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EXHIBITS

STATUS OF RESPONSES
TO AEC QUESTIONS OF MAY 31, 1973

Question	Status	
General-1	Complete, see Section 5.1.1, pages 5.1-1 thru 5.1-25, RO	
General-2	Complete, see Section 5.1.1, pages 5.1-1 thru 5.1-25, RO	
General-3	Complete, see Section 5.1.1, pgaes 5.1-1 thru 5.1-25, RO	
General-4	Complete, see Section 5.1.1, pages 5.1-1 thru 5.1-25, RO	
A-1	Complete, see Section 2.1, page 2.1-1, RO	
A-2	Complete, see Section 2.1, Figure 2.1-6	1
A-3	Complete, see Section 2.2, pages 2.2-1, 2.2-7a	1
A-4	Complete, see Section 2.2.3, pages 2.2-15 & 16, RO	
A-5	Complete, see Section 2.2.3, pages 2.2-15 & 16, RO; and Section 2.5.1, page 2.5-3, RO	
A-6	Complete, see Section 2.5.1, page 2.5-2, RO	
A-7	Complete, see Section 2.2.3, pages 2.2-15 & 16, RO	
A-8	Complete, see Section 2.6.1, page 2.6-1, RO	
A-9	Complete, see Section 2.6.1, page 2.6-1, RO	
A-10	Complete, see Section 2.6.1, page 2.6-2, RO	
A-11	Complete, see Section 2.6.4, page 2.6-3, RO	
A-12	Complete, see Section 2.6 and 6.2 , pages 6.2-8-8e	1
A-13	Complete, see Section 6.1.3.1, pages 6.1-4 and 5, RO	
A-14	Complete, see Section 6.1.3.1, page 6.1-5, RO	
A-15	Complete, see Section 6.1.3.1, page 6.1-5, RO	
A-16	Complete, see TAbles 2.6-30 thru Table 2.6-36, pages 2.6-36 thru 2.6-42, RO	
A-17	Complete, see Section 2.7.5.9, pages 2.7-15 and 16, RO	
A-18	Complete, see Section 2.7.3.5, page 2.7-6, RO	
A-19	Complete, see DNR reports submitted by letter October 1, 1973	1
A-20	Complete, see Section 2.7.5.9, page 2.7-16, RO	
A-21	Complete, see Section 2.7.5.9, page 2.7-14, RO, page 2.7-16, RO	
A-22	Complete, see Section 2.7.3.4, pages 2.7-4 and 5, RO	
A-23	Complete, see DNR reports submitted by letter October 1, 1973	1
A-24	Complete, see Section 2.8, pages 2.8-1 & 2, RO	
B-1	Complete, see Section 3.3, pages 3.3-1, 3.3-2 and Figure 3.3-1	1
B-2	Complete, see Section 3.4, pages 3.4-1, 3.4-2, 3.4-3	1
B-3	Complete, see Section 3.4, pages 3.4-3a, 3.4-4	1
B-4	Complete, see Section 3.4, pages 3.4-1, 3.4-2 3.4-3	1

Question	Status	
B-5	Complete, see Section 5.1, pages 5.1-3, 5.1-3a	1
B-6	To be submitted by Amendment	
B-7	Complete, see Figure 3.5-16, RO	
B-8	Complete, see Section 3.6, pages 3.6-3, 3.6-3a	1
B-9	Complete, see Section 3.6.5, page 3.6.5, RO	
C-1	Complete, see Section 4.1 page 4.1-4 and Section 5.4 page 5.4-2	1
C-2	Complete, see Section 4.1.2, pages 4.1-1 and 2, RO	
D-1	Complete, see Section 5.3 Table 5.3-11	1
D-2a	Complete, see Section 5.1.3, pages 5.1-28 thru 30, RO	
D-2b	Complete, see Section 5.1.3, page 5.1-30, RO	
D-2c	Complete, see Section 5.1.2, page 5.1-26, RO	
D-2d	Complete, see Section 5.1.2. page 5.1-27, RO	
D-2e	Complete, see Section 5.1.2, pages 5.1-26 & 27, RO	
D-2f	Complete, see Section 3.6, page 3.6-5 and Section 5.4 page 5.4-2	1
D-2g	Complete, see Section 3.6, page 3.6-5, Section 5.4, page 5.4-2	1
D-3	Complete, see Section 5.1, pages 5.1-31, 5.1-32	1
D-4	Complete, see Section 6.1.1.1, page 6.1-2, RO	
D-5	Complete, see Section 5.1.3, page 5.1-30, RO	
D-6	Complete, see Section 5.1, pages 5.1-31, 5.1-32	1
D-7a	Complete, see Sections 5.2.1 and 5.2.3, pages 5.2-1 thru 5.2-3, RO	
D-7b	To be submitted by Amendment	1
D-7c	Complete, see Sections 5.2.1 and 5.2.3, pages 5.2-1 thru 5.2-3, RO	
D-8a	Complete, see Table 5.3-2, page 5.3-15, RO	
D-8b	Complete, see Section 5.3.1.4, page 5.3-4, RO	
D-8c	Complete, see Section 5.3.1.2, pages 5.3-3 & 4	
D-8d	Complete, see Section 2.2, pages 2.2-4 and 2.2-5	1
D-9	Complete, see Section 5.3.1.4, pages 5.3-4 thru 5.3-8, RO	
D-10	To be submitted by Amendment	1
D-11	Complete, see Section 5.4.1, pages 5.4-1 and 2, RO	
D-12	Complete, see Section 5.8, pages 5.8-1 and 2, RO	
E-1	Complete, see Section 6.1.1.1, page 6.1-2, RO	
E-2	Complete, see Section 5.3, page 5.3-9	1
E-3	Complete, see Section 6.3, pages 6.3-2 thru 6.3-7	1
E-4	Complete, see Section 6.2.4, page 6.2-8, RO	
F	Complete, see Section 7.2 pages 7.2-1, 7.2-2	1
G-1	Complete, see Section 9.1.2.1, pages 9.1-2, RO and 9.1-6, RO	
G-2	To be submitted by Amendment	
G-3	Complete, see Section 9.2 pages 9.2-1 thru 9.2-3	1
G-4	To be submitted by Amendment	
G-5	Complete, see Section 9.3 pages 9.3-1 thru 9.3-2a	1

Question	Status	
H-1	Complete, see Section 10.1, Table 10.1.3 and pages 10.1-5, 10.1-5a.	1
H-2	To be submitted by Amendment	
H-3	Complete, see Section 10.1, pages 10.1-5, 10.1-5a	1
H-4	Complete, see Section 10.1, Table 10.1-3	1
I	Complete, see Section 12.0, pages 12.0-3, 12.0-4	1
J	Complete, see Appendex 3A, pages 3A-1-3A-16	1

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT NO. 2
INSTRUCTION SHEET

SECTION 2.0 - SITE

REMOVE	INSERT REV. 0
Pages 2.1-1 & 2.1-2	Pages 2.1-1 & 2.1-2
Page 2.2-4	Page 2.2-4
Pages 2.2-15 thru 2.2-17	Pages 2.2-15 thru 2.2-19
Pages 2.5-2 thru 2.5-8	Pages 2.5-2 thru 2.5-8
Pages 2.6-1 thru 2.6-6	Pages 2.6-1 thru 2.6-6a
Pages 2.6-36 thru 2.6-42	Pages 2.6-36 thru 2.6-42
Pages 2.7-4 thru 2.7-14	Pages 2.7-4 thru 2.7-16
---	Pages 2.7-42 thru 2.7-44
Pages 2.8-1 & 2.8-2	Pages 2.8-1 & 2.8-2

SECTION 3.0 - PLANT

REMOVE	INSERT REV. 0
Pages 3.4-1 thru 3.4-6	Pages 3.4-1 thru 3.4-3
Figs. 3.4-1 thru 3.4-6	Figs. 3.4-1 thru 3.4-4
Fig. 3.5-6	Fig. 3.5-6
Page 3.6-5	Page 3.6-5

SECTION 4.0 - EFFECTS OF CONSTRUCTION

REMOVE	INSERT REV. 0
Pages 4.1-1 thru 4.1-5	Pages 4.1-1 thru 4.1-5

SECTION 5.0 - EFFECTS OF PLANT OPERATION

REMOVE	INSERT REV. 0
Pages 5.1-1 thru 5.1-6	Pages 5.1-1 thru 5.1-38
Fig. 5.1-1	Figs. 5.1-1 thru 5.1-25
Pages 5.2-1 thru 5.2-6	Pages 5.2-1 thru 5.2-18
Pages 5.3-3 thru 5.3-24	Pages 5.3-3 thru 5.3-26
Fig. 5.3-1	Fig. 5.3-1
Page 5.4-1	Pages 5.4-1 & 5.4-2
Pages 5.8-1 & 5.8-2	Pages 5.8-1 & 5.8-2

SECTION 6.0 - MONITORING PROGRAMS

REMOVE	INSERT REV. 0
Pages 6.1-1 thru 6.1-19	Pages 6.1-1 thru 6.1-21
Page 6.2-8	Page 6.2-8

SECTION 9.0 - ALTERNATIVE SOURCES AND SITES

REMOVE	INSERT REV. 0
Pages 9.1-2 thru 9.1-5	Pages 9.1-2 thru 9.1-6

REMOVE	INSERT REV. 0
SECTION 10.0 - PLANT DESIGN ALTERNATIVES	
Pages 10.1-7 thru 10.1-14	Pages 10.1-7 thru 10.1-14
SECTION 13.0 - REFERENCES	
Pages 13.0-6 thru 13.0-11	Pages 13.0-6 thru 13.0-13

1.1 REQUIREMENT FOR POWER

The requirement for new generating capacity from St. Lucie Unit No. 2 is best understood in the light of the historical growth of power requirements on Florida Power & Light's system together with projections of this growth into the future.

Florida Power & Light projects an 11.5% average annual growth rate in peak demand for the years 1974 - 1982. The Company's peak demand has been doubling approximately every 5 years for the past 15 years. To meet this projected growth, the current 1972 system capability of 6857 MW must be expanded to 22,081 MW by 1982. This expansion of system capability takes into account the necessity of maintaining an adequate reserve margin to preserve system capability and reliability.

In order to meet the capacity requirements resulting from this high annual growth rate Florida Power & Light will install a nuclear fueled generating unit with an 850 MW gross summer peak capability. This unit is required by 1980 to provide adequate generating capability to serve the projected loads.

1.1.1 DEMAND CHARACTERISTICS

The Florida Power & Light system is one of the most rapidly growing systems in the country. The increase in demand is due to the population growth in the State of Florida and increased per capita use of electricity. The 1970 census figures show that Florida's growth was second only to that of California when the total number of new residents is considered, and second only to that of Nevada on a percentage basis. The influx of people has since the end of World War II resulted in continually increasing demands for power. During 1972 Florida Power & Light experienced the addition of about 120,000 new customers. This rapid rate of load growth is documented further in the Florida Power & Light annual report 1972.(1)

For the 12 months ending in December 1972 the Florida Power & Light energy profile by load types was 50.7% residential, 29% commercial and 8.5% industrial. The remaining kilowatt-hour usages were 7.15% governmental, 3.9% municipal and Co-op systems and 0.75% other including street lighting. The peak hour demand has essentially the same ratio as the kilowatt hour sales. This basis distribution is not expected to change materially during the next 10 to 15 years. Florida Power & Light also has contracted commitments for power supply to certain non-owned distribution systems within the Florida Power & Light service area.

Table 1.1-1 and Figure 1.1-1 show the annual system peak hour demand for the years 1968 - 1972 and the forecast demand for 1973 - 1982. The actual peak loads for 1970, 1971 and 1972 reflect reductions due to load curtailment on peak which, for the most part, were voluntary.

Historically, the peak hour demand for Florida Power & Light system has occurred during the summer months of July, August or September. The subtropical climate together with the high proportion of residential and commercial load, 80% of total demand, and the consequent high saturation of air conditioning make the Florida Power & Light system's peak demand extremely weather sensitive. Figure 1.1-2 shows the annual load duration curves for 1970, 1971 and 1972. The expected load duration curve for the years 1973 - 1982 is shown in Figure 1.1-3.

Florida Power & Light maintains a forecast of peak hour demands and KWH energy sales for the system extending 20 years into the future which is reviewed and updated as deemed necessary, generally on an annual basis. Regression and correlation analysis of historical data are the means for extrapolating load trends into the future. The resulting forecasts are modified by comparison with various independently constructed forecasts for the nation and the Florida Power & Light service territory. The Florida Power & Light system is divided into five load areas. Load projections are made for the system as a whole and for each separate load area. The results of these various projections are then combined and modified to form a single consistent load forecast. Forecasts include all sales of power to municipalities and co-ops not covered by an interchange agreement.

1.1.2 POWER SUPPLY

1.1.2.1 Capacity Resources

Florida Power & Light utilizes economic fuel analysis and probabilistic reliability studies to aid in planning its bulk power supply. Table 1.1-2 shows the actual and planned generating capability by category for the years 1968-1982. The capabilities listed are "gross summer peak" expected at the time of system peak hour demand and reflect unit deratings due to higher ambient temperatures. At present, Florida Power & Light plans no capacity sales or purchases except on an emergency basis. Retirements were considered on the capability figures, however none are planned through 1982. This data is shown graphically on Figure 1.1-4.

1.1.2.2 Reserve Margin

The system reserve criterion for Florida Power & Light is established primarily on loss-of-load probability (LOLP) calculations based on system 15 minute gross peak demand, weekly load models (based on system history), and forced outage rates based on EEI published data which represent typical outage rates used industry-wide. All maintenance is scheduled to minimize the LOLP. Florida Power & Light attempts to maintain enough reserve margin to produce a LOLP of 0.10 days/yr with the spinning reserve requirement of all other companies in the Florida subregion of Southeast Reliability Council (SERC) available to it at a 0.010 forced outage rate.

The calculational program builds a capacity outage table from size and forced outage rate. After the individual units have been scheduled for maintenance, the program proceeds with the risk calculation.

To the peak load for each day the estimates of effective capability of units on maintenance are added. This quantity is subtracted from the system installed capability to determine the "Critical Outage" for each day. For each critical outage, the program's "Capacity Outage Table" will yield a "Chance" or "Expected Value" of the occurrence of this particular outage. These individual daily chances are totaled for the year, providing a loss of probability expected.

The program assumes that the critical outage for the peak of the day should be used as the design criterion for the passing on the adequacy of system installed reserve. If the system passes the peak hour, it passes the day. Similarly, if it fails the peak hour, a capacity shortage of one day is counted. Present and planned interconnections do not enter into reserve criterion except to insure the available transportation of spinning reserve power.

Figure 1.1-5 depicts the LOLP for Florida Power & Light through 1982. As can be seen a delay in the availability of St. Lucie Unit No. 2 would have a significant adverse effect on the reliability of the Florida Power & Light system. The data shown includes the effect of the 490 MW of spinning reserve available from other Florida subregion companies at the outage rate of 0.01.

1.1.3 SYSTEM DEMAND AND RESOURCE CAPABILITY COMPARISON

Figure 1.1-6 shows actual capability and peak demand data from 1968 through 1972 and forecasted data for 1973 through 1982. The resources capability and generating capability are identical since Florida Power & Light has no commitments for firm sales or purchases.

Figure 1.1-7 depicts the actual and projected reserve margin for the years 1968 through 1972 and 1973 through 1982 respectively. The system reserve is also shown without St. Lucie Unit No. 2 for the years 1980 through 1982.

1.1.4 INPUT AND OUTPUT DIAGRAM

The Florida Power & Light input-output diagram is shown in Figure 1.1-8 and for 1980, the first year of scheduled full power operation for St. Lucie Unit No. 2. The input has been broken down to indicate the 850 MW capability of St. Lucie Unit No. 2, 2306 MW of other nuclear generation, fossil capability of 17,798 MW and 2727 MW of gas turbine capability.

The output diagram is similarly broken down by load category. At the time of system peak hour demand the loads are expected to be composed of 7645 MW residential, 4375 MW governmental and 700 MW for municipalities, Co-ops and others. The peak hour demand of 15,090 MW leaves a reserve of 2591 MW with the 17,681 MW of generating capability.

1.1.5 REPORT FROM THE REGIONAL RELIABILITY COUNCIL

Florida Power & Light is a part of the Florida subregion of the Southeast Reliability Council (SERC). The Florida subregion requires an installed reserve equal to the sum of the two largest operating units in the subregion. The reserve responsibilities are divided among the group according to each member's previous annual peak load and largest generating unit.

The 1973 report of the SERC for the Florida subregion is attached [2] and points up the need for St. Lucie II to maintain adequate capability in the Florida subregion.

TABLE 1.1-1

SYSTEM LOAD, CAPACITY AND RESERVE

YEAR	GROSS ONE HOUR PEAK DEMAND (MW)	GROSS SUMMER PEAK CAPABILITY (MW)	RESERVE WITH ST. LUCIE UNIT NO. 2 (MW)	(1%)	RESERVE WITHOUT 1/ ST. LUCIE UNIT NO. 2 (MW)	(1%)
1968	3925	4298	373	9.4		
1969	4470	5125	655	14.7		
1970	5125	5569	444	8.7		
1971	5525	6013	488	8.8		
1972	6145	6857	712	11.6		
1973	7105	8713	1608	22.6		
1974	7940	9397	1457	18.4		
1975	8820	10,081	1261	14.3		
1976	9800	11,731	1931	19.7		
1977	10,925	11,331	2406	22.0		
1978	12,150	14,131	1981	16.3		
1979	13,525	15,731	2206	16.3		
1980	15,090	17,681	2591	17.2	1741	11.5
1981	16,760	19,881	3121	18.6	2271	13.6
1982	18,520	22,081	3561	19.2	2711	14.6

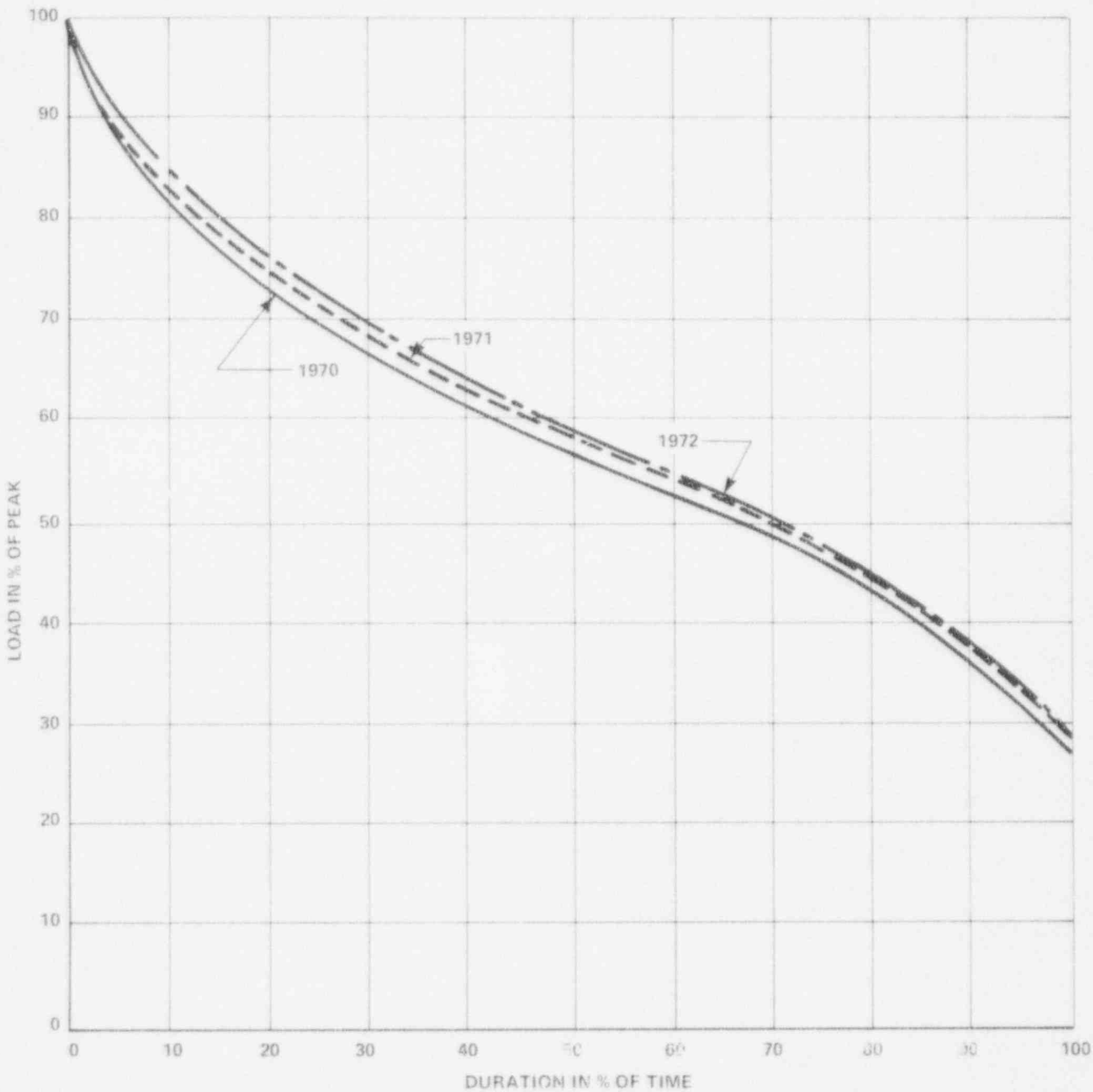
Note: 1/ Same as "with St. Lucie Unit No. 2" except as indicated.

TABLE 1.1-2

GROSS SUMMER PEAK CAPABILITY

AND UNIT ADDITIONS

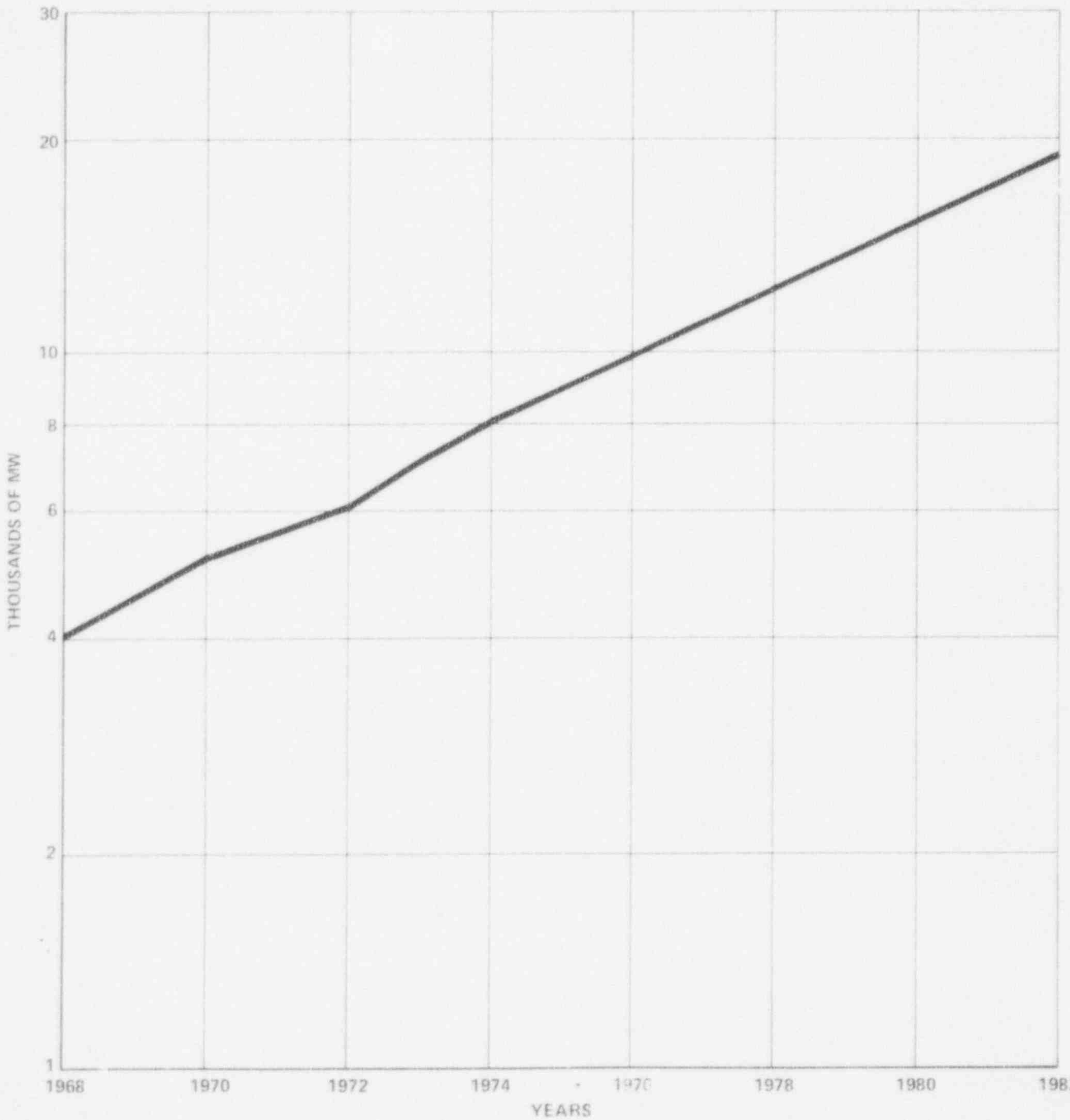
YEAR	UNIT ADDITIONS	CAPABILITY (MW)	FUEL	SYSTEM CAPABILITY (MW) NUCLEAR STEAM	FOSSIL STEAM	FOSSIL GAS TURBINE	TOTAL
1968					4271	27	4298
1969					5098	27	5125
1970					5098	471	5569
1971					5098	915	6013
1972					5498	1356	6857
1973	Turkey Point No 3	728	Nuclear				
	Turkey Point No 4	728	Nuclear				
	Sanford No 5	400	Fossil	1456	5898	1356	8713
1974	Ft. Myers Gas Turbines	684	Fossil	1456	5898	2043	9397
1975	Gas Turbines	684	Fossil	1456	5898	2727	10,081
1976	St. Lucie No 1	850	Nuclear				
	Manatee No 1	800	Fossil	2306	6698	2727	11,731
1977	Manatee No 2	800	Fossil				
	Martin No 1	800	Fossil	2306	8298	2727	13,331
1978	Martin No 2	800	Fossil	2306	9098	2727	14,131
1979	Steam Turbine	800	Fossil				
	Steam Turbine	800	Fossil	2306	10,698	2727	15,731
1980	St. Lucie No 2	850	Nuclear				
	Steam Turbine	1100	Fossil	3156	11,798	2727	17,681
1981	Steam Turbine	1100	Fossil				
	Steam Turbine	1100	Fossil	3156	13,998	2727	19,881
1982	Steam Turbine	1100	Fossil				
	Steam Turbine	1100	Fossil	3156	16,198	2727	22,081



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

ANNUAL LOAD DURATION CURVE
1970, 1971, 1972

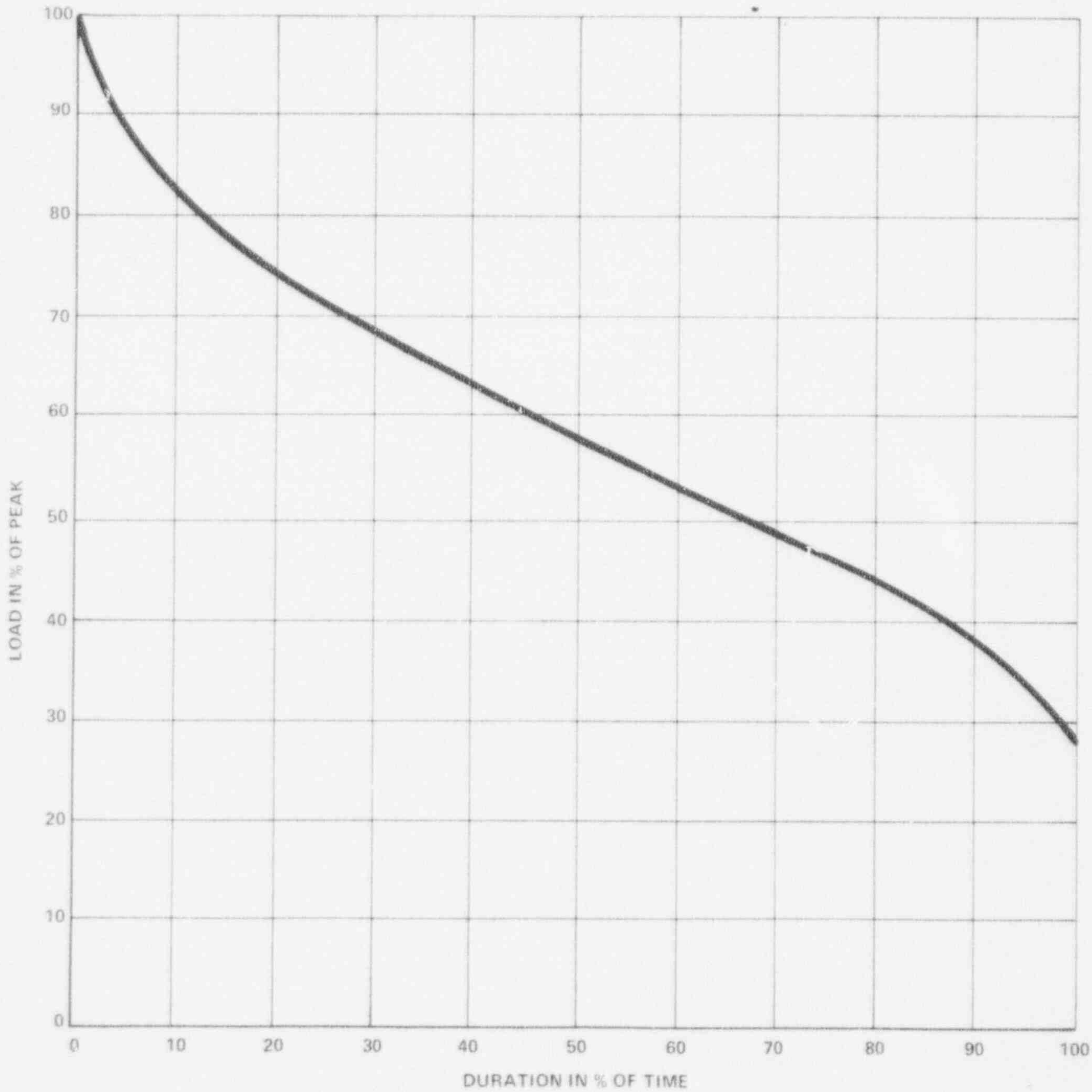
FIGURE 1.1-2



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

SYSTEM 60 MINUTE GROSS PEAK DEMAND

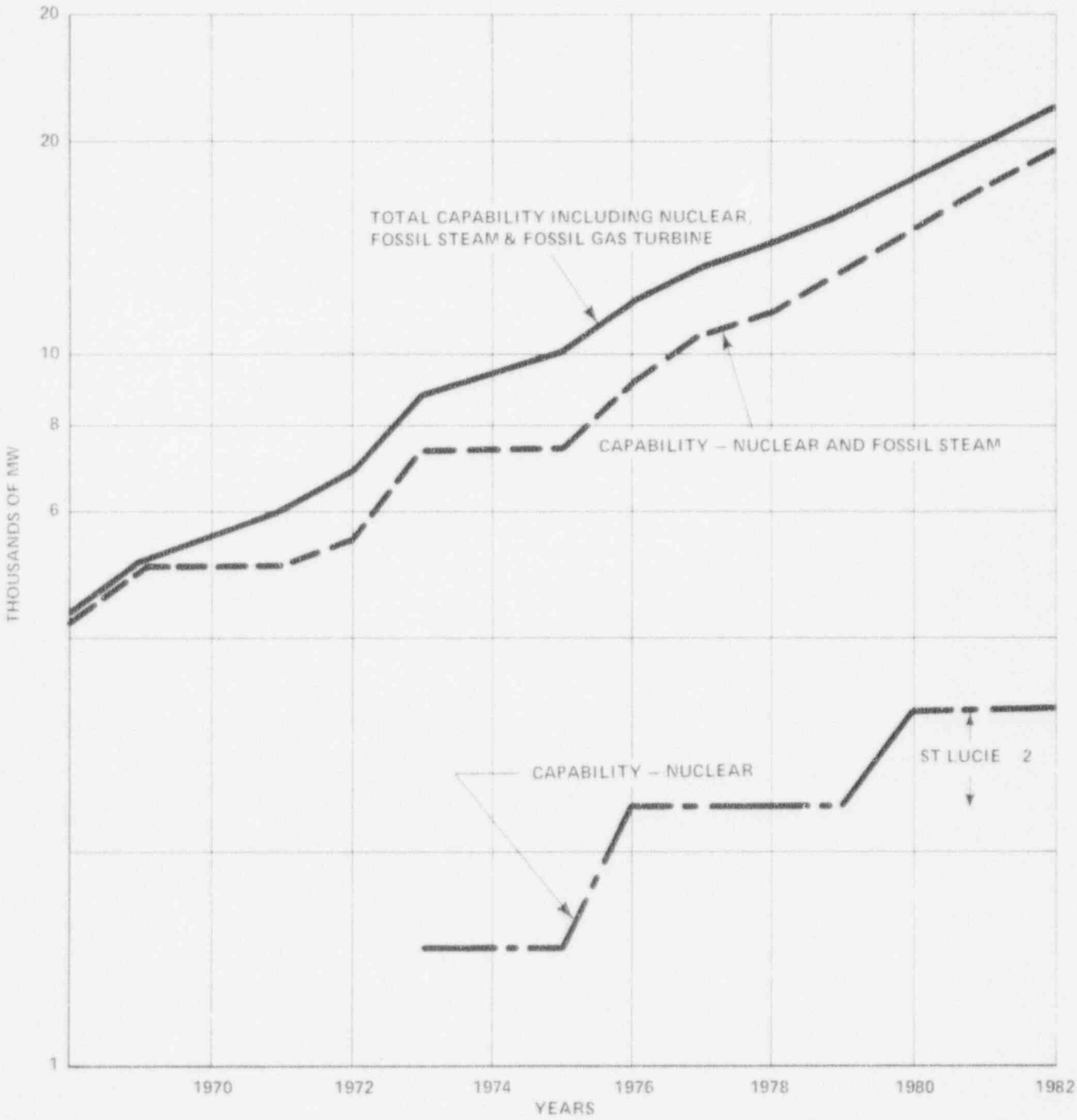
FIGURE 1.1-1



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PROJECTED ANNUAL LOAD DURATION CURVE – 1973-1982

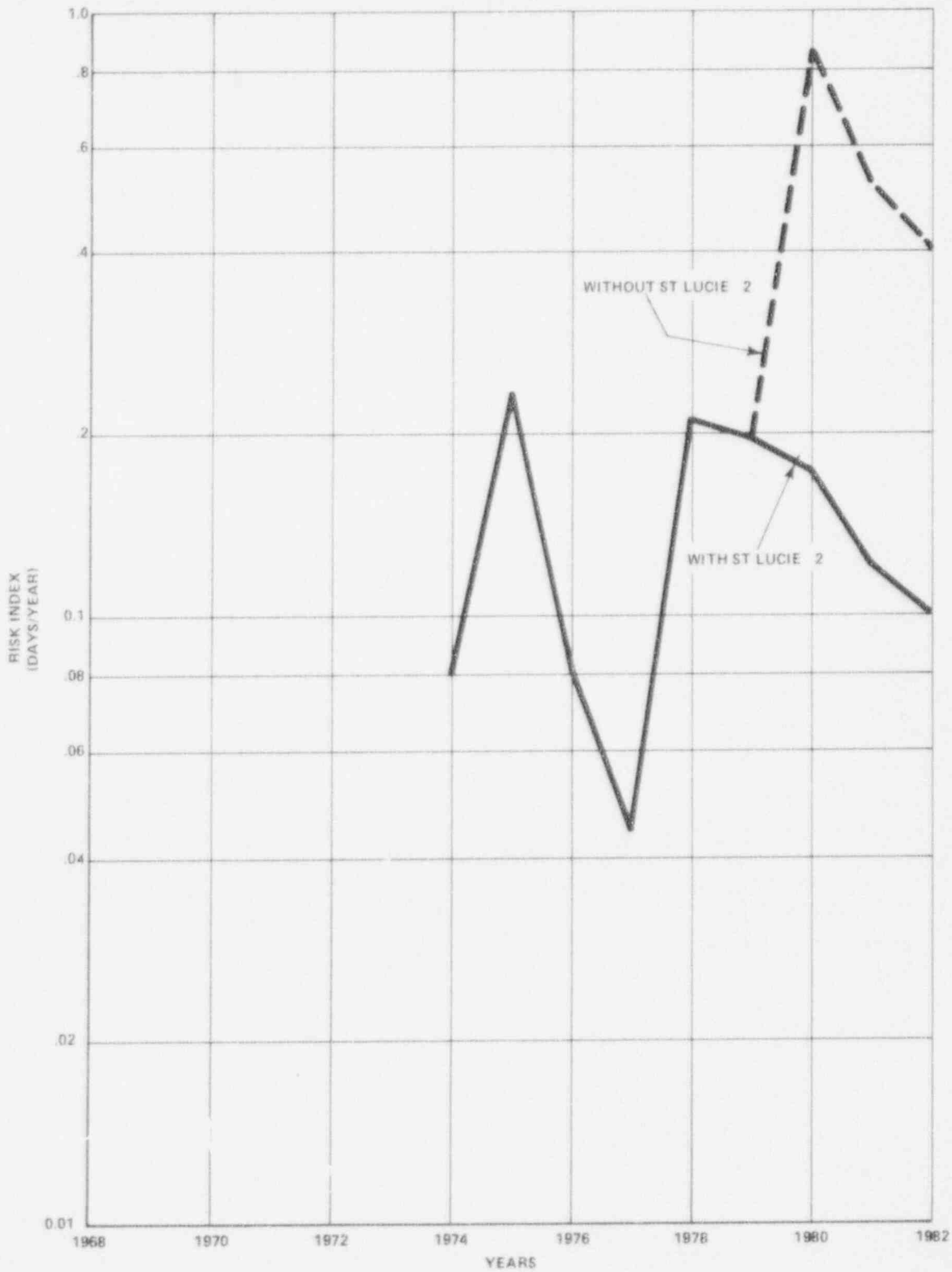
FIGURE 1.1-3



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

SYSTEM PEAK CAPABILITY
SUMMER GROSS

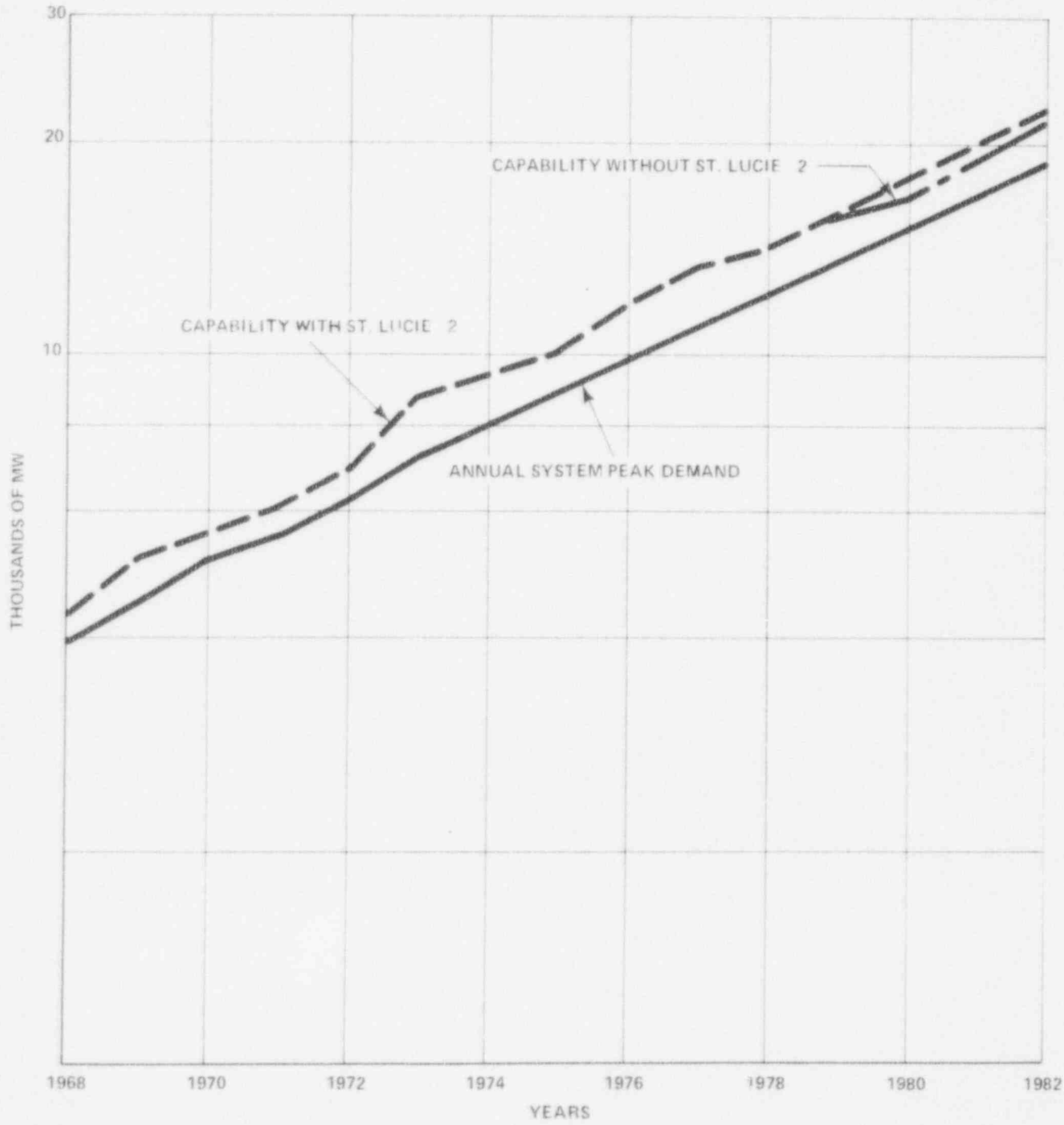
FIGURE 1.1-4



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

LOSS-OF-LOAD PROBABILITY

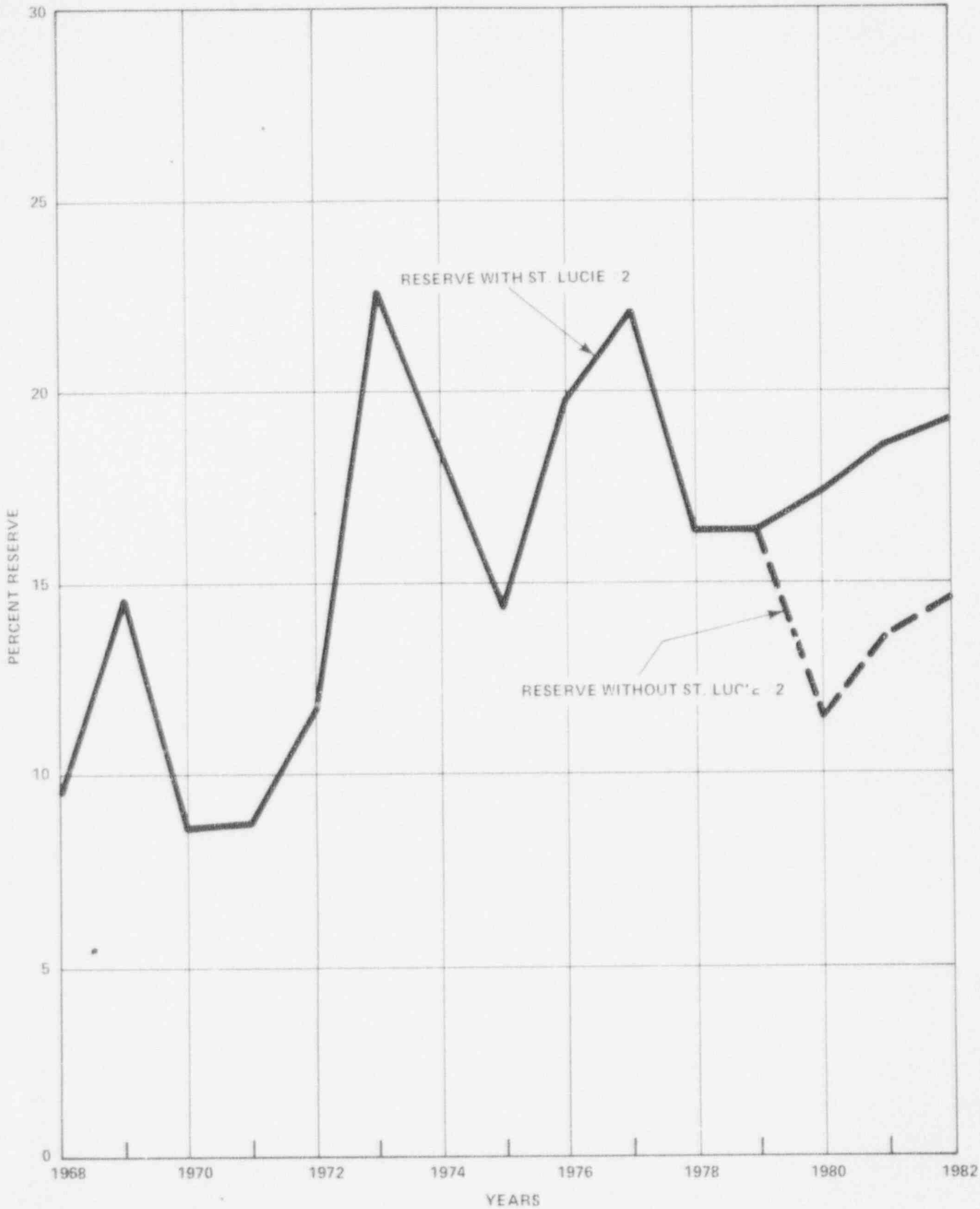
FIGURE 1.1-5



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

SYSTEM LOAD AND CAPABILITY

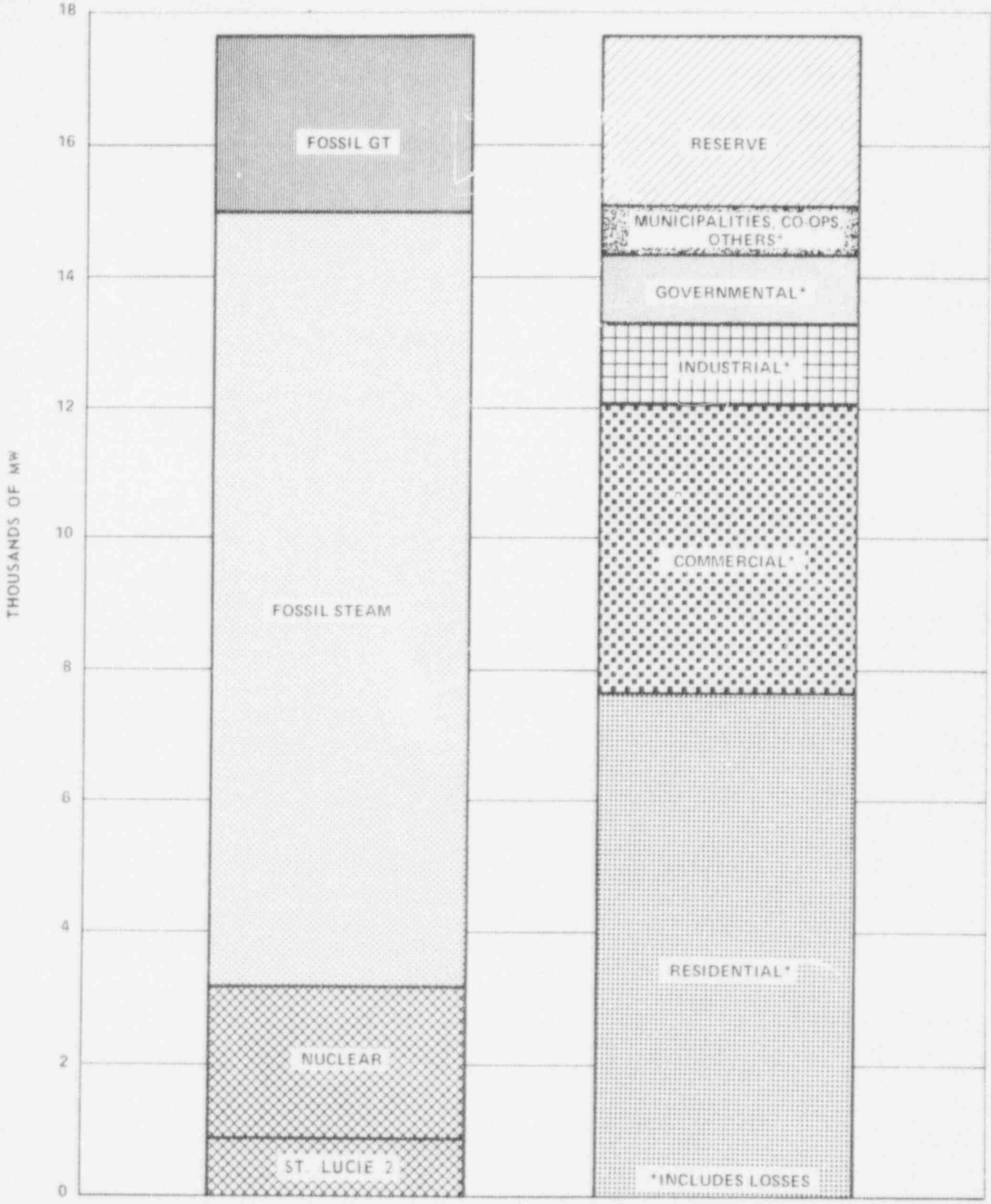
FIGURE 1.1-6



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

SYSTEM RESERVE MARGIN

FIGURE 1.1-7



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

SYSTEM INPUT-OUTPUT

FIGURE 1.1-8

1.2 OTHER PRIMARY OBJECTIVES

There are no primary objectives of the proposed facility other than the supply of adequate and reliable electric energy.

1.3 CONSEQUENCES OF DELAY

The Florida Power & Light Company has an obligation to serve the electric power requirements within its service territory (Chapter 366.03, Florida Statutes). Any delay in the availability of the proposed unit will adversely affect Florida Power & Light's ability to satisfy this obligation. Specifically the loss-of-load probability expressed in days per year, for the year 1980 would increase from 0.172 to 0.855 without the proposed unit. Corresponding figures for 1981 and 1982 are 0.12 and 0.1 with the proposed unit and 0.519 and 0.399 without the proposed unit.

Florida Power & Light has an obligation to maintain reserve, both installed and spinning, as part of the Florida Subregion of SERC. The high values of risk and their attendant low values of reserve (Table 1.1-1) not only would lower Florida Power & Light's ability to meet system load but would also adversely affect the reliability of the Florida Subregion.

2.1 SITE LOCATION AND LAYOUT

The site for the St. Lucie Nuclear Power Plant consists of approximately 1132 acres on Hutchinson Island in St. Lucie County about half way between the cities of Fort Pierce and Stuart on the East Coast of Florida. The nearest population center is the City of Fort Pierce which is eight miles from the site across the Indian River. The location of the site is indicated on the map of Florida, Figure 2.1-1, as are the major cities of the State. As an aid in location, the approximate road distances from the site to the principal cities are: Miami 120 miles, Jacksonville 225 miles, Tampa 150 miles, Tallahassee 360 miles, Atlanta, Georgia 550 miles. The Georgia state line is some 260 miles away at the closest point.

Figure 2.1-2 provides a map of the east-central portion of the State of Florida that locates the plant site relative to the geography of the State within a 100 mile radius. Figure 2.1-3, on a larger scale, presents an aerial view of the locale out to a 10-mile radius from the plant site, and identifies natural and improved features and reference points. The Company's property lines are shown in Figure 2.1-4 on a plan of a portion of Hutchinson Island. Figure 2.1-5 provides a plan view of the plant, Units 1 & 2, with the finished elevations. Figure 2.1-6 presents an aerial view of the locale out to a 5-mile radius from the plant site as of September 1973.

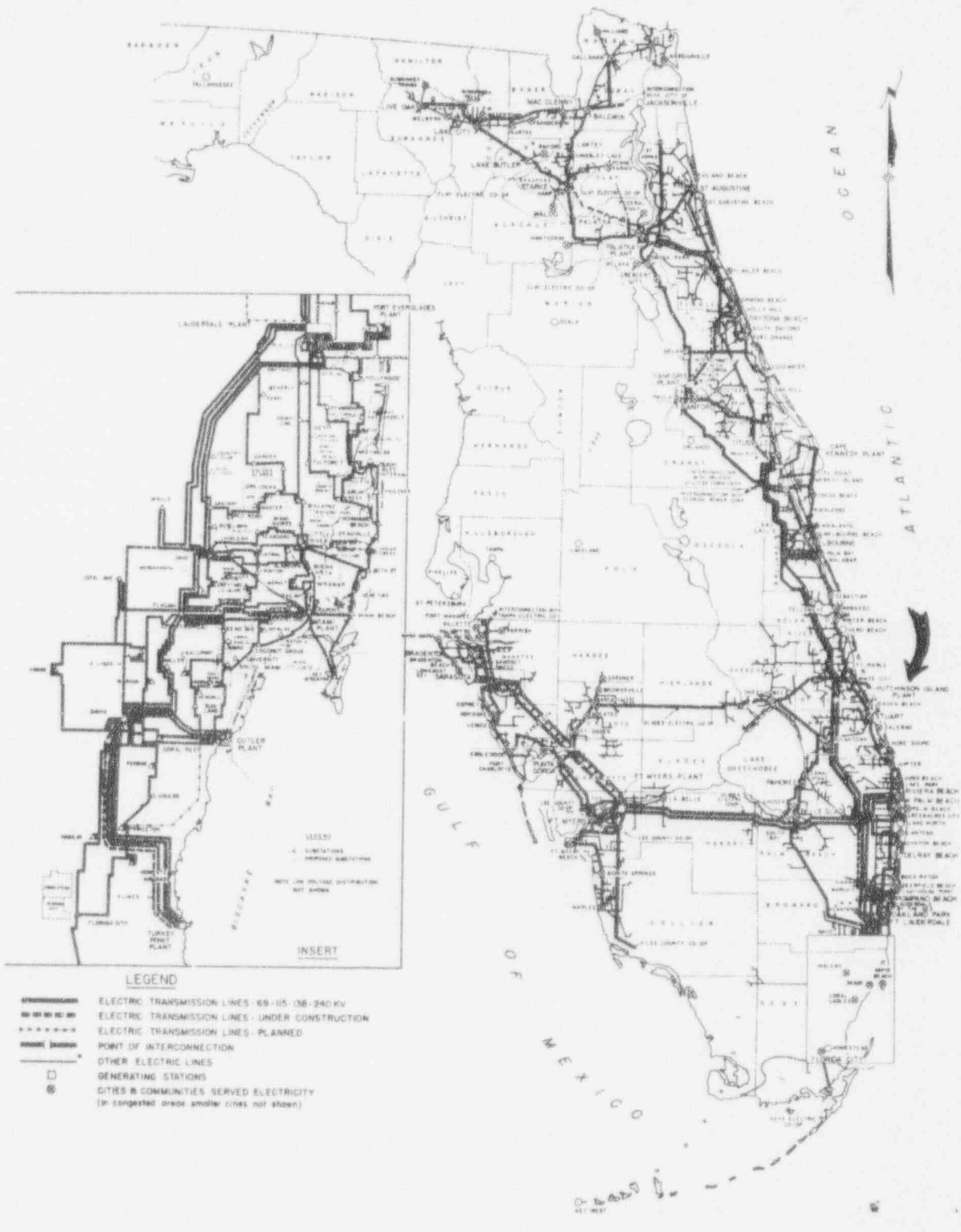
Of the 1132 acres owned by FP&L, approximately 300 acres will be occupied or modified by the plant (Units 1 & 2) and the plant facilities. There are no plans for a visitor's center to be located at the site. The present plans for plant fencing include a perimeter security fence west of State Highway A1A that encloses all of the plant buildings and structures. There are at present, no plans to fence any of the FPL property east of State Highway A1A, however this is subject to review by the AEC for purposes of developing the plant security program. Fencing, if required, would be local and would enclose only the canals west of the beach dune. 3

The site itself is generally flat. Much of it consists of swamp and, outside the mosquito control areas, the land is covered with a dense vegetation characteristic of Florida coastal mangrove swamps. At the ocean shore the land rises slightly in a dune or ridge to approximately 15 feet above mean low water. The island itself is populated only at the northern and southern ends, the nearest inhabited area being some seven miles north of the reactor site and the closest inhabited area to the south at a distance of around 4.5 miles.

The St. Lucie plant, then, is sited near the center of a long, narrow, offshore island. To the east is the Atlantic Ocean with the north flowing Gulf Stream currents evident only a few miles offshore. Near shore a weak counter-current flowing south is usually felt. To the west, the island is separated from the mainland by the Indian River. It should be noted that the Indian River is not a river in the usually accepted sense but more a long, thin, tidal lagoon stretching down the southeastern coast of Florida between the mainland and a long series of offshore islands. Passes or inlets between the islands connect the Indian River with the ocean while a very limited number of small streams flow into it. With the exception of Lake Okeechobee some 35 miles to the southwest, there are no major geographic features or important true rivers in the vicinity.

Another fact of importance regarding the site is that there are currently no wells producing fresh water on Hutchinson Island and the many attempts to develop wells, even at considerable depths, have proved unsuccessful. This has limited the development of the island and kept most of the area uninhabited. Development of the northern and southern ends has been possible only because fresh water could be brought from the mainland by pipe lines of limited capacity.

The mainland to the west of the plant site has a low population density. The heavily populated region begins at the West Palm Beach area 45 miles to the south. As will be discussed in detail in the next section, the immediate surrounding area is agricultural in nature with very limited industrial development.



FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNIT 2

PLANT MAJOR CITIES AND THE FP&L SERVICE AREA

FIGURE 2.1-1

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S.R. 605
U.S. 1
SUNSHINE
STATE
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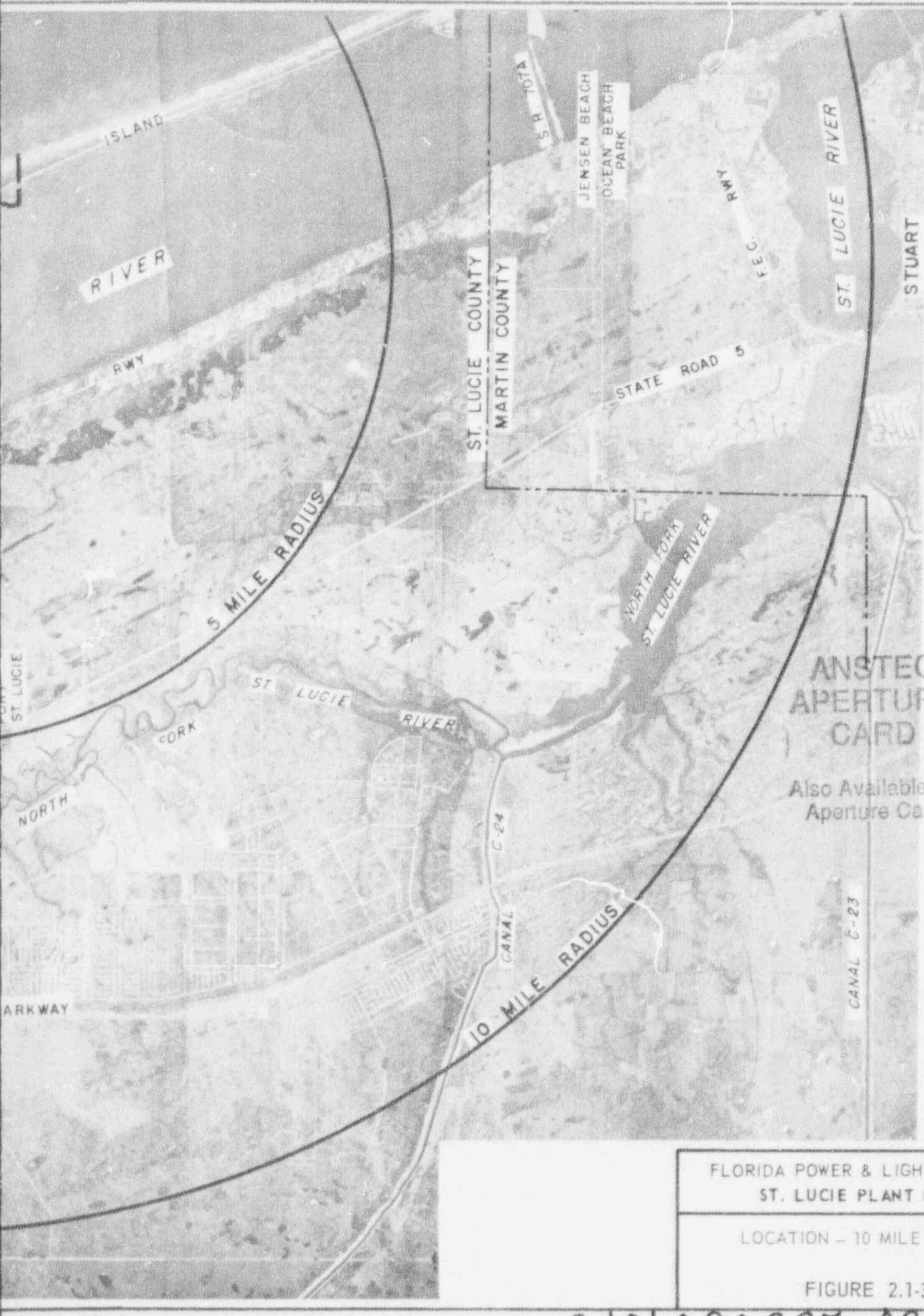

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

LOCATION – 10 MILE RADIUS

FIGURE 2.1-3

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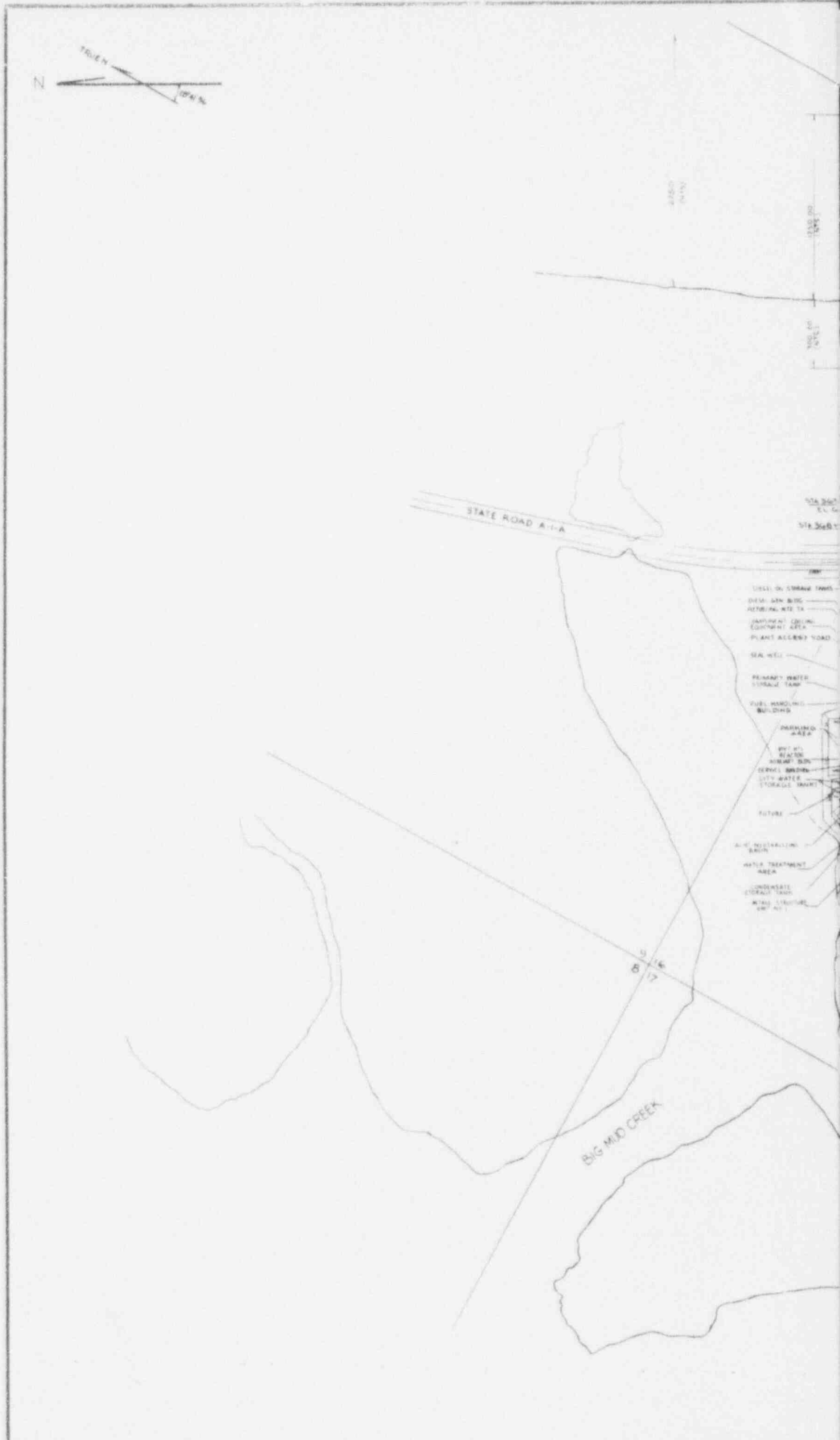

N
STATE ROAD A-1-A
PLANT ACCESS ROAD
PRIMARY WATER STORAGE TANK
FUEL HANDLING BUILDING
PARKING AREA
FUTURE
WATER TREATMENT AREA
CONDENSATE STORAGE TANK
BIG MUD CREEK

REFERENCE DWGS
LIST OF DRAWINGS 2998-A-146
ENLARGED PLOT PLAN 2998-G-059

NOTE:
1. PLANT DATUM SHALL BE MEAN LOW WATER IN ATLANTIC OCEAN EL 0.00'
2. COORDINATES ARE BASED ON STATE PLANE COORDINATES SYSTEM, EAST ZONE

9406090227-04

DWG NO. 2998-G-058

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

SITE PLOT PLAN

FIGURE 2.1-5

ATLANTIC
STATE ROAD A-I-A
HUTCHINSON ISLAND
BIG MUD CREEK
PROPERTY LINE
SAVANNAS RECREATION AREA
I MILE
INDIAN RIVER
S.R. 707
NEAREST RESIDENCE
3 MILES
INDIAN RIVER ESTATES
S.R. 5
U.S. I
5 MILES
SPANISH LAKES

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

LOCATION – 5 MILE RADIUS
FIG. 2.1-6 SEPT. 1973

2.2 REGIONAL DEMOGRAPHY, LAND AND WATER USE

2.2.1 POPULATION AND POPULATION DISTRIBUTION

The population and population distribution in the vicinity of the St. Lucie site was studied initially in 1968. The data was subsequently updated in 1971 to reflect the results of the 1970 census. From March to October 1974 a review of the work to date was conducted to i) verify the earlier predictions of permanent residents; ii) to assess more fully the transient population potential of the area; and iii) to assess the potential growth characteristics of the area. The latter study concluded that:

a) The earlier projections of numbers of permanent residents were substantially correct and no major discrepancies in the earlier studies from recognized and acceptable parameters of demographic projections were noted.
b) Projections beyond 10 miles, i.e., 10 to 50 miles, were in agreement with the earlier studies. 6
c) Projections within 10 miles differed due primarily to the transient population.
d) Hutchinson Island development is likely to cater to tourist or transient use of the island and luxury condiminiums. The latter population group tends to be of a decidedly seasonal nature.

The maximum concentration of persons in the area, which accounts for the winter peak tourist season, is provided in Tables 2.1-1A through 1C. These provide the population distributions by sector and cumulative numbers for the winter peak season for 0 to 5 and 5 to 10 miles respectively.

Figure 2.2-1 shows the population density for 1970, 1980, 1990 and 2000 within a 5-mile radius of the site, sectioned into sixteen directional radii. Figures 2.2-2 and 2.2-3 combined, show similar information for 5, 10, 20, 30, 40 and 50 mile radii.

The cumulative population data for annular radii out to 50 miles is shown in Table 2.2-1D. The 1974 and 1970 figures for distances to 10 miles are provided in this table. 6

The population estimates have been derived from an analysis of 1970 census tract data and rates of migration and construction in the subject areas. The 1980, 1990 and 2000 projections have been formulated after a careful study of past trends and probable future commercial, residential and industrial development. In all cases, these figures are based on the most reliable information available. The methodology employed was in accordance with generally accepted economic research practices.

2.2.1.1 Population Within 10 Miles

Figure 2.2-1 indicates that the area within a 5-mile radius of the proposed site is sparsely populated at the present time. Hutchinson Island, within a 4-mile radius of the site, does not contain any population at present. The present total population within the 10-mile radius (Figure 2.2-2) is estimated at over 47,000. The largest concentrations of population exist in Sectors WNW, NW and S. Population in the western sectors is not concentrated in any one area, and the population density in these areas is low. However, the area in the 5 to 10 mile arc is good land and, in many cases, has been subdivided. There is a strong indication that this is the area that will experience the bulk of population growth within the next 28 years for the Fort Pierce area. 6

Fort Pierce, the county seat of St. Lucie County, is located a little north of the center of the county, a distance of 8 miles from the site, and on the Indian River, which is part of the Intracoastal Waterway. Its 29,721 inhabitants account for 60% of the entire county's population.

Other population clusters are located to the Southwest at Port St. Lucie; in the north at Lakewood Park; adjoining Fort Pierce at Sunland Gardens, Harmony Heights and Paradise Park; and in the east-central section is Collins Park Estates.

The future trends of population in the 0 - 5 mile and 5 - 10 mile zones, measured from the plant on Hutchinson Island have been analyzed. Hutchinson Island, having more than a 25-mile stretch of ocean and beach frontage, will have a population made up not only of permanent residents but of a considerable number of transients. The same can be said of the LPZ area where it touches the mainland. In addition, it is noteworthy that among the permanent residents, will be those who own there Florida residences as second homes. These second homes characteristically are utilized only for a month or two during the year. Northern residents owning such second homes in Florida tend to occupy them in the winter time (usually February or March), while southerners who own second homes on beach fronts in Florida tend to occupy them during the summer, in July or August. 6

In addition to the distinct transient nature of the population, the area tends to be further subdivided by a distinct seasonality. The winter season in Florida by and large extends from December through the end of April, but the accent tends to be in February and March. During this period northerners migrate to Florida staying a month or more in the traditional Florida winter season tourist fashion. Summertime visitors and transients tend to be limited to their summer vacation, i. e. a week, 2 weeks, or 3 weeks, and are usually on the move either in campers or by car or station wagon. Such tourists are oftentimes on a trip throughout the state to see different areas, and therefore are likely not to stay for more than two or three days or possibly a week. The peak months of the winter, February and March, and the peak months of the summer season, July and August, see the highest use of transient and tourist facilities, catering to different types of clientele. Transient and permanent population estimates are provided in Table 2.2-1C.

With regard to permanent residents, summertime travel vacations tend to reduce the number of permanent residents present at any given time. At any given time it is estimated that between 10% and 20% of the year-round population is away during the summer months of July and August. This likely reduction in permanent population is not reflected in Table 2.2-1C, i.e., the figures therein tend to overestimate the permanent population during the summer.

The single-family home has tended to dominate the area along the coast opposite Hutchinson Island in both Martin and St. Lucie Counties. However, in the last several years the rising expense of building and much higher land costs has resulted in the recent trend to the multi-family dwelling and the condominium. On Hutchinson Island, condominium developments over the past two years have been aimed at a retirement market and at a second home market. At the present time and for the foreseeable future they tend to be occupied at a higher rate during the winter months than in the summer months. Many such units are owned by out-of-the-state residents who typically occupy them for a month or two a year with perhaps an occasional rental to friends and leaving them empty for the rest of the year.

There may come a time when condominiums along the beach will be permanently occupied the entire year by residents, but this is not in sight yet. Even those who are retired or live in some of the condominium developments that have been built on Hutchinson Island may be year-round residents but tend to leave for the summer months for either their second original home, or for cooler climates. While it is conceivable that as times goes on the general amenities of the area will improve and make living on the Island year-round more pleasant, it is more likely that the increasing significance of the tourist and recreation industry on the Island and nearby will tend to create a sense of transiency and impermanence. Thus, it is expected that in the summer the area will serve a transient tourist population, and in the peak winter months the area will serve more of the permanent condominium owners.

In any case, these two occupational peaks will see valleys in the months of May and June and in the months of September through December, when the transient population and the tourist industry will be relatively dormant on the island and nearby mainland. This is true throughout Florida and has been so for the last 50 years of tourist economic history in the state.

Finally, the permanent population may further be affected by the lack of permanent employment in the area and the relatively narrow economic base on which the entire area rests. Hutchinson Island is backed by a hinterland in St. Lucie and Martin Counties, where employment, while varied, is not to be found in depth. There are few large employers within the 10-mile and indeed within the 50-mile circle - from the proposed St. Lucie plant, and although the economy is slowly broadening, the small size of the urban areas such as Stuart, Fort Pierce and others do not form an economic foundation on which large, sophisticated or expanded gainful employment may be forthcoming. Under normal circumstances, urban areas foster and develop their own employment and their size to some extent becomes a function of the jobs created within the so-called market area. While employment has been expanding slowly in the Martin County and St. Lucie County area, there are no signs that either the supply of labor sufficient to support major industrial plants or manufacturing employment is present, nor is there any sign that the area offers economic or locational inducements sufficient to justify a location of any major employer in the area. Thus, the area will likely cater to those who are retired and those who have incomes generated from other sources of capital, from the return on principal or on retirement pools of income originating in other parts of the country.

Building costs and land costs are rising sharply in the area, and present indications are that condominiums in and around Hutchinson Island, now running between $50,000 and $110,000 in cost, will be $75,000 to $150,000 in the near future. There are few if any new rental apartments in the area to house those on limited incomes or in retirement. Market support for the development of expensive condomimium residences is present in the area, but is relatively limited to the affluent, any of whom use these condomimiums as second homes, and that the permanent residents of the area will tend to live more inland, in rental houses, smaller multi-family developments or in single-family homes inland, where shelter and land costs are less.

Studies conducted to date indicate that the land available for development on Hutchinson Island will be almost totally utilized by the end of this decade (by 1980) and that the high cost of land and construction will result in the building of expensive condominiums, a limited number of middle-price ($40,000 - $60,000) condominiums, luxury motels and the construction of more camper condominium sites for the mobile and travel-conscious clientele. The Island will thus tend to be a haven for the well-to-do, with two seasonal peaks, one in March and one in July. Few if any rental or other apartments available for people actually gainfully employed in the area will be constructed. Most evident will be a number of luxury condominiums in the $75,000 to $150,000 price class, with perhaps half or more of the units occupied by people who use them less than two months a year.

Although population growth of the magnitude discussed therein is conceivable, all studies to date indicate such growth is highly unlikely. The bases are:

1. The relatively limited number of ways to reach Hutchinson Island tend to limit residential development there.
2. The addition of an extra causeway or two to the area is likely to expand the area's use, however, as a tourist and recreation area, because of an increasing inte[illegible] such natural ecological areas.
3. Lack of additional fresh water on the Island at [illegible] time and the difficulties inherent in developing additional water resources for the Island will tend to reduce the attractiveness of the Island for permanent development.
4. The sharply increasing cost of land and of construction on the Island will tend to restrict development to fairly dense use such as condominiums and the like.

5. The lack of depth of the economic base of the St. Lucie/ Martin County area and the lack of any significant employers or job opportunities in the area tend to limit Hutchinson Island particularly, and the area along the Indian River either to fairly affluent retirees living in luxury condominiums or transients seeking a view of the ocean and beach. 6
6. Stringent development laws, tough zoning restrictions, public and official opinions will tend to limit mass development of Hutchinson Island.
7. The Island will see high seasonality of use with peaks in winter and summer.

2.2.1.2 Population Between 10 and 50 Miles

The area within the 50-mile radius (Figure 2.2-3) contains an estimated total population of over 310,000. Over 70% of these people reside outside of a 25-mile radius from the site. The major population concentrations are found along the Florida coast line -- principally to the south. During the next 28 years, the area depicted in the figures as Sector H will experience the largest population growth. This sector (H) encompasses the northern portion of what is known as the Florida Gold Coast.

The 1970 census (1) confirms the long range estimates made earlier and gives the 1970 population of major cities within a 50 mile radius: Ft. Pierce, 29,721; Stuart, 4,820; Indiantown, 2,285; Vero Beach, 11,908; Okeechobee, 3,715; West Palm Beach, 57,375. 6

Nearly one-quarter of the population of Martin County live in Stuart, a city of 4,820 inhabitants in 1970. Another population cluster of 2,283 persons is at the small city of Indiantown which is located in the south-central portion of the county, about 26 or 27 miles southwest of the plant site. Small concentrations will be found at Port Sewall, Salerno, Gomez and Hobe Sound. These small communities are along the Waterway south and east of Stuart, ranging from 11 to 22 miles from plant site.

Of the 1970 population, about 68% are concentrated in and around the Indian River county seat of Vero Beach, a city with 11,900 people. Approximately 10,000 people live in the northeastern eighth of the county and 2,000 are spread very sparsely around the western two-thirds to three-fourths of the county.

The Okeechobee county seat, the City of Okeechobee, has the only large concentration of population. Its nearly 4,000 citizens comprise about 38% of the population of the county. The remainder of the inhabitants are scattered over a very wide area.

Of the total estimated 350,000 persons in Palm Beach County, about one-third are living within the study area.Of that portion, 95% live in the coastal region, clustered near the City of West Palm Beach. About 6,000 persons live on the shore of Lake Okeechobee in the Pahokee area, about 45 miles from the plant site.

There are no main concentrations in that portion of Brevard County which is included in this report. There is, however, a small urban development in the Sebastian Inlet area.

The areas under study in Osceola, Highlands and Glades counties are very sparsely populated.

2.2.1.3 Low Population Zone

On the basis of the investigation of population density and land use, the Applicant has determined that the area lying within 5 miles of the plant is presently and likely will remain sufficiently low in population density to be considered a low population zone. The area contained, in 1968, 1,980 persons and is projected to have a maximum of 12,150 persons by the year 2000.

The Regulatory Staff has concluded that in its opinion it is conceivable that during the plant lifetime the population growth on Hutchinson Island could grow to a level such that a future reduction in the low population zone (LPZ) might be required. By copy of its September 3, 1974 letter the Staff required that modifications of engineered safety features be implemented to accommodate an LPZ of as little as one mile, i.e., to a point
where essentially all land within the LPZ is owned by the Applicant. The 6
growth potential within 10 miles of the facility is discussed in Section 2.1.3.1 . Studies to date indicate that the growth contemplated by the Staff, although conceivable, is most unlikely. Nonetheless, modifications will be incorporated in the design to insure compliance with 10 CFR 100.11 (a) (2) dose requirements at one mile.

2.2.1.4 Transient Population (See also Section 2.2.1.1)

Housing and transient tourist resort developments built, under construction or planned on Hutchinson Island in the 0-to-5 mile zones and the 5-to-10 mile zones north and south of the facility has been evaluated as of July 24, 1974. The study reveals that the Island is somewhat more developed to the south than to the north, largely beyond the LPZ in the 5 to 10 mile zone. There are about 20 completed major buildings, condominium, or resort developments on Hutchinson Island as of July, 1974 and at that time there were 8 building projects under construction, and 9 apartment projects in the planning stage. Several of them have been in the planning stage for several years.

The area south of the plant is predominantly condominium and trailer/camper or transient accommodations. The northern end of the Island beyond the LPZ along A1A and the Causeway is dominated by a number of smaller motels, efficiencies and some sizeable single-family homes which have been there for some time, representing the beach area east of Fort Pierce.

South of the plant, the area includes Outdoor Resorts, a camper development of 1,300 campers about 4.9 miles south of the plant on Nettles Island, plus about 125 motel rooms. The southern edge of the 5-mile LPZ ring therefore is to a large extent transient, the only permanent residents being fewer than 100 families permanently resident year-round on Nettles Island. Beyond the LPZ, the 5-to-10 mile zone to the south, there are some 517 condominium units, and some 801 transient units. Of these, 709 are camper sites in Venture Out and Holiday Out, and 92 in the motel, Holiday Inn. Thus, to the south of the 2,643 existing units, 2,126 units or 80% are transient rather than permanent residents. 6

The most important center of recreational activities in the vicinity of the plant is the Savannas Recreation Area, located approximately five miles west-northwest of the plant. Operated jointly by the City of Ft. Pierce and St. Lucie County, it features boating, fishing, swimming, camping and picnicking. Overnight campers totaled approximately 9000 during a recent 12-month period, while 160,000 day visitors were reported.

Monthly records of the attendance at the Savannas Recreation Area are maintained by the Fort Pierce-St. Lucie County Playground and Recreation Board. From these records the maximum daily attendance for this area during the period of October, 1972, through September, 1973, is estimated to have been 1,040 visitors. This estimate is based on the tally of the peak attendance in the month of June, 840 visitors per day average, plus the largest single registered group, representative of the maximum expected deviation from the average. Public park areas are located at the north end of Hutchinson Island. The nearest park to the St. Lucie Plant site (and furthest from Ft. Pierce) Douglas Memorial, is more than five miles north of the plant. It is lightly used, averaging 25-50 visitors per day during the summer, with few visitors during the winter. A public beach and park is located approximately seven miles south of the plant. It is estimated that 50-100 persons will wander for no longer than an hour along the ocean beach adjacent to the plant each day. Other recreational activities in the vicinity of the plant include surfing and fishing in the ocean, and fishing and boating in the Indian River. Ducks are hunted on Hutchinson Island in season. Participants in these activities within several miles of the plant are few in number. Shellfishing in Indian River is currently prohibited by order of the State Board of Health. 6

The city of Stuart is a boating and fishing resort, and boatmen and fishermen increase the transient population on both a year-round and seasonal basis.

A scenic attraction, McKee Jungle Gardens, about three miles south of Vero Beach on U. S. #1 and a horse breeding farm at Fellsmere bring visitors to those areas.

2.2.1.5 Population Center

The nearest "population center" is the city of Fort Pierce at an airline distance of eight miles in a northwest direction from the containment building, 1.6 times the distance from the plant to the outer boundary of the low population zone.

2.2.1.6 Public Facilities and Institutions

The Fort Pierce Memorial Hospital is located eight miles northwest of containment building (12 miles distant by highway). Douglas Memorial Park is located more than five miles north of the containment building. A public park and beach is located approximately seven miles south of the containment building. 6

Five small municipal parks are located within the city. Jonathan Dickinson State Park is located in the southeastern corner of the county, south of Jupiter. It covers some 16 or 17 square miles and lies within 29 miles of the plant site. Its facilities include picnic tables, refreshments, boat ramps and camp sites.

2.2.2 REGIONAL LAND USES

The area studied extends fifty miles in all directions from the plant site. Included in the study area were all or parts of nine counties of Florida: St. Lucie, Martin, Indian River, Okeechobee, Palm Beach, Brevard, Osceola, Highlands and Glades.

The gross area studied is 7,854 square miles, more than one-half of which is water -- represented by the Atlantic Ocean, the Indian and St. Lucie Rivers, and Lake Okeechobee. It will be observed from Figure 2.1-7 that a line running southerly from a point 22 1/2° west of north, through the plant site, to a point 22-1/2° east of south very closely parallels the Intracoastal Waterway and the Atlantic Ocean shoreline. This, in effect, cuts the land area to about half of the total 7,854 square miles mentioned earlier. From this can be subtracted about 350 square miles of Lake Okeechobee. Some 125 square miles of water in the Indian and St. Lucie Rivers, forming part of the Intracoastal Waterway can also be deducted. Approximately 75 square miles of the Atlantic Ocean between Jupiter Inlet and Palm Beach should be subtracted. When these total deductions of approximately 550 square miles of water are deducted from one-half of the gross area, there remains about 3,375 square miles of land area, but with no deductions for small lakes. An examination of U. S. Navy Hydrographic Office Chart #1290 and U. S. Coast and Geodetic Survey Chart #1247 reveal no apparently habitable land masses in that portion of the Atlantic Ocean which is included in the gross area of the study.

The overall impressions gained as a result of the study of the subject areas were:

a) An expanding area of the East Coast of southern Florida, having four principal concentrations of population -- around the cities of Vero Beach, Fort Pierce, Stuart and West Palm Beach -- all located in the coastal region;

b) An area of low, mostly flat land with elevations running from 50 feet in the western portion to sea level on the east. The central sections are about 20' to 25' above sea level. Swampy areas such as the St. Johns Marsh, Loxahatchee Slough, Allapattah Flats and a portion of Big Cypress occupy large parts of the study area;

c) Agri-business is the dominant contributor to the commercial economy. Citrus, vegetable and flower culture; cattle raising, including dairying; and related enterprises such as packing houses, processing plants, farm equipment and fertilizer sales are spread throughout the area;

d) The tourist attractions, and hence heavier seasonal concentrations of population, are found along the Intracoastal Waterway.

e) The general impression is one of a large area which will expand its activities and population generally in the coastal regions with more gradual expansion of the agricultural economy to the westward.

2.2.2.1 Agricultural Land Use

Tables 2.2-1, 2.2-2 and 2.2-3 show selected statistics on agriculture for six of the subject counties. Data for the counties of Osceola, Highlands and Glades are not presented because of the minimal area of these counties that lies within the 50-mile radius. For all practical purposes, agricultural activities within the six county area portrayed in the following tables can be considered as representative of the study area as a whole.

The statistics shown in Tables 2.2-1 and 2.2-2 pertain to the entire spectrum of agricultural activity in the subject counties and describe these activities by type and by quantitative production measurements. Table 2.2-3 in turn provides specific data for dairy activities. As shown in the table, Okeechobee and Palm Beach Counties exhibit a considerably greater degree of dairy farm activity than the other four counties. In Okeechobee County, the bulk of dairy farm activities can be generally identified as being in those portions of Sectors L and M in the 25 to 50 mile arc. Although only the northern portions of Palm Beach County are included within the 50-mile radius, it appears that it is in these areas that most of the dairy farm activity is found. That portion of Sectors I and J in the 25 and 50 mile radius is the area of Palm Beach County where the bulk of dairy farm activity is concentrated.

The bulk of dairy farm activities in Martin, Indian River and St. Lucie Counties take place in Sector J, 10-25 mile arc; Sector N, 25-50 mile arc; and Sectors N and M, 10-25 mile arc, respectively. Dairy activity in Brevard County is relatively insignificant and that which exists is not within that portion of the county that comes within the 50-mile radius.

2.2.2.2 Generalized Land Use by County

St. Lucie County

a) Location

St. Lucie County, with its 540 square miles of land area, is located on the Atlantic seaboard about 230 miles south of Jacksonville and 120 miles north of Miami. In it is the site for the nuclear power plant on Hutchinson Island. It is bordered on the north by Indian River County, on the west by Okeechobee County and on the south by Martin County. Almost all of its area lies within 25 miles of the plant site and its northwestern corner, the most distant point, is about 31 miles distant.

b) General Description

Like its neighbors, St. Lucie County is also flat. The western three-fifths of its area is largely covered by St. Johns Marsh in the northern portion and the Allapattah Flats to the south. The remaining two-fifths paralleling the coast, is flatwoods country but much of the area has been put to productive use for cattle and citrus operations. The swampy area varies in elevation from about 50 feet at the western limits to 25 feet on the east. The flatwoods run east from there to sea level at the Intracoastal Waterway.

Long, narrow, sandy keys known as Hutchinson Island and Sprang Island lie along the entire mainland between the Intracoastal Waterway and the Atlantic Ocean. They are separated from each other by Fort Pierce Inlet, opposite the city of the same name.

The area near the plant site is not settled. This same statement applies to most of Hutchinson Island. The portion near Fort Pierce Inlet, however, does have resort developments on it.

c) Land Uses

The Agribusiness Committee of the Fort Pierce - St. Lucie County Chamber of Commerce reports that two-thirds of the land area of the county is given over to the general agricultural industry; 41 percent pasture land; 23 percent citrus; and one percent vegetables. The citrus figures appear somewhat higher than those given in estimates by the Florida Department of Agriculture but are accurate enough for purposes of this report.

The citrus groves are, in general, located in two major areas in the northern and central sections of the county and generally west of Fort Pierce. The first area is longitudinal in direction and about three or four miles inland from the Indian River, and extends about ten miles south of the Indian River - St. Lucie County line. The second is connected to the first at its southern extremity and turns west of the first area. The nearest of the major grove concentrations are eight or nine miles removed from the site.

The dairy nearest to the St. Lucie plant is located approximately 14 miles west-southwest of the site, and the present size of the dairy herd is approximately 1,000 head.

The cattle raising region is largely in the western half of the county but not limited to that area, with 41 percent of the county's land area given to this use. Small beef and dairy cattle herds can be found between the citrus areas west of Fort Pierce and west of Port St. Lucie.

Florida Power and Light has reviewed the St. Lucie County area for the purpose of locating the hypothetical cow. Upon review of the one mile radius extending from the Unit #2 reactor building all the land encompassed is within the plant site (see Figure 2.1-6). Extending the scope to 1.5 miles, additional land on Hutchinson Island is included outside FP & L property lines. These additional areas, however, are zoned by St. Lucie County as residential R-4 and R-1A (see Figure 2.24). As the radius is again increased to 1.75 miles, mainland areas, east of the R.E.C. Railway are now included. These land parcels are also zoned residential R-1A. Further west, past the railway, 2.1 --- 2.6 miles WSW of Unit #2 are land areas zoned argricultural (A-1). As seen from the 5 mile aerial photograph this section east of the Savannas is covered with dense foliage and is primarily a swamp area. Because of the density of bushes and trees grazing land is very limited. This area, if cleared, could possibly be used to pasture a cow although none are known to be present in this region. Since the grazing areas are almost non existent, a sizeable portion of the cows feedings would probably have to be supplemented as a result of the above limitations. Estimates for supplemental feedings may exceed 50%. There is no potential for commercial dairying in this area. 3

Vegetable growing is a much smaller part of the county's agribusiness. Among the crops produced are tomatoes, squash, cabbage and dandelions. Of these, tomatoes represent the major money crop. Tomatoes comprise 99 percent of the entire reported vegetable crop each year.

Although of lesser economic importance, the beekeeper industry produces well over 600,000 pounds of honey a year. Horse breeding, swine production, poultry farms and a number of ornamental nursery farms are also part of the county's agricultural production.

Industrial employers of St. Lucie County are mainly centered around Fort Pierce. Some of these and their employed-force brackets are:

Bell Division of Ward Baking Company	200 +	Employees
Ten packing houses with seasonal employment	101-200	Employees
Six packing houses with seasonal employment	51-100	Employees
Sherold of Florida, Inc. - Quartz Crystals (Electronics)	51-100	Employees
Plastic Specialties - Plastic Pipe Fittings	26-50	Employees
Rinker Materials Corp. - Concrete Products	26-50	Employees
Wilson-Toomer Fertilizer Co. - Fertilizer	26-50	Employees
Twelve miscellaneous employers	11-25	Employees

The vehicular traffic passing the plant site on State Road A-1-A can be characterized as local, private passenger vehicles, typically of the order of 100 cars per day, exclusive of temporary traffic generated by plant construction activity.

d) Probable Future Land Uses

It is probable that some 15,000 additional acres will be added to the citrus production land resources inventory by 1974. Another 30,000 acres are estimated to be added by the year 2000. It is further estimated that 25,000 to 30,000 acres of pasture land will be added during the next 30 years. These changes will come about as the result of the reclamation of swampy lands in the western portion of the county.

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An examination of the zoning on Hutchinson Island reveals a pattern common to Florida's "Gold Coast." The land areas bordering on the Atlantic side of the island are zoned R-4 which allows 18 units per acre for apartments and condominiums and 36 units per acre for either hotel or motel usage. It is obvious that this is an enticement for major hotel and motel developments to expand the constantly growing tourist trade in St. Lucie County.

On the west side of A-1-A most of the land, is of a low density residential classification (R-1A) allowing only 3 units per acre.

A majority of this area is now mangroves and will probably not be developed until the availability of the higher density areas deminishes somewhat. It should also be noted, that the costs involved in providing fill for the areas would be an additional deterrent to development.

There has been no official census taken since 1970 in either St. Lucie
or Martin County. Future population estimates for 1980 have been
researched with the following results: references in the State of 1
Florida Statistical Abstract 1972 as published by the Bureau of
Economic and Business Research College of Business Administration, the
University of Florida, are contained in the listing below. This
study was coordinated with the State of Florida Department of
Administration, Bureau of Planning.

	1970 Population (Census)	1980 Projected
St. Lucie County	50,836	61,800
Martin County	28,035	40,700

In relation to recent investigations, the Applicant feels that the St. Lucie County estimate is conservative. Highly geared promotional activities, such as those used by the developers of Port St. Lucie have dramatically accelerated growth in the 5 - 6 mile radius SW of the plant site. As the success of this and similiar developments continue the agriculturally zoned land parcels east of highway US#1 will soon be deminished. These occurrences, however, are not at all unusual for the State of Florida. Development of these and other local land parcels will eventually develop during the construction period of Unit #2.

e) Water Uses in the Plant Vicinity

No successful fresh water wells have been found on Hutchinson Island. Details of local hydrology can be found in Section 2.5 of this report. Details of water recreation activity on Big Mud Creek (an inlet of the Indian River) are presented in Section 2.2.1.6 of this report.

Martin County

a) Location

Martin County is on the East Coast of Florida, with its northern limits near St. Lucie Inlet. Its county seat, Stuart, is located about 35 miles north of the City of West Palm Beach and 18 miles south of Fort Pierce. It is bordered on the north by St. Lucie County; on the west by the Lake and County of Okeechobee; and on the south by Palm Beach County. The land area of the county is entirely within 35 miles of the plant site and its northern border, north of Jensen Beach, is within six miles of the site.

b) General Description

The topography of this county differs somewhat from that of its northerly neighbors. The swampy area of the Allapattah Flats and the Loxahatchee Slough, part of the northern reaches of the Everglades, do not extend fully to the county's western boundaries.

In the western third of the county, the flats are interspersed with large patches of flatwoods. The Flats, Slough and Glades regions have more open water areas observable.

Agricultural activities in Martin County include cut-flower production. The St. Lucie River, with its connections to the Intracoastal Waterway, the St. Lucie Canal and the ocean, provide boating and fishing activity.

c) Land Uses

Agriculture is the primary use of land in this county. The Florida Department of Agriculture reports that over 50,000 acres of Martin County are in developed groves. This is almost 15 percent of its total land area.

The County Agent estimates that:

> There are about 500 acres in the ornamental horticultural category planted to supply the cut flower trade in chrysanthemums, roses, Easter lilies, and miscellaneous varieties;
>
> There are about 20,000 head of beef cattle and a minor number of cattle in dairy herds:
>
> The row crops, planted on 2,500 acres, include tomatoes, cumcumbers, peppers, and watermelons.

The County Agent states that the agricultural activitives are located west of the Sunshines State Parkway, the cut-flower operations are west of and close to the Stuart area because of the climatic advantages provided by the St. Lucie River. Residential and commercial uses are east of the Parkway and, in general, east of U. S. #1. Industry is in Stuart and also clustered near the airport.

d) Probable Future Uses

Based upon the information supplied by such authorities as the City Manager of Stuart, the County Agricultural Agent and local real estate brokers, it is believed that future expansion of industry will be mainly in the Stuart area and probably near the airport's present industrial cluster.

The residential expansion will be eastward toward the Waterway and southward toward Salerno. Some westward expansion is anticipated between Palm City and Sunshine State Parkway. A very large housing development, which will sit astride the Martin-Palm Beach Counties boundary, is in the "talking" and promotional stage. It is reported to be some 5,400 acres in size and is intended to serve as the development center for a 17,000 acre improvement. Plans are vague at this time.

Commercial development of the Stuart area is now taking place and will be expanded.

Indian River County

a) Location

All but a few square miles in the northwest corner of Indian River County lie within the study area. It occupies most of Sectors N and O from 25 to 50 miles outward. Its most southeasterly point is about 15 miles from the plant site. Its north line, at its junction with the ocean, is 37 miles north-northwest of the plant site. Its eastern boundary is the Atlantic Ocean and on the west is Osceola County. Its two southern neighbors are St. Lucie and Okeechobee Counties.

b) General Description

A generally flat expanse of land, somewhat poorly drained and having the western three-quarters of its area covered by the St. Johns Marsh, this county is one of the major citrus producers of Florida. The general land cover is flatwoods. Major development has been confined to the eastern one-quarter, along the coast. Agriculture is dominant in the central section of the county, with cattle raising spotted in several areas but noticeably in the southwestern corner of the county, some 30 miles northwest of the plant site.

c) Land Uses

Crop use accounts for about 15 percent of the total county land area. Pasture and range lands cover about one-third of the county. The largest concentration of citrus groves is along the coastal region in the southern three-quarters of the county and lying between Interstate #95 and the Intracoastal Waterway. Another large but not so extensive grove area lies along the St. Lucie-Indian River Counties boundary and west of Interstate #95.

The vegetable and other row crop area is mainly concentrated in the northern part of the county, midway between Interstate #95 and the Osceola-Indian River Counties boundary and it covers some 35 to 40 square miles of area.

Cattle raising has previously been commented upon. In this connection, it should be noted the directions of expansion are west and north, and mainly in the western third of the county.

Some 29,000 acres, about nine percent of the county, can be designated as developing urban area and, with the exception of Fellsmere community, about 37 miles northwest of the plant, is along the Waterway and the ocean.

There has been recent and appreciable industrial buildup on the mainland around the City of Vero Beach. Among the important employers are:

Piper Aircraft Company - Airplanes	1,835 Employees
Verogrand Corporation - Machinery	100 Employees
Crosby Builders - Building Supplies	57 Employees
Hobart Brothers - Electrode Coatings	35 Employees
Templin Fabricators - Trusses	30 Employees
Karnish Instruments - Aircraft Parts	30 Employees
Airlite Processing - Permalite	16 Employees
Miscellaneous Service Employers	100 Employees

d) Probable Future Land Uses

There is little to indicate any major changes in the types of land use in the future. The extent of use will increase, especially in the coastal region where further urbanization will take place. It is probable that strip development along the route of Interstate #95 will occur in the next few years and that such change will be related to the agricultural expansion in the middle and western parts of the county.

Okeechobee County

a) Location

This agricultural and cattle county shares its borders with six neighbors - on the north, Osceola and Indian River; on the east, St. Lucie; on the south, Martin and Glades; on the west, Highlands. The greater part of the area under study lies almost due west of the plant site, in the 25 to 50 mile band in a portion of Sector K, all of Sectors L and M and part of Sector N. The most easterly boundary is 27 miles from the plant site.

b) General Description

The country is generally open and flat. Elevations are about 50 feet in much of the county. Flatwoods areas are to be found along Taylor Creek and Cypress Slough and their tributaries and also in many scattered locations.

c) Land Uses

The reports of a 1964 agricultural census show the following:

> Less than three percent of the total land area was given over to farming, reported as 499,000 acres, of which 81.8 percent was under cultivation or actual farming use;
>
> The total number of farms was 199; 10 percent engaged in the dairy business and 36 percent were in the beef cattle business;[1]
>
> It is noted that 17 of the farms were from 1,000 to 1,999 acres in size, while 39 were larger.*

From a report by the Florida Department of Agriculture, only 3,329 acres in Okeechobee County were listed in the commercial inventory of citrus acreage. Industry is almost totally non-existent in the county. Aside from the residential use in the City of Okeechobee and the small percentage of total land area that is used for farming, citrus and cattle, some 95 percent of the county is undeveloped.

d) Probable Future Land Uses

The probabilities are for substantial increases in agricultural production acreage.

Palm Beach County

a) Location

This lower Florida East Coast county is bounded on the north by Martin; on the south by Broward; and on the west by Hendry. Its eastern limit is the Atlantic Ocean. It has some 40 miles of shoreline on Lake Okeechobee as part of its western land limits. Its principal city and the county seat is West Palm Beach, which is located about 47 miles south-southeast of the site.

That portion of Palm Beach County which is included in the study area is shaped like a partial segment of a parabola. It lies within Sectors H, I, J and a small portion of K, all of the latter and about one-third of the area in Sector J are covered by Lake Okeechobee. The closest part of the Martin-Palm Beach Counties boundary to the plant site is near Jupiter, about 28 miles distant. The area under study lies within the 25 to 50 mile band.

*1. A more recent local release states that in 1968 there are "40 to 45 dairies in the county.

b) General Description

Palm Beach County covers a large area and includes more than 2,000 square miles of land area, about one-quarter of which is in the study area.

The coastal area, for a distance west of about 20 miles, is a flatwoods section. West of this, and in general west of U. S. #441, the land is swampy and constitutes a large portion of the Everglades. Within the county, but not in the study area, is Loxahatchee National Wildlife Refuge. In the northern portion of the county and in the study area is the Loxahatchee Slough, lying west of the Sunshine State Parkway. It contains large areas of open water and is part of the "Glades". Very little flatwoods are found in the western part of the county. Elevations range from about 25 feet to sea level.

c) Land Uses

Industry is in various locations in the study area, the most isolated of these being the Pratt & Whitney Aircraft Development Center located 29 miles south and slightly west of the plant site. Other industries are located at Palm Beach Gardens; west of Riviera Beach; near Mangonia; clustered near Palm Beach International Airport; and near the City of West Palm Beach. All are from 29 to 50 miles removed from the plant site and all generally slightly east of south, in Sector H.

The winter vegetable farms are found mainly in the western part of the county in Sector J. Sugarcane is also produced in this area. Principal row crops are celery, snap beans, radishes, tomatoes, corn, peppers and cabbages.

Citrus groves are to be found in the northeastern part of the county. The Florida Department of Agriculture reports that as of the end of 1967, Palm Beach County had over 17,000 acres of its land planted with citrus trees.

Residential developments are found mainly in the eastern coastal region. Within the study area the major concentrations are in the southern 15 miles - between 35 and 50 miles from the plant site. The population section of this study includes full details. West Palm Beach and its adjoining neighbors are primarily residential in character. Populations along this coastal section fluctuate seasonally, with large increases in the winter.

d) Probable Future Uses

It is reasonable to expect expansion of industry in the vicinity of Palm Beach International Airport; residential increases are reflected in the data supplied in the population study included in this report. Agriculture expansion will be in the western portion of the county, with beef herds and sugarcane production increasing on the land that must be reclaimed for such uses.

Brevard County

a) Location

That portion of Brevard County which is included in this study lies mainly in Sector O, with its coastal area in Sector P. Its most southeasterly point is about 37 miles from the site. Its southwesterly limits in Sector N, are 50 miles from the plant site.

b) General Description

Brevard County is generally flat land running from sea level to elevations of 25 feet to 30 feet, largely covered with flat woods and is very sparsely settled. It is moderately to poorly drained land with some improved pasture and tree crops.

c) Land Uses

In the northern limits of that portion of the county within a 50 mile radius of the plant site, there are extensive citrus groves. The most easterly is astride the proposed Interstate #95. Two larger concentrations are west and somewhat north of the first area. Developed pastures and cattle herds are found along the Brevard-Indian River Counties boundary about 40 miles from the plant site. Some row crops are produced immediately north of the previously mentioned citrus grove area, west of Interstate #95.

d) Probable Future Land Uses

Expansion of the cattle, citrus and row crop operations, especially in the central portion of the sector, is most likely. The Waterway will attract additional tourists and a larger urban development will take place in the southern part of the county in the coastal region.

Osceola County

a) Location

That portion of Osceola County which is included in the study area is confined to the southeastern corner of the county; an area of less than 40 square miles, centered about Yeehaw Junction. It is in Sector N and its nearest point is 44 miles from the site.

b) General Description

The portion of Osceola County under study is moderately drained flatwoods which area is largely undeveloped.

c) Land Uses

There is only a very small area of independent agricultural activity in Osceola County.

d) Probable Future Land Uses

It is generally conceded that the probable future land use in Osceola County will be agricultural in nature.

Highlands County

a) Location

That portion of Highlands County included in the study area is limited to about 15 square miles in the most easterly portion of the county. Its nearest point to the site is 47 miles distant and located in Sector L.

b) General Description

The portion of Highlands County in the study area lies along the Kissimmee River, which is also the boundary between Highlands and Okeechobee Counties. It is at an elevation of 25 feet or slightly lower and is undeveloped.

c) Land Use

The area is presently undeveloped.

Glades County

a) Location

That portion of the county included in the study area is located in portions of Sectors K and L, in the outer limits of the 25 to 50 mile arc. It consists of approximately 100 square miles of the northeastern corner of Glades County and about half of it is covered by Lake Okeechobee. Its closest boundary is 41 miles from the site.

b) General Description

The Glades County area under study is mainly open country with a few small patches of flatwoods. Its altitude varies from a maximum of about 25 feet down to 15 feet at the shores of Lake Okeechobee. The eastern portion is swampy, with brushwoods being toward the west. It is an undeveloped area of the county.

c) Land Uses

This Glades County area is almost totally undeveloped land except as noted under the population section.

2.2.3 REGIONAL WATER USES

Both the cities of Ft. Pierce and Stuart have public water supplies from wells developed in the shallow Anasthasia aquifier. The Stuart wells are located 11 miles southwest of the site. Water for plant usage is obtained from the City of Ft. Pierce from a well field located 10 miles northwest of the plant site.

Data on the water supply wells at Stuart and Ft. Pierce are listed below.

City	No. of wells	Average Ground Surface Elevation	Average Depth of Well	Average gal/day per well
Ft. Pierce	17	+20	110 ft	500,000
Stuart	12	+15	105 ft	170,000

No large industrial water usage exists in the area. Irrigation and stock watering account for the largest withdrawals of ground water. Water from the shallow aquifier is used for irrigation by farmers growing vegetables and citrus fruits, by ranchers for pasture lands, stock watering and feed crops. Many of the artesian wells were originally drilled for irrigating vegetable crops.

The total use of artesian water for irrigation may be about 10 million gallons per day during the dry season. During the rainy season most of these wells are not used. 0

Only two wells were found on Hutchinson Island. Despite the adequate, or more than adequate, supplies of well water on the mainland, no successful freshwater wells have been found on Hutchinson Island.

The approximate number of wells in various communities in the vicinity of the site (within six mile radius) are listed below.

Location	Approximate Number of Wells
Ankona	65
Eldred	53
Eden	70
Indian River Estates	22
Port St. Lucie (West of US #1)	500-600
Walton	75
White City (east of US #1 & South of SR-712)	130
White City (other area within 6 mile radius)	100-150
Between South City limits of Ft. Pierce and and northtown limits of Eldred along SR-707	91
South of White City and north of Jensen Beach Road	50

Field permeability tests at the plant site have indicated a seepage of flow of about 15,000 feet per year in the top 30 feet of the sand deposits. Taking the highest permeability coefficient obtained and a hydraulic gradient of 100 percent any discharge introduced into the ground at the plant site would reach the Indian River in about a day. The discharge would then be greatly diluted. Because of the width of Indian River and presence of a continuous flow of ground water toward the coast line, there is no possibility of subsurface flow from the site to the mainland. This precludes any intrusion of plant releases into the mainland ground water supplies.

The 210 to 550 gpm of water drawn from the Ft. Pierce water supply system has been regarded as totally consumed by the plant. It will be either discharged to the ocean after passing through the radwaste and chemical waste system or to the ground water after passing through the sanitary waste system. Refer to Table 3.3-1 for a description of the distribution of the water drawn by the plant from the Ft. Pierce municiple supply.

An average of 500,000 gal/dy of water is obtained from each of the 17 wells of the Ft. Pierce Municipal water supply system. Thus, the system is capable of a supply rate of 8,500,000 gal/day. This quantity is sufficiently large such that the plant withdrawals will create no difficulties. The normal usage of 210 gpm represents 3.6 percent of the available supply.

Both the Indian River and Atlantic Ocean in the vicinity of the plant are used for recreation; such as boating, swimming and sports fishing, and for commercial fishing as described in Section 2.7.5.9.

TABLE 2.2-1

SELECTED AGRICULTURAL DATA

SELECTED COUNTIES

1964

	COUNTY					
	St. Lucie	Martin	Indian River	Okee-chobee	Palm Beach	Brevard
Approximate Total Land in Acres	376,320	357,760	327,040	499,200	1,265,920	660,480
Total Number of Farms	505	134	370	199	529	572
Acres in Farms	338,532	173,041	232,496	408,520	448,276	191,157
Percent Land Area in Farms	90.0%	48.4%	71.1%	81.8%	35.4%	28.9%
Average Size Farm in Acres	670.4	1,291.4	628.4	2,052.9	847.4	334.2
Number of Farms with Cropland	464	115	348	118	467	555
Number of Farms with Pastured Land	84	51	65	172	179	83
Number of Farms with Irrigated Land	293	67	256	24	329	108
Acres of Irrigated Land in Farms	74,894	25,453	58,140	5,974	238,396	3,870
Number of Farms by Type:						
Field Crop Farms Other Than Vegetable & Fruit & Nut	-	-	1	-	89	-
Cash-Grain	-	-	-	-	-	-
Tobacco	-	-	-	-	-	-
Cotton	-	-	-	-	-	-
Other Field Crops	-	-	1	-	89	-
Vegetable Farms	12	3	1	2	141	2
Fruit and Nut Farms	294	12	250	14	21	286
Poultry Farms	7	-	2	1	9	7
Dairy Farms	5	7	4	20	21	2
Livestock Farms Other Than Poultry or Dairy	30	22	15	71	52	22
General Farms	1	2	-	2	3	-
Miscellaneous and Unclassified Farms	156	88	97	89	193	253

Source; U.S. Department of Commerce

TABLE 2.2-1A

0-5 MILE
REVISED SECTOR PROJECTIONS

Based on Winter
Permanent Peak Population Including Transients

SECTOR	Distance	1970	1980	1990	2000
SSE					
A	4-5	50	2910	3100	3160
B	3-4	0	400	575	630
C	2-3	0	0	0	10
D	1-2	0	0	55	80
E	0-1	0	0	0	0
S					
A	4-5	200	255	350	390
B	3-4	50	80	100	110
C	2-3	0	0	0	0
D	1-2	0	0	0	0
E	0-1	0	0	0	0
SSW					
A	4-5	100	120	150	190
B	3-4	100	180	185	205
C	2-3	100	160	210	270
D	1-2	0	0	0	0
E	0-1	0	0	0	0
SW					
A	4-5	100	1010	1120	1220
B	3-4	0	0	10	30
C	2-3	50	75	125	150
D	1-2	25	45	55	55
E	0-1	0	0	0	0
WSW					
A	4-5	245	750	810	850
B	3-4	10	50	60	100
C	2-3	105	120	130	140
D	1-2	60	100	110	120
E	0-1	0	0	0	0
W					
A	4-5	200	285	320	575
B	3-4	15	80	130	180
C	2-3	85	125	200	220
D	1-2	20	40	40	40
E	0-1	0	0	0	0
WNW					
A	4-5	150	370	400	460
B	3-4	105	130	255	305
C	2-3	55	85	100	100
D	1-2	0	0	0	0
E	0-1	0	0	0	0
NW					
A	4-5	120	135	160	190
B	3-4	35	65	65	65
C	2-3	0	0	0	0
D	1-2	0	0	0	0
E	0-1	0	0	0	0
NNW					
A	4-5	0	675	785	875
B	3-4	0	300	400	480
C	2-3	0	200	300	350
D	1-2	0	0	0	50
E	0-1	0	0	0	0
N					
A	4-5	0	0	0	0
B	3-4	0	0	0	0
C	2-3	0	0	0	0
D	1-2	0	300	500	550
E	0-1	0	0	0	0
	TOTALS	1980	9045	10800	12150

TABLE 2.2-1B

0-10 MILE
REVISED SECTOR PROJECTIONS

Based on Winter
Permanent Peak Population Including Transients

SECTOR	DISTANCE	1970	1980	1990	2000
SSE	0-5	50	3310	3730	3880
	5-10	590	4150	5500	6250
S	0-5	250	335	450	500
	5-10	4000	5200	7300	9250
SSW	0-5	300	460	545	665
	5-10	1325	2160	2950	3800
SW	0-5	175	1130	1310	1455
	5-10	1210	3450	4250	5650
WSW	0-5	420	1020	1110	1210
	5-10	940	2950	4000	4300
W	0-5	320	530	690	1015
	5-10	900	1050	1450	1800
WNW	0-5	310	585	755	865
	5-10	9150	11750	14440	17420
NW	0-5	155	200	225	255
	5-10	26225	31940	41700	51550
NNW	0-5	0	1175	1485	1755
	5-10	2750	4650	5850	6700
N	0-5	0	300	500	550
	5-10	0	0	0	0

TABLE 2.2-1C

ESTIMATED AND PROJECTED NUMBER
OF PERMANENT RESIDENTS AND TRANSIENTS
WITHIN TEN MILES OF THE ST. LUCIE PLANT SITE
WINTER PEAK SEASONS (FEBRUARY - MARCH)
1970 - 2000

	Permanent			Transients		
Year	0 - 5 Miles	5 - 10 Miles	TOTAL	0 - 5 Miles	5 - 10 Miles	TOTAL
1970	1,680	45,340	47,020	300	1,750	2,050
1974	3,350	50,885	54,235	3,130	3,400	6,530
1980	5,145	63,300	68,445	3,900	4,000	7,900
1990	6,300	82,740	89,040	4,500	4,700	9,200
2000	7,250	101,520	108,770	4,900	5,200	10,100

TABLE 2.2-1D
CUMULATIVE POPULATION DATA*
FOR ANNULAR RADII

Miles	0-1		1-2		2-3		3-4		4-5		5-10		10-20	20-30	30-40	40-50
Year	1970	1974	1970	1974	1970	1974	1970	1974	1970	1974	1970	1974				
1970	0	0	105		175		235		650		45,340		24,450	47,950	55,950	126,300
1980	0	0	140	485	250	765	340	1,285	860	6,510	61,150	67,300	42,284	77,100	82,700	181,800
1990	0	0	180	760	320	1,065	450	1,780	1,150	7,195	82,980	87,440	60,850	108,830	109,600	240,350
2000	0	0	220	895	410	1,240	595	2,105	1,575	7,910	102,800	106,720	76,400	138,900	119,700	300,800

* Estimates based on the 1970 census update and the 1974 study are shown for comparison in the region of interest, 0 to 10 miles.

TABLE 2.2-2

SELECTED DATA ON AGRICULTURAL PRODUCTION

SELECTED COUNTIES

1964

Commercial Farms	St. Lucie	Martin	Indian River	Okeechobee	Palm Beach	Brevard
	COUNTY					
Dollar Value of Products Sold by Source:						
All Farm Products Sold	$32,676,856	$11,206,766	$21,421,540	$14,379,388	$96,159,282	$12,294,444
Average Per Farm	85,542	114,355	73,361	117,864	217,064	33,409
All Crops	30,512,990	8,222,745	19,723,766	499,752	86,213,300	11,671,839
Field Crops, Other Than Vegetables & Fruits & Nuts	31,360	12,896	2,593,156	10,551	27,007,431	320
Vegetables	3,492,515	1,030,959	189,989	199,000	48,738,596	18,309
Fruits and Nuts	26,754,853	1,977,531	16,533,130	250,451	4,360,845	11,269,990
Forest Products & Horticultural Specialty Products	234,262	5,201,359	407,491	39,750	6,106,428	383,220
All Livestock and Livestock Products	2,148,566	2,984,021	1,694,084	13,860,736	9,943,181	573,184
Poultry and Poultry Products	71,024	9,488	16,235	33,254	420,268	159,473
Dairy Products	1,006,776	2,067,045	768,102	11,205,926	7,215,230	98,394
Livestock and Livestock Products Other Than Poultry or Dairy	1,070,766	907,488	909,747	2,621,556	2,307,683	315,317

Note: Major categories (all crops and all livestock and livestock products) will not add to total dollar value of all products sold due to additional miscellaneous farm incomes not included in breakdown.

Source: U.S. Department of Commerce

TABLE 2.2-3

SELECTED DATA ON DAIRY FARMS

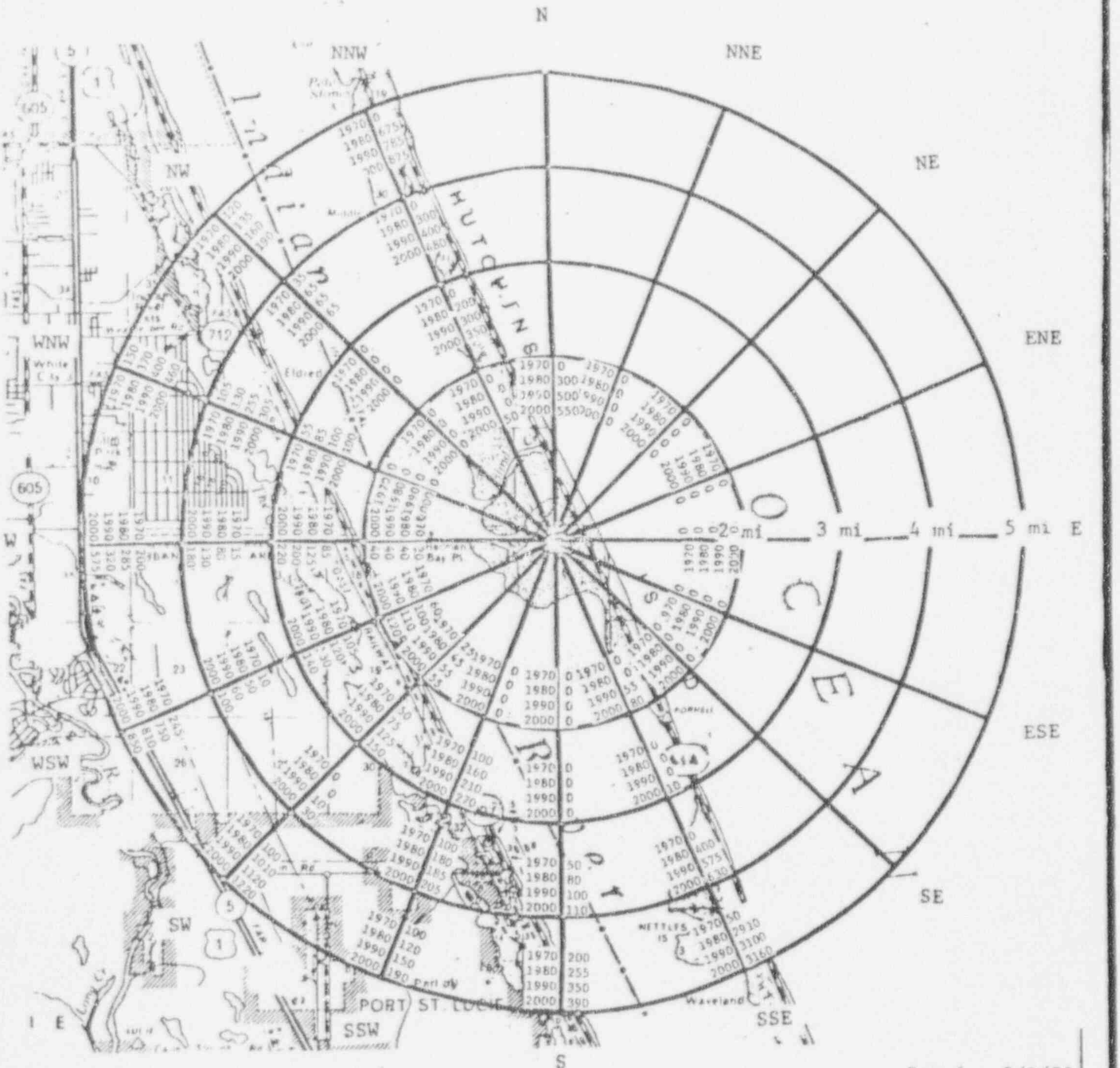
SELECTED COUNTIES

1964

	COUNTY					
	St. Lucie	Martin	Indian River	Okee-chobee	Palm Beach	Brevard
Total Farms Reporting Milk Cows	8	11	8	42	30	8
Number of Milk Cows	2,040	3,600	2,123	23,148	14,027	175
Breakdown of Farms by Number of Milk Cows at Hand						
1 or 2	3	3	4	17	3	6
3 or 4	-	1	-	3	1	-
5 to 9	-	-	-	1	4	-
10 to 19	-	-	-	1	-	-
20 to 29	-	-	-	-	-	-
30 to 49	-	-	-	1	-	-
50 or more	5	7	4	19	22	2
Commercial Farms Only						
Number of Farms with Milk Cows	7	10	5	30	23	5
Number of Milk Cows	2,039	3,599	2,119	23,123	13,929	171
Number of Farms Selling Milk and Cream	5	7	4	21	21	2
Dollar Value of Milk and Cream	$1,006,776	$2,067,045	$768,102	$11,205,926	$7,215,230	$98,394

Source: U.S. Department of Commerce

SL2



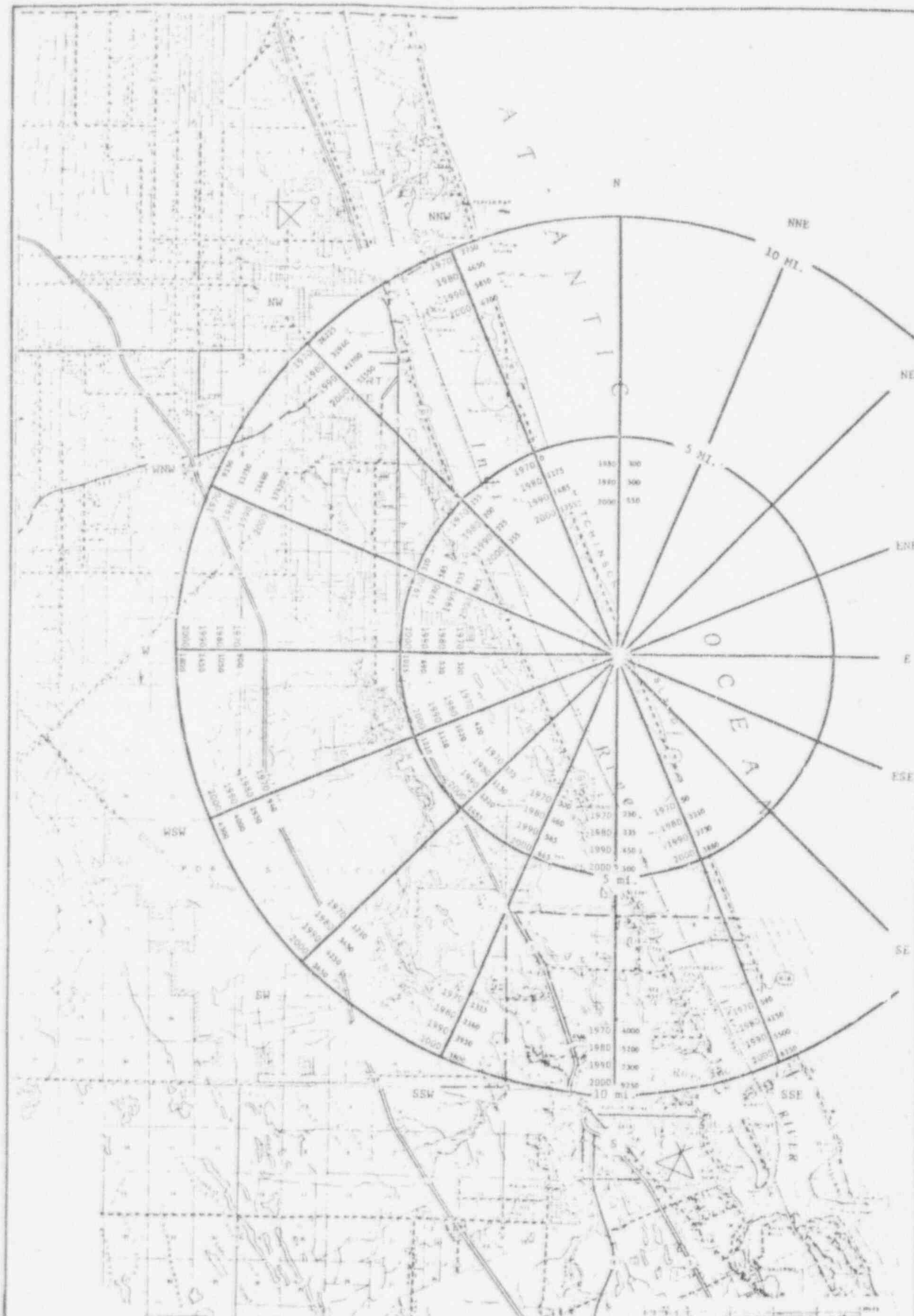
Rev 6 - 5/9/75

SCALE

ST. LUCIE PLANT

POPULATION DENSITY

FIG. 2.2-1



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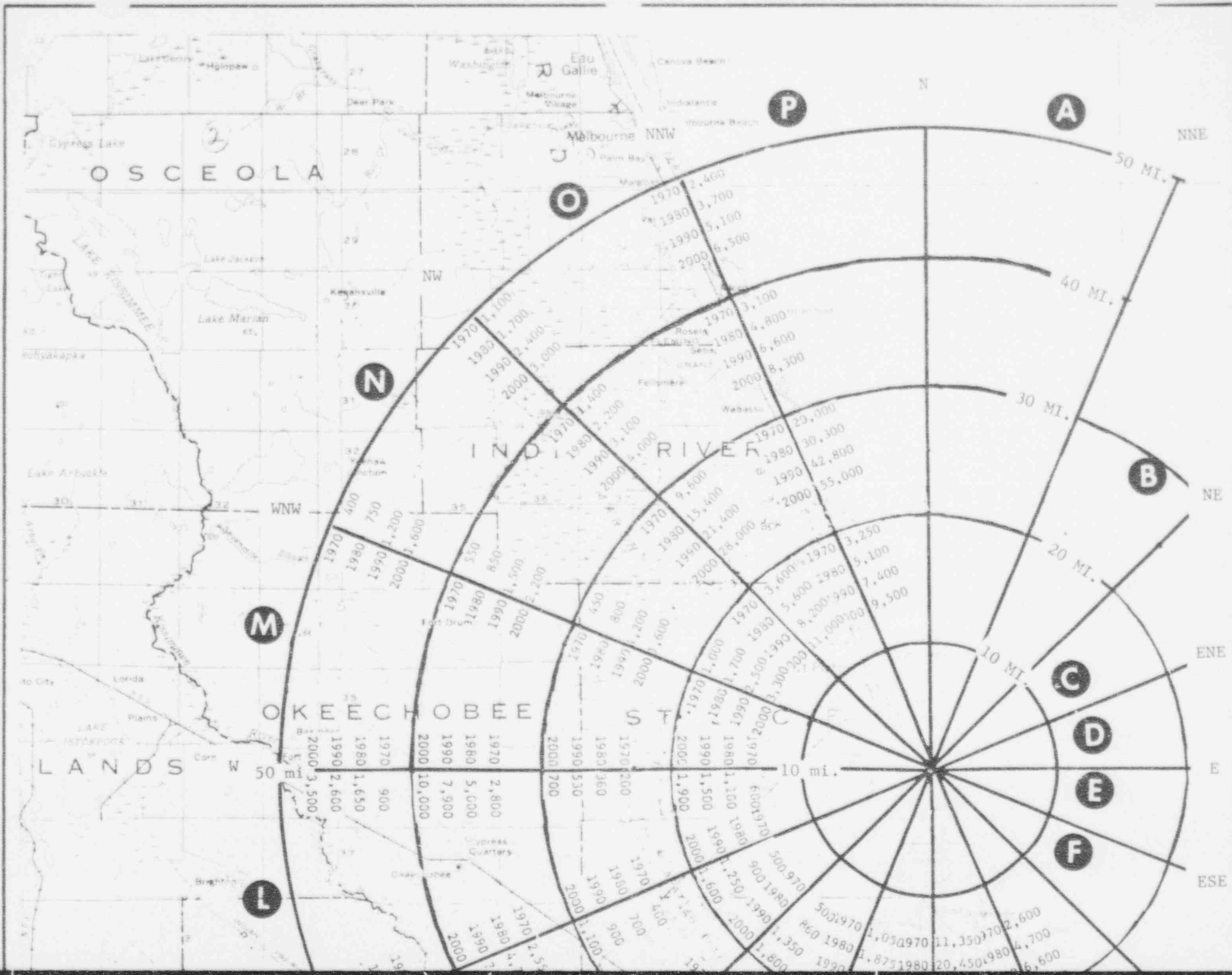
FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

POPULATION DENSITY WITHIN 10 MILES

FIGURE 2.2-2



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OSCEOLA
INDIAN RIVER
OKEECHOBEE
ST. LUCIE
LANDS
Melbourne
Eau Gallie
Palm Bay
Lake Marian
Lake Jackson
Lake Kissimmee
Cypress Lake
Lake Arbuckle
Kenansville
Yeehaw Junction
Fort Drum
Fellsmere
Wabasso
Roseland
Deer Park
Holopaw
Okeechobee
Cypress Quarters
Brighton
Lorida
Indialantic
Melbourne Beach
1970 2,400
1980 3,700
1990 5,100
2000 6,500
1970 3,100
1980 4,800
1990 6,600
2000 8,300
1970 20,000
1980 30,300
1990 42,800
2000 55,000
1970 3,250
1980 5,100
1990 7,400
2000 9,500
1970 3,600
1980 5,600
1990 8,200
2000 11,000
1970 9,600
1980 15,400
1990 21,400
2000 28,000
1970 1,000
1980 1,700
1990 2,500
2000 3,300
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1970 450
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1980 5,000
1990 7,900
2000 10,000
1970 900
1980 1,650
1990 2,600
2000 3,500
1970 200
1980 360
1990 530
2000 700
1970 600
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1990 1,500
2000 1,900
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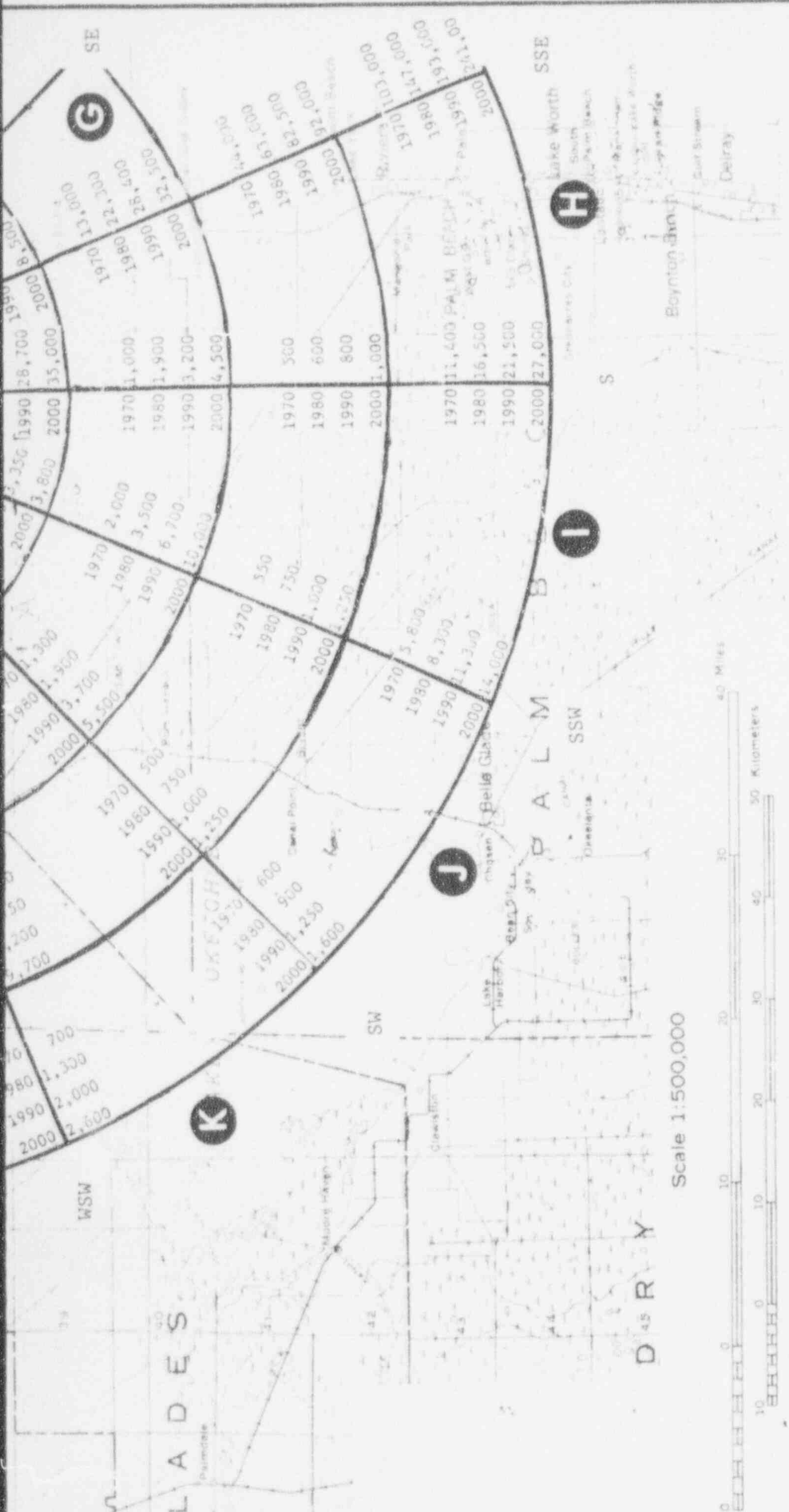
1980 900
1990 1,250
2000 1,600
1970 400
1980 700
1990 900
2000 1,100
1970 500
1980 860
1990 1,350
2000 1,800
1970 1,050
1980 1,875
1970 11,350
1980 20,450
1970 2,600
1980 4,700
6,600
1970 2,55



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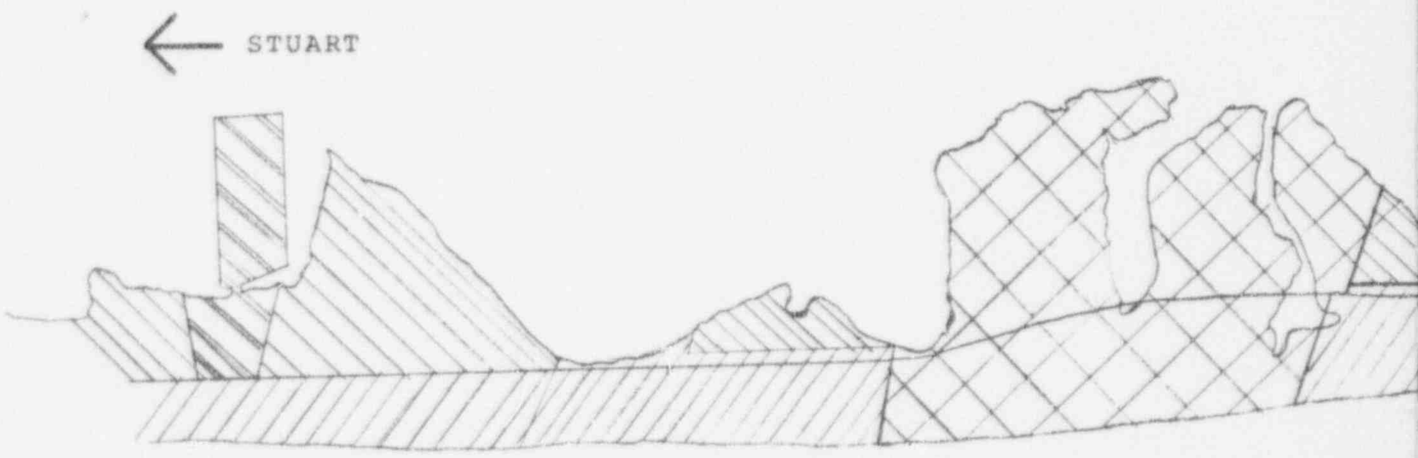
FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

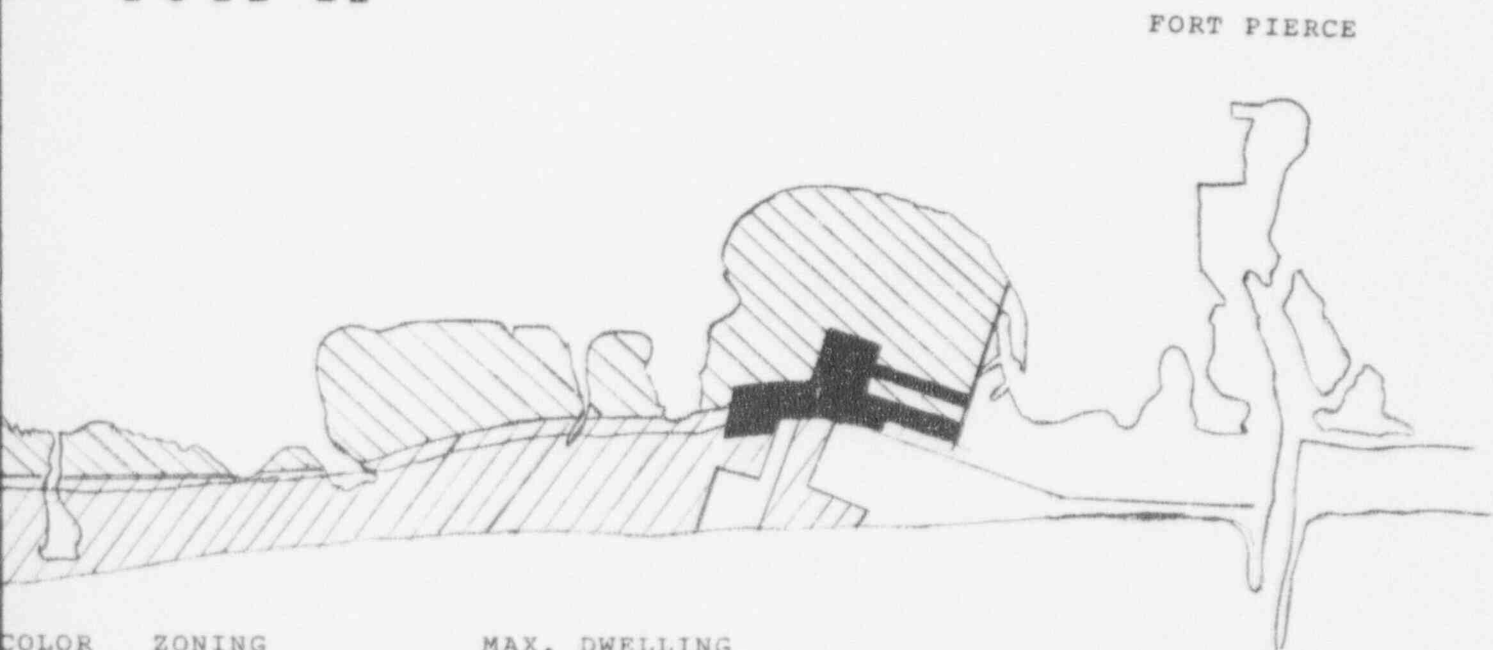
POPULATION DENSITY WITHIN
50 MILES

FIGURE 2.2-3

HUTCHINSO
ZONING



N. ISLAND
G MAP



COLOR CODE	ZONING CLASSIFICATION	MAX. DWELLING UNITS PER ACRE
	FPL SITE	
	B-2	18
	A-1(campground)	15
	A-1	1
	R-1A	3
	R-4	18*

* 36 for Motels & Hotels

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

HUTCHINSON ISLAND
ZONING MAP
FIGURE 2.2-4

1

2.3 REGIONAL HISTORIC AND NATURAL LANDMARK SIGNIFICANCE

The National Register of Historic Places[1] lists no historic places on or near the Plant site or Hutchinson Island. The nearest places listed are the Pelican Island National Wildlife Refuge and the site of Salvors Camp for Spanish Wrecks, both near the town of Sebastian approximately 40 miles north of the Plant. The Okeechobee Battlefield is located about the same distance west of the Plant, near the town of Okeechobee.

The State of Florida, Board of Archives and History states "no historical damage will be done by this project."[2] They further indicate there are unexplored middens and mounds, but these are mainly located on or near the north end of the site (that part of the site to be left in its natural state).

The transmission line right-of-way is being surveyed for possible historic, natural or archaeological sites of significance.

2.4 GEOLOGY

2.4.1 PHYSIOGRAPHY

The Floridan Plateau is the partially submerged southeastern peninsula of the North American Continental Shelf. The peninsula of the state of Florida is the exposed portion above sea level of the Floridan Plateau. This region is described as part of the Atlantic Coastal Plain physiographic province. The region of study generally includes the Florida Peninsula and the counties of St. Lucie, Martin, Indian River and Okeechobee.

Within this physiographic province is the Atlantic Coastal Ridge, which extends along the Atlantic Ocean shore as an irregularly shaped strip ranging from 5 to 10 miles wide between geomorphic units of the Eastern Sandy Flatlands and the Everglades swampland on the west and the Atlantic Ocean on the east.

2.4.2 GEOMORPHOLOGY

The site is located on the east coast of Florida on an offshore sand bar named Hutchinson Island, part of St. Lucie County.

Hutchinson Island has been developed and has remained exposed above mean sea level since the Pleistocene age, approximately one million years ago. The Pleistocene sediments are slightly thicker at the site than at the mainland due to the depositional processes associated with the island development.

There are about 13,000 feet of sedimentary rock formations overlying the crystalline rock basement in this region (1). Generally speaking, the upper 600 feet of sediments consist of soft rock formations that are partially cemented and indurated sands and clays. Beneath these materials are moderately hard to very hard formations of limestone, dolomite, sandstone, shale and anhydrite. These formations become thicker toward the east coast and gradually taper off near the center of the Florida Peninsula.

The topography of this area is a bar and swale type. There is a low bar near elevation (+) 14 feet on the ocean side of the island. The surface of the island then slopes downward toward the Indian River to about elevation (+) 4 feet, generally forming a swale or marsh. To the north and west of the site, both Big Mud Creek and the Indian River are continuations of the swale and are very shallow, 5 to 10 feet deep. There is a dredged channel in the Indian River as part of the Intracoastal Waterway. To the west, on the mainland, there is another bar with a maximum elevation of about (+) 40 feet parallel to the coast. To the east, the Atlantic Ocean deepens gradually to a depth of 120 feet at a distance of about 15 to 20 miles offshore from Hutchinson Island.

The site was originally covered by a mangrove swamp. A small road-dike, for mosquito control, has been constructed around the portion of the site that is adjacent to Big Mud Creek and the Indian River. The swamp usually has saline water as its surface water in the site area.

There is 4 to 6 feet of peat immediately beneath the surface of the undeveloped portion of the site. This material is a dark brown or black residuum produced by the partial decomposition and disintegration of trees, mangrove roots and other vegetation. This peat was probably formed during the past several thousand years.

2.4.3 STRATIGRAPHY

The Anastasia formation of Pleistocene age underlies the peat (2). No differentiation has been made between the various Pleistocene and possible Pliocene deposits which extend to about elevation (-) 135 to (-) 155 feet below sea level. This material has been termed "Anastasia Contemporaneous". There is an inference from geologic and engineering evidence that the discontinuous cemented pockets are the erosional remnants of the Fort Thompson formation. The Anastasia formation is quite possibly composed of marine, brackish and fresh water deposits. Petrographic studies have shown that at some locations, the well rounded, frosted sand is indicative of a beach or marine depositional environment. At other places within the formation, there is a blackening of shells which may indicate a reducing or brackish depositional environment. Also identified was a fresh water gastropod from one of the partially cemented, discontinuous pockets.

The Anastasia formation consists of gray, slightly clayey and silty fine to medium sand with fragmented shells and, in places, fragmented shell beds with slightly clayey to silty fine sands. There are also discontinuous pockets of cemented sandstone with shells and sandy limestone. Occasional discontinuous thin plastic clay lenses were also found in the upper part of the formation.

The Anastasia aquifer is the main source of water supply for several towns and cities in this coastal area, including the towns of Fort Pierce and Stuart.

The Hawthorne formation of Miocene age unconformably underlies the Anastasia in this region. This formation probably ranges from about 300 to 600 feet thick near the coast and thins toward the northwest. The upper 100 to 150 feet of the Hawthorne formation consists of green, slightly clayey and silty, very fine sand. The lower part becomes generally more clayey. In some areas, there are thin layers of sandy phosphatic limestone and chert in the lower part of the formation. In other areas, the lithology of the lower part of the Hawthorne formation changes slightly to a gray white phosphoritic sandy clay. This formation is generally dense and indurated due to desiccation and cementation.

Below the Hawthorne formation is a continuous horizon of Oligocene limestone called the Suwannee formation. The Suwannee limestone is a cream colored, slightly porous granular mass of limy particles. It contains very few distinguishable fossils. The Suwannee formation is separated from the Hawthorne by an unconformity. The Suwannee formation is probably the only Oligocene age formation in this area. The top of this formation is near elevation (-) 200 feet in Indian River County and thickens eastward to near (-) 700 feet in Martin County.

Below the Suwannee formation are formations of Eocene age. These formations include the Ocala Group limestones and the Avon Park limestone. The thickness of the Eocene age sediments in this area has not been precisely determined but is thought to be at least 1800 feet, or to extend to or below elevation (-) 2500 feet.

The Eocene formations dip and generally thicken to the southeast. The top of the uppermost formation within the Eocene formations, the Ocala limestone, is an irregularly eroded surface and its position is known only approximately.

Below the Eocene formations are the Paleocene formations. These formations are probably limestones and dolomites and extend to about elevation (-) 4200 feet. The Paleocene formations are relatively impermeable and not a part of the principal artesian system of Florida.

Below the generally dense Paleocene formations are the Upper Cretaceous or other Mesozoic rocks. These rocks extend downward to about elevation (-) 13,000 feet in this area. It is postulated that the basement rocks of gneisses and schists underlie the Mesozoic formations. This has not been verified as no well has penetrated that deep in this region.

2.4.4 STRUCTURE

The rocks composing Floridan Plateau range in age from recent deposits, which are still accumulating, to a Precambrian core of metamorphic and igneous rocks similar to those in the Piedmont of the eastern United States. It is believed that the Precambrian core is an arched peninsula with an axis oriented in a north-northwesterly direction (3).

Most of the state is underlain by formations of the Tertiary and Quaternary systems. They have never been subjected to great pressure from overburden or heat and have apparently never suffered from intense tectonic forces. As a result, they have become indurated only by cementation and chemical precipitation.

There is some evidence of faulting along both the east and west coasts (2,4). This is in the vicinity of the edge of the continental shelf in the southernmost portion of Florida. The faulting is essentially minor fracturing that is associated with the flexure of an arch rather than the profound faulting that would result from horst development. There is also a postulated normal fault in the western portion of Indian River County, 15 miles northwest of the site, which is aligned in a north-northwesterly direction (3). This fault has been postulated on a variation in the top of the Suwannee and Ocala Formations from data obtained in deep borings. However, contours can be drawn from the same data that show no faulting.

The St. Lucie River in St. Lucie County parallels the coast at a distance of about 2 miles inland. This is a possible lineation that may tie in with the postulated faults in Martin and Indian River Counties. The closest distance from this possible lineation to the site is about 3 miles. This possible lineation may also be explained by the bar and swale topography present in the area. However, there is no published geologic literature that indicates that this possible lineation is a fault or is even structurally controlled.

In order to check the possible significance of this lineation, two borings were located on the mainland opposite Hutchinson Island. The general stratigraphy found in these borings is in agreement with conditions found at the site. The borings show a gentle dip of the Miocene sediments toward the ocean, which is typical along the Florida east coast. Therefore, evidence indicates that there is no displacement in the Miocene formations within three miles of the site.

Extensive deep geologic and geophysical studies have been made to the north at Cape Kennedy in conjunction with the launching pads and supporting structures for the NASA space program. These deep borings have found some minor displacements within the Hawthorne formation of Miocene age. There is no suggestion from this work that these displacements extend as deep as the basement or into the overlying sediments. Geophysical studies north of Jacksonville, Florida show no sharp discontinuities in the thicknesses of Tertiary strata near the edge of the shelf that might suggest faulting.

The structure of the geologic formations at the site is uncomplicated. The younger or Pleistocene and Miocene formations are generally flat, dipping very slightly to the southeast at about 15 feet per mile. The older or deeper formations probably dip at a somewhat greater angle. There was no evidence found in the field work and borings to suggest any significant geologic structure within a two mile radius of the site.

2.4.5 SEISMOLOGY

The historical earthquakes observed in Florida have been infrequent, of low to moderate intensity, with epicenters far removed from the site (5,6). The one area of observed earthquake concentration, Green Cove Springs, is more than 180 miles from the site and about 25 miles south of Jacksonville, Florida. The other earthquakes within the state have been scattered. There is no evidence that any are related to known structural features. The strongest earthquake felt in the state was centered far to the north, at Charleston, South Carolina. There is no evidence of any structural features which might project the effects of such an earthquake toward this site at some later time.

There are reasonably well authenticated records of fourteen different earthquakes during the past 241 years whose epicenters were in or near the state of Florida. Two of these had estimated epicentral intensities of VI (Modified Mercalli Scale). Eleven others had epicentral intensities between IV and V. The remaining one had a still lower epicentral intensity.

Several of the postulated Florida epicenters are widely scattered throughout the Plateau. However, it is significant that ten, and possibly eleven, of the estimated epicenters have occurred within about 50 miles of Green Cove Springs. The nearest of these epicenters to the site is approximately 180 miles away.

The origin and the depth of the foci of these earthquakes in the vicinity of Green Cove Springs have not been established. The estimated intensities suggest that these are minor readjustments probably associated with the flexure which accompanied the formation of the Ocala uplift.

2.5 HYDROLOGY

2.5.1 SURFACE-WATER HYDROLOGY

The St. Lucie site is located on the Hutchinson Island in St. Lucie County. The surface hydrologic boundaries of the site are the Atlantic Ocean to the east and Indian River to the west. The average annual temperature is 75 F; the average annual precipitation at Fort Pierce is above 62 inches. The average annual water loss due to evaporation in the area is estimated to be 40 to 45 inches. Rainfall is seasonal, and above 65 percent of the annual amount occurs during the rainy season from June through October. During this period, the rain usually occurs as localized heavy showers. High soil permeability provides significant groundwater recharge from local precipitation, with little runoff.

According to information supplied by the Mosquito Control Commission at Fort Pierce, some areas of Hutchinson Island, including the site, were flooded nine years ago. This was accomplished by the construction of a five foot high road dike penetrated by culverts equipped with flap valves. High tide automatically provides the necessary water cover on the island during the months from September to March. During the remainder of the year water has to be pumped from the Indian River.

The United States Coast and Geodetic Survey Maps indicate the ave[illegible] range of ocean tide in this area to be approximately three feet [illegible]t the Indian River tidal range is approximately one foot.

Normal tides in the area are semidiurnal having two highs and lows of approximately equal magnitude every 23½ hours. Information contained in References 2 and 3 gives normal and spring tide ranges at Fort Pierce, St. Lucie Inlets (jetties) and at locations within the Indian River. Those data are given below.

	Mean Range (ft)	Spring Range (ft)	Mean Tide Level (ft)
Fort Pierce Inlet (Breakwater)	2.6	3.0	1.3
Fort Pierce (City Dock)	0.7	0.8	0.3
Jensen Beach	0.5	-	-
Port Sewall	0.5	-	-
St Lucie Inlet (Jetty)	2.6	3.0	1.3

According to data recorded at the Fort Pierce city dock, the average time difference between high water at the jetties and high water in the Indian River is +1 hour and 51 minutes. Between low water occurrences, the time difference is +2 hours and 11 minutes. High and low tides in the plant site vicinity occur 5 to 10 minutes later. Tide relationships between the ocean and St. Lucie Inlets, together with those between the Indian River at Fort Pierce and the site vicinity are graphically presented in Figure 2.5-1.

Limited data are currently available on the near-shore currents at Hutchinson Island. Readings taken by the Florida Department of Natural Resources are given in Table 6.1-2 and indicate that along shore flows vary from 1.6 fps southward to 0.4 fps northward. The Applicant is presently installing two recording current meters which will take readings for a period of one year (see Section 6.1.1.1 for details of the monitoring program). 0

In the West Palm Beach area, the maximum 24-hour total rainfall was 15.23 inches recorded in April, 1942. Short period rainfall amounts of 6.0 inches in one hour have been recorded west of the West Palm Beach area. The probable maximum precipitation, 32 inches, would occur over a small 10 sq. mile area during the first 24-hour period in a severe hurricane with a probable recurrence period of 75 to 100 years.

Due to the extremely shallow nature of the estuarine river adjacent to the site and to the flat terrain, the hydrological flood flow characteristics are dominated by surge flooding and the associated hurricane winds. In the September 1947 hurricane, 6 to 8 foot tides were noted in Indian River in the vicinity of Fort Pierce. In the August 1949 hurricane, a tide height of 8.5 ft MSL was recorded at Stuart, Florida near St. Lucie Inlet. In the September 1928 hurricane, which also affected Fort Pierce, a tide of 10.1 ft MSL was recorded at Palm Beach, some 50 miles to the south of Fort Pierce. In general, it appears that a tide elevation on the order of 8 plus feet due to a hurricane has been the highest observed in Indian River, both at the inlets and at opposite ends of the reach of river. The peak tide elevation due to the probable maximum hurricane (PMH) is estimated to be 11.8 ft MLW ocean (10.5 ft MSL) along the beach-front of Hutchinson Island, and 8.0 ft MLW river (7.7 ft MSL) in Indian River at the plant site.

In the PMH, a signficant wave height of 25 feet with a period of 9.3 seconds could be generated offshore of Hutchinson Island and directed toward shore. The significant wave height occurring in Indian River at or in the vicinity of the plant site during the PMH occurrence would be on the order of 5 feet with a wave period of 5.5 seconds. Wave runup was estimated from the breaking waves on the 1 and 3 side slopes surrounding the plant embankment. During an occurrence of the PMH, wave runup would be 10.12 feet from the oceanside and 5.8 feet from the Indian River above the peak tide elevations.

In consideration of the above results, all features of the plant essential to safety will be flood protected to an elevation +22 ft MLW ocean.

The Indian River is generically a salt water estuary rather than a river, and as such, does not have a sustained flow. It is not normally used as a water source or outlet with respect to the Hutchinson Island plant. Extreme low tides have been observed on numerous occasions in coastal bays and rivers bordering on or emptying into the Atlantic Ocean or the Gulf of Mexico. They are the result of hurricane passage far enough north or south of a coastal area (depending on whether east or west coast of Florida) to have sustained winds oriented either offshore (for bays and open coasts) or along the primary axis of coastal rivers. They may also occur as a result of a storm remaining stationary, or looping just offshore, so that sustained offshore winds of long duration prevail over the coastal area. For example, at Tampa, Florida tide levels at Seddon Island were lowered to -5.1 ft MSL during passage of the October 1944 hurricane. Similarly tides at Cedar Keys, Florida were lowered to -4.5 ft MSL as a result of the August 1949 hurricane, and to -3.1 ft MSL from the famed "Cedar Key Hurricane", which looped just offshore of the area. For a condition of extreme low tide to occur at the plant site, the PMH must either pass inland some 25-30 miles north of the plant site or remain stationary some 20-30 miles offshore of the site area. For the former condition north winds up to 60 mph would prevail over Indian River prior to storm passage inland; a wind shift to the west would then occur and wind speeds would increase to 100 mph and higher. Water levels in Indian River would be lowered rapidly from Fort Pierce southward to and including the plant site area under the effect of strong north winds. At low tide (see Figure 2.5-1) the average depth in the river is about 4 feet. Under 50-60 mph winds water levels would be lowered about 0.8 foot per mile below Fort Pierce and raised at a comparable rate in the vicinity of Jensen Beach. Some tidal inflow from the ocean at Fort Pierce would prevent water levels in that area from receding much below normal tide; however, near the center of the reach, i.e., the vicinity of the plant site, several feet of lowering can be expected to occur as the removal rate exceeds the inflow rate through Fort Pierce Causeway. It is estimated that an extreme low tide elevation of 3.0 ft MLW river can be expected to occur at the plant site during an occurrence of the above conditions.

St. Lucie Unit No. 2 will utilize 1150 cfs of water from the Atlantic Ocean as condenser cooling water. The Indian River will provide a source of up to a maximum of 30,000 gpm of water for the Emergency Cooling Water System. Further information concerning the plant surface water use is given in Section 3.3.1. 0

2.5.2 GROUND WATER HYDROLOGY

2.5.2.1 Aquifers

Regional

The region under study is the area of St. Lucie, Martin, Indian River, and Okeechobee Counties. Two main aquifers are found in this region: a shallow non-artesian or locally artesian aquifer, and a deep artesian aquifer.

The shallow aquifer is the principal source of fresh water in the site region. It consists of the Anastasia formation and extends to a depth of about 150 feet below the land surface. It is composed principally of sand that contains thin lenses of shell, limestone, or sandstone which are generally more permeable than the sand (2).

The shallow aquifer receives most of its recharge from rainfall in the immediate surface area. In general, surface water runoff is small. A small amount of recharge to the shallow aquifer also comes from downward seepage of artesian water used for irrigation.

The discharge of the shallow aquifer is by flow into streams, or lakes, by direct flow into the ocean, by evaportranspiration, and by pumping from wells. Canals and ditches in the area carry some ground water away. The transmissibility of this aquifer in Martin County has been measured to be approximately 20,000 gallons per day per foot (2).

The deep aquifer of the area and principal artesian aquifer of the region is the Floridian aquifer which underlies all of Florida and southern Georgia and consists mainly of permeable limestone beds. The top of the Floridian aquifer in Martin County is usually between 600 and 800 feet below the ground surface and underlies the Hawthorne formation which is an aquiclude. The thickness of the Floridian aquifer in this immediate vicinity is unknown, since no well has completely penetrated it. It is estimated to be approximately 2000 feet thick. The artesian pressure head (piezometric surface) in the area of the site is estimate to average about 45 feet (See Figure 2.5-2) below ground level.

The principal recharge area for the Floridian aquifer in this region is in the area of central Florida around Polk County where the limestone aquifer is overlain by semi-confining beds of the Hawthorne formation which are somewhat permeable for downward leakage or percolation.

The discharge points of the Floridian aquifer are springs and wells and areas where upward leakage occurs through the confining beds. There are no known natural springs in the region, but further discharge may occur in submarine springs approximately 25 miles off shore where the Floridian aquifer is exposed in the ocean floor.

Local

Underlying the 4 to 6 feet of surface peat is the Anastasia formation upper limit which extends to about elevations (-) 135 to (-) 155 feet and consists of grey, slightly silty, fine-to-medium sand with varying amounts of fragmented shells. It also contains discontinuous pockets of cemented sand with shells and sandy limestone. Occasionally, discontinuous thin, plastic clay lenses are found in the upper part of the formation. The Anastasia formation is an unconfined or non-artesian aquifer.

Below the Anastasia formation, the upper 100 feet of the Hawthorne formation at the site consists of a green, slightly clayey to silty, very fine sand. Conditions from about 250 feet and extending to the 400 foot depth of boring termination, are sandy and clayey silts which form the principal aquiclude for the underlying Floridian artesian aquifer.

2.5.2.2 Field Operations

To determine the general ground water environment at the proposed site, piezometers were installed in ten of the borings to measure ground water levels in the Anastasia and the Hawthorne formation (See Figure 2.5-3). Readings of water levels in the piezometers were taken periodically throughout April, 1968. The data are presented in summary form in Figure 2.5-4.

Two additional piezometers were installed in borings B-17 and B-18 on the mainland and monitored for the two month period from the end of June 1968 to the end of August 1968. The locations of these piezometers are shown on Figure 2.5-5. Rainfall records were kept for the same period. The results are presented in summary form on Figures 2.5-6.

Water samples were obtained from selected piezometers which sampled the Indian River (Big Mud Creek), and the water at the site (swamp water). Chemical tests were conducted on these samples. The test results are shown in Table 2.5-1.

The water temperature measured at various depths of the piezometers indicated an average of 75.8F with negligible variation. Private wells within a radius of 6 miles of the site were surveyed. The data collected are presented in Exhibit 2.5-1.

Constant head field permeability tests were conducted in accordance with the Bureau of Reclamation procedures. Detailed descriptions of the procedures and the results of the field permeability tests are shown in Exhibit 2.5-2.

2.5.2.3 Ground Water Levels

The ground water table occurs very near, or above, the ground surface at the site due to the mosquito control ponds. A continuous body of water was found at the site to the depths investigated. The slight artesian head of 0.5 to 1.0 foot was observed in piezometers P-1 and P-8 installed in the top of the Hawthorne formation (See Figure 2.5-4).

Ground water fluctuations in drill holes in response to tidal changes indicate relatively uniform transmissibilities of the sand desposits. Piezometer P-11 was installed near the Atlantic Ocean shore in the Anastasia formation and directly reflected tidal variations. Piezometers along the Big Mud Creek (P-7, P-9, P-10 installed in the Anastasis formation indicated water levels less than 0.5 foot above the tidal range recorded in the Big Mud Creek. This is probably due to the higher water level on the land side of the dike. Piezometer P-2 was installed partially into the Hawthorne formation, but it generally reflected the Anastasia levels.

On the mainland, piezometer readings varied more than those on Hutchinson Island. The piezometers reflected recent rainfalls within 1 to 5 days after the rainfall. The average water levels were generally decreasing after the large rainfall between July 5 and July 9. During this five day period, 5.82 and 4.91 inches of rain were recorded at Stuart and Fort Pierce, respectively. The effect of the tidal variation was not evaluated.

The average slope of the water levels between the two peizometers was 0.03 percent towards the ocean.

2.5.2.4 Ground Water Development

Water Use

All public, and most domestic, supplies of water in the region are obtained from ground water sources. Ground water is also used extensively for irrigation, stock watering and industry.

The cities of Fort Pierce and Stuart have public water supplies from wells developed in the shallow aquifer (See Table 2.5-2). The city of Fort Pierce water supply wells are 10 miles northwest of the site, and Stuart wells are 11 miles southwest of the site. No large industrial water usage exists in the area. Irrigation and stock watering account for a large percentage of withdrawals of ground water. The total use of artesian water for irrigation may be about 10 million gallons per day during the dry season. During the rainy season, most of these wells are not used.

Water Quality

Chemical analyses of water sample taken from the wells on the mainland indicate that the water from the shallow aquifer has a lower mineral content than the deeper artesian water (2).

The piezometric surface of the Floridian aquifer in Martin County is about 50 feet above mean sea level. This pressure head should be sufficient to insure at least 200 feet of fresh water below sea level. Artesian wells in Martin County down to about 1500 feet have shown high chloride content. It appears that this is due to seawater from the Pleistocene epoch rather than from recent sea water encroachment.

The natural fresh water source on Hutchinson Island is rainfall. Because of the low lying land, the permeable nature of the soils and the short distance to points of discharge, the water table is probably only a few inches above mean sea level. Wells in many places on the island are still in fresh water a foot of so below the water table. However, even moderate pumping allows salty water to enter the wells. At the plant site, pumping Indian River water into the pond has increased the mineral concentration of the ground water. Results of water chemical analyses on seven samples taken at the site are given in Table 2.5-1.

Soil Filtration

Field permeability tests made during this investigation have indicated a seepage rate of about 15,000 feet per year in the top 30 feet of the sand deposits at the site. Taking the highest permeability coefficient obtained and a hydraulic gradient of 100 percent, any discharge introduced into the ground at the reactor site would reach the Indian River in about a day. The discharge would be st ngly diluted immediately. Because of the proximity and width of the Indian River and the presence of low flow of ground water toward the coast line, there is no possibility of subsurface flow from the site to the mainland under these conditions.

2.5.2.5 Air Photo Studies

The four county area immediately west of the site was studied using aerial photographs and air reconnaissance to determine if there were any surface indications of geologic structure. The counties involved were Indian River County, St. Lucie County, Martin County, and Okeechobee County. The entire region was examined using the index mosaic sheets. The immediate vicinity of the site (within a radius of about 5 miles) was studied stereoscopically. The island and the adjacent areas were also covered by direct visual observation from the air.

The land-forms geomorphology of the four county area vary from flat to slightly rolling, typical of an emerging coast (3). The off-shore sand islands extending along the ocean shores of Indian River, St. Lucie, and Martin counties have a flat topography with a maximum elevation of about 15 feet. Across the Indian River on the mainland, a narrow beach ridge extends along the shoreline with a maximum elevation of about 40 feet.

Behind the ridge are found long, shallow, swampy, mucky-bottom swales. These swales are called "the Savannas", and they parallel and lie west of the narrow beach ridge bordering the Indian River. Beyond the Savannas, the land is generally flat with a maximum elevation of about 30 feet extending for approximately 20 miles inland where a gentle slope paralleling the coast line brings the ground elevation to approximately 70 feet within a distance of about 2 miles.

West of the Savannas and the beach ridge, the following general observations can be made about the surface drainage characteristics of the four county area:

a. Internal (vertical) drainage is the most prominent feature.

b. The two primary surface drainage ways in the area are the St. Lucie River (North Fork in St. Lucie County, South Fork in Martin County) and the Kissimmee River.

c. Sandy ridges and bluffs paralleling the coast line are found inland at several locations.

d. Man-made works such as canals and spoil banks have distorted the natural drainage patterns in some areas.

The primary and secondary drainage paths were located and defined as the first phase of the air photo study. The shapes of subsidence areas were noted to vary from perfectly circular to elongated. In general, the subsidence areas form a drainage pattern which can be described as a combination of collinear or parallel channelless basins and swallow holes reflecting past littoral action and the limestone-solution action of the flat-lying limestone, respectively.

The St. Lucie River North and South Forks, have a braided drainage pattern upstream and a slightly reticular drainage pattern near the mouth. Near the Indian River, areas of elongated bays with inter-related series of channels and oval lakes were observed along with swamps or marshes. The long axes of the ovals were generally found to be parallel to each other and to the coastline. Some ovals were not drained by surface channels. The indications are that the materials on the edges of these bays are unconsolidated, coarse grained, and the materials in the bays are generally soft, unconsolidated silt, pera, or other highly organic matter. These appear to be swales in the origninal beach deposits.

Several sand ridges were observed inland in the area under study. A well-drained sand slope runs parallel to the coastline along the northeast corner of the Okeechobee County into the western half of Martin County of Lake Okeechobee. This slope represents the limit of the Penholoway Terrace Postulated by Cooke (See Regional Geology Paragraph 2.4-1).

In general, the occurrence of the basins were noted to increase midway between these ridges. Otherwise, the basins were found to be randomly distributed. Even though a general southeasterly drainage direction is indicated for the primary drainage ways, the secondary drainage paths showed a random distribution of drainage directions. The local non-symmetrical tributary distribution of the secondary and primary drainageways appear to point to the influence of the sand ridges. The secondary drainage paths exhibit a generally dendritic drainage pattern.

Topographic and drainage patterns were found to have strong lineations parallel to the coast line (See Figure 2.5-7). The directions of the elongation of a great number of basins are also an indication of this general lineation. In Indian River County, the vicinity of Blue Cyprus Lake also very strongly shows a topographic as well as drainage lineation supplementing the general observation. This particular lineation appears to approximate an extension of the major sand ridge traversing the area of study. This ridge also forms the drainage divide between the Kissimee River and the St. Lucie River basins. Lineations indicated by the secondary drainageways are considered unreliable since artificial drainage efforts have altered natural drainage patterns extensively at this level of drainage, sometimes re-establishing minor drainage divides.

In conclusion, the air photo studies do not indicate any geologic structures that cannot be related to an emerging coast. The oval shaped swales, topographic and drainage lineations found are typical features of such a coast and the associated past littoral action. The circular subsidence areas (swallow holes) are probably a reflection of the limestone solution activity. None of the features mentioned exist at the site.

2.5.2.6 Conclusions

This investigation of the ground water hydrology of Hutchinson Island permits the conclusion that the possibility of any detrimental effect upon the mainland ground water environment from any accidental release of radioactive materials, gases, or from any other activities at the plant site is extremely remote.

TABLE 2.5-1

WATER QUALITY ANALYSIS

LAW ENGINEERING TESTING COMPANY

Lab. No.	8231	8232	8240
Sample Location	P-1	P-2	P-11
Date of collection	3-30-1968	3-28-1968	3-28-1968
Silica (SiO_2)	15.1	10.1	8.4
Iron (Fe)	1.4	1.2	4.1
Manganese (Mn)	0.0	0.0	0.0
Calcium (Ca)	1364	1820	1204
Magnesium (Mg)	781	190	173
Sodium (Na)	10000	11400	12700
Potassium (K)	477	427	406
Bicarbonate (HCO_3)	256	659	573
Carbonate (CO_3)	0	0	0
Sulfate (SO4)	2515	387	387
Chloride (Cl)	20800	19200	18600
Fluoride (F)	21	6	1
Nitrate (NO_3)	0.2	0.0	0.0
Dissolved solids			
Calculated	36164	33928	33907
Residue on evaporation at 105 C	39840	44580	45760
Residue at 600° C	35860	38960	40560
Organic solids	3724	4961	4627
Hardness as $CaCO_3$	6620	5330	3720
Noncarbonate hardness as $CaCO_3$.	6410	4790	3250
Alkalinity as $CaCO_3$, Phenolphthalein	0	0	0
Alkalinity as $CaCO_3$, Total	210	540	470
Specific conductance (micromhos at 25° C)	40000	38500	40000
pH	6.40	6.15	5.5
Color			
pH saturation (calculated)	6.84	6.38	6.60
Langelier Index, I	-0.44	-0.23	-1.10
Salinity	33630	33780	32680
Specific gravity	1.024	1.027	1.028

NOTE: All analytical results are in mg/liter

TABLE 2.5-1

WATER QUALITY ANALYSIS

LAW ENGINEERING TESTING COMPANY

Lab. No........................	8231	8232	8240
Sample Location	P-1	P-2	P-11
Date of collection............	3-30-1968	3-28-1968	3-28-1968
Silica (SiO_2).................	15.1	10.1	8.4
Iron (Fe).....................	1.4	1.2	4.1
Manganese (Mn)................	0.0	0.0	0.0
Calcium (Ca)..................	1364	1820	1204
Magnesium (Mg)................	781	190	173
Sodium (Na)...................	10000	11400	12700
Potassium (K).................	477	427	406
Bicarbonate (HCO_3)............	256	659	573
Carbonate (CO_3)...............	0	0	0
Sulfate (SO4).................	2515	387	387
Chloride (Cl).................	20800	19200	18600
Fluoride (F)..................	21	6	1
Nitrate (NO_3).................	0.2	0.0	0.0
Dissolved solids			
Calculated..................	36164	33928	33907
Residue on evaporation at 105 C	39840	44580	45760
Residue at 600° C...........	35860	38960	40560
Organic solids..............	3724	4961	4627
Hardness as $CaCO_3$.............	6620	5330	3720
Noncarbonate hardness as $CaCO_3$.	6410	4790	3250
Alkalinity as $CaCO_3$, Phenolphthalein	0	0	0
Alkalinity as $CaCO_3$, Total.....	210	540	470
Specific conductance (micromhos at 25° C)...........	40000	38500	40000
pH............................	6.40	6.15	5.5
Color.........................			
pH saturation (calculated).....	6.84	6.38	6.60
Langelier Index, I............	-0.44	-0.23	-1.10
Salinity......................	33630	33780	32680
Specific gravity..............	1.024	1.027	1.028

NOTE: All analytical results are in mg/liter

TABLE 2-5-1 (Cont'd)

WATER QUALITY ANALYSIS

LAW ENGINEERING TESTING COMPANY

Lab No.	8233	8234	8235	8236
Sample Location	P-3a	Big Mud Creek	Swamp Water	P-9
Date of collection	3-31-1968	3-31-1968	3-31-1968	4-6-1968
Silica (SiO_2)				
Iron (Fe)				
Manganese (Ma)				
Calcium (Ca)	432	436	440	1800
Magnesium (Mg)				
Sodium (Na)				
Potassium (K)				
Bicarbonate (HCO_3)	354	305	232	854
Carbonate (CO_3)	0	0	0	0
Sulfate (SO_4)	2709	2902	3225	271
Chloride (Cl)	17600	19400	20800	19200
Fluoride (F)				
Nitrate (NO_3)				
Dissolved solids				
Calculated 105 C.	45600	40540	44940	44880
Residue on evaporation at 600° C.	30220	31140	34540	38740
Hardness as $CaCO_3$				
Noncarbonate hardness as $CaCO_3$				
Alkalinity as $CaCO_3$, Phenolphthalein	0	0	0	0
Alkalinity as $CaCO_3$, Total	290	250	190	700
Specific conductance (micromhos at 25° C)				
pH	7.10	7.40	7.70	6.30
Color				
pH saturation (calculated)	7.25	7.28	7.42	6.24
Langelier Index, I.	-0.15	+0.12	+0.28	+0.06
Salinity	31230	34330	36630	33630
Specific gravity	1.018	1.020	1.024	1.026

NOTE: All analytical results are in mg/liter

TABLE 2.5-2

AVERAGE CHARACTERISTICS OF
FORT PIERCE AND STUART
PUBLIC WATER SUPPLY WELLS

CITY	NO. OF WELLS	AVERAGE GROUND SURFACE ELEV.	AVERAGE DEPTH OF WELLS	AVERAGE GAL. PER DAY PER WELL
Ft. Pierce	17	+20	110 Ft.	500,000
Stuart	12	+15	105 Ft.	170,000

EXHIBIT 2.5-1

PRIVATE WELL SURVEY

In May 1968 the existing private wells within a six mile radius of around the site were surveyed by Law Engineering Testing Company.

In addition to Hutchinson Island, where only two wells were found, the area surveyed can be divided into two zones of well concentration:

1. Along State Road 707
2. Along U.S. Highway #1

In these zones there were many private wells. Therefore, no attempt was made to locate and record every well in the area. Approximate number of wells in the various communities are given in Table 2.5-3. Other data are presented below.

In general, every house was found to have one or more wells. Also, almost every well was found to be capped and attached to a pump so that measurements of water levels could not be made at the time of the survey. All shallow wells in the area are drilled and cased full depth with screen on the ends. In the area of Eldred and Eden, shallow wells are 20 to 40 feet deep. Further inland, in White City, 40 to 60 feet deep wells are common.

Only two roads extend west from SR-707 to U. S. #1 within the survey area. These are the Walton Road and the White City Road (SR-712). Along the former, there are no wells. South of SR-712 is a large tract owned by General Development Corporation (Indian River Estates). Presently, this development has 22 homes with expansion planned for the near future.

The cities of Fort Pierce and Stuart have water supply systems on U. S. #1, the Fort Pierce water system extends to the State Farmer's Market. Water from Stuart is piped to Hutchinson Island. This system extends as far north as Holiday Out, a trailer resort located in St. Lucie County approximately 5 miles south of the site. The Port St. Lucie Community, which presently has 500 to 600 homes, also has a private water supply system.

There is no heavy industrial demand for water supply in the area surveyed.

EXHIBIT 2.5-2

FIELD PERMEABILITY TESTING

Two types of pump-in, constant head type field permeability tests were conducted at two locations, as shown on Figure 2.5-8. These consisted of open-end pipe and well permeater methods of testing, as outlined in the Bureau of Reclamation's "Earth Manual". (1) Field permeability tests were also planned at proposed locations of major structures in the swamp area and borings were made for this purpose. However, these holes were found to be clogged with organic fines. In an attempt to remedy this problem, the bore holes were re-drilled and cleaned, using clean swamp water and diluted hydrochloric acid. However, this attempt failed; therefore, tests in the swamp were abandoned.

A total of four test holes were drilled in the vicinity of Boring B-2, two for the open-end pipe (PC-1 and PC-2, fully cased) and two for the well permeameter method (PU-1 and PU-2, partially cased). Dimensions for these holes are shown in Figure 2.5-9. The subsurface conditions as determined by boring B-2 are given in the attached log, Figure 2.5-10.

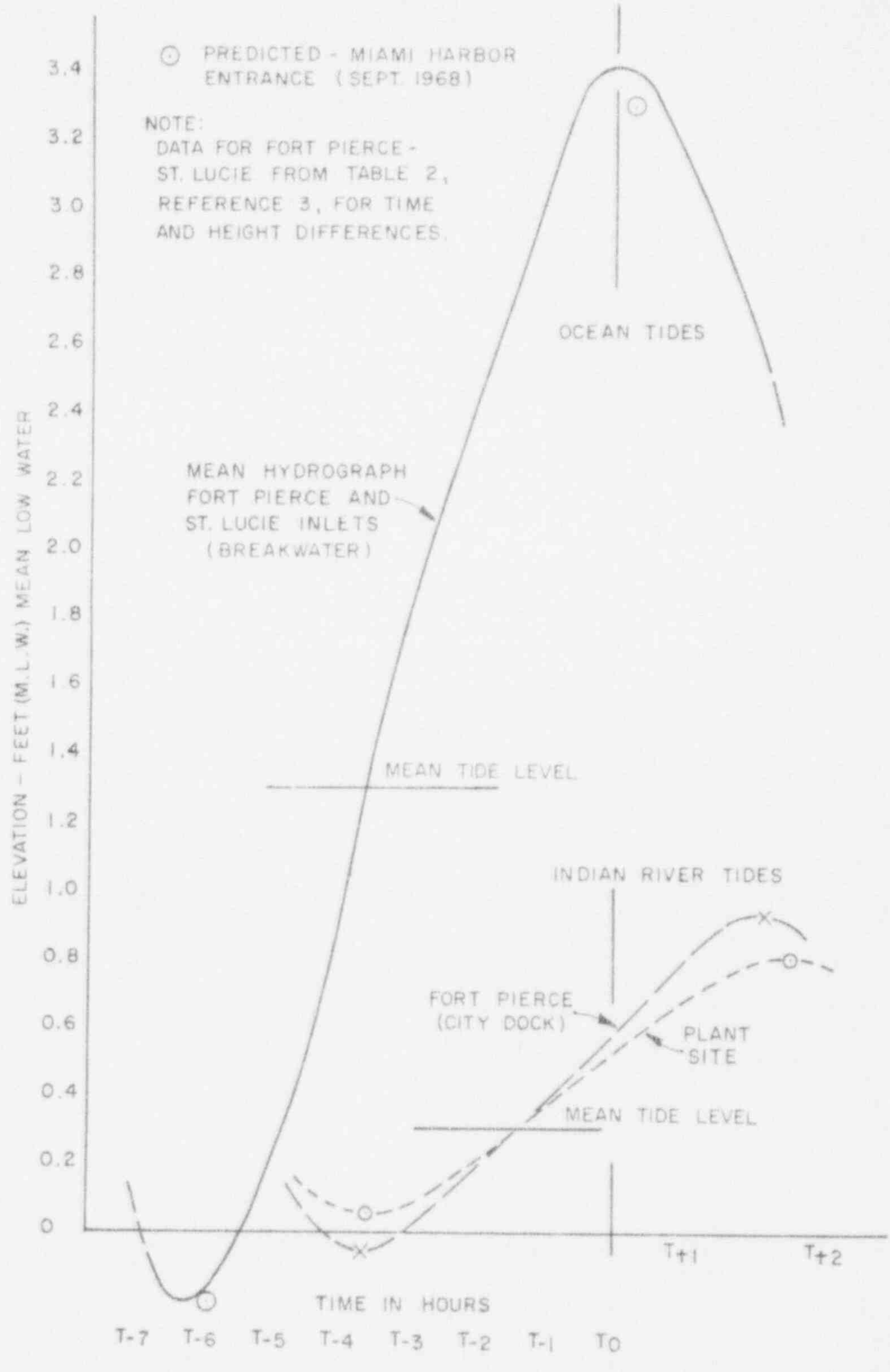
In all test holes, casings were advanced by jetting or by washing and driving. All holes were carefully cleaned before testing was begun. After cleaning, cased holes PC-1 and PC-2, were completely filled with limestone ranging in size from 3/8 to 4 inches. All casings were sealed on the outside using expansive clay pellets.

In conducting all permeability tests clean water was pumped into the casing and a constant gravity head maintained in the casing during the test. The flow was measured with a water meter, the constant head in the casing being maintained by means of regulating valves.

Graphs of cumulative discharge versus cumulative time are shown in Figures 2.5-11 through 2.5-14. The coefficients of permeability were determined using the steady flow part of these curves for the two types of tests.

The field permeability values obtained for all four tests are shown in Figure 2.5-8. Laboratory permeability test results compare favorably with these values.

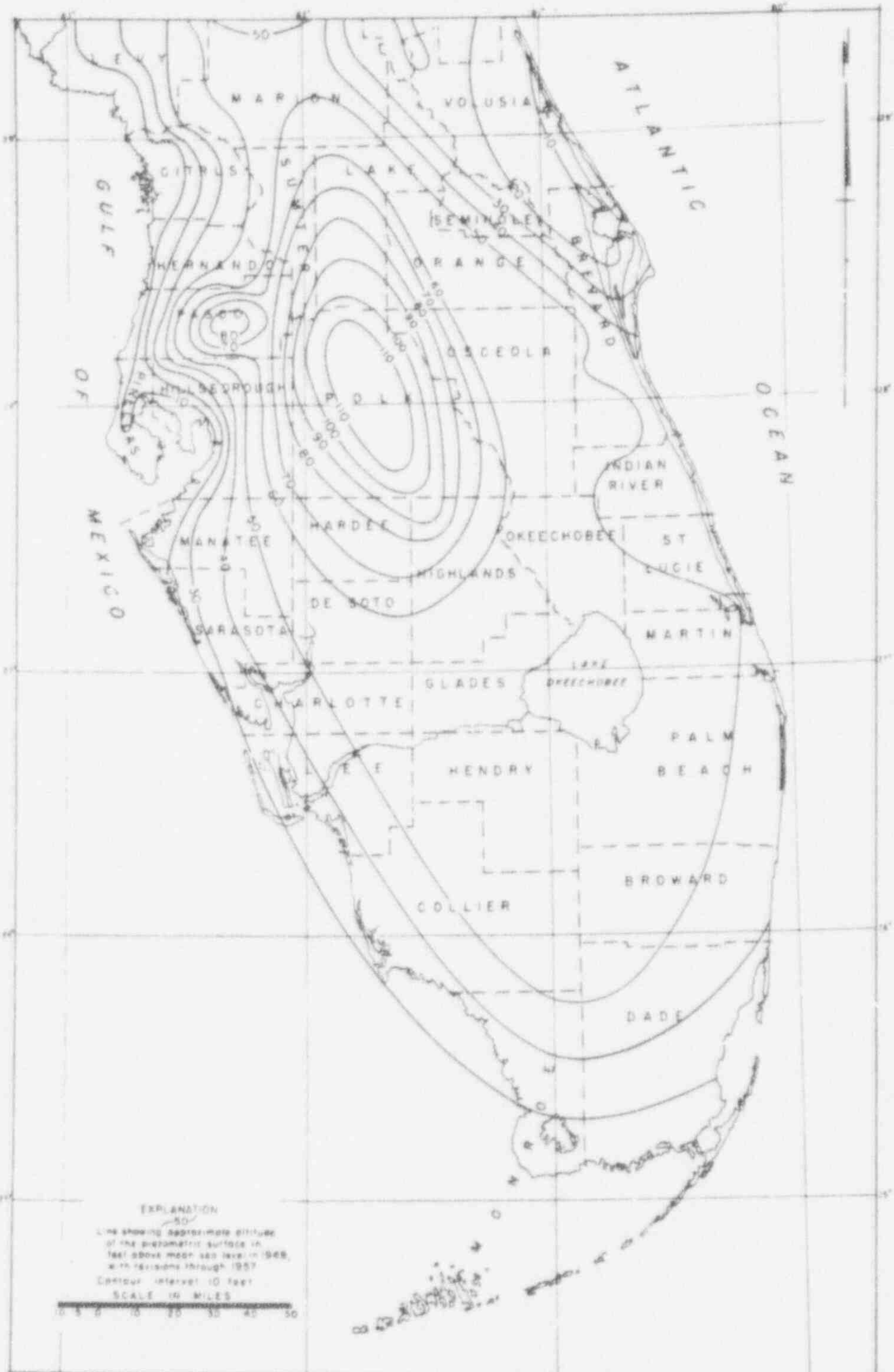
(1) Bureau of Reclamation, Earth Manual, Denver, Colorado, 1963, First Edition, Revised, pp. 541-562.



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

HUTCHINSON ISLAND PLANT NORMAL TIDE RELATIONS VICINITY OF HUTCHINSON ISLAND

FIGURE 2.5-1



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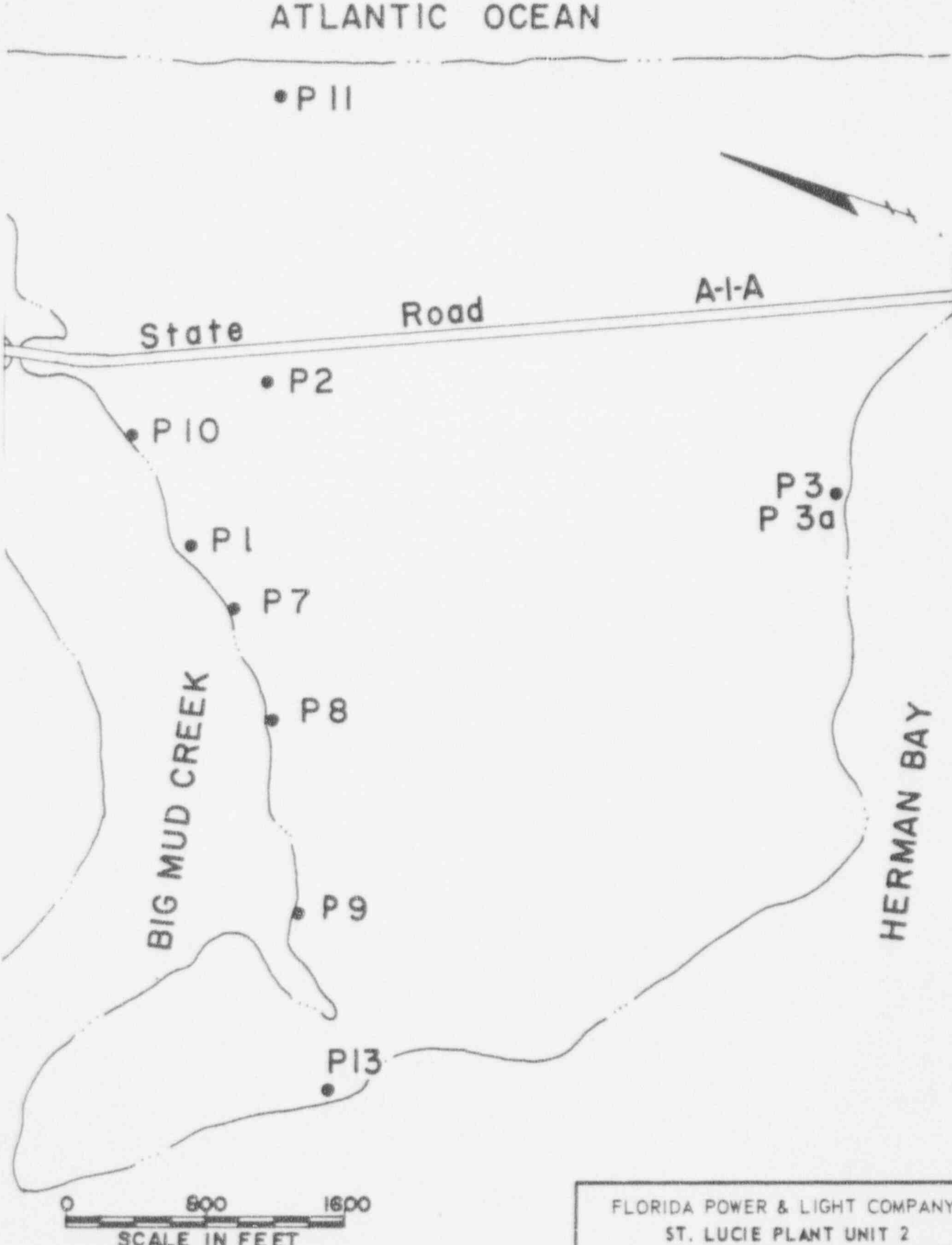
PIEZOMETRIC SURFACE OF THE FLORIDAN AQUIFER

FIGURE 2.5-2



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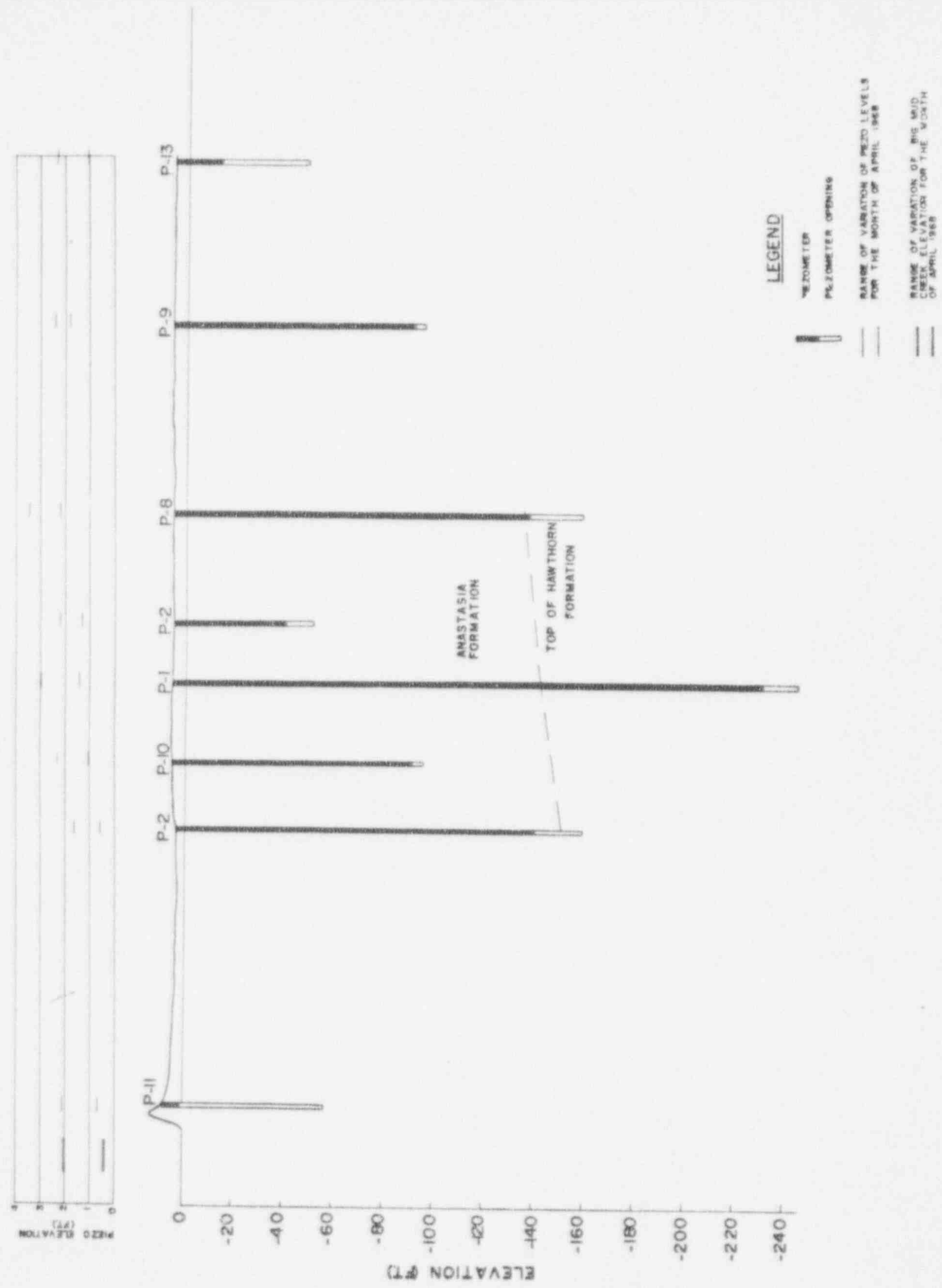
PIEZOMETER LOCATIONS

FIGURE 2.5-3



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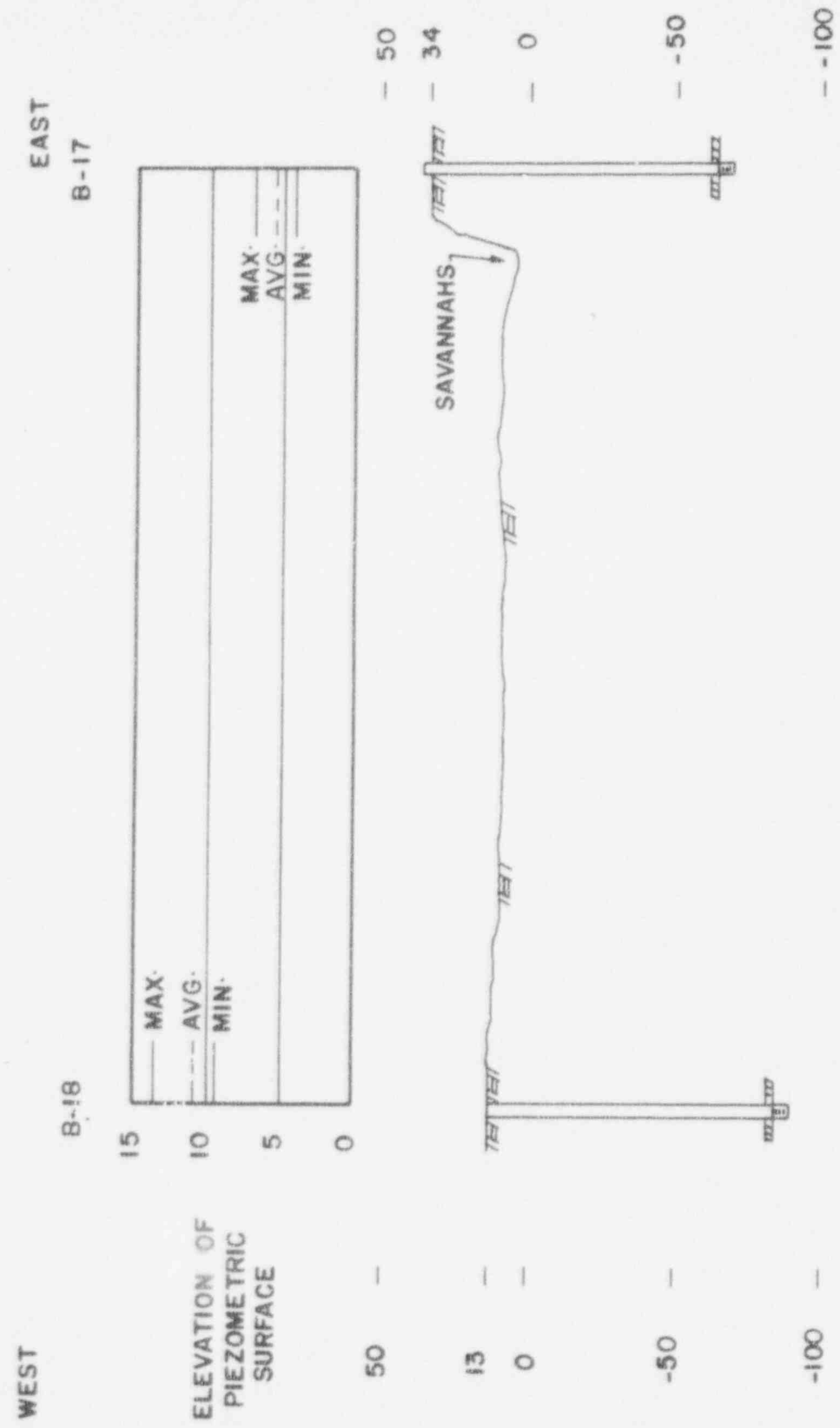
PIEZOMETRIC CROSS SECTION

FIGURE 2.5-4



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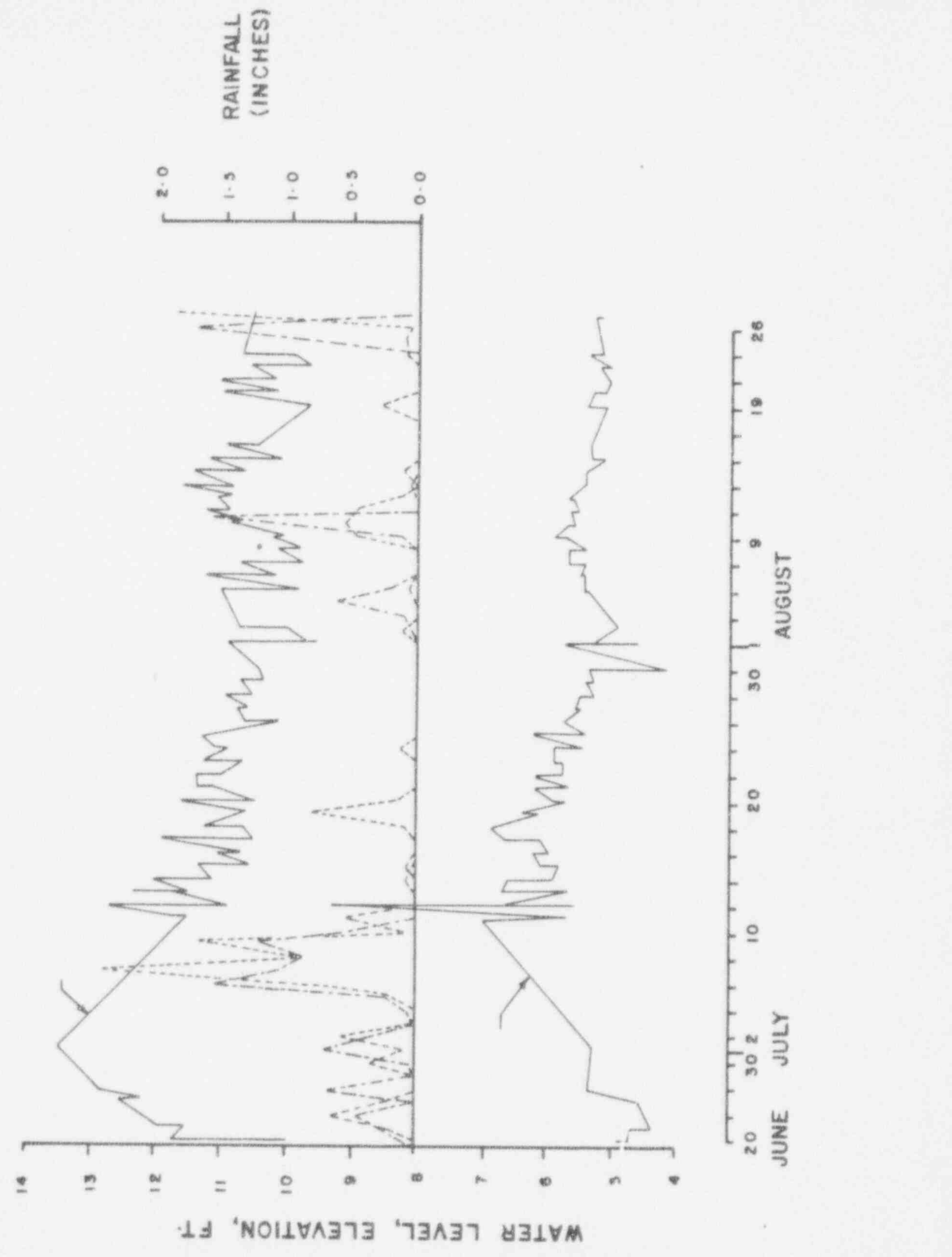
PIEZOMETRIC CROSS SECTION
BORINGS 17 AND 18

FIGURE 2.5-5



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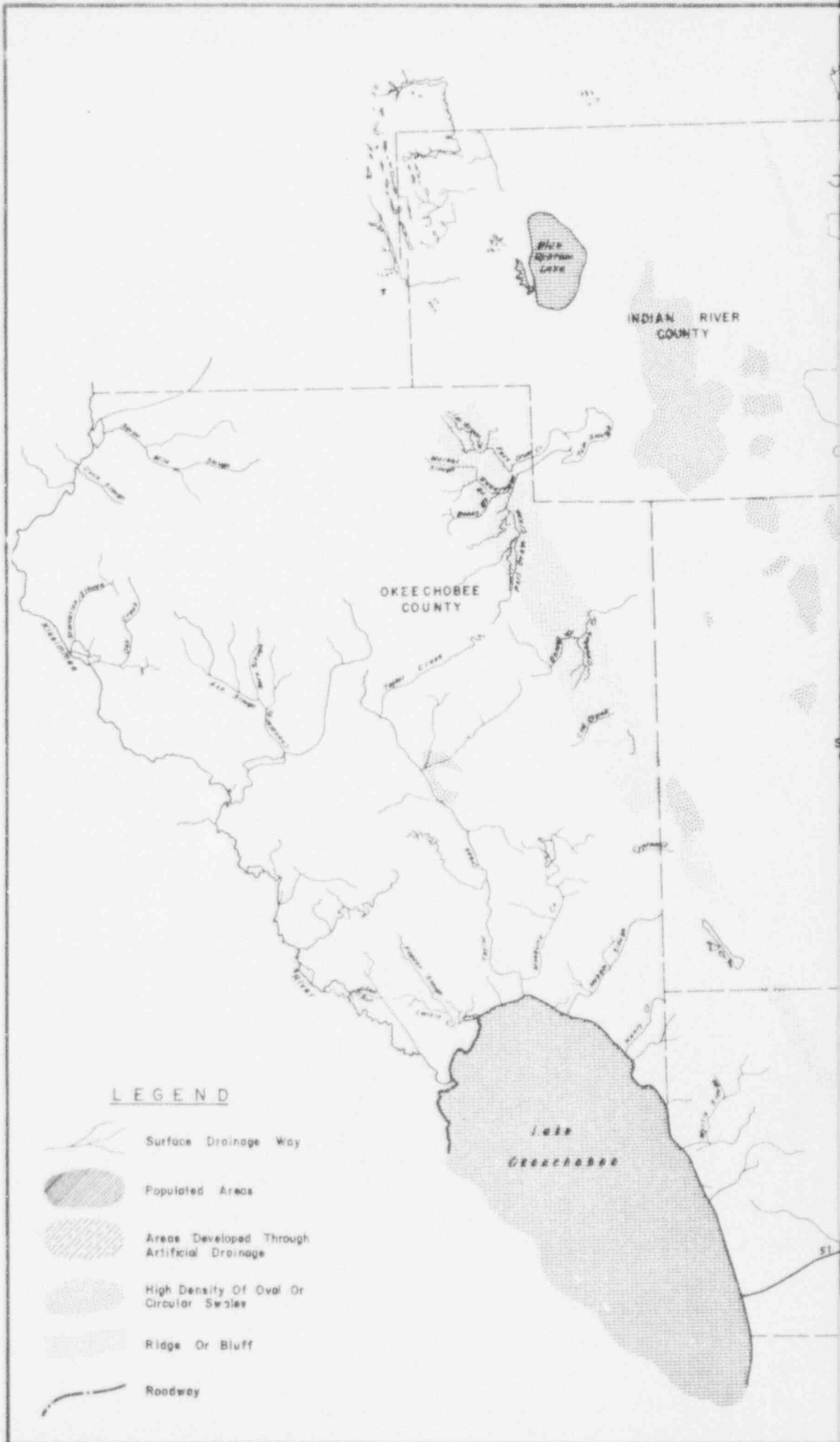
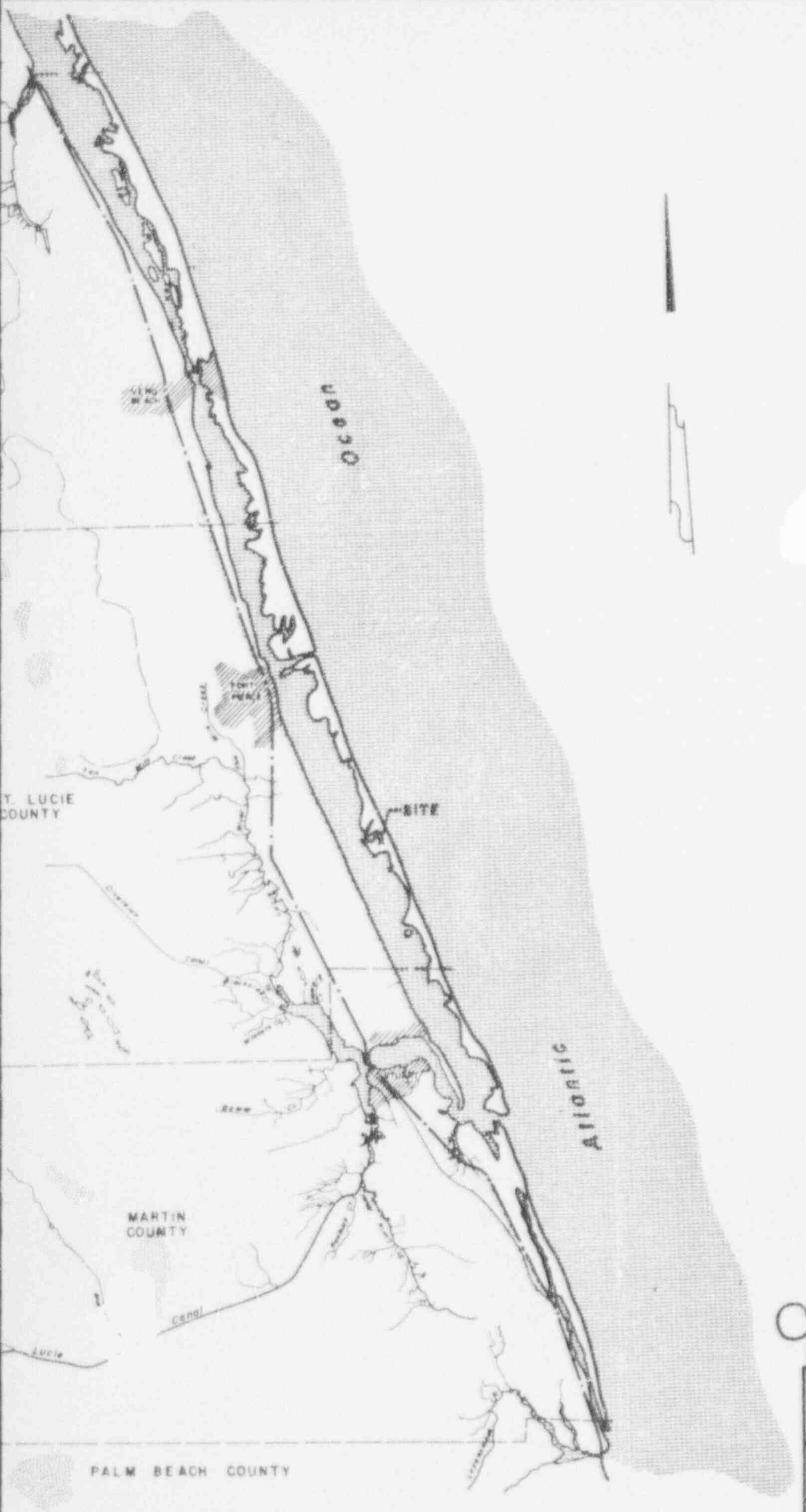
PIEZOMETRIC DATA FOR P-17, P-18

FIGURE 2.5-6


INDIAN RIVER COUNTY
OKEECHOBEE COUNTY
Lake Okeechobee
LEGEND
Surface Drainage Way
Populated Areas
Areas Developed Through Artificial Drainage
High Density Of Oval Or Circular Swales
Ridge Or Bluff
Roadway



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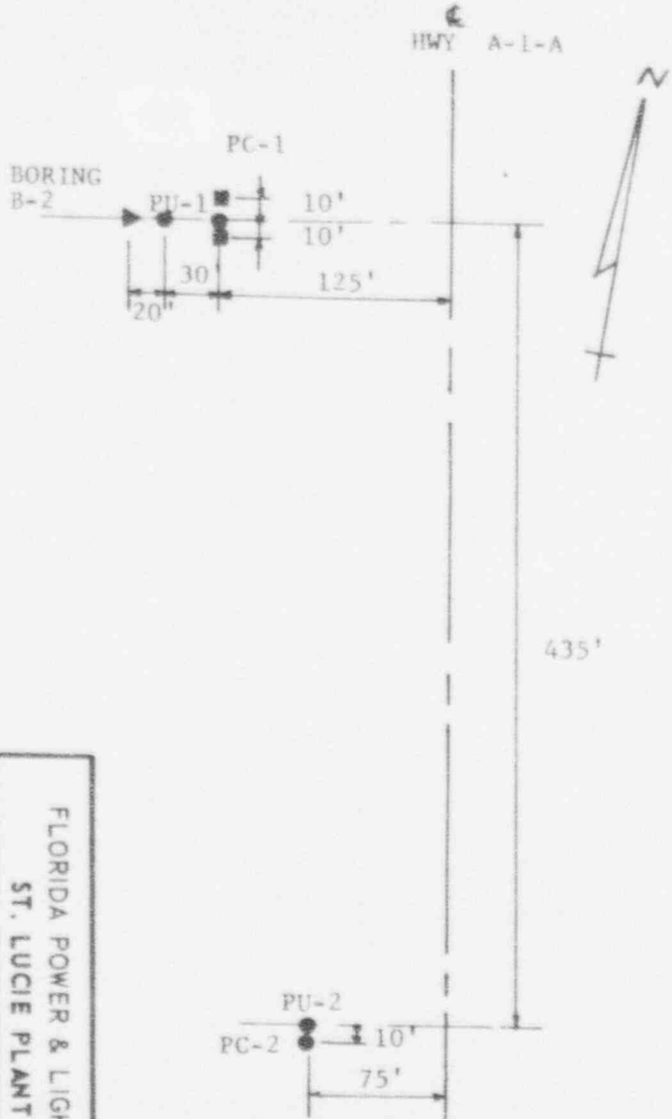
ST. LUCIE PLANT UNIT 2

REGIONAL MAP OF SURFACE DRAINAGE

FIGURE 2.5-7



TEST RESULTS

HOLE	PERMEABILITY, k (FEET PER SECOND)	
	OPEN PIPE METHOD	WELL PERMEAMETER METHOD
PC - 1	7.5×10^{-3}	
PU - 1		6.7×10^{-4}
PC - 2	3.4×10^{-5}	
PU - 2		4.9×10^{-5}

HUTCHINSON ISLAND - NUCLEAR PLANT
JOB NUMBER EC-163

LABORATORY PERMEABILITY TESTS

Permeability Tests were run on undisturbed samples from two locations. The samples were cut into discs 2.5 inches in diameter and 1 inch thick and sealed in closed chambers. They were then subjected to an unbalanced head of water and the rate of flow through the soil was measured.

RESULTS

BORING NO.	DEPTH	e	k	SOIL CLASSIFICATION
B-8	15'-16.5'	0.740	9.9×10^{-2} ft./min.	GREY SLIGHTLY SILTY FINE TO COARSE SAND (SHELL FRAGMENTS RETAINED IN SIEVE NO. 40)
B-13	35'-37'	0.915	2.8×10^{-2} ft./min.	GREY SLIGHTLY SILTY VERY FINE SAND WITH TRACE OF SHELLS

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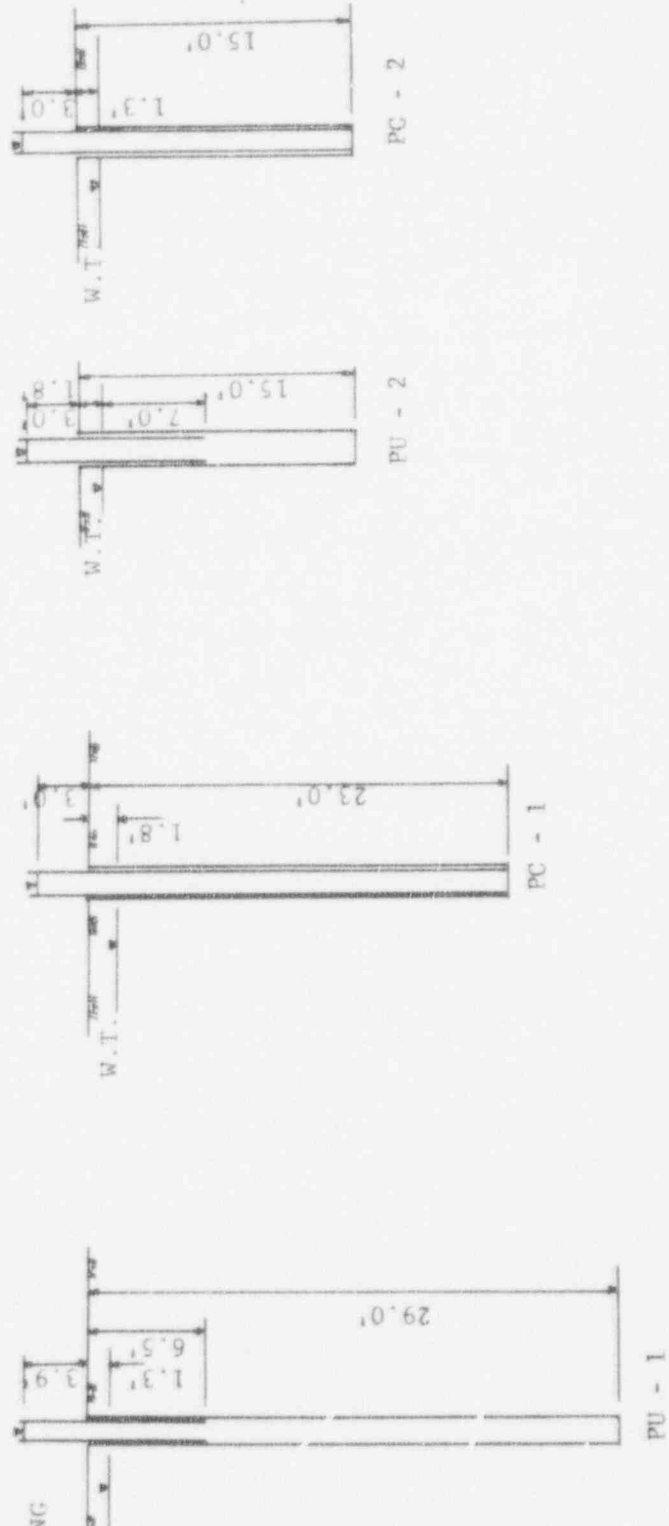
TEST BORING RESULTS

FIGURE 2.5-8



NOTE: 4 inch I.D. casing used throughout.

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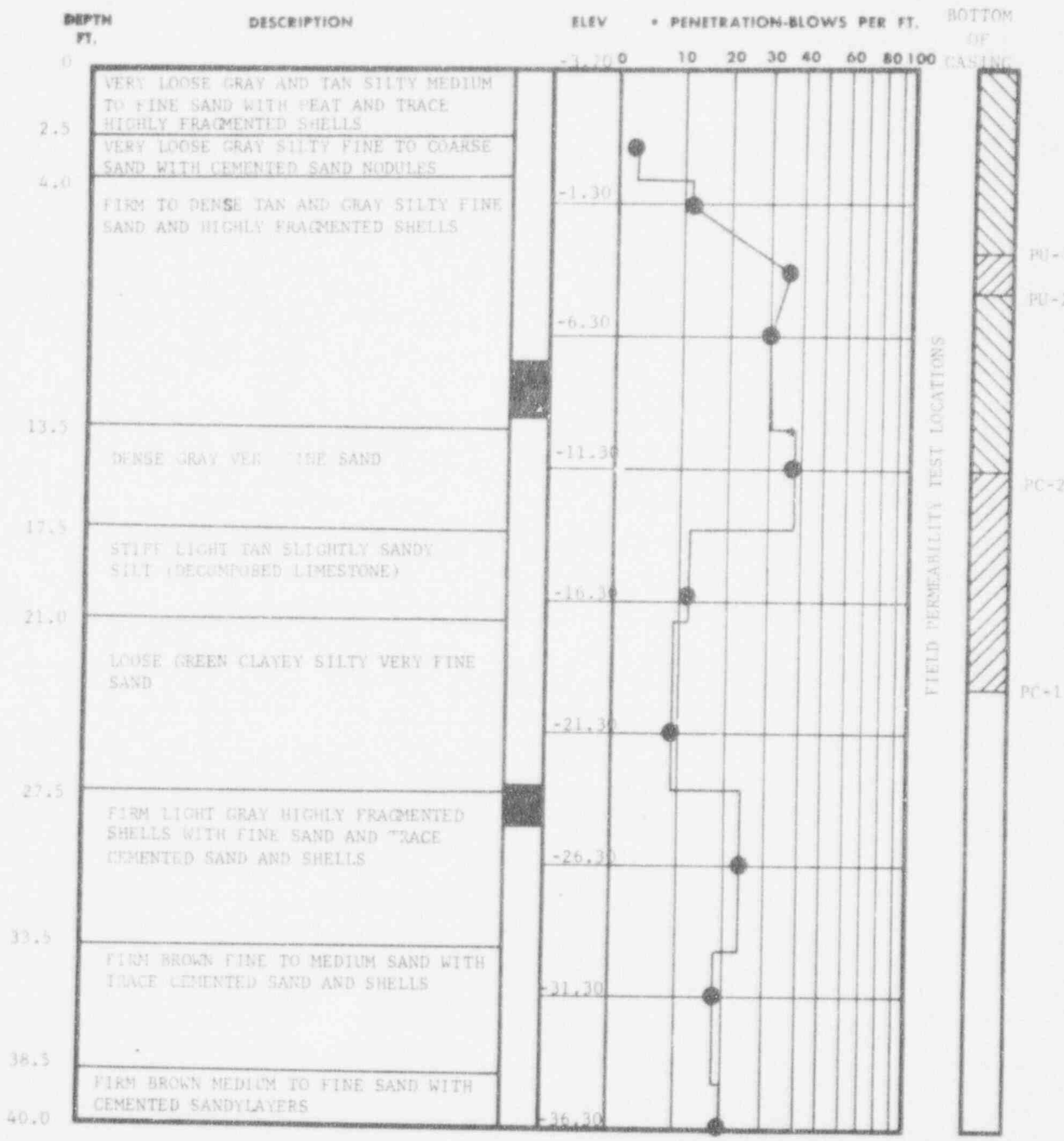
ST. LUCIE PLANT UNIT 2

CASING ARRANGEMENT

FIGURE 2.5-9



TEST BORING RECORD

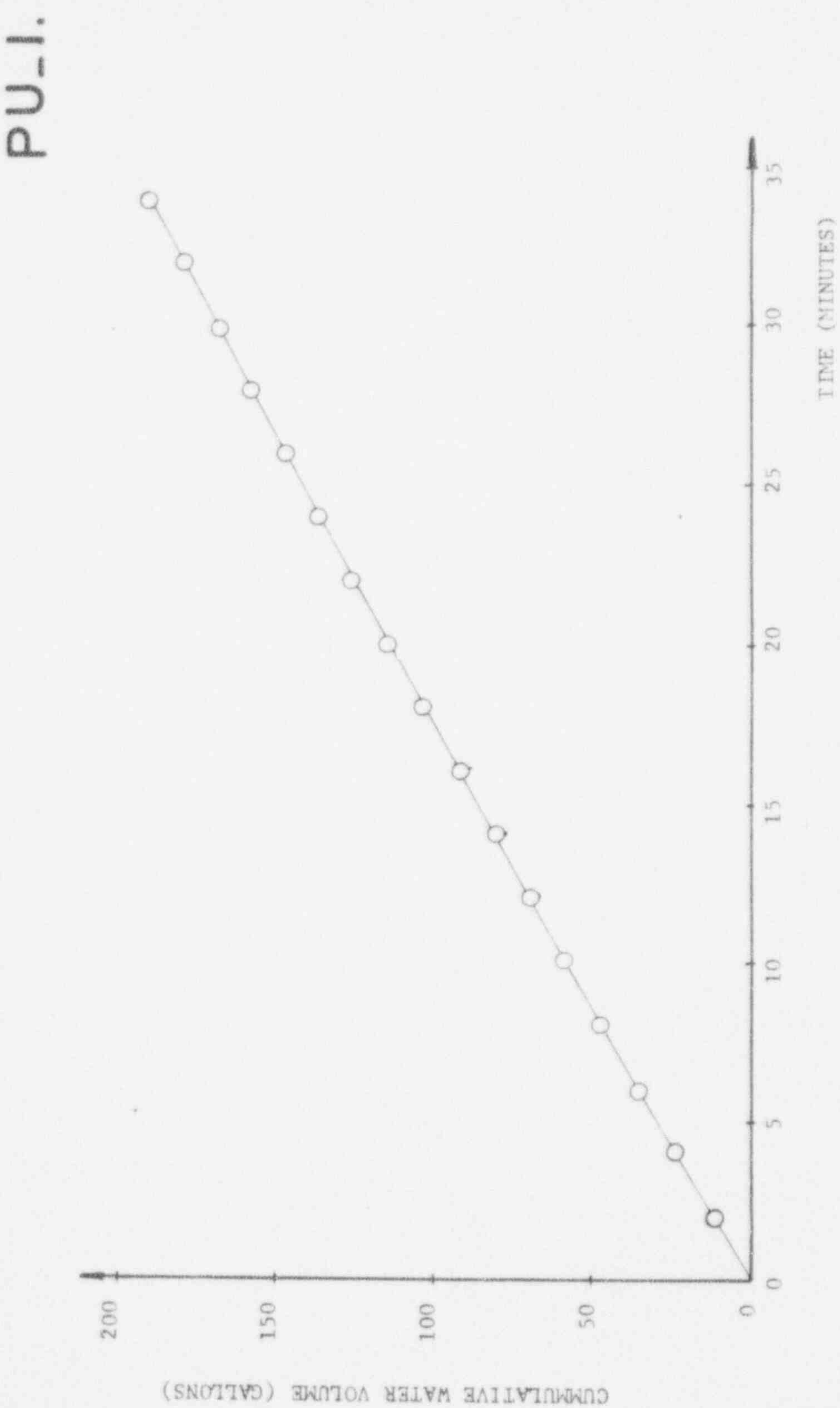
BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

UNDISTURBED SAMPLE
% ROCK CORE RECOVERY
WATER TABLE, 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

TEST BORING RECORD BORING B-2

FIGURE 2.5-10



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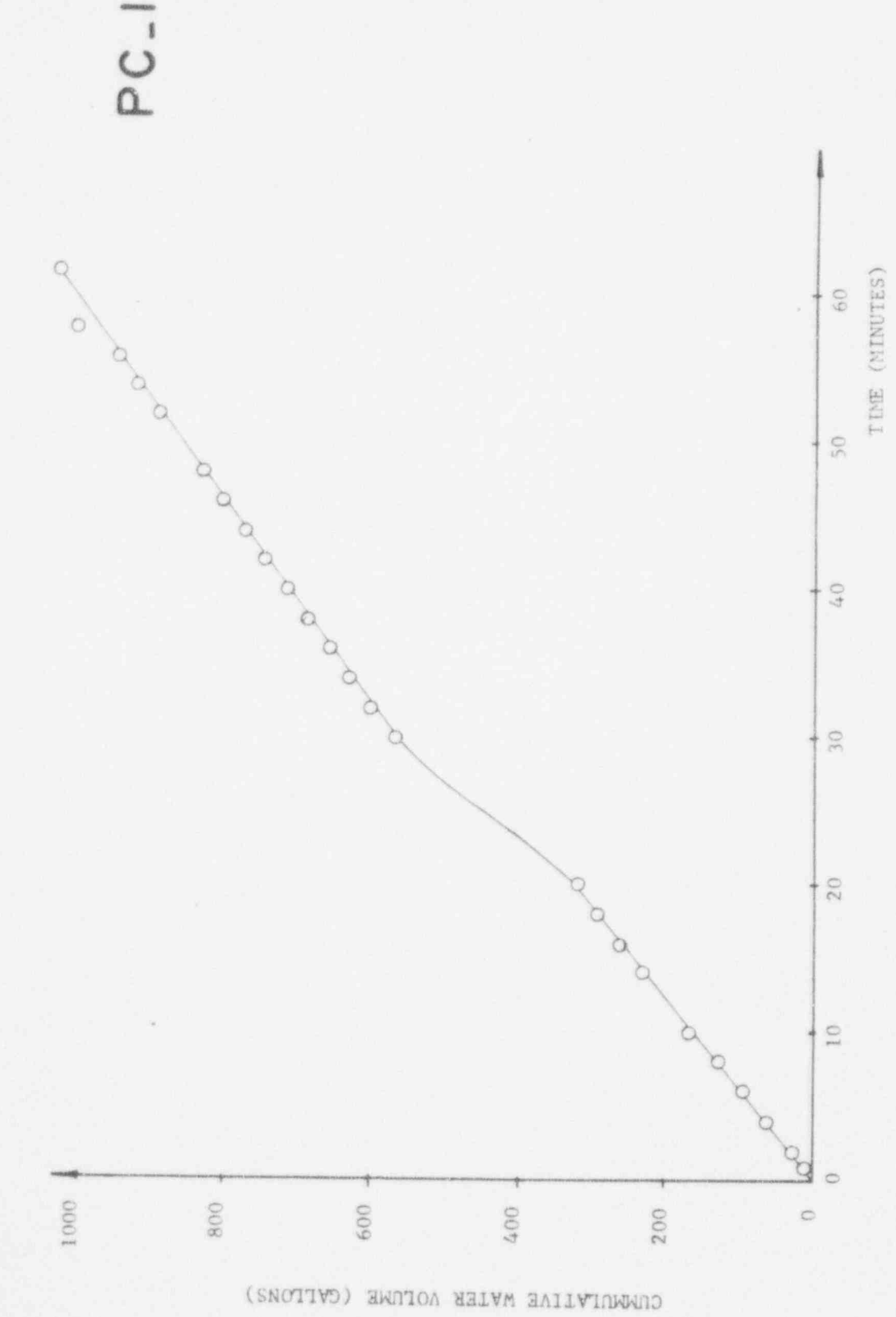
ST. LUCIE PLANT UNIT 2

FIELD PERMEABILITY TEST OPEN-END PIPE METHOD

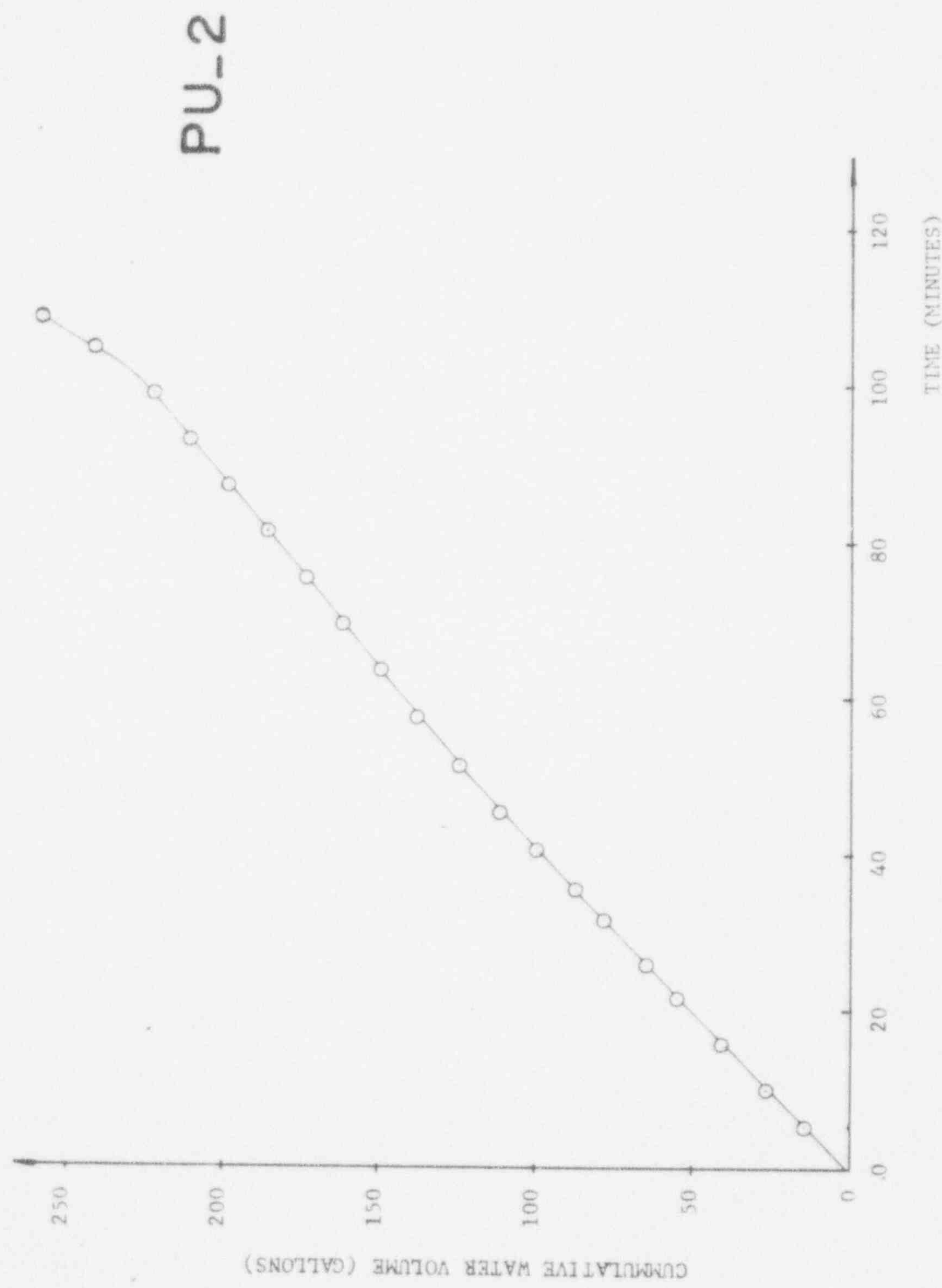
FIGURE 2.5-11



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

FIELD PERMEABILITY TEST OPEN-END PIPE METHOD

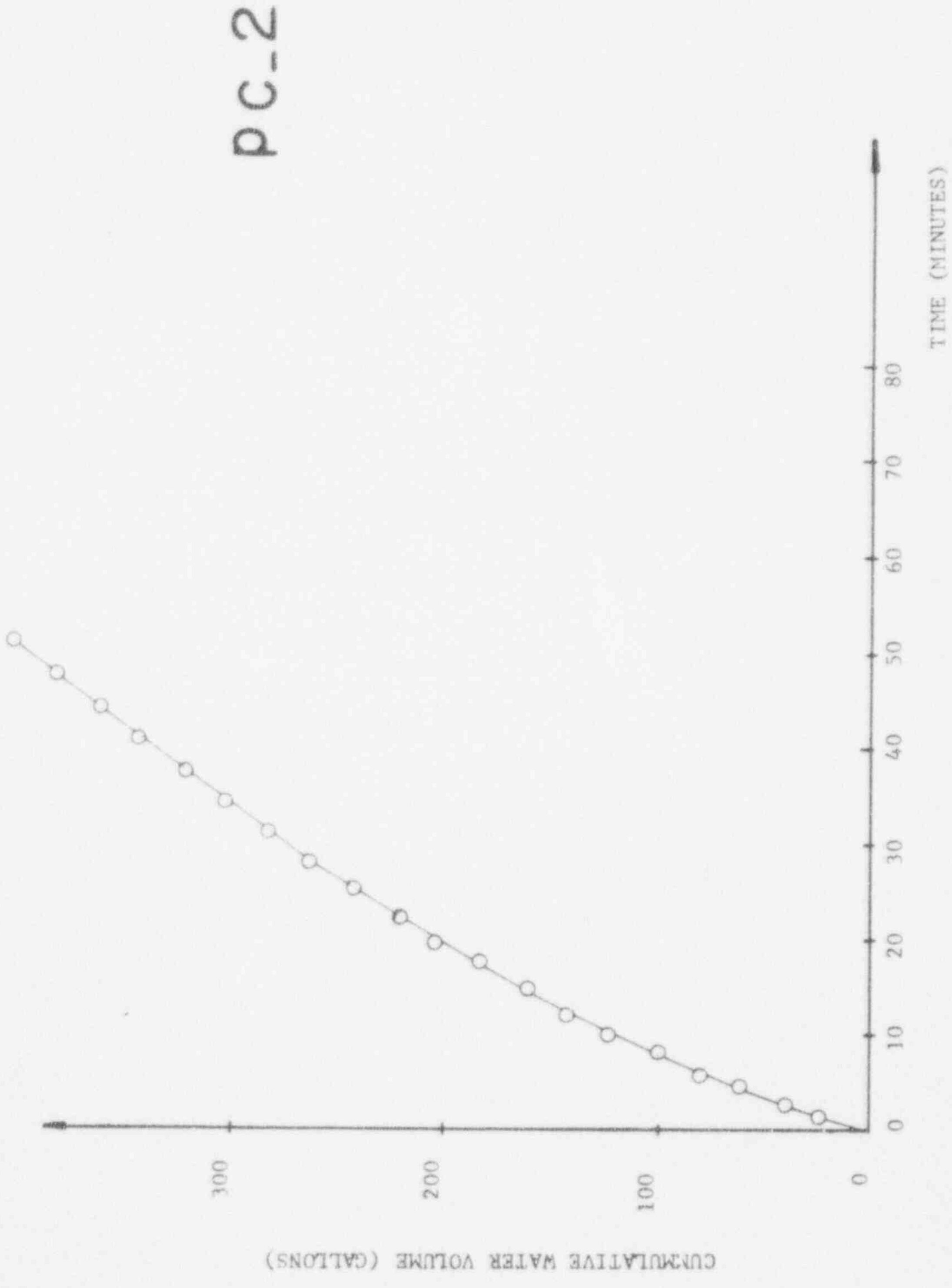
FIGURE 2.5-12



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

FIELD PERMEABILITY TEST WELL
PERMEAMETER METHOD

FIGURE 2.5-13



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

FIELD PERMEABILITY TEST OPEN-END PIPE METHOD

FIGURE 2.5-14

2.6 METEOROLOGY

2.6.1 GENERAL CLIMATE

The climate of the St. Lucie site is classified as Tropical Savanna according to the Koeppen-Geiger[1] system of climatic classification. The climate is featured by a long, warm summer with abundant rainfall followed by a mild, dry winter. The high frequency of onshore winds and the proximity of the warm waters of the Gulfstream result in warm, humid conditions during most of the year. During the winter months, the area is occasionally subjected to an outbreak of cold continental air; however, the cold air mass usually moderates rapidly. Consequently, subfreezing temperatures rarely occur in the area.

Rainfall is unevenly distributed during the year. The heaviest rainfall occurs during the period of June through October, followed by a distinct dry period from November through March.

The site is periodically affected by the passage of tropical cyclones of various intensities with the months of September and October having the highest frequency.

The terrain in the site area is essentially flat with elevations in the surrounding area ranging approximately from 20 to 30 feet, MSL. The topography should exert little or no influence on the meteorological characteristics of the site. 0

2.6.2 TEMPERATURE

Long term temperature data for the site were based on records from the National Weather Service cooperative observing station at Ft. Pierce[2] located approximately 9.5 miles northwest of the site. The thermometer at this station is at a height of 5 feet above ground in a standard instrument shelter. 0

The average daily temperature based on records maintained at Fort Pierce[2] ranges from 64.7 F in January to 81.8 F in August with an annual average of 73.7 F. The highest temperature on record is 101 F occurring in June, while the record lowest temperature is 24 F recorded in January. Table 2.6-1 is a presentation of monthly and annual mean and extreme temperatures. Figure 2.6-1 is a graphical presentation of these data. Monthly and annual cumulative frequency distributions of hourly temperatures are shown in Figures 2.6-2 through 2.6-14.

Temperature data collected at the site during the period March 1971 through February 1972 are presented in Table 2.6-2[3]. During this 12 month period, temperatures ranged from a low of 41 F in February 1972 to a high of 94 F in April 1971.

On the average, there are 39 days each year when the temperature equals or exceeds 90 F, while temperatures of 32 F or lower average one day per year[4]. Table 2.6-1 shows the average number of days per year the temperature is equal to or greater than 90 F and equal to or below 32 F for each month of the year.

2.6.3 ATMOSPHERIC WATER VAPOR AND FOG

The location of the St. Lucie site on a subtropical coast imparts a humid, marine characteristic to the local climate. Hence atmospheric water vapor content is one of the highest in the country. Although there are numerous methods of reporting atmospheric water vapor, the three more common methods, relative humidity, wet-bulb, and dew point temperatures will be utilized in this report.

The most complete, long-term records of atmospheric humidity for the site area are those compiled at the National Weather Service Office in West Palm Beach[4,5] approximately 47 miles south of the site. The 0
average annual wet-bulb temperature is 69.3 F and ranges from a maximum of 76.5 F in August to a minimum of 60.9 F in January; whereas the dew point temperature averages 66 F for the year and ranges from 74 F in July, August and September to 57 F in December and January. Relative humidity, because of its direct relationship to air temperature, shows considerable diurnal variation. For example, on an average annual basis, the relative humidity ranges from an average maximum of 82 percent at 7 am to an average minimum of 60 percent at 1 pm. Monthly and annual average relative humidity, wet-bulb and dew point temperatures are presented in Table 2.6-3 and Figure 2.6-15. Cumulative frequency distributions of hourly wet-bulb temperatures as recorded at West Palm Beach during the ten-year period 1948-1957 for each month of the year are presented in Figures 2.6-2 through 2.6-13. The annual cumulative frequency distribution is shown in Figure 2.6-14.

Heavy fog which reduces visibility to 1/4 mile or less is an infrequent occurrence in the site area. During the 27-year period 1944-1970, heavy fog occurred on an average of eight days during the year. The most likely month for heavy fog formation is during the month of January when 2 days are recorded on average. July, on the other hand, has had no record of heavy fog during the 27-year period of record.

2.6.4 PRECIPITATION

Rainfall in the area is unevenly distributed during the year. There is a distinct rainy season from June through October followed by a dry season beginning in November and extending through March. The months of April and May can be described as a transitional period between the dry and wet seasons. On the average, September is the wettest month with 9.66 inches and February's 2.35 inches represents the driest month. The annual average rainfall amounts to 61.70 inches.

The maximum monthly rainfall of 24.86 inches was recorded in September 1960. The driest month on record is April 1967 when a sparse 0.04 inches was measured. Table 2.6-4 lists the maximum, minimum, and normal monthly and annual rainfall totals as recorded at West Palm Beach[4]. A graphical representation of these data are shown in Exhibit 2.6-16. The average number of days during the year when precipitation equals or exceeds 0.01 inches is 13.1. September, with 17 days, and February, with 6 days represent the extremes in number of precipitation days. The monthly and annual average number of precipitation days are shown in Table 2.6-4.

The maximum observed rainfall for time periods of 5 minutes through 24 hrs are listed in Table 2.6-5[6]. The storm of April 17, 1942 set maximum rainfall records for all time periods from 1 through 24 hours. The maximum point rainfall records for time periods less than one hour are due to strong convective activity in the form of thunderstorms.

Table 2.6-6 presents estimated average return period in years for maximum rainfall amounts for selected durations for the St. Lucie site. These statistics are based on West Palm Beach precipitation data.[7] A comparison of Tables 2.6-5 and 2.6-6 shows the 100-year estimated amounts were exceeded for time periods of 1, 2, 3, 6, 12 and 24 hours; whereas the maximum observed one hour rainfall of 4.40 in. has an estimated return period of 80 years.

A theoretical upper limit of precipitation is known as the Probable Maximum Precipitation (PMP) and is an order of magnitude estimate of an extremely rare rainfall[7].

The PMP is derived using two basic principles - storm transposition and storm maximization. It is assumed that all storms which produced the heaviest rainfall in a meteorologically homogeneous region containing the area under consideration could have passed over the area. The actual conditions during the storms are then increased to the critical meteorological conditions considered probable for the region. The critical meteorological conditions are based on an analysis of air mass properties (effective precipitable water, depth of inflow layer, temperatures, winds, etc.), synoptic situations prevailing during the recorded storms in the region, topographical features, season of occurrence and location of the areas involved [7 a,b]. 0

In the site area, the PMP for a 10 square mile area and a rainfall duration period of 6 hours is 34 inches[7]. This is an average rainfall rate of almost 6 inches per hour. Such a rainfall rate was observed at Hialeah, Florida during the hurricane of 1947[8].

The maximum point rainfall observed in the United States during a 6 hour period is 32 inches, recorded on July 8, 1942 at Smethport, Pennsylvania[9].

In central Florida, rainfall of 13.6 and 16.0 inches occurring over a 10 square mile area during a 6 hour period were observed during October 1924 and September 1950, respectively.[10]

2.6.5 STORMS

The cycle of storms for the site area takes the form of thunderstorms and tropical storms during summer and early fall months and extropical storms during the winter and early spring.

Thunderstorms have been recorded during each month of the year. However, better than 80 percent occur during the period from May through September. July and August experience the maximum number of thunderstorm days with 16 during an average month. On an annual average basis, there are 78 days during which thunderstorms are observed. Table 2.6-7 lists the average monthly and annual thunderstorm days as recorded at West Palm Beach during the period 1943-1971.(4)

Some of the thunderstorms are accompanied by hail and locally damaging winds. The one degree, latitude-longitude square in which the site is located has experienced an annual average of 3 hailstorms during the period 1953-67.(11) The occurrence of hail is more likely during the months of March, April and May.

Occasionally, some of the more severe thunderstorm cells will produce a tornado. Although maximum tornadic winds have not been measured, estimates of 300 mph based on structural damage have been made.

In general, Florida tornadoes are less severe than those affecting the midwest United States. Tornado paths in Florida are generally short and extensive damage rarely occurs.(8) The maximum wind speeds associated with Florida tornadoes are estimated between 200 and 300 mph.(12)

Another important characteristic of the tornado is the rapid drop in atmospheric pressure which can amount to an estimated 3 in. of mercury in 3 seconds. Fortunately, tornadoes are rarely more than a few hundred yards wide and in most cases have path lengths less than 5 miles.(13)

The mean annual frequency of tornadoes observed in a one degree square surrounding the site is 1.3. According to Thom(14), the probability of a tornado striking a point within the one degree square containing the plant site is 8.7×10^{-4} with a recurrence interval of about 1150 years.

Historically, tornadoes have been observed during all seasons in southeastern Florida; however, the greatest frequency occurs during the spring. Figure 2.6-17 shows the total number of tornadoes which have occurred in one degree squares in southern Florida during the period 1953-1962.

Tropical cyclones are classified according to their stage of development. The hurricane with highest sustained wind speeds of 74 mph or higher, represents the strongest stage of development. Tropical cyclones with sustained winds in the range of 39 to 73 mph are classified as tropical storms and as tropical depressions when wind speeds are less than 30 mph.(15)

During the period 1900-1963, the Florida Peninsula has been affected by 65 tropical cyclones. Of these, 25 were classified as hurricanes, 33 as tropical storms and 7 as tropical depressions.(16) Table 2.6-8 is a presentation of the monthly and annual distribution of tropical cyclones affecting the Florida Peninsula. Roughly half the storms in each category passed close enough to the St. Lucie site to affect it with strong winds and/or heavy rainfall. September and October are the preferred months for hurricanes in the site area.

Hurricane paths affecting the site are are generally toward the west-northwest with an average forward speed of about 12 mph. In any given year, the chances of hurricane force winds affecting the site area are 1 in 15.(8)

2.6.6 WINDS

The prevailing wind direction for the area is east-southeast with an annual frequency of 11.5 percent. The dominant wind regime feature of the area is the high frequency of onshore winds and above average wind speed. For the 90° sector east-northeast through southeast, the annual frequency is about 40 percent. Except for the months of December and January, the prevailing wind direction is within this 90° sector. The 10.5 mph average annual wind speed ranks among the highest for the southeastern United States. Calms occur only 7 percent of the total hours. Tables 2.6-9 through 2.6-21 are presentations of monthly and annual wind rose data for West Palm Beach.(17) Seasonal and annual wind rose data as measured at the site during the period March 1, 1971 through February 29, 1972 are shown in Tables 2.6-22 through 2.6-26.(3) During the one-year period, calms and variable winds occurred 5.2 percent of the total hours. The prevailing wind direction was east and the annual average wind speed was 8.3 mph.

Based on a 20-year period of record (1950-1969) at West Palm Beach(4), the maximum observed one minute average wind speed was 86 mph from the east-southeast recorded in August 1964. Maximum observed one minute wind speeds for each month of the year and their associated wind directions are presented in Table 2.6-27. During the hurricane of August 1949, winds at West Palm Beach reached 110 mph with gusts to 125 mph before the anemometer was blown away. The highest one-minute wind speed was estimated at 120 mph with gusts to 130 mph.

Thom(18) has expressed the distribution of extreme wind speeds in terms of a mean recurrence interval based on a Fisher-Tippett Type II extreme value distribution. The mean recurrence intervals for one-minute average wind speeds are shown in Table 2.6-28. These wind speeds are for a one-minute average at a height 30 ft above the ground based on observed data during a 21-year period of record. It can be seen from these data that one-minute average wind speed of 120 mph has a recurrence interval of 100 years.

An upper limit wind speed associated with the Probable Maximum Hurricane(19) occurring at the coast in the site area has been estimated to be 150 mph for a 10-minute average at the 30 ft level. This is the equivalent of a 182 mph one-minute average and about 236 mph for a 1/2 second gust.

2.6.7 CLOUDINESS, SUNSHINE AND SOLAR RADIATION

The average annual sky cover (in tenths of the celestial dome) from sunrise to sunset at West Palm Beach(4) is 6.1. Maximum cloudiness occurs during the period June through October followed by a decrease in cloudiness from November through May. Percentage of possible sunshine during the year averages 65 percent ranging from a maximum of 73 percent in April to a minimum of 60 percent from September through December.

The average daily solar radiation ranges from 2156 Btu per sq ft in May to 1124 Btu per sq ft in December.(5)

Average monthly cloud cover, sunshine, and solar radiation are listed in Table 2.6-29.

2.6.8 ATMOSPHERIC DIFFUSION

Atmospheric diffusion can be defined as the ability of the atmosphere to dispose of gases and particles emitted into the air. The diffusion is governed primarily by atmospheric motion (wind) and the vertical distribution of temperature (stability).

The onsite meteorological program began in March 1971. Measurements of wind direction, speed and vertical temperature differential are being continuously monitored in order to assess the diffusion potential of the site. Wind direction was classified according to the 16 point compass and wind speed according to the standard wind speed classes (calm 1-3, 4-7, 8-12, 13-18, 19-24, 25-31 and greater than 31 mph).

Atmospheric stability was classified according to the Pasquill classification system as determined by the vertical temperature difference as follows:

Pasquill Class	Description	T(F)/190 ft
A	Extremely unstable	$\leq$ - 2.0
B	Unstable	- 1.9 to - 1.8
C	Slightly unstable	- 1.7 to - 1.4
D	Neutral	- 1.3 to - 0.5
E	Slightly stable	- 0.4 to + 1.5
F	Stable	+ 1.6 to + 4.2
G	Extremely stable	>+ 4.2

The first complete year of meteorological data acquisition indicates favorable atmospheric diffusion conditions at the site. This is due to the proximity of the site to the warm waters of the Gulf Stream, the above average wind speed, and the low frequency of calms. Moreover, unfavorable diffusion conditions associated with stagnating high pressure system rarely affects the area.(20)

An analysis of one year of onsite data(3) shows neutral and unstable conditions occurring 56.2 percent of the total hours while inversions (Pasquill classes F and G) prevailed only 10.5 percent of the time. The annual distribution of the seven stability classes at the site is as follows:

Pasquill Class	Frequency (%)*
A	23.1
B	2.9
C	5.9
D	24.3
E	33.4
F	8.4
G	2.1

* All values listed are subject to computer round-off to the second decimal.

The joint relative frequency of stability, wind direction and speed for the period March 1, 1971 through February 29, 1972 are shown in Tables 2.6-30 through 2.6-36.

TABLE 2.6-1

MONTHLY AND ANNUAL
MEAN AND EXTREME TEMPERATURES
FORT PIERCE FLORIDA
(1904-1960)

Month	Mean Temperatures(F) Daily Max	Daily Min	Daily Mean	Extreme Temperatures(F) Record Max	Record Min	Mean Number Days with Temperature* ≥90F	≤32F
January	73.1	56.3	64.7	88	24	0	1
Feb	74.5	56.7	65.5	90	26	0	+
March	77.5	59.6	68.6	93	35	+	0
April	80.8	64.0	72.5	96	40	+	0
May	84.8	68.5	76.5	98	50	1	0
June	87.7	72.1	79.9	101	60	6	0
July	89.4	73.4	81.4	100	61	10	0
August	89.6	74.0	81.8	99	62	15	0
Sept	87.5	73.9	80.7	99	60	6	0
Oct	83.4	69.9	76.6	96	48	1	0
Nov	77.8	62.4	70.2	90	32	+	0
Dec	74.2	57.2	65.8	91	27	0	+
Annual	81.7	65.7	73.7	101	24	39	1

* Period of Record 1951-1960
+ Less than ½

TABLE 2.6-2

MONTHLY AND ANNUAL TEMPERATURE DATA(F)
HUTCHISON ISLAND ON-SITE METEOROLOGICAL MONITORING PROGRAM
MARCH 1971 - FEBRUARY 1972

Month	Average Daily Maximum	Average Daily Minimum	Monthly
January	77	66	71
February	72	58	65
March	73	58	66
April	78	65	71
May	81	70	75
June	85	73	79
July	86	75	80
August	87	75	81
September	84	75	80
October	82	72	77
November	76	67	72
December	76	69	73
Annual	80	69	74

Extremes:
Maximum 94 April 1971
Minimum 41 February 1972

TABLE 2.6-3

MONTHLY AND ANNUAL MEAN RELATIVE HUMIDITY
WET BULB AND DEWPOINT TEMPERATURES (F)
WEST PALM BEACH, FLORIDA

Month	Relative Humidity(%) (1965 - 1969) 1AM	7AM	1PM	7PM	Wet Bulb(F) (1949 - 1965)	Dewpoint(F) (1949 - 1965)
January	79	81	59	73	60.9	57
February	81	83	56	70	61.8	58
March	76	79	54	66	64.2	61
April	75	78	53	65	66.9	63
May	77	78	59	70	71.1	68
June	84	83	69	77	74.5	72
July	85	85	65	76	76.3	74
August	82	84	63	73	76.5	74
September	84	86	66	78	76.1	74
October	82	84	65	75	71.2	68
November	77	80	56	71	65.7	62
December	76	78	56	70	61.4	57
Annual	80	82	60	72	69.3	66

TABLE 2.6-4

MONTHLY AND ANNUAL AVERAGE AND EXTREME
PRECIPITATION (INCHES) AND NUMBER OF DAYS
PRECIPITATION ≥0.01 INCHES
WEST PALM BEACH, FLORIDA
(1931-1960)

Month	Maximum Monthly[1]	Year	Minimum Monthly[1]	Year	Normal	Average Number of Days Precipitation ≥0.01[2]
January	7.92	1958	0.22	1960	2.48	7
February	6.88	1966	0.29	1948	2.35	6
March	9.11	1947	0.33	1956	3.44	8
April	18.26	1942	0.04	1967	4.34	7
May	14.10	1946	0.39	1967	5.11	11
June	17.91	1966	1.07	1952	7.53	14
July	17.74	1941	1.22	1961	6.66	15
August	13.52	1950	2.16	1955	6.74	16
September	24.86	1960	2.73	1939	9.66	17
October	18.74	1965	2.16	1962	7.96	14
November	7.16	1947	0.33	1944	2.86	8
December	8.73	1949	0.06	1968	2.57	7
Annual	24.86	Sept 1960	0.04	April 1967	61.70	131

1 Period of Record 1939-1969

2 Period of Record 1943-1969

TABLE 2.6-5

MAXIMUM RECORDED POINT RAINFALL
WEST PALM BEACH, FLORIDA

	M I N U T E S				H O U R S				
Time Period	5	10	15	60	2	3	6	12	24
Amount (inches)	0.74	0.90	1.17	4.40	8.35	8.77	9.90	15.16	15.23
Date	7/19/58	9/16/59	5/11/58	4/17/42	4/17/42	4/17/42	4/17/42	4/17/42	4/17/42
Period of Record	1953-1961			1941-1961					1939-1961

SL2

TABLE 2.6-6

ESTIMATED RAINFALL FREQUENCY FOR THE ST. LUCIE SITE
(inches)

	Return Period (Years)						
Time Interval	1	2	5	10	25	50	100
30 minutes	1.6	1.9	2.3	2.6	3.0	3.3	3.5
1 hour	2.1	2.4	3.0	3.3	3.7	4.1	4.6
2 hours	2.4	2.9	3.6	4.3	4.7	5.4	6.0
3 hours	2.7	3.3	4.1	4.8	5.5	6.1	6.8
6 hours	3.2	3.8	5.0	6.0	6.8	7.6	8.5
12 hours	3.7	4.5	6.0	7.1	8.1	9.4	10.5
24 hours	4.3	5.4	7.1	8.5	9.9	11.1	12.5

TABLE 2.6-7

AVERAGE MONTHLY AND ANNUAL THUNDERSTORM ACTIVITY
WEST PALM BEACH, FLORIDA
(1943-1971)

Month	Average Number of Thunderstorm Days
January	1
February	1
March	2
April	4
May	7
June	13
July	16
August	16
September	11
October	5
November	1
December	1
Annual	78

TABLE 2.6-8

MONTHY DISTRIBUTION OF TROPICAL CYCLONES
AFFECTING THE FLORIDA PENINSULA
(1900-1963)

Month	Hurricanes	Tropical Storms	Tropical Depressions	Total
January	0	0	0	0
February	0	1	0	1
March	0	0	0	0
April	0	0	0	0
May	0	1	0	1
June	2	2	2	6
July	2	3	1	6
August	3	9	2	14
September	10	5	1	16
October	7	9	1	17
November	1	2	0	3
December	0	1	0	1
Annual	25	33	7	65

TABLE 2.6-9

DIRECTIONAL - SPEED - TIME INTERVAL
JANUARY WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA
(1956-1960)

	Windspeed (mph)							
	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.1	1.0	2.0	1.0	0.5	0.1	4.7	11.7
NNE	0.1	0.4	0.5	0.6	0.5	0.5	2.6	16.7
NE	+	0.2	0.7	0.7	1.0	0.2	2.8	16.8
ENE	+	0.3	1.3	1.3	1.2	0.3	4.5	15.8
E	+	0.7	2.4	3.0	0.9	0.1	7.1	13.4
ESE		0.8	2.0	1.9	0.3		5.0	11.9
SE	0.1	1.4	2.7	2.7	0.5	0.1	7.4	11.8
SSE	+	0.5	1.4	1.6	0.3	0.1	3.9	12.8
S	+	1.3	2.2	1.1	0.3	0.1	4.9	10.8
SSW	0.1	0.9	1.5	0.7	0.3	0 +	3.4	10.8
SW	0.1	1.4	1.5	0.6	0.1		3.5	9.1
WSW	0.1	1.1	2.3	1.1	0.2	+	4.8	10.7
W	0.1	1.2	3.3	1.4	0.3	0.2	6.5	11.1
WNW	0.3	1.6	3.3	2.6	1.0	0.4	9.2	12.5
NW	0.1	2.4	6.0	4.6	1.4	0.1	14.7	12.0
NNW	0.1	2.3	3.8	2.0	0.8	0.1	9.1	11.2
CALM	5.9						5.9	
TOTAL	7.0	17.4	36.7	26.9	9.6	2.5	100	11.5

+ indicates more than 0, but less than 0.05

TABLE 2.6-10

DIRECTIONAL - SPEED - TIME INTERVAL
FEBRUARY WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	Windspeed (mph)							
	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.1	1.0	1.8	1.1	0.6	+	4.7	12.1
NNE	+	0.2	0.9	0.8	0.2		2.1	12.4
NE	+	0.2	0.7	1.5	0.3		2.7	13.9
ENE		0.2	1.8	2.3	1.0	0.1	5.4	14.5
E	+	0.5	2.9	2.9	1.2	0.1	7.6	13.6
ESE	+	1.0	3.0	2.4	0.4	+	6.9	12.1
SE	+	1.3	4.7	3.4	0.6	0.1	10.1	12.4
SSE		1.5	3.2	3.5	0.8		9.0	12.4
S	0.1	2.1	3.6	1.3	0.4		7.5	9.9
SSW	+	1.7	2.0	1.1	0.2	+	5.1	10.1
SW	0.1	1.7	2.1	0.8	0.3		5.0	9.7
WSW	+	1.2	1.3	0.8	0.3	0.1	3.7	10.8
W	0.1	1.1	1.8	0.8	0.6	0.3	4.6	12.4
WNW	+	1.2	2.2	2.1	1.2	0.3	7.0	13.6
NW	0.1	1.6	3.7	2.5	0.6	0.2	8.7	11.8
NNW	+	1.6	3.1	1.8	0.3	0.1	7.0	10.8
CALM	2.7						2.7	
TOTAL	3.5	18.1	38.7	29.3	9.1	1.3	100	11.7

+ indicates more than 0, but less than 0.05

TABLE 2.6-11

DIRECTIONAL - SPEED - TIME INTERVAL
MARCH WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

Windspeed (mph)

	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.1	1.2	1.7	0.8	0.2	0.1	4.2	10.5
NNE	+	0.5	1.2	1.4	0.5	+	3.7	13.1
NE	+	0.3	1.2	1.6	0.1		3.3	12.6
ENE	+	0.3	2.2	1.4	0.3	+	4.3	12.5
E	0.1	0.5	2.0	2.4	0.6	0.4	6.0	14.0
ESE	0.1	0.9	3.0	2.9	0.3	+	7.2	12.0
SE	0.1	2.0	3.6	3.4	0.9	0.1	10.1	11.8
SSE	0.1	1.5	2.6	3.5	1.0	0.1	8.7	12.9
S	+	1.7	2.3	1.5	0.3	+	5.8	10.6
SSW	0.2	1.8	1.9	1.0	0.3	+	5.3	9.9
SW	0.2	1.9	1.2	0.8	0.3		4.5	9.5
WSW	0.2	1.8	1.2	1.2	0.3	0.1	4.7	10.4
W	0.2	1.8	2.2	1.0	0.3	0.2	5.6	10.4
WNW	+	1.9	2.3	1.9	0.7	0.2	6.9	11.7
NW	0.2	1.6	3.7	2.1	0.4	0.1	8.2	10.9
NNW	0.1	1.8	3.8	2.0	0.3		8.1	10.4
CALM	3.4						3.4	
TOTAL	5.1	21.6	36.1	28.9	7.0	1.3	100	11.1

\+ indicates more than 0, but less than 0.05

TABLE 2.6-12

DIRECTIONAL - SPEED - TIME INTERVAL
APRIL WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	Windspeed (mph)							
	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.1	0.8	1.1	1.3	0.4	+	3.7	12.1
NNE	+	0.3	0.6	1.3	0.3		2.5	13.5
NE	+	0.2	0.9	1.9	0.5	0.1	3.6	14.1
ENE	0.1	0.5	2.3	3.7	0.9	0.1	7.6	14.1
E	0.1	0.8	5.1	9.1	2.4	0.1	17.7	14.3
ESE	+	1.7	7.3	7.9	1.1	0.1	18.1	12.6
SE	0.1	1.3	3.8	4.3	1.2	0.1	10.8	12.7
SSE	0.1	0.8	1.7	2.3	0.9	0.4	6.2	14.2
S	0.1	1.2	1.5	0.8	0.3	0.1	3.9	10.4
SSW	0.2	0.8	0.9	0.4	0.2	0.1	2.5	9.9
SW	+	0.9	1.2	0.4	0.2	0.1	2.8	10.7
WSW	+	0.6	1.0	0.7	0.1	0.1	2.5	11.1
W	0.1	1.1	0.8	0.7	0.1	0.3	3.2	11.9
WNW	0.3	0.9	1.7	0.6	0.3	0.1	3.8	10.5
NW	0.3	1.1	1.8	1.3	0.4	0.1	4.9	10.9
NNW	0.1	0.7	1.4	0.9	0.3	0.2	3.6	11.8
CALM	2.7						2.7	
TOTAL	4.3	13.6	33.1	37.6	9.5	1.9	100	12.4

+ indicates more than 0, but less than 0.05

TABLE 2.6-13

DIRECTIONAL - SPEED - TIME INTERVAL
MAY WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	Windspeed (mph)							
	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.2	0.8	0.8	0.2			1.9	7.7
NNE	+	0.3	0.6	0.4	0.2		1.6	11.7
NE	+	0.4	1.6	2.3	0.6	+	4.9	13.5
ENE	+	0.6	5.5	5.6	1.4	0.1	13.2	13.4
E	0.[illegible]	1.3	6.2	6.3	0.6	0.1	14.5	12.4
ESE	+	2.3	8.9	8.6	0.8	+	20.7	12.0
SE	0.1	2.1	4.7	3.7	0.5		11.2	11.3
SSE	0.2	1.0	1.7	1.0	0.1		4.1	10.2
S	0.1	1.4	0.8	0.2	+		2.6	7.7
SSW	0.1	1.4	0.8	0.1			2.4	7.4
SW	0.1	1.5	1.5	0.4	+		3.4	8.4
WSW	0.1	1.3	1.0	0.2	+		2.7	7.7
W	0.2	0.7	1.3	0.3	0.1		2.6	8.7
WNW	0.2	1.3	0.9	0.5	0.3		3.2	9.3
NW	0.1	1.0	0.8	0.1			2.0	7.5
NNW	0.1	1.0	0.6	0.1			1.7	7.6
CALM	7.2						7.2	
TOTAL	8.9	18.5	37.6	29.9	4.8	0.3	100	10.4

\+ indicates more than 0, but less than 0.05

TABLE 2.6-14

DIRECTIONAL - SPEED - TIME INTERVAL
JUNE WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	Windspeed (mph)							
	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.1	1.1	0.4	0.1			1.7	7.3
NNE	0.1	0.3	0.4	0.4	0.1		1.3	10.9
NE	+	0.4	0.8	1.0	0.1		2.3	12.0
ENE	0.1	0.8	2.6	3.4	0.6	+	7.5	12.8
E	0.1	1.2	6.1	4.4	+		11.9	11.2
ESE	0.1	2.5	8.3	4.5	0.1		15.6	10.7
SE	0.2	3.1	5.2	2.8	+		11.4	9.8
SSE	0.1	2.3	2.4	1.8	+	0.1	6.8	9.9
S	0.3	3.5	2.0	0.6	0.2	+	6.7	8.2
SSW	0.1	2.9	1.8	0.4	0.2	+	5.4	8.2
SW	0.1	2.6	1.8	0.7	0.1		5.3	8.6
WSW	0.2	1.8	1.9	0.6	+		4.4	8.6
W	0.2	1.7	1.1	0.3	0.1		3.3	7.7
WNW	0.3	1.5	0.8	0.3		0.1	2.9	7.7
NW	0.2	1.0	0.6	0.1			1.9	7.0
NNW	0.1	0.9	0.6	0.2			1.8	7.6
CALM	10.1						10.0	
TOTAL	12.3	27.4	36.8	21.6	1.7	0.2	100	8.9

+ indicates more than 0, but less than 0.05

TABLE 2.6-15

DIRECTIONAL - SPEED - TIME INTERVAL
JULY WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	Windspeed (mph)							
	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.1	0.7	0.1	0.1			1.0	6.0
NNE	+	0.4	0.2	+			0.6	6.9
NE	0.1	0.5	0.1	0.1			0.7	7.2
ENE	+	0.7	1.0	0.8	+		2.5	10.1
E	0.2	1.1	3.8	4.1	0.3		9.5	11.8
ESE	0.2	3.3	8.7	5.2	0.1		17.4	10.4
SE	0.3	3.0	6.4	4.2	0.3		14.1	10.5
SSE	0.2	2.0	3.2	2.0	+		7.4	9.8
S	0.3	4.6	2.7	0.5			8.0	7.3
SSW	0.2	3.7	2.2	0.3			6.4	7.4
SW	0.2	3.9	2.2	0.5	0.1		6.8	7.6
WSW	0.2	2.2	1.0	0.3	+		3.9	7.7
W	0.2	1.6	1.2	0.3	0.1	+	3.4	8.2
WNW	0.2	1.6	0.6	0.4	0.1		2.9	7.8
NW	0.3	1.2	0.3	0.1	+	+	2.0	6.9
NNW	0.2	0.9	0.2	+			1.3	6.0
CALM	12.0						12.0	
TOTAL	14.8	31.3	33.7	19.1	1.0	0.1	100	8.2

+ indicates more than 0, but less than 0.05

TABLE 2.6-16

DIRECTIONAL - SPEED - TIME INTERVAL
AUGUST WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	Windspeed (mph) 0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.1	1.0	0.6	0.1	0.1		1.9	8.1
NNE	0.1	0.7	0.5	0.4	0.1		1.6	9.6
NE	0.1	0.8	1.0	1.5	0.1		3.5	11.6
ENE	+	0.8	2.8	2.3	0.2		6.1	11.5
E	0.1	1.4	5.6	3.9	0.1		11.1	11.2
ESE	0.1	2.6	7.7	3.8	0.2		14.3	10.4
SE	0.1	3.0	3.8	2.0	0.1		9.1	9.5
SSE	0.1	2.0	1.5	0.8	+		4.5	8.6
S	0.2	3.3	1.8	0.4	+		5.8	7.5
SSW	0.1	2.6	2.0	0.4	+		5.1	7.9
SW	0.2	3.3	2.2	0.3		+	6.0	7.5
WSW	0.1	2.3	1.6	0.4	0.1		4.4	8.2
W	0.2	2.6	1.5	0.4	0.1	0.1	4.8	8.2
WNW	0.1	2.2	0.8	0.5	0.1		3.6	7.8
NW	0.2	1.8	0.6	0.2	0.1	+	2.8	7.4
NNW	0.2	1.6	0.4	0.1	+	+	2.3	6.9
CALM	13.0						13.0	
TOTAL	14.7	31.9	34.5	[illegible]	1.1	0.2	100	8.1

+ indicates more than 0, but less than 0.05

TABLE 2.6-17

DIRECTIONAL - SPEED - TIME INTERVAL
SEPTEMBER WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	Windspeed (mph)							
	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.3	1.7	1.4	0.3	+		3.7	8.1
NNE	0.2	0.8	1.0	1.2	0.4	0.1	3.7	12.3
NE	0.1	1.1	2.1	3.3	1.0	0.1	7.6	13.2
ENE	+	1.2	5.8	6.5	1.4	0.2	15.1	13.1
E	0.1	2.1	5.6	5.1	0.6	0.2	13.8	11.9
ESE	0.1	2.9	4.9	2.8	0.1	0.4	11.2	10.9
SE	0.1	2.3	2.9	1.8	0.1	0.1	7.3	10.2
SSE	0.1	1.3	1.8	1.3	0.3	0.2	5.0	11.3
S	0.1	1.8	1.2	0.4	0.2	+	3.7	8.6
SSW	0.1	1.5	1.3	0.4	0.2	+	3.4	8.9
SW	0.1	1.4	0.6	0.3	+		2.5	7.9
WSW	0.2	1.4	0.9	0.5	+		3.0	8.4
W	0.2	1.0	0.8	0.3	+		2.3	8.0
WNW	0.2	1.7	0.6	0.3			2.8	7.2
NW	0.1	1.4	1.1	0.3			2.9	7.7
NNW	0.3	1.6	0.9	0.2	+		2.9	7.6
CALM	9.1						9.1	
TOTAL	11.3	25.2	33.0	24.8	4.4	1.3	100	9.8

\+ indicates more than 0, but less than 0.05

TABLE 2.6-18

DIRECTIONAL - SPEED - TIME INTERVAL
OCTOBER WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	Windspeed (mph)							
	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	+	2.1	2.4	0.7	0.2		5.4	9.0
NNE		0.8	1.4	1.9	0.6	0.2	4.9	13.6
NE	0.1	0.9	2.3	2.4	1.8	1.1	8.5	15.5
ENE	0.1	0.8	3.9	4.0	2.4	0.9	12.0	15.3
E	+	1.0	3.3	2.9	0.9	0.1	8.2	12.6
ESE	+	1.9	3.5	2.0	+		7.5	10.2
SE		1.6	2.7	1.4	0.2		6.0	10.2
SSE	0.2	1.0	1.3	1.3	+		3.9	10.4
S	0.2	1.3	1.3	0.6	0.1	+	3.5	8.8
SSW	0.1	1.0	0.6	0.2	0.1		1.9	8.2
SW	0.1	1.3	0.9	0.4	+		2.7	8.4
WSW	0.1	0.6	0.8	0.5	0.2	+	2.3	10.5
W	0.1	1.0	1.0	0.2	0.1	+	2.5	8.8
WNW	+	1.9	2.0	0.7	0.1		4.7	8.8
NW	0.3	2.5	3.2	2.3	0.3		8.6	10.0
NNW	0.2	2.0	3.0	1.1	0.2	+	6.5	9.5
CALM	10.7						10.7	
TOTAL	12.3	21.8	33.8	22.5	7.2	2.5	100	10.2

\+ indicates more than 0, but less than 0.05

TABLE 2.6-19

DIRECTIONAL - SPEED - TIME INTERVAL
NOVEMBER WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	WINDSPEED (mph)							
	0.3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.1	1.1	2.6	2.2	0.6	0.1	6.7	12.1
NNE	+	0.4	1.2	1.7	0.8	0.4	4.4	15.2
NE	+	0.6	2.0	2.4	1.5	0.8	7.4	15.9
ENE	0.1	0.7	3.3	5.8	2.6	0.4	12.8	15.0
E	+	0.6	4.0	6.7	1.9	+	13.2	14.2
ESE		0.9	4.0	2.6	0.4	+	7.9	11.8
SE	0.1	0.9	2.2	1.5	0.1		4.8	10.9
SSE		0.5	1.3	0.7			2.5	10.8
S	+	0.8	2.0	0.4	+		3.2	9.2
SSW	0.1	1.0	1.4	0.5	0.1		3.0	9.0
SW	0.1	0.9	1.1	0.3	0.1		2.6	9.1
WSW	0.1	0.4	0.5	0.2	0.1		1.3	8.9
W	+	1.1	1.2	0.3	0.1	+	2.7	8.8
WNW	0.1	1.7	1.3	0.4	0.2		3.6	8.8
NW	0.2	2.7	3.7	2.3	0.8	0.1	9.7	10.9
NNW	0.1	1.8	5.2	3.1	0.6	0.1	11.0	11.2
CALM	3.2						3.2	
TOTAL	4.2	16.0	37.1	31.0	9.9	1.9	100	11.9

\+ indicates more than 0, but less than 0.05

TABLE 2.6-20

DIRECTIONAL - SPEED - TIME INTERVAL
DECEMBER WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	WINDSPEED (mph)							
	0-3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	+	1.5	1.8	1.2	0.5	+	5.0	11.0
NNE	0.1	0.3	1.0	0.9	0.6	0.2	3.0	14.1
NE	0.2	0.6	2.1	2.0	0.7	+	5.6	12.6
ENE	0.1	0.6	4.4	5.6	2.4	0.7	13.7	14.8
E	0.1	0.9	4.6	5.5	0.8	0.1	12.0	12.9
ESE	+	0.8	2.6	2.8	0.1		6.4	11.8
SE	+	1.0	2.4	1.3	0.1		4.8	10.4
SSE	+	0.6	1.0	1.4	0.2		3.3	12.1
S	0.1	1.1	0.9	0.5	0.1		2.7	9.3
SSW		0.8	0.9	0.3	0.1		2.3	9.5
SW	+	1.1	1.2	0.5	0.1		2.9	9.2
WSW		1.0	0.9	0.4	0.1	+	2.3	9.3
W	0.1	0.9	0.8	0.3	0.1	+	2.1	9.1
WNW	0,2	1.7	2.0	1.8	0.5	0.1	6.2	11.2
NW	0.2	2.9	5.6	3.8	0.7	0.2	13.4	11.3
NNW	0.1	1.9	4.5	3.8	0.8	+	11.2	11.8
CALM	3.2						3.2	
TOTAL	4.3	17.7	36.7	32.2	7.8	1.3	100	11.6

\+ indicates more than 0, but less than 0.05

TABLE 2.6-21

DIRECTIONAL - SPEED - TIME INTERVAL
ANNUAL WIND SUMMARY (PERCENT OF TOTAL HOURS)
WEST PALM BEACH, FLORIDA

	WINDSPEED (mph)							
	0.3	4-7	8-12	13-18	19-24	≥25	Total	Average speed
N	0.1	1.2	1.4	0.7	0.3	+	3.7	10.4
NNE	0.1	0.5	0.8	0.9	0.4	0.1	2.7	13.3
NE	0.1	0.5	1.3	1.7	0.6	0.2	4.4	13.9
ENE	+	0.6	3.1	3.5	1.2	0.2	8.7	13.9
E	0.1	1.0	4.3	4.7	0.9	0.1	11.0	12.8
ESE	0.1	1.8	5.3	4.0	0.3	+	11.5	11.3
SE	0.1	1.9	3.8	2.7	0.4	+	8.9	11.0
SSE	0.1	1.2	1.9	1.8	0.3	0.1	5.4	11.4
S	0.1	2.0	1.8	0.7	0.2	+	4.8	9.0
SSW	0.1	1.7	1.4	0.5	0.1	+	3.8	8.9
SW	0.1	1.8	1.5	0.5	0.1	+	4.0	8.7
WSW	0.1	1.3	1.2	0.6	0.1	+	3.3	9.4
W	0.1	1.3	1.4	0.5	0.2	0.1	3.6	9.7
WNW	0.2	1.6	1.6	1.0	0.4	0.1	4.8	10.5
NW	0.2	1.8	2.6	1.6	0.4	0.1	6.7	10.7
NNW	0.1	1.5	2.3	1.3	0.3	+	5.5	10.4
CALM	7.0						7.0	
TOTAL	8.6	21.8	35.6	26.7	6.1	1.2	100	10.5

+ indicates more than 0, but less than 0.05

TABLE 2.6-22

HUTCHINSON ISLAND METEOROLOGICAL TOWER 50 FOOT HEIGHT
WIND FREQUENCY DISTRIBUTION IN PERCENT

SEASON: WINTER
DEC. 1, 1971 TO FEB. 29, 1972

WIND SECTOR	WIND SPEED CLASSES IN M.P.H. 1-3	4-7	8-12	13-18	19-24	25-31	31+	TOTAL PERCENT	AVERAGE SPEED M.P.H
NNE	0.14	1.19	1.24	0.37	0.46	0.00	0.00	3.39	10.19
NE	0.05	1.10	1.97	1.51	0.73	0.14	0.00	5.50	12.43
ENE	0.05	1.51	2.38	1.37	0.78	0.14	0.00	6.23	11.60
E	0.05	1.92	2.79	1.37	0.55	0.00	0.00	6.69	10.68
ESE	0.05	5.18	5.41	1.37	0.09	0.00	0.00	12.09	8.56
SE	0.05	2.47	5.36	1.47	0.09	0.00	0.00	9.44	9.67
SSE	0.18	2.02	3.85	1.15	0.05	0.00	0.00	7.24	9.31
S	0.37	5.22	4.81	0.60	0.00	0.00	0.00	10.99	7.86
SSW	0.32	2.06	1.74	0.60	0.18	0.00	0.00	4.90	8.42
SW	0.55	2.43	1.69	0.60	0.18	0.00	0.00	5.45	8.07
WSW	0.46	1.28	0.78	0.05	0.00	0.00	0.00	2.57	6.14
W	0.41	0.55	0.41	0.18	0.14	0.00	0.00	1.69	8.16
WNW	0.41	0.96	0.96	0.50	0.18	0.00	0.00	3.02	8.74
NW	0.18	2.66	2.02	0.60	0.00	0.00	0.00	5.45	7.68
NNW	0.18	1.83	2.34	0.82	0.00	0.00	0.00	5.18	8.81
N	0.05	1.37	2.52	1.47	0.09	0.00	0.00	6.09	11.47
CALM AND VARIABLE		0.00	0.00	0.00	0.00	0.00	0.00	4.08	1.66
TOTALS	3.52%	33.76%	40.27%	14.02%	4.12%	0.27%	0.00%	100.00%	9.00

NUMBER OF VALID SEASONAL OBSERVATIONS = 2183

NUMBER OF INVALID SEASONAL OBSERVATIONS = 1

NOTE: ALL PERCENTS ARE BASED ON VALID SEASONAL OBSERVATIONS FOR WIND SPEEDS AT THE 50 FT ELEVATION

TABLE 2.6-23

HUTCHINSON ISLAND METEOROLOGICAL TOWER 50 FOOT HEIGHT
WIND FREQUENCY DISTRIBUTION IN PERCENT

SEASON: SPRING
MAR. 1, 1971 TO MAY 31, 1971

WIND SECTOR	WIND SPEED CLASSES IN M.P.H. 1-3	4-7	8-12	13-18	19-24	25-31	31+	TOTAL PERCENT	AVERAGE SPEED M.P.H.
NNE	0.16	0.84	3.42	0.95	0.00	0.00	0.00	5.37	9.65
NE	0.21	2.74	2.95	0.21	0.00	0.00	0.00	6.11	7.93
ENE	0.05	2.42	2.37	0.00	0.00	0.00	0.00	4.85	7.27
E	0.37	3.27	4.21	0.05	0.00	0.00	0.00	7.90	7.59
ESE	0.26	2.58	3.37	0.11	0.00	0.00	0.00	6.32	7.47
SE	0.42	1.53	4.32	1.32	0.00	0.00	0.00	7.59	9.61
SSE	0.32	1.58	2.74	1.58	0.00	0.00	0.00	6.22	9.60
S	0.11	1.21	2.85	0.79	0.11	0.00	0.00	5.06	9.53
SSW	0.47	1.37	2.11	1.48	0.47	0.00	0.00	5.90	10.30
SW	0.47	3.32	2.85	1.69	0.90	0.11	0.00	9.33	10.01
WSW	0.58	2.32	2.69	0.37	0.42	0.00	0.00	6.38	8.84
W	0.42	2.48	1.26	0.26	0.00	0.00	0.00	4.43	7.10
WNW	0.58	2.00	2.90	1.00	0.00	0.00	0.00	6.48	8.41
NW	0.47	1.74	4.58	1.63	0.00	0.00	0.00	8.43	9.46
NNW	0.11	1.05	1.05	0.68	0.00	0.00	0.00	2.90	9.27
N	0.05	0.79	2.11	2.21	0.00	0.00	0.00	5.16	11.52
CALM AND VARIABLE		0.00	0.00	0.00	0.00	0.00	0.00	1.58	1.37
TOTALS	5.05%	31.24%	45.79%	14.33%	1.90%	0.11%	0.00%	100.00%	8.88

NUMBER OF VALID SEASONAL OBSERVATIONS = 1898

NUMBER OF INVALID SEASONAL OBSERVATIONS = 310

NOTE: ALL PERCENTS ARE BASED ON VALID SEASONAL OBSERVATIONS FOR WIND SPEEDS AT THE 50 FT ELEVATION

TABLE 2.6-24

HUTCHINSON ISLAND METEOROLOGICAL TOWER 50 FOOT HEIGHT
WIND FREQUENCY DISTRIBUTION IN PERCENT

SEASON: SUMMER
JUNE 1, 1971 TO AUG. 31, 1971

WIND SECTOR	WIND SPEED CLASSES IN M.P.H. 1-3	4-7	8-12	13-18	19-24	25-31	31+	TOTAL PERCENT	AVERAGE SPEED M.P.H.
NNE	0.11	1.03	0.65	0.11	0.00	0.00	0.00	1.89	7.23
NE	0.70	2.06	0.76	0.11	0.00	0.00	0.00	3.63	6.01
ENE	0.70	3.47	2.27	0.05	0.00	0.00	0.00	6.50	6.70
S	0.65	5.85	5.31	0.22	0.00	0.00	0.00	12.02	7.26
ESE	0.54	4.87	4.44	0.11	0.00	0.00	0.00	9.96	7.06
SE	0.70	6.17	7.47	0.32	0.00	0.00	0.00	14.67	7.64
SSE	0.43	3.63	3.47	0.60	0.00	0.00	0.00	8.12	7.61
S	0.54	2.44	3.74	1.08	0.00	0.00	0.00	7.80	8.78
SSW	0.22	2.76	2.17	0.43	0.05	0.00	0.00	5.63	7.64
SW	0.60	4.93	2.00	0.11	0.00	0.00	0.00	7.63	6.20
WSW	0.43	1.89	0.32	0.38	0.05	0.00	0.00	3.09	6.56
W	0.81	1.84	0.81	0.05	0.00	0.00	0.00	3.52	5.74
WNW	0.32	1.68	0.16	0.05	0.00	0.00	0.00	2.22	5.39
NW	0.05	0.87	0.60	0.00	0.00	0.00	0.00	1.52	6.82
NNW	0.11	0.22	0.11	0.05	0.00	0.00	0.00	0.49	6.89
N	0.27	1.03	0.60	0.05	0.00	0.00	0.00	1.95	6.36
CALM AND VARIABLE		0.00	0.00	0.00	0.00	0.00	0.00	9.37	1.18
TOTALS	7.19%	44.72%	34.87%	3.74%	0.11%	0.00%	0.00%	100.00%	6.59

NUMBER OF VALID SEASONAL OBSERVATIONS = 1847

NUMBER OF INVALID SEASONAL OBSERVATIONS = 361

NOTE: ALL PERCENTS ARE BASED ON VALID SEASONAL OBSERVATIONS FOR WIND SPEED AT THE 50 FT ELEVATION

TABLE 2.6-25

HUTCHINSON ISLAND METEOROLOGICAL TOWER 50 FOOT HEIGHT
WIND FREQUENCY DISTRIBUTION IN PERCENT

SEASON: FALL
SEP. 1, 1971 TO NOV. 30, 1971

WIND SECTOR	WIND SPEED CLASSES IN M.P.H. 1-3	4-7	8-12	13-18	19-24	25-31	31+	TOTAL PERCENT	AVERAGE SPEED M.P.H.
NNE	0.05	0.69	2.43	1.47	0.23	0.00	0.00	4.85	11.34
NE	0.14	1.88	2.61	0.92	0.73	0.00	0.00	6.27	10.67
ENE	0.78	2.75	5.27	2.61	0.50	0.00	0.00	11.90	9.97
E	0.18	3.89	6.00	2.98	0.23	0.00	0.00	13.28	9.89
ESE	0.37	2.88	3.43	1.28	0.05	0.00	0.00	8.01	8.90
SE	0.37	3.11	3.02	0.55	0.00	0.00	0.00	7.05	7.74
SSE	0.27	2.70	1.05	0.16	0.00	0.00	0.00	4.21	6.82
S	0.23	1.51	1.28	0.14	0.00	0.00	0.00	3.16	7.36
SSW	0.23	2.01	0.96	0.41	0.14	0.00	0.00	3.75	8.11
SW	0.96	3.48	2.20	0.46	0.00	0.00	0.00	7.10	6.97
WSW	0.46	2.15	1.28	0.23	0.00	0.00	0.00	4.12	6.99
W	0.27	1.01	0.27	0.00	0.00	0.00	0.00	1.56	5.47
WNW	0.41	1.60	0.46	0.05	0.00	0.00	0.00	2.52	5.73
NW	0.87	3.89	1.28	0.27	0.00	0.00	0.00	6.32	6.45
NNW	0.23	1.51	1.65	0.78	0.00	0.00	0.00	4.17	8.58
N	0.09	0.73	2.43	2.66	0.00	0.00	0.00	5.91	11.70
CALM AND VARIABLE		0.00	0.00	0.00	0.00	0.00	0.00	5.82	1.57
TOTALS	5.91%	35.81%	35.62%	14.97%	1.88%	0.00%	0.00%	100.00%	8.36

NUMBER OF VALID SEASONAL OBSERVATIONS = 2184

NUMBER OF INVALID SEASONAL OBSERVATIONS = 0

NOTE: ALL PERCENTS ARE BASED ON VALID SEASONAL OBSERVATIONS FOR WIND SPEEDS AT THE 50 FT ELEVATION

TABLE 2.6-26

HUTCHINSON ISLAND METEOROLOGICAL TOWER 50 FOOT HEIGHT
WIND FREQUENCY DISTRIBUTION IN PERCENT

ANNUAL WIND REPORT
MAR. 1, 1971 TO FEB. 29, 1972

WIND SECTOR	WIND SPEED CLASSES IN M.P.H. 1-3	4-7	8-12	13-18	19-24	25-31	31+	TOTAL PERCENT	AVERAGE SPEED M.P.H.
NNE	0.11	0.94	1.94	0.74	0.18	0.00	0.00	3.91	10.07
NE	0.26	1.91	2.10	0.73	0.39	0.04	0.00	5.42	9.72
ENE	0.39	2.50	3.13	1.08	0.35	0.04	0.00	7.50	9.28
E	0.30	3.66	4.56	1.23	0.21	0.00	0.00	9.96	8.88
ESE	0.30	3.88	4.18	0.76	0.04	0.00	0.00	9.16	8.09
SE	0.37	3.27	4.97	0.92	0.02	0.00	0.00	9.55	8.57
SSE	0.30	2.47	2.75	0.86	0.01	0.00	0.00	6.39	8.44
S	0.31	2.65	3.16	0.63	0.02	0.00	0.00	6.77	8.33
SSW	0.31	2.05	1.71	0.71	0.21	0.00	0.00	4.99	8.68
SW	0.65	3.49	2.17	0.70	0.26	0.02	0.00	7.30	7.92
WSW	0.48	1.90	1.26	0.25	0.11	0.00	0.00	3.99	7.46
W	0.47	1.42	0.67	0.12	0.04	0.00	0.00	2.71	6.62
WNW	0.43	1.54	1.10	0.39	0.05	0.00	0.00	3.51	7.53
NW	0.41	2.37	2.10	0.62	0.00	0.00	0.00	5.49	7.88
NNW	0.16	1.20	1.34	0.60	0.00	0.00	0.00	3.30	8.76
N	0.11	0.99	1.96	1.64	0.18	0.00	0.00	4.88	11.09
CALM AND VARIABLE		0.00	0.00	0.00	0.00	0.00	0.00	5.15	1.42
TOTALS	5.36%	36.22%	39.08%	12.01%	2.08%	0.10%	0.00%	100.00%	8.25

NUMBER OF VALID ANNUAL OBSERVATIONS = 8112

NUMBER OF INVALID ANNUAL OBSERVATIONS = 672

NOTE: ALL PERCENTS ARE BASED ON VALID ANNUAL OBSERVATIONS FOR WIND SPEEDS AT THE 50 FT ELEVATION

TABLE 2.6-27

MONTHLY MAXIMUM OBSERVED ONE MINUTE WINDSPEED
WEST PALM BEACH, FLORIDA
(1950-1969)

Month	Fastest Mile (mph)	Direction Degrees
Jan	48	290
Feb	46	290
March	51	270
April	55	320
May	45	270
June	71	090
July	45	200
Aug	86	130
Sept	55	030
Oct	74	160
Nov	35	340
Dec	36	070
Annual	86	130

TABLE 2.6-28

ONE MINUTE WIND SPEED RECURRENCE INTERVALS
WEST PALM BEACH, FLORIDA

Recurrence Interval (Years)	Wind Speed (mph)
2	50
10	80
25	100
50	110
100	120

TABLE 2.6-29

MONTHLY AND ANNUAL AVERAGE SKY COVER AND INSULATION DATA
WEST PALM BEACH, FLORIDA

Month	Average Sky Cover[a] (Tenths) Sunrise to Sunset	Average Number of Days[b] Clear	Partly Cloudy	Cloudy	Percent[c] of Possible Sunshine	Solar[d] Radiation (BTU/ft^2-day)
Jan	5.8	7	12	12	64	1235
Feb	5.6	8	11	9	68	1474
March	5.6	8	13	10	70	1769
April	5.6	8	13	9	73	1986
May	5.8	8	12	11	70	2156
June	6.8	9	12	14	70	2009
July	6.6	3	14	14	64	1964
Aug	6.5	3	16	12	68	1843
Sept	7.1	2	13	15	60	1622
Oct	6.4	6	13	12	60	1437
Nov	5.6	7	14	9	60	1308
Dec	5.6	9	11	11	60	1124
Annual	6.1	73	154	138	65	1666

Periods of Record

a) 1949-1969 c) 1916-1960

b) 1946-1969 d) 1951-1960

TABLE 2.6-30

ST. LUCIE SITE
WIND DISTRIBUTION BY PASQUILL STABILITY CLASS A
PERCENTAGE FREQUENCY DISTRIBUTION
(NUMBER OF OBSERVATIONS = 8764)

SPEED	WIND DIRECTION																	
(MPH)	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM	0.07																	0.07
1-3				0.02	0.07	0.04	0.02	0.01	0.01	0.02	0.02	0.03			0.04	0.01	0.01	0.33
4-7		0.16	0.33	1.03	1.45	2.60	1.69	1.28	0.20	0.13	0.21	0.26	0.19	0.20	0.18	0.27	0.12	10.26
8-12		0.74	0.74	0.45	0.65	1.10	1.10	2.72	0.50	0.25	0.21	0.42	0.28	0.14	0.22	0.31	0.23	10.06
13-18		0.54	0.09	0.01	0.12	0.17	0.06	0.29	0.31	0.13	0.05	0.16	0.08	0.05	0.05	0.14	0.07	2.17
19-24						0.01						0.04	0.02	0.02	0.03			0.13
25-31																		
>31																		
TOTAL	0.07	1.43	1.15	1.51	2.23	3.91	2.87	4.29	1.02	0.51	0.51	0.94	0.58	0.42	0.53	0.64	0.44	23.11

Note: All values are subject to computer round-off
Period of Record - March 1, 1971 to February 29, 1972
Height of wind sensor, 50 feet above grade

|0

TABLE 2.6-31

ST. LUCIE SITE
WIND DISTRIBUTION BY PASQUILL STABILITY CLASS B
PERCENTAGE FREQUENCY DISTRIBUTION
(NUMBER OF OBSERVATIONS = 8764)

SPEED (MPH)	WIND DIRECTION CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM	0.05																	0.05
1-3					0.03	0.01	0.01	0.01		0.01	0.03		0.01	0.01				0.13
4-7		0.02	0.10	0.14	0.16	0.21	0.12	0.11	0.04	0.08	0.04	0.09	0.08	0.03	0.02	0.06	0.02	1.38
8-12		0.10	0.05	0.07	0.04	0.05	0.03	0.06	0.09	0.03	0.04	0.08	0.03	0.04		0.02	0.04	0.82
13-18		0.10	0.03		0.03	0.02	0.01	0.03	0.05		0.01	0.04	0.02		0.01	0.1	0.05	0.43
19-24		0.03										0.03	0.01					0.08
25-31																		
>31																		
TOTAL	0.05	0.26	0.19	0.21	0.28	0.30	0.17	0.22	0.18	0.13	0.14	0.25	0.15	0.08	0.03	0.10	0.11	2.89

Note: All values are subject to computer round-off
Period of Record - March 1, 1971 to February 29, 1972
Height of wind sensor, 50 feet above grade

|0

TABLE 2.6-32

ST. LUCIE SITE
WIND DISTRIBUTION BY PASQUILL STABILITY CLASS C
PERCENTAGE FREQUENCY DISTRIBUTION
(NUMBER OF OBSERVATIONS = 8764)

SPEED	WIND DIRECTION																	
(MPH)	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM	0.21																	0.21
1-3			0.01	0.01	0.09	0.01			0.01	0.03	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.31
4-7		0.09	0.12	0.21	0.12	0.25	0.29	0.24	0.16	0.05	0.17	0.32	0.12	0.13	0.15	0.12	0.06	2.60
8-12		0.14	0.12	0.13	0.10	0.09	0.16	0.12	0.18	0.27	0.15	0.27	0.05	0.02	0.04	0.04	0.11	2.02
13-18		0.08	0.14	0.03	0.01	0.08		0.03	0.11	0.02	0.13	0.05	0.01	0.01	0.01	0.01		0.66
19-24		0.02	0.02		0.01						0.01	0.01	0.01					0.08
25-31																		
>31																		
TOTAL	0.21	0.34	0.30	0.38	0.35	0.44	0.45	0.38	0.46	0.39	0.47	0.67	0.21	0.18	0.23	0.19	0.20	5.89

Note: All values are subject to computer round-off
Period of Record - March 1, 1971 to February 29, 1972
Height of wind sensors, 50 feet above grade

TABLE 2.6-33

ST. LUCIE SITE
WIND DISTRIBUTION BY PASQUILL STABILITY CLASS D
PERCENTAGE FREQUENCY DISTRIBUTION
(NUMBER OF OBSERVATIONS = 8764)

SPEED (MPH)	WIND DIRECTION																	
	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM	0.41																	0.41
1-3		0.02	0.03	0.02	0.07	0.06	0.04	0.07	0.01	0.01	0.04	0.09	0.03	0.09	0.07	0.08	0.06	0.82
4-7		0.28	0.22	0.46	0.46	0.89	0.77	0.59	0.55	1.06	1.17	1.10	0.47	0.25	0.40	0.56	0.27	9.42
8-12		0.55	0.45	0.49	0.77	1.01	0.53	0.39	0.81	1.38	0.84	0.55	0.34	0.14	0.12	0.34	0.26	8.68
13-18		0.44	0.25	0.48	0.51	0.46	0.13	0.12	0.24	0.25	0.37	0.17	0.03	0.02	0.18	0.13	0.22	4.04
19-24		0.03	0.07	0.12	0.06	0.03	0.01				0.01	0.05						0.61
25-31				0.01														0.01
>31																		
TOTAL	0.41	1.36	1.04	1.43	1.91	2.50	1.53	1.19	1.60	2.70	2.42	1.96	0.87	0.58	0.80	1.13	0.80	24.31

Note: All values are subject to computer round-off
Period of Record - March 1, 1971 to February 29, 1972
Height of wind sensor, 50 feet above grade

|0

TABLE 2.6-34

ST. LUCIE SITE
WIND DISTRIBUTION BY PASQUILL STABILITY CLASS E
PERCENTAGE FREQUENCY DISTRIBUTION
(NUMBER OF OBSERVATIONS = 8764)

WIND DIRECTION

SPEED (MPH)	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM	1.40																	1.40
1-3		0.09	0.09	0.18	0.23	0.26	0.44	0.57	0.42	0.35	0.35	0.74	0.53	0.41	0.36	0.28	0.13	5.53
4-7		0.31	0.33	0.62	1.12	1.18	2.04	2.18	1.92	1.66	0.80	1.81	0.97	0.63	0.70	1.17	0.51	17.40
8-12		0.32	0.38	0.50	0.72	0.72	0.90	0.57	0.47	0.47	0.36	0.30	0.24	0.14	0.30	0.67	0.41	7.48
13-18		0.06	0.02	0.03	0.14	0.1[illegible]	0.11	0.14	0.03	0.03	0.04	0.08	0.02					0.93
19-24				0.06														0.06
25-31																		
>31																		
TOTAL	1.40	0.79	0.84	1.38	2.20	2.36	3.51	3.46	2.85	2.52	1.57	2.94	1.77	1.18	2.51	2.13	1.08	33.36

Note: All values are subject to computer round-off

Period of Record - March 1, 1971 to February 29, 1972
Height of wind sensor, 50 feet above grade

|0

TABLE 2.6-35

ST. LUCIE SITE
WIND DISTRIBUTION BY PASQUILL STABILITY CLASS F
PERCENTAGE FREQUENCY DISTRIBUTION
(NUMBER OF OBSERVATIONS = 8764)

WIND DIRECTION

SPEED (MPH)	Calm	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm	2.24																	2.24
1-3		0.20	0.06	0.15	0.14	0.09	0.22	0.30	0.34	0.28	0.20	0.31	0.30	0.21	0.24	0.24	0.07	3.40
4-7		0.10	0.06	0.06	0.04	0.03	0.05	0.13	0.27	0.26	0.11	0.35	0.14	0.11	0.09	0.38	0.34	2.58
8-12						0.01	0.02	0.03	0.01	0.01		0.01						0.09
13-18		0.01																0.01
19-24																		
25-31																		
>31																		
TOTAL	2.24	0.31	0.14	0.20	0.18	0.13	0.32	0.46	0.62	0.57	0.30	0.69	0.44	0.32	0.34	0.61	0.42	8.35

Note: All values are subject to computer round-off.
Period of Record - March 1, 1971 to February 29, 1972.
Height of wind sensors, 50 feet above grade

SL2

|0

TABLE 2.6-36

ST. LUCIE SITE
WIND DISTRIBUTION BY PASQUILL STABILITY CLASS G
PERCENTAGE FREQUENCY DISTRIBUTION
(NUMBER OF OBSERVATIONS = 8764)

WIND DIRECTION

SPEED (MPH)	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM	0.70																0.70	
1-3		0.05	0.01	0.03	0.03	0.02	0.06	0.01	0.03	0.05	0.05	0.14	0.09	0.09	0.14	0.13	0.04	1.06
4-7								0.01		0.01	0.01	0.03	0.01	0.01		0.19	0.04	0.32
8-12					0.01												0.01	
13-18																		
19-24																		
25-31																		
>31																		
TOTAL	0.70	0.05	0.01	0.03	0.03	0.03	0.06	0.02	0.03	0.06	0.07	0.17	0.10	0.10	0.14	0.32	0.09	2.10

Note: All values are subject to computer round-off
Period of Record - March 1, 1971 to February 29, 1972
Height of wind sensors, 50 feet above grade

SL2

0

TABLE 2.6-37

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE METEOROLOGICAL DATA

PERIOD OF RECORD: MARCH 1, 1971, to DEC. 31, 1972
ANNUAL HOURLY PERCENT FREQUENCY OF VERTICAL
TEMPERATURE STABILITY CATEGORIES BY WIND DIRECTION AND
WIND SPEED (MPH)
PASQUILL STABILITY CATEGORY A

WIND DIR	WIND SPEED (MPH) ADJUSTED TO 10 METER ELEVATION								
	1<4	4<8	8<13	13<19	19<25	25-31	>31	Total%	
NNE	0.012	0.447	0.702	0.050	0.000	0.000	0.000	1.211	
NE	0.137	1,341	0.546	0.087	0.000	0.000	.0.000	2.111	
ENE	0.230	1.646	0.720	0.098	0.000	0.000	0.000	2.683	1
E	0.242	2.658	1.329	0.137	0.006	0.000	0.000	4.372	
ESE	0.093	1.670	1.006	0.050	0.000	0.000	0.000	2.819	
SE	0.043	1.155	2.726	0.075	0.000	0.000	0.000	3.999	
SSE	0.012	0.192	0.602	0.205	0.000	0.000	0.000	1.012	
S	0.056	0.081	0.155	0.043	0.000	0.000	0.000	0.335	
SSW	0.050	0.155	0.174	0.025	0.000	0.000	0.000	0.404	
SW	0.081	0.279	0.466	0.106	0.006	0.000	0.000	0.938	
WSW	0.019	0.230	0.447	0.050	0.012	0.000	0.000	0.758	
W	0.025	0.192	0.180	0.019	0.006	0.000	0.000	0.422	
WNW	0.043	0.230	0.224	0.050	0.012	0.000	0.000	0.522	
NW	0.050	0.329	0.286	0.019	0.000	0.000	0.000	0.683	
NNW	0.037	0.149	0.242	0.000	0.000	0.000	0.000	0.428	
N	0.019	0.130	0.832	0.224	0.006	0.000	0.000	1.211	
Variable and Calm								0.049	
Total								23.957	

TABLE 2.6-38

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE METEOROLOGICAL DATA

PERIOD OF RECORD: MARCH 1, 1971, to DEC. 31, 1972
ANNUAL HOURLY PERCENT FREQUENCY OF VERTICAL
TEMPERATURE STABILITY CATEGORIES BY WIND DIRECTION AND
WIND SPEED (MPH)
PASQUILL STABILITY CATEGORY B

WIND DIR	WIND SPEED (MPH) ADJUSTED TO 10 METER ELEVATION								
	1<4	4<8	8<13	13<19	19<25	25-31	>31	Total%	
NNE	0.006	0.087	0.050	0.006	0.000	0.000	0.000	0.149	
NE	0.037	0.093	0.062	0.012	0.000	0.000	0.000	0.205	1
ENE	0.093	0.062	0.056	0.012	0.000	0.000	0.000	0.224	
E	0.043	0.143	0.099	0.019	0.000	0.000	0.000	0.304	
ESE	0.031	0.106	0.043	0.000	0.000	0.000	0.000	0.180	
SE	0.031	0.106	0.068	0.012	0.000	0.000	0.000	0.217	
SSE	0.006	0.031	0.087	0.019	0.000	0.000	0.000	0.143	
S	0.025	0.043	0.025	0.006	0.000	0.000	0.000	0.099	
SSW	0.019	0.043	0.050	0.012	0.000	0.000	0.000	0.124	
SW	0.012	0.068	0.093	0.025	0.019	0.000	0.000	0.217	
WSW	0.012	0.075	0.043	0.012	0.006	0.000	0.000	0.149	
W	0.019	0.019	0.031	0.000	0.000	0.000	0.000	0.068	
WNW	0.006	0.031	0.012	0.000	0.000	0.000	0.000	0.050	
NW	0.012	0.056	0.031	0.006	0.000	0.000	0.000	0.106	
NNW	0.012	0.012	0.056	0.006	0.000	0.000	0.000	0.087	
N	0.012	0.012	0.099	0.037	0.012	0.000	0.000	0.174	
Variable and Calm								0.031	
Total								2.527	

TABLE 2.6-39

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE METEOROLOGICAL DATA

PERIOD OF RECORD: MARCH 1, 1971, TO DEC. 31, 1972
ANNUAL HOURLY PERCENT FREQUENCY OF VERTICAL
TEMPERATURE STABILITY CATEGORIES BY WIND DIRECTION AND
WIND SPEED (MPH)
PASQUILL STABILITY CATEGORY C

WIND DIR	WIND SPEED (MPH) ADJUSTED TO 10 METER ELEVATION							
	1<4	4<8	8<13	13<19	19<25	25-31	>31	Total%
NNE	0.006	0.075	0.062	0.012	0.000	0.000	0.000	0.155
NE	0.043	0.093	0.068	0.006	0.000	0.000	0.000	0.211
ENE	0.043	0.081	0.062	0.012	0.006	0.000	0.000	0.205
E	0.043	0.143	0.093	0.012	0.000	0.000	0.000	0.292
ESE	0.037	0.118	0.068	0.000	0.000	0.000	0.000	0.224
SE	0.006	0.099	0.068	0.006	0.000	0.000	0.000	0.180
SSE	0.006	0.050	0.075	0.025	0.000	0.000	0.000	0.155
S	0.025	0.012	0.099	0.006	0.000	0.000	0.000	0.143
SSW	0.050	0.062	0.062	0.025	0.000	0.000	0.000	0.199
SW	0.037	0.149	0.118	0.025	0.000	0.000	0.000	0.329
WSW	0.037	0.031	0.031	0.012	0.000	0.000	0.000	0.112
W	0.037	0.037	0.006	0.000	0.000	0.000	0.000	0.081
WNW	0.031	0.043	0.000	0.000	0.000	0.000	0.000	0.075
NW	0.037	0.025	0.019	0.000	0.000	0.000	0.000	0.081
NNW	0.031	0.043	0.019	0.000	0.000	0.000	0.000	0.093
N	0.019	0.056	0.081	0.019	0.019	0.000	0.000	0.192
Variable and Calm								0.049
Total								2.776

1

TABLE 2.6-40

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE METEOROLOGICAL DATA

PERIOD OF RECORD: MARCH 1, 1971, TO DEC. 31, 1972
ANNUAL HOURLY PERCENT FREQUENCY OF VERTICAL
TEMPERATURE STABILITY CATEGORIES BY WIND DIRECTION AND
WIND SPEED (MPH)
PASQUILL STABILITY CATEGORY D

WIND DIR	WIND SPEED (MPH) ADJUSTED TO 10 METER ELEVATION							
	1<4	4<8	8<13	13<19	19<25	25-31	>31	Total%
NNE	0.112	0.317	0.466	0.137	0.043	0.000	0.000	1.075
NE	0.174	0.323	0.832	0.397	0.075	0.006	0.000	1.807
ENE	0.261	0.497	1.099	0.317	0.081	0.000	0.000	2.254
E	0.236	1.087	1.540	0.379	0.037	0.000	0.000	3.279
ESE	0.199	0.851	0.727	0.130	0.012	0.000	0.000	1.919
SE	0.174	0.683	0.460	0.081	0.012	0.000	0.000	1.410
SSE	0.112	0.689	0.913	0.168	0.006	0.000	0.000	1.888
S	0.124	1.025	1.422	0.118	0.000	0.000	0.000	2.689
SSW	0.224	1.207	1.012	0.310	0.000	0.000	0.000	2.763
SW	0.255	1.018	0.640	0.130	0.019	0.000	0.000	2.062
WSW	0.118	0.404	0.385	0.031	0.006	0.000	0.000	0.944
W	0.199	0.255	0.149	0.006	0.000	0.000	0.000	0.609
WNW	0.224	0.422	0.161	0.093	0.000	0.000	0.000	0.900
NW	0.186	0.602	0.385	0.050	0.000	0.000	0.000	1.223
NNW	0.099	0.217	0.323	0.081	0.000	0.000	0.000	0.720
N	0.081	0.348	0.584	0.354	0.025	0.000	0.000	1.391
Variable and Calm								0.416
Total								27.349

1

TABLE 2.6-41

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE METEOROLOGICAL DATA

PERIOD OF RECORD: MARCH 1, 1971, TO DEC. 31, 1972
ANNUAL HOURLY PERCENT FREQUENCY OF VERTICAL
TEMPERATURE STABILITY CATEGORIES BY WIND DIRECTION AND
WIND SPEED (MPH)
PASQUILL STABILITY CATEGORY E

WIND DIR	WIND SPEED (MPH) ADJUSTED TO 10 METER ELEVATION							
	1<4	4<8	8<13	13<19	19<25	25 31	>31	Total%
NNE	0.174	0.416	0.242	0.012	0.000	0.000	0.000	0.844
NE	0.248	0.708	0.546	0.081	0.031	0.000	0.000	1.615
ENE	0.329	1.366	0.702	0.149	0.000	0.000	0.000	2.546
E	0.292	1.447	1.006	0.124	0.000	0.000	0.000	2.869
ESE	0.596	2.223	0.832	0.062	0.000	0.000	0.000	3.713
SE	0.714	2.391	0.627	0.087	0.000	0.000	0.000	3.819
SSE	0.627	1.882	0.484	0.019	0.000	0.000	0.000	3.012
S	0.335	1.273	0.404	0.075	0.012	0.000	0.000	2.099
SSN	0.422	0.751	0.267	0.056	0.000	0.000	0.000	1.497
SW	0.770	1.577	0.186	0.050	0.000	0.000	0.000	2.583
WSW	0.776	0.969	0.174	0.012	0.000	0.000	0.000	1.931
W	0.633	0.615	0.093	0.000	0.000	0.000	0.000	1.341
WNW	0.453	0.807	0.180	0.000	0.000	0.000	0.000	1.441
NW	0.366	1.223	0.428	0.006	0.000	0.000	0.000	2.024
NNW	0.192	0.416	0.267	0.000	0.000	0.000	0.000	0.876
N	0.130	0.329	0.292	0.037	0.000	0.000	0.000	0.789
Variable and Calm								1.124
Total								34.123

1

TABLE 2.6-42

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE METEOROLOGICAL DATA

PERIOD OF RECORD: MARCH 1, 1971, TO DEC. 31, 1972
ANNUAL HOURLY PERCENT FREQUENCY OF VERTICAL
TEMPERATURE STABILITY CATEGORIES BY WIND DIRECTION AND
WIND SPEED (MPH)
PASQUILL STABILITY CATEGORY F

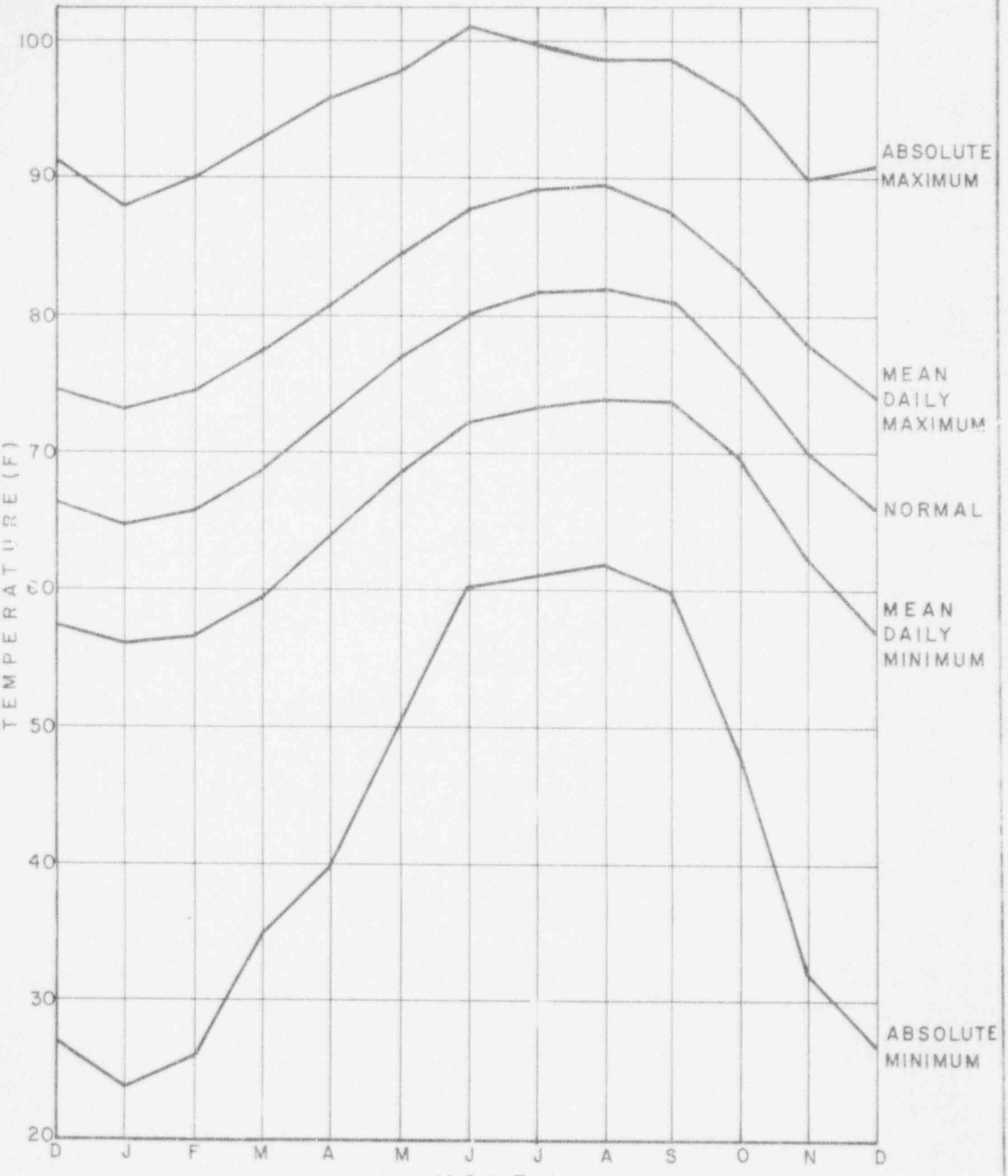
WIND DIR	WIND SPEED (MPH) ADJUSTED TO 10 METER ELEVATION								
	1<4	4<8	8<13	13<19	19<25	25-31	>31	Total%	
NNE	0.087	0.068	0.000	0.000	0.000	0.000	0.000	0.155	
NE	0.118	0.050	0.000	0.000	0.000	0.000	0.000	0.168	
ENE	0.130	0.050	0.000	0.006	0.000	0.000	0.000	0.186	
E	0.093	0.056	0.006	0.000	0.000	0.000	0.000	0.155	1
ESE	0.180	0.062	0.019	0.000	0.000	0.000	0.000	0.261	
SE	0.255	0.124	0.025	0.000	0.000	0.000	0.000	0.404	
SSE	0.279	0.192	0.006	0.000	0.000	0.000	0.000	0.478	
S	0.248	0.199	0.012	0.000	0.000	0.000	0.000	0.460	
SSN	0.248	0.062	0.000	0.000	0.000	0.000	0.000	0.310	
SW	0.273	0.267	0.006	0.000	0.000	0.000	0.000	0.546	
WSW	0.317	0.106	0.006	0.000	0.000	0.000	0.000	0.428	
W	0.230	0.106	0.000	0.000	0.000	0.000	0.000	0.335	
WNW	0.298	0.186	0.000	0.000	0.000	0.000	0.000	0.484	
NW	0.286	0.329	0.000	0.000	0.000	0.000	0.000	0.615	
NNW	0.118	0.261	0.000	0.000	0.000	0.000	0.000	0.379	
N	0.199	0.099	0.000	0.006	0.000	0.000	0.000	0.304	
Variable and Calm								1.794	
Total								7.462	

TABLE 2.6-43

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE METEOROLOGICAL DATA

PERIOD OF RECORD: MARCH 1, 1971, TO DEC. 31, 1972
ANNUAL HOURLY PERCENT FREQUENCY OF VERTICAL
TEMPERATURE STABILITY CATEGORIES BY WIND DIRECTION AND
WIND SPEED (MPH)
PASQUILL STABILITY CATEGORY G

WIND DIR	WIND SPEED (MPH) ADJUSTED TO 10 METER ELEVATION								
	1<4	4<8	8<13	13<19	19<25	25-31	>31	Total%	
NNE	0.012	0.006	0.000	0.000	0.000	0.000	0.000	0.019	
NE	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.019	
ENE	0.019	0.006	0.000	0.000	0.000	0.000	0.000	0.025	
E	0.012	0.000	0.012	0.000	0.000	0.000	0.000	0.125	1
ESE	0.037	0.000	0.000	0.000	0.000	0.000	0.000	0.037	
SE	0.006	0.006	0.000	0.000	0.000	0.000	0.000	0.012	
SSE	0.025	0.006	0.000	0.000	0.000	0.000	0.000	0.031	
S	0.043	0.025	0.000	0.000	0.000	0.000	0.000	0.068	
SSN	0.081	0.012	0.000	0.000	0.000	0.000	0.000	0.093	
SW	0.118	0.037	0.000	0.000	0.000	0.000	0.000	0.155	
WSW	0.062	0.006	0.000	0.000	0.000	0.000	0.000	0.068	
W	0.081	0.012	0.000	0.000	0.000	0.000	0.000	0.093	
WNW	0.186	0.043	0.000	0.000	0.000	0.000	0.000	0.230	
NW	0.130	0.161	0.000	0.000	0.000	0.000	0.000	0.292	
NNW	0.037	0.050	0.000	0.000	0.000	0.000	0.000	0.087	
N	0.043	0.012	0.000	0.000	0.000	0.000	0.000	0.056	
Variable and Calm								0.497	
Total								1.807	

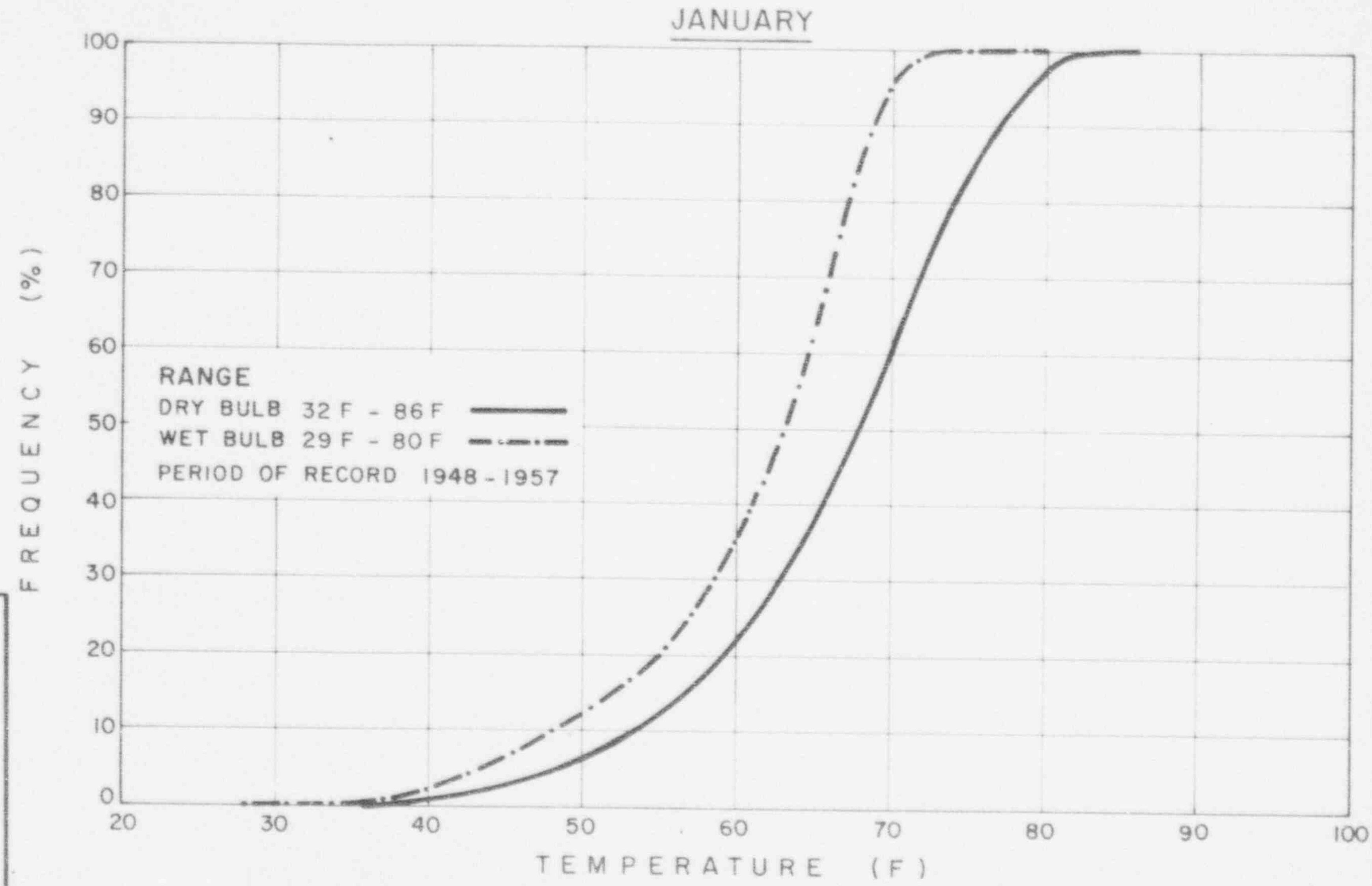


PERIOD OF RECORD 1904-1960

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MEAN DAILY AND EXTREME TEMPERATURE (F) FT. PIERCE, FLORIDA

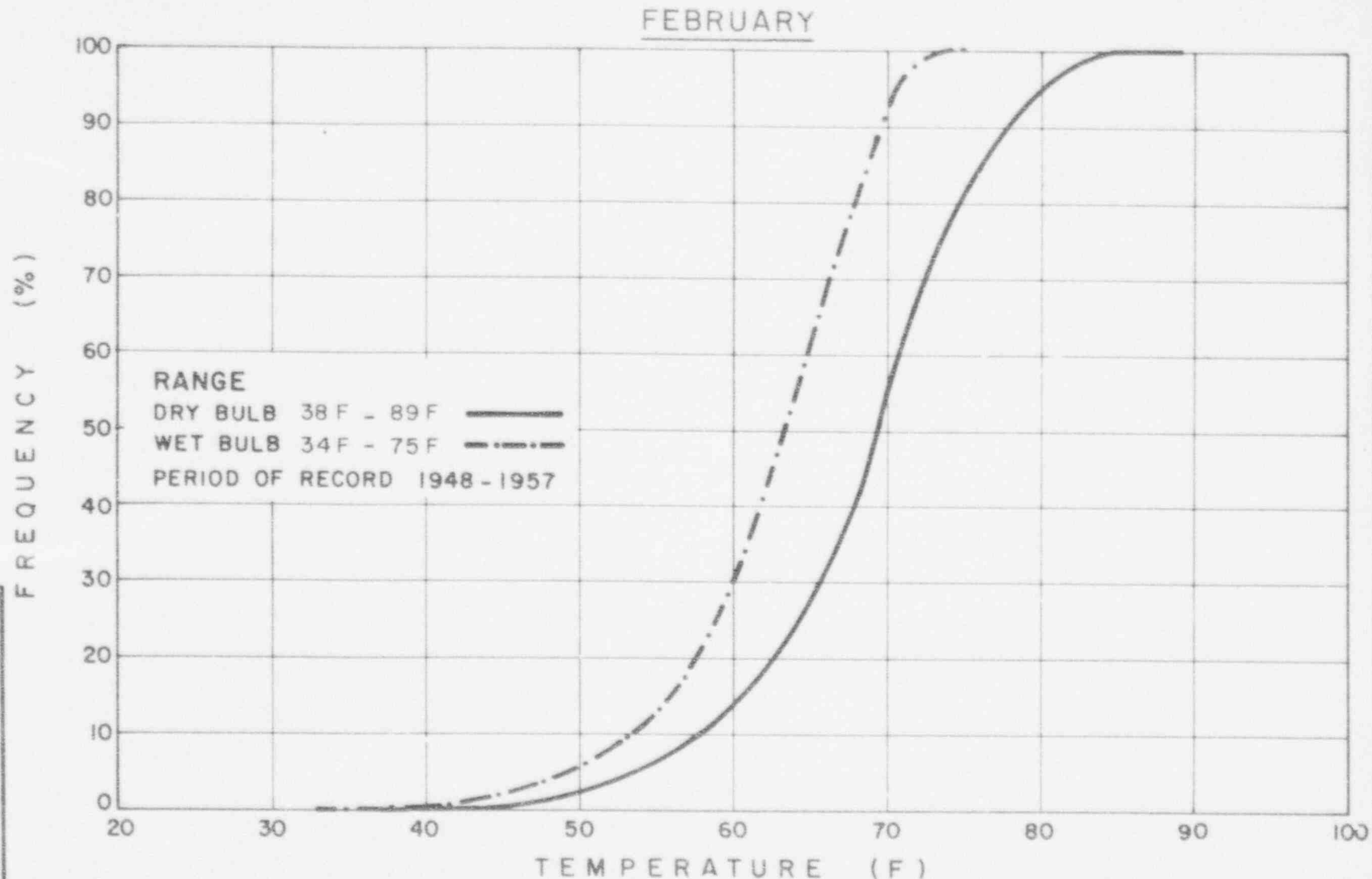
FIGURE 2.6-1



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH FLORIDA

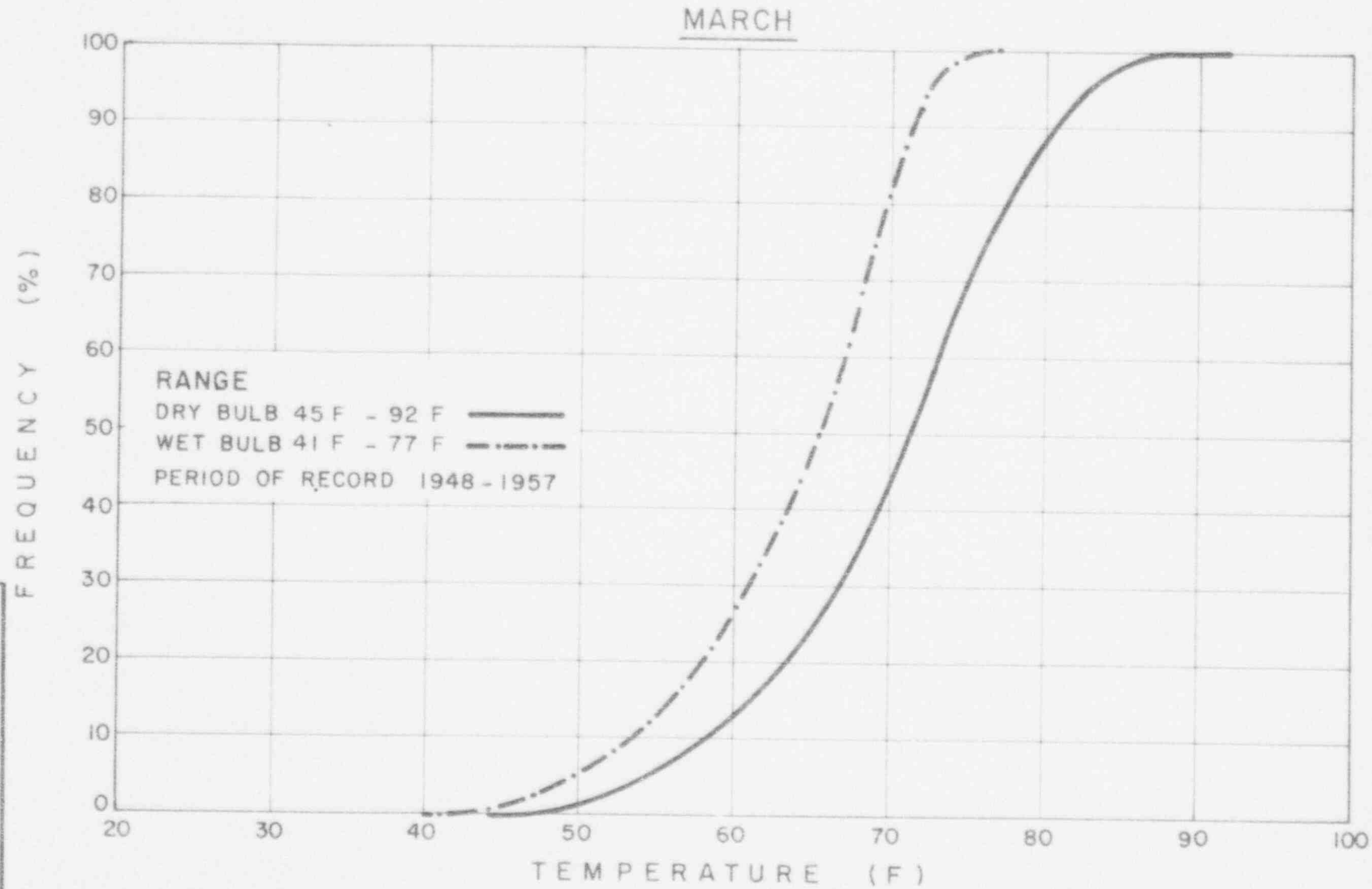
FIGURE 2.6-2



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH FLORIDA

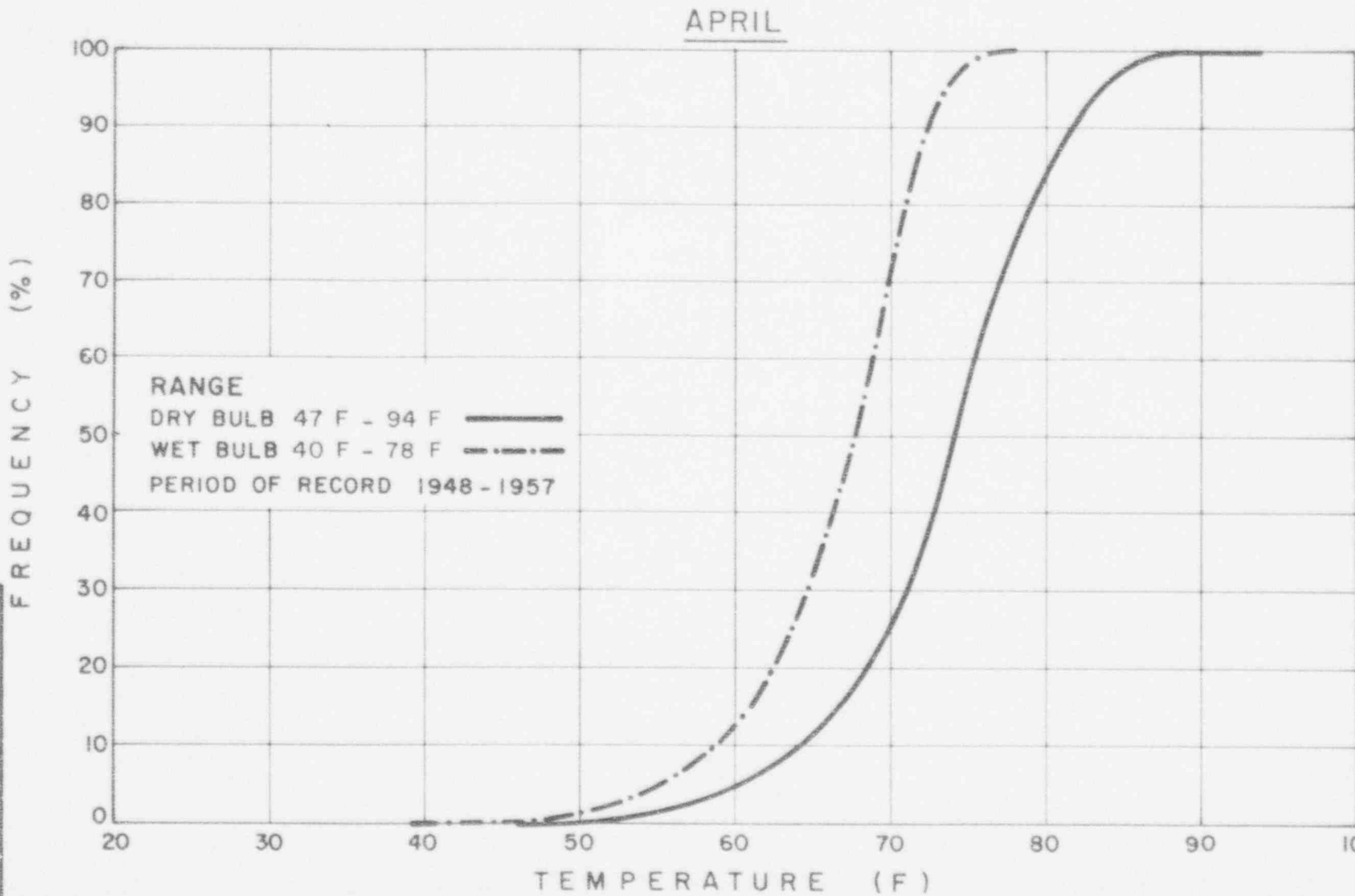
FIGURE 2.6-3



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH FLORIDA

FIGURE 2.6-4

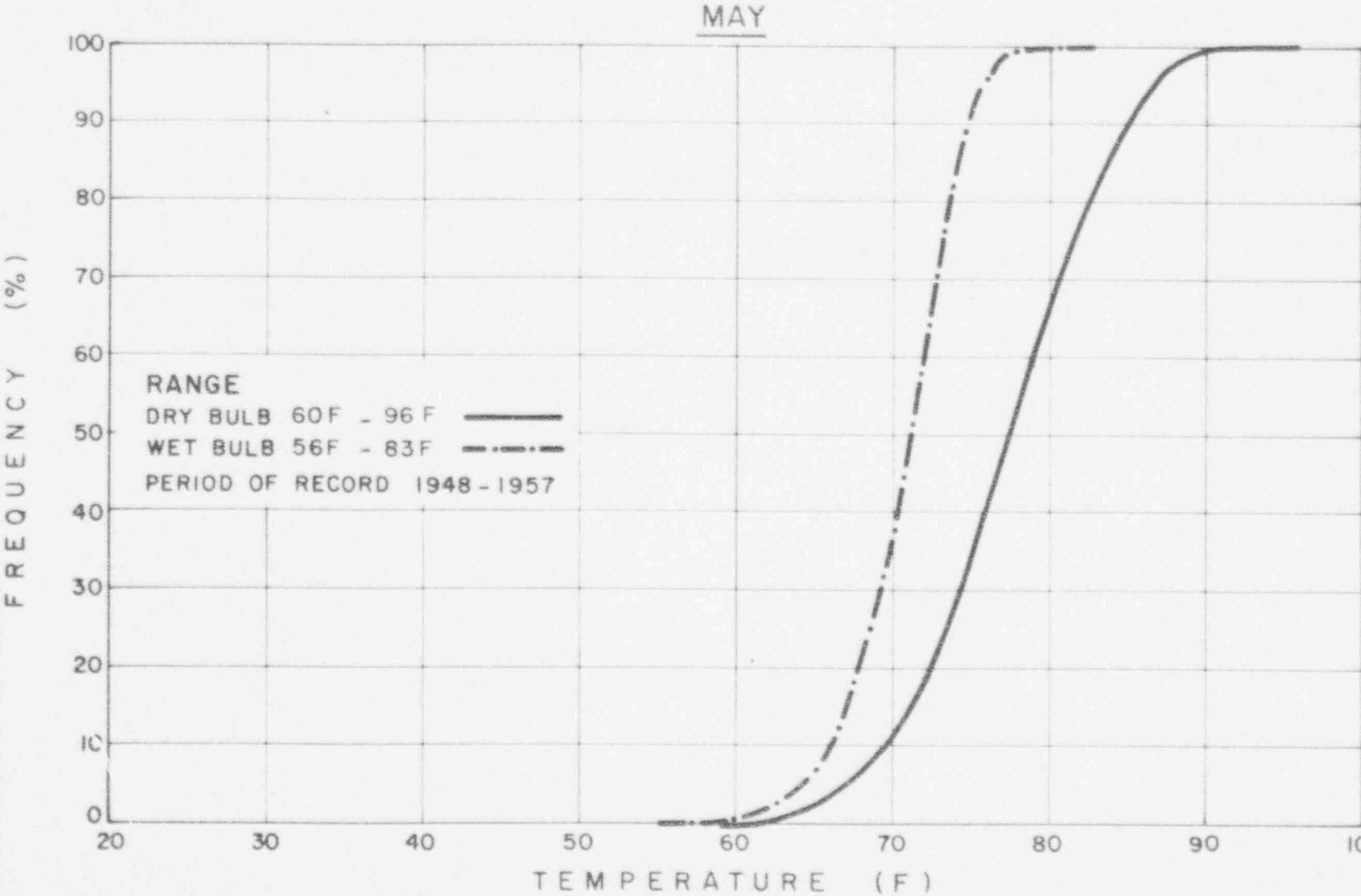


FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH FLORIDA

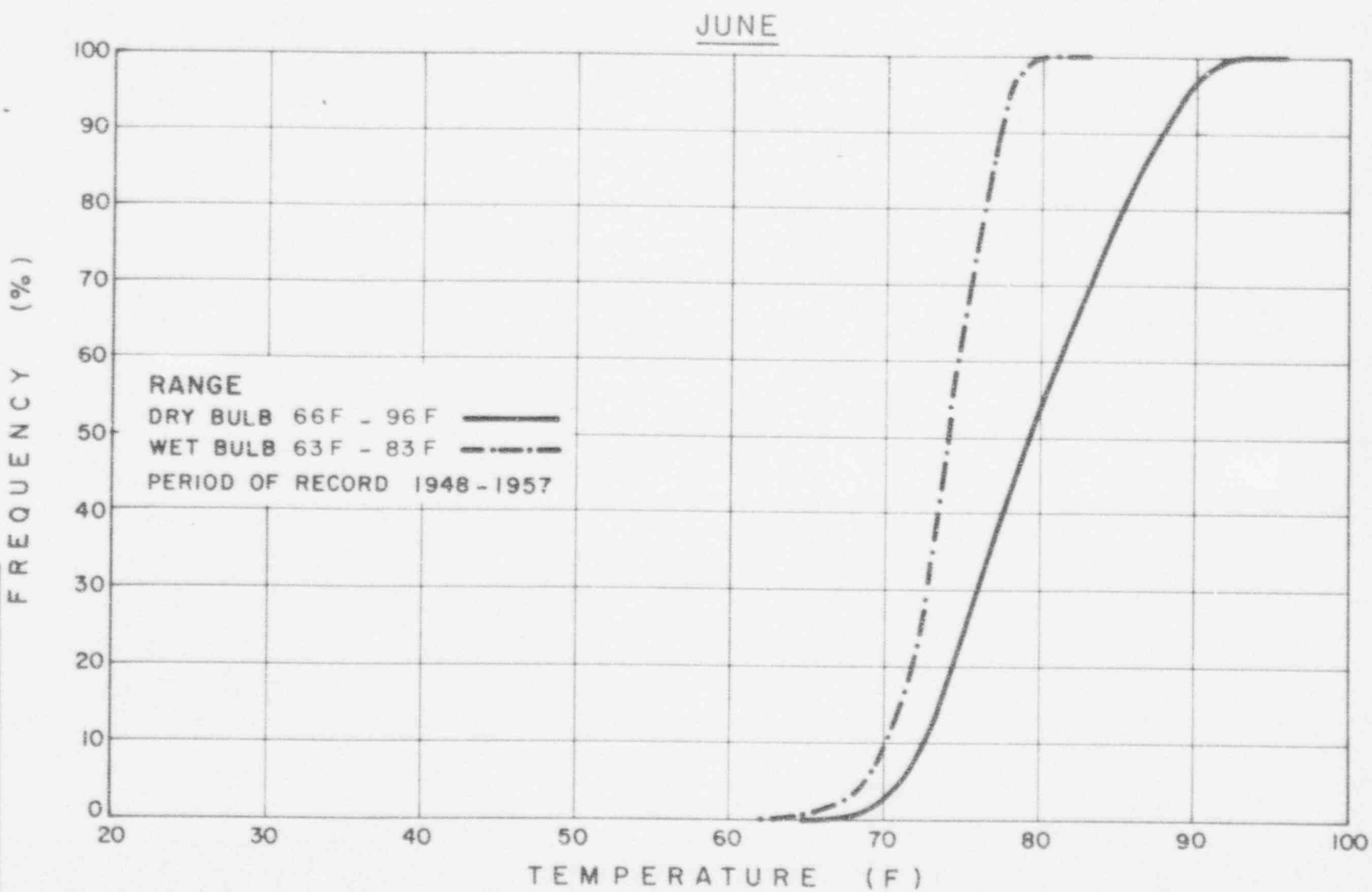
FIGURE 2.6-5



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH FLORIDA

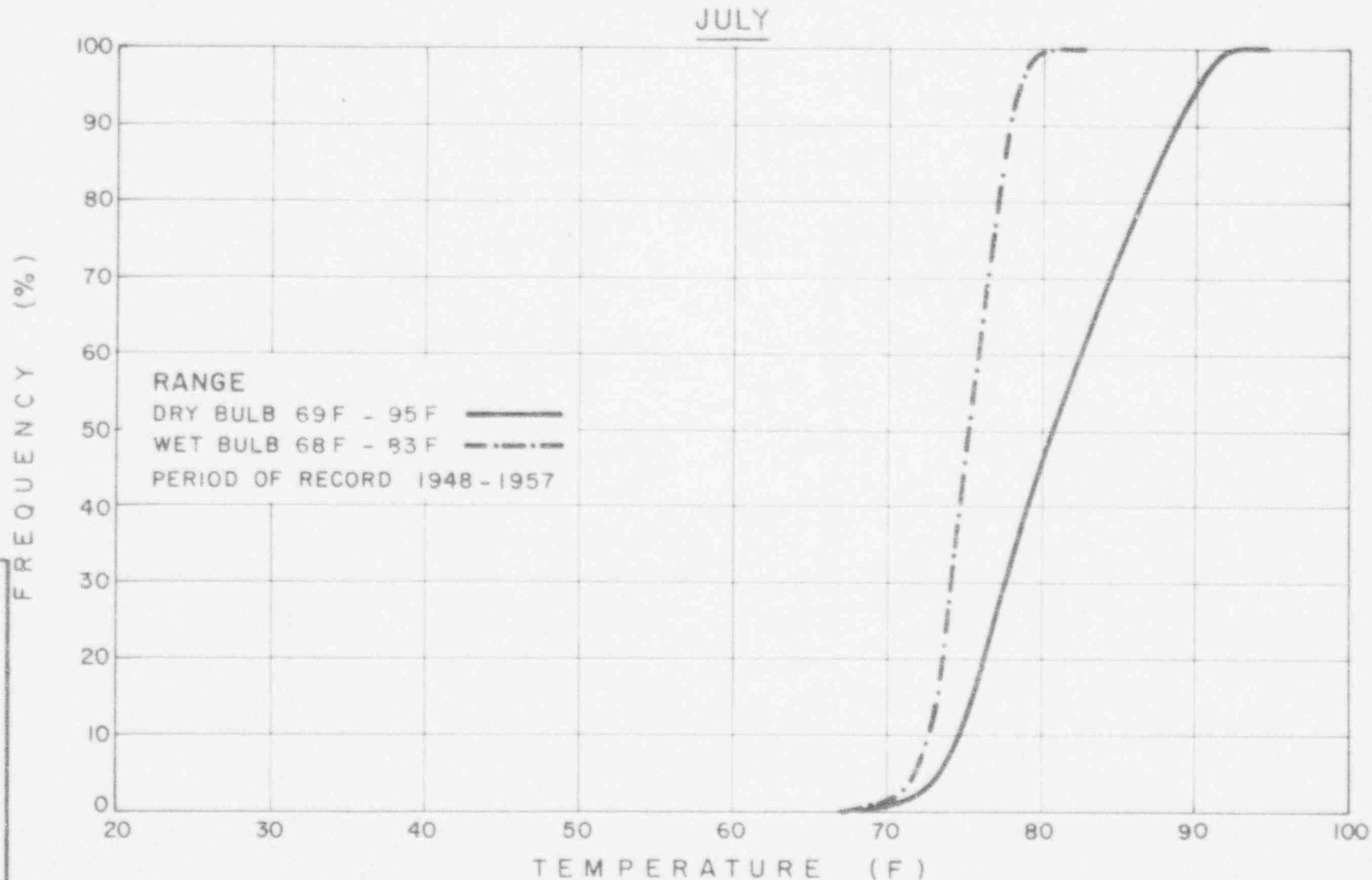
FIGURE 2.6-6



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUALS TO STATED VALUES WEST PALM BEACH FLORIDA

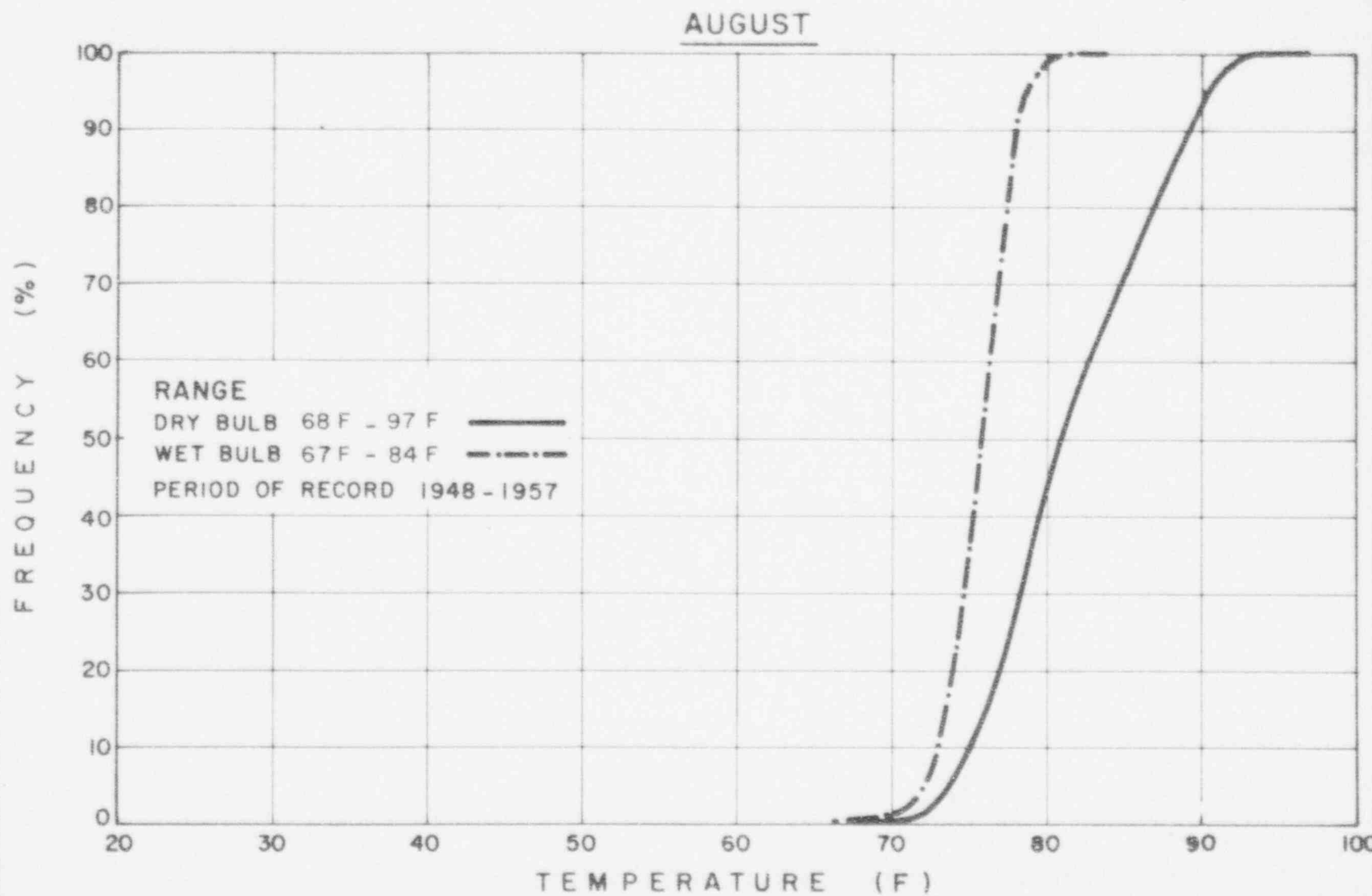
FIGURE 2.6-7



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH FLORIDA

FIGURE 2.6-8

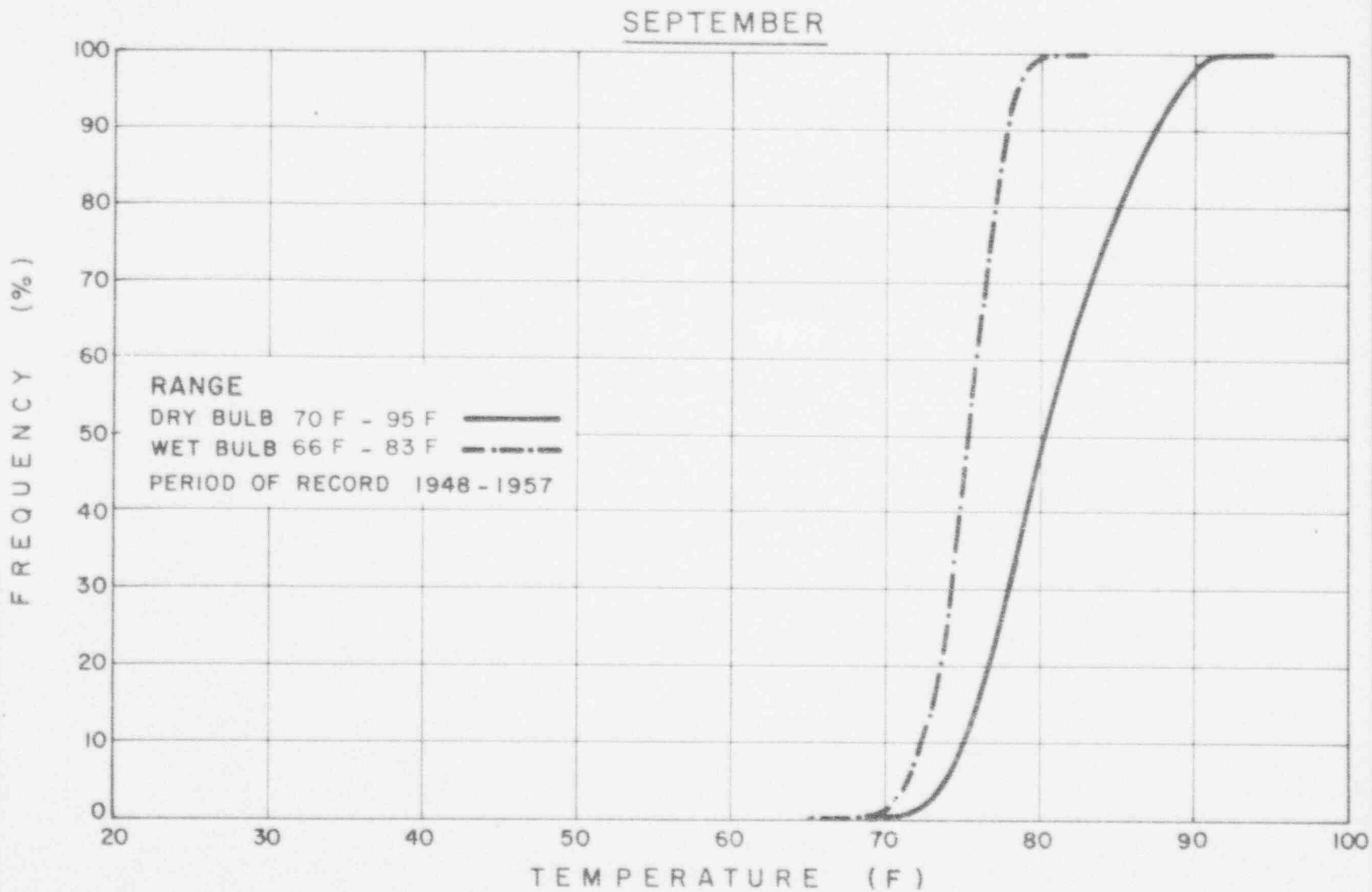


FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH FLORIDA

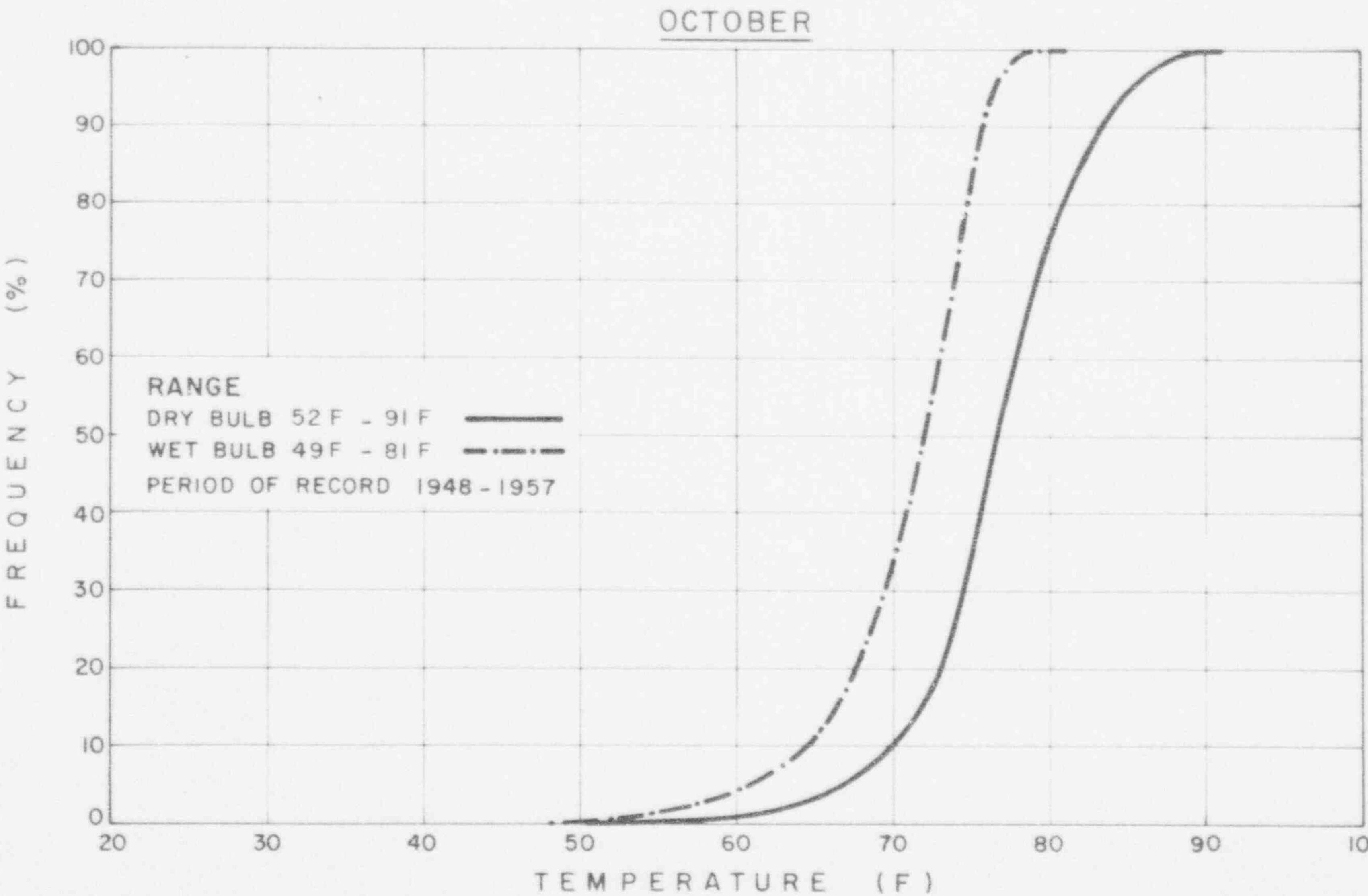
FIGURE 2.6-9



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH FLORIDA

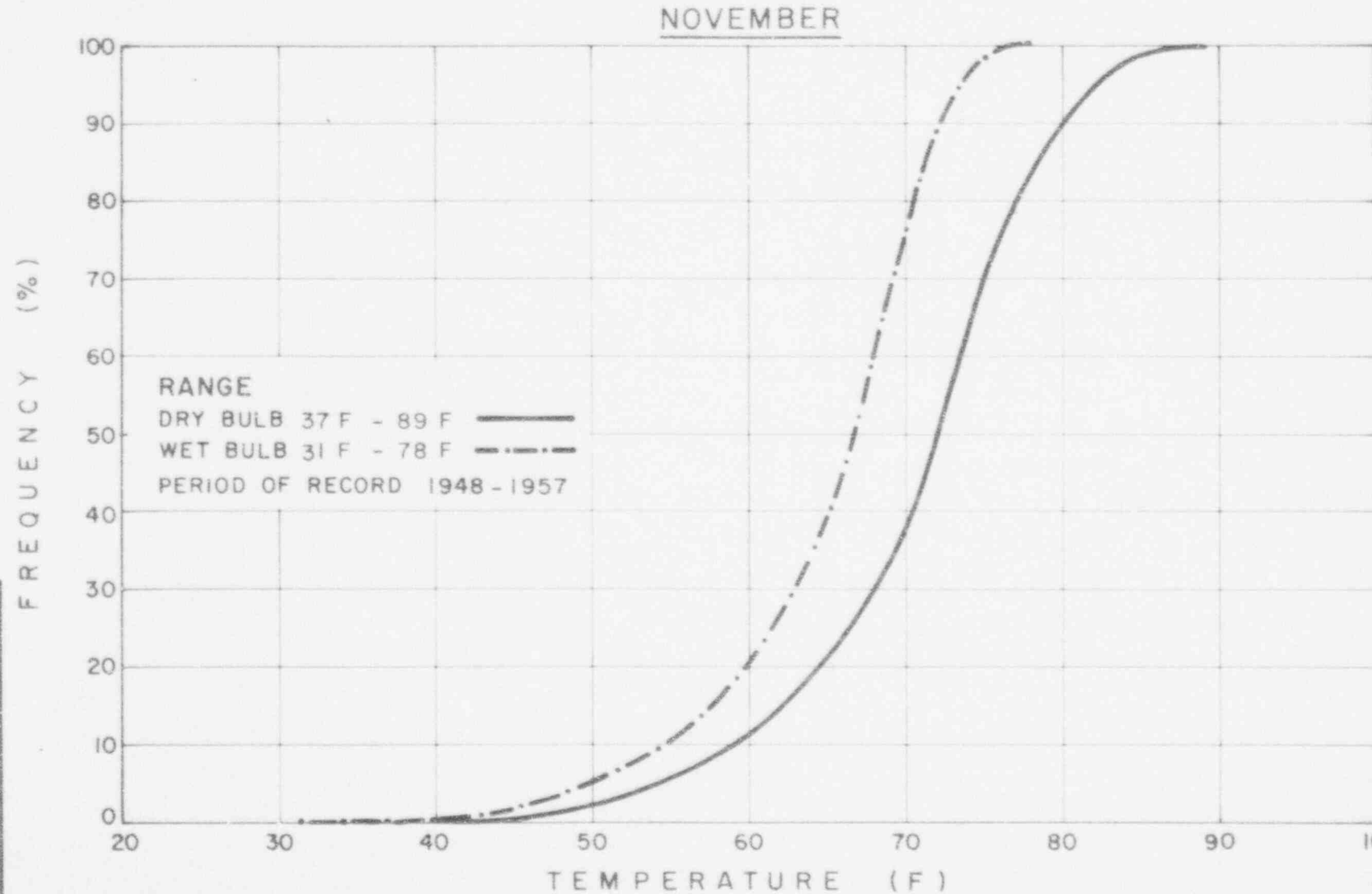
FIGURE 2.6-10



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH FLORIDA

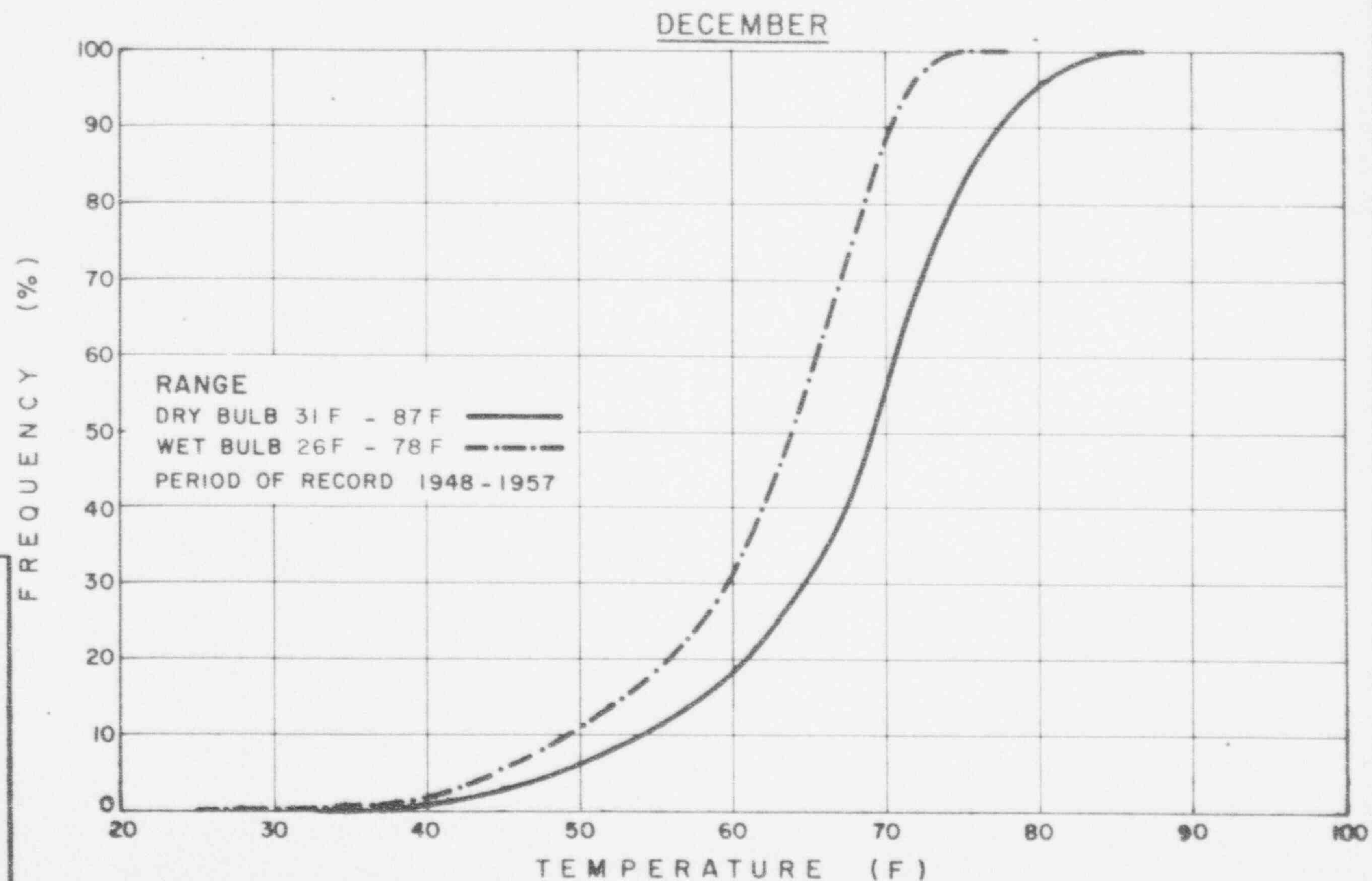
FIGURE 2.6-11



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH, FLORIDA

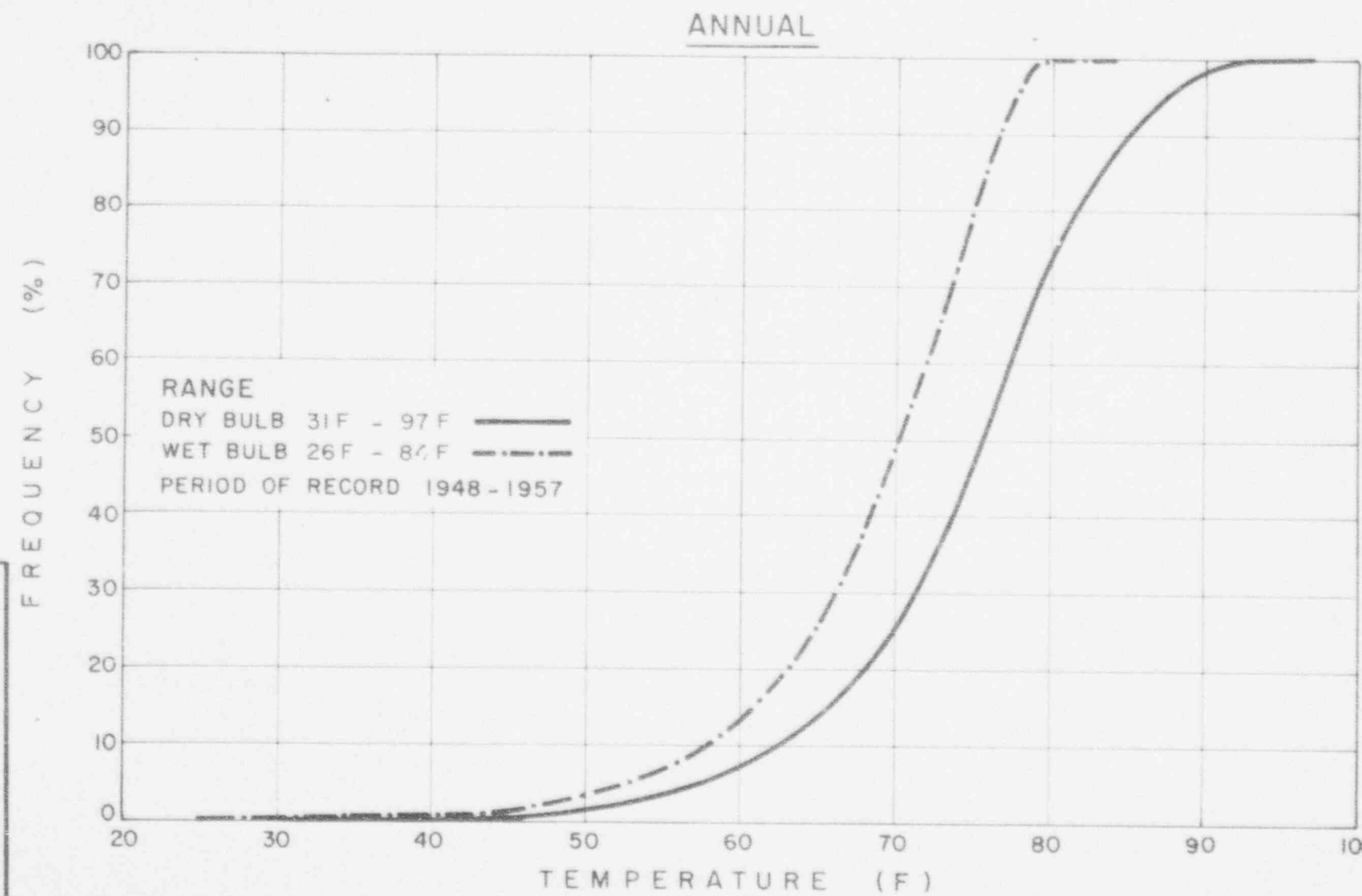
FIGURE 2.6-12



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES
WEST PALM BEACH, FLORIDA

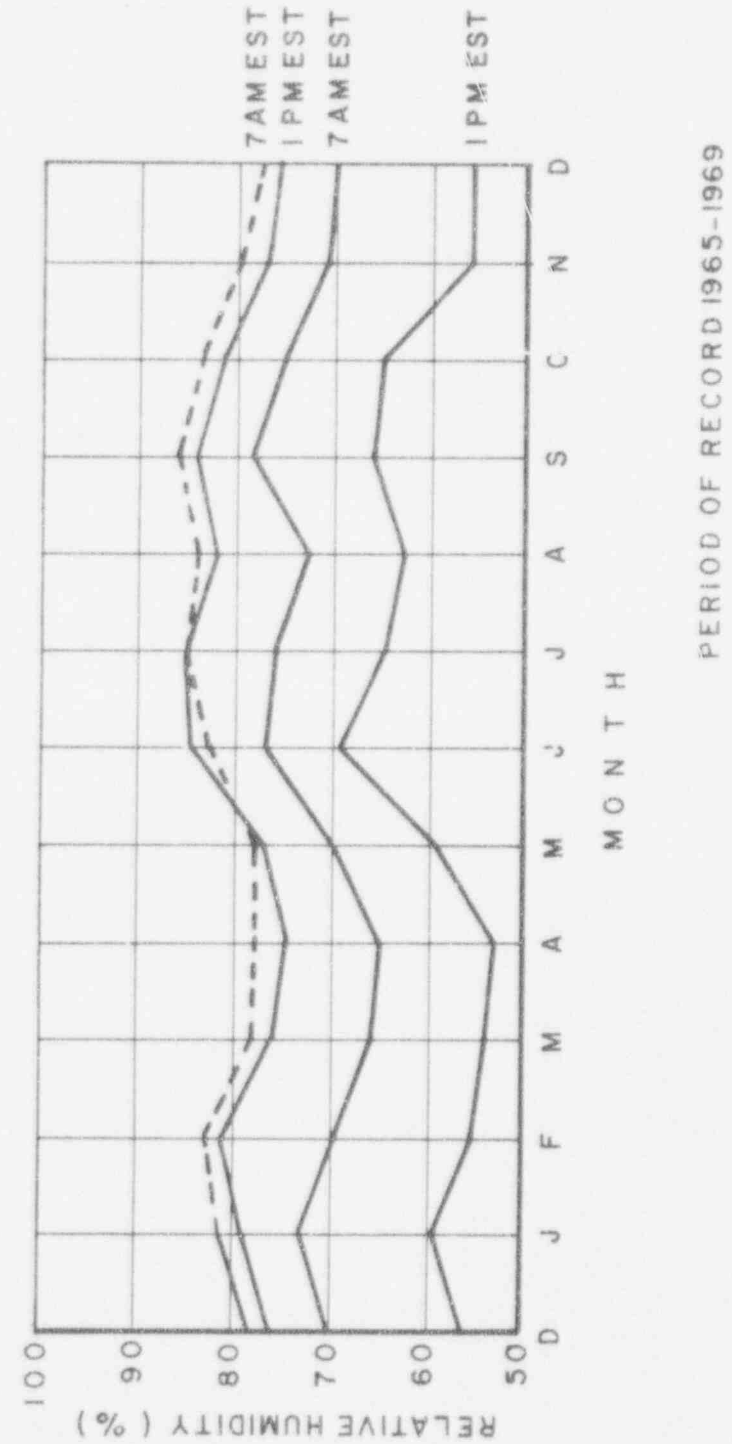
FIGURE 2.6-13



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PERCENT OF HOURS DRY & WET BULB TEMPERATURES ARE LESS THAN OR EQUAL TO STATED VALUES WEST PALM BEACH, FLORIDA

FIGURE 2.6-14

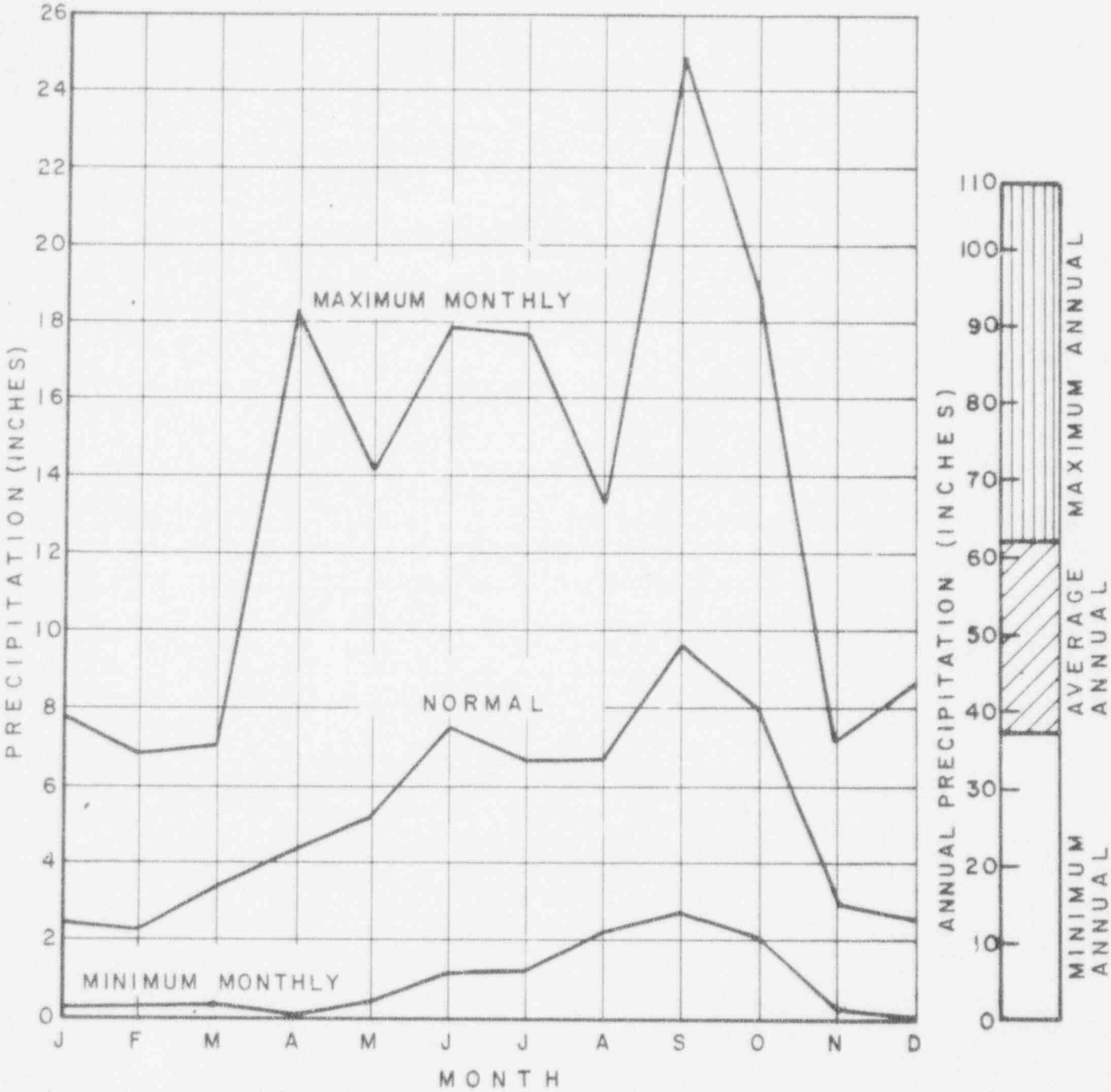


FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNIT 2

MEAN 1AM, 7AM, 1PM & 7PM EST
RELATIVE HUMIDITY (PERCENT)
WEST PALM BEACH, FLORIDA

FIGURE 2.6-15

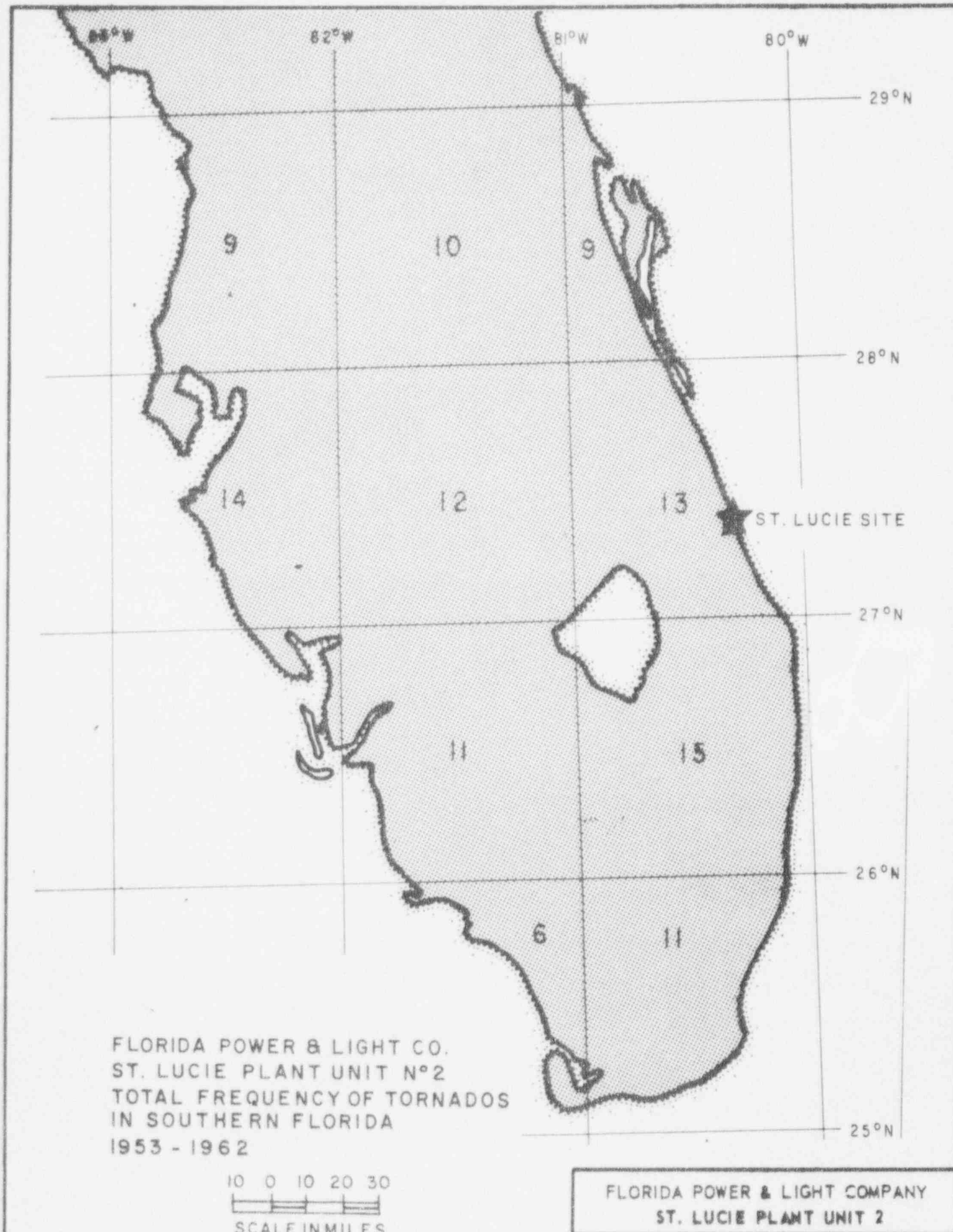


PERIOD OF RECORD:
NORMAL 1931 - 1960
EXTREMES 1939 - 1969

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY AND ANNUAL MEAN AND EXTREME PRECIPITATION (INCHES) WEST PALM BEACH, FLORIDA

FIGURE 2.6-16



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

TOTAL FREQUENCY OF TORNADOS
IN SOUTHERN FLORIDA

FIGURE 2.6-17

2.7 ECOLOGY

2.7.1 GENERAL

Hutchinson Island is a bar and swale barrier island located on the east coast of Florida between the cities of Fort Pierce and Stuart. The island, oriented north-south, is approximately 22 miles long with a maximum width of about one mile. The eastern (Atlantic Ocean) side of Hutchinson Island consists of a dune line with approximate elevation of +15 feet MSL. This low bar slopes toward the west to about elevation + 4 feet MSL, generally forming a swale. The island is separated from the Florida mainland by the Indian River, a shallow tidal lagoon.

More detailed information on the geology and topography of Hutchinson Island is presented in Section 2.4 of this report.

2.7.2 TERRESTRIAL VEGETATION

Hutchinson Island is typical of the offshore sandbar islands which line the southern U S Atlantic coastline. It consists of an eastern sandbar which rises to approximately +15 feet MSL. This dune line divides the island into two habitats, a beach-dune eastern zone and a western swale primarily occupied by mangroves.

2.7.2.1 Coastal Strand Beaches and Dunes

The coastal beach and dune habitat extends from the high tide mark to the dune line. The Australian pine (*Casuarina* spp.) has established heavy growth on the dunes. These trees have such a compact and extensive root system and their foliage provides such dense shade that virtually no plants can grow under them. The most abundant plant seen on the foreshore slope of the dune ridge is seaoats (*Uniola paniculata*), and many shrubs, herbs, and grasses are found on the upper slopes, top and face of the dune ridge. The normal vegetation of the dune line is listed in Table 2.7-1.

2.7.2.2 Mangrove Swamps

Mangrove swamps are principally maintained by tidal and occasional storm-driven incursions of sea water as well as by rain. In the lower zones along Indian River and Big Mud and Blind Creeks, the red mangrove (*Rhizophora mangle*) predominated while the larger black mangrove (*Avicennia nitida*) and the smaller white mangrove (*Laguncularia racemosa*) were established on higher ground which was less frequently and less deeply flooded. In an undisturbed environment, mangrove swamps are noteworthy for their high productivity with leaf fall leading to a basal mangrove peat which provides the energy source to support a rich population of zooplankton, insects, snails, fiddler crabs, and minnows, which in turn support large populations of fish, reptiles, birds and mammals.

Much of the mangrove forest was destroyed in the 1930's and 1940's when a mosquito control program was initiated under the WPA. The mangrove swamps were trenched, diked, and flooded with seawater which remained stagnant at a relatively fixed level. Since mangrove roots obtain their oxygen supply through specialized breathing pores which are normally only slightly above mean high water level, such flooding caused the death of large numbers of trees, primarily the black mangroves, and drastically reduced the productivity of the area.

In these stagnant, high water areas there has been little or no recovery of the original black mangrove. Red mangrove growth has developed over the past 25 to 40 years in some parts of the swamp areas. This is not a restoration of the original black mangrove swamp but it is a partial restoration of a major species. The best regrowth of mangroves, mostly red mangroves, has occurred in the area across Highway A-1-A from the plant site. The area of least regrowth is northwest of Blind Creek and on the finger northwest of the construction area.

With these large areas of mangroves destroyed, it is unlikely that any part of Hutchinson Island near the plant site is capable of supporting a normal complement of animals, especially mammals, birds, and reptiles. Presently, animal life in the water-impounded areas is very sparse. There are now virtually no fiddler crabs, ladder spiders, and snails. Fish minnows (e.g., species of Fundulus) are few and the abundance of water birds is below normal.

Those parts of the Island which have been altered for mosquito control are relative biological deserts where the normal ecosystem of mangrove swamps no longer exists. If some restoration of the former mangrove swamp life is desired, a program of reestablishing tidal exchanges into these areas could, in time, restore some of their productivity.

Table 2.7-1 lists almost all of the plants present in the area when ecologically undisturbed.

2.7.2.3 Upland Areas

The few upland areas of loamy and shell soils are usually located well above normal tides. On these mounds are found the coastal hardwoods and cabbage palm scrub type forests. The cabbage palm (Sabal palmetto) is usually the tallest and most abundant tree. A few live oaks and the red bay are common, and the Australian pine is increasing and may predominate in some areas. These and other shrub and tree-size plants are listed in Table 2.7-1.

With the exception of mangroves bordering the outside of a perimeter road, the area immediately surrounding the plant and bordered by the road is now almost completely changed by settling ponds, spoil bank, and fill from pumping of the dredges. The topography is uneven and the spoil and fill material are of many different qualities, ranging from sand to silt to rock and shells. The old black mangroves remain in some ponded areas and there is some growth of red mangroves between the outer perimeter road and an inner canal.

The spoil and sill materials are piled up to +25 feet MSL, and some of the sides and slopes of these piles have a few grasses, bushes and weeds growing on them. The most common grass is a dropseed or smut grass, Sporobolus floridanus, a bunch grass not useful as a pasture grass or for sodded lawns. This grass is not salt-tolerant and it grows on high spoil because the soils have been leached of salt by rains.

2.7.2.4 Agriculture Near the Plant Site

Citrus groves comprise the major agricultural resource of the area. The nearest groves are located near U S Route 1 five miles west of the plant site. The nearest truck farm is in Martin County, approximately ten miles south of the site.

2.7.3 TERRESTRIAL ANIMALS

2.7.3.1 Mammals

Of the nearly forty species of mammals reported for Hutchinson Island, the racoon, opossum, and beach mouse appear to be the most abundant. The "rare or endangered" Florida manatee and Florida panther may also occasionally visit the vicinity of the island.

There is no evidence that hunting is a significant activity on the island, although some duck hunting along Indian River is reported and hunting for small mammals may be assumed.

Table 2.7-2 lists the mammals which inhabit Hutchinson Island and the surrounding areas.

The dairy nearest to the St. Lucie Plant is located 14 miles west-southwest of the plant site. Domesticated livestock were not observed nearer than seven miles from the plant. Single grazing animals may exist at closer distances, but on the mainland west of the Savannas, and not closer than five miles from the plant site. The nearest beef producer is near Port St. Lucie, approximately five miles southwest of the plant.

2.7.3.2 Birds

Nearly 160 species of birds are either resident or visitors to the island. Water birds are the most common. Table 2.7-3 lists the species which inhabit Hutchinson Island, and Table 2.7-4 specifies which of the species are classified as "rare or endangered."

The major impact on terrestrial life from plant operation will probably result from lighting the buildings and perimeter fence. Some migrating bird species, when caught in a storm front, become disoriented, are attracted by lights, and may be killed in large numbers by dashing themselves against the lights or supporting structures [1, 2].

2.7.3.3 Insect Infestation in the Area

The only mosquito species indigenous to Hutchinson Island is the salt marsh mosquito (Aedes taeniorhynchus). The common varieties of domestic mosquitos (Culex spp.) are not capable of breeding in salt water marshes and, therefore, are not to be found on Hutchinson Island. The salt marsh mosquito is not a carrier of encephalitis and, correspondingly, there have been no reports of disease vectors made to the St. Lucie County

Health Department for the Hutchinson Island area. Florida Power and Light gives full support to the St. Lucie County Mosquito Control District and allows its personnel to flood the low-lying land on the site in order to control mosquito populations.

2.7.3.4 Sea Turtle Nests on Hutchinson Island

The beach along Hutchinson sland is an important nesting area for Atlantic loggerhead turtles, (Caretta caretta caretta). Data collected in July 1972 by the Florida Department of Natural Resources [3] from nine segments of beach, each 0.75 miles long, indicated the existence of 1420 nests. Nesting density was found to increase from north to south. The total number of loggerhead turtle nests was estimated by plotting nesting density (number of nests per 0.75 miles of beach) of the various survey areas against distance along the beach, and geometrically calculating the area under the curve.

The number of loggerhead turtle nests on Hutchinson Island beaches during 1971 was estimated earlier as 3550. Routa's 1968 estimate [4] of total nesting on Hutchinson Island was 5265 nests, but his method assumed no north-south nesting density gradient, so his calculations incorporated unweighted ratios, and included at least one green turtle nest and several unidentified nests. All of these factors are error sources for the final estimate, and partly explain the discrepancy in the three different numbers.

The 1971 estimates of clutch size for loggerhead turtles range between 120 and 130 eggs per nest. Assuming an average of 120 eggs per nest, total estimated egg production for loggerhead turtles nesting on Hutchinson Island was 426,000 in 1971. Nest predation by racoons reached a total of 395 nests or 28 percent of nests surveyed. Thirty-four percent (111 nests) were plundered within 48 hours of nesting. Figure 2.7-1 indicates the locations of the study segments and the data findings.

The loggerhead has the most northerly and extensive breeding territory of any of the Atlantic sea turtles. It has been so consistently persecuted at the nesting ground, however, that the original patterns of the nesting can no longer be discerned. In America the Atlantic loggerheads still nest as far north as the coast of North Carolina.

Until recently the Atlantic loggerhead appeared to be in no serious
immediate danger. When the nesting takes place on beaches and coastal 3
islands of the United States, the turtles are protected by law, and varyingly effective patrols control poaching. Lately, however, their future is threatened by a marked expansion of the racoon population, and by the rapid development of the coastlines as real estate and recreational areas. Even where the beach is not disturbed, when the turtles come ashore to nest they are confused by lights along coastal highways. The emerging hatchlings may be disoriented enough to be veered away from their usually direct path to the sea and be killed by the thousands on the highways.

An extensive search of the entire Atlantic Coast of Hutchinson Island revealed 22 nests of the Atlantic green turtle (Chelonia mydas mydas), which displayed a high degree of nest selectivity. With one exception, nest sites were far above mean high water, either at the base or on top of the dune face, and were never located on beaches where erosion (northern areas) or accretion (southernmost study segment) was substantial.

Green turtles produce about 100 eggs per nest and each mature female nests about 4 times each season. After nesting, dogs, lizzards, and racoons attack and destroy many of the nests. The eggs in undisturbed nests hatch after 60 days, and the hatchling turtles are subjected to new dangers, including birds, and fish, once they get to the ocean. 0

At the present time, the green sea-turtle is included in the list of threatened wildlife of the U.S. (compiled by the U.S. Department of the Interior, Fish and Wildlife Service) primarily due to the overexploitation by man for food. During their nesting season the turtles are now protected by Florida game laws. Nesting of the green turtle is already sufficiently limited on Hutchinson Island so that neither it nor any part of the U.S. is considered to be a principal nesting ground of the species [5].

There is a regular seasonal arrival of a colony of young green turtles off the west coast of peninsular Florida near Cedar Key. None is ever less than several months old, suggesting that their hatching place is a long distance away. Some green turtles still come ashore singly to nest along the lower east coast of Florida, but this happens so infrequently 0
that the nests there cannot be considered the source of any green turtle population.

The main controlling influence in the survival of the green turtle is either protection of the nesting habitat or, when that is not feasible, retrieval and artificial hatching of the eggs.

Since 1956, the House of Refuge Museum located on Hutchinson Island has been transplanting, hatching, rearing, and releasing turtles from eggs laid in nests on the beach [6]. This organization, with Dr. A. Carr of the University of Florida, has been instrumental in preserving the green turtle as a native Florida animal.

Six nests of the Atlantic leatherback turtle (<u>Dermochelys coriacea coriacea</u>) were encountered during the 1971 survey. The nests were widely dispersed throughout the island but all were located well above mean high water at the base of the dune face.

No data are available which provide a reliable estimate of the world population of sea turtles to better than a factor of three or four. No data exist on the current population ratios among the loggerhead, green and leatherback varieties, but of the three, the leatherback is the least commonly seen on Hutchinson Island. These sea turtles are found throughout the world, principally between the latitudes of 35'N and 35'S. The Hutchinson Island shoreline is estimated to contain approximately 0.1 percent of the world shoreline suitable for turtle nesting. On the basis of nesting data, the world population of sea turtles is about 10,000,000. The percentage that nested on Hutchinson Island in 1972 is, therefore, approximately 0.014 percent [3].

The St. Lucie Plant site nesting shoreline is slightly less than 0.1 of the entire ocean side shoreline length of the island. Therefore, the approximate fraction of the population of sea turtles nesting on the site is 0.001 percent.

2.7.3.5 Intertidal Fauna

The open sandy beach of Hutchinson Island is subject to the force of ocean waves which produce a physically unstable environment. No macroscopic plants can survive on the beach, so the sand beach is essentially an environment occupied by animals and some microscopic plants.

The intertidal community of Hutchinson Island has not been studied but some unpublished data on the beach fauna of Jupiter beach, an area similar to Hutchinson Island, is available [25]. Intertidal organisms were collected 1.25 miles south of Jupiter Inlet, approximately 30 miles south of the St. Lucie site. Both mega and meiofauna were collected. Three species of megafaunal organisms were found on Jupiter beach; the most common was the anomura crab Emerita talpoida, followed by the polychaete Nerine agilis. In addition, one speciman of the intertidal pelecypod, Donax variabilis, was found. 0

The meiofauna (organisms less than 1 mm in size) was sampled quantitively. The most abundant organisms were foraminifera, gastropods and harpacticoid copecods, in that order. In addition a few nematodes, ostracods and calanoid copecods were collected. The density of the Jupiter beach meiofauna was calculated, and ranged from 650 to 1770 organisms per m^2.

Another megafaunal organism, not collected at Jupiter, is known to occur on Hutchinson Island. The ghost crab, Ocypode albicans, is a common inhabitant of sandy beaches and spends most of its life above the high tide line, and is therefore, not strictly intertidal.

2.7.4 INDIAN RIVER ECOLOGY

Ecological surveys of the Indian River adjacent to and including Big Mud Creek were made during 1968, 1969 and 1970 by Dr. James B. Lackey for the Florida Power and Light Company [9]. The findings show that Indian River supports an enormous biomass of manatee grass (Syringodium filiforme) and several species of macroscopic algae. Turtle grass (Thalassia) was not found. The dominant alga was Gracilaria, but several others are also common, most of which are red algae, although patches of Sphacelaria, a brown alga, were found. This "forest", often up to 10 inches high, contains large numbers of gammarids, shrimp, isopods, small crabs, and juvenile fish. Eggs of various invertebrates are found here, and the branches and leaves of the plants support large numbers of caprellids, bryozoans, very small worms, and very small attached algae. The leaves of manatee grass are a substrate for the attachment of vast quantities of organisms, mostly diatoms (e.g. Licmophora), and also various protozoa (including the colonial ciliate Zoothamnium).

The Indian River affords protection to a great variety of and number of animals, and provides them with an abundance of food, especially the smaller forms which feed on attached diatoms and other plants.

The characteristics of the water, especially salinity and turbidity, vary considerably with time. There is an increase in biomass from the eastern shore to the western shore, and the growth is so thick as to trap and hold free-floating material (e.g. eggs, copepods, protozoa, and invertebrates).

The Indian River supports abundant and diverse plankton which thrive due to a constant raindown of organic matter in the overgrown areas. This organic matter undergoes bacterial decomposition on the bottom and liberates mineral salts which are utilized by the algae. The protozoa, rotifers and copepods, among other organisms, maintain their high population by utilizing the bacteria. All of the plankton algal groups are present in the river except the Coccolithophora and Silicoflagellata. The diversity of species (more than 90) indicates water of no extreme condition, and the large numbers of organisms per unit volume suggest a high nutrient concentration. Gross inspection of the bottom growths in the Indian River indicate that it is a highly productive and balanced biological environment.

The sediment-water interface is also densely populated and hence it is assumed to be an area of intense biochemical activity, although this inference may not be valid for large areas, since only four cores were examined during the surveys. But these contained a large number of organisms of great diversity, and are comparable to cores from other estuaries such as Great South Bay, New York. The same groups were found in the sediment as in the water, and in addition, four species of sulfur bacteria were present. Diatoms and dinoflagellates were less abundant, but colorless euglenids and ciliates were more abundant both in species and in biomass. The interface bacteria appear to decompose much organic matter, which is utilized by the colorless euglenids, and the ciliates in turn eat the bacteria.

The benthic population is large, as shown by Dr. A. Carr in a May 1969 report to the Florida Power and Light Company [9], and contains shellfish, tube dwelling worms, and crustaceans. They either dwell in the mud or in tubes or crawl about in the macroscopic growths or on the bottom. Accordingly, they are hardly susceptible to being displaced and swept along by a moderate current.

Tows in Big Mud Creek and in the channel of the Intracoastal Waterway revealed adult calanoid copepods but very few eggs or larval forms. There appear to be no great numbers of suspended invertebrates, eggs, or juvenile forms of the copepods present in the sections of the river examined.

The only organisms of direct economic importance found thus far in the river in significant numbers have been shrimp and young blue crabs (an occasional fish and a very few conchs are also present). Normally, speckled trout are available for sport fishing, but in May and June of 1970 fishermen were far more abundant in both inlets. Channel bass, speckled trout, and snook are the fish most taken, but drum, sheepshead and mangrove snappers have also been caught. However, none of these were collected during the survey.

2.7.5 ATLANTIC OCEAN

The Atlantic Ocean bounds Hutchinson Island to the east. The sea floor slopes gently to a depth of about 40 feet, a little more than one nautical mile (nmi) offshore, then rises to form Pierce Shoal which is nearly two nmi offshore. Here, minimum water depth is 21 feet (U S Coast and Geodetic Chart 1247). Five nmi east of the plant site is the St. Lucie Shoal, with a minimum depth of 20 feet. Beyond the St. Lucie Shoal, water depths gradually increase with distance offshore and the 120 feet contour occurs approximately 11 nmi offshore of the St. Lucie Plant site.

Most of the environmental and ecological data presented below have been provided by the Florida Department of Natural Resources (FDNR) Marine Research Laboratory. This information has been abstracted from three reports which contain results of the preliminary environmental studies of coastal waters near Hutchinson Island [10, 11, 12]. These studies are discussed in detail in Section 6.1 of this report. 1

2.7.5.1 Salinity

Surface and bottom salinities have been measured at five stations offshore of Hutchinson Island (Figure 2.7-2). From September 1971 to November 1972, salinity varied from 33.0 to 38.0 parts per thousand (0/00), with 75 percent of the values between 34.0 and 36.0 0/00. The maximum variation between surface and bottom salinity at any station was 3.0 0/00, as was the maximum difference in salinity between stations in any given sampling period.

In general, salinity was lowest during the fall and winter, increasing to a seasonal maximum during the summer. Table 2.7-5 and Figures 2.7-3 through 2.7-7 show the salinity of Atlantic Ocean water offshore of Hutchinson Island.

These data, in general, agree with those obtained by the U S Coast and Geodetic Survey [13] at Canova Beach, Florida, which is located approximately 50 miles north of Hutchinson Island. There, mean salinity of the Atlantic Ocean peaks in May at 36.6 0/00 and reaches a low of 35.4 0/00 in November. The greater variability in salinity at Hutchinson Island may reflect the proximity of St. Lucie and Fort Pierce Inlets as well as countercurrents and eddies induced by the Gulf Stream.

2.7.5.2 Temperature

Florida Power and Light Company (FP&L) maintains a temperature monitoring station located approximately 2,000 feet offshore of the St. Lucie Plant site. Two thermographs installed at the station monitor surface and bottom (30 ft depth) water temperature.

Two years of water temperature data (December 1970 to November 1972) have been tabulated as five-day average temperatures and are shown in Table 2.7-6. Water temperatures (five-day means) offshore of Hutchinson Island ranged from 66 F to 83 F for the two year period of record. Lowest temperatures occurred in January, February and March, while highest temperatures were recorded in September and October. Figures 2.7-3 to 2.7-7 show monthly water temperatures recorded at the five stations offshore of Hutchinson Island.

Anomalous decreases in water temperature occurred both in July and August of 1971 and June, July and August of 1972. Long-term water temperature records from Canova Beach and Daytona Beach, both located north of Hutchinson Island, show similar depressions of summer temperatures. This phenomenon has been explained by the U S Coast and Geodetic Survey as the result of summer upwelling which occurs along this section of Florida's East coast (13). If the upwelling theory is valid, it may explain the high phosphate concentrations measured at all five Hutchinson Island stations in July, 1972, since upwelling normally brings deep, nutrient rich water to the surface.

2.7.5.3 Dissolved Oxygen

Dissolved oxygen (DO) concentrations were measured at the five stations established offshore of Hutchinson Island. Surface and bottom levels of DO were measured monthly from December 1971 to November 1972. These data have been tabulated and are shown in Table 2.7-7 and Figures 2.7-8 to 2.7-12.

In general, DO levels ranged from 5.0 to 7.0 mg/l for the period November 1971 to June 1972. In July, August and September 1972, DO concentrations dropped markedly, and values as low as 3.2 mg/l were recorded. These low DO levels coincide with decreased water temperatures, increased phosphate concentrations and very low phytoplankton density. These phenomena indicate that upwelling occurred during this period of time. During upwelling, the surface waters are displaced by deeper waters, characterized by lower temperature, high nutrient concentrations and often, low levels of dissolved oxygen.

2.7.5.4 Nutrients

From February 1972 to November, monthly surface and bottom water samples taken at five stations offshore of Hutchinson Island were analyzed for the following nutrients: phosphate (PO_4), nitrate (NO_3), nitrite (NO_2), ammonia (NH_3) and silicate (SO_4).

Phosphate values were quite similar from station to station during any single sampling period, but varied markedly from month to month. Phosphate concentrations ranged from 0.017 to 0.420 mg/l (0.179 to 4.42 mg at PO_4-P/m^3). Peak phosphate levels occurred during July 1972, when very few phytoplankton were observed. A second peak was recorded in October 1972 and coincided with a fall bloom of phytoplankton.

Concentrations of nitrate ranged from 0.0022 to 0.0748 mg/l (0.036 to 1.206 mg at NO_3-N/m^3). Nitrate levels between surface and bottom samples taken at the same station were quite variable, and there appears to be no obvious correlation between nitrate levels and phytoplankton numbers.

In general, nitrate levels were low, ranging from zero to 0.0188 mg/l (zero to 0.408 mg at NO^2-N/m3). Lowest values occurred during July 1972 when very few phytoplankton were present. The rather high levels observed in November 1972 (0.0014 to 0.0106 mg/l) may have represented degradation products from the previous month's phytoplankton bloom.

Ammonia concentrations varied by three orders or magnitude, with values of 0.001 to 1.000 mg/l (0.005 to 0.911 mg/l or 0.294 to 53.588 mg at NH_3-N/m^3). As with the phosphate concentrations, ammonia values were reasonably similar between stations during any sampling period, but fluctuated from month to month. Highest concentrations occurred in February 1972, with much lower levels prevailing thereafter. Lowest values were recorded during July 1972, when phosphate levels peaked and phytoplankton numbers were very low.

The levels of silicate measured offshore of Hutchinson Island varied from 0.072 to 0.900 mg/l (0.78 to 9.88 mg at SiO_4-Si/m^3). The concentration of silicate was highest in July 1972, when phytoplankton were scarce. The low levels of silicate observed in October 1972 may have reflected the phytoplankton bloom which occurred at that time, as diatoms require silicate for the production of frustules. However, silicate concentrations were quite variable, and correlations between silicate levels, phytoplankton numbers and concentrations of the other nutrients are not apparent.

Tables 2.7-8 to 2.7-12 show levels of the nutrients mentioned above as recorded at Hutchinson Island.

2.7.5.5 Chlorophyll a

Monthly surface and bottom water samples from all stations were analyzed for chlorophyll a from November 1971 to November 1972. Concentrations of this pigment ranged from 0.08 to 7.70 mg/m^3. Highest values occurred at Station I (nearest shore) and may reflect an input of terrestrial vegetation to the nearshore waters. Chlorophyll a levels correlated well with the autumn 1972 phytoplankton bloom. It is difficult to interpret the February and May 1972 chlorophyll a peaks as phytoplankton samples were not taken during those months.

Chlorophyll a concentrations measured at the five Hutchinson Island stations are given in Table 2.7-13.

2.7.5.6 Phytoplankton

Phytoplankton collected at five stations offshore of Hutchinson Island were enumerated and identified. Phytoplankton densities ranged from 1.0 to 30,532.9 cells/l for the 45 samples taken from September 1971 to November 1972. In general, phytoplankton densities were relatively similar from station to station during any given sampling period. The greatest variation in cell density occurred in September 1971, when a difference of 10^3 cells/l was recorded between Station I and Station V. (See Table 2.7-14 and Figures 2.7-13 to 2.7-17.)

From the available data, it appears that two blooms occur yearly. The autumn bloom peaks in September-October, and a winter bloom occurred in January 1972.

Very few phytoplankton were collected in November 1971 and during March-September 1972. Lowest cell densities occurred in July 1972, when fewer than 20 cells/l were obtained.

Phytoplankton cell density correlates very poorly with nutrient levels. Highest phosphate values occurred in July when cell counts were lowest, but the October 1972 bloom coincided with high phosphate concentrations. Similarly, comparison of phytoplankton densities with levels of nitrate, nitrite, ammonia and silicate showed no apparent correlations, positive or negative.

Chlorophyll a concentrations in surface water samples showed a reasonable, positive correlation with phytoplankton cell counts, as would be expected.

In general, the phytoplankton collected at Hutchinson Island were numerically dominated by diatoms, although five samples contained more than 50 percent dinoflagellates and/or blue gree algae (Oscillatoriaceae).

Although many species of diatoms and dinoflagellates, as well as a few blue-green algae, were identified, the most important members of the planktonic flora, in terms of number and frequency of appearance, were the following diatoms:

- Nitzschia spp.
- Bellerochea sp. "A"
- Chaetoceros spp.
- Thalassionema nitzschioides
- Skeletonema costatum

Various species of Nitzschia were present in large numbers during all nine sampling periods, while Chaetoceros spp. and Bellerochea sp. "A" were numerous during seven sampling periods. Bellerochea sp. "A" was not plentiful in the January and March 1972 collections, and may be inhibited by low temperatures. Thalassionema nitzschioides was very abundant during six of the sampling periods, and Skeletonema costatum was present in large numbers on five of the collection days.

In November 1971, Station III was dominated by blue-green algae, as was Station I of the following November. During July 1972, a period of very low phytoplankton density, dinoflagellates (primarily Ceratium spp.) formed more than 50 percent of the flora at Stations III, IV and V and more than 10 percent of the phytoplankton collected at Stations I and II.

2.7.5.7 Zooplankton

Zooplankton were collected every other month at the five stations offshore of Hutchinson Island. Data are available from September 1971 to July 1972. Total zooplankton ranged from 244 to 12,023 organisms/m^3 and copepods varied in number from 82 to 10,930 per m^3 (see Table 12.7-15). Copepod numbers and total zooplankton counts correlate well, and zooplankton density appears broadly correlated with phytoplankton cell counts.

Station I yielded fewest zooplankton, while the greatest numbers were found at Station III. Zooplankton were least abundant in November 1971, peaked in January 1972, and remained relatively constant until July of the same year, when their numbers declined. These data are shown graphically in Figures 2.7-18 through 2.7-22.

Copepods of the genera Acartia, Paracalamis, Oithona, Temora, Undinula, Corycaeus, Euterpina and Labidocera were frequently collected in large numbers, as were the larvacean Oikopleura and various larval forms of both invertebrates and vertebrates.

2.7.5.8 Benthic Fauna

An analysis of the benthic fauna data indicates that the diversity of taxa found at Stations II, IV and V were similar throughout the sampling period, while Station III had a somewhat less diverse fauna. Data from Station I seems to indicate a paucity of fauna both qualitatively and quantitatively.

In terms of numbers of organisms per square meter, Station IV appears to be the most productive followed by Station V and II, respectively. Station III appears comparable to II, IV and V quantitatively although the diversity is lower. Station I again rates considerably lower than the others. These data are shown graphically in Figure 2.7-23.

The most obvious factor which might be responsible for this distribution is sediment size. It has been suggested by many investigators that benthic organisms show a marked preference for different substrates. From the data provided, it is evident that Stations II, IV and V are quite similar in substrate, having a mixed sand-shell fragment composition. The size range is fairly coarse. Station III has a more intermediate sized sediment while the particular sizes at Station I are quite fine.

In the analysis of data it was observed that polychaetes and echinoderms were not counted after January 1972. Gastropods were only counted in September 1971. For this reason data were compared both with and without consideration of these groups. Generally the observed trends were not greatly affected.

It should be noted that polychaetes were quite numerous at Stations II, IV and V but were found in comparatively low numbers at III and I. Station III is comparable in population density to II, IV and V if polychaetes are not included. Initially, (Sept. 71- Jan. 72) Station III had considerably fewer bivalves than Stations II, IV and V; however, in March through July their densities were very comparable, reaching a peak in March 1972.

Echinoderms and decapods were found in highest numbers at Station I (Nov. 71 and May 72 respectively). In contrast, lancelets were never found at Station I. Amphipods reached their highest numbers as Station IV in Jan. 1972.

Peak density of benthic invertebrates was noted in January 1972 for Stations IV and V, November 1971 for Station II and March 1972 for Station III. Station I had a peak density in May due to an unusually high number of bivalves in the samples. This was also reflected in the number of species obtained.

The total number of species found at the stations are shown below by group.

	I	II	III	IV	V
Annelids	14	32	15	33	32
Molluscs	7	46	15	51	29
Amphipods	3	10	4	9	8
Isopods		2	2		1
Decapods	5	7	3	10	15
Stomatopods				1	
Echinoderms	2	2	1	6	5
Lancelets		1	1	1	1
Total	31	100	41	111	91

The greatest diversity occurred at Stations IV, II and V respectively while the diversity at Stations I and III was significantly lower.

Comparison of the data for temperature, salinity and nutrients with that for benthic abundance and species variation show no relationship.

As mentioned previously, substrate type would appear to be the principal factor involved. Seasonal variations at each station in the numbers of organisms present may well be due to life habits of individuals.

2.7.5.9 Fishes

Fish populations in the area offshore of Hutchinson Island have not been rigorously examined from either a qualitative or quantitative standpoint, The available data are sparse and most records deal with species of economic importance. Springer (14) investigated the fish of the lower St. Lucie and Indian Rivers, but confined his sampling to waters west of Hutchinson Island. Gunter and Hall (15) also sampled the ichthyofauna of the St. Lucie River, but confined their studies to the area inland of Sewall Point.

Few fish have been collected at the five Hutchinson Island offshore stations. A single 15 minute tow with a 12 ft balloon trawl was made at each station every other month from September 1971 to March 1972. A total of 39 fish were collected using this technique. Table 2.7-16 shows the numbers and species of fish caught, by station.

Seines 50 feet in length were used to collect fishes at the three beach stations established on Hutchinson Island. A total of 11,598 fish were captured from October 1971 to March 1972, 11,407 of them in November 1971 collection. The great majority of these (11,241 of 11,407) consisted of various species of anchovy (Engraulidae). The numbers and species of fish collected by seining are given in Table 2.7-17.

Fish, such as ladyfish (Elops saurus, [16], snook (Centropomus undecimalis [17] and the various species of billfish, are taken primarily by sport fishermen. As stated in Ref 18, St. Lucie County is the northernmost county on Florida's east coast with an extensive winter sports fishery. While the value of this fishery has not been determined, it presumably forms a significant portion of the income St. Lucie County derives from its tidal waters.

Three species of fish, king mackerel, Spanish mackerel, and bluefish, are discussed below. These fish were chosen for detailed discussion because they are found in the ocean offshore of Hutchinson Island and because they form an important constituent of the St. Lucie County fin fishery.

The Spanish mackerels (genus Scomberomorus) form the nucleus of the St. Lucie County fin fishery. A number of scientists have studied this group of fish and as a result, it is reasonably well-known. Klima [19] investigated both the biology and fishery for Spanish mackerel (Scomberomorus maculatus) in southern Florida. Generally, this fish is abundant in Florida waters from October through February or March. In southeastern Florida, the Spanish mackerel spawns in coastal waters from August to December. This fish moves north in the spring, and is found as far north as the Gulf of Maine (where it is sparse and rare). Spanish mackerel remain in the north until September, when they move south. Klima gives the distribution of the genus Scomberomorus throughout the world as encompassed by the 68 F isotherm. Information from local fisherman in St. Lucie County indicates that Spanish mackerel migrate close to shore, as most of the commercial catch is netted within a mile or so of the shoreline. In southeastern Florida, the Spanish mackerel spawns in coastal waters from August to December, but eggs and larvae of this species have not been reported offshore of Hutchinson Island. 0

Beaumariage [20] has synopsized much of the literature dealing with the Spanish and king mackerels. His data show that Spanish mackerel from the east coast of Florida are essentially spawned out by the end of September. King mackerel (Scomberomorus cavalla) which occur in the same area spawn later in the year, beginning in September and ending in October. Larvae (3-7 mm total length) of both Spanish and king mackerel were captured in plankton tows made off Cape Kennedy during September. The small size of the larvae indicates that the eggs from which they were hatched were spawned near the point where the collection was made, offshore of Cape Kennedy.

Wollam [21] has investigated the distribution of larval and juvenile forms of king and Spanish mackerel in the western north Atlantic. Although most of the specimens he examined were captured in the Gulf of Mexico (including all the Spanish mackerel), 22 king mackerel were obtained during September from stations located about 70 miles east northeast of Cape Kennedy. Wollam believes that the southern portion of the range of the king mackerel is not an important spawning area, due to the paucity of larvae and juveniles which have been collected there. He also states that the larvae which have been observed are the result of spawning of resident (non-migratory) fish.

In an effort to determine the migratory patterns of king mackerel, Moe (22) tagged 128 king mackerel offshore of Jupiter Inlet in 25-30 fathoms of water (26° 56 N, 79° 58'W). No tags were returned. King mackerel apparently migrate north farther offshore than do Spanish mackerel. In St. Lucie County, most king mackerel are caught eight to ten miles from shore.

The bluefish, Pomatomus saltatrix, is found on the east coast of North America from Cape Florida to Nova Scotia. It is a pelagic fish, and migrates to the north as the water temperature increases in the spring and early summer. Data obtained from a tagging program (23) show that bluefish on the east coast of Florida migrate to the north during the months of February through April. During this period of northward travel, bluefish remain near the coast of southern Florida. Commercial fishermen from St. Lucie County net much of the commercial catch within one mile of shore.

Bluefish spawn off the east coast of Florida in depths of 60 to 300 feet. Mr. D. Deul of the National Marine Fisheries Service Narragansett Laboratory has collected ripe bluefish off south Florida in the spring, but doubts that this fish spawns south of Cape Kennedy (personal communication).

Landings of commercial fishes in St. Lucie County are dominated by migratory pelagic fish, such as the bluefish (Pomatomus saltatrix) Spanish mackerel (Scomberomorus maculatus) and king mackerel (Scomberomorus cavalla). In 1971, (24) landings in St. Lucie County yielded 3,072,838 lb of finfish work $682,997. Bluefish, Spanish mackerel and king mackerel formed 69.1 percent of the total St. Lucie landings, with a $493,310 value at dockside (72.2 percent of total value of St. Lucie finfish landings). The 1971 St. Lucie finfish landings formed 4.9 percent of total Florida finfish landings. Table 2.7-18 shows St. Lucie County landings (1971) for bluefish, Spanish mackerel and king mackerel as a percentage of total Florida landings for these fish.

St. Lucie County commercial fishery landing data for the seven most important species (bluefish, groupers, king mackerel, black mullet, spotted sea trout, Spanish mackerel and spot) are given for the period 1970 to 1972 in Table 2.7-19. This information, tabulated as pounds per month for each of the above species, is shown in the attached tables. The seven species enumerated form approximately 90 percent of the annual St. Lucie County landings, by weight.

According to local sources, approximately 60 to 65 commercial fishing boats are based in Fort Pierce. Most of the boats are small, 24 to 26 feet long, and usually have a crew of two or three men. 0

At the present time, three charter boats and one party boat sail from Fort Pierce. The charter boats carry six fishermen and the party boat about 50. One or two more charter boats work out of Fort Pierce during the winter, as does one additional party boat. As of 1972 approximately 1800 pleasure craft were registered in St. Lucie County, according to the office of St. Lucie tax collector.

The precise location of the fishing grounds is not available. However, net fishermen usually work within one mile of shore when fishing for bluefish and Spanish mackerel. King mackerel groupers and snapper are caught with hook and line, usually eight to ten miles offshore. Mr. D. Deuel, of the Narragansett Laboratory of the National Marine Fisheries Service, has stated that most of the winter king mackerel are caught near the 90 foot contour, in the vicinity of Jupiter Inlet and Hobe Sound, south of Hutchinson Island. 0

None of the fishes collected from the Indian River or offshore of Hutchinson Island are included in the 1973 edition of "Threatened Wildlife of the United States," compiled by the Bureau of Sports Fisheries and Wildlife, Department of the Interior (Resource Publication 114, March 1973).

TABLE 2.7-1

LOCAL PLANTS

I. Dune Ridge Plants:

1. Situated on the foreshore slope of the dune

    Uniola paniculata -- sea oats

    Ipomoea pes-caprae -- beach morning-glory

    Iva imbricata -- marsh elder

    Spartina patens -- cordgrass

2. Situated on the upper slopes, top and back

    Suriana maritima -- bay cedar

    Yucca spp -- Spanish bayonet

    Coccoloba uvifera -- sea grape

    Opuntia spp -- prickly pear cactus

    Sesuvium portulacastrum -- sea purslane

    Helianthus debilis -- sand sunflower

    Canavalia obtusifolia -- dune pea vine

    Casuarina spp -- Australian pine

II. Mangroves and Mangrove Border Plants:

Avicennia nitida - black mangrove

Laguncularia racemosa - white mangrove

Rhizophora mangle - red mangrove

Batis maritima - saltwort

Baccharis halimifolia - sand myrtle

Schinus terebinthifolius - Brazilian pepper tree

Casuarina spp - Australian pine

Ficus aurea - native fig

Distichlis spicata - salt grass

Notable is the ABSENCE of buttonwood trees (*Conocarpus*) and many sedges and rushes, such as *Juncus* and *Spartina*

TABLE 2.7-1 - continued

III. Upland, Coastal Hammock Forest (partial list):

Sabal palmetto - cabbage palm
Quercus virginiana - live oak
Persea spp - red bay
Casuarina - Australian pine
Morus rubra - red mulberry
Baccharis spp - sand myrtle
Serenoa repens - saw palmetto
Rapenea guyanensis - Rapanea
Icacorca paniculata - marl berry
Zanthoxylon clava-hercules - Hercules club
Rhus copallina - sumach
Rhus toxicodendron - poison ivy
Eugenia spp - stopperwoods

TABLE 2.7-2

NATIVE MAMMALS OF HUTCHINSON ISLAND AND SURROUNDING AREAS
(Abundance proportional to number of "X's")

Species	Abundance & Location		
	Hutch. Island	Indian River	Mainland
Virginia opossum (Didelphis virginiana)	XXX		XXX
Short-tailed shrew (Blarina brevicauda)	X		X
Least shrew (Crypotis parva)	X		X
Eastern mole (Scalopus aquaticus)	XX		XX
Mississippi myotis (Myotis austroriparius)	XX	XX	XX
Big brown bat (Eptesicus fuscus)	XX	XX	XX
Yellow bat (Dasypterus floridanus)	X	X	X
Evening bat (Nycticeus humeralis)	X	X	X
Florida freetail bat (Tadarida cynocephala)	X	X	X
Armadillo (Dasypus novemcinctus)			XX
Cottontail rabbit (Sylvilagus floridanus)			XX
Marsh rabbit (Sylvilagus palustris)	XX		X
Gray squirrel (Sciurus carolinensis)	X		X
Fox squirrel (Sciurus niger)			X
Flying squirrel (Glaucomys volans)			X
Pocket gopher (Geomys pinetus)			X
Rice rat (Oryzomys palustris)	X		X
Beach mouse (Peromyscus polionotus)	XXX		XX
Pine mouse (Peromyscus gossypinus)	XX		XXX
Cotton rat (Sigmodon hispidus)	XX		XX
Wood rat (Neotoma floridana)	X		X
Roof rat (Rattus novegicus)			X
Brown rat (Rattus rattus)	X		X
Porpoise (Stenella frontalis)		X	
Gray fox (Urocyon cinereoargenteus)	X		X
Black bear (Ursus americanus)			X
Raccoon (Procyon lotor)	XXX		XXX
Mink (Mustela frenata)	X		X
Spotted skunk (Spilogale ambarvalis)	X		X
Striped skunk (Mephitis mephitis)			X
River otter (Lutra canadensis)	X	X	X
Panther (Felis concolor)			X
Bobcat (Lynx rufus)	X		X
Manatee (Trichechus manatus)		X	
White-tailed deer (Odocoileus virginianus)	X		XX

The following mammals are classed as "rare or endangered":

Florida manatee, Trichechus manatus latirostris (Harlan)
Florida panther, Felis concolor coryi (Bangs)

One mammal is listed with status (undetermined):

Florida water rat, Neofiber alleni (probably nigrescens A. H. Howell)

TABLE 2.7-3

LOCAL BIRD SPECIES

Below is a list of bird species that inhabit Hutchinson Island and adjacent land areas, with abundance proportional to the number of "X" marks given. Seasonal use of the area is indicated as follows:

- W = Winter
- Sp = Spring
- Su = Summer
- F = Fall

Status is given by:

- M = Migrant
- P = Permanent

Species	Abundance	Seasonal Occurrence	Status
Common loon (Gavia immer)	X	W	
Horned grebe (Podiceps auritus)	X	W	
Pied-billed grebe (Podilymbus podiceps)	X	W, Sp	
White pelican (Pelecanus erythrorhynchos)	XX	W	
Brown pelican (Pelecanus occidentalis)	XXX		P
Gannet (Morus bassanus)	X	W	
Double-crested cormorant (Phalacrocorax auritus)	XXX		P
Anhinga (Anhinga anhinga)	XX		P
Magnificant frigatebird (Fregata magnificens)	X		P
Great white heron (Ardea occidentalis)	X	Sp, Su	
Great blue heron (Ardea herodias)	XXX		P
Green heron (Butorides virescens)	X		P
Little blue heron (Florida caerulea)	XX		P
Cattle egret (Bubulcus ibis)	XXXX		P
Common egret (Casmerodius albus)	XXXX		P
Snowy egret (Leucophoyx thula)	XXX		P
Louisiana heron (Hydranassa tricolor)	XX		P
Black-crowned night heron (Nycticorax nycticorax)	X		P
Yellow-crowned night heron (Nyctanassa violacea)	X		P
Least bittern (Ixobrychus exilis)	X		P
Wood ibis (Mycteria americana)	XX		P
Glossy ibis (Plegadis falcinellus)	X		P
White ibis (Eudocimus albus)	XX		P
Pintail (Anas acuta)	X	W	
Mottled duck (Anas fulvigula)	X		P
Green-winged teal (Anas carolinensis)	X	W	
Blue-winged teal (Anas discors)	XXX	W	

TABLE 2.7-3 (Cont'd)

Species	Abundance	Seasonal Occurrence	Status
American widgeon (Mareca americana)	X	W	
Shoveller (Spatula clypeata)	X	W	
Wood duck (Aix sponsa)	X		P
Ringed-necked duck (Aythya collaris)	X	W	
Lesser scaup (Aythya affinis)	XX	W	
Hooded merganser (Lophodytes cucullatus)	X	W	
Red-breasted merganser (Mergus serrator)	XXX	W	
Turkey vulture (Cathartes aura)	XXX		P
Black vulture (Coragyps atratus)	XX		P
Swallow-tailed kite (Elanoides forficatus)	X		P
Cooper's hawk (Accipiter copperii)	X		P
Red-tailed hawk (Buteo jamaicensis)	X		P
Red-shouldered hawk (Buteo lineatus)	X		P
Bald eagle (Haliaeetus leucocephalus)	X	W, Sp, F	
Marsh hawk (Circus cyaneus)	X		P
Osprey (Pandion haliaetus)	XXX		P
Peregrine falcon (Falco peregrinus)	X	W	
Pigeon hawk (Falco columbarius)	X	W	
Sparrow hawk (Falco sparverius)	XXX		P
Bobwhite (Colinus virginianus)	XXX		P
Clapper rail (Rallus longirostris)	X		P
Purple gallinule (Porphyrula martinica)	X		P
Common gallinule (Gallinula chloropus)	XX		P
American coot (Fulica americana)	XXXX	W	
Semipalmated plover (Charadrius semipalmatus)	X	W	
Piping plover (Charadrius melodus)	X	W	
Killdeer (Charadrius vociferus)	XX		P
Black-bellied plover (Squatarola squatarola)	XXX	W	
Ruddy turnstone (Arenaria interpres)	XX	W	
American woodcock (Philohela minor)	X	W	
Common snipe (Capella gallinago)	X	W	
Spotted sandpiper (Actitis macularia)	X		M
Willet (Catoptrophorus semipalmatus)	XX	Sp, Su, F	
Greater yellowlegs (Totanus malanoleucus)	X	W	
Lesser yellowlegs (Totanus flavipes)	X	W	
Least sandpiper (Erolia minutilla)	X	F, W, Sp	
Dunlin (Erolia alpina)	XX	W	
Short-billed dowitcher (Limnodronus griseus)	XXX	W	
Semipalmated sandpiper (Ereunetes pusilus)	X	W, Sp	
Western sandpiper (Ereunetes mauri)	X	W	
Sanderling (Crocethia alba)	XXX	W	
Avocet (Recurvirostra americana)	X		M
Great black-backed gull (Larus marinus)	X	W	
Herring gull (Larus argentatus)	XX	W, Sp, F	
Ring-billed gull (Larus delawarensis)	XXXX	W	
Laughing gull (Larus atricilla)	XXX		P
Bonaparte's gull (Larus philadelphia)	XX	W	

TABLE 2.7-3 (Cont'd)

Species	Abundance	Seasonal Occurrence	Status
Forster's tern (Sterna forsteri)	X		M
Common tern (Sterna hirundo)	X		M
Royal tern (Thalasseus maximus)	XXX		P
Sandwich tern (Thalasseus sandvicensis)	XX		P
Caspian tern (Hydroprogne caspia)	XX	W	
Black skimmer (Rynchops nigra)	XXX		P
Mourning dove (Zenaidura macroura)	XXX		P
Ground dove (Columbigallina passerina)	XX		P
Yellow-billed cuckoo (Coccyzus americanus)	XX	Su	
Smooth-billed ani (Crotophaga ani)	XX		P
Barn owl (Tyto alba)	X		P
Screech owl (Otus asio)	X		P
Great-horned owl (Bubo virginianus)	X		P
Barred owl (Strix varia)	X		P
Chuck-wills widow (Caprimulgus carolinensis)	X	Su	
Common nighthawk (Chordeiles minor)	XX	Su	
Ruby-throated hummingbird (Archilochus colubris)	X	Su	
Belted kingfisher (Megaceryle alcyon)	XXX		P
Yellow-shafted flicker (Colaptes auratus)	XX		P
Pileated woodpecker (Dryocopus pileatus)	X		P
Red-bellied woodpecker (Centurus carolinus)	XX		P
Red-headed woodpecker (Melanerpes erythrocephalus)	X		P
Yellow-bellied sapsucker (Sphyrapicus varius)	X	W	M
Downy woodpecker (Dendrocopos pubescens)	X		P
Eastern kingbird (Tyrannus tyrannus)	XX	Su	
Great crested flycatcher (Myriarchus crinitus)	XX	Su	
Eastern phoebe (Sayornis phoebe)	X	W	
Tree swallow (Iridoprocne bicolor)	XXXXX	W	M
Purple martin (Progne subis)	XX	Su	
Blue jay (Cyanocitta cristata)	XX		P
Scrub jay (Aphelocoma coerulescens)	X		P
Common crow (Corvus brachyrhnchos)	X		P
Fish crow (Corvus ossifragus)	XXXXX		P
House wren (Troglodytes aedon)	X	W	
Carolina wren (Thryothorus ludovicianus)	X		P
Long-billed marsh wren (Telmatodytes palustris)	X	W	
Mockingbird (Mimus polyglottos)	XXX		P
Catbird (Dumetella carolinensis)	XX	W	M
Brown thrasher (Toxostoma rufum)	X		P
Robin (Turdus migratorius)	XXXXX	W	
Hermit trush (Hylocichla guttata)	X	W	
Eastern bluebird (Sialia sialis)	X		P
Blue-gray gnatcatcher (Polioptila caerulea)	XX	Su	
Ruby-crowned kinglet (Regulus calendula)	X	W	

TABLE 2.7-3 (Cont'd)

Species	Abundance	Seasonal Occurrence	Status
Cedar waxwing (*Bombycilla cedrorum*)	XXX	W	M
Loggerhead shrike (*Lanius ludovicianus*)	XX		P
Starling (*Sturnus vulgaris*)	XX		P
White-eyed vireo (*Vireo griseus*)	X	Su	
Solitary vireo (*Vireo solitarius*)	X	W	
Black and white warbler (*Mniotilta varia*)	X		M
Worm-eating warbler (*Helmitheros vermivorus*)	X		M
Orange-crowned warbler (*Vermivora celata*)	X	W	
Myrtle warbler (*Dendroica coronata*)	XXX	W	M
Parula warbler (*Parula americana*)	X		M
Yellow warbler (*Dendroica petechia*)	X		M
Yellow-throated warbler (*Dendroica dominica*)	X	Su	
Pine warbler (*Dendroica pinus*)	X		P
Prairie warbler (*Dendroica discolor*)	XXX	W	M
Ovenbird (*Seiurus aurocapillus*)	X	W	M
Northern watertrush (*Seiurus noveboracensis*)	X		M
Yellowthroat (*Geothlypis trichas*)	XX		P
American redstart (*Setophaga ruticilla*)	XX		M
House sparrow (*Passer domesticus*)	XXX		P
Eastern meadowlark (*Sturnella magna*)	XX		P
Red-winged blackbird (*Agelaius phoeniceus*)	XXXX		P
Baltimore oriole (*Icterus galbula*)	X		M
Rusty blackbird (*Euphagus carolinus*)	XX	W	
Boat-tailed grackle (*Cassidix mexicanus*)	XXXX		P
Common grackle (*Quisculas quisculas*)	XXX		P
Brown-headed cowbird (*Molothrus ater*)	XX		M
Summer tanager (*Piranga rubra*)	XX	Su	
Cardinal (*Richmondena cardinalis*)	XXX		P
Indigo bunting (*Passerina cyanea*)	X		M
Painted bunting (*Passerina ciris*)	XX		M
American goldfinch (*Spinus tristis*)	XXX	W	
Rufous-sided towhee (*Pipilo erythrophthalmus*)	XX		P
Savannah sparrow (*Passerculus sandwichensis*)	XX	W	
Sharp-tailed sparrow (*Ammospiza caudacuta*)	X	W	
Seaside sparrow (*Ammospiza maritima*)	X		P
Chipping sparrow (*Spizella passerina*)	X	W	
Field sparrow (*Spizella pusilla*)	X	W	
White-throated sparrow (*Zonotrichia albicollis*)	X	W	
Swamp sparrow (*Melospiza georgiana*)	X	W	M
Song sparrow (*Melospiza melodia*)	X	W	

TABLE 2.7-4

RARE OR ENDANGERED SPECIES OF BIRDS

Several species of birds classified as "Rare or Endangered" by the U S Bureau of Sport Fisheries and Wildlife (1968) may occasionally occur in the region of Hutchinson Island. These include the following:

Florida great white heron, *Ardea o. occidentalis* (Audubon)

> This bird breeds primarily in southern Florida but may occasionally wander northward through the Hutchinson Island area.

Short-tailed hawk, *Buteo brachyurus* (Viellot)

> This species is more likely to occur inland but it could also occur in the Hutchinson Island area. It breeds throughout peninsular Florida, being more common in deep cypress swamps.

Southern bald eagle, *Haliaeetus leucocephalus* (Linnaeus)

> Eagles doubtless occur everywhere along the Indian River, never with any great abundance; they all migrate northward out of the state during the summer months.

American peregrine falcon, *Falco peregrinus anatum* (Bonaparte)

> Peregrine falcons (also known as duck hawks) are classified as rare migrants along the Atlantic Coastal islands bordering the eastern coast of Florida; some writers list this species as a regular winter resident; this species is likely to occur on Hutchinson Island itself.

TABLE 2.7-5

OCEAN WATER SALINITY OFFSHORE OF HUTCHINSON ISLAND, parts per thousand

DATE		STATION I	II	III	IV	V
Sept 1971	S*	34.0	36.0	36.0	36.0	35.5
	B**	34.0	36.5	36.0	36.0	35.0
Nov 1971	S	33.0	34.0	35.0	36.0	36.2
	B	34.0	34.5	35.0	35.8	36.0
Dec 1971	S	35.0	34.0	34.0	33.9	35.0
	B	35.0	34.5	34.0	34.0	35.0
Jan 1972	S	35.0	35.0	34.5	34.0	34.5
	B	35.0	34.0	34.0	33.0	34.0
Feb 1972	S	34.0	34.0	34.0	34.0	34.0
	B	34.0	34.0	34.0	35.0	36.0
Mar 1972	S	35.0	35.0	35.5	36.0	34.0
	B	36.0	38.0	37.0	36.0	35.0
Apr 1972	S	36.0	35.5	36.0	36.0	36.0
	B	36.0	36.0	35.5	36.0	36.0
May 1972	S	37.0	38.0	35.0	35.0	36.0
	B	37.0	38.0	35.0	35.0	36.0
Jun 1972	S	36.0	36.0	36.0	36.0	36.0
	B	37.0	37.0	37.0	37.0	37.0
5 Jul 1972	S	35.0	36.0	37.0	38.0	38.0
	B	38.0	37.0	37.0	38.0	37.0
18 Jul 1972	S	36.0	36.0	37.0	38.0	36.0
	B	35.0	38.0	38.0	38.0	36.0
Aug 1972	S	35.0	35.0	35.5	35.5	36.0
	B	36.0	36.0	36.5	36.5	36.0
Sept 1972	S	36.0	33.0	35.0	35.0	35.0
	B	37.0	36.0	36.0	35.0	36.0
Oct 1972	S	35.5	35.5	36.0	35.5	35.5
	B	36.5	36.5	36.5	36.5	36.5
Nov 1972	S	35.0	34.0	34.0	34.0	35.0
	B	35.0	34.0	34.0	34.0	35.0

* S= Surface Sample
** B= Bottom Sample

TABLE 2.7-6

OCEAN WATER TEMPERATURES OFFSHORE OF HUTCHINSON ISLAND
FIVE-DAY MEANS F

Month	Day	Mean Temperature Surface	Bottom
Dec 1970	1-5	76	75
	6-10	74	73
	11-15	74	74
	16-20	73	74
	21-25	73	74
	26-31	69	70
Jan 1971	1-5	69	69
	6-10	72	72
	11-15	73	73
	16-20	68	71
	21-25	66	64
	26-31	68	68
Feb 1971	1-5	71	69
	6-10	67	69
	11-15	69	66
	16-20	72	71
	21-25	74	73
	26-28	74	73
Mar 1971	1-5	66	66
	6-10	68	67
	11-15	73	71
	16-20	-	70
	21-25	-	70
	26-31	-	70
Apr 1971	1-5	-	69
	6-10	69	69
	11-15	71	70
	16-20	73	73
	21-25	73	73
	26-30	73	73
May 1971	1-5	74	74
	6-10	75	75
	11-15	73	73
	16-20	74	71
	21-25	76	74
	26-31	76	75

TABLE 2.7-6 (cont'd)

Month	Day	Mean Temperature Surface	Mean Temperature Bottom
June 1971	1-5	78	77
	6-10	80	79
	11-15	80	79
	16-20	80	79
	21-25	80	79
	26-30	78	75
Jul 1971	1-5	78	77
	6-10	83	81
	11-15	81	77
	16-20	78	76
	21-25	80	78
	26-31	79	77
Aug 1971	1-5	78	75
	6-10	78	75
	11-15	79	78
	16-20	75	73
	21-25	77	74
	26-31	81	81
Sept 1971	1-5	83	82
	6-10	82	82
	11-15	81	82
	16-20	82	82
	21-25	83	83
	26-30	82	82
Oct 1971	1-5	83	82
	6-10	82	83
	11-15	81	82
	16-20	81	81
	21-25	81	80
	26-31	80	80
Nov 1971	1-5	79	-
	6-10	78	-
	11-15	74	-
	16-20	76	-
	21-25	74	-
	26-30	74	-
Dec 1971	1-5	74	73
	6-10	73	74
	11-15	75	76
	16-20	73	75
	21-25	72	73
	26-31	74	75

TABLE 2.7-6 (cont'd)

Month	Day	Mean Temperature Surface	Bottom
Jan 1972	1-5	75	76
	6-10	74	75
	11-15	74	76
	16-20	71	71
	21-25	74	73
	26-31	76	75
Feb 1972	1-5	74	74
	6-10	69	70
	11-15	71	69
	16-20	72	-
	21-25	65	-
	26-29	72	-
Mar 1972	1-5	70	-
	6-10	71	-
	11-15	69	-
	16-20	75	76
	21-25	75	75
	26-31	75	74
Apr 1972	1-5	74	73
	6-10	74	73
	11-15	73	74
	16-20	70	67
	21-25	74	73
	26-30	73	73
May 1972	1-5	74	74
	6-10	77	77
	11-15	77	76
	16-20	78	78
	21-25	78	78
	26-31	80	80
June 1972	1-5	80	80
	6-10	81	80
	11-15	80	80
	16-20	80	80
	21-25	73	70
	26-30	76	74

TABLE 2.7-6 (cont'd)

Month	Day	Mean Temperature Surface	Mean Temperature Bottom
Jul 1972	1-5	78	75
	6-10	79	76
	11-15	81	79
	16-20	82	81
	21-25	83	81
	26-31	78	73
Aug 1972	1-5	82	82
	6-10	78	77
	11-15	77	78
	16-20	82	82
	21-25	82	81
	26-31	83	82
Sep 1972	1-5	82	82
	6-10	83	84
	11-15	83	83
	16-20	84	83
	21-25	83	84
	26-30	83	83
Oct 1972	1-5	83	83
	6-10	81	80
	11-15	80	79
	16-20	80	80
	21-25	78	77
	26-31	80	79
Nov 1972	1-5	80	80
	6-10	80	80
	11-15	79	79
	16-20	76	77
	21-25	74	74
	26-30	72	73

TABLE 2.7-7

DISSOLVED OXYGEN CONCENTRATIONS OFFSHORE OF HUTCHINSON ISLAND, mg/1

DATE		STATION NUMBERS I	II	III	IV	V
Sept 1971	S*	5.9	5.3	6.6	7.3	5.7
	B**	5.7	5.9	5.8	6.8	6.4
Dec 1971	S	6.9	6.9	6.5	6.8	6.9
	B	6.9	6.7	6.7	6.7	6.3
Jan 1972	S	6.5	7.2	6.2	6.2	6.2
	B	6.5	6.9	6.3	6.5	-
Feb 1972	S	5.4	5.9	5.3	4.1	5.7
	B	6.6	5.9	6.8	6.7	6.6
Mar 1972	S	6.8	6.2	6.5	8.0	7.2
	B	6.7	6.2	6.0	6.0	7.0
Apr 1972	S	7.1	-	6.1	-	-
	B	6.5	-	6.0	-	-
May 1972	S	6.0	5.8	6.4	6.5	6.5
	B	6.7	5.8	6.0	6.0	5.8
June 1972	S	5.8	6.3	6.2	6.2	6.1
	B	5.4	6.1	6.3	6.0	6.0
5 July 1972	S	4.6	6.4	6.6	6.3	8.6
	B	5.9	6.6	7.0	6.8	6.8
18 July 1972	S	4.8	4.3	5.6	3.9	4.3
	B	5.1	4.9	6.1	4.9	4.9
Aug 1972	S	4.5	4.3	3.9	3.2	3.3
	B	4.8	5.0	5.1	4.3	3.9
Sept 1972	S	6.3	6.1	4.0	-	-
	B	6.0	4.1	4.4	-	-
Oct 1972	S	7.8	6.8	6.1	6.5	6.1
	B	5.7	6.6	6.4	6.3	6.3
Nov 1972	S	6.5	6.2	9.1	8.4	7.0
	B	5.9	5.9	5.5	5.4	6.4

* Surface
** Bottom

TABLE 2.7-8

PHOSPHATE CONCENTRATIONS OFFSHORE OF HUTCHINSON ISLAND, mg/1

DATE		STATION NUMBERS				
		I	II	III	IV	V
Feb 1972	S*	-	0.039	0.032	0.034	0.056
	B**	0.044	0.032	0.034	0.033	0.047
Mar 1972	S	0.065	0.055	0.055	0.052	0.066
	B	0.054	0.052	0.052	0.065	0.070
Apr 1972	S	0.150	0.136	0.168	0.138	0.161
	B	0.141	0.168	>1.000	0.134	0.129
May 1972	S	0.043	0.020	0.019	0.071	0.021
	B	0.017	0.027	0.040	0.037	0.032
Jun 1972	S	0.038	0.032	0.030	0.034	0.039
	B	0.043	0.032	0.030	0.032	0.038
Jul 1972	S	0.345	0.365	0.359	0.386	0.404
	B	0.420	0.346	0.408	0.323	0.386
Aug 1972	S	0.069	0.056	0.076	0.100	0.059
	B	0.095	0.059	0.119	0.068	0.126
Sep 1972	S	0.084	0.058	0.059	0.060	0.055
	B	0.102	0.070	0.061	0.063	0.060
Oct 1972	S	0.205	0.342	0.212	0.185	0.236
	B	0.197	0.249	0.189	0.192	0.225
Nov 1972	S	0.038	0.316	0.027	0.036	0.308
	B	0.047	0.035	0.038	0.027	0.030

* Surface
** Bottom
range, in mg/1: 0.017 to 0.420, plus one reading of >1.000
0.179 to 4.42 mg at PO_4-P/m^3

TABLE 2.7-9

NITRATE CONCENTRATIONS OFFSHORE OF
HUTCHINSON ISLAND, mg/l

DATE		STATION NUMBERS				
		I	II	III	IV	V
Feb 1972	S*	-	0.0244	0.0134	0.0274	0.0748
	B**	0.0133	0.0247	0.0280	0.0279	0.0139
Mar 1972	S	0.0096	0.0058	0.0076	0.0100	0.0189
	B	0.0025	0.0024	0.0149	0.0062	0.0171
Apr 1972	S	0.0341	0.0118	0.0138	0.0128	0.0158
	B	0.0230	0.0180	0.0183	0.0172	0.0145
May 1972	S	0.0272	0.0200	0.0116	0.0227	0.0030
	B	0.0161	0.0308	0.0218	0.0304	0.0025
Jun 1972	S	0.0103	0.0090	0.0040	0.0081	0.0098
	B	0.0112	0.0090	0.0022	0.0028	0.0084
Jul 1972	S	0.0177	0.0120	0.0131	0.0130	0.0084
	B	0.0043	0.0141	0.0054	0.0064	0.0087
Aug 1972	S	0.0077	0.0093	0.0034	0.0111	0.0055
	B	0.0048	0.0071	0.0067	0.0051	0.0194
Sep 1972	S	0.0073	0.0113	0.0197	0.0186	0.0040
	B	0.0138	0.0064	0.0036	0.0064	0.0026
Oct 1972	S	0.0058	0.0118	0.0177	0.0112	0.0105
	B	0.0104	0.0107	0.0084	0.0071	0.0264
Nov 1972	S	0.0083	0.0061	0.0105	0.0216	0.0734
	B	0.0082	0.0090	0.0121	0.0070	0.0065

*Surface
**Bottom
range, in mg/l: 0.0022 to 0.0748
0.036 to 1.206 mg at NO_3-N/m^3

TABLE 2.7-10

NITRITE CONCENTRATIONS OFFSHORE OF HUTCHINSON ISLAND, mg/l

Date		Station Numbers I	II	III	IV	V
Feb 1972	S*	-	0.0029	0.0027	0.0016	0.0086
	B**	0.0039	0.0027	0.0030	0.0016	0.0066
Mar 1972	S	0.0017	0.0004	0.0003	0.0009	0.0019
	B	0.0004	0.0006	0.0013	0.0007	0.0188
Apr 1972	S	0.0048	0.0018	0.0025	0.0022	0.0042
	B	0.0038	0.0020	0.0037	0.0023	0.0028
May 1972	S	0.0004	0.0006	0.0027	0.0041	0.0013
	B	0.0001	0.0022	0.0113	0.0181	0.0032
Jun 1972	S	0.0014	0.0003	0.0004	0.0006	0.0008
	B	0.0008	0.0003	0.0017	0.0007	0.0009
Jul 1972	S	0.0000	0.0005	0.0002	0.0000	0.0000
	B	0.0000	0.0002	0.0000	0.0000	0.0013
Aug 1972	S	0.0016	0.0021	0.0009	0.0041	0.0013
	B	0.0016	0.0006	0.0066	0.0009	0.0045
Sep 1972	S	0.0051	0.0046	0.0051	0.0046	0.0034
	B	0.0084	0.0043	0.0038	0.0036	0.0052
Oct 1972	S	0.0019	0.0025	0.0023	0.0020	0.0020
	B	0.0024	0.0025	0.0021	0.0015	0.0030
Nov 1972	S	0.0082	0.0079	0.0015	0.0033	0.0106
	B	0.0067	0.0036	0.0014	0.0020	0.0015

Range in mg/l: 0.0000 to 0.0188
0.0000 to 0.480 mg at NO_2-N/m^3

* Surface
** Bottom

TABLE 2.7-11

AMMONIA CONCENTRATIONS OFFSHORE OF
HUTCHINSON ISLAND, mg/l

DATE		STATION NUMBERS I	II	III	IV	V
Feb 1972	S*	-	0.846	0.885	0.911	>1.000
	B**	0.800	>1.000	0.865	0.682	0.880
Mar 1972	S	0.004	0.004	0.006	<0.005	0.035
	B	0.005	0.008	0.015	0.010	0.038
Apr 1972	S	<0.005	<0.005	0.006	<0.005	<0.005
	B	0.008	<0.005	0.089	0.006	0.003
May 1972	S	<0.001	<0.001	<0.001	<0.001	<0.001
	B	<0.001	<0.001	<0.001	<0.001	<0.001
Jun 1972	S	0.0045	<0.0010	<0.0010	0.0055	0.0120
	B	<0.0010	0.0030	<0.0010	<0.0010	<0.0050
Jul 1972	S	<0.005	<0.005	<0.005	<0.005	<0.005
	B	<0.005	0.012	<0.005	<0.005	<0.005
Aug 1972	S	0.011	<0.005	<0.005	0.030	<0.005
	B	0.028	<0.005	0.023	<0.005	0.044
Sep 1972	S	0.013	0.013	0.010	0.010	0.010
	B	0.041	0.011	0.045	0.017	<0.005
Oct 1972	S	0.024	<0.005	<0.005	<0.005	<0.005
	B	<0.005	<0.005	<0.005	<0.005	<0.005
Nov 1972	S	0.017	0.010	0.010	-	0.274
	B	0.029	0.010	0.010	0.010	0.005

*Surface
**Bottom
range, in mg/l: <0.001 to >1.000 (0.005 to 0.911)
or 0.294 to 53.5 mg at NH_3-N/m^3

TABLE 2.7-12

SILICATE CONCENTRATIONS OFFSHORE OF HUTCHINSON ISLAND, mg/l

DATE		STATION NUMBERS I	II	III	IV	V
Feb. 1972	S*	-	0.225	0.164	0.211	0.266
	B**	0.265	0.199	0.294	0.200	0.268
Mar. 1972	S	0.147	0.072	0.105	0.111	0.111
	B	0.098	0.139	0.162	0.071	0.117
Apr. 1972	S	0.193	0.131	0.118	0.133	0.145
	B	0.177	0.153	0.153	0.137	0.153
May 1972	S	0.187	0.152	0.239	0.232	0.515
	B	0.245	0.410	0.227	0.226	0.326
June 1972	S	0.289	0.166	0.099	0.150	0.171
	B	0.155	0.097	0.094	0.090	0.121
July 1072	S	0.383	0.725	0.376	0.487	0.506
	B	0.344	0.409	0.364	0.430	0.374
Aug. 1972	S	0.348	0.400	0.120	0.342	0.231
	B	0.166	0.125	0.230	0.148	0.303
Sept. 1972	S	0.616	0.476	0.426	0.474	0.694
	B	0.427	0.516	0.434	0.524	0.546
Oct. 1972	S	0.400	0.275	0.420	0.325	0.355
	B	0.900	0.245	0.520	0.380	0.360
Nov. 1972	S	0.311	0.260	0.187	0.257	0.357
	B	0.266	0.249	0.179	0.209	0.279

* Surface
** Bottom
range, in mg/l: 0.072 to 0.900
0.78 to 9.88 mg at SiO_4 - Si/m^3

TABLE 2.7-13

CHLOROPHYLL "A" CONCENTRATIONS MEASURED OFFSHORE OF HUTCHINSON ISLAND, mg/m^3

DATE		STATION NUMBERS I	II	III	IV	V
Nov 1971	S*	2.55	2.26	0.76	2.14	3.14
	B**	7.70	1.92	0.94	1.85	2.18
Dec 1971	S	1.09	0.88	0.87	0.66	0.51
	B	2.14	1.21	1.71	2.28	2.42
Jan 1972	S	1.46	0.98	1.57	0.75	0.90
	B	2.05	2.78	1.18	1.11	2.07
Feb 1972	S	3.99	2.40	2.55	1.68	2.89
	B	5.87	2.89	2.41	1.79	2.75
Mar 1972	S	2.13	0.97	0.08	0.99	0.92
	B	1.51	1.15	0.08	1.50	1.85
Apr 1972	S	2.76	1.01	0.78	1.48	1.77
	B	4.99	2.04	1.62	3.79	3.67
May 1972	S	1.62	1.07	2.03	3.92	2.40
	B	1.21	2.49	4.39	2.57	3.56
Jun 1972	S	0.86	0.77	0.60	0.61	0.47
	B	5.86	0.31	0.26	0.55	1.42
Jul 1972	S	0.82	0.31	0.60	0.82	1.02
	B	0.43	0.33	0.24	0.38	0.65
Aug 1972	S	2.25	0.64	0.81	0.75	0.98
	B	1.47	0.51	0.63	0.68	1.31
Sep 1972	S	2.89	1.65	2.45	2.11	2.27
	B	4.85	2.06	2.75	1.47	2.06
Oct 1972	S	6.50	3.50	2.14	2.30	4.54
	B	5.20	3.18	1.52	3.41	5.29
Nov 1972	S	1.09	1.48	0.87	0.95	0.56
	B	1.60	1.60	0.90	1.15	0.74

*Surface
**Bottom

TABLE 2.7-14

PHYTOPLANKTON CONCENTRATIONS OFFSHORE OF HUTCHINSON ISLAND, CELLS/1

DATE	STATION NUMBERS				
	I	II	III	IV	V
Sept. 1971	92.8	4655.1	1357.9	449.9	30,532.9
Nov. 1971	9.6	4.3	19.3	3.6	3.2
Jan. 1972	1088.1	248.1	763.9	919.3	123.7
Mar. 1972	165.5	83.8	53.2	243.8	12.3
May 1972	122.3	47.3	42.7	90.3	286.1
July 1972	1.0	14.4	3.1	4.3	7.2
Sep. 1972	201.3	414.7	166.0	238.1	179.7
Oct. 1972	845.9	2,111.6	664.3	3,233.5	5,612.8
Nov. 1972	7.9	15.7	15.2	11.8	24.9

TABLE 2.7-15

ZOOPLANKTON CONCENTRATIONS OFFSHORE OF HUTCHINSON ISLAND, ORGANISMS/M^3

DATE		STATION NUMBERS				
		I	II	III	IV	V
Sept. 1971	Copepods	178	1128	1206	820	458
	Total	299	1416	2638	1211	958
Nov. 1971	C	206	159	82	198	215
	T	244	478	249	550	307
Jan. 1972	C	2292	3232	3948	2872	4570
	T	3005	4868	5462	4971	7432
Mar. 1972	C	1613	1111	2207	1895	1082
	T	1965	1441	2399	2847	1291
May 1972	C	2576	1085	10930	4958	3041
	T	3943	1525	12023	5775	3769
July 1972	C	194	958	2303	758	492
	T	379	1758	3843	2135	1272

TABLE 2.7-16

FISH COLLECTED BY TRAWL
OFFSHORE OF HUTCHINSON ISLAND

SPECIES	STATION NUMBERS I	II	III	IV	V
Synodontidae					
Synodus foetens inshore lizardfish		1		2	
Serranidae					
Centropristis philadelphica rock sea bass					2
Gerreidae					
Eucinostomus gula silver jenny				2	
Sparidae					
Archosargus probatocephalus sheepshead	11				
Gobiidae					1
taken by bottom grab					
Scorpaenidae					
Scorpaena brasiliensis barbfish					2
Triglidae					
Prionotus scitulus leopard searobin	3	1			1
Prionotus martis barred searobin		1			1
Bothidae					
Bothus ocellatus eyed flounder				2	
Citharichthys Macrops spotted whiff	1				3

TABLE 2.7-16 (cont'd)

SPECIES	STATION NUMBERS I	II	III	IV	V
Etropus crossotus fringed flounder	1				
Paralichthys abligutta gulf flounder	2				
Synacium papillosum dusky flounder				1	1

TABLE 2.7-17

FISH COLLECTED BY BEACH SEINE AT THREE HUTCHINSON ISLAND SHORE STATIONS

SPECIES	STATION NUMBERS VI	VII	VIII
Clupeidae			
Harengula pensacolae Scaled sardine	19	10	
Opisthonema oglinum Atlantic threadfin herring	3	3	
Sardinella anchovia Spanish sardine	22	1	
Brevoortia sp. Menhaden			1
Engraulidae			
Anchoa cubana Cuban anchovy	3240	1970	8
Anchoa mitchelli Bay anchovy	5	1	
Anchoa nausta Longnose anchovy	3758	2234	18
Engraulis eurystole Silver anchovy	5	2	
Pomatomidae			
Pomatomus saltatrix Bluefish	2	2	
Carangidae			
Caranx chrysos Blue runner	1		
Caranx hippos Crevalle jack	1		
Chloroscombrus chrysurus Atlantic bumper	31	12	

TABLE 2.7-17 (cont'd)

SPECIES	STATION NUMBERS VI	VII	VIII
Selene vomer Lookdown	7		
Trachinotus carolinus Pompano	3	18	1
Trachinotus falcatus rermit	5	2	6
Gerreidae			
Eucinostomus gula Silver jenny		1	
Sparidae			
Lagodon rhomboides Pinfish	1		
Sciaenidae			
Menticirrhus littoralis Gulf kingfish	11	26	22
Umbrina coroides Sand drum	7	62	12
Leiostomus xanthurus Spot	59		
Pogonias chromis Black drum	1		
Mugilidae			
Mugil cephalus Striped mullet		5	

TABLE 2.7-18

1971 FINFISH LANDINGS, FLORIDA AND ST. LUCIE COUNTY

Species	Florida Landings, lb	St. Lucie Landings, lb	St. Lucie Landings as % Fla. Landings
Bluefish	2,134,989	228,663	10.7
Spanish Mackerel	9,964,946	679,110	6.8
King Mackerel	5,644,148	1,217,356	21.6
Total Finfish Landings	63,203,944	3,072,838	4.9

Data obtained from Florida Landings, Annual Summary 1971, Current Fisheries Statistics No. 5919. Data in Table 2.7-19 is taken from Preliminary Florida Landings, 1970 to 1972. Numerical discrepancies between Tables 2.7-18 and 2.7-19 reflect the difference between preliminary and final data as compiled in the Current Fisheries Statistics Bulletins. 1

Table 2.7-19

ST LUCIE COUNTY FINFISH LANDINGS, LB - 1970

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Bluefish	150,178	87,733	199,470	75,869	49,762	17,343	4,264	14,344	11,720	15,722	35,057	63,682	725,144
Groupers	6,822	1,957	1,363	7,259	5,273	15,029	7,732	1,613	9,701	15,431	14,774	9,788	96,742
King Mackerel	1,633	7,213	73,284	126,557	54,220	21,722	64,325	117,493	73,975	15,737	53,390	405,352	994,901
Mullet, Black	4,927	672	2,073	1,067	824	4,566	16,915	27,959	4,867	12,383	12,962	21,793	111,008
Sea Trout, Spotted	10,361	5,277	6,153	10,460	2,940	9,068	10,843	13,731	2,746	1,210	3,466	4,533	80,788
Spanish Mackerel	22	338	154,645	70,617	13,770	6,534	2,925	4,991	4,734	2,241	880,871	100,401	1,242,089
Spot	1,126	2,121	2,287	44,671	21,462	43,502	29,073	29,433	10,928	20,229	49,746	21,834	276,412
Total	175,069	105,311	439,275	336,500	148,251	117,764	116,077	209,564	118,671	82,953	1,050,266	627,383	3,527,084

1970 Total Finfish Landing in St Lucie County Equaled 3,948,940 lb (preliminary data); The Species Noted Above Formed 89.3 percent of the Total.

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Table 2.7-19 (Cont'd.)

ST LUCIE COUNTY FINFISH LANDINGS, LB - 1971

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Bluefish	72,823	24,293	28,515	47,219	9,046	656	498	4,785	12,536	9,750	8,286	7,881	226,288
Groupers	3,945	3,445	37,058	266	720	8,195	7,033	8,012	35,694	2,299	264	3,994	110,925
King Mackerel	255,269	72,273	84,555	22,772	117,926	93,367	62,903	99,671	82,607	41,539	4,730	222,123	1,159,726
Mullet, Black	601	134	1,550	1,617	3,672	9,854	23,188	14,814	14,232	10,368	16,930	19,116	116,096
Sea Trout, Spotted	1,959	3,127	2,345	2,230	3,530	3,003	7,284	7,022	5,654	4,925	3,281	3,129	47,489
Spanish Mackerel	167,816	17,687	149,166	210,416	3,878	5,148	6,783	15,117	10,729	15,585	14,436	43,157	659,918
Spot	41,523	12,134	5,193	1,709	18,136	28,346	27,753	50,531	49,891	46,641	23,470	3,931	309,258
Total	543,927	133,093	308,382	286,229	156,908	148,569	135,422	199,952	211,343	131,107	71,417	303,331	2,629,700

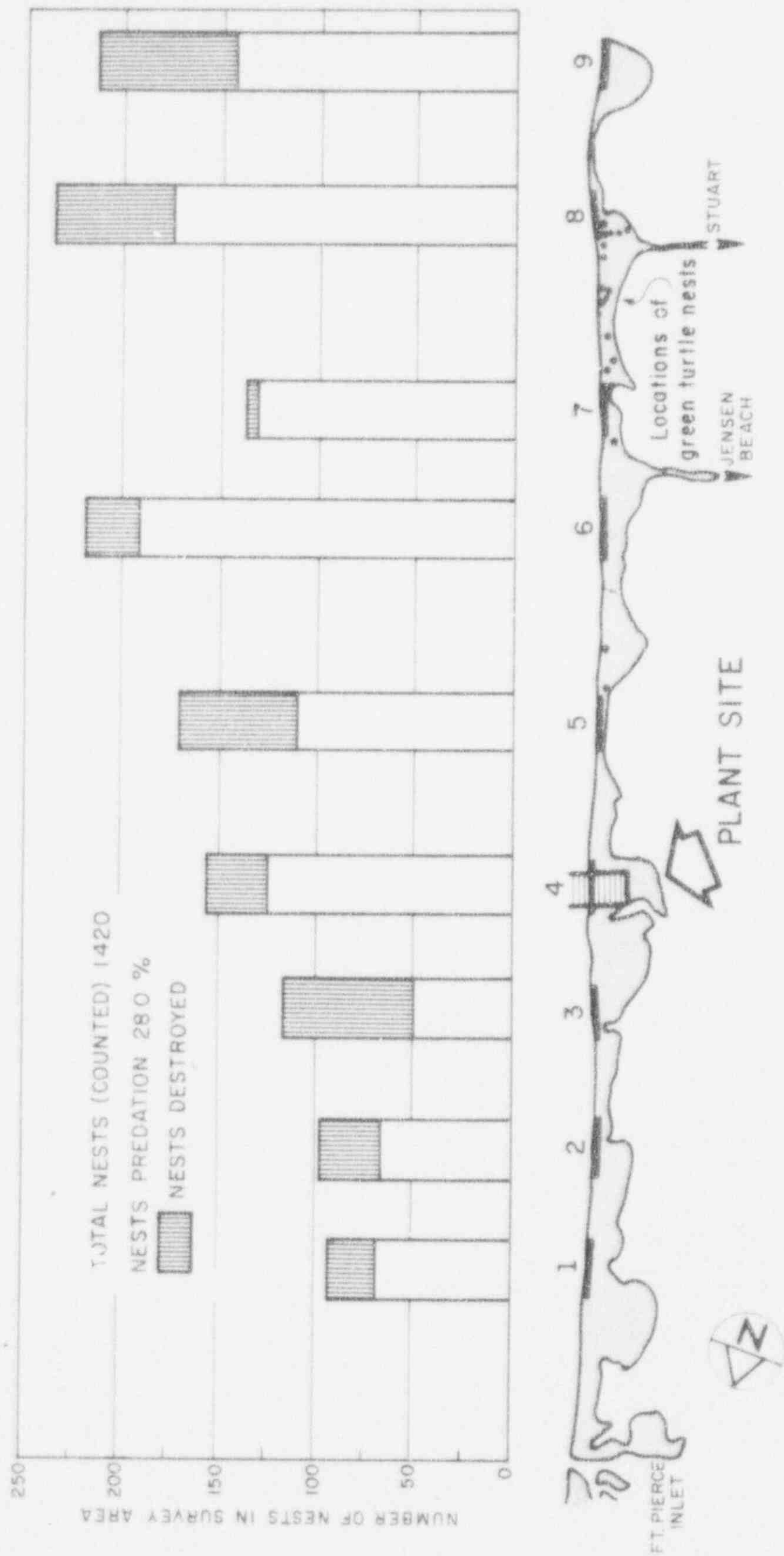
1971 Total Finfish Landings in St Lucie County Equaled 2,883,303 lb (preliminary data); the Species Noted Above Formed 91.2 Percent of the Total.

Table 2.7-19 (Cont'd.)

ST LUCIE COUNTY FINFISH LANDINGS, LB - 1972

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Bluefish	14,995	46,176	139,049	102,806	12,729	5,912	2,048	3,213	10,741	23,384	15,548	32,042	408,643
Groupers	1,650	3,484	21,547	655	10,826	12,690	18,319	9,051	1,573	3,418	5,507	1,132	89,852
King Mackerel	428,172	105,334	159,190	41,899	33,461	52,693	18,870	79,614	102,781	28,921	8,281	237,813	1,297,029
Mullet, Black	1,750	5,700	385	-	1,280	2,774	15,660	14,221	18,062	12,426	9,040	13,372	94,670
Sea Trout, Spotted	2,601	6,813	2,478	1,481	4,101	6,033	5,943	4,700	3,749	5,188	4,578	3,806	51,471
Spanish Mackerel	30,619	4,597	144,507	79,891	18,053	11,317	8,083	7,258	55,838	91,957	286,936	252,206	991,262
Spot	8,672	6,297	6,632	1,818	29,985	43,473	38,699	61,371	14,628	28,534	55,402	3,760	304,271
Total	488,459	178,401	473,788	228,550	110,435	139,892	107,622	179,428	207,372	193,828	383,292	544,131	3,237,198

1972 Total Finfish Landings in St Lucie County Equaled 3,564,267 lb (preliminary data); the Species Noted Above Formed 90.8 Percent of the Total.

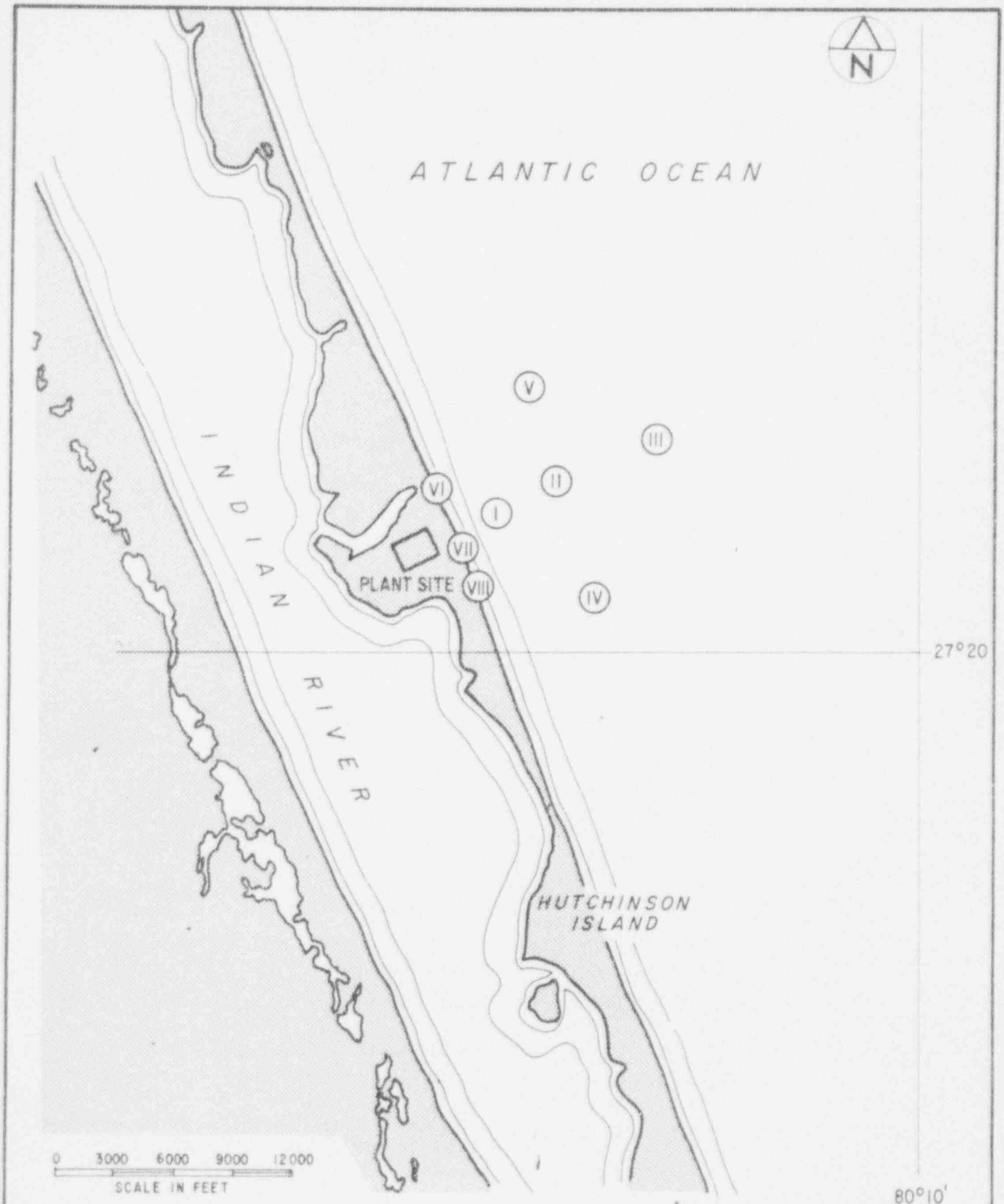


FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNIT 2

TURTLE NEST SURVEY AREAS
DENSITY OF NESTING AND PREDATION

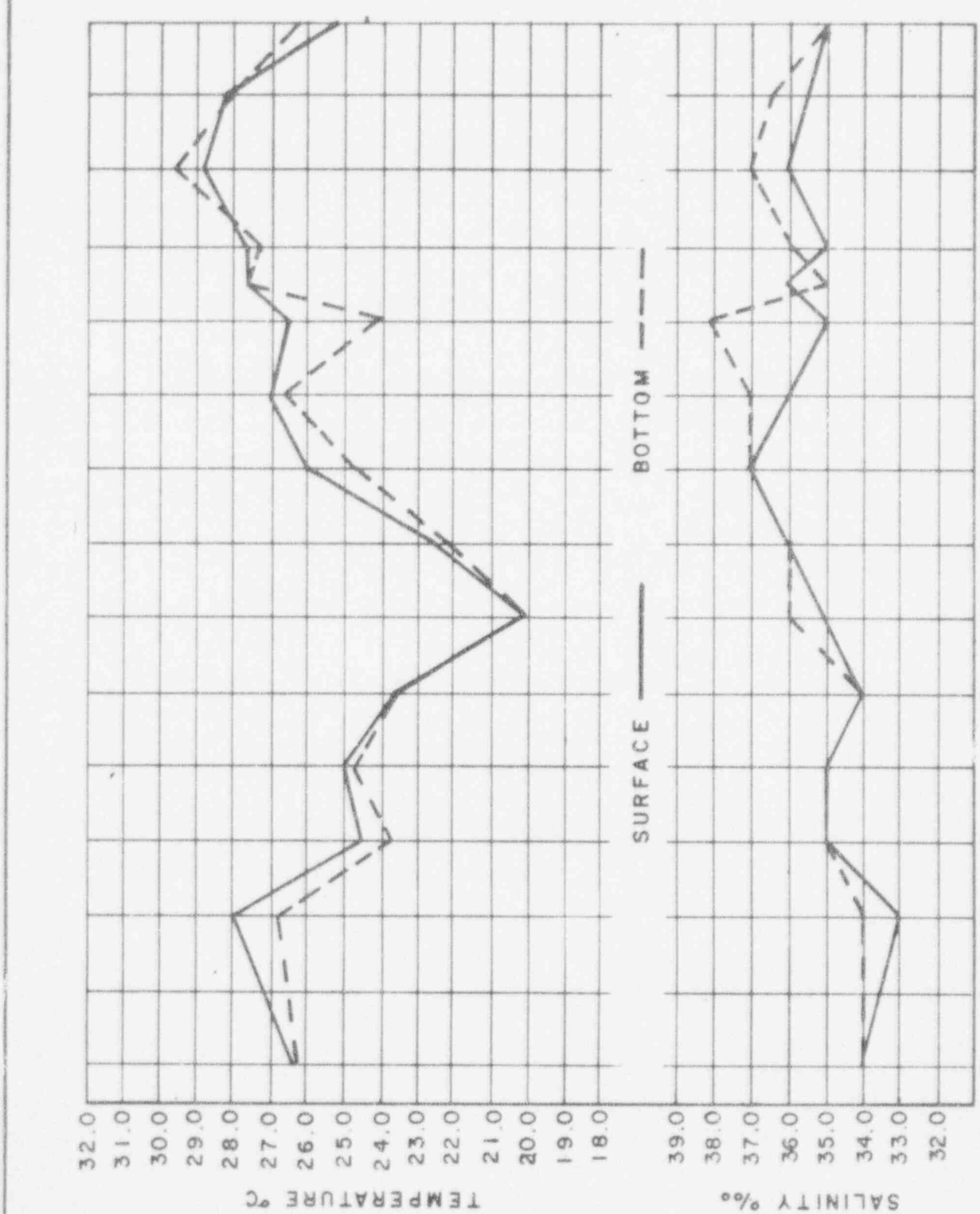
FIGURE 2.7-1



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

LOCATION OF MARINE ENVIRONMENTAL SAMPLING STATION IN ATLANTIC OCEAN OFF HUTCHINSON ISLAND FLORIDA

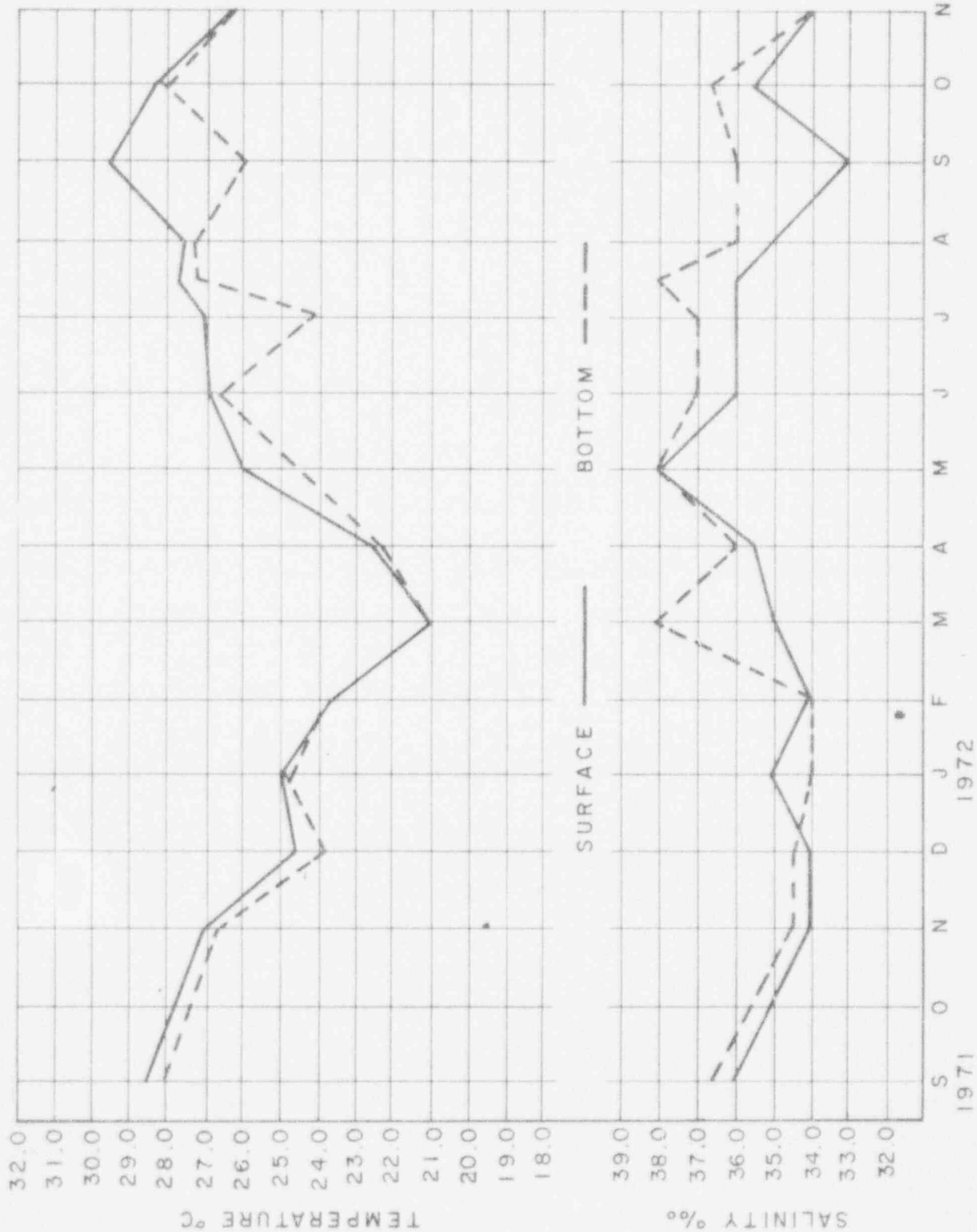
FIGURE 2.7-2



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY TEMPERATURE AND SALINITY
STATION I

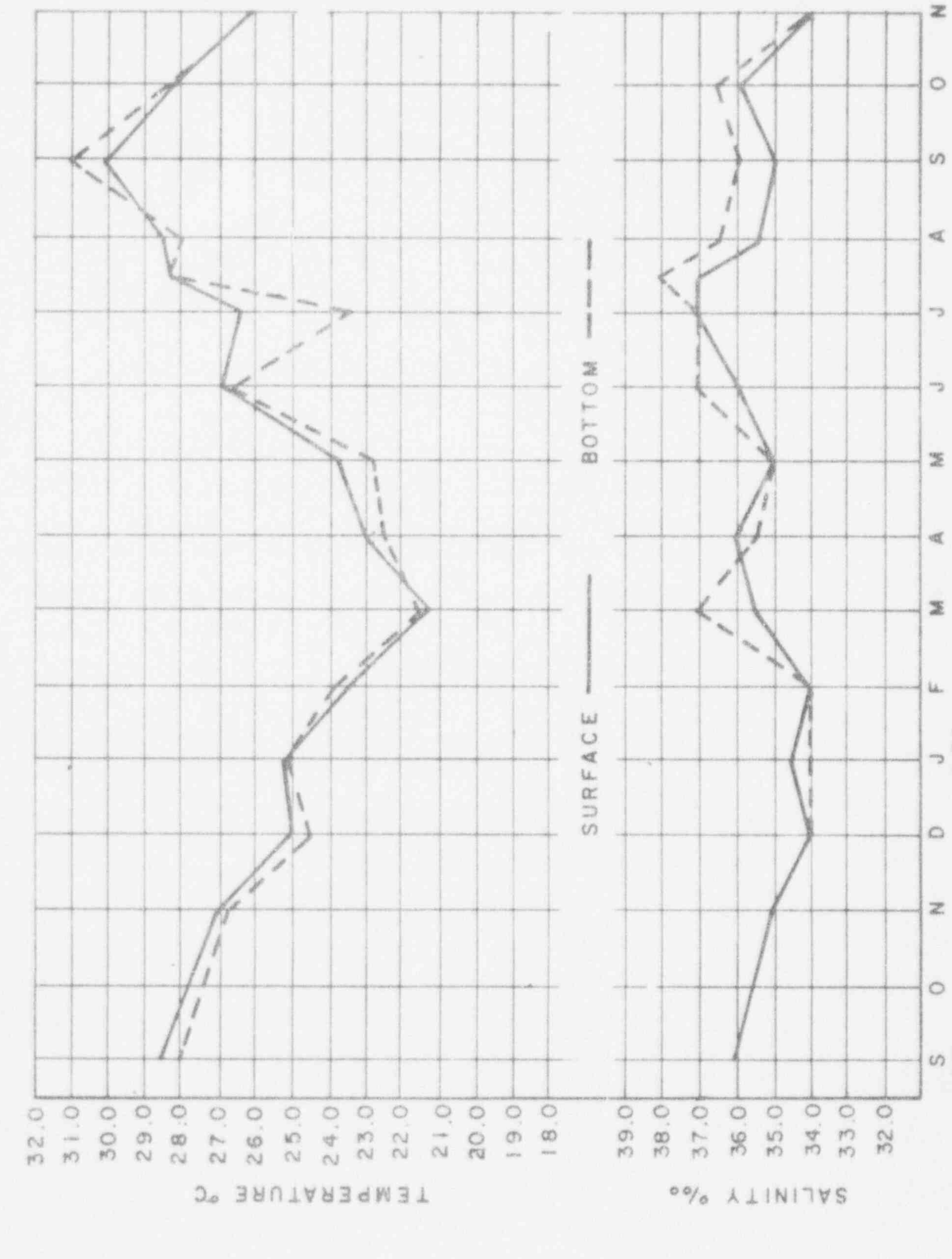
FIGURE 2.7-3



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY TEMPERATURE AND SALINITY
STATION II

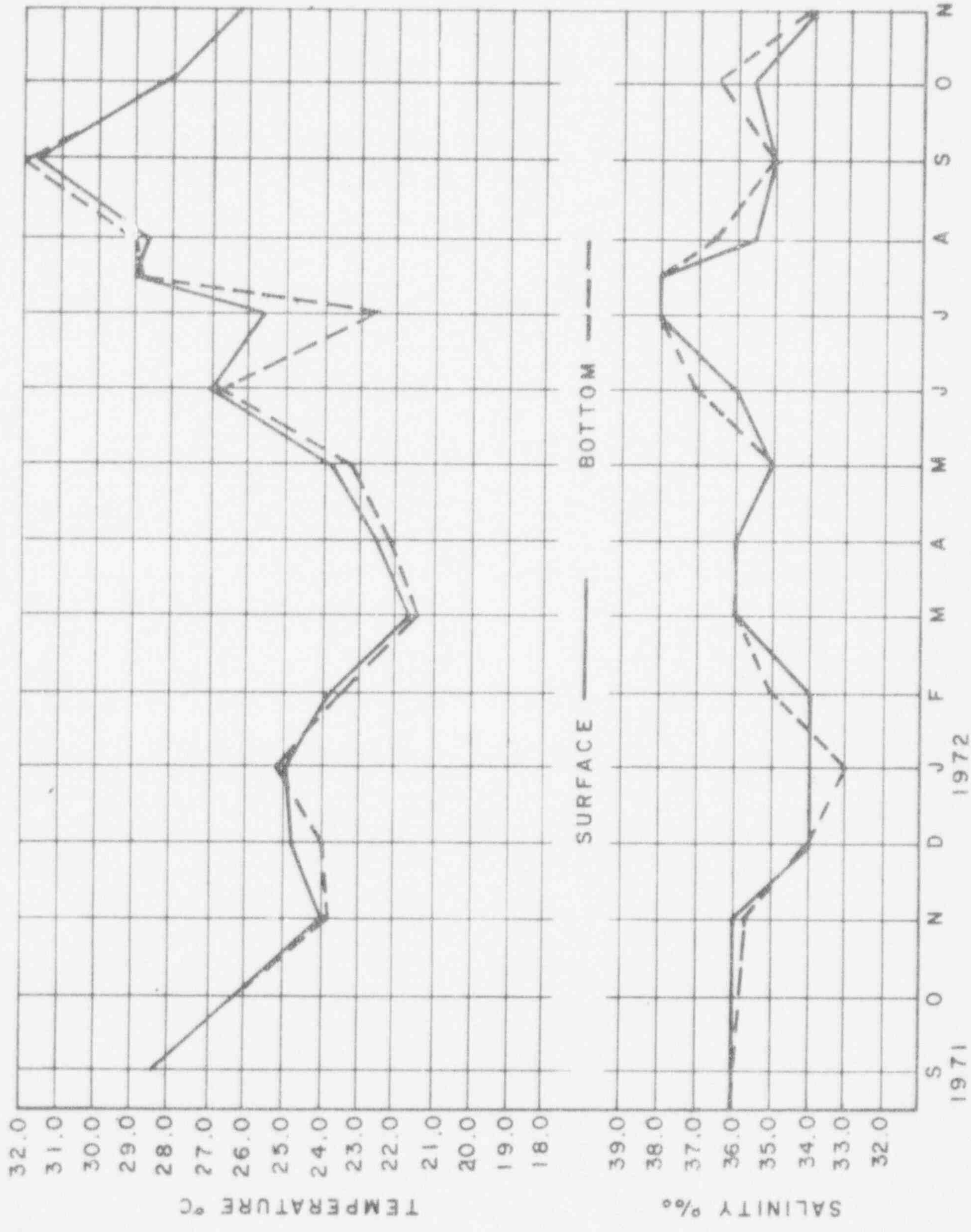
FIGURE 2.7-4



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY TEMPERATURE AND SALINITY
STATION III

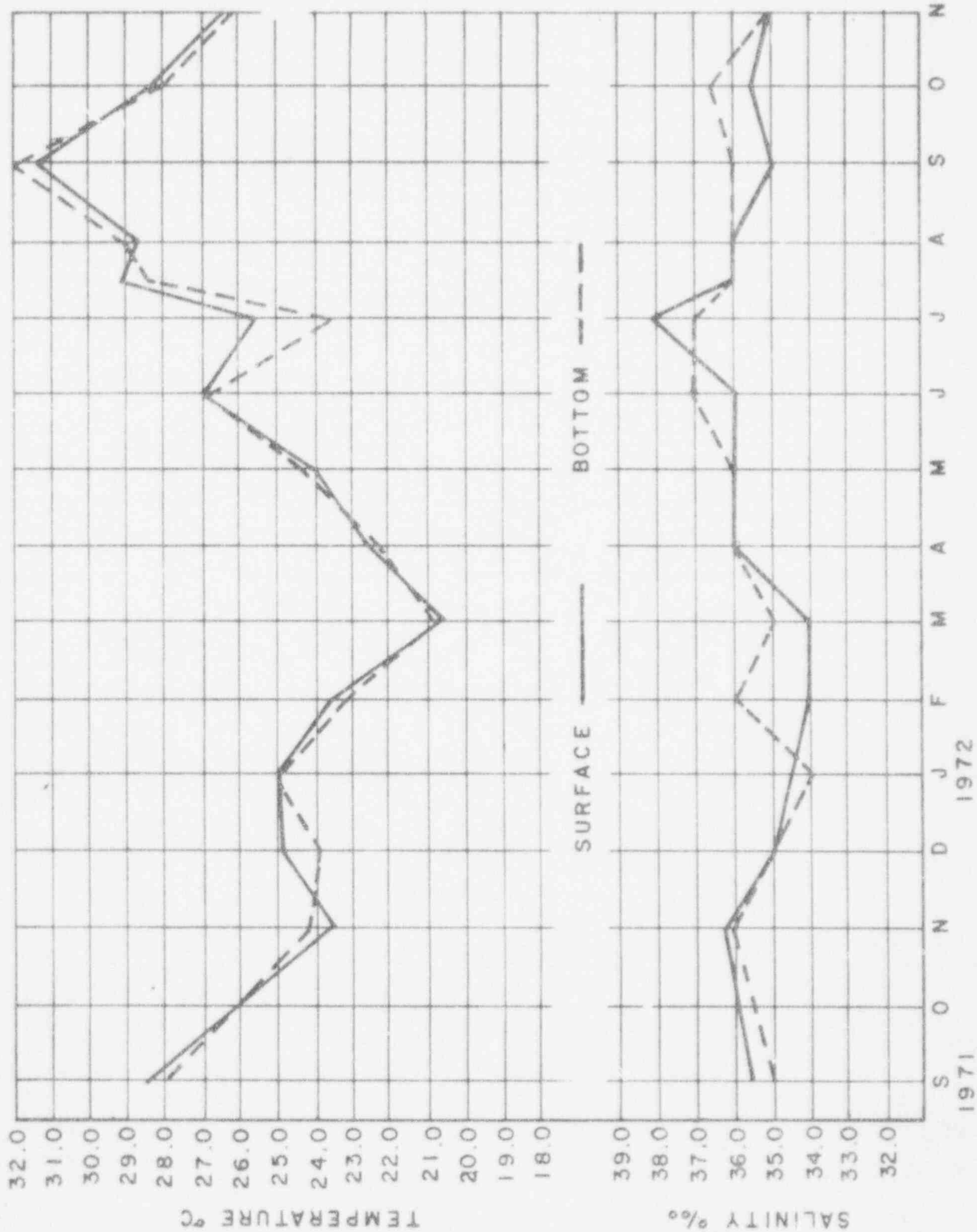
FIGURE 2.7-5



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY TEMPERATURE AND SALINITY
STATION IV

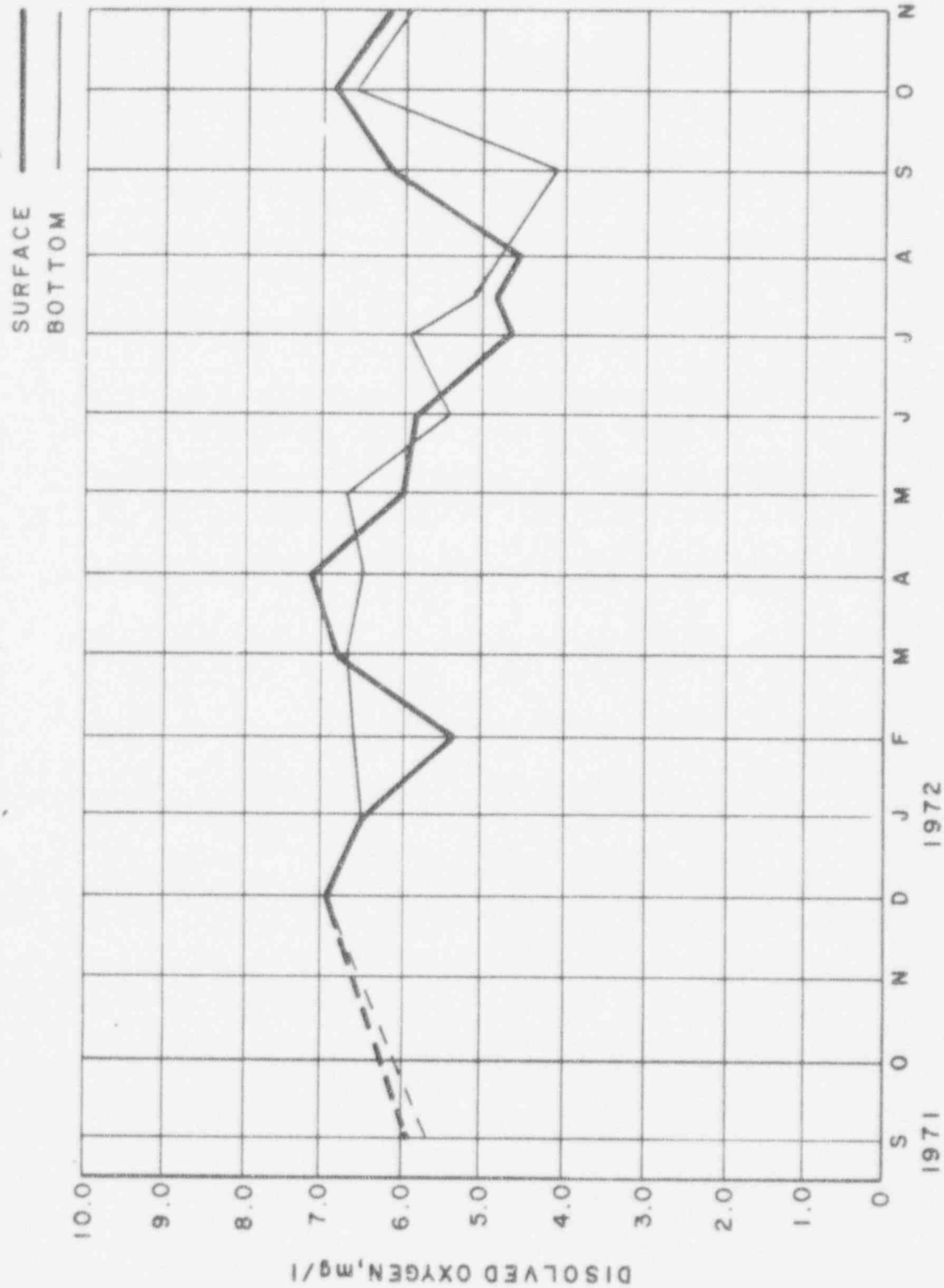
FIGURE 2.7-6



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY TEMPERATURE AND SALINITY
STATION V

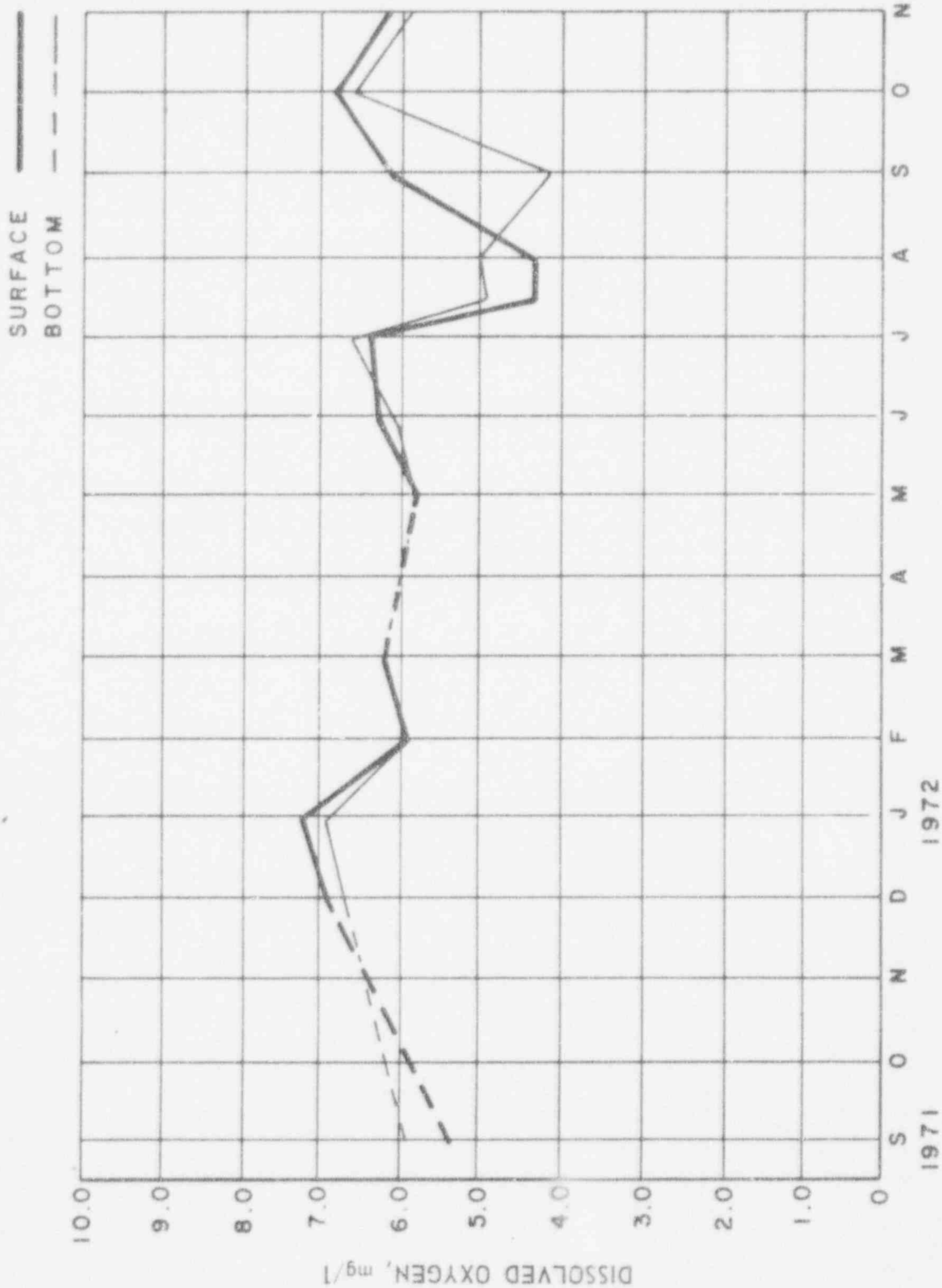
FIGURE 2.7-7



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY DISSOLVED OXYGEN
STATION I

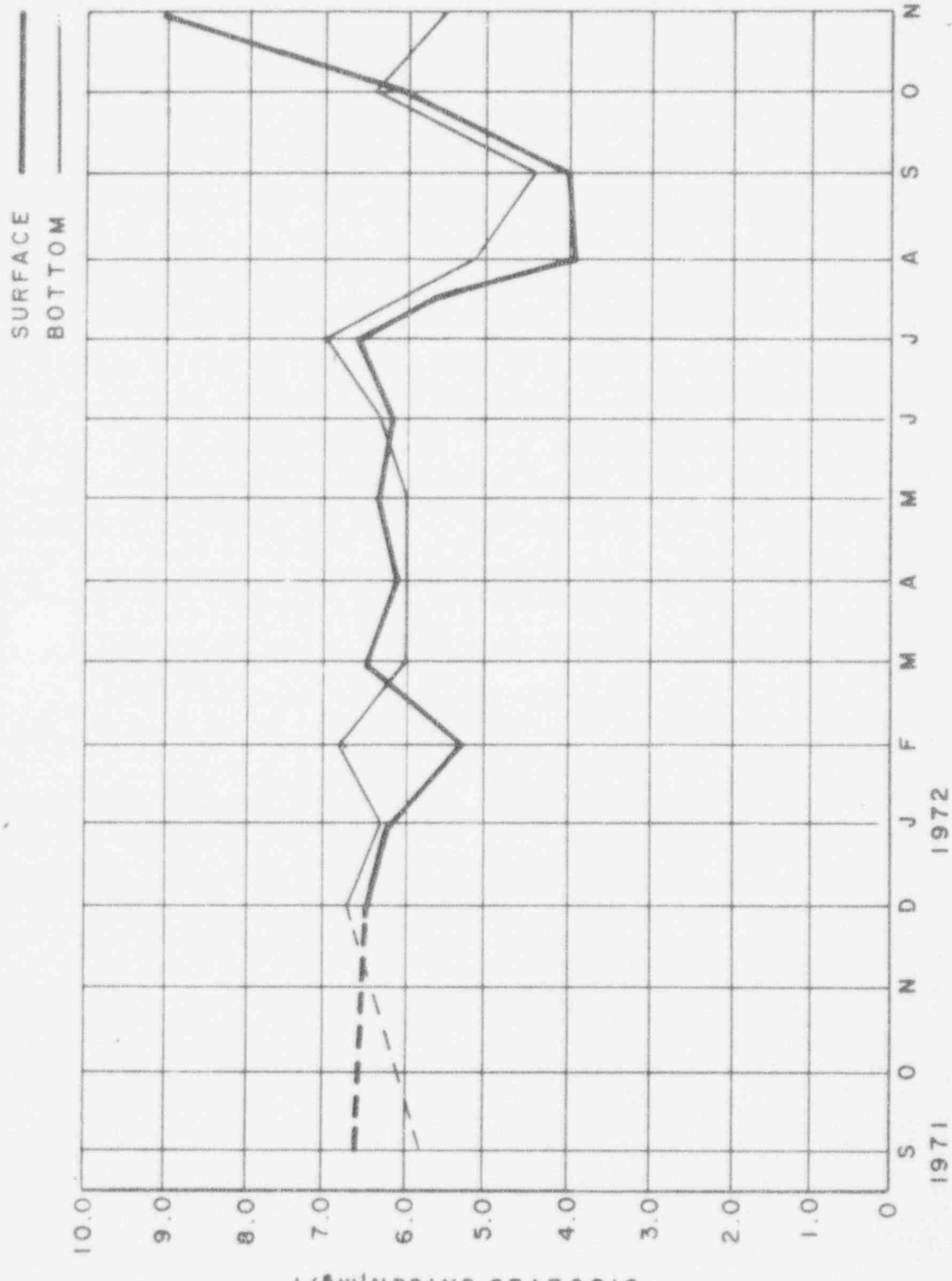
FIGURE 2.7-8



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY DISSOLVED OXYGEN
STATION II

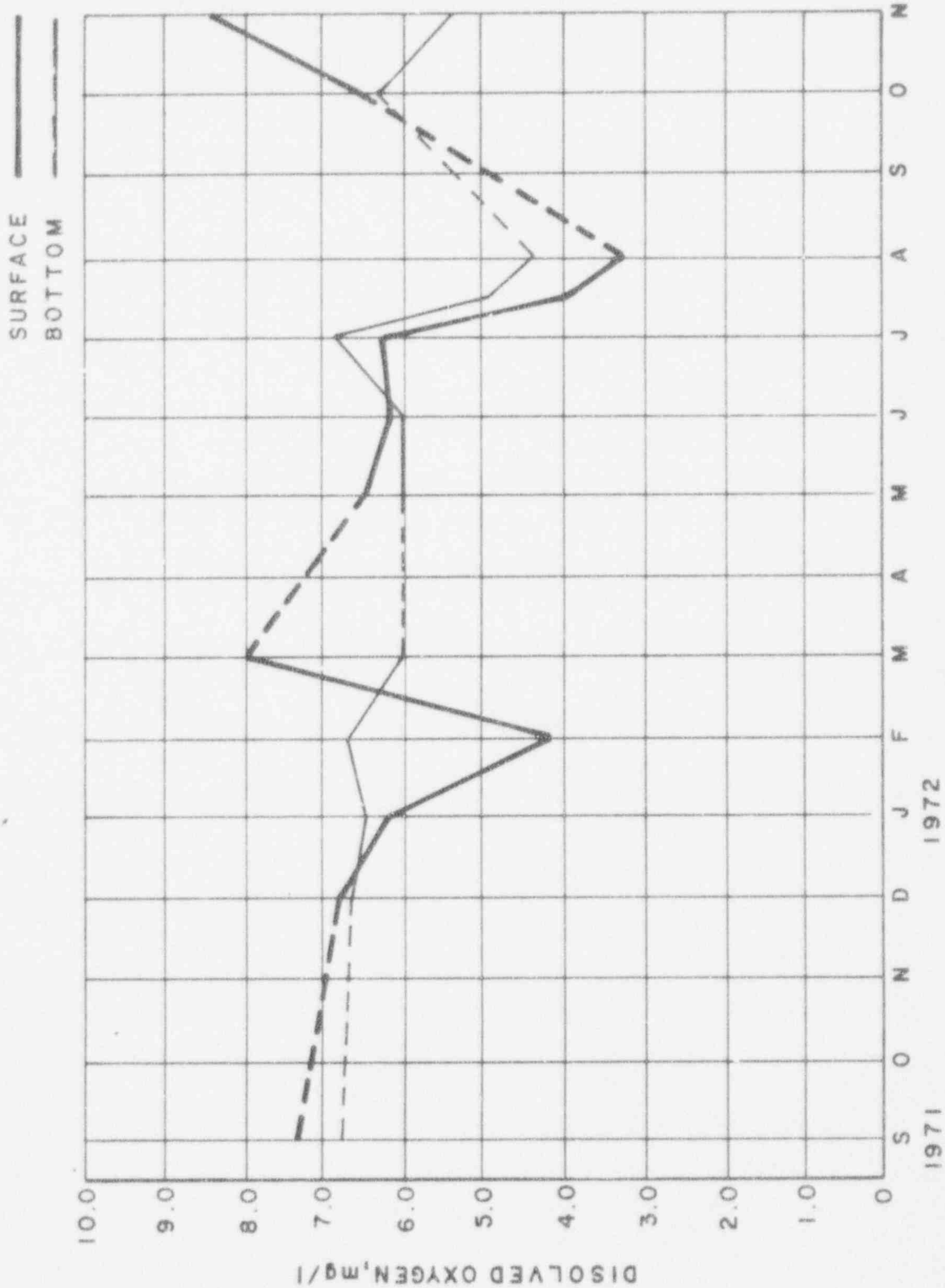
FIGURE 2.7-9



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY DISSOLVED OXYGEN
STATION III

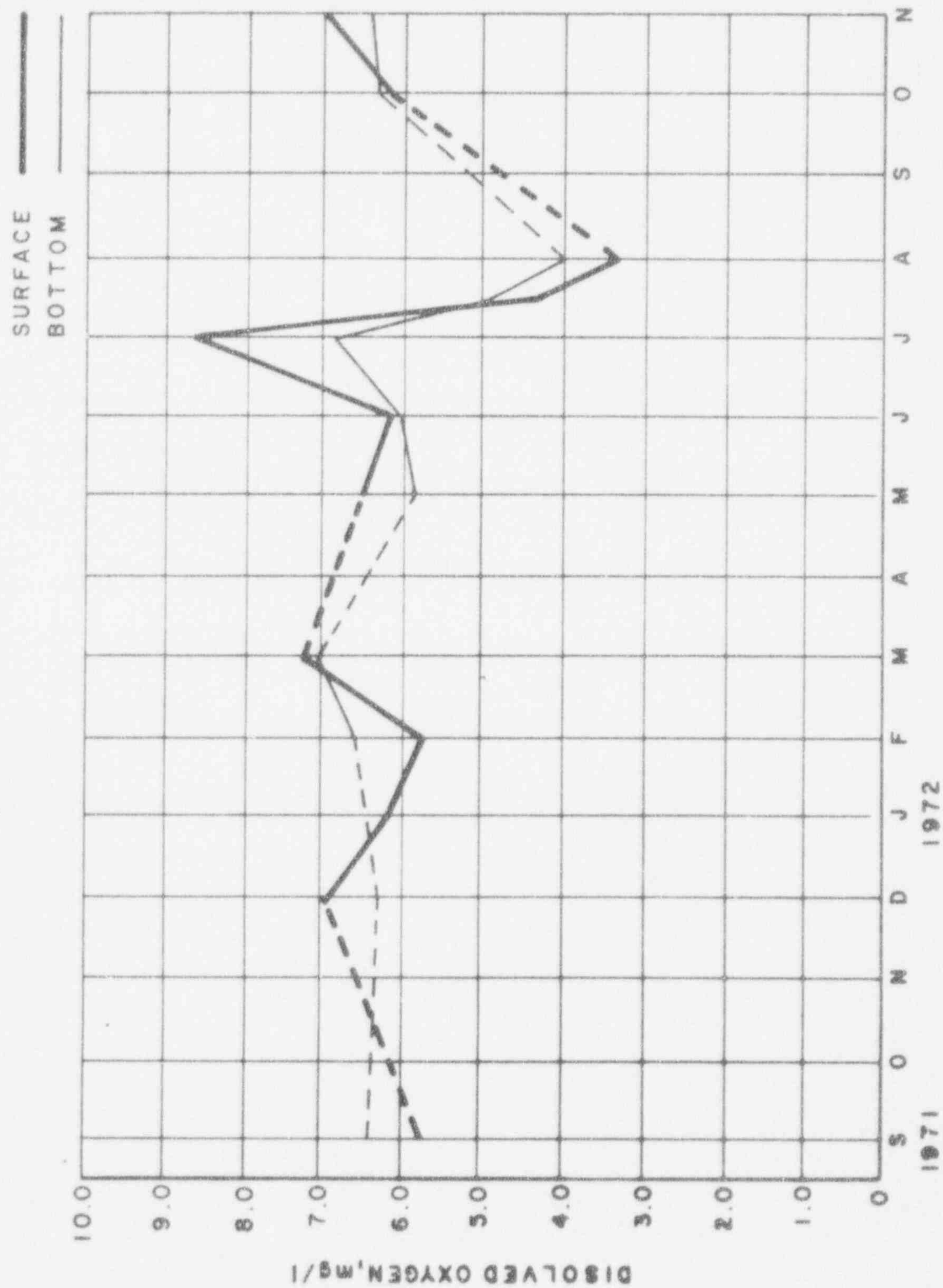
FIGURE 2.7-10



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY DISSOLVED OXYGEN
STATION IV

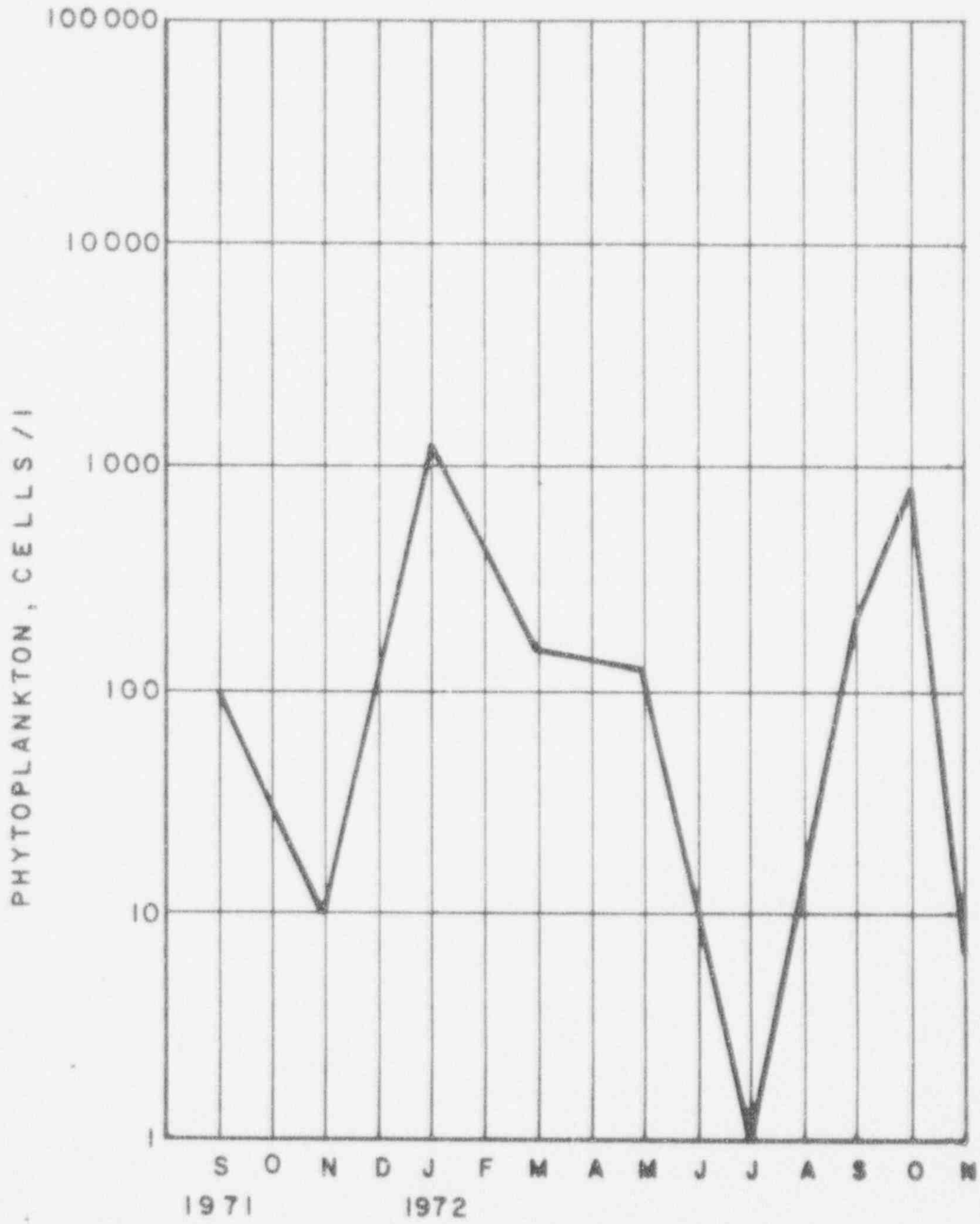
FIGURE 2.7-11



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MONTHLY DISSOLVED OXYGEN
STATION V

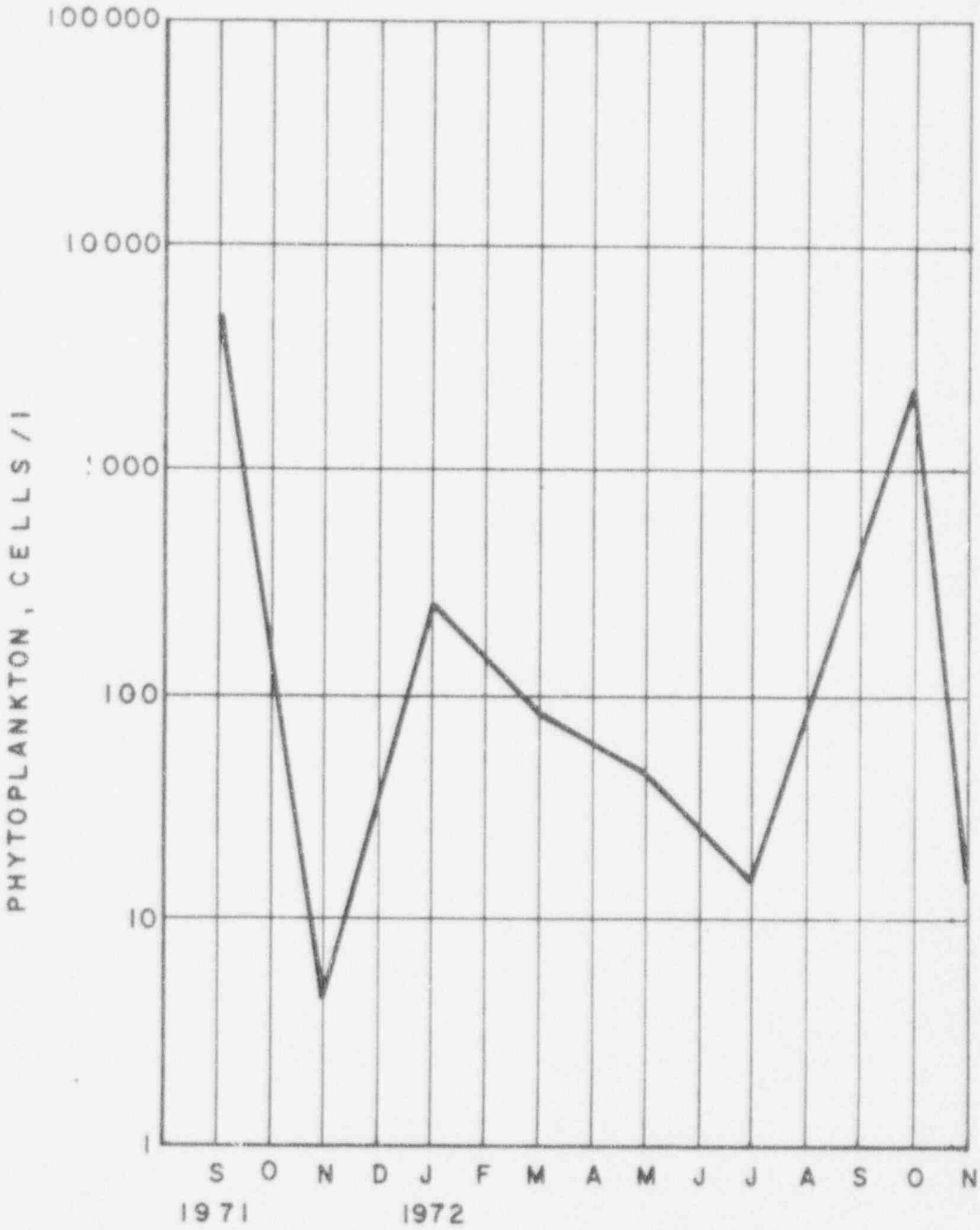
FIGURE 2.7-12



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PHYTOPLANKTON CELL COUNTS
STATION I

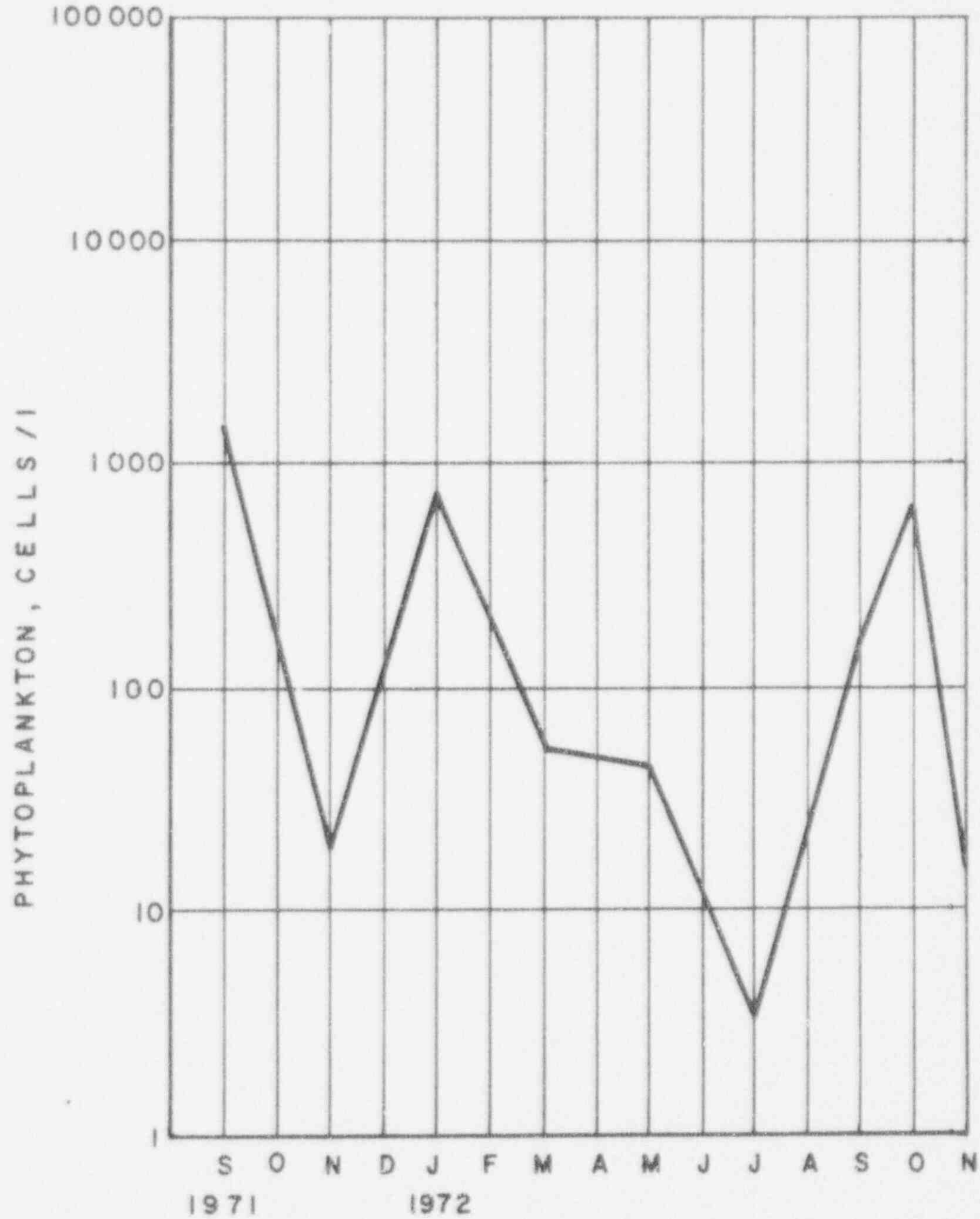
FIGURE 2.7-13



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PHYTOPLANKTON CELL COUNTS
STATION II

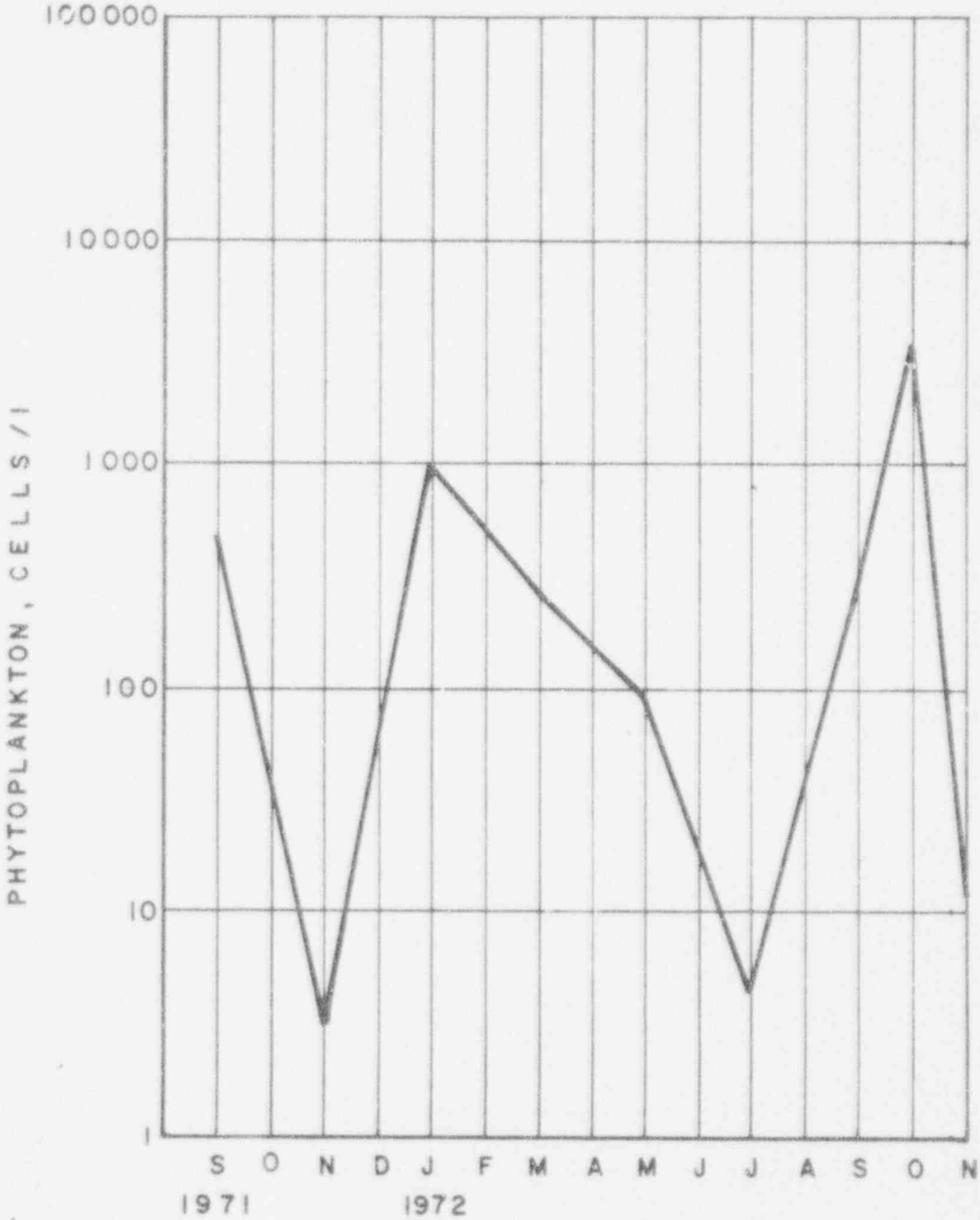
FIGURE 2.7-14



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PHYTOPLANKTON CELL COUNTS
STATION III

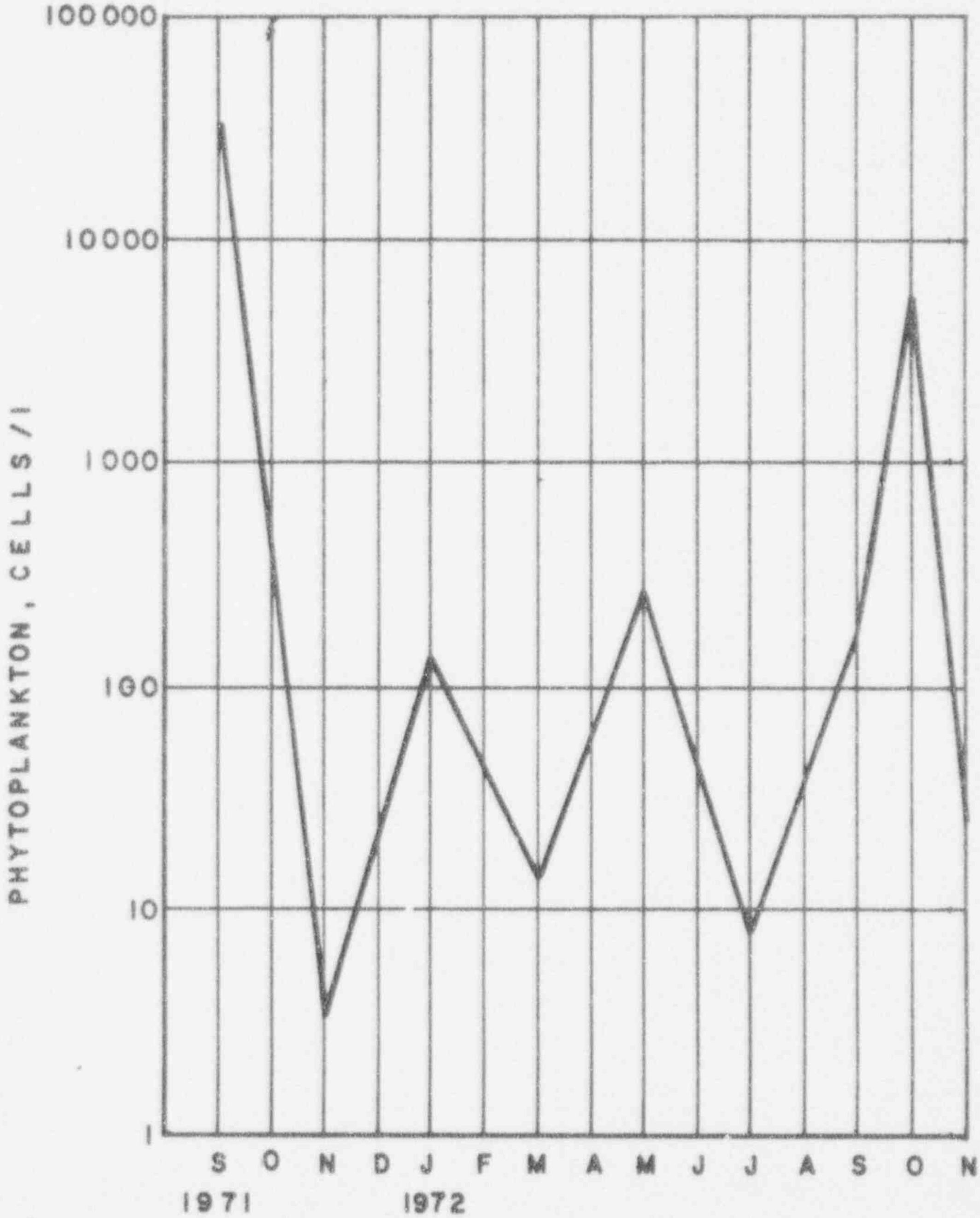
FIGURE 2.7-15



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PHYTOPLANKTON CELL COUNTS
STATION IV

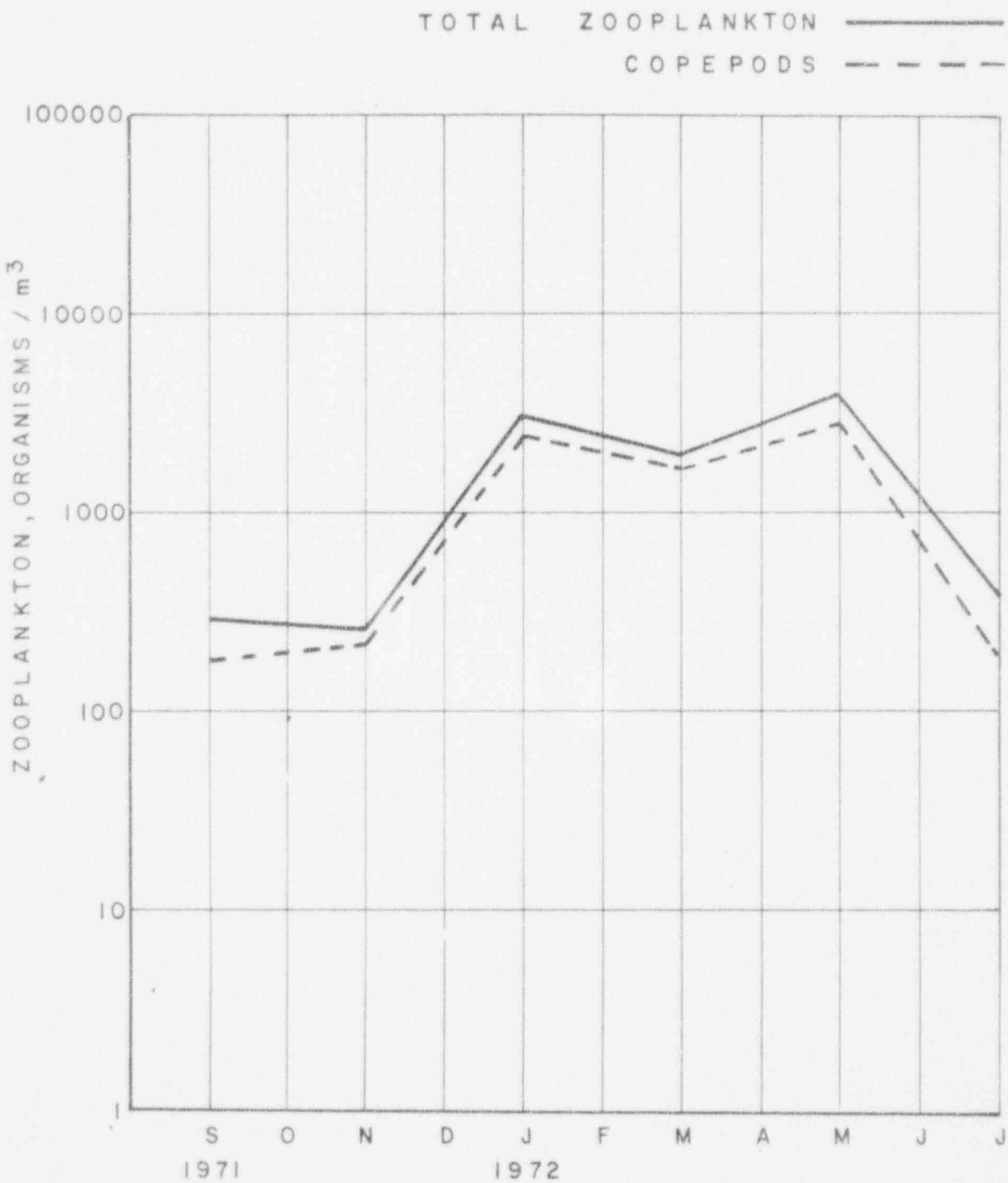
FIGURE 2.7-16



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PHYTOPLANKTON CELL COUNTS
STATION V

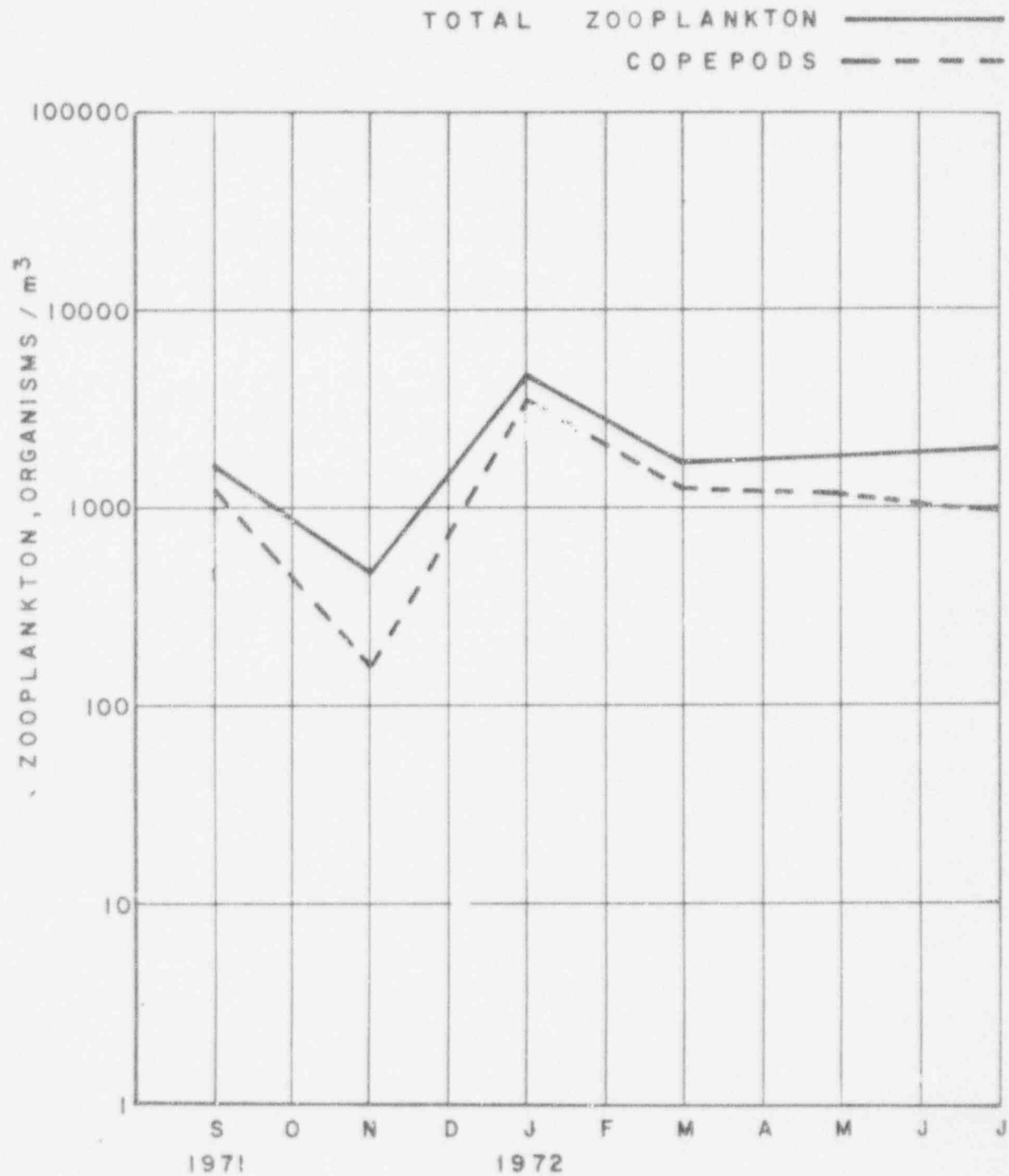
FIGURE 2.7-17



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

ZOOPLANKTON COUNTS
STATION 1

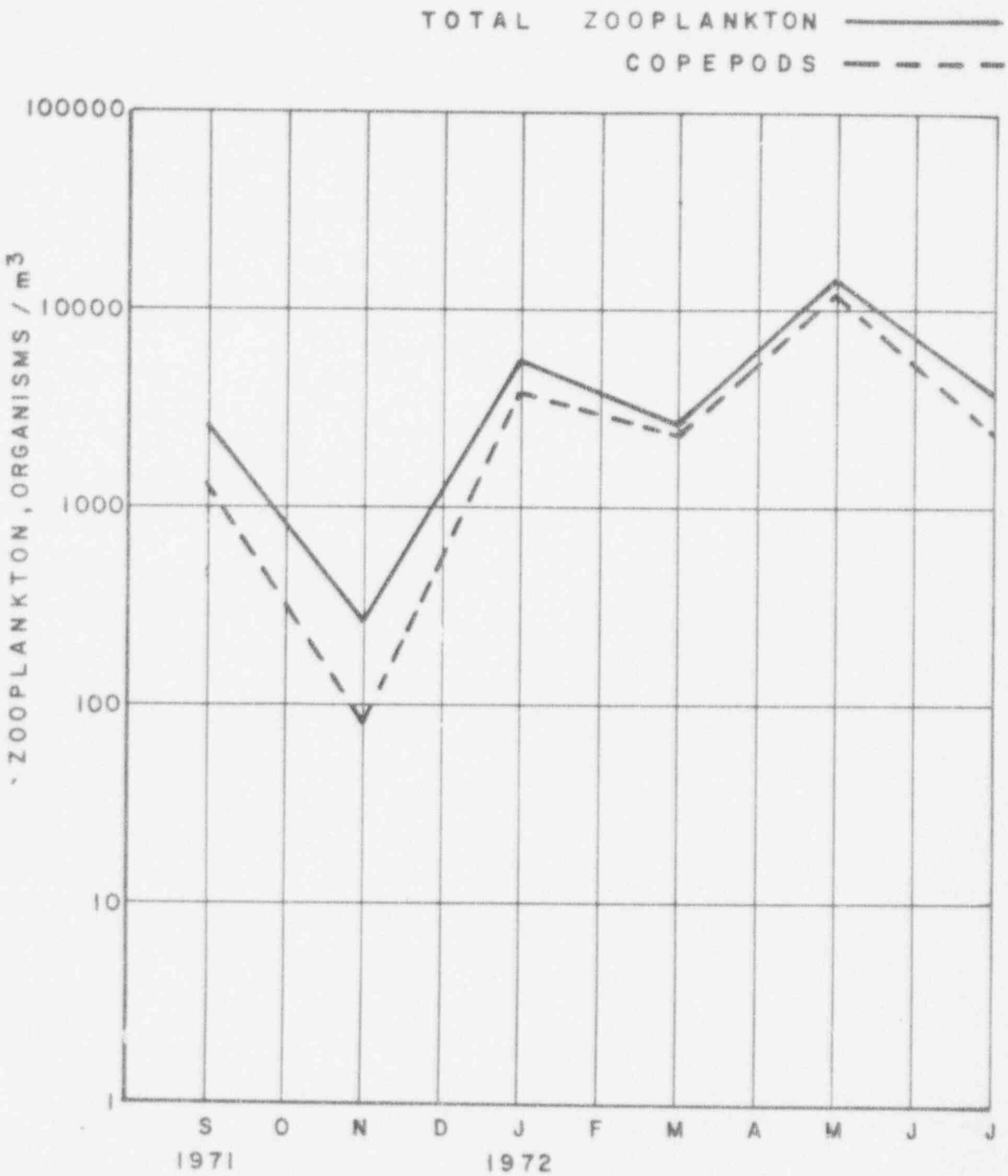
FIGURE 2.7-18



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

ZOOPLANKTON COUNTS
STATION II

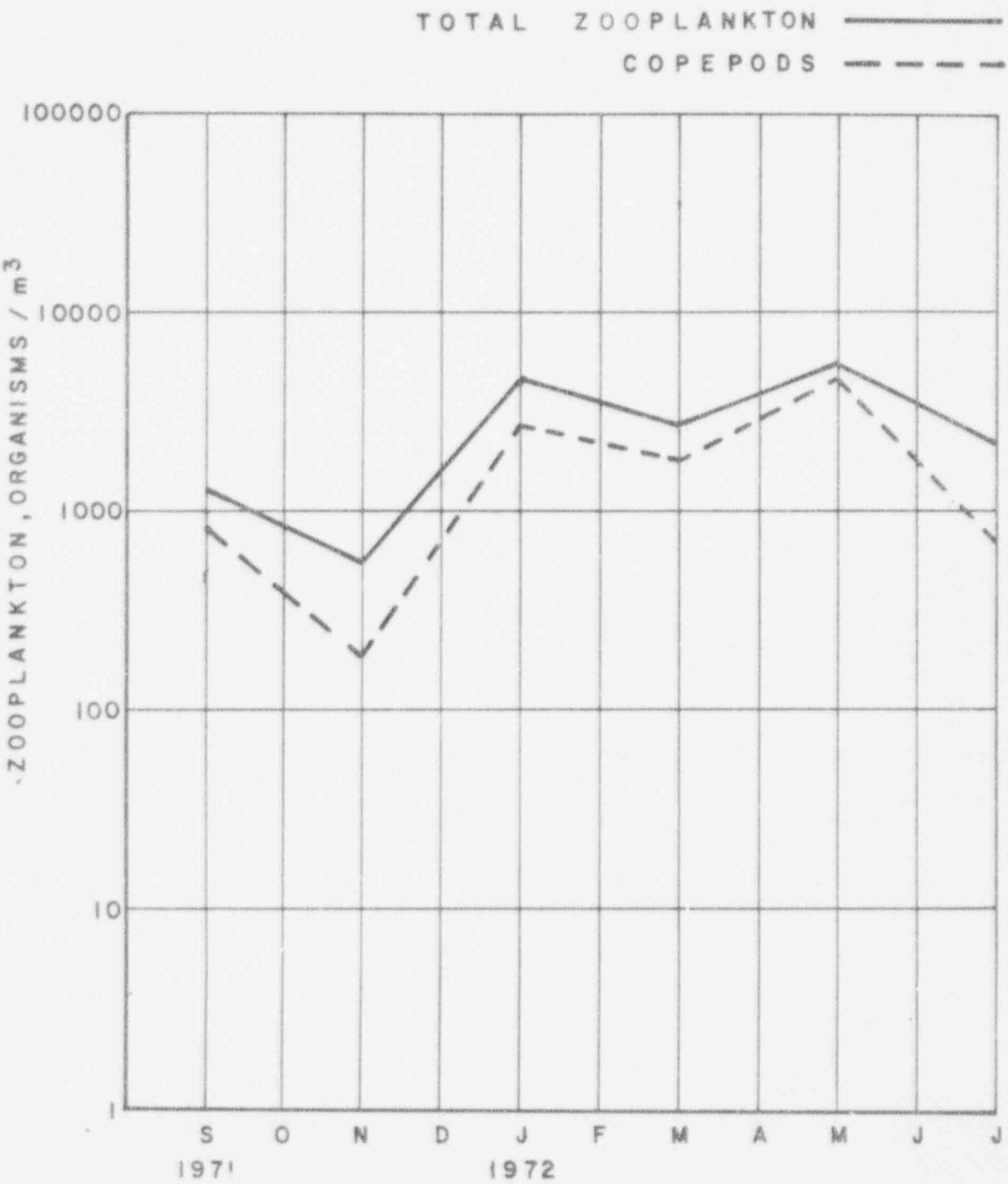
FIGURE 2.7-19



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

ZOOPLANKTON COUNTS
STATION III

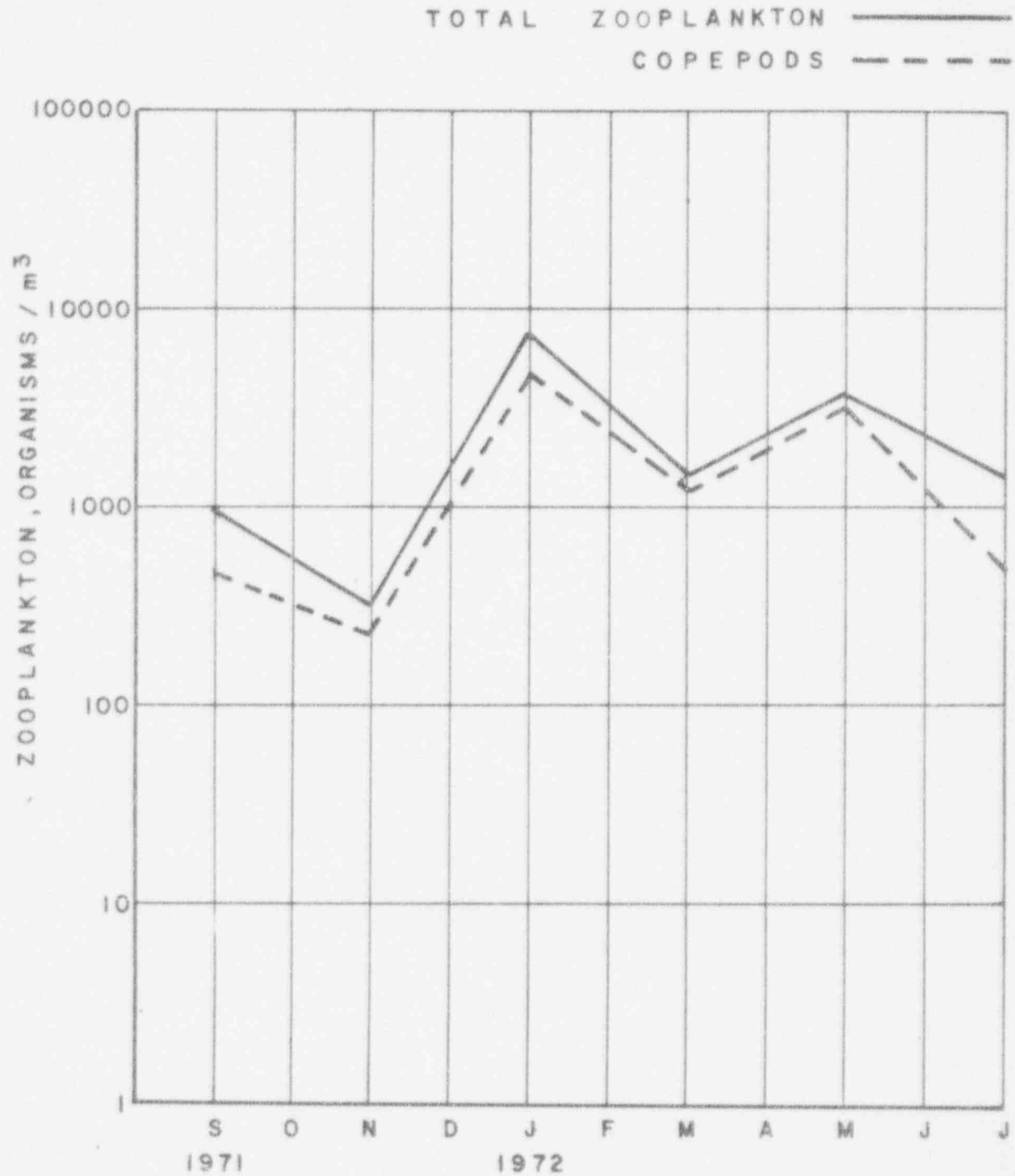
FIGURE 2.7-20



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

ZOOPLANKTON COUNTS
STATION IV

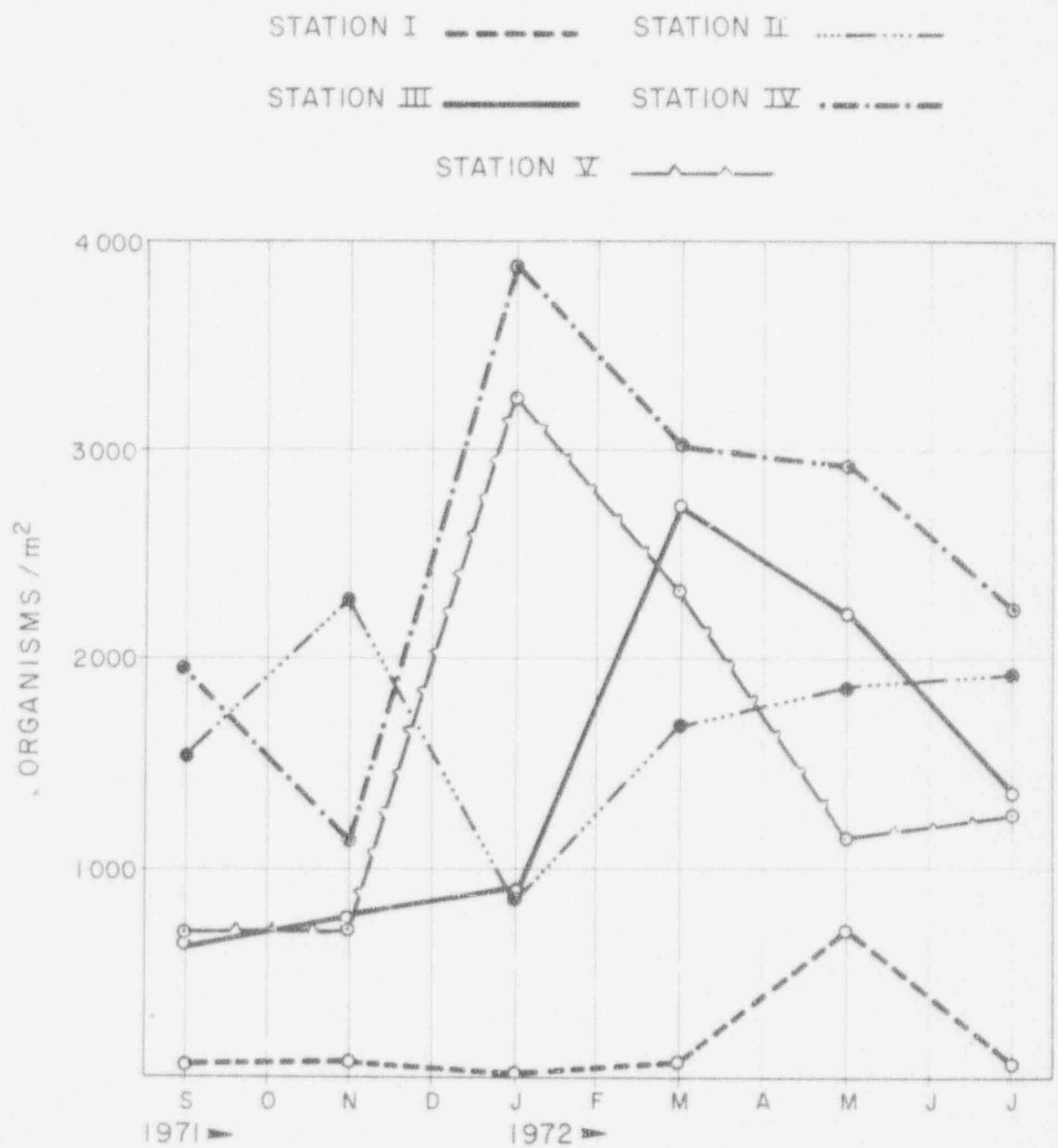
FIGURE 2.7-21



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

ZOOPLANKTON COUNTS
STATION V

FIGURE 2.7-22



FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNIT 2

BENTHIC ORGANISMS COLLECTED AT HUTCHINSON ISLAND (EXCLUDING ANNELIDS, ECHINODERMS AND GASTROPODS)

FIGURE 2.7-23

2.8 BACKGROUND RADIOLOGICAL CHARACTERISTICS

The Florida State Division of Health, in cooperation with FP&L, has been conducting a preoperation radiation monitoring program for Unit No. 1 and sequentially for Unit No. 2 since January 1971. When Unit No. 1 begins commercial operation (1975) the program will evolve into an operational monitoring program for Unit No. 1 and a continuing preoperational radiation monitoring program for Unit No. 2. This will provide approximately nine years of preoperational data for Unit No. 2, which is expected to begin commercial operation in 1979.

The program includes sampling of air, precipitation, surface water, bottom sediment, beach sand, various aquatic biota, mulk, terrestrial biota and soil. Appendix I, of this report, contains the background radiation monitoring data reported from January 1, 1971 to December 30, 1972. Table 2.8-1 summarizes the radiation background levels reported during 1971 and 1972. Figures 2.8-1 and 2.8-2 show the radiological surveillance sampling stations and marine biota sampling stations, respectively. The annual whole body background gamma exposure at the St. Lucie Site is expected to be 120 mrem. 0

TABLE 2.8-1

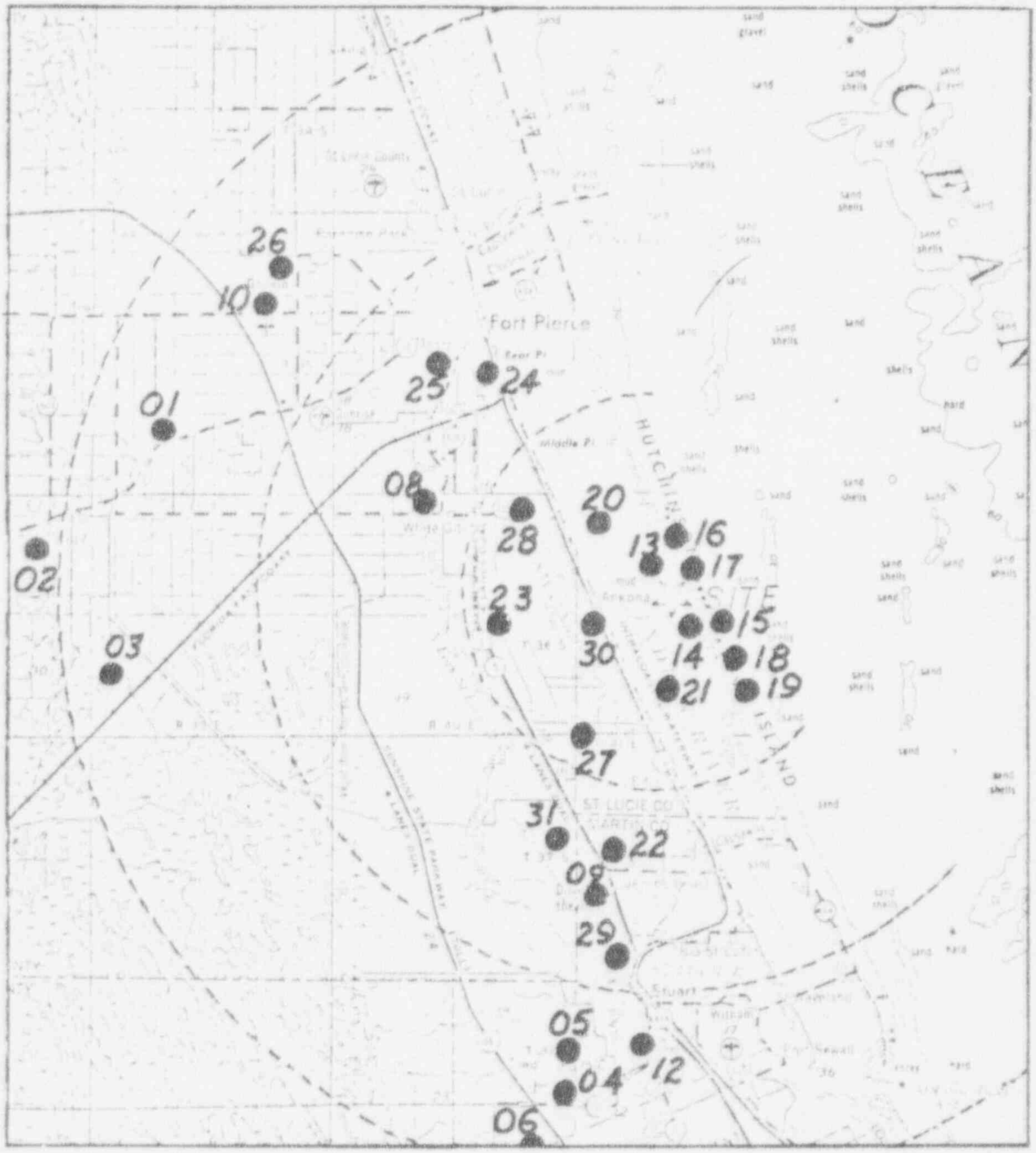
TYPICAL BACKGROUND CONCENTRATIONS - 1971

Well Water (pCi/l)	- 20
Sea Water (pCi/l)	- 490; K 40-320
Biota (Fish) (pCi/kg)	-3000; K 40-2000; Fe 55-30; Sr 90-18
Citrus (pCi/kg)	-1800; K 40-1700; Sr 90-40; Cs 137-70
Milk (pCi/l)	K 40-150; Sr 90-6; I 131--; Cs 137-90
Soil (pCi/kg)	K 40-400; Zr 95-100; Cs 137-200
Beach Sand (pCi/kg)	Zr 95-70; Cs 137-200; Ce 144-400

TYPICAL BACKGROUND CONCENTRATIONS - 1972

Well Water (pCi/l)	-less than MDA*
Sea Water (pCi/l)	-496; K 40-464
Biota (Fish) (pCi/kg)	-2800; K 40-2230; Sr 90-7
Citrus (pCi/kg)	-1950; K 40-2160; Sr 90-50; Cs 137-85
Milk (pCi/l)	K 40-1500; Sr 90-less than MDA; I 131-less than MDA; Cs 137-88
Soil (pCi/kg)	K 40-900; Zr 95-130; Cs 137-210
beach Sand (pCi/kg)	Cs 137-less than MDA; Zr 95-84; Ce 144-less than MDA

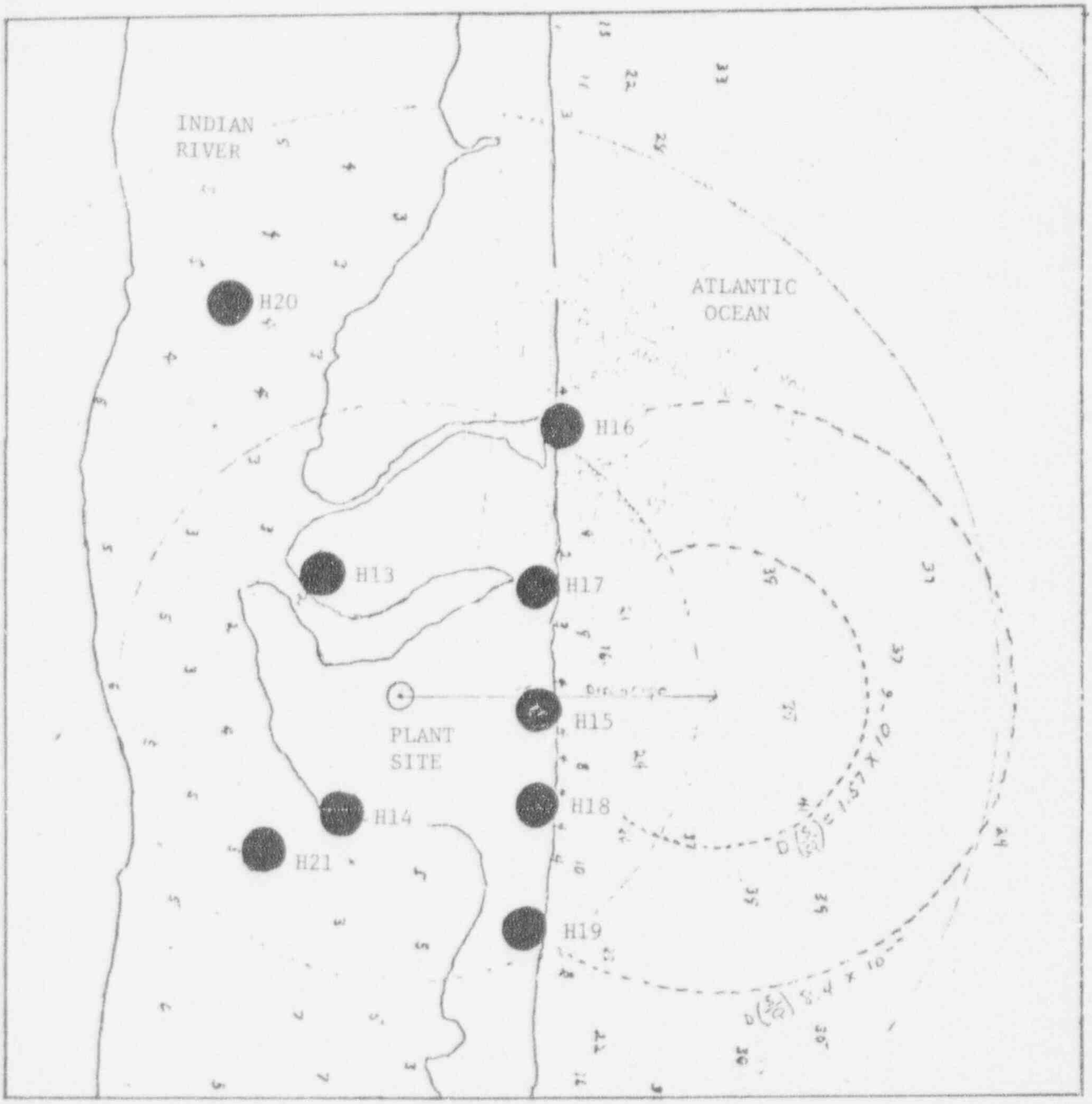
* MDA's are reported in Table 6.1-4, Section 6.1.5. 0



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

RADIOLOGICAL SURVEILLANCE
SAMPLING STATIONS

FIGURE 2.8-1



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

MARINE BIOTA SAMPLING LOCATIONS

FIGURE 2.8-2

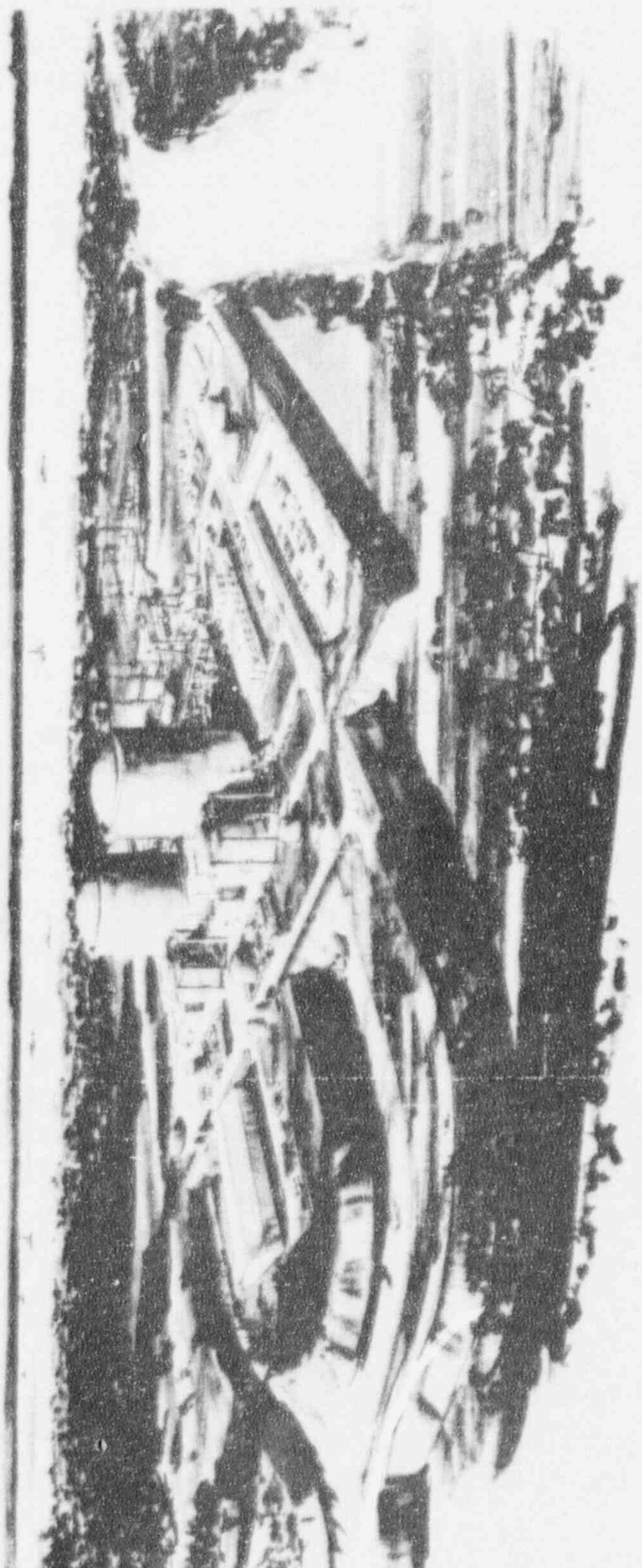
2.9 OTHER ENVIRONMENTAL FEATURES

Other than those discussed in the eight preceeding sections, there are no additional environmental features pertinent to a description of the physical and ecological characteristics of the Saint Lucie site.

3.1 EXTERNAL APPEARANCE

Figure 3.1-1 depicts the St. Lucie Plant and its immediate surroundings after the completion of Unit No. 2. Plans for landscaping the site are not yet complete, however, the post construction landscape will be made environmentally compatible with the surrounding area. Section 2.1 of this report provides a detailed description of the St. Lucie Site as well as figures showing the plant perimeter and exclusion boundary. Figures 10.1-3 and 10.1-4 are aerial photographs of the site taken during the construction of Unit No. 1 on November 17, 1972.

The radioactive liquid and gaseous release points are shown on Figure 3.5-6.



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

ARTIST'S RENDITION OF COMPLETED FACILITY – UNIT NO. 2 ON LEFT

FIGURE 3.1-1

3.2 REACTOR AND STEAM ELECTRIC SYSTEM

a) Reactor

The reactor core is fueled with uranium dioxide pellets enclosed in zircaloy tubes with welded end plugs. The tubes are fabricated into assemblies in which end fittings prevent axial motion and grids prevent lateral motion of the tubes. The core consists of 217 fuel assemblies loaded with three different U-235 enrichments. The control element assemblies (CEA's) consist of NiCrFe alloy clad boron carbide absorber rods which are guided by tubes located within the fuel assembly.

The reactor vessel and its closure head are fabricated from manganese-moly steel internally clad with stainless steel. The vessel and its internals are designed so that the integrated neutron flux (greater than 1.0 Mev) at the vessel wall will be less than 2.14×10^{19} nvt over a 40-year period.

The internal structures include the core support barrel, the core support plate, the core shroud, the thermal shield, and the upper guide structure assembly. The core support barrel is a right circular cylinder supported from a ring flange from a ledge on the reactor vessel. It carries the entire weight of the core. The core support plate transmits the weight of the core to the core support barrel by means of vertical columns and a beam structure. The core shroud surrounds the core and minimizes the amount of bypass flow. The upper guide structure provides a flow shroud for the CEA's and prevents upward motion of the fuel assemblies during pressure transients. Lateral motion limiters are provided at the lower end of the core support barrel assembly.

b) Reactor Coolant System

The reactor coolant system is arranged as two closed loops connected in parallel to the reactor vessel. Each loop consists of one 42-in.-ID outlet (hot) pipe, one steam generator, two 30-in.-ID inlet (cold) pipes and two pumps. An electrically heated pressurizer is connected to one of the loops and a safety injection line is connected to each of the four inlet legs.

The reactor coolant system operates at a nominal pressure of 2,250 psi absolute. The reactor coolant enters near the top of the reactor vessel, then flows downward between the reactor vessel shell and the core support barrel into the lower plenum. It then flows upward through the core, leaves the reactor vessel, and flows through the tube side of the two vertical U-tube steam generators where heat is transferred to the secondary system. Reactor coolant pumps return the reactor coolant to the reactor vessel.

The two steam generators are vertical shell and U-tube units. The steam generated in the shell side of the steam generator flows upward through moisture separators which are designed to reduce its moisture content to less than 0.2 percent. All surfaces in contact with the reactor coolant are either stainless steel or NiCrFe alloy in order to maintain reactor coolant purity.

The reactor coolant is circulated by four electric motor driven single-suction centrifugal pumps. The pump shafts are sealed by mechanical seals. The seal performance is monitored by pressure and temperature sensing devices in the seal system.

c) Containment

The containment is comprised of a steel containment vessel surrounded by a reinforced concrete shield building. The containment vessel is a low leakage steel shell which is designed to confine the radioactive material that could be released from a postulated loss of integrity of the reactor coolant system boundary coupled with gross failure of fuel elements in the core. It is a cylindrical vessel with hemispherical dome and ellipsoidal bottom. The shield building is a medium leakage concrete structure which surrounds the steel containment vessel. It protects the containment vessel from external missiles, and provides biological shielding and a means of collecting radioactive fission products that may leak from the containment following a major hypothetical accident.

The containment in conjunction with the engineered safety features is designed to withstand the internal pressure and coincident temperature resulting from the energy release associated with the worst postulated loss-of-coolant accident at a power level of 2,700 Mwt.

d) Engineered Safety Features

Engineered safety features comprise several systems provided to protect the public and plant personnel in the highly unlikely event of an accidental release of radioactive fission products from the reactor system, particularly as the result of loss-of-coolant accidents. These safeguards function to localize, control, mitigate, and terminate such accidents to hold exposure levels below applicable limits.

The engineered safety features are:

1) Safety injection system (including high pressure and low pressure safety injection pumps and the safety injection tanks)

2) Containment spray system

3) Containment cooling system

4) Shield building ventilation

5) Hydrogen recombiner and purge

6) Containment isolation

In the highly unlikely event of a loss-of-coolant accident, the safety injection system injects borated water into the reactor coolant system. This provides cooling to limit core damage and fission product release, and assures adequate shutdown margin regardless of temperature. The injection systems also provide continuous long-term post-accident cooling of the core by recirculation of borated water from the containment sump.

The containment is equipped with two 100 percent capacity spray systems and an independent full capacity containment cooling system for cooling the containment atmosphere following the postulated loss-of-coolant accident.

The containment sprays supply borated water to cool and reduce pressure in the containment atmosphere. The system is designed so that with one pump, one set of spray nozzles, and one shutdown cooling heat exchanger in operation, adequate cooling is provided to cool the containment atmosphere. The pumps take suction initially from the refueling water tank. Long term cooling is based on suction from the containment sump through the recirculation lines.

The containment cooling system is designed to provide containment atmosphere mixing by recirculation. The cooling coils and fans of the containment cooling system are sized to provide adequate containment cooling at post-accident conditions of temperature and humidity.

A shield building ventilation system is provided to maintain a negative pressure in the annulus between the steel containment and the concrete shield building following a loss-of-coolant accident. Two independent 100 percent capacity systems are provided. This system reduces the escape of radioactivity to the environment. The out-leakage from the containment is consolidated with the in-leakage from the outside into the annulus, because of the negative pressure. It is processed before being released into the atmosphere.

e) Plant Instrumentation and Control

The reactor control system provides for startup and shutdown of the reactor and for adjustment of the reactor power in response to turbine load demand. The Nuclear Steam Supply System is capable of following a ramp change from 15 percent to 100 percent power at a rate of ±5 percent per minute and at greater rates over smaller load change increments up to a step change of 10 percent. This control is normally accomplished by automatic movement of one or more preselected groups of CEA's in response to a change in reactor coolant temperature, with manual control capable of overriding the automatic signal at any time. A temperature controller compares the existing average reactor coolant temperature with the value corresponding to the power called for by the temperature control program. If the temperature is different, the CEA's are adjusted until the difference is zero. Regulation of the reactor coolant temperature in accordance with this program maintains the secondary steam pressure within operating limits and matches reactor power to load demand.

The reactor is controlled by a combination of control element assemblies and dissolved boric acid in the reactor coolant. Boric acid is used for reactivity changes associated with large but gradual changes in water temperature and fuel burnup. Additions of boric acid also provide an increased shutdown margin during the initial loading and subsequent refuelings.

CEA movement provides changes in reactivity for shutdown or power changes. The CEA's are actuated by control drive mechanisms mounted on the reactor vessel head. The control drive mechanisms are designed to permit rapid insertion of the CEA's into the reactor core by gravity. CEA motion can be initiated manually or automatically.

The pressure in the reactor coolant system is controlled by regulating the temperature of the coolant in the pressurizer, where steam and water are held in thermal equilibrium. Steam is formed by the pressurizer heaters or condensed by the pressurizer spray to reduce variations caused by expansion and contraction of the reactor coolant due to reactor system temperature changes.

Over-pressure protection is provided by power-operated relief valves and spring-loaded safety valves connected to the pressurizer and designed in accordance with Section III of the ASME code. The discharge from the pressurizer safety and relief valves is released under water in the pressurizer quench tank, where it is condensed and cooled. In the event the discharged steam exceeds the capacity of the tank, the tank relieves to the containment atmosphere.

f) Instrumentation

The nuclear instrumentation includes out-of-core and in-core flux detectors. Ten channels of out-of-core instrumentation monitor the neutron flux and provide reactor protection and control signals during startup and power operation. Four of the channels follow the neutron flux through the startup range, and six channels follow the neutron flux from within the startup range through the full power range. Of the latter, four are used for reactor protection and two for reactor control. The neutron flux detectors are located in instrument thimbles in the biological shield around the reactor vessel.

The in-core monitors provide information on neutron flux distribution.

The reactor parameters are maintained within the acceptable limits by the inherent characteristics of the reactor, by the CEA system, by boron in the moderator and by the operating procedures. In addition, in order to preclude unsafe conditions for plant equipment or personnel, the reactor protective system initiates reactor shutdown if selected parameters reach their preset limits. Four independent channels normally monitor each of the selected plant parameters. The reactor protective system logic is designed to initiate protective action whenever the signal of any two of four channels reaches the preset limit. Redundancy is provided in all parts of the reactor protective system to assure that no single failure will prevent protective action when it is required.

The process instrumentation monitoring includes those critical channels which are used for protective action. Additional temperature, pressure, flow and liquid level monitoring is provided, as required, to keep the operating personnel informed of plant conditions, and to provide information from which plant processes can be evaluated and/or regulated. The boron concentration in the reactor coolant water is also monitored and the information is presented in the control room.

Instrument signals penetrating the containment are electric. Instrument signal transmission for the remaining plant instruments is either electric or pneumatic depending on the function to be served. The wiring and cabling between sensor locations and control room or control panel are physically separated and mechanically protected.

The plant gaseous and liquid effluents are monitored for radioactivity. Activity levels are displayed and off-normal values are annunciated. Area monitoring stations are provided to measure radioactivity at selected locations in the plant.

g) Electrical Systems

The St. Lucie plant includes a 1,000 Mva, 0.85 power-factor generator delivering power to a 240 kv switchyard through a step-up power transformer. Auxiliary power is utilized at 6.9 kv, 4.16 kv, 480 v, and 120 v ac. 125 v dc systems are also provided for emergency power, engineered safety features control, and essential nuclear instrumentation.

The auxiliary load is normally supplied from two auxiliary transformers connected to the main generator bus. Startup power is supplied from two startup transformers connected to the 240 kv switchyard. Emergency power for the engineered safety features is supplied by redundant diesel generators.

h) Auxiliary Systems

1) Chemical and Volume Control System

The activity level in the reactor coolant system is controlled by continuous purification of a bypass stream of reactor coolant. Water removed from the reactor coolant system is cooled in the regenerative heat exchanger. From there, the coolant flows to the letdown heat exchanger and then through a filter and a demineralizer where corrosion and fission products are removed. It is then sprayed into the volume control tank, and returned to the reactor coolant system by the charging pumps.

The chemical and volume control system automatically adjusts the amount of reactor coolant to compensate for changes in specific volume due to coolant temperature changes and reactor coolant pump shaft controlled seal leakage in order to maintain a constant level in the pressurizer.

The CVCS system injects chemicals into the reactor coolant system to control coolant chemistry and minimize corrosion.

2) Shutdown Cooling System

The shutdown cooling system is used to reduce the temperature of the reactor coolant at a controlled rate from 300 F approximately to a refueling temperature of approximately 130 F and to maintain the proper reactor coolant temperatures during refueling.

The shutdown cooling system utilizes the low-pressure safety injection pumps to recirculate the reactor coolant through two shutdown heat exchangers, returning it to the reactor coolant system through the low-pressure injection header. Use of one shutdown heat exchanger will provide cooldown capability at a reduced rate.

The component cooling system supplies cooling water for the shutdown heat exchangers.

3) Component Cooling Water System

The component cooling water system, consisting of three pumps and two heat exchangers, removes heat from the various auxiliary systems associated with the reactor coolant system. Corrosion inhibited, demineralized water is circulated by the system through all components of the nuclear steam supply system that require cooling water. During reactor shutdown, component cooling water is also circulated through the shutdown heat exchangers. The component cooling system provides an intermediate barrier between the reactor coolant system and the intake cooling water system and thus helps prevent release of activity directly into the environment in the event of a leak from the primary to the secondary side.

4) Fuel Handling and Storage

New fuel is stored dry in vertical racks within a storage vault in the fuel handling building. Room is provided for storing approximately one-third of a core. The vault construction and fuel assembly spacing preclude accidental criticality.

The fuel pool is a reinforced concrete stainless steel lined structure which provides storage capacity for approximately one and one-third cores. Spent fuel assemblies are stored in vertical racks so spaced as to preclude criticality with no credit taken for the borated pool water.

Cooling and purification equipment is provided for the fuel pool water. This equipment may also be used for cleanup of refueling water after each fuel change in the reactor.

The fuel handling systems provide for the safe handling of fuel assemblies and control element assemblies under all foreseeable conditions and for the required assembly, disassembly, and storage of reactor internals. These systems include a refueling machine located inside containment above the refueling pool, the fuel transfer carriage, the tilting machines, the fuel transfer tube, a fuel handling machine in the spent fuel storage room, and various devices used for handling the reactor vessel head and internals.

5) Sampling Systems

Two sampling systems are provided; one for the reactor coolant and its auxiliary systems, and one for the turbine steam and feedwater system.

These systems are used for determining both chemical and radiochemical conditions of the various process fluids used in the plant.

6) Cooling Water Systems

The surface condenser is cooled by the circulating water system which takes suction from, and discharges into, the Atlantic Ocean, by a combination of pipes and canals.

An intake cooling water system provides seawater from the circulating water system intake structure to the component cooling water heat exchangers and the turbine cooling water heat exchangers.

The turbine cooling water system removes heat from the turbine generator oil cooler, hydrogen coolers, feed pump oil coolers, sample coolers, and other components by circulating demineralized water buffered with potassium dichromate through the system.

7) Plant Ventilation Systems

Separate ventilation systems are provided for the containment vessel, the control room, the auxiliary building, and the turbine building. A purge system is also provided for the containment vessel atmosphere.

The annular space between the steel containment vessel and the concrete shield building has a separate ventilation system with charcoal filters. This system is automatically put into operation following a loss-of-coolant accident.

8) Plant Fire Protection System

The fire protection system provides water to fire hydrants, spray systems and hose racks in the various areas of the plant.

Where possible, noncombustible and fire resistant materials are used throughout the facility, particularly in areas containing critical portions of the plant such as the containment structure, control room, cable spreading room, and rooms containing components of the engineered safety features systems.

A number of portable fire extinguishers are placed at key locations for use in extinguishing limited fires.

Fire detectors with alarms have also been provided at a number of locations where there is heavy concentration of electrical cables and in the diesel generator rooms to get an early warning on potential fire hazards.

TABLE 3.2-1

REACTOR AND STEAM ELECTRIC SYSTEM COMPONENTS

Reactor type	Pressurized water
Full power thermal rating	2560 MWt.
Reactor manufacturer	Combustion Engineering Inc.
Architect-engineer	Ebasco Services Inc.
Number of units	Two
	Unit No. 1 Startup February 1975
	Unit No. 2 Startup September 1979
Turbine generator type	Tandem compound, four flow
	Impulse reaction type
Turbine manufacturer	Westinghouse
Turbine rated output	841 MWe. Gross
Turbine maximum output (not guaranteed)	874 MWe. Gross
Inplant electric power consumption (at full load)	40 MWe.

3.3 PLANT WATER USE

This section describes the water use pattern for the St. Lucie Unit No. 2 in terms of flows and the relative condition of water in each input and output from the various plant water systems. A flow diagram showing overall plant water use is shown in Figure 3.3-1. Table 3.3-1 lists the estimated flow rates.

3.3.1 WATER SOURCES AND CONDITIONS

All water required for normal plant operation will be drawn from either
the Atlantic Ocean or the Fort Pierce Municipal Water Supply System.
Provisions have been made for emergency cooling water to be drawn from
Big Mud Creek in the event that the normal cooling water supply is in-
terrupted. There is no use of ground water on the plant site for plant
operation other than what percolates to the ground water from the 1
sanitary waste treatment system and the settling basin located south of
the plant. Surface water will be used to maintain the mosquito control
program in the undeveloped areas of the plant site.

The plant heat dissipation systems, including condenser cooling water and miscellaneous closed cooling systems will utilize ocean water on a once through basis. The water required for potable, sanitary, and other general uses will be supplied by the Fort Pierce water system, without further treatment. The makeup water supply to the nuclear steam system will also be drawn from the Fort Pierce water system, but will be demineralized in the water treatment system described in Section 10.4.3 prior to use. This is necessary because of the requirement of mineral free water for steam generation. The quality of the Fort Pierce water is shown in Table 3.6-1.

The discharge of various waters from the heat dissipation system, radwaste management system, chemical and biocide system and sanitary waste system are schematically shown in the flow diagram, Figure 3.3-1. The quality of the discharge water from the heat dissipation system will generally be the same as that of ocean water, but will differ from the input condition by increased temperature. As noted in Section 3.4, the temperature rise is estimated at 24 F maximum, 21 F normal full load and an average one day rise is less than 21 F.

Chlorine gas will be added intermittently to the condenser cooling water in order to control the growth of microorganisms in the cooling system. Only one of the eight sections of the condenser will be chlorinated at a time. This addition of chlorine will result in a free residual chlorine concentration of approximately 1.5 mg/l in the condenser cooling water before it enters the discharge canal. This residual chlorine concentration will occur only during the chlorination periods. After entering the discharge canal, the free residual chlorine will be immediately reacted with the chlorine demand from the cooling water flow coming from the other seven untreated water boxes. Thus, any available free chlorine is expected to be consumed prior to discharge to the Atlantic Ocean.

The radwaste management system discharge will be through 3 in. pipe to the discharge canal. Refer to Section 3.5 for further information on flow variations and quality description.

Release of waste water from the chemical system will be to the circulating water discharge. In this facility, the regenerant waste water from the demineralizer treatment system is estimated normally at 150,000 gallons per day. It is alkaline in character and will be released to the discharge canal after neutralization. Further detailed description on flow variations and quality changes are given in Section 10.4.5 and Figure 3.3-1. 1

Sanitary waste water generated at the plant will be collected and treated in a sewage treatment facility described in Section 3.7. After the treatment, the normal flow will be allowed to percolate through a leaching field to the ground water thereby eliminating any discharge to surface waters from the sanitary waste system.

TABLE 3.3-1

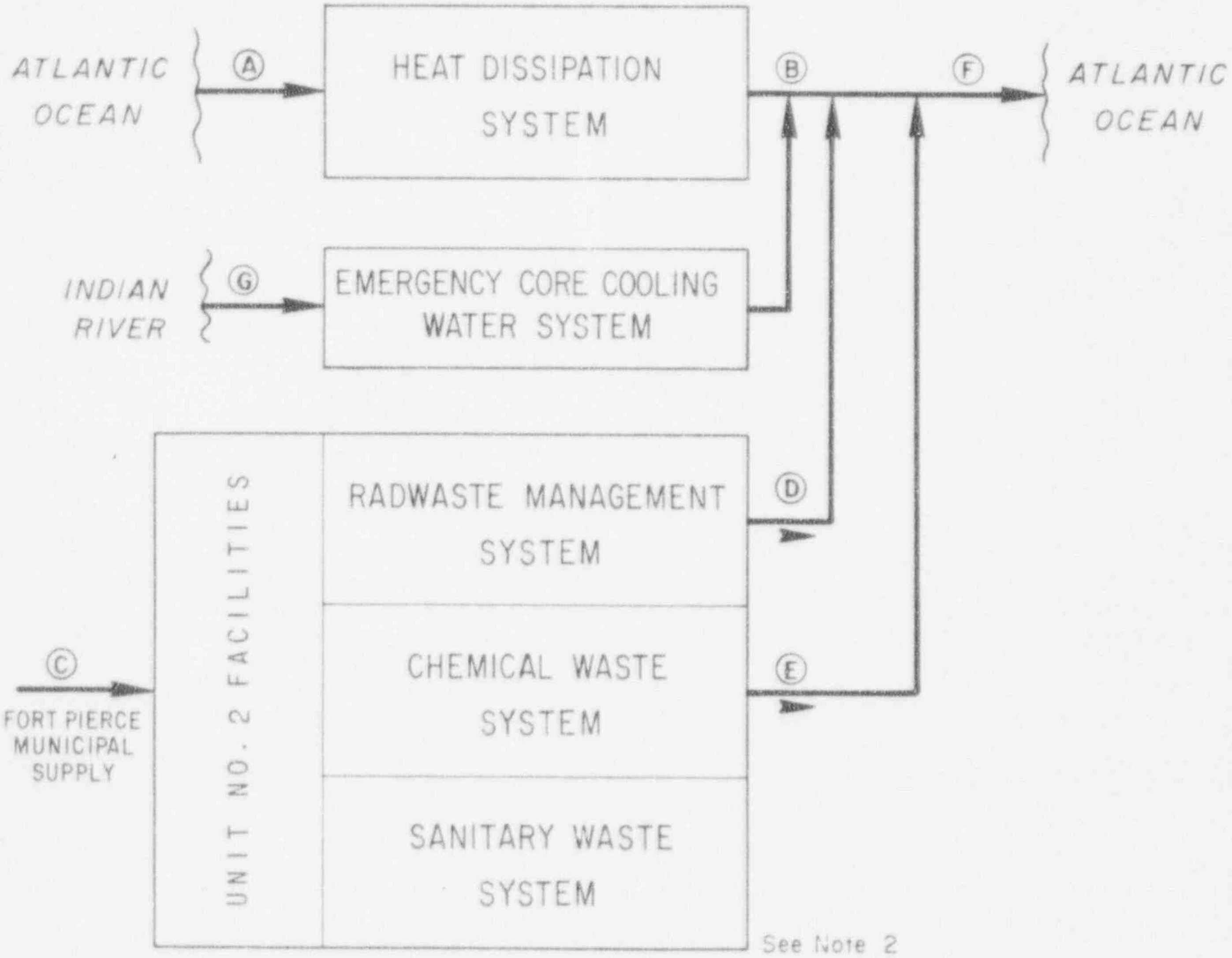
ESTIMATED SYSTEM FLOW RATES FOR UNIT NO. 2
FLOWS (gpm)

Location	Normal Operation	Maximum Condition	Minimum Condition (Shutdown)
A	530,000	530,000	14,500
B	530,000	530,000	14,500
C	210	550	0
D	3.5	200	0
E	200	500	0
F	530,203.5	530,700	0
G	0	29,000	0

0

Total consumptive use = 210 gpm average

550 gpm maximum



NOTES:

1- Refer to Table 3.3-1 for each Stream Flow Rates thus marked (A) etc.

2- No Discharge Due to Ground Percolation of Treated Effluent.

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PLANT WATER USE SYSTEM

FIGURE 3.3-1

3.4 HEAT DISSIPATION SYSTEM

3.4.1 INTRODUCTION

The design objectives of the condenser cooling water system for Unit No. 2 are to take maximum advantage of existing facilities of Unit No. 1 while meeting the applicable State of Florida Water Quality Standards for discharge into open waters. This approach will minimize the environmental impact resulting from the construction of the Unit No. 2 condenser cooling water system.

The condenser cooling water system for Unit No. 2 is a once-through system with intake and discharge pipes in the Atlantic Ocean and canals to the plant. Design flow is 530,000 gpm (1150 cfs). At a load of 850 MW the maximum design temperature rise of the water passing through the condenser will be approximately 24° F. However, the average temperature rise for normal full load operation will be approximately 21° F because of daily plant loading.

The major components of the heat dissipation system include:

a) two intake lines*

b) one discharge line

c) an intake canal*

d) a discharge canal*

e) a recirculation canal*

*Shared facilities with Unit No. 1

Figure 3.4-1 is a general plan of the system. Because there are numerous shared facilities between Units 1 and 2, the following sections present detailed descriptions of the major components of the heat dissipation system for both Units 1 and 2.

3.4.2 INTAKE SYSTEM

There are two ocean intake structures, one for each unit. The ocean
intake structures will be located 1200 ft offshore and about 2400 ft
south of the discharge structure. As shown in Figure 3.4-2, the top
of the intakes will be situated approximately 8 ft below the water
surface at mean low water. A vertical section to prevent sanding
and a velocity cap to minimize fish entrapment will be provided. No
screens or grates are planned. Horizontal intake velocities will be
less than 1 fps. As water passes under the velocity caps, the flow
becomes vertical (downward) and velocity increases to 2.9 fps. The
flow then becomes horizontal as water enters the intake pipes, and 1
increases to approximately 10 fps. An estimate of the surface velocity
to be expected at the ocean intake facilities indicates that it would

be on the order of ≤0.1fps. Since these surface velocities are very small in magnitude, the thermal plume is not expected to be influenced 1
by this velocity.

From the ocean intake point, water at a rate of 2300 cfs (1150 cfs per unit) will be drawn through two buried 12 ft diameter pipelines at 10 fps to the intake canal. Figure 3.4-3 shows the buried pipelines. The 300 ft wide intake canal begins 450 ft west of the shoreline and carries the cooling water some 5000 ft to the Plant intake structures at approximately 0.9 fps. The water velocity in the canal will vary with the tide level. For two unit operation, the maximum velocity is 0.91 1
fps and the average velocity is 0.86 fps.

There are two Plant intake structures, one for each unit. Each Plant intake structure consists of four bays, each containing a coarse screen, a traveling screen and a circulating water pump. The approach velocity to each bay will be less than 1 fps. The entrance velocity into the intake forebay will be about 1.4 fps and the velocity through the travelling screens will range between 2.1 and 2.4 fps. From this structure, the water flows through a buried pipeline to the condenser at about 7 fps.

The four coarse screens consist of a fixed rack with 3" spacing to holdup large pieces of trash. The rack is cleaned with a manually operated rake that is lowered over the rack with the aid of a monorail hoist. The four traveling screens consist of a continuous belt of baskets fitted with copper mesh screen with a clear opening of 3/8". The basket speed is variable from 2.5 to 10 fpm. Debris is cleaned 1
from the baskets by fixed spray nozzles that wash the debris into a sluiceway where it is routed to a sheet-pile holding pit or to the settling basin installed at the south end of the plant island. The screen wash water flow rate is approximately 250gpm for each screen. The travelling screens are normally operated in the automatic mode wherein a differential water level across the baskets initiates operation.

Although there is no substantive evidence available at present, it is believed that the travelling screen duty will be small due to the design of the ocean intake structures.

3.4.3 Discharge System

3.4.3.1 Discharge Canal

The heated water (increased 24 F in temperature), leaving both unit condensers, flows through a buried pipe for approximately 500 ft and then about 2200 ft in a canal. The discharge head wall is located on the western side of the sand dune line. State Road A-1-A will be carried over the canal on a bridge. From the canal outfall structure, the heated water is carried by buried pipeline to the ocean.

3.4.3.2 Unit No. 1 Discharge Pipeline

The cooling water discharge system for St. Lucie Unit No. 1 consists of a 12 ft diameter pipe about 1500 ft long running easterly from the discharge canal outfall structure to the transition section of a two port Y nozzle. The pipe will be buried under the sand dunes and beach and beneath the ocean bottom. Each port of the Y discharge nozzle will be 7-1/2 ft in diameter and is designed for an average flow of 575 cfs and a discharge velocity of about 13 fps. Ocean depth at the discharge point is -18 ft (MLW). A short sloping trench will be excavated to -36 ft with plans to line it with tremie concrete, sheet piling and riprap to prevent scour from the jet discharge. The centerline of the discharge ports will be 30 ft below the water surface. The design is a high momentum type jet which produces a relatively high degree of entrainment of ambient water, thus enhancing the diluting characteristics of the outfall.

3.4.3.3 Unit No. 2 Discharge Pipeline 1

The Unit No. 2 cooling water discharge will be carried about 3110 ft in a 12 foot diameter pipeline buried under the beach, under the ocean and perpendicular to the shore line. The preliminary design of the diffuser system indicates that the pipe line will terminate at a depth of about 40 ft below MLW and at a distance of about 2810 ft from shore.

The last 1060 ft of the submerged pipe (starting 2050 ft from the canal outfall structure) will be fitted with 48 equally spaced high velocity jets. Each jet will be 1-1/2 ft in diameter, spaced 22-1/2 ft between their centers. The jets are located on either side of the 1060 foot long main manifold, thereby making the distance between the consecutive jets (on the same side of the manifold) 45 feet center to center as shown in Figure 3.4-4. Each of the jets will discharge horizontally. Ocean depth at the discharge point of the first jet (i.e. the one close to the shore and located at 2050 feet from the canal outfall structure) is about 35 feet below MLW. The corresponding ocean depth at the last jet is about 40 feet below MLW.

Thus, the heated water is discharged through a number of buoyant jets from a common manifold, forming a multiport jet diffuser system. The high efflux velocity of the buoyant jet (i.e., initial momentum), in addition to its submergence, produces a relatively high degree of entrainment of ambient water. This enhances the diluting characteristics of the outfall. This is an effective method for diluting heat with minimal environmental effect and, as seen in Section 5.1, the resulting temperatures do not violate the applicable water quality standards.

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Recirculation between discharge and intake is mainly a function of the currents and the effective dilution at the ocean intake. With northerly currents and during slack current conditions, no recirculation is expected. Some recirculation might occur under a southerly current and the degree of expected recirculation is evaluated in Section 5.1. Section 5.1 gives detailed analyses of the recirculation that is expected and it is esti ed that, when both units are in operation, the recirculation woulc on the order of 0.5F. This amounts to a recirculation factor of about 2 percent. From this recirculation factor, it is possible to estimate the reconcentration of radionuclides in the canal due to recirculation of plant effluent back through the intake. Table 5.3-8 provides base concentrations which when multiplied by 1.02 give the concentration due to recirculation. Both first order reconcentration and no radioactive decay are assumed. 1

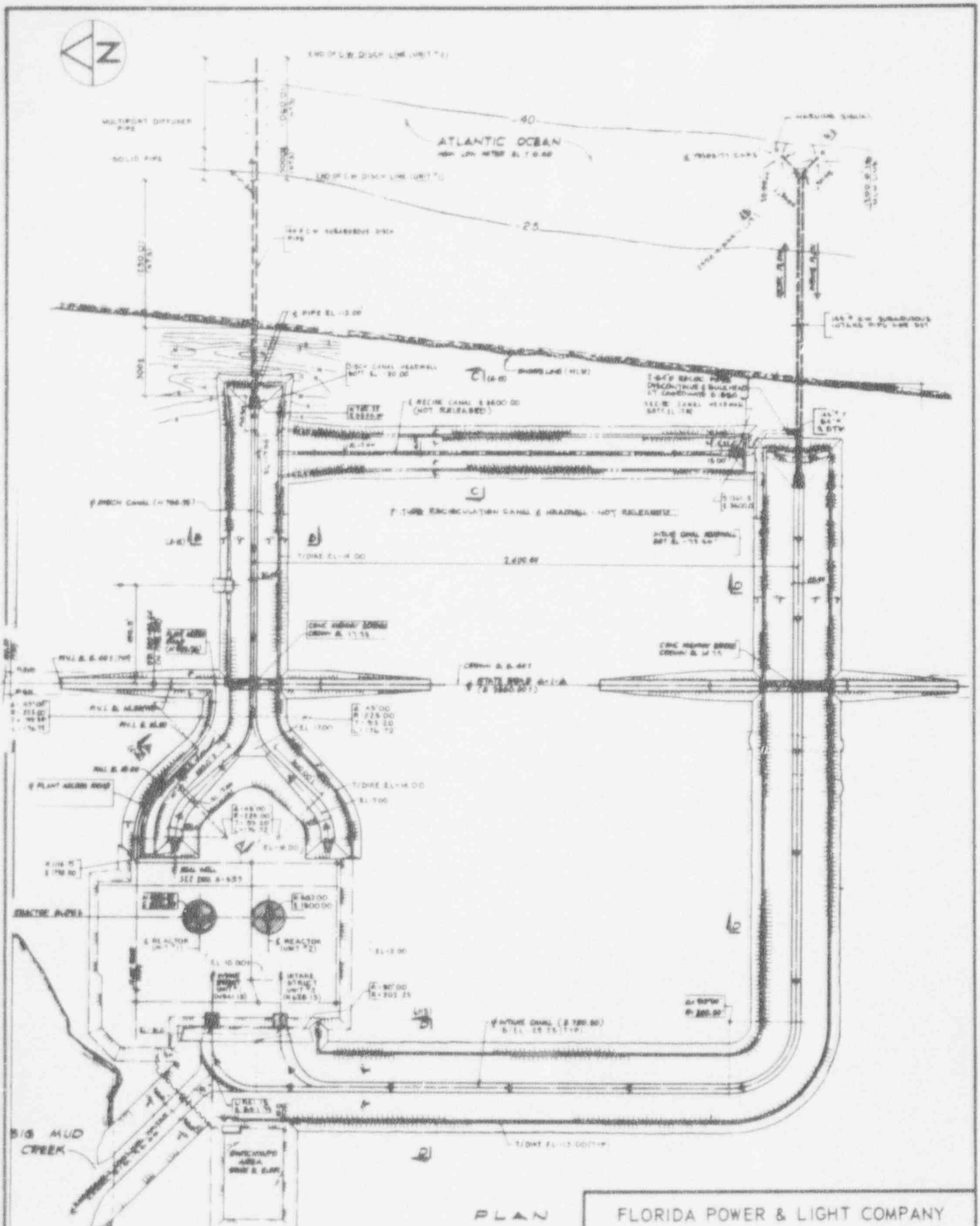
3.4.3 EMERGENCY WATER SUPPLY SYSTEM

The emergency water supply system is installed to provide sufficient cooling water for at least 30 days to facilitate and maintain safe plant shutdown or to permit control of a loss of reactor coolant accident (LOCA) and is designed to meet the requirements of AEC Regulatory Guide 1.27. The system is described at length in Section 9.2.7 of the PSAR.

The emergency water supply is from Bid Mud Creek via a canal tied to the intake cooling water canal. The intake canal front of the intake structure is separated from Big Mud Creek by a s et pile barrier wall, which is placed at the interface of the intake canal and the emergency cooling canal. The barrier maintains separation between the primary and secondary sources of emergency cooling water during normal plant operation. The wall is designed to withstand normal water differential between the canals (up to 15 ft) and wind loadings (120 mph). To assure passage of emergency water through the sheet pile wall, nine stub pipes (normally plugged with pneumatic devices) penetrate the wall. If emergency water is required, the plugs are deflated by remote manual actuation from the control room and water will flow through the stubs via gravity. The plugs are reinforced rubber membranes that are maintained inflated at approximately 10 psi. Each pipe stub is designed to pass the minimum rate of cooling water (14,500 gpm) of cooling water required during a shutdown or LOCA.

The pneumatic plugs, which prohibit flow from Big Mud Creek to the intake canal during normal operation, are tested semi-annually. Each

plug is deflated individually making use of the air chamber located on the sheet pile structure, the pressure relief valve connected to the chamber and pet cocks, which are integral with the air lines. The pet cocks are locked open during normal operation. The test is considered 1
successful if the plug deflates and leaves the stub. The plug will then be inspected and if found satisfactory is replaced in the pipe stub.



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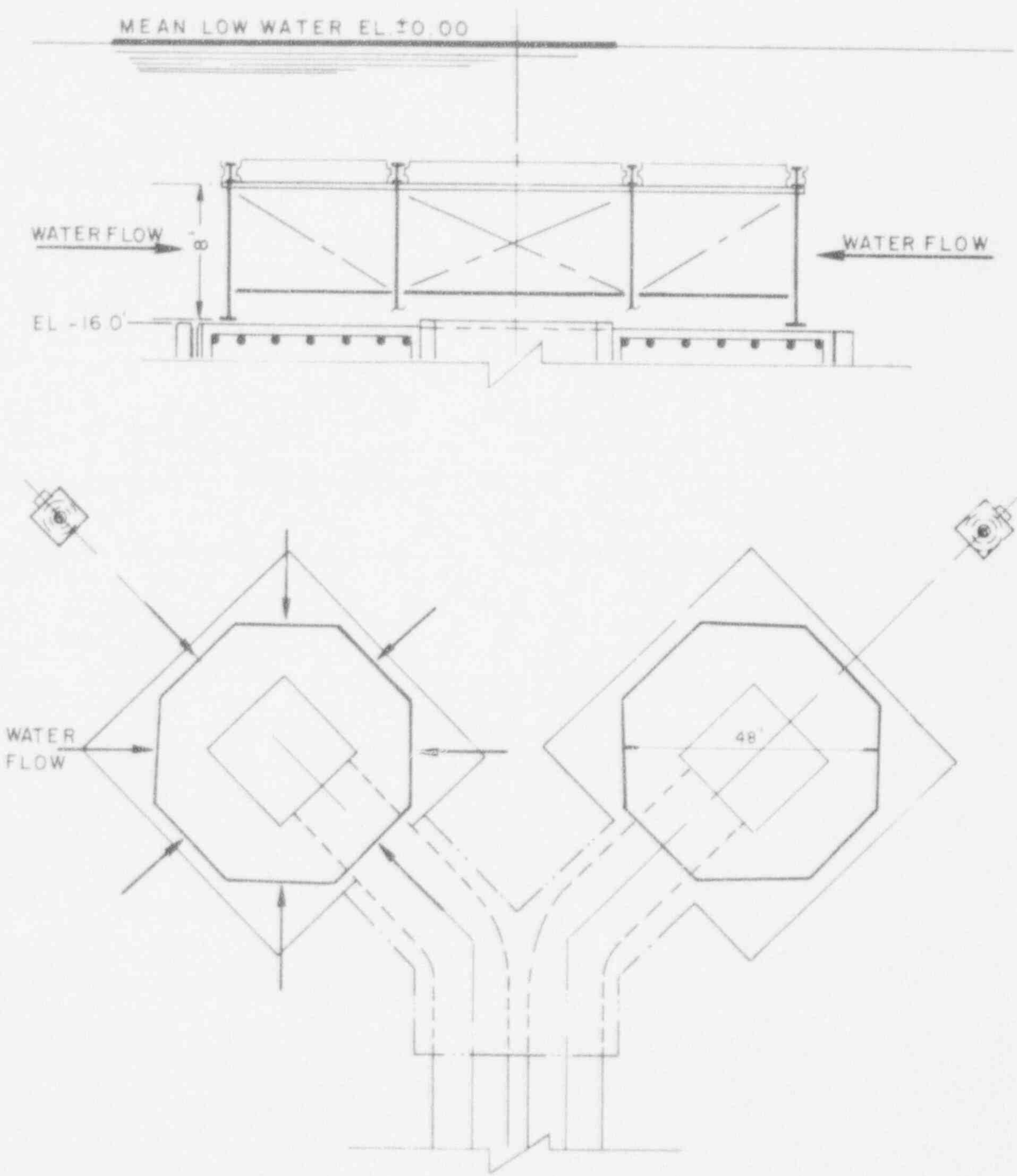
GENERAL LAYOUT OF THE PLANT

FIGURE 3.4-1



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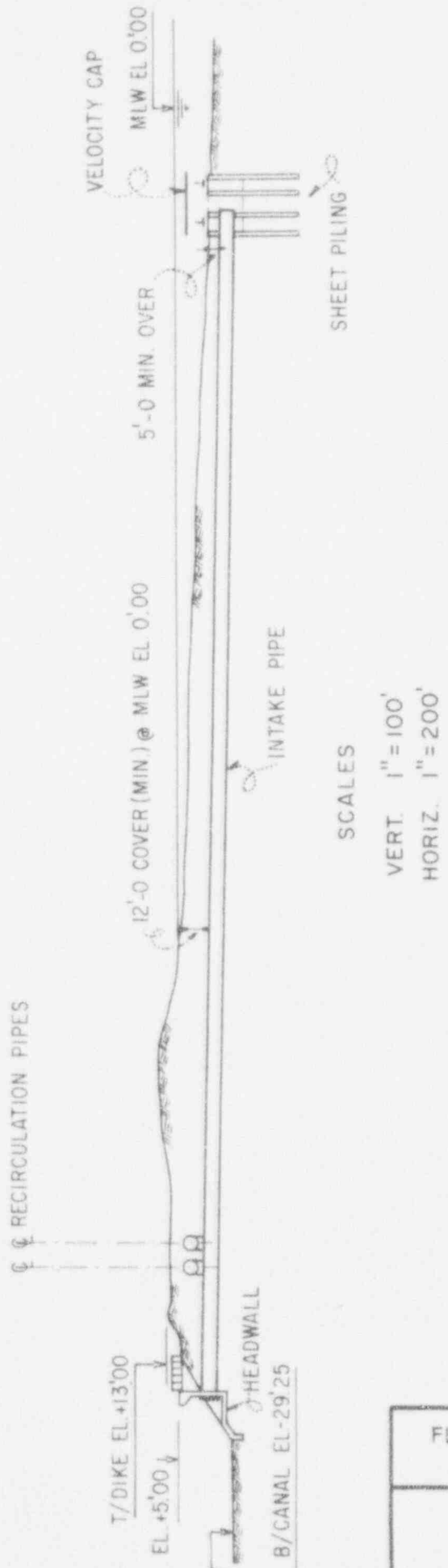
DETAILS OF THE VELOCITY CAP FOR COOLING WATER INTAKE

FIGURE 3.4-2



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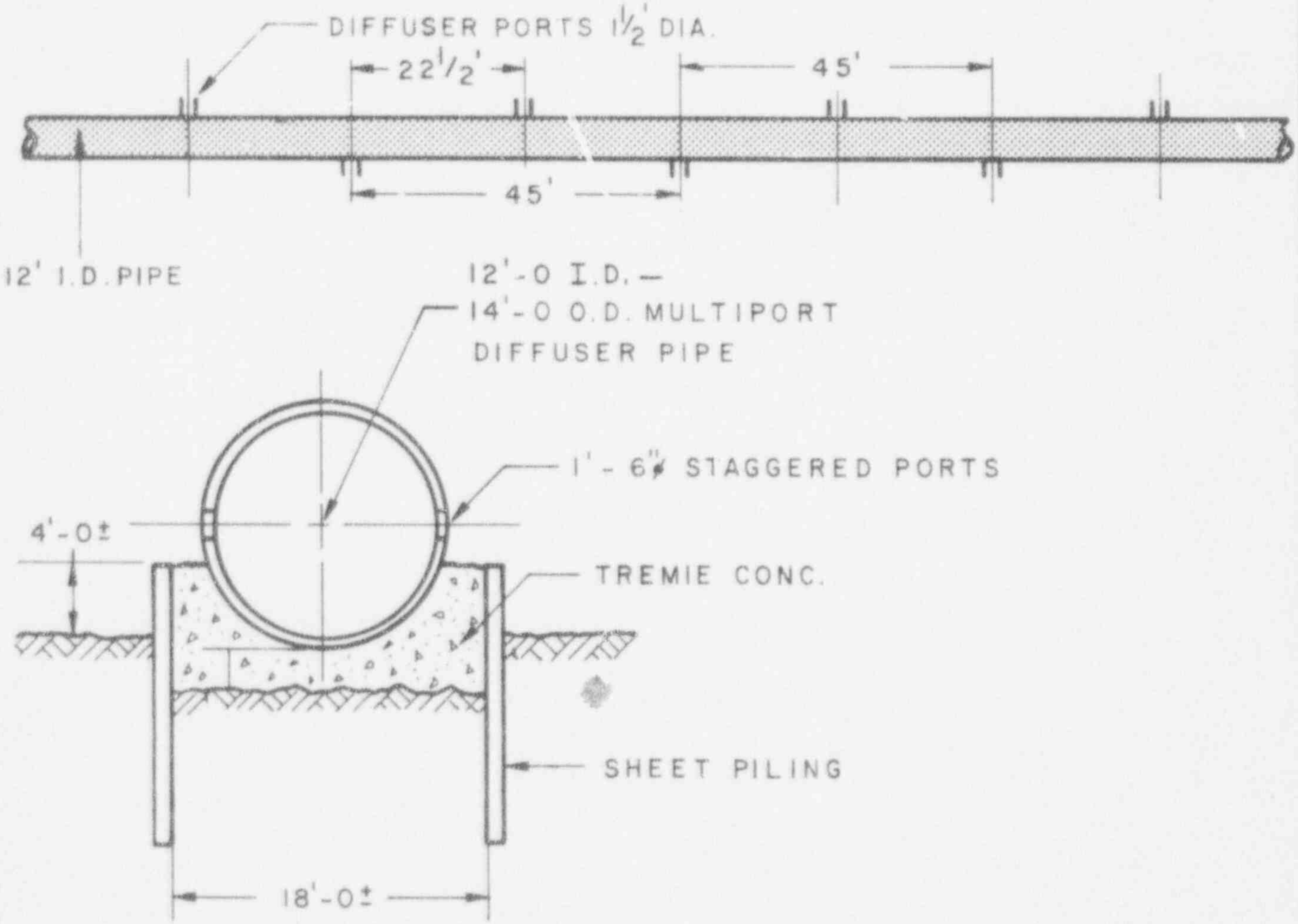
OCEAN INTAKE DETAILS

FIGURE 3.4-3



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DETAILS OF THE MULTIPORT DIFFUSER

FIGURE 3.4-4

3.5 RADWASTE SYSTEMS

The waste management system, located in the auxiliary building, is composed of tanks, process equipment and piping necessary for handling radioactive wastes within the confines of the plant and for preparing these wastes for reuse or for offsite disposal. The waste management system includes two subsystems; (1) the boric acid recovery system for normally recoverable liquids, and (2) the waste treatment system for nonrecoverable liquid, gaseous and solid wastes.

The waste treatment system treats all nonrecoverable radioactive liquid wastes, solid wastes and gaseous waste mixtures. The system is also designed to process effluent with an activity level based on plant operation with 1 percent failed fuel although, the anticipated percent of failed fuel is expected to be well below this value. The basic processing methods used are storage, filtration, concentration, and ion exchange. Radioactive solid wastes are compacted in drums for offsite disposal. Any releases of gaseous and liquid effluent from the waste treatment processes shall be in accordance with the provisions of Part 20 of Title 10 of the Code of Federal Regulations. Means are provided to sample potentially radioactive liquid and gaseous wastes in storage tanks prior to their release.

The waste management system is designed to provide controlled treatment and disposal of gaseous and solid wastes and either disposal or reuse of liquid wastes. The principal design criterion concerning disposal is to ensure that the general public is protected by maintaining releases of radioactive materials well within the limits of 10CFR20. Releases of radioactivity will be via the batch process after the stored liquid or gas to be released has been sampled. Liquid will be released to its circulating water discharge canal, which has an 2300 cfs (530,000 gpm) design flow. Gases will be discharged to the plant vent which is located on the side of the shield building and is released to the atmosphere at an elevation of 202 ft. 3

3.5.1 SOURCE TERMS

Appendix 1 to Regulatory Guide 4.2 "Preparation of Environmental Reports for Nuclear Power Plants" is a questionnaire containing 36 questions concerning basic data utilized in source term calculations. Responses to these questions are provided as Appendix 3A to this document. This Appendix supplements the source term discussions that follow. 3

3.5.1.1 Fission Products

The mathematic model used for determining the specific concentration of nuclides in the reactor coolant involves a group of time dependent simultaneous equations. The fuel pellet region and reactor coolant region are analyzed by applying a mass balance of production and removal for each nuclide thereby establishing a set of first order, differential equations. In the fuel pellet region the mass balance includes the fission product production by direct fission yield, by parent fission product decay, and by neutron activation, and removal by decay, by neutron activation, and by escape to the reactor coolant. In the coolant region the analysis includes the fission product production by escape from the fuel through defective fuel rod cladding, by parent decay in the coolant, and by neutron activation of coolant fission products. Removal is by decay, by coolant purification, by feed (makeup) and bleed (letdown to waste management system) for fuel burnup, and by leakage or other feed and bleed due to such operations as cold or hot startups and shutdowns or load follow operations.

The expression derived to determine the fission product inventory in the fuel pellet region is:

$$\frac{dN_{p,i}}{dt} = FY_i P + (f_{i-1}\lambda_{i-1} + \sigma_{i-1}\Phi)\ N_{p,i-1} - (\lambda_{i-1} + \nu_i + \sigma_i\Phi)\ N_{p,i}$$

and in the reactor coolant region is:

$$\frac{dN_{c,i}}{dt} = D\nu_i\ N_{p,i} + (f_{i-1}\lambda_{i-1} + \sigma_{i-1}\Phi\ FCS)\ N_{c,i-1}$$

$$-\left(\lambda_i + \frac{R}{W}\ \eta_i + \frac{(1-\eta i)C}{C_o\quad Ct} + \frac{Q}{W}\right)\ N_{c,i}$$

where:

- N = population, atoms
- F = average fission rate, fissions/MWt-sec
- Y = U-235 fission yield of nuclide fraction
- P = core power, MWt
- λ = decay constant, sec^{-1}
- σ = microscopic cross section, cm^2
- ϕ = thermal neutron flux, neutrons/cm^2-sec
- ν = escape rate coefficient, sec^{-1}
- f = branching fraction
- t = time, sec.
- D = defective fuel rod cladding, fraction
- FCS = core coolant volume to reactor coolant volume ratio
- R = purification flow rate during power cycle, lbs/sec
- W = reactor coolant mass during power cycle, lbs
- η = resin efficiency of chemical and volume control system ion exchanger for a given nuclide, fraction
- C_o = initial boron concentration, ppm
- C = boron reduction rate by feed and bleed, ppm/sec compensating for fuel burnup

Q = leakage or other feed and bleed from reactor coolant lbs/sec

Subscripts

p, pellet region

c, core region

i, designates the nuclide parameters (i.e., $_{54}Xe^{133}$)

i-1 designates the parent nuclide parameters (i.e., $_{53}I^{133}$)

The model does not involve the fuel plenum and gap region of the core because the escape rate coefficients represent the overall release from the fuel pellets to the reactor coolant.

The production terms involving the microscopic cross section are used only to produce Cs^{134} from Cs^{133}, the stable end product of the 133 chain. The removal term involving the microscopic cross section is used only with Xe^{135} and only in the pellet region because of insignificant effects on other nuclides and in the coolant region.

The fission product activity concentrations used as basic source terms are given in Table 3.5-1. The data used for these calculations are given in Table 3.5-2. The effects of expected plant operation as a result of start-ups and shutdowns are simulated by using a constant liquid waste rate of 1.2 gpm or 617,000 gallons per year. The tritium concentration is based on no recycle of concentrator distillate.

The primary factor in determining the fission product inventories is the escape rate coefficient. This is an empirical coefficient which was derived from experiments initiated by Bettis and performed in the NRX and MTR reactors.(1) The escape rate coefficients derived from these data are given in Table 3.5-2. The escape rate coefficients were obtained from test rods which were operated at high linear heat rates. The linear heat rates were uniform over the test sections which were 10.25 inches in length. The exact linear heat rates were not precisely known but post-irradiation showed that some tests rods had experienced centerline melting. Later tests were conducted in the NRX reactor to determine the effect of rod length on the release of fission gases and iodines from defective fuel. (2) A by-product of these experiments was the effect of linear heat rate on the escape rate coefficient. The escape rate coefficient for several nuclides as a function of the linear heat rate is shown in Figure 3.5-1. Also shown in Figure 3.5-1 are the escape rate coefficients used for noble gases and halogens. Since the average heat rate for a fuel rod will be well below the crossover points in Figure 3.5-1 which is above 17 kilowatts per foot in each case, the presently used escape rate coefficients are conservative.

3.5.1.2 Fuel Experience

Current operation of stainless steel clad fuel rods in the Connecticut Yankee reactor shows fuel failure rates on the order of 0.01 percent.

Zircaloy-clad UO_2 fuel in the Obrigheim reactor in Germany sustained a fuel failure rate just over 0.1 percent in its first cycle; this has fallen in the second cycle to essentially zero (0.001 percent). The fuel failure rate in the Dresden 1 reactor over a nine-year period has averaged 0.1 percent with the rate more recently being even lower. Fuel in the Mihama reactor in Japan and the Point Beach reactor has exceeded the burnup at which failures in fuel of similar design were observed in Ginna, without exhibiting increases in coolant activity (indicative of fuel defects).

The fact that widespread defects in some reactors, associated with fuel clad contamination have now been recognized and corrective measures taken, provides further assurance that failures at this frequency from this cause will not occur in the future. Existing licensing regulations limit coolant activity to that associated with 1 percent failed fuel. Over the lifetime of an operating reactor, it is expected that coolant activity levels corresponding to 0.1 percent failed fuel will predominate.

3.5.1.3 Leakage Sources

There are several potential sources of leakage from the plant systems that can contribute to the total release to the environs. If leakage occurs from systems containing reactor coolant, gaseous radioactivity could be released via several pathways.

Normal leakage from the reactor coolant system exposed to the containment atmosphere is expected to be 40 gallons per day or less. Reactor coolant nuclide activities given in Table 3.5-1 are used as source terms for all leakage calculations. Under equilibrium conditions, 10 percent or less of the iodine and particulates leaking into the containment remains in the atmosphere and is available for release. The other 90 percent of the iodine and particulates is either plated out in the containment or remains in the liquids and is collected in the containment sump. The annual average exposed leakage into the reactor auxiliary building (of unprocessed reactor coolant at 120 F) is expected to be 10 gallons per day or less. 3

Regulatory Guide 1.42 (RG 1.42) recommends leakage values to be used in gaseous release pathway estimates. These suggested leakage values have been used in the gaseous release analysis.

Estimated liquid and gaseous releases due to leakage from various systems containing radioactivity are discussed later in this section.

3.5.2 LIQUID WASTE SYSTEMS

3.5.2.1 Design Bases

The boron recovery system and the liquid waste system (integral parts of the waste management system) are designed to:

a) Process the various potentially radioactive liquid wastes such that the radioactivity release to the environs during normal operation will be as low as practicable. The numerical design objectives for releases during normal operation are to limit average annual liquid activity release quantity to 5 Ci and average annual activity release concentration to 2×10^{-8} Ci/cc excluding tritium and dissolved fission product gases.

b) Limit the annual average tritium discharge concentration to 5×10^{-6} Ci/cc in accordance with the proposed Appendix I to 10 CFR 50.

c) Limit releases due to anticipated operational occurrences within 10 CFR 20.

3.5.2.2 System Description

Liquid waste influent to the waste management system, shown in Table 3.5-3 is segregated by chemistry and/or probable source activity for more efficient processing. Tritiated, hydrogenated, borated reactor coolant quality wastes of potentially high activity are mainly processed in the boron recovery system. Aerated, chemically contaminated, and low activity liquid wastes are received and processed separately in the liquid waste system.

a) Boron Recovery System

The major influent to the boron recovery system is reactor coolant from the chemical and volume control system letdown due to feed and bleed operations for shutdown, startups, and boron dilution over core life. Reactor coolant quality water from valve and equipment leakoffs, drains and relief valve within the containment are collected in the reactor drain tank and subsequently processed by this system. Reactor coolant from leakoffs and drains in the reactor auxiliary building are collected in the equipment drain tank of the liquid waste system.

The boron recovery diagrams are shown on Figures 3.5-2, 3.5-3 and 3.5-4. The borated and hydrogenated water discharged by the reactor drain pumps or diverted by the chemical and volume control system volume control tank diversion valve (V-2500) is sent to the flash tank where dissolved hydrogen and fission gases are stripped by a counter current flow of nitrogen gas from the liquid and discharged to the gas decay tanks. Hydrogen is stripped from the water so that an explosive gas mixture does not occur in subsequent process equipment. Use of nitrogen cover gas in the holdup tanks provides additional protection. The nitrogen stripping medium maintains a slight overpressure in the flash tank to prevent air in-leakage, thus precluding potential formation of an explosive gas mixture in the flash tank. In the event of a high liquid level in the flash tank, the influent is automatically diverted to the holdup tanks. A low level in the flash tank stops the flash tank pumps automatically. The flash tank high and low pressure and level alarms are annunciated in the control room. A flow switch in the inlet line to the flash tank automatically opens the nitrogen supply valve and starts the flash tank pumps when water enters the tank. The degassed liquid is automatically pumped from the flash tank to the holdup tanks. The holdup tanks provide sufficient storage capacity to accumulate discharges until a sufficient volume is available for further processing on a batch basis. The radioactivity of the liquid is significantly reduced during storage by natural decay of the short lived radionuclides. During this period any degasification and radioactive decay can be monitored by liquid sample analysis or periodic sampling of the tank gas space with the gas analyzer. Air in-leakage to the holdup tanks is precluded by a nitrogen overpressure maintained in the tanks. As the holdup tanks fill, nitrogen is displaced to other interconnected holdup tanks or to the gas collection header. The holdup tanks have high and low water level and pressure alarms which are annunciated in the control room. In the event process fluid has to bypass the flash tank due to malfunction of the flash tank controls or pumps, the stored liquid can be recirculated by the holdup drain or recirculation pumps to the flash tank to remove any hydrogen once the flash tank returns to service. The holdup recirculation pump supplies flushing water to the preconcentrator ion exchangers and spent resin tank during resin sluice operations.

Normally, the contents of the holdup tanks are transferred to the boric acid concentrator through the preconcentrator filter and preconcentrator ion exchanger. If necessary, the contents of one holdup tank may be recirculated through a preconcentrator filter and ion exchanger while a second holdup tank's contents are processed through the other preconcentrator filter and ion exchanger prior to discharge to the boric acid concentrators. The holdup pumps and holdup recirculation pump are stopped on low holdup tank level. The boric acid concentrators have both automatic sampling and local grab sample provisions to ensure control of the effluent chemistry. The boric acid concentrators provide a level signal that, after the initial manual pump start, automatically starts and stops the holdup or holdup recirculation pump aligned to either boric acid concentrator. The two boric acid concentrators have a very low usage factor (approximately 4 percent) and thus provide a high system reliability and availability.

The bottoms from each boric acid concentrator are pumped via the boric acid discharge strainer to the boric acid holding tank for temporary storage and sampling. The recovered boric acid may then be returned to the makeup tanks for recycle or discharged to the drumming station for ultimate offsite disposal.

The concentrator distillate passes through one of the two boric acid condensate ion exchangers to remove boron carryover and into one of the two boric acid condensate tanks. While one boric acid condensate tank is filling, the other is sampled and discharged. In the event that the contents of the tank do not meet the chemical or radioactivity limitations, the contents can be recycled to the holdup tanks for further processing or recycled through the boric acid condensate ion exchangers.

A local high and low level alarm is provided on the boric acid condensate tanks. The boric acid condensate pumps automatically stop on low water level in the tanks.

Prior to controlled discharge of the treated liquid waste, the fluid must be analyzed and its activity verified as acceptably low. Discharge is accomplished through an effluent radiation monitor which records the release activity level and automatically terminates discharge on high radiation. If reuse in the plant is desired, the fluid is analyzed for acceptability of both chemistry and activity.

Design data for the major components are listed in Table 3.5-4. Flow, temperature, and pressure data are given in Table 3.5-5 with the locations corresponding to process points on Figures 3.5-2, 3.5-3, and 3.5-4.

The nuclide concentrations for normal operation and for anticipated operational occurrences adjusted to 70 F are indicated for selected locations in the chemical and volume control system in Tables 3.5-8 and 3.5-9 respectively. The selected locations are indicated by the process points on Figures 3.5-2, 3.5-3, and 3.5-4. Normal operation is defined as operating with 0.1 percent failed fuel, and anticipated operational occurrences is defined as operation with 1 percent failed fuel.

Analysis is made assuming that the activities in Table 3.5-3 exist in the coolant upstream of the purification equipment in conjunction with the expected equipment performance given in Table 3.5-6 and in Table 3.5-7.

Systems similar in function and design to the boron recovery system described herein have been used successfully at plants such as Connecticut Yankee and Ginna. Even with significant coolant radioactivity at Ginna, releases have been controlled well within the 10CFR20 limits.

All process components have been used extensively in the nuclear industry to remove radioactive contaminants from liquids. The performance of process units used in the analysis is in agreement with general industry experience.

b) Liquid Waste System

The liquid waste system is shown on Figure 3.5-5. Liquid wastes include those from the laboratory sink drains, decontamination area drains, floor drains, building sumps, laundry effluent, and contaminated showers. 3
The wastes are segregated for batch processing by collection in the equipment drain tank, chemical drain tank, and laundry drain tanks.

Low activity, aerated, and potentially dirty liquid drains and building sumps discharge to the equipment drain tank. Low activity chemical drains from the sampling system, decontamination drains, and chemical laboratory drains flow to the chemical drain tank. When a sufficient volume is collected in the drain tanks, the contents are sampled and neutralized, if required, and then pumped through a filter to the waste concentrator. The boric acid concentrators are available for processing liquid wastes if the waste concentrator is not available for service.

Concentrator bottoms are pumped to the drumming station which is described in Section 3.8. The condensate (distillate) passes through the waste ion exchanger and is collected in the waste condensate tanks and monitored for radioactivity. In the event that discharge limitations can not be met, the condensate can be recirculated through the waste ion exchanger, returned to the waste concentrator, or the holdup tanks in the boron recovery system for further treatment. Normally at least one holdup tank will be available for storage of waste condensate for reprocessing through a boric acid concentrator if necessary.

After the condensate activity has been determined to be sufficiently low by sample analysis, the tanks are pumped out at a controlled rate to the circulating water discharge. The activity of the discharge line effluent is monitored and recorded. Should the activity exceed the high set point value, the discharge is automatically terminated.

The laundry wastes are collected in the laundry drain tanks and analyzed for activity. Because of negligible activity levels, the laundry waste is normally pumped from the tanks through a filter to the circulating water discharge via the radiation monitor mentioned above. The tank contents can be processed in the waste concentrator prior to discharge if significant activity is detected.

All tanks are equipped with water level instrumentation alarms and their respective pumps are tripped on low level signals.

Design data for the major components is given in Table 3.5-10. Flow, temperature, and pressure are given in Table 3.5-10 with the locations corresponding to data points on Figure 3.5-5. Expected performance of components is given in Table 3.5-12.

The nuclide concentrations adjusted to 70 F for normal operation and anticipated operational occurrences are given in Tables 3.5-13 and 3.5-14, respectively. The selected locations are indicated by the process data points on Figure 3.5-5.

As indicated in Table 3.5-3, an estimated 156,000 gallons per year of liquid wastes, exclusive of laundry wastes are processed in the liquid waste system. The activity of the aerated liquid wastes collected in the equipment drain tank and chemical drain tank is approximately 1 percent of the reactor coolant activity, owing to dilution from washdown and decontamination procedures. 3

Major radioactivity removal is accomplished by the concentrators. Experience indicates that a concentrator DF (bottoms to distillate) of 10^4 can be obtained. The concentrators are specified at this rating and testing by the vendor has confirmed the performance.

Table 3.5-15 lists the leakage sources and the assumptions used in calculating estimated normal and anticipated operational occurrence releases due to leakage sources. Additional plant liquid releases can result from turbine system leakage.

c) System Design

The Liquid Waste System is designed for batch type operation. These batching operations proceed intermittently at faster flow rates than the annual average process rates and therefore the system components are sized accordingly. Tables 3.5-4 and 3.5-10 list the design parameters for the major components of the liquid waste system.

d) Estimated Releases

The expected liquid releases from the plant are summarized by nuclide in Table 3.5-16. The reactor coolant concentrations utilized from this evaluation are indicated in Table 3.5-1. The curies released from the boron recovery and liquid waste systems are determined by multiplying the nuclide concentrations in the boric acid and waste condensate tanks as shown in Tables 3.5-8, 3.5-9, 3.5-13, and 3.5-14 by the waste processed through each system. The waste schedule is shown in Table 3.5-3.

e) Release Points

The only liquid release point from the waste management system to the environs is via the boric acid condensate or the waste condensate pumps discharge to the circulating water discharge. Prior to discharge the contents of the tank to be discharged are sampled for chemical and radioactivity concentrations. If the contents of the tank are found acceptable in terms of environmental discharge limits, the tank contents are discharged. A radiation monitor is provided in the discharge line to verify that the fluid discharge is below the applicable radioactivity limits. In the event that the discharged activity is unacceptable, the discharge monitor automatically terminates discharge operations. The discharge is located on Figures 3.5-4 and 3.5-5. Release points from the plant are shown on Figure 3.5-6.

f) Dilution Factors

An average annual dilution factor of 1.73×10^5 is obtained in the circulating water discharge based on 513,000 gpm flow in the discharge canal and an average annual liquid effluent flow rate of 2.95 gpm from the boron recovery system and the liquid waste system. The discharge and intake pipes are separated by 2400 feet of ocean shoreline which results in a negligible recirculation of discharged water.

3.5.3 GASEOUS WASTE SYSTEM

3.5.3.1 Design Bases

The gaseous waste system processes the vent gases from equipment located in the chemical and volume control system, waste management system and fuel pool system, such that the radioactive gaseous release to the environs will be as low as practicable. The numerical design objective for releases during normal operation is to limit the site boundary noble gas dose to less than 10 mrem/year and iodine-131 and particulate site boundary concentrations to 10^{-5} times 10 CFR 20 limits. Releases due to anticipated operational occurrences will be within 10 CFR 20 limits.

3.5.3.2 System Description

a) Waste Gas Systems

The principal flow paths of the waste gas system are shown on Figure 3.5-7. Process flow and activity data are given in Table 3.5-17, component data in Table 3.5-18.

Plant gaseous releases come from the steam generator blowdown, reactor auxiliary building ventilation, turbine system leakage, steam jet air ejector operation, and containment purging, gas collection header and gas surge header.

Releases from the reactor auxiliary building ventilation system are based on leakage of unprocessed reactor coolant at 120 F. Containment purging results in a constant release regardless of percent failed fuel since the airborne radioactivity removal system is operated for as long as required to achieve the required activity level.

Waste gas is collected from the various source components by three headers; containment vent header, gas surge header, and gas collection header. The containment vent header receives hydrogenated potentially radioactive gas mixtures vented from the reactor drain tank, quench tank, refueling failed fuel detector vent, and reactor vessel head vent within the containment and directs the gases to the gas surge header. Hydrogenated and potentially radioactive gases vented from the volume control tank, flash tank, and boric acid concentrators in the reactor auxiliary building are also directed to the gas surge header along with the discharge gas from the gas analyzer. The vented gases flow to the surge tank where they are collected prior to being compressed. The gases remain in the surge tank until removed by the waste gas compressors which are automatically controlled by pressure instrumentation located on the surge tank. The surge tank is equipped with a drain line to remove any water that accumulates in the tank due to condensation. A water level switch with a local alarm on the surge tank indicates to the operator when the tank should be emptied.

Since the contents of the surge tank are expected to contain significant amounts of hydrogen, the gas is sampled frequently by the gas analyzer to determine the oxygen-hydrogen composition. If oxygen should increase above 2 percent by volume (2 percent by volume below allowable limit) an alarm is annunciated, and provisions are made to purge with nitrogen. A nitrogen line connected to the surge tank, and a pressure regulating valve in the line opens when pressure in the tank falls below 1.5 psig thereby maintaining a positive pressure above atmospheric and preventing air ingress.

The gases flow from the gas surge tank to a compressor where they are compressed to 165 psig and cooled by an aftercooler prior to entering the gas decay tanks where the gases are held up for radioactive decay. Two compressors are available for transferring the gas to the gas decay tanks controlled by pressure instrumentation on the surge tank. One compressor starts when pressure in the surge tank increases to 3 psig and stops when pressure falls to 1.5 psig. The second compressor starts at 7 psig and stops at 5 psig.

Aftercoolers supplied with each gas compressor cool the compressed gas prior to entering the gas decay tanks. There are three gas decay tanks (each provided with a pressure indicator including local alarm and temperature indicator) which receive the compressed gas from the waste gas compressors. The decay tanks have sufficient storage capacity for an average 30 day holdup, and after radioactivity has decayed to an acceptable level which is consistent with the design objective and has been verified by laboratory sample analysis, the gas is released to the environment via the vent pipe at a controlled rate.

The fill procedure for the decay tanks is to have only one tank lined up to the compressor discharge. When the pressure in the tank increases to 165 psig the tank is isolated and manually switched over to an empty tank. The gaseous radioactivity in the filled isolated tank is allowed to decay for an average decay time of approximately 30 days. During this decay period the gas is periodically sampled and activity level determined.

The following components are located in the discharge line from the gas decay tanks to the plant vent; a pressure reducing valve, pressure indicator, needle valve, pneumatic operated fail closed on-off valve, an in-line radiation monitor, and a gas flow meter.

Prior to release, the required flow rate is determined, and the set point on the radiation monitor is established. Initially the discharge valve from the gas decay tank, needle valve and pneumatic operated valve are closed. The on-off pneumatic operated valve is opened and placed in automatic, and the discharge valve on the desired gas decay tanks is opened. The pressure reducing valve will automatically close when pressure from the decay tank in excess of 10 psig is sensed at the pressure reducing valve outlet. The needle valve is then opened as required to establish the desired flow rate to the vent pipe, and the pressure reducing valve will open to maintain constant downstream pressure of 10 psig. The on-off pneumatic operated valve automatically closes on high radioactivity level thus terminating discharge flow. An alarm will annunciate this event in the control room. When discharge flow decreases and the decay tank pressure decreases to approximately 10 psig, as noted by observing the gas flow meter and pressure indicator on the gas decay tank, the pressure reducing valve set point must be reduced to vent the tank down to atmospheric pressure.

The system flow paths and release points of the gases from the gas decay tanks and gas collection header are indicated on Figure 3.5-7. The diagram also shows the only flow bypass line in the waste gas system. This line from the gas surge tank to the vent pipe bypasses the waste gas compressor and gas decay tanks. This path is used to bypass compressors and gas decay tanks when the air or nitrogen is purged from process equipment after initial plant startup or maintenance operations. During these periods essentially no activity will be present in the gas streams and it is unnecessary to route these gases to the gas decay tanks. A locked closed valve facilitates administrative control of this bypass line.

The waste gas system has connections for sampling the gas in the containment vent header gas surge tank, and each gas decay tank. The gas to the gas surge header is primarily hydrogen, and a gas analyzer located in the sampling system is used to monitor hydrogen and oxygen concentration. Connections are available in the sampling system for taking a grab sample via gas analyzer to determine activity level prior to release.

The gas collection header collects the gases from primarily aerated vents of process equipment in the waste management system, chemical and volume control system, and fuel pool system. A listing of sources is given in Table 3.5-19. Because of the large volume of gas and the low activity level from the sources, the gases are routed directly to the vent pipe. The gases and expected activities to the vent pipe from the gas collection header are given in Table 3.5-17 at process data point No. 12. As a further check on activity from this source, the plant vent contains radioactivity monitors with alarms to indicate unexpected activity release.

The hydrogen and nitrogen required for plant operations are also a part of this system and redundant supply headers for each gas are provided. Hydrogen gas is supplied to the volume control tank gas space to maintain the desired concentration of reactor coolant dissolved hydrogen to suppress the net decomposition of water in the reactor flux. Nitrogen cover and/or purge gas is provided to the holdup tanks, quench tank, reactor drain tank, safety injection tanks, spent resin tank, and gas surge tank. A nitrogen stream is supplied to the flash tank for degassing liquid waste, and periodic purges with nitrogen are provided as required for various waste management system and chemical and volume control system components. The two gas supply systems include relief valves, regulators, and instrumentation with alarms and valving to allow flexible operation. A low pressure alarm indicates when the backup source should be placed in service.

3.5.3.3 Estimated Releases

The estimated releases from the waste gas system in curies per year are listed in Table 3.5-20. The source terms and assumptions used to determine these releases are given in Section 3.5.1.2. These release estimates are based on the guidance provided by Regulatory Guide 1.42 3
except that a 0.1% failed fuel rate was assumed. All the non-

condensable gases in the condenser are released to the environment. The releases from the reactor auxiliary building are calculated by multiplying the leak rate for reactor auxiliary building equipment by the appropriate partition factors and ventilation system filter efficiencies. The assumed leak rates, partition factors, and filter efficiencies are given in Table 3.5-15.

During normal operation the expected activity releases from the plant is based on a 0.1 percent failed fuel, while the anticipated operational occurrences are assumed at 1.0 percent failed fuel. The radioactivity that is released from the failed fuel is reduced in concentration by the process equipment in the chemical and volume control system and waste management system. For iodine, the purification and preconcentrator ion exchanger decontamination factor (DF) is 10^3, and a liquid to gas partition factor of 10^4 is used for the reactor drain tank, flash tank, holdup tank, equipment drain tank, and boric acid concentrator. Noble gases are stripped by a factor of approximately 2 in the flash tank and 5 in the boric acid concentrator. Activity will also be reduced by natural decay due to residence time in the reactor drain tank, holdup tank, and gas decay tanks.

3.5.3.4 Release Points

Release points to the vent pipe from the gas decay tanks are indicated on Figure 3.5-7 and Table 3.5-17. The gaseous effluents from the reactor auxiliary building ventilation system and containment purge system are also released from the vent pipe. The vent pipe is shown on reactor auxiliary building general arrangement Figure 3.5-8. The air ejector releases are from the turbine area. The air ejectors are shown on Figure 3.5-10. All the release points are shown on the plant liquid and gaseous release points diagram Figure 3.5-6. 3

3.5.4 Steam Generator Blowdown Process System

Steam generator blowdown is utilized to maintain the total dissolved solid (TDS) content of steam generator secondary side coolant at or below the normal operating limit. Normally the blowdown stream's temperature is reduced during passage through the blowdown heat exchanger prior to its release to the discharge canal. In the event that activity in the blowdown stream resulting from primary to secondary leakage exceeds a specified value an alarm will be annunciated in the control room, and flow will be diverted to the blowdown process system. A schematic of this system is provided as Figure 3.5-11. 3

Blowdown diverted to one of the three process streams passes through filters and demineralizers prior to entering one on the three monitor tanks. Processed blowdown pumped from the monitor tanks to the discharge canal is continuously monitored for activity level. Automatic release termination capability on high activity level is provided.

TABLE 3.5-1

REACTOR COOLANT SPECIFIC ACTIVITY (μCi/cc), 577 F

Nuclide	Half Life	Anticipated Operational Occurrences (1.0% Failed Fuel)	Normal Operations (0.1% Failed Fuel)	Nuclide	Half Life	Anticipated Operational Occurrences (1.0% Failed Fuel)	Normal Operations (0.1% Failed Fuel)
H-3	12.3y	0.132	0.107	I-133	21h	5.66	0.566
Br-84	32m	4.66(-2)*	4.66(-3)	Xe-133	5.3d	181.0	18.1
Kr-85m	4.4h	1.49	0.149	Te-134	42m	2.62(-2)	2.62(-3)
Kr-85	10.8y	0.885	8.85(-2)	I-134	52m	0.62	6.2(-2)
Kr-87	76m	0.81	8.1(-2)	Cs-134	2.1y	0.10	1.0(-2)
Kr-88	2.8h	2.6	0.26	I-135	6.7h	2.7	0.27
Rb-88	18m	2.55	0.255	Xe-135	9.2h	7.53	0.753
Rb-89	15m	6.4(-2)	6.4(-3)	Cs-136	13d	2.55(-2)	2.55(-3)
Sr-89	51d	5.07(-3)	5.07(-4)	Cs-137	30y	0.32	3.2(-2)
Sr-90	28.8y	2.61(-4)	2.61(-5)	Xe-138	17m	0.36	3.6(-2)
Y-90	64h	1.02(-3)	1.02(-4)	Cs-138	32m	0.69	6.9(-2)
Sr-91	9.7h	3.56(-3)	3.56(-4)	Ba-140	12.8d	6.11(-3)	6.11(-4)
Y-91	59d	0.111	1.11(-2)	La-140	40.2h	5.85(-3)	5.85(-4)
Mo-99	67h	2.03	0.203	Pr-143	13.6d	5.84(-3)	5.84(-4)
Ru-103	39.6d	4.13(-3)	4.13(-4)	Ce-144	285d	4.13(-3)	4.13(-4)
Ru-106	367d	2.48(-4)	2.48(-5)	(Corrosion Products)			
Te-129	67m	2.51(-2)	2.51(-3)	Co-60	5.2y	5.19(-4)	5.19(-4)
I-129	1.7(7)y	7.21(-8)	7.21(-9)	Fe-59	45d	2.13(-5)	2.13(-5)
I-131	8.0d	3.97	0.397	Co-58	71d	4.66(-3)	4.66(-3)
Xe-131m	12d	1.48	0.148	Mn-54	312d	2.75(-5)	2.75(-5)
Te-132	78h	0.33	3.3(-2)	Cr-51	27d	3.8(-3)	3.8(-3)
I-132	2.3h	1.09	0.109	Zr-95	65d	9.35(-7)	9.35(-7)

*( ) denotes power of ten.

TABLE 3.5-2

BASES FOR REACTOR COOLANT RADIOACTIVITY

Core power level, Mwt	2700
Fuel cycle full power days	357
Percent failed fuel	1.0
CVCS purification ion exchanger decontamination factor	10
Purification flow rate (CVCS purification ion exchanger), gpm	40
Effective purification flow rate for lithium and cesium removal, gpm	8
Fission product escape rate coefficients, sec^{-1} (Based on centerline melting of fuel)	
Noble gases (Xenon, Krypton)	6.5×10^{-8}
Iodines, Cs	2.3×10^{-8}
Te, Mo.	1.4×10^{-9}
All others	1.4×10^{-11}
Feed and bleed liquid waste for fuel burnup, gal/yr	216,000
Other feed and bleed liquid waste, gal/yr	617,000
Thermal neutron flux, $n/cm^3 sec$	4.3×10^{13}
Reactor coolant volume, ft^3	9662

TABLE 3.5-3

SOURCES AND VOLUMES OF LIQUID WASTE

1. Boron Recovery System

Source	Waste Generating Operation	Volume (gal/yr)
Chemical and volume control system	Boron reduction for fuel burnup	216,000
	Cold shutdown and startups	332,000
	Hot shutdowns and startups	161,000
	Refueling shutdown and startup	68,000
Resin dewatering	Sluice and dewater 256 ft^3 resin per year at 2 ft^3 water/ft^3 resin	3,800
Reactor coolant leakage	200 gpd for four reactor coolant pumps	62,600
		843,400

2. Liquid Waste System

Equipment drains and leakage	75 gal/day	28,000
Sample and laboratory sink drains	20 gal/day	7,000
Equipment decontamination	10 gpm for 20 minutes per day	73,000
Floor drains	5 gpm for 10 minutes per day	18,000
Fuel cask washdown	400 gal/cask per refueling	30,000
Sub-total		156,000
Laundry	200 gal/day	73,000
Showers	4 showers per day at 30 gal per shower	44,000
Total	Estimated Normal Operation	273,000

3

TABLE 3.5-4

DESIGN DATA FOR BORON RECOVERY [illegible]TEM COMPONENTS

Ion Exchangers	Preconcentrator	Boric Acid Condensate
Quantity	2	2
Type resin	Mixed Bed	Hydroxil Anion
Design pressure, psig	150	150
Design temperature, F	200	200
Normal operating pressure, psig	40	25
Normal operating temperature, F	100	120
Resin volume, ft^3	32	32
Materials	SS	SS
ASME Code, Section	III, Class 2	III, Class 2

Tanks	Reactor Drain	Flash	Holdup	Boric Acid Condensate	Boric Acid Holding
Quantity	1	1	4	2	1
Internal Volume, gal	1600	400	40,000	7,300	2,400
Design pressure, psig	25	15	10	Atmos.	Atmos.
Design temperature, F	250	250	240	250	200
Normal operating pressure, psig	0.5	0.5	0.5(psia)	Atmos.	Atmos.
Normal operating temperature, F	120	120	120	120	150
Blanket gas	Nitrogen	Nitrogen	Nitrogen		
Material	SS	SS	SS	SS	SS
ASME Code, Section	III,3	III,3	VIII,1		

Pumps	Flash Tank	Reactor Drain	Holdup Drain, Holdup Recir. Boric Acid Cond.	Boric Acid Holding
Quantity-full capacity	2	2	5	2
Type	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Design pressure, psig	150	150	150	150
Design temperature, F	200	200	200	200

TABLE 3.5-4 (Cont'd)

Pumps	Flash Tank	Reactor Drain	Holdup Drain, Holdup Recir. Boric Acid Cond.	Boric Acid Holding
Design conditions				
Flow, gpm	150	50	50	50
Head, ft	51	140	140	96
Wetted materials	SS	SS	SS	SS
Seal type	Mechanical	Mechanical	Mechanical	Mechanical
Motor horsepower	7.5	5	5	5
Motor voltage, volt	460	460	460	460
ASME Code, Section	III, 3	III, 3	None	None

Filters	Preconcentrator
Quantity	2
Type of Elements	Replaceable Cartridge
Retention of 2 micron particles, %	98
Design pressure, psig	150
Design temperature, F	200
Design flow, gpm	100
Material	Stainless Steel
ASME Code, Section	VIII

Boric Acid Concentrator

Quantity	2
Design pressure, psig	80
Design temperature, F	250
Design flow, gpm	20
Cooling water flow rate, gpm	650
Steam required at 15 psig, lb/hr	13,000
ASME Code, Section	VIII

TABLE 3.5-5

BORON RECOVERY SYSTEM PROCESS FLOW DATA

Mode #1(1)

Location:	1	2	3	4	5	6	7	8
Flow, gpm	200 gpd	50	50	50	50	60	50	50
Pressure, psig	1	4	12	7.5	6.5	4	45	2
Temperature, F	120	120	120	120	120	120	120	120

Mode #2(1)

Location:	1	2	3	4	5	6	7	8
Flow, gpm	200 gpd	-	-	40	40	50	40	40
Pressure, psig	1	-	-	5	4.5	4	44	2
Temperature, F	120	-	-	120	120	120	120	120

Mode #3(1)

Location:	1	2	3	4	5	6	7	8
Flow, gpm	200 gpd	-	-	84	84	94	84	84
Pressure, psig	1	-	-	21	18.5	4	34	2
Temperature, F	120	-	-	120	120	120	120	120

Mode #4(1)

Location:	1	2	3	4	5	6	7	8
Flow, gpm	200 gpd	-	-	128	128	138	128	128
Pressure, psig	1	-	-	51	45.5	4	18	2
Temperature, F	120	-	-	120	120	120	120	120

TABLE 3.5-5 (Cont'd)

Mode #5 (1)

Location:	12	13	14	15	16	17	18	19	20	21
Flow, gpm	20	20	20	20	0-10	16-19	15-19	50	50	50
Pressure, psig	3	65	62	60	5	5	2	4	60	10
Temperature, F	120	120	120	120	120	120	120	120	120	120

Mode #6 (1)

Location:	9	10	11	15a	16a
Flow, gpm	50	50	50	50	50
Pressure, psig	4	32	27	24	20
Temperature, F	120	120	120	120	120

Mode #7

Location:	22	23
Flow, gpm	50	50
Pressure, psig	4	40
Temperature, F	150	150

NOTES:

(1) The modes of operation are defined as follows:

Mode No.	Description
1	Processing RDT Contents
2	CVCS normal purification VCT diversion processing
3	CVCS intermediate purification VCT diversion processing
4	CVCS maximum purification VCT diversion processing
5	Processing holdup tank contents via the boric acid concentrator
6	Holdup tank contents recirculation
7	Pumping BAHT contents to the BAMT in the CVCS.

(2) The pressure drop across the filters and ion exchangers will vary with loading.

TABLE 3.5-6

EXPECTED FILTER AND ION EXCHANGER PERFORMANCE

Nuclide	Chemical and Volume Control System: Filter DF	Chemical and Volume Control System: Ion Exchanger DF	Boron Recovery Waste Processing System: Filter DF	Boron Recovery Waste Processing System: Ion Exchanger DF
Br-84	1	10^3	1	10^2
Rb-88	1	1	1	10^2
Rb-89	1	1	1	10^2
Sr-89	1	10^2	1	10
Sr-90	1	10^2	1	10
Y-90	1	1	1	10
Sr-91	1	10^2	1	10
Y-91	1	1	1	10
Mo-99	1	1	1	10
Ru-103	1	10	1	10
Ru-106	1	10	1	10
Te-129	1	10	1	10
I-129	1	10^3	1	10^3
I-131	1	10^3	1	10^3
Te-132	1	10	1	10
I-132	1	10^3	1	10^3
I-133	1	10^3	1	10^3
Te-134	1	10	1	10
I-134	1	10^3	1	10^3
Cs-134	1	1	1	10^2
I-135	1	10^3	1	10^3
Cs-136	1	1	1	10^2
Cs-137	1	1	1	10^2
Cs-138	1	1	1	10^2
Ba-140	1	10^2	1	10
La-140	1	10	1	10
Pr-140	1	10	1	10
Ce-144	1	10	1	10
Co-60	10	1	1	1
Fe-59	10	1	1	1
Co-58	10	1	1	1
Mn-54	10	1	1	1
Cr-51	10	1	1	1
Zr-95	10	1	1	1

TABLE 3.5-7

BORON RECOVERY SYSTEM PERFORMANCE DATA

Flash tank DF for fission gases	2
Boric acid concentrator	
DF for liquid (influent to distillate)	200
DF for fission gases	5
Holdup tank delay factor, days	9
Annual system condensate released to circulating water discharge[(1)]	
Volume, gal.	843,000
Activity, curies	
H-3	339
Dissolved Fission Product Gases	24,500
All Others	0.89

Note: (1) The volume and activity values obtained are based on 843,000 gals of waste to BMS with 1% failed fuel.

TABLE 3.5-8

BORON RECOVERY SYSTEM (BRS) MAXIMUM NUCLIDE CONCENTRATIONS (70F) DURING NORMAL OPERATIONS (μCi/cc)

Nuclide	CVCS 6 BRS 1	CVCS 7	CVCS 10 BRS 2,3,4,5	BRS 6,7,8	BRS 12,13,14	BRS 15	BRS 16	BRS 18,19,20,21
H-3	1.47(-1)*	1.47(-1)	1.47(-1)	1.47(-1)	1.47(-1)	1.47(-1)	1.47(-1)	1.47(-1)
Br-84	6.40(-3)	6.40(-2)	6.43(-6)	6.43(-6)	0.0	0.0	0.0	0.0
Kr-85m	2.05(-1)	2.05(-1)	2.05(-1)	1.03(-1)	1.71(-16)	1.71(-16)	0.0	3.43(-17)
Kr-85	1.22(-1)	1.22(-1)	1.22(-1)	6.11(-2)	6.10(-2)	6.10(-2)	0.0	1.22(-2)
Kr-87	1.12(-1)	1.12(-1)	1.12(-1)	5.59(-2)	0.0	0.0	0.0	0.0
Kr-88	3.59(-1)	3.59(-1)	3.59(-1)	1.79(-2)	0.0	0.0	0.0	0.0
Rb-88	3.52(-1)	3.52(-1)	3.52(-1)	3.52(-1)	0.0	0.0	0.0	0.0
Rb-89	8.80(-3)	8.80(-3)	8.80(-3)	8.80(-3)	0.0	0.0	0.0	0.0
Sr-89	6.99(-4)	6.99(-4)	6.99(-6)	6.99(-6)	6.18(-6)	6.18(-7)	3.09(-5)	3.09(-9)
Sr-90	3.60(-5)	3.60(-5)	3.60(-7)	3.60(-7)	3.60(-7)	3.60(-8)	1.80(-6)	1.80(-10)
Y-90	1.41(-4)	1.41(-4)	1.41(-4)	1.41(-4)	1.36(-5)	1.36(-6)	6.83(-5)	6.83(-9)
Sr-91	4.91(-4)	4.91(-4)	4.91(-6)	4.91(-6)	9.72(-13)	9.72(-14)	4.86(-12)	4.86(-16)
Y-91	1.53(-2)	1.53(-2)	1.53(-2)	1.53(-2)	1.38(-2)	1.40(-3)	6.89(-2)	6.89(-6)
Mo-99	2.80(-1)	2.80(-1)	2.80(-1)	2.80(-1)	3.00(-2)	3.00(-3)	1.50(-1)	1.50(-5)
Ru-103	5.70(-4)	5.70(-4)	5.70(-5)	5.70(-5)	4.87(-5)	4.87(-6)	2.43(-4)	2.43(-8)
Ru-106	3.42(-5)	3.42(-5)	3.42(-6)	3.42(-6)	3.36(-6)	3.36(-7)	1.68(-1)	1.68(-9)
Te-129	3.50(-3)	3.50(-3)	3.46(-4)	3.46(-4)	0.0	0.0	0.0	0.0

*Numbers in ( ) are powers of ten

SL2

TABLE 3.[illegible]-8 (Cont'd)

Nuclide	CVCS 6 BRS 1	CVCS 7	CVCS 10 BRS 2,3,4,5	BRS 6,7,8	BRS 12,13,14	BRS 15	BRS 16	BRS 18,19,20,21
I-129	9.95(-9)	9.95(-9)	9.95(-12)	9.95(-12)	9.95(-12)	9.95(-15)	4.97(-13)	4.97(-17)
I-131	5.48(-1)	5.48(-1)	5.48(-4)	5.48(-4)	2.52(-4)	2.52(-7)	1.26(-5)	1.26(-9)
Xe-131m	2.04(-1)	2.04(-1)	2.04(-1)	1.02(-1)	6.07(-2)	6.07(-2)	0.0	1.21([illegible]
Te-132	4.55(-2)	4.55(-2)	4.60(-3)	4.60(-3)	6.92(-4)	6.92(-5)	3.5(-3)	3.46[illegible]
I-132	1.50(-1)	1.50(-1)	1.50(-4)	1.50(-4)	0.0	0.0	0.0	0.0
I-133	7.81(-1)*	7.81(-1)	7.81(-4)	7.81(-4)	6.25(-7)	6.26(-10)	3.13(-8)	3.13(-12)
Xe-133	2.49(+1)	2.49(+1)	2.49(+1)	1.25(+1)	3.82	3.82	0.0	7.64(-1)
Te-134	3.60(-3)	3.60(-3)	3.61(-4)	3.61(-4)	0.0	0.0	0.0	0.0
I-134	8.56(-2)	8.56(-2)	8.55(-5)	8.55(-5)	0.0	0.0	0.0	0.0
Cs-134	1.38(-2)	1.38(-2)	1.38(-2)	1.38(-2)	1.37(-2)	1.37(-4)	6.80(-3)	6.84(-7)
I-135	3.72(-1)	3.72(-1)	3.72(-4)	3.72(-4)	7.35(-14)	7.35(-17)	3.68(-15)	3.68(-19)
Xe-135	1.04	1.04	1.04	5.19(-1)	8.18(-11)	8.18(-11)	0.0	1.63(-11)
Cs-136	3.50(-3)	3.50(-3)	3.50(-3)	3.50(-3)	2.20(-3)	2.18(-5)	1.10(-3)	1.09(-7)
Cs-137	4.42(-2)	4.42(-2)	4.42(-2)	4.42(-2)	4.41(-2)	4.41(-4)	2.21(-2)	2.21(-6)
Xe-138	4.97(-2)	4.97(-2)	4.97(-2)	2.48(-2)	0.0	0.0	0.0	0.0
Cs-138	9.52(-2)	9.52(-2)	9.52(-2)	9.52(-2)	0.0	0.0	0.0	0.0
Ba-140	8.43(-4)	8.43(-4)	8.43(-6)	8.43(-6)	5.18(-6)	5.18(-7)	2.59(-5)	2.59(-9)
La-140	8.07(-4)	8.07(-4)	8.07(-5)	8.07(-5)	1.95(-6)	1.95(-7)	9.74(-6)	9.74(-10)
Pr-143	8.06(-4)	8.06(-4)	8.06(-5)	8.06(-5)	5.11(-5)	5.11(-6)	2.55(-4)	2.55(-8)

*Numbers in ( ) are powers of ten.

SL2

TABLE 3.5-8 Cont'd)

Nuclide	CVCS 6 BRS 1	CVCS 7	CVCS 10 BRS 2,3,4,5	BRS 6,7,8	BRS 12,13,14	BRS 15	BRS 16	BRS 18,19,20,21
Ce-144	5.70(-4)	5.70(-4)	5.70(-5)	5.70(-5)	5.57(-5)	5.57(-6)	2.79(-4)	2.79(-8)
Co-60	7.16(-4)	7.16(-5)	7.16(-5)	7.16(-5)	7.14(-5)	7.14(-5)	3.60(-3)	3.57(-7)
Fe-59	2.94(-5)	2.94(-6)	2.94(-6)	2.94(-6)	2.56(-6)	2.56(-6)	1.28(-4)	1.28(-8)
Co-58	6.40(-3)	6.43(-4)	6.43(-4)	6.43(-4)	5.89(-4)	5.89(-4)	2.94(-2)	2.94(-6)
Mn-54	3.79(-5)	3.79(-6)	3.79(-6)	3.79(-6)	3.72(-6)	3.72(-6)	1.86(-4)	1.86(-8)
Cr-51	5.20(-3)	5.24(-4)	5.24(-4)	5.24(-4)	4.19(-4)	4.19(-4)	2.10(-2)	2.09(-6)
Zr-95	1.[illegible](-6)	1.29(-7)	1.29(-7)	1.29(-7)	1.17(-7)	1.17(-7)	5.86(-6)	5.86(-10)

*Numbers in ( ) are powers of ten

SL2

TABLE 3.5-9

BORON RECOVERY SYSTEM (BRS) MAXIMUM NUCLIDE CONCENTRATIONS (70F) DURING ANTICIPATED OPERATIONS (uCi/cc)

Nuclide	CVCS 6 1	CVCS 7	CVCS 10 2, 3, 4, 5	6, 7, 8	12, 13, 14	15	16	18, 19, 20, 21
H-3	1.82(-1)*	1.82(-1)	1.82(-1)	1.82(-1)	1.82(-1)	1.82(-1)	1.82(-1)	1.82(-1)
Br-84	6.43(-1)	6.43(-1)	6.43(-5)	6.43(-5)	0.0	0.0	0.0	0.0
Kr-85m	2.06	2.06	2.06	1.03	1.72(-15)	1.72(-15)	0.0	3.43(-16)
Kr-85	1.22	1.22	1.22	6.10(-1)	6.09(-1)	6.09(-1)	0.0	1.22(-1)
Kr-87	1.12	1.12	1.12	5.59(-1)	0.0	0.0	0.0	0.0
Kr-88	3.59	3.59	3.59	1.79	0.0	0.0	0.0	0.0
Rb-88	3.52	3.52	3.52	3.52	0.0	0.0	0.0	0.0
Rb-89	8.83(-2)	8.83(-2)	8.83(-2)	8.83(-2)	0.0	0.0	0.0	0.0
Sr-89	7.00(-3)	7.00(-3)	6.99(-5)	6.99(-5)	6.18(-5)	6.18(-6)	3.09(-4)	3.09(-8)
Sr-90	3.60(-4)	3.60(-4)	3.60(-6)	3.60(-6)	3.60(-6)	3.60(-7)	1.80(-5)	1.80(-9)
Y-90	1.40(-3)	1.40(-3)	1.40(-3)	1.40(-3)	1.36(-4)	1.36(-5)	6.83(-4)	6.83(-8)
Sr-91	4.90(-3)	4.90(-3)	4.91(-5)	4.91(-5)	9.72(-12)	9.72(-13)	4.86(-11)	4.86(-15)
Y-91	1.53(-1)	1.53(-1)	1.53(-1)	1.53(-1)	1.38(-1)	1.38(-1)	6.89(-1)	6.89(-5)
Mo-99	2.80	2.80	2.80	2.80	2.99(-1)	3.00(-2)	1.50	1.50(-4)
Ru-103	5.70(-3)	5.70(-3)	5.69(-4)	5.69(-4)	4.87(-4)	4.87(-5)	2.40(-3)	2.44(-7)
Ru-106	3.42(-4)	3.42(-4)	3.42(-5)	3.42(-5)	3.36(-5)	3.36(-6)	1.68(-4)	1.68(-8)
Te-129	3.46(-2)	3.46(-2)	3.50(-3)	3.50(-3)	0.0	0.0	0.0	0.0
I-129	9.95(-8)	9.95(-8)	9.95(-11)	9.95(-11)	9.95(-11)	9.95(-14)	4.97(-12)	4.97(-16)
I-131	5.48	5.48	5.50(-3)	5.50(-3)	2.50(-3)	2.52(-6)	1.26(-4)	1.26(-8)
Xe-131m	2.04	2.04	2.04	1.02	6.07(-1)	6.07(-1)	0.0	1.21(-1)
Te-132	4.55(-1)	4.55(-1)	4.55(-2)	4.55(-2)	6.90(-3)	6.92(-4)	3.46(-2)	3.46(-6)
I-132	1.50	1.50	1.50(-3)	1.50(-2)	0.0	0.0	0.0	0.0
I-133	7.81	7.81	7.80(-3)	7.80(-3)	6.26(-6)	6.26(-9)	3.13(-7)	3.13(-11)
Xe-133	2.49(+2)	2.49(+2)	2.49(+2)	1.25(+2)	3.82(+1)	3.82(_1)	0.0	7.64

* Numbers in ( ) are powers of ten.

TABLE 3.5-9 (Cont'd)

Nuclide	CVCS 6 1	CVCS 7	CVCS 10 2, 3, 4, 5	6, 7, 8	12, 13, 14	15	16	18, 19, 20, 21
Te-134	3.62(-2)*	3.62(-2)	3.60(-3)	3.60(-3)	0.0	0.0	0.0	0.0
I-134	8.55(-1)	8.55(-1)	8.55(-4)	8.55(-4)	0.0	0.0	0.0	0.0
Cs-134	1.38(-1)	1.38(-1)	1.38(-1)	1.38(-1)	1.37(-1)	1.40(-3)	6.84(-2)	6.84(-6)
I-135	3.73	3.73	3.70(-3)	3.70(-3)	7.35(-13)	7.35(-16)	3.68(-14)	3.68(-18)
Xe-135	10.39	10.39	10.39	5.19	8.18(-10)	8.18(-10)	0.0	1.64(-10)
Cs-136	3.52(-2)	3.52(-2)	3.52(-2)	3.52(-2)	2.18(-2)	2.18(-4)	1.09(-2)	1.09(-6)
Cs-137	4.42(-1)	4.42(-1)	4.42(-1)	4.42(-1)	4.41(-1)	4.40(-3)	2.20(-1)	2.21(-5)
Xe-138	4.97(-1)	4.97(-1)	4.97(-1)	2.48(-1)	0.0	0.0	0.0	0.0
Cs-138	9.52(-1)	9.52(-1)	9.52(-1)	9.52(-1)	0.0	0.0	0.0	0.0
Ba-140	8.40(-3)	8.40(-3)	8.43(-5)	8.43(-5)	5.18(-5)	5.18(-6)	2.59(-4)	2.59(-8)
La-140	8.10(-3)	8.10(-3)	8.07(-4)	8.07(-4)	1.95(-5)	1.95(-6)	9.74(-5)	9.74(-9)
Pr-143	8.10(-3)	8.10(-3)	8.06(-4)	8.06(-4)	5.11(-4)	5.11(-5)	2.60(-3)	2.55(-7)
Ce-144	5.70(-3)	5.70(-3)	5.70(-4)	5.70(-4)	5.70(-4)	5.57(-5)	2.80(-3)	2.79(-7)
Co-60	7.16(-4)	7.16(-5)	7.16(-5)	7.16(-5)	7.14(-5)	7.14(-5)	3.60(-3)	3.57(-7)
Fe-59	2.94(-5)	2.94(-6)	2.94(-6)	2.94(-6)	2.56(-6)	2.56(-6)	1.28(-4)	1.28(-8)
Co-58	6.40(-3)	6.34(-4)	6.43(-4)	6.43(-4)	5.89(-4)	5.89(-4)	2.94(-2)	2.94(-6)
Mn-54	3.79(-5)	3.79(-5)	3.79(-6)	3.79(-6)	3.72(-6)	3.72(-6)	1.86(-4)	1.86(-8)
Cr-51	5.20(-3)	5.24(-4)	5.24(-4)	5.24(-4)	4.19(-4)	4.19(-4)	2.10(-2)	2.09(-6)
Zr-95	1.29(-6)	1.29(-7)	1.29(-7)	1.29(-7)	1.17(-7)	1.17(-7)	5.86(-6)	5.86(-10)

*Numbers in ( ) are powers of ten.

TABLE 3.5-10

DESIGN DATA FOR LIQUID WASTE SYSTEM COMPONENTS

1. Ion Exchanger	Waste
Quantity	1
Type resin	Mixed bed
Design pressure, psig	150
Design temperature, F	200
Normal operating pressure, psig	40
Normal operating temperature, F	120
Resin volume, ft^3	32
Materials	SS
ASME code, division	VIII

2. Tanks	Equipment Drain	Chemical Drain	Laundry Drain	Waste Condensate
Quantity	2	1	2	2
Internal volume, gal.	25,000	1000	2000	1725
Design pressure, psig	Atmos.	Atmos.	Atmos.	Atmos.
Design temperature, F	200	200	200	250
Normal Operating pressure, psig	Atmos.	Atmos.	Atmos.	Atmos.
Normal operating temperature, F	120	120	120	120
Material	SS	SS	SS	SS
ASME code, division	VIII, I(1)	VIII, I(1)	VIII, I(1)	N.A.

3. Pumps	Equipment Drain, Chemical Drain Laundry Drain, Waste Condensate
Quantity	6
Type	Centrifugal
Design pressure, psig	150
Design temperature, F	200

TABLE 3.5-10 (Cont'd)

3.	Pumps (cont'd)	Equipment Drain, Chemical Drain Laundry Drain, Waste Condensate	
	Design conditions		
	Flow, gpm	50	
	Head, ft	140	
	Wetted materials	SS	
	Seal type	Mechanical	
	Motor horsepower	7.5	
	Motor voltage/phase/hz	460/3/60	
	ASME code	N.A.	
4.	Filters	Waste	Laundry
	Quantity	1	1
	Type of elements	Replaceable Cartridge	Replaceable Cartridge
	Particle retention	25 micron, absolute	150 micron, nominal
	Design pressure, psig	150	150
	Design temperature, F	200	200
	Design flow, gpm	50	50
	Material	Stainless Steel	Stainless Steel
	ASME code, division	VIII	VIII
5.	Waste Concentrator		
	Quantity	1	
	Design pressure, psig	80	
	Design temperature, F	250	
	Design flow, gpm	2	
	Cooling water flow rate, gpm	130	
	Steam required at 15 psig, lb/hr	1300	
	ASME code, division	VIII	

TABLE 3.5-11

LIQUID WASTE SYSTEM
PRESSURE, TEMPERATURE AND FLOW DATA

Mode 1[(1)]

Location	1	2	3	4	5	6	7	8	9
Pressure, psig	0.5	0.5	2.0	67	0.5	2.0	2.0	0.5	2.0
Temperature, F	120	120	120	120	120	120	120	120	120
Flow, gpm	0.825	.912	7	2	.209	0	0	0.223	0

Location	10	11	12	13	14	15	16
Pressure, psig	2.0	2.0	67	5	4	4	62
Temperature, F	120	120	120	120	120	120	120
Flow, gpm	0	0	2	2	2	55	50

Mode 2[(2)]

Location	1	2	3	4	5	6	7	8	9
Pressure, psig	0.5	0.5	2.0	2.0	0.5	2.0	67	0.5	2.0
Temperature, F	120	120	120	120	120	120	120	120	120
Flow, gpm	0.825	0.912	0	0	0.209	7	2	.223	0

Location	10	11	12	13	14	15	16
Pressure, psig	2.0	2.0	67	5	4	62	62
Temperature, F	120	120	120	120	120	120	120
Flow, gpm	0	0	2	2	2	55	50

TABLE 3.5-11 (Cont'd)

Mode 3(3)

Location	1	2	3	4	5	6	7	8	9
Pressure, psig	0.5	0.5	2.0	2.0	0.5	2.0	2.0	0.5	2.0
Temperature, F	120	120	120	120	120	120	120	120	120
Flow, gpm	0.825	0.912	0	0	C.209	0	0	0.223	55

Location	10	11	12	13	14	15	16
Pressure, psig	62	47	2.0	0	0	0	0
Temperature, F	120	120	120	120	120	120	120
Flow, gpm	50	50	0	0	0	0	0

(1) Mode 1 Processing equipment drain tank contents via the waste concentrator; discharging a waste condensate tank.

(2) Mode 2 Processing chemical drain tank contents via the waste concentrator; discharging a waste condensate tank.

(3) Mode 3 Discharging a laundry drain tank.

TABLE 3.5-12

LIQUID WASTE SYSTEM EXPECTED PERFORMANCE

Ion exchanger decontamination factor	
Tritium, corrosion products	1
All others	10
Filter decontamination factor	
All nuclides	1
Waste concentrator decontamination factor	500
Holdup time for liquid waste system, days	
Anticipated	1
Normal	4.5

TABLE 3.5-13

LIQUID WASTE SYSTEM NORMAL ACTIVITY DISTRIBUTION (μCi/cc at 70F)

Location	1	2	3 & 12	13	14	15	21
H-3	6.65(-3)*	1.48(-3)	5.29(-3)	5.29(-3)	5.29(-3)	5.29(-3)	5.29(-3)
Br-84	1.31(-7)	6.43(-5)	0.0	0.0	0.0	0.0	0.0
Kr-85m	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kr-85	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kr-87	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kr-88	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rb-88	4.05(-6)	3.50(-3)	0.0	0.0	0.0	0.0	0.0
Rb-89	9.22(-8)	8.83(-5)	0.0	0.0	0.0	0.0	0.0
Sr-89	2.22(-5)	6.99(-6)	1.71(-5)	3.42(-8)	3.42(-9)	3.22(-9)	3.42(-4)
Sr-90	3.56(-6)	3.60(-7)	2.72(-6)	5.44(-9)	5.44(-10)	5.43(-10)	5.44(-5)
Y-90	3.38(-7)	1.41(-6)	1.93(-7)	3.87(-10)	3.86(-11)	1.21(-11)	3.89(-6)
Sr-91	1.82(-7)	4.91(-6)	6.37(-10)	1.27(-12)	1.27(-13)	5.66(-17)	1.27(-8)
Y-91	5.39(-4)	1.53(-4)	4.15(-4)	8.29(-7)	8.29(-8)	7.87(-8)	8.30(-3)
Mo-99	7.02(-4)	2.80(-3)	4.11(-4)	8.22(-7)	8.22(-8)	2.69(-8)	8.20(-3)
Ru-103	1.53(-5)	5.70(-6)	1.18(-5)	2.37(-8)	2.37(-9)	2.19(-9)	2.37(-4)
Ru-106	2.64(-6)	3.42(-7)	2.01(-6)	4.03([illegible])	4.03(-10)	3.99(-10)	4.03(-5)
Te-129	1.48(-7)	3.46(-5)	0.0	0.0	0.0	0.0	0.0
I-129	9.95(-10)	9.95(-11)	7.58(-10)	1.52(-12)	1.52(-13)	1.52(-13)	1.52(-8)
I-131	3.80(-3)	5.50(-3)	2.90(-3)	5.74(-6)	5.74(-7)	3.89(-7)	5.74(-2)
Xe-131m	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Te-132	1.35(-4)	4.55(-4)	8.55(-5)	1.71(-7)	1.71(-8)	6.67(-9)	1.70(-3)
I-132	1.32(-5)	1.50(-3)	2.97(-18)	5.95(-21)	5.95(-22)	4.35(-36)	5.95(-17)
I-133	6.24(-4)	7.80(-3)	7.13(-5)	1.43(-7)	1.43(-8)	4.04(-10)	1.40(-3)
Xe-133	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Te-134	9.71(-8)	3.62(-5)	0.0	0.0	0.0	0.0	0.0

* Numbers in ( ) are powers of ten.

TABLE 3.5-13 (Cont'd)

Location	1	2	3 & 12	13	14	15	21
I-134	2.90(-6)*	8.55(-4)	0.0	0.0	0.0	0.0	0.0
Cs-134	1.20(-3)	1.38(-4)	9.20(-4)	1.84(-6)	1.84(-7)	1.83(-7)	1.84(-2)
I-135	9.55(-5)	3.70(-3)	1.48(-8)	2.96(-11)	2.96(-12)	4.16(-17)	2.96(-7)
Xe-135	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cs-136	3.76(-5)	3.52(-5)	2.90(-5)	5.82(-8)	5.82(-9)	4.58(-9)	5.82(-4)
Cs-137	4.40(-3)	4.42(-4)	3.30(-3)	6.67(-6)	6.67(-7)	6.66(-7)	6.67(-2)
Xe-138	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cs-138	1.96(-6)	9.52(-4)	0.0	0.0	0.0	0.0	0.0
Ba-140	8.89(-6)	8.43(-6)	6.87(-6)	1.37(-8)	1.37(-9)	1.08(-9)	1.37(-4)
La-140	1.22(-6)	8.07(-6)	4.71(-7)	9.42(-10)	9.42(-11)	1.46(-11)	9.42(-6)
Pr-143	9.03(-6)	8.06(-6)	6.98(-6)	1.39(-8)	1.39(-9)	1.11(-9)	1.40(-4)
Ce-144	4.13(-5)	5.70(-6)	3.15(-5)	6.31(-8)	6.31(-9)	6.24(-9)	6.31(-4)
Co-60	6.78(-5)	7.16(-6)	5.17(-5)	1.03(-7)	1.03(-7)	1.03(-7)	1.00(-3)
Fe-59	8.61(-7)	2.94(-7)	6.64(-7)	1.33(-9)	1.33(-9)	1.24(-9)	1.33(-5)
Co-58	2.54(-4)	6.43(-5)	1.95(-4)	3.91(-7)	3.91(-7)	3.74(-7)	3.90(-3)
Mn-54	2.81(-6)	3.79(-7)	2.15(-6)	4.30(-9)	4.30(-9)	4.26(-9)	4.30(-5)
Cr-51	1.07(-4)	5.24(-5)	8.27(-5)	1.65(-7)	1.65(-7)	1.48(-7)	1.70(-3)
Zr-95	4.83(-8)	1.29(-8)	3.71(-8)	7.43(-11)	7.43(-11)	7.08(-11)	7.23(-7)

* Numbers in ( ) are powers of ten.

TABLE 3.5-14

LIQUID WASTE SYSTEM ANTICIPATED OPERATIONAL OCCURRENCE ACTIVITY DISTRIBUTION (μCi/cc at 70F)
(Reference Figure 11.2-4)

WMS Location	1	2	3 & 12	13	14	15	21
H-3	1.60(-2)*	1.82(-3)	1.13(2)	1.13(-2)	1.13(-2)	1.13(-2)	1.13(-2)
Br 84	7.88(-6)	6.43(-4)	4.99(-18)	0.0	0.0	0.0	9.98(-17)
Kr 85m	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kr 85	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kr 87	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kr 88	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rb 88	2.43(-4)	3.52(-2)	0.0	0.0	0.0	0.0	0.0
Rb 89	5.53(-6)	8.83(-4)	0.0	0.0	0.0	0.0	0.0
Sr 89	5.15(04)	6.99(-5)	3.92(-4)	7.85(-7)	7.85(-8)	7.74(-8)	7.80(-3)
Sr 90	3.59(-5)	3.60(-6)	2.74(-5)	5.48(-8)	5.48(-9)	5.48(-9)	5.48(-4)
Y 90	1.81(-5)	1.41(-5)	1.32(-5)	2.63(-8)	2.63(-9)	2.03(-9)	2.63(-4)
Sr 91	1.07(-5)	4.91(-5)	3.75(-6)	7.51(-9)	7.51(-10)	1.35(-10)	7.51(-5)
Y 91	1.17(-2)	1.50(-3)	8.90(-3)	1.78(-5)	1.78(-6)	1.76(-6)	1.78(-1)
Mo 99	3.74(-2)	2.80(-2)	2.73(-2)	5.45(-5)	5.45(-6)	4.25(-6)	5.45(-1)
Ru 103	3.92(-4)	5.70(-5)	2.98(-4)	5.97(-7)	5.97(-8)	5.87(-8)	6.00(-3)
Ru 106	3.26(-5)	3.42(-6)	2.48(-5)	4.97(-8)	4.97(-9)	4.96(-9)	4.97(-4)
Te 129	8.88(-6)	3.46(-4)	3.32(-11)	6.64(-14)	6.64(-15)	2.25(-21)	6.64(-10)
I 129	9.95(-9)	9.95(-10)	7.58(-9)	1.52(-11)	1.52(-12)	1.52(-12)	1.52(-7)
I 131	1.69(-1)	5.48(-2)	1.27(-1)	2.54(-4)	2.54(-5)	2.33(-5)	2.54
Xe 131m	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Te 132	7.00(-3)	4.60(-3)	5.20(-3)	1.04(-5)	1.04(-6)	8.40(-7)	1.04(-1)
I 132	7.92(-4)	1.50(-2)	3.29(-6)	6.58(-9)	6.58(-10)	4.75(-13)	6.58(-5)
I 133	3.60(-2)	7.81(-2)	2.13(-2)	4.27(-5)	4.27(-6)	1.93(-6)	4.27(-1)
Xe 133	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Te 134	5.82(-6)	3.62(-4)	4.76(-15)	9.52(-18)	9.52(-19)	0.0	9.52(-14)

*Numbers in ( ) are powers of ten.

TABLE 3.5-14 (Cont'd)

WMS Location	1	2	3 & 12	13	14	15	21
I 134	1.73(-4)	8.60(-3)	1.58(-11)	3.16(-14)	3.16(-15)	2.09(-23)	3.16(-10)
Cs 134	1.35(-2)	1.40(-3)	1.03(-2)	2.05(-5)	2.05(-6)	2.05(-6)	2.05(-1)
I 135	5.70(-3)	3.73(-2)	1.20(-3)	2.34(-6)	2.34(-7)	1.95(-8)	2.34(-2)
Xe 135	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cs 136	1.50(-3)	3.52(-4)	1.10(-3)	2.23(-6)	2.23(-7)	2.11(-7)	2.23(-7)
Cs 137	4.41(-2)	4.40(-3)	3.36(-2)	6.72(-5)	6.72(-6)	6.72(-6)	6.72(-1)
Xe 138	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cs 138	1.17(-4)	9.50(-3)	8.97(-17)	1.79(-19)	1.79(-20)	0.0	1.79(-15)
Ba 140	3.49(-4)	8.43(-5)	2.64(-4)	5.29(-7)	5.29(-8)	5.01(-8)	5.30(-3)
La 140	6.83(-5)	8.07(-5)	4.73(-5)	9.47(-8)	9.47(-9)	6.26(-9)	9.47(-4)
Pr 143	3.47(-4)	8.06(-5)	2.63(-4)	5.26(-7)	5.26(-8)	5.00(-8)	5.30(-3)
Ce 144	5.36(-4)*	5.70(-5)	4.08(-4)	8.17(-7)	8.17(-8)	8.15(-8)	8.20(-3)
Co 60	7.09(-5)	7.16(-6)	5.41(-5)	1.08(-7)	1.08(-7)	1.08(-7)	1.10(-3)
Fe 59	2.09(-5)	2.94(-7)	1.59(-6)	3.19(-9)	3.19(-9)	3.14(-9)	3.19(-5)
Co 58	5.12(-4)	6.43(-5)	3.90(-4)	7.81(-7)	7.81(-7)	7.73(-7)	7.80(-3)
Mn 54	3.58(-6)	3.79(-7)	3.73(-6)	5.47(-9)	5.47(-9)	5.45(-9)	5.46(-5)
Cr 51	3.17(-4)	5.24(-5)	2.41(-4)	4.83(-7)	4.83(-7)	4.71(-7)	4.80(-3)
Zr 95	1.01(-7)	1.29(-8)	7.68(-8)	1.54(-10)	1.52(-10)	1.52(-10)	1.54(-6)

*Numbers in ( ) are powers of ten.

SL2

TABLE 3.5-15

ASSUMPTIONS USED IN CALCULATING ESTIMATED NORMAL AND ANTICIPATED OPERATIONAL OCCURRENCE RELEASES (1)

	Estimated Normal Releases	Anticipated (2) Operational Occurrence
1. Steam Generator Blowdown		
Main steam flow rate, lb/hr	11,206,000	11,206,000
Liquid inventory per steam generator, lb	130,500	130,500
Blowdown rate, gal/day	200 (26,567)	1,200
Fuel failure, %	0.1	1.0
Iodine partition coefficient	5×10^{-2} (10^{-2})	5×10^{-2}
2. Releases to Reactor Auxiliary Building (3)		
Fuel failure, %	0.1	1.0
Leakage to reactor auxiliary building, gal/day	10 (19.2)	10
Iodine partition coefficient	5×10^{-3}	5×10^{-3}
3. Secondary System Releases		
Steam generator tube leakage rate, gal/day	20 (18.1)	120
Failed fuel, %	0.1	1.0
Condenser iodine partition coefficient	5×10^{-4} (10^{-4})	5×10^{-4}
Flow rate into condenser, lb/hr	7,840,000	7,840,000
Steam weight in main steam piping from steam generator to turbine stop valves (both loops), lb	7940	7940
Condenser steam space (4), lb	327	327
Turbine steam (4), lb	87,000	87,000

(1) Regulatory Guide 1.42 assumptions utilized in the gaseous release analysis that differ from normally applied values are shown in parenthesis.

(2) Releases for anticipated operational occurrences are assumed processed through the waste management system.

(3) Assumed reactor coolant activities to 120 F.

(4) Including hotwell

TABLE 3.5-15 (Cont'd)

Steam generator steam space,(3) lb	9,500	9,500	
Total steam space, lb	104,767	104,767	
Condenser hotwell water weight, lb	680,000	680,000	
Liquid inventory between hotwell and steam generator, lb	480,000	480,000	
Steam leakage to turbine building, lb/hr	20 (1700)	20	3
4. Containment Purge System			
Releases independent of % failed fuel			
Reactor coolant system leak rate, lb/hr	50 (10)		3
Airborne activity cleanup flow rate	20,000 cfm = .48 volume/hr.		
HEPA filter efficiency, %	99.9		
Charcoal filter efficiency, %			
Organic iodine	70		
Inorganic iodine	90		
Operating time of removal system after shutdown, hr	10		
Purge initiation after shutdown, hr	10		
Purge flow rate	20,000 cfm = .48 volume/hr.		
Purge frequency, times/yr.	4		
Purge filter efficiencies, %	0		
Iodine partition coefficient	0.1		
5. Liquid Waste System Releases(4)			
Miscellaneous waste, gal	156,000		
Laundry and showers	117,000		

(3) Including piping

(4) See item 1 for assumptions about blowdown releases from steam generator.

TABLE 3.5-15 (Cont'd)

6) Decay Tanks

	Holdup Time days	Tank Inventory per cent
Reactor Drain Tank	3	50
Holdup Tank	9	50
Boric Acid Condensate Tank	3	50

7) Calculation Assumptions for Seafood Ingestion Dose

A. Individual Dose

1) Consumption

a) fish, kg/yr 18

b) crustacea, kg/yr 9

c) mollusk, kg/yr 9

2) Discharge canal flow, gpm 513,000

3) Reconcentration Factors

Radionuclide	Fish	Crustacea	Mollusks
Cr-51	100	1,000	1,000
Mn-54	3,000	10,000	50,000
Fe-55	1,000	4,000	20,000
Fe-59	1,000	4,000	20,000
Co-58	100	10,000	300
Co-60	100	10,000	300
Rb-86	30	50	10
Sr-89	1	1	1
Sr-90	1	1	1
Y-90	30	100	100
Y-91	30	100	100
Zr-95	30	100	100
Zr-97	30	100	100
Nb-95	100	200	200
Mo-99	10	100	100
Ru-103	3	100	100
Ru-106	3	100	100
Rh-105	10	100	100
Sb-127	1,000	1,000	1,000
Te-127m	10	10	100
Te-129m	10	10	100
Te-131m	10	10	100
Te-132	10	10	100
I-131	20	100	100

TABLE 3.5-15 (Cont'd)

Radionuclide	Fish	Crustacea	Mollusks
I-132	20	100	100
I-133	20	100	100
I-135	20	100	100
Cs-136	30	50	10
Cs-137	30	50	10
Ba-140	3	3	3
Ce-141	30	100	100
Ce-143	30	100	100
Ce-144	30	100	100
Pr-143	100	1,000	1,000
Nd-147	100	1,000	1,000
Pm-147	100	1,000	1,000
Pm-149	100	1,000	1,000
Sm-153	100	1,000	1,000
H-3	1	1	1

B. Population Dose

1) Consumption of seafood harvest in St. Lucie County

	Total	Contaminated Fish Consumed
a) fin fish, kg/yr	$1.2x10^6$	$1.2x10^5$
b) mollusk, kg/yr	$1.0x10^5$	$1.0x10^4$
c) crustacea, kg/yr	$4.7x10^3$	$4.7x10^2$

2) Seafood harvested from contaminated waters, % 10

3) Ocean dilution factor 20

8) Population Density Data

Population within 5.0 mil. (1970) $1.165x10^3$

Annular population,

5 - 10 mi.	$4.53x10^4$
10 - 20 mi.	$2.45x10^4$
20 - 30 mi. -	$4.79x10^4$
30 - 40 mi.	$5.59x10^4$
40 - 50 mi.	$1.26x10^5$
0 - 50 mi.	$3.01x10^5$

TABLE 3.5-16

EXPECTED LIQUID RELEASES FROM THE LIQUID WASTE SYSTEM

Nuclide	Curies Released per Year: Normal Operation (0.1% Failed Fuel)	Curies Released per Year: Anticipated Operation (1.0% Failed Fuel)	Activity in Circulating Water Discharge (μCi/cc): Normal Operation (0.1% Failed Fuel)	Activity in Circulating Water Discharge (μCi/cc): Anticipated Operation (1.0% Failed Fuel)
H-3	2.26 (2)*	3.39 (2)	2.21 (-7)	3.32 (-7)
Br-84	0.0	0.0	0.0	0.0
Kr-85m	1.09 (-13)	1.09 (-12)	0.0	1.07 (-21)
Kr-85	3.89 (+1)	3.89 (+2)	3.81 (-8)	3.81 (-7)
Kr-87	0.0	0.0	0.0	0.0
Kr-88	0.0	0.0	0.0	0.0
Rb-88	0.0	0.0	0.0	0.0
Rb-89	0.0	0.0	0.0	0.0
Sr-89	1.41 (-5)	2.71 (-4)	1.38 (-14)	2.66 (-13)
Sr-90	1.29 (-6)	1.80 (-5)	1.26 (-15)	1.76 (-14)
Y-90	2.18 (-5)	2.22 (-4)	2.13 (-14)	2.18 (-13)
Sr-91	1.62 (-12)	3.02 (-7)	1.59 (-21)	2.96 (-16)
Y-91	2.21 (-2)	2.24 (-1)	2.16 (-11)	2.19 (-10)
Mo-99	4.79 (-2)	4.88 (-1)	4.69 (-11)	4.78 (-10)
Ru-103	8.06 (-5)	9.09 (-4)	7.90 (-14)	8.90 (-13)
Ru-106	5.89 (-6)	6.47 (-5)	5.77 (-15)	6.34 (-14)
Te-129	0.0	5.04 (-18)	0.0	0.0
I-129	1.99 (-10)	3.39 (-9)	1.95 (-19)	3.32 (-18)
I-131	5.14 (-4)	5.22 (-2)	5.04 (-13)	5.11 (-11)
Xe-131m	3.87 (+1)	3.87 (+2)	3.79 (-8)	3.79 (-7)
Te-132	1.10 (-3)	1.29 (-2)	1.09 (-12)	1.26 (-11)
I-132	0.0	1.06 (-9)	5.58 (-42)	1.04 (-18)
I-133	5.39 (-7)	4.30 (-3)	5.28 (-16)	4.23 (-12)
Xe-133	2.44 (+3)	2.44 (+4)	2.39 (-6)	2.39 (-5)
Te-134	0.0	0.0	0.0	9.95 (-35)
I-134	0.0	0.0	0.0	0.0
Cs-134	2.40 (-3)	2.64 (-2)	2.37 (-12)	2.59 (-11)

*Numbers in ( ) are powers of ten

TABLE 3.5-16 (Cont'd)

Nuclide	Curies Released per Year Normal Operation (0.1% Failed Fuel)	Curies Released per Year Anticipated Operation (1.0% Failed Fuel)	Activity in Circulating Water Discharge (μCi/cc) Normal Operation (0.1% Failed Fuel)	Activity in Circulating Water Discharge (μCi/cc) Anticipated Operation (1.0% Failed Fuel)
I-135	5.57 (-14)	4.36 (-5)	0.0	4.27 (-14)
Xe-135	5.22 (-8)	5.22 (-7)	5.11 (-17)	5.11 (-16)
Cs-136	3.53 (-4)	3.90 (-3)	3.46 (-13)	3.86 (-12)
Cs-137	7.90 (-3)	8.54 (-2)	7.75 (-12)	8.37 (-11)
Xe-138	0.0	0.0	0.0	0.0
Cs-138	0.0	0.0	0.0	0.0
Ba-140	9.67 (-6)*	1.95 (-4)	9.47 (-15)	1.91 (-13)
La-140	3.12 (-6)	4.51 (-5)	3.06 (-15)	4.41 (-14)
Pr-143	8.30 (-5)	9.27 (-4)	8.13 (-14)	9.08 (-13)
Ce-144	9.71 (-5)	1.10 (-3)	9.51 (-14)	1.05 (-12)
Co-60	1.30 (-3)	1.40 (-3)	1.25 (-12)	1.35 (-12)
Fe-59	4.24 (-5)	4.78 (-5)	4.15 (-14)	4.68 (-14)
Co-58	9.90 (-3)	1.11 (-2)	9.68 (-12)	1.09 (-11)
Mn-54	6.49 (-5)	7.15 (-5)	6.36 (-14)	7.01 (-14)
Cr-51	6.90 (-3)	7.70 (-3)	6.73 (-12)	7.58 (-12)
Zr-95	1.96 (-6)	2.21 (-6)	1.92 (-15)	2.16 (-15)
Total: H-3	2.26 (+2)	3.39 (+2)	2.21 (-7)	3.32 (-7)
Total: Noble Gas	2.51 (+3)	2.51 (+4)	2.47 (-6)	2.46 (-5)
Total: All Others	1.01 (-1)	9.22 (-1)	9.87 (-11)	9.02 (-10)

*Numbers in ( ) are powers of ten.

TABLE 3.5-16 (Cont'd)

TURBINE BUILDING FLOOR DRAINAGE

Nuclide	Curies Released Per Year Normal Operating (0.1% Failed Fuel)	Anticipated Operation (1.0% Failed Fuel)
H-3	1.29 (-1)	5.47 (-1)
Br-84	3.18 (-7)	2.01 (-5)
Rb-88	9.93 (-6)	5.97 (-4)
Rb-89	2.18 (-7)	1.31 (-5)
Sr-89	4.32 (-5)	1.32 (-3)
Sr-90	1.84 (-6)	6.08 (-5)
Y-90	1.99 (-11)	1.20 (-9)
Sr-91	2.51 (-6)	1.40 (-4)
Y-91	6.50 (-4)	2.38 (-2)
Mo-99	1.49 (-3)	8.30 (-2)
Ru-103	2.03 (-5)	7.93 (-4)
Ru-106	2.07 (-6)	6.36 (-5)
Te-129	1.17 (-4)	4.60 (-3)
I-129	6.49 (-10)	1.93 (-8)
I-131	7.27 (-3)	3.62 (-1)
Te-132	2.80 (-4)	1.52 (-2)
I-132	8.60 (-4)	4.72 (-2)
I-133	1.37 (-3)	8.04 (-2)
Te-134	2.51 (-7)	1.51 (-5)
I-134	6.67 (-6)	4.03 (-4)
Cs-134	8.65 (-4)	2.62 (-2)
I-135	2.15 (-4)	1.28 (-2)
Cs-136	6.81 (-5)	3.43 (-3)
Cs-137	2.87 (-3)	8.55 (-2)
Cs-138	4.76 (-6)	2.86 (-4)
Ba-140	1.64 (-5)	7.53 (-4)
La-140	2.67 (-6)	1.52 (-4)
Pr-143	1.58 (-5)	7.28 (-4)

TABLE 3.5-16 (Cont'd)

Nuclide	Curies Released Per Year: Normal Operating (0.1% Failed Fuel)	Anticipated Operation (1.% Failed Fuel)
Ce-144	3.38 (-5)	1.05 (-3)
Co-60	4.59 (-5)	1.38 (-4)
Fe-59	1.15 (-6)	4.29 (-6)
Co-58	2.95 (-4)	1.04 (-3)
Mn-54	2.24 (-6)	7.02 (-6)
Cr-51	1.60 (-4)	6.51 (-4)
Zr-95	2.02 (-11)	1.22 (-10)

TABLE 3.5-17

WASTE GAS SYSTEM FLOW DATA POINTS

ANTICIPATED OPERATIONAL OCCURRENCE FOR 1% FAILED FUEL*

Position No.	1	2	3	4	5	6
Flow, scfm	2.46(-2)	$(1.90\text{-}9.5)\times10^{-4}$	3.46(-3)	1.96(-2)	4.82(-2)	9.65(-2)
Pressure, psig	0.5-7	0.5-7	0.5-7	0.5-7	0.5-7	0.5-7
Temperature/F	70-120	70-120	70-120	70-120	70-120	70-120
Kr-85m μCi/cc	0.12	2.19	0	0-22	4.16	2.19
Kr-85 "	0.464	2.24	21.8	0.16	2.56	2.24
Kr-87 "	0.206	1.24	0	8.29(-2)	2.30	1.24
Kr-88 "	0.140	3.81	0	0.35	7.24	3.81
Xe-131m "	0.728	3.18	21.5	0.26	4.26	3.18
Xe-133 "	81.80	257.0	996.	32.14	381.0	257.0
Xe-135 "	1.12	11.21	0	1.18	21.1	11.21
Xe-138 "	2.12(-3)***	0.51	0	3.98(-3)	1.01	0.51
I-129 "	4.80(-14)	2.70(-14)	3.98(-16)	1.29(-15)	2.84(-14)	2.70(-14)
I-131 "	2.31(-4)	1.20(-4)	7.76(-7)	7.06(-8)	1.[illegible](-4)	1.20(-4)
I-132 "	4.50(-6)	2.63(-6)	0	1.38(-8)	2.[illegible](-6)	2.63(-6)
I-133 "	1.57(-4)	8.26(-5)	9.53(-10)	9.72(-8)	8.25(-5)	8.26(-5)
I-134 "	1.00(-6)	7.21(-7)	0	5.37(-9)	9.07(-7)	7.21(-7)
I-135 "	3.03(-5)	3.16(-5)	0	4.24(-8)	1.68(-5)	3.16(-5)

* Concentrations of nuclides are reduced by a factor of 10 for the expected operation of 0.1% failed fuel.

** Activity values calculated at standard temperature and pressure.

*** Numbers in ( ) are powers of ten.

TABLE 3.5-17

WASTE GAS SYSTEM FLOW DATA POINTS (Cont'd.)

ANTICIPATED OPERATIONAL OCCURRENCE FOR 1% FAILED FUEL*

Position No.	7	8	9	10	11	12
Flow, scfm	0.097	0.097	0.097	0.097	0.097	0.75
Pressure, psig	0.5-7	10-165	10-165	10	< 0.1	< 0.1
Temperature/F	70-120	70-110	80	80	80	70-120
Kr-85m μCi/cc**	2.19	2.19	0	0	0	1.33(-3)
Kr-85 "	2.24	2.24	2.22	2.22	2.22	4.31(-2)
Kr-87 "	1.24	1.24	0	0	0	2.80(-4)
Kr-88 "	3.81	3.81	0	0	0	1.70(-3)
Xe-131m "	3.18	3.18	0.56	0.56	0.56	4.41(-2)
Xe-133 "	257.0	257.0	4.98	4.98	4.98	2.29
Xe-135 "	11.21	11.21	0	0	0	9.92(-3)
Xe-138 "	0.51	0.51	0	0	0	3.52(-10)
I-129 "	2.70(-14)***	2.70(-14)	2.30(-13)	2.30(-13)	2.30(-13)	1.84(-15)
I-131 "	1.20(-4)	1.20(-4)	9.10(-6)	9.10(-6)	9.10(-6)	3.54(-6)
I-132 "	2.63(-6)	2.63(-6)	0	0	0	2.82(-10)
I-133 "	8.26(-5)	8.26(-5)	0	0	0	4.97(-9)
I-134 "	7.21(-7)	7.21(-7)	0	0	0	6.60(-12)
I-135 "	3.16(-5)	3.16(-5)	0	0	0	1.63(-10)

* Concentrations of nuclides are reduced by a factor of 10 for the expected operation of 0.1% failed fuel.

** Activity values calculated at standard temperature and pressure.

*** Numbers in ( ) are powers of 10.

TABLE 3.5-18

COMPONENT DATA

1. Waste Gas Compressor

Type	Diaphragm Positive Displacement
Quantity	2
Capacity, scfm	2
Discharge pressure, psig	0-165
Codes	ASME Boiler and Pressure Vessel Code, Section III, Class 3; ASME Power Test Code PTC-9, Displacements Compressors, Vacuum Pumps and Blowers
Materials	Carbon Steel
Design temperature, F	150 - Inlet; 350 - Outlet
Design pressure, psig	200

2. Compressor Aftercooler

Type	Shell and Tube
Quantity	2
Codes: gas side	ASME Boiler and Pressure Vessel Code, Section III, Class 3
shell side	ASME Boiler and Pressure Vessel Code, Section III, Class 3
Materials	Carbon Steel
Discharge temperature, F	110

3. Compressor Inlet Filter

Type	Stainless Steel Screen
Quantity	2
Rating	5 micron
Clean pressure drop, psi @ 2 Cfm	0.3
Code	ASME Boiler and Pressure Vessel Code, Section III, Class 3

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

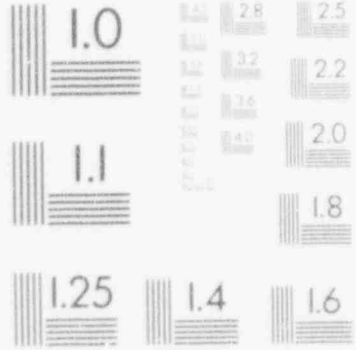
IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION
TEST TARGET (MT-3)



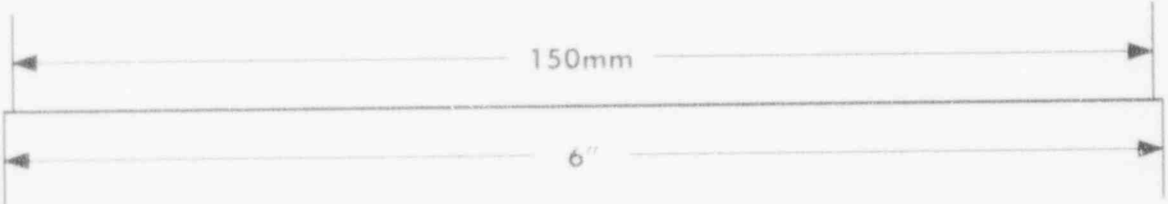


TABLE 3.5-18 (Cont'd)

4. Gas Surge Tank

Type	Vertical
Quantity	1
Volume, ft^3	10
Design pressure, psig	40
Design temperature, F	200
Codes	ASME Boiler and Pressure Vessel Code, Section III, Class 3
Material	Carbon steel

5. Gas Decay Tank

Type	Vertical
Quantity	3
Volume, each, ft^3	144
Design pressure, psig	190
Design temperature, F	250
Codes	ASME Boiler and Pressure Vessel Code, Section III, Class 3
Material	Carbon steel

TABLE 3.5-19

GAS COLLECTION HEADER SOURCE POINTS

1. Preconcentrator ion exchanger vent
2. Holdup tank vent
3. Boric acid condensate ion exchanger vent
4. Boric acid holding tank vent
5. Boric acid condensate tank vents
6. Waste ion exchanger
7. Equipment drain tank vent
8. Chemical drain tank vent
9. Laundry drain tank vents
10. Waste condensate tank vents
11. Spent resin tank vent
12. Waste concentrator vent
13. CVCS ion exchanger vents
14. Fuel pool system ion exchanger vent
15. Boric acid makeup tank vents
16. Charging pump vents
17. Charging pump seal lubrication tank vents
18. Boric acid makeup pump vents

TABLE 3.5-20

ESTIMATED GASEOUS RELEASES BASED ON REGULATORY GUIDE 1.42 (Ci/sec)* AND 0.1% FAILED FUEL

Isotope	Gas Surge Header	Gas Collection Header	Steam Generator Blowdown	Reactor Auxiliary Building Vent	Turbine Building Leakage From Secondary System	Steam Jet Air Ejector	Containment Purge	Turbine Steam Heating	Total Ci/sec.	Total Ci/yr.
Kr-85m	0	4.72(-8)	6.16(-11)	1.54(-7)	1.54(-11)	1.01(-7)	4.72(-9)	5.44(-13)	3.08(-7)	9.68(0)
Kr-85	1.01(-5)**	1.54(-6)	3.65(-11)	9.16(-8)	9.16(-12)	6.04(-8)	1.29(-7)	3.24(-13)	1.19(-5)	3.74(+2)
Kr-87	0	9.84(-9)	3.30(-11)	8.40(-8)	8.28(-12)	5.44(-8)	1.69(-9)	2.85(-13)	1.50(-7)	4.72(0)
Kr-88	0	6.08(-8)	1.06(-10)	2.70(-7)	2.68(-11)	1.76(-7)	1.09(-8)	9.48(-13)	5.20(-7)	1.64(+1)
Xe-131m	2.46(-6)	1.58(-6)	6.08(-11)	1.53(-7)	1.53(-11)	1.01(-7)	4.44(-8)	5.40(-13)	4.32(-6)	1.36(+2)
Xe-133	2.55(-6)	8.12(-5)	7.48(-9)	1.88(-5)	1.88(-9)	1.24(-5)	2.70(-6)	6.64(-11)	1.18(-4)	3.70(+3)
Xe-135	0	3.52(-7)	3.03(-10)	7.64(-7)	7.64(-11)	4.80(-7)	2.76(-8)	2.69(-12)	1.62(-6)	5.12(+1)
Xe-138	0	1.27(-9)	1.39(-11)	3.74(-8)	3.41(-12)	2.25(-8)	2.86(-10)	1.20(-13)	6.18(-8)	1.94(0)
I-129	1.04(-18)	6.56(-20)	4.88(-19)	3.74(-17)	1.22(-17)	4.04(-17)	1.64(-17)	4.32(-19)	1.08(-16)	3.42(-9)
I-131	4.12(-11)	1.26(-10)	2.35(-11)	2.06(-9)	5.92(-10)	1.95(-9)	9.04(-10)	2.09(-11)	5.72(-9)	1.80(-1)
I-132	0	1.00(-14)	5.44(-12)	5.64(-10)	1.37(-10)	4.52(-10)	1.89(-10)	4.84(-12)	1.35(-9)	4.24(-2)
I-133	0	1.76(-13)	1.65(-11)	2.94(-9)	4.16(-10)	1.36(-9)	1.26(-9)	1.46(-11)	6.00(-9)	1.89(-1)
I-134	0	2.34(-16)	1.28(-13)	3.22(-10)	3.21(-12)	1.06(-11)	8.80(-11)	1.13(-13)	4.24(-10)	1.33(-2)
I-135	0	5.80(-15)	3.57(-12)	1.40(-9)	8.96(-11)	2.96(-10)	5.68(-10)	3.16(-12)	2.36(-9)	7.48(-2)

* Activity values calculated at standard temperature and pressure.

** Numbers in ( ) are powers of ten

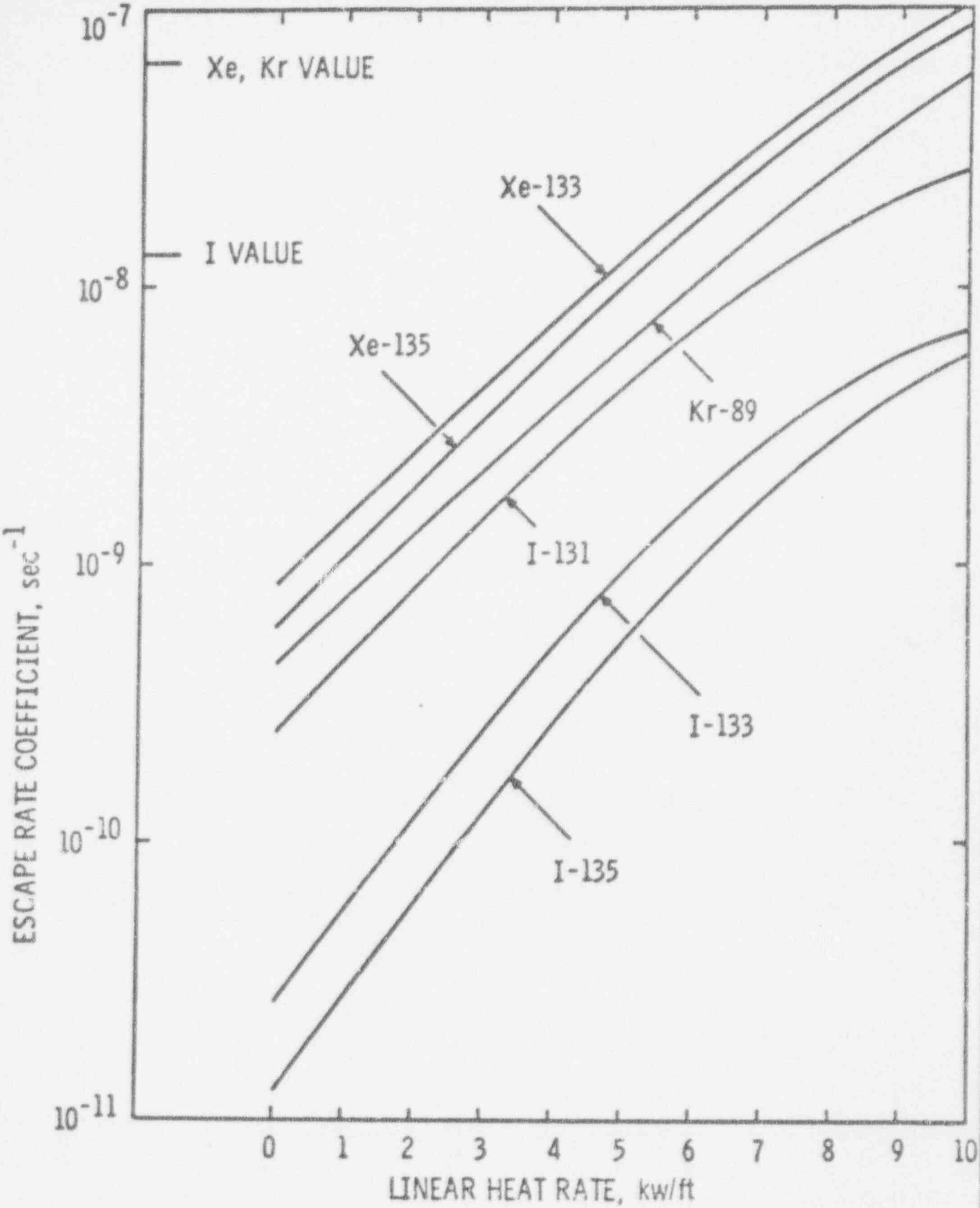
TABLE 3.5-20 (Cont'd)

Isotope	Turbine Building Leakage from Secondary System		Steam Jet Air Ejector		Containment Purge	
	Estimated Normal Releases	Anticipated Operational Occurrence Releases	Estimated Normal Releases	Anticipated Operational Occurrence Releases	Estimated Normal Releases	Anticipated Operational Occurrence Releases
Kr-85m	8.36(-6)**	5.01(-4)	3.28(0)	1.97(+2)	7.42(-1)	7.42(-1)
Kr-85	2.17(-6)	1.30(-4)	8.52(-1)	5.11(+1)	2.03(+1)	2.03(+1)
Kr-87	4.51(-6)	2.70(-4)	1.77(0)	1.06(+2)	2.66(-1)	2.66(-1)
Kr-88	1.46(-5)	8.74(-4)	5.71(0)	3.43(+2)	1.71(0)	1.71(0)
I-129	6.49(-10)	1.93(-8)	1.27(-7)	3.78(-6)	2.58(-9)	2.58(9)
I-131	7.27(-3)	3.62(-1)	1.43(0)	7.10(+1)	1.42(-1)	1.42(-1)
Xe-131m	8.35(-6)	5.01(-4)	3.27(0)	1.96(+2)	6.98(-0)	6.98(-0)
I-132	8.88(-4)	4.72(-2)	1.69(-1)	9.26(0)	2.97(-2)	2.97(-2)
I-133	1.42(-3)	8.04(-2)	2.69(-1)	1.58(+1)	1.98(-1)	1.98(-1)
Xe-133	1.02(-3)	6.13(-2)	4.00(+2)	2.40(+4)	4.26(+2)	4.26(+2)
I-134	6.63(-6)	4.01(-4)	1.31(-3)	7.87(-2)	1.39(-2)	1.39(-2)
I-135	2.15(-4)	1.37(-2)	4.20(-2)	2.52(0)	8.93(-2)	8.93(-2)
Xe-135	4.24(-5)	2.54(-3)	1.66(+1)	9.97(+2)	4.35(0)	4.35(0)
Xe-138	1.80(-6)	1.10(-4)	7.14(-1)	4.31(+1)	4.51(-2)	4.51(-2)

* Activity values calculated at standard temperature and pressure.

** Numbers in ( ) are powers of ten.

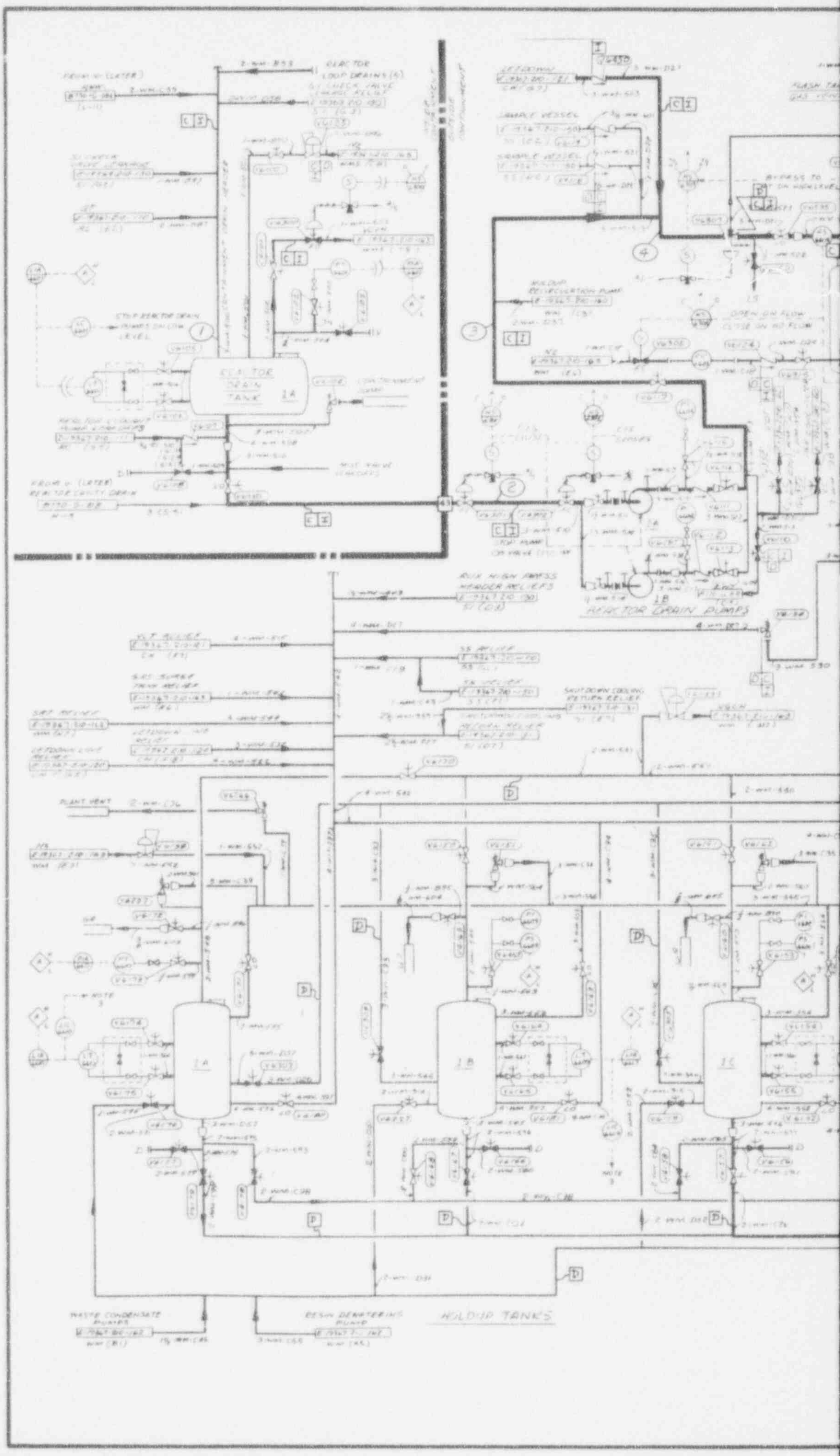
SL2

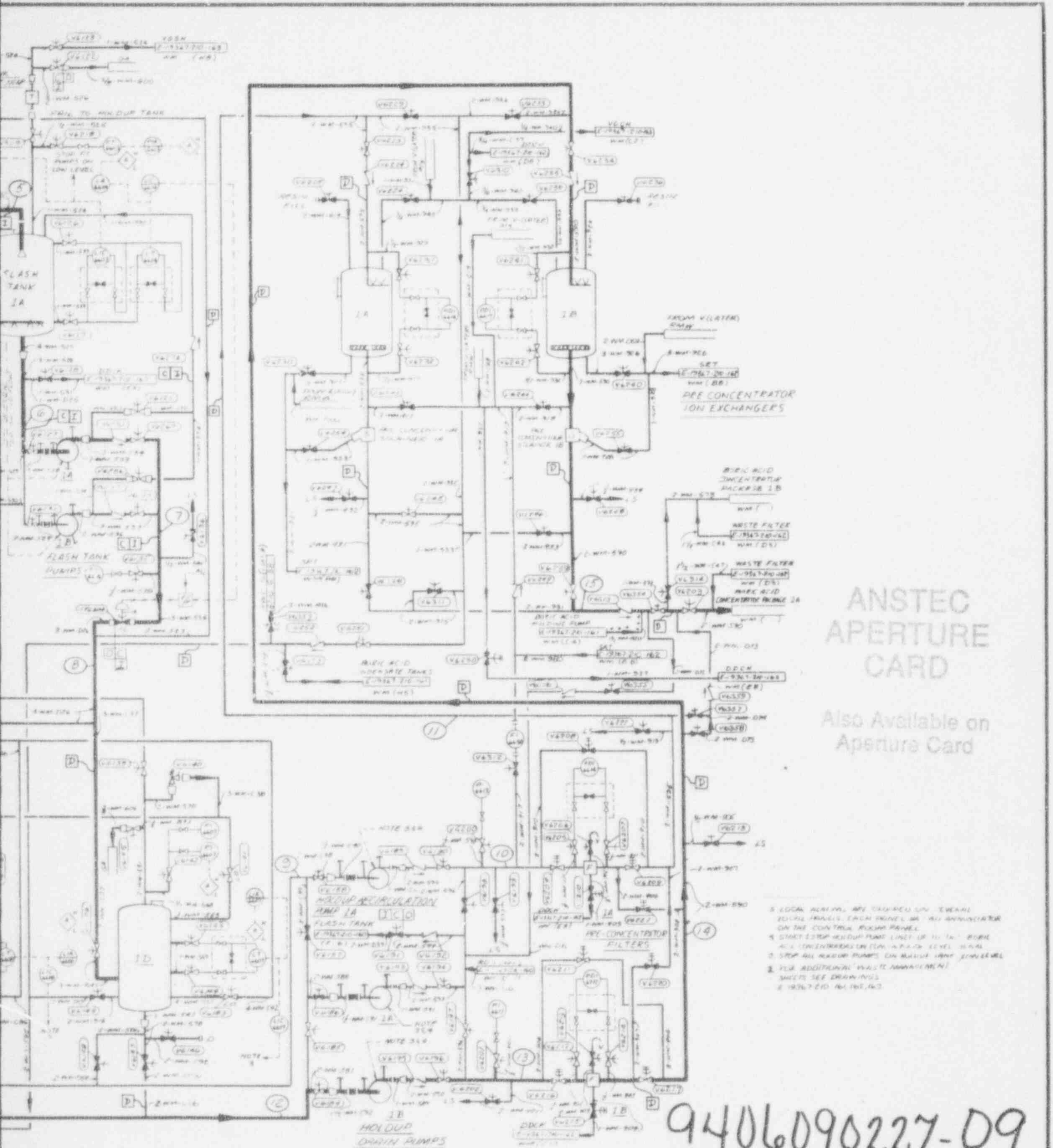


FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

ESCAPE RATE COEFFICIENTS

FIGURE 3.5-1


REACTOR LOOP DRAINS (4)
REACTOR DRAIN TANK
REACTOR DRAIN PUMPS
PLANT VENT
HOLDUP TANKS
WASTE CONDENSATE PUMPS
RESIN DEWATERING PUMP



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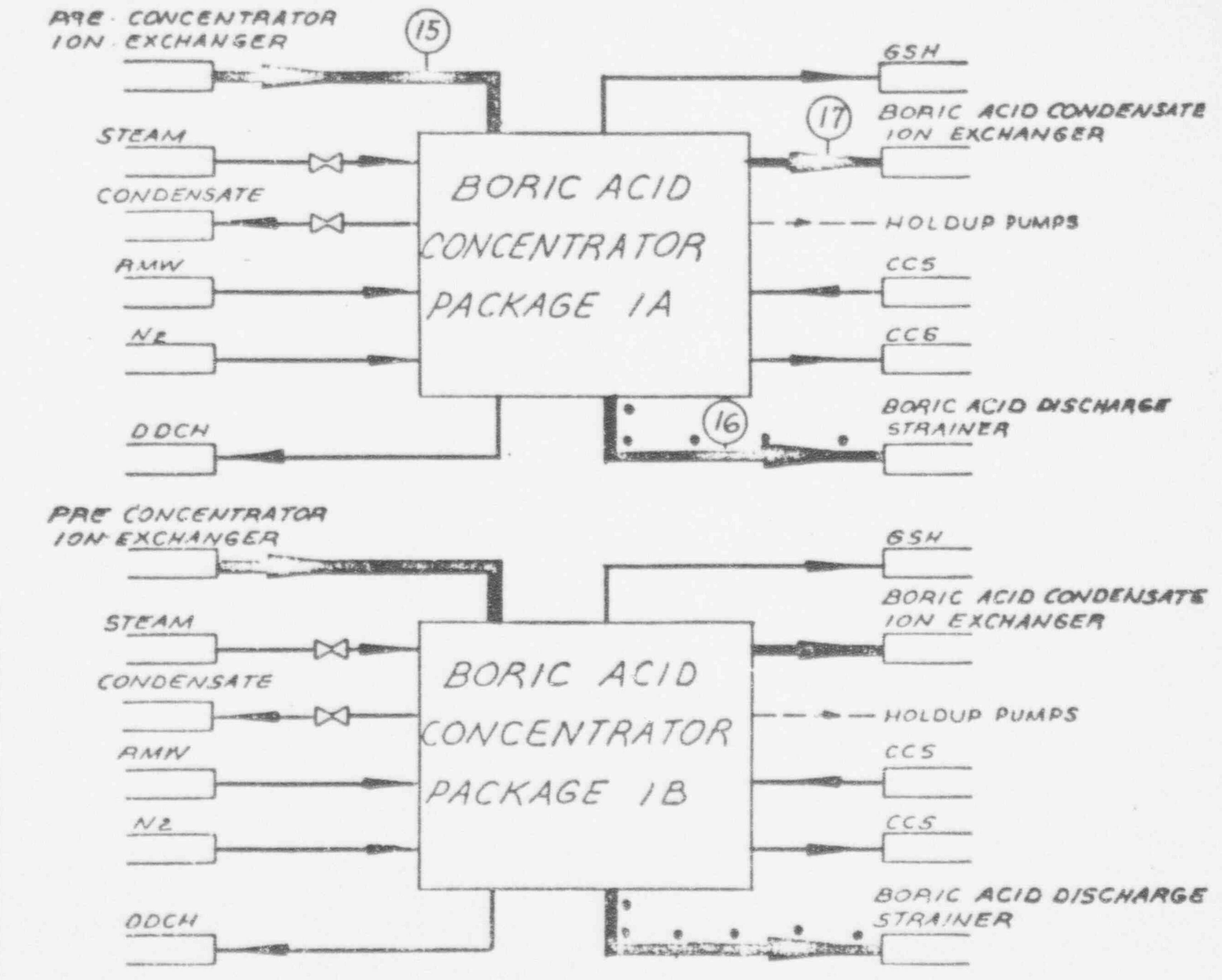
FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNIT 2

WASTE MANAGEMENT SYSTEM
P&I DIAGRAM

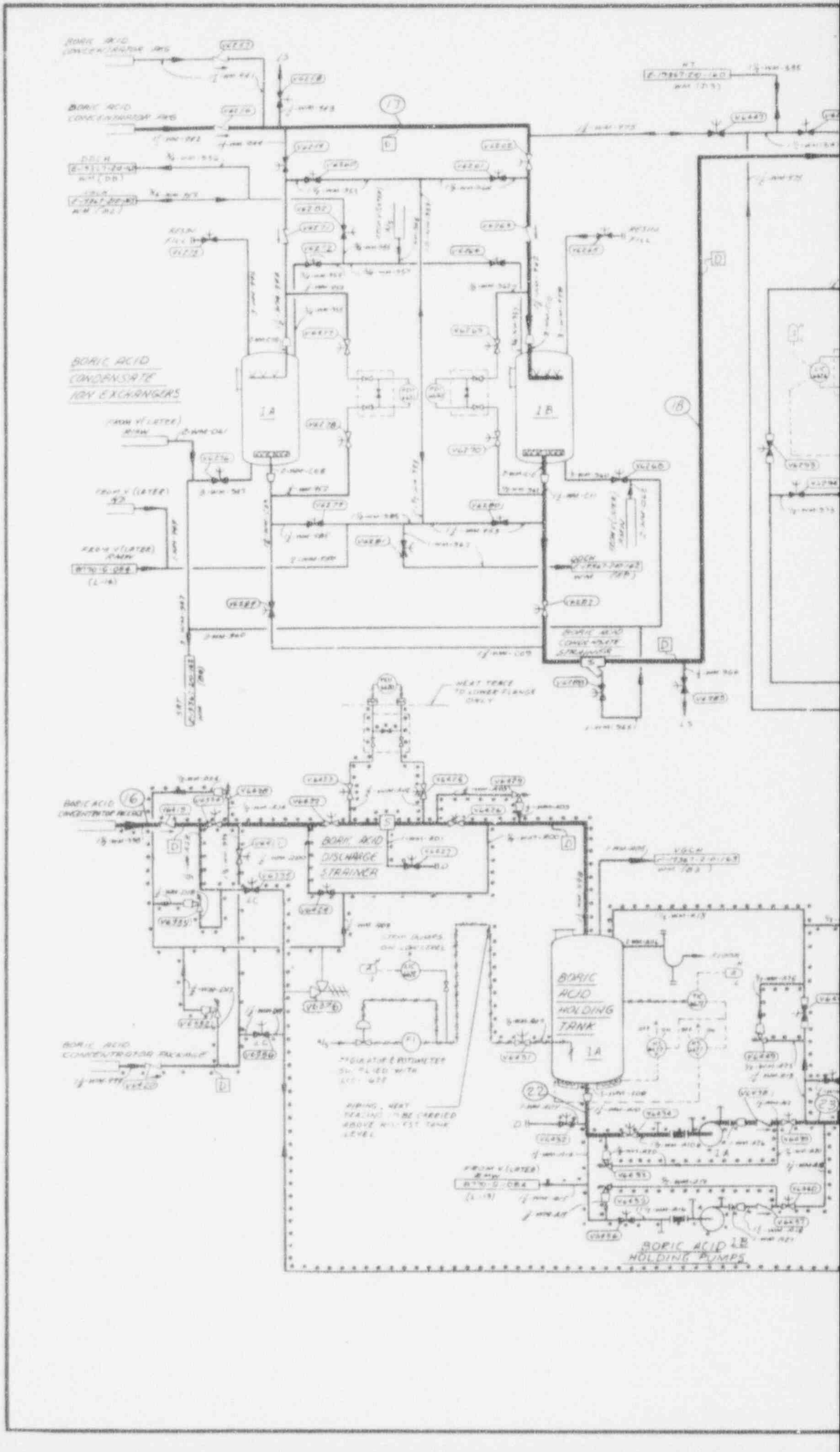
FIGURE 3.5-2



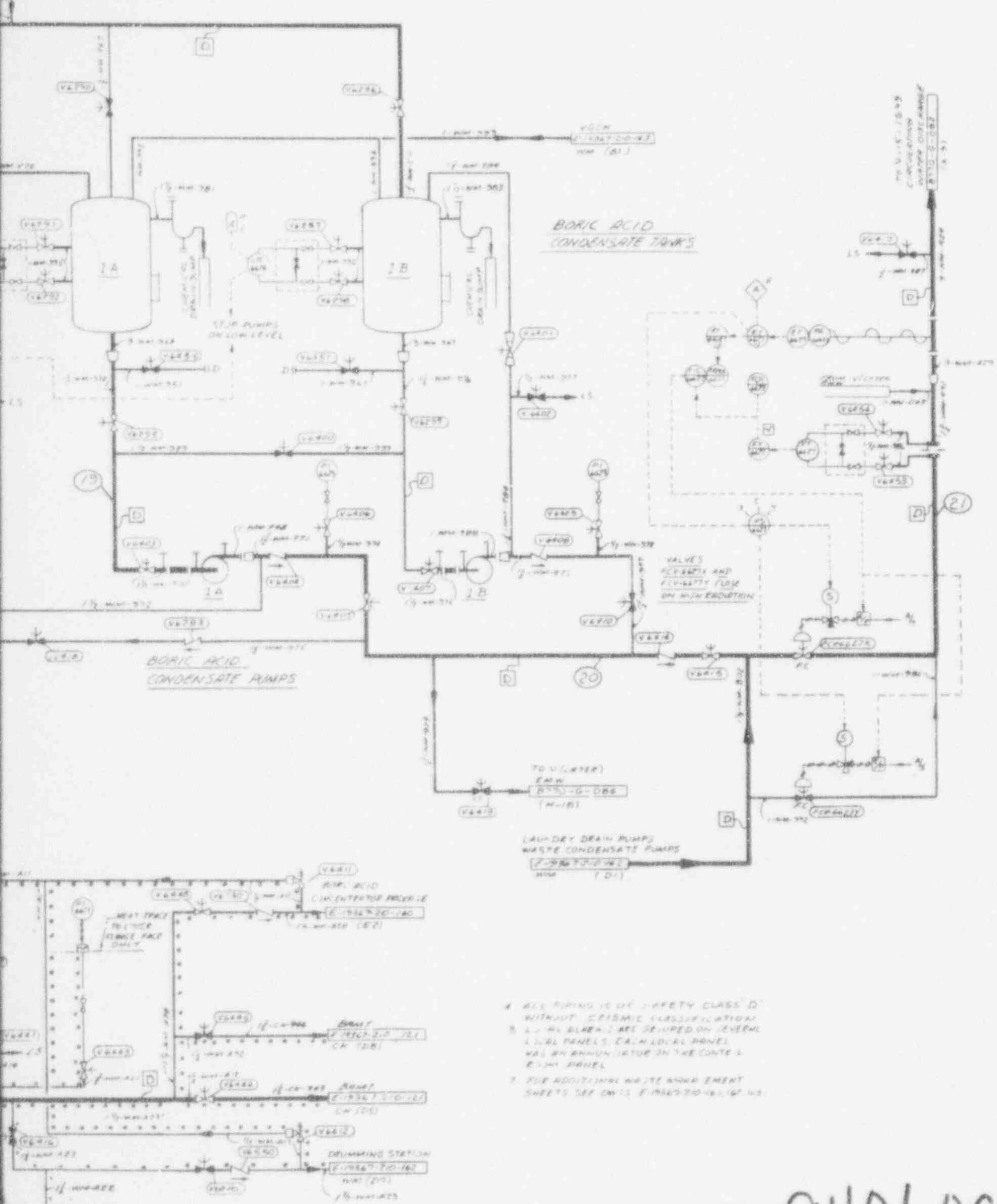
FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

BORIC ACID CONCENTRATOR PACKAGE

FIGURE 3.5-3



BORIC ACID
CONDENSATE
ION EXCHANGERS
1A
1B
BORIC ACID
DISCHARGE
STRAINER
BORIC
ACID
HOLDING
TANK
1A
BORIC ACID
HOLDING PUMPS



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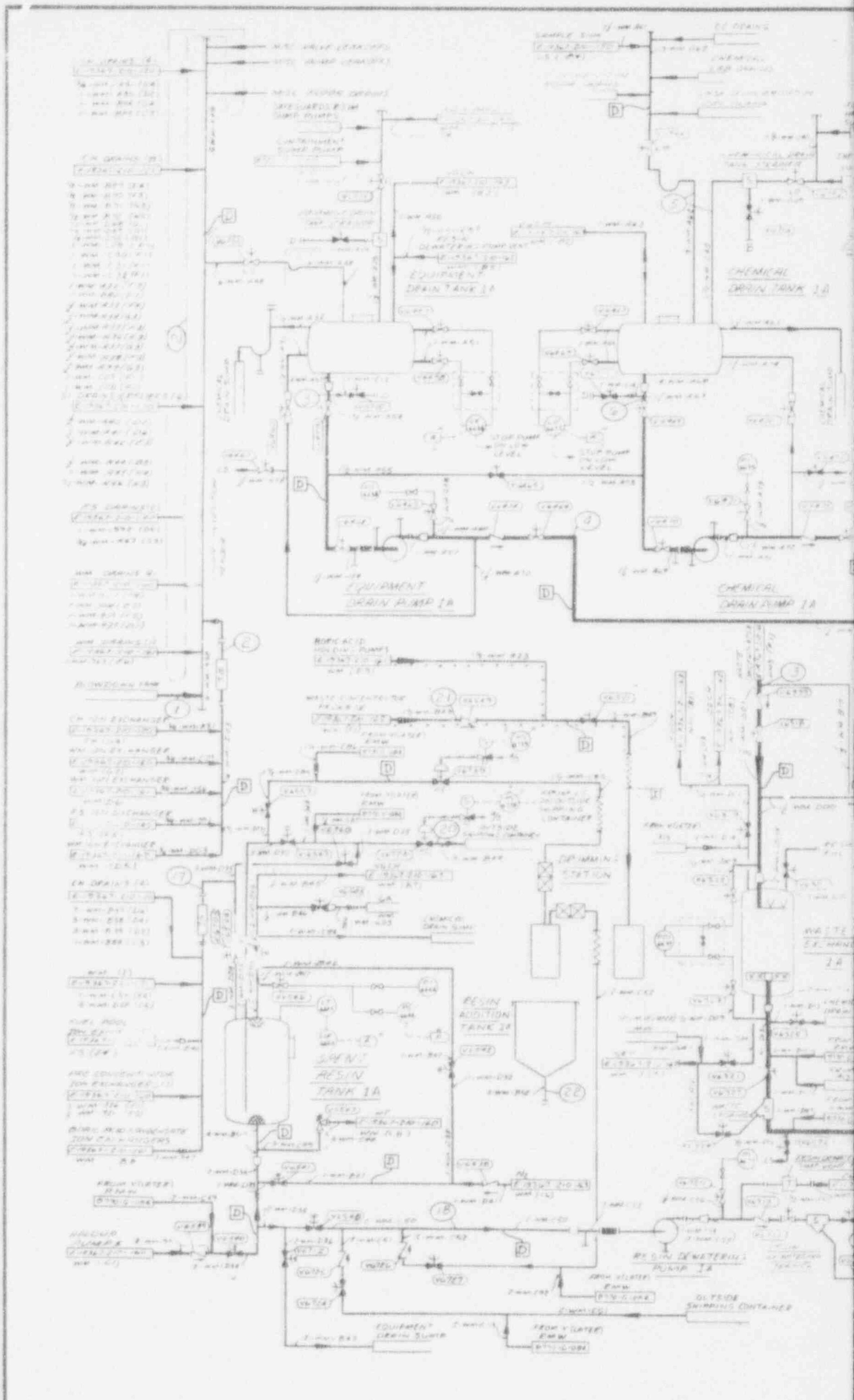
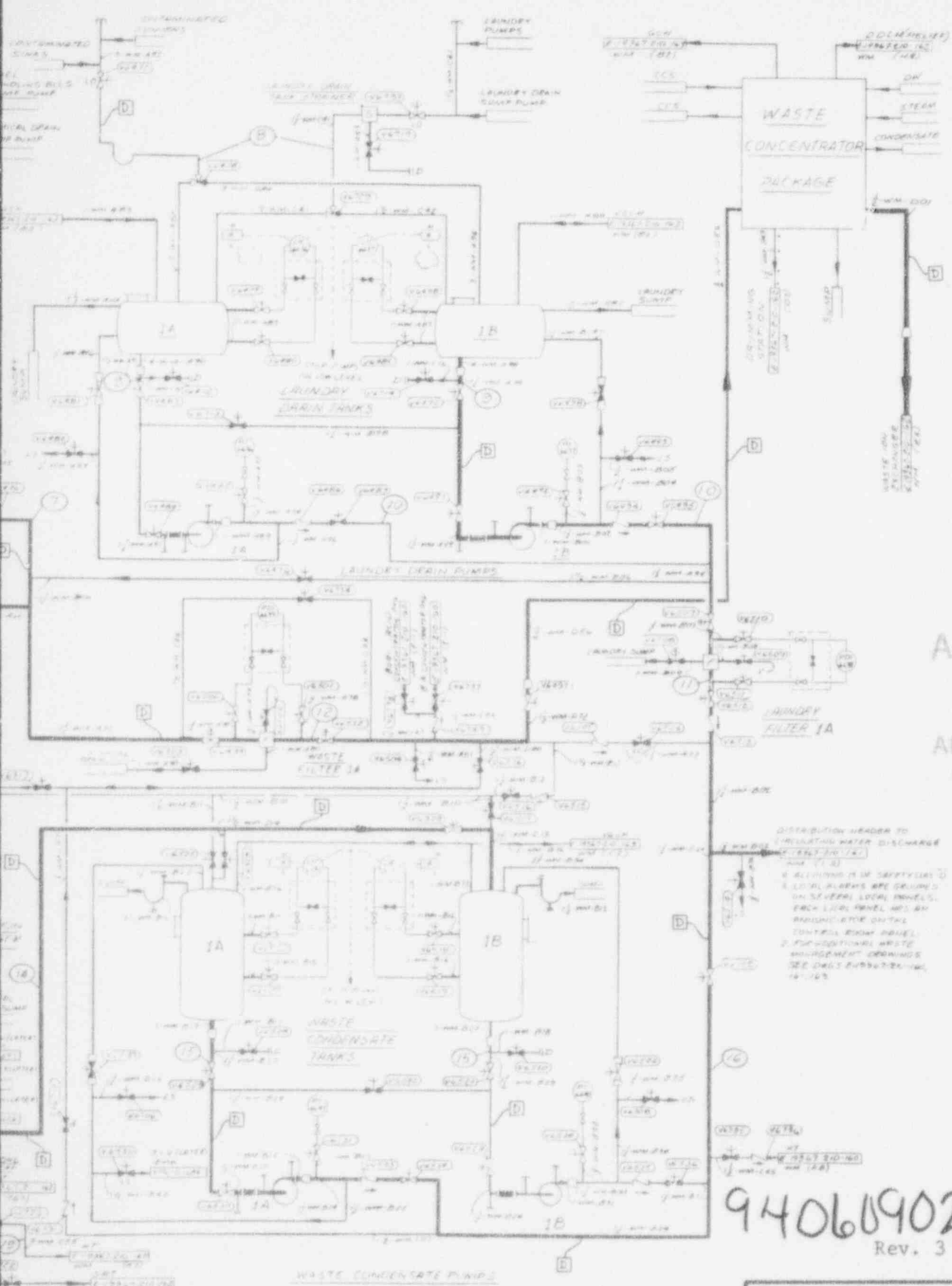
FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNIT 2

WASTE MANAGEMENT SYSTEM
P&I DIAGRAM

FIGURE 3.5-4


EQUIPMENT DRAIN TANK 1A
CHEMICAL DRAIN TANK 1A
EQUIPMENT DRAIN PUMP 1A
CHEMICAL DRAIN PUMP 1A
BORIC ACID HOLDING PUMPS
SPENT RESIN TANK 1A
RESIN ADDITION TANK 1A
RESIN DEWATERING PUMP 1A
OUTSIDE SHIPPING CONTAINER
EQUIPMENT DRAIN SUMP
CHEMICAL DRAIN SUMP



3

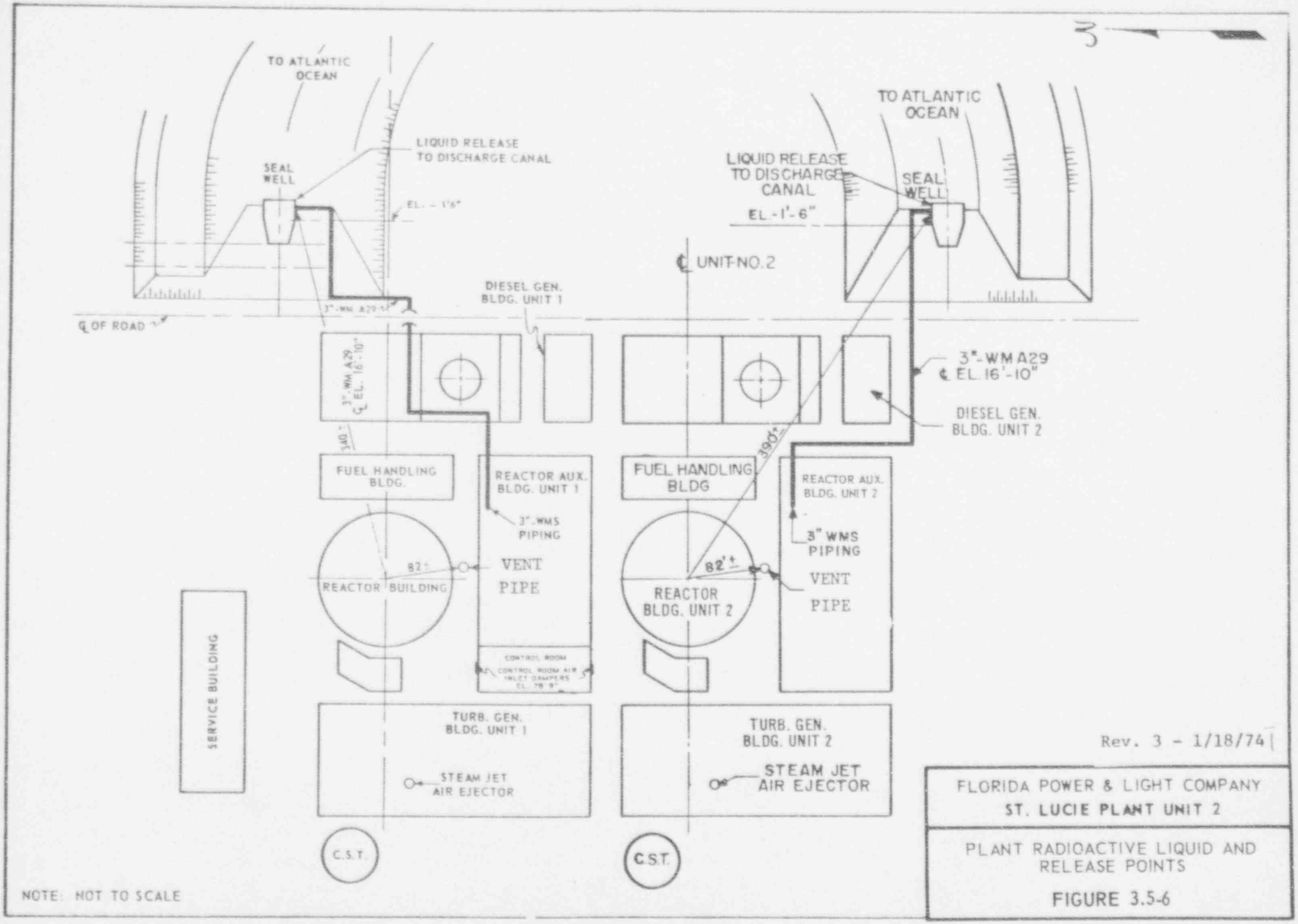
9406090227-11

Rev. 3 - 1/18/74

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

WASTE MANAGEMENT SYSTEM
P & I DIAGRAM

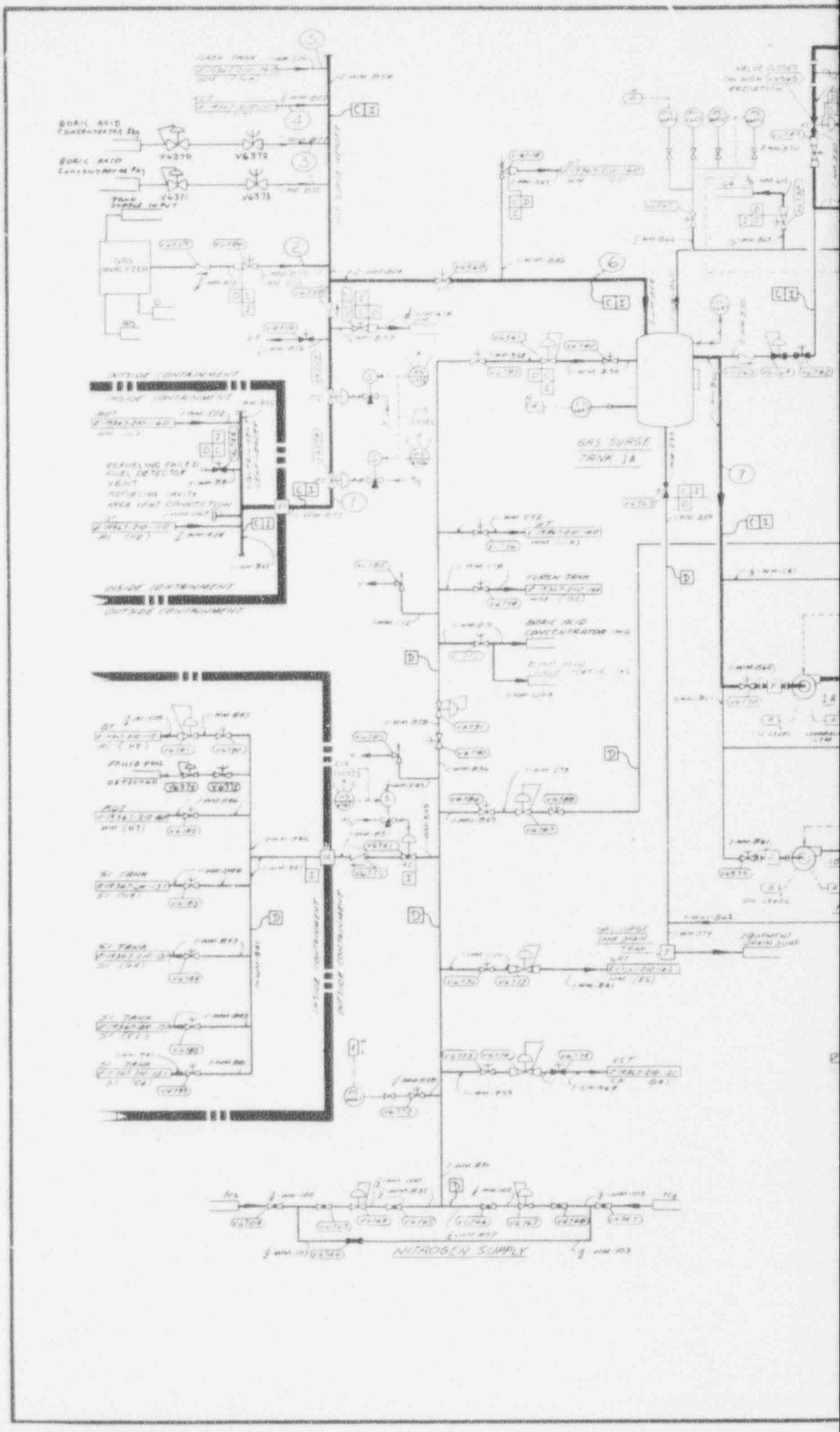
FIGURE 3.5-5

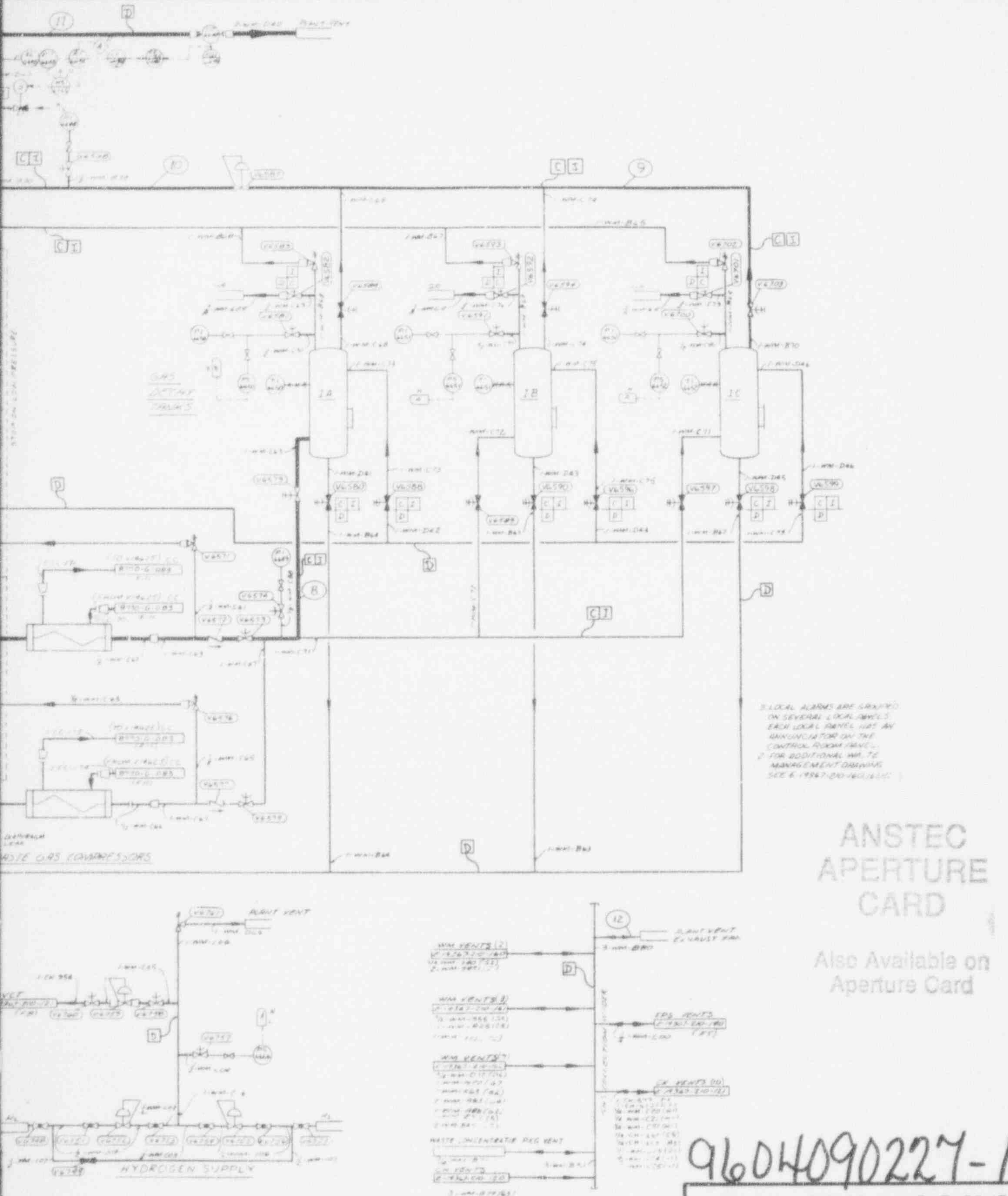


FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

PLANT RADIOACTIVE LIQUID AND RELEASE POINTS

FIGURE 3.5-6


BORIC ACID CONCENTRATOR PKG
V6370
V6372
V6371
V6373
GAS ANALYZER
INSIDE CONTAINMENT
OUTSIDE CONTAINMENT
REFUELING FAILED FUEL DETECTOR VENT
REFUELING CAVITY AREA VENT CONNECTION
GAS SURGE TANK 1A
FLASH TANK
VALVE CLOSED ON HIGH RADIATION
EQUIPMENT DRAIN SUMP
NITROGEN SUPPLY



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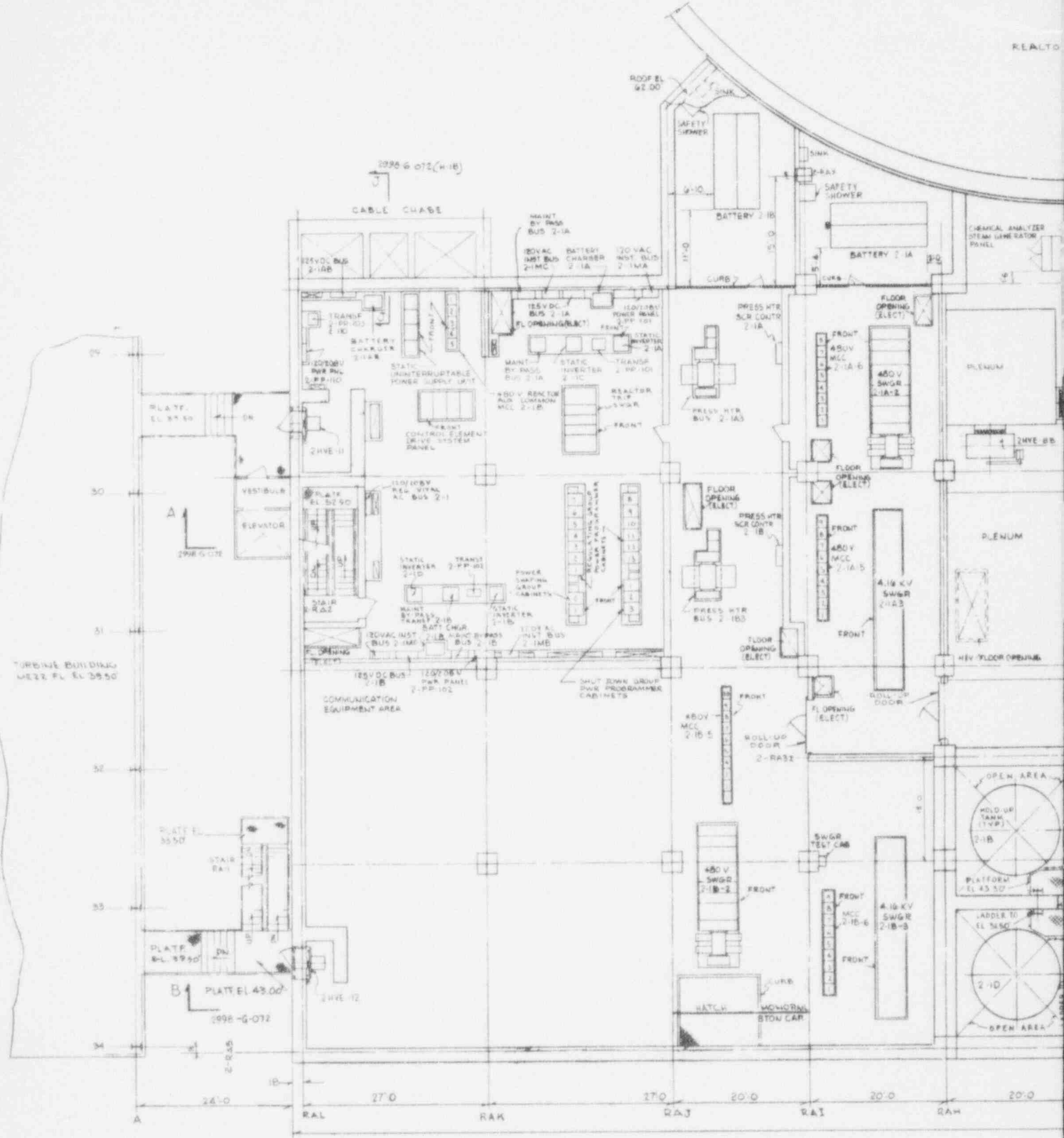
FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

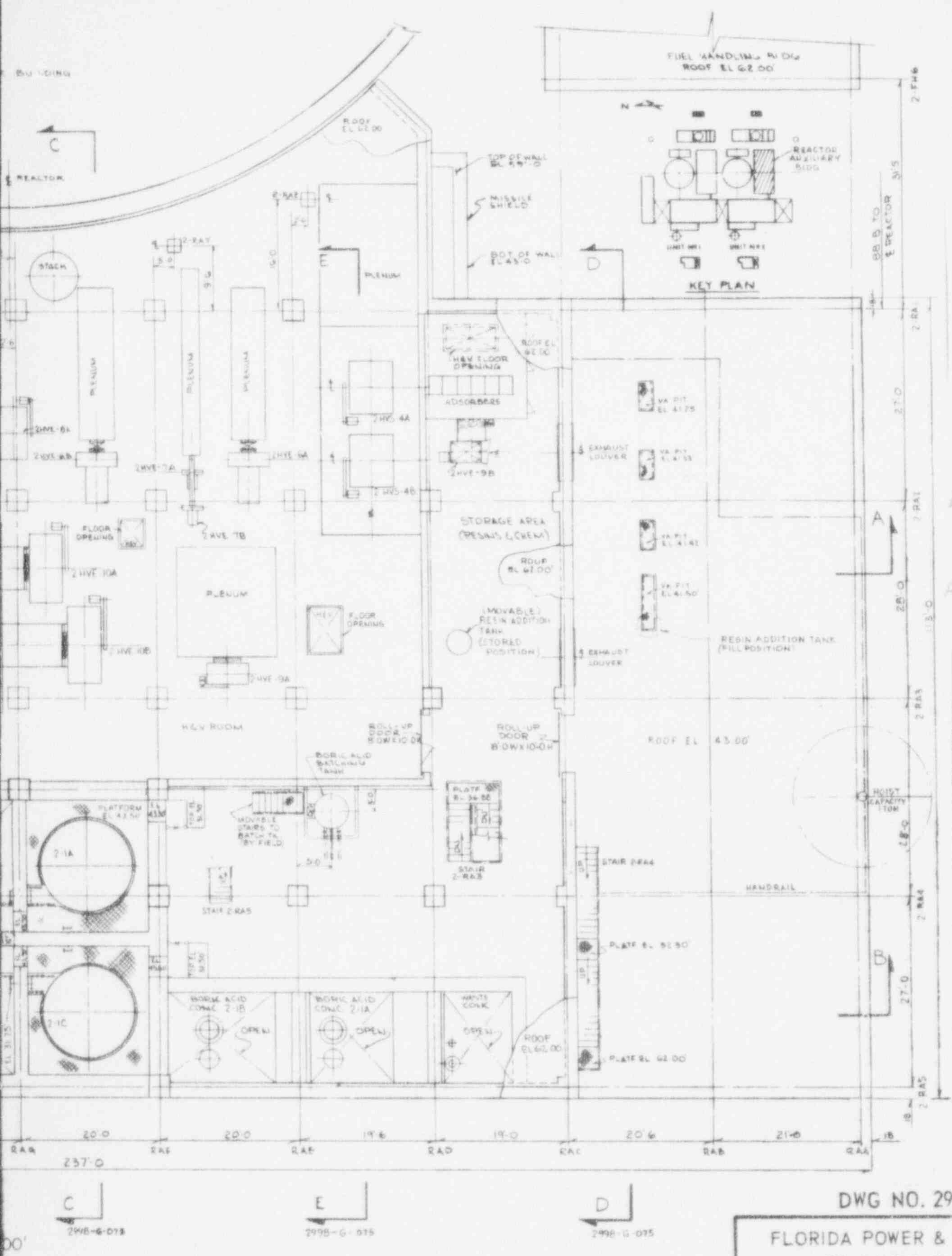
WASTE MANAGEMENT SYSTEM
P&I DIAGRAM

FIGURE 3.5-7



REALTO
ROOF EL 62.00
SINK
SAFETY SHOWER
BATTERY 2-1B
BATTERY 2-1A
CABLE CHASE
CHEMICAL ANALYZER STEAM GENERATOR PANEL
FLOOR OPENING (ELECT)
PLENUM
480V SWGR 2-1A-2
480V MCC 2-1A-6
480V MCC 2-1A-5
4.16 KV SWGR 2-1A3
PRESS HTR SCR CONTR 2-1A
PRESS HTR BUS 2-1A3
PRESS HTR SCR CONTR 2-1B
PRESS HTR BUS 2-1B3
REACTOR TRIP SWGR
CONTROL ELEMENT DRIVE SYSTEM PANEL
STATIC UNINTERRUPTABLE POWER SUPPLY UNIT
VESTIBULE
ELEVATOR
STAIR 2-RA2
COMMUNICATION EQUIPMENT AREA
SHUT DOWN GROUP PWR PROGRAMMER CABINETS
480V MCC 2-1B-5
480V SWGR 2-1B-2
480V MCC 2-1B-6
4.16 KV SWGR 2-1B-3
SWGR TEST CAB
ROLL-UP DOOR 2-RA32
HOLD-UP TANK (TYP) 2-1B
2-1D
OPEN AREA
HATCH
MONORAIL 6TON CAP
TURBINE BUILDING MEZZ FL EL 39.50
PLATF EL 43.00
2998-G-072
24'-0
27'-0
20'-0
RAL
RAK
RAJ
RAI
RAH

PLAN AT EL. 43



DWG NO. 2998-G-071

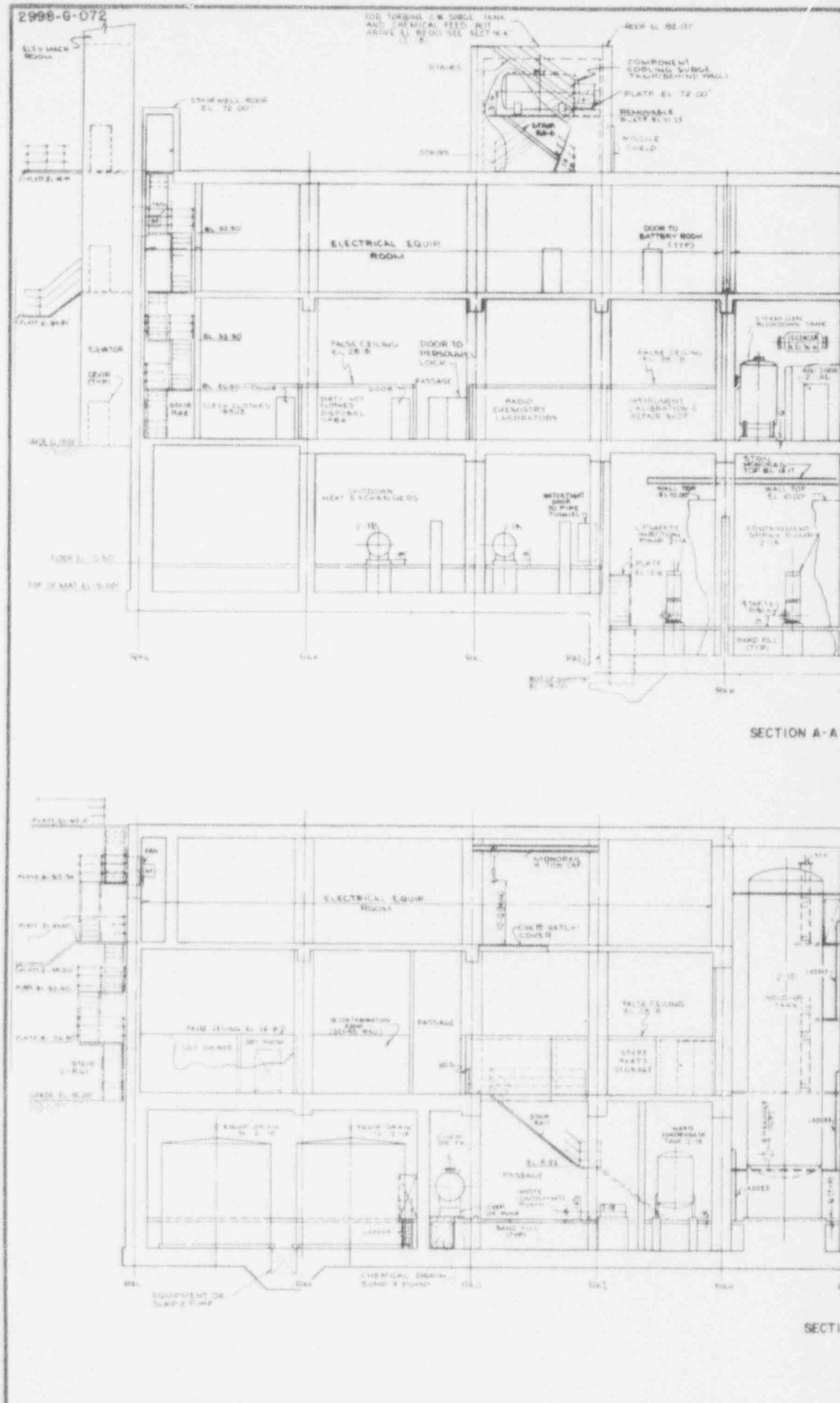
FLORIDA POWER & LIGHT COMPANY

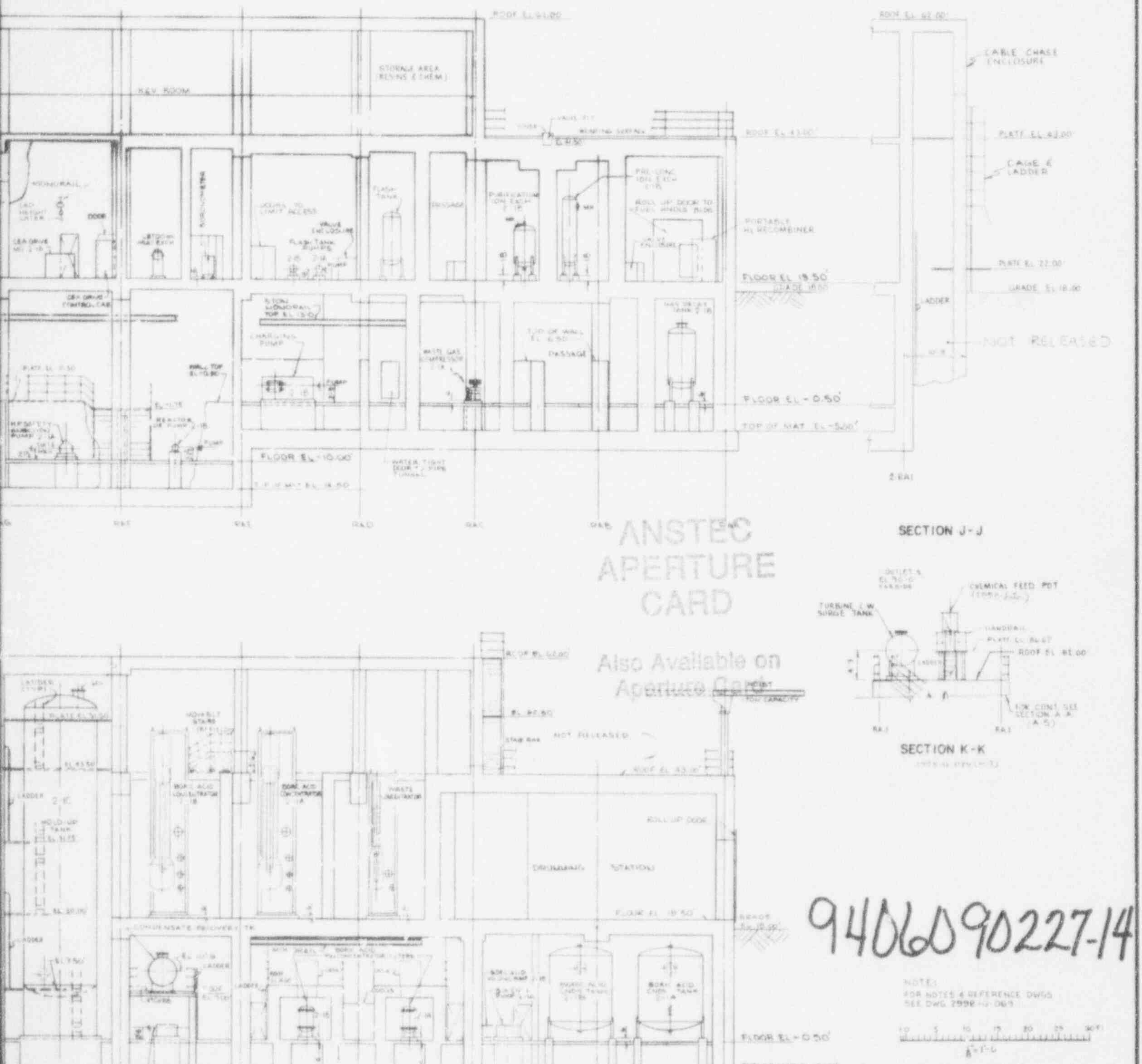
ST. LUCIE PLANT UNIT 2

GENERAL ARRANGEMENT
REACTOR AUXILIARY BUILDING
PLAN SHEET 3

FIGURE 3.5-8

NOTE:
FOR NOTES & REFERENCE DWGS SEE DWG
NO. 2998-G-069


2998-G-072
ROOF EL. 82.00'
COMPONENT COOLING SURGE TANK (BEHIND WALL)
PLATF. EL. 72.00'
REMOVABLE
MISSILE SHIELD
STAIRS
STAIRWELL ROOF EL. 72.00'
ELEVATOR
ELECTRICAL EQUIP ROOM
DOOR TO BATTERY ROOM (TYP)
FALSE CEILING
DOOR TO PERSONNEL LOCK
PASSAGE
RADIO CHEMISTRY LABORATORY
SHUTDOWN HEAT EXCHANGERS
SAND FILL (TYP)
SECTION A-A
ELECTRICAL EQUIP ROOM
MONORAIL
PASSAGE
SPARE PARTS STORAGE
PASSAGE
CHEMICAL DRAIN SUMP & PUMP
EQUIPMENT DR. SUMP & PUMP
SECTIO



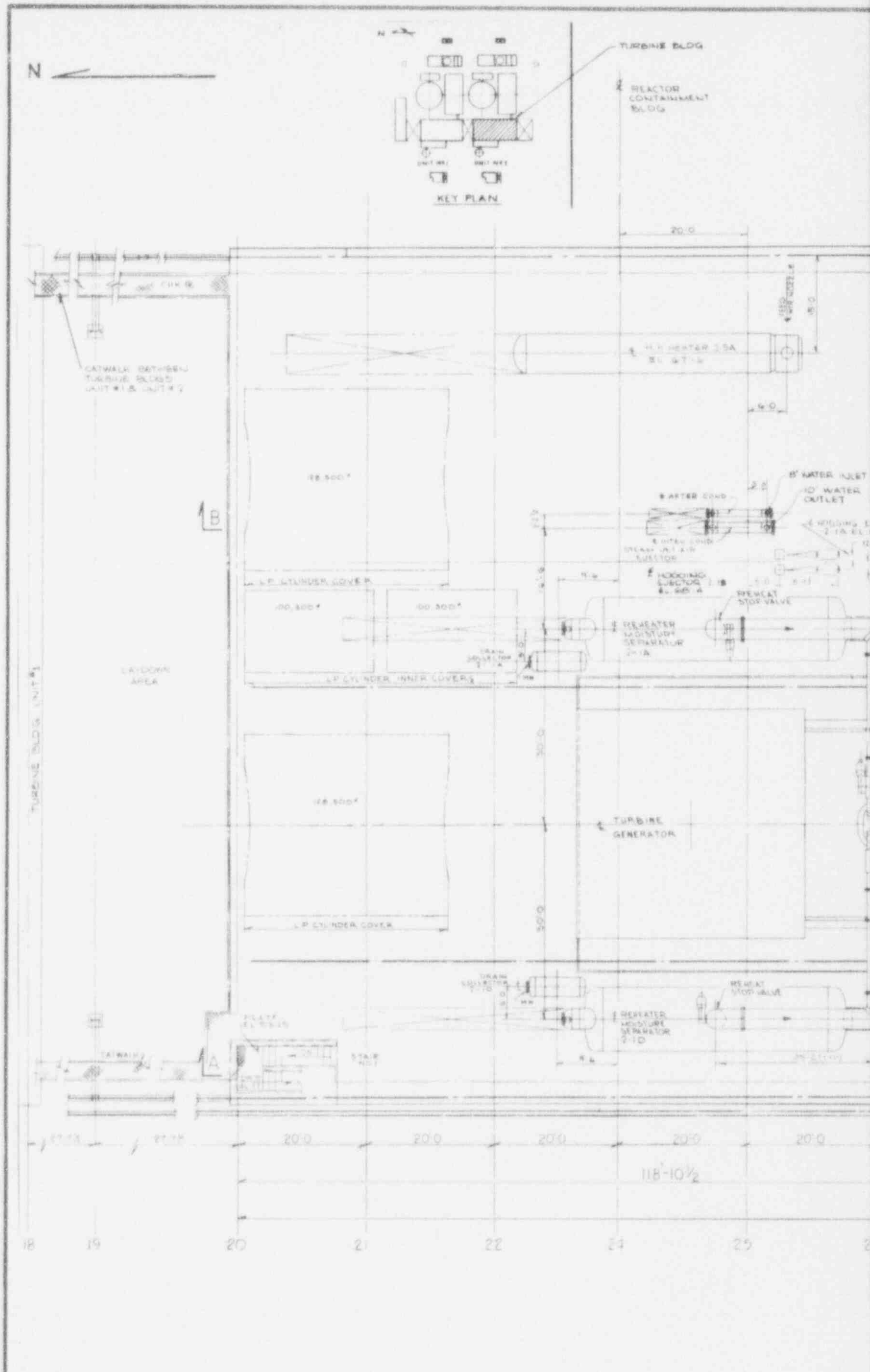
DWG NO. 2998-G-072

FLORIDA POWER & LIGHT COMPANY

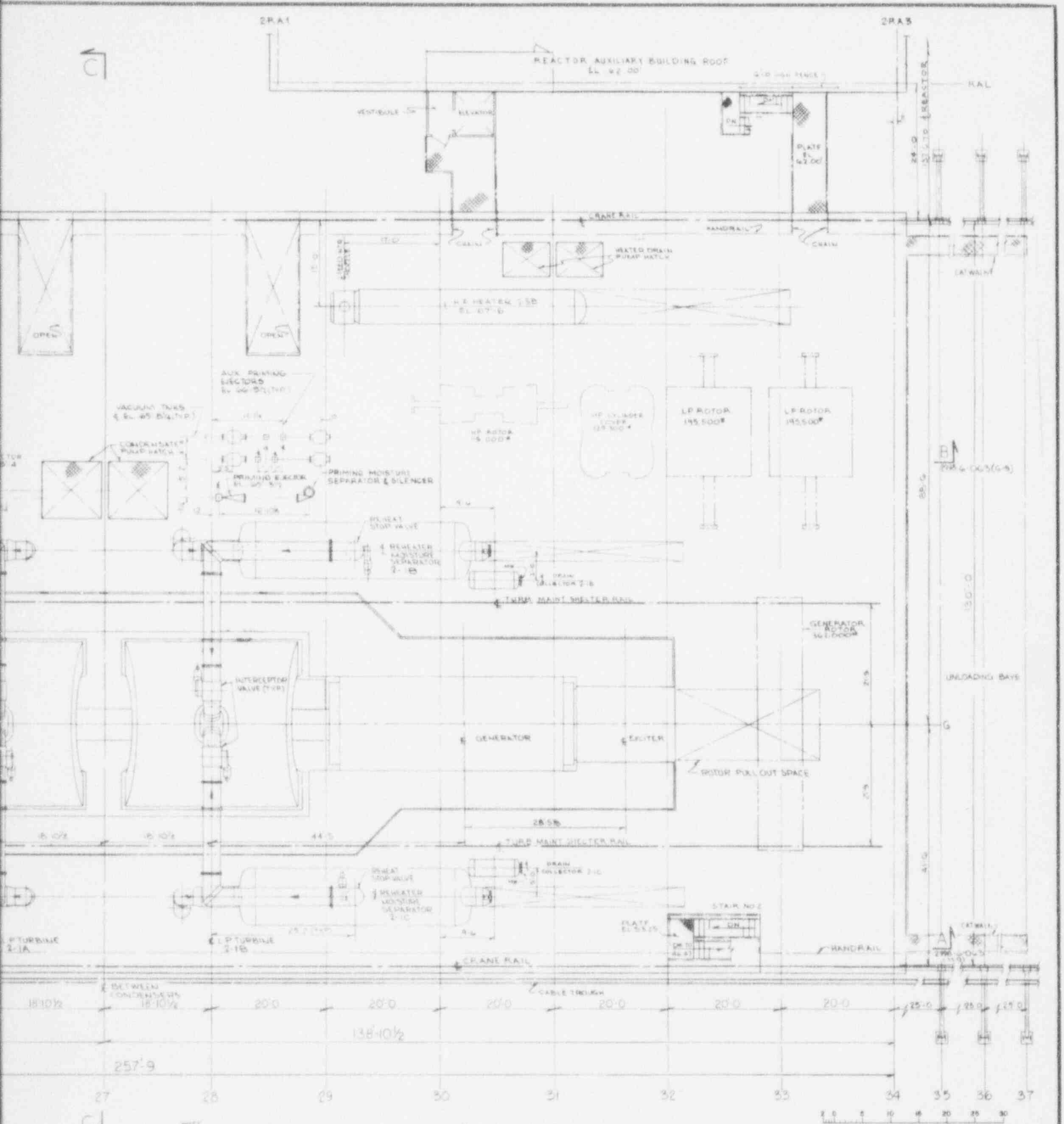
ST. LUCIE PLANT UNIT 2

GENERAL ARRANGEMENT
REACTOR AUXILIARY BUILDING
SECTIONS SHEET 1

FIGURE 3.5-9



N
TURBINE BLDG
REACTOR CONTAINMENT BLDG
KEY PLAN
CATWALK BETWEEN TURBINE BLDGS UNIT #1 & UNIT #2
LAYDOWN AREA
TURBINE BLDG UNIT #1
L.P. CYLINDER COVER
L.P. CYLINDER INNER COVERS
8" WATER INLET
10" WATER OUTLET
REHEATER MOISTURE SEPARATOR
REHEAT STOP VALVE
TURBINE GENERATOR
STAIR
CATWALK
20'0
118'-10½
18
19
20
21
22
24
25



NOTE
FOR GENERAL NOTES & REFERENCE DWGS. SEE 2998-G-064

OPERATING FLOOR PLAN EL. 62.00'

DWG NO. 2998-G-062

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

GENERAL ARRANGEMENT
TURBINE BUILDING
OPERATING FLOOR – PLAN

FIGURE 3.5-10

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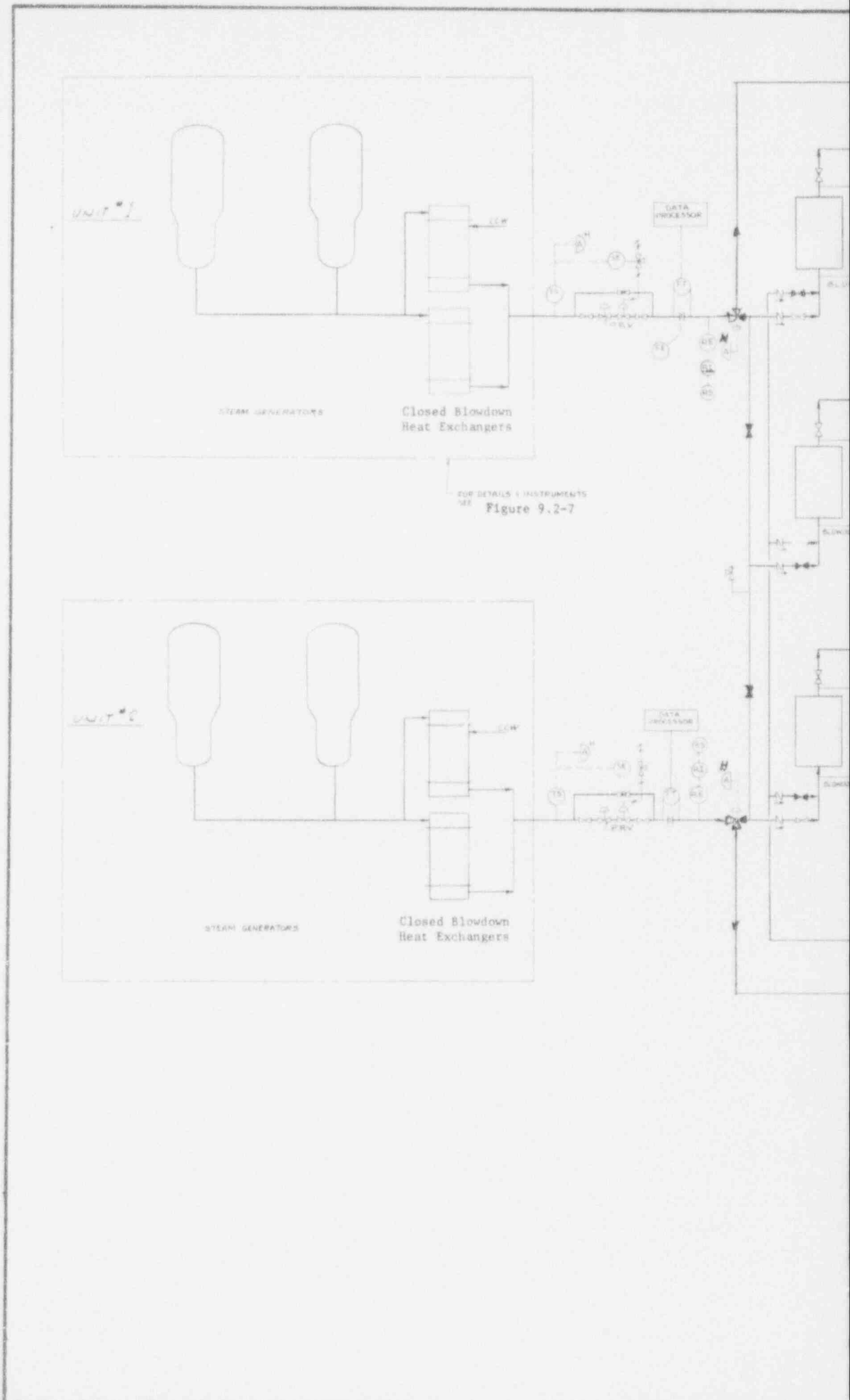
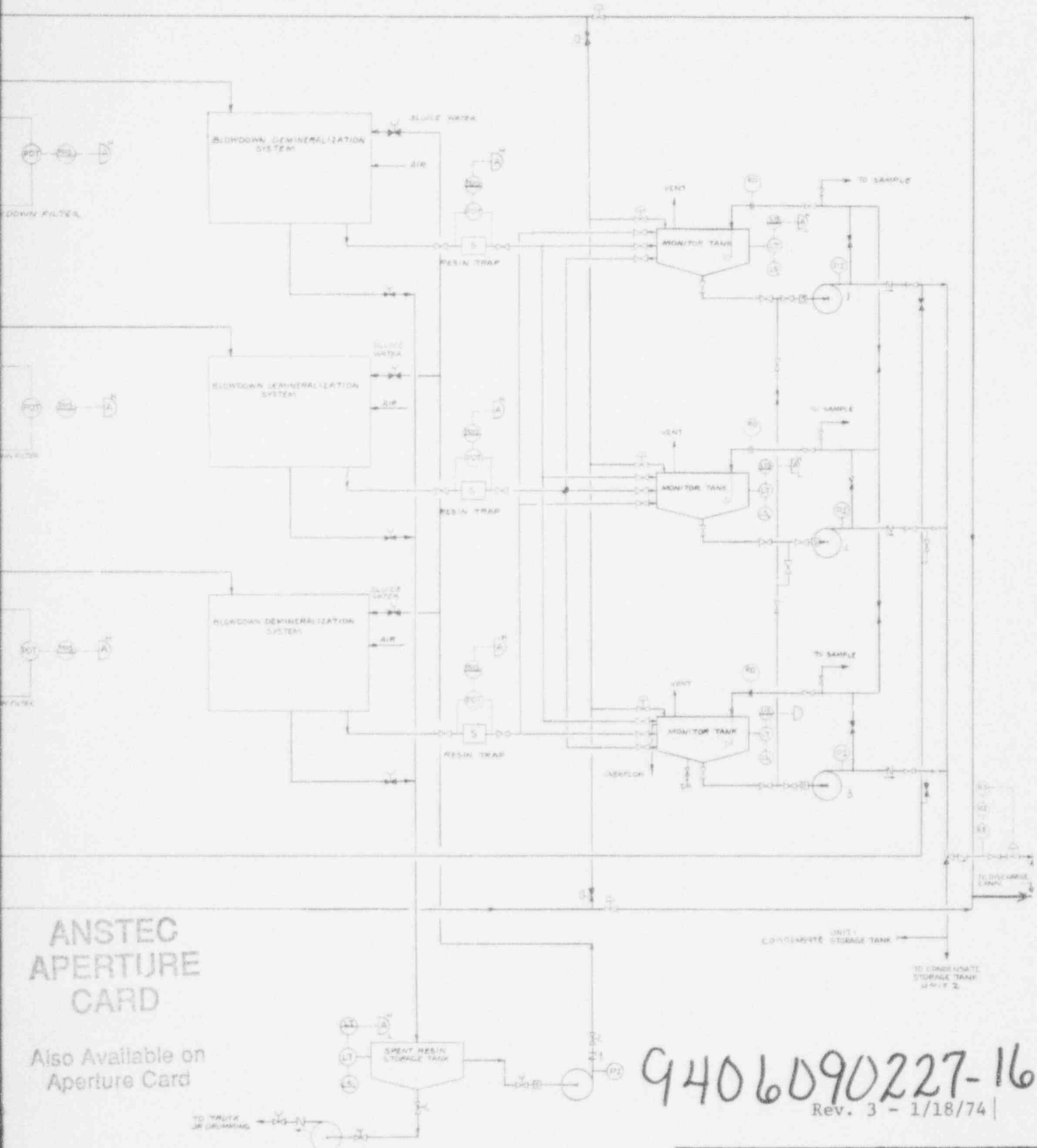

UNIT #1
DATA PROCESSOR
CCW
STEAM GENERATORS
Closed Blowdown
Heat Exchangers
FOR DETAILS & INSTRUMENTS
SEE Figure 9.2-7
UNIT #2
DATA PROCESSOR
CCW
STEAM GENERATORS
Closed Blowdown
Heat Exchangers



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Rev. 3 - 1/18/74

FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNITS 1 & 2

STEAM GENERATOR BLOWDOWN PROCESS SYSTEM P&I DIAGRAM

FIGURE 3.5-11

SL2

3.6 CHEMICAL AND BIOCIDE SYSTEMS

The purpose of this section is to describe the chemical additives such as corrosion inhibitors, and the waste streams from water treatment and other operations that may enter the environment as the result of operating St. Lucie Units Nos. 1 & 2.

This discussion outlines the methods by which liquid and gaseous effluents will be treated, controlled and discharged and includes the expected nominal quantities that will be discharged.

The order of presentation is:

a) Release of chemicals in waste water from the plant water treatment facility

b) Chemicals released from plant corrosion control systems

c) Chemicals released from plant control laboratories

d) Chemicals released from biocide control

e) Miscellaneous chemicals released.

3.6.1 CHEMICALS RELEASED FROM PLANT WATER TREATMENT FACILITY

Water from Fort Pierce municipal system is used for steam system makeup water during plant operation. This water is purified in an on-site water treatment facility comprising two demineralizer trains, each with a 600 gpm net capacity.

The mineral constituents in the water which are removed by the ion exchange resins are in turn released from the resins by washing with sulfuric acid and sodium hydroxide during regeneration. These regenerant streams are then discharged to a holding basin where they are neutralized by the addition of acid or caustic as required.

The neutralized basin contents will be discharged to the circulating water system. Table 3.6-1 presents the average and maximum expected levels of the constituents in the Fort Pierce water. From these data, estimates have been made of the average and maximum releases in pounds expected on a continuous basis from the water treatment facility. The results are summarized in Table 3.6-2 which also indicates the small incremental increases in mg/l over the background concentrations for each of the listed constituents in the Fort Pierce water.

3.6.2 CHEMICALS RELEASED FROM PLANT CORROSION CONTROL SYSTEMS

A number of chemicals are used in corrosion control of various plant systems. These chemicals are used in small amounts under highly controlled conditions. The various plant systems where these chemicals are utilized, along with their functions and principles of corrosion control, are given in the following table.

Chemicals Released From Plant Corrosion Control Systems

For control of corrosion in susceptible plant water systems, the various chemical additives and their service functions are indicated in this table:

Chemical Additive	System Served	Purpose
Hydrazine	Boiler Feed Water and Reactor Coolant System	Oxygen Scavenging
Mono-, Di-, & Trisodium Phosphate	Steam Generator Feed water System	pH Control of Water
Cyclohexylamine	Condensate Feed water	pH Control
Potassium Dichromate	Closed System of Cooling Water for Turbine Cooling and Component Cooling	Inhibition of Corrosion of Iron and Steel
Nitrogen and Hydrogen	Various Nuclear Steam Supply Systems	Cover Gas exclusion of Air and Oxygen

For each of the above additives, the quantities used, their mode of application, and rates of consumption and release are given below.

Hydrazine

Hydrazine is added to the steam generator make-up water to remove residual oxygen which, if not removed, would be detrimental to the turbine operation. The end products of the reaction between oxygen and hydrazine are water and free nitrogen gas which does not affect turbine operation. The free nitrogen will be removed in the condenser de-aerator and released to the atmosphere.

Only trace quantities of nitrogen and any residual hydrazine are released since the steam generator make-up water will have been vacuum de-aerated prior to treatment with hydrazine. Approximately 0.65 lb/hr of free nitrogen will be released at the maximum rate of hydrazine injection into the feedwater system.

Phosphates

The coordinated control and addition of phosphates in the steam generator water will result in phosphate concentrations ranging from 8 to 80 mg/l. In normal operation, these are released from the steam generator in the blowdown stream. This release is intermittent and depends on the concentration of silica in the water, condenser tube leakage and steam generator tube leakage. The blowdown may be treated in the radwaste management system, or it may be released, if low in activity, to the circulating water system.

The design blowdown rate of steam generator cycle water is 1.5 percent of the full power steam flow. The release for St. Lucie Unit No. 2 will be approximately 14 lb/hr of phosphate (PO_4) to the circulating water system, or for both units, 28 lb/hr of phosphate. This would cause a concentration increase of 0.05 ppm at the point of discharge to the ocean. During normal operation, however, the release will be less than 10 percent of this design value. Draining a steam generator for maintenance is a rare occurence. However, during draining, the release of phosphate will be less than the rate of discharge during blowdown.

Cyclohexylamine

In the condensate feedwater system, a concentration of about 2 mg/l of cyclohexylamine is maintained. It is released to the environment in the blowdown of the steam generator flowing into the circulating water system. At the maximum blowdown rate of 1.5 percent, the concentration of cyclohexylamine would be one part per billion at the point of discharge to the ocean.

At normal plant operating rates the discharge rate will be less than 10 percent of this maximum still exists.

Potassium Dichromate

In the closed cooling systems for turbine cooling water and for component cooling, a 200 to 300 mg/l concentration of dichromate (CrO_4) is maintained in order to inhibit corrosion. Since these are closed systems, there will be no chromate releases during normal plant operation: During periods of equipment malfunction or maintenance, the potential for release of chromates does exist. Maintenance practices are to collect and recycle the chromated water as much as is practicable, however it is recognized that the potential for chromate release does exist.

Since the component cooling water is potentially radioactive, drains serving the areas housing equipment and piping of the component cooling system are routed to the radioactive waste management system. The turbine cooling water is not potentially radioactive and the equipment is installed outdoors in the turbine building. Drains serving this area are tied to the plant storm drains which flow to a settling basin located south of the plant island. This settling basin also collects wash water from the intake structure travelling screens when the wash water is not routed to the trashpit located in front of the intake structure. 1

Approximately 30,000 gallons of chromated water are contained in the turbine cooling water system. If the highly unlikely events of a complete release of the turbine cooling water to the settling basin, no dilution with any other waters in the storm drains or settling basin, and complete percolation to the intake canal over a period of just a few days are postulated, the result is only a part per billion increase in the background chromate concentration in the intake canal. This is significantly less than the limits prescribed by the State of Florida for release of chromium to the environment. If a more probable sequence ov events is considered the chromate releases are many orders-of-magnitude less. Providing a lined holding basin (many acres in size) for hold up and evaporation of these waters, in lieu of a earthen diked settling basin would further reduce the chromate releases. However the costs are judged to be high in relation to the added benefit. 1

3.6.3 RELEASE OF CHEMICALS FROM THE LABORATORY

The plant chemical laboratories are organized to perform radiochemical, wet, dry and photometric analyses. Some typical determinations are: alkalinity, ammonia, boron, calcium, conductance, crud separation, fluoride, hardness, hydrazine, hydrogen, iodine, iron, lithium, oxygen, pH, phosphate, silica, strontium, sulfate and turbidity. The estimated annual use of laboratory chemicals is presented in Table 3.6-3. (One unit would consume about one half this usage).

Table 3.6-3 indicates the expected maximum annual weight and volume usage of laboratory chemicals. The average use will be approximately 50 to 80 percent of the values listed. The liquid and solid wastes from the control laboratory are collected and batch processed by the radwaste management system where they are concentrated for packing as solids, and whenever practical, they are neutralized, filtered, diluted, and discharged to the circulating water system.

1

3.6.4 CHEMICALS RELEASED FROM BIOCIDE CONTROL

The system for biocide control, as described in Section 10.5, comprises adding gaseous chlorine at the pump intake to the circulating cooling water at a rate sufficient to provide a concentration of up to 5 ppm of chlorine for fifteen minutes each day. Therefore, chlorine requirement for St. Lucie Units 1 and 2 will be about 700 lbs/day.

A portion of the chlorine will combine with organic materials and nitrogenous and carbonaceous materials in the seawater. The chlorine combining with amino compounds will form mono-, di-, and triamino chloramine compounds. The balance will be available to combat the growth of microorganisms and the incipient organic slime materials. This biocidal action will retard the fouling of condenser tubing.

During the fifteen minute period of treatment the chlorine content of the cooling water leaving the condensers will be controlled to contain a maximum free chlorine residual content of 1.5 mg/1. The total cooling water flow of 530,000 gpm in one unit will be divided between the two condensers (with 2 water boxes per condenser) in parallel flow. The flow in each water box will be successively chlorinated, therefore any free residual chlorine discharged will be diluted by a 3:1 ratio of unchlorinated cooling water discharged by the three other water boxes. If Unit No. 1 is also operating, the dilution ratio will be 7:1 in the discharge canal. A portion of all of the residual chlorine will be reduced to chlorides and chloramines by the oxidation of compounds contained in the diluting seawater. For the purposes of evaluating environmental effects, it was assumed that the reduction of free residual chlorine will not occur.

3.6.5 MISCELLANEOUS CHEMICALS RELEASED

This section covers such releases as hydrogen, carbon dioxide, nitrogen, boric acid and various drains.

The hydrogen leakage from the main generators will be 400 scf per day, continuous, for each of the two 850 MW units.

Similarly, for each of the two units, the carbon dioxide used for purging the main generator is estimated as 64,000 scf per year.

For the various nuclear steam supply systems of each unit, the release of nitrogen cover gas is 260,000 scf per year.

Boric acid is used for reactor reactivity control. A small amount of the boric acid is discharged to the circulating water system, since it is carried over from the boric acid concentrators on a continuous basis. The annual release of boric acid by this mechanism is approximately 170 pounds for two units. Boric acid may also be released on a contingency basis from the various storage tanks in the plant. Once during the life of the plant, the release of the contents of the refueling water storage tank is postulated. For two units done at two intervals, the release from each would be approximately 8,3000 pounds of boric acid into the circulating water system over a period of eight hours. With a recirculating water flow rate of 530,000 gpm per unit, this results in an addition of approximately 2 ppm boric acid to the area of discharge into the Atlantic Ocean.

Also, on a similar b... the release of the contents of the boric acid hold-up tanks once during each fuel cycle would result in addition 2,400 pounds of boric acid to the circulating water system over a period of four hours. With a recirculating water flow rate of 530,000 gpm per unit, this results in an addition of approximately 1 ppm of boric acid to the area of discharge to the Atlantic Ocean.

The floor drains and equipment drains that are potentially radioactive are routed to the radwaste management system for processing by concnetration to a solid prior to the release of residual water.

Storm drains, floor and equipment drains that are not potentially radioactive are routed to a settling basin located at the south end of the plant island.

It has been suggested that heavy metals could be released to the circulating water system from plant equipment in contact with the sea water. By several orders of magnitude, the condenser tubes constitute the largest metal surface in contact with sea water. Corrosion or erosion of the condenser tubes would release copper and zinc to the circulating water. Assuming a corrosion rate of 0.0008 inches per year and 6.2×10^7 in^2 of tube surface in contact with sea water, the calculated release is approximately 7 ppb of which approximately 80 percent is copper. Erosion is also a possible tube wastage mechanism, but is considered to be a lesser contributer. Water velocity in the tubes is maintained less than 7 fps to reduce the potential for erosion. Strainers are installed in the system to reduce the amount of particulates passing through the tubes. The condenser is chlorinated periodically to minimize the growth of shells and barnacles. All of the above reduce the potential for tube erosion. 1

TABLE 3.6-1

ANALYSES OF CITY WATER - FORT PIERCE, FLORIDA

CONSTITUENT	AVERAGE WATER ANALYSIS mg/1	MAXIMUM WATER ANALYSIS mg/1
Ca, Calcium	24.0	32.0
Mg, Magnesium	3.4	6.6
Na, Sodium	13.2	16.3
Fe, Iron	0.006	-
HCO_3, Bicarbonate	12.8	20.7
CO_3, Carbonate	-	-
SO_4, Sulfate	47.0	53.0
Cl, Chloride	22.0	25.0
CO_2, (as CO_2)	4.0	6.5
SiO_2 (as SiO_2)	5.0	10.0
Turbidity, APHA	3.0	-
Conductivity, (Micromhos/cm)	200.	312.0
TDS (Total Dissolved Solids)	131.4	176.1
pH	8.2	9.2

TABLE 3.6-2

ESTIMATED RELEASE OF CHEMICAL ELEMENTS IN WASTEWATER FROM THE PLANT WATER TREATMENT FACILITY FOR UNITS NOS. 1 & 2

Chemical Released	Continuous Release lb/hr *		Incremental Increase in Concentration mg/l	
	Ave	Max	Ave	Max
Calcium	7.7	10	0.03	0.10
Magnesium	1.1	2.8	0.005	0.004
Sodium	170	212	0.66	2.3
Iron	0.011	0.013	0.44×10^{-4}	1.5×10^{-4}
Silicon	1.6	3.2	6×10^{-3}	0.2
Bicarbonate	8.2	13.3	0.028	0.11
Sulfate	183	207	0.71	2.5
Chloride	14.2	16.3	0.06	0.21
pH	7.0	7.5	-	-
Total Dissolved Solids	386	465	1.5	5.8

*The above values are based upon a treated water flow rate of 500 gpm average and 1000 gpm maximum.

TABLE 3.6-3

ESTIMATED ANNUAL USE OF LABORATORY CHEMICAL FOR UNITS NOS. 1 & 2

Chemical	Amount Solid	Amount Liquid
Acetic Acid, glacial		20 l
Alkaline Iodide Solution		15 l
Ammonia-Free Water		24 l
Ammonia Notrogen Standard		8 l
Ammonium Acetate	6 lb	
Ammonium Chloride	2 lb	
Alizarol Cyanine	200 g	
Ammonium Hydroxide	48 lb	
Ammonium Molybdate	20 lb	
Ammonium Molybdate Solution		20 l
Ammonium Oxalate	5 lb	
Ammonium Nitrate	2 lb	
Ammonium Phosphate Monobasic	6 lb	
Ammonium Vanadate (meta)	1.5 lb	
Ammonium Persulfate	2 lb	
Ascarite	6 lb	
Barium Acetate	2 lb	
Barium Chloride	6 lb	
Barium Chloride N/40		6 l
Barium Sulfate	5 lb	
Boric Acid Standard		20 l
Borax Sulfide Buffer		8 l
Boric Acid	50 lb	
Brom Cresol Greem		1 l
Brom Phenol Blue	10 g	
Buffer Reference Solution, ph 5.00		10 l
Buffer Reference Solution, ph 7.00		30 pt
Buffer Reference Solution, ph 9.18		40 pt
Carbon Tetrachloride		2 gal
Calcium Carbonate Standard		2 l
Calcium Chloride		2 l
Carminic Acid	40 g	
Cobalt Chloride	2 lb	
Chloroform		8 gal
Cupric Sulfate	8 lb	
Dextrose	8 lb	
Dimethylglyoxime	4 oz	
p-Dimethylaminobenzaldehyde	1 kg	
p-Diphenylamine Sulfonic Acid		32 oz
Diphenylcarbazone	200 g	
Di-sodium phosphate	2 lb	
E.D.T.A. Solution		24 l
Eriochrome Black T		2 l
Ferric Nitrate	2 kg	
Ferric Chloride	4 lb	

TABLE 3.6-3 (cont'd)

Chemical	Amount Solid	Amount Liquid
Ferrous Ammonium Sulfate	10 lb	
Glycerin		20 qt
Hydrazine Dihydrochloride	200 g	
Hydrochloric Acid	50 lb	
Hydrogen		6 A-size cyl (gas)
Hydrogen Peroxide	4 lb	
Hydroquinone	4 lb	
Hydroxylamine Hydrochloride	2 lb	
Hydroxy Quinoline	½ lb	
Iodine	1 lb	
Indigo Carmine	200 g	
Isopropyl Alcohol		12 gal
Lithium Flame Standard		6 l
Mannitol	40 lb	
Manganese Chloride	4 lb	
Manganous Sulfate		6 qt
Mercuric Nitrate, 0.0141 N		16 l
Mercuric Thiocyanate	2 g	
Methyl Alcohol		10 gal
Methyl Orange		6 pints
Murexide-Sodium Chloride	400 g	
Nessler's Reagent		6 pints
Nickel Chloride	1 lb	
Nitric Acid	200 lb	
Oxalic Acid	20 lb	
Phenolphthalein		6 qt
Phosphate Standard		6 l
Platinizing Solution		400 ml
Potassium Acid Phthalate	4 lb	
Potassium Bi-iodate		2 qt
Potassium Chromate Indicator		10 l
Potassium Chloride	6 lb	
Potassium Chromate	4 lb	
Potassium Hydroxide	90 lb	
Potassium Iodate-Iodide		4 l
Potassium Iodide	2 lb	
Potassium Nitrate	2 lb	
Potassium Pyrosulfate	4 lb	
Reagent Alcohol (95%)		8 gal
Silica Standard		4 l
Silver Nitrate	2 lb	
Sodium Bisulfite	4 lb	
Sodium Carbonate		4 l
Sodium Chlorate	4 lb	
Sodium Chloride Standard	6 lb	
Sodium Chromate	4 lb	
Sodium Fluoride Standard		12 l
Sodium Hydroxide	8 lb	

TABLE 3.6-3 (cont'd)

Chemical	Amount Solid	Amount Liquid
Sodium Hypochlorite		4 gal
Sodium Nitrate	2 lb	
Sodium Thiocyanate	4 lb	
Sodium Thiosulfate Solution, N/100		12 gal
Starch Indicator		6 l
Strontium Nitrate	1 lb	
Sulfuric Acid	200 lb	
Thiosemicarbazide	400 g	
THO Indicator	400 g	
Tolidin Solution		6 l
Toluene		8 l
Zinc Sulfate	4 lb	
Zirconium Oxynitrate	2 lb	
Molybdate Reagent		30 l
Phosphoric Acid, 85%, Orthos	20 lb	
Potassium Dichromate Indicator		30 qt
Acetone		16 gal
Barium Nitrate	16 lb	
TISAB Solution		30 gal

3.7 SANITARY WASTE TREATMENT AND DISPOSAL SYSTEM

3.7.1 DESCRIPTION OF SANITARY WASTES

As a basis for design of the sanitary waste facilities for the St. Lucie Plant, it is estimated that a maximum population of 100 will be engaged at the site in administrative, operational and maintenance functions. Of this total, it is estimated that 90 persons will comprise the permanent staff that will be distributed equally over the 24 hour day, seven days per week. The remaining 10 persons are considered temporary staff that would be engaged at the plant site only during major maintenance periods. Assuming normal use of toilet and kitchen facilities, a unit wastewater flow of 20 gallons per capita per day has been conservatively used to predict the sanitary waste flow. Based upon the foregoing, a design sanitary waste flow of 2000 gallons per day has been defined. The raw wastewater will contain little or no dissolved oxygen and will contain settleable, suspended and dissolved organic and inorganic solids. A portion of these solids will require removal prior to disposal of the wastewater to the ground.

3.7.2 DESCRIPTION OF THE TREATMENT SYSTEM

Raw sanitary wastewater is conveyed by gravity to a pneumatic ejector station which is located ahead of the septic tank and which serves to pump the wastewater into the septic tank. The ejector station is a compressed-air, vacuum type with automatic operation controlled by high and low water level probes located in the wet wells.

Ejector station discharge will be conveyed to the septic tank which is reinforced concrete. Based upon the design flow and governing standards, a 2300 gallon capacity tank is provided to allow for 24 hours retention of the daily flow and for storage of approximately 300 gallons of sludge. The tank incorporates a baffle wall that divides the tank volume into 2/3 and 1/3 parts and which acts to minimize the potential for short-circuiting. Tank effluent is then discharged by gravity into a siphon box for transport to a leaching field flow-splitting box.

3.7.3 DESCRIPTION OF WASTE DISPOSAL SYSTEM

Septic tank effluent is disposed of via a regulatory agency approved leaching field system composed of six leaching lines, each 100 feet long and of four inch perforated vitreous clay pipe. Each pipe is sloped at 1/4 to 1/2 inch per 10 feet of length and is surrounded by approximately 1'-9" of one inch crushed stone and screened gravel. The effective leaching area is 900 feet^2.

3.7.4 DIESEL GENERATOR-GASEOUS WASTE

Two 3500 Kw (approx) diesel generator sets for St. Lucie Unit No. 2 will be used to supply power to those electrical loads which are needed to achieve a safe shutdown of the plant or to mitigate the consequences of a loss of coolant accident. Each 3500 Kw diesel generator set operating at full capacity, will require a maximum of 240 gallons per hour of No. 2 diesel fuel oil.

The diesel generator sets are used only in the event of a loss of normal AC power. Consequently, their frequency of service will be limited to periodic testing of about one hour duration on a semi-monthly basis to ascertain operational readiness. Due to the infrequent operation of the diesel generators, the combustion products released will be insignificant.

The following table indicates the combustion products released per pound of fuel consumed for each 3500 Kw diesel generator set based on manufacturers data and the U S Environmental Protection Agency's publication No. AP-42, February 1972, entitled "Compliance of Air Pollutant Emission Factors".

Combustion Product	Emission Factor $lb/10^3$ gal	Emissions Per D-G Set lb/hr
Particulate	25	6.0
Oxides of sulfur* (SO_x as SO_2)	58	15.6
Carbon monoxide	68	16.3
Hydrocarbons	27	6.4
Oxides of nitrogen (NO_x as NO_2)	348	145.
Aldehydes (as HCHO)	4	.94
Organic acids	7	1.68

*These figures are based on No. 2 diesel fuel oil with a sulfur content of 0.5 percent taken from Table 3.2 of EPA's Publication No. AP-42.

3.8 RADIOACTIVE MATERIALS INVENTORY

a) Fresh Fuel

Nuclear fuel for the reactor is slightly enriched uranium in the form of 0.44 inch diameter, 137 inch long rods of sintered uranium oxide pellets encapsulated in zircaloy. Each fuel assembly contains 176 fuel rods, and there are 217 fuel assemblies in the reactor. Each year during normal operation about 72 fuel assemblies will be replaced. This requires five truckloads of about 8 containers each, 2 assemblies per container. The total weight of the uranium in the 72 fuel assemblies is approximately 28 metric tons. The nuclear fuel will be transported by truck from the supplier, Combustion Engineering, located in Windsor, Connecticut, to the plant site, a shipping distance of about 1400 miles.

Combustion Engineering's containers for transferring unirradiated zircaloy clad fuel assemblies containing special nuclear material are identified as Models 927A, 927B and 927C. The Atomic Energy Commission has authorized the use of these shipping containers for the delivery of special nuclear material to a carrier (Amendment 71-3 to Special Nuclear Material License SNM-1067) and the United States Department of Transportation (USDOT) has issued Special Permit No. 6078, including First Revision, authorizing the shipment of special nuclear material in these containers. Details of shipping are discussed in Section 5.3.4.2.

The above mentioned shipping container(s) consist of a lower and upper shell. These steel shells have a positive closure which prevents inadvertent opening. The outer diameter of the assembled container is 43 inches. Each container houses two unirradiated zircaloy clad fuel bundles that are individually protected by a polyethylene covering. Internal structures and a clamping assembly secure the fuel bundles within the individual containers. The gross weights of model 927A, 927B and 927C containers are 6200 lbs., 6200 lbs. and 7200 lbs. respectively.

Fuel must be transported to the recovery facility where valuable uranium and plutonium are recovered and residual radioactive wastes are packaged for safe disposal.

The St. Lucie Unit No. 2 will discharge approximately 72 spent fuel assemblies containing approximately 28 metric tons of uranium and 240 Kg of plutonium about once a year after the first 20 months of operation. The spent fuel will be cooled in the spent fuel pool for a minimum of 4 months prior to shipment to reduce the radioactivity and heat generation in the spent fuel. During this period, the fuel assemblies will be monitored to determine whether there are any "leakers" which will require canning prior to insertion in shipping casks to further ensure against activity leakage.

After the cooling period, the spent fuel will be loaded into shipping casks designed and constructed to meet the rigorous requirements of the AEC and USDOT. These requirements provide for cooling, radiation shielding and containment of radioactivity for protection of the public in the event of abnormal and accident conditions as well as for normal conditions of transport. Prior to use, each cask design and its transport system will be reviewed and approved by AEC and USDOT, and transportation will be authorized by license issued by the AEC. License provisions will include adequate quality assurance, testing program and operating procedures to assure equipment is constructed and used in accordance with approved designs and procedures. When loaded, the casks will be carefully surveyed for leak tightness and surface radioactivity contamination and inspected to assure that they have been properly prepared for shipment and fully comply with license provisions governing transportation. Shipment will also be placarded in accordance with federal regulations.

Detailed shipping and packaging safety requirements are contained in Section 5.3.4.2 B.

It is planned that spent fuel will be transported by barge and/or exclusive use truck. Based on this plan, approximately three barge shipments or 36 truck shipments will be made per year with two fuel elements per cask and one cask per truck. It is anticipated that the destination will be Allied-Gulf Nuclear Services in Barnwell, South Carolina. The total yearly spent fuel shipping program will be carried out in approximately one month by barge or two to three months by truck.

b) Solid Radwaste

Spent resins, waste evaporator bottoms, and some process liquids will be dewatered and concentrated and, with other solid wastes, loaded into containers for shipment and disposal. It is estimated that there will be about 15 to 20 truckloads of wastes each year. Final arrangements have not been completed, but if shipped to the nearest disposal site, Morehead, Kentucky, the distance will be about 800 miles. The carriers will be licensed contractors operating in accordance with Department of Transportation and other applicable regulations.

Shipping containers or vehicles will not normally be stored on site. If short term storage does occur on site, the allowed locations will be selected such that the security and radiological surveillance procedures for plant operation are met with respect to the activity involved.

1) Expected Quantities of Radwaste (See Table 3.8-1)

The concentrator bottoms input is estimated at approximately 11,700 gallons per year. This results from two sources. The first source is from the processing of 156,000 gallons of liquid waste from primarily decontamination operations and floor washdowns. This waste is concentrated to approximately 8000 gallons or 940 cubic feet of concentrate per year to be solidified for shipment.

The second source, steam generator blowdown due to primary to secondary leakage, is processed similarly to liquid waste. Approximately 3,700 gallons or 440 cubic feet per year are generated as a result of a continuous 20 gpd steam generator leakage for normal operation.

To solidify the 11,700 gallons of liquid requires approximately two pounds of cement per pound of liquid. Using a liquid density of 10 pounds per gallon, 117,000 pounds of liquid requires 235,000 pounds of cement powder for a total weight of 352,000 pounds. The density of the cured mixture is approximately 100 pounds per cubic foot resulting in a solidified waste volume of 3520 cubic feet. Approximately 490 55-gallon drums will be required per year to dispose of this waste. The principal radionuclides in the waste are Cs-137 or Co-60 depending on the extent of failed fuel.

The anticipated operational occurrence with a steam generator leak of 120 gpd results in approximately 22,000 gallons per year of bottoms and 4,360 cubic feet of solidified waste. The estimated activity of the concentrator bottoms solid radwaste is included in Table 3.8-2.

The ion exchange resins will be shipped dewatered containing a volume of approximately 256 cubic feet per year. Activities on the various ion exchange resin beds after six months and one year decay are shown on Table 3.8-3. Cesium-137 dominates the activity that must be shipped, but without significant failed fuel, Co-60 would dominate. Assuming eight beds are disposed of per year (one purification, one deborating, two preconcentrator, two boric acid condensate, one waste condensate, and one fuel pool purification) the mixed activity would be about 23,000 Ci or 90 Ci/ft^3.

Approximately 14 filter elements per year will be shipped. Packaging requirements for filter cartridges will be based on the activities contained in Table 3.8-4.

Miscellaneous compressible solid waste such as contaminated clothing, plastic sheeting, and tape, accumulates as a result of health physics and maintenance activities. Volumes before compression typically range from 1000 to 2500 cubic feet per year at operating plants. The baler compacts the compressible solid waste with a volume reduction ranging from 5 to 10, thus producing 100 to 500 cubic feet per year as shipped. The activity is expected to range from 0.5 to 1 curie per year.

Noncompressible solid waste such as tools and contaminated equipment, is estimated to range from 500 to 1000 cubic feet per year as packaged. The estimated activity ranges from 5 to 15 curies.

2) Packaging and Shipping

As discussed in Section 3.8 C.1, liquid wastes are solidified by mixing with cement in standard, 55-gallon steel drums. The drums are preloaded with dry cement, transported via a monorail chain hoist system to the fill station, and filled with a predetermined volume of concentrator bottoms. Activity levels in the drums will be controlled such that shipments will not exceed the limits specified in Title 49 of Code of Federal Regulations.

Spent resins are sluiced to a shipping container or 55 gallon drums from the spent resin tank and dewatered via the resin dewatering pump. Activity levels will be controlled such that shipments will not exceed the limits specified in Title 49 of Code of Federal Regulations.

TABLE 3.8-1

INPUTS TO SOLID WASTE SYSTEM PER CORE CYCLE
BASED ON CONTINUOUS OPERATION WITH 1 PERCENT FAILED FUEL

Liquids	Quantity	Operation	Approximate Shipped Volume/Yr. (cu ft)	Approximate No. of Drums (55 gal)
Concentrator Bottoms, gal/yr	8,000	miscellaneous waste processing	2405*	330
Concentrator Bottoms, gal/yr	3,700	steam generator blow-down processing estimated normal operation	1115*	160
Concentrator Bottoms, gal/yr	22,000	steam generator blow-down processing anticipated operational occurrence	4360*	640
Solids				
IX Resins, dewatered, ft^3	256	sluice ion exchangers once per year	256	40
Filter Elements	14 per year	change each filter cartridge twice per year	196**	28**
Miscellaneous Compressible Solid Waste, ft^3	1,000 to 2,500	compact	100-500	14-70
Miscellaneous Noncompressible Waste, ft^3	500 to 1,000	place in suitable containers	500-1000	

* Mixed with cement, absorbents, and solidified for shipment.
** Approximate values.

TABLE 3.8-2

WASTE CONCENTRATOR BOTTOMS INPUT ACTIVITY TO SOLID RADWASTE SYSTEM

	Normal Operation (1% failed fuel)		Anticipated Operational Occurrence (0.1% failed fuel)	
Nuclide	Waste Concentration (μCi/cc at 70 F)	Total Curies/year	Waste Concentration (μCi/cc at 70F)	Total Curies/year
H-3	2.21(-3)	9.86(-2)	1.39(-2)	1.60
Sr-89	1.67(-4)	7.45(-3)	8.68(-3)	.998
Sr-90	1.07(-5)	4.77(-4)	5.5 (-4)	6.33(-2)
Y-90	4.34(-6)	1.94(-4)	3.6 (-4)	4.14(-2)
Sr-91	1.35(-8)	6.02(-7)	9.12(-5)	1.05(-2)
Y-91	3.78(-3)	1.69	1.97(-1)	22.66
Mo-99	9.3 (-3)	.415	7.44(-1)	85.56
Ru-103	1.28(-4)	5.71(-3)	6.70(-2)	7.71
Ru-106	1.02(-5)	4.55(-4)	5.24(-3)	.603
I-129	2.981(-9)	1.33(-7)	1.52(-7)	1.75(-5)
I-131	5.72(-2)	2.55	3.32	382.80
Te-132	1.87(-3)	8.34(-2)	1.38(-1)	15.87
I-133	1.56(-3)	6.96(-2)	5.54(-1)	63.71
Cs-134	4.1 (-3)	.183	2.1 (-1)	24.15
I-135	3.08(-7)	1.37(-5)	2.74(-3)	.315
Cs-136	5.08(-4)	2.27(-2)	2.8 (-2)	3.22
Cs-137	1.12(-2)	.500	6.54(-1)	75.21
Ba-140	1.2 (-4)	5.35(-3)	6.6 (-3)	.759
La-140	1.06(-5)	4.73(-4)	1.29(-3)	.148
Pr-143	1.19(-4)	5.31(-3)	6.52(-3)	.750
Ce-144	1.69(-4)	7.54(-3)	8.72(-3)	1.003
Co-60	2.14(-4)	9.54(-3)	1.1 (-3)	.127
Fe-59	3.36(-6)	1.50(-4)	1.35(-5)	1.55(-3)
Co-58	1.63(-3)	7.27(-2)	8.42(-3)	.968
Mn-54	1.21(-5)	4.50(-4)	5.8 (-5)	6.67(-3)
Cr-51	1.05(-3)	4.68(-2)	5.56(-3)	.639
Zr-95	3.22(-7)	1.44(-5)	1.67(-6)	1.23(-4)
Total		5.78		689

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TABLE 3.8-3

ACTIVITY ON ION EXCHANGER RESINS AFTER DECAY (CURIES)

Nuclide	CVCS Purification		CVCS Deborating		WMS Pre Conc.(each)		FPS Purification	
	6 mo	1 yr	6 mo	1 yr	6 mo	1 yr	6 mo	1 yr
Br-84	0	0	0	0	0	0	0	0
Rb-88	0	0	0	0	0	0	0	0
Rb-89	0	0	0	0	0	0	0	0
Sr-89	9.0	0.736	0	0	1.81(-2)*	1.47(-3)	3.88(-2)	3.17(-3)
Sr-90	24.2	24.0	0	0	4.84(-2)	4.78(-2)	3.05(-2)	3.01(-2)
Y-90	0	0	0	0	0	0	0	0
Sr-90	0	0	0	0	0	0	0	0
Y-91	58.5	6.85	0	0	2.93	0.343	4.96(-3)	5.81(-4)
Mo-99	0	0	0	0	0	0	0	0
Ru-103	2.74	1.16(-2)	0	0	5.50(-3)	2.32(-4)	1.57(-2)	6.65(-4)
Ru-106	11.7	8.25	0	0	2.33(-2)	1.65(-2)	1.79(-2)	1.27(-2)
Te-129	0	0	0	0	0	0	0	0
I-129	1.10(-2)	1.10(-2)	5.24(-6)	5.24(-6)	2.27(-7)	2.2(-7)	7.92(-6)	7.92(-6)
I-131	2.08(-3)	0	2.38(-5)	0	0	0	4.41(-5)	0
Te-132	0	0	0	0	0	0	0	0
I-132	0	0	0	0	0	0	0	0
I-133	0	0	0	0	0	0	0	0
Te-134	0	0	0	0	0	0	0	0
I-134	0	0	0	0	0	0	0	0
Cs-134	3380	2850	0	0	169	142.5	188	159
I-135	0	0	0	0	0	0	0	0
Cs-136	2.18(-3)	0	0	0	1.51(-4)	0	1.16(-4)	0
Cs-137	18,280	18,040	0	0	914	904	89.4	88.4
Cs-138	0	0	0	0	0	0	0	0
Ba-140	1.72(-3)	0	0	0	0	0	2.52(-5)	0
La-140	0	0	0	0	0	0	0	0
Pr-143	3.10(-3)	0	0	0	0	0	3.11(-5)	0
Ce-144	170	109	0	0	0.338	0.216	0.245	0.157
Fission Product Total	21,900	21,000	2.91(-5)	5.24(-6)	1065	1050	280	250
Cr-51	6.3(-2)	0	1.52(-3)	0	0	0	0	0
Mn-54	0.20	0.133	0	0	0	0	0	0
Co-58	3.18	0.534	7.65(-3)	1.28(-2)	0	0	1.8(-2)	3.05(-3)
Fe-59	0	0	0	0	0	0	0	0
Co-60	7.77	7.28	0.186	0.174	1.22(-2)	1.14(-2)	1.22(-2)	1.14(-2)
Zr-95	0	0	0	0	0	0	0	0
Corrosion Product Total	11.21	7.95	0.264	0.187	1.22(-2)	1.14(-2)	3.02(-2)	1.45(-2)

Note: * denotes power of 10

TABLE 3.8-4

ACTIVITY ON FILTER CARTRIDGES AFTER DECAY (CURIES)

Nuclide	1A		1B		WMS-Pre-Concentrator (Each)		WMS Waste		FPS Purification	
	6 mo	1 yr	6 mo	1 yr	6 mo	1 yr	6 mo	1 yr	6 mo	1 yr
Co-60	37.4	35.0	3.74	3.5	6.92(-2)*	6.48(-2)	**	**	6.86(-2)	6.42(-2)
Fe-59	1.90(-2)	**	**	**	**	**	**	**	**	**
Co-58	17.9	3.00	1.79	0.330	3.32(-2)	**	**	**	1.02(-1)	1.71(-2)
Mn-54	0.98	0.655	9.8(-2)	6.55(-2)	**	**	**	**	**	**
Cr-51	0.364	**	3.64(-2)	**	**	**	**	**	**	**
Zr-95	2.82(-2)	**	**	**	**	**	**	**	**	**
Total	56.6	38.7	5.66	3.87	1.024(-1)	6.48(-2)	**	**	1.706(-1)	8.13(-2)

** less than 10^{-2}

* ( ) power of 10

3.9 TRANSMISSION FACILITIES

The construction and operation of St. Lucie Unit No. 2 will not require any additions to the power transmission system external to the plant site. As part of the development of St. Lucie Unit No. 1, three 240 kv circuits are being installed along a single right of way and will be operational in 1973-74(1). Each of these three circuits is capable of carrying the total power load from either Unit No. 1 or Unit No. 2. Therefore, no additional transmission lines will be required resulting from the construction of St. Lucie Unit No. 2.

The Unit No. 1 circuits are carried on separate structures in a single corridor. For the Indian River crossing, a long span design using single 3400 Kc mil ACSR/AW conductors was chosen. The land portions of the transmission link are carried on concrete H-frame structures with an average span length of about 660 ft. Conductors are 2-1691 Kc mil. Right-of-way width is 1200 ft. immediately adjacent to the Indian River shore to minimize effects on adjacent properties, and 660 ft. elsewhere. Half the right-of-way is required for the three transmission circuits, the remainder being held for future expansion.

Line routing was chosen to avoid residential or other developed areas. Of the approximately 760 arces of right-of-way, 43 acres of ridge land on the west side of the Indian River are divided into tracts. The two houses located within this 43 acres have been purchased by FP&L. Approximately 712 acres of right-of-way are considered undeveloped and have been used for natural pasture lands. Of these 712 acres, approximately 80 acres are cultivated in orange trees, 40 acres are a water storage savanna and 30 acres are included in river swamp. The transmission line facilities will have very little effect on the orange groves within the right-of way and have no significant effect on the water storage in the savannas or the river swamp. Approximately 630 acres of right-of-way are suitable for residential and commercial development, of which 4800 acres were held by a single land development company. The right-of-way has created a potential green belt through this future development.

The switching station within the plant boundaries will have four input bays which will be constructed for Unit No. 1. These four bays will suffice for both Units No. 1 and No. 2. However, the eastern end of the third circuit for Unit No. 1 will be moved about 200 feet south and then used as the backup circuit for Unit No. 2.

Approximately 1000 sq ft of additional land will be required to locate the main transformers for Unit No. 2. The new connecting lines from the Unit No. 2 main transformers to the switchyard will be a single span and will not require any intervening tower structures.

Therefore, there will be virtually no environmental impact resulting from the construction of the additional transmission facilities associated with the St. Lucie Unit No. 2.

APPENDIX 3A

PRESSURIZED WATER REACTORS
BASIC DATA FOR SOURCE TERM CALCULATION

1) Operation power (mwt) at which impact is to be analyzed.

   The rated power of the nuclear steam supply system is 2570 mwt, of which 2560 mwt is generated by the reactor and 10 mwt by the reactor coolant pumps. Accident analyses and calculations of radioactivity discharges were performed assuming operation at 2700 mwt (105 percent of rated power) for conservatism.

2) Weight of the uranium loaded (first loading and equilibrium cycle).

   The first loading weight of uranium will be 82.85 metric tons and the equilibrium loadings will be 85.4 metric tons.

3) Isotopic ratio in the fresh fuel (first loading and equilibrium cycle).

   The fuel enrichments for St. Lucie Unit No. 2 are as follows: 1

	Batch	Enrichment (w/o U^{235})
Initial Loading	A	1.93
	B	2.33
	C	2.82

   The equilibrium cycle fuel enrichments for reload batches have not been firmed up at this time since the physics evaluation studies have not been completed.

   The best estimate of the fuel enrichments for the equilibrium core is:

	Batch	Enrichment (w/o U^{235})
	D	(48 assemblies) 3.40 (25 assemblies) 2.85
Equilibrium Core	E	(48 assemblies) 3.40 (25 assemblies) 2.85
	F	(48 assemblies) 3.07 (25 assemblies) 2.66

4) Expected percent of leaking fuel.

   1.0 percent leaking fuel is the basis for maximum design and maximum anticipated releases. 0.1 percent leaking fuel is the basis for expected releases.

5) Escape rate coefficients used (or reference).

The escape rate coefficients for fission product releases are as follows:

Elements	Escape Rate Coefficients, sec^{-1}
Noble Gases	6.5×10^{-8}
Halogens, Cesium	2.3×10^{-8}
Tellurium, Molybdenum	1.4×10^{-9}
All Others	1.4×10^{-11}

6) Plant capacity factor, percent.

It is estimated that St. Lucie Unit No. 2 will operate with a plant capacity factor of 72 percent for the first cycle. An 80 percent factor is expected for subsequent cycles.

7) Number of steam generators.

St. Lucie Unit No. 2 has two steam generators. 1

8) Type of steam generator (recirculating, straight through).

Each steam generator is a verticle U-tube recirculating heat exchanger with the reactor coolant on the tube side and the secondary fluid on the shell side.

9) Mass of primary coolant in system total (lbs) and mass of primary coolant in reactor (lbs).

When operating at 100 percent power, the reactor contains 201,700 lbs of primary coolant. The Reactor Coolant System including the pressurizer and Chemical and Volume Control System (CVCS) contains 464,317 lbs of coolant when operating at 100 percent power. Excluding the CVCS, the Reactor Coolant System contains 434,796 lbs of coolant when operating at 100 percent power.

Under the same operating conditions, the reactor contains 44,719 lbs of coolant in the active core region.

When operating at 105 percent power, the reactor contains 200,000 lbs of primary coolant. The Reactor Coolant System including the pressurizer and Chemical Volume Control System contains 460,300 lbs of coolant when operating at 105 percent power. Excluding the CVCS, the Reactor Coolant System contains 430,8000 lbs of coolant when operating at 105 percent power.

10) Primary coolant flow rate (lbs/hr).

Reactor coolant flow rate (4 pumps) is 122×10^6 lbs/hr.

11) Mass of steam and mass of liquid in each steam generator (lbs).

Each steam generator contains 9,500 lbs of steam and 130,500 lbs of water under operating conditions of 105 percent power.

12) Total mass of secondary coolant (lbs).

Total mass of secondary coolant is expected to be approximately 1.3×10^6 lbs.

13) Steam generator operating conditions at 100 percent power are as follows:

Outlet Steam Pressure	800 psig
Flow Rate	11,206,000 lb/hr (2 Units)
	5,603,000 lb/hr (1 Unit)
Steam Temperature	520.3°F
Steam Quality	99.8%

Steam generator operating conditions at 105 percent power are as follows:

Outlet Steam Pressure	815 psia
Flow Rate	11,760,000 lb/hr (2Units) 1
	5,880,000 lb/hr (1 Unit)
Steam Temperature	520.3°F
Steam Quality	99.8%

14) Total flow rate in the condensate demineralizer (lb/hr).

St. Lucie Unit No. 2 does not have a condensate demineralizer. The total flow rate in the condenser is 7,820,000 lb/hr at 100 percent power. The total flow rate in the condenser is 8,225,000 lb/hr at 105 percent power.

15) What is the containment free volume (ft^3)?

The net free containment is 2.5×10^6 ft^3.

16) What is the expected leak rate of primary coolant (lb/hr) to the containment atmosphere?

Leakage of the reactor coolant to the containment atmosphere is expected to be 240 lb/day or 10 lb/hr.

17) How often is the containment purged? Is it filtered prior to release? Are iodine absorbers provided? What decontamination factor is expected?

For the purposes of evaluating environmental impact, it is assumed that the containment will be purged 4 times per year for long term access with the reactor shut down. It is expected that short term access with the reactor at power can be achieved without reliance on purging. The containment iodine cleanup system (see question 18) will be operated prior to purging operations. The purge flow rate is 42,000 cfm. The purge stream is processed through a pre-filter and then a HEPA filter prior to release to atmosphere. The expected HEPA filter efficiency is 99.9 percent for particles 0.3 microns and larger in diameter. No iodine absorbers are provided.

18) Is there a continuous air cleanup for iodine in the containment? If so, what volume per unit time is circulated through it? What decontamination factor is expected? At what concentration will purging be initiated?

There is an airborne radioactivity removal system which will be operated intermittently. There are two fans, each of which is capable of processing 10,000 cfm (0.24 vol/hr). A decontamination factor of 100 is expected based on a charcoal absorber efficiency of 99.9 percent. It is expected that purging operations will be initiated after the cleanup system has been operated for a period of 10 hours after reactor shutdown.

19) Give the total expected annual average letdown rate (lb/hr) during power operation.

a) What fraction of the letdown is returned to the primary system? How is it treated? What are the expected decontamination factors for removal of principal isotopes? 1

b) How is Li and Cs normally controlled?

c) What fraction of this goes to boron control system? How is this treated, demineralization, evaporation, filtration?

d) Is plant design for load follow or base load? What fraction of the letdown stream is diverted to the radwaste system for boron control? How is this treated (demineralization, evaporation, filtration, etc.) and what fraction will be discharged from the plant.

a) The total expected continuous letdown rate is 40 gpm or 19,800 lbs/hr which flows through a prefilter, demineralizer and afterfilter in the Chemical and Volume Control System to remove soluble and particulate activity from the reactor coolant. The expected demineralizer and filter decontamination factors are listed below. During steady state power operation all of this letdown flow is returned to the reactor coolant system after purification.

Element	Ion Exchanger* Decontamination Factor	Filter Decontamination Factor
H-3, Kr, Y, Mo, Xe, Cs	1	1
Ru, Te, La, Pr, Ce	10	1
Sr, Ba	100	1
Br, Rb, I	1,000	1
Corrosion Products	1	10

b) Provisions have been incorporated in the CVCS for intermittent removal of cesium and lithium during normal purification of the letdown flow. A separate mixed bed ion exchanger with a 3:1 cation to anion volume ratio is employed approximately 20 percent of the time for this purpose, with a decontamination factor of 10 for these isotopes. For system analysis assume that the continuous purification ion exchanger (in a, above) is not in service during periods when the Li removal ion exchanger is being used. 1

c) During periods of reactor coolant fluid expansion or feed and bleed operation for boron concentration changes, all of the letdown flow is diverted, after purification, to the Waste Management System for additional treatment prior to discharge. It is estimated that approximately 780,000 gallons of liquid wastes per year will be discharged from the Waste Management System as a result of these operations. Operations of the Waste Management System are discussed in Section 3.5 of the Environmental Report and Section 11.2 of the PSAR.

d) St. Lucie Unit No. 2 is designed for load following.

3.8 percent of the 40 gpm letdown stream is diverted to the Boron Management System for boron recovery.

The Boron Management System processes 780,000 gallons of diverted letdown per year. This diverted stream passes through a flash tank, enters a hold-up tank, passes through a pre-concentration filter, and then into the boric acid concentrator. The concentrator is assumed to release all its effluents (concentrate and distillate) to the Waste Management System for processing.

The entire 780,000 gallons of diverted letdown is processed through the Boron Management System & Waste Management System and then discharged from the plant.

20) What fraction of the letdown stream is stripped of noble gases and iodines? How are these gases collected? What decay do they receive prior to release? Indicate stripping fraction.

Letdown returned to the Reactor Coolant System is not stripped of noble gases. Iodine is removed in the CVCS ion exchangers with an expected decontamination factor of 1,000.

21) What fraction of the noble gases and iodines are stripped from that portion of the letdown stream which is sent to the boron control system? How are these gases collected? What decay do they receive before release?

Approximately 90 percent of the noble gases are stripped from fluids routed through the Waste Management System. The flash tank is used for stripping inert gases from the letdown flow prior to processing in the Waste Management System demineralizers, filters and concentrators. Stripped gases are collected in the gas decay tanks. As indicated in Section 3.5 of the Environmental Report the gases are held in the gas decay tanks for an average time of 30 days.

Three 144 cu ft gas decay tanks are provided to hold up the waste gas at 165 psig. Approximately 50,000 scf per year (140 scf per day) of nitrogen and hydrogen gas are generated due to all degassifying operations. An overall partition factor 10^{-3} (including plate-out effect) is assumed for iodine in the gas decay tanks. 1

* Ion exchange performance is based on data in WAPD-TM-215.

22) Are releases from the decay tanks passed through a charcoal absorber? What decontamination factor is expected?

No.

23) How frequently is the system shutdown and degassed? How many volumes of the primary coolant system are degassed in this way each year? What fraction of the gases present are removed? What fraction of other principle nuclides are removed and by what means? What decay time is provided?

The Reactor Coolant System will be degassed through the volume control tank prior to each of the assumed five cold shutdowns during the operating cycle. Approximately five reactor coolant system volumes will be degassed in this way each year. Conservatively, it is assumed that all gases are removed during each degasification and are routed to the gas decay tank for an average decay time of 30 days discussed in the response to Item 21. Approximately 7,500 scf of nitrogen and hydrogen gas are generated for the five shutdown degassing operations.

Other soluble nuclides are removed by the dilution of reactor coolant due to feed and bleed operations. It is anticipated that an average value of 56 percent of such nuclides will be removed during each shutdown. The maximum reactor coolant system concentrations at 0.1 percent failed fuel were used for evaluation of normal release.

24) Are there any other methods of degassing (i.e., through pressurizer, etc.)? If so, describe. How is it treated?

Degassing of the Reactor Coolant System is accomplished primarily through the volume control tank in the Chemical and Volume Control System. Chemistry control may dictate venting of the pressurizer through the steam space sample gas line. The cooled sample will be routed to the flash tank and thence to the Gaseous Radwaste System.

Gas removed from the pressurizer through the Sampling System is routed through the flash tank to the Gaseous Radwaste System terminating in the gas decay tanks. There they are held up as described in the response to Item 21.

25) What is the expected leak rate of primary coolant to the secondary system?

The total average annual primary to secondary leak rate is assumed to be approximately 20 gallons per day with 0.1 failed fuel. The estimated Technical Specification limit on secondary iodine concentration is 1.6 ci/cc.

26) What is the normal rate of system generator blowdown? Where are the gases from the blowdown vent discharged? Are there charcoal absorbers on the blowdown tank vent? If so, what decontamination factor is expected?

The normal blowdown required is determined by the amount of steam generator leakage and the time that the leakage occurs. A condenser leak will require immediate attention to maintain secondary chemistry. For a continuous 20 gallon per day primary to secondary leak an average annual blowdown of approximately 200 gallons per day is required to maintain the steam generator total dissolved solids below a normal limit of 500 ppm (400 ppm boric acid plus 100 ppm of normal boiler water additives or impurities). Blowdown may be routed to the blowdown process system. The blowdown heat exchanger eliminates the need for a blowdown tank and vent. 3

27) What is the expected leak rate of steam to the turbine building? What is the ventilation air flow through the turbine building (cfm)? Where is it discharged? Is the air filtered or treated before discharge? If so, provide expected performance.

The turbine building is an open structure with no ventilation system for the equipment areas. It is estimated that the leakage in the turbine area is in the order of 20 lb/hr, of which about 10 percent would be in vapor form.

28) What is the flow rate of gaseous effluent from the main condenser ejector? What treatment is provided? Where is it released?

The main condenser air ejector discharge rate is 25 scfm air. It is released to the atmosphere. The activity concentration at which the air ejector flow will be transferred to the plant vent is approximately 1×10^{-8} μci/cc.

29) What is the origin of the steam used in the gland seals (i.e., is it primary steam, condensate, or demineralized water from a separate source, etc.) How is the effluent steam from the gland seals treated and disposed of?

The gland sealing steam is taken from the main steam line header. The leak-off from the gland seals is condensed in the gland steam condenser and returned to the main condenser. The gland steam condenser is vented by an exhauster fan to the off gas header which combines with the main condenser air ejector discharge. The gland steam exhauster flow rate is 740 cfm of air.

30) What is the expected leak rate of primary coolant to the auxiliary building? What is the ventilation air flow through the auxiliary building (cfm)? Where is it discharged? Is the air filtered or otherwise treated before discharge. If so, provide expected performance. 1

The expected leak rate of primary coolant to the auxiliary building is 10 gallons per day.

The ventilation flow rate throuth the various reactor auxiliary building areas is as follows:

a) Control room: 2000 cfm

b) Laboratory and personnel areas: 10,000 cfm

c) Switchgear and electrical equipment areas: 50,000 cfm

d) Waste management system and chemical and volume control system areas: 70,600 cfm

e) Engineered safety features area: 60,000 cfm

The exhaust from potentially contaminated areas (d) of the building is discharged to the plant vent. Other areas are exhausted directly outside the building. Air exhaust from the engineered safety features area will be exhausted through charcoal filters under accident conditions.

31) Provide the average gallons/day and Ci/cc for the following categories of liquid effluent. Use currently observed data in

the industry where different from the PSAR or the Environmental Report (indicate which is used):

a) High-level wastes (for example, primary coolant letdown, "clean" or low conductivity waste, equipment drains and deacrated wastes);

b) "Dirty" wastes (for example, floor drain wastes, high-conductivity wastes, aerated wastes and laboratory wastes);

c) Laundry, decontamination and wash-down wastes;

d) Steam generator blowdown - give average flow rate and maximum short-term flows and their duration;

e) Drains from turbine building.

For these wastes (a-e) provide:

1) Number of capacity of collector tanks.

2) Fraction of water to be recycled or factors controlling decision.

3) Treatment steps-include number, capacity and process decontamination factor for each principal nuclide for each step. If step is optional state factors controlling decision.

4) Decay time from primary loop to discharge.

(a) High Level Wastes: High activity "clean" wastes consist of reactor coolant letdown diverted to the boron recovery system (portion of the Waste Management System) as the result of coolant expansion or feed and bleed operations for boron concentration adjustment, sample system drains, valve leakoffs and various reactor coolant auxiliary stem relief valves. It is estimated that approximately 780,000 gallons per year of "clean" waste will be generated at an average rate of 2200 gallons per day with an expected activity of approximately 30 Ci/cc prior to any processing. More than 99 percent of the "clean" waste will be discharged to the boron recovery system after processing in the CVCS ion exchangers. Table 2.3.7-1 yields a more conservative estimate.

(b) Dirty waste consist of floor drains from possible contaminated areas, decontamination drains, chemical laboratory drains, and reactor coolant auxiliary systems equipment drains. It is estimated that approximately 155,000 gallons of these 3
wastes could be generated during the annual operating

cycle at an average rate of 425 gal/day with an expected activity of approximately 0.1 Ci/cc prior to processing.

The dirty wastes are normally directed to the equipment drain (EDT) or chemical drain (CDT) tanks. An approximate breakdown of waste to these two tanks is as follows:

Waste Source	Gallons/Day	Influent Activity (Fraction of RCS Activity)	EDT	CDT
Equipment Drains and Leakage	75	0.01	X	
Sample and Lab Drains	20	0.1		X
Decontamination Drains	180	0.001		X
Floor Drains	150	0.1	X	

3

(c) Laundry Waste: Laundry waste consists of drains from the laundry and contaminated showers. Approximately 117,000 gal/year of these wastes are assumed to be generated with an expected influent activity level of approximately 10^{-5} μCi/cc prior to dilution.

(d) Turbine Building Drains: The drains from the turbine building are estimated to be 1 GPM or 1440 gallons per day. The activity concentration has not been calculated, but other plant experience indicates an order of 1×10^{-5} μCi/cc can be expected. 3

(1) Number and Capacity of Collector Tanks (Refer to Section 3.5 of this report for location of tanks in processing scheme.)

Tank	Quantity	Capacity (gal)
Reactor Drain Tank	1	1,560
Flash Tank	1	400
Holdup Tank	4	40,000 (ea)
Boric Acid Condensate Tank	2	7,300 (ea)
Boric Acid Holding Tank	1	2,400
Equipment Drain Tank	2	25,000 (ea)
Laundry Drain Tank	2	2,000 (ea)
Chemical Drain Tank	1	1,000
Spent Resin Tank	1	3,200
Waste Condensate Tank	2	1,370 (ea)

(2) Fraction of Water Recycled: It is expected that most of the water processed by the boron recovery system will be recycled. However, the effluent from the concentrators enables discharge to the environment at concentrations well below current proposed discharge guidelines when dilted in the circulating water flow, and thus represent a negligible effect on the environment. For environmental impact it is assumed that all of the concentrator condensate wastes are discharged.

(3) Treatment Steps: A discussion of processing "clean" and "dirty" wastes is given in Section 3.5 of this report. The expected equipment performance is given in Tables 1 and 2.

Ion exchanger performance is based on data in WAPD-TM-215. Normally it is expected that the pH of the miscellaneous dirty wastes will be adjusted to obtain the optimum waste concentrator performance for the retention of iodine.

(4) Cooling Time Prior to Discharge: There is no direct discharge of wastes from the primary loop to the environment. Because of the very small discharge flow rates of liquid wastes compared to the circulating water flow rate and the minimum processing times required for all wastes, it is expected that the heating effect of liquid waste discharge on the environment is negligible and insignificant. A nine day holdup time is assumed for liquid radwaste processing as shown in Table 1. 1

32) Dilution flow rate for liquid effluents, minimum and normal gpm and total gallons per year.

The normal dilution flow rate for Unit 2 is 530,000 gpm. For short periods of time this may be reduced to 265,000 gpm. The annual dilution flow rate is estimated to be 2.5-2.7 x 10^{11} gallons allowing for equipment maintenance.

33) How is waste concentrate (filter cake, demineralizer resin, evaporator bottoms) handled? Give total volume, weight and curies per day or year.

Treatment of Bottoms and Resins: Concentration bottoms will either be reused or stabilized in 55 gallon drums for offsite disposal. Spent resins will be collected in the spent resin tank, prior to being sluiced to 55 gallon drums or a shielded shipping container for offsite disposal.

Source	Unsolidified Volume per Year	Curies per Year (Maximum Expected)
Concentrator Bottoms (with reuse of boric acid concentrator bottoms)	8,000 gal	80
Spent Resins	256 ft^3	2,000

It is expected that boric acid concentrator bottoms will be reused.

34) Include the expected annual volume of dry waste and curie content of each drum.

The expected annual volume of solidified liquids is 2400 ft^3 with an acitvity of 0.25 Ci/drum.

The expected activity for shipping containers containing spent resins is 57.4 Ci/drum.

35) For demineralizer regenerants, provide (a) time between regeneration; (b) treatment of regenerants; (c) regenerant volumes; and (d) fraction discharged. 1

The 2 Boron Recovery Processing System Pre-Concentrator ion exchangers the 2 Chemical Volume Control System ion exchangers, and the Liquid Waste System ion exchanger are not regenerated. Spent resins are collected and shipped in shielded containers for offsite disposal.

36) Provide a process and instrumentation flow diagram for the gaseous and liquid radwaste systems.

Figure 3.5-5 of the Environmental Report is a process and instrumentation diagram for the Liquid Waste System. Figure 3.5-7 of the Environmental Report is a process and instrumentation diagram for the Gaseous Waste System.

TABLE 3.A-1

EXPECTED OPERATING CONDITIONS

I. Boron Recovery Process System

1. 780,000 gal/yr water due to the cold and hot shutdown and fuel burnup for a base loaded plant.

2. Average 9 day holdup based on average fill and process time of one holdup tank.

3. Equipment Performance
   a) Ion exchanger and filter DF (See Table 2)
   b) Boric acid concentrator overall DF=200 (inlet/distillate) and DF=10^4 (bottoms to distillate)
   c) Gas stripping overall DF=10 for flash tank and concentrator (i.e., dissolved fission gases in liquid effluent)

4. Influent activity = average RCS activity

II. Waste Treatment Process System 1

A. Liquid, exclusive of steam generator blowdown

1. Influent activity = 0.01 RCS activity, due to dilution from decontamination, washdown, etc. No fission gases in aerated influent.

2. 156,000 gal/yr miscellaneous waste

3. Nominal 9 day process time

4. Equipment performance
   a) Waste concentrator overall DF=500 (inlet/disillate) DF=10^4 (bottom to distillate)
   b) Waste condensate ion exchanger DF=10

B. Liquid, steam generator blowdown only

1. Average RCS activity (no fission gas in blowdown)

2. 5 gph SG tube leak, 50 gph blowdown to waste treatment process system

3. Nominal 20,000 gal steam generator water volume

4. Process time and equipment performance same as IIA

TABLE 3.A-1 (Cont'd)

C. Gaseous release from gas decay tank

1. Gas stripping DF=10

2. Average 30 day holdup for decay

III. Basis for Gas Collection Header Releases

A. Noble Gas Release

1. Release due to diffusion from holdup tank

2. Average 20 ft depth @ 100 F

B. Iodine Releases (I-131 only)

1. Boron recovery processing system
   a) Iodine partition factor in holdup tank = 10^{-2}
      (ratio of weight of iodine in air to water)
   b) CVCS ion exchanger DF=10^{3} 1

2. Waste treatment process system
   a) Iodine partition factor = 10^{-3}

TABLE 3.A-2

TABULATION OF EXPECTED DECONTAMINATION FACTORS

Nuclide	CVCS Purification Ion Exchanger	Boron Recovery Processing System Pre-Concentrator Ion Exchanger	Filter	Nuclide	CVCS Purification Ion Exchanger	Boron Recovery Processing System Pre-Concentrator Ion Exchanger	Filter
H-8	1	1	1	I-133	1000	1000	1
Br-84	1000	1000	1	Xe-133	1	1	1
Kr-85m	1	1	1	Te-134	10	10	1
Kr-85	1	1	1	I-134	1000	1000	1
Kr-87	1	1	1	Cs-134	1	100	1
Kr-88	1	1	1	I-135	1000	1000	1
Rb-88	1000	10	1	Xe-135	1	1	1
Rb-89	1000	10	1	Cs-136	1	100	1
Sr-89	100	10	1	Cs-137	1	100	1
Sr-90	100	10	1	Xe-138	1	1	1
Y-90	1	10	1	Cs-138	1	100	1
Sr-91	100	10	1	Ba-140	100	10	1

TABLE 3-A-2 (Cont'd)

Nuclide	CVCS Purification Ion Exchanger	Boron Recovery Processing System Pre-Concentrator Ion Exchanger	Filter	Nuclide	CVCS Purification Ion Exchanger	Boron Recovery Processing System Pre-Concentrator Ion Exchanger	Filter
Y-91	1	10	1	La-140	10	10	1
Mo-99	1	10	1	Pr-143	10	10	1
Ru-103	10	10	1	Ce-144	10	10	1
Ru-106	10	10	1	Co-60	1	1	10
Te-129	10	10	1	Fe-59	1	1	10
I-129	1000	1000	1	Co-58	1	1	10
I-131	1000	1000	1	Mn-54	1	1	10
Xe-131m	1	1	1	Cr-51	1	1	10
Te-132	10	10	1	Zr-95	1	1	10
I-132	1000	1000	1				

4.1 SITE PREPARATION AND PLANT CONSTRUCTION

4.1.1 SUMMARY OF PLANS AND SCHEDULES

Since St. Lucie Unit No. 2 is to be an exact duplicate of Unit No. 1, the design, manpower and equipment are readily available to initiate construction almost immediately. To meet a 1979 fuel loading date, the site preparation for the reactor and auxiliary buildings must commence February 15, 1975. Any improvement in this date will result in a significant potential for an earlier completion date. Site preparation for the intake and discharge canals, switchyard, transmission lines, highway bridges and plant roads for Unit No. 2 are in various stages of construction as part of the Unit No. 1 construction program.

It is expected that an average of 750 workers will be employed in the construction force. The force is expected to peak at 1400 between December 1977 and December 1978, decline to 900 in January 1979, 500 by the end of May 1979, and to zero by the end of March 1980.

Initial loading of fuel is scheduled for September 1979, and initial commercial operation is scheduled for December 1979.

4.1.2 CUT AND FILL AREAS

Cutting the beach and dune line for installation of the intake and discharge pipelines increases the possibility of wave damage during major storms. The sand dune is the highest point on the Island and is therefore its defense against wave overrun. To maintain the dunes during construction, the installation of the discharge pipeline will be accomplished in two phases. A trench will be opened either east or west of the dune, but not breaching the dune, the pipe will be installed and the trench filled in before proceeding with the second phase. A second temporary "dune" will then be established using previously excavated sands and sheet piling. The temporary "dune" will be located over the previously installed pipe and blend well into the existing dune to afford a continuous dune line. The existing dune will then be excavated, the pipe installed, and the dune restored.

Installation of the discharge pipeline through the dune and beach is estimated to require two months. Since the beach and dune will be restored to the original conditions after installation of the pipeline, the sand excavated from the trenches into which the lines are to be installed will be stockpiled in the immediate vicinity and will be readily available for filling in the trenches.

The site area for Unit No. 2 is located on a portion of an approximate 300 acre tract of previously filled and dewatered mangrove swamp. The terrestrial habitat of this area has already been markedly changed by the filling and dredging of canals and spoil banks required for the construction of Unit No. 1. No additional land beyond this 300 acre site will be disturbed for the construction of Unit No. 2. 3

After construction, the crest of the restored dune will be planted with Australian Pine to match existing vegetation at the site of the intake and discharge excavations. The east side of the dune will remain in its natural unplanted state in order to react to natural wave action cycles.

A 100 to 200 ft wide border of naturally occurring vegetation (mainly mangroves) will be left between the plant site and the Indian River. The only exception is the barge facility on Big Mud Creek which is not visible from the mainland and only visible from one location on State Road A-1-A. The services of a landscape architect will be employed for all landscaping operations. 1

4.1.5 MISCELLANEOUS

The National Register of Historic Places lists no historic places on or near the plant site of Hutchinson Island. The State of Florida, Board of Archives and History has indicated that no historical damage will be done by the construction of power facilities on this site. Due to the porous nature of subsurface conditions at the site, the use of explosives is not anticipated.

Approximately ten acres of land will be permanently utilized by the plant and its adjacent intake and discharge structures. Building material supply areas and service lines for Unit No. 2 are completed or have been approved for the construction of Unit No. 1. Disposition of construction and operational trash will be completed through the filling of borrow pits, adding clean fill and compaction.

4.1.6 CONSTRUCTION EFFECTS ON WILDLIFE HABITATS

The construction of Unit No. 1 has affected the wildlife only in the relatively small area where construction has been in progress. Construction noise may have caused some disturbance also in the immediately surrounding area. Overall effects on wildlife, as a result of the construction of Unit No. 2, are expected to be minimal because the site was disturbed during Unit No. 1 construction.

During construction, elevated outside lighting will be extinguished as much as possible when a storm front moves through, in order to protect migrating birds which otherwise might become confused and fly into the lights and supporting structures.

Construction of the discharge system may affect loggerhead turtle nesting during at least one nesting season. Loggerhead turtles average 200 nests per mile on the portion of the beached owned by FP&L, but no leatherback or green turtles nests were observed further north than one mile south of the area of the proposed intake pipeline. 0

If construction is active in the beach area during the turtle breeding season, a nest surveillance and relocation program will be instituted on those areas of the beach affected by construction activity. Nests found will be immediately transferred to some suitable safe location for hatching and release. This program will minimize short-term effects of construction, and no long-term effects are expected to result.

Turtle hatchlings emerge from the nest and immediately head for the ocean, leaving their nesting and breeding ground for distant feeding areas. Light is known to disorient turtles during all stages of their life cycle, and hatchlings could become confused by plant lighting and perhaps be prevented from reaching the ocean safely. In order to mini-

Prior to exavation for the foundations of the turbine building reactor building, intake structure and seal well, local dewatering will be implimented. Water extracted during this process will be directed to either the intake or discharge canals or the settling basin south of the plant island. To assure protection of the ocean biota, any discharges to coastal waters will meet all applicable State of Florida regulations for turbidity.

The nuclear reactor building and its auxiliary buildings will occupy approximately 5 acres of this 300 acre site. The service building, parking and lay down as well as other temporary use area for Unit No. 1 will be utilized for Unit No. 2. It is anticipated that no additional mangrove swamp acreage will be cleared for Unit No. 2. 3

During construction, all solid wastes are transported to a fill area southwest of the switchyard. Periodically, combustibles are burned. All material is covered with clean fill somewhat in the manner of a sanitary landfill. Operational disposal will be carried out in a manner consistent with local sanitary regulations and practices.

Combined construction effects of Units 1 and 2 will be minimal as Unit No. 1 is scheduled for initiation of commercial operations mid 1975 while construction for Unit No. 2 is not scheduled to begin until early 1975.

Approximately 830 acres of the Applicant's land area will continue in its preconstruction form to the extent that is possible within the dictates of the mosquito control district and the AEC. It is not anticipated that recreational and other uses of the surrounding area will be impaired. However, security requirements may necessitate restricted access even in peripheral areas of the Applicant's property, thereby limiting access to the beach or other recreational sites within the Applicant's jurisdiction. Indian River, including Big Mud Creek, and the ocean beach below the dune line (mean high water) will remain available to the public. Existing small dirt roads, if not closed for security reasons, could be used for general access. The canals could become desirable fishing areas, unless security restrictions prohibit their use.

4.1.3 CONSTRUCTION FORCE

No special burden on schools, public facilities and services by the work force is anticipated as there was no evidence of strain on the local communities during the peak employment of over 1200 construction workers for Unit No. 1. It is expected that many of the present workers will remain employed at the site for Unit No. 2 construction and thereby reduce fluctuations in the economies of the nearby communities. 3

Minor traffic congestion can be expected along Highway A1A and the causeways leading to the mainland during rush hour periods. Only a small amount of inconvenience is anticipated from construction noise, dust and smoke as the island project is well isolated from populated areas. As of May 1972, the nearest inhabited areas on Hutchinson Island were 7 miles to the north and 4.5 miles south of the plant site.

mize possible hatchling disorientation, a screen of Australian pines will be maintained along the beach dune line bordering the plant property. This may help the hatchlings to orient toward the ocean by both screening out any light from the plant and by increasing the contrast between ocean and shore.

Studies of green turtles indicate that they avoid lights and activity on the beach when selecting a nesting site. Loggeerhead nests are common along even developed areas of the Florida coast, so that while female loggerheads may be displaced from the immediate vicinity, they may well nest on other portions of the island. 0

Prior to the construction on the plant site, mosquito control canals allowed seawater to inundate the area now bordered by the intake and discharge canal structures east of highway A-1-A. To deter mosquito breeding during plant operation, periodic flushing of this area will be made by pumping in seawater from the intake canal.

4.1.7 EFFECTS OF DREDGING FOR DISCHARGE PIPES ON THE OFFSHORE BENTHIC FAUNA

The effects of construction of the discharge line for Unit No. 2 will have a minimal effect on the benthic production of the area. The discharge line will involve dredging a channel approximately 3,500 feet out into the ocean to a depth of about 20 feet. The channel will be protected by sheet piling for the first 1,250 feet and will be about 40 feet wide. An unprotected channel 80 feet wide will continue for 250 feet to the terminus of the Unit 1 discharge pipe. The additional 2,000 feet of unprotected channel will be about 60 feet wide and include the remaining pipe and diffuser sections for Unit No. 2 discharge. Approximately 17,600 square meters of area or a sediment volume of 82,000 cubic meters will be disturbed. The dredge spoils will not be deposited on the ocean floor. All material not utilized as backfill will be transported to an approved onshore disposal area.

The ocean intake structures for Unit No. 1 which will also serve Unit No. 2 are under construction. The environmental effects of the intakes have been discussed in the Unit No. 1 Environmental Report and will not be considered here.

The total surface disturbed by dredging will be approximately 17,600 square meters. This represents less than 0.06 percent of the 34,900,000 square meters of ocean bottom within the 30 foot depth contour between Fort Pierce Inlet and St. Lucie Inlet.

To obtain an approximation of the benthic faunal density in that area, data obtained from Station I by Ingle and Joyce were used[1,2,3]. Average values for polychaetes and amphipods were determined. However, since the high and low values for other faunal groups were extremely variable, the highest values were used to develop a conservative approximation of the standing crop of bivalves, echinoderms and decapods.

The estimated density of benthic organisms for Station I is given in Table 4.1-1. In addition, estimates of the maximum number of organisms eliminated by dredging operations are also tabulated. It must be emphasized that a relatively small area will be disturbed and that the assumption of 100 percent mortality is high. It would appear on the basis of these estimates that the effects on the benthic ecology of the area will not be significant.

Of additional importance is the amount of time required for the benthic fauna to become reestablished in the disturbed area. According to Godcharles[4], benthic fauna became reestablished in the Tampa Bay area in less than 240 days. In areas where sea grasses occurred, revegetation was slow but appeared to have little effect on benthic faunal abundance. It was felt that the exposure of shell particles by dredging might create favorable conditions. Luntz[5] concluded that sediment drift in the area during dredging had little effect on oysters. Shellfish mortality was low unless the organisms were actually buried by spoils. He observed little difference in spawning and setting in dredged and undredged areas. Ingle[6] also reported the limited effects of turbidity and sediment drift on fish and shellfish.

Pfitzenmeyer and Drobeck[7] noted that the major factors affecting reburrowing activities in the clam, Mya arenaria, were temperatures, sediment size and size of the organism. Rapid reburrowing (1-4 hrs) occurred between 8.8 C and 21 C in fine (0.5mm) sediments. In addition, small clams (60 mm) were more successful than larger size classes. Hanks[8] noted that in "new" experimental saltwater ponds, a benthic community was established quite rapidly. Polychaetes were well established within nine months. Clams of the genus Macoma became well established after the first six months. Amphipods and certain decapods became established within the first year.

It is concluded that the effects of dredging on the offshore benthic community will be minimal. The use of sheet piling and the on-shore disposal of spoil material will further limit any adverse effects. The disturbed area will be relatively small and it would appear that reestablishment of benthic communities in the affected area should be complete within one year.

4.1.8 CHEMICAL RELEASES DURING CONSTRUCTION

Chemicals are used during plant construction and startup primarily
for cleaning system piping and equipment. Volatiles, such as acetone,
are used for cleaning stainless steel components. Alkaline solutions
such as 1200 ppm tri-sodium phosphate, 1200 ppm sodium bicarbonate
and 160 ppm DOW chemical DIS-FO-57 detergent or alternately 2000 ppm
tri-sodium phosphate, 1000 ppm disodium phosphate and a wetting agent
are used for cleaning carbon steel components. Components may require
cleaning to remove chemical preservatives, but on a lesser scope than 1
the systems cleaning requirements. Spent chemicals are routed to the
settling basin south of the plant island or to the neutralization
basin located in the water treatment plant if neutralization is
required prior to discharge.

TABLE 4.1-1

ESTIMATED ELIMINATION OF BENTHIC FAUNA DUE TO DREDGING CHANNELS FOR DISCHARGE PIPE*

Benthic Organisms	Estimated Density per Meter^2 at Station I	Number Eliminated By Dredging Discharge Channel
Polychaetes†	100	1.76×10^6
Bivalves**	550	9.68×10^6
Echinoderms**	150	2.64×10^6
Amphipods†	15	0.26×10^6
Decapods**	80	1.41×10^6
Totals	930	16.39×10^6

* Assume 100 percent mortality of disturbed organisms.

** Represents highest population.

† Represents average population.

4.2 TRANSMISSION FACILITIES CONSTRUCTION

Power transmission from Unit No. 2 will utilize existing switchyard and transmission lines designed and erected for Unit No. 1 and, therefore, will produce virtually no additional environmental impact.

4.3 RESOURCES COMMITTED (CONSTRUCTION)

The resources such as iron, steel and concrete in the construction of St. Lucie Unit No. 2 are those common to any large industrial facility. Most other resources are either left undisturbed or committed only temporarily as during construction or during the life of the plant and are not irreversibly or irretrievably lost.

Restrictions on use of the plant during construction should be similar to those associated with other heavy industrial facilities. Public access to the site may have to be controlled due to AEC security requirements, but recreational and other uses of the surrounding area should not be impaired. The Indian River, including Big Mud Creek and the ocean beach, will remain public property.

It would appear that only a small portion of the land used for plant buildings, such as the reactor, control room, radwaste and the turbine-generator buildings, would be irreversibly committed. Also, some facility components, such as large underground concrete foundations and certain equipment, are essentially irretrievable due to practical aspects of reclamation and/or radioactive decontamination. The degree of dismantlement of the plant, as previously noted, will be determined by the intended future use of the site. This will involve a balance of health and safety considerations, salvage values and environmental effects.