Florida Power & Light Company

ST. LUCIE PLANT

ANNUAL NON-RADIOLOGICAL MONITORING REPORT

1979

Volume 1

ABIOTIC MONITORING

Florida Power & Light Company

St. Lucie Plant

Annual Non-Radiological

Monitoring Report

1979

Volume I

ABIOTIC Monitoring

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EXECUTIVE SUMMARY

VOLUME I

Introduction

This document is the fourth consecutive annual report on abiotic monitoring at the Florida Power & Light Company St. Lucie Plant. It is Volume I of three volumes submitted in accordance with the St. Lucie Unit No. 1 Environmental Technical Specifications, Appendix B, Section 5.6.1.a. The report covers the period from January 1, 1979 through December 31, 1979.

Thermal

Four thermal limitations are required by the Environmental Technical Specifications (ETS): 1) discharge canal maximum release temperature ($111^{o}F$); 2) maximum temperature rise across the condenser ($26^{o}F$); 3) maximum temperature within the zone of mixing ($93^{o}F$) and 4) maximum surface temperature rise over ambient within the zone of mixing ($5.5^{o}F$).

Analysis of the thermal data as specified in the preceding paragraph showed that the only ETS violation which occurred during 1979 was for "maximum surface temperature rise over ambient within the zone of mixing." The length of time for which the temperatures were in excess of the ETS limitation were relatively brief.

An assessment of the thermal effects on the offshore marine environment caused by the operation of the St. Lucie plant is presented in Volumes II and III of the Annual Report. No significant adverse environmental impact could be attributed to plant operations during 1979.

Chemical

Chemical monitoring was conducted during 1979 in the discharge canal at the St. Lucie Plant for dissolved oxygen, pH, salinity, heavy metals and total residual chlorine. Dissolved oxygen and heavy metals were also monitored in the intake canal.

Dissolved oxygen was not significantly depleted in the condenser cooling water during plant passage.

Total residual chlorine values were well below ETS limits for the entire year.

Heavy metal concentrations were generally within the expected ranges with only a few random instances of concentrations above minimum detection limits of the instruments used in analysis. Additionally, no adverse environmental impacts are believed to have occurred from the presence of the noted chemicals.

The pH values were within the normal ranges of nearshore oceanic waters.

entering a pipe buried under the dune and the ocean floor. The water is carried about 365 m (1,200 ft) offshore and discharged through a Y-port nozzle located approximately 9 m (30 ft) below the water surface. The discharge pipe is located 730 m (2,400 ft) north of the intake pipe.

The purpose of chemical and thermal limitations and monitoring is to provide a reasonable assurance that the aquatic ecosystem in the area of the thermal plume will be subjected to no unacceptable environmental impact. It is also desirable to maintain the quality of receiving body of water so that human uses of the water are protected, and so that local aquatic biota do not suffer adversely from exposure to any chemical discharges.

This document provides a report of the abiotic monitoring programs for the period from January 1, 1979 through December 31, 1979. Also included herein are discussions of various reports and studies (Sections D, E and G) prepared or performed during 1979 which are required by the ETS. Submitted simultaneously with this volume (Non-Radiological Environmental Monitoring Report, Volume I, 1979) are two other volumes (Non-Radiological Environmental Monitoring Report, Volumes II and III), which describe the biotic monitoring carried out during 1979. Together, these three volumes satisfy the requirements of St. Lucie Unit No. 1, Environmental Technical Specifications, Appendix B, Section 5.6.1.a.

A. INTRODUCTION

In 1970, Florida Power & Light Company (FPL) was issued a construction permit by the United States Atomic Energy Commission (now Nuclear Regulatory Commission) for the construction of Unit No. 1 of the St. Lucie Plant, and 810-megawatt nuclear-powered electric generating station on Hutchinson Island in St. Lucie County, Florida.

Unit No. 1 was placed on-line in March 1976. Plant operation was intermittent in 1976, but was base loaded throughout 1977, 1978 and 1979, except for repair and refueling outages. The condenser cooling water is provided by a once-through circulating water system which consists of intake and discharge pipes in the ocean linked by canals to the plant. Cooling water is drawn from the Atlantic Ocean through an intake structure located 365 m (1,200 ft) offshore. The intake structure is covered with a concrete velocity cap, the top of which is approximately 2.4 m (8 ft) below the water surface. From the intake point, water is drawn into the intake canal through a pipe buried under the dunes and ocean bottom. The 90 m (300 ft) wide canal carries the cooling water about 1,500 m (5,000 ft) to the plant intake structure where pumps provide a design flow of 33,400 liters/sec. (530,000 gpm). The cooling water then moves through the intake screens, passes through the plant and is released into the discharge canal.

The temperature rise of the water passing through the condensers is limited to $26^{o}F$ ($14.3^{o}C$). After leaving the plant, the heated water passes through a 60 m (200 ft) wide discharge canal before

B. THERMAL (ETS 3.1.A.5)

Introduction

Four thermal limitations are prescribed by the St. Lucie Unit 1 Environmental Technical Specifications (ETS): 1) discharge canal maximum release temperature (111°F or 44°C); 2) maximum temperature rise across the condenser (26°F or 14.3°C); 3) maximum temperature within the zone of mixing (93°F or 34°C); and 4) maximum surface temperature rise over ambient within the zone of mixing (5.5°F or 3.1°C).

Data were collected for item (1) using a temperature sensor located near the discharge canal terminus. The output from the sensor is recorded continuously on a strip chart located in a structure near the sensor. Data for item (2) are obtained from a series of RTD sensors located in the intake and discharge water lines. Output is transmitted to the reactor control room where it is logged hourly.

Items (3) and (4) are monitored using self-contained continuous recording thermographs located near the ocean intake and at the predicted location of the discharge surface plume maximum temperature.

MAXIMUM DISCHARGE CANAL WATER TEMPERATURE

The maximum discharge canal water temperature was determined and tabulated (Table B-1) for each day that the plant was operating during 1979. As can be seen in the tabulation, no single canal temperature was dominant for the entire reporting period.

The variation in ambient inlet water temperature coupled with fluctuations in power plant thermal output are responsible for

the relatively wide fluctuations of discharge canal temperatures.

Figure B-1 graphically illustrates the varied maximum discharge canal temperatures observed during 1979 and compares them with observed values during 1978. The maximum discharge canal release temperature limit of 111°F was not exceeded during 1979.

MAXIMUM CONDENSER TEMPERATURE RISE (Condenser ΔT)

ETS 2.1.2 states:

> "Under normal full power operation, the temperature rise across the condenser shall not exceed 26° F or 14.3° C. Under the following conditions, the condenser temperature rise shall not exceed 35° F or 20° C for greater than a 72-hour period: 1) Condenser and/or circulating water pump maintenance; 2) Throttling circulating water pumps to minimize use of chlorine; 3) Fouling of circulating water system."

Table B-2 shows a tabulation of condenser ΔT values for 1979. Figure B-2 is a comparison of 1978 and 1979 data. Review of Figure B-2 shows that the plant operated near the design temperature rise the majority of the time. All reported values which exceeded the 26° F limitation were the result of one or more of the stated conditions. Only one temperature was reported above the 35° F limitation; it occurred for less than the 72-hour required limit, and thus was not in violation of the Environmental Technical Specifications.

MAXIMUM TEMPERATURE WITHIN THE ZONE OF MIXING

Table B-3 summarizes the maximum daily surface temperatures reported within the ocean discharge zone of mixing during 1979.

The maximum temperature observed in the zone of mixing during 1979 was 92°F. Thus, all temperatures measured in the ocean mixing zone were within the 93°F ETS limitation.

As in previous years, 100% retrieval of surface plume temperature data was not achieved due to suspected vandalism as well as exposure to an extremely harsh environment. These factors resulted in loss of data as reported in Section G, Reportable Occurrences, of this report.

Figure B-3 shows a comparison of ocean mixing zone maximum temperatures for 1978 and 1979. It can be seen that temperature ranges and frequencies for the two years are similar.

MAXIMUM SURFACE TEMPERATURE RISE - ZONE OF MIXING (ΔT)

Daily surface temperature rises above ambient in the ocean zone of mixing are summarized in Table B-4. As has been the case with other data obtained from the thermographs, 100% data retrieval was not possible for the 1979 reporting period. These factors resulted in the loss of data as reported in Section G, Reportable Occurrences, of this report.

Some time periods were observed when the discharge zone of mixing temperature was less than the ocean intake area temperature resulting in negative ΔT values. This was believed to be caused by time delay in passage of water through the plant, variations in ocean surface temperatures and surface currents.

Figure B-4 compares 1978 and 1979 data and illustrates the variations which occurred in measuring temperatures under the stated conditions.

TABLE B-1

ST. LUCIE PLANT
MAXIMUM DISCHARGE CANAL TEMPERATURE
TEMPERATURE DURATION

Number of Days	Maximum Temperature (^{o}F)	% of Operating Days	Accumulated % of Operating Days
1	111	0.4	0.4
0	110	0	0.4
2	109	0.7	1.0
10	108	3.5	4.5
15	107	5.2	9.7
12	106	4.2	13.8
8	105	2.8	16.6
18	104	6.2	22.8
8	103	2.8	25.6
20	102	6.9	32.5
11	101	3.8	36.3
18	100	6.2	42.6
8	99	2.8	45.3
16	98	5.5	50.8
15	97	5.2	56.1
19	96	6.6	62.6
12	95	4.2	66.8
20	94	6.9	73.7
15	93	5.2	78.9
17	92	5.9	84.8
3	91	1.0	85.8
14	90	4.8	90.7
3	89	1.0	91.7
2	88	0.7	92.4
2	87	0.7	93.1
2	86	0.7	93.8
2	85	0.7	94.5
2	84	0.7	95.2
0	83	0	95.2
1	82	0.4	95.5
1	81	0.4	95.8
7	80	2.4	98.3
0	79	0	98.3
0	78	0	98.3
0	77	0	98.3
1	76	0.4	98.6
0	75	0	98.6
0	74	0	98.6
0	73	0	98.6
1	72	0.4	99.0
1	71	0.4	99.3
0	70	0	99.3
2	69	0.7	100.0

TABLE B-2

ST. LUCIE PLANT
MAXIMUM CONDENSER Δ T
TEMPERATURE DURATION TABLE

Number of Days	Maximum ΔT (^{o}F)	% Of Operation Days	Accumulated % Of Operating Days
1	36*	0.4	0.4
0	35	0	0.4
0	34	0	0.4
0	33	0	0.4
1	32	0.4	0.7
0	31	0	0.7
3	30	1.1	1.8
1	29	0.4	2.2
6	28	2.2	4.3
4	27	1.4	5.8
9	26	3.3	9.1
14	25	5.1	14.1
116	24	42.0	56.2
72	23	26.1	82.2
35	22	12.7	94.9
1	21	0.4	95.3
3	20	1.1	96.4
1	19	0.4	96.7
0	18	0	96.7
1	17	0.4	97.1
1	16	0.4	97.5
1	15	0.4	97.8
1	14	0.4	98.2
0	13	0	98.2
1	12	0.4	98.6
1	11	0.4	98.9
1	10	0.4	99.3
0	9	0	99.3
1	8	0.4	99.6
1	7	0.4	100.0

* Two circulating water pumps off for maintenance. 72 hour ETS limitation of 35^{o} F was not exceeded.

TABLE B-3

ST. LUCIE PLANT
ZONE OF MIXING MAXIMUM TEMPERATURE
TEMPERATURE DURATION CURVE

Number of Days	Maximum Temperature (^{o}F)	% of Total Days of Data Collection	Accumulated % of Days of Data Collection
2	92	0.9	0.9
2	91	0.9	1.8
4	90	1.8	3.6
6	89	2.7	6.4
14	88	6.4	12.7
7	87	3.2	15.9
16	86	7.3	23.2
14	85	6.4	29.5
23	84	10.5	40.0
9	83	4.1	44.1
17	82	7.7	51.8
10	81	4.5	56.4
11	80	5.0	61.4
11	79	5.0	66.4
2	78	0.9	67.3
3	77	1.4	68.6
5	76	2.3	70.9
9	75	4.1	75.0
11	74	5.0	80.0
11	73	5.0	85.0
10	72	4.5	89.5
5	71	2.3	91.8
9	70	4.1	95.9
4	69	1.8	97.7
3	68	1.4	99.1
2	67	0.9	100.0

TABLE B-4

ST. LUCIE PLANT
ZONE OF MIXING MAXIMUM SURFACE TEMPERATURE RISE
TEMPERATURE DURATION CURVE

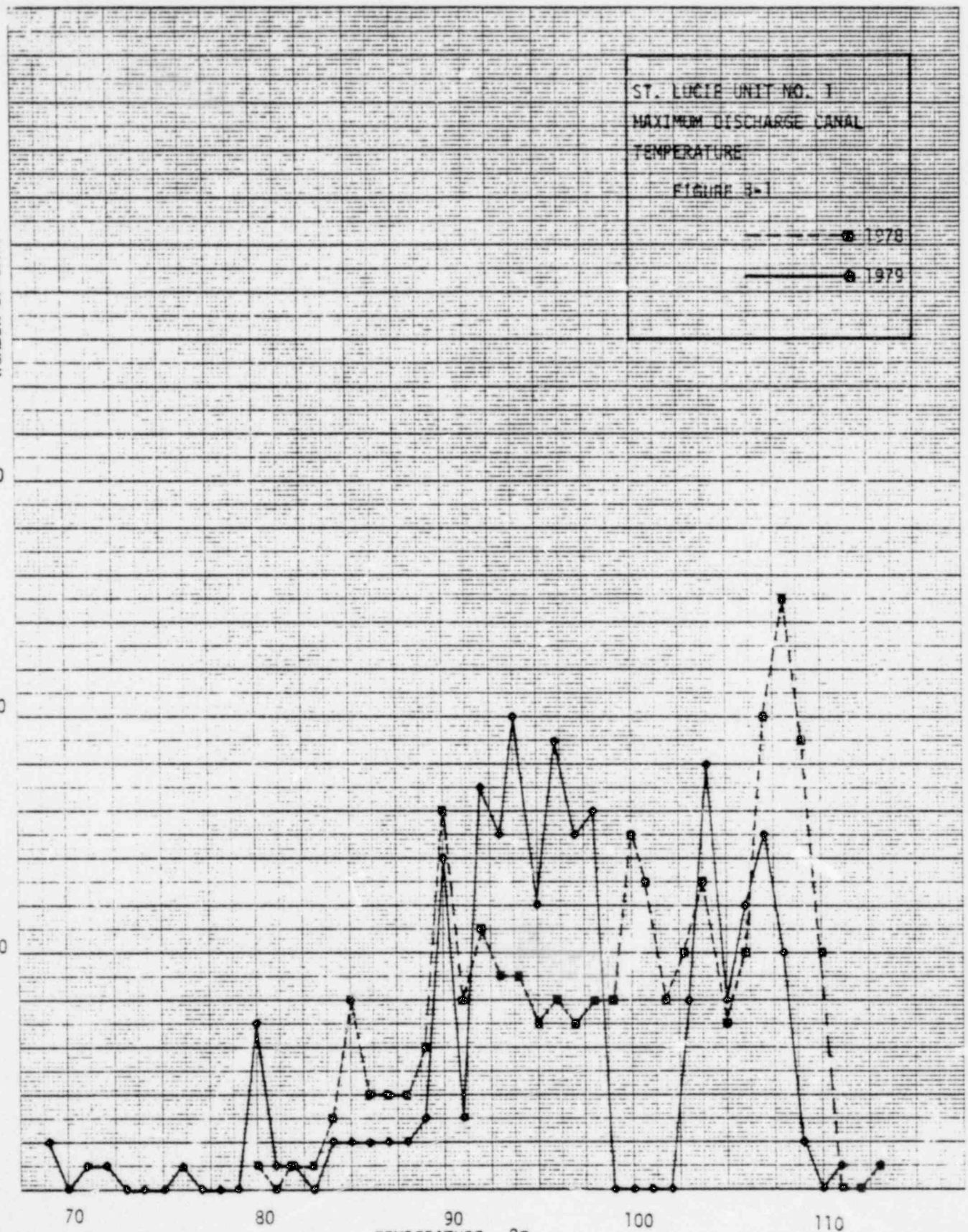
Number Of Days	Maximum ΔT (^{o}F)	% Of Total Days Of Data Collection	Accumulated % Of Days Of Data Collection
2	8.1*	1.3	1.3
0	5.5	0	1.3
1	5.4	0.6	1.9
0	5.3	0	1.9
4	5.2	2.5	4.4
0	5.1	0	4.4
1	5.0	0.6	5.1
0	4.9	0	5.1
4	4.8	2.5	7.6
0	4.7	0	7.6
0	4.6	0	7.6
5	4.5	3.2	10.8
0	4.4	0	10.8
5	4.3	3.2	13.9
0	4.2	0	13.9
5	4.1	3.2	17.1
3	4.0	1.9	19.0
6	3.9	3.8	22.8
0	3.8	0	22.8
0	3.7	0	22.8
8	3.6	5.1	27.8
1	3.5	0.6	28.5
18	3.4	11.4	39.9
0	3.3	0	39.9
7	3.2	4.4	44.3
5	3.1	3.2	47.5
3	3.0	1.9	49.4
0	2.9	0	49.4
0	2.8	0	49.4
7	2.7	4.4	53.8
3	2.6	1.9	55.7
10	2.5	6.3	62.0
0	2.4	0	62.0
0	2.3	0	62.0
5	2.2	3.2	65.2
1	2.1	0.6	65.8
0	2.0	0	65.8
0	1.9	0	65.8
3	1.8	1.9	67.7
2	1.7	1.3	69.0
4	1.6	2.5	71.5
0	1.5	0	71.5
6	1.4	3.8	75.3

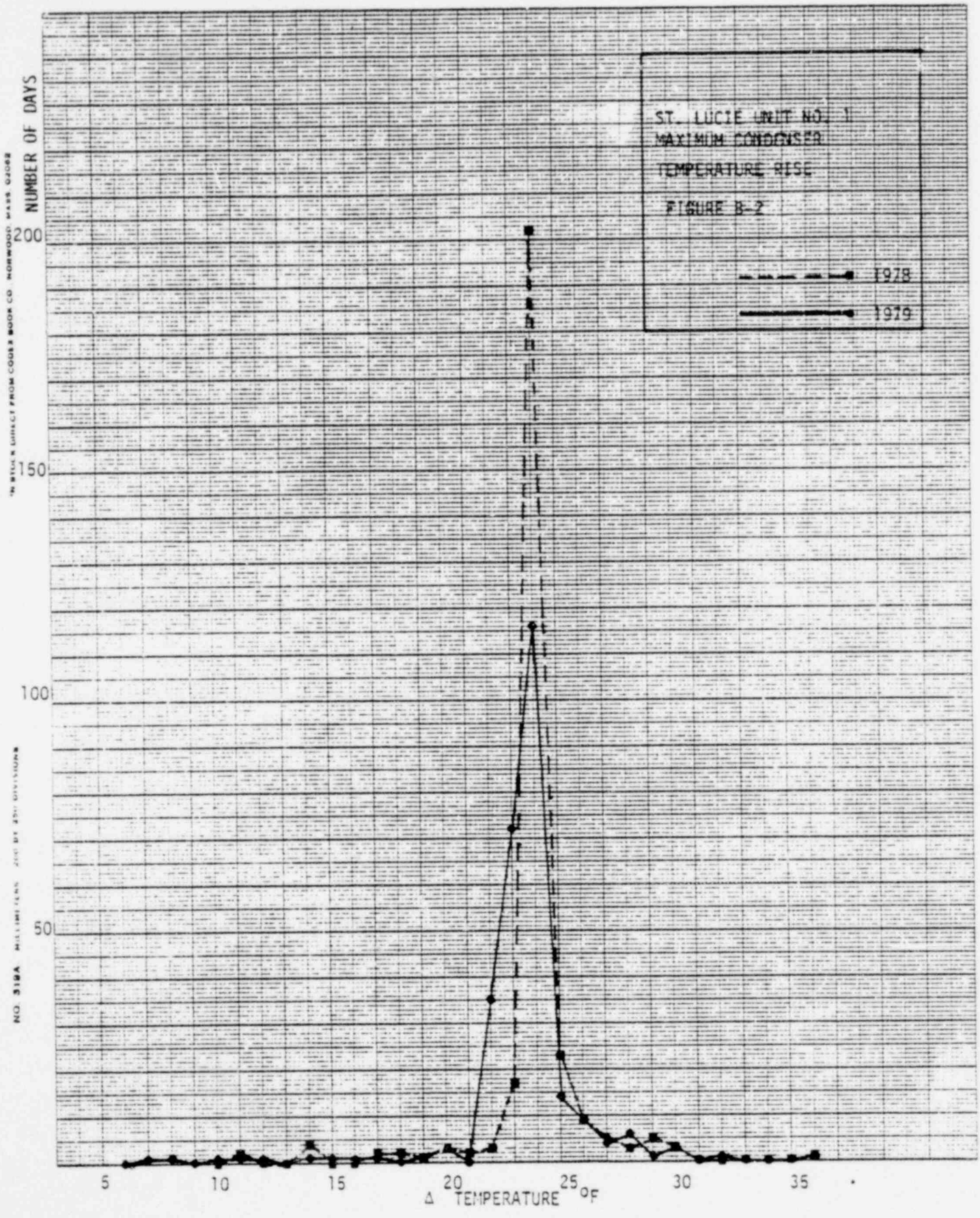
TABLE B-4

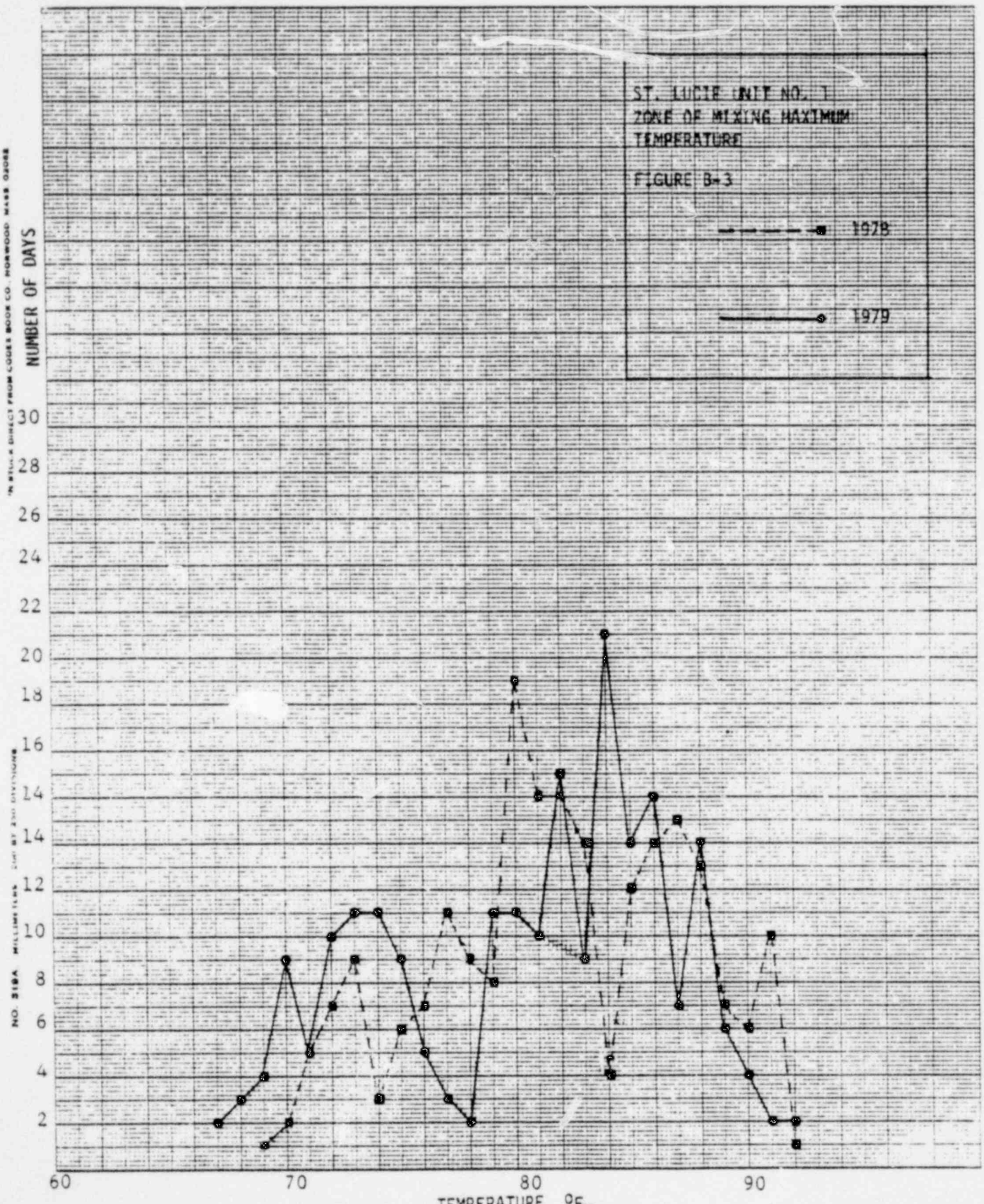
ST. LUCIE PLANT (Cont.)
ZONE OF MIXING MAXIMUM SURFACE TEMPERATURE RISE
TEMPERATURE DURATION CURVE

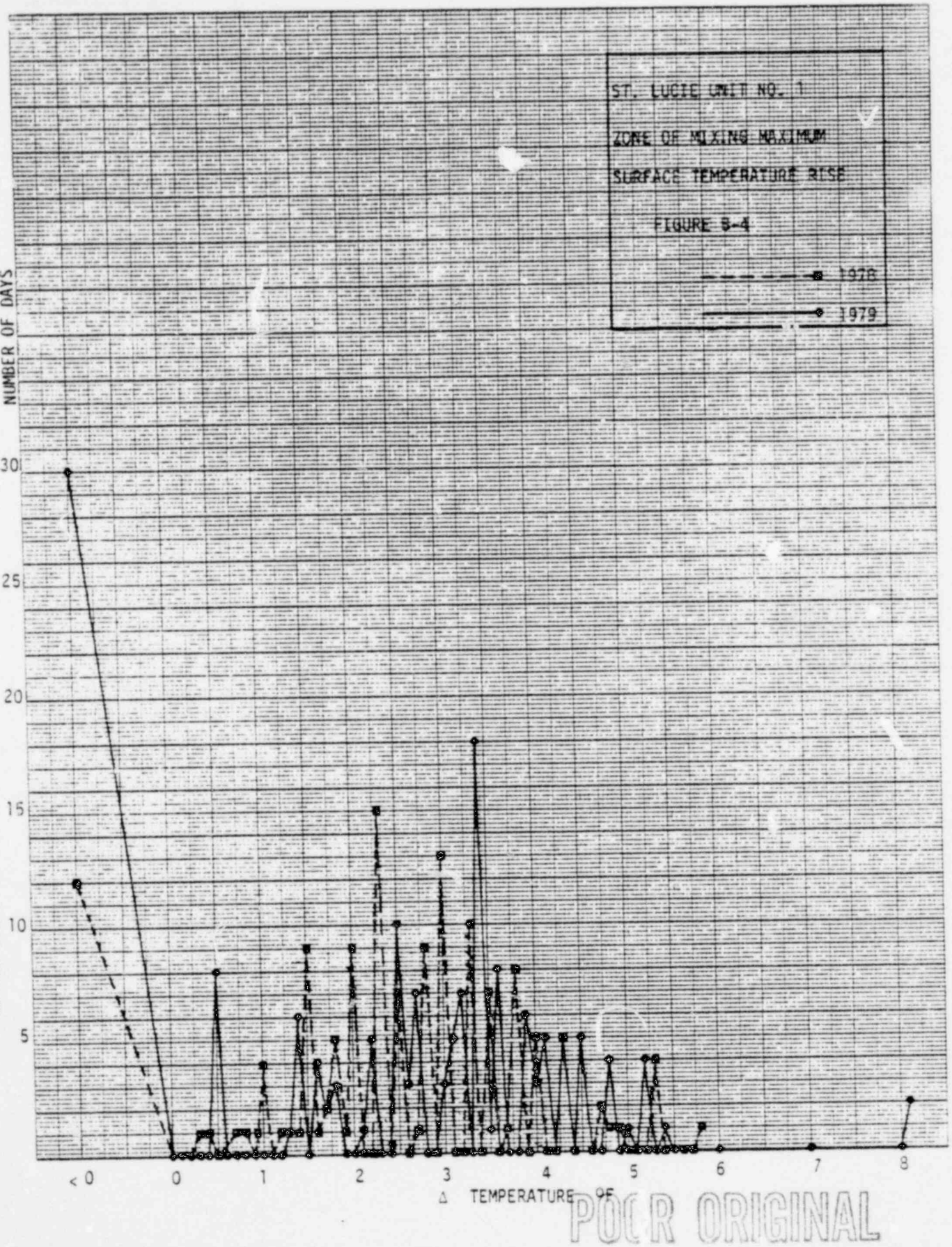
Number Of Days	Maximum Δ T (°F)	% Of Total Days Of Date Collection	Accumulated % Of Days Of Data Collection
1	1.3	0.6	75.9
0	1.2	0	75.9
0	1.1	0	75.9
0	1.0	0	75.9
0	0.9	0	75.9
0	0.8	0	75.9
0	0.7	0	75.9
0	0.6	0	75.9
8	0.5	5.1	81.0
0	0.4	0	81.0
0	0.3	0	81.0
0	0.2	0	81.0
0	0.1	0	81.0
0	0	0	81.0
30	< 0	19.0	100.0

* Two Out-Of-Specification, ΔT values, were reported in February, 1979. A subsequent, more intensive analysis of the raw data and evaluation of the thermograph instruments' history indicated a high probability that these Δ T's are the result of an instrument malfunction not detected on the initial inspection of data. The recalculated values are fully explained in Section G. of this report.









C. CHEMICAL (ETS 3.1.A.1 through 3.1.A.4)

INTRODUCTION

Tables C-1 and C-2 summarize the chemical monitoring program for 1979 associated with the operation of the cooling water system at the St. Lucie Plant. Dissolved oxygen (D.O.), pH, salinity, heavy metals and total residual chlorine (T.R.C.) were monitored in the discharge canal. Dissolved oxygen and heavy metals were also measured in the intake canal.

TOTAL RESIDUAL CHLORINE (ETS 3.1.A.1)

During 1979 total residual chlorine levels ranged from below the instrument maufacturer's specified analytical detection limit of 0.01 ppm to a high of 0.03 ppm. All reported values were well below the ETS limit of 0.1 mg/L at the terminus of the discharge canal. Due to the very low residual chlorine values it is believed that no adverse environmental impact occurred as a result of chlorination at the St. Lucie Plant.

Section D. of this report describes the St. Lucie Plant's Minimum Effective Chlorine Usage Program as required by the ETS.

HEAVY METALS (ETS 3.1.A.2)

The purpose of heavy metals monitoring was to detect any measurable concentrations above ambient seawater levels which could be attributed to cooling water passage through the plant.

Table C-2 shows the intake and discharge canal heavy metals concentrations measured during 1979. Values for arsenic, chromium,

copper, lead and mercury show no measurable increase in concentration after plant cooling system passage.

Values obtained for nickel showed an increase in nickel concentration of 0.03 mg/L for the samples obtained in April. No specific conclusions could be drawn from this data, since this is the only time that nickel was observed above detectable levels in intake or discharge canal water for 1978 and 1979.

Relatively small amounts of zinc were detected in some intake and discharge water samples during 1979. Table C-2 illustrates a rather random occurrence of zinc during the sampling. All values are near minimum detection limit, except for the November discharge sample for which no explanation was apparent.

Iron was routinely found in all intake and discharge canal samples in relatively low concentrations. The only value of potential interest was an elevated September discharge sample, for which no explanation could be offered.

None of the heavy metal concentrations observed during 1979 are believed to have resulted in any adverse environmental impact to the nearshore ecosystem at the St. Lucie Plant site.

pH (ETS 3.1.A.3)

The purpose of pH monitoring in the discharge canal was to insure that the pH of once-through cooling system water was not being altered by plant passage when compared to the generally accepted pH levels for nearshore marine waters. The pH for the 1979 samples ranged from 8.1 to a 8.4, thus the pH is stable and within the normal range of these waters.

DISSOLVED OXYGEN (ETS 3.1.A.4)

Dissolved oxygen was monitored in the intake and discharge canals to determine the effect of plant cooling water system passage. As can be seen in Figure C-1, dissolved oxygen concentrations are generally unaffected by plant passage. The very slight depletion occurring between intake and discharge waters is not unexpected due to the heating of water during passage through the plant condensers. No adverse environmental impact was believed to have occurred from the minimal dissolved oxygen depletion observed during 1979.

SALINITY

Salinity monitoring was required only through January 23, 1979, since it was deleted from the ETS by Amendment 29 to Operating License DPR-67 on that date. Salinity data gathered between January 1, 1979 and January 23, 1979, as tabulated in Table C-1, ranged from a low of 33.7 o/oo to a high of 35.5 o/oo and revealed no values considered unusual for nearshore marine environments.

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1

Month JANUARY 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]	SALINITY[2]	T.R.C.[3]	
1			8.2		35.5		
2			8.2		34.2		
3	6.5		8.2	6.2	34.4	.01	
4			8.1		34.5		
5			8.1		34.5		
6			8.1		34.2		
7			8.1		34.1		
8			8.1		35.0		
9	6.6		8.1	6.3	35.2	.02	
10			8.1		33.8		
11			8.1		34.0		
12			8.1		33.9		
13			8.1		34.0		
14			8.2		34.0		
15			8.2		34.0		
16	6.9		8.2	6.7	33.7	.01	
17			8.2		33.8		
18			8.2		33.8		
19			8.2		33.7		
20			8.2		34.0		
21			8.2		34.0		
22			8.2		34.0		
23	6.5		8.2	7.5	35.0	0.1	
24			8.2				
25			8.2				
26			8.2				
27			8.2				
28			8.2				
29			8.2				
30	7.0		8.2	7.3			
31			8.2			.00	

NOTES:

[1]Dissolved Oxygen in ppm.

[2]Salinity in ppt. (Deleted from ETS effective January 24, 1979)

[3]Total Residual Chlorine in ppm.

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month FEBRUARY 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.2				
2			3.2				
3			8.2				
4			8.2				
5			8.2				
6	6.7		8.2	6.5			
7			8.2			<.01	
8			8.2				
9			8.2				
10			8.2				
11			8.2				
12			8.2				
13	7.2		8.2	7.28		<.01	
14			8.2				
15			8.2				
16			8.2				
17			8.2				
18			8.2				
19			8.2				
20	7.18		8.2	7.30		<.01	
21			8.2				
22			8.2				
23			8.2				
24			8.2				
25			8.2				
26			8.2				
27	6.55		8.2	6.37		<.01	
28			8.2				
29							
30							
31							

NOTES:
[1] Dissolved Oxygen in ppm.
[2] Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month MARCH 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.2				
2			8.2				
3			8.2				
4			8.2				
5			8.2				
6	6.7		8.2	6.6			
7			8.2			<.01	
8			8.1				
9			8.2				
10			8.2				
11			8.2				
12			8.2				Did not chlorinate 3/12 - 3/16
13	6.6		8.2	6.4			
14			8.2				
15			8.2				
16			8.2				
17			8.2				
18			8.2				
19			8.1			<.01	
20			8.1				
21	6.7		8.2	6.6			
22			8.2				
23			8.1			.01	
24			8.2				
25			8.2				
26			8.2			0.015	
27	6.6		8.2	6.4			
28			8.2				
29			8.2			<.01	
30			8.1				
31			8.1				

NOTES:
[1] Dissolved Oxygen in ppm.
[2] Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month APRIL 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.2				Refueling -
2			8.2				No chlorination
3	6.4		8.2	6.4			
4			8.2				
5			8.2				
6			8.2				
7			8.2				
8			8.2				
9			8.2				
10			8.2				
11	9.0		8.3	9.0			
12			8.3				
13			8.3				
14			8.3				
15			8.3				
16			8.3				
17	6.4		8.3	6.4			
18			8.3				
19			8.3				
20			8.3				
21			8.3				
22			8.3				
23			8.3				
24	6.4		8.3	6.5			
25			8.3				
26			8.3				
27			8.3				
28			8.3				
29			8.3				
30			8.2				
31							

NOTES:
[1] Dissolved Oxygen in ppm.
[2] Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month MAY 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1	6.5		8.2	6.5			Refueling -
2			8.2				No chlorination
3			8.3				
4			8.2				
5			8.2				
6			8.2				
7			8.2				
8	6.5		8.2	6.5			
9			8.2				
10			8.2				
11			8.2				
12			8.2				
13			8.2				
14			8.2				
15	6.6		8.2	6.6			
16			8.2				
17			8.2				
18			8.2				
19			8.2				
20			8.2				
21			8.2				
22			8.2				
23	6.2		8.3	6.2			
24			8.3				
25			8.3				
26			8.3				
27			8.3				
28			8.3				
29	6.4		8.3	6.4			
30			8.4				
31			8.3				

NOTES:
[1] Dissolved Oxygen in ppm.
[2] Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month JUNE 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.3				
2			8.4				
3			8.2				
4			8.2				
5			8.2				
6	6.4		8.2	6.49			Refueling
7			8.2				No chlorination
8			8.2				
9			8.2				
10			8.2				
11			8.2				
12			8.2			.03	
13	6.0		8.2	5.6			
14			8.2				
15			8.2				
16			8.2				
17	6.2		8.2				
18			8.2				
19			8.2	5.70			
20			8.3				
21			8.2			.03	
22			8.3				
23			8.2				
24			8.3				
25			8.2				
26	6.0		8.2	6.22			
27			8.3			.03	
28			8.2				
29			8.3				
30			8.2				
31			8.3				

NOTES:
[1]Dissolved Oxygen in ppm.
[2]Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month JULY 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.3				
2			8.2				
3	5.80		8.2	5.60			
4			8.2				
5			8.2			<.01	
6			8.2				
7			8.2				
8			8.2				
9			8.2				
10	6.20		8.2	5.70			
11			8.2			.03	
12			8.2				
13			8.2				
14			8.2				
15			8.2				
16			8.2				
17	5.80		8.2	5.50		.02	
18			8.2				
19			8.2				
20			8.2				
21			8.2				
22			8.2				
23			8.2				
24	7.20		8.1	6.80		.02	
25			8.2				
26			8.1				
27			8.2				
28			8.1				
29			8.1				
30			8.1				
31	7.20		8.2	6.70			

NOTES:
[1]Dissolved Oxygen in ppm.
[2]Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month AUGUST 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.2				
2			8.2			.01	
3			8.2				
4			8.2				
5			8.2				
6			8.2				
7	5.9		8.2	5.6		.02	
8			8.2				
9			8.2				
10			8.2				
11			8.2				
12			8.2				
13			8.2				
14	6.6		8.2	6.2			
15			8.2			.01	
16			8.2				
17			8.2				
18			8.2				
19			8.2				
20			8.2				
21	5.9		8.1	5.8			
22			8.2			0.02	
23			8.2				
24			8.2				
25			8.2				
26			8.2				
27			8.2				
28	5.8		8.2	5.2		0.01	
29			8.1				
30			8.2				
31			8.2				

NOTES:
[1] Dissolved Oxygen in ppm.
[2] Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month SEPTEMBER 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.2				
2			8.2				
3							
4			8.2				
5			8.2				
6	5.5		8.1	5.2		.01	
7			8.1				
8			8.1				
9			8.1				
10			8.1				
11	7.2		8.1	6.6			
12			8.1			.02	
13			8.1				
14			8.1				
15			8.1				
16			8.1				
17			8.1				
18	6.9		8.1	6.4		.01	
19			8.1			.01	
20			8.1				
21			8.1				
22			8.1				
23			8.1				
24			8.1				
25	6.8		8.2	6.9			Did not chlorinate
26			8.1				9/22-9/30
27			8.1				
28			8.1				
29			8.1				
30			8.1				
31							

NOTES:
[1] Dissolved Oxygen in ppm.
[2] Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month OCTOBER 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.1				
2			8.2				
3	5.9		8.2	5.9		.02	
4			8.2				
5			8.2				
6			8.2				
7			8.2				
8			8.2			.02	
9	6.0		8.2	6.0			
10			8.2				
11			8.2				
12			8.1				
13			8.1				
14			8.2				
15			8.1				Did not chlorinate
16	6.0		8.1	6.0			10/15-10/23
17			8.1				
18			8.1				
19			8.1				
20			8.1				
21			8.1				
22			8.1				
23	5.8		8.1	5.8			
24			8.1			.02	
25			8.1				
26			8.1				
27			8.1				
28			8.1				
29			8.1				
30	6.2		8.1	6.1		.03	
31			8.1				

NOTES:
[1] Dissolved Oxygen in ppm.
[2] Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month NOVEMBER 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.1				
2			8.2				
3			8.2				
4			8.2				
5			8.2				
6	6.6		8.2	6.6			
7			8.2			.02	
8			8.2				
9			8.2				
10			8.2				
11			8.2				
12			8.1				
13	6.2		8.2	6.2			
14			8.1				
15			8.1				
16			8.2			.01	
17			8.1				
18			8.2				
19			8.2				
20	6.4		8.1	6.3		.02	
21			8.1				
22			8.1				
23			8.1				
24			8.1				
25			8.1				
26			8.1				
27	6.7		8.1	6.6			
28			8.2			.02	
29			8.2				
30			8.2				
31							

NOTES:
[1]Dissolved Oxygen in ppm.
[2]Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
CHEMICAL PARAMETERS
TABLE C-1 (Cont.)

Month DECEMBER 1979

DAY	INTAKE		DISCHARGE				REMARKS
	D.O.[1]		pH	D.O.[1]		T.R.C.[2]	
1			8.2				
2			8.2				
3			8.2				
4	5.8		8.2	6.0			
5			8.2			.02	
6			8.2				
7			8.2				
8			8.2				
9			8.2				
10			8.2				
11	5.7		8.2	5.6		.01	
12			8.1				
13			8.1				
14			8.1				
15			8.1				
16			8.1				
17			8.1				
18	6.1		8.1	5.9		.01	
19			8.1				
20			8.1				
21			8.1				
22			8.1				
23			8.1				
24			8.1				
25			8.1				
26	6.1		8.1	6.0		.02	
27			8.2				
28			8.2				
29			8.2				
30			8.2				
31			8.2				

NOTES:
[1] Dissolved Oxygen in ppm.
[2] Total Residual Chlorine in ppm

ST. LUCIE PLANT UNIT NO. 1
HEAVY METALS

TABLE C-2

A. INTAKE

YEAR 1979

	ARSENIC[1]	CHROMIUM[2]	COPPER[2]	IRON[2]	LEAD[2]	MERCURY[2]	NICKEL[2]	ZINC[2]
JAN.	<0.002	< .02	< .02	.32	< .05	< .0002	< .02	< .02
FEB.	<0.002	< .02	< .02	.34	< .05	< .0002	< .02	< .02
MAR.	<0.002	< .02	< .02	.14	< .05	< .0002	< .02	.03
APR.	<0.002	< .02	< .02	.42	< .05	< .0002	.12	.02
MAY	<0.002	< .02	< .02	.18	< .05	< .0002	< .02	< .02
JUNE	*	< .02	< .02	.05	< .05	< .0002	< .02	< .02
JULY	<0.002	< .02	< .02	.08	< .05	< .0002	< .02	.03
AUG.	<0.002	< .02	< .02	.06	< .05	< .0002	< .02	.02
SEPT.	<0.002	< .02	< .02	.05	< .05	< .0002	< .02	< .02
OCT.	<0.002	< .02	< .02	.26	< .05	< .0002	< .02	< .02
NOV.	<0.002	< .02	< .02	.33	< .05	< .0002	< .02	< .02
DEC.	<0.002	< .02	< .02	.35	< .05	< .0002	< .02	.04

B. DISCHARGE

	ARSENIC[1]	CHROMIUM[2]	COPPER[2]	IRON[2]	LEAD[2]	MERCURY[2]	NICKEL[2]	ZINC[2]
JAN.	<0.002	< .02	< .02	.21	< .05	< .0002	< .02	< .02
FEB.	<0.002	< .02	< .02	.08	< .05	< .0002	< .02	< .02
MAR.	<0.002	< .02	< .02	.12	< .05	< .0002	< .02	< .03
APRIL	<0.002	< .02	< .02	.25	< .05	< .0002	.15	.02
MAY	<0.002	< .02	< .02	.05	< .05	< .0002	< .02	< .02
JUNE	*	< .02	< .02	.06	< .05	< .0002	< .02	< .02
JULY	<0.002	< .02	< .02	.07	< .05	< .0002	< .02	.03
AUG.	<0.002	< .02	< .02	.05	< .05	< .0002	< .02	.02
SEPT.	<0.002	< .02	< .02	1.40	< .05	< .0002	< .02	.04
OCT.	<0.002	< .02	< .02	.24	< .05	< .0002	< .02	< .02
NOV.	<0.002	< .02	< .02	.30	< .05	< .0002	< .02	.10
DEC.	<0.002	< .02	< .02	.26	< .05	< .0002	< .02	.05

NOTE: 1 Results in PPM *Samples lost
2 Results in mg/L

D. MINIMUM EFFECTIVE CHLORINE USAGE STUDY PROGRESS REPORT (ETS 4.2)

A chlorine solution is added to the seawater passing through the plant ahead of the plant intake structure for biofouling control. The chlorinated seawater subsequently passes through the main condensers and component cooling water heat exchangers and finally into the discharge canal.

During 1977 and 1978 data were obtained in an attempt to relate condenser efficiency to chlorine injection rates. It was determined that they were apparently unrelated. Additionally, observations of the level of biofouling were carried out on the component cooling water heat exchangers, where efficiency testing was impractical. Visual observations of the condenser inlet water boxes, during 1978, after utilizing varying chlorine injection rates, indicated that an injection rate sufficient to yield a 1.5 ppm free residual chlorine concentration at the outlet waterbox was necessary for biofouling control. As of the end of 1978 plant personnel were unable to inspect the condition of the component cooling water heat exchangers in order to assess the effect of these chlorine injection rates. As stated in the 1978 Annual Report, initial estimates of required chlorine usage were too low and injection rates were, therefore raised in late 1978. The chlorine injection rates remained at the higher levels until inspections during the April and May 1979 refueling outage.

Starting the July 1979, the chlorine injection rates were decreased based on testing, which revealed that a lower chlorine injection rate than previously used would obtain the same levels

of free residual chlorine at the condenser outlet waterboxes, which had previously been shown to be effective. It was believed that the installation of titanium alloy condenser tubes during the refueling outage was somehow related to this phenomenon. Inspection of the component cooling water heat exchangers during the 1979 refueling outage indicated that no increase in the level of biofouling had occurred. Although no inspection of the heat exchangers has been performed since the post-refueling outage chlorine injection rate reduction, it is believed that tne component cooling water heat exchangers have not experienced biofouling problems. Observations of chlorine effectiveness will co nue to be made with an ultimate goal of optimization of heat exchanger surface cleanliness and chlorine residuals at the lowest possible levels of discharge.

Total residual chlroine levels are reported in Section C of this report. As can be seen in Table C-1 the residuals have been consistently below the ETS limit of 0.1 ppm at the terminus of the discharge canal. Table D-1 shows the monthly chlorine injection rates used in 1979. It is believed that no adverse environmental impact has resulted from the use of chlorine at the St. Lucie Plant.

TABLE D - 1

ST LUCIE UNIT NO. 1
CHLORINE INJECTION RATES
1979

Months	Cl_2 Injection Rate (lbs/hr)	Total Number of Days/Month Chlorination Occurred
January	167	30
February	167	27
March	167	27
April	Refueling	0
May	Refueling	0
June	167 & 104	22
July	104, 125 & 146	30
August	125	31
September	125 & 146	19
October	146	20
November	146	25
December	146	31

NOTE: Chlorination was performed on one waterbox once per day for 1.5 hours at the above listed injection rates.

E. ADDITIONAL BIOTIC RESULTS

Some sea turtle entrapment in the intake canal has occurred during the monitoring period from January 1, 1979 through December 31, 1979. A large mesh turtle net placed in the intake canal is used to capture the entrapped turtles. A total of 164 turtles were caught, tagged and released unharmed to the ocean. Loggerhead turtles accounted for 162 of the number and two green turtles comprised the balance.

In addition to the number of turtles noted above, some mortality of sea turtles has been noted in the intake canal with 13 loggerheads and one green being recovered. With the exception of three accidental deaths directly associated with netting, the cause of death for the remainder of the turtles (11) was unknown.

F. CHANGES TO THE ENVIRONMENTAL TECHNICAL SPECIFICATIONS

During 1979, the Nuclear Regulatory Commission (NRC) issued Amendment No. 29 to Operating License No. DPR-67 on January 24, 1979. This amendment consisted of changes to the Environmental Technical Specifications in response to FP&L's requests dated August 1, 1977; October 27, 1977; August 29, 1978; and September 29, 1978. The amendment revised Appendix B Administrative Controls to reflect individual title changes and department name changes; deleted salinity, primary coolant activity, and fish impingement monitoring requirements; included Centigrade temperature equivalents in addition to Fahrenheit, wherever specified; and authorized a $2^{o}F$ increase in the allowable condenser cooling water temperature rise.

By its letters dated April 12 and September 10, 1979, FP&L has requested that deletion of thermal and chemical limits and monitoring requirements on the basis of ALAB-515 (Yellow Creek). As of December 31, 1979, the NRC had not yet approved this request.

G. REPORTABLE OCCURRENCES

The following Reportable Occurence Reports were filed with NRC's Region II office of Inspection and Enforcement during 1979.

R.O. NUMBER	DATE OF R.O.	TITLE
335-B-79-01	1-5-79	Ocean Intake Area - Recording Thermographs
335-B-79-02*	3-14-79	Zone of Mixing - Surface Temperature Rise
335-B-79-03	8-15-79	Ocean Discharge Area - Recording Thermographs
335-B-79-04	11-13-79	Ocean Intake Area - Recording Thermographs
335-B-79-05	12-10-79	Ocean Discharge Area - Recording Thermographs

* R. O. 335-B-79-02 reported two out-of specification values for February 26 and 27, 1979 of 8.5°F and 6.7°F respectively. A subsequent, more intensive analysis of the raw data revealed that these values were actually 8.1°F for February 26 and 8.1°F for February 27. Evaluation of thermograph instruments' history indicated a high probability that these temperatures were the result of instrument malfunction not detected on the initial inspection of data. The corrected temperatures were not believed to have caused any adverse environmental impact.