thin beds of brown crystalline, dolomitic limestone--section is major source of water to shallow wells.
Miocene	Hawthorn Formation	Gray to blue-green and olive-green clay, and sandy limestone--usually phosphatic with abundant, well-rounded, polished granules and pebbles of phosphate. Formation not usually considered a good source of water; some wells tap lenses of sand and limestone in the upper part.

Source: Causey and Phelps, 1978.

Table 2.5-6

SUMMARY OF FLORIDAN AQUIFER WATER QUALITY IN STUDY AREA^a

<u>Parameter</u>	<u>Concentration (mg/l)</u>		
	<u>Minimum</u>	<u>Mean</u>	<u>Maximum</u>
Specific Conductance (umhos/cm)	58	528	1187
Hardness (as CaCO ₃)	45	248	435
Calcium	11	60	96
Magnesium	4	26	43
Sodium	13	19	90
Bicarbonate	54	186	309
Sulfate	0	88	130
Chloride	13	28	210

^a See Appendix D, Table D-7 for complete analyses

Source: U.S. Geological Survey, Water Data Storage and Retrieval System (WATSTORE)

Table 2.5-7 (Revision 1)
SUMMARY OF FLORIDAN AQUIFER WATER QUALITY,
TEST WELL F-1a

Parameter ^b	Sampling Date			
	August, 1980	November, 1980	April, 1980	July, 1980
Specific Conductance (umhos/cm)	521	430	378	296
Hardness (as CaCO ₃) (mg/l)	243	216	236	216
Calcium (mg/l)	55.5	40.7	54.4	46.2
Magnesium (mg/l)	22.8	25.4	22.9	24.4
Sodium (mg/l)	13.1	11.8	14.7	14.2
Bicarbonate (mg/l) ^c	190	153	188	193
Sulfate (mg/l)	125	77.92	64.07	38.6
Chloride (mg/l)	21.0	10.8	13.7	14.3

- a See Figure 2.5-23
b Complete analyses in Appendix D
c Reported as Alkalinity, in mg/l HCO₃

Table 2.5-8
SUMMARY OF SHALLOW AQUIFER TESTING IN
WELLS GW-1, GW-2, AND GW-3

Wells	Pumping Rate (gallons per minute)	Duration of Pumping (minutes)	Hydraulic Conductivity ^b , (gpd/ft ²)	Aquifer Thickness (ft.)	Storage Coefficient ^c	Specific Yield ^c
GW-1	79	360	4×10^2	40	6.5×10^{-5}	--
GW-2	12	267	3×10^2	30	5.8×10^{-4}	--
GW-3	12/20 ^d	60/78 ^d	3×10^2	20	5.3×10^{-4}	2×10^{-2}

- a See Figure 2.5-23
- b Hydraulic conductivity obtained by dividing calculated values of transmissivity by aquifer thickness
- c Average values for time-drawdown and time-recovery solutions
- d Discharge was adjusted from 12 gallons per minute (gpm) to 20 gpm after 60 minutes because of early stabilization of pumping water levels. The discharge rate of 20 gpm was maintained for an additional 78 minutes.

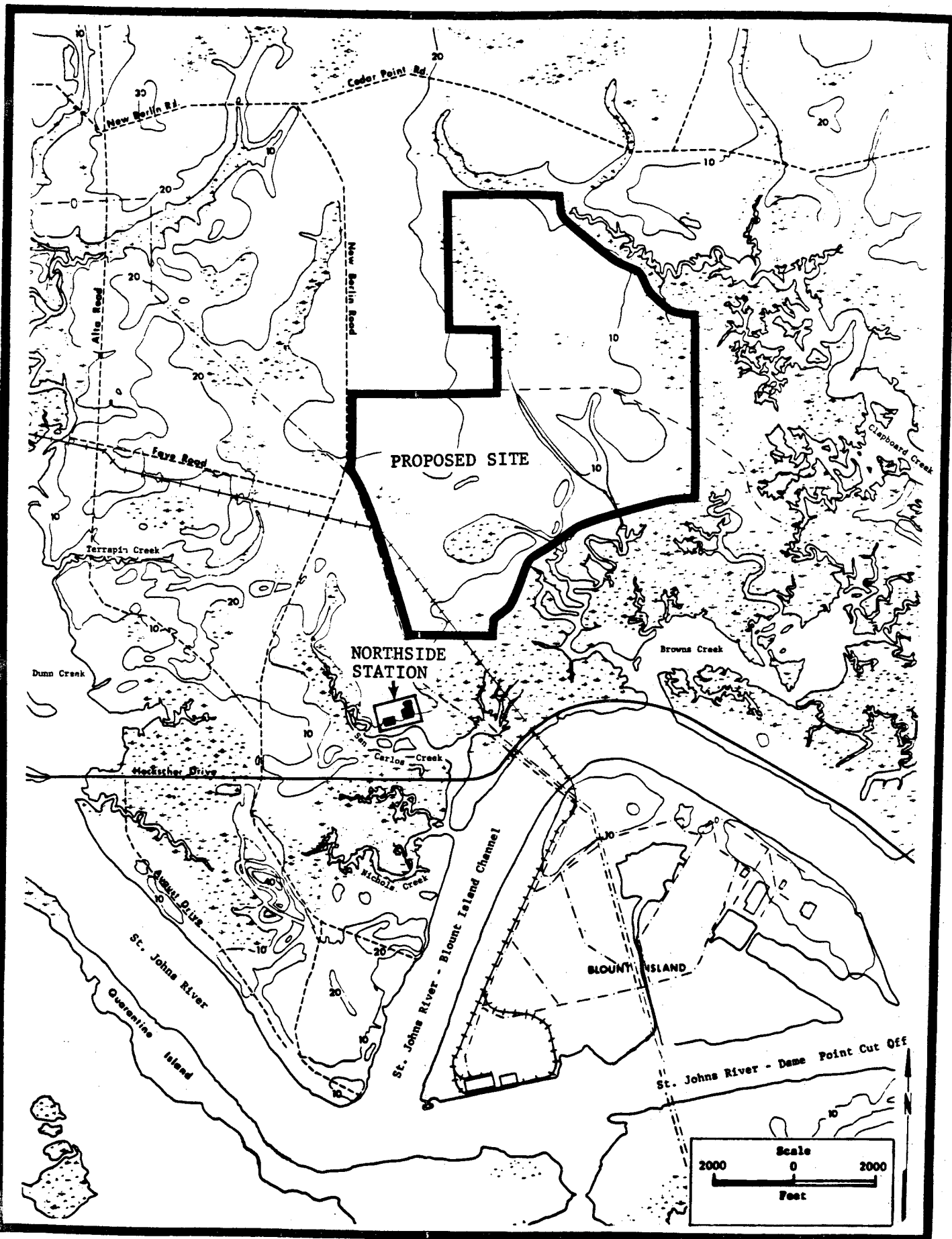
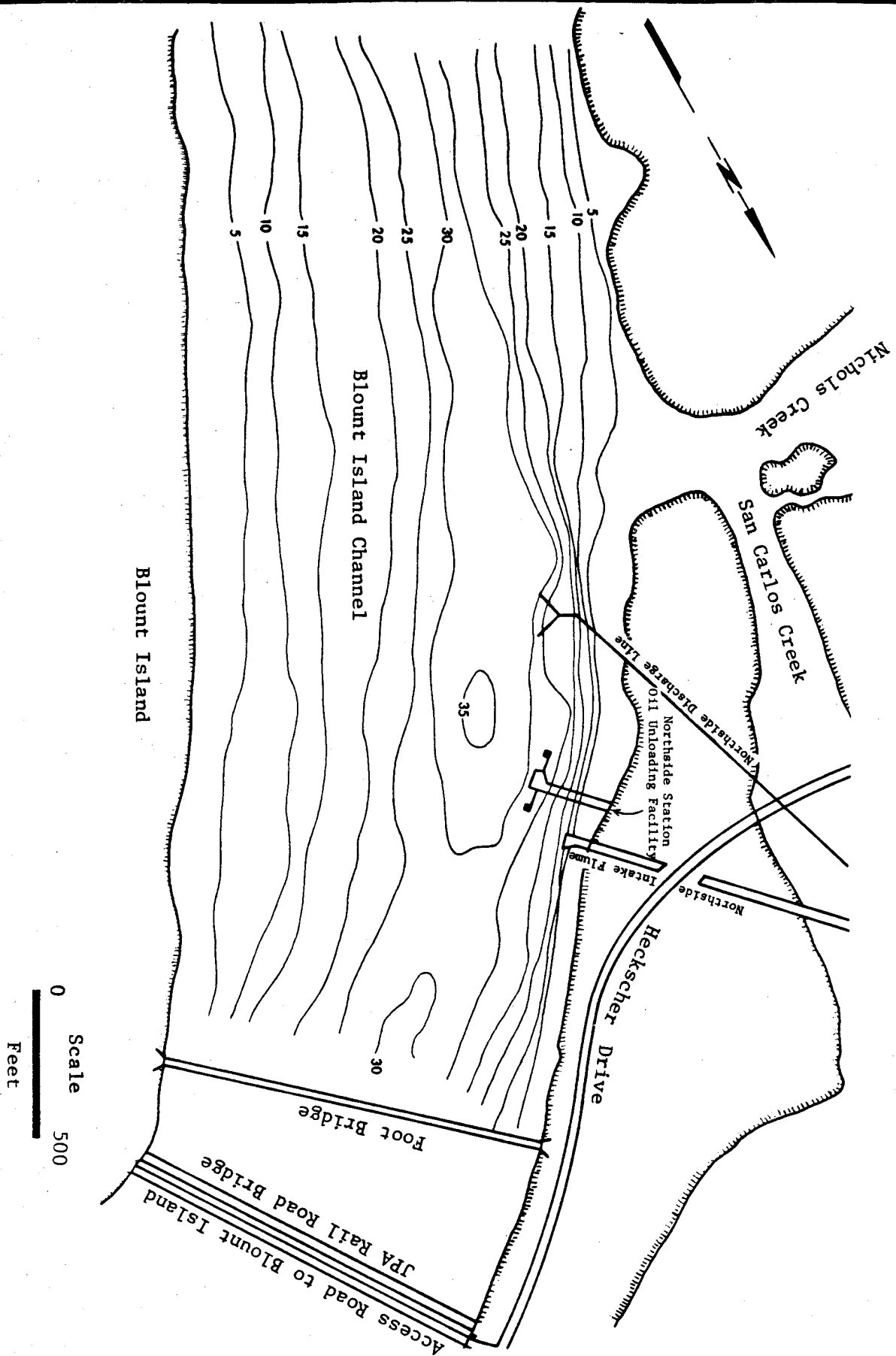


Figure 2.5-1 Surface Waters in the Proposed Site Vicinity

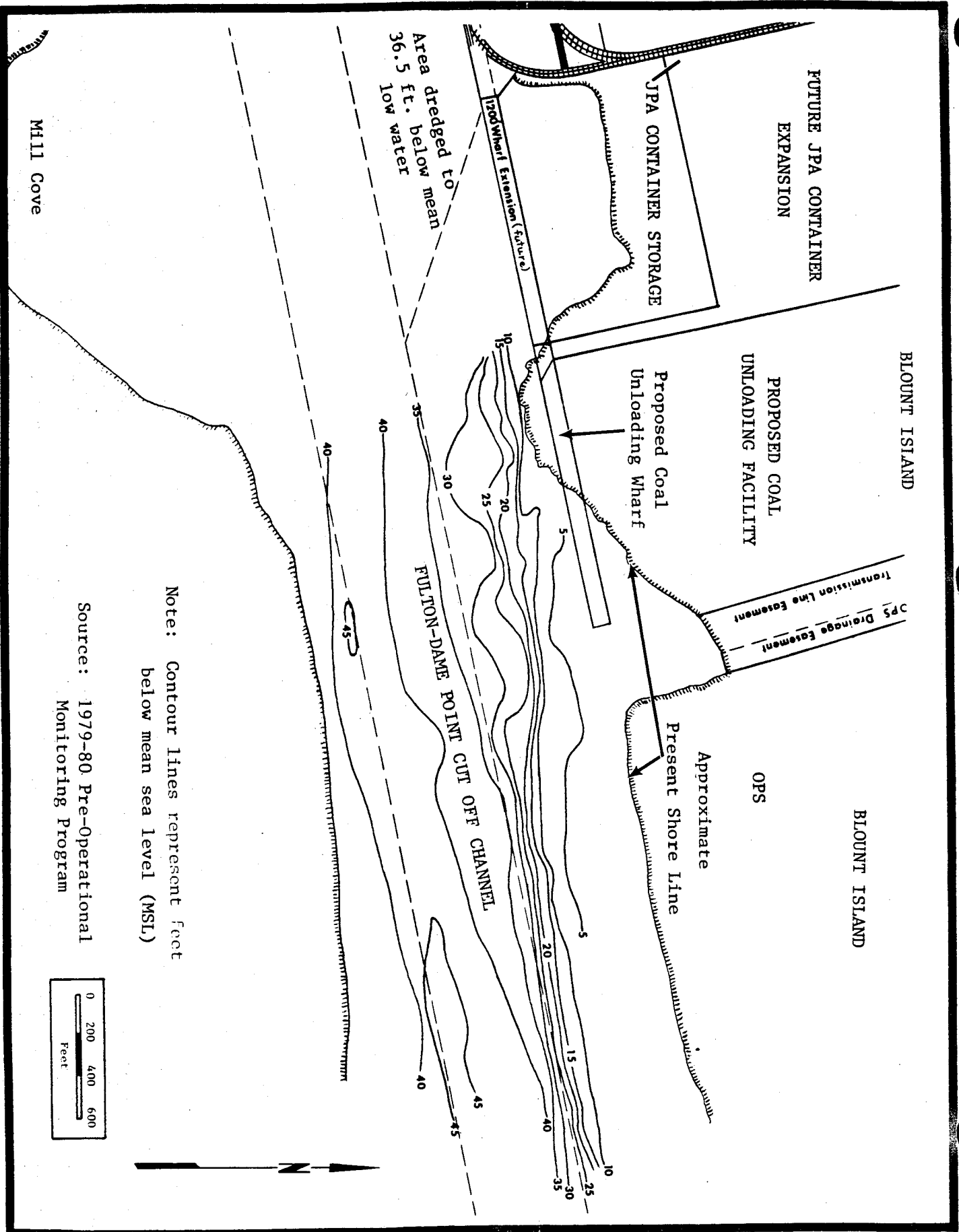
Figure 2.5-2 Bathymetry in Northside Station Discharge Area, July, 1980



Note: Contour lines represent feet below mean sea level (MSL)

Source: 1979-80 Pre-Operational Monitoring Program

Figure 2.5-3 Bathymetry in Proposed Coal Unloading Facility Area, July 1980



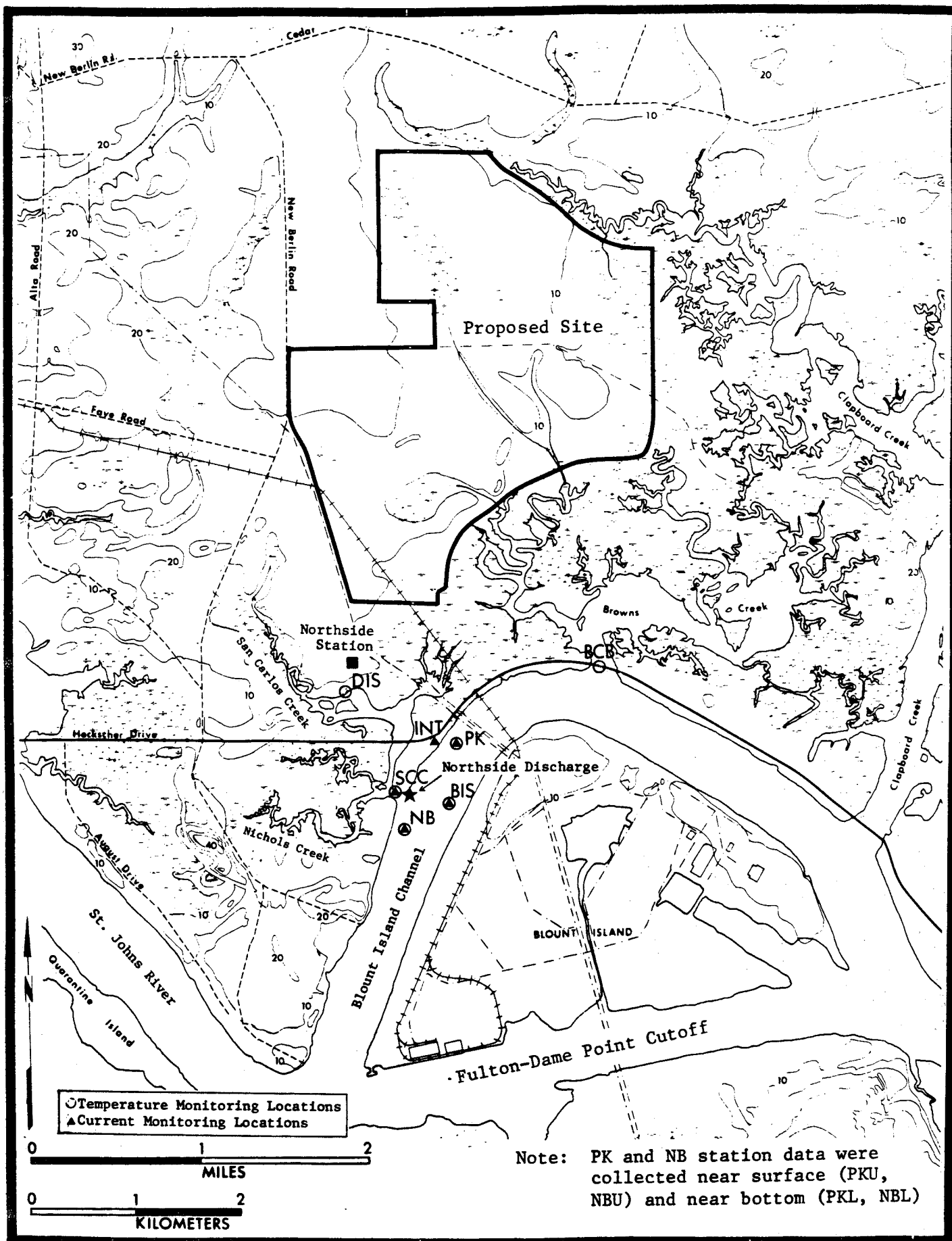
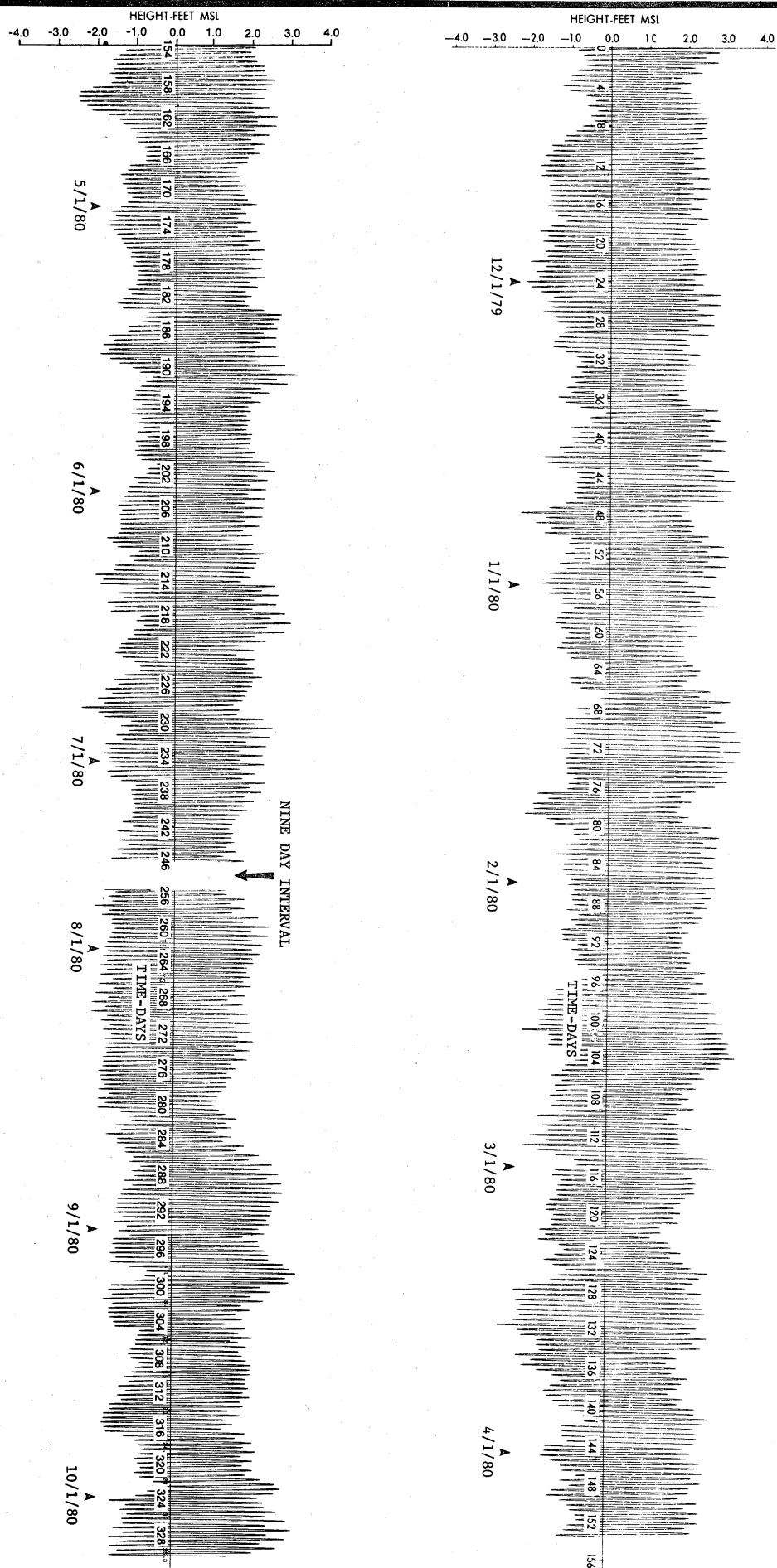


Figure 2.5-4 Hydrological Monitoring Sites in the St. Johns River

Figure 2.5-5 Tidal Heights in the St. Johns River at the Proposed Site (Station SCC), November 1979-November 1980

Source: 1979-80 Pre-Operational Monitoring Program



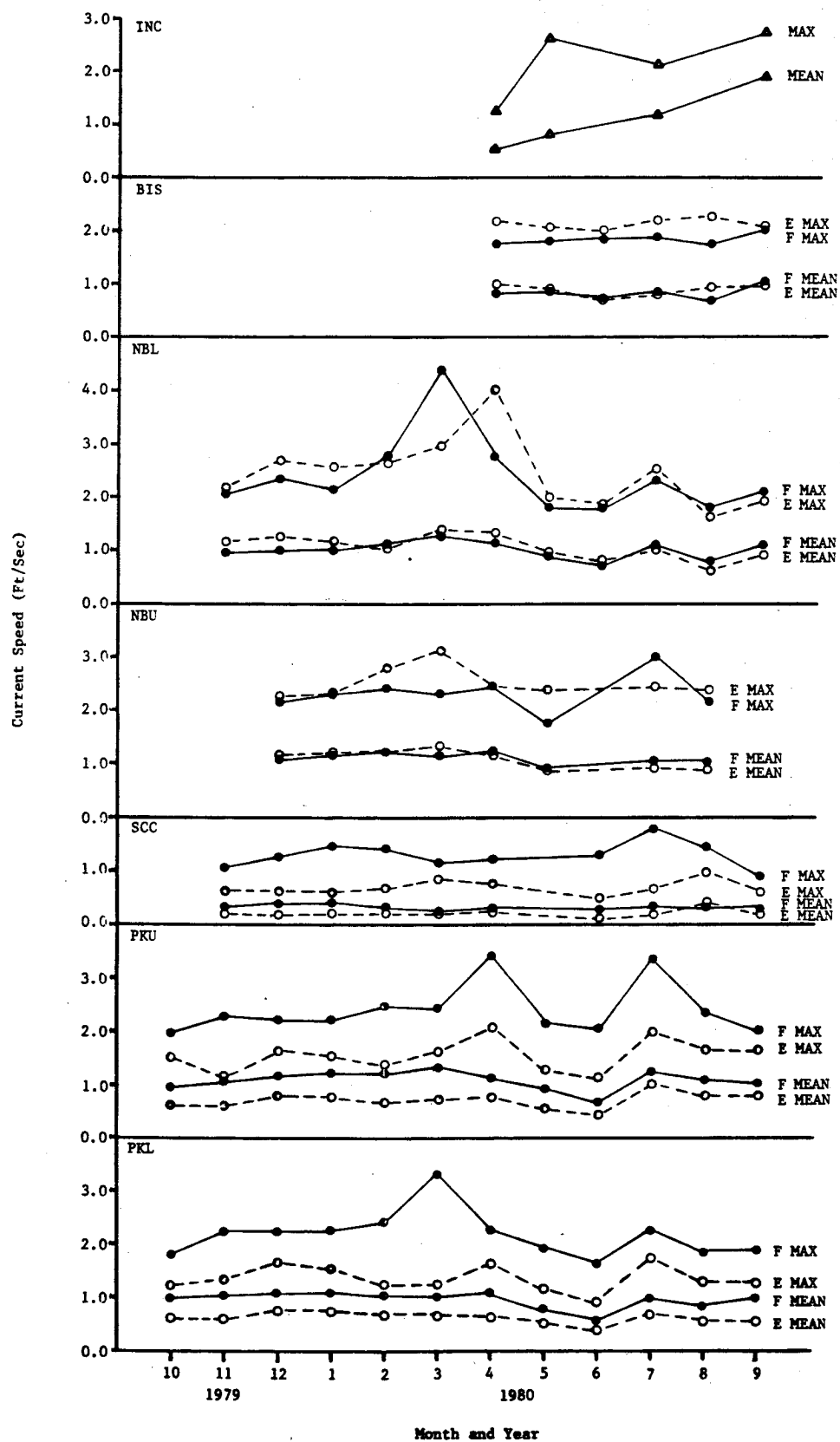
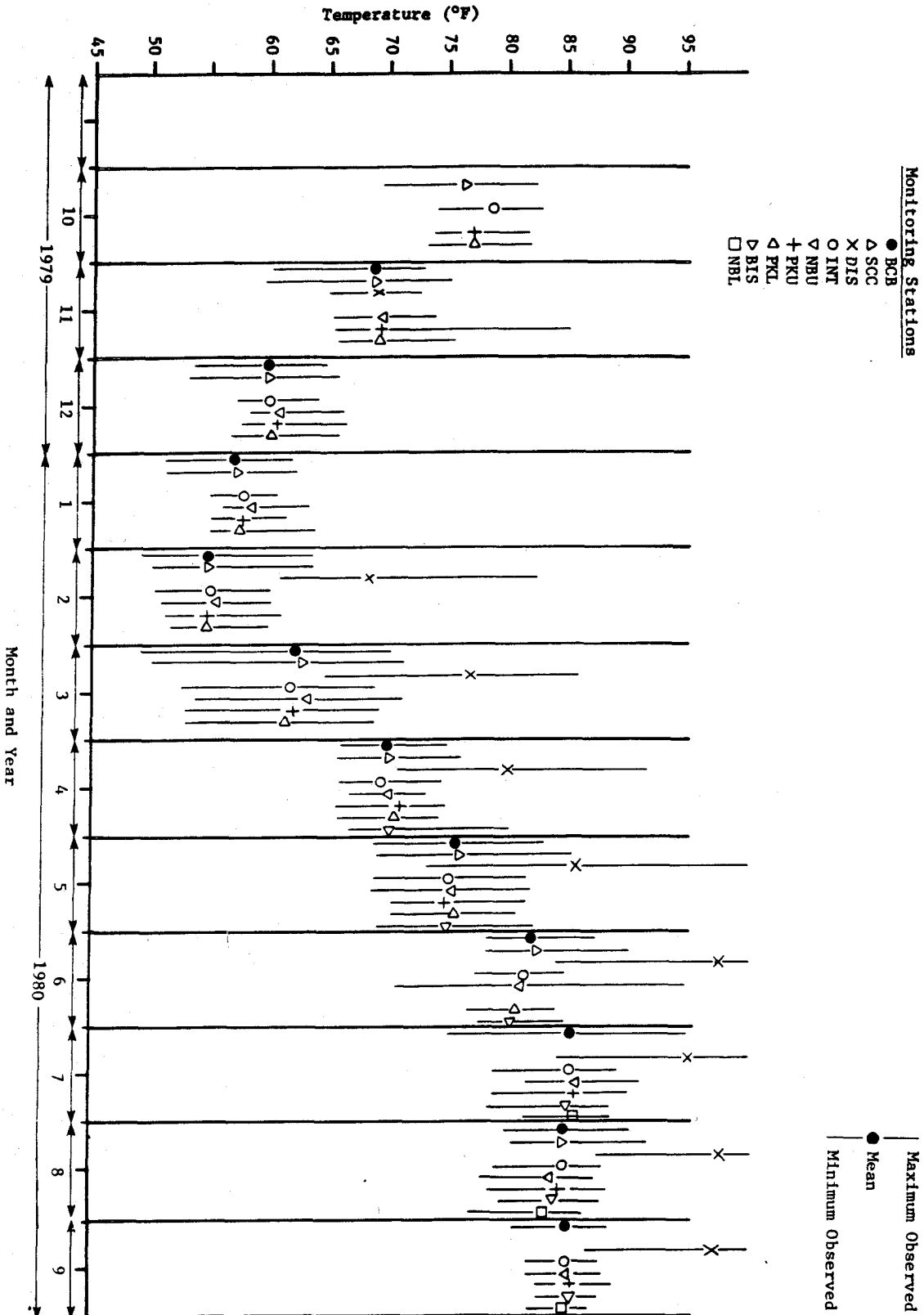


Figure 2.5-6

Monthly Variation of Maximum and Mean Current Speeds for Flood and Ebb Tides at Each Station

Figure 2.5-7

Monthly Mean Temperatures and Extremes in the St. Johns River at the Proposed Site, October 1979-September 1980



Source: 1979-80 Pre-Operational Monitoring Program

(Station Locations Shown on Figure 2.5-4)

Monitoring Stations
 ● DCB
 △ SSC
 × DRS
 ○ DRT
 ▽ DRI
 + PRL
 ▴ PRL
 ▾ PRL
 ▹ PRL
 ▸ PRL

(Station Locations Shown on Figure 2.5-5)
 Source: 1979-80 Pre-Operational Monitoring Program

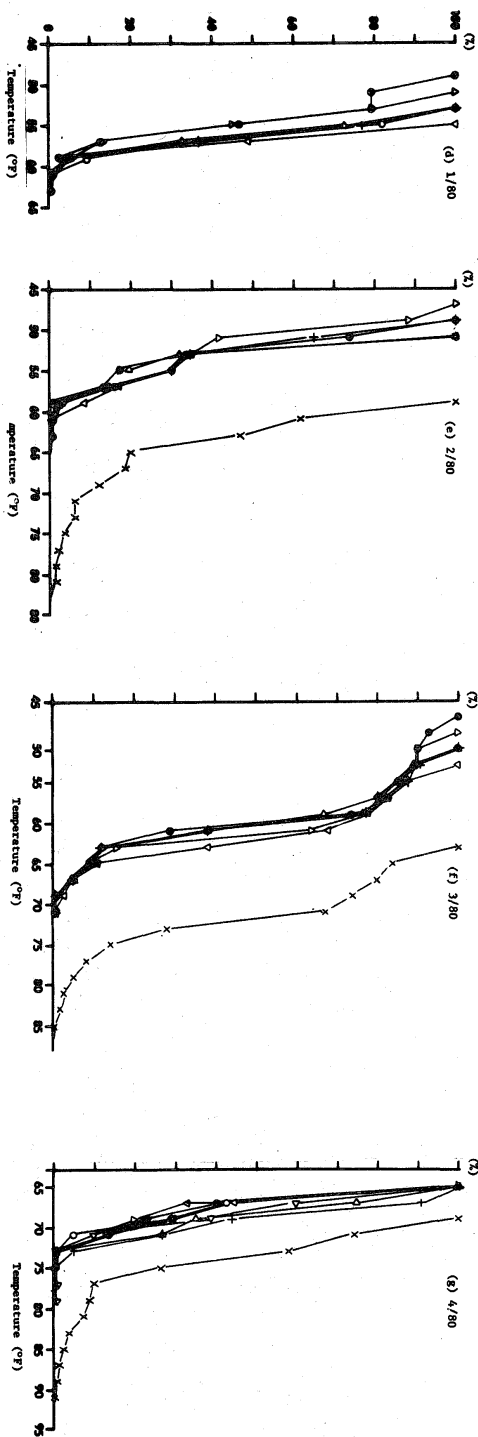
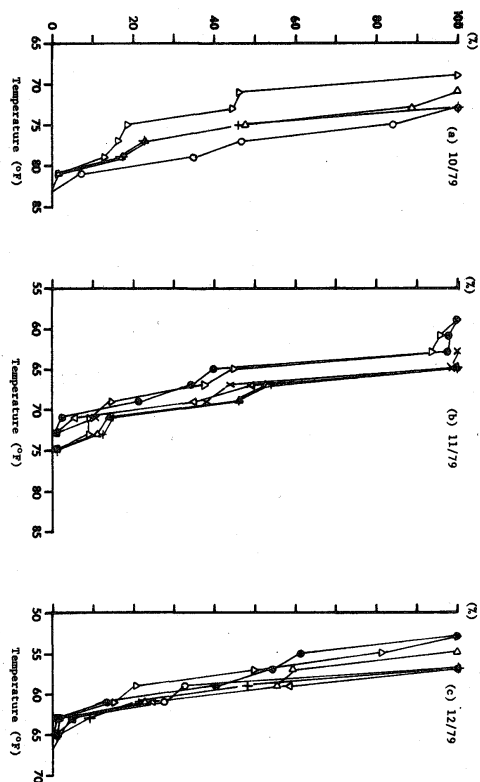


Figure 2.5-8 Monthly Temperature Frequency in the St. Johns River at the Proposed Site, October, 1979-September, 1980

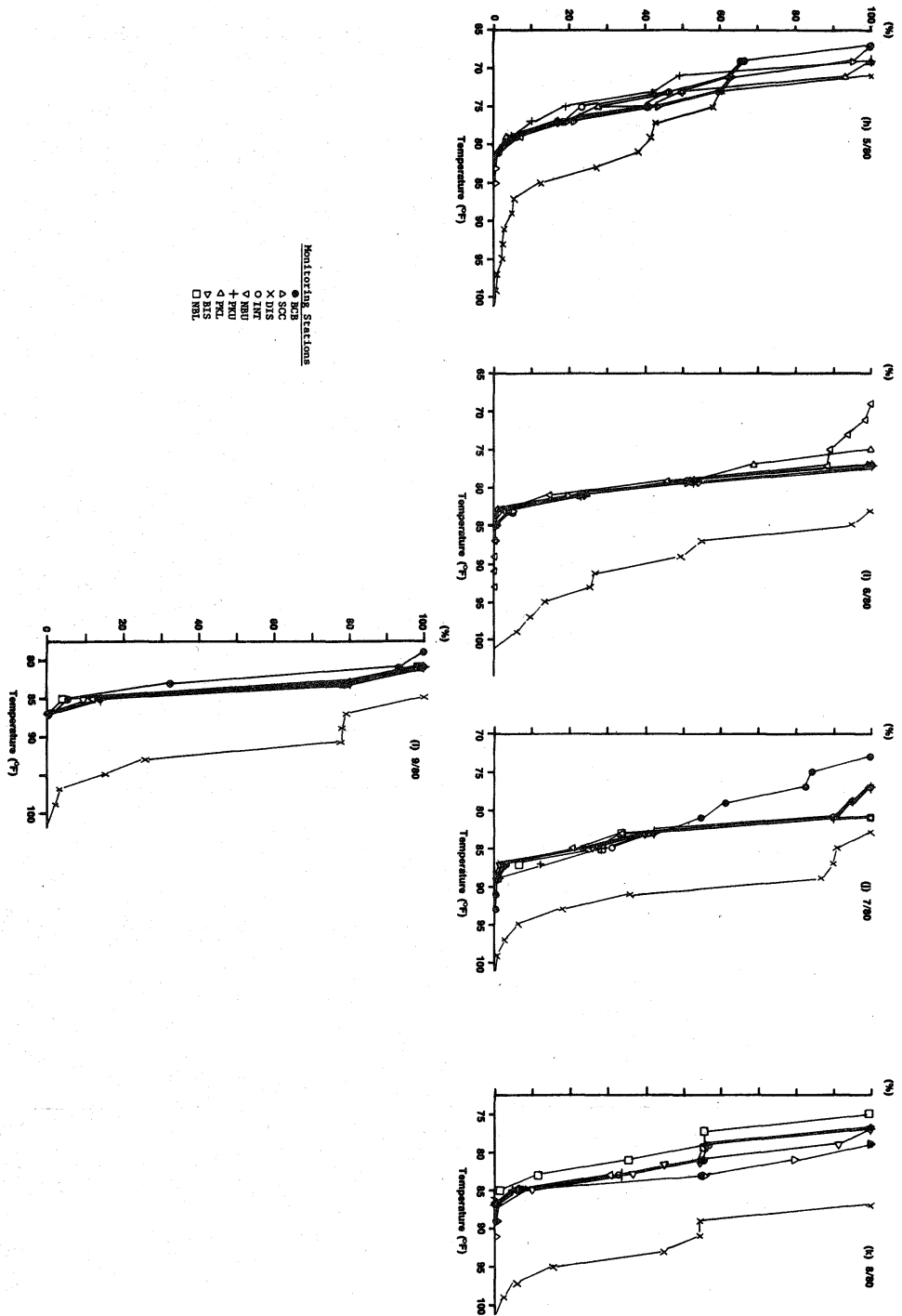
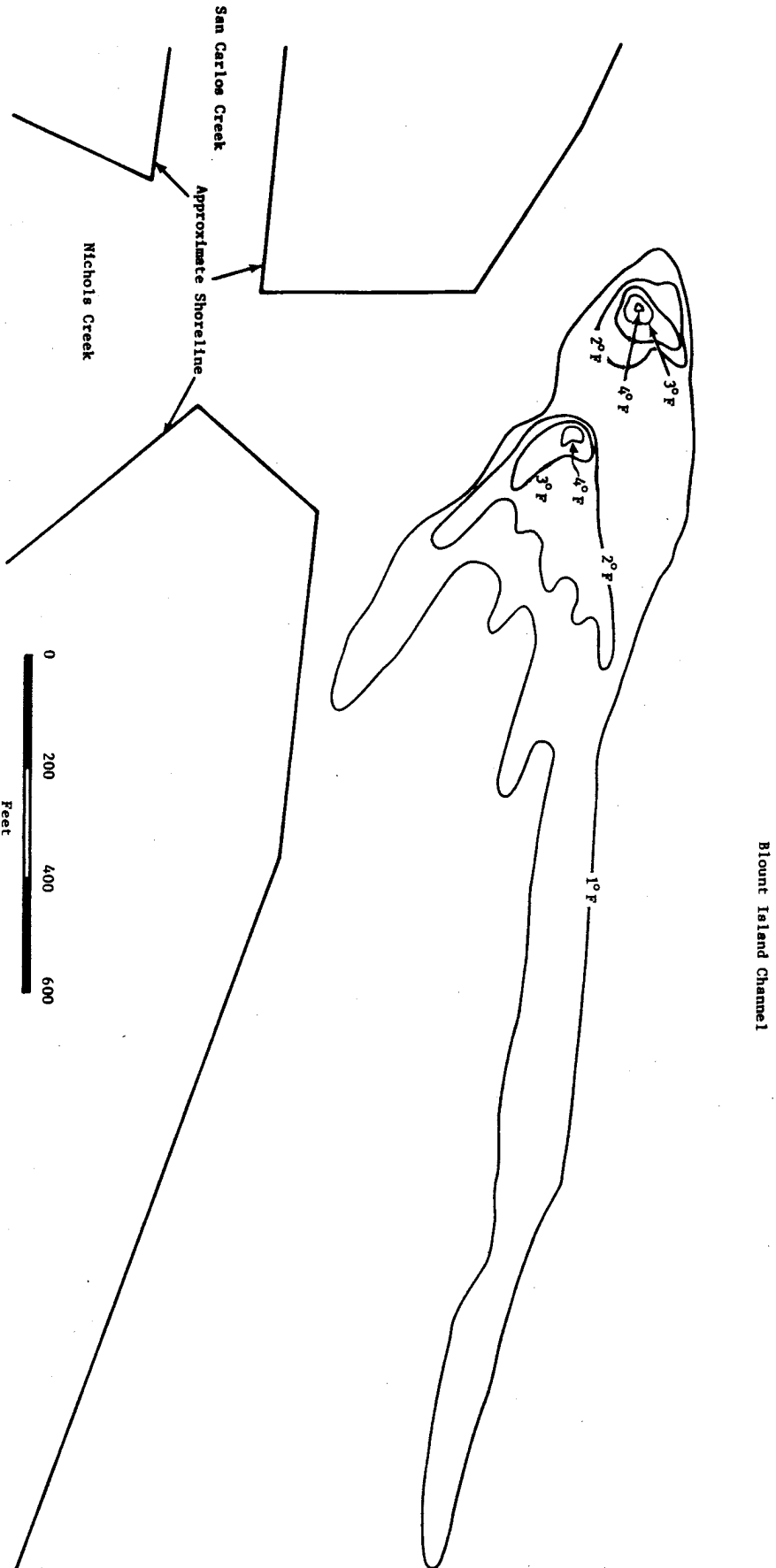


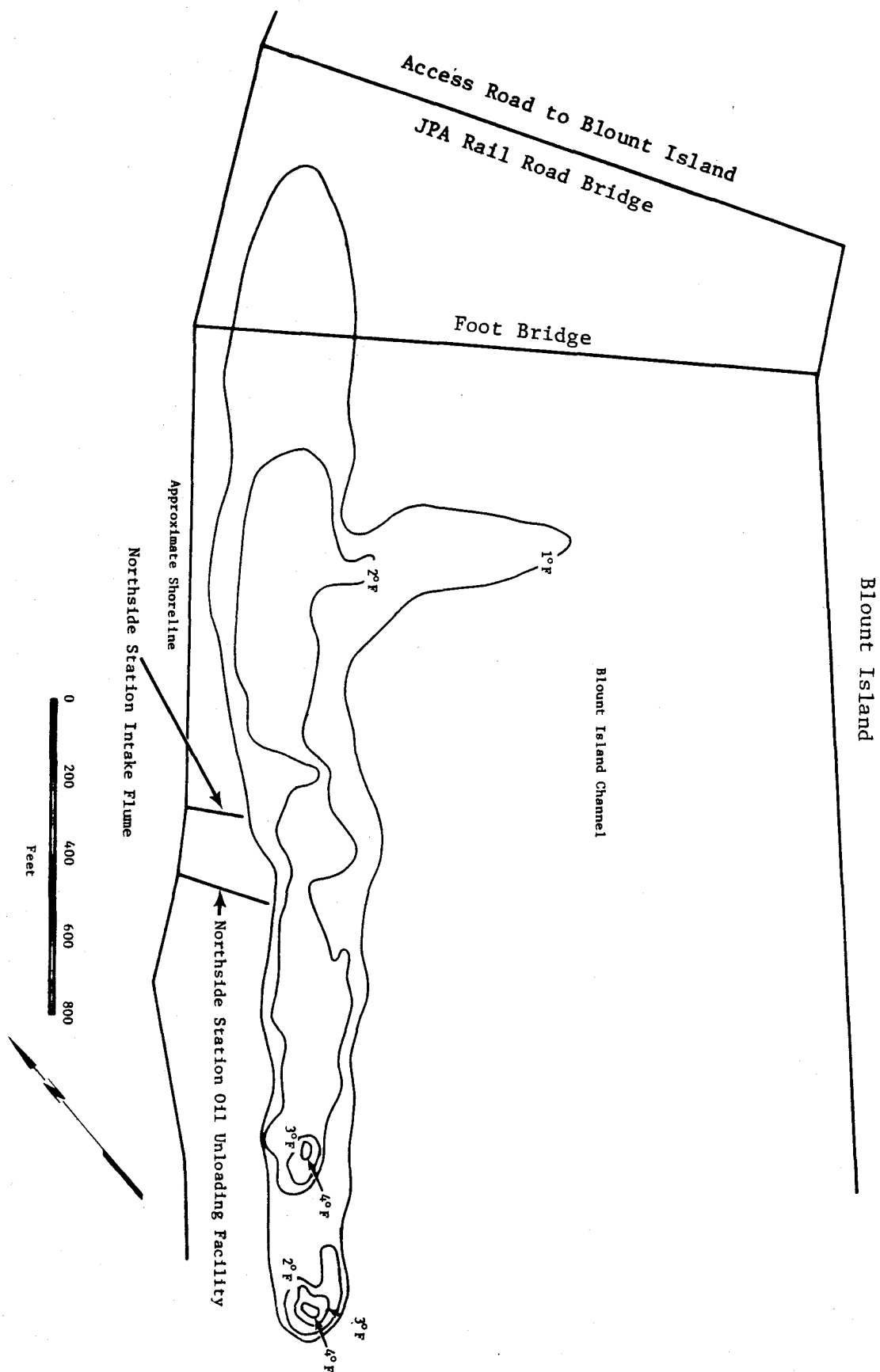
Figure 2.5-8 Monthly Temperature Frequency in the St. Johns River at the Proposed Site, October, 1979-September, 1980 (cont.)

Figure 2.5- 9 Extent of Northside Station Thermal Discharge, Plan View at One Meter Depth, Survey 1 (Flood Tide)



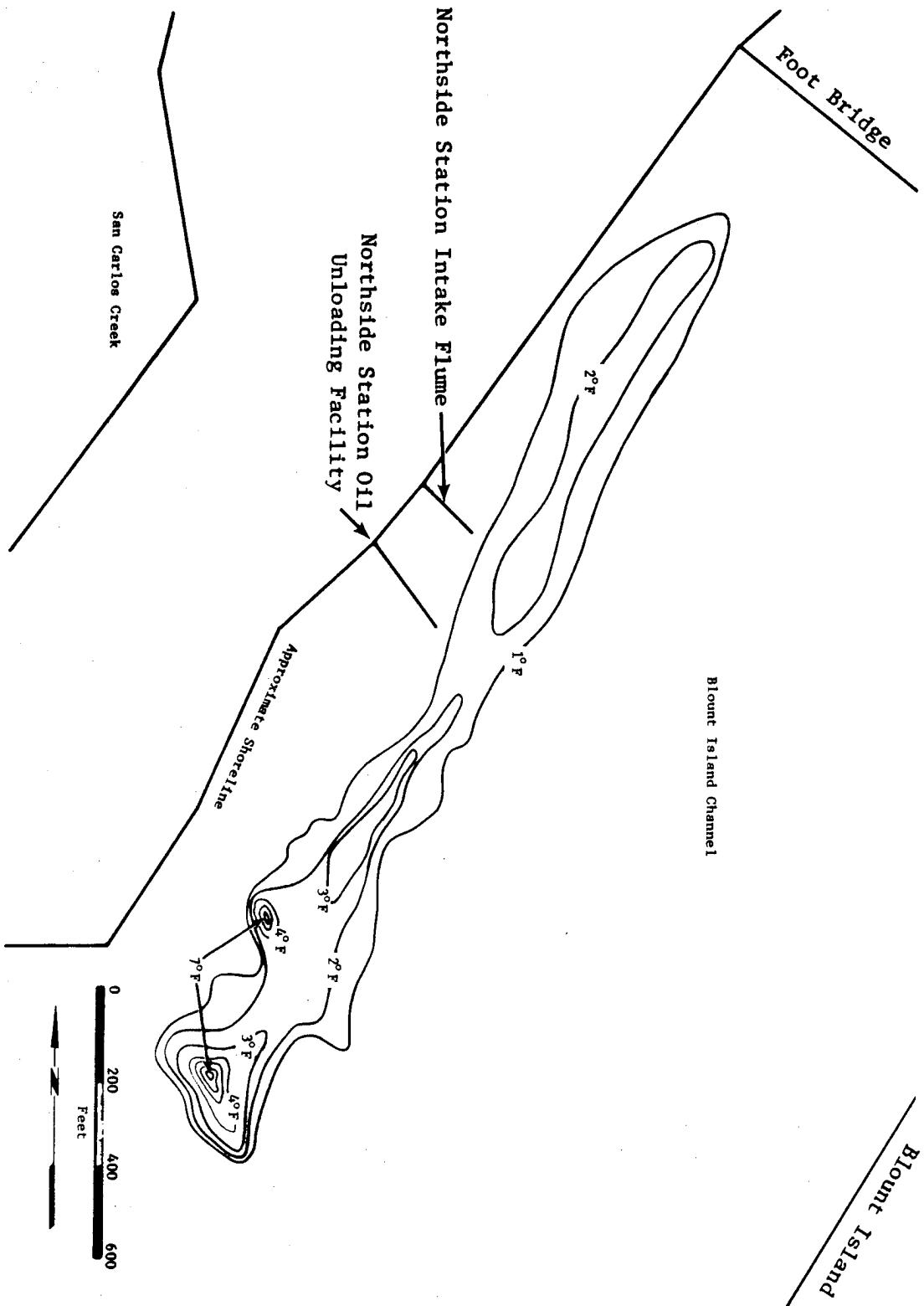
Source: Pre-Operational Monitoring Program, September 3, 1980

Figure 2.5-10 Extent of Northside Station Thermal Discharge, Plan View at One Meter Depth, Survey 2 (Ebb Tide)



Source: Pre-Operational Monitoring Program, September 3, 1980

Figure 2.5-11
Extent of Northside Station Thermal Discharge, Plan View
at One Meter Depth, Survey 3 (Start of Flood Tide)



Source: Pre-Operational Monitoring Program, September 4, 1980

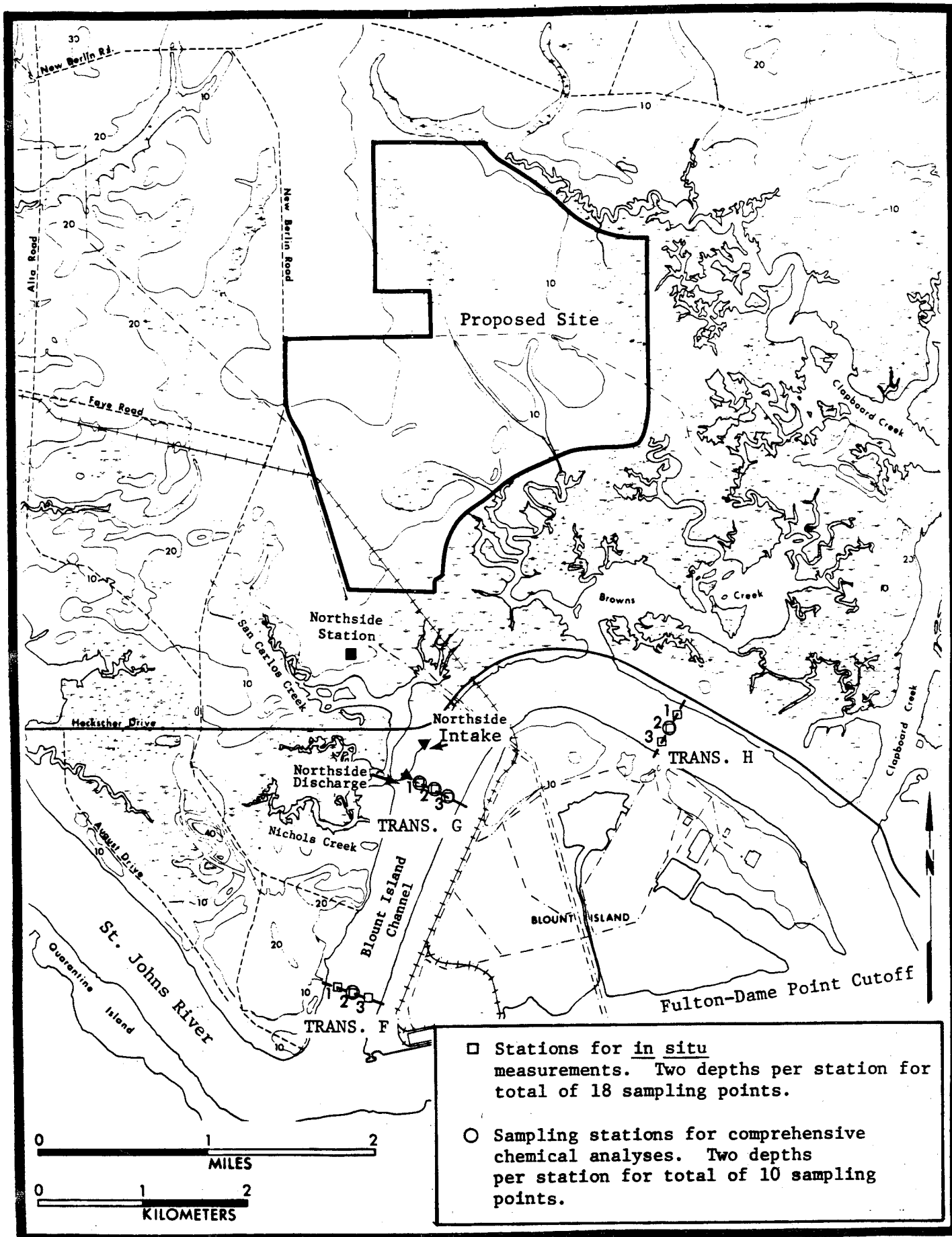
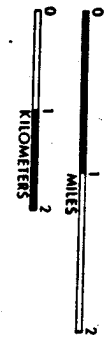


Figure 2.5-12

St. Johns River Water Quality Monitoring Locations

Figure 2.5-13 Historical Water Quality Sampling Sites -
St. Johns River



- Sampling Site Location (Approximate)
- ★ STORET Sampling Station
- RM- Miles above Mouth of River

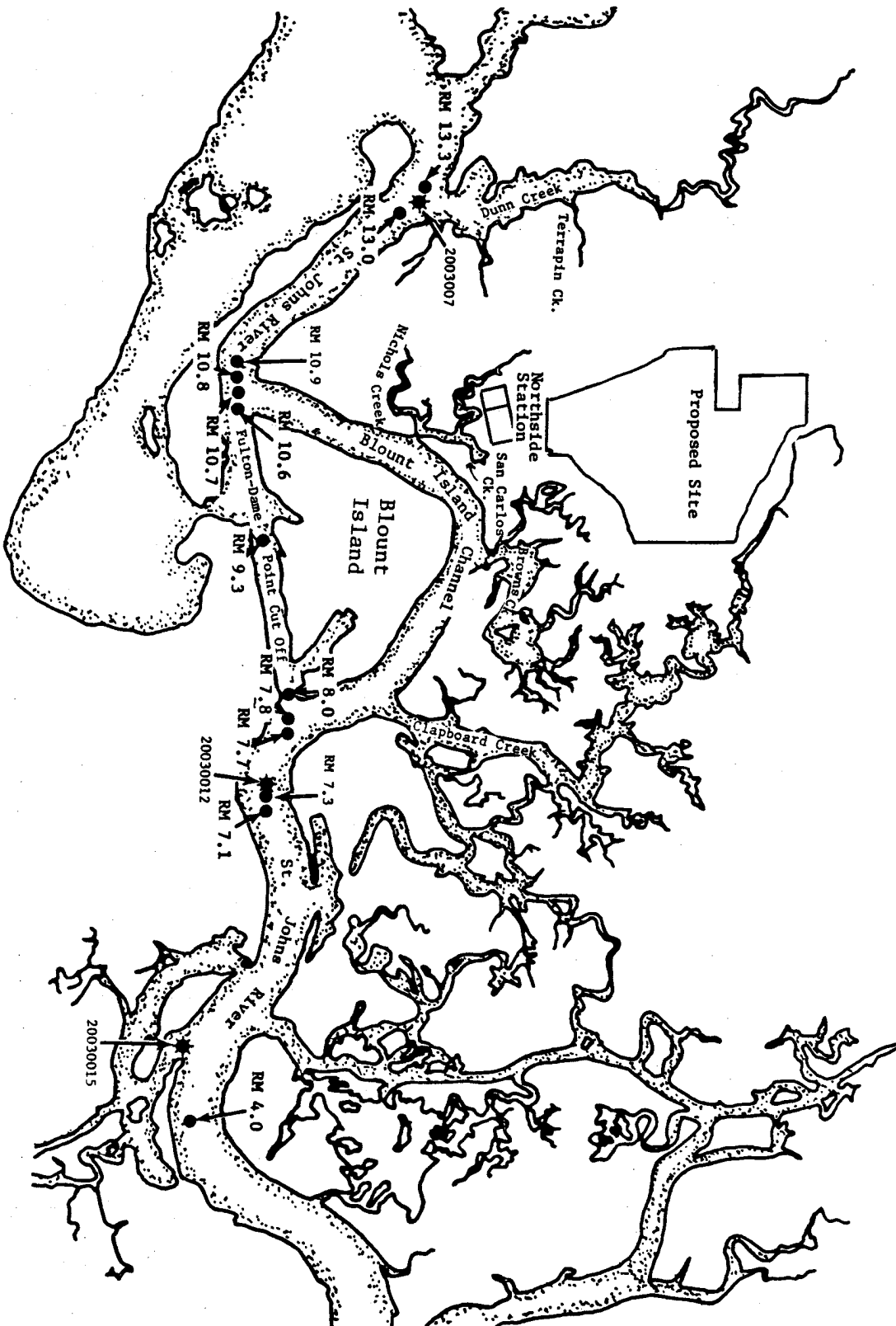


Figure 2.5-14 Historical Water Quality Sampling Sites - Blount Island Channel, Browns Creek, Nichols Creek, and San Carlos Creek



★ Sampling Station location (Approximate)

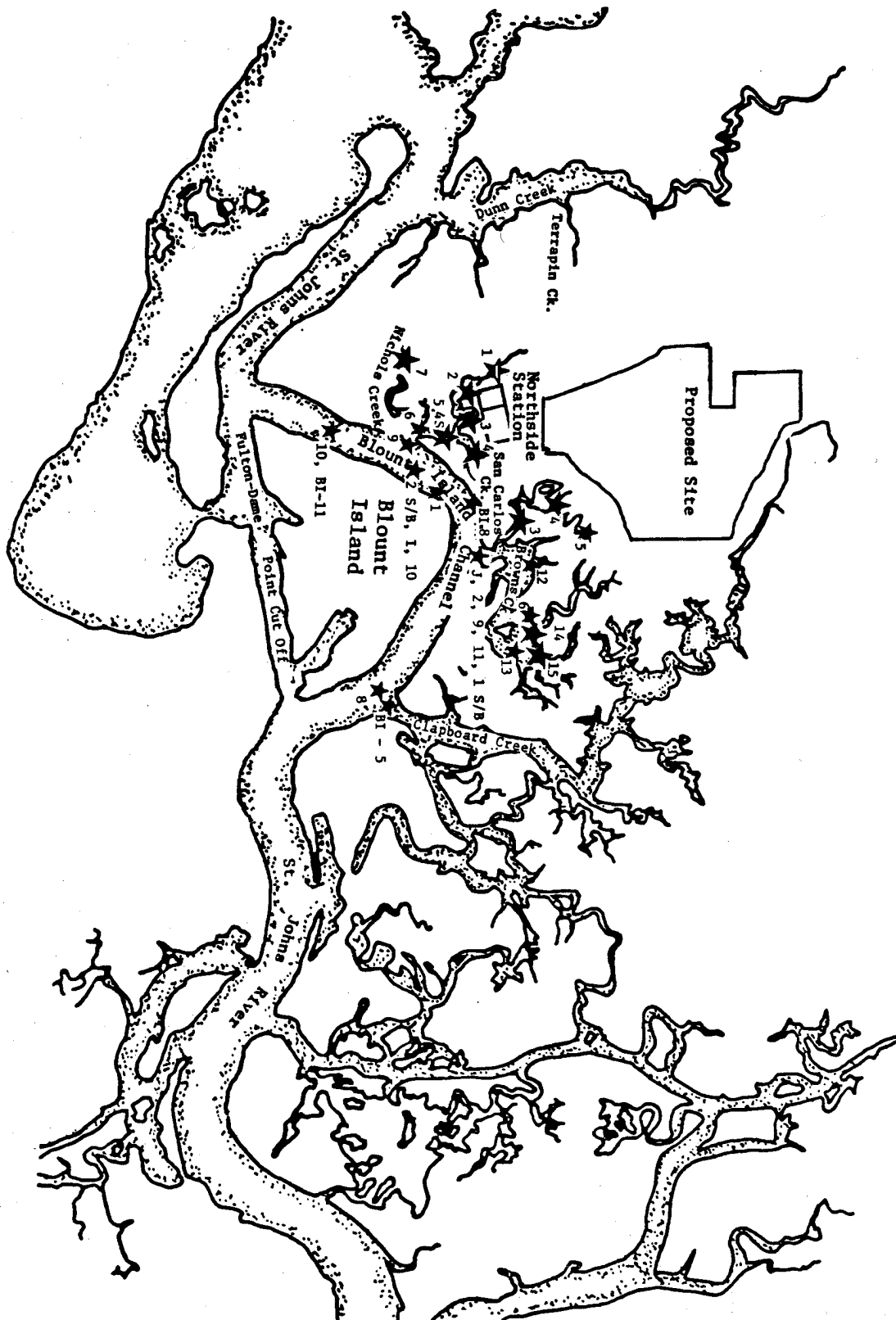


Figure 2.5-15 Frequency of Occurrence of Northside Station Pumping Modes

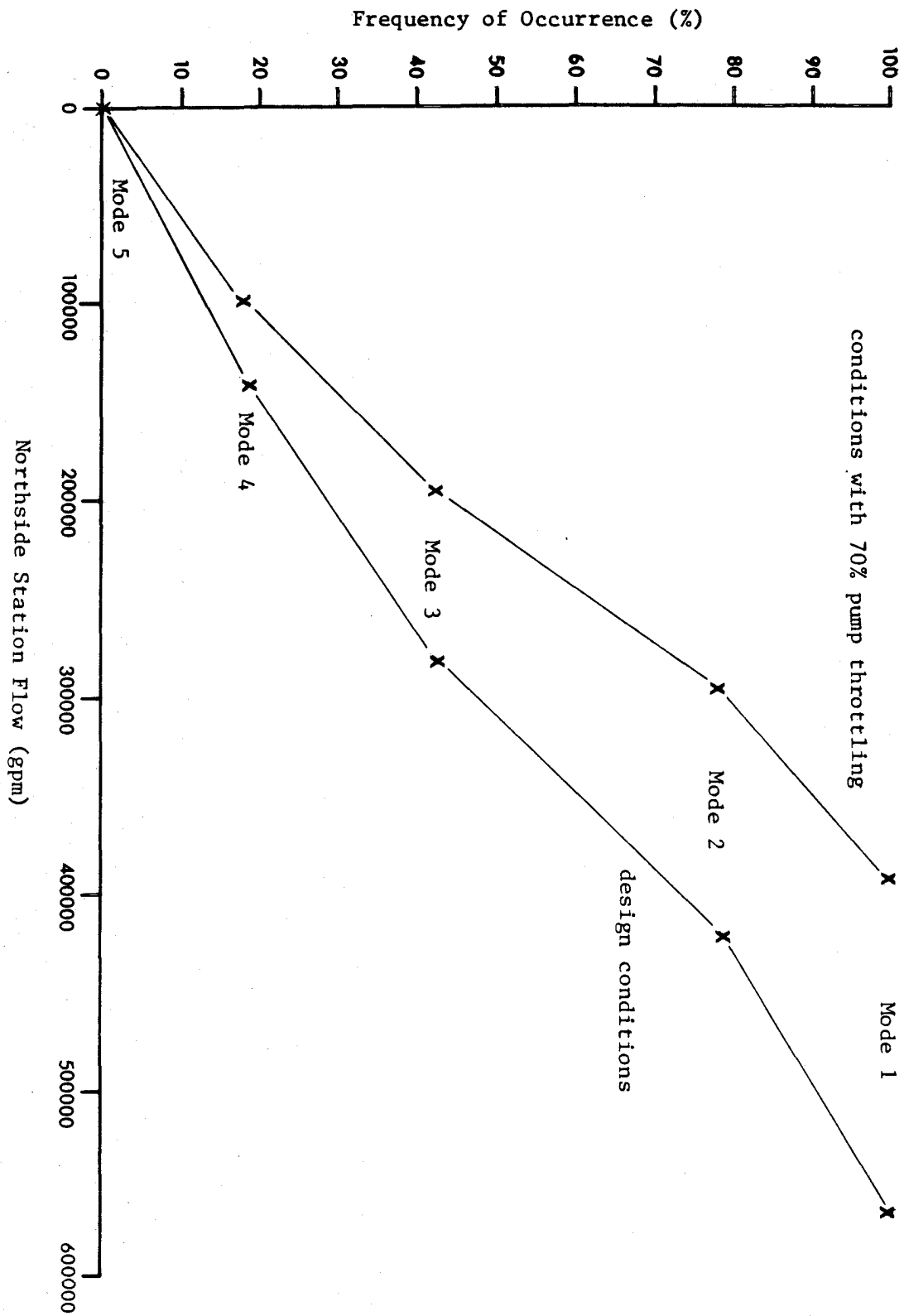
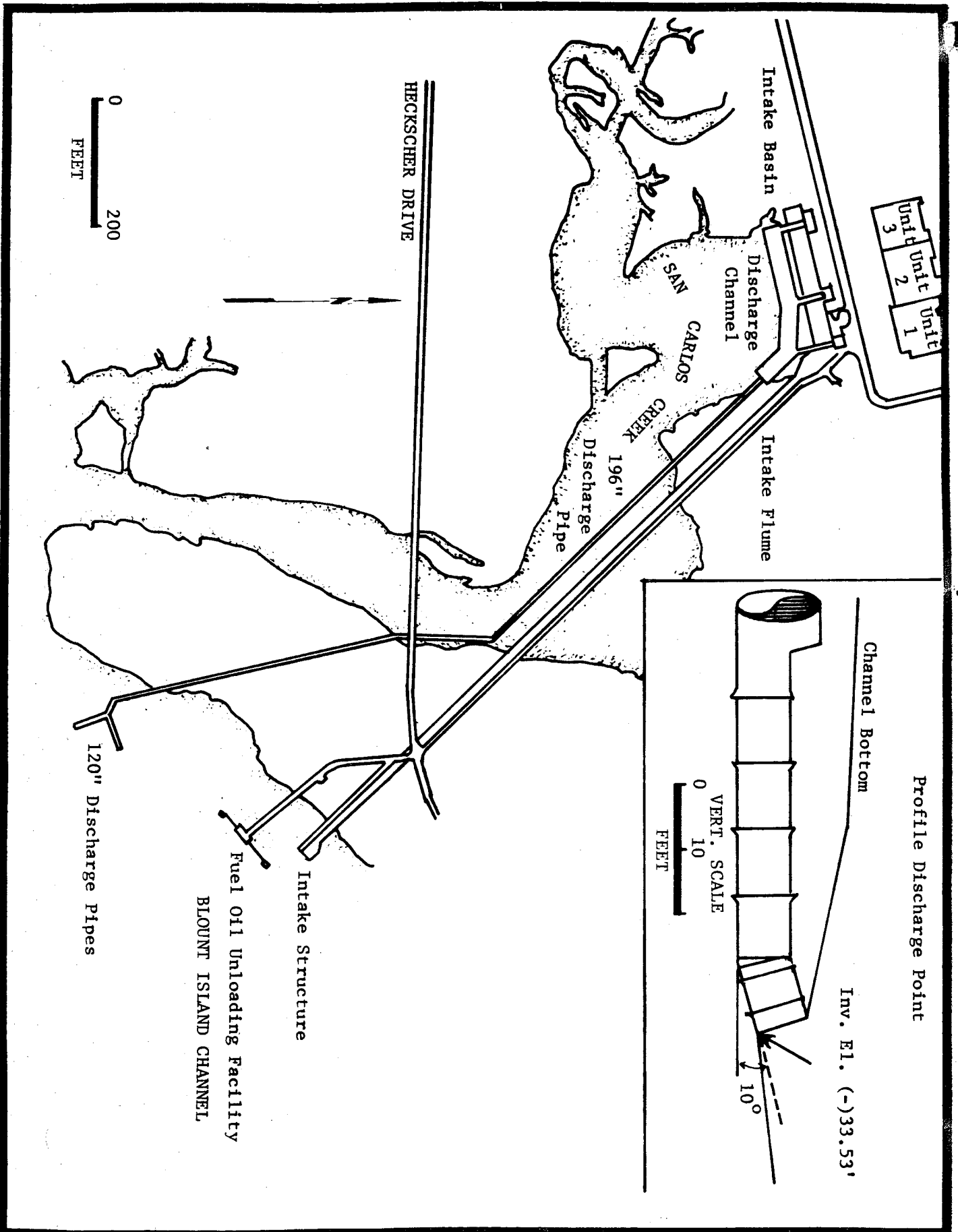


Figure 2.5-16 Northside Station Circulating Water System



Plume Centerline Distance to 2°F Isotherm

Northside Only, Average Conditions

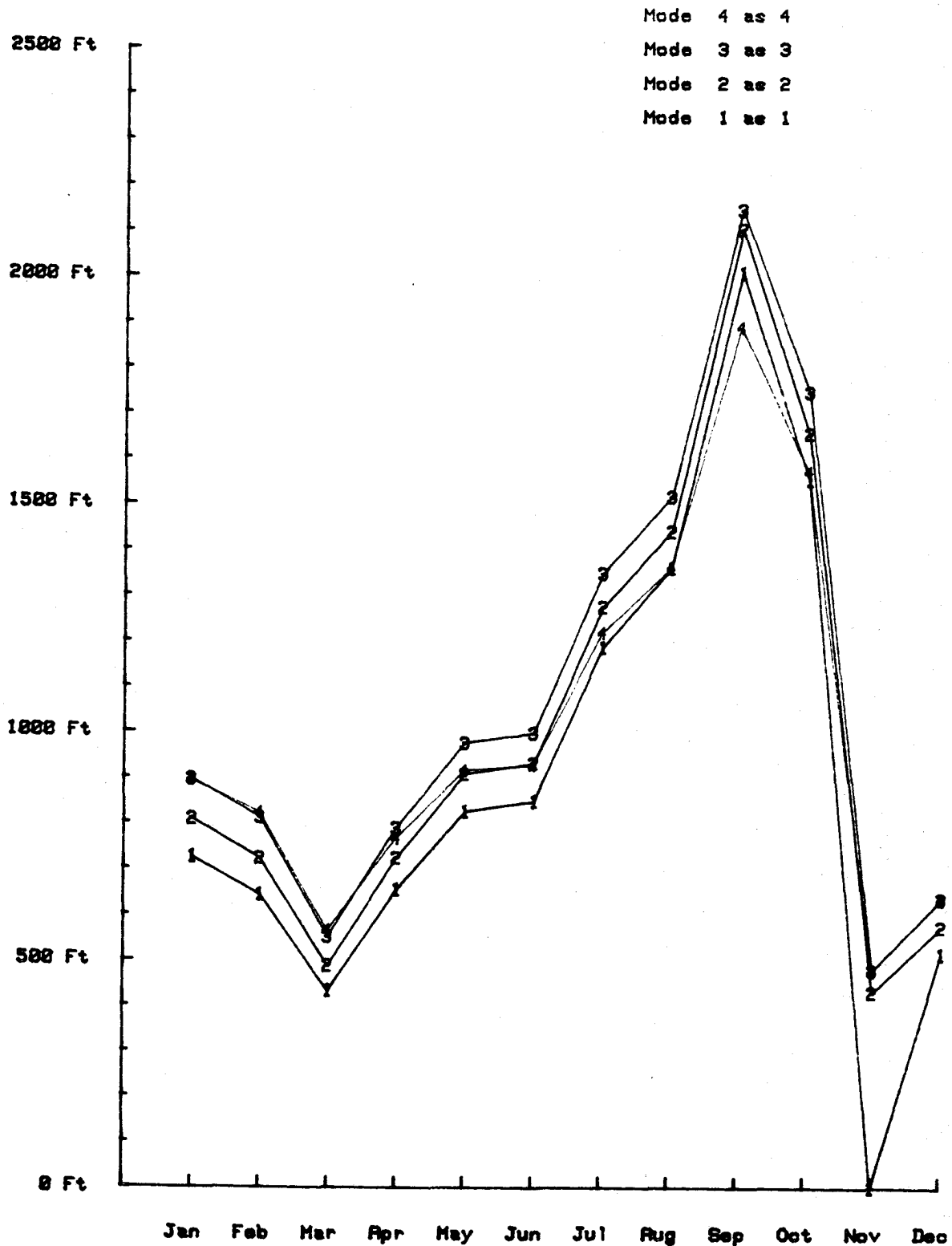


Figure 2.5-17

Predicted Plume Centerline Distance to 2°F Isotherm for Northside Station Operation, Average Conditions

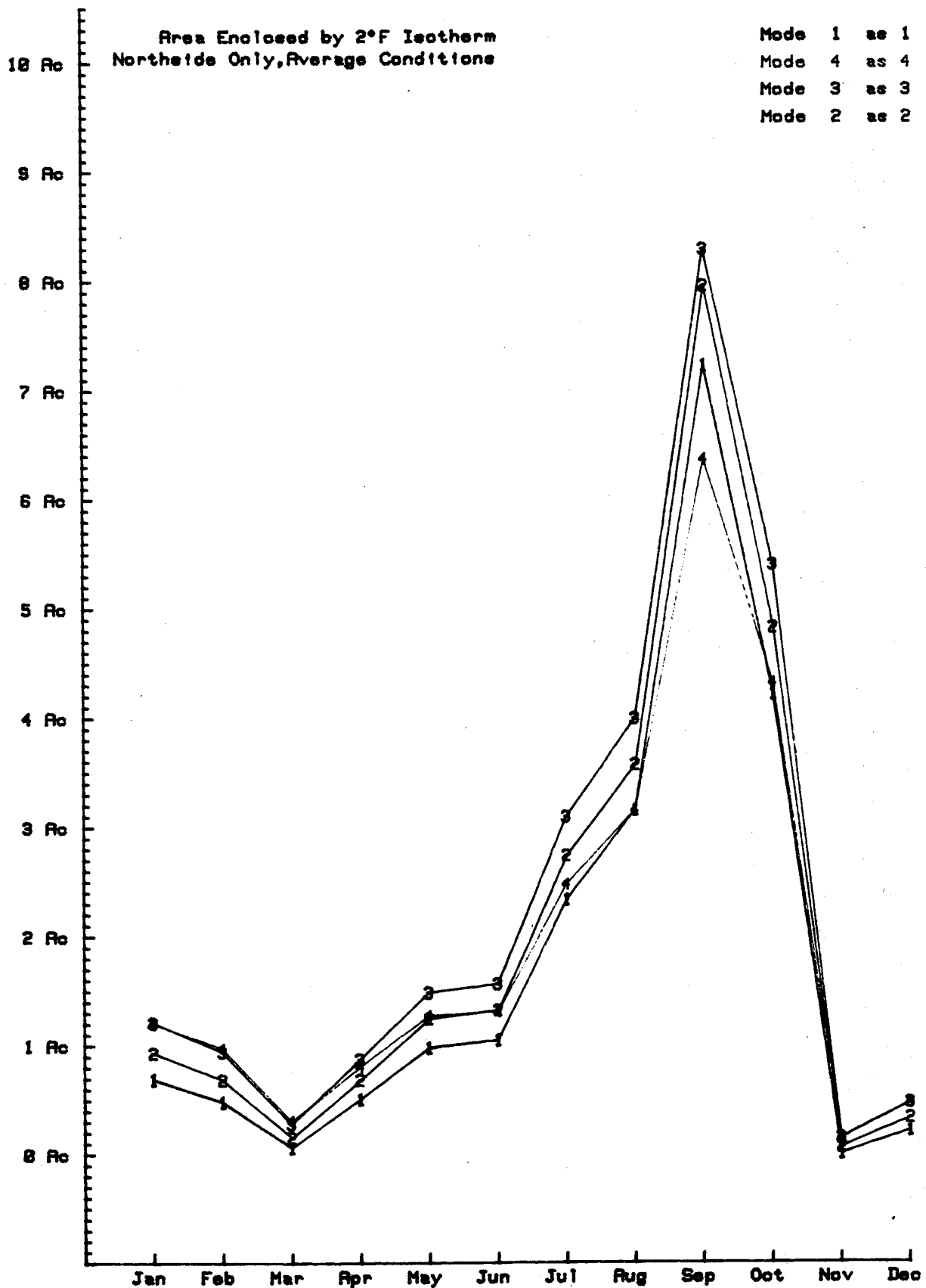


Figure 2.5-18

Predicted Area Enclosed by 2°F Isotherm for Northside Station Operation,
Average Conditions

Plume Centerline Distance to 2°F Isotherm
Northside Only, Extreme Conditions

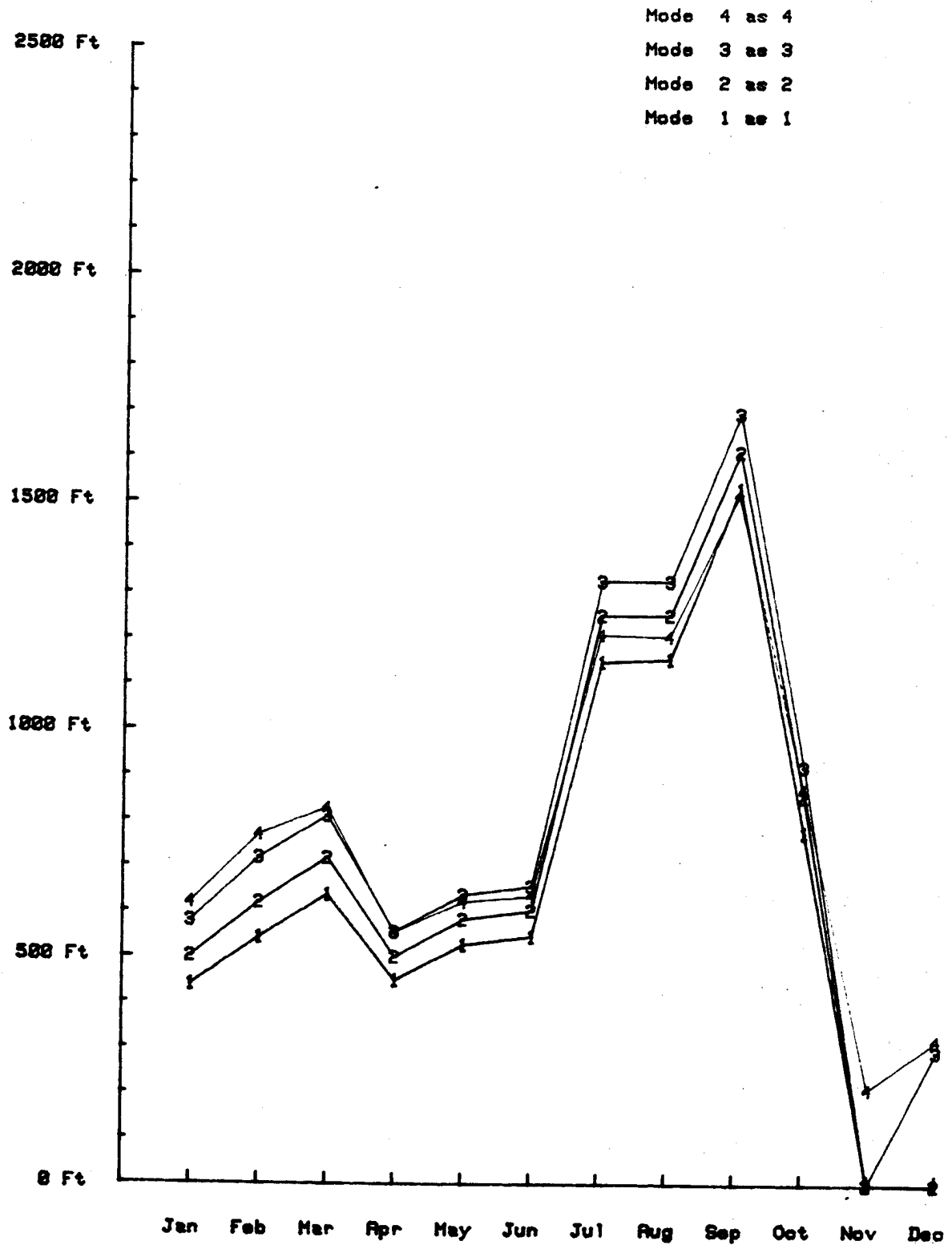


Figure 2.5-19

Predicted Plume Centerline Distance to 2° Isotherm for Northside Station Operation, Extreme Conditions

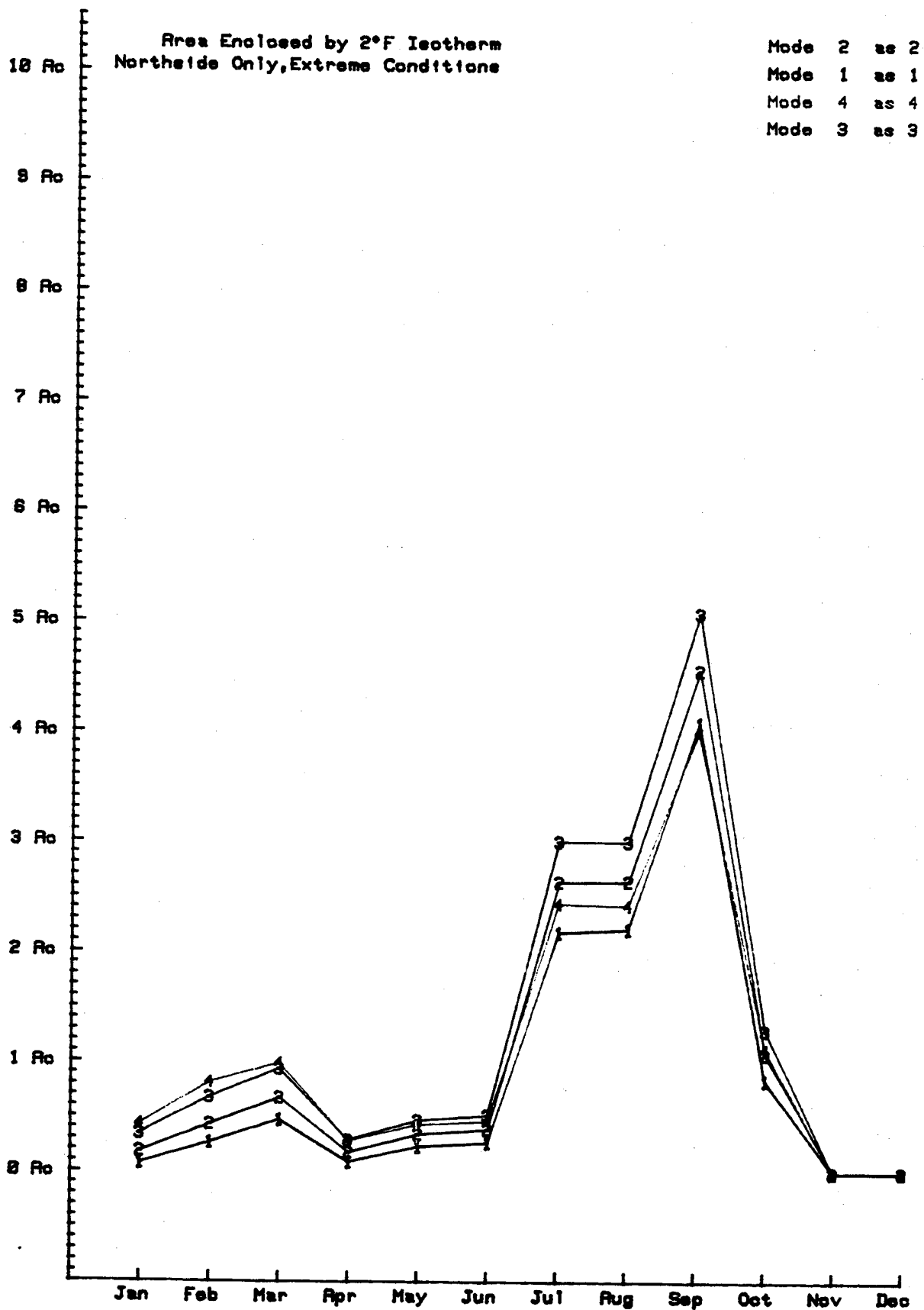


Figure 2.5-20 Predicted Area Enclosed by 2°F Isotherm for Northside Station Operation, Extreme Conditions

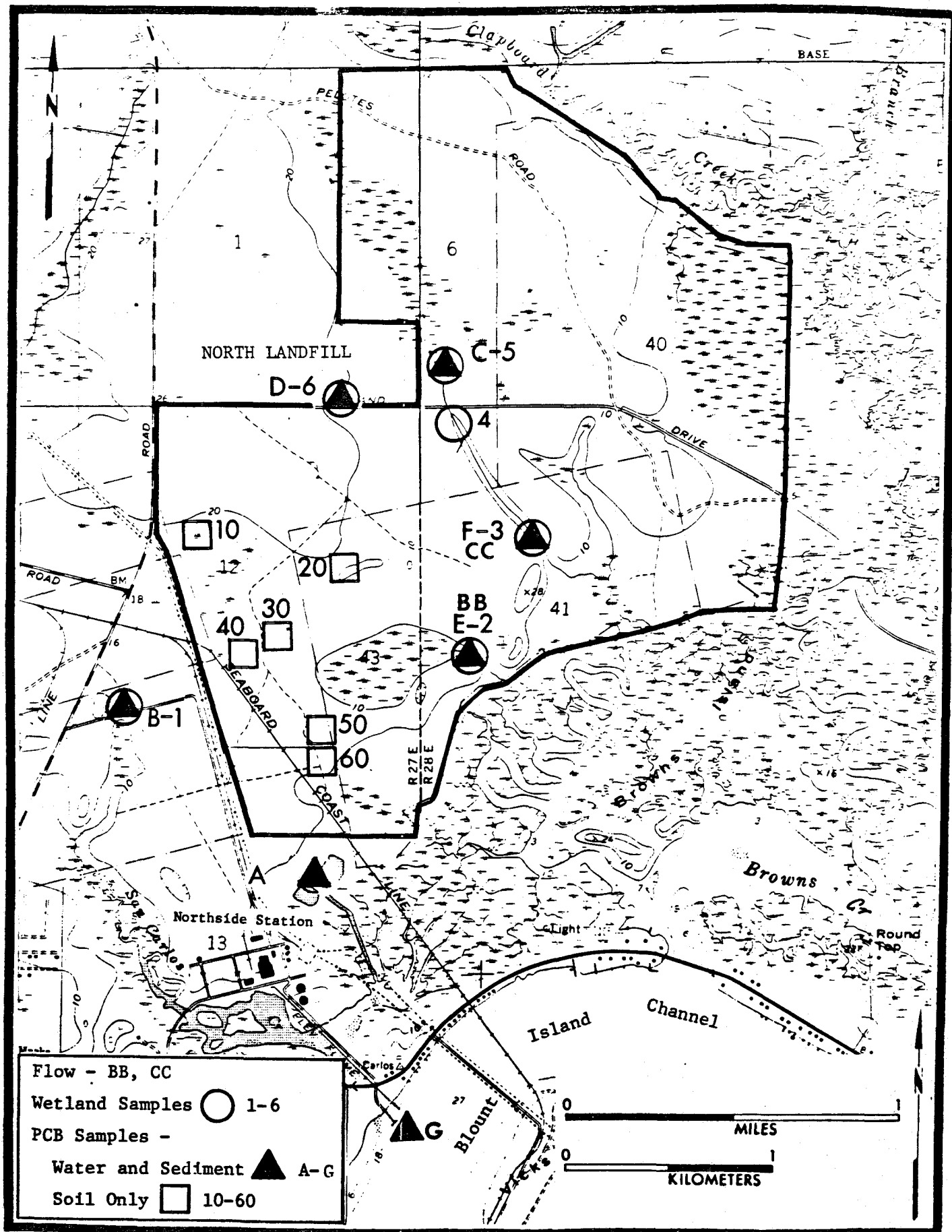
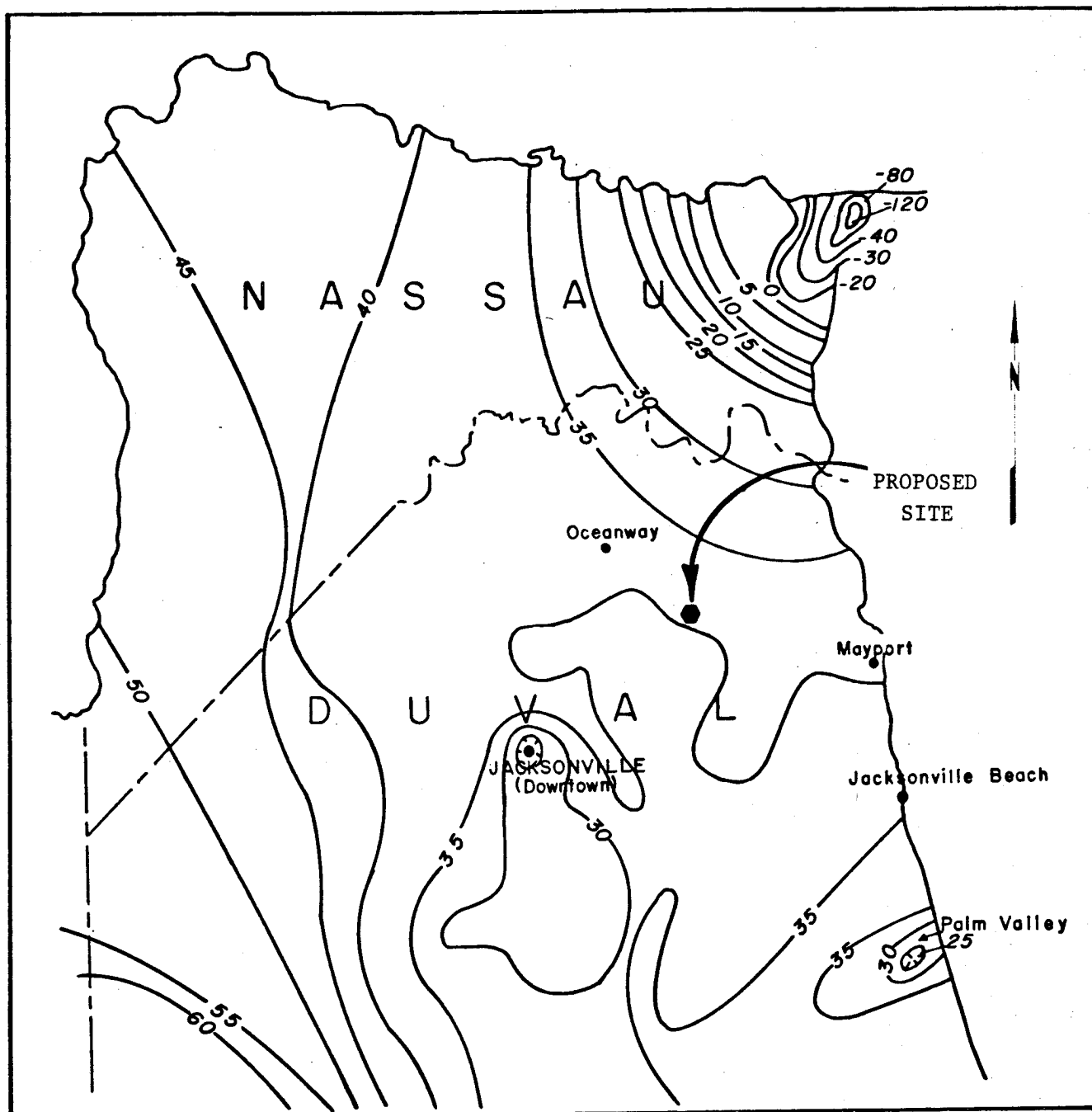


Figure 2.5-21 Water Quality and PCB Sampling Locations for Waterbodies in the Proposed Site Area



Source: Laughlin et al., 1980

—30— POTENTIOMETRIC CONTOUR - Shows altitude at which water level would have stood in tightly cased wells. Machures indicate depressions. Contour intervals 5, 20, and 40 feet. Datum is National Geodetic Vertical Datum of 1929 (NGVD).

SCALE
10 MILES 0 10 MILES

Figure 2.5-22 Potentiometric Surface Map of the Floridan Aquifer:
May, 1979

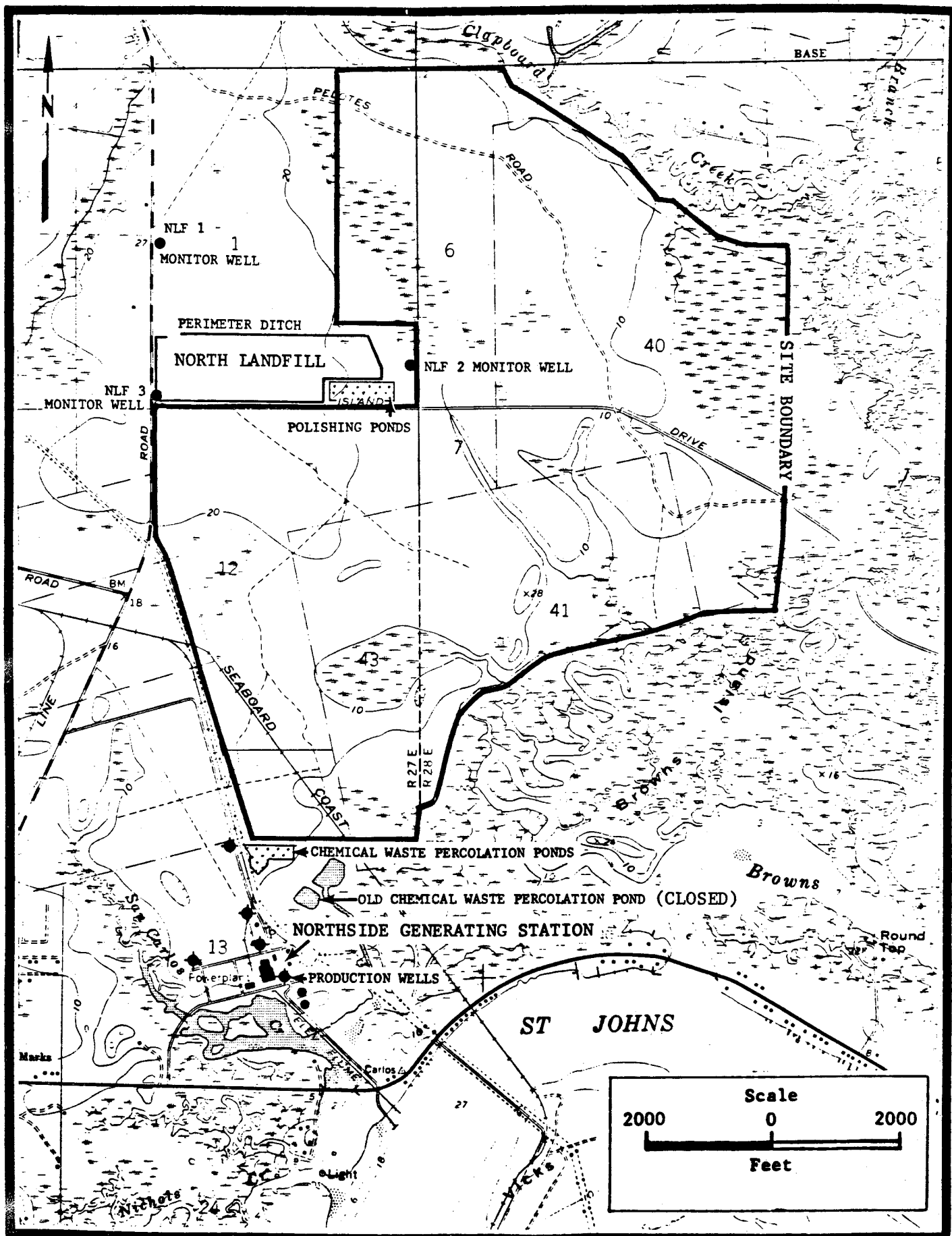


Figure 2.5-24 Location of Facilities Adjacent to the Proposed Site

2.6 CLIMATOLOGY

2.6.1 General Climatology

The influence of the Atlantic Ocean and the Bermuda high pressure system results in the prevailing subtropical marine climate of the northeastern Florida region. Long, warm, humid summers and short, mild winters prevail. Because of its southerly location and marine influences, this area exhibits a fairly constant climate, evidenced by small annual and diurnal temperature variations. Rainfall is moderate to heavy during the summer and light during the winter. Well developed extra-tropical migratory high and low pressure centers usually traverse north of the region, and their influence on the area is therefore minimal.

Extremely hot weather is rare because of the maritime climate. Maximum temperatures over a summer usually do not exceed the middle 90's, and winter temperatures are mild, interrupted only a few times per season by northerly or northwesterly intrusions of polar air. Inland locations generally display a greater range of temperatures than do coastal locations due to the rapid heating and cooling of ground surfaces as compared with water bodies.

Winds are of moderate speed and occur predominately from the southeast to southwest during the warmer half of the year. During the cooler months, the predominant wind direction is northwesterly. Along the coastal areas of northeastern Florida, local land-sea breeze circulations modify regional wind patterns by adding an easterly wind component during the daytime hours and a westerly component at night.

The average annual rainfall in this region is over 50 inches. Summer precipitation (May-October) is usually twice the winter precipitation (November-April). Winter precipitation results from frontal systems, pre-frontal squall lines, and wave disturbances along fronts stalled over the Florida peninsula. Summer precipitation is mostly of the convective

type, resulting in frequent summertime afternoon thundershowers. Tropical disturbances periodically cause significant additional precipitation during the summer and fall seasons.

2.6.2 Jacksonville Climatological Conditions

The following climatological summary information was obtained from meteorological data which were recorded at the Jacksonville International Airport and Imeson Field Airport. The Jacksonville International Airport (located approximately 14 km west-northwest of the site) is the closest currently operating first-order weather station. Imeson Airport (located approximately 8 km west of the site) was closed in 1971. The data collected from both of these locations are felt to be representative of long-term, on-site conditions because of their proximity to the proposed site.

2.6.2.1 Temperatures

Monthly and annual values of average daily mean, maximum and minimum temperatures recorded at Jacksonville during the period 1941-1970 are presented in Table 2.6-1. Temperature extremes are also included. The annual mean temperature is 68.4°F, with the monthly means ranging from 54.6°F in January to 81.0°F in July and August. The highest temperature recorded was 105°F (July, 1942), and the lowest temperature was 12°F (December, 1962).

2.6.2.2 Atmospheric Humidity

Because of its maritime location, the atmosphere in northeastern Florida is moist, with an average relative humidity of about 75 percent. Table 2.6-2 presents monthly and annual averages of relative humidity observed at Jacksonville. Relative humidities are generally highest during the early morning hours, typically ranging between 80 and 90 percent,

compared to about 50 and 60 percent during the afternoon. Mean relative humidities tend to be lowest in the spring months and highest in the summer months; however, seasonal differences are small.

2.6.2.3 Winds

Figure 2.6-1 is an annual surface level wind rose for the period 1970 to 1974 at Jacksonville. These data indicate a fairly even distribution of wind directions, but with winds from the southwest and northwest quadrants slightly more frequent than the others. Table 2.6-3 presents monthly average wind speeds and directions recorded at Jacksonville during the period 1941 to 1970. The annual average wind speed for this period was 8.4 miles per hour (mph), with northwesterly winds being most common. The most common direction varies from southwesterly in the spring and summer to northeasterly and northwesterly in the fall and winter. The monthly mean wind speed varies from 9.4 mph in February and March to 7.2 mph in August.

Winds in excess of 40 mph have been recorded in every month of the year at Jacksonville. Strong, gusty surface winds often occur in association with severe thunderstorm activity, well developed cold fronts, and tropical cyclones. The fastest mile of wind (the fastest speed, in miles per hour, of any "mile" of wind which passes the anemometer) on record at Jacksonville is 82 mph; it was associated with Hurricane Dora in September, 1964. One method which is used to quantify wind potential for a given area is the 100-year fastest mile wind speed which is the maximum expected wind over a 100-year interval. The 100-year fastest mile wind speed as calculated by the American National Standard Institute (ANSI, 1972) in the Jacksonville area is 100 mph.

2.6.2.4 Precipitation

Rainfall in the Jacksonville area reaches a maximum during the summer months and diminishes during the late fall and winter months. Summer rainfall tends to be in the form of convective showers with large differences in amounts from one location to another on any given day.

Winter precipitation is generally associated with frontal activity from migrating low pressure systems and is more evenly distributed in a spacial sense.

The average annual rainfall at Jacksonville during the period 1941 to 1970 was 54.47 inches (USDC, 1978). Monthly average rainfall amounts are listed in Table 2.6-4. The month with the highest average rainfall was August with 7.89 inches. Lowest average rainfall occurred during November with 1.79 inches. The record rainfall for one month occurred during September, 1949 when 19.36 inches were recorded. The record for a 24-hour period is 10.17 inches, which occurred in September, 1950.

Based on various observations and extrapolation techniques, Hershfield (1961) calculated expected maximum point precipitation quantities for various durations and return periods. These calculated values are presented in Table 2.6-5.

2.6.2.5 Visibility

Five years (1964-1968) of visibility data from the Imeson Airport were analyzed to determine background visibility in the Jacksonville region. The visibility data are those reported by the National Weather Service as "prevailing visibility". By definition, prevailing visibility means the greatest horizontal visibility (visual range) prevailing throughout at least half of the horizon circle which need not necessarily be continuous. Daytime visibility is measured by observing markers (i.e., buildings, towers, terrain) against the horizon sky; nighttime visibility measurements are based on observing unfocused, moderately intense light sources.

The results of a summary of the hourly observations for the five year period are presented in Table 2.6-6. The data indicated that the most frequent prevailing visibilities are between 8 and 12 miles. These values are fairly typical of visibilities in the eastern U.S. (Trijonis and Yuan, 1978).

2.6.3 Dispersion Climatology

2.6.3.1 Stability

Atmospheric stability in conjunction with general wind patterns and mixing height determines the potential of the atmosphere to disperse airborne pollutants. Atmospheric stability conditions are typically categorized as unstable, neutral, or stable. An unstable atmosphere is one in which rapid diffusion takes place in both the horizontal and vertical direction. In terms of temperature changes with height, an unstable atmosphere is characterized by a sharp decrease in temperature with height. Neutral conditions, which are characterized by moderate decreases of temperature with height, are common in the atmosphere and are associated with moderate diffusion rates. A stable atmosphere is characterized by only slight decreases, or even increases of temperature with height, and greatly reduced diffusion rates in comparison with unstable or neutral atmospheres.

The stability classifications presented in this section are based on the Turner (1964) or "STAR" method, which assigns a stability on the basis of surface wind speed, cloud cover, and solar angle. The mean seasonal and annual frequency distribution of stability classes for a five-year period from 1970 to 1974 at Jacksonville is summarized in Table 2.6-7. The seasonal stability distribution indicates that during the summer months there is a high incidence of unstable (Classes A, B and C) conditions (39 percent), while winter has the lowest incidence of unstable conditions (13 percent) and the highest percentage of neutral (Class D) conditions (48 percent). The largest relative percentage of stable (Class E) conditions (50 percent) occurs during the fall. There are also distinct diurnal trends displayed by atmospheric stability. The daytime hours are characterized by unstable conditions; stable conditions prevail at night.

Appendix F contains a summary of wind directions and speeds categorized by these stability classes. This is referred to as STAR program data.

2.6.3.2 Mixing Height

An important parameter which describes the regional dispersion capability of the atmosphere is mixing height. Mixing height is simply the vertical extent of the surface layer within which relatively vigorous mixing of pollutants takes place. Holzworth (1972) has compiled statistical summaries for mixing height at various locations throughout the United States based on twice daily balloon soundings. Average mixing heights and associated average wind speeds through the mixing layer for Jacksonville during the period 1960 to 1964 are shown in Table 2.6-8. This table also shows the number of episodes characterized by two or more consecutive days with mixing heights and mixing layer wind speeds lower than selected values. Holzworth's comparison of 62 locations throughout the United States indicates that conditions in northeastern Florida are more favorable for regional dispersion than are most other areas of the country.

2.6.4 On-Site Meteorological Conditions

2.6.4.1 General

An on-site meteorological monitoring program was conducted to provide data which would, together with the regional data described above, allow a description of on-site meteorological conditions to support the environmental impact analyses. Wind direction and speed, temperature, humidity, precipitation, and an atmospheric stability parameter were monitored from December, 1979 to December, 1980 at a location approximately 3.5 km north-northeast of the proposed plant stack. Figure 6.2-13 in Chapter 6 depicts the location of the monitoring facility and Section 6.2.6 provides a detailed discussion of the monitoring program.

Brief summaries of the data collected are presented in the following sections along with comparisons with regional data. The data reported for the month of December in the following paragraphs are actually a

combination of December, 1979 and December, 1980 data since the monitoring program actually commenced on December 10, 1979 and ceased on December, 10, 1980. The results of the monitoring program are discussed in more detail in four quarterly reports (Envirosphere; 1980, 1980a, 1980b, 1981), which have been submitted to the Florida Department of Environmental Regulation (FDER) and USEPA. These reports contain the raw hourly and/or daily data for the various parameters, monthly summaries, and quality assurance data.

2.6.4.2 Temperatures

Table 2.6-9 presents the monthly and annual mean and extreme temperatures measured at the monitoring facility along with the monthly mean Jacksonville International Airport temperatures reported during 1980. The highest recorded hourly average temperature was 98.9°F and the lowest was 28.0°F. The monthly mean temperatures ranged from 50.2°F in February to 80.6°F in July, and the annual mean temperature was 68.4°F. The monthly mean temperatures reported at the Jacksonville International Airport during the same period of record were 2 to 3°F higher than the mean monthly and annual temperatures recorded at the monitoring facility. The differences are probably due to a combination of different equipment, different measurement heights above ground level and the difference in distances from the ocean. With the exception of the below average temperatures recorded during the month of February, the year was comparable to the average temperatures normally observed at the airport, which are summarized in Table 2.6-1.

2.6.4.3 Atmospheric Humidity

Table 2.6-10 summarizes the monthly and annual mean relative humidity as a function of time of day at the monitoring facility. The relative humidity was computed from the ambient temperature and the dewpoint temperature which were both measured at the monitoring facility. The relative humidity at the site was high during the early morning hours

throughout the entire year, with mean 1 a.m. humidities ranging from 82 percent in February to 96 percent in September. The lowest relative humidity usually occurred during the afternoon hours. Seasonally, the lowest relative humidities generally occurred during the early spring and late fall months. These on-site mean relative humidity values are about 10 percent higher than the long term mean relative humidity values recorded at Jacksonville International Airport which are summarized in Table 2.6-2. This difference is probably due to a combination of different measuring equipment, differences in the measurement heights above ground level, differences in distance from the ocean and the proximity of the on-site monitoring station to ponds and wetlands.

2.6.4.4 Winds

Table 2.6-11 presents the monthly and annual averaged wind speeds and most frequent wind directions measured at the monitoring facility and at the Jacksonville International Airport during 1980. The monthly average wind speeds ranged from 4.5 mph in September to 7.3 mph in March. The prevailing wind directions during the winter months were generally northwesterly and shifted to the west during the early summer months and to the east in late summer/early fall. Wind speeds observed at the Jacksonville International Airport during the same period of record were slightly higher and wind directions generally exhibited a somewhat greater northerly component during the winter.

Comparison of the 1980 on-site and Jacksonville International Airport wind data to the long term average (1970-1974) wind conditions at the airport, as summarized in Table 2.6-3, indicates that the wind speeds during the past year were lower than normal, but that the distribution of directions were similar.

Figures 2.6-2 and 2.6-3 present the 1980 annual wind roses for the on-site and Jacksonville International Airport wind data, respectively. The 1980 Jacksonville International Airport wind rose is very similar to

the 5 year (1970-1974) airport wind rose presented in Figure 2.6-1, indicating that from a wind direction standpoint 1980 was a "representative" year. The 1980 on-site wind rose is similar to the airport wind rose, but there are a few differences. The on-site wind exhibited particularly large westerly, northwesterly and southwesterly components while the airport data exhibited strong westerly and northerly components. There were also a significantly higher number of calm wind conditions reported at the airport, and the on-site data exhibited a greater occurrence of winds between 1 and 3 mph. These differences can be attributed in part to the differences in measuring equipment and to the differences in observational methods used to compile the two data bases. While the on-site data uses electronically averaged wind data using up to 600 samples per hour, the airport data is a nearly instantaneous observation made by an observer once per hour.

2.6.4.5 Precipitation

The precipitation was measured at the monitoring facility using a volumetric rain gauge. The monthly precipitation totals are summarized in Table 2.6-12. Monthly totals ranged from a low of 1.05 inches in February to a high of 8.08 inches in June. The annual total precipitation measured during the year (41.2 inches) was relatively light compared to the climatological normal of 54.5 inches measured at the Jacksonville International Airport as presented in Table 2.6-4.

2.6.4.6 Stability

The horizontal wind direction standard deviation, or wind sigma, was computed directly from the wind direction measurements at the on-site monitoring station. The wind direction standard deviation provides one indication of the atmospheric stability. Table 2.6-13 presents the seasonal and annual frequency distributions of the various stability classes as determined by this method. Although there was some variation of

the stability classifications throughout the year, the only clear seasonal pattern was the occurrence of less unstable and more stable conditions during the winter than in the other seasons.

The stability classification system used on the Jacksonville International Airport data, discussed in Section 2.6.3.1, is based on a different method which used cloud cover, wind speed and sun angle. This stability classification, commonly referred to as the Turner classification method, was applied to five years of airport data and is summarized in Table 2.6-7. A comparison of Tables 2.6-7 and 2.6-13 indicates significantly more stable conditions at the airport than on-site. However, the difference is more likely due to differences in stability determination methods than to actual stability condition differences.

2.6.5 References

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Table 2.6-1

ATMOSPHERIC TEMPERATURE (°F) AT JACKSONVILLE, FLORIDA
1941-1970

<u>Month</u>	<u>Averages</u>		<u>Mean</u>	<u>Extremes</u>	
	<u>Daily Max.</u>	<u>Daily Min.</u>		<u>Highest</u>	<u>Lowest</u>
Jan	64.6	44.5	54.6	85	19
Feb	66.9	45.7	56.3	88	19
Mar	72.2	50.1	61.2	91	25
Apr	79.0	57.1	68.1	95	35
May	84.6	63.9	74.3	100	45
Jun	88.3	70.0	79.2	103	56
Jul	90.0	72.0	81.0	105	61
Aug	89.7	72.3	81.0	102	64
Sep	86.0	70.4	78.2	100	50
Oct	79.2	61.7	70.5	96	38
Nov	71.4	51.0	61.2	88	21
Dec	65.6	45.1	55.4	84	12
Annual	78.1	58.7	68.4	105	12

Source: U.S. Department of Commerce, 1978

Table 2.6-2

MEAN MONTHLY AND ANNUAL RELATIVE HUMIDITY (%)
AT JACKSONVILLE, FLORIDA
1936-1978

Month	Hour of the Day (LST)			
	0100	0700	1300	1900
Jan	85	87	57	74
Feb	82	85	52	68
Mar	82	85	49	65
Apr	83	85	47	64
May	85	84	50	66
Jun	87	86	56	72
Jul	88	87	58	75
Aug	90	90	60	78
Sep	89	91	62	79
Oct	88	90	58	78
Nov	87	89	55	78
Dec	86	88	58	77
Annual	86	87	55	73

Source: U.S. Department of Commerce, 1978

Table 2.6-3

LONG-TERM AVERAGE
WIND CONDITIONS AT JACKSONVILLE, FLORIDA

<u>Month</u>	<u>Average Speed (mph) (1941-1970)</u>	<u>Most Common Direction (1950-1963)</u>	<u>Fastest Mile (1941-1970)</u>
Jan	8.4	NW	41
Feb	9.4	WSW	52
Mar	9.4	NW	44
Apr	9.1	SE	48
May	8.6	WSW	62
Jun	8.3	SW	76
Jul	7.5	SW	49
Aug	7.2	SW	52
Sep	8.1	NE	82
Oct	8.6	NE	72
Nov	8.1	NW	60
Dec	8.2	NW	62
Annual	8.4	NW	82

Source: U.S. Department of Commerce, 1978

Table 2.6-4

AVERAGE MONTHLY RAINFALL AT JACKSONVILLE, FLORIDA
1941-1970

<u>Month</u>	<u>Mean (inches)</u>	<u>Maximum (inches)</u>	<u>Minimum (inches)</u>
Jan	2.78	7.29	0.06
Feb	3.58	8.85	0.52
Mar	3.56	10.18	0.18
Apr	3.07	11.61	0.17
May	3.22	10.43	0.61
Jun	6.27	12.90	2.19
Jul	7.35	16.21	1.97
Aug	7.89	16.24	1.92
Sep	7.83	19.36	1.02
Oct	4.54	13.44	0.16
Nov	1.79	7.85	T
Dec	<u>2.59</u>	7.09	0.04
Annual	54.47		

a Trace

Source: U.S. Department of Commerce, 1978

Table 2.6-5

JACKSONVILLE AREA
CALCULATED MAXIMUM POINT PRECIPITATION
(inches)

<u>Rainfall Period</u>	<u>Return Period (Years)</u>						
	<u>1</u>	<u>2</u>	<u>5</u>	<u>10</u>	<u>25</u>	<u>50</u>	<u>100</u>
30 minutes	1.5	1.7	2.1	2.4	2.7	3.0	3.2
1 hour	2.0	2.2	2.6	3.0	3.4	3.8	4.1
2 hours	2.3	2.7	3.3	3.7	4.3	4.8	5.3
3 hours	2.5	3.0	3.8	4.2	4.8	5.4	6.0
6 hours	3.0	3.5	4.5	5.1	6.0	6.9	7.3
12 hours	3.5	4.2	5.5	6.4	7.2	8.0	9.0
24 hours	4.0	4.9	6.4	7.5	8.5	9.8	11.0

Source: Hershfield, 1961

Table 2.6-6 (Revision 1)

PERCENT FREQUENCY DISTRIBUTION OF VISIBILITY
AT IMESON AIRPORT
(1964-1968)

<u>Season</u>	<u>0-2</u>	<u>2-4</u>	<u>Distance (Miles)</u>		<u>8-12</u>	<u>>12</u>
			<u>4-6</u>	<u>6-8</u>		
Spring	9.6	6.5	8.1	26.3	39.7	9.7
Summer	3.5	4.6	7.1	32.7	46.3	5.8
Fall	2.6	3.9	7.6	38.2	45.1	2.6
Winter	<u>5.1</u>	<u>5.7</u>	<u>9.1</u>	<u>36.7</u>	<u>38.1</u>	<u>5.3</u>
Annual	5.2	5.1	8.0	33.5	42.4	5.8

Source: U.S. Department of Commerce, 1969

Table 2.6-6

PERCENT FREQUENCY DISTRIBUTION OF VISIBILITY
AT IMESON AIRPORT
(1964-1968)

<u>Season</u>	<u>0-2</u>	<u>2-4</u>	<u>Distance (Miles)</u>		<u>8-12</u>	<u>12</u>
			<u>4-6</u>	<u>6-8</u>		
Spring	9.6	6.5	8.1	26.3	39.7	9.7
Summer	3.5	4.6	7.1	32.7	46.3	5.8
Fall	2.6	3.9	7.6	38.2	45.1	2.6
Winter	<u>5.1</u>	<u>5.7</u>	<u>9.1</u>	<u>36.7</u>	<u>38.1</u>	<u>5.3</u>
Annual	5.2	5.1	8.0	33.5	42.4	5.8

Source: U.S. Department of Commerce, 1969

Table 2.6-7

FREQUENCY DISTRIBUTION OF STABILITY CLASSES
AT JACKSONVILLE, FLORIDA
1970-1974

<u>Pasquill Stability Class</u>	<u>Percent Frequency by Season</u>				
	<u>Dec-Feb</u>	<u>Mar-May</u>	<u>Jun-Aug</u>	<u>Sept-Nov</u>	<u>Annual</u>
A - Extremely Unstable	0	1	2	1	1
B - Unstable	4	6	15	5	7
C - Slightly Unstable	9	14	22	11	14
D - Neutral	48	40	20	33	35
E - Stable (all)	39	39	41	50	43

Source: U.S. Department of Commerce, 1974

Table 2.6-8

AVERAGE MIXING HEIGHTS AND EPISODES OF LIMITED DISPERSION
AT JACKSONVILLE, FLORIDA
1960-1964

	Morning		Afternoon	
	<u>Average Mixing Height (m)</u>	<u>Average Mixing Layer Wind Speed (m/s)</u>	<u>Average Mixing Height (m)</u>	<u>Average Mixing Layer Wind Speed (m/s)</u>
Winter	345	5.2	1058	6.7
Spring	447	5.3	1639	7.1
Summer	567	4.3	1681	5.6
Autumn	418	4.7	1321	6.5
Annual	444	4.9	1424	6.5

Number of Episodes Lasting Two or More Days

<u>Mixing Height (m)</u>	<u>Wind Speed (m/s)</u>		
	<u>≤2</u>	<u>≤4</u>	<u>≤6</u>
≤ 500	0	0	1
≤ 1000	0	2	12
≤ 1500	0	12	43

Source: Holzworth, 1972

Table 2.6-9

MONTHLY MEAN AND EXTREME TEMPERATURES (°F)
 MEASURED AT THE ON-SITE MONITORING FACILITY
 VERSUS MONTHLY MEAN TEMPERATURES MEASURED
 AT JACKSONVILLE INTERNATIONAL AIRPORT DURING 1980

<u>Month</u>	<u>On-Site Monitoring Facility</u>			<u>Jacksonville Airport</u>
	<u>Highest</u>	<u>Lowest</u>	<u>Mean</u>	<u>Mean</u>
January	74.6	28.0	52.5	53.1
February	78.3	24.8	50.2	50.9
March	81.4	23.3	61.5	62.3
April	86.5	43.5	66.4	68.8
May	89.0	55.9	72.7	74.3
June	92.5	57.7	77.5	80.2
July	98.9	62.4	80.6	83.0
August	93.3	67.0	79.4	81.9
September	89.7	64.8	77.5	79.8
October	86.9	36.5	66.7	68.2
November	80.4	32.1	59.4	62.1
December	76.0	31.1	54.9	56.3
Annual	98.9	28.0	65.8	68.3

Table 2.6-10

MONTHLY AND ANNUAL MEAN RELATIVE HUMIDITY (%)
MEASURED AT THE ON-SITE MONITORING FACILITY DURING 1980

Month	Hour of Day (LST)			
	0100	0700	1300	1900
January	95	97	84	89
February	82	87	60	68
March	86	87	63	73
April	86	92	56	68
May	92	96	71	73
June	91	97	68	73
July	93	98	71	76
August	92	98	67	73
September	96	98	66	73
October	92	96	64	71
November	90	90	64	84
December	94	97	66	86
Annual	91	94	67	75

Table 2.6-11

MONTHLY AND ANNUAL WIND SPEED AND DIRECTION
 MEASURED AT THE ON-SITE MONITORING FACILITY AND
 JACKSONVILLE INTERNATIONAL AIRPORT
 DURING 1980

<u>Month</u>	<u>On-Site Monitoring Facility</u>		<u>Jacksonville International Airport</u>	
	<u>Most Frequent Direction</u>	<u>Speed (mph)</u>	<u>Most Frequent Direction</u>	<u>Speed (mph)</u>
January	WNW	5.0	N	6.0
February	NW	6.1	SW	7.2
March	SW	7.3	SW	8.4
April	WSW	6.7	W	7.2
May	W	6.3	W	6.3
June	WSW	5.7	WSW	6.2
July	W	5.9	W	6.7
August	NE	5.1	ENE	5.1
September	ENE	4.5	E	3.8
October	NNW	4.8	N	4.3
November	NNW	5.2	N	5.1
December	<u>NNE</u>	<u>5.1</u>	<u>NE</u>	<u>5.8</u>
Annual	WSW	5.6	W	6.0

Table 2.6-12

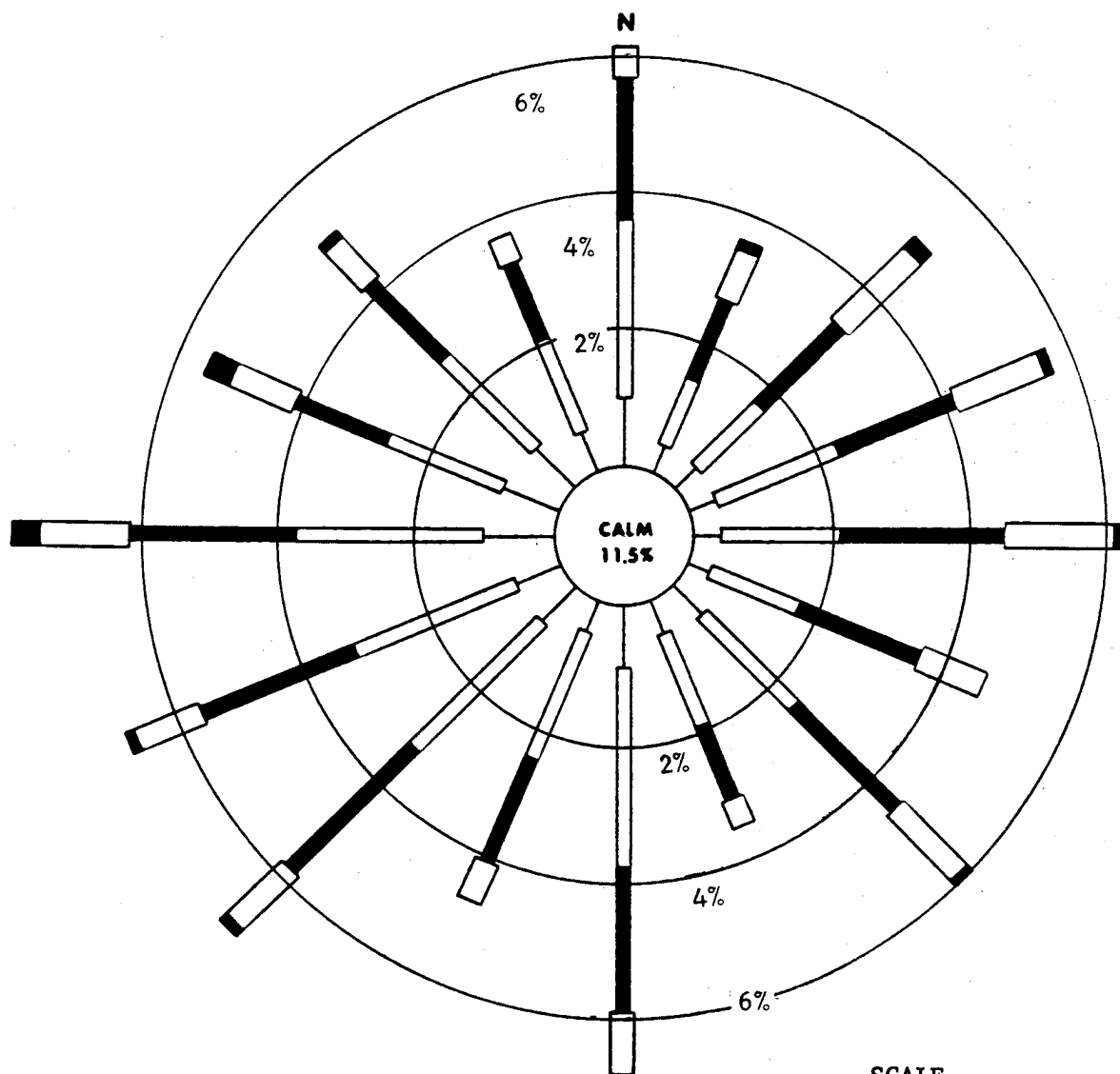
MONTHLY AND ANNUAL PRECIPITATION
MEASURED AT THE ON-SITE MONITORING FACILITY
DURING 1980

<u>Month</u>	<u>Total (inches)</u>
January	3.37
February	1.05
March	6.41
April	4.39
May	3.65
June	8.08
July	1.99
August	3.44
September	2.91
October	1.26
November	1.88
December	2.76
Annual	41.19

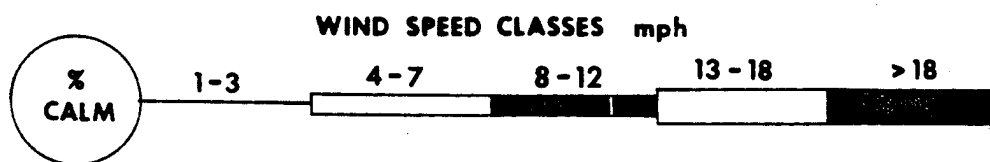
Table 2.6-13

SEASONAL AND ANNUAL FREQUENCY DISTRIBUTION
OF STABILITY CLASS AS DETERMINED BY WIND SIGMA IN 1980

<u>Stability Class:</u>	<u>Sigma Range (Degrees)</u>	<u>Percent Frequency by Season</u>				
		<u>Dec-Feb</u>	<u>Mar-May</u>	<u>Jun-Aug</u>	<u>Sept-Nov</u>	<u>Annual</u>
A - Extremely Unstable	≥ 22.5	3.3	6.5	10.6	7.9	8.2
B - Unstable	17.5-22.4	9.5	11.8	12.0	13.8	12.4
C - Slightly Unstable	12.5-17.4	21.9	26.4	26.0	29.8	27.2
D - Neutral	7.5-12.4	31.0	37.1	36.5	26.5	33.3
E - Slightly Stable	3.8-7.5	19.4	9.1	8.8	11.9	10.2
F - Stable	< 3.8	14.9	9.1	6.1	10.1	8.7

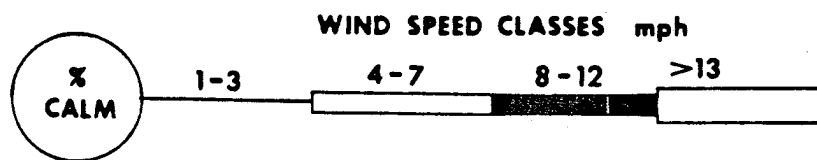
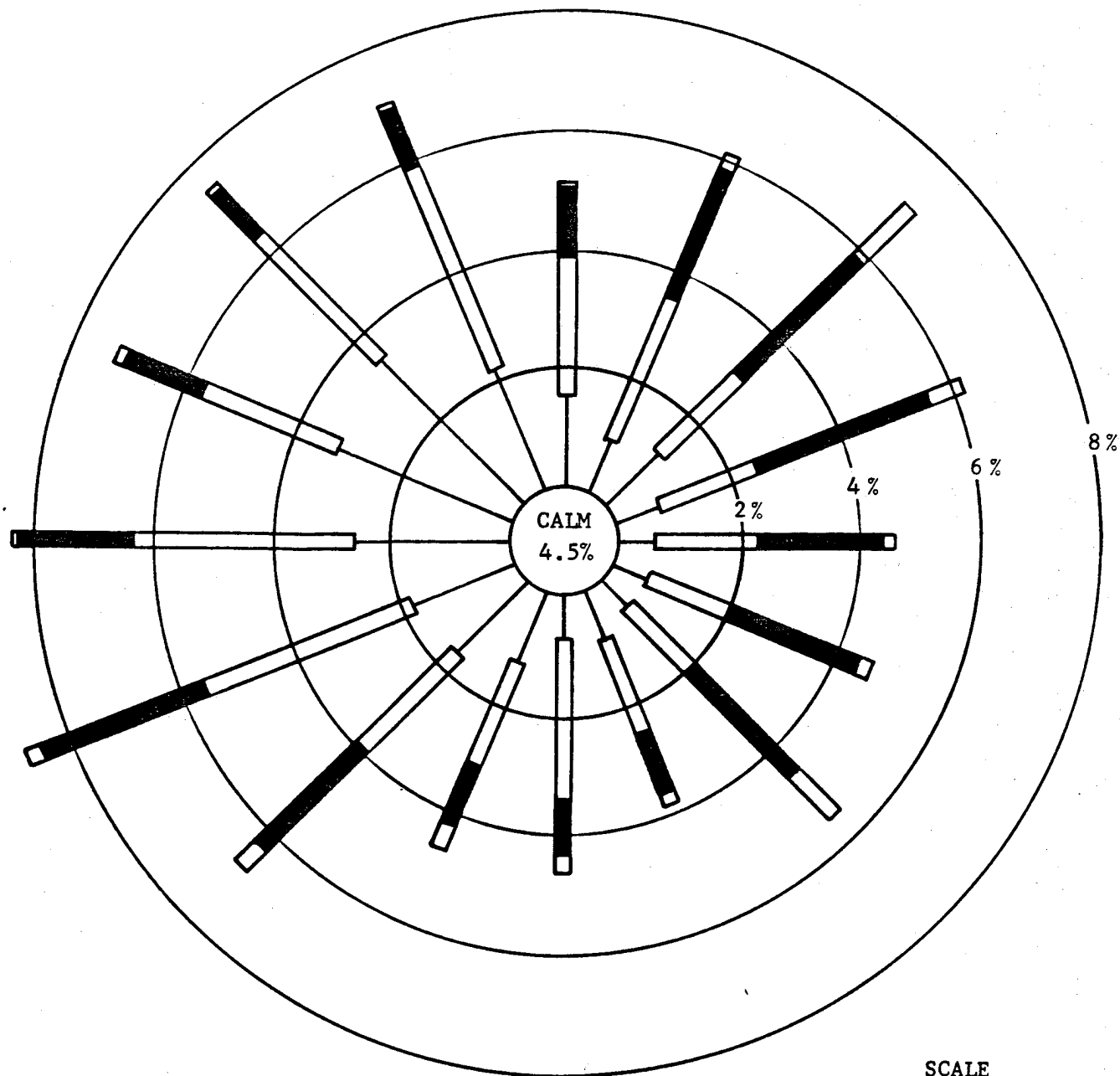


SCALE
.75" = 2%



Source: USDC, 1974

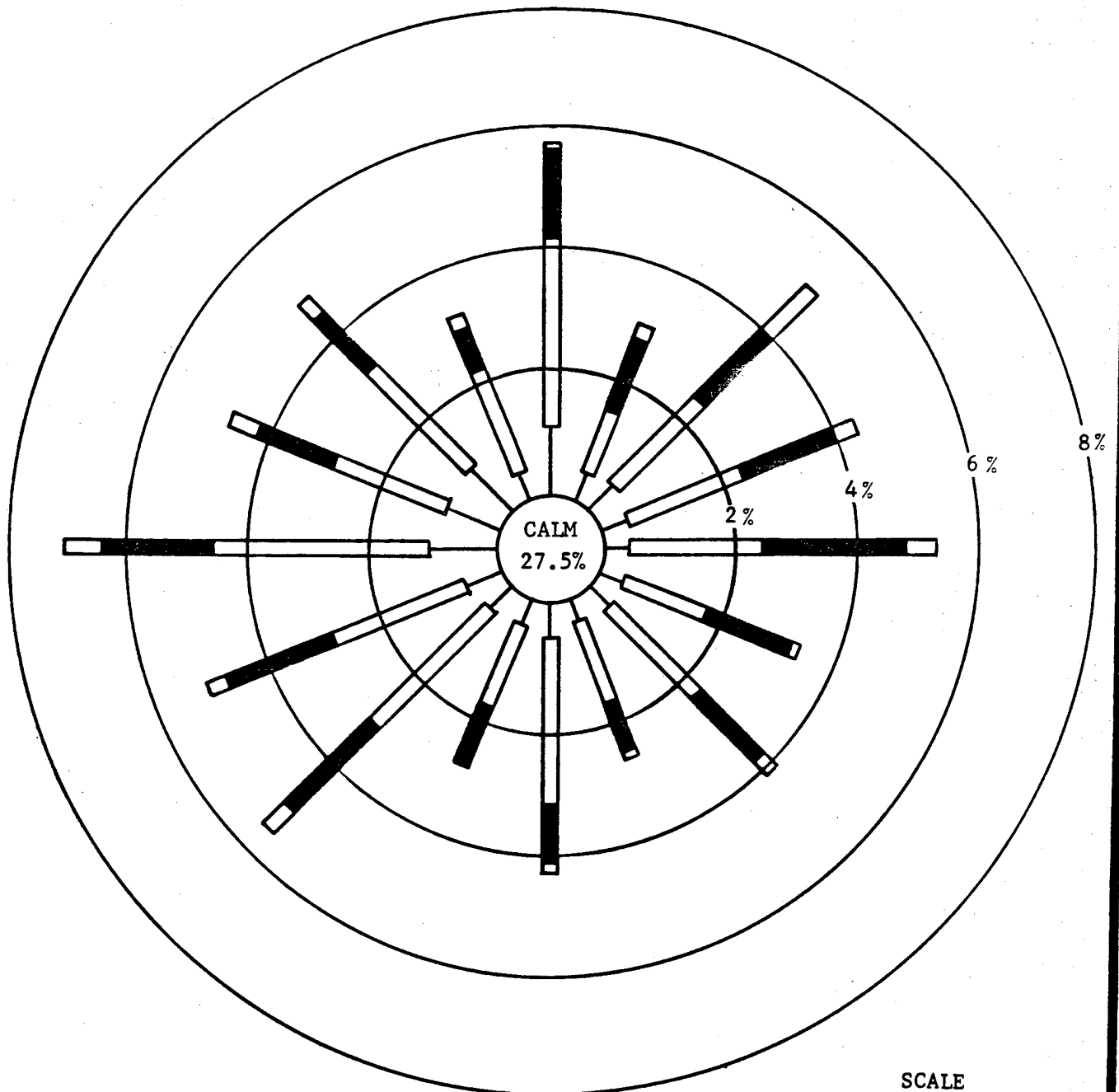
Figure 2.6-1 Jacksonville, Florida Annual Wind Rose (1970-1974)



SCALE
 .75" = 2%

Figure 2.6-2

Annual Wind Rose (Dec. 10, 1979-Dec. 10, 1980) On Site Monitoring Facility



SCALE
.75" = 2%



Figure 2.6-3

Annual Wind Rose (Dec. 10, 1979-Dec. 10, 1980)
Jacksonville International Airport

2.7 AIR QUALITY

2.7.1 Ambient Air Quality Standards

Ambient air quality standards (AAQS) have been established by the USEPA and the FDER to protect the health and welfare of the general public. These standards (NAAQS and FAAQS) have been developed for seven air pollutants, known as the criteria pollutants, and are presented in Table 2.7-1. The national primary standards define levels of air quality which the USEPA Administrator judges are necessary to protect public health with an adequate margin of safety. The national secondary standards define levels of air quality which the USEPA Administrator judges are necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. The States have the flexibility to establish ambient standards which are more stringent than the national standards, and in fact, Florida has established standards which are more stringent than the federal primary standards for sulfur dioxide, particulates and ozone (photochemical oxidants).

The current attainment status of Duval and its contiguous counties with respect to meeting national ambient air quality standards as determined by USEPA and the states of Florida and Georgia through monitoring and/or other means is shown in Table 2.7-2. In general, the counties of interest meet the primary and secondary NAAQS for almost all criteria pollutants. The exception is the Jacksonville Metropolitan Area (Duval County) which is listed as a nonattainment area for ozone and the secondary particulate standard. In the case of the secondary particulate standard, the actual area of nonattainment is that portion of Jacksonville bounded on the south and east by the St. Johns River, on the west by I-95 and on the north by the Trout River as indicated in Figure 2.7-1 (FDER, 1979). The proposed plant will be 9.4 km from the closest boundary of this nonattainment area. For ozone, the entire county is nonattainment.

2.7.2 Prevention of Significant Deterioration Increments

Both federal and state regulations require that major new sources (such as the proposed plant) undergo a review to ensure that the projected emissions together with emissions from other new sources (constructed after a certain baseline date) will not cause significant deterioration of air quality above baseline air quality levels. This applies in areas where current air quality is cleaner than that allowed by the ambient air quality standards discussed above. The amount of incremental air quality deterioration allowed (PSD increment) for sulfur dioxide and particulates is dependent upon the classification of the region. Class I areas (national parks, wilderness areas, etc.) are allowed very limited increases in calculated ground level pollutant concentrations while moderate increases are allowed in Class II areas. Class III areas are allowed even greater concentration increases. Table 2.7-3 presents the allowable ground level concentration increases for Class I, Class II, and Class III areas.

Duval County and all contiguous counties are designated as Class II areas (moderate amounts of air quality deterioration allowed) under classifications created by PSD regulations promulgated by EPA on December 5, 1974, and confirmed by the Clean Air Act Amendments of 1977 (CAA77). Areas which are nonattainment for sulfur dioxide or particulates are not affected by this classification since the PSD regulations do not apply to those areas.

The CAA77 mandated that certain international and national parks and wilderness areas above specified size limits and other specified federal lands be Class I for PSD. The Okefenokee Wilderness, located in southern Georgia with a small extension into northern Florida, received the Class I designation. The southern boundary of the Okefenokee Wilderness Area is 61 km from the proposed site. The only other PSD Class I areas designated for the state of Florida are the Everglades National Park, the Bradwell Bay

Wilderness Area, the Saint Marks Wilderness Area, and the Chassahowitzka Wilderness Area, all of which are too distant for consideration in this document. In neighboring Georgia, the Wolfe Island Wildlife Refuge is the next closest Class I area; however, it is farther than 100 km from the proposed site and is not considered further in this document.

As indicated above, only emissions from certain new sources count against the PSD increments; impacts from older sources (constructed prior to a specific baseline date) are counted as part of the baseline air quality. The entire PSD increment is available to a major new source unless (1) other new sources have been constructed since the baseline date and therefore consume some of the PSD increments, (2) the baseline air quality levels (those existing as of the baseline date) were already so high that adding the entire PSD increment would result in violation of the ambient air quality standards (which form a lid or cap on total allowable pollutant concentrations), or (3) a combination of these two factors. Thus, in order to determine how much of the PSD increments in Table 2.7-3 are available to the proposed project, it is necessary to determine the baseline date and the baseline concentrations of sulfur dioxide and particulates.

The latest revisions to the federal PSD regulations [45 FR (154) 52675-52748, August 7, 1980] fix the baseline date as the first date after August 7, 1977 on which a complete PSD application is received for a source in the baseline area. This was December 27, 1977. Thus all sources which came into operation after this date consume PSD increment. However, under the federal rules, major sources commencing construction after January 6, 1975 (as well as major modifications) consume PSD increment also. Under the Florida PSD regulations (FAC, Chapter 17-2, 1979), all sources which were issued a construction permit after December 31, 1974 consume PSD increment. Therefore, all three of these dates must be noted when determining whether the emissions from a particular source count against the available increments. This increment consumption analysis is contained in Chapter 5, Section 5.3.

Since no air quality monitoring equipment was actually in operation in the immediate site vicinity on either December 27, 1977 or December 31, 1974, baseline air quality levels for the proposed site were assumed to be current air quality levels, as determined from the 1979-80 on-site monitoring program. As indicated in Section 2.7.3.2, the current air quality levels are low enough such that when added to the allowable PSD increments, the resulting totals do not exceed FAAQS or NAAQS; thus the entire PSD increments are available for the proposed project and other increment consuming sources.

2.7.3 Existing Air Quality

2.7.3.1 Existing Regional Air Quality Data

Criteria Pollutants

The existing regional air quality data presented in this section were supplied by the Jacksonville Bio-Environmental Services Division (BESD) (1980). The locations of the air quality monitoring sites are depicted in Figure 2.7-1. Although none of the stations are located close enough to the proposed site to be considered entirely representative, the available data from these monitoring stations do provide a good indication of regional air quality patterns.

The available data for particulates (TSP) are presented in Table 2.7-4. TSP data were collected by the high volume sampler method. These data indicate that annual levels in the outlying areas average less than 40 micrograms per cubic meter (ug/m^3). Some of the downtown Jacksonville locations slightly exceed the annual standard of $60 \text{ ug}/\text{m}^3$. Maximum 24-hour values in the rural areas average less than $90 \text{ ug}/\text{m}^3$, whereas, some of the downtown locations are most recently (1979 data) reporting $100\text{--}200 \text{ ug}/\text{m}^3$. The most recent data (1979) indicate that second-highest 24-hour values (second-highest short-term values rather than highest values are compared with standards) downtown still slightly exceed the $150 \text{ ug}/\text{m}^3$ standard.

Table 2.7-5 presents the available sulfur dioxide (SO_2) data. Some of the data were collected by continuous samplers while some were collected by 24-hour bubblers. Annual values in the outlying areas are 5 to 15 ug/m^3 . However, some of the monitors close to major emission sources (see Figure 2.7-1) report annual values of 20 ug/m^3 (i.e., Heckscher and Wayland). Highest 24-hour averages in the outlying areas are mostly in the range of 30-60 ug/m^3 whereas monitors close to the major emission sources report highest 24-hour averages of 100-200 ug/m^3 and highest 1-hour averages of 400-900 ug/m^3 . Most of the monitors are significantly influenced by the existing major SO_2 sources.

The available data on nitrogen dioxide (NO_2) concentrations are presented in Table 2.7-6. Some of these data were collected by continuous analyzers and some by 24-hour bubblers. The data indicate that annual concentrations in the outlying areas average less than 20 ug/m^3 whereas downtown values are about 40 ug/m^3 . Some of the monitors are affected by major point sources and others are presumably greatly influenced by transportation sources.

Small amounts of data are also available for carbon monoxide (CO) and ozone (O_3) (Jacksonville BESD, 1978). These data indicate that maximum CO levels are about 8,000 ug/m^3 , 8-hour average, and 14,000 ug/m^3 , 1-hour average (well below the allowable values of 10,000 ug/m^3 8-hour average and 40,000 ug/m^3 1-hour average). The O_3 1-hour average Florida standard of 160 ug/m^3 is, however, often exceeded in the warm summer months; maximum values reported have been nearly 300 ug/m^3 .

Sulfates

Although there are no ambient standards for sulfates, these pollutants have been receiving increasing attention in connection with acid precipitation concerns. Therefore, the background values for this parameter were investigated so that the predicted plant impacts (Chapter 5) could be put in perspective. Background sulfates data were obtained from

the FDER (1980). Data were available for only, one year (1979) in Jacksonville. Twenty-six samples from the hi-vol particulate filters were taken (essentially every other hi-vol filter) and the mean sulfate concentration was 9.06 ug/m^3 . The highest 24-hour average value reported was 18.20 ug/m^3 and the lowest was 2.90 ug/m^3 .

Precipitation Acidity

Precipitation chemistry in the Jacksonville region has been investigated by Brezonik, et al. (1980) as part of a statewide study to assess the regional variations in atmospheric fluxes of nutrients to lakes and soils. As part of this study, a precipitation chemistry network of 24 stations was set up beginning in the fall of 1977. The Jacksonville area station, located near the International Airport, commenced operation in August of 1978 and continued until fall of 1979.

Results indicate a mean volume-weighted precipitation pH of 4.69 for Jacksonville for the available data in calendar year 1979 on a total rainfall of 157 cm. For the data available in the period from May 1, 1978 to April 30, 1979 (Brezonik's one year intensified project effort), the volume weighted pH was 4.74 on a total rainfall of 122 cm. This latter value can be compared with other values observed in the state by examining Figure 2.7-2, taken from the Brezonik study. It should be recognized, however, that there is great variability within the data, on a seasonal basis and even within rainfall events.

2.7.3.2 On-Site Air Quality Conditions

General

An on-site air quality monitoring program was conducted in conjunction with the on-site meteorological monitoring program discussed in Section 2.6.4.1. The purpose of the air quality monitoring program, which is described in detail in Chapter 6, Section 6.2.6, was to determine baseline

the FDER (1980). Data were available for only one year (1979) in Jacksonville. Twenty-six samples from the hi-vol particulate filters were taken (essentially every other hi-vol filter) and the mean sulfate concentration was 9.06 ug/m^3 . The highest 24-hour average value reported was 18.20 ug/m^3 and the lowest was 2.90 ug/m^3 .

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air quality concentrations over the monitoring period, which extended from December, 1979 to December, 1980, for use in the air quality impact assessment contained in Chapter 5, Section 5.3. Data were collected for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, total suspended particulates, lead, and a number of trace elements.

The results of the monitoring program are presented in detail in four quarterly reports (Envirosphere; 1980, 1980a, 1980b, 1981) which have been submitted to the FDER and USEPA. These reports contain the raw hourly and/or daily data as well as monthly summaries and quality assurance data. Only brief summaries of the monitoring results are presented in the following paragraphs.

Two sets of air quality background data are presented below. For each parameter a summary of the entire data base is presented, followed by a summary of the values which occurred in conjunction with winds from 290 degrees clockwise through 160 degrees (corresponding roughly with the northwest, northeast, and southeast quadrants). This second set of values for each parameter is intended to represent background air quality levels uninfluenced by the major existing sources (which generally exist in the southwest quadrant) whose impacts are modelled in the air quality impact analyses in Chapter 5, Section 5.3. These concentrations represent the baseline concentration levels for purposes of the PSD analysis which were referred to in Section 2.7.2 as well as the background concentrations used in determining compliance with ambient air quality standards discussed in Section 2.7.1. This procedure for determining baseline/background concentrations differs from that presented in the PSD report for the project (Envirosphere, 1980c) because on-site data were not available for use in that document. However, use of the on-site data in this manner for baseline/background determination was discussed with and approved by Region IV EPA (Nagler, 1980).

Sulfur Dioxide

A summary of the sulfur dioxide data collected in the on-site monitoring program is presented in Table 2.7-7. As indicated, the annual arithmetic mean was 7 ug/m^3 , which is well within the allowable annual level of 60 ug/m^3 in Florida. Second-highest 24 and 3-hour averages were 116 ug/m^3 and 289 ug/m^3 , respectively, both of which are well below the Florida standards of 260 ug/m^3 and 1300 ug/m^3 . For winds other than from the southwest quadrant, as discussed above, background values measured were 4 ug/m^3 , 21 ug/m^3 , and 90 ug/m^3 for the annual, second-highest 24-hour, and second-highest 3-hour periods, respectively. This second set of background values is used in the air quality analyses in Chapter 5, Section 5.3.

Nitrogen Dioxide

A summary of the nitrogen dioxide data collected in the on-site monitoring program is presented in Table 2.7-8. The annual arithmetic mean concentration recorded was 12 ug/m^3 , which is well below the standard of 100 ug/m^3 . By eliminating values associated with winds from the southwest quadrant, an annual background value of 10 ug/m^3 was computed. This value is utilized in the air quality analyses in Chapter 5, Section 5.3.

Carbon Monoxide

Table 2.7-9 presents a summary of the on-site carbon monoxide data. The second-highest 8-hour and 1-hour averages were $4,500 \text{ ug/m}^3$ and $5,200 \text{ ug/m}^3$, respectively. These values are well below the 8-hour and 1-hour standards of $10,000 \text{ ug/m}^3$ and $40,000 \text{ ug/m}^3$, respectively. The annual arithmetic mean carbon monoxide concentration was 600 ug/m^3 .

Ozone

Table 2.7-10 presents a summary of the on-site ozone data. Ozone monitoring was conducted during the "warm season" only (that is, from April through October) since this is when the highest concentrations normally occur. The results indicate a second-highest measured 1-hour average of 210 ug/m^3 versus the federal standard of 235 ug/m^3 .

Total Suspended Particulates

A summary of the on-site total suspended particulates data is presented in Table 2.7-11. The data indicate an annual geometric mean concentration of 29 ug/m^3 which is much lower than the Florida and federal annual secondary standard of 60 ug/m^3 . The second-highest 24-hour average value recorded was 57 ug/m^3 , versus the Florida and federal secondary standard of 150 ug/m^3 . Considering days when at least two thirds of the winds were from other than the southwest quadrant, the annual and short-term background levels were 27 ug/m^3 and 50 ug/m^3 . These somewhat lower values are used in the ambient impact analyses in Chapter 5, Section 5.3.

Lead

A number of the on-site particulate filters were analyzed for lead. The quarterly arithmetic mean concentrations were 0.16 ug/m^3 , 0.09 ug/m^3 , 0.07 ug/m^3 , and 0.07 ug/m^3 for the first, second, third and fourth calendar quarters of 1980. These values are all far below the 1.5 ug/m^3 quarterly arithmetic mean allowed by the federal standard.

Trace Elements

An analysis for several trace elements was conducted on twelve of the particulate filters (one per month selected at random). The highest and lowest values as well as the mean concentrations for sulfate, nitrate, chloride, fluoride, arsenic, beryllium, cadmium, mercury, selenium, and asbestos are presented in Table 2.7-12. The sulfate values agree well with the regional data discussed in Section 2.7.3.1; comparable data for the other parameters were not available.

2.7.4 Existing Air Pollution Sources

The locations of the major pollutant sources in the area are depicted in Figure 2.7-1. In addition to these major sources, there are a large number of minor sources in the area which also contribute to air pollution. Emissions characteristics for the sources within 50 km of the proposed plant (and for certain new sources within 100 km of the nearest Class I area) were obtained from the Jacksonville BESD (Drake, 1980), FDER (Cole, 1980), and Georgia Department of Natural Resources (Mitchell, 1980). Emission rate data for SO_2 and TSP, the two primary pollutants from stationary point sources, were obtained.

Tables 2.7-13 and 2.7-14 present the emission characteristics, stack parameters, and locations of the significant existing sources in the area for SO_2 and TSP, respectively, in addition to those for the proposed plant. It should be noted that the emission parameters presented in Table 2.7-13 and 2.7-14 do not in all cases exactly represent every discrete point source. Various point sources of relatively small emission levels were judiciously combined using the most representative stack and exit parameters; i.e., the emission parameters which either represent the largest proportion of total emissions, or the emission parameters which theoretically result in the highest ground level concentrations (low stack heights, low exit velocities and temperatures). In all cases, however, the correct total emissions from all existing sources were maintained.

2.7.5 References

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Table 2.7-1 (Revision 1)

NATIONAL AND FLORIDA AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	National		Florida Standards ($\mu\text{g}/\text{m}^3$)
		Primary ($\mu\text{g}/\text{m}^3$)	Secondary ($\mu\text{g}/\text{m}^3$)	
Sulfur Dioxide	Annual	80		60
	24-Hour ^a	365		260
	3-Hour ^a		1,300	1,300
Particulates	Annual ^b	75	60 ^c	60
	24-Hour ^a	260	150	150
Nitrogen Oxides	Annual	100	100	100
Carbon Monoxide	8-Hour ^a	10,000	10,000	10,000
	1-Hour ^a	40,000	40,000	40,000
Ozone	1-Hour ^a	235	235	-
Photochemical Oxidants	1-Hour ^a	-	-	160
Nonmethane Hydrocarbons ^c	3-Hour ^a	160	160	160
Lead	3-Month	1.5	1.5	-

a Not to be exceeded more than once per year

b Geometric mean

c Only a guide

Sources: 40 CFR50, 1971
FAC, Chapter 17-2, 1979

Table 2.7-2

ATTAINMENT STATUS OF DUVAL AND NEARBY COUNTIES
WITH RESPECT TO THE NATIONAL AMBIENT AIR QUALITY STANDARDS

<u>County</u>	<u>TSP</u>	<u>SO₂</u>	<u>O₃</u>	<u>NO_x</u>	<u>CO</u>
Georgia					
Charlton	4	4	3, 4	3, 4	3, 4
Camden	4	4	3, 4	3, 4	3, 4
Florida					
Nassau	4	4	3, 4	3, 4	3, 4
Duval	2	3	1	3, 4	3, 4
Clay	4	4	3, 4	3, 4	3, 4
St. Johns	4	4	3, 4	3, 4	3, 4
Baker	4	4	3, 4	3, 4	3, 4

Code: 1 Does not meet primary standards
 2 Does not meet secondary standards
 3 Cannot be classified
 4 Better than national standards
 3, 4 Cannot be classified or better than national standards

Source: Federal Register, March 3, 1978

Table 2.7-3

ALLOWABLE PSD INCREMENTS

<u>Pollutant</u>	<u>Class I</u> <u>(ug/m³)</u>	<u>Class II</u> <u>(ug/m³)</u>	<u>Class III</u> <u>(ug/m³)</u>
Sulfur Dioxide			
Annual arithmetic mean	2	20	40
24-hour maximum ^a	5	91	182
3-hour maximum ^a	25	512	700
Particulates			
Annual geometric mean	5	19	37
24-hour maximum ^a	10	37	75

a Not to be exceeded more than once per year.

Source: Federal Register, June 19, 1978

Table 2.7-4

JACKSONVILLE AREA HISTORICAL
TOTAL SUSPENDED PARTICULATES DATA ($\mu\text{g}/\text{m}^3$)

<u>Site</u>	<u>Year</u>	<u>Highest 24-Hour</u>	<u>Second-Highest 24-Hour (Standard: 150)</u>	<u>Annual Geometric Mean (Standard: 60)</u>
E. Adams	1977	279	196	67.1
	1978	364	255	67.6
	1979	195	176	62.1
Arlington River	1977	110	107	44.6
W. Monroe	1977	198	106	57.0
San Mateo	1977	91	83	38.5
Hendricks	1977	143	98	48.1
	1978	91	87	44.9
	1979	162	124	54.0
Margaret	1977	130	114	64.9
Verna	1977	91	86	42.4
Sandalwood	1977	86	73	32.3
Lenox	1977	101	88	37.0
2800 University	1977	65	60	34.3
	1978	89	76	37.8
	1979	72	68	37.0
Sixth Street	1977	95	84	50.4
	1978	110	103	47.6
	1979	116	110	44.1
Ft. Caroline	1977	92	81	44.7
Edenfield	1977	80	77	35.9
	1978	100	68	43.8
New Berlin	1977	85	79	37.4
	1978	97	84	36.1

Table 2.7-4 (Continued)

JACKSONVILLE AREA HISTORICAL
TOTAL SUSPENDED PARTICULATES DATA ($\mu\text{g}/\text{m}^3$)

<u>Site</u>	<u>Year</u>	<u>Highest 24-Hour</u>	<u>Second-Highest 24-Hour (Standard: 150)</u>	<u>Annual Geometric Mean (Standard: 60)</u>
Heckscher	1977	80	78	46.7
	1978	82	70	44.6
4012 University	1977	84	71	37.6
	1978	93	91	41.6
Craig Field	1978	87	65	33.1
	1979	75	60	35.1
Shell Oil	1979	120	114	48.1
Spring Park	1978	62	61	35.7
Sheffield	1979	64	64	33.4
Beaver	1979	81	79	47.3
Ft. Caroline Stp.	1979	78	76	45.6
Cedar Bay Stp.	1979	74	69	37.0

Source: Jacksonville BESD, 1980

Table 2.7-5 (Revision 1)
JACKSONVILLE AREA HISTORICAL
SULFUR DIOXIDE DATA (ug/m³)

Site	Year	Highest 1-Hour	Second Highest 1-Hour	Highest 24-Hour	Second	
					Highest 24-Hour (Standard: 260)	Annual Mean (Standard: 60)
E. Adams	1977	---	---	84	55	19.0
	1978	---	---	65	55	17.8
Arlington River	1977	---	---	55	39	8.5
	1978	---	---	---	---	---
Kooker Park	1977	681	641	135	102	17.1
	1978	393	353	72	53	16.9
	1979	432	406	---	---	7.0
San Mateo	1977	---	---	36	17	4.9
W. Monroe	1977	602	524	89	75	9.3
Hendricks	1977	---	---	128	103	16.0
	1978	---	---	123	113	22.4
Margaret	1977	---	---	36	26	6.1
Verna	1977	---	---	48	6	6.7
Sandalwood	1977	---	---	58	26	6.9
Lenox	1977	---	---	54	20	6.8
2800 University	1977	---	---	58	48	14.0
	1978	---	---	41	34	14.8
Sixth Street	1977	---	---	76	64	13.5
	1978	---	---	48	24	12.2

Table 2.7-5 (Revision 1) (Continued)

JACKSONVILLE AREA HISTORICAL
SULFUR DIOXIDE DATA (ug/m³)

Site	Year	Highest 1-Hour	Second Highest 1-Hour	Highest 24-Hour	Second Highest 24-Hour (Standard: 260)	Annual Mean (Standard: 60)
Lancaster	1977	---	---	60	51	11.2
Ft. Caroline	1977	---	---	45	41	10.5
Le Baron	1977	458	314	82	52	12.1
	1978	249	249	82	48	17.8
Edenfield	1977	---	---	101	55	13.8
	1978	---	---	41	37	14.7
New Berlin	1977	484	432	64	48	11.1
	1978	---	---	81	59	16.5
Heckscher	1977	---	---	122	118	20.0
	1978	355	330	43	40	16.4
Blount Island	1977	---	---	217	52	14.3
Eastport	1977	---	---	101	72	13.5
	1978	---	---	39	27	12.2
Wayland	1977	---	---	227	80	20.7
4012 University	1977	851	733	83	65	12.5
	1978	956	929	122	35	17.9
Craig Field	1978	---	---	27	22	13.4
Fire Station	1979	524	445	---	---	---

Table 2.7-5 (Revision 1) (Continued)
JACKSONVILLE AREA HISTORICAL
SULFUR DIOXIDE DATA ($\mu\text{g}/\text{m}^3$)

<u>Site</u>	<u>Year</u>	<u>Highest 1-Hour</u>	<u>Second Highest 1-Hour</u>	<u>Highest 24-Hour</u>	<u>Second</u>	
					<u>Highest 24-Hour</u>	<u>Annual Mean</u>
					<u>(Standard: 260)</u>	<u>(Standard: 60)</u>
Spring Park	1978	---	---	27	23	14.9
Ft. Caroline Stp	1979	209	170	---	---	---
Southside Library	1979	537	497	---	---	---
Cedar Bay Stp.	1979	406	353	---	---	---

Source: Jacksonville BERSD, 1980

Table 2.7-6

JACKSONVILLE AREA HISTORICAL
NITROGEN DIOXIDE DATA ($\mu\text{g}/\text{m}^3$)

Site	Year	Highest 24-Hour	Second-Highest 24-Hour	Annual Mean (Standard: 100)
E. Adams	1977	74	68	40.9
	1978	46	44	33.8
Arlington River	1977	58	45	31.2
Kooker Park	1977	67	63	40.7
	1978	50	47	33.3
San Mateo	1977	159	55	27.7
W. Monroe	1977	67	57	40.0
Hendricks	1977	70	55	34.2
	1978	59	46	30.2
Margaret	1977	76	74	38.8
Verna	1977	63	61	36.4
2800 University	1977	52	42	24.6
	1978	34	31	20.3
Sixth Street	1977	64	54	37.7
	1978	58	46	32.6
Edenfield	1977	38	32	18.5
	1978	26	23	15.3
New Berlin	1977	31	28	15.1
	1978	29	22	13.5
Heckscher	1977	43	41	22.8
	1978	29	29	20.6
Blount Island	1977	40	32	16.4
Eastport	1977	45	34	18.9
	1978	27	23	16.4

Source: Jacksonville BESD, 1980

Table 2.7-7

MONTHLY AND ANNUAL ON-SITE SULFUR DIOXIDE CONCENTRATIONS ($\mu\text{g}/\text{m}^3$)

Month	1-Hour		3-Hour		24-Hour		Arithmetic Mean	Number of Observations
	High	2nd High	High	2nd High	High	2nd High		
December 1979	131	107	90	86	24	23	5	466
January 1980	450	361	323	289	116	116	9	689
February	146	75	49	49	12	12	3	645
March	306	227	204	170	40	40	6	626
April	92	81	58	51	22	21	3	668
May	178	165	128	117	34	33	7	708
June	157	155	107	103	34	34	8	688
July	144	131	81	73	33	31	7	693
August	249	199	171	148	60	59	10	678
September	291	168	199	177	42	40	10	658
October	165	136	93	80	19	19	4	705
November	149	128	115	106	27	27	6	677
December	223	183	107	101	29	29	10	216
Annual	450	361	323	289	116	116	7	8117
Standard	-	-	-	1300	-	260	60	

Table 2.7-8

MONTHLY AND ANNUAL ON-SITE NITROGEN DIOXIDE CONCENTRATIONS ($\mu\text{g}/\text{m}^3$)

<u>Month</u>	<u>1-Hour</u>		<u>Arithmetic Mean</u>	<u>Number of Observations</u>
	<u>High</u>	<u>2nd High</u>		
December 1979	48	43	10	505
January 1980	94	73	14	643
February	69	67	25	610
March	67	60	13	659
April	55	51	13	668
May	55	55	10	698
June	70	51	11	673
July	56	55	7	665
August	39	39	4	679
September	56	55	8	654
October	56	56	14	706
November	62	56	14	680
December	86	79	23	218
Annual	94	86	12	8058
Standard	-	-	100	

Table 2.7-9

MONTHLY AND ANNUAL ON-SITE CARBON MONOXIDE CONCENTRATIONS ($\mu\text{g}/\text{m}^3$)

<u>Month</u>	<u>1-Hour</u>		<u>8-Hour</u>		<u>Arithmetic Mean</u>	<u>Number of Observations</u>
	<u>High</u>	<u>2nd High</u>	<u>High</u>	<u>2nd High</u>		
December 1979	7300	4500	4500	4500	800	504
January 1980	2700	2300	2000	2000	700	692
February	3900	3800	3700	3600	200	635
March	3100	1900	1500	1500	200	687
April	1500	1500	1400	1400	500	669
May	1700	1700	1600	1500	600	702
June	3000	2900	2400	2300	600	600
July	4000	3500	2900	2900	500	701
August	5200	5000	4500	4500	1000	344
September	4100	4000	3300	3000	500	586
October	2200	2100	1900	1900	500	692
November	4400	4100	1100	1100	300	681
December	2400	1700	1400	1400	500	217
Annual	7300	5200	4500	4500	600	7710
Standard	-	40,000	-	10,000	-	

Table 2.7-10

MONTHLY AND ANNUAL ON-SITE OZONE CONCENTRATIONS ($\mu\text{g}/\text{m}^3$)

<u>Month</u>	<u>1-Hour</u>		<u>Arithmetic Mean</u>	<u>Number of Observations</u>
	<u>High</u>	<u>2nd High</u>		
April 1980	190	190	79	619
May	198	178	75	743
June	200	186	76	711
July	212	210	65	694
August	198	196	52	702
September	174	153	43	704
October	169	167	54	735
Season	212	210	61	4908
Standard	-	235	-	

Table 2.7-11

MONTHLY AND ANNUAL ON-SITE TOTAL SUSPENDED PARTICULATE
CONCENTRATIONS ($\mu\text{g}/\text{m}^3$)

<u>Month</u>	<u>24-Hour</u>		<u>Geometric</u>	<u>Number of</u>
	<u>High</u>	<u>2nd High</u>	<u>Mean</u>	<u>Observations</u>
December 1979	34	30	22	6
January 1980	41	36	27	11
February	44	42	33	8
March	37	37	30	10
April	61	42	31	10
May	57	41	31	10
June	57	57	38	10
July	55	39	31	10
August	48	39	26	11
September	33	32	22	7
October	50	48	34	10
November	41	41	30	10
December	27	21	21	3
Annual	61	57	29	116
Standard	-	150	60	

Table 2.7-12

ON-SITE AIRBORNE TRACE ELEMENT CONCENTRATIONS (ug/m³)

<u>Parameter</u>	<u>Lowest Concentration</u>	<u>Highest Concentration</u>	<u>Mean Concentration</u>
Sulfate, SO ₄	1.2	19.1	10.7
Nitrate, NO ₃	0.8	.34	.17
Chloride, Cl	0.0	2.49	.85
Fluoride, F	.001	.5	.15
Arsenic, As	< .001	< .002	< .002
Beryllium, Be	< .002	< .003	< .003
Cadmium, Cd	< .0003	.0024	.0009
Mercury, Hg	0.0	.003	.0009
Selenium, Se	< .0003	< .0005	< .0005
Asbestos	ND	ND	ND

ND = None Detected

Note: When all concentrations for a parameter were below detection limits, the highest detection limit is reported as the mean; this is the case for arsenic, beryllium, and selenium. When only some of the concentrations for a parameter were below detection limits, the mean was computed using values 1/10,000 less than the detection limits for those cases when the value reported was less than the detection limit; this was the case only for cadmium.

Table 2.7-13 (Revision 1)
SO₂ EMISSION INVENTORY

	Emm. Rate (G/Sec)	Stack Ht. (M)	Stack Temp. (Deg-K)	Exit Vel. (M/Sec)	Stack Dia. (M)	X-Coord. (KM)	Y-Coord. (KM)
1. St. Johns River Power Park 1&2	1176.6	194.2	327.6	18.29	10.13	447.1	366.3
1a. SJRPP Auxiliary Boilers	25.6	85.4	441.0	12.2	2.08	447.0	366.5
2. Containter Corp.	154.4	103.6	441.5	12.89	4.51	455.1	386.7
3. Florida Steel	15.1	48.8	589.0	2.4	2.10	406.3	350.5
4. Naval Air Station	4.4	13.1	505.4	6.1	1.07	434.3	343.5
5. Alton Box Board	37.9	76.2	477.0	9.2	3.78	439.9	359.3
6. Alton Box Board	14.0	56.7	424.0	10.0	3.20	439.9	359.3
7. Alton Box Board	2.5	9.8	491.0	9.1	1.00	439.7	358.1
8. Anchor Hocking	5.6	14.6	573.0	15.6	0.91	431.5	357.5
9. Celotex	4.7	22.9	700.0	3.5	0.91	446.4	362.6
10. Celotex	7.3	15.5	586.0	11.7	1.22	427.6	357.3
11. Celotex	5.0	13.7	339.0	14.6	1.20	446.4	362.6
12. Celotex	3.1	15.2	436.0	7.7	0.94	446.4	362.6
13. Dickerson (Sommers)	1.8	9.2	340.0	26.0	1.07	438.8	361.1
14. Houdaille (Phillips)	9.3	11.6	376.0	31.1	0.98	442.7	345.7
15. Houdaille (Soutel)	8.4	11.6	380.0	31.9	0.98	429.0	361.4
16. JEA Bulk Terminal	4.2	12.2	355.0	9.5	0.91	439.3	359.8
17. JEA Kennedy Turbines	117.0	13.7	714.0	8.8	5.84	440.0	359.1
18. JEA Kennedy 8,9,10	308.4	84.0	408.0	23.2	4.12	440.0	359.1
19. JEA Northside Turbines	117.0	10.1	780.0	18.3	6.56	446.9	364.9
20. JEA Northside 1	667.0	76.2	414.0	19.0	4.88	446.9	364.9
21. JEA Northside 2	589.7	91.4	408.0	8.5	5.33	446.9	364.9
22. JEA Northside 3	1194.9	106.7	407.0	17.4	7.01	446.9	364.9
23. JEA Southside 3&4	181.1	84.0	415.0	21.7	3.24	437.6	353.8
24. JEA, SS. 1,2,5, Turbines	295.7	84.0	422.0	21.6	4.27	437.6	353.8
25. NAS Mayport	3.5	12.2	544.0	4.0	0.91	460.4	362.8
26. Refined Metals	5.0	31.1	355.0	18.7	0.77	431.8	358.3
27. Clidden	17.8	12.2	658.0	9.8	1.12	436.1	360.7
28. Clidden	21.2	15.2	514.0	18.2	1.22	436.1	360.7
29. St. Regis Paper	3.1	18.3	505.0	4.0	0.91	440.2	368.3
30. St. Regis Paper	146.7	32.3	433.0	16.1	2.13	441.8	365.6
31. St. Regis Paper	22.8	40.5	500.0	11.4	2.44	441.8	365.6

Table 2.7-13 (Continued)
SO₂ EMISSION INVENTORY

	Emm. Rate (G/Sec)	Stack Ht. (M)	Stack Temp. (Deg-K)	Exit Vel. (M/Sec)	Stack Dia. (M)	X-Coord. (KM)	Y-Coord. (KM)
32. St. Regis Paper	35.9	38.1	389.0	14.9	2.59	441.8	365.6
33. St. Regis Paper	3.0	22.9	350.0	9.5	1.42	441.8	365.6
34. Anheuser Busch	60.9	15.9	505.0	8.6	1.37	437.9	366.8
35. Anheuser Busch	12.3	21.3	333.0	11.4	2.06	437.9	366.8
36. Anheuser Busch	9.0	21.3	333.0	8.3	1.68	437.9	366.8
37. Union Camp	7.3	15.5	586.0	11.7	1.22	427.6	357.3
38. Container Corp	78.6	75.6	485.0	14.4	2.44	455.1	386.7
39. Dickerson (Talleyrand Rd)	22.1	9.2	340.0	26.0	1.07	438.5	355.5
40. Naval Air Station Mayport	1.4	18.3	505.4	7.9	1.52	460.4	362.8
41. St. Regis Container	3.1	15.2	436.0	7.7	0.94	446.4	362.6
42. Container Corp	128.7	75.6	485.0	14.4	2.44	455.1	386.7
43. Container Corp	273.6	75.6	480.0	16.25	3.35	455.1	386.7
44. Container Corp	78.7	75.6	480.0	19.35	2.44	455.1	386.7
45. Container Corp	35.3	88.1	484.0	18.65	1.22	455.1	386.7
46. NAS Jacksonville	1.4	13.11	505.4	61	1.07	434.3	343.5
47. ITT Rayonier	3.5	37.5	307.0	19.57	.91	453.0	385.0
48. ITT Rayonier	4.4	37.5	303.0	4.24	.91	453.0	385.0
49. ITT Rayonier	22.1	30.5	308.0	8.05	.61	453.0	385.0
50. ITT Rayonier	43.0	76.2	371.0	13.13	2.29	453.0	385.0
51. Gainesville Alachua Power Plant	277.0	106.7	408.0	15.24	5.29	364.0	292.6
52. Occidental Chemical	12.9	15.2	467.0	23.9	1.46	320.9	369.8
53. Occidental Chemical	15.5	30.5	468.0	11.8	2.29	328.9	368.9
54. Occidental Chemical	84.0	61.0	356.0	30.6	1.83	320.9	369.8
55. Occidental Chemical	15.5	15.3	468.0	11.8	2.29	321.1	369.8

Sources: Drake, 1980; Cole, 1980; Mitchell, 1980

Note: Emission sources listed include those within 50 km of the proposed plant or within 100 km of the Okefenokee Wilderness Area.

Table 2.7-14 (Revision 1)
TSP EMISSION INVENTORY

	Emm. Rate (G/Sec)	Stack Ht. (M)	Stack Temp. (Deg-K)	Exit Vel. (M/Sec)	Stack Dia. (M)	X-Coord. (KM)	Y-Coord. (KM)
1. St. Johns River Power Park 1&2	46.4	194.2	327.6	18.29	10.13	447.1	366.3
2. St. Johns River Power Park 1&2 (Fugitives)	15.4	Various source heights and locations in plant vicinity					
3. Alton Box Board	12.1	76.2	477.0	9.2	3.78	439.9	359.3
4. Alton Box Board	11.2	56.7	424.0	10.0	3.20	439.9	359.3
5. Anchor Hocking	5.1	14.6	573.0	15.6	0.91	431.5	357.5
6. Celotex	2.2	22.9	700.0	3.5	0.91	446.4	362.6
7. Celotex	5.3	13.7	339.0	14.6	1.20	446.4	362.6
8. Celotex	4.8	27.4	338.8	21.4	1.00	446.4	362.6
9. Dickerson (Sommers)	2.0	9.2	340.0	26.0	1.07	438.8	361.1
10. Houdaille (Phillips)	5.1	11.6	376.0	31.1	0.98	442.7	345.7
11. Houdaille (Soutel)	9.2	11.6	380.0	31.9	0.98	429.0	361.4
12. JAX Bulk Terminal	7.8	12.2	355.0	9.5	0.91	439.3	359.8
13. JEA Kennedy Turbines	18.2	13.7	714.0	8.8	5.84	440.0	359.1
14. JEA Kennedy 8,9,10	30.5	84.0	408.0	23.2	4.12	440.0	359.1
15. JEA Northside Turbines	18.2	10.1	780.0	18.3	6.56	446.9	364.9
16. JEA Northside 1	24.5	76.2	414.0	19.0	4.88	446.9	364.9
17. JEA Northside 2	21.1	91.4	408.0	8.5	5.33	446.9	364.9
18. JEA Northside 3	58.8	106.7	407.0	17.4	7.01	446.9	364.9
19. JEA Southside 3&4	19.4	84.0	415.0	21.7	3.24	437.6	353.8
20. JEA, SS. 1,2,5, Turbines	32.8	84.0	422.0	21.6	4.27	437.6	353.8
21. Refined Metals	1.0	31.1	355.0	18.7	0.77	431.8	358.3
22. Glidden	3.8	12.2	658.0	9.8	1.12	436.1	360.7
23. Glidden	4.0	15.2	514.0	18.2	1.22	436.1	360.7
24. St. Regis Paper	9.3	32.3	433.0	16.1	2.13	441.8	365.6
25. St. Regis Paper	14.6	40.5	500.0	11.4	2.44	441.8	365.6
26. St. Regis Paper	19.2	38.1	389.0	14.9	2.59	441.8	365.6
27. St. Regis Paper	6.0	22.9	350.0	9.5	1.42	441.8	365.6
28. Anheuser Busch	4.3	15.9	505.0	8.6	1.37	437.9	366.8
29. Anheuser Busch	1.7	21.3	333.0	11.4	2.06	437.9	366.8
30. Anheuser Busch	2.3	21.3	333.0	8.3	1.68	437.9	366.8
31. Container Corp	13.6	103.6	441.5	12.89	4.51	455.1	386.7

Table 2.7-14 (Continued)
TSP EMISSION INVENTORY

	Emm. Rate (G/Sec)	Stack Ht. (M)	Stack Temp. (Deg-K)	Exit Vel. (M/Sec)	Stack Dia. (M)	X-Coord. (KM)	Y-Coord. (KM)
32. Container Corp	54.6	75.6	480.0	16.0	3.00	455.1	386.7
33. Naval Air Station, Jax	2.6	13.1	505.4	6.1	1.07	434.3	343.5
34. Dickerson (Talleyrand Rd)	4.5	13.4	331.0	5.8	1.83	438.5	355.5
35. Dickerson (Talleyrand Rd)	1.6	9.2	340.0	26.0	1.07	438.5	355.5
36. Naval Air Station, Mayport	3.5	18.3	505.4	7.9	1.52	460.4	362.8
37. Livingston Ind.	1.2	11.0	310.0	23.4	0.52	439.5	365.9
38. Container Corp	9.6	76.6	485.0	14.4	2.44	455.1	386.7
39. Container Corp	17.3	75.6	480.0	16.25	3.35	455.1	386.7
40. Container Corp	10.5	88.1	484.0	18.65	1.22	455.1	386.7
41. Cargill	1.4	34.75	Amb.+10°F	19.4	1.07	416.0	350.0
42. Anheuser Busch	1.3	21.2	322.1	9.9	1.68	437.9	366.8
43. Anheuser Busch	1.4	21.3	327.0	10.6	2.06	437.9	366.8
44. Jax Bulk Term	.4	3.63	Amb.	38.4	1.07	439.3	359.8
45. Union Camp	.4	15.54	586.0	11.7	1.22	427.6	357.3
46. Livingston	1.2	11.0	Amb.	23.4	.52	439.5	365.9
47. ITT Rayonier	4.5	30.5	453.0	8.02	3.05	453.0	385.0
48. ITT Rayonier	4.5	30.5	438.0	9.27	3.05	453.0	385.0
49. Gainesville Alachua							
Power Plant	23.0	106.7	408.0	14.25	5.29	364.0	292.6
50. Occidental Chemical	.5	15.2	467.0	23.9	1.46	320.9	369.8
51. Occidental Chemical	3.2	61.0	356.0	30.6	1.83	320.9	369.8

Sources: Drake, 1980; Cole, 1980; Mitchell, 1980

Note: Emission sources listed include those within 50 km of the proposed plant or within 100 km of the Okefenokee Wilderness Area.

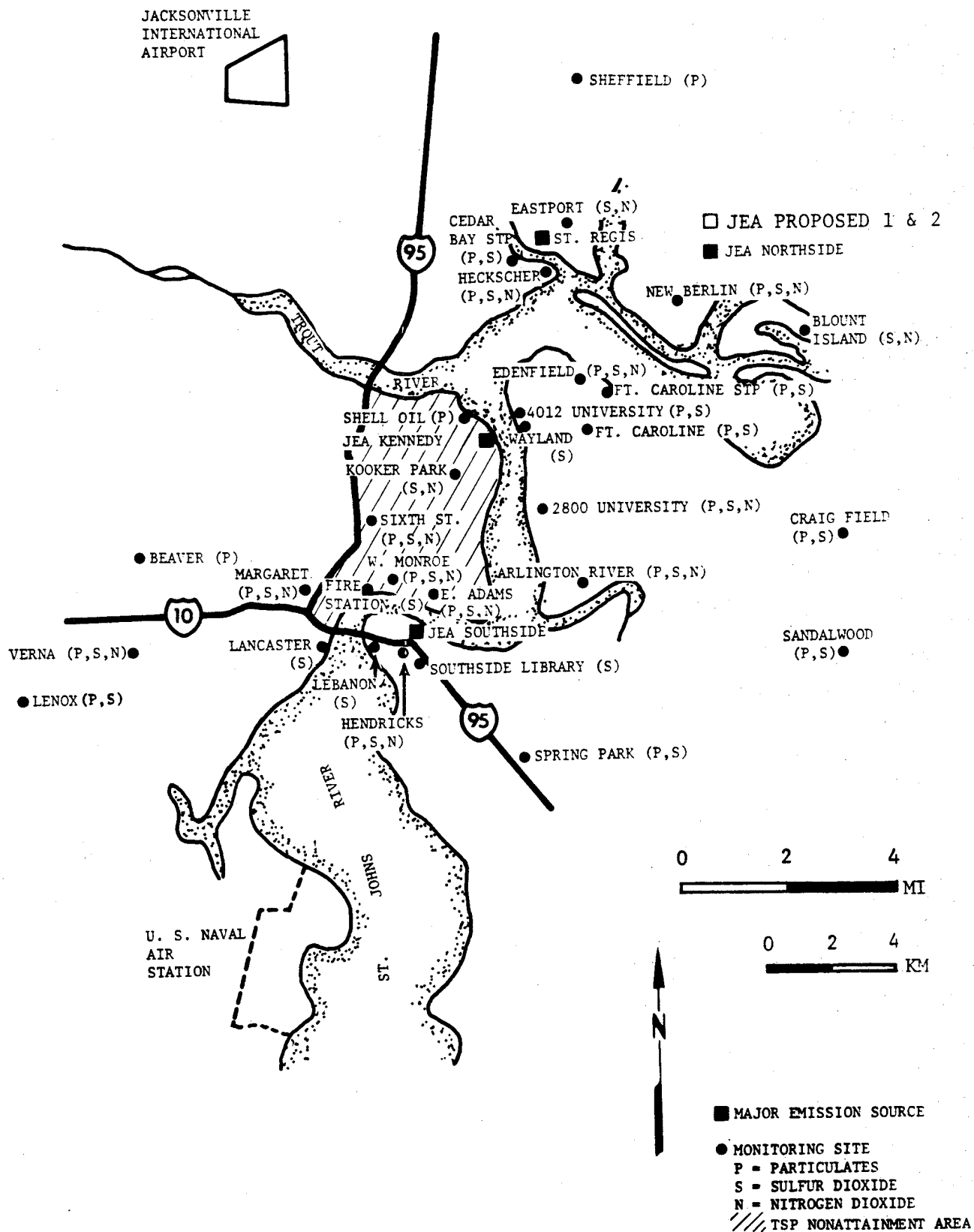


Figure 2.7-1 Locations of Major Emission Sources and Monitoring Sites

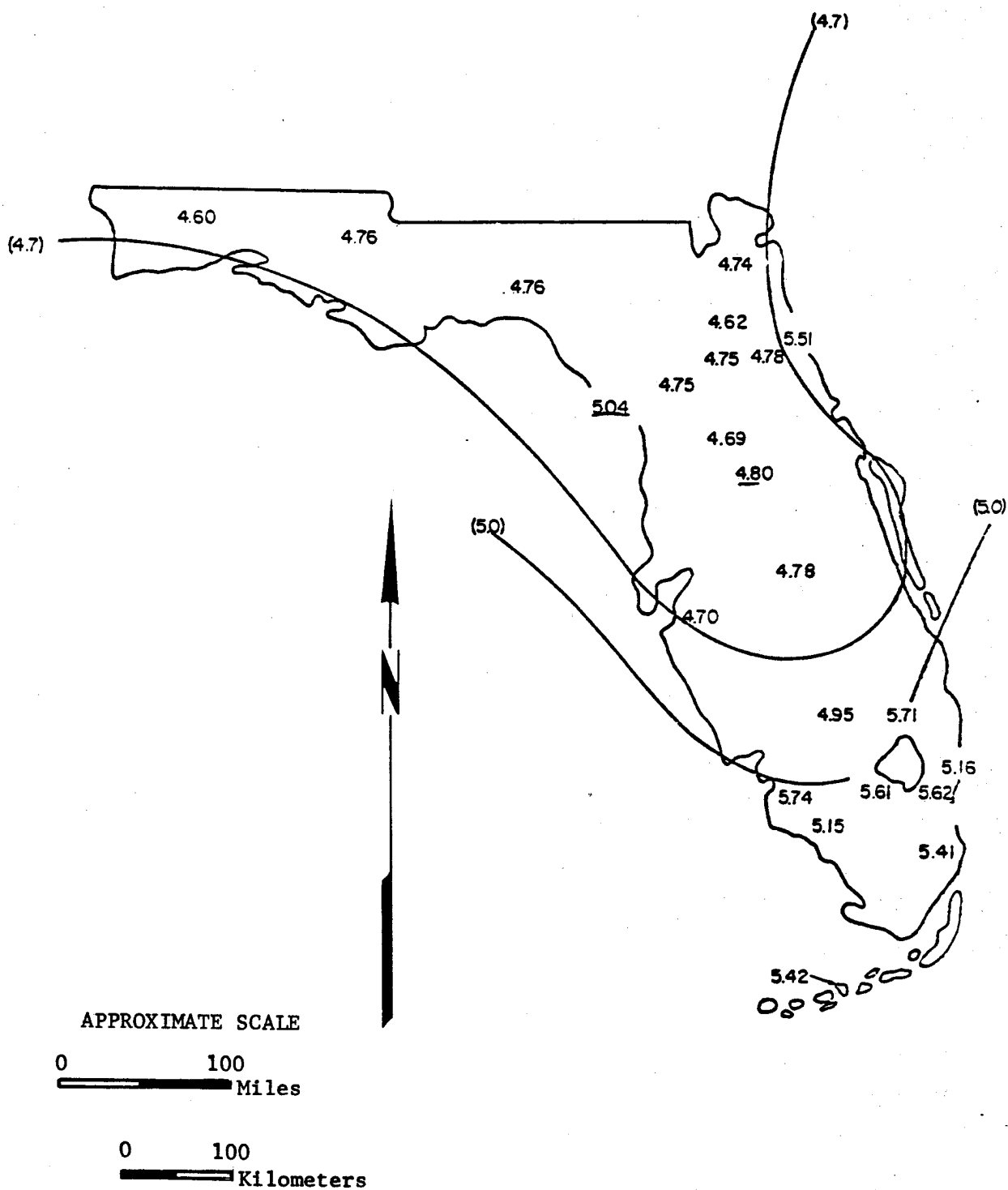


Figure 2.7-2 Volume-weighted Mean pH of Precipitation Throughout Florida, May 1978-April 1979

2.8 AQUATIC ECOLOGY

2.8.1 Aquatic Environment in the Area

The aquatic habitats of the St. Johns River on and in the vicinity of the proposed plant site and the coal unloading facility site are shown in Figure 2.8-1. Figure 2.8-2 shows the relationship of the proposed site to the Designated Critical Habitat of the Florida Manatee and the Nassau River-St. Johns River Marshes Aquatic Preserve.

On-site freshwater habitats consist of two creeks, associated perched hardwood swamps and cypress swamps. The creeks originate on the site and discharge into the Browns Creek salt marsh complex. Freshwater habitats in these areas are typical of many similar habitats throughout the region. Seasonal fluctuations in water levels and stream flows limit the number and diversity of the freshwater flora and fauna.

The tidal creek and salt marsh areas that border the site are contiguous with the extensive Atlantic coastal marsh system. This type of area provides habitat for many common estuarine fish, and serves as a nursery area for most of the commercially and recreationally important species located in the region. The tidal creeks are commercially fished for blue crabs and shrimp. There is year-round recreational fishing off boats, bridges, and shore.

The Blount Island Channel of the St. Johns River was the main river channel before the Fulton-Dame Point Cutoff was constructed in 1950-51. The present channel is bordered in some areas by narrow strips of salt marsh contiguous with the tidal creek salt marshes. In addition, the Blount Island Channel supports both commercial and recreational fisheries for blue crabs, shrimp and fish.

Food chains and other interspecies relationships of the study area's aquatic ecosystem are outlined in Figure 2.8-3. These pathways and relationships have been studied and described in the literature by E.P. Odum (1971), H.T. Odum (1971), Lugo et al. (1971), Olson and Burgess (1967), Lauff (1967) and many others. As depicted in Figure 2.8-3, the primary producers of this ecosystem include the salt marsh plants, periphyton and phytoplankton. Periphyton and phytoplankton are microscopic single celled or filamentous algae whereas the salt marsh vegetation are larger rooted plants. These producers all have one major ecological function in common; through the process of photosynthesis, they convert solar energy into usable energy in the form of organic matter. As a result, a reservoir of organic matter is maintained within the system, thereby providing a substantial food supply or energy source to the heterotrophic organisms, i.e., bacteria, invertebrates and vertebrates.

Phytoplankton are planktonic and consequently occur throughout the water column; however, their role in primary production is restricted to the upper surface waters (approximately 1-2 meters) of the study area. In contrast, periphyton grow in the photic zone attached to submerged substrates such as those which occur in the salt marsh and on tidal flats. As previously mentioned, extensive growths of salt marsh vegetation occur in the study area, particularly adjacent to the tidal creeks. These rooted plants shed their dying and dead stems, leaves and roots. Microbial heterotrophs, in turn, facilitate the utilization of this particulate organic detritus by zooplankton and other detritus consumers. In comparison to this major pathway, a second pathway links the autotrophs to the heterotrophs. Microflora, phytoplankton and periphyton, are grazed upon by herbivores and filter feeders such as attached macroinvertebrates and various zooplankters and fish. In turn, these herbivores, filter feeders, as well as detritivores are subjected to predation by carnivores. Other pathways linking typical species of nekton to lower trophic levels and commercial and recreational fishing are also shown in Figure 2.8-3.

2.8.2 Plankton

2.8.2.1 Zooplankton

The following two components of the zooplankton community, based on size, were monitored on a quarterly basis from fall 1979 to summer 1980:

Mesoplankton - those planktonic animals (holoplankton and meroplankton) which are retained by a 202 micron mesh net but not by a 363 micron mesh net (i.e., cladocerans, copepods).

Macrozooplankton - large agile holoplankters and meroplankters that are larger than 363 microns (i.e., mysids, cumaceans).

Appendix B, Table B-4 lists seasonal average mean densities for total zooplankton in the Blount Island area (Figure 2.8-4) while Appendix B, Table B-5 lists the occurrence of zooplankton with respect to type and season.

The mesoplankton were dominated by copepods with occasional occurrences of cladocerans. In all four seasons the copepods were dominated by the calanoid Acartia tonsa. Acartia tonsa is a euryhaline species and is commonly found in subtropical as well as temperate estuaries in North America. A review of A. tonsa, other species of calanoids and their eurytopic natures (Bowman, 1971) suggests the following sensitivities to fluctuations in salinity and temperature in order of least susceptibility: Acartia tonsa < Psuedodiaptomus coronatus < Paracalanus crassirostris < Labidocera aestiva < Paracalanus parvus < Temora turbinata < Centropages furcatus < Temora stylifera. The above ordination closely follows the succession of calanoids in this estuary.

The number of calanoid species found within the vicinity of the proposed plant site is typical of southern estuaries. Generally, the number of calanoid species increases as one leaves the estuaries and

proceeds toward the open ocean. This change in species richness is due to an increase in intraspecific competition and a narrowing of ecological niches (Bowman, 1971).

Generally, the variety of cyclopoid and calanoid species peaked during the winter while greatest numbers occurred in the spring and summer. Species of calanoid copepods in the Blount Island Channel ranged from four during the summer and fall to six during the winter while species of cyclopoid copepods ranged from one during the spring and summer to three during the winter. Tidal creeks and the river had the same species of cyclopoid and calanoid copepods but their densities were different. Variable densities are considered to be attributable to the patchy distribution of zooplankton rather than to environmental stress.

Cladocerans in this portion of the St. Johns estuary appeared during all four seasons. During fall the freshwater cladoceran Bosmina longirostris was found both in the river and tidal creeks. Numbers of B. longirostris were less than 1 individual/m³ and represented only a fraction of a percent of the total zooplankton population. The appearance of B. longirostris was due to a shift in the salinity regime from greater than 18 to less than 10 ppt. B. longirostris is common to the lower southern reaches of the St. Johns River where salinities are less than 1 mg/l (previous sampling by Envirosphere). A similar instance where Bosmina sp. were reported in the vicinity of the proposed plant site (mouth of San Carlos Creek) occurred during August, 1973 and July, 1975. During this time, respective salinities were 18.2 and 13.2 mg/l (Rehm et al., 1975).

During the winter and spring of 1980, the marine cladoceran Podon polyphemoides was present. Gravid organisms carrying from one to five eggs were found in the river and tidal creeks. With the exception of the river station EPl (Figure 2.8-4) during the winter, their average mean densities were less than 5 individuals/m³. At river station EPl, P. polyphemoides had an average mean density of 43 individuals/m³ and represented 4 percent of the total zooplankton population.

Daphnia spp. and Evadne normandii were other cladocerans present in both the river and tidal creeks. These plankters appeared during August, 1980 with average mean densities of 3 and 8 organisms/m³ and accounted for less than one percent of the total zooplankton community.

In addition, the mesoplankton are comprised of small meroplankters (temporary plankters) which become inhabitants of benthic and attached communities. These meroplankton were dominated by barnacle nauplii and cypris (Balanus sp.) with greatest nauplii densities occurring in spring. Barnacles appear to be the major fouling organism associated with the cooling water condensers at the Northside Station (plant operator personal communication). Other meroplankters found within the study site were polychaete larvae, bivalve veligers, and post-larvae clams and snails.

Sagitta sp. (arrowworm) and mysids were found to be the most abundant macrozooplankton (Appendix B, Table B-6 and B-7). Mysids were the dominant epibenthic macrozooplankters while Sagitta sp. was most abundant near the surface. Less abundant macrozooplankton but ecologically and economically important are the early life stages of the nekton community. These are conveniently defined as the "ichthyoplankton" and are described in greater detail in Section 2.8.5.1.

An atypical macrozooplankton in the estuarine community, Creseis acicula, appeared in the Blount Island Channel on August 8, 1980. These plankters, often called "sea butterflies" (Russell and Yonge, 1975), are normally found in the Gulf Stream and open ocean where the deposition of their skeletons results in an oceanic sediment known as pteropod ooze. The presence of C. acicula was associated with salinities greater than 25 ppt, confirming they were transported into the river from the ocean.

2.8.2.2 Phytoplankton

The composition of the phytoplankton community in the vicinity of the proposed plant site (Figure 2.8-4) is typical of an estuarine system which has a salinity range from 10 to 30 ppt. In a recent study (JEA, 1976), it

was shown that the phytoplankton communities were dominated by pennate and centric diatoms, dinoflagellates and cryptomonads with occasional occurrences of green and blue-green algae. Total densities of algae were found to range from 200 to 6,750 organisms/ml.

Phytoplankton primary productivity studies in the study area are being conducted for the NGS NPDES Permit renewal in 1982. Levels of primary production during June and August, 1980 ranged from 5 to 8 $\text{gO}_2/\text{m}^3/\text{day}$ in the tidal creeks while they were found to range from 3 to 5 $\text{gO}_2/\text{m}^3/\text{day}$ in Blount Island Channel. As evidenced by the data, productivities tend to be high in the tidal creeks and moderately high in the river during the growing season.

2.8.3 Periphyton

Periphyton studies are being conducted in the study area as part of the comprehensive NPDES study for the NGS. Examination of general trends during the fall of 1979 through the summer of 1980 showed that periphyton colonization rates on artificial substrates are higher in summer and spring than in fall and winter. Macroscopic observations of the biofouled substrates showed they were covered with green filamentous algae which were later identified as the centric diatom Melosira nummuloides. Microscopic examination showed that the artificial substrates were dominated by pennate diatoms of the genus Navicula, with Navicula cancellata as the dominant species.

2.8.4 Macroinvertebrates

2.8.4.1 Benthic Macroinvertebrates

The St. Johns River in the vicinity of the proposed plant site (Figure 2.8-4) supports a sparse benthic community with species of macroinvertebrates that are characteristic to southeastern estuaries in the United States (Roberts, 1974).

Results of the 1979-80 study of the benthic macroinvertebrates are tabulated in Appendix B, Tables B-8 and B-9. Two distinct faunal assemblages were observed in the tidal creeks and river channel in the vicinity of the proposed site. The sediment distribution in the vicinity of the proposed site is presented in Figure 2.8-5. Fine mud and sand found in the tidal creeks were dominated by polychaetes and amphipods, whereas the muddy sand substrate of the river channels was dominated by a small clam, Mulinia lateralis. M. lateralis showed seasonal shifts in population with peak abundance in the winter and lower numbers in the summer. Williams (1978) reported similar seasonal shifts for M. lateralis in the Cape Fear River, North Carolina. Polychaete and amphipod communities in the creeks had lowest population densities during the winter and highest in the spring and summer.

The river stations in Blount Island Channel (Figure 2.8-4) generally had a lower faunal variety than the tidal creek stations. Both the creek and channel stations exhibited a greater variety of species than the far field stations in Dunn Creek and Mill Cove.

The sampling revealed that the macroinvertebrate population at all stations is sparse. The lowest density of organisms per square meter was recorded at river station EP2 in the fall and the highest density at station EP3 in the spring; less than one organism per square meter and 12,157 organisms per square meter, respectively. Results of this study correlate well with previous studies done in the area (U.S. Army Corps of Engineers, 1973; Rehm, et al., 1975; JEA, 1973).

The benthic nekton and invertebrate densities as shown in Appendix B, Table B-8 for the St. Johns River and contiguous creeks near the NGS shows a seasonal distribution which is typical of the southeastern United States region. Seasonal occurrences of species is as would be expected and is in agreement with previous studies in the southeastern region. The distribution of organisms and their densities reflects the hydrography of the region. In an estuarine ecosystem, the habitat differences between

stations is often times significant. This results in populations of organisms accumulating in habitat which is optimum for that particular species. This trend was reflected in sampling the St. Johns River and its contiguous creeks and is seen in the localized concentrations of particular species during sampling periods.

The proposed site for the coal unloading facility is located on Blount Island adjacent to the Fulton-Dame Point Cutoff (Figure 2.8-4). Benthic invertebrate densities near the proposed coal unloading site are presented in Appendix B, Table B-8. Depauperate densities may be a reflection of the previous environmental impact from periodic dredging. Species density and composition of the OP stations when compared with the Mill Cove (MCV) Station shows a reduced numbers in species and densities. Of the OP stations, Station OP3 shows a greater variety of species. Blount Island is a dredge spoil island and distribution of organisms is suspected to have been impacted by that action. Freshwater runoff and tidal activity limit species composition in the area.

2.8.4.2 Fouling Organisms

The organisms responsible for bio-fouling, called the fouling community, in an estuarine environment are oysters, barnacles and other organisms which attach to structures that are submerged during a tidal cycle. The fouling community found in the study area of the St. Johns River is typical of similar estuaries. From observations made within the study area, there are several varieties of species with normal population densities within the fouling community. The communities display predictable species succession. That is, the sequence of species at various times and locations was similar to those described in past studies in like environments (Roberts, 1974).

Samples taken from intertidal structures within the study area were dominated by barnacles and oysters. No economic importance is attached to these communities. The oysters are not of economic importance because the Florida Department of Natural Resources has classified the St. Johns River in Duval County as unapproved for shellfish harvesting (Van Tassel, 1980).

In comparing samples taken from the immediate vicinity of the proposed plant site to samples taken in adjacent areas, no apparent variation occurred. This was probably due to the well mixed estuarine characteristics of the St. Johns River. Such mixing promotes fouling organism homogeneity which can be indicative of overall water quality and the abundance of fouling organisms' larvae available to colonize exposed surfaces.

2.8.5 Fish and Other Nekton

2.8.5.1 Ichthyoplankton (Nekton Larvae)

Total Ichthyoplankton

Mean densities of total fish larvae, including shrimp larvae and crab post-larvae, in river and creek zones (Figure 2.8-4) showed similar seasonal trends over the 12 month study period (Appendix B, Figure B-1). A minor peak of about 235 larvae/1000 m³ occurred in late January, following November densities of approximately 50/1000 m³ and 100/1000 m³ in the river and creeks, respectively. The January peak was associated with reduced salinities (Appendix B, Figure B-2) which might have caused larval concentration in the lower estuary as larvae moved away from fresher waters in the upper estuary. Maximum densities were observed in late May when fish larvae numbered about 16,000/1000 m³ in both channel and creeks. Mean densities remained at about 16,000/1000 m³ in the creeks and plateaued at around 10,000/1000 m³ in the river through the end of the study. Generally, greatest numbers of larvae were taken at the bottom over incoming and outgoing tides. Highest mean densities were

observed at the bottom on the outgoing tide. Seasonally, total numbers of species within the study area increased from 14 in the fall to a high of 46 during the spring and declined to 18 in the summer. Over the same period, total mean densities increased. Annual occurrence of selected species is shown in Figure 2.8-6. Tables B-10 and B-11 of Appendix B list seasonal average mean densities for ichthyoplankton and nekton post-larvae in the study area.

Important Species

Weakfish (Cynoscion regalis) appeared in the study area in early April (Appendix B, Figure B-3). Mean densities were low, with the channel about four times greater than the creeks. Density in the river increased through May to approximately $950/1000\text{ m}^3$, decreased and then peaked at $1,539/1000\text{ m}^3$ in August. Creeks reached a maximum density ($2,081/1000\text{ m}^3$) in May, declined below river densities and then had a minor peak in August. These data infer a second spawning effort. Highest densities occurred at the bottom for both rising and falling tides.

Spot (Leiostomus xanthurus) were collected initially during mid-December sampling in Blount Island Channel, but were not taken in the creeks until early January (Appendix B, Figure B-4). Once they appeared in the study area, densities increased and decreased in waves. River collections demonstrated three peaks; early January ($11/1000\text{ m}^3$), late February ($8/1000\text{ m}^3$) and mid-April ($20/1000\text{ m}^3$). Creeks were concurrent with peak river concentrations at densities of $16/1000\text{ m}^3$, $31/1000\text{ m}^3$ and $38/1000\text{ m}^3$. No depth preference was detected. Spot larvae were not found in the channel after late April or late May in the creeks.

Menhaden (Brevoortia spp.) entered the channel in early January and creeks by late January (Appendix B, Figure B-5). Numbers peaked in late February at densities of 19 and 58 per 1000 m^3 in the channel and creeks, respectively. In the channel, larvae maintained densities of around

10/1000 m³ through late March with a minor density peak (17/1000 m³) over April. A secondary peak (43/1000 m³) in the creeks was observed in late April. Densities were greater in creeks, but never exceeded 100/1000 m³. No depth preferences were noted. The second peak of menhaden is believed to be primarily attributable to Brevoortia smithi. Menhaden larvae disappeared from the river in late May and were not collected in creeks after June.

Spotted seatrout (Cynoscion nebulosus) first appeared in samples during May (Appendix B, Figure B-6). Channel densities were 272/1000 m³, declining to 96/1000 m³ in early June, and reached 624/1000 m³ by the termination of the study in August. Highest densities were collected consistently from the bottom on incoming tides and dominated the outgoing tidal samples through May. After May, surface samples had highest densities. In the tidal creeks, bottom samples of both tides consistently had greater numbers of larvae. From July through the end of the study, densities in the creeks were greater than in the channel, indicating the marsh was being utilized as a nursery.

Throughout the study period, croaker (Micropogonias undulatus) densities (Appendix B, Figure B-7) were greatest at the bottom and densities in the channel were greater than in the creeks. Croaker preferred the bottom on the incoming tide in the channel from November to late February and in the creeks from early April until they disappeared from samples in June. Density peaks were found in late January and early April. The January peak of 232/1000 m³ in the channel and 166/1000 m³ in the creeks was associated with decreased salinity. No croaker were collected after June.

Silver perch (Bairdiella chrysura) were collected from late April through August. Density peaked in late May at 69 and 68 per 1000 m³ in the channel and creeks, respectively, and declined through the termination of the study (Appendix B, Figure B-8). The bottom was preferred at all stations through the tidal cycle and study period.

Black drum (Pogonias cromis) was present for only a short period during the late spring (Appendix B, Figure B-9). Larvae were collected first in early April at 98/1000 m³ (river) and 45/1000 m³ (creeks) and were not caught beyond early June. Channel density was greater than creeks, but no tidal patterns were noted.

Early drum larvae that could not be identified were categorized as "Sciaenidae species". Because several different species were composited in this class, no distinct density peaks were detected. These unknown sciaenid larvae showed a preference for the bottom on an incoming tide (Appendix B, Figure B-10), perhaps riding a lower, more dense water mass into the estuary. When first collected in late April, densities were relatively high (169/1000 m³ in the river and 208/1000 m³ in the creeks), indicating that spawning was probably occurring in or near the estuary. Densities increased into July to 980/1000 m³ in the river and 302/1000 m³ in the creeks and then decreased through August. The study area is considered a nursery area for this group.

Blue crab post-larvae and juveniles entered the study area in January (Appendix B, Figure B-11). Maximum channel densities of 24/1000 m³ were recorded for late May while creek densities peaked approximately one month later in early July (43/1000 m³). In August, densities declined. Overall, highest densities were found in the creeks.

Penaeid shrimp post-larvae were present in fall samples at densities of 14 and 25 per 1000 m³ in the river and creeks, respectively (Appendix B, Figure B-12). Shrimp were present in reduced numbers until April when numbers began to increase. Peak numbers were collected in August when estimated densities reached 1286/1000 m³ in the channel and 970/1000 m³ in the creeks. Surface river samples normally provided the highest densities after January.

Anchovy species is a combined category for larvae and early juveniles of bay and striped anchovies. Anchovies were present in reduced numbers from November into April (Appendix B, Figure B-13). Their abundance began

to increase in late May, with approximately 3,900/1000 m³ in the river and 3,300/1000 m³ in the creeks. Densities were roughly unchanged through July followed by maximum densities of 5,400/1000 m³ in August. Tidal or depth patterns were not seen in the creeks, but anchovies appeared to favor the bottom on an incoming tide in the channel from May until the end of the study. From the larval stages collected, it was concluded that the study area is being utilized as a spawning ground and nursery.

Goby species (Appendix B, Figure B-14) is a composite of all the species of gobies collected during the study. Though collected in all seasons, goby densities remained at about ten or less per 1000 m³ within the study area until early March. A minor peak of about 1,600/1000 m³ occurred in the river in late May. Density in the creeks steadily increased to an August maximum of approximately 8,400/1000 m³. Maximum river densities in August were about 2,500/1000 m³. During the summer, largest larval density in the creeks was usually at the surface on an outgoing tide and serves as an efficient dispersal mechanism.

Spawning and Nursery Grounds

Silverside species utilized the marsh as spawning and nursery grounds in the late winter and early spring. Gobies, blennies, silversides, and sciaenid species spawned in the spring through the summer in tidal creeks and salt marshes and appeared to utilize these areas as a nursery.

Spot, which spawn offshore, utilized the marsh as a nursery. Black drum, weakfish, and spotted seatrout apparently spawned in Blount Island Channel or the nearby river channel. Their larvae used the estuary as a nursery ground. Croaker and menhaden, which spawn offshore, were collected in both tidal creeks and channel zones. Low numbers and consistent standard length measurements suggest that the study area is not a nursery for these species. Life history information on the commercially important species is supplied in Appendix B.

Anchovies were the only fish that spawned in both the creeks and channel. After hatching, larvae used both areas as nurseries. The majority of the anchovy species collected were probably the bay anchovy, but their lack of fin ray development precluded positive identification. When anchovy larvae were identifiable by fin ray counts, samples contained some striped as well as bay anchovies.

An assessment of the spawning and nursery grounds in the waters adjacent to the proposed coal unloading facility (Figure 2.8-4) was performed during the spring and summer. The larval ichthyofauna of the drainage ditch bordering the coal unloading facility site was dominated by the naked goby, 445/1000 m³ (Appendix B, Table B-21). Commercially important species comprised only 13 percent of the spring sample. The relatively small numbers of individuals collected and limited habitat size would preclude this area as an important spawning or nursery ground for any species except the naked goby.

Ichthyoplankton Entrained by Northside Station

Although ichthyoplankton densities in the NGS discharge (source of makeup for proposed plant) were greater than channel densities for certain species, total densities were consistently lower. Likewise, the number of species entrained was less than the number collected in sampling zone EP2 (Figure 2.8-4), the source of cooling water makeup for NGS. Direct comparison of NGS entrainment and subzone EP2 data for species such as gobies would be biased. Gobies are believed to be spawning and living in the attached oyster community encrusting the cooling water intake flume. Data for entrained ichthyoplankton are presented in Appendix B, Table B-12. In winter, total entrainment densities (77/1000 m³) were about one-fourth the average mean density of ichthyoplankton found in subzone EP2 (327/1000 m³). Spot and menhaden were the only commercially important species entrained in densities greater than those found in subzone EP2. Of the forage species, concern has been expressed over the entrainment of the

Atlantic silverside, (Menidia menidia) (Beck and Miller, 1974). During the survey, numbers of entrained silverside species were relatively low (4-9 per 1000 m³).

Spring entrainment numbers (2,394/1000 m³) for total ichthyoplankton were less than half the average mean density found in subzone EP2 (5,543/1000 m³). Spot, croaker and menhaden were entrained in densities greater than those in the general water column of subzone EP2. High croaker entrainment values resulted from an unusually large number of croaker larvae being entrained during a single sampling episode.

Ichthyoplankton entrained by the NGS during the summer was about one half (4,555/1000 m³) of the ichthyoplankton density (10,686/1000 m³) in subzone EP2. Numbers of species entrained were always less than those found in EP2. Individual species densities, except for the gobies which live and spawn in the oyster community of NGS's intake flume, were consistently less than those found in the contiguous channel subzone.

2.8.5.2 Adult and Juvenile Nekton

Results of the quarterly fishery survey conducted from fall 1979 to summer 1980 in the three predominant aquatic habitats (freshwater creeks, tidal creeks, river) in the vicinity of the proposed plant site are discussed in this section. Sampling sites are shown in Figure 2.8-4.

Fish species and numbers sampled by electrofishing in the two freshwater creeks on the proposed site are listed in Appendix B, Table B-13. No fish collected during this survey were not listed as being rare or endangered.

Fish from each freshwater creek were found to be similar. Each fish community consisted primarily of poecillids, and the least killifish (Heterandria formosa). Other fish collected included two types of catfish; yellow and black bullhead (Ictalurus natalis and Ictalurus melas), redbfin

pickerel (Esox americanus), bluegill sunfish (Lepomis macrochirus) and black crappie (Pomoxis nigromaculatus). Although the latter two species are considered to have recreational value, none were larger than 15 cm. Absence of large sunfish and crappie may be the result of the size of their habitat, especially during dry periods when the amount of freshwater is limiting. As a result, there was no recreational fishing observed in the creeks during the study period. Other organisms associated with these two freshwater creeks, such as amphibians and reptiles, are presented in Section 2.9.2.2.

Types and numbers of fish, crab and shrimp collected in the tidal creeks (San Carlos and Browns Creeks) are presented in Appendix B, Tables B-14 and B-15. Common estuarine organisms such as grass shrimp (Palaeomonetes spp.), killifish (Fundulus spp.), silversides (Menidia spp.), and majorras (Eucinostomus argenteus), were found to occur in large numbers during all seasons. These organisms are typical of estuarine salt marsh creeks. With the exception of the mojarras, these organisms spend their entire life cycle within the tidal tributaries of the St. Johns River. Large numbers of other organisms were collected in the tidal creeks only during specific seasons. This substantiates the seasonal role of the tidal creeks and marsh as a nursery area. Most of these organisms are commercially valuable and enter the estuary as post-larvae after being spawned offshore. They include penaeid shrimp (Penaeus setiferus, P. aztecus and P. duorarum), blue crabs (Callinectes sapidus), Atlantic croaker (Micropogonias undulatus), spot (Leiostomus xanthurus), sea trouts (Cynoscion spp.), drum (Sciaenops ocellata, Pogonias cromis), and Atlantic menhaden (Brevoortia tyrannus). No rare or endangered fish were observed or collected in the tidal creeks.

Results of the current nekton survey (fish, crabs and shrimp) in the St. Johns River (Blount Island Channel) are presented in Appendix B, Tables B-16 and B-17. The species composition and periodicity of occurrence observed during the survey are considered typical for this type of estuary (Dahlberg, 1976). Fall and winter otter trawl collections were dominated

by a small non-commercially important sciaenid, the star drum (Stellifer lanceolatus). In spring and summer, the Atlantic croaker (Micropogonias undulatus) was dominant. No rare or endangered fish species were collected or observed in the estuarine study zones during the monitoring period.

Nekton collected in selected areas near the proposed coal unloading facility site (Figure 2.8-4) are listed in Appendix B, Tables B-18, B-19, and B-20. Aquatic sampling areas for this facility included a dredge spoil pond and drainage ditch on Blount Island, and the Fulton-Dame Point Cutoff.

The dredge spoil pond is a vestige of the Back River that has been used as a settling pond for dredged spoil effluent and as such has a bottom composed of silty fines. Water depth in the pond is approximately 2 feet. The dominant fish collected in the pond by seining, i.e., sheepshead minnow (Cyprinodon variegatus), was highly stress tolerant. Fish collections made by gill netting were dominated by blue crabs (Callinectes sapidus) and mullet (Mugil cephalus and M. curema). Seine collections in the drainage ditch which connects the spoil area to the Fulton-Dame Point Cutoff were dominated by killifish (Fundulus spp.) and spot (Leiostomus xanthurus). Fish catches from otter trawling in the Fulton-Dame Point Cutoff consisted of common estuarine forms. With the exception of the manatee and the alligator, no rare, threatened, or endangered nekton were observed in the vicinity of the proposed coal unloading facility site during the sampling period.

2.8.6 Aquatic Macrophytes

Freshwater macrophytes occur in the aquatic communities present on the proposed plant site and located in the vicinity of the site during the wet season. Types of freshwater communities on the site include hardwood swamp, cypress swamp, and creek habitats (Section 2.9.2). Hardwood swamps were dominated by bladderworts (Utricularia spp). Other aquatic plants

found in the hardwood swamps included duckweed (Lemna minor), floating heart (Nymphoides spp.), white arum (Peltandra sagittaeifolia), pickerel-weed (Pontedera cordata), and cat-tail (Typha latifolia). Representatives of the cypress swamps included bladderworts (Utricularia spp.), sphagnum moss (Sphagnum spp.), narrow leaved sagittaria (Sagittaria graminea), pickerel weed (Pontedera cordata), floating heart (Nymphoides spp.), water lily (Nymphaea odorata) and duckweed (Lemna minor). On-site creeks which are bordered by hardwood bottomlands exhibit little diversity and have small populations of duckweed (Lemna minor) and golden club (Orontium aquaticum).

Extensive tidal salt marshes border the proposed site on both the south and east sides (Figure 2.8-1). The dominant estuarine aquatic macrophytes in these areas are black rush (Juncus roemerianus) and salt marsh cordgrass (Spartina spp.). Areas of Blount Island Channel in the vicinity of the proposed site are bordered by narrow marshy areas with growths of black rush and cordgrass. These areas are not extensive due to the channelized nature of the river and construction of sea walls and rip rap embankments. Submerged aquatic macrophytes do not occur in the channel.

2.8.7 Aquatic Mammals

A weekly manatee watch was conducted at the Northside Station from January to April, 1980, as described in Chapter 6, Section 6.2.4.2. Manatees were not seen in the vicinity of the Northside thermal discharge during the watch. A single manatee was seen in the Blount Island Channel during the summer sampling period and several sightings were reported by local inhabitants during the same period. Although the study area is within the designated critical habitat of the manatee, little or no forage is available for the manatee. Therefore, the vicinity of the proposed plant is probably not a preferred habitat. The only other aquatic mammal observed in the study area was the bottlenose dolphin, which was seen in the vicinity of the Fulton-Dame Point Cutoff.

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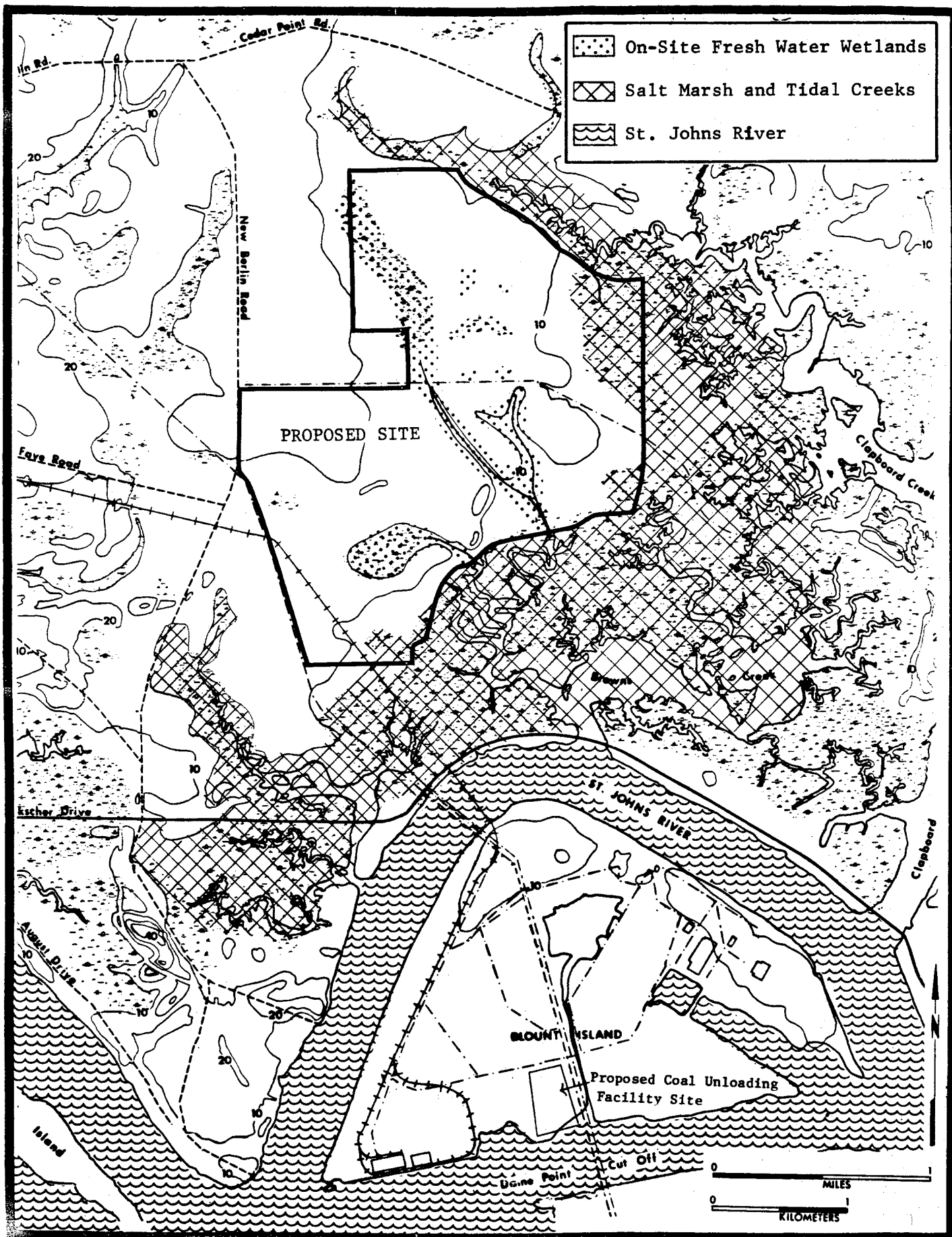
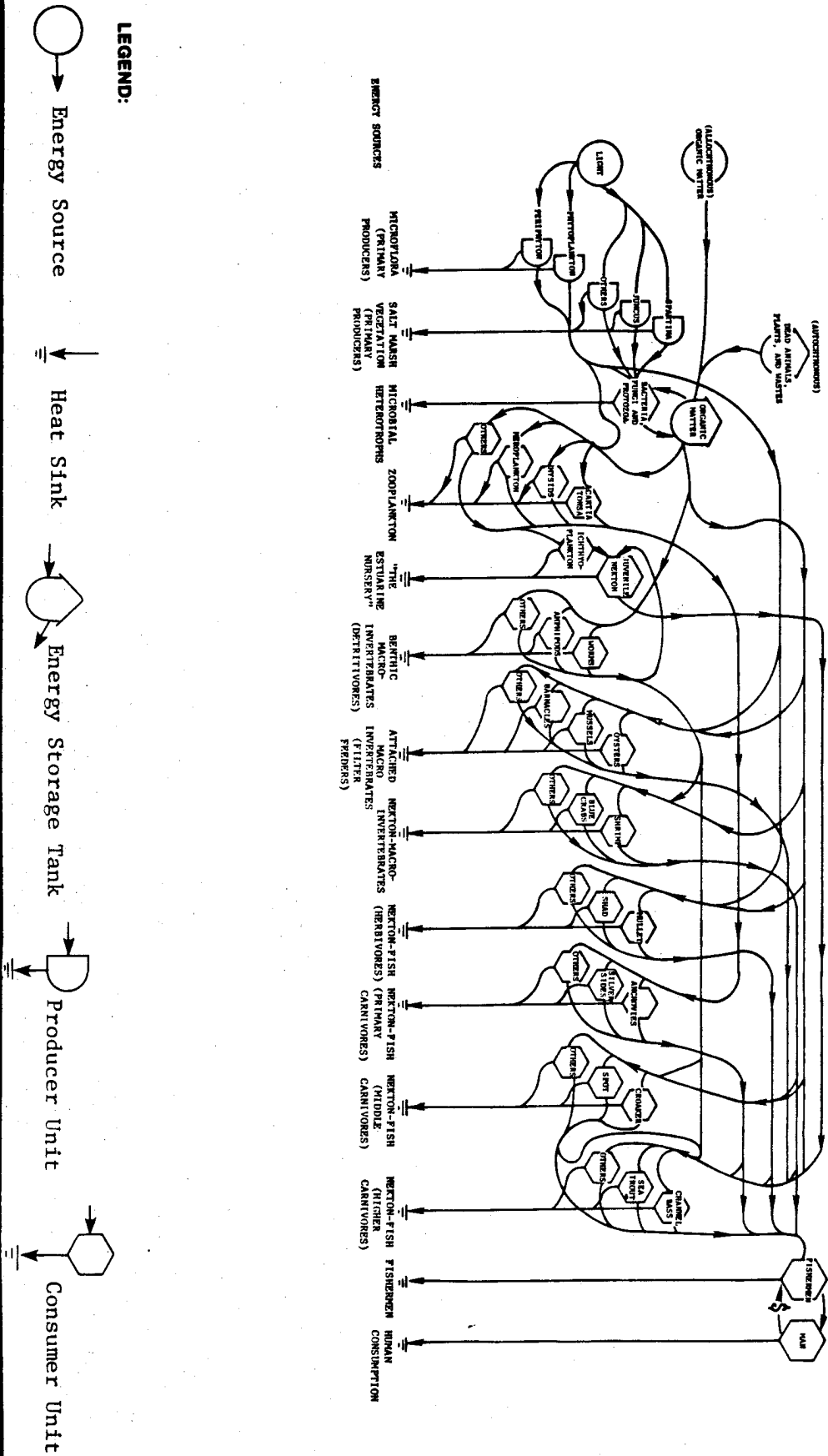


Figure 2.8 -1 Aquatic Habitat Types in the Vicinity of the Proposed Site

Figure 2.8-3

Food Chains and Other Interspecies Relationships of the Blount Island Channel Ecosystem and Adjacent Aquatic Communities



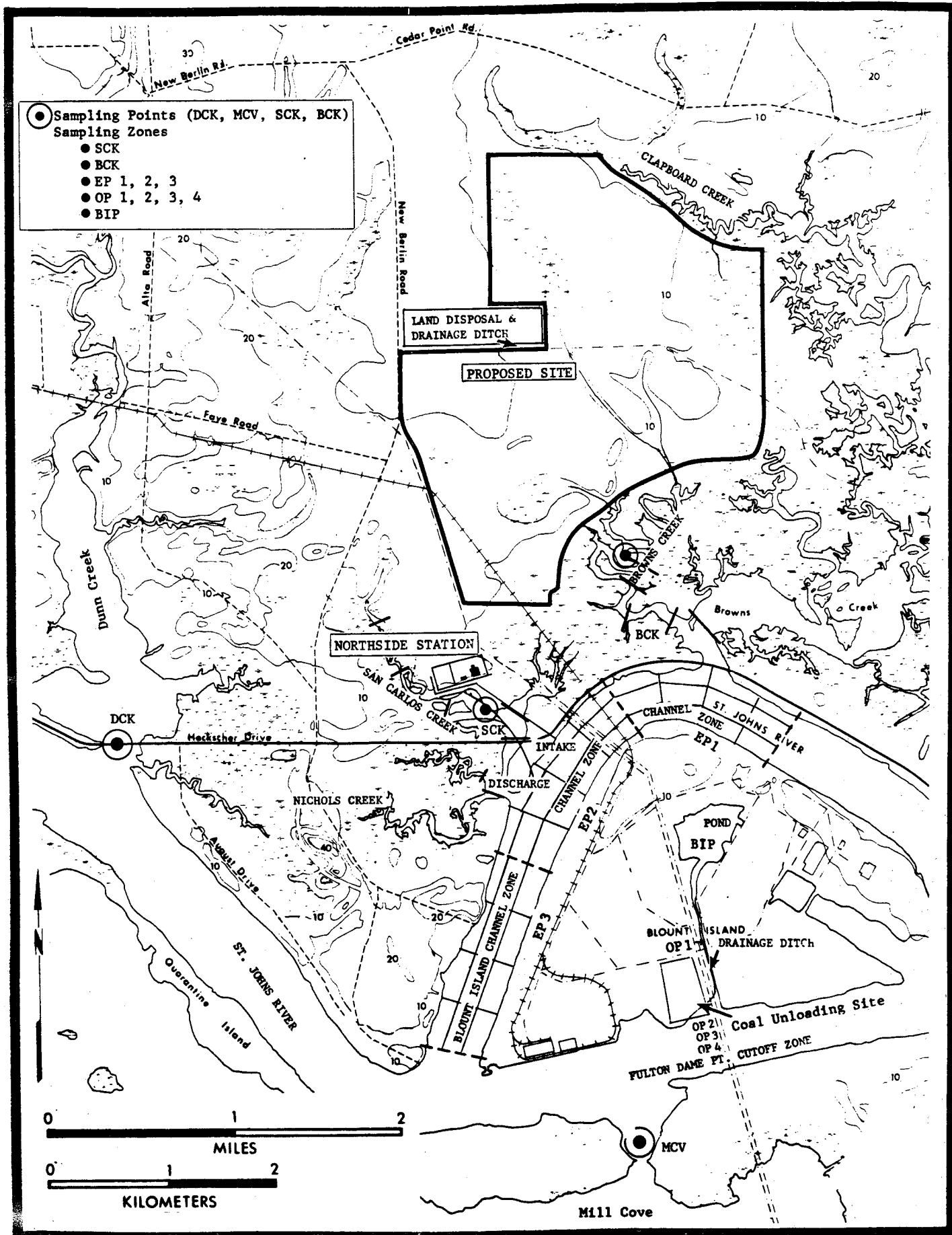


Figure 2.8-4 Aquatic Ecology Study Area

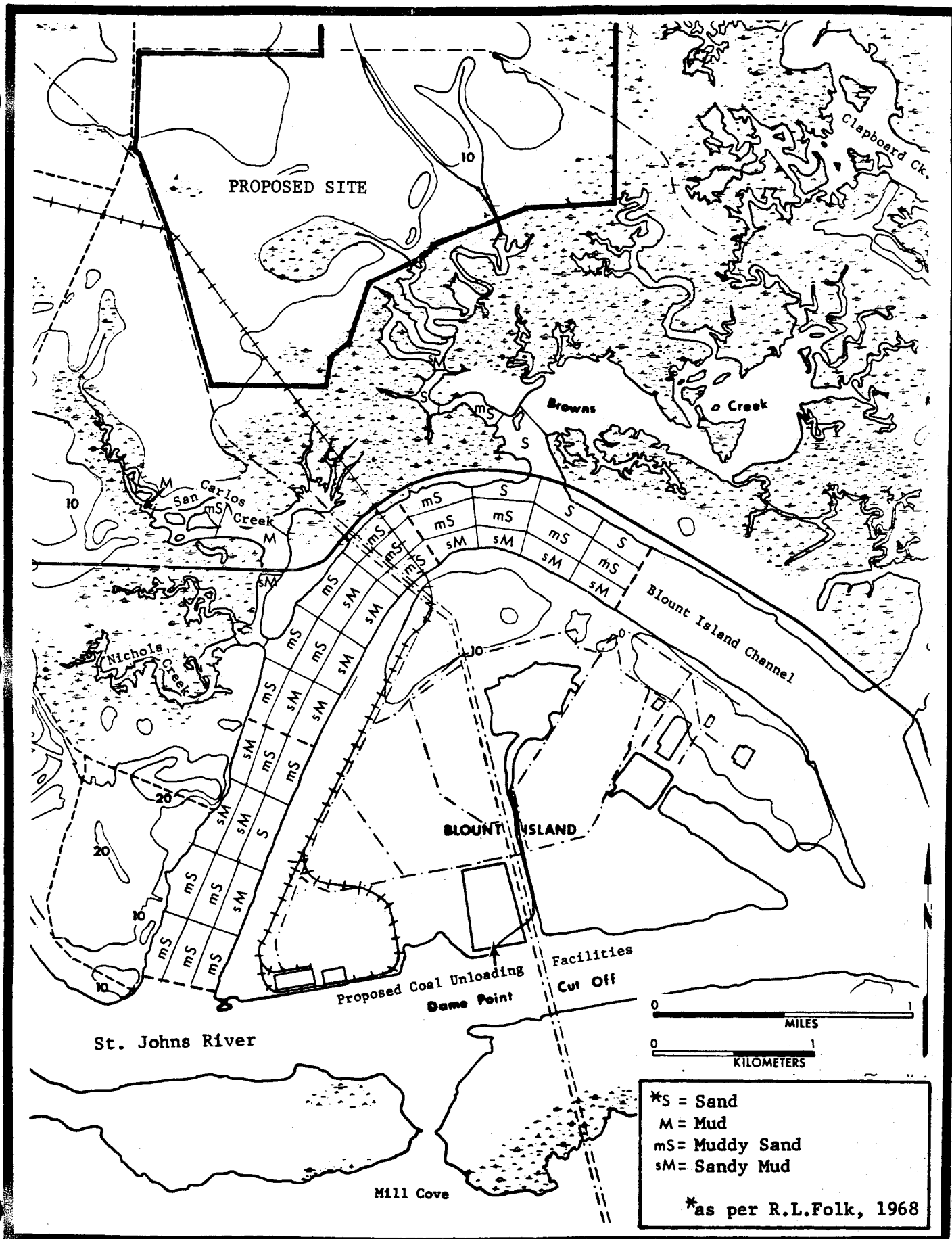
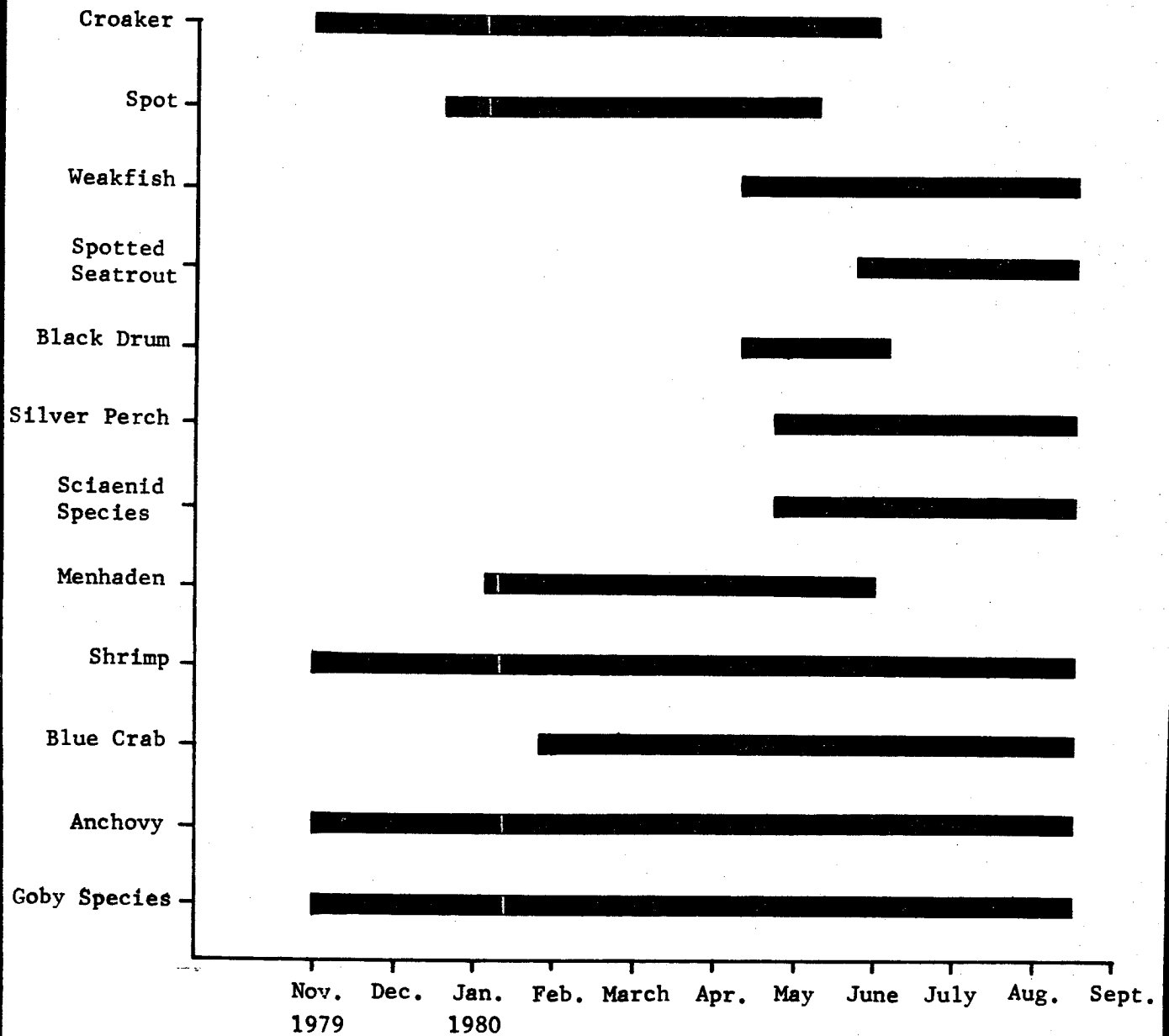


Figure 2.8-5

Sediment Types at Aquatic Sampling Sites



Source: 1979-1980 Preapplication
Monitoring Program

Figure 2.8-6 Annual Occurrence of Selected Ichthyoplankton Species of the St. Johns River, November, 1979 - September, 1980

2.9 TERRESTRIAL ECOLOGY

2.9.1 General Terrestrial Ecology

2.9.1.1 Floristic Ecology

The northeastern part of Florida falls within the Southern Mixed Forest category as defined by Kuchler (1964). The physiognomy of this type is characterized as a tall forest of broadleaf deciduous and evergreen species, and a coniferous component. Dominant trees are sweetgum (Liquidambar styraciflua), southern magnolia (Magnolia grandiflora), slash pine (Pinus elliottii), loblolly pine (Pinus taeda), and oaks (Quercus sp.). Various other components include maple (Acer sp.), hickories (Carya sp.), hollies (Ilex sp.), wax myrtle (Myrica sp.), bay (Persea sp.), cabbage palmetto (Sabal palmetto) and saw palmetto (Serenoa repens).

Several vegetation types occur within the Southern Mixed Forest, including: pine forests, swamp forests and mixed deciduous and evergreen forests which are not periodically flooded. Pine forests occupy both upland well drained soils and low poorly drained soils. Upland pine forests are commonly divided into sandhill and sand pine scrub types. Sandhill forests are characteristically open and dominated by longleaf pine (Pinus palustris) and turkey oak (Quercus laevis). This type has been altered in the past through logging and clearing for citrus groves. The sand pine scrub forests are usually characterized by a sand pine (Pinus clausa) canopy with a dense shrub layer of myrtle oak (Quercus myrtifolia) and live oak (Quercus virginiana). This forest type is mostly restricted to well drained sand deposits that have been strongly washed and sorted by wind and wave action. Both the sandhill and sand pine forests are maintained by fire. Succession in these forests proceeds toward the mixed hardwood forest type when fires are excluded.

Pine forests that occur on poorly drained soils are termed pine flatwoods. The pine flatwood vegetation type is one of the most common types in Florida (Monk, 1965). A canopy of this type may be dominated by longleaf pine, slash pine or pond pine (Pinus serotina). The understory is typically composed of saw palmetto, ink berry (Ilex glabra), and running oak (Quercus pumila). The pine flatwoods vegetation type is also maintained by fire. Periodic fires kill the competing hardwood species in the understory, leaving the fire tolerant pines to develop. In the absence of fire, ecological succession in the pine flatwoods proceeds toward a hardwood forest.

Swamp forests consist of three main types in northeastern Florida: cypress swamps, mixed hardwood swamps characterized by deciduous species, and hardwood swamps characterized by evergreen species, which are commonly termed bayheads. Swamp forests occur where seasonal or continuous flooding prevails.

Cypress swamps are dominated by either bald cypress (Taxodium distichum) or pond cypress (Taxodium ascendens). The bald cypress dominated swamps typically border sloughs, lagoons, rivers, ponds and lakes. Pond cypress dominated swamps are frequently found in depressions in pine flatwoods. Succession in cypress swamps is toward the bayhead and mixed hardwood types when improved drainage is present.

Mixed hardwood swamps typically border creeks, rivers, sloughs and basins which are regularly flooded. Considerable variation in species diversity occurs from place to place. The most common species are red maple (Acer rubrum), water oak (Quercus nigra), Carolina ash (Fraxinus caroliniana), blackgum (Nyssa biflora), dahoon (Ilex cassine), sweetgum (Liquidambar styraciflua), button bush (Cephalanthus occidentalis), cabbage palmetto (Sabal palmetto), sweet bay (Magnolia virginiana), and swamp bay (Persea palustris). This forest type is considered to be climax on rich lowland sites.

Bayhead forests develop from marshes, swamps, or low pine flatwoods (particularly those dominated by pond pine). Soils on which bayheads occur are high in organic matter and subject to seasonal flooding. This vegetation type is dominated by broadleaf evergreen trees including sweet bay, swamp bay, and loblolly bay (Gordonia lasianthus). Bayheads are considered to be climax on low acidic soils which are high in organic matter and are subject to seasonal flooding. Where improved drainage occurs, some species typical to the mixed hardwood forest type frequently occur.

The hardwood hammock (also referred to as southern mixed forest, upland mixed hardwood forest or hardwood forest) occurs on fairly rich sandy soils and exhibits best growth and development in areas where limestone and phosphatic deposits outcrop. This vegetation type can also occur in less fertile areas when fire has been eliminated or retarded long enough to permit succession beyond the subclimax pine stage. The hardwood hammock is considered to be climax vegetation of northern and central Florida (Monk, 1965) and is characterized by southern magnolia (Magnolia grandiflora), laurel oak (Quercus hemispherica), scrub holly (Ilex opaca), and ironwood (Carpinus caroliniana).

Four vegetation types have been described for Duval County, Florida (Davis, 1967), including pine flatwoods, longleaf pine ridges, coastal marshes, and cypress swamps. The pine flatwood is the most extensive type, covering about 85 percent of the county. The pine flatwood within Duval County is typical of pine flatwoods in Florida. Coastal marshes border portions of the St. Johns River and Nassau River and comprise about 10 percent of the county. Longleaf pine ridges and cypress swamps occur within the pine flatwoods, occupying less than 5 percent of the county.

2.9.1.2 Faunistic Ecology

Urbanization has left Duval County with a limited amount of habitat suitable for many game and nongame species which typically occur elsewhere in the region. However, the southeastern and western portions of the

county still have areas where wildlife is plentiful. Bobwhite Quail (Colinus virginianus), Mourning Dove (Zenaida macroura), gray squirrels (Sciurus carolinensis), fox squirrels (Sciurus niger), Wild Turkeys (Meleagris gallopavo), white-tailed deer (Odocoileus virginianus), racoons (Procyon lotor), and numerous species of waterfowl are among the game species still found in the county.

Salt and brackish marsh areas in the eastern and northern portions of the county are frequented by birds such as Clapper Rails (Rallus longirostros), Great Blue Herons (Ardea herodias), Great Egrets (Casmerodius albus egretta), and Red-winged Blackbirds (Agelaius phoeniceus). The dendritic network of tidal creeks and mudflats provide habitat for the American alligator (Alligator mississippiensis), raccoon (Procyon lotor) and marsh rabbit (Sylvilagus palustris), while hardwood hammocks which dot the marsh are inhabited by numerous additional species of wildlife.

Various types of pine forest make up a significant portion of the county. In the more xeric communities which are dominated by longleaf pine and turkey oak, armadillos (Dasypus novemcinctus) and cotton rats (Sigmodon hispidus) are among the more common mammalian species. Rufus-sided Towhees (Pipilo erythrophthalmus), Bachman's Sparrows (Aimophila aestivalis), and several species of woodpecker which utilize the snags present are among the bird species typically found. This community also supports huntable populations of Bobwhite Quail (Colinus virginianus) in certain areas.

Duval County is in the Atlantic flyway and open water habitats are used as resting or wintering areas by many species of migrating waterfowl. The furbearer population within the county does support some trapping but the size of the reported harvest indicates that it is not economically important with only 25 bobcats, 40 otter and no mink reported for 1978-79. Both the bobcat and otter are reported as absent from the more heavily developed areas in the county (Brady, 1980).

2.9.2 Specific Description of the Terrestrial Environment of the Site Area

2.9.2.1 Plant Communities

Plant Site

Nine major vegetation communities were identified within the boundaries of the proposed plant site (Figure 2.9-1), including: pine flatwoods, grassy scrub, grassy scrub/pine flatwoods, hardwood swamp, hardwood hammock, bottomland hardwood, bayhead, cypress swamp, and salt marsh. These communities occupy approximately 504, 25, 363, 100, 415, 80, 28, 40, and 41 acres, respectively. The woody and herbaceous species observed in each of these vegetation types are listed in Appendix A, Tables A-1 and A-2. The pine flatwoods, grassy scrub/pine flatwoods, hardwood hammock, and hardwood swamp comprise the largest percentage of the proposed site with 30, 22, 25, and 6 percent, respectively. Remaining types (cypress swamp, bayhead, salt marsh, grassy scrub, and bottomland hardwood) occupy a smaller percentage (2.4, 1.7, 2.5, 1.5, and 4.8 percent, respectively) of the proposed site than the others, but exhibit different characteristics. Each type is discussed in Appendix A, with emphasis given to those occupying large areas of the site and to those considered to be unique or of some ecological importance.

Rare, Threatened and Endangered Plant Species

No endangered plant species are reported to occur in Duval County (Ward, 1979). Two species, southern lip fern (Cheilanthes microphylla) and spoon flower (Peltandra sagittifolia), are listed as rare for Duval County. Spoon flower was observed on the site. One individual was found in the bayhead community which borders the hardwood swamp in the southern portion of the site. Two threatened species, Jackson-vine (Smilax smallii) and Bartram's ixia (Sphenostigma coelestinum) are reported for Duval County (Ward, 1979). Neither of these species were observed on the site.

Existing Stresses and Perturbations

Existing stresses and perturbations to naturally occurring vegetation can be divided into two categories, those induced by natural causes and those induced by human activity. The principal natural cause on the proposed site is fire. Fire tends to eliminate most hardwood and shrub species but leaves the more fire resistant long leaf pines. Logging is the principal unnatural cause on the proposed site.

Approximately 800 acres of the proposed site exhibit some evidence of fire, such as scarred tree boles or the charred remains of trees. Scarred boles are the only evidence of fire in the pine flatwoods in the northern portion of the site. This is indicative that some time, perhaps 10 years or more, has passed since the area was disturbed by fire.

Fire has had a more recent effect on the southern portion of the site. Within the last five years, approximately 400 acres were burned. Evidence of this fire consists of scarred boles as well as charred remains of trees and shrubs. This fire appears to have been contained within the drier grassy scrub/pine flatwood vegetation type. Wet conditions in the bayheads and cypress swamps apparently prevented fire from spreading into these areas.

The occurrence of fire within the pine flatwoods and grassy scrub/pine flatwoods vegetation type is not as adverse an effect as it would appear. These vegetation types require fire to maintain their successional stage. In the absence of fire, succession in these vegetation types proceeds towards a mixed hardwoods type.

Logging induces both direct and indirect effects. The removal of canopy trees is a direct effect as well as the disturbance to shrub and herbaceous species from logging equipment. The increased fire hazard from the improper disposal of slash is an indirect effect. Another indirect effect results from the removal of the forest canopy. What was once deep

shade becomes direct sunlight. This abrupt change produces changes in species composition. Logging was initiated on the proposed site in July, 1980 by the present owners (Northshore Development Corporation). The standing timber is being cut for pulp. The plan is to log the northern portion of the site first and then move to the southern half. To date a large portion of the approximately 395 acres of the pine flatwoods to the north of Island Drive has been cleared.

Blount Island

The proposed coal unloading facility will occupy an approximate 55 acre site on Blount Island. An additional 31 acres will be used to construct a rail line connecting this site to the proposed power plant. Blount Island has been severely disturbed in the last 10 to 15 years. As a result, the remaining areas of natural vegetation are restricted to the periphery of the island, primarily along the old river channel, and along the remnants of Alligator Creek. Six major vegetation types were identified on Blount Island (Figure 2.9-2), including: mixed hardwood, grassy scrub, Myrica shrub, Baccharis shrub, water/beach, and salt marsh. Five of these six (grassy scrub, myrica shrub, water/beach, Baccharis shrub and salt marsh) occur within the boundaries of the proposed unloading facility. For the purpose of summarizing the common woody and herbaceous species observed on Blount Island, the six vegetation types identified were combined into one type termed riparian and reported in Appendix A, Tables A-1 and A-2. Each of the six types is discussed in Appendix A from the perspective of Blount Island and of the proposed unloading facility site.

Rare, Threatened and Endangered Plant Species

No endangered plant species are reported to occur in Duval County (Ward, 1979). Southern lip fern (Cheilanthes microphylla) and spoon flower (Peltandra sagittifolia) are listed as rare species which may occur in Duval County. Neither species was observed on Blount Island, nor are

habitats on Blount Island conducive to their occurrence. Jackson-vine (Smilax smallii) and Barthram's ixia (Sphenostigma coelestinum) are considered to be threatened species which have been observed in portions of Duval County. Neither of these species was observed on Blount Island or within the site of the proposed unloading facility.

Existing Stresses and Perturbations

The existing stresses and perturbations to naturally occurring vegetation can be divided into two categories, those induced by natural causes and those induced by human activity. The principal natural cause of stress and perturbation to vegetation of Blount Island is storm activity and associated high tides. Several unnatural causes or those attributable to human activity commonly occur on Blount Island. Storage of cars and trucks, dredge spoil disposal, solid waste disposal and development of vacant land are the primary examples of unnatural causes attributed to human activity.

Vegetation located on the margins of Blount Island along the St. Johns River is subject to disturbances from storms. Storms exert stress from high winds, wave action, and flooding due to high tides.

Dredge spoil disposal is the one unnaturally caused stress which has had the greatest effect on the natural vegetation composition of Blount Island. Dredge spoil disposal has a wide range of effects. Typically, disposed spoil is different both chemically and physically than previously existing substrates. Spoil sites are generally diked for the disposal process; as a result the disposal area is frequently inundated giving rise to wetland species. When spoil disposal activities are complete or temporarily halted and the disposal site dries out, conditions are no longer favorable for wetland species. These frequently fluctuating conditions due to dredging activity impede the progress of ecological succession.

The use of vacant land by the Jacksonville Port Authority (JPA) for storage of imported cars and trucks exerts a continual stress on the vegetation in the storage areas. For the most part, cars are stored in large paved areas, but often the inventory is placed on open grassy areas. The movement to and from these storage areas as well as vehicular shading of vegetation disrupt the existing vegetative growth. Construction of additional paved storage areas also results in loss of naturally vegetated areas. Storage of scrap metal and various pieces of equipment associated with Offshore Power Systems (OPS) and JPA operations effectively removes natural vegetation and prevents the land from becoming revegetated.

2.9.2.2 Animal Communities

Plant Site Habitats

Nine habitat types are present on the proposed plant site. Hardwood swamp, hardwood hammock, pine flatwoods and grassy scrub/pine flatwoods make up the majority of the site comprising approximately 83 percent of the total area with the cypress swamp, bottomland hardwood, bayhead, grassy scrub, and salt marsh accounting for the remainder. Similar vegetative communities were combined because of their common use by faunal species. Mammals, birds, reptiles and amphibians observed during the course of the one year on-site study are presented in Appendix A, Tables A-21, A-22, A-23, and A-24. Each of the habitat types and their characteristic faunal species are discussed in Appendix A.

Biologically Sensitive Areas

Hardwood Swamp

Hardwood swamp is a biologically sensitive habitat. The loss of wetland habitat and associated fauna is an area of continuing concern for both state and federal agencies. As shown in Figure 2.9-1, hardwood swamp is present in two areas of the proposed site and occupies approximately 100 acres.

Salt Marsh

Only a small amount (approximately 41 acres) of salt marsh falls within the proposed site boundary (Figure 2.9-1). A much larger area exists to the east of the site. This habitat type is highly productive and depends on tides to provide nutrient and energy subsidy and waste removal for those organisms adapted to this environment. Great Blue Herons (Ardea herodias), Great Egrets (Casmerodius albus), Snowy Egrets (Egretta thula) and Louisiana Herons (Hydranassa tricolor) all use the marsh as a principal feeding area. The Clapper Rail (Rallus longirostris) was frequently seen and heard in the marsh and on the mud flats bordering the tidal creeks. An abandoned Osprey (Pandion haliaetus) nest was observed in the salt marsh off the site during the January aerial survey and on a subsequent trip, a pair of Osprey were seen and were assumed to be nesting. The marsh plays an important role in the life cycle of many organisms.

Rookery

A rookery was discovered north of Island Drive and just east of the proposed site boundary (Figure 2.9-3). The ecological sensitivity of the area stems from it being used by various wading birds as a colonial nesting site. Cattle Egrets (Bubulcus ibis), Snowy Egrets, Louisiana Herons and White Ibis (Endocimus albus) were the most common nesters with Great Egrets, Black-crowned Night Herons (Nycticorax nycticorax) and Anhingas (Anhinga anhinga) being present in lesser numbers. The largest number of active nests (1614) was found in June followed by a substantial decline in July (958) and August (206).

Great Egrets were the earliest nesters followed closely by Snowy Egrets. Loss of suitable nesting and feeding habitat has resulted in the Snowy Egret and the Louisiana Heron being listed by the Florida Game and Fresh Water Fish Commission as a "species of special concern". Appendix A, Table A-22 contains a list of the birds observed in the rookery while the results of the three censusing efforts are presented in Appendix A, Table A-27.

Important Species

A species is defined by the Florida Department of Environmental Regulation as "important" if: (1) it is commercially or recreationally valuable; (2) it is rare, endangered, threatened, or protected; or (3) it has unique ecological value. All species observed on the proposed site and falling into any of the above categories are included in the following discussion. Several additional species are also discussed even though they were not actually observed on the site.

Commercially or Recreationally Valuable Species

Whitetail Deer (*Odocoileus virginianus*)

The whitetail deer is the most important big game animal in the eastern United States. Rarely having a home range of more than one mile in diameter, this species is a browser feeding primarily on twigs, shrubs, forbs, fungi and acorns (Burt, 1976). No deer or deer sign were observed on the proposed plant site.

Eastern Gray Squirrel (*Sciurus carolinensis*)

The squirrel is an important small game animal in certain parts of its range. Home ranges vary from 2-7 acres with population sizes ranging from 2-20 per acre (Burt, 1976). Squirrels were conspicuously absent in hardwood hammock areas that seemed to have the necessary components for good squirrel habitat.

Marsh Rabbit

The marsh rabbit is another popular game animal in many areas. Preferring wetter habitats, this small mammal was much in evidence by its droppings in the less mature of the two bayhead areas.

Furbearers

Evidence of several furbearers was found on the proposed plant site. Raccoons which are chiefly nocturnal were not encountered during the course of the field work but their footprints were found in both the salt marsh and bayhead habitats. The marshes abundant fiddler crab population is probably an attractive food item for the resident population of raccoons.

Several opossums (Didelphis marsupialis) were observed on the site. Opossums are occasionally hunted for sport but are not as economically important as certain other furbearers. One river otter (Lutra canadensis) was observed. However, this aquatic mammal is not thought to be present in sufficient numbers to be considered commercially significant. There did not appear to be any evidence that there was a significant amount of hunting or trapping on the site.

Bobwhite Quail

The Bobwhite Quail is a popular game bird which thrives in the open fields and pine flatwoods of the southeast. Because they favor early succession stages, quail have undoubtedly benefited from the conversion of forested land to farmland. A covey of approximately eight birds was flushed during the field study. However, the proposed plant site currently supports only a small population of this game bird.

Endangered or Threatened Species

Several species of wildlife observed on the proposed plant site enjoy some degree of protective legal status at either the state or federal level. Species known to occur or with a high probability of occurrence along with their status are presented in Appendix A, Table A-28.

American Alligator (Alligator mississippiensis)

Alligators are found in various wetland types throughout the state of Florida. This reptile is adaptive and seems equally suited to inhabiting ponds, rivers, the edges of large lakes and the interiors of swamps and freshwater marshes. The individual encountered on the proposed site was found at the mouth of a stream that meanders through the area.

Hunting has greatly reduced the alligators numbers during recent years. Through protection, the species has recovered in numbers along much of the coastal southeast (McDiarmid, 1978).

Gopher Tortoise (Gopherus polyphemus), Eastern Indigo Snake
(Drymarchon corais couperi)

Numerous gopher tortoise burrows and several gopher tortoises were observed on the proposed plant site. The xeric pine flatwoods have the dry, well-drained soils that are a major requirement for "preferred" gopher tortoise habitat.

The gopher tortoise constructs long burrows (up to 35 feet in length) which may be used by a variety of different vertebrates. The eastern indigo snake which normally prefers moister habitats may seek shelter in tortoise burrows when inhabiting these dryer areas. The pine flatwoods are not the prime habitat of the snake and Duval County is thought to support only a small population of this reptile (Moler, 1980). No eastern indigo snakes were observed on the proposed plant site.

Wood Stork (Mycteria americana)

This large wading bird was observed on several occasions flying over the marsh to the east of the proposed site. This species is highly colonial and nests in large rookeries and averages two young fledged per successful nest. Wood storks typically feed in shallow water (6-10 inches

deep) where they probe with their bills partly open for small fish. Because of his specialized feeding technique, the species is more adversely affected than other waders by drainage or altered hydroperiod in marshes (Kale, 1978).

Bald Eagle (*Haliaeetus leucocephalus*)

This species was once common in Florida, nesting along most of the state's coastline. Eagles nest in tall pine or cypress trees with nests typically located in the crown of the dominant tree in a stand. Nests are repaired in early fall with a clutch of two or three eggs being laid as early as late October (Kale, 1978).

The slash pine (*Pinus elliottii*) bordering the proposed site at the edge of the salt marsh is potential nesting habitat for eagles. However, no evidence of recent or active nests was observed within several miles of the proposed site during two aerial surveys and an extensive ground reconnaissance effort.

Species with Unique Ecological Value

No species found on the proposed plant site are seen as possessing unique ecological value.

Blount Island

Blount Island, the site of the proposed unloading facility, has a number of wildlife habitats including: ponds, salt marsh, grassy areas, and beach. The habitats are disturbed but still provide niches for a variety of bird fauna. The ponds, which are remnants of dredge spoil areas, provide suitable areas for a number of wading birds such as Great Blue Herons, Snowy Egrets, Louisiana Herons, and Great Egrets. *Juncus spartina* communities border these ponds as well as portions of the St. Johns River and Alligator Creek. These salt marsh areas provide habitat for Clapper Rail and Red-winged Blackbirds. The grassy areas provide

habitat for Killdeer and Cattle Egrets, while various plovers, sandpipers, gulls, and terns are common along the beaches at low tide. A number of snakes, including diamond back rattlesnake, cottonmouth, southern black racer and corn snakes are reported as inhabiting many of the habitats on Blount Island. The marsh rabbit was the only mammal actually sited on the island. A description of the wildlife habitat on Blount Island is provided in Appendix A.

Biologically Sensitive Areas

Least Tern Nesting Area

Nesting Least Terns (Sterna albifrons) and their eggs were observed in three areas on Blount Island with each area (Figure 2.9-2) being characterized by sparse vegetation and a certain degree of remoteness. A decline in suitable nesting sites has prompted the Florida Game and Fresh Water Fish Commission to list the Least Tern as threatened. Man-made spoil banks are now important nesting areas for this bird and help offset the loss of much of the tern's natural nesting habitat (Downing, 1973). Wilson's Plovers (Charadrius wilsonia) and Killdeer were also thought to be nesting in these areas but no nests were actually located.

Important Species

A species is defined by the FDER as "important" if: (1) it is commercially or recreationally valuable; (2) it is rare, endangered, threatened or protected; or (3) it has unique ecological value. Species observed on Blount Island and falling into any of the above categories are included in the following discussion.

Commercially or Recreationally Valuable Species

The marsh rabbit and Bobwhite Quail, both popular game animals, were observed on Blount Island. However, because the island has only limited access, none of the island's fauna are considered commercially or recreationally important.

Endangered or Threatened Species

Several species of wildlife observed on Blount Island enjoy some degree of protective legal status at either the state or federal level. The species along with their status are presented in Appendix A, Table A-28.

Least Tern

Least Terns were found nesting in three different locations (Figure 2.9-2) on Blount Island.

Wood Stork

Wood Storks, in groups of 6-8, were observed on several occasions feeding in the ponds and drainage ditch on Blount Island.

Species with Unique Ecological Value

No species found on Blount Island are seen as possessing unique ecological value.

2.9.3 References

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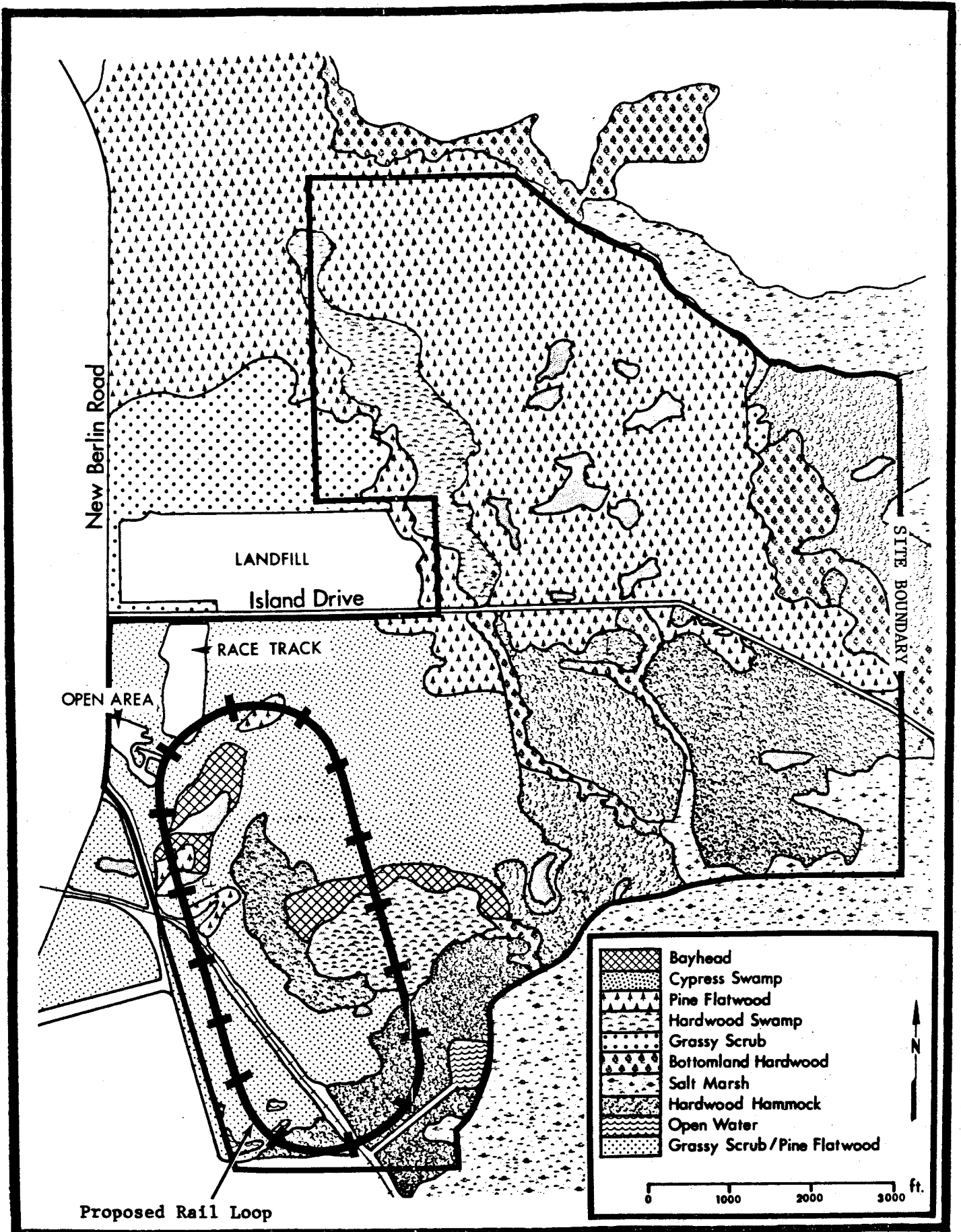
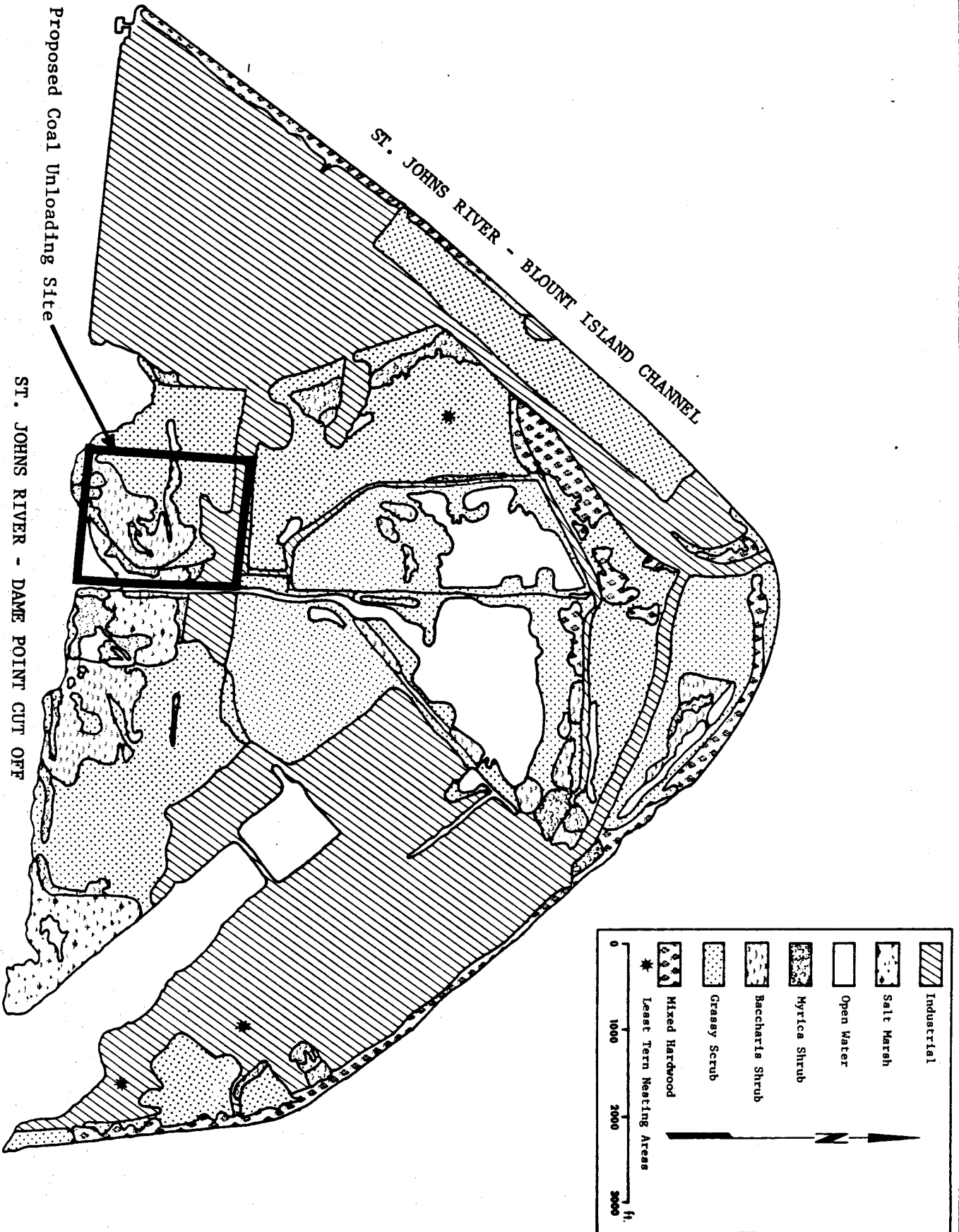


Figure 2.9-1 Vegetation Communities of the Proposed Plant Site

Figure 2.9-2 Vegetation Communities and Wildlife on Blount Island



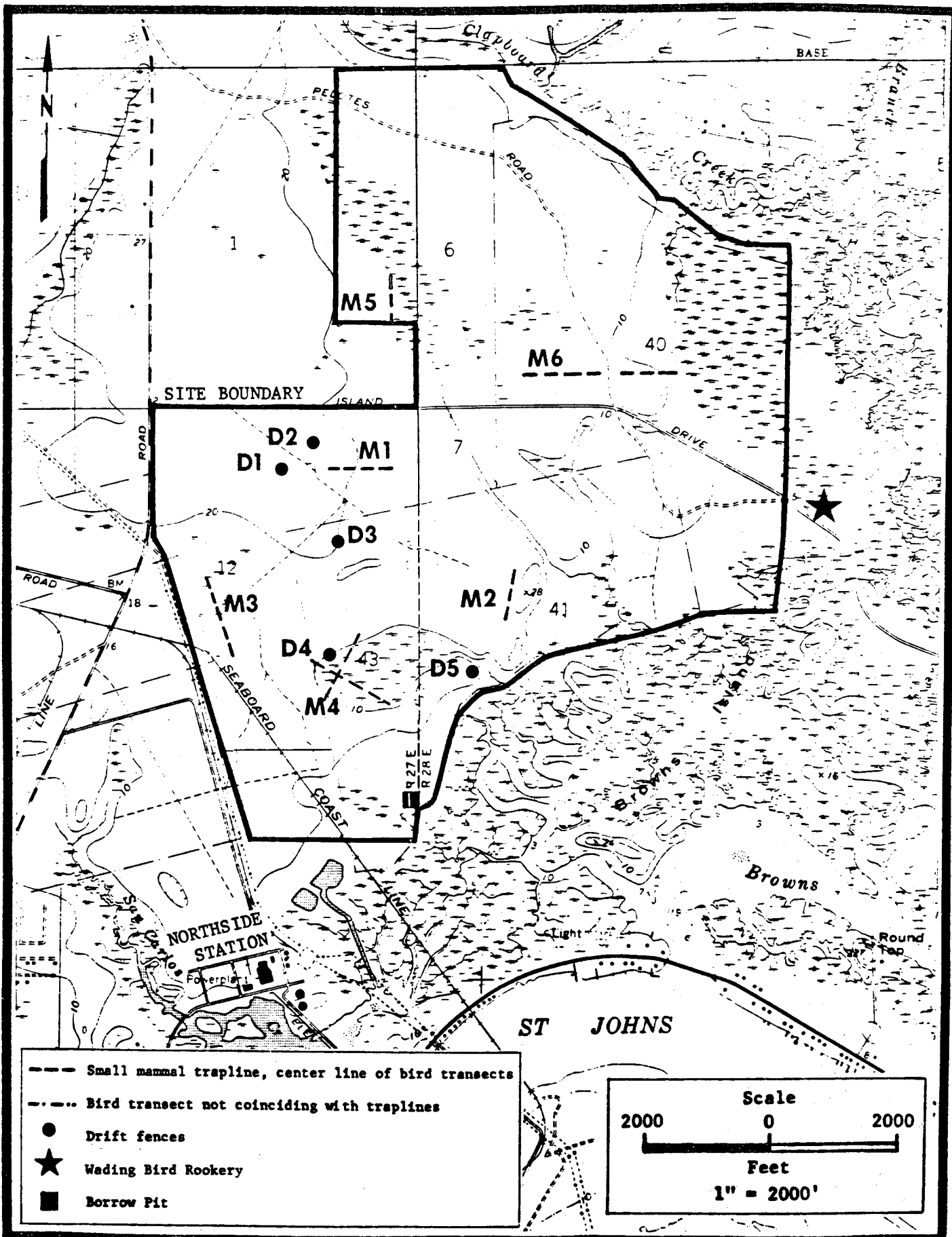


Figure 2.9-3 Wildlife Sampling Locations

2.10 OTHER ENVIRONMENTAL FEATURES

2.10.1 Noise

In order to describe the existing noise environment, a two season monitoring program was conducted. Noise levels were monitored at six locations on and around the proposed plant site during the first survey, which was in the winter. Three additional locations were added to the summer survey to describe the existing noise environment around the proposed coal unloading facility on Blount Island. (Plans for the coal unloading facility were not far enough along to allow inclusion of this site in the winter noise survey.) The locations of all nine monitoring locations are shown on Figure 2.10-1.

The results of the survey are presented in Tables 2.10-1, 2.10-2, and 2.10-3. Table 2.10-1 presents the equivalent sound levels (L_{eq}) and EPA's day/night sound level (L_{DN}) over each 24-hour survey period for the winter and summer surveys. The equivalent sound level is the steady state sound level which contains the same amount of energy as the real time - varying sound level over the same period. The mathematical definition of L_{eq} for a time interval defined as occupying the period between two points in time t_1 and t_2 is:

$$L_{eq} = 10 \log \left[\frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{P^2(t)}{P_o^2} dt \right]$$

where $P(t)$ is the time varying sound pressure and P_o is a reference sound pressure. The monitoring equipment utilized in the surveys computed hourly L_{eq} 's internally. The L_{eq} for each 24-hour period was determined from the hourly L_{eq} values monitored by the continuous analyzer using the following equation:

$$L_{eq} = 10 \log \left[\frac{1}{n} \sum_{i=1}^n 10^{x_i/10} \right]$$

where: x_i = hourly L_{eq} in dB(A)
 n = number of hourly values

EPA's day/night sound level (L_{DN}) is calculated the same as the L_{eq} except that a 10 decibel penalty is added to the hourly L_{eq} values between 10 p.m. and 7 a.m. This is done to emphasize the need for a quieter noise environment during normal sleep hours. In mathematical terms, L_{DN} is related to L_{eq} as follows:

$$L_{DN} = 10 \log \frac{1}{24} \left[15 (10^{L_d/10}) + 9 (10^{(L_n + 10)/10}) \right]$$

where $L_d = L_{eq}$ for the daytime (7 a.m. to 10 p.m.)
 $L_n = L_{eq}$ for the nighttime (10 p.m. to 7 a.m.)

If significant seasonal variations in noise levels exist, a winter versus summer survey would be most likely to show the variation. The L_{eq} and L_{DN} figures presented in Table 2.10-1 indicate that no significant seasonal variation exists at the proposed site. Noise levels at some monitoring locations were slightly quieter in the winter while at others, they were quieter in the summer. Overall, the time of year appears to make little difference in the ambient noise levels at the site.

The noise levels do vary, however, between the different monitoring locations. This variation can be seen in the values presented in Table 2.10-1. The loudest monitoring location was, as expected, at the Northside Station. The $L_{eq}(24)$ was 69 and 64 dB(A) during the winter and summer surveys, respectively. The quietest location was at the nearest residence to the northeast, approximately 2 miles from the location of the proposed plant. The $L_{eq}(24)$ was 50 and 51 dB(A), respectively, during the two surveys.

The USEPA's noise level guidelines are presented in Table 2.10-4 for comparison. All of the monitoring locations except the Northside Station, the north site boundary, and Blount Island would be included in the first

category listed; that is, "Residential with Outside Space and Farm Residences". The outdoor noise guideline levels are an L_{DN} of 55 dB(A) or less to protect against activity interference and an $L_{eq}(24)$ of 70 dB(A) for hearing loss considerations. The L_{DN} of 55 dB(A) is equalled or exceeded at all locations except the nearest northeast residence which is 2-3 dB(A) below the guidelines. However, none of these locations have noise levels approaching the 70 dB(A) hearing loss consideration level.

The monitoring locations at the NGS, the north site boundary, and Blount Island would be classified as "industrial" and only EPA's $L_{eq}(24)$ guideline of 70 dB(A) for the hearing loss consideration would apply. The equivalent 24-hour noise levels [$L_{eq}(24)$] at these locations were 64-69, 48-53, and 60 dB(A), respectively. All are below the 70 dB(A) guideline. The loudest noise source in the site area appears to be diesel trucks on New Berlin Road going to and from the city landfill, diesel trucks on Heckscher Drive servicing the many industrial facilities in the area, and dirt bikes in the community of New Berlin. This community, about 2-1/2 miles south of the proposed plant site, is also subject to noise from activities at the car import facility on Blount Island immediately across the river.

Tables 2.10-2 and 2.10-3 present a summary of the L_{10} , L_{50} and L_{90} decile levels obtained during the two surveys. These decile levels are the dB(A) levels exceeded 10, 50 and 90 percent of the time, respectively, and were calculated hourly for a 24-hour period at each monitoring location. The hourly data are presented in Appendix N.

The summary includes the arithmetic mean of each decile level and the standard deviation of the hourly values. These values describe the variability of the noise environment at the monitoring locations over the 24-hour period. In general, all of the noise levels obtained fall within two standard deviations of the mean level. For example, at New Berlin, during the winter survey (Table 2.10-2), the L_{10} mean was 55 dB(A) with a

standard deviation of 5.2. Therefore, most of the 24 L_{10} levels obtained were between 44.6 and 65.4 dB(A). This is a moderately variable L_{10} noise level. By contrast, the summer survey at the Northside Generating Station (Table 2.10-3) indicates the noise level was almost steady state with the L_{10} ranging only between 62 and 66 dB(A).

Further indication of the variability is obtained by comparing the L_{10} and L_{90} noise levels. A slight difference indicates almost steady state noise caused either by a high background level, such as at the Northside Station, or by a lack of intrusive sounds which were not apparent at any of the locations. Even the quietest monitoring location (at the nearest northeast residence) was affected by aircraft noise from flyovers and takeoffs and landings at Jacksonville International Airport, located about 8 miles west of the monitoring site. Jet noise from takeoffs and landings was apparent only under certain atmospheric conditions, however. This location was affected very little by truck noise.

The values presented in Tables 2.10-2 and 2.10-3 are not statistically comparable with any known guidelines, and should be used only in describing the noise environment in general terms.

2.10.2 Aesthetics

The proposed site is in a relatively flat area, located on the eastern boundary of an area suitable for industrial development and the western boundary of tidal marshes. The general vista to the east of the plant site is open due to the marshes. The vista is mixed to the west of the site with spotty industrial development and forest vegetation between developments. Located adjacent to the proposed site is the Northside Station, which has three stacks of various height. The tallest stack stands 360 feet high. Other significant structural features in proximity to the proposed site include the NGS transmission towers, the shipping cranes and the Offshore Power Systems crane on Blount Island, and the St. Regis Paper Company plant and water tower.

The viewshed, centered on the proposed site, extends mostly to the south due to openness of the St. Johns River and marshes (Table 2.2-2). On the southern shore of the St. Johns River, homes adjacent to the river are most affected. The majority of homes and commercial districts in the area do not have a view of the existing industrial structures because of tree cover height. The only major road south of the river that offers a view of the industrial structures in proximity to the proposed site is Fort Caroline Road where it runs contiguous up to the marshes and Mill Cove. Due to the speed limit on Fort Caroline Road and limited openness of the views, viewing time is brief. The view from the Fort Caroline National Memorial is that of an industrial area including the Offshore Power Systems crane, NGS transmission towers, and the St. Regis Paper Company plant.

On the north side of the river approximately 0.5 mile south of the proposed site along Heckscher Drive at Nichols Creek, there is another viewing opportunity. With the NGS in the foreground, the view is typical of an industrialized section of Heckscher Drive.

West of the proposed site, there are only limited views of structures in the site vicinity due to the height and nearness of trees. Those views that do occur are along roads where trees are either small or located back from the road. Heckscher Drive runs parallel to the St. Johns River in an east-west direction, and provides the means for obtaining views from the east, as well as some views from the west approach. To the east, marsh borders much of the road on its northern side. Consequently, openness of the marsh allows a significant exposure of the NGS from Heckscher Drive.

2.10.3 References

U.S. Environmental Protection Agency, 1974. Information Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. 550/9-74-004. Washington, D.C. 20460.

Table 2.10-1
COMPARISON OF WINTER AND SUMMER EQUIVALENT (L_{eq})
AND DAY/NIGHT (L_{DN}) SOUND LEVELS

Station Number ^a	Location	L_{eq} (24) dB(A)		L_{DN} dB(A)	
		Winter	Summer	Winter	Summer
1	New Berlin	56	58	59	62
2	North Site Boundary	53	48	54	56
3	Nearest Residence (NW)	55	54	57	56
4	Nearest Residence (NE)	50	51	52	53
5	Browns Creek	64	61	65	65
6	Northside Station	69	64	71	71
7	Blount Island	-	60	-	65
8	Dames Point	-	62	-	63
9	Beacon Hills	-	52	-	56

^a See Figure 2.10-1

Table 2.10-2
MEAN AND STANDARD DEVIATION OF DECILE SOUND LEVELS (dBA)
WINTER SURVEY

<u>Station Number^a</u>	<u>Location</u>	<u>L₁₀</u>		<u>L₅₀</u>		<u>L₉₀</u>	
		<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>
1	New Berlin	55	5.2	49	3.0	47	1.8
2	North Site Boundary	49	5.6	44	4.1	40	2.7
3	Nearest Residence (NW)	52	6.2	43	4.3	40	2.8
4	Nearest Residence (NE)	48	5.8	41	4.8	37	3.0
5	Browns Creek	48	8.6	52	8.0	48	5.2
6	Northside Station	65	6.9	61	4.5	59	2.3

^a See Figure 2.10-1

Table 2.10-3
MEAN AND STANDARD DEVIATION OF DECILE SOUND LEVELS (dBA)
SUMMER SURVEY

Station Number ^a	Location	L ₁₀		L ₅₀		L ₉₀	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
1	New Berlin	57	4.2	52	1.8	50	1.5
2	North Site Boundary	48	5.3	40	4.4	36	4.1
3	Nearest Residence (NW)	52	6.3	45	6.3	40	5.3
4	Nearest Residence (NE)	49	5.8	44	3.6	40	2.3
5	Browns Creek	60	4.3	54	2.7	52	1.4
6	Northside Station	64	1.0	63	0.8	62	0.7
7	Blount Island	59	6.2	50	4.6	43	4.2
8	Dames Point	59	4.9	52	3.5	47	1.5
9	Beacon Hills	54	2.1	50	2.5	45	4.6

^a See Figure 2.10-1

Table 2.10-4
ENVIRONMENTAL PROTECTION AGENCY NOISE LEVEL GUIDELINES^a

Yearly Average^b Equivalent Sound Levels Identified as
Requisite to Protect the Public Health and Welfare with
an Adequate Margin of Safety

	Measure	Indoor		Outdoor			
		Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects	Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects
Residential with Outside Space and Farm Residences	L _{DN} Leq(24)	45	70	45	55	70	55
Residence with No Outside Space	L _{DN} Leq(24)	45	70	45			
Commercial	Leq(24)	(c)	70	70 (e)	(c)	70	70 (e)
Inside Transportation	Leq(24)	(c)	70	(c)			
Industrial	Leq(24) ^f	(c)	70	70 (e)	(c)	70	70 (e)
Outside Space	L _{DN} Leq(24)	45	70	45	55	70	55
Educational	L _{eq} (24) L _{eq} (24) ^f	45	70	45	55	70	55
Recreational Areas	L _{eq} (24)	(c)	70	70 (e)	(c)	70	70 (e)
Farm Land and General Unpopulated Land	L _{eq} (24)				(c)	70	70 (e)

Table 2.10-4 (Continued)
ENVIRONMENTAL PROTECTION AGENCY NOISE LEVEL GUIDELINES^a

- a USEPA, 1974
- b Refers to energy rather than arithmetic averages.
- c Since different types of activities appear to be associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communication is a critical activity. [See Figure D-2 (USEPA, 1974) for noise levels as a function of distance which allow satisfactory communication.]
- d Based on lowest level.
- e Based on hearing loss.
- f An $L_{eq}(8)$ of 75 dB may be identified in these situations so long as the exposure over the remaining 16 hours per day is low enough to result in a negligible contribution to the 24-hour average, i.e., no greater than an L_{eq} of 60 dB.

Note: Explanation of identified level for hearing loss: The exposure period which results in hearing loss at the identified level is a period of 40 years.

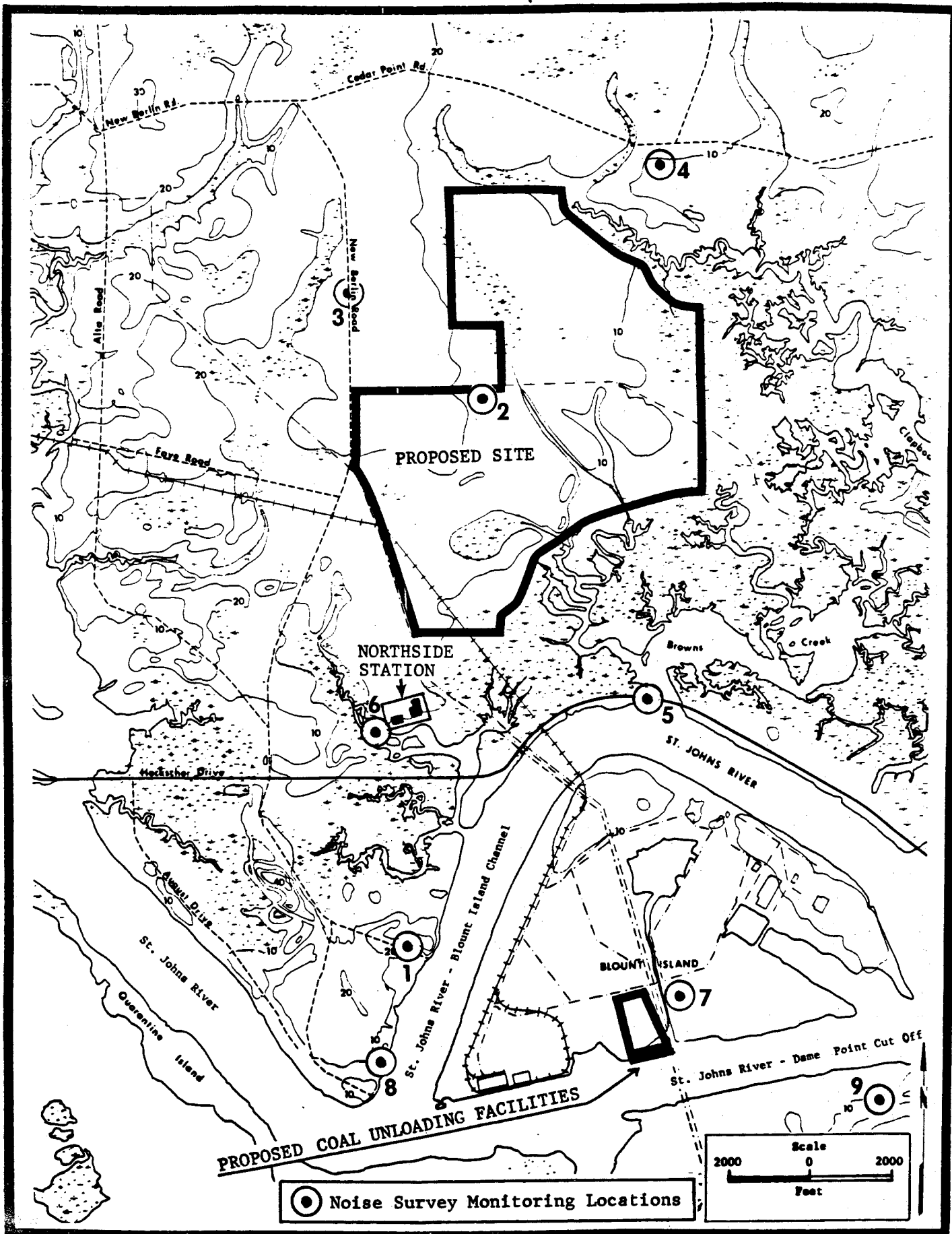


Figure 2.10-1

Noise Survey Monitoring Locations

2.11 ENVIRONMENTAL SETTING OF TRANSMISSION CORRIDOR

Section 9.6 describes the process by which a 0.5-1 mile wide preferred corridor (Figure 2.11-1) between the proposed plant and the Robinwood, Fort Caroline and Normandy Substations was selected. Following certification of the corridor, the applicant will select a precise right-of-way (ROW) within the approved corridor with known widths (200 feet or less) and probable tower locations. Route specific field examinations will then be made to identify and characterize any highly sensitive areas (as defined in Section 9.6.3) within the ROW.

The preferred corridor includes an existing transmission ROW. It is expected that the new ROW will be routed adjacent to the existing ROW for over 90 percent of its length.

2.11.1 Corridor Description

The region through which the preferred corridor passes is characterized by abundant and diverse wetland types, large farm and agricultural acreage, and extensive natural upland communities such as pine flatwoods. No agricultural lands in the area are considered prime or unique by the Duval County Soil Conservation Service (J. Mitchell, 1980). Rapidly expanding commercial, industry and residential sectors are on the south side of the St. Johns River, in the general Robinwood Substation vicinity, and in western and southwestern Jacksonville. The preferred corridor requires crossing of only one major river, the St. Johns River. Several towers will be located in Mill Cove in a shallow area occasionally exposed at low tide. Appendix K provides a photographic depiction of the preferred corridor and its immediate vicinity.

Table 2.11-1 shows percentages of land cover types by corridor segment. The first segment from the proposed plant to the Robinwood Substation (Segment A') is predominantly wetland and open water. The upland area is primarily Blount Island, a highly disturbed habitat. Three

Least Tern (Sterna albifrons) colonies were found nesting there during 1980 (see Section 2.9.2.2). The remaining corridor to the Robinwood Substation (Segments B', C', D, E) contains a large amount of wetlands according to a Jacksonville land cover map (Jacksonville Area Planning Board, 1975). The area adjacent to the existing ROW includes little wetland acreage, however. Several large drainage canals in the corridor, as observed from ground and aerial surveys, are contributing to the degradation of wetlands within the area.

The corridor for the proposed plant toward the Normandy Substation initially (Segment G) passes through a diverse array of land use and habitat types. Most of this area is upland, and a portion near Pulaski Road (Figure 2.11-1) includes low and medium population density. The next segment (H) is primarily upland and agricultural. More wetlands occur in the northern half of this mile-wide corridor than in its southern half. The final segments (I' and J) are also largely upland and agricultural lands. About 20 percent of these corridor segments are made up of several wetland types. The preferred corridor avoids all large wooded wetland stands.

2.11.2 Sensitive Areas and Habitats

The most sensitive land cover types in the preferred corridor include populated areas, wetlands and nesting areas for Osprey (Pandion haliaetus) and Least Terns. Osprey nests are common to the region and have been constructed on transmission towers near the NGS and on Blount Island. It was assumed that the maximum width of the new right-of-way will be a conservative 200 feet throughout its length and located adjacent to the existing ROW. The population sensitive, wetland and open water acreage that would be included within the new ROW are shown on Table 2.11-2.

No species classified by the U.S. Fish and Wildlife Service as threatened or endangered are known to use the preferred corridor for nesting, breeding, or for major life history requirements (Palmer, 1980). The more mobile sensitive species such as the Manatee (Trichechus manatus),

Eastern Brown Pelican (Pelicanus occidentalis) and Southern Bald Eagle (Haliaeetus leucocephalus) likely cross portions of the corridor, but do not specifically require habitats located within the corridor. Due to open habitat and dry, friable soil, potential exists for the gopher tortoise (Gophers polyphemus) and gopher frog (Rana areolata aesopus) to occur along the ROW. No burrows were located, however, during ROW searches.

Likewise, with the exception of the Least Tern, no species classified as rare and endangered by the State of Florida, are known to require habitats in the corridor area. Least Terns, which are classified as threatened in the State of Florida (Kale, 1978), nest on sandy spoil banks in the coastal area. No rare and endangered plant species are known to occur in the corridor.

2.11.3 References

Jacksonville Area Planning Board, 1975. Land Cover and Selected Characteristics, Duval County (Map).

Kale, H.W., II, 1978. Rare and Endangered Biota of Florida, Volume Two, Birds. University Presses of Florida. Gainesville, Florida.

Mitchell, J., 1980. Personal Communication. Duval County Soil Conservation Service. Jacksonville, Florida.

Palmer, D., 1980. Personal Communication. U.S. Fish and Wildlife Service. Jacksonville, Florida.

LAND COVER (PERCENT) IN THE PREFERRED CORRIDOR

[illegible]

Table 2.11-1 (Continued)

LAND COVER (PERCENT) IN THE PREFERRED CORRIDOR

Land Cover Category ^a	Corridor Segments ^b to Robinwood and Fort Caroline Substations (Length)					Corridor Segments ^b to Normandy Substation (Length)			
	A' (7.0 mi)	B' (0.5 mi)	C' (2.7 mi)	D (0.7 mi)	E (1.5 mi)	G (8.3 mi)	H (7.1 mi)	I' (7.9 mi)	J (5.4 mi)
Open Water	-	-	-	-	-	0.9	0.2	0.2	0.5
Borrow Pit	-	-	-	-	-	-	-	-	-
Rivers/Streams	-	-	-	-	-	-	-	-	-
Oligohaline System	-	-	-	-	-	-	-	-	-
Medium Saline Estuary	21.9	-	-	-	-	-	-	-	-
Spoil Bank	7.0	-	-	-	-	-	-	-	-
Tidal Flat	0.8	-	-	-	-	-	-	-	-

^a Categories modified from (Jacksonville Area Planning Board, 1975); computations based on same reference.

^b Corridor segments are shown in Figure 2.11-1.

Table 2.11-2

POPULATION-RELATED AND WETLAND LAND COVER TYPES AND
ACREAGES IN AN ASSUMED NEW ROW^a ADJACENT
TO THE EXISTING ROW IN THE PREFERRED CORRIDOR

Site to Robinwood Substation^b

<u>Land Cover Type</u>	<u>Acreage</u>
Recreational Area	10.0
Populated Area (low density)	1.2
Freshwater Marsh	0.4
Salt Water Marsh	29.5
Beach and Dune	2.7
Spoil Area	12.3
Open Water	24.5

Site to Normandy Substation^b

<u>Land Cover Type</u>	<u>Acreage</u>
Populated Area (medium density)	9.6
Proposed Pop Area (medium density)	15.3
Archaeologically Sensitive Area	131.3
Hardwood Swamp	23.0
Cypress Swamp	0.9
Salt Water Marsh	2.7

^a 200 feet wide - represents maximum ROW width

^b See Figure 2.11-1 for corridor route. Photographic description of corridor and sensitive areas are in Appendix K.

Note: This table was prepared to illustrate sensitive land cover acreages that potentially could be included in a new 200 foot wide ROW if located adjacent to the existing ROW for its entire length. At the present time, it is anticipated that the new ROW will be adjacent over approximately 90 percent of its length. During the ROW selection process, highly sensitive areas will be characterized and avoided to the extent possible.

[illegible]

	Existing Transmission Line
	Preferred Corridor
	Open Space/Recreation
	Highly Sensitive Areas
	Highly Sensitive Wetland Areas
	Salt Marshes
H/C	Heron Colony
A/n	Archaeological Site
PSA	Population Sensitive Areas
X or X'	Corridor Segment