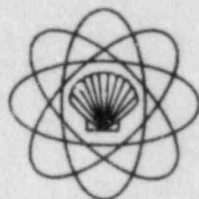


**RADIOLOGICAL ENVIRONMENTAL  
MONITORING PROGRAM  
ANNUAL REPORT**

**For The  
CALVERT CLIFFS NUCLEAR POWER PLANT  
UNITS 1 AND 2  
January 1, — December 31, 1983**



**Prepared by  
BALTIMORE GAS & ELECTRIC COMPANY  
MARCH 1984**

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ELECTRIC ENGINEERING  
DEPARTMENT

March 27, 1984

The Regional Administrator  
Region I, U. S. Nuclear Regulatory Commission  
631 Park Avenue  
King of Prussia, Pennsylvania 19406

Subject: Calvert Cliffs Nuclear Power Plant, Units 1 and 2  
Operating License Nos. DPR-53 and DPR-69  
Appendix B (Environmental Technical Specifications)  
Section 5.6.1

Gentlemen:

In compliance with Section 5.6.1 of the Calvert Cliffs Environmental Technical Specifications, we are submitting the Annual Radiological Environmental Monitoring Report, dated March 1984. Should you desire further information, please contact us.

Very truly yours,

Gary R. Fuhrman  
Director  
Environmental Programs

GRF:cij

Enclosure (1)

cc: Document Control Desk  
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MONITORING PROGRAM  
ANNUAL REPORT  
FOR THE  
CALVERT CLIFFS NUCLEAR PLANT  
UNITS 1 AND 2  
JANUARY 1 - DECEMBER 31, 1983

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BALTIMORE GAS AND ELECTRIC COMPANY

MARCH 1984

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#### A. SUMMARY

During this operating period for Calvert Cliffs Nuclear Power Plant Units 1 and 2, Teledyne Isotopes and Baltimore Gas and Electric Company (BG&E) analyzed samples from the aquatic, atmospheric, and terrestrial environments. A total of 1,089 analyses were performed on 742 environmental samples during this period. In addition, BG&E personnel analyzed 620 thermoluminescent dosimeters (TLD's) for ambient radiation dose rates.

Samples from the aquatic environment included bay water, fish, shellfish (oysters and crabs), and sediment. Bay water was analyzed for tritium, Sr-89, Sr-90, and gamma emitting nuclides. Fish, shellfish, and sediment were analyzed for gamma emitting nuclides. Fish bones and sediment were also analyzed for Sr-89 and Sr-90.

Monitoring of the atmospheric environment included sampling air and precipitation. Air particulates and gaseous iodine were collected on glass fiber filters and silver zeolite molecular sieve cartridges, respectively. The particulate filters were analyzed for gross beta activity and for gamma emitting nuclides, while the molecular sieve cartridges were analyzed for I-131. Analyses were made for Sr-89 and Sr-90 on quarterly composited air particulate filters. Precipitation was analyzed for gross beta, H-3, Sr-89, Sr-90, and gamma emitting nuclides.

Samples from the terrestrial environment included milk, vegetation, soil, and ground water samples. Milk samples were analyzed for gamma emitters, I-131, Sr-89, and Sr-90. The vegetation and soil samples were analyzed for gamma emitters, Sr-89, and Sr-90. The ground water samples were analyzed for H-3 and gamma emitters.

Measurements of external radiation were performed by analyzing TLD's from 13 locations surrounding the plant.

Low levels of various radionuclides were observed in the environs of the plant during 1983. Some of these observations are attributable to fallout from past atmospheric nuclear testing, and some are related to the operation of the plant. With reference to the latter observations: H-3 was observed in a few bay water samples from location 7; Ag-110m was observed in a few crab samples from locations 3 and 8 and in all oyster samples from location 5; Zn-65 was also observed in some oyster samples from location 5; and Co-60 appeared in sediment samples in a pattern similar to that observed in the past.

In order to assess the plant's contribution to the ambient radiation levels of the surrounding environment, dose calculations were performed using the plant's effluent release data, on site meteorological data, and appropriate pathways. The results of these dose calculations indicate:

- a. a maximum thyroid dose (via inhalation and garden vegetable

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pathways) of 0.15 mrem at location 14, which is 0.2% of the acceptable limit of 75 mrem/year as specified in 40 CFR 190 Environmental Radiation Protection Standards for Nuclear Power Operation, and a maximum thyroid dose (via milk pathway) of 0.07 mrem at location 15, which is less than 0.1% of the acceptable limit of 75 mrem/year (40 CFR 190);

- b. a maximum whole body gamma dose of 0.06 mrem at location 15, which is less than 0.3% of the acceptable dose of 25 mrem/year (40 CFR 190);
- c. a maximum whole body dose (via all liquid pathways) of 0.03 mrem, which is less than 0.2% of the acceptable limit of 25 mrem/year (40 CFR 190).

Thus it is concluded, based upon the levels of radioactivity observed and the various dose calculations performed, that the operation of Calvert Cliffs Nuclear Power Plant Units 1 and 2 during 1983 did not cause any significant changes in the radionuclide inventory of the surrounding environment or in the ambient radiation levels.

## B. INTRODUCTION

Baltimore Gas and Electric Company (BG&E) has been conducting a radiological environmental monitoring program in the environs of the Calvert Cliffs Nuclear Power Plant since the summer of 1970. The Calvert Cliffs site is an operating nuclear generating station consisting of two PWR units. Unit 1 achieved criticality on October 7, 1974 and commenced commercial operation in May 1975. Unit 2 achieved criticality on November 30, 1976 and went into commercial operation April 1, 1977. Since July 29, 1977, the monitoring program has been operating under combined Environmental Technical Specifications for Units 1 and 2 (20). Prior to this date, separate Environmental Technical Specifications (21, 22) were in effect for each unit.

Results of the monitoring program for the preoperational and previous operational periods through December 31, 1982, have been reported in a series of documents (1-19).

Results of the monitoring program for the current operational period of January 1, 1983 through December 31, 1983 are included in this report. The report presents the type and number of samples analyzed, the analyses performed (see Tables 1 and 2 for a summary of the surveillance program), the relative position of sampling locations with respect to the Calvert Cliffs Nuclear Power Plant (see Appendix A for relevant maps and figures), and the data generated during 1983 (see Appendix B for the tabulation of the raw data collected). Interpretation of the data and conclusions are presented in the body of this report.

## C. PROGRAM

The environmental surveillance data collected during this reporting period were compared with that generated in previous periods in evaluating the environmental radiological impact of the operation of Calvert Cliffs Nuclear Power Plant Units 1 and 2 during the year 1983.

### C.1 Objectives

The objectives of the radiological environmental monitoring program are:

- a. To determine whether any statistically significant increase occurs in the concentration of radionuclides in important pathways,
- b. To detect any measurable buildup of long-lived radionuclides in the environment,
- c. To monitor and evaluate ambient radiation levels,
- d. To verify that radioactivity and ambient radiation levels attributable to the plant are within the limits specified in the Technical Specifications (20) and the Environmental Radiation Protection Standards as set forth in 40 CFR Part 190.

## C.2 Sample Collection

The locations of the individual sampling stations are listed in Table A-1 and shown in Figure A-2. All samples were collected by consultants to, or personnel of, Baltimore Gas and Electric Company according to BG&E operating procedures (22). Radiochemical analyses were performed by Teledyne Isotopes and BG&E in accordance with established laboratory procedures (24,25).

Ambient radiation measurements were made by BG&E personnel in accordance with BG&E operating procedures (25). These measurements were made with thermoluminescent dosimeters as previously described (10).

## C.3 Data Interpretation

Analytical data generated during the program are routinely evaluated. In the interpretation of the data several factors are important and are discussed here to avoid repetition in the sections that follow.

It is a characteristic of environmental monitoring data that many results occur at or below the minimum detectable level (MDL). In this report, all results at or below the relevant MDL are reported as being "less than" the MDL value.

Annual means, ranges, and typical MDL's are presented for each type of analysis and for every sample media in Table 1. (In the case of gamma spectrometry, if no activity of a particular nuclide was found, no average was calculated for that nuclide.) Results of individual analyses are also presented with applicable standard deviations in the data tables of Appendix B.

## C.4 Program Exceptions

No rooted aquatic plants were found during 1983.

Samples of crabs were unavailable during the first quarter of 1983.

Edible fish samples were unavailable during the first and second quarters of 1983.



## RESULTS AND DISCUSSIONS

All environmental samples were either analyzed by Teledyne Isotope's laboratory procedures (24) or BG&E laboratory procedures (25). The analytical results for this reporting period, presented in Appendix B and also summarized on an annual basis in Table 2, have been divided into four categories -- aquatic environment, atmospheric environment, terrestrial environment, and external radiation.

### D.1 Aquatic Environment

The aquatic environment surrounding the plant was monitored by analyzing samples of bay water, aquatic organisms, and bottom sediment. These samples were obtained from various sampling locations on the Chesapeake Bay near the plant.

#### D.1.a Bay Water

Monthly bay water samples were taken from two locations; the Plant Intake area (location 8), and the Plant Outfall area (location 7). These samples were analyzed for H-3, gamma emitters, and Sr-89 and Sr-90.

Monthly analyses for H-3 showed detectable concentrations in only four samples collected from location 7. These concentrations ranged from  $184 \pm 118$  to  $301 \pm 117$  pCi/l, and they are similar to the results observed in both the preoperational (6) and previous operational periods (19).

Monthly analyses for gamma emitters exhibited no detectable concentrations of any fission or activation products in these samples.

Quarterly analyses for radiostrontium exhibited no detectable concentrations of these nuclides in any of the composited samples.

#### D.1.b Aquatic Organisms

Quarterly samples of aquatic organisms were taken from five locations; the pound nets south of Cove Point (location 1), Kenwood Beach (location 3), Rocky Point (location 4), Camp Conoy (location 5), and Plant Intake area (location 8). The edible portions of these samples were analyzed for gamma emitters, and samples of fish bones were analyzed for Sr-89 and Sr-90.

Quarterly analyses of fish samples collected during the third and fourth quarters from location 1 showed detectable concentrations of Cs-137 in most of the samples in the range of  $6 \pm 5$  to  $16 \pm 9$  pCi/kg. This range of results is similar to the ranges previously observed in both the preoperational (6) and prior operational periods (19).

Quarterly analyses for gamma emitters in shellfish samples from three of



the four locations exhibited detectable concentrations of Ag-110m. For crab samples the Ag-110m concentrations ranged from  $18 \pm 13$  to  $24 \pm 14$  pCi/kg, and for oysters the Ag-110m ranged from  $24 \pm 8$  to  $535 \pm 30$  pCi/kg, with the highest concentration observed at location 5. In addition to Ag-110m, detectable concentrations of the activation product Zn-65 (ranging from  $60 \pm 34$  to  $96 \pm 33$  pCi/kg) were also observed in some of the oyster samples from location 5. The concentration levels of these nuclides are similar to levels observed in previous years (15-19), and their presence is probably plant-related.

Quarterly radiostrontium analyses of the bones of fish samples showed no measureable concentrations of Sr-89. Strontium-90 on the other hand, was observed in most samples in the range of  $3.5 \pm 1.6$  to  $15 \pm 5$  pCi/kg. These results are similar to the general patterns observed in both the preoperational (6) and previous operational periods (19).

#### D.1.c Sediment

Quarterly sediment samples were taken from four locations; Camp Conoy (location 5), Long Beach (location 6), Plant Intake area (location 8), and Plant Outfall area (location 7). These samples were analyzed for gamma emitters and Sr-89 and Sr-90.

Quarterly analyses for gamma emitters in these samples revealed the presence of the following radionuclides: Cs-137 in all samples from all locations, ranging from  $170 \pm 51$  to  $1103 \pm 124$  pCi/kg; Co-60 in most of the samples from all locations, ranging from  $121 \pm 108$  to  $427 \pm 132$  pCi/kg; and Ce-144 in the first quarter sample from the control location 6 at a concentration of  $541 \pm 378$  pCi/kg. The range of Cs-137 concentrations exhibited are similar to the ranges observed in the preoperational (6) and prior operational (19) periods. In addition, the presence of Ce-144 in a sample obtained in the first quarter of the year is probably related to past nuclear weapons testing, since this radionuclide is typical of the "main fallout nuclides", and it appears to follow the same trends observed in previous reporting periods (16-19). On the other hand, Co-60 is among the activation and fission products released from the plant in routine radioactive discharges. Its range of concentrations is similar to those observed in previous operational periods (19).

Quarterly radiostrontium analyses of the sediment samples exhibited no measureable concentrations of either Sr-89 or Sr-90.

#### D.2 Atmospheric Environment

The atmospheric environment was monitored by analyzing samples of air particulate filters, silver zeolite cartridges, and precipitation samples. These samples were collected from various locations surrounding the plant.

D.2.a Air Particulate Filters

Weekly composite air filters were collected from seven locations; On Site (location 17), On Site (location 18), Knotty Pine (location 19), Lusby (location 20), Long Beach (location 21), Cove Point (location 22), and Taylors Island (location 23). These samples were analyzed for beta activity, gamma emitters, and Sr-89 and Sr-90.

Weekly analyses for beta activity on air particulate filters revealed that the annual range of data for each location was much lower than the annual ranges exhibited in previous years (16-19). This is most probably due to a gradual decrease of atmospheric fallout from past nuclear weapons testing. The current ranges are similar to those observed prior to September, 1976 when the Peoples Republic of China detonated the first of a series of nuclear weapons (12).

Monthly analyses for gamma emitters showed no measureable concentrations of any fission or activation by-products in these samples.

Quarterly radiostrontium analyses of air particulate filters exhibited no detectable concentration of Sr-89 in any of the samples and only two detectable concentrations of Sr-90 in the second and fourth quarter samples from location 20 and 21, both of which were very close to the MDL for this type of analysis.

D.2.b Air Iodine

Weekly composite radioiodine samples were collected from five locations; On Site (location 17), On Site (location 18), Lusby (location 20), Cove Point (location 22), and Taylors Island (location 23).

Radioiodine analyses performed on the samples from all locations exhibited no detectable concentrations of I-131.

D.2.c. Precipitation

Monthly composite precipitation samples were collected from one site, On Site (location 18) and were analyzed for gross beta, H-3, gamma emitters, and Sr-89 and Sr-90.

Monthly analyses for beta activity in precipitation samples revealed that the annual range of data for this location was less than the ranges of data in recent years (13-19) and similar to the ranges observed prior to the start of the nuclear weapons testing by the Peoples Republic of China (12).

Quarterly analyses for H-3 in composites of these samples revealed no measureable concentrations of this radionuclide.

Monthly analyses for gamma emitters showed no detectable concentrations of any fission or activation products in these samples.

Quarterly radionstrontium analyses of the composited precipitation samples exhibited no detectable presence of either Sr-89 or Sr-90 in any of the samples tested.

### D.3 Terrestrial Environment

The terrestrial environment was monitored by analyzing samples of milk, vegetation, soil, and well water. These samples were collected from various sampling locations near the plant.

#### D.3.a Milk

Milk samples were collected monthly when available from two locations; a nearby farm (location 15) and a local store in the town of St. Leonard (location 30). These samples were analyzed for I-131, gamma emitters, and Sr-89 and Sr-90.

Analyses for I-131 in these samples showed no detectable concentrations of this radionuclide in any of the samples from either location. Typical MDL's were in the range of 0.1 to 0.3 pCi/l. In addition, further analyses of these samples for other gamma emitters revealed no measureable concentrations of any fission or activation products.

Radiostrontium analyses of the milk samples exhibited no detectable presence of Sr-89 in any of the samples. The analyses did reveal the presence of Sr-90 in all of the milk samples from both locations, ranging from  $1.2 \pm 0.4$  to  $5.0 \pm 0.9$  pCi/l. The presence of Sr-90 is most probably due to fallout from past nuclear weapons testing.

#### D.3.b Vegetation

Vegetation samples were collected from three locations; On Site (location 14); a nearby farm (location 15), and another nearby farm (location 16). These samples were analyzed for gamma emitters and Sr-89 and Sr-90.

Analyses for gamma emitters in these samples revealed the presence of measurable concentrations of Cs-137 in two of the vegetation samples (viz.,  $9.2 \pm 9.2$  pCi/kg in the August cabbage sample from location 14 and  $41 \pm 15$  pCi/kg from the November tobacco sample from location 16). These results are similar to those observed in previous operational periods (19) and are probably the result of fallout from past nuclear weapons testing.

Radiostrontium analyses of vegetation samples revealed no detectable presence of Sr-89 in any of the samples. On the other hand, the analyses revealed the presence of Sr-90 in most of the vegetation samples, ranging from  $14 \pm 2$  to  $110 \pm 10$  pCi/kg. This range of Sr-90 results indicate the same general patterns observed in previous years (16-19) and is most

probably attributable to fallout from past weapons testing.

D.3.c            Soil

Soil samples were taken from three On Site locations; 11, 12, and 13. These samples were analyzed for gamma emitters and Sr-89 and Sr-90.

Analyses for gamma emitters revealed the presence of Cs-137 in most of these samples, ranging from 74+/-51 to 478+/-68 pCi/kg. These results are similar to those observed in the preoperational (6) and previous operational periods (19) and are probably due to the deposition of fallout from past nuclear weapons testing.

Radiostrontium analyses of the soil samples showed no detectable concentrations of Sr-89, and only a single detectable concentration of Sr-90 in the June sample from location 11. The Sr-90 result is similar to the results observed in both the preoperational (6) and previous operational (19) periods and is probably related to fallout from past nuclear testing.

D.3.d            Well Water

Quarterly well water samples were collected from five locations; Chesapeake Country Club (location 2), On Site (location 10), Long Beach (location 21), and White Sands Club (locations 25A and 25B). These samples were analyzed for H-3 and gamma emitters.

Quarterly analyses for H-3 and gamma emitters in these samples showed no measureable concentrations of any fission or activation by-products.

D.4                External Radiation

Thermoluminescent dosimeters were collected monthly from 13 locations surrounding the plant, namely: Plant Outfall (location 7), On Site (location 17), On Site (location 18), Knotty Pine (location 19), Lusby (location 20), Long Beach (location 21), Cove Point (location 22), Taylors Island (location 23), On Site (location 24), White Sands Club Sign (location 25), St. Leonard (location 26), Solomons Island (location 27), and Bertha Church (location 28). The dosimeters were read for external radiation dose rate in milliRem (mR).

The TLD data for each location are compiled in Table B-14 and are presented on an annual basis in Table 2. The current means and ranges expressed in Table 2 were compared with the means and ranges for the span of years from 1978 to 1982 (15-19). This comparison revealed that the means and ranges for 1983 were similar to those observed in the five preceding years.

E.        CONCLUSION

Low levels of various radionuclides were observed in the environment



surrounding the plant during 1983. Most of these observations were attributed to the fallout from atmospheric nuclear weapons testing, and others were related to the operation of the plant (viz., H-3 in bay water; Zn-65 and Ag-110m in shellfish samples; and Co-60 in sediment samples).

In order to assess the plant's contribution to the ambient radiation levels of the surrounding environment, dose calculations were performed using the plant's effluent release data, on site meteorological data, and appropriate pathways. The results of these dose calculations indicate:

- a. a maximum thyroid dose (via inhalation and garden vegetable pathways) of 0.15 mrem at location 14, which is 0.2% of the acceptable limit of 75 mrem/year as specified in 40 CFR 190 Environmental Radiation Protection Standards for Nuclear Power Operations, and a maximum thyroid dose (via milk pathway) of 0.07 mrem at location 15, which is less than 0.1% of the acceptable limit of 75 mrem/year (40 CFR 190);
- b. a maximum whole body gamma dose of 0.06 mrem at location 15, which is less than 0.3% of the acceptable dose of 25 mrem/year (40 CFR 190);
- c. a maximum whole body dose (via all liquid pathways) of 0.03 mrem, which is less than 0.2% of the acceptable limit of 25 mrem/year (40 CFR 190).

Thus it is concluded, based upon the levels of radioactivity observed and the various dose calculations performed, that the operation of Calvert Cliffs Nuclear Power Plant Units 1 and 2 during 1983 did not cause any significant changes in the radionuclide inventory of the surrounding environment or in the ambient radiation levels.

TABLE 1  
SYNOPSIS OF THE 1983 CALVERT CLIFFS NUCLEAR POWER PLANT RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM  
Dockets Nos. 50-317/318

SAMPLE TYPE	SAMPLING* FREQUENCY	NUMBER OF LOCATIONS	NUMBER COLLECTED	ANALYSIS	ANALYSIS* FREQUENCY	NUMBER PERFORMED
AQUATIC ENVIRONMENT						
Bay Water	M	2	24	H-3	M	24
				Gamma (GeLi)	M	24
				Sr-89	QC	8
				Sr-90	QC	8
Fish <sup>(1)</sup>	Q	1	14	Flesh		
				Gamma (GeLi)	Q	14
				Bones		
				Sr-89	Q	14
			Sr-90	Q	14	
Shell Fish <sup>(2)</sup> (Crabs & Oysters)	Q	4	17	Flesh		
				Gamma (GeLi)	Q	17
Bottom Sediments	Q	4	16	Gamma (GeLi)	Q	16
				Sr-89	Q	16
				Sr-90	Q	16
Rooted Aquatic Plant <sup>(3)</sup>	Spring & Fall	1	-	Gamma (GeLi)	2/A	-
				Sr-89	2/A	-
				Sr-90	2/A	-
ATMOSPHERIC ENVIRONMENT						
Air Iodine <sup>(4)</sup>	M	5	256	I-131	M	256
Air Particulates <sup>(5)</sup>	M	7	360	Gross Beta	M	360
				Gamma (GeLi)	MC	77
				Sr-89	QC	35
				Sr-90	QC	35
Precipitation <sup>(6)</sup>	Continuous	1	12	H-3	QC	4
				Gross Beta	M	12
				Gamma (GeLi)	M	12
				Sr-89	QC	4
				Sr-90	QC	4



TABLE 1 (CONTINUED)  
SYNOPSIS OF THE 1983 CALVERT CLIFFS NUCLEAR POWER PLANT RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM  
Dockets Nos. 50-317/318

<u>SAMPLE TYPE</u>	<u>SAMPLING* FREQUENCY</u>	<u>NUMBER OF LOCATIONS</u>	<u>NUMBER COLLECTED</u>	<u>ANALYSIS</u>	<u>ANALYSIS* FREQUENCY</u>	<u>NUMBER PERFORMED</u>
TERRESTRIAL ENVIRONMENT						
Milk <sup>(7)</sup>	M	2	10	Gamma (GeLi)	M	10
				Sr-89	M	10
				Sr-90	M	10
				I-131	M	10
Vegetation <sup>(8)</sup>	At Harvest	3	7	Gamma (GeLi)	A	7
				Sr-89	A	7
				Sr-90	A	7
Soil	SA	3	6	Gamma (GeLi)	SA	6
				Sr-89	SA	6
				Sr-90	SA	6
Ground Water	Q	5	20	H-3	Q	20
				Gamma (GeLi)	Q	20
External Radiation	M	13	620	TLD	M	620

\* W - weekly, M - monthly, Q - quarterly, SA - semi-annual, A - annual, C - composite

- (1) Edible species are sampled when available.
- (2) The location of crab samples may vary depending upon their availability.
- (3) Sampling may be interrupted when no rooted aquatic plants are available.
- (4) The collection devices contain silver zeolite.
- (5) After a minimum decay of 72 hrs, beta counts are performed. Gamma spectrometry is performed on monthly composites of weekly samples. Strontium -89 and -90 analyses are performed on quarterly composites of weekly samples.
- (6) All analyses subject to sufficient sample collection.
- (7) Samples collected when available.
- (8) Predominant food crops (corn & small grains) are sampled when available.

TABLE 2  
ANNUAL SUMMARY OF RADIOACTIVITY IN THE ENVIRONS  
OF THE CALVERT CLIFFS NUCLEAR POWER PLANT  
UNITS 1 AND 2 (JAN. - DEC. 1983)

Docket Nos. 50-317/318

Sample Type	Site	Radioactivity	Typical MDL's	Annual Results	
				Mean (f)*	Range***
<u>Aquatic Environment</u>					
Bay water	7 Plant Outfall	H-3	132	pCi/l 222(4/12)	(<124-222)
<u>Fish</u>					
Bluefish	1 Cove Point	Sr-90	4	pCi/kg (Wet)	
		Cs-137	13	12(3/5)	-
Flounder	1 Cove point	Sr-90	4		
		Cs-137	13	12(2/3)	(<13-16)
Spot	1 Cove Point	Sr-90	4	15(1/1)	-
Weakfish	1 Cove point	Sr-90	4		
		Cs-137	13	12(3/5)	(< 13-16)
<u>Shellfish</u>					
Crabs	3 Kenwood Beach**	Ag-110m	12	pCi/kg (Wet) 18(1/1)	-
	8 Plant Intake	Ag-110m	12	25(1/1)	-
Oysters	3 Kenwood Beach**	Ag-110m	12	24(1/1)	-
	5 Camp Conoy	Zn-65	34	78(2/4)	(<34-96)
		Ag-110m	12	310(4/4)	(<12-535)
<u>Bottom Sediment</u>					
	5 Camp Conoy	Co-60	69	pCi/kg (Dry) 273(2/4)	(<69-357)
		Cs-137	-	527(4/4)	-
	6 Long Beach**	Co-60	69	369(3/4)	(<69-427)
		Cs-137	-	861(4/4)	-
		Ce-144	184	541(1/4)	-
	7 Plant Intake	Co-60	69	150(3/4)	(<69-190)
		Cs-137	-	250(4/4)	-
	8 Plant Intake	Co-60	69	373(1/4)	-
		Cs-137	-	562(4/4)	-

TABLE 2 (CONTINUED)  
ANNUAL SUMMARY OF RADIOACTIVITY IN THE ENVIRONS  
OF THE CALVERT CLIFFS NUCLEAR POWER PLANT  
UNITS 1 AND 2 (JAN. - DEC. 1983)

Docket Nos. 50-317/318

Sample Type	Site	Radioactivity	Typical MDL's	Annual Results	
				Mean (f)*	Range***
<u>Atmospheric Environment</u>					
Air Particulates				$10^{-2}$ pCi/m <sup>3</sup>	
	17 On Site	Gross Beta	0.2	1.1(51/52)	(<0.2-2.7)
	18 On Site	Gross Beta	0.2	1.3(52/52)	(<0.2-2.5)
	19 Knotty Pine	Gross Beta	0.2	1.2(50/52)	(<0.2-2.8)
	20 Lusby	Gross Beta	0.2	1.3(52/52)	(<0.2-2.6)
	21 Long Beach	Gross Beta	0.2	1.3(52/52)	(<0.2-2.1)
	22 Cove Point	Gross Beta	0.2	1.4(51/52)	(<0.2-2.5)
	23 Taylors Island**	Gross Beta	0.2	1.3(52/52)	(<0.2-2.3)
 <u>Precipitation</u>					
	15 On Site	Gross Beta	0.2	$\frac{\text{pCi/l}}{4.5(12/12)}$	(<0.2-9.6)
 <u>Terrestrial Environment</u>					
Milk				$\frac{\text{pCi/l}}{4.3(5/5)}$	
	15 Farm	Sr-90	-	4.3(5/5)	(3.1-5.3)
	30 Local Store**	Sr-90	-	2.6(5/5)	(1.2-4.8)
 <u>Vegetation</u>					
Pasture	14 Old Bay Farm	Sr-90	5	$\frac{\text{pCi/kg (Wet)}}{27(2/2)}$	(<5-40)
Cabbage	14 Old Bay Farm	Sr-90	5	110(1/2)	-
		Cs-137	17	9.2(1/1)	-
Turnip	14 Old Bay Farm	Sr-90	5	34(11)	-
Hay	16 Farm	Sr-90	5	58(1/1)	-
Tobacco	16 Farm	Sr-90	5	38(1/1)	-
		Cs-137	17	41(1/1)	-

TABLE 2 (CONTINUED)  
ANNUAL SUMMARY OF RADIOACTIVITY IN THE ENVIRONS  
OF THE CALVERT CLIFFS NUCLEAR POWER PLANT  
UNITS 1 AND 2 (JAN. - DEC. 1983)

Docket Nos. 50-317/318

Sample Type	Site	Radioactivity	Typical MDL's	Annual Results	
				Mean (f)*	Range***
External Radiation	7 Plant Outfall			Mr/30 day 3.14(11/12)	**** (2.73-3.69)
	17 On Site			4.93(12/12)	(4.18-5.62)
	18 On Site			4.32(12/12)	(3.83-5.1)
	19 Knotty Pine			4.19(12/12)	(3.7-5.06)
	20 Lusby			3.94(12/12)	(3.51-4.41)
	21 Long Beach			4.28(12/12)	(3.84-5.12)
	22 Cove Point			3.90(12/12)	(3.51-4.29)
	23 Taylors Island**			5.57(12/12)	(4.7-7.02)
	24 On Site			5.12(12/12)	(4.57-5.81)
	25 White Sands Club Sign			4.82(12/12)	(4.31-5.46)
	26 St. Leonard			4.19(12/12)	(3.65-5.46)
	27 Solomons			3.69(12/12)	(3.32-4.12)
	28 Bertha			4.41(12/12)	(3.95-5.04)

\* Mean encompasses only detectable quantities; fractions in parenthesis represent the proportion of detectable quantities to total quantities in a data set. For External Radiation, the fractions represent the portion of TLD's recovered to the total placed in the field.

\*\* Control locations.

\*\*\* Minimum observable to maximum observed.

\*\*\*\* Minimum to maximum observed.

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- (21) Calvert Cliffs Nuclear Power Plant, Unit Number 1, License No. DPR-53, Appendix A, Technical Specifications; Appendix B, Environmental Technical Specifications.
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- (28) U.S. NRC Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977.
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## APPENDIX A

Appendix A contains information concerning the environmental samples which were collected during the period of January 1, 1983 to December 31, 1983.

Sample locations and specific information about the individual locations are given in Table A-1. Figure A-2 shows the locations of sampling stations with respect to the plant site. Figure A-1 shows the location of the Calvert Cliffs Nuclear Power Plant with respect to Southern Maryland and the Chesapeake Bay.

TABLE A-1  
LOCATIONS OF ENVIRONMENTAL SAMPLING STATIONS  
FOR THE CALVERT CLIFFS NUCLEAR POWER PLANT

Dockets Nos. 50-317/318

<u>Station</u>	<u>Description</u>	<u>Distance (Feet)</u>	<u>Direction (Sector)</u>
1	Pound Nets South of Cove Point	38,000	SE
2	Chesapeake Country Club	20,000	SSE
3	Kenwood Beach	35,000	NNW
4	Rocky Point	10,000	NNW
5	Camp Canoy	3,000	SE
6	Long Beach	15,000	NNW
7	Plant Outfall Area	2,500	NE
8	Plant Intake Area	5,000	E
10	Onsite Well	600	SE
11	On Site	1,300	WNW
12	On Site	1,600	WSW
13	On Site	2,400	SSE
14	Cultivated Field On Site	1,200	W
15	Farm	24,000	WSW
16	Farm	22,000	SW
17	On Site	1,200	NW
18	On Site	2,000	SE
19	Knotty Pine (Giovanni's)	8,900	WSW
20	Lusby	9,900	SSW
21	Long Beach	14,000	NW
22	Cove Point	24,000	SE
23	Taylor's Island	40,000	ENE
24	On Site	1,800	NW
25	White Sands Club Sign	7,300	WSW
26	St. Leonard	27,000	NW
27	Solomons	42,000	S
28	Bertha	17,000	S
29	Flag Ponds	7,500	NW
30	Store (Lusby)	9,900	SSW
IS	On Site	1,400	SSW
PS	Plant Site	4,600	NNW

\* Distance measured from plant vent.

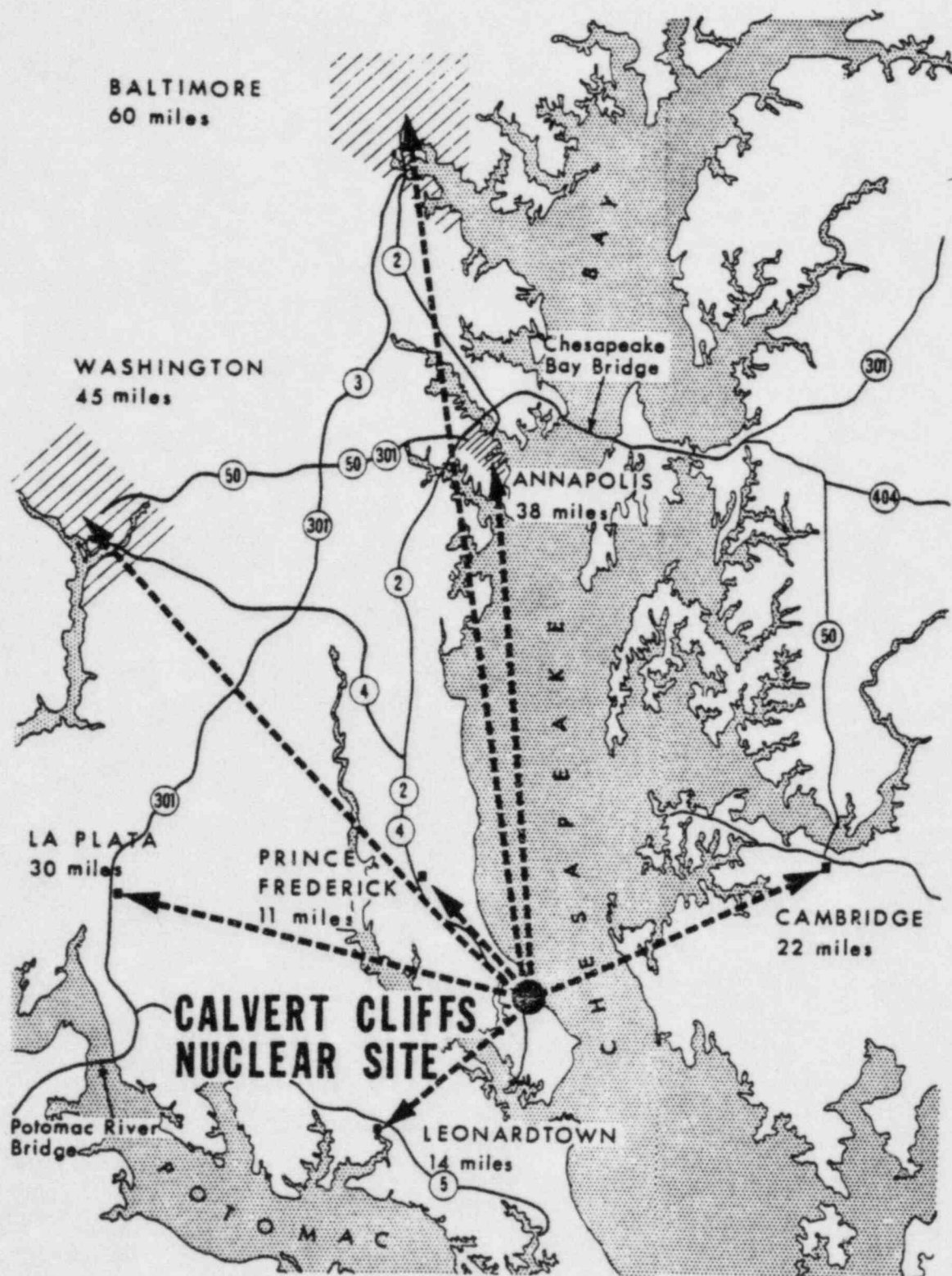
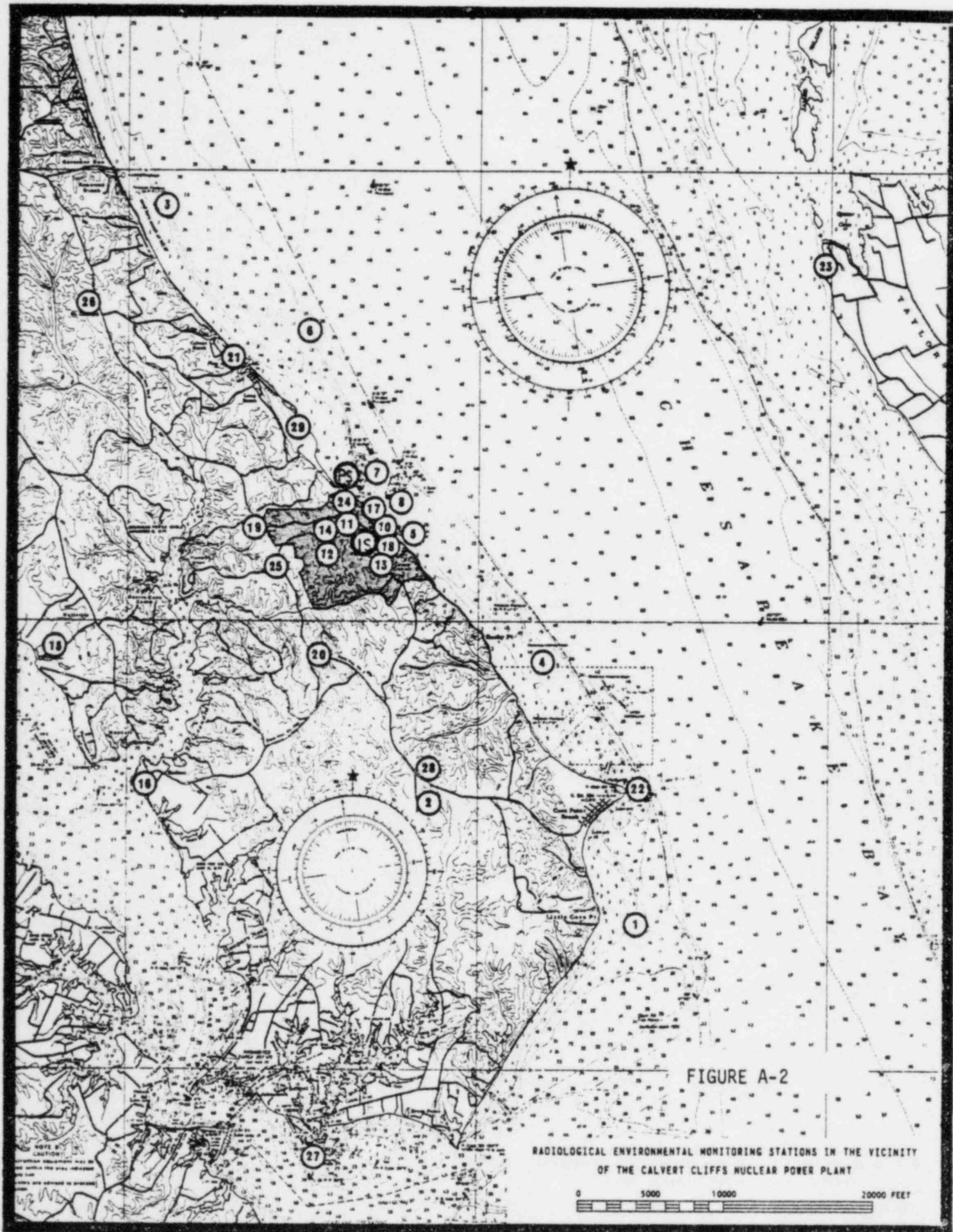


FIGURE A-1

Map of Southern Maryland and Chesapeake Bay Showing  
Location of Calvert Cliffs Nuclear Power Plant







January 1 - December 31, 1983  
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## APPENDIX B

Appendix B is a presentation of the analytical results of the 1983 Calvert Cliffs Nuclear Power Plant Radiological Environmental Monitoring Program.

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TABLE B-1  
CONCENTRATIONS OF TRITIUM, GAMMA EMITTERS, AND  
STRONTIUM-89 AND -90 IN BAY WATER  
(Results in Units of pCi/l +/- 2 Sigma)

<u>Date</u>	<u>Station Number</u>	<u>H-3</u>	<u>Gamma Emitters</u>	<u>Sr-89**</u>	<u>Sr-90**</u>
01/11/83	7	< 124	*		
	8	< 124	*		
02/16/83	7	184+/-118	*	< 4	< 0.5
	8	< 125	*	< 3	< 0.4
03/28/83	7	< 141	*		
	8	< 141	*		
04/12/83	7	< 139	*		
	8	< 139	*		
05/18/83	7	< 139	*	< 4	< 0.5
	8	< 137	*	< 5	< 0.8
06/15/83	7	212+/-134	*		
	8	< 141	*		
07/13/83	7	189+/-132	*		
	8	< 138	*		
08/18/83	7	< 140	*	< 5	< 0.9
	8	< 140	*	< 5	< 1.0
09/16/83	7	< 124	*		
	8	< 124	*		
10/14/83	7	< 125	*		
	8	< 126	*		
11/18/83	7	< 124	*	< 3	< 0.9
	8	< 125	*	< 3	< 0.5
12/14/83	7	301+/-117	*		
	8	< 123	*		

\*Naturally occurring K-40 was observed in all samples. All other gamma emitters not cited were < MDL; typical MDL's are given in Table B-13.

\*\*Quarterly results.

TABLE B-2  
CONCENTRATIONS OF GAMMA EMITTERS\* AND STRONTIUM-89  
AND -90 IN FLESH AND BONES OF EDIBLE FISH  
(Results in Units of pCi/kg +/- 2 Sigma)

Station No.	Sample Date	Sample Type	Sr-89	Sr-90	Cs-137
1 (Pound Nets South of Cove Point)	First Quarter	**	**	**	**
1	Second Quarter	**	**	**	**
1	07/21/83	Bluefish Weakfish	< 35 < 40	7.0+/-3.2 < 7.5	< MDL < MDL
1	08/08/83	Bluefish Weakfish	< 7 < 4	3.5+/-1.6 < 1.0	12+/-7 15+/-7
1	09/06/83	Bluefish Flounder Spot Weakfish	< 30 < 40 < 30 < 35	15+/-6 15+/-5 15+/-6 14+/-4	10+/-9 16+/-9 < MDL 6+/-5
1	10/03/83	Bluefish Flounder Weakfish	< 10 < 8 < 6	< 5 4.1+/-1.3 < 2	13+/-8 8+/-6 < MDL
1	11/01/83	Bluefish Flounder Weakfish	< 4 < 4 < 3	1.3+/-0.7 < 1.0 < 0.7	< MDL < MDL 16+/-9

\* Naturally occurring K-40 was observed in all samples. All other gamma emitters not cited were < MDL; typical MDL's are given in Table B-13.

\*\* No samples.

TABLE B-3  
CONCENTRATIONS OF GAMMA EMITTERS\* IN  
SHELLFISH SAMPLES  
(Results in Units of pCi/kg +/- 2 Sigma)

<u>Station No.</u>	<u>Sample Date</u>	<u>Sample Type</u>	<u>Zn-65</u>	<u>Ag-110m</u>
3 (Kenwood Beach Control Location)	First Quarter	Crabs	**	**
	01/11/83	Oysters	< MDL	< MDL
	06/15/83	Crabs	< MDL	18+/-13
	04/12/83	Oysters	< MDL	24+/-8
	08/09/83	Crabs	< MDL	< MDL
	08/18/83	Oysters	< MDL	< MDL
	10/04/83	Crabs	< MDL	< MDL
	10/14/83	Oysters	< MDL	< MDL
4 (Rocky Point)	First Quarter	Crabs	**	**
	06/15/83	Crabs	< MDL	< MDL
	08/09/83	Crabs	< MDL	< MDL
	10/04/83	Crabs	< MDL	< MDL
5 (Camp Conoy)	01/11/83	Oysters	60+/-34	535+/-30
	04/12/83	Oysters	< MDL	416+/-23
	08/18/83	Oysters	96+/-33	118+/-15
	10/14/83	Oysters	< MDL	170+/-16
8 (Plant Intake)	First Quarter	Crabs	**	**
	06/15/83	Crabs	< MDL	25+/-14
	08/09/83	Crabs	< MDL	< MDL
	10/04/83	Crabs	< MDL	< MDL

\*Naturally occurring K-40 observed in all samples. All other gamma emitters not cited were < MDL; typical MDL's are given in Table B-13.

\*\*No samples.



TABLE B-4  
CONCENTRATIONS OF GAMMA EMITTERS\* AND  
STRONTIUM -89 AND -90 IN BOTTOM SEDIMENT  
(Results in Units of pCi/kg (Dry) +/- 2 Sigma)

Station No.	Date	Sr-89	Sr-90	Co-60	Cs-137	Ce-144
5 (Camp Canoy)	03/24/83	< 80	< 9	< MDL	170+/-51	< MDL
	06/14/83	< 70	< 10	< MDL	594+/-112	< MDL
	08/18/83	< 50	< 7	189+/-138	455+/-109	< MDL
	10/14/83	< 20	< 5	357+/-104	889+/-129	< MDL
6 (Long Beach Control Location)	03/24/83	< 80	< 9	353+/-116	970+/-132	541+/-378
	06/14/83	< 60	< 10	427+/-132	653+/-105	< MDL
	08/18/83	< 30	< 4	< MDL	716+/-125	< MDL
	10/14/83	< 40	< 8	328+/-89	1103+/-124	< MDL
7 (Plant Outfall)	03/24/83	< 100	< 10	190+/-77	286+/-81	< MDL
	06/14/83	< 50	< 7	121+/-108	177+/-64	< MDL
	08/18/83	< 30	< 5	< MDL	197+/-75	< MDL
	10/14/84	< 50	< 9	139+/-57	340+/-74	< MDL
8 (Plant Intake)	03/24/83	< 60	< 7	313+/-111	710+/-107	< MDL
	06/14/83	< 50	< 5	< MDL	333+/-77	< MDL
	08/18/73	< 20	< 4	< MDL	431+/-99	< MDL
	10/14/83	< 10	< 3	< MDL	772+/-92	< MDL

\* Naturally occurring K-40, Ra-226, and Th-232 were observed in all samples. All other gamma emitters not cited were < MDL; typical MDL's are given in Table B-13.

TABLE B-5  
CONCENTRATIONS OF I-131 IN FILTERED AIR  
(Results in Units of  $10^{-3}$  pCi/m<sup>3</sup> +/- 2 Sigma)

Start Date	Stop Date	On Site #17	On Site #18	Lusby #20	Cove Point #22	Taylor's Island# #23
01/03/83	01/10/83	< 4.8	< 4.8	< 4.5	< 4.7	< 4.1
01/10/83	01/17/83	< 4.9	< 3.8	< 4.1	< 5.0	< 4.0
01/17/83	01/24/83	< 5.6	< 4.1	< 4.2	< 5.4	< 3.9
01/24/83	01/31/83	< 5.2	< 3.6	< 4.0	< 4.2	< 4.3
01/31/83	02/07/83	< 5.8	< 3.8	< 4.1	< 5.2	< 4.1
02/07/83	02/15/83	< 5.0	< 3.5	< 3.9	< 4.5	< 3.9
02/15/83	02/22/83	< 6.0	< 4.0	< 4.2	< 5.5	< 4.3
02/22/83	02/28/83	< 6.5	< 4.8	< 4.9	< 6.0	< 4.0
02/28/83	03/07/83	< 5.9	< 4.1	< 4.4	< 5.7	< 4.2
03/07/83	03/14/83	< 4.8	< 4.1	< 4.2	< 5.2	< 4.0
03/14/83	03/21/83	< 4.2	< 4.0	< 4.5	< 5.2	< 4.1
03/21/83	03/28/83	< 4.4	< 4.0	< 4.2	< 5.2	< 4.2
03/28/83	04/04/83	< 4.1	< 4.0	< 4.6	< 5.1	< 4.2
04/04/83	04/11/83	< 4.5	< 4.2	< 4.2	< 5.2	< 4.4
04/11/83	04/18/83	< 4.1	< 4.3	< 4.2	< 5.4	< 4.3
04/18/83	04/25/83	< 4.5	< 4.3	< 4.2	< 5.6	< 4.5
04/25/83	05/02/83	< 4.2	< 4.4	< 4.5	< 5.6	< 4.3
05/02/83	05/09/83	< 4.2	< 4.2	< 4.1	**	< 4.2
05/09/83	05/16/83	< 4.4	< 4.3	< 4.0	< 4.8	< 4.2
05/16/83	05/23/83	< 4.3	< 4.6	< 4.0	< 4.3	< 3.5
05/23/83	05/31/83	< 3.5	< 3.8	< 3.5	< 4.3	< 3.4
05/31/83	06/06/83	< 5.3	< 5.2	< 4.9	< 5.7	< 3.8
06/06/83	06/13/83	< 4.4	< 4.3	< 4.3	< 5.0	< 3.6
06/13/83	06/20/83	< 4.3	< 4.0	< 4.3	< 4.8	< 3.2
06/20/83	06/27/83	< 4.3	< 4.8	< 4.2	< 5.4	< 3.6
06/27/83	07/05/83	< 3.6	< 4.5	< 4.0	< 4.3	< 3.8
07/05/83	07/11/83	< 5.5	< 5.4	< 5.3	< 4.7	< 4.3
07/11/83	07/18/83	< 4.6	< 4.6	< 4.4	< 4.0	< 4.6
07/18/83	07/25/83	< 4.8	< 5.0	< 4.7	< 4.9	< 4.2
07/25/83	08/01/83	< 4.7	< 5.5	< 4.2	< 4.7	< 4.2
08/01/83	08/08/83	**	< 4.9	< 4.4	< 4.7	< 4.2
08/08/83	08/15/83	< 4.3	< 4.2	< 4.4	< 4.8	< 4.0
08/15/83	08/22/83	< 4.7	< 4.2	< 4.7	< 4.6	< 4.5
08/22/83	08/29/83	< 4.3	< 4.5	< 4.5	< 4.6	< 4.8

TABLE B-5 (CONTINUED)  
CONCENTRATIONS OF I-131 IN FILTERED AIR  
(Results in Units of  $10^{-3}$  pCi/m<sup>3</sup> +/- 2 Sigma)

Start Date	Stop Date	On Site #17	On Site #18	Lusby #20	Cove Point #22	Taylor's Island* #23
08/29/83	09/03/83	< 3.8	< 4.2	< 3.8	< 4.1	< 3.9
09/03/83	09/12/83	< 5.6	< 4.9	< 5.3	< 4.5	< 4.6
09/12/83	09/19/83	< 4.5	< 4.8	< 4.7	< 5.1	< 4.5
09/19/83	09/26/83	< 4.4	< 4.4	< 4.6	< 4.9	< 4.4
09/26/83	10/03/83	< 3.4	< 4.4	< 4.7	< 3.7	< 4.6
10/03/83	10/10/83	< 4.0	< 4.7	< 4.3	< 5.4	< 3.2
10/10/83	10/17/83	< 4.9	< 4.3	< 4.6	< 5.5	< 3.9
10/17/83	10/24/83	< 4.5	< 4.5	< 4.6	< 5.1	< 4.4
10/24/83	10/31/83	< 4.3	< 4.2	< 4.4	< 4.9	< 3.9
10/31/83	11/07/83	< 4.3	< 4.5	< 4.7	< 4.8	< 3.9
11/07/83	11/14/83	< 4.4	**	< 4.2	< 5.4	< 4.4
11/14/83	11/21/83	< 4.1	**	< 4.8	< 5.6	< 3.8
11/21/83	11/28/83	< 4.2	< 4.1	< 4.7	< 5.6	< 5.0
11/28/83	12/05/83	< 4.6	< 4.2	< 4.9	< 5.3	< 5.3
12/05/83	12/12/83	< 4.2	< 4.3	< 4.2	< 4.7	< 5.2
12/12/83	12/19/83	< 4.9	< 4.3	< 4.4	< 5.1	< 6.2
12/19/83	12/27/83	< 3.7	< 3.5	< 3.5	< 4.4	< 4.1
12/27/83	01/03/84	< 4.4	< 4.2	< 4.3	< 4.9	< 5.4

\*Control Location

\*\*Air Sampler Malfunction

TABLE B-6  
CONCENTRATIONS OF BETA EMITTERS IN AIR PARTICULATES  
(Results in Units of  $10^{-2}$  pCi/m<sup>3</sup> +/- 2 Sigma)

Start Date	Stop Date	On Site #17	On Site #18	Knotty Pine #19	Lusby #20	Long Beach #21	Cove Point #22	Taylor's Island* #23
01/03/83	01/10/83	0.7+/-0.2	1.5+/-0.2	1.0+/-0.2	1.7+/-0.3	1.7+/-0.2	1.6+/-0.3	1.6+/-0.3
01/10/83	01/17/83	0.7+/-0.3	0.8+/-0.2	1.0+/-0.2	1.0+/-0.2	1.0+/-0.2	0.8+/-0.3	0.8+/-0.2
01/17/83	01/24/83	0.8+/-0.2	1.0+/-0.2	1.0+/-0.2	1.0+/-0.2	0.9+/-0.2	0.9+/-0.3	1.1+/-0.2
01/24/83	01/31/83	0.3+/-0.2	1.6+/-0.2	1.2+/-0.2	1.5+/-0.2	1.3+/-0.2	1.3+/-0.3	1.4+/-0.3
01/31/83	02/07/83	0.6+/-0.3	0.8+/-0.2	0.7+/-0.2	1.0+/-0.2	1.0+/-0.2	0.8+/-0.3	0.8+/-0.2
02/07/83	02/15/83	0.7+/-0.2	1.7+/-0.2	1.4+/-0.2	1.6+/-0.3	1.4+/-0.2	1.5+/-0.3	1.9+/-0.3
02/15/83	02/22/83	0.3+/-0.3	1.5+/-0.3	1.4+/-0.2	1.6+/-0.3	1.8+/-0.2	1.3+/-0.3	1.7+/-0.3
02/22/83	02/28/83	0.5+/-0.3	1.3+/-0.3	1.2+/-0.2	1.5+/-0.3	1.3+/-0.2	1.0+/-0.3	1.4+/-0.3
02/28/83	03/07/83	0.6+/-0.3	1.6+/-0.3	1.7+/-0.2	1.4+/-0.3	1.6+/-0.2	1.7+/-0.3	1.8+/-0.3
03/07/83	03/14/83	0.5+/-0.3	0.6+/-0.2	0.6+/-0.2	0.7+/-0.2	0.8+/-0.2	0.4+/-0.2	0.7+/-0.3
03/14/83	03/21/83	1.1+/-0.2	0.5+/-0.2	0.7+/-0.2	0.7+/-0.2	0.6+/-0.2	0.7+/-0.3	0.8+/-0.2
03/21/83	03/28/83	1.1+/-0.2	0.9+/-0.2	0.9+/-0.2	1.2+/-0.2	0.9+/-0.2	0.9+/-0.3	1.3+/-0.2
03/28/83	04/04/83	1.1+/-0.2	1.4+/-0.2	1.4+/-0.2	1.1+/-0.2	1.1+/-0.2	1.2+/-0.3	1.1+/-0.2
04/04/83	04/11/83	0.4+/-0.2	0.4+/-0.2	0.4+/-0.2	0.5+/-0.2	0.7+/-0.2	0.5+/-0.3	0.9+/-0.3
04/11/83	04/18/83	0.8+/-0.2	0.8+/-0.2	0.9+/-0.2	0.8+/-0.2	0.9+/-0.2	0.5+/-0.3	0.7+/-0.2
04/18/83	04/25/83	1.1+/-0.2	1.1+/-0.2	1.3+/-0.2	1.3+/-0.2	1.0+/-0.2	1.0+/-0.3	0.9+/-0.2
04/25/83	05/02/83	2.7+/-0.3	2.4+/-0.3	2.5+/-0.3	2.6+/-0.3	2.0+/-0.2	2.3+/-0.3	2.3+/-0.3
05/02/83	05/09/83	0.9+/-0.2	1.1+/-0.3	1.1+/-0.2	1.1+/-0.2	1.1+/-0.2	**	0.8+/-0.2
05/09/83	05/16/83	1.4+/-0.3	0.9+/-0.2	1.1+/-0.2	1.2+/-0.2	1.0+/-0.2	1.1+/-0.2	0.7+/-0.2
05/16/83	05/23/83	0.6+/-0.2	0.8+/-0.2	1.0+/-0.2	0.8+/-0.2	0.9+/-0.2	0.9+/-0.2	0.9+/-0.2
05/23/83	05/30/83	0.7+/-0.2	0.6+/-0.2	0.8+/-0.2	0.9+/-0.2	0.8+/-0.2	0.7+/-0.2	0.5+/-0.2
05/31/83	06/06/83	0.9+/-0.3	1.2+/-0.3	1.0+/-0.2	1.3+/-0.3	1.1+/-0.2	1.0+/-0.3	0.9+/-0.2
06/06/83	06/13/83	1.5+/-0.3	1.5+/-0.3	1.6+/-0.2	1.7+/-0.3	1.3+/-0.2	1.4+/-0.3	1.3+/-0.2
06/13/83	06/20/83	2.3+/-0.3	2.5+/-0.3	2.8+/-0.3	2.4+/-0.3	1.9+/-0.2	1.8+/-0.3	2.0+/-0.3
06/20/83	06/27/83	1.5+/-0.3	1.6+/-0.3	1.4+/-0.2	1.5+/-0.3	1.3+/-0.2	2.5+/-0.3	1.3+/-0.2
06/27/83	07/05/83	1.1+/-0.2	1.0+/-0.3	1.1+/-0.2	1.0+/-0.2	0.7+/-0.2	1.0+/-0.2	1.8+/-0.2
07/05/83	07/11/83	0.8+/-0.3	1.2+/-0.3	1.0+/-0.2	1.2+/-0.3	0.7+/-0.2	1.0+/-0.3	1.3+/-0.3
07/11/83	07/18/83	1.8+/-0.3	2.4+/-0.3	1.6+/-0.2	2.0+/-0.3	1.0+/-0.2	1.8+/-0.3	1.7+/-0.3
07/18/83	07/25/83	1.2+/-0.3	1.5+/-0.3	1.4+/-0.2	1.5+/-0.3	0.9+/-0.2	1.5+/-0.3	1.0+/-0.2
07/25/83	08/01/83	1.4+/-0.3	1.7+/-0.3	1.1+/-0.2	1.3+/-0.3	0.7+/-0.2	1.3+/-0.3	1.8+/-0.3
08/01/83	08/08/83	**	1.0+/-0.3	0.6+/-0.2	0.9+/-0.2	0.2+/-0.2	1.1+/-0.3	1.1+/-0.2
08/08/83	08/15/83	1.6+/-0.3	1.5+/-0.3	1.0+/-0.2	1.4+/-0.3	1.4+/-0.2	1.9+/-0.3	0.9+/-0.2
08/15/83	08/22/83	2.5+/-0.3	2.0+/-0.3	2.2+/-0.2	2.4+/-0.3	2.1+/-0.2	2.2+/-0.3	1.6+/-0.3
08/22/83	08/29/83	1.1+/-0.2	1.1+/-0.2	1.4+/-0.2	1.6+/-0.3	1.6+/-0.2	1.5+/-0.3	0.9+/-0.3



TABLE B-6 (CONTINUED)  
CONCENTRATIONS OF BETA EMITTERS IN AIR PARTICULATES  
(Results in Units of  $10^{-2}$  pCi/m<sup>3</sup> +/- 2 Sigma)

Start Date	Stop Date	On Site #17	On Site #18	Knotty Pine #19	Lusby #20	Long Beach #21	Cove Point #22	Taylor's Island* #23
08/29/83	09/03/83	1.5+/-0.2	1.5+/-0.3	1.5+/-0.2	1.6+/-0.2	1.7+/-0.2	2.3+/-0.3	1.6+/-0.3
09/03/83	09/12/83	1.9+/-0.3	2.1+/-0.3	1.6+/-0.2	1.8+/-0.3	2.1+/-0.3	2.3+/-0.4	1.9+/-0.3
09/12/83	09/19/83	1.2+/-0.3	1.6+/-0.3	1.3+/-0.2	1.4+/-0.3	1.6+/-0.2	1.9+/-0.3	1.3+/-0.2
09/19/83	09/26/83	1.3+/-0.3	1.6+/-0.3	1.3+/-0.2	1.5+/-0.3	2.0+/-0.2	2.1+/-0.3	1.3+/-0.3
09/26/83	10/03/83	1.5+/-0.3	1.5+/-0.3	0.9+/-0.2	1.1+/-0.3	1.4+/-0.2	1.5+/-0.3	0.9+/-0.2
10/03/83	10/10/83	2.1+/-0.3	1.7+/-0.3	1.2+/-0.2	1.4+/-0.3	2.0+/-0.2	2.1+/-0.3	1.4+/-0.2
10/10/83	10/17/83	0.9+/-0.2	1.1+/-0.2	0.8+/-0.2	0.8+/-0.2	1.0+/-0.2	1.3+/-0.3	0.8+/-0.2
10/17/83	10/24/83	1.0+/-0.2	1.0+/-0.2	0.7+/-0.2	0.8+/-0.2	1.4+/-0.2	1.3+/-0.3	0.6+/-0.2
10/24/83	10/31/83	0.8+/-0.2	1.1+/-0.2	0.8+/-0.2	0.9+/-0.2	1.1+/-0.2	1.2+/-0.3	0.8+/-0.2
10/31/83	11/07/83	0.7+/-0.2	0.7+/-0.2	0.5+/-0.2	0.6+/-0.2	0.7+/-0.2	0.9+/-0.3	0.8+/-0.2
11/07/83	11/14/83	1.0+/-0.2	1.0+/-0.6	**	0.9+/-0.2	1.4+/-0.2	1.6+/-0.3	1.0+/-0.2
11/14/83	11/21/83	0.7+/-0.2	1.0+/-1.0	**	0.9+/-0.2	1.2+/-0.2	1.2+/-0.3	1.4+/-0.2
11/21/83	11/28/83	1.2+/-0.2	1.7+/-0.2	0.6+/-0.2	1.4+/-0.3	2.1+/-0.2	2.1+/-0.3	1.6+/-0.3
11/28/83	12/05/83	1.0+/-0.2	1.0+/-0.2	0.3+/-0.2	0.8+/-0.2	1.3+/-0.2	1.6+/-0.3	1.2+/-0.3
12/05/83	12/12/83	0.9+/-0.2	1.2+/-0.2	1.7+/-0.2	1.5+/-0.3	1.8+/-0.2	1.9+/-0.3	1.4+/-0.3
12/12/83	12/19/83	1.6+/-0.3	1.6+/-0.3	1.7+/-0.2	1.9+/-0.3	1.5+/-0.2	1.7+/-0.3	2.0+/-0.3
12/19/83	12/27/83	1.5+/-0.2	1.7+/-0.2	2.1+/-0.2	2.1+/-0.2	1.9+/-0.2	2.0+/-0.3	1.4+/-0.3
12/27/83	01/03/84	2.0+/-0.3	2.2+/-0.3	2.3+/-0.2	2.5+/-0.3	2.1+/-0.3	2.3+/-0.3	2.0+/-0.3

\*Control location

\*\*Air Sampler Malfunction

TABLE B-7  
CONCENTRATIONS OF GAMMA EMITTERS,  
STRONTIUM-89, AND -90 IN AIR PARTICULATES  
(Results in Units of  $10^{-3}$  pCi/m<sup>3</sup>  $\pm$  2 Sigma)

<u>Station No.</u>	<u>Date</u>	<u>Sr-89*</u>	<u>Sr-90*</u>	<u>Gamma Emitters</u>
17 (On Site)	1/83	< 1.0	< 0.5	**
	2/83	< 5.0	< 0.3	**
	3/83			***
	4/83			**
	5/83	< 1.0	< 0.3	**
	6/83			**
	7/83			**
	8/83	< 3.0	< 0.2	**
	9/83			**
	10/83			**
	11/83	< 1.0	< 0.2	**
	12/83			**
18 (On Site)	1/83	< 6.0	< 0.4	**
	2/83	< 3.0	< 0.2	**
	3/83			***
	4/83			**
	5/83	< 1.0	< 0.3	**
	6/83			**
	7/83			**
	8/83	< 0.9	< 0.2	**
	9/83			**
	10/83			**
	11/83	< 1.0	< 0.2	**
	12/83			**
19 (Kotty Pine)	1/83	< 7.0	< 0.5	**
	2/83	< 5.0	< 0.4	**
	3/83			***
	4/83			**
	5/83	< 1.0	< 0.4	**
	6/83			**
	7/83			**
	8/83	< 0.9	< 0.1	**
	9/83			**
	10/83			**
	11/83	< 0.6	< 0.1	**
	12/83			**
20 (Lusby)	1/83	< 7.0	< 0.5	**
	2/83	< 4.0	< 0.5	**
	3/83			***
	4/83			**

TABLE B-7 (CONTINUED)  
CONCENTRATIONS OF GAMMA EMITTERS,  
STRONTIUM-89, AND -90 IN AIR PARTICULATES  
(Results in Units of  $10^{-3}$  pCi/m<sup>3</sup> +/- 2 Sigma)

<u>Station No.</u>	<u>Date</u>	<u>Sr-89*</u>	<u>Sr-90*</u>	<u>Gamma Emitters</u>
(Lusby Con't)	5/83	< 1.0	0.7+/-0.3	**
	6/83			**
	7/83			**
	8/83	< 1.0	< 0.3	**
	9/83			**
	10/83			**
	11/83	< 1.0	< 0.2	**
	12/83			**
21 (Long Beach)	1/83	< 20	< 0.4	**
	2/83	< 3.0	< 0.5	**
	3/83			***
	4/83			**
	5/83	< 1.0	< 0.2	**
	6/83			**
	7/83			**
	8/83	< 1.0	< 0.2	**
	9/83			**
	10/83			**
	11/83	< 0.9	0.1+/-0.1	**
	12/83			**
22 (Cove Point)	1/83	< 30	< 0.6	**
	2/83	< 5.0	< 0.4	**
	3/83			***
	4/83			**
	5/83	< 2.0	< 0.3	**
	6/83			**
	7/83			**
	8/83	< 3.0	< 0.3	**
	9/83			**
	10/83			**
	11/83	< 1.0	0.2	**
	12/83			**
23 (Taylors Island)	1/83	< 30	< 0.5	**
	2/83	< 3.0	< 0.3	**
	3/83			**
	4/83			**
	5/83	< 1.0	< 0.3	**
	6/83			**
	7/83			**
	8/83	< 3.0	< 0.3	**

TABLE B-7 (CONTINUED)  
CONCENTRATIONS OF GAMMA EMITTERS,  
STRONTIUM-89, AND -90 IN AIR PARTICULATES  
(Results in Units of  $10^{-3}$  pCi/m<sup>3</sup> +/- 2 Sigma)

<u>Station</u> <u>No.</u>	<u>Date</u>	<u>Sr-89*</u>	<u>Sr-90*</u>	<u>Gamma</u> <u>Emitters</u>
(Taylors	9/83			**
Island	10/83			**
Con't)	11/83	< 1.0	< 0.2	**
	12/83			**

\* Composites of weekly samples.

\*\* Naturally occurring K-40 and Be-7 were observed in most samples.  
All other gamma emitters not cited were MDL; typical MDL's are  
given in Table B-13.

\*\*\*Samples stolen.



TABLE B-8  
CONCENTRATIONS OF BETA, TRITIUM, GAMMA EMITTERS\*  
AND STRONTIUM-89 AND -90 IN PRECIPITATION--STATION IS (ON SITE)  
(Results in Units of pCi/l +/- 2 Sigma)

<u>Date</u>	<u>Beta</u>	<u>H-3**</u>	<u>Sr-89</u>	<u>Sr-90</u>
01/83	4.2+/-0.6			
02/83	4.4+/-0.6	< 140	< 5	< 0.6
03/83	4.0+/-0.6			
04/83	4.5+/-0.6			
05/83	4.3+/-0.6	< 139	< 4	< 0.5
06/83	6.3+/-0.7			
07/83	9.6+/-1.0			
08/83	6.1+/-0.7	< 125	< 10	< 0.7
09/83	3.1+/-0.6			
10/83	2.6+/-0.5			
11/83	2.8+/-0.5	< 124	< 2	< 0.3
12/83	2.0+/-0.5			

\*Naturally occurring Be-7 was observed in most samples. All other gamma emitters not cited were < MDL; typical MDL's are given in Table B-13.

\*\*Quarterly analyses or composited monthly samples.

TABLE B-9  
CONCENTRATIONS OF GAMMA EMITTERS\*, IODINE-131,  
STRONTIUM-89, AND -90 IN MILK SAMPLES  
(Results in Units of pCi/l +/- 2 Sigma)

<u>Date</u>	<u>Station No.</u>	<u>Sr-89</u>	<u>Sr-90</u>	<u>I-131</u>
03/27/83	15 (Farm)	< 5	5.0+/-0.9	< 0.3
	30 (Store)	< 3	1.4+/-0.6	< 0.2
04/24/83	15	< 4	5.3+/-0.8	< 0.2
	30	< 3	2.7+/-0.6	< 0.2
05/30/83	15	< 2	3.5+/-0.5	< 0.2
	30	< 3	1.2+/-0.4	< 0.2
06/27/83	15	< 3	4.4+/-0.7	< 0.1
	30	< 4	3.0+/-0.7	< 0.2
07/28/83	15	< 2	4.8+/-0.6	< 0.3
	30	< 2	3.1+/-0.7	< 0.3

\*Naturally occurring K-40 was observed in all samples. All other gamma emitters not cited were < MDL; typical MDL's are given in Table B-13.

TABLE B-10  
CONCENTRATIONS OF GAMMA EMITTERS\* AND  
STRONTIUM-89 AND -90 IN VEGETATION  
(Results in Units of pCi/kg (Wet) +/- 2 Sigma)

<u>Station No.</u>	<u>Sample Date</u>	<u>Sample Type</u>	<u>Isotope Observed</u>	<u>Concentrations</u>
14	07/27/83	Cabbage	Sr-89	< 20
			Sr-90	< 5
15	06/27/83	Pasture	Sr-89	< 30
			Sr-90	40+/-4
15	07/27/83	Pasture	Sr-89	< 30
			Sr-90	14+/-2
14	08/19/83	Cabbage	Sr-89	< 100
			Sr-90	110+/-10
			Cs-137	9.2+/-9.2
14	10/15/83	Turnip	Sr-89	< 10
			Sr-90	34+/-1
16	11/09/83	Hay	Sr-89	< 40
			Sr-90	58+/-13
16	11/09/83	Tobacco	Sr-89	< 30
			Sr-90	38+/-8
			Cs-137	41+/-15

\* Naturally occurring K-40 was observed in all samples. All other gamma emitters not cited were < MDL; typical MDL's are given in Table B-13.

TABLE B-11  
CONCENTRATIONS OF GAMMA EMITTERS\* AND  
STRONTIUM-89 AND -90 IN SOIL  
(Results in Units of pCi/kg (Dry) +/- 2 Sigma)

Date	06/06/83			11/09/83		
Station	11	12	13	11	12	13
No.	(On Site)	(On Site)	(On Site)	(On Site)	(On Site)	(On Site)
Sr-89	< 30	< 40	< 70	< 30	< 50	< 60
Sr-90	17+/-5	< 8	< 30	< 5	< 7	< 9
Cs-137	178+/-53	< MDL	478+/-68	293+/-75	< MDL	74+/-51

\* Naturally occurring K-40, Ra-226, and Th-232 were observed in all samples. All other gamma emitters not cited were < MDL; typical MDL's are given Table B-13.



TABLE B-12  
CONCENTRATIONS OF TRITIUM AND GAMMA EMITTERS  
IN GROUND WATER  
(Results in Units of pCi/l +/- 2 Sigma)

<u>Station No.</u>	<u>Date</u>	<u>H-3</u>	<u>Gamma Emitters</u>
2** (Chesapeake Country Club)	03/15/83	< 124	*
	06/21/83	< 140	*
	08/15/83	< 139	*
	11/09/83	< 126	*
10 (On Site Well)	03/15/83	< 123	*
	06/21/83	< 140	*
	08/15/83	< 140	*
	11/09/83	< 126	*
21 (Long Beach)	03/15/83	< 125	*
	06/21/83	< 141	*
	08/15/83	< 139	*
	11/09/83	< 126	*
25A** (White Sands Club)	03/15/83	< 141	*
	06/21/83	< 138	*
	08/15/83	< 140	*
	11/09/83	< 125	*
25B** (White Sands Club)	03/15/83	< 141	*
	06/21/83	< 141	*
	08/15/83	< 140	*
	11/09/83	< 125	*

\* Naturally occurring K-40 was observed in most samples. All other gamma emitters not cited were < MDL; typical MDL's are given in Table B-13.

\*\* Control location.

TABLE B-13  
TYPICAL MDL'S FOR GAMMA SPECTROMETRY

<u>Selected Nuclides</u>	<u>Baywater pCi/l</u>	<u>Fish pCi/kg</u>	<u>Shellfish pCi/kg</u>	<u>Sediment pCi/kg</u>	<u>Particulates 10<sup>-3</sup>pCi/m<sup>3</sup></u>
Na-22	1.3	14	16	46	2.1
Cr-51	14	72	188	449	26
Mn-54	1.0	11	12	44	1.8
Co-58	1.2	17	17	44	2.3
Fe-59	3.2	44	48	114	5.2
Co-60	1.4	16	19	69	1.9
Zn-65	2.5	29	34	104	4.5
Nb-95	1.7	24	26	61	2.4
Zr-95	2.1	26	26	83	2.9
RuRh-106	9.0	76	109	333	15
Ag-110m	1.1	11	12	40	1.8
Te-129m	1.3	17	19	45	28
I-131	8.7	34	49	210	31
Cs-134	1.2	11	12	45	1.9
Cs-137	1.1	13	11	-	1.9
Ba-140	11	50	71	265	28
La-140	4.5	26	50	155	15
Ce-144	7.4	32	37	184	6.6

TABLE B-13 (CONTINUED)  
TYPICAL MDL'S FOR GAMMA SPECTROMETRY

<u>Selected Nuclide</u>	<u>Precipitation pCi/l</u>	<u>Milk pCi/l</u>	<u>Vegetation pCi/kg</u>	<u>Soil pCi/kg</u>	<u>Well Water pCi/l</u>
Na-22	3.6	6.2	26	33	1.4
Cr-51	59	37	149	248	21
Mn-54	3.4	4.7	18	30	1.0
Co-58	4.4	4.5	19	31	1.3
Fe-59	8.0	11	64	68	4.5
Co-60	4.5	6.2	29	40	0.9
Zn-65	6.5	12	54	69	2.4
Nb-95	8.0	4.7	23	35	2.0
Zr-95	8.6	8.6	35	53	2.5
RuRh-106	33	43	132	247	8.4
Ag-110m	3.6	4.2	14	27	1.0
Te-129m	5.0	4.3	18	26	1.7
I-131	47	4.9	46	53	3.9
Cs-134	3.2	4.9	18	37	1.1
Cs-137	3.2	5.3	17	-	1.0
Ba-140	45	13	82	106	24
La-140	28	5.3	36	59	11
Ce-144	24	32	40	142	6.9

TABLE B-14  
EXTERNAL RADIATION  
(Results in Units of mR/30 Days +/- 2 Sigma)

Location #7	Jan.	2.92+/-0.30	Jul.	3.69+/-0.68
	Feb.	3.09+/-0.54	Aug.	3.52+/-0.28
	Mar.	3.21+/-0.16	Sep.	3.28+/-0.34
	Apr.	2.93+/-0.28	Oct.	3.50+/-0.34
	May	*	Nov.	2.77+/-0.01
	Jun.	2.73+/-0.20	Dec.	2.90+/-0.14
Location #17	Jan.	4.75+/-0.26	Jul.	5.38+/-0.66
	Feb.	4.85+/-0.34	Aug.	5.61+/-0.62
	Mar.	5.04+/-0.14	Sep.	5.62+/-0.34
	Apr.	4.76+/-0.72	Oct.	4.89+/-0.42
	May	4.48+/-0.70	Nov.	4.18+/-1.56
	Jun.	4.91+/-0.70	Dec.	4.71+/-0.14
Location #18	Jan.	4.26+/-0.18	Jul.	4.49+/-0.36
	Feb.	4.14+/-0.22	Aug.	4.83+/-0.66
	Mar.	4.32+/-0.32	Sep.	5.11+/-0.92
	Apr.	4.12+/-0.20	Oct.	4.28+/-0.24
	May	3.83+/-0.28	Nov.	3.90+/-0.44
	Jun.	4.24+/-0.08	Dec.	4.31+/-0.34
Location #19	Jan.	3.87+/-0.02	Jul.	4.66+/-0.40
	Feb.	3.82+/-0.18	Aug.	4.40+/-0.16
	Mar.	4.10+/-0.04	Sep.	5.06+/-0.44
	Apr.	3.76+/-0.30	Oct.	4.41+/-0.72
	May	3.94+/-0.36	Nov.	4.29+/-1.04
	Jun.	3.82+/-0.18	Dec.	4.16+/-0.18
Location #20	Jan.	4.00+/-0.56	Jul.	4.00+/-0.60
	Feb.	4.01+/-0.44	Aug.	4.38+/-0.60
	Mar.	4.28+/-0.44	Sep.	4.41+/-0.38
	Apr.	3.66+/-0.46	Oct.	4.00+/-0.12
	May	3.51+/-0.26	Nov.	3.57+/-0.64
	Jun.	3.67+/-0.12	Dec.	3.83+/-0.20
Location #21	Jan.	4.14+/-0.04	Jul.	4.33+/-0.08
	Feb.	4.12+/-0.60	Aug.	4.81+/-0.88
	Mar.	4.29+/-0.44	Sep.	5.12+/-0.02
	Apr.	3.84+/-0.30	Oct.	4.46+/-0.40
	May	4.03+/-0.30	Nov.	3.98+/-0.28
	Jun.	4.04+/-1.04	Dec.	4.17+/-0.32
Location #22	Jan.	3.80+/-0.66	Jul.	4.01+/-0.46
	Feb.	3.82+/-0.72	Aug.	4.04+/-0.68
	Mar.	4.12+/-0.22	Sep.	4.22+/-0.24
	Apr.	4.00+/-0.66	Oct.	4.29+/-0.24
	May	3.51+/-0.42	Nov.	3.53+/-0.56
	Jun.	3.54+/-0.54	Dec.	3.93+/-0.34

TABLE B-14 (CONTINUED)  
EXTERNAL RADIATION  
(Results in Units of mR/30 Days +/- 2 Sigma)

Location	#23	Jan.	5.70+/-0.16	Jul.	6.31+/-0.72
		Feb.	4.75+/-0.84	Aug.	5.86+/-1.00
		Mar.	5.60+/-0.70	Sep.	7.02+/-0.36
		Apr.	4.86+/-0.58	Oct.	6.12+/-0.76
		May	5.21+/-0.30	Nov.	5.05+/-0.30
		Jun.	5.08+/-0.40	Dec.	5.27+/-0.44
Location	#24	Jan.	4.69+/-0.24	Jul.	5.81+/-0.22
		Feb.	5.17+/-0.06	Aug.	5.81+/-1.44
		Mar.	5.15+/-0.56	Sep.	5.58+/-0.16
		Apr.	4.68+/-0.44	Oct.	5.42+/-0.06
		May	4.72+/-0.22	Nov.	4.57+/-0.42
		Jun.	4.68+/-1.00	Dec.	4.92+/-0.34
Location	#25	Jan.	4.53+/-0.38	Jul.	5.45+/-0.24
		Feb.	4.49+/-0.44	Aug.	5.46+/-0.58
		Mar.	4.84+/-0.28	Sep.	5.19+/-0.90
		Apr.	4.61+/-0.22	Oct.	5.46+/-0.50
		May	4.31+/-0.22	Nov.	4.40+/-1.58
		Jun.	4.46+/-0.42	Dec.	4.64+/-0.22
Location	#26	Jan.	4.13+/-0.64	Jul.	4.35+/-0.18
		Feb.	3.65+/-0.12	Aug.	4.50+/-0.48
		Mar.	4.44+/-0.72	Sep.	5.46+/-1.90
		Apr.	3.83+/-0.16	Oct.	4.07+/-0.16
		May	4.28+/-0.70	Nov.	3.74+/-0.26
		Jun.	3.79+/-0.40	Dec.	4.02+/-0.82
Location	#27	Jan.	3.90+/-0.06	Jul.	3.78+/-0.01
		Feb.	3.85+/-0.02	Aug.	3.78+/-0.28
		Mar.	4.12+/-0.22	Sep.	3.92+/-0.46
		Apr.	3.56+/-0.16	Oct.	3.85+/-0.30
		May	3.32+/-0.14	Nov.	3.40+/-0.28
		Jun.	3.43+/-0.22	Dec.	3.41+/-0.30
Location	#28	Jan.	4.47+/-0.56	Jul.	4.70+/-0.50
		Feb.	4.20+/-0.12	Aug.	4.55+/-0.62
		Mar.	4.45+/-0.42	Sep.	5.04+/-1.20
		Apr.	4.44+/-0.16	Oct.	4.56+/-0.34
		May	3.95+/-0.36	Nov.	4.02+/-0.26
		Jun.	4.08+/-0.64	Dec.	4.42+/-0.26

\* TLD unavailable due to inclement weather.



January 1 - December 31, 1983  
Dockets Nos. 50-317/318

#### APPENDIX C

Appendix C contains a table of the results of the BG&E laboratory's participation in the Environmental Protection Agency's Cross-Check Program during the period of January 1, 1983 to December 31, 1983.

TABLE C-1  
RESULTS OF EPA CROSS CHECK PROGRAM FOR 1983

Collection Date	Sample Type & Units	Isotope Observed	Laboratory's Results	EPA's Results
02/04/83	Water-pCi/l	Cr-51	67+/-27	45+/-8.7
		Co-60	26+/-4	22+/-8.7
		Zn-65	31+/-6	21+/-8.7
		Ru-106	57+/-30	48+/-8.7
		Cs-134	24+/-3	20+/-8.7
		Cs-137	24+/-3	19+/-8.7
02/11/83	Water-pCi/l	H-3	2406+/-241	2568+/-612
03/18/83	Water-pCi/l	Beta	29+/-3	28+/-8.7
03/25/83	Filter-pCi/filter	Beta	94+/-9 (59+/-6)*	68+/-8.7
		Cs-137	35+/-3	27+/-8.7
04/01/83	Water-pCi/l	I-131	32+/-8	27+/-10
05/09/83	Water-pCi/l	Beta	141+/-14	149+/-15
		Co-60	36+/-4	30+/-10
		Cs-134	37+/-4	33+/-10
		Cs-137	31+/-4	27+/-10
06/03/83	Water-pCi/l	Cr-51	77+/-30	60+/-8.7
		Co-60	15+/-3	13+/-8.7
		Zn-65	42+/-7	36+/-8.7
		Ru-106	38+/-22	40+/-8.7
		Cs-134	47+/-4	47+/-8.7
		Cs-137	31+/-4	26+/-8.7
06/10/83	Water-pCi/l	H-3	1223+/-138	1529+/-337
07/15/83	Water-pCi/l	Beta	**	**
08/05/83	Water-pCi/l	I-131	**	**
08/26/83	Filter-pCi/filter	Beta	53+/-5 (38+/-4)*	36+/-8.7
		Cs-137	22+/-2	15+/-8.7
10/07/83	Water-pCi/l	Cr-51	75+/-20	51+/-8.7
		Co-60	25+/-3	19+/-8.7
		Zn-65	50+/-8	40+/-8.7
		Ru-106	71+/-25	52+/-8.7
		Cs-134	17+/-3	15+/-8.7
		Cs-137	27+/-3	22+/-8.7
10/10/83	Water-pCi/l	H-3	1000+/-100	1210+/-329

TABLE C-1 (CONTINUED)  
RESULTS OF EPA CROSS CHECK PROGRAM FOR 1983

<u>Collection Date</u>	<u>Sample Type &amp; Units</u>	<u>Isotope Observed</u>	<u>Laboratory's Results</u>	<u>EPA's Results</u>
11/14/83	Water-pCi/l	Beta	53+/-5	67+/-8.7
		Co-60	14+/-2	11+/-8.7
		Cs-134	16+/-2	15+/-8.7
		Cs-137	17+/-2	15+/-8.7
11/19/83	Water-pCi/l	Beta	**	**
11/25/83	Filter-pCi/filter	Beta	66+/-7 (46+/-5)*	50+/-9
		Cs-137	33+/-4	28+/-9
12/16/83	Water-pCi/l	I-131	27+/-8	28+/-10

\* Numbers in parentheses are the result of using EPA's efficiency (about 50%) with our raw data to calculate Beta concentrations, in order to show that there is agreement between our respective raw data sets, but disagreement between our counting efficiencies (i.e., our efficiency for filters is about 36%).

\*\* Unable to analyze sample due to inoperable counting equipment, sample backlog, or sample received from EPA too late to analyze before its due date.



CHARLES CENTER • P.O. BOX 1475 • BALTIMORE, MARYLAND 21203

ELECTRIC ENGINEERING  
DEPARTMENT

March 27, 1984

The Regional Administrator  
Region I, U. S. Nuclear Regulatory Commission  
631 Park Avenue  
King of Prussia, Pennsylvania 19406

Subject: Calvert Cliffs Nuclear Power Plant, Units 1 and 2  
Operating License Nos. DPR-53 and DPR-69  
Appendix B (Environmental Technical Specifications)  
Section 5.6.1

Gentlemen:

In compliance with Section 5.6.1 of the Calvert Cliffs Environmental Technical Specifications, we are submitting the Annual Radiological Environmental Monitoring Report, dated March 1984. Should you desire further information, please contact us.

Very truly yours,

Gary R. Fuhrman  
Director  
Environmental Programs

GRF:clj

Enclosure (1)

cc: Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555 (18 copies)

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