

**Florida  
Power**  
CORPORATION

Crystal River Unit 3  
Docket No. 50-302

April 26, 1991  
3F0491-08

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555

Subject: Annual Radiological Environmental Operating Report

Dear Sir:

Florida Power Corporation hereby submits the 1990 Annual Radiological Environmental Operating Report in compliance with Crystal River Unit 3's Technical Specification, Appendix A, Section 6.9.1.5(c). The report contains the data obtained from the radiological environmental surveillance program conducted for the Crystal River site for 1990.

Sincerely,

G.L. Boldt,  
Vice President  
Nuclear Production

GLB:LVC:wla

Attachment

xc: Regional Administrator, Region II  
Senior Resident Inspector  
NRR Project Manager

9105060113 901231  
PDR ADOCK 05000302  
R PDR

A Florida Progress Company

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

1990

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

Approved By:

*John D. Stephenson for S.W. Johnson*  
Manager, Site Nuclear Services

Date:

4/24/91

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## INTRODUCTION

This report is submitted as required by Technical Specification 6.9.1.5(c) to Crystal River Facility Operating License No. DPR-72. In accordance with this specification, the following information must be included in this report:

- Summaries
- Interpretations
- Unachievable LLDs, and
  - An analysis of trends of the results of the radiological environmental studies and previous annual reports.
  - An assessment of any observed impact of plant operation on the environment.

**NOTE:** If harmful effects or evidence of irreversible damage are detected by the monitoring, the Report shall provide an analysis of the problem and a planned course of action to alleviate the problem.

- Summarized and tabulated results, in the format of Regulatory Guide 4.8 (December 1975), of all radiological environmental samples taken during the report period.

**NOTE:** If some results are not available for inclusion, the report shall note and explain the reason for the missing results. The missing results shall be submitted as soon as possible in a supplementary report.

- A summary description of the REMP.
- A map of all sampling locations keyed to a table giving distances and directions from the reactor.
- Unavailability of milk or fresh leafy vegetable samples required by Table 3.12-1 of Technical Specifications.
- The results of land-use censuses.
- Results of Interlaboratory Comparison Program.



## I. SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The analytical results of the Crystal River Unit 3 (CR-3) operational Radiological Environmental Monitoring Program (REMP) for 1990 are contained in this report. The operational program began on January 1, 1977 just prior to initial criticality, which was achieved on January 14, 1977.

Sampling of the facility environs is performed by the State of Florida Department of Health and Rehabilitative Services (FDHRS), Office of Radiation Control. The State also performs the required analyses, participates in the Environmental Protection Agency's (EPA's) Interlaboratory Comparison Program, and performs the annual land-use census.

Sample station locations are given in Table I-1 and Figures I-2, -3, and -4. Sample frequency and analysis type may be determined from Table I-2. Figure I-1 illustrates the relevant exposure pathways.

Except for air sample gross beta results and direct radiation measurements, most of the analytical results are below the lower limit of detection (LLD) of the sample. Sample LLDs are generally much lower than the required "a priori" LLD. When measurable results are reported, the values are also usually less than the required "a priori" LLD.

The results of the 1990 REMP have been compared to previous years' results. This comparison, in part illustrated by the trend graphs<sup>1</sup> of Section IV, shows no evidence of increasing radionuclide buildup in any of the sample media. Additionally, these results verify the effectiveness of in-plant measures for controlling radioactive releases. When combined with dose calculation results<sup>2</sup> (based upon actual release data and a hypothetical individual residing at the Site Boundary), the REMP data indicate that the environmental impact of CR-3's operation is not significant.

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<sup>1</sup>Trend graphs illustrate the mean measured concentration of a particular radionuclide for the year. When measurable results are not obtained, the highest sample LLD is plotted.

<sup>2</sup>For 1990 releases, the whole body dose commitment to the maximum individual was calculated to be 0.38 mrem.

TABLE 1-1  
FLORIDA POWER CORP. - CR3 - 1990  
SAMPLE STATION LOCATIONS

SAMPLE MEDIA	STATION ID	DIRECTION	DISTANCE
TLD	C60	N	4400 FT.
	C61	NNE	4400
	C62	NE	5300
	C63	ENE	4400
	C64	E	4400
	C65	ESE	1740
	C66	SE	1600
	C67	SSE	1480
	C68	S	1500
	C69	SSW	1780
	C41	SW	2100
	C70	WSW	4400
	C71	WNW	3600
	C72	NW	2400
	C73	NNW	2000
	C27	W	3400
	C18	N	5.2 MI.
	C03	NNE	5.3
	C04	NE	6.3
	C74	ENE	5.5
	C75	E	4.2
	C76	ESE	5.4
	C08	SE	3.5
	C77	SSE	3.2
	C09	S	3.2
	C78	WSW	4.1
	C14G	W	2.8
	C01	NW	4.9
	C79	NNW	5.0
	C47-Control	ESE	80

TABLE I-1 (CONT'D)  
FLORIDA POWER CORP. - CR3 - 1990  
SAMPLE STATION LOCATIONS

SAMPLE MEDIA	STATION ID	DIRECTION	DISTANCE
AIR	C07	ESE	7.5 MI.
	C18	N	5.2
	C40	E	3.5
	C41	SW	0.4
	C46	N	0.4
	C47-Control	ESE	80
WATER			
SEAWATER	C14H	NW	0.1
	C14G	W	2.8
	C13-Control	WSW	3.4
GROUND WATER	C40-Control	E	3.5
DRINKING WATER	C07-Control	ESE	7.5
	C10-Control	ESE	5.9
	C18-Control	N	5.2
SHORELINE SEDIMENT	C09-Control	S	3.2
	C14H	NW	0.1
	C14M	W	1.2
	C14G	W	2.8
FISH & OYSTERS	C29	N	2.0
	C30-Control	WSW	3.6
VEGETATION	C48A	N	0.8
	C48B	NNE	0.8
	C47-Control	ESE	80
WATERMELON	C04	ENE	6.3
CITRUS	C19	ENE	8.5

TABLE I-2  
FLORIDA POWER CORP. - CR3 - 1990  
SAMPLING AND ANALYSIS PROGRAM

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD <sup>(1)</sup>
TLD	30	Quarterly	γ Dose	---
Air Iodine	6	Weekly	I-131	0.07 pCi/m <sup>3</sup>
Air Particulate	6	Weekly	Gross β	0.01
		Quarterly	γ Spec :	
			Cs-134	0.05
			Cs-137	0.06
Seawater	3	Monthly	Tritium	3000 pCi/L
		Monthly	γ Spec :	
			Mn-54	15
			Fe-59	30
			Co-58	15
			Co-60	15
			Zn-65	30
			Zr-Nb-95	15
			I-131	1
			Cs-134	15
			Cs-137	18
			Ba-La-140	15

(1) The maximum "a priori" LLD

TABLE 1-2 (Cont'd)  
 FLORIDA POWER CORP. - CR3 - 1990  
SAMPLING AND ANALYSIS PROGRAM

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD
Ground Water	1	Semiannual	Tritium	2000 pCi/L
		Semiannual	γ Spec : (2)	(2)
Drinking Water	3	Quarterly	Tritium	
		Quarterly	γ Spec : (2)	(2)
Shoreline Sediment	4	Semiannual	γ Spec :	
			Cs-134	150 pCi/kg
			Cs-137	180
Carnivorous Fish and Oysters	2	Quarterly	γ Spec :	
			Mn-54	130 pCi/kg
			Fe-59	260
			Co-58	130
			Co-60	130
			Zn-65	260
			Cs-134	130
			Cs-137	150

(2) Same as Seawater γ Spec

TABLE I-2 (Cont'd)  
FLORIDA POWER CORP. - CR3 - 1990  
SAMPLING AND ANALYSIS PROGRAM

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD
Broad Leaf Vegetation	3	Monthly (3)	γ Spec :	
			I-131	60 pCi/kg
			Cs-134	60
			Cs-137	80
Citrus	1	Annual (4)	γ Spec :	
			(5)	(5)
Watermelon	1	Annual (4)	γ Spec :	
			(5)	(5)

- 
- (3) When available  
(4) During harvest  
(5) Same as broad leaf vegetation



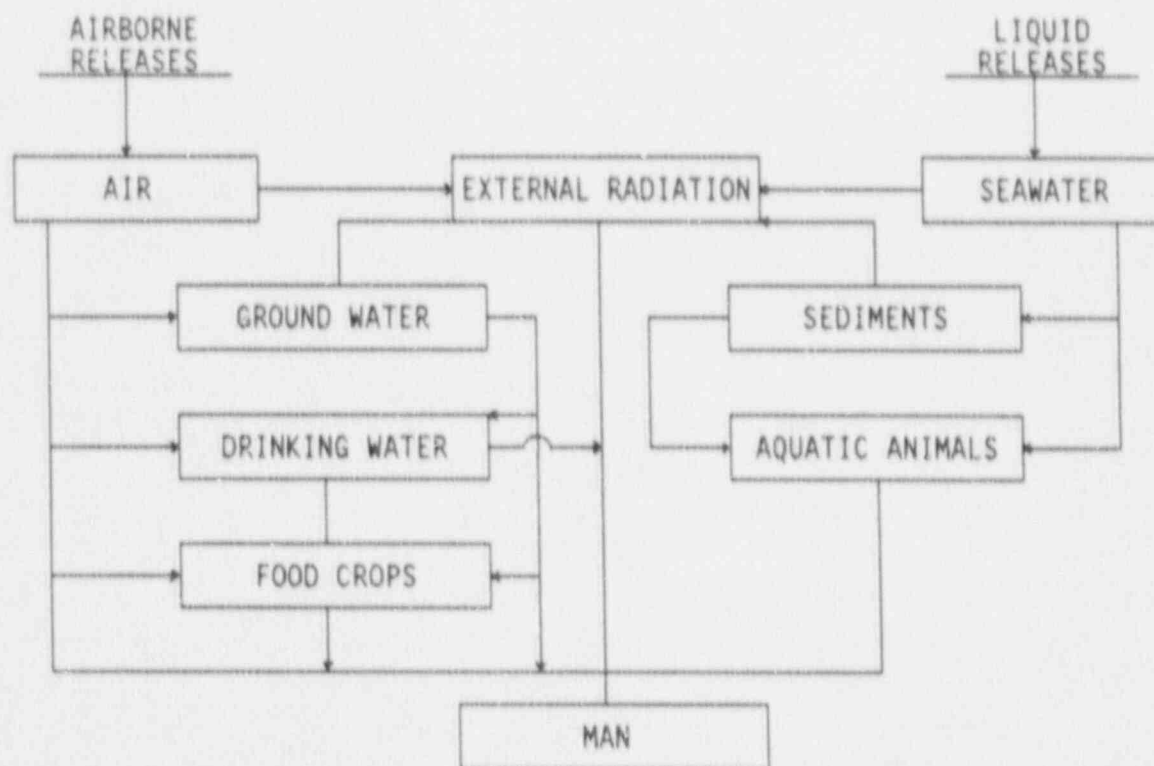


FIGURE I-1: Environmental Media and Exposure Pathways

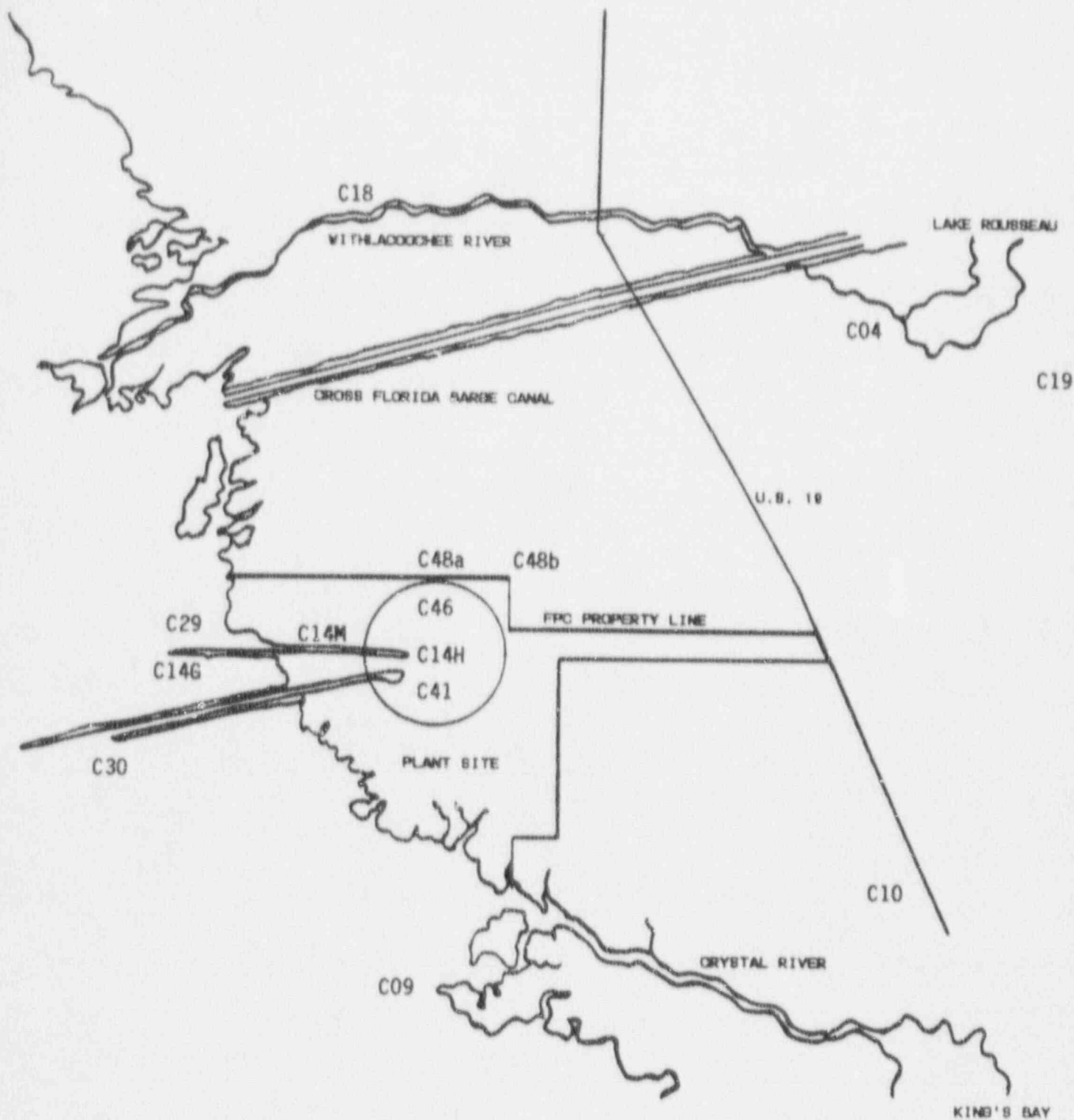


FIGURE I-2: ENVIRONMENTAL MONITORING SAMPLE STATION LOCATIONS

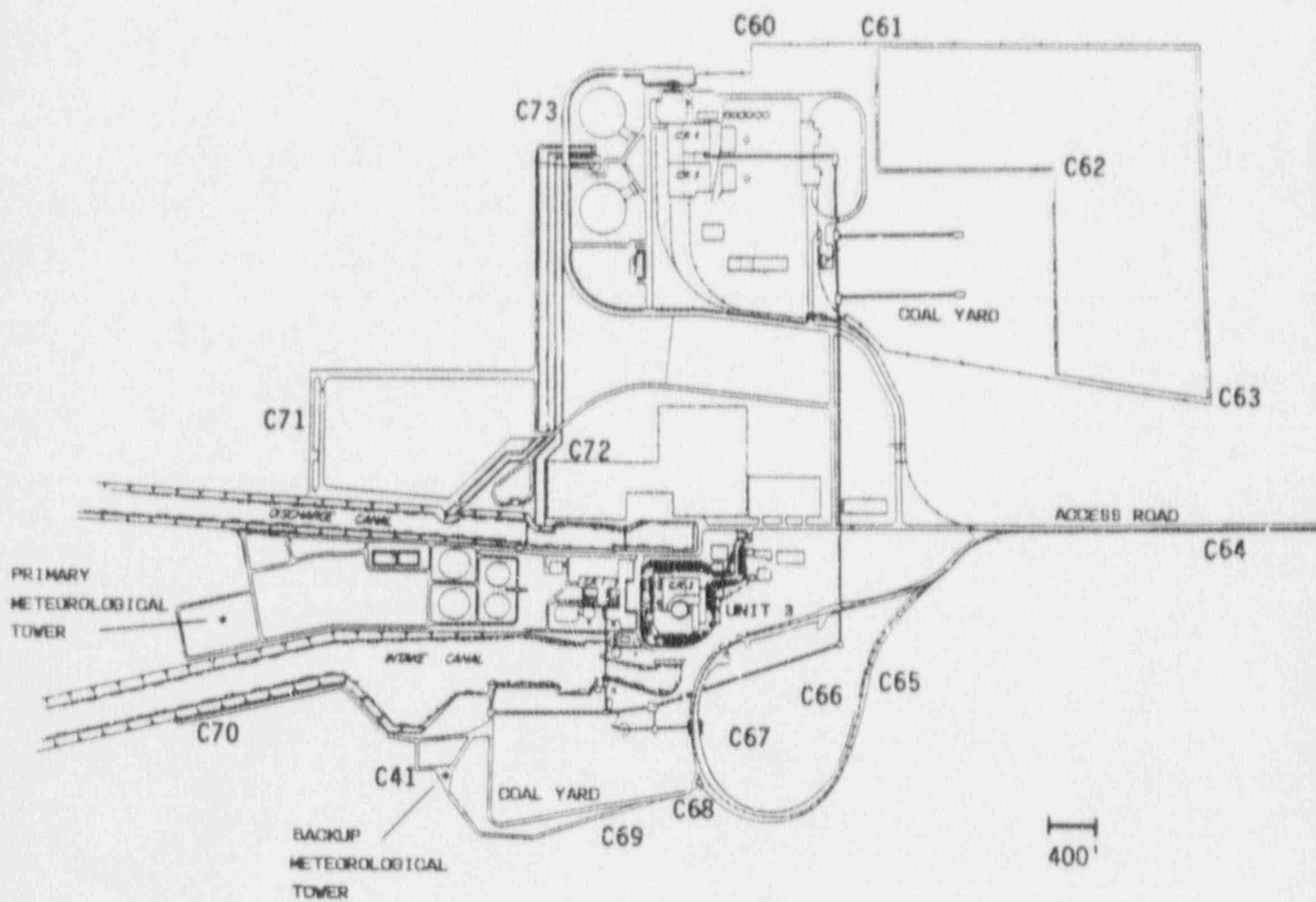


FIGURE I-3: ENVIRONMENTAL MONITORING TLD LOCATIONS (SITE BOUNDARY)

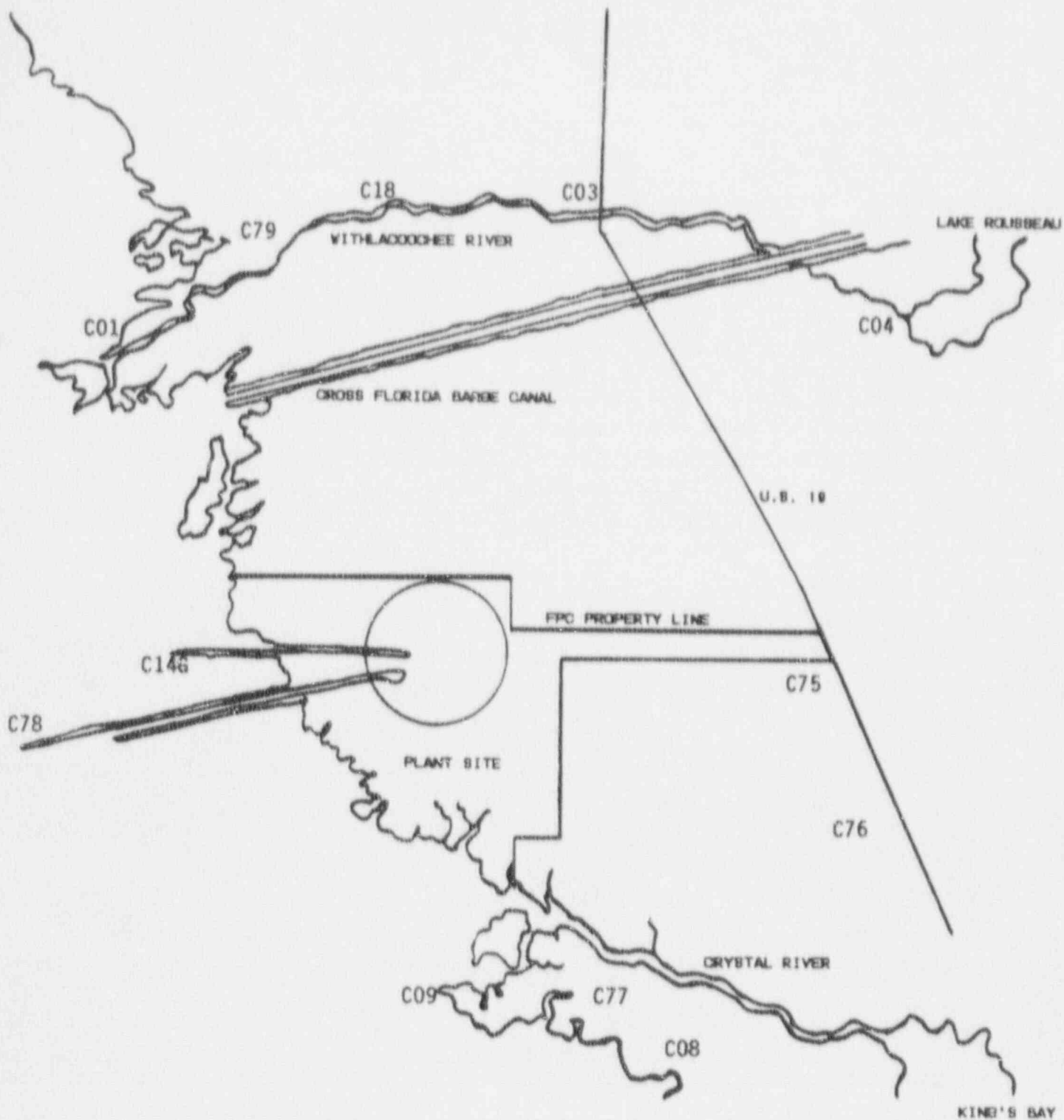


FIGURE I-4: ENVIRONMENTAL MONITORING TLD LOCATIONS (5 MILES)

## II. LAND-USE CENSUS

A land-use census to identify the nearest residences, vegetable gardens, and potential milk-producing animals within a five mile radius of the nuclear plant was conducted in June. The distance in miles and bearing in degrees for each receptor type in each of the sixteen sectors is summarized below.

SECTOR	NEAREST RESIDENCE	NEAREST GARDEN	NEAREST MILK ANIMAL
N	4.4 @ 2°	4.5 @ 2°	**
NNE	3.8 @ 15°	4.5 @ 13°	**
NE	3.8 @ 55°	4.3 @ 52°	**
ENE	3.4 @ 60°	4.2 @ 61°	4.3 @ 70°
E	3.5 @ 97°	4.1 @ 93°	**
ESE	4.2 @ 101°	4.2 @ 101°	**
SE	4.4 @ 136°	*	**
SSE	3.4 @ 150°	*	*
S	*	*	*
SSW	*	*	*
SW	*	*	*
WSW	*	*	*
W	*	*	*
WW	*	*	*
NW	4.6 @ 319°	*	*
NNW	4.5 @ 338°	4.5 @ 339°	**

\* None

\*\* All sectors around the plant which are not exclusively water or marshland might occasionally have milk-producing animals at the plant boundary. Most of the land adjacent to the plant site is woodland; however, much of the land in the immediate area is pastureland for cattle and a few horses. Stray cattle are often seen in the wooded areas adjacent to the plant site. These cattle are raised for beef or veal. At times there may be fresh females in these herds, but these animals roam freely and are not milked. A few goats have also been located at residences within the survey area. None of these cows or goats are known to be providing milk for human use, and the owners are not willing to make samples of milk available.

FLORIDA DEPT. OF HRS - EPA INTERLABORATORY CROSS-CHECK PROGRAM DATA

January through June, 1990

Media	Nuclide	Collection			EPA	Units	Normal.	Mean of	N.D.K.	Action
		Mon	Day	Yr	Known		Range	Analyses		Level
FILTER	Alpha	03	30	90	5	pCi/F	0.118	5.33	0.12	
FILTER	Beta	03	30	90	31	pCi/F	0.118	28.33	-0.92	
FILTER	Cs-137	03	30	90	10	pCi/F	0.000	11.00	0.35	
FILTER	Sr-90	03	30	90	10	pCi/F	0.788	8.33	-1.92	
MILK	I-131	04	27	90	99	pCi/L	0.354	98.00	-0.17	
MILK	Cs-137	04	27	90	24	pCi/L	0.000	25.00	0.35	
MILK	K	04	27	90	1550	mg/L	0.379	1536.67	-0.30	
MILK	Sr-89	04	27	90	23	pCi/L	0.000	22.00	-0.35	
MILK	Sr-90	04	27	90	23	pCi/L	0.000	21.00	-0.69	
WATER	Alpha	01	26	90	12	pCi/L	0.118	10.33	-0.58	
WATER	Alpha	05	11	90	22	pCi/L	0.492	15.67	-1.83	
WATER	Beta	01	26	90	12	pCi/L	0.000	12.00	0.00	
WATER	Beta	05	11	90	15	pCi/L	0.236	19.00	1.39	
WATER	Co-60	02	09	90	15	pCi/L	0.118	15.67	0.23	
WATER	Co-60	06	08	90	24	pCi/L	0.118	25.67	0.58	
WATER	Zn-65	02	09	90	139	pCi/L	0.211	139.67	0.08	
WATER	Zn-65	06	08	90	148	pCi/L	0.197	153.00	0.58	
WATER	Ru-106	02	09	90	139	pCi/L	0.464	138.00	-0.12	
WATER	Ru-106	06	08	90	210	pCi/L	0.056	206.00	-0.33	
WATER	Ba-133	02	09	90	74	pCi/L	0.169	73.00	-0.25	
WATER	Ba-133	06	08	90	99	pCi/L	0.295	96.33	-0.46	
WATER	Cs-134	02	09	90	18	pCi/L	0.118	17.33	-0.23	
WATER	Cs-134	06	08	90	24	pCi/L	0.000	24.00	0.00	
WATER	Cs-137	02	09	90	18	pCi/L	0.236	18.00	0.00	
WATER	Cs-137	06	08	90	25	pCi/L	0.118	25.67	0.23	
WATER	H-3	02	23	90	4976	pCi/L	0.225	5143.33	0.56	
WATER	H-3	06	22	90	2933	pCi/L	0.165	3033.33	0.49	
WATER	Sr-89	01	12	90	25	pCi/L	0.236	21.33	-1.27	
WATER	Sr-89	05	04	90	7	pCi/L	0.118	7.67	0.23	
WATER	Sr-90	01	12	90	20	pCi/L	0.394	18.33	-1.92	
WATER	Sr-90	05	04	90	7	pCi/L	0.000	7.00	0.00	

NOTES:

Normal.: Normalized range. As defined in "Environmental Radioactivity Range Laboratory Intercomparison Studies Program Fiscal Year 1981 - 1982", Environmental Monitoring Systems Laboratory, U. S. Environmental Protection Agency, P. O. Box 93478, Las Vegas, Nevada, 89193-3478. EPA-600/4-81-004, February, 1981.

N.D.K.: Normalized deviation of the mean from the known value, as defined in EPA-600/4-81-004.



FLORIDA DEPT. OF HRS - EPA INTERLABORATORY CROSS-CHECK PROGRAM DATA

July through December, 1990

Media	Nuclide	Collection			EPA Units	Normal.	Mean of	N.D.K.	Action
		Mon	Day	Yr	Known	Range	Analyses		Level
FILTER	Alpha	08	31	90	10 pCi/F	0.236	12.33	0.81	
FILTER	Beta	08	31	90	62 pCi/F	0.118	59.33	-0.92	
FILTER	Cs-137	08	31	90	20 pCi/F	0.000	22.00	0.69	
FILTER	Sr-90	08	31	90	20 pCi/F	0.473	15.33	-1.62	
MILK	I-131	09	28	90	58 pCi/L	0.295	58.33	0.10	
MILK	Cs-137	09	28	90	20 pCi/L	0.236	21.00	0.35	
MILK	K	09	28	90	1700 mg/L	0.188	1744.33	0.90	
MILK	Sr-89	09	28	90	16 pCi/L	1.345	21.00	1.73	
MILK	Sr-90	09	28	90	20 pCi/L	0.709	8.67	-3.93	1
WATER	Alpha	09	21	90	10 pCi/L	0.000	10.00	0.00	
WATER	Beta	09	21	90	10 pCi/L	0.000	14.00	1.39	
WATER	Co-60	10	05	90	20 pCi/L	0.118	21.33	0.46	
WATER	Zn-65	10	05	90	115 pCi/L	0.197	119.00	0.58	
WATER	Ru-106	10	05	90	151 pCi/L	0.630	153.67	0.31	
WATER	Ba-133	10	05	90	110 pCi/L	0.054	105.67	-0.68	
WATER	Cs-134	10	05	90	12 pCi/L	0.118	11.33	-0.23	
WATER	Cs-137	10	05	90	12 pCi/L	0.236	13.00	0.35	
WATER	H-3	10	19	90	7203 pCi/L	0.255	5656.33	-3.72	2
WATER	I-131	08	10	90	39 pCi/L	0.098	40.67	0.48	

NOTES:

Normal.: Normalized range. As defined in "Environmental Radioactivity Laboratory Intercomparison Studies Program Fiscal Year 1981 - 1982", Environmental Monitoring Systems Laboratory, U. S. Environmental Protection Agency, P. O. Box 93478, Las Vegas, Nevada, 89193-3478. EPA-600/4-81-004, February, 1981.

N.D.K.: Normalized deviation of the mean from the known value, as defined in EPA-600/4-81-004.

NDP: No data provided. No data was provided to EPA for inclusion in their report.

NA: Not available. Report containing this data has not yet been received from EPA, Las Vegas.

ACTION LEVEL:

- (1) Cause: Erroneously over estimated chemical recovery of strontium carrier.  
Corrective Action: Try to improve purity of isolated strontium carrier.
- (2) Cause: Incorrect counting efficiency used in calculation.  
Corrective Action: Double check all parameters used in the calculation.

#### IV-A. AIRBORNE PATHWAY

Air samples are taken at five locations in the vicinity of the plant. The control location is 80 miles ESE of the plant.

Table IV-A.1 provides a statistical summary of the analytical results for 317 gross beta samples and 317 Iodine samples.

The results for one gross beta and one Iodine sample were not reported for the following reason:

C40 7/30/91: Sample not collected due to power outage.

Of 317 particulate samples analyzed for gross beta activity, 316 had measurable activity. The average indicator concentration was 15 pCi/1,000 m<sup>3</sup> with a range of 3 to 131 pCi/1,000 m<sup>3</sup>. The average indicator concentration during 1987 was 16 pCi/1,000 m<sup>3</sup>; 6 pCi/1,000 m<sup>3</sup> for 1988; and 15 pCi/1,000 m<sup>3</sup> for 1989.

Three hundred and seventeen samples were analyzed for Iodine activity, with none having measurable activity.

Tables IV-A.2 and IV-A.3 provide the results for each weekly air sample.

Second Quarter composite data are summarized in Table IV-A.4. Measurable quantities of Cesium were not identified. The highest LLD was 1.3 pCi/1,000 m<sup>3</sup>.

TABLE IV-A.1

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE		
AIRBORNE IODINE (pCi/m <sup>3</sup> )	$\gamma$ Spec 317 I-131	0.024	<LLD	-	-	<LLD	0
15 AIRBORNE PARTICULATES (pCi/1000m <sup>3</sup> for Gross B, pCi/1000m <sup>3</sup> for $\gamma$ Spec)	Gross B 317	2.5	15 (264/265) (3 - 131)	C40 3.5 @ 85°	40 (52/53) (5 - 131)	12 (53/53) (6 - 29)	0
	$\gamma$ Spec 24						
	Cs-134	6.9	<LLD	-	-	<LLD	0
	Cs-137	6.6	<LLD	-	-	<LLD	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-A.2

FLORIDA POWER CORP. - CR3 - 1990

pCi/m<sup>3</sup> 1001WE - 131 IN AIR

COLLECTION DATE	E07	C18	C40	C41	C46	C47
01-02	<.02	<.02	<.02	<.02	<.02	<.02
01-09	<.02	<.02	<.02	<.02	<.02	<.02
01-16	<.03	<.03	<.03	<.03	<.03	<.03
01-22	<.03	<.03	<.03	<.03	<.03	<.03
01-29	<.03	<.02	<.02	<.02	<.03	<.02
02-06	<.02	<.02	<.02	<.02	<.02	<.02
02-12	<.04	<.04	<.04	<.04	<.04	<.04
02-19	<.03	<.03	<.03	<.03	<.03	<.03
02-26	<.03	<.03	<.03	<.03	<.03	<.03
03-05	<.03	<.03	<.03	<.03	<.03	<.03
03-12	<.02	<.02	<.02	<.02	<.02	<.02
03-19	<.03	<.03	<.03	<.03	<.03	<.03
03-26	<.03	<.03	<.03	<.03	<.03	<.03
04-02	<.03	<.03	<.03	<.03	<.03	<.03
04-09	<.03	<.03	<.03	<.03	<.03	<.03
04-17	<.02	<.02	<.02	<.02	<.02	<.02
04-23	<.03	<.03	<.03	<.03	<.03	<.03
04-30	<.02	<.02	<.02	<.02	<.02	<.02

TABLE IV-A.2 (Cont'd)  
 FLORIDA POWER CORP. - CR3 - 1990  
 pCi/m<sup>3</sup> IODINE - 131 IN AIR

COLLECTION DATE	C07	C18	C40	C41	C46	C47
05-07	<.02	<.02	<.02	<.02	<.02	<.02
05-14	<.03	<.03	<.03	<.03	<.03	<.03
05-21	<.02	<.02	<.02	<.02	<.02	<.02
05-29	<.02	<.02	<.02	<.02	<.02	<.02
06-04	<.04	<.03	<.03	<.03	<.03	<.03
06-11	<.02	<.02	<.02	<.02	<.02	<.02
06-18	<.02	<.02	<.02	<.02	<.02	<.02
06-25	<.02	<.02	<.02	<.02	<.02	<.02
07-07	<.02	<.02	<.02	<.02	<.02	<.02
07-09	<.02	<.02	<.02	<.02	<.16	<.02
07-16	<.02	<.02	<.02	<.02	<.02	<.02
07-23	<.02	<.02	<.02	<.02	<.02	<.02
07-30	<.02	<.02	----	<.02	<.02	<.02
08-06	<.03	<.03	<.03	<.03	<.03	<.03
08-13	<.03	<.03	<.03	<.03	<.03	<.03
08-20	<.02	<.02	<.02	<.02	<.02	<.02
08-28	<.02	<.02	<.02	<.02	<.02	<.01

TABLE IV-A.2 (Cont'd)  
 FLORIDA POWER CORP. - CR3 - 1990  
 pCi/m<sup>3</sup> IODINE - 131 IN AIR

COLLECTION DATE	C07	C18	C40	C41	C46	C47
09-04	<.02	<.02	<.02	<.02	<.02	<.02
09-10	<.02	<.02	<.02	<.02	<.02	<.02
09-17	<.02	<.02	<.02	<.02	<.02	<.02
09-25	<.02	<.02	<.02	<.02	<.02	<.02
10-01	<.03	<.03	<.03	<.03	<.03	<.03
10-08	<.02	<.02	<.02	<.02	<.02	<.03
10-15	<.04	<.03	<.04	<.03	<.03	<.03
10-22	<.02	<.02	<.07	<.02	<.02	<.02
10-29	<.02	<.02	<.03	<.02	<.02	<.02
11-05	<.04	<.04	<.04	<.04	<.04	<.04
11-13	<.02	<.02	<.02	<.02	<.02	<.02
11-19	<.04	<.04	<.04	<.04	<.04	<.04
11-26	<.02	<.02	<.02	<.02	<.02	<.02
12-03	<.02	<.02	<.02	<.02	<.02	<.02
12-10	<.03	<.03	<.03	<.04	<.04	<.04
12-18	<.03	<.03	<.03	<.03	<.03	<.03
12-24	<.02	<.02	<.02	<.02	<.02	<.02
12-31	<.03	<.03	<.03	<.03	<.03	<.03



TABLE IV-A.3

FLORIDA POWER CORP. - CR3 - 1990

pCi/1000m<sup>3</sup> GROSS B IN AIR

COLLECTION DATE	C07	C18	C40	C41	C46	C47
01-02	10	17	14	16	16	14
01-09	5	4	6	5	7	8
01-16	17	18	15	20	19	<4
01-22	6	13	5	7	8	6
01-29	13	15	23	13	16	16
02-06	9	9	8	8	12	4
02-12	7	10	9	9	8	10
02-19	10	13	14	9	15	11
02-26	9	10	10	9	13	8
03-05	12	12	14	9	8	10
03-12	13	11	15	14	10	11
03-19	9	12	14	10	12	8
03-26	17	13	16	17	19	20
04-02	10	12	14	12	11	11
04-09	13	13	9	15	10	11
04-17	12	16	16	17	17	12
04-23	19	19	14	18	15	18
04-30	9	13	14	16	12	16

TABLE IV-A.3 (Cont'd)  
 FLORIDA POWER CORP. - CR3 - 1990  
 pci/1000m<sup>3</sup> GROSS 8 IN AIR

COLLECTION DATE	C07	C18	C40	C41	C46	C47
05-07	11	14	10	13	9	10
05-14	10	15	9	10	12	12
05-21	9	14	14	7	11	12
05-29	9	8	9	11	9	9
06-04	17	14	10	16	11	12
06-11	10	8	8	7	8	10
06-18	12	12	12	10	15	9
06-25	12	18	21	10	16	9
07-02	13	10	11	14	13	8
07-09	12	11	11	9	<33	16
07-16	6	8	10	6	7	6
07-23	6	6	11	3	8	5
07-30	8	9	---	11	10	4
08-06	9	13	11	8	11	6
08-13	16	16	15	17	22	14
08-20	10	13	13	12	13	12
08-28	12	7	16	13	4	8

TABLE IV-A.3 (Cont'd)

FLORIDA POWER CORP. - CR3 - 1990

pCi/1000m<sup>3</sup> GROSS D IN AIR

COLLECTION DATE	C07	C18	C40	C41	C46	C47
09-04	10	17	23	28	18	20
09-10	46	50	131	37	46	35
09-17	14	13	19	16	15	11
09-25	20	29	32	19	21	15
10-01	17	21	14	17	17	10
10-08	14	18	13	13	16	11
10-15	6	8	11	9	6	5
10-22	17	12	19	15	14	12
10-29	19	14	19	14	15	13
11-05	22	17	16	23	20	18
11-13	12	19	18	16	15	14
11-19	39	59	112	29	40	29
11-26	27	24	36	17	28	19
12-03	11	11	10	11	12	6
12-10	21	23	27	15	21	19
12-18	20	25	42	21	26	19
12-24	9	10	7	9	9	9
12-31	15	16	14	13	16	12

TABLE IV-A.4

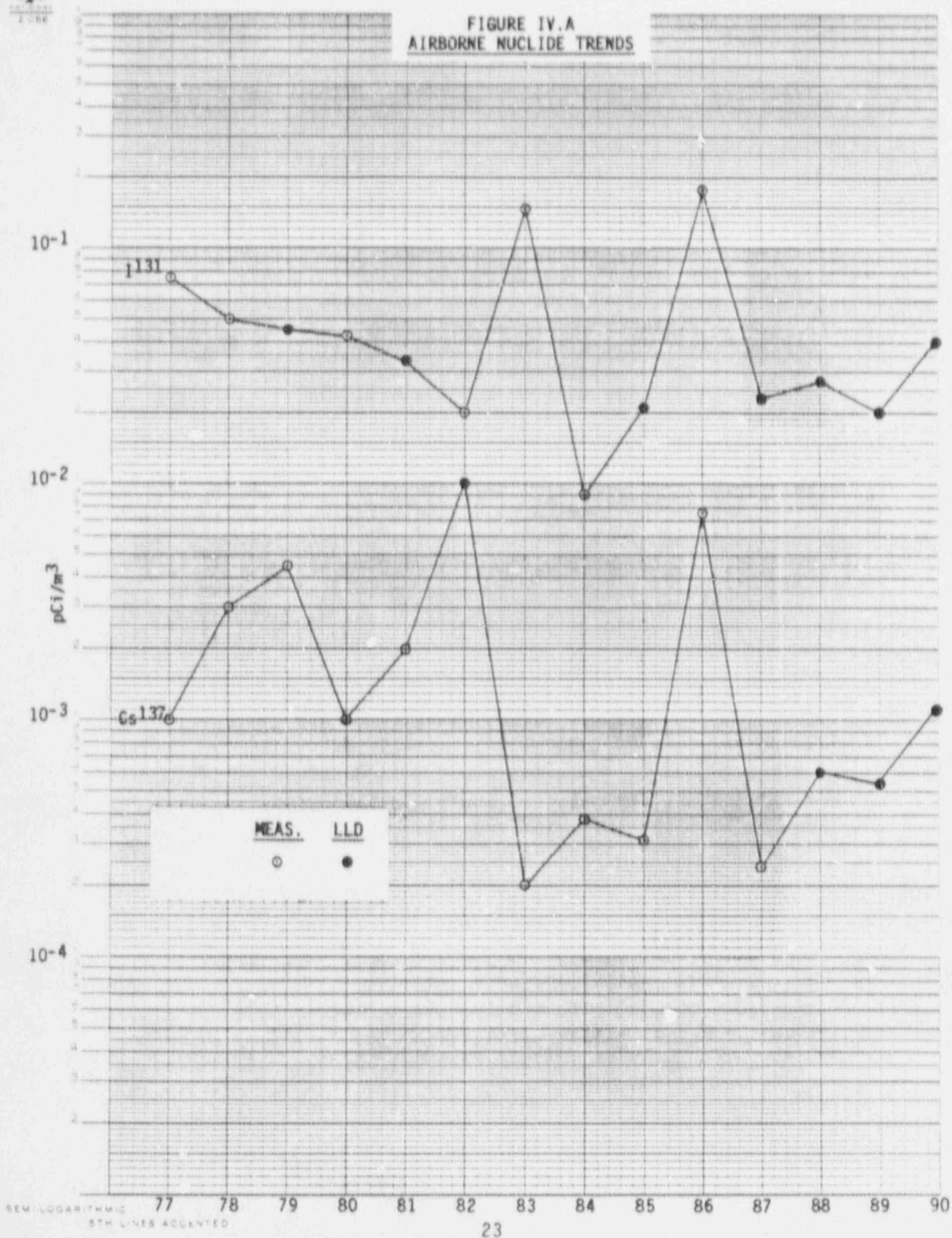
FLORIDA POWER CORP. - CR3 - 1990

pCi/1000m<sup>3</sup> 7 EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATES

STATION	NUCLIDE	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER
C07	Be-7	103	96	85	103.5
	K-40	<14	9	<15	<19
	Cs-134	<0.7	<0.7	<0.5	<1.3
	Cs-137	<0.7	<0.4	<0.8	<1.0
C18	Be-7	100	91	93	99.9
	K-40	<13	<13	<15	<16.8
	Cs-134	<0.8	<0.8	<0.7	<1.2
	Cs-137	<0.7	<0.6	<0.7	<0.8
C40	Be-7	80	90	73	108.2
	K-40	<15	<11	<16	<20.1
	Cs-134	<0.6	<0.9	<0.7	<0.9
	Cs-137	<0.7	<0.7	<0.7	<1.0
C41	Be-7	106	92	103	103.4
	K-40	<18	<12	<12	<17.8
	Cs-134	<0.9	<0.6	<0.7	<0.4
	Cs-137	<0.7	<0.8	<0.8	<0.8
C46	Be-7	78	98	86	99.6
	K-40	<14	<14	<14	<17.6
	Cs-134	<0.5	<0.7	<0.9	<0.9
	Cs-137	<0.7	<0.6	<0.8	<0.9
C47	Be-7	86	87	82	100.1
	K-40	<22	<15	13	<19.7
	Cs-134	<0.8	<0.7	<0.8	<1.1
	Cs-137	<0.7	<0.7	<0.8	<1.1



FIGURE IV.A  
AIRBORNE NUCLIDE TRENDS



#### IV-B. DIRECT RADIATION

Direct radiation measurements (using TLDs) were taken at sixteen locations within one mile of the plant, at thirteen locations ranging from 2.8 to 6.3 miles from the plant, and at one control location 80 miles from the site. The highest on-site dose was 77 mrem/yr at station C62 (NNE at 5300 feet). The highest off-site dose was 51 mrem/yr at station C75 (East at 4.2 miles). The control station (C47) dose was 47 mrem/yr. The average for all stations was 53 mrem/yr.

Third Quarter results for station C64 are not available since the TLD package was missing at collection time.



TABLE IV-B

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

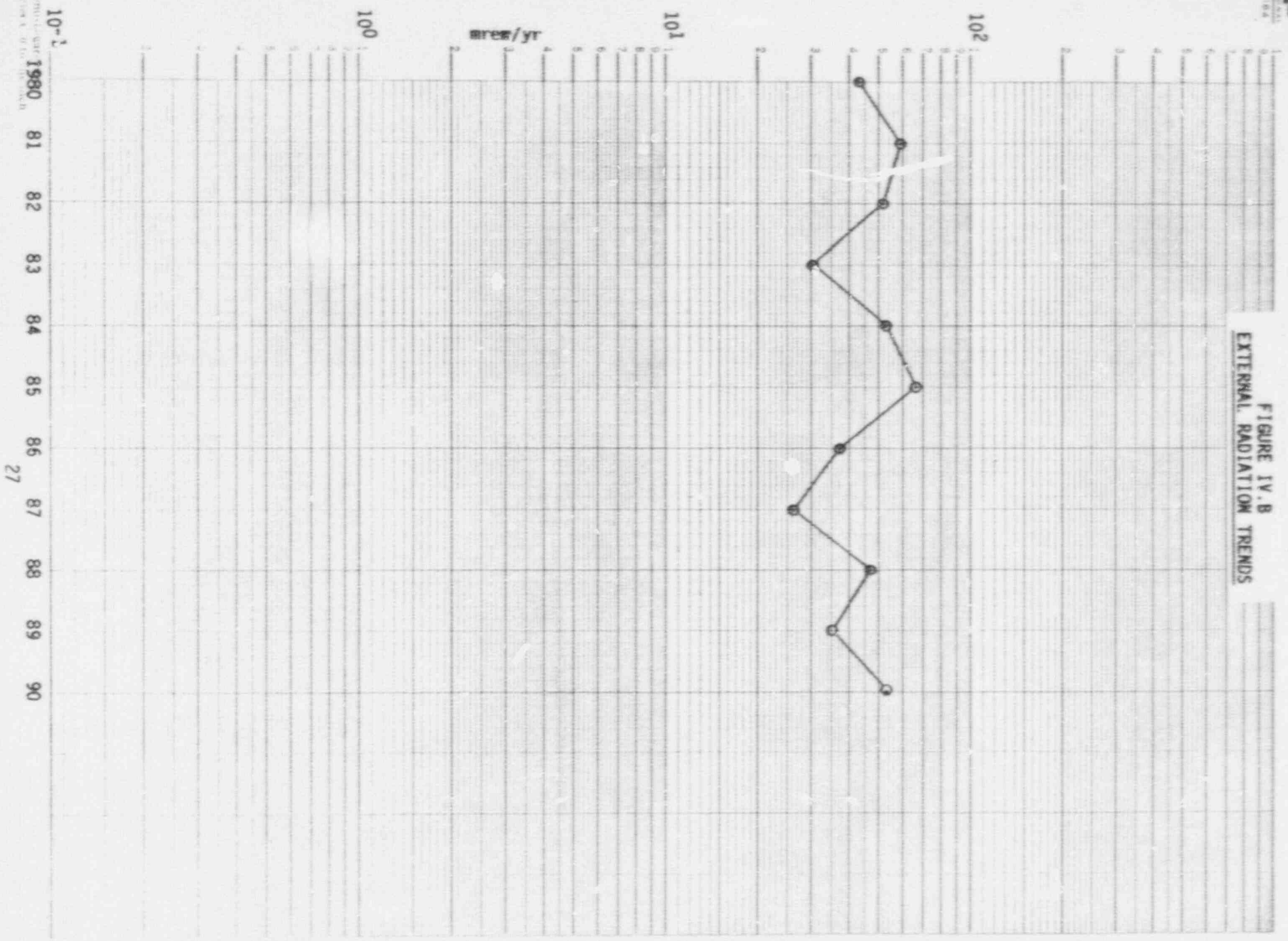
JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD)	<u>ALL INDICATOR LOCATIONS</u>	<u>LOCATION WITH HIGHEST MEAN</u>		<u>CONTROL LOCATION</u>		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN	NAME	MEAN	MEAN		
			RANGE	DISTANCE & BEARING	RANGE	RANGE		
DIRECT	7 DOSE 119	15	53 (114/115)	C62	77 (4/4)	47 (4/4)		0
RADIATION (mrem/yr)			(39 - 80)	0.9 @ 35'	(74 - 80)	(45 - 49)		

TABLE IV-B.1  
FLORIDA POWER CORP. - CR-3 - 1990  
mrem/yr  $\gamma$  Dose

TLD STATION	Quarter:	1	2	3	4
C01		46	48	46	48
C03		47	47	47	45
C04		46	46	46	45
C08		43	45	43	44
C09		47	46	45	46
C14G		50	53	50	53
C18		49	51	48	53
C27		63	67	67	67
C41		60	63	57	64
C47 (CONTROL)		47	46	45	49
C60		53	53	51	53
C61		69	55	61	59
C62		80	77	75	74
C63		58	62	56	63
C64		49	53	--	53
C65		52	56	52	55
C66		54	58	54	57
C67		55	55	54	56
C68		55	56	53	55
C69		59	56	56	54
C70		59	58	61	58
C71		55	59	55	60
C72		58	60	55	61
C73		51	58	49	58
C74		41	46	39	46
C75		51	53	49	55
C76		46	50	43	51
C77		41	41	39	45
C78		46	46	43	51
C79		53	50	50	53

FIGURE IV.B  
EXTERNAL RADIATION TRENDS



#### IV-C. WATERBORNE PATHWAY

To evaluate the waterborne pathway, seawater, groundwater, drinking water, and shoreline sediment samples are taken.

1. Monthly seawater grab samples are taken at two locations in the discharge canal and at one control location near the mouth of the intake canal. Of twenty-four indicator samples, nine had a measurable amount of Tritium at an average level of 301 pCi/L. Five samples taken at the control location, C13, indicated measurable amounts of Tritium at an average level of 127 pCi/L.

Gamma spectral analysis was performed on thirty-six samples. For the required radionuclides, there were no measured activities.

2. Semiannual groundwater samples are taken at one location, station C40. Gamma spectral and Tritium analyses are performed on both samples. All results were less than the LLD. Since plant startup, all results, except for the results of one 1985 Tritium analysis, have been less than LLD. As indicated by Figure IV-C.2, the 1985 Tritium value of 170 pCi/L is less than the typical LLD, and much less than the required "a priori" LLD of 2,000 pCi/L.
3. Quarterly drinking water samples are drawn from three locations: the Crystal River Public Water Plant (C07), the Indian Waters Public Water Supply (C10), and the Yankeetown City Well (C18). All samples were collected and analyzed for gamma emitters and Tritium. None of the samples yielded measurable activities for Tritium or the required gamma emitters.
4. Semiannual shoreline sediment samples are taken at three indicator locations in the discharge canal (C14H, C14M, C14G) and one control location (C09) at Fort Island Gulf Beach. Of the eight samples analyzed, four had measurable amounts of Cs-137. Cobalt-60 was identified in all six indicator samples taken in the discharge canal. (See Table IV-C.4.a.) Cobalt-58 was identified in five of the six discharge canal samples. No other gamma emitters attributable to CR-3 were found in measurable quantities.

TABLE IV-C.1

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS		LOCATION WITH HIGHEST MEAN		CONTROL LOCATION		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
				MEAN RANGE	NAME	MEAN RANGE	MEAN RANGE			
SEA WATER (pCi/L)	Tritium 36	230	301 (9/24) (90 - 1270)	C14H 0.1 @ 315	537 (3/12) (120 - 1270)	127 (5/12) (100 - 153)			0	
	7 Spec 36									
	Mn-54	4	<LLD	-	-	<LLD			0	
	Fe-59	8	<LLD	-	-	<LLD			0	
	Co-58	4	<LLD	-	-	<LLD			0	
	Co-60	4	<LLD	-	-	<LLD			0	
	Zn-65	8	<LLD	-	-	<LLD			0	
	Zr-Nb-95	7	<LLD	-	-	<LLD			0	
	I-131	5	<LLD	-	-	<LLD			0	
	Cs-134	5	<LLD	-	-	<LLD			0	
	Cs-137	4	<LLD	-	-	<LLD			0	
	Ba-La-140	11	<LLD	-	-	<LLD			0	

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-C.1.a  
 FLORIDA POWER CORP. - CR3 - 1990  
 pCi/L  $\gamma$  EMITTERS AND TRITIUM IN SEAWATER

STATION	MONTH	H-3	K-40	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-Nb-95	I-131	Cs-134	Cs-137	Ba-La-140
C13	JAN	<150	210 $\pm$ 40	<3	<10	<4	<3	<10	<8	<6	<5	<3	<5
	FEB	100 $\pm$ 40	300 $\pm$ 40	<3	<10	<4	<5	<10	<7	<6	<3	<4	<6
	MAR	140 $\pm$ 50	240 $\pm$ 40	<4	<9	<4	<4	<7	<7	<6	<4	<5	<8
	APR	120 $\pm$ 50	210 $\pm$ 40	<4	<9	<4	<4	<11	<7	<6	<5	<4	<4
	MAY	<190	270 $\pm$ 40	<4	<10	<3	<5	<9	<8	<4	<5	<3	<11
	JUN	<150	260 $\pm$ 30	<4	<9	<5	<4	<8	<5	<7	<4	<4	<6
	JUL	120 $\pm$ 60	380 $\pm$ 50	<4	<9	<4	<5	<9	<6	<5	<5	<4	<5
	AUG	<120	380 $\pm$ 40	<4	<7	<3	<4	<9	<8	<4	<5	<3	<8
	SEP	<130	260 $\pm$ 40	<4	<9	<3	<4	<9	<7	<5	<3	<4	<6
	OCT	<130	299 $\pm$ 36	<4	<7	<4	<6	<8	<7	<7	<4	<5	<7
	NOV	<175	289 $\pm$ 38	<4	<9	<3	<4	<7	<8	<8	<3	<4	<7
	DEC	153 $\pm$ 46	237 $\pm$ 24	<2	<6	<2	<3	<7	<5	<3	<3	<4	<5
C14H	JAN	1270 $\pm$ 70	250 $\pm$ 40	<3	<9	<4	<4	<7	<7	<6	<4	<4	<5
	FEB	120 $\pm$ 40	270 $\pm$ 40	<4	<7	<3	<3	<9	<7	<7	<4	<4	<7
	MAR	220 $\pm$ 50	260 $\pm$ 40	<3	<8	<4	<4	<8	<9	<6	<4	<3	<6
	APR	<150	250 $\pm$ 40	<3	<8	<5	<5	<12	<8	<9	<4	<4	<4
	MAY	<190	270 $\pm$ 40	<5	<11	<4	<4	<9	<8	<7	<4	<5	<7
	JUN	<150	310 $\pm$ 40	<4	<8	<4	<5	<9	<5	<6	<4	<4	<6
	JUL	<180	290 $\pm$ 40	<3	<8	<4	<4	<8	<5	<5	<5	<3	<6
	AUG	<120	250 $\pm$ 40	<4	<9	<5	<5	<7	<6	<4	<4	<3	<6
	SEP	<130	270 $\pm$ 40	<4	<9	<4	<5	<8	<7	<5	<5	<5	<6
	OCT	<130	279 $\pm$ 39	<4	<10	<3	<5	<9	<6	<6	<4	<5	<7
	NOV	<175	269 $\pm$ 35	<4	<9	<4	<4	<8	<7	<9	<5	<4	<5
	DEC	<139	243 $\pm$ 38	<4	<7	<4	<5	<9	<6	<5	<4	<4	<7



TABLE IV-C.1a (CONT'D)  
 FLORIDA POWER CORP. - CR3 - 1990  
 pCi/L  $\gamma$  EMITTERS AND TRITIUM IN SEAWATER

STATION	MONTH	H-3	K-40	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-Nb-95	I-131	Cs-134	Cs-137	Ba-La-140
C14G	JAN	206 $\pm$ 50	300 $\pm$ 40	<4	<10	<2	<3	<7	<6	<6	<4	<4	<7
	FEB	80 $\pm$ 40	220 $\pm$ 40	<4	<11	<3	<4	<11	<7	<6	<4	<4	<6
	MAR	220 $\pm$ 50	250 $\pm$ 40	<4	<10	<4	<5	<7	<6	<6	<5	<4	<6
	APR	170 $\pm$ 50	260 $\pm$ 40	<5	<9	<4	<5	<10	<8	<6	<4	<4	<6
	MAY	<190	260 $\pm$ 40	<4	<8	<4	<5	<12	<8	<8	<5	<4	<7
	JUN	<150	300 $\pm$ 40	<4	<10	<5	<5	<10	<8	<6	<5	<4	<5
	JUL	<180	270 $\pm$ 40	<4	<10	<4	<3	<9	<7	<6	<4	<4	<7
	AUG	90 $\pm$ 40	260 $\pm$ 40	<5	<9	<3	<4	<8	<8	<5	<4	<4	<7
	SEP	<130	310 $\pm$ 50	<4	<9	<3	<4	<9	<7	<6	<4	<5	<6
	OCT	<130	343 $\pm$ 42	<4	<8	<4	<5	<9	<7	<7	<5	<4	<6
	NOV	<175	307 $\pm$ 37	<3	<8	<4	<5	<8	<7	<8	<4	<5	<6
	DEC	339 $\pm$ 50	282 $\pm$ 39	<4	<8	<4	<4	<8	<7	<4	<5	<4	<4

FIGURE IV-C.1  
SEAWATER NUCLIDE TRENDS

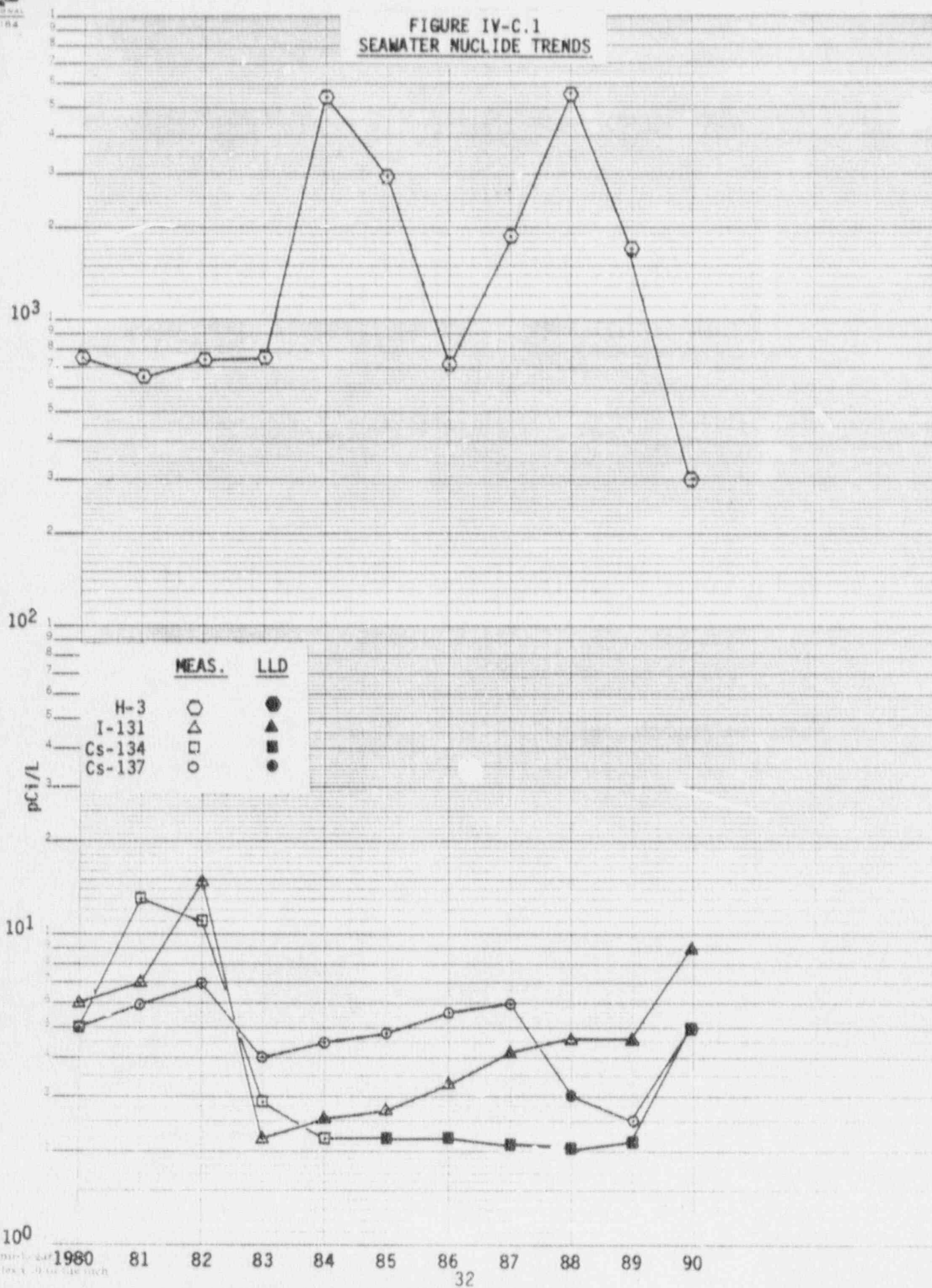


TABLE IV-C.2  
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY  
CRYSTAL RIVER UNIT 3 DOCKET NO. 5-302  
CITRUS COUNTY, FLORIDA JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE	MEAN RANGE	
GROUND WATER (pCi/L)	Tritium 2	230	None	-	-	<LLD	0
	γ Spec 2						
	Mn-54	4	None	-	-	<LLD	0
	Fe-59	8	None	-	-	<LLD	0
	Co-58	4	None	-	-	<LLD	0
	Co-60	4	None	-	-	<LLD	0
	Zn-65	8	None	-	-	<LLD	0
	Zr-Nb-95	7	None	-	-	<LLD	0
	I-131	5	None	-	-	<LLD	0
	Cs-134	5	None	-	-	<LLD	0
	Cs-137	4	None	-	-	<LLD	0
	Ba-La-140	11	None	-	-	<LLD	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specification.

TABLE IV-C.2.a

FLORIDA POWER CORP. - CR3 - 1990

pCi/L  $\gamma$  EMITTERS AND TRITIUM IN GROUND WATER

STATION	NUCLIDE	FIRST HALF	SECOND HALF
C40	H-3	<130	<120
	Mn-54	<4	<3
	Fe-59	<9	<8
	Co-58	<5	<4
	Co-60	<4	<5
	Zn-65	<9	<10
	Zr-Nb-95	<6	<7
	I-131	<5	<6
	Cs-134	<5	<3
	Cs-137	<4	<4
	Ba-La-140	<7	<7
	K-40	<57	<67



FIGURE IV-C.2  
GROUND WATER NUCLIDE TRENDS

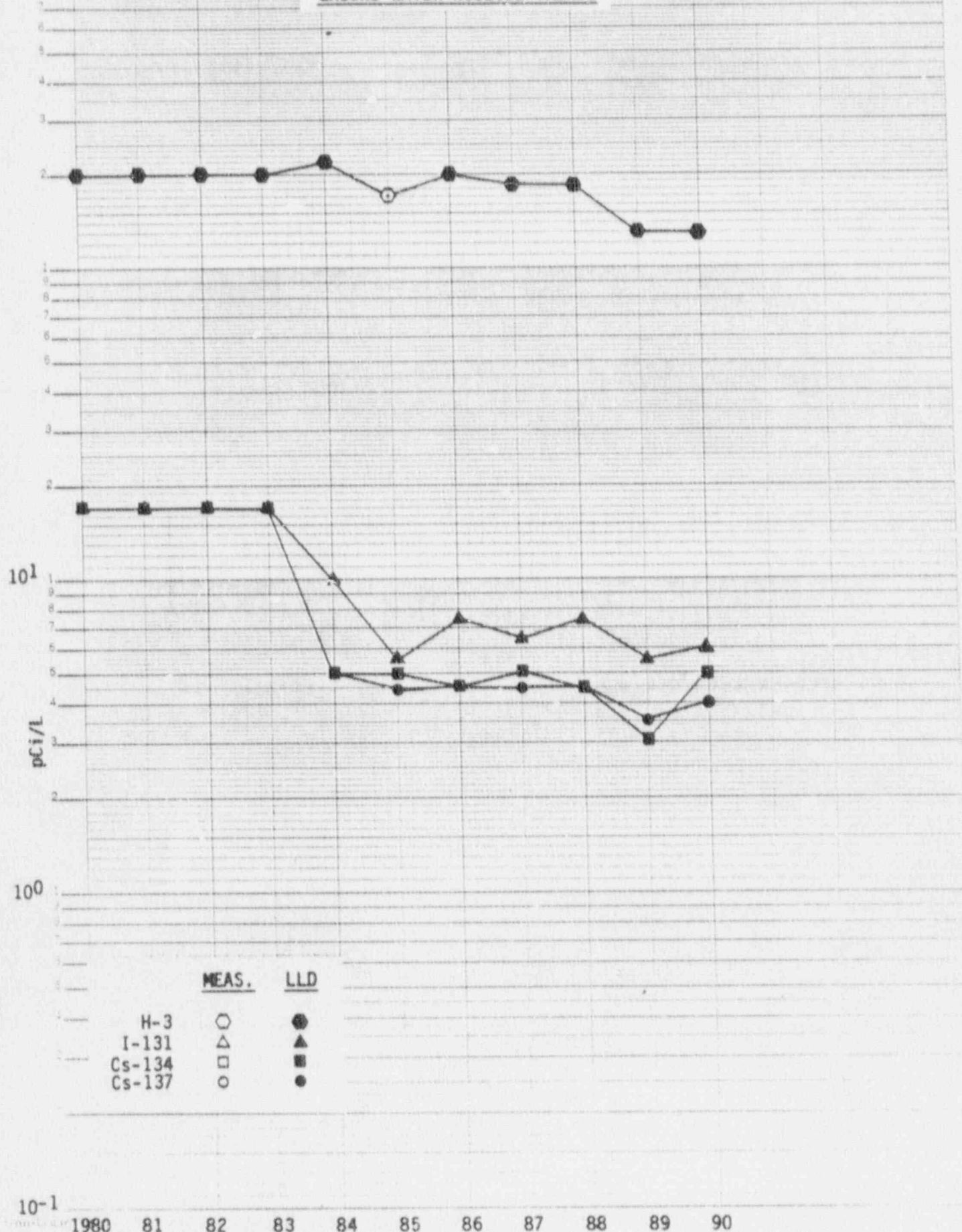


TABLE IV-C.3

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE		
DRINKING WATER (pCi/L)	Tritium 12	250	None	-	-	<LLD	0
	γ Spec 12						
	Mn-54	4	None	-	-	<LLD	0
	Fe-59	8	None	-	-	<LLD	0
	Co-58	4	None	-	-	<LLD	0
	Co-60	4	None	-	-	<LLD	0
	Zn-65	8	None	-	-	<LLD	0
	Zr-Nb-95	7	None	-	-	<LLD	0
	I-131	5	None	-	-	<LLD	0
	Cs-134	5	None	-	-	<LLD	0
	Cs-137	4	None	-	-	<LLD	0
	Ba-La-140	11	None	-	-	<LLD	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.



TABLE IV-C.3.a

FLORIDA POWER CORP. - CR3 - 1990

pCi/L  $\gamma$  EMITTERS AND TRITIUM IN DRINKING WATER

STATION	DATE	H-3	K-40	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zn-Nb-95	I-131	Cs-134	Cs-137	Ba-La-140
C07	02-09-90	<130	<61	<4	<11	<4	<4	<8	<6	<4	<4	<4	<5
	04-02-90	<160	<63	<3	<7	<4	<4	<8	<7	<7	<4	<4	<7
	07-02-90	<200	<61	<4	<6	<4	<4	<9	<6	<5	<4	<3	<5
	10-01-90	<138	<54	<3	<9	<3	<4	<9	<6	<8	<4	<4	<6
C10	02-09-90	<130	<78	<5	<8	<4	<4	<8	<8	<6	<4	<4	<6
	04-02-90	<160	<60	<4	<9	<3	<4	<8	<6	<7	<4	<4	<7
	07-02-90	<170	<71	<3	<10	<4	<5	<8	<8	<5	<5	<4	<8
	10-01-90	<130	52 $\pm$ 26	<4	<11	<5	<3	<9	<7	<8	<5	<4	<7
C18	02-06-90	<130	<43	<3	<8	<4	<5	<7	<5	<6	<4	<4	<6
	04-02-90	<150	<58	<4	<9	<3	<4	<7	<8	<7	<4	<4	<6
	07-02-90	<170	<58	<3	<9	<3	<3	<8	<7	<5	<4	<4	<6
	10-01-90	<152	<63	<4	<7	<5	<3	<7	<7	<6	<4	<5	<7

FIGURE IV-C.3  
DRINKING WATER NUCLIDE TRENDS

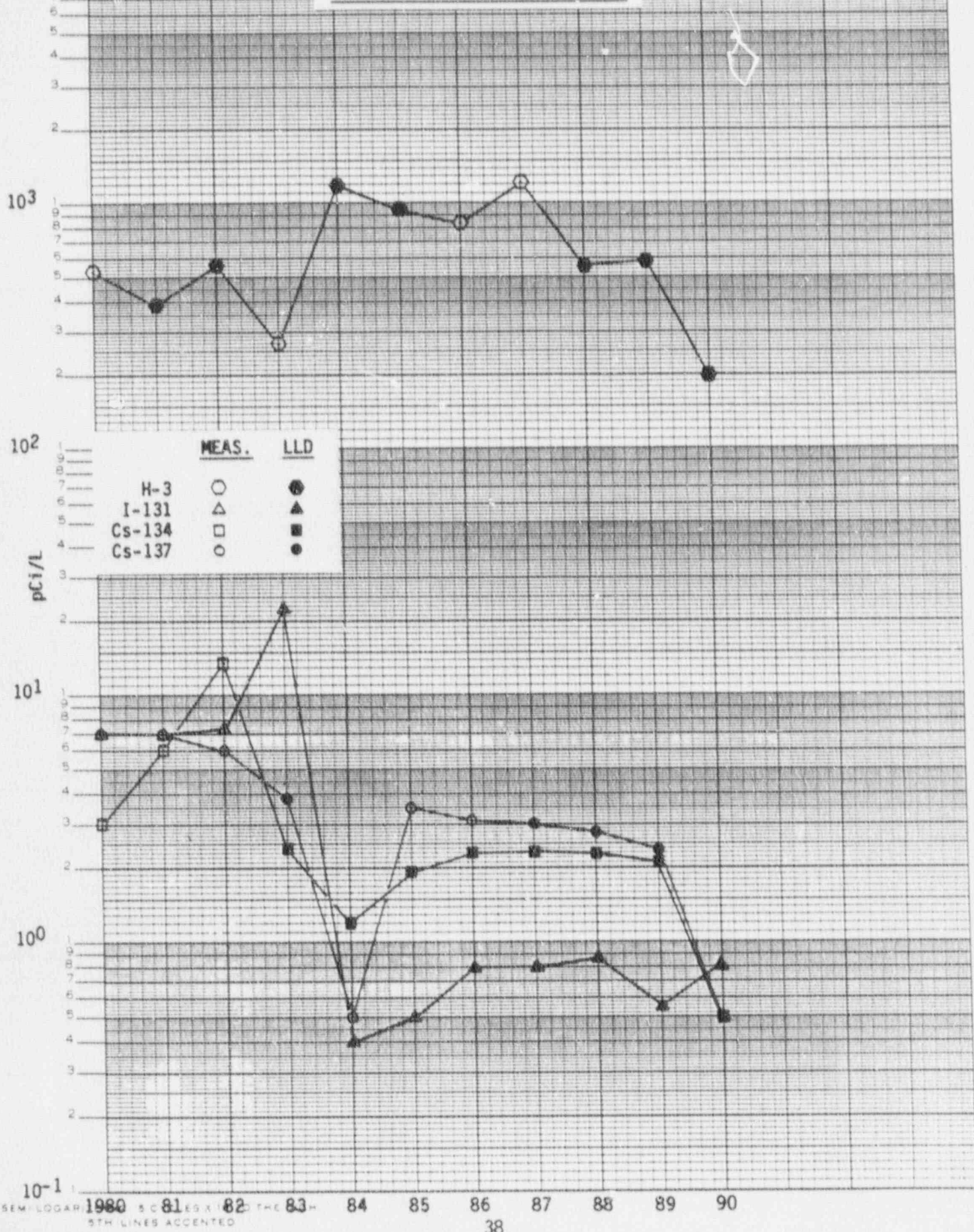


TABLE IV-C.4

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	<u>ALL INDICATOR LOCATIONS</u>	<u>LOCATION WITH HIGHEST MEAN</u>		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME	MEAN RANGE		
SHORELINE SEDIMENT (pCi/kg)	7 Spec 8						
	Cs-134	14	<LLD	-	-	<LLD	0
	Cs-137	12	45 (3/6) (22 - 78)	C14H 0.1 @ 315°	57 (2/2) (35 - 78)	<LLD	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.



TABLE IV-C.4.a

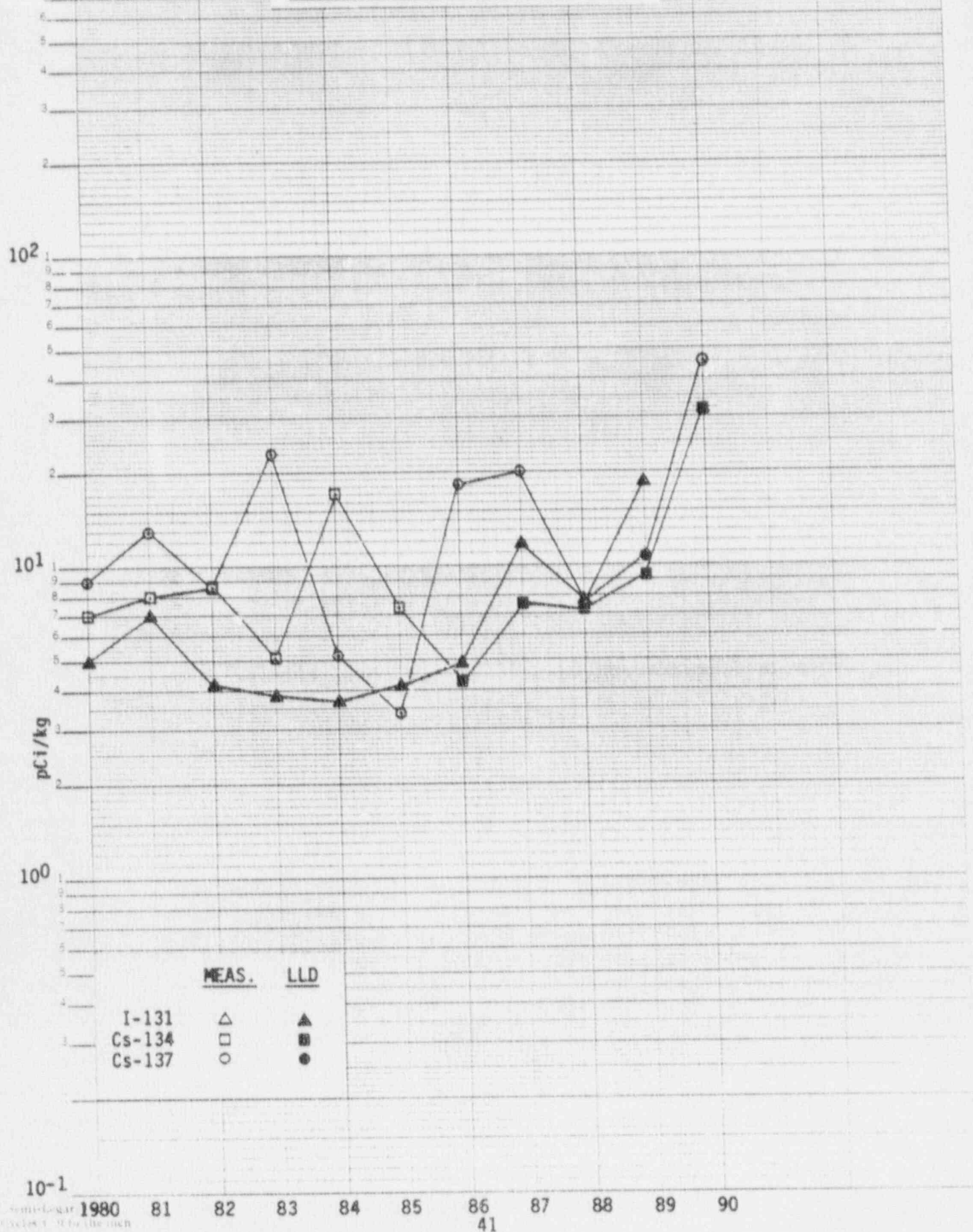
FLORIDA POWER CORP. - CR3 - 1990

pCi/kg  $\gamma$  EMITTERS IN SHORELINE SEDIMENT

STATION	PERIOD	Cs-134	Cs-137	Co-58	Co-60	K-40
C09(1)	First Half	<10	<8	<8	<8	300 $\pm$ 50
	Second Half	<12	<8	<8	<9	300 $\pm$ 60
C14H	First Half	<20	35 $\pm$ 8	67 $\pm$ 10	145 $\pm$ 8	720 $\pm$ 110
	Second Half	<33	78 $\pm$ 11	1977 $\pm$ 33	2000 $\pm$ 26	1380 $\pm$ 150
C14M	First Half	<18	22 $\pm$ 7	30 $\pm$ 7	234 $\pm$ 13	650 $\pm$ 100
	Second Half	<19	<22	125 $\pm$ 10	290 $\pm$ 11	510 $\pm$ 90
C14G	First Half	<21	22 $\pm$ 5	<19	65 $\pm$ 14	250 $\pm$ 80
	Second Half	<13	<17	71 $\pm$ 8	142 $\pm$ 8	380 $\pm$ 70

(1) C09 is the control station at Ft. Gulf Island Beach. C14H, M, & G are discharge canal stations.

FIGURE IV-C.4  
 SHORELINE SEDIMENTS NUCLIDE TRENDS



#### IV-D. INGESTION PATHWAY

To evaluate the ingestion pathway, fish, oysters, citrus, and watermelon samples are taken.

1. Quarterly carnivorous fish samples were taken at two locations: C29 at the end of the discharge canal, and C30, the control location near the mouth of the intake canal. None of the required radionuclides were found in measurable quantities. The highest Cs-137 LLD for station C29 is 48 pCi/kg.
2. Quarterly oyster samples were taken at the same locations as fish samples, C29 and C30. Two of four C29 samples had measurable amounts of Co-58 at an average level of 47 pCi/kg. The Third Quarter sample at C29 indicated Co-60 at a level of 76 pCi/kg. Radionuclides attributable to CR-3 were not identified in the four samples taken at C30, the control station.
3. Monthly broadleaf vegetation samples were taken at two indicator locations, C48a and C48b, and one control location, C47. Twenty of twenty-four indicator samples had measurable amounts of Cs-137 with an average concentration of 90 pCi/kg and a range of 17 to 288 pCi/kg. Twelve of twelve control station samples had measurable amounts of Cs-137 with an average of 167 pCi/kg and a range of 32 to 970 pCi/kg.
4. Annual watermelon and citrus (oranges) samples are taken at stations C04 and C19, respectively. Cesium-137 was measured in the watermelon sample at a level of 7 pCi/kg.



TABLE IV-D.1

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS		LOCATION WITH HIGHEST MEAN		CONTROL LOCATION		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE	MEAN RANGE	MEAN RANGE	MEAN RANGE	
CARNIVOROUS FISH (pCi/kg)	7 Spec 8								
	Mn-54	9	<LLD		-	-	<LLD	<LLD	0
	Fe-59	16	<LLD		-	-	<LLD	<LLD	0
	Co-58	9	<LLD		-	-	<LLD	<LLD	0
	Co-60	10	<LLD		-	-	<LLD	<LLD	0
	Zn-65	17	<LLD		-	-	<LLD	<LLD	0
	Cs-134	9	<LLD		-	-	<LLD	<LLD	0
	Cs-137	9	<LLD		-	-	<LLD	<LLD	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-D.1.a

FLORIDA POWER CORP. - CR3 - 1990

pCi/kg  $\gamma$  EMITTERS IN CARNIVOROUS FISH

STATION	QUARTER	Mn-54	Co-58	Co-60	Fe-59	Zn-65	Cs-134	Cs-137	K-40
C29	1	<10	<12	<11	<29	<29	<12	<10	2610
	2	<9	<10	<12	<24	<29	<9	<11	2520
	3	<46	<46	<60	<96	<110	<30	<48	3590
	4	<35	<30	<31	<55	<63	<38	<26	1653
C30	1	<7	<9	<10	<26	<26	<10	<10	1650
	2	<7	<10	<11	<23	<26	<14	<10	1390
	3	<11	<12	<13	<35	<25	<11	<13	2670
	4	<10	<9	<15	<26	<27	<10	<12	2435

FIGURE IV-D.1  
INGESTION PATHWAY (CARNIVOROUS FISH)  
NUCLIDE TRENDS

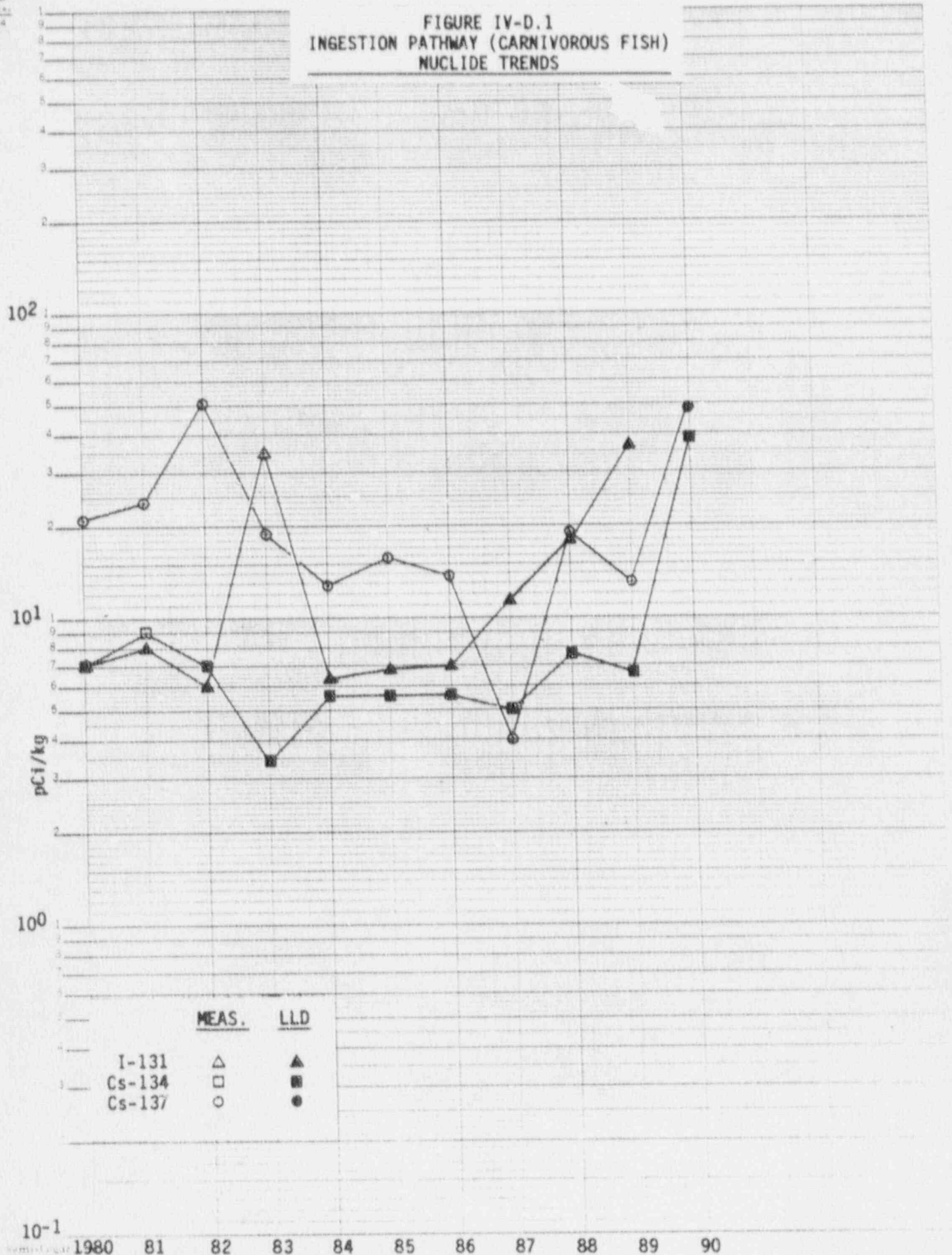


TABLE IV-D.2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY  
 CRYSTAL RIVER UNIT 3                      DOCKET NO. 5-302  
 CITRUS COUNTY, FLORIDA                      JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE		
OYSTERS (pCi/kg)	7 Spec 8						
	Mn-54	9	<LLD	-	-	<LLD	0
	Fe-59	16	<LLD	-	-	<LLD	0
	Co-58	9	47 (2/4) (22 - 71)	C29 2 @ 280°	47 (2/4) (22 - 71)	<LLD	0
	Co-60	10	76 (1/4)	C29 2 @ 280°	16 (1/4)	<LLD	0
	Zn-65	17	<LLD	-	-	<LLD	0
	Cs-134	9	<LLD	-	-	<LLD	0
	Cs-137	9	<LLD	-	-	<LLD	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.



TABLE IV-D.2.a  
 FLORIDA POWER CORP. - CR3 - 1990  
 pCi/kg  $\gamma$  EMITTERS IN OYSTERS

STATION	QUARTER	Mn-54	Co-58	Co-60	Fe-59	Zn-65	Cs-134	Cs-137	K-40
C29	1	<24	71	<37	<58	<61	<31	<34	<790
	2	<11	22	<15	<22	<25	<12	<14	860
	3	<48	<44	76	<82	<120	<46	<70	1200
	4	<15	<17	<18	<31	<29	<20	<19	1038
C30	1	<21	<23	<22	<55	<53	<22	<22	<800
	2	<11	<10	<15	<28	<27	<14	<13	1150
	3	<42	<38	<51	<75	<73	<43	<43	<1660
	4	<10	<12	<15	<27	<29	<14	<14	1500

FIGURE IV-D.2  
INGESTION PATHWAY (OYSTERS) NUCLIDE TRENDS

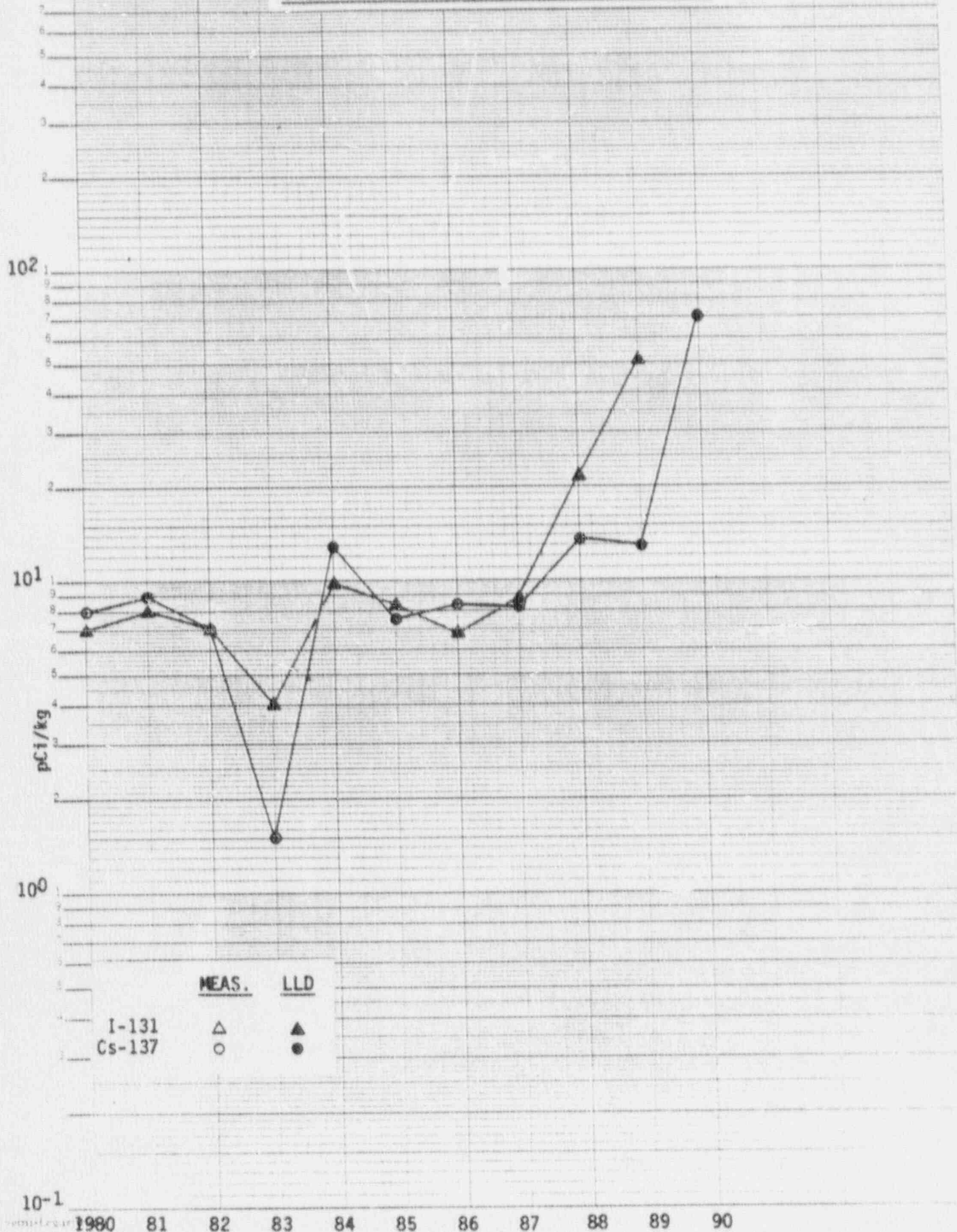




TABLE IV-D.3

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE		
VEGETATION (pCi/kg)	7 Spec 36						
	I-131	9	<LLD	-	-	<LLD	0
	Cs-134	8	<LLD	-	-	<LLD	0
	Cs-137	8	90 (20/24) (17 - 288)	C47 80 @ 110°	167 (12/12) (32 - 970)	167 (12/12) (32 - 970)	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-D.3.a

FLORIDA POWER CORP. - CR3 - 1990

pCi/kg OF  $\gamma$  EMITTERS IN BROAD LEAF VEGETATION

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C47	JAN	<30	<20	970 $\pm$ 23	3010 $\pm$ 200
	FEB	<17	<19	37 $\pm$ 10	3530 $\pm$ 230
	MAR	<18	<15	32 $\pm$ 10	4050 $\pm$ 220
	APR	<17	<17	38 $\pm$ 11	4060 $\pm$ 240
	MAY	<20	<13	253 $\pm$ 15	3510 $\pm$ 200
	JUN	<27	<22	51 $\pm$ 13	3740 $\pm$ 240
	JUL	<14	<11	331 $\pm$ 14	2310 $\pm$ 150
	AUG	<12	<11	60 $\pm$ 8	2890 $\pm$ 170
	SEP	<13	<10	37 $\pm$ 7	2820 $\pm$ 160
	OCT	<22	<14	66 $\pm$ 9	2355 $\pm$ 169
	NOV	<22	<15	64 $\pm$ 9	3025 $\pm$ 181
	DEC	<12	<13	67 $\pm$ 8	2077 $\pm$ 136
C48a	JAN	<31	<21	45 $\pm$ 10	1710 $\pm$ 170
	FEB	<22	<20	22 $\pm$ 9	3840 $\pm$ 240
	MAR	<15	<15	17 $\pm$ 8	3170 $\pm$ 200
	APR	<20	<19	<24	2490 $\pm$ 240
	MAY	<14	<16	21 $\pm$ 8	2300 $\pm$ 200
	JUN	<22	<17	52 $\pm$ 8	4030 $\pm$ 230
	JUL	<18	<16	68 $\pm$ 11	2370 $\pm$ 170
	AUG	<13	<12	128 $\pm$ 10	2390 $\pm$ 150
	SEP	<12	<14	<17	2540 $\pm$ 160
	OCT	<21	<12	241 $\pm$ 12	1623 $\pm$ 129
	NOV	<19	<15	53 $\pm$ 10	1900 $\pm$ 138
	DEC	<11	<11	61 $\pm$ 8	1447 $\pm$ 108

TABLE IV-D.3.a (CONT'D)

FLORIDA POWER CORP. - CR3 - 1990

pCi/kg OF  $\gamma$  EMITTERS IN BROAD LEAF VEGETATION

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C48b	JAN	<21	<13	34 $\pm$ 8	2880 $\pm$ 160
	FEB	<13	<13	<19	3410 $\pm$ 200
	MAR	<23	<18	<25	4490 $\pm$ 270
	APR	<20	<20	24 $\pm$ 4	3430 $\pm$ 230
	MAY	<23	<16	55 $\pm$ 10	2460 $\pm$ 190
	JUN	<19	<13	48 $\pm$ 10	4560 $\pm$ 220
	JUL	<19	<15	202 $\pm$ 12	1770 $\pm$ 130
	AUG	<14	<10	154 $\pm$ 11	1990 $\pm$ 130
	SEP	<15	<14	288 $\pm$ 14	1580 $\pm$ 150
	OCT	<25	<15	179 $\pm$ 12	1698 $\pm$ 132
	NOV	<21	<17	41 $\pm$ 9	1709 $\pm$ 142
	DEC	<13	<12	67 $\pm$ 7	2031 $\pm$ 130

FIGURE IV-D.3  
 VEGETATION NUCLIDE TRENDS

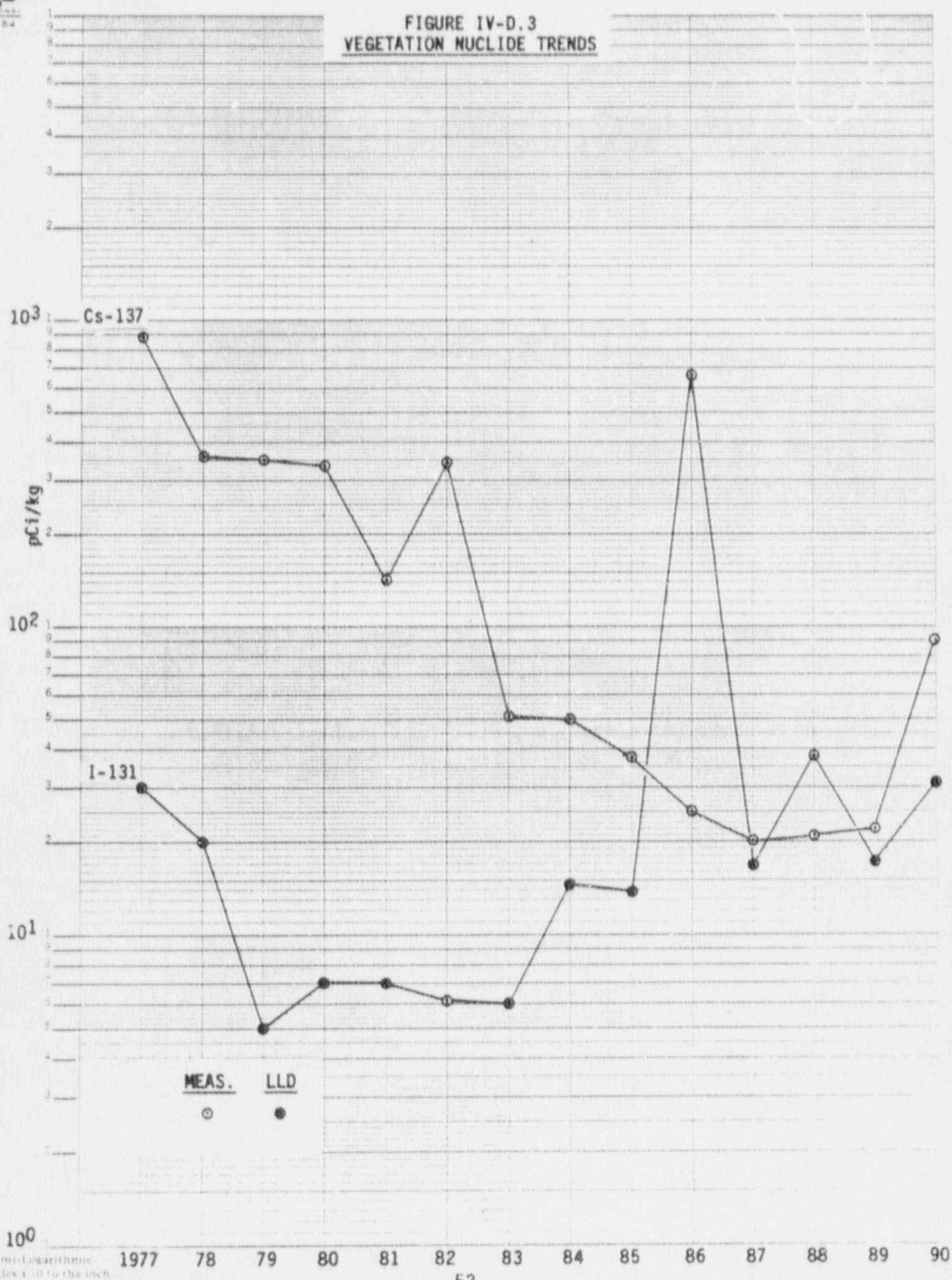




TABLE IV-D.4

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1990

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE		
WATERMELON (pCi/kg)	γ Spec 1						
	I-131	9	<LLD	-	-	None	0
	Cs-134	8	<LLD	-	-	None	0
	Cs-137	8	<LLD	-	-	None	0
CITRUS (pCi/kg)	γ Spec 1						
	I-131	9	<LLD	-	-	None	0
	Cs-134	8	<LLD	-	-	None	0
	Cs-137	8	7 (1/1)	C19 8.5 @ 65°	9 (1/1)	None	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-D.4.a  
 FLORIDA POWER CORP. - CR3 - 1990  
 pCi/kg OF 7 EMITTERS IN WATERMELON AND CITRUS

STATION	DATE	I-131	Cs-134	Cs-137	K-40
C04 - Watermelon	06-20-90	<6	<6	<7	1590
C19 - Citrus	01-02-90	<8	<5	7	1360