RH-78-3-BF2

ENVIRONMENTAL RADIOACTIVITY LEVELS
BROWNS FERRY NUCLEAR PLANT

1977

CONTENTS

ENVIRONMENTAL RADIOACTIVITY LEVELS

BROWNS FERRY NUCLEAR PLANT

1977

Introduction

The Browns Ferry Nuclear Plant (BFNP), operated by the Tennessee Valley Authority, is located on a site owned by TVA containing 840 acres of land in Limestone County, Alabama, bounded on the west and south by Wheeler Reservoir (see figure 1). The site is 10 miles southwest of Athens, Alabama, and 10 miles northwest of Decatur, Alabama. The plant consists of three boiling water reactors; each unit is rated at 3,293 MWt and 1,098 MWe. Unit 1 achieved criticality on August 17, 1973, and began commercial operation on August 1, 1974. Unit 2 began commercial operation on March 1, 1975. However, a fire in the cable trays on March 22, 1975 forced the shutdown of both reactors. Units 1 and 2 resumed operation and Unit 3 began testing in August 1976. Unit 3 began commercial operation in January 1977.

The preoperational environmental monitoring program established a baseline of data on the distribution of natural and manmade radioactivity in the environment near the plant site. However, seasonal, yearly, and random variations in the data were observed. In order to determine the potential increases in environmental radioactivity levels caused by the plant, comparisons were made between data for indicator stations (those near the plant) and control stations (those remote from the plant) in conjunction with comparisons with preoperational data.

Field staffs in the Division of Environmental Planning and the Division of Forestry, Fisheries, and Wildlife Development carried out the sampling program outlined in tables 1 and 17. Sampling locations are shown in figures 2, 3, and 4. All the radiochemical and instrumental analyses were conducted in a central laboratory at Muscle Shoals, Alabama. Alpha and beta analyses were performed on Beckman Low Beta II and Beckman Wide Beta II low background proportional counters. Two Nuclear Data Model 100 multichannel analyzer systems employing sodium iodide, NaI(Tl) detectors and one Nuclear Data Model 4420 in conjunction with Germanium, Ge(Li) detection systems, were used to analyze the samples for specific gamma-emitting radionuclides. Samples of water, vegetation, air particulates, food crops, and charcoal (specific analysis for ^{131}I) are routinely counted with NaI(Tl) detection systems. If significant concentrations of radioisotopes are identified, or if there is a reasonable expectation of increased radioactivity levels (such as during periods of increased

fallout), these samples are counted on the Ge(Li) system. Identification of gamma-emitting radionuclides in all other types of samples is routinely performed by analysis on the Ge(Li) system. A TVA fabricated beta-gamma coincidence counting system is utilized for the determination of I-131 concentrations in milk.

Data were entered in computer storage for processing specific to the analysis conducted. An IBM 370 Model 165 computer, employing an ALPHA-M least squares code, was used to solve multimatrix problems associated with estimating the activities of the gamma-emitting nuclides analyzed by NaI(Tl). The data obtained by Ge(Li) detectors were resolved by the ND-4420 software.

The detection capabilities for environmental sample analysis given as the nominal lower limits of detection (LLD) are listed in table 2. Samples processed by NaI(Tl) gamma spectroscopy were analyzed for 13 specific gamma-emitting radionuclides and radionuclide combinations*. All photopeaks found in Ge(Li) spectra were identified and quantified. LLD's for the analysis of the radionuclides listed below* are given in table 2-B. LLD's for additional radionuclides identified by Ge(Li) analysis were calculated for each analysis and nominal values are listed in the appropriate data tables. In the instances where an LLD has not been established, an LLD value of zero was assumed. For each sample type, only the radionuclides for which values greater than the LLD were reported are listed in the data tables.

---

*The following radionuclides and radionuclide combinations are quantified by the ALPHA-M least-squares computer code: $^{141,144}Ce$; ^{51}Cr; ^{131}I; $^{103,106}Ru$; ^{134}Cs; ^{137}Cs; ^{95}Zr-Nb; ^{58}Co; ^{54}Mn; ^{65}Zn; ^{60}Co; ^{40}K; and ^{140}Ba-La.

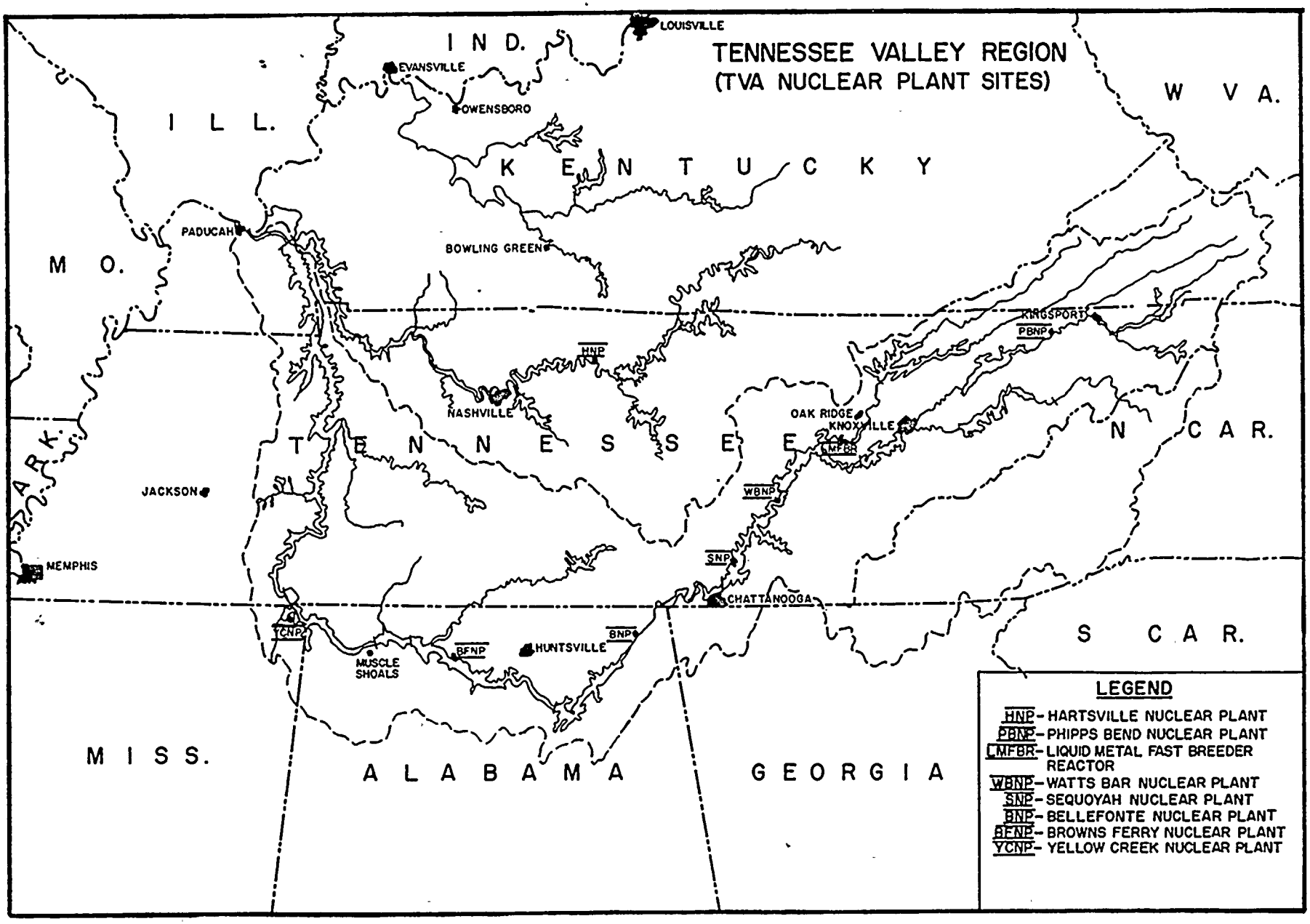

TENNESSEE VALLEY REGION
(TVA NUCLEAR PLANT SITES)
LOUISVILLE
EVANSVILLE
OWENSBORO
PADUCAH
BOWLING GREEN
NASHVILLE
HNP
KINGSPORT
PBNP
OAK RIDGE
KNOXVILLE
LMFBR
WBNP
SNP
CHATTANOOGA
JACKSON
MEMPHIS
YCNP
BFNP
MUSCLE SHOALS
HUNTSVILLE
BNP
I N D.
I L L.
K E N T U C K Y
W V A.
M O.
T E N N E S S E E
N C A R.
S C A R.
M I S S.
A L A B A M A
G E O R G I A
LEGEND
HNP - HARTSVILLE NUCLEAR PLANT
PBNP - PHIPPS BEND NUCLEAR PLANT
LMFBR - LIQUID METAL FAST BREEDER REACTOR
WBNP - WATTS BAR NUCLEAR PLANT
SNP - SEQUOYAH NUCLEAR PLANT
BNP - BELLEFONTE NUCLEAR PLANT
BFNP - BROWNS FERRY NUCLEAR PLANT
YCNP - YELLOW CREEK NUCLEAR PLANT

Figure 1

Table 1

ENVIRONMENTAL RADIOACTIVITY SAMPLING SCHEDULE

Station Location	Air Filter	Charcoal Filter	Rain-water	Heavy Particle Fallout	Soil	Vegetation	Milk	River Water	Well Water	Public Water	Aquatic Life and Sediment	Foods
Muscle Shoals	W	W	M	M	A					M		
Lawrenceburg	W	W	M	M	A							
Rogersville	W	W	M	M	A							
Athens	W	W	M	M	A							
Decatur	W	W	M	M	A					M		
Courtland	W	W	M	M	A							
Site NW-1	W	W	M	M	A							
Site N-2	W	W	M	M	A							
Site NE-3	W	W	M	M	A							
Site NW-4	W	W	M	M	A							
Site WSW-5	W	W	M	M	A							
Farm B						Q	W					
Farm Bi						Q	W					
Farm H						Q	W		M			
Farm T						Q	W					
Farm L						Q	W					
Control Farms						Q	W					A
Onsite Well									M			
Wheeler Dam										M		
Elk River								M				
Tennessee River								M			S	
Champion Paper Co.										W		
Various Local Farms												A

W - Weekly M - Monthly S-Semiannually A-Annually

ATMOSPHERIC MONITORING

The atmospheric monitoring network is divided into three groups. Four local air monitors are located on or adjacent to the plant site in the quadrants of greatest wind frequency. One additional station is located at the point of maximum predicted off-site concentration of radionuclides (see figure 3). Four perimeter air monitors are located at distances out to 10 miles from the plant, and two remote air monitors are located at distances out to 45 miles. These monitoring stations are shown in figure 2. The remote monitors are used as control or baseline stations. At each monitor, air is continuously pulled through a Hollingsworth and Voss HV-70 particulate filter at a regulated flow of 3 ft^3/min. In series with, but downstream of, the particulate filter is a charcoal filter used to collect iodine. Each monitor has a collection tray and storage container to obtain rainwater on a continuous basis and a horizontal platform that is covered with gummed acetate to catch and hold heavy particle fallout. Thermoluminescent dosimeters are used to record gamma radiation levels at each remote and perimeter station.

Each of the local air monitors is fitted with a GM tube that continuously scans the particulate filter. The disintegration rate of the atmospheric radioactivity is continuously recorded at each station and radiotelemetered into the plant. These stations will detect any significant airborne release from BFNP.

Air filters are collected weekly and analyzed for gross beta activity. During this reporting period, one sample was not obtained because of adverse weather conditions, one was lost, and two were lost because of equipment malfunction. No analyses are performed until 3 days after sample collection. The samples are composited monthly for analysis of specific gamma-emitting radionuclides and quarterly for ^{89}Sr, ^{90}Sr analysis. The results are combined for each station to obtain a annual average. These data are presented in table 4.

With reference to table 3, which contains the maximum permissible concentrations (MPC) recommended by 10 CFR 20 for nonoccupational exposure, it is seen that the maximum beta concentration is 0.70 percent MPC.

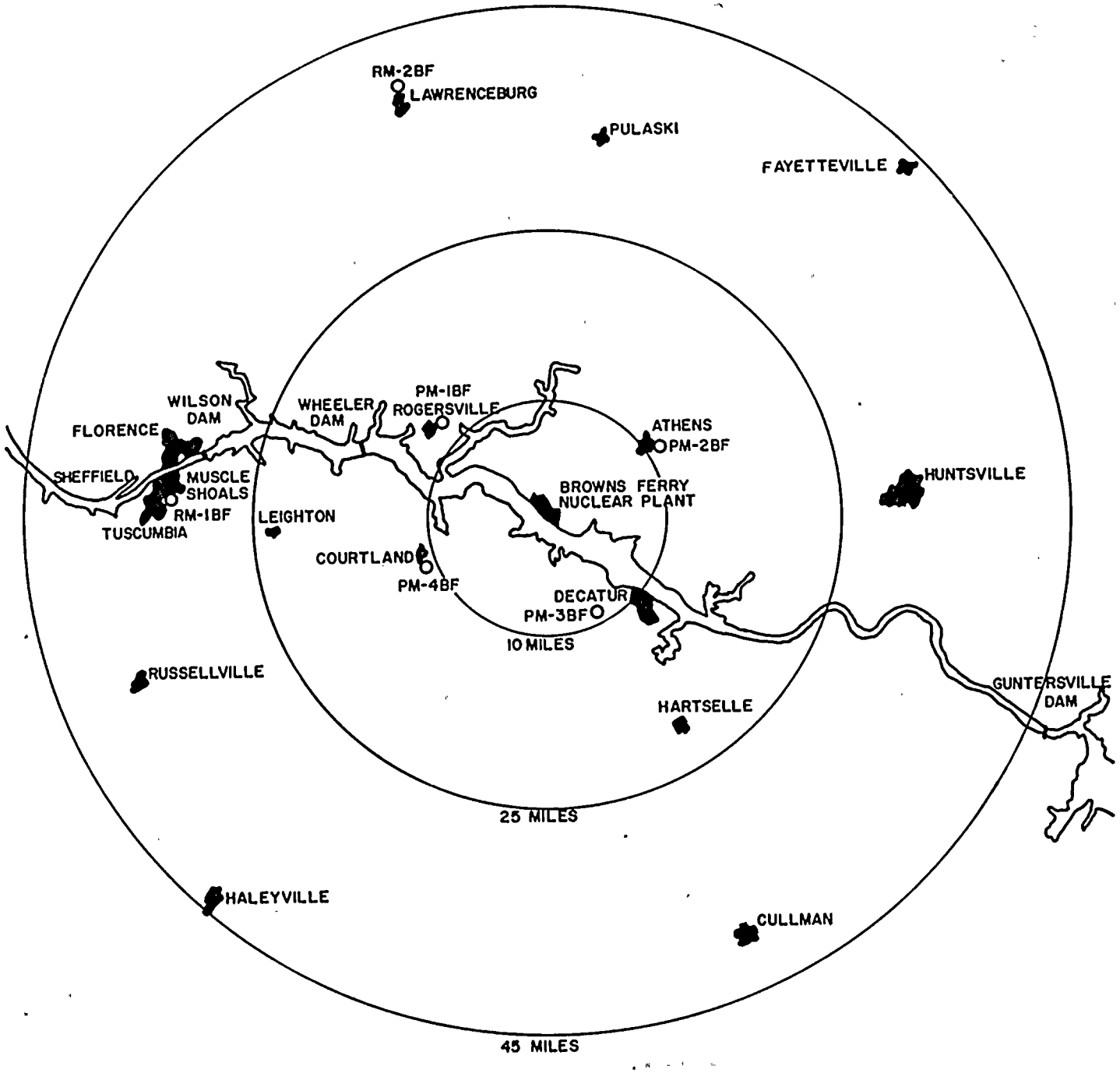
Rainwater is collected monthly and a 3.5-liter sample analyzed for specific gamma-emitting radioisotopes. The results are shown in table 5. In this sampling period, one sample was lost when its container burst, and three were lost because of equipment malfunction.

The gummed acetate that is used to collect heavy particle fallout is changed monthly. One sample was lost during this reporting period. The sample is ashed and counted for gross beta activity. The results are given in table 6.

Charcoal filters are collected and analyzed for radioiodine. The filter is counted in a single channel analyzer system. The data are shown in table 7, where the highest value reported is 0.06 percent MPC for ^{131}I. In this reporting period, one sample was not obtained because of adverse weather conditions, one was accidently destroyed, and two were lost due to equipment malfunction.

Figure 2

ATMOSPHERIC AND TERRESTRIAL MONITORING NETWORK



O—ENVIRONMENTAL MONITORING STATION

NOTE: THE FOLLOWING SAMPLES ARE COLLECTED FROM EACH STATION:

AIR PARTICULATES	RAINWATER
RADIOIODINE	SOIL
HEAVY PARTICLE FALLOUT	

Figure 3

LOCAL MONITORING STATIONS

BROWNS FERRY NUCLEAR PLANT

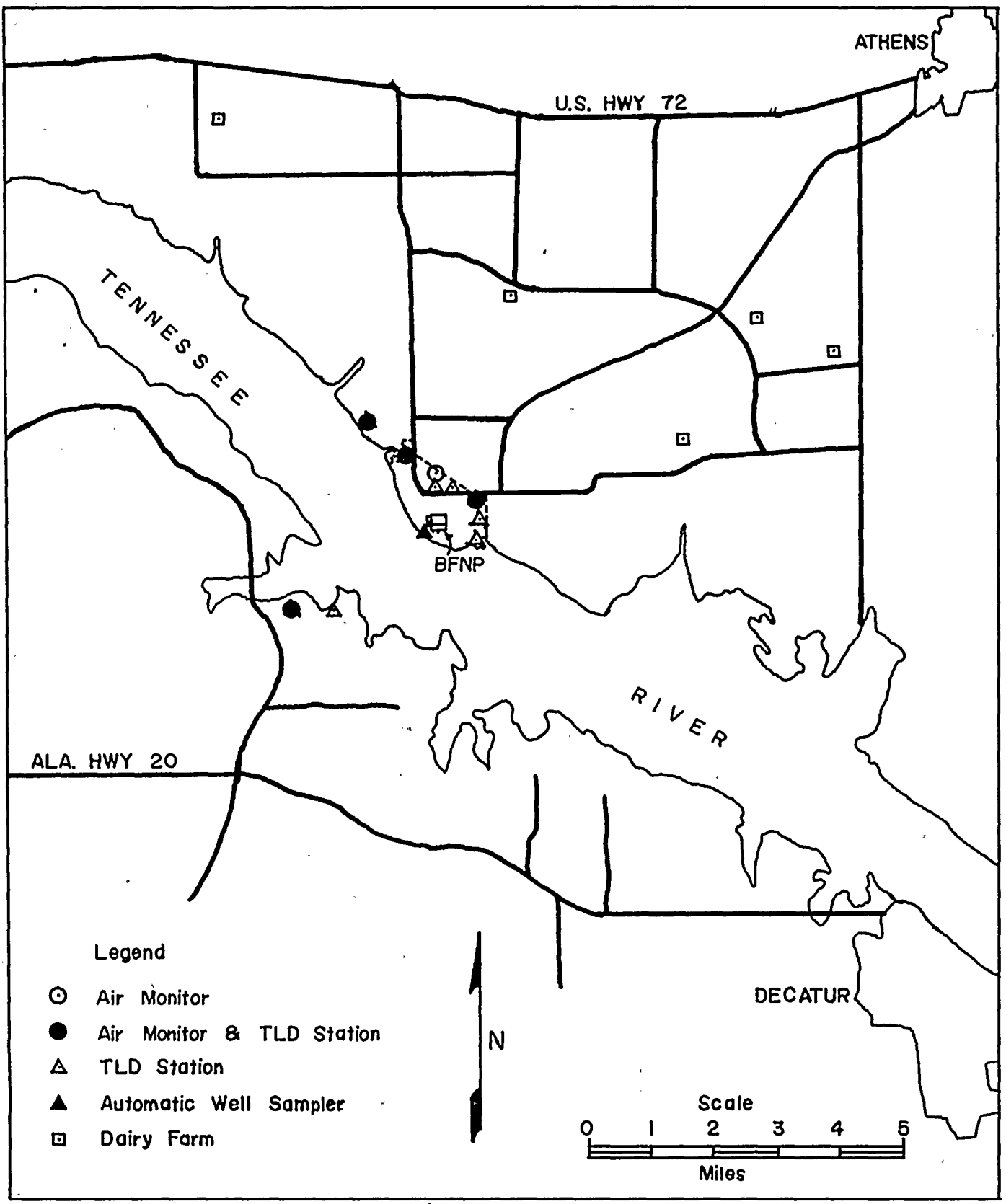


Table 2

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

A. Specific Analyses

NOMINAL LOWER LIMIT OF DETECTION (LLD)*

	Air Particulates pCi/m^3	Charcoal pCi/m^3	Fallout mCi/Km^2	Water pCi/l	Vegetation and grain pCi/g, dry	Soil and Sediment pCi/g, dry	Fish, clam flesh, plankton, pCi/g, dry	Clam shells pCi/g, dry	Foods, meat, poultry, pCi/Kgm, wet	Milk pCi/l
Total α					0.01				1.5	
Gross α	0.005		0.05	2.0	0.05	0.35	0.1	0.7		
Gross β	0.01			2.3	0.20	0.70	0.1	0.7	25	
^{3}H				330						
^{131}I		0.01								0.5
^{89}Sr	0.005			10	0.25	1.5	0.5	5.0	40	10
^{90}Sr	0.001			2	0.05	0.3	0.1	1.0	8	2

*All LLD values for isotopic separations are calculated by the method developed by Pasternack and Harley as described in HASL-300. Factors such as sample size, decay time, chemical yield, and counting efficiency may vary for a given sample; these variations may change the LLD value for the given sample. The assumption is made that all samples are analyzed within one week of the collection date.

Table 2

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

B. Gamma Analyses

NOMINAL LOWER LIMIT OF DETECTION (LLD)

	Air particulates pCi/m³		Water and milk pCi/l		Vegetation and grain pCi/g, dry		Soil and sediment pCi/g, dry		Fish pCi/g, dry		Clam flesh and plankton pCi/g, dry	Clam shells pCi/g, dry		Foods, tomatoes potatoes, etc.) pCi/Kgm, wet		Meat and poultry pCi/Kgm, wet	
	NaI*	Ge(Li)**	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)
^{141,144}Ce	0.03		30		0.55		0.35		0.35			0.35		38		90	
^{144}Ce		0.02		33		0.22		0.06		0.06	0.35		0.06		33		40
^{51}Cr	0.07	0.03	60	44	1.10	0.47	0.60	0.10	0.60	0.10	0.56	0.60	0.10	60	44	200	90
^{131}I	0.01	0.01	15	8	0.35	0.09	0.20	0.02	0.20	0.02	0.07	0.20	0.02	15	8	50	20
^{103,106}Ru	0.04		30		0.65		0.45		0.45			0.45		30		150	
^{106}Ru		0.03		40		0.51		0.11		0.11	0.74		0.11		40		90
^{134}Cs	0.01	0.02	10	26	0.20	0.33	0.12	0.08	0.12	0.08	0.48	0.12	0.08	10	26	40	50
^{137}Cs	0.01	0.01	10	5	0.20	0.06	0.12	0.02	0.12	0.02	0.08	0.12	0.02	10	5	40	15
^{95}Zr-Nb	0.01		10		0.20		0.12		0.12			0.12		10		40	
^{95}Zr		0.01		10		0.11		0.03		0.03	0.15		0.03		10		20
^{95}Nb		0.01		5		0.05		0.01		0.01	0.07		0.01		5		15
^{58}Co	0.02	0.01	15	5	0.23	0.05	0.20	0.01	0.20	0.01	0.07	0.20	0.01	15	5	55	15
^{54}Mn	0.02	0.01	10	5	0.20	0.05	0.15	0.01	0.15	0.01	0.08	0.15	0.01	10	5	40	15
^{65}Zn	0.02	0.01	15	9	0.25	0.11	0.23	0.02	0.23	0.02	0.17	0.23	0.02	15	9	70	20
^{60}Co	0.01	0.01	10	5	0.17	0.06	0.11	0.01	0.11	0.01	0.08	0.11	0.01	10	5	30	15
^{40}K	0.10		100		2.50		0.90		0.90			0.90		100		400	
^{140}Ba-La	0.02		15		0.68		0.15		0.15			0.15		15		50	
^{140}Ba		0.02		25		0.34		0.07		0.07	0.30		0.07		25		50
^{140}La		0.01		7		0.08		0.02		0.02	0.10		0.02		7		15

*The NaI(Tl) LLD values are calculated by the method developed by Pasternack and Harley as described in HASL-300 and Nucl. Instr. Methods 91, 533-40 (1971). These LLD values are expected to vary depending on the activities of the components in the samples. These figures do not represent the LLD values achievable on a given sample. Water is counted in a 3.5-L Marinelli beaker. Vegetation, fish, soil, and sediment are counted in a 1-pint container as dry weight. The average dry weight is 120 grams for vegetation and 400-500 grams for soil sediment and fish. Meat and poultry are counted in a 1-pint container as dry weight, then corrected to wet weight using an average moisture content of 70%. Average dry weight is 250 grams. Air particulates are counted in a well crystal. The counting system consists of a multichannel analyzer and either a 4" x 4" solid or 4" x 5" well NaI(Tl) crystal. The counting time is 4000 seconds. All calculations are performed by the least-squares computer program ALPHA-H. The assumption is made that all samples are analyzed within one week of the collection date.

**The Ge(Li) LLD values are calculated by the method developed by Pasternack and Harley as described in HASL-300. These LLD values are expected to vary depending on the activities of the components in the samples. These figures do not represent the LLD values achievable on given samples. Water is counted in either a 0.5-L or 3.5-L Marinelli beaker. Solid samples such as soil, sediment, and clam shells are counted in a 0.5-L Marinelli beaker as dry weight. The average dry weight is 400-500 grams. Air filters and very small volume samples are counted in petrie dishes centered on the detector endcap. The counting system consists of a ND-4420 multichannel analyzer and either a 8%, 14%, or 16% Ge(Li) detector. The counting time is normally 8 hours. All spectral analysis is performed using the software provided with the ND-4420. The assumption is made that all samples are analyzed within one week of the collection date.

Table 3

MAXIMUM PERMISSIBLE CONCENTRATIONS

FOR NONOCCUPATIONAL EXPOSURE

	MPC	
	In Water pCi/l	In Air pCi/m^3
Alpha	30	
Nonvolatile beta	3,000	100
Tritium	3,000,000	200,000
^{137}Cs	20,000	500
$^{103,106}Ru$	10,000	200
^{144}Ce	10,000	200
^{95}Zr-^{95}Nb	60,000	1,000
^{140}Ba-^{140}La	20,000	1,000
^{131}I	300	100
^{65}Zn	100,000	2,000
^{54}Mn	100,000	1,000
^{60}Co	30,000	300
^{89}Sr	3,000	300
^{90}Sr	300	30
^{51}Cr	2,000,000	80,000
^{134}Cs	9,000	400
^{58}Co	90,000	2,000

TABLE 4

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN AIR

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2

LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
AIR FILTER PCI/CUBIC METER	GROSS ALPHA 43	0.005	0 VALUES <LLD			0.01(7/ 43) 0.01- 0.01	
	GROSS BETA 568	0.010	0.14(465/ 466) 0.02- 0.70	PM-3BF DECATUR A 8.2 MILES SSE	0.15(52/ 52) 0.02- 0.45	0.13(102/102) 0.02- 0.51	
	GAMMA (NAI) 130						
	CE-141,144	0.030	0.06(56/ 106) 0.03- 0.13	PM-2BF ATHENS A 10.9 MILES NE	0.08(6/ 11) 0.03- 0.13	0.06(14/ 24) 0.03- 0.09	
	BA-140,LA-140	0.020	0.03(16/ 106) 0.02- 0.05	PM-2BF ATHENS A 10.9 MILES NE	0.04(1/ 11) 0.04- 0.04	0.03(7/ 24) 0.02- 0.05	
	RU-103,106	0.040	0.05(18/ 106) 0.04- 0.07	LM-3BF NORTHEAST 1.0 MILES NE	0.07(1/ 12) 0.07- 0.07	0.05(5/ 24) 0.04- 0.06	
	ZR-95,NB-95	0.010	0.05(82/ 106) 0.01- 0.13	PM-2BF ATHENS A 10.9 MILES NE	0.06(8/ 11) 0.03- 0.11	0.05(18/ 24) 0.01- 0.13	
	CO-58	0.020	0.02(1/ 106) 0.02- 0.02	LM-1BF NORTHWEST 1.0 MILES N	0.02(1/ 12) 0.02- 0.02	0.03(1/ 24) 0.03- 0.03	
	CR-51	0.070	0.07(1/ 106) 0.07- 0.07	LM-3BF NORTHEAST 1.0 MILES NE	0.07(1/ 12) 0.07- 0.07	0.07(1/ 24) 0.07- 0.07	
	I-131	0.010	0.02(28/ 106) 0.01- 0.12	LM-3BF NORTHEAST 1.0 MILES NE	0.05(4/ 12) 0.02- 0.12	0.02(12/ 24) 0.01- 0.04	
	GAMMA (GELI) 2		2 VALUES <LLD			0 VALUES <LLD	
	SR-89 44	0.005	ANALYSIS PERFORMED -- ALL BELOW LLD 0.01(26/ 36) 0.01- 0.02	PM-3BF DECATUR A 8.2 MILES SSE	0.01(2/ 4) 0.01- 0.02	0.02(6/ 8) 0.01- 0.08	
	SR-90 44	0.001	0.00(9/ 36) 0.00- 0.00	PM-2BF ATHENS A 10.9 MILES NE	0.00(2/ 4) 0.00- 0.00	8 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 5

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN RAIN

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RM-78-3-BF2

LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b]	RANGE[b]	CONTROL LOCATIONS MEAN (F)[b]	RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
RAIN PCI/L	GAMMA (NAI)								
	^{104}CE-141,144	30.000	37.26(1/ 86)	PM-4BF COURTLAND A	37.26(1/ 11)		30.77(1/ 18)		
			37.26- 37.26	10.5 MILES WSW	37.26- 37.26		30.77- 30.77		
	BA-140,LA-140	15.000	22.31(15/ 86)	LM-1BF NORTHWEST	33.27(1/ 9)		20.47(3/ 18)		
			15.03- 46.27	1.0 MILES N	33.27- 33.27		17.28- 23.33		
	CO-60	10.000	25.60(1/ 86)	PM-2BF ATHENS A	25.60(1/ 10)		18 VALUES <LLD		
			25.60- 25.60	10.9 MILES NE	25.60- 25.60				
	RU-103,106	30.000	37.53(17/ 86)	LM-4BF LM-4BF	49.90(1/ 9)		49.13(3/ 18)		
			30.19- 49.98	1.7 MILES NNW	49.90- 49.90		38.02- 57.54		
	CS-134	10.000	10.71(1/ 86)	LM-1BF NORTHWEST	10.71(1/ 9)		10.92(2/ 18)		
			10.71- 10.71	1.0 MILES N	10.71- 10.71		10.58- 11.25		
	ZR-95,NB-95	10.000	16.03(27/ 86)	PM-2BF ATHENS A	20.11(5/ 10)		15.11(6/ 18)		
			10.16- 30.50	10.9 MILES NE	12.04- 28.42		10.15- 32.88		
	I-131	15.000	18.70(5/ 86)	PM-1BF ROGERSV'LE A	19.65(1/ 8)		24.64(3/ 18)		
			16.01- 20.82	13.8 MILES NW	19.65- 19.65		17.62- 33.70		
	GAMMA (GELI)								
	^{24}CE-141	NOT ESTAB	12.01(7/ 19)	LM-1BF NORTHWEST	16.68(1/ 2)		22.68(2/ 5)		
			6.02- 16.68	1.0 MILES N	16.68- 16.68		15.55- 29.80		
	BA-140	25.000	66.28(8/ 19)	LM-5BF DAVIS FARM	109.10(1/ 2)		92.08(2/ 5)		
			26.26- 109.10	2.5 MILES WSW	109.10- 109.10		61.66- 122.50		
	LA-140	7.000	54.48(10/ 19)	LM-3BF NORTHEAST	95.25(1/ 1)		67.75(2/ 5)		
			29.61- 95.25	1.0 MILES NE	95.25- 95.25		54.22- 81.27		
	RU-103	20.000	26.81(6/ 19)	PM-4BF COURTLAND A	32.60(1/ 1)		37.20(2/ 5)		
			21.92- 32.60	10.5 MILES WSW	32.60- 32.60		26.97- 47.43		
	ZR-95	10.000	21.54(4/ 19)	PM-1BF ROGERSV'LE A	36.52(1/ 4)		62.53(1/ 5)		
			12.16- 36.52	13.8 MILES NW	36.52- 36.52		62.53- 62.53		
	NB-95	5.000	19 VALUES <LLD				25.15(2/ 5)		
							10.72- 39.57		
	I-131	8.000	50.85(9/ 19)	PM-4BF COURTLAND A	83.14(1/ 1)		68.60(2/ 5)		
			35.20- 83.14	10.5 MILES WSW	83.14- 83.14		30.00- 107.20		
	NP-239	NOT ESTAB	81.34(9/ 19)	PM-4BF COURTLAND A	121.70(1/ 1)		112.63(2/ 5)		
			35.97- 121.70	10.5 MILES WSW	121.70- 121.70		56.95- 168.30		
	I-132	NOT ESTAB	94.75(9/ 19)	LM-1BF NORTHWEST	204.90(1/ 2)		118.69(2/ 5)		
			49.80- 204.90	1.0 MILES N	204.90- 204.90		68.87- 168.50		
	TE-132	NOT ESTAB	38.14(9/ 19)	LM-1BF NORTHWEST	50.91(1/ 2)		51.21(2/ 5)		
			25.44- 50.91	1.0 MILES N	50.91- 50.91		28.28- 74.14		
	TC-99M	NOT ESTAB	42.63(9/ 19)	LM-1BF NORTHWEST	74.51(1/ 2)		44.90(2/ 5)		
			24.04- 74.51	1.0 MILES N	74.51- 74.51		24.91- 64.89		
	MO-99	NOT ESTAB	45.93(1/ 19)	PM-4BF COURTLAND A	45.93(1/ 1)		5 VALUES <LLD		
			45.93- 45.93	10.5 MILES WSW	45.93- 45.93				

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 6

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN HEAVY PARTICLE FALLOUT

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
GUM PAPER MCI/SQ.KM	GROSS BETA	0.050	3.34(107/ 107)	PH-4BF COURTLAND A	5.28(12/ 12)	4.91(24/ 24)	
	131		0.11- 41.81	10.5 MILES WSW	0.19- 41.81	0.10- 59.02	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 7

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN CHARCOAL FILTERS

NAME OF FACILITY BROWNS FERRY - DOCKET NO. RH-78-3-8F2
LOCATION OF FACILITY LIMESTONE ALABAMA REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
CHARCOAL FILTERS							
PCI/CUBIC METER	IODINE - AIR	0.010	0.02(67/ 466)	PH-1BF ROGERSV'LE A	0.03(6/ 52)	0.03(13/102)	
	568		0.01- 0.06	13.8 MILES NW	0.01- 0.06	0.01- 0.06	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Terrestrial Monitoring

Milk

Milk is collected from at least four farms within a 10-mile radius of the plant (see figure 3), and from four control farms. Raw milk is analyzed weekly for ^{131}I, and monthly for gamma-emitting isotopes and for radiostrontium. The average results for each farm are shown in table 8.

Cow censuses were conducted in May and September 1977. It was determined that there are no dairy farms nearer the plant than the nearest farm being sampled.

Vegetation

So that any relationship between fallout on pastureland and the presence of radionuclides in milk might be seen, pasturage is sampled quarterly at the farms from which milk is collected and analyzed for gamma-emitting radionuclides. Table 9 gives the results obtained from the laboratory analyses of these samples.

Soil

Soil samples are collected annually near each monitoring station to provide an indication of a long-term buildup of radioactivity in the environment. These samples are analyzed for gamma-emitting radionuclides and strontium 89 and 90. The results are given in table 10.

Ground Water

An automatic sequential-type sampling device has been installed on a well down-gradient from Browns Ferry Nuclear Plant. A composite sample from this well is analyzed for gamma-emitting radionuclides monthly and composited quarterly for determination of tritium. A grab sample is also taken from a control well up-gradient from the plant. During this reporting period, samples were not taken from the control location for four separate sampling periods. The results of the analysis of well water are shown in table 11.

Public Water

Potable water supplies taken from the Tennessee River in the vicinity of Browns Ferry Nuclear Plant are sampled and analyzed for gross beta and gamma-emitting radionculides, and composited quarterly for tritium analysis. Scheduled strontium analyses were not performed during this reporting period. The first potable water supply downstream from the plant is equipped with an automatic sampler with composite samples collected weekly.

Two additional supplies downstream and one public water supply upstream are collected by monthly grab sampling. Table 12 indicates the results from the analysis of potable water samples. The maximum beta concentration is 0.57 percent MPC.

Environmental Gamma Radiation Levels

Thermoluminescent dosimeters (TLD's) are placed at nine stations around the plant near the plant boundary and at the perimeter and remote air monitors to determine the gamma exposure rates at these locations. The TLD's are changed every 3 months. The quarterly gamma radiation levels determined from these TLD's are given in table 13.

Poultry and Food Crops

Food crops, grains, and poultry raised in the vicinity of Browns Ferry Nuclear Plant and at control locations are sampled as they become available during the growing season, and analyzed for gamma-emitting radionuclides. During this sampling period samples of tomatoes, potatoes, green beans, peaches, cabbage, soy beans, and poultry were collected and analyzed for specific gamma-emitting radionuclides. The results are given in tables 14, 15, and 16. Corn was not sampled during this reporting period, and no sample of tomatoes or peaches was taken from a control location.

TABLE 8

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN MILK

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
MILK							
PCI/L	IODINE-MILK	0.500	11.07(26/ 259)	FARM BI	17.54(7/ 51)	18.45(24/199)	
	458		0.71- 67.95	4.5 MILES ENE	0.94- 67.95	0.63- 117.18	
	GAMMA (GELI)						
	2						
	CS-137	5.000	1 VALUES <LLD			5.29(1/ 1)	
						5.29- 5.29	
	MILK SCAN						
	104						
	BA-140,LA-140	15.000	59 VALUES <LLD			24.97(1/ 45)	
						24.97- 24.97	
	CS-137	10.000	11.89(5/ 59)	FARM L	11.89(3/ 12)	12.20(3/ 45)	
			10.56- 13.22	5.75 MILES ENE	11.50- 12.49	10.38- 14.78	
	I-131	15.000	51.23(2/ 59)	FARM BI	61.97(1/ 12)	60.91(2/ 45)	
			40.49- 61.97	4.5 MILES ENE	61.97- 61.97	22.71- 99.11	
	SR-89	10.000	22.74(3/ 60)	FARM BI	38.03(1/ 12)	39.60(3/ 46)	
	106		10.44- 38.03	4.5 MILES ENE	38.03- 38.03	15.09- 78.58	
	SR-90	2.000	4.74(56/ 60)	FARM B	7.53(11/ 12)	5.11(39/ 46)	
	106		2.32- 9.74	7.0 MILES NNW	4.89- 9.74	2.02- 15.05	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 9

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN VEGETATION

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b]	RANGE[b]	CONTROL LOCATIONS[b] MEAN (F)	RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
VEGETATION PCI/GM (DRY WEIGHT)	GAMMA (NAI) 21								
	CE-141,144	0.550	1.45(5/ 10)	FARM L	2.29(1/ 2)		3.06(9/ 11)		
			0.61- 2.29	5.75 MILES ENE	2.29-	2.29	0.88-	8.33	
	CO-60	0.170	10 VALUES <LLD				0.19(1/ 11)		
							0.19-	0.19	
	RU-103,106	0.650	10 VALUES <LLD				1.21(6/ 11)		
							0.84-	2.40	
	CS-137	0.200	10 VALUES <LLD				0.21(2/ 11)		
							0.20-	0.21	
	ZR-95,NB-95	0.200	0.95(10/ 10)	FARM B	1.31(2/ 2)		2.36(11/ 11)		
			0.54- 1.94	7.0 MILES NNW	1.05-	1.57	0.65-	6.96	
	ZN-65	0.250	10 VALUES <LLD				0.35(1/ 11)		
							0.35-	0.35	
	MN-54	0.200	10 VALUES <LLD				0.25(1/ 11)		
							0.25-	0.25	
	GAMMA (GELI) 15								
	CE-141	0.200	7.50(9/ 10)	FARM T	12.26(1/ 2)		19.52(5/ 5)		
			0.44- 14.53	7.0 MILES ENE	12.26-	12.26	0.40-	35.40	
	CE-144	0.220	3.32(8/ 10)	FARM BI	4.93(1/ 2)		3.74(3/ 5)		
			1.98- 4.93	4.5 MILES ENE	4.93-	4.93	2.15-	5.39	
	BA-140	0.340	19.43(5/ 10)	FARM B	24.00(1/ 2)		43.51(4/ 5)		
			9.02- 24.00	7.0 MILES NNW	24.00-	24.00	27.24-	59.43	
	LA-140	0.080	20.12(4/ 10)	FARM B	26.73(1/ 2)		46.08(4/ 5)		
			13.29- 26.73	7.0 MILES NNW	26.73-	26.73	28.38-	66.11	
	RU-103	0.200	3.42(8/ 10)	FARM B	7.35(1/ 2)		7.55(3/ 5)		
			0.23- 7.35	7.0 MILES NNW	7.35-	7.35	6.18-	8.38	
	RU-106	0.510	1.05(1/ 10)	FARM H	1.05(1/ 2)		5 VALUES <LLD		
			1.05- 1.05	3.75 MILES N	1.05-	1.05			
	CS-137	0.060	0.24(5/ 10)	FARM L	0.38(1/ 2)		0.25(1/ 5)		
			0.15- 0.38	5.75 MILES ENE	0.38-	0.38	0.25-	0.25	
	ZR-95	0.110	5.07(9/ 10)	FARM T	8.98(1/ 2)		13.56(5/ 5)		
			0.91- 8.98	7.0 MILES ENE	8.98-	8.98	0.93-	23.28	
	NB-95	0.050	3.07(10/ 10)	FARM L	3.45(2/ 2)		5.78(5/ 5)		
			0.49- 4.60	5.75 MILES ENE	3.31-	3.59	2.16-	8.70	
	CO-58	0.050	0.07(1/ 10)	FARM H	0.07(1/ 2)		5 VALUES <LLD		
			0.07- 0.07	3.75 MILES N	0.07-	0.07			
	I-131	0.090	4.60(5/ 10)	FARM B	5.54(1/ 2)		9.91(4/ 5)		
			2.89- 5.54	7.0 MILES NNW	5.54-	5.54	7.62-	13.41	
	I-133	NOT ESTAB	0.79(2/ 10)	FARM L	0.89(1/ 2)		1.47(2/ 5)		
			0.68- 0.89	5.75 MILES ENE	0.89-	0.89	1.38-	1.57	
	BI-214	0.100	0.62(6/ 10)	FARM B	1.32(2/ 2)		1.75(4/ 5)		
			0.16- 2.45	7.0 MILES NNW	0.18-	2.45	0.55-	3.41	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 9 (CONTINUED)

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN VEGETATION

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
	TL-208	NOT ESTAB	10 VALUES <LLD			0.15(1/ 5) 0.15- 0.15	
	I-132	NOT ESTAB	1.91(2/ 10) 1.76- 2.05	FARM B 7.0 MILES NNW	2.05(1/ 2) 2.05- 2.05	2.43(2/ 5) 1.83- 3.04	
	TE-132	NOT ESTAB	1.61(4/ 10) 1.27- 1.99	FARM B 7.0 MILES NNW	1.99(1/ 2) 1.99- 1.99	3.11(4/ 5) 2.24- 4.35	
	TC-99M	NOT ESTAB	1.64(4/ 10) 1.14- 2.46	FARM B 7.0 MILES NNW	2.46(1/ 2) 2.46- 2.46	2.43(4/ 5) 1.99- 2.76	
	MO-99	NOT ESTAB	10 VALUES <LLD			55.99(1/ 5) 55.99- 55.99	
	AC-228	NOT ESTAB	10 VALUES <LLD			0.29(1/ 5) 0.29- 0.29	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 10

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN SOIL

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2

LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS[b] MEAN (F) RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
SOIL PCI/GM (DRY WEIGHT)	GAMMA (GELI) 11						
	CE-144	0.060	0.10(2/ 9)	PM-2BF ATHENS A	0.13(1/ 1)	0.30(1/ 2)	
			0.07- 0.13	10.9 MILES NE	0.13- 0.13	0.30- 0.30	
	RU-103	NOT ESTAB	9 VALUES <LLD			0.03(1/ 2)	
						0.03- 0.03	
	CS-137	0.020	0.58(9/ 9)	PM-2BF ATHENS A	1.08(1/ 1)	1.20(2/ 2)	
			0.27- 1.08	10.9 MILES NE	1.08- 1.08	1.07- 1.33	
	ZR-95	0.030	0.10(6/ 9)	PM-4BF COURTLAND A	0.11(1/ 1)	0.07(1/ 2)	
			0.06- 0.11	10.5 MILES WSW	0.11- 0.11	0.07- 0.07	
	NB-95	0.010	0.15(9/ 9)	PM-2BF ATHENS A	0.20(1/ 1)	0.15(2/ 2)	
			0.10- 0.20	10.9 MILES NE	0.20- 0.20	0.14- 0.15	
	BI-214	0.020	0.98(9/ 9)	LM-4BF LM-4BF	1.25(1/ 1)	0.99(2/ 2)	
			0.56- 1.25	1.7 MILES NNW	1.25- 1.25	0.85- 1.13	
	BI-212	0.100	1.23(9/ 9)	PM-3BF DECATUR A	1.71(1/ 1)	0.99(2/ 2)	
			0.71- 1.71	8.2 MILES SSE	1.71- 1.71	0.87- 1.10	
	RA-223	NOT ESTAB	0.40(1/ 9)	LM-4BF LM-4BF	0.40(1/ 1)	2 VALUES <LLD	
			0.40- 0.40	1.7 MILES NNW	0.40- 0.40		
	TL-208	0.020	0.37(9/ 9)	PM-3BF DECATUR A	0.48(1/ 1)	0.35(2/ 2)	
			0.19- 0.48	8.2 MILES SSE	0.48- 0.48	0.32- 0.38	
	AC-228	0.060	1.34(9/ 9)	PM-3BF DECATUR A	1.75(1/ 1)	1.29(2/ 2)	
			0.79- 1.75	8.2 MILES SSE	1.75- 1.75	1.21- 1.37	
	PA-228	NOT ESTAB	1.07(5/ 9)	LM-2BF NORTH	5.04(1/ 1)	0.06(2/ 2)	
			0.05- 5.04	0.9 MILES NNE	5.04- 5.04	0.06- 0.07	
	SR-89	1.500	9 VALUES <LLD			2 VALUES <LLD	
	11		ANALYSIS PERFORMED -- ALL BELOW LLD				
	SR-90	0.300	0.43(3/ 9)	PM-1BF ROGERSVILLE A	0.62(1/ 1)	0.34(2/ 2)	
	11		0.31- 0.62	13.8 MILES NW	0.62- 0.62	0.32- 0.35	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 11

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN WELL WATER

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION [a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F) [b] RANGE [b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) [b] RANGE [b]	CONTROL LOCATIONS MEAN (F) [b] RANGE [b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
WELL WATER							
PCI/L	GROSS BETA	2.300	6.62(1/ 1)	BROWNS FERRY	6.62(1/ 1)	0 VALUES <LLD	
	1		6.62- 6.62	WELL NO. 6	6.62- 6.62		
	GAMMA (NAI)						
	19						
	CS-134	10.000	13.21(1/ 12)	BROWNS FERRY	13.21(1/ 12)	7 VALUES <LLD	
			13.21- 13.21	WELL NO. 6	13.21- 13.21		
	ZN-65	15.000	15.08(1/ 12)	BROWNS FERRY	15.08(1/ 12)	7 VALUES <LLD	
			15.08- 15.08	WELL NO. 6	15.08- 15.08		
	I-131	15.000	21.04(1/ 12)	BROWNS FERRY	21.04(1/ 12)	7 VALUES <LLD	
			21.04- 21.04	WELL NO. 6	21.04- 21.04		
	TRITIUM	330.000	414.00(1/ 4)	BROWNS FERRY	414.00(1/ 4)	4 VALUES <LLD	
	8		414.00- 414.00	WELL NO. 6	414.00- 414.00		

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 12

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN PUBLIC WATER SUPPLY

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BE2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
PUBLIC WATER SUPPLY							
PCI/L	GROSS BETA	2.300	5.39(61/ 73)	CHAMPION PAPER CO AL	6.22(43/ 49)	3.88(9/ 12)	
	85		2.32- 17.20	TRM 282.6	2.32- 17.20	2.36- 7.99	
	GAMMA (NAI)						
	83						
	RU-103,106	30.000	71 VALUES <LLD			31.69(1/ 12)	
						31.69- 31.69	
	CS-134	10.000	11.67(2/ 71)	WHEELER DAM AL	13.30(1/ 12)	12 VALUES <LLD	
			10.03- 13.30	TRM 274.9	13.30- 13.30		
	CS-137	10.000	10.56(2/ 71)	SHEFFIELD AL	10.65(1/ 12)	12 VALUES <LLD	
			10.47- 10.65	TRM 254.3	10.65- 10.65		
	ZR-95,NB-95	10.000	10.90(1/ 71)	CHAMPION PAPER CO AL	10.90(1/ 47)	12 VALUES <LLD	
			10.90- 10.90	TRM 282.6	10.90- 10.90		
	CR-51	60.000	60.97(1/ 71)	CHAMPION PAPER CO AL	60.97(1/ 47)	12 VALUES <LLD	
			60.97- 60.97	TRM 282.6	60.97- 60.97		
	ZN-65	15.000	15.57(1/ 71)	SHEFFIELD AL	15.57(1/ 12)	12 VALUES <LLD	
			15.57- 15.57	TRM 254.3	15.57- 15.57		
	I-131	15.000	71 VALUES <LLD			20.36(1/ 12)	
						20.36- 20.36	
	GAMMA (GELI)						
	1						
	BI-214	NOT ESTAB	17.94(1/ 1)	CHAMPION PAPER CO AL	17.94(1/ 1)	0 VALUES <LLD	
			17.94- 17.94	TRM 282.6	17.94- 17.94		
	TRITIUM	330.000	424.00(2/ 12)	WHEELER DAM AL	501.00(1/ 4)	4 VALUES <LLD	
	16		347.00- 501.00	TRM 274.9	501.00- 501.00		

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Table 13

ENVIRONMENTAL GAMMA RADIATION LEVELS

Quarter	Location	Environmental Gamma Radiation Levels mR/Hour	mR/Quarter
January-March 1977	On-Site (9)*		
	Maximum	0.009	20.8
	Minimum	0.006	12.9
	Average**	0.008 ± 0.002	18.0 ± 5.2
	Off-Site (6)		
	Maximum	0.011	23.5
	Minimum	0.005	10.0
	Average	0.007 ± 0.004	15.5 ± 9.2
April-June 1977	On-Site (9)		
	Maximum	0.010	21.4
	Minimum	0.006	13.6
	Average	0.008 ± 0.002	17.5 ± 5.2
	Off-Site (6)		
	Maximum	0.011	24.2
	Minimum	0.006	13.2
	Average	0.007 ± 0.004	16.4 ± 8.2
July-September 1977	On-Site (7)		
	Maximum	0.010	21.9
	Minimum	0.006	12.6
	Average	0.008 ± 0.003	18.0 ± 6.4
	Off-Site (6)		
	Maximum	0.010	22.8
	Minimum	0.007	15.2
	Average	0.008 ± 0.002	18.4 ± 5.0
October-December 1977	On-Site (9)		
	Maximum	0.016	35.0
	Minimum	0.005	11.6
	Average	0.010 ± 0.006	21.2 ± 12.2
	Off-Site (6)		
	Maximum	0.014	31.6
	Minimum	0.006	13.5
	Average	0.009 ± 0.006	20.4 ± 12.8

*Number of stations (three TLD's at each station)
**All averages reported ±2σ

TABLE 14

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN FOOD CROPS

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
CABBAGE PCI/KGM (WET WEIGHT)	GAMMA (NAI) 2		1 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	
GREEN BEANS PCI/KGM (WET WEIGHT)	GAMMA (NAI) 3		2 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	
PEACHES PCI/KGM (WET WEIGHT)	GAMMA (NAI) 1		1 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			0 VALUES <LLD	
POTATOES PCI/KGM (WET WEIGHT)	GAMMA (NAI) 2		1 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	
TOMATOES PCI/KGM (WET WEIGHT)	GAMMA (NAI) 1		2 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			0 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 15

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN GRAIN

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-8E2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
SOYBEAN							
PCI/GM (DRY WEIGHT)	GAMMA (NAI)						
	3		2 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 16.

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN POULTRY

NAME OF FACILITY BROWNS FERRY DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
POULTRY							
PCI/KGM (WET WEIGHT)	GAMMA (NAI)						
	2		1 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Reservoir Monitoring

Samples are collected from the Tennessee River as detailed in table 17. Samples collected for radiological analysis include plankton from three of these cross sections and bottom fauna and sediment from four cross sections. The locations of these cross sections are shown on the accompanying map (figure 4) and conform to sediment ranges established and surveyed by the Data Services Branch, TVA.

Water

Water samples are collected automatically by sequential type sampling devices at three cross sections and composite samples analyzed monthly for gamma-emitting radionuclides. Further composites are made quarterly for strontium and tritium analyses. Sampling locations are shown in table 17. One sample was not obtained when the sampling equipment was damaged by severe weather. Grab samples were also collected monthly from the vicinity of the plant discharge to the Tennessee River, and at a point on the Elk River. Results are displayed in table 18.

Fish

Radiological monitoring for fish is accomplished by analysis of composite samples of adult fish taken from each of three contiguous reservoirs--Wilson, Wheeler, and Guntersville. No permanent sampling stations have been established within each reservoir; this reflects the movement of fish species within reservoirs as determined by TVA data from the Browns Ferry Nuclear Plant preoperational monitoring program. Two species, white crappie and smallmouth buffalo, are collected representing both commercial and game species. Sufficient fish are collected in each reservoir to yield 250 to 300 grams oven-dry weight for analytical purposes. All samples are collected semiannually and analyzed for gamma-emitting radionuclides. The composite samples contain approximately the same quantity of flesh from each fish. For each composite a subsample of material is drawn for counting. Results are given in tables 19, 20, and 21.

Plankton

As indicated in table 17, net plankton (all phytoplankton and zooplankton caught with a 100 μ mesh net) is collected for radiological analyses at each of three stations by vertical tows with a 1/2-meter net. At least 50 grams (wet weight) of material is necessary for analytical

accuracy. Samples are collected semiannually and analyzed for gross beta activity, and when quantities are sufficient, for gamma activity and ^{89}Sr and ^{90}Sr content. Results are shown in table 22.

Sediment

Sediment samples are collected from Ponar dredge hauls made for bottom fauna. Gamma radioactivity and ^{89}Sr and ^{90}Sr content are determined semiannually in composite samples collected from each of four stations. Locations of these stations are shown in table 17. Results are shown in table 23.

Bottom Fauna

The flesh and shells of Asiatic clams collected semiannually from the cross sections at four stations (table 17) are analyzed for gamma-emitting radionuclides. Levels of ^{89}Sr and ^{90}Sr are determined on the shells, and on the flesh when sufficient amounts were available. A 50-gram (wet weight) sample provides sufficient activity for counting. Results are given in tables 24 and 25.

Table 17

SAMPLING SCHEDULE - RESERVOIR MONITORING

River/river mile	Biological samples (collected semiannually)				Water samples (collected monthly)
	Zooplankton, chlorophyll, phytoplankton	Benthic fauna	Sediment	Fish[a]	
Tennessee 277.98	X	X	X		
Tennessee 285.2					b
Tennessee 288.78		X	X		
Tennessee 291.76	X				
Tennessee 293.5					b
Tennessee 293.70 (discharge area)		X	X		c
Tennessee 305.0					b
Tennessee 307.52	X	X	X		
Elk 20.5					c

a. Gill net and/or electroshocker will be used for collection. Samples of fish are collected from Guntersville, Wheeler, and Wilson Reservoirs.
b. Automatic sampler.
c. Grab sample.

Figure 4

RESERVOIR MONITORING NETWORK

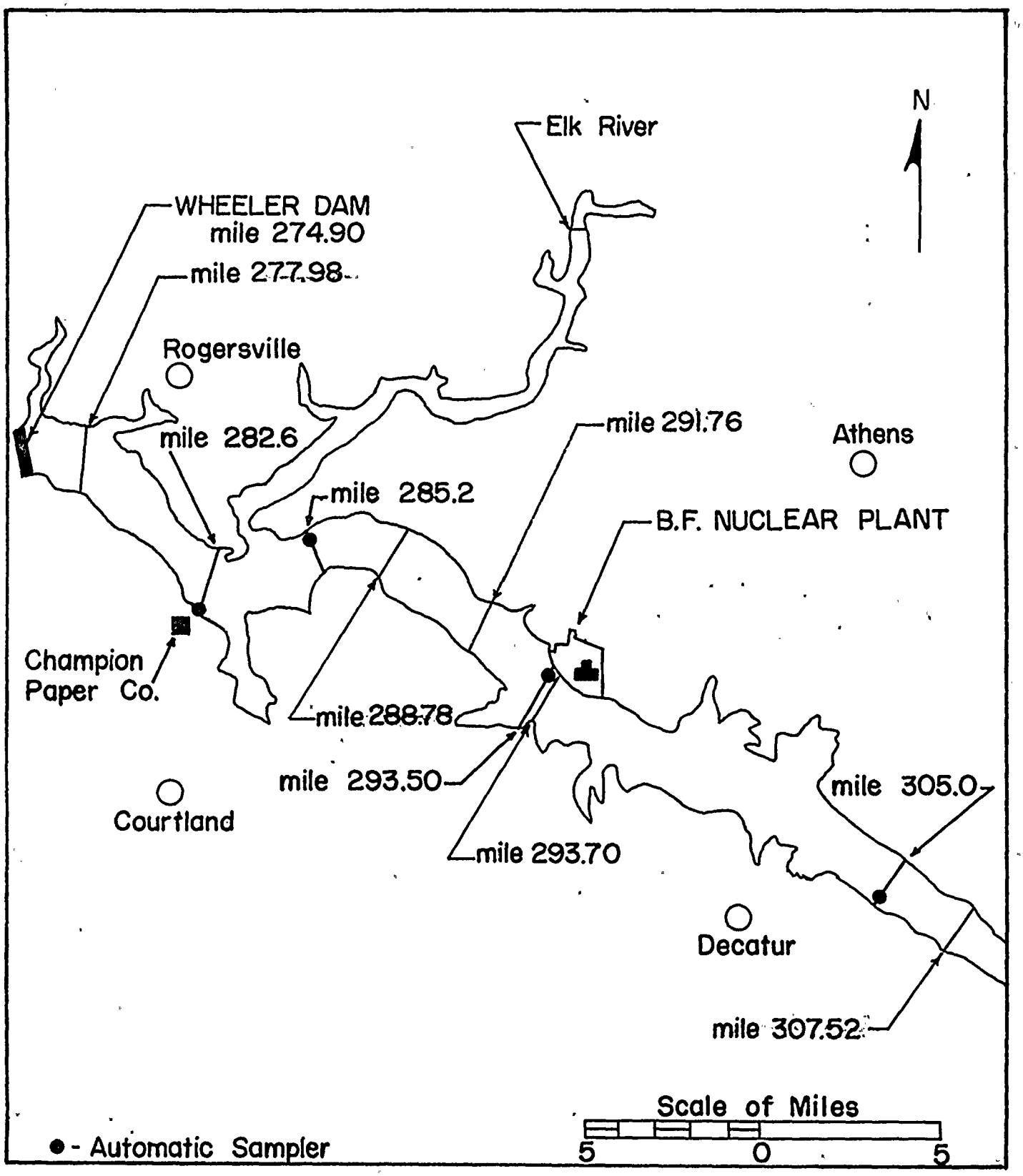


TABLE 18

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN RESERVOIR WATER (TOTAL)

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
RESERVOIR WATER							
PCI/L	GROSS ALPHA	2.000	2 VALUES <LLD			0 VALUES <LLD	
	2		ANALYSIS PERFORMED -- ALL BELOW LLD				
	GROSS BETA	2.300	2.69(4/ 4)	TRM 293.7	2.88(2/ 2)	3.41(1/ 2)	
	6		2.30- 3.46		2.30- 3.46	3.41- 3.41	
	TOTAL ALPHA	0.400	2 VALUES <LLD			0.44(1/ 2)	
	4					0.44- 0.44	
	GAMMA (NAI)						
	53						
	CE-141,144	30.000	33.28(1/ 31)	TRM 293.5	33.28(1/ 10)	22 VALUES <LLD	
			33.28- 33.28		33.28- 33.28		
	BA-140,LA-140	15.000	20.41(1/ 31)	TRM 293.5	20.41(1/ 10)	22 VALUES <LLD	
			20.41- 20.41		20.41- 20.41		
	CS-134	10.000	12.24(1/ 31)	TRM 285.2	12.24(1/ 10)	22 VALUES <LLD	
			12.24- 12.24		12.24- 12.24		
	CS-137	10.000	10.34(1/ 31)	TRM 293.5	10.34(1/ 10)	22 VALUES <LLD	
			10.34- 10.34		10.34- 10.34		
	CR-51	60.000	31 VALUES <LLD			72.82(1/ 22)	
						72.82- 72.82	
	GAMMA (GELI)						
	6						
			5 VALUES <LLD			1 VALUES <LLD	
			ANALYSIS PERFORMED -- ALL BELOW LLD				
	SR-89	10.000	10 VALUES <LLD			6 VALUES <LLD	
	16		ANALYSIS PERFORMED -- ALL BELOW LLD				
	SR-90	2.000	10 VALUES <LLD			6 VALUES <LLD	
	16		ANALYSIS PERFORMED -- ALL BELOW LLD				
	TRITIUM	330.000	443.00(5/ 20)	TRM 293.7	479.67(3/ 12)	16 VALUES <LLD	
	36		333.00- 663.00		367.00- 663.00		

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 19

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN FISH (WHITE CRAPPIE, FLESH)

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
WHITE CRAPPIE (FL) PCI/GM (DRY WEIGHT)	GAMMA (NAI)						
	^{6}BA-140,LA-140	0.150	0.16(2/ 4) 0.16- 0.17	WHEELER RESERVOIR IRM 274.9	0.17(1/ 2) 0.17- 0.17	0.34(1/ 2) 0.34- 0.34	
	CS-137	0.120	0.15(2/ 4) 0.15- 0.15	WILSON RESERVOIR IRM 259.4	0.15(1/ 2) 0.15- 0.15	0.31(1/ 2) 0.31- 0.31	
	CR-51	0.600	4 VALUES <LLD			0.79(1/ 2) 0.79- 0.79	
	I-131	0.200	0.48(2/ 4) 0.40- 0.55	WHEELER RESERVOIR IRM 274.9	0.55(1/ 2) 0.55- 0.55	0.67(2/ 2) 0.61- 0.74	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 20

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN FISH (SMALLMOUTH BUFFALO, FLESH)

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
SM.MOUTH BUFF (FL) PCI/GM (DRY WEIGHT)	GAMMA (NAI) 6						
	BA-140,LA-140	0.150	0.30(1/ 4)	WILSON RESERVOIR	0.30(1/ 2)	0.20(1/ 2)	
			0.30- 0.30	TRM 259.4	0.30- 0.30	0.20- 0.20	
	CS-137	0.120	4 VALUES <LLD			0.13(1/ 2)	
						0.13- 0.13	
	CR-51	0.600	0.72(1/ 4)	WILSON RESERVOIR	0.72(1/ 2)	0.81(1/ 2)	
			0.72- 0.72	TRM 259.4	0.72- 0.72	0.81- 0.81	
	I-131	0.200	0.46(1/ 4)	WILSON RESERVOIR	0.46(1/ 2)	0.59(1/ 2)	
			0.46- 0.46	TRM 259.4	0.46- 0.46	0.59- 0.59	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 21

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN FISH (SMALLMOUTH BUFFALO, WHOLE)

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-8E2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
SM.MOUTH BUFF (WH) PCI/GM (DRY WEIGHT)	GAMMA (NAI)						
	^{6}BA-140,LA-140	0.150	0.21(1/ 4) 0.21- 0.21	WHEELER RESERVOIR TRM 274.9	0.21(1/ 2) 0.21- 0.21	2 VALUES <LLD	
	I-131	0.200	0.31(2/ 4) 0.30- 0.32	WHEELER RESERVOIR TRM 274.9	0.32(1/ 2) 0.32- 0.32	0.63(1/ 2) 0.63- 0.63	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 22

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN PLANKTON

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
PLANKTON							
PCI/GM (DRY WEIGHT)	GROSS BETA	0.100	16.10(4/ 4)	TRM 291.76	17.67(2/ 2)	21.32(2/ 2)	
	6		8.14- 20.91		15.16- 20.17	18.67- 23.96	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 23

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN SEDIMENT

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
SEDIMENT AVG PCI/GM (DRY WEIGHT)	GAMMA (GELI)						
	CE-141	NOT ESTAB	0.10(1/ 6)	TRM 277.98	0.10(1/ 2)	2 VALUES <LLD	
			0.10- 0.10		0.10- 0.10		
	CE-144	0.060	0.34(3/ 6)	TRM 288.78	0.48(1/ 2)	2 VALUES <LLD	
			0.25- 0.48		0.48- 0.48		
	CO-60	0.010	0.11(6/ 6)	TRM 288.78	0.13(2/ 2)	2 VALUES <LLD	
			0.07- 0.14		0.13- 0.14		
	RU-103	NOT ESTAB	0.32(1/ 6)	TRM 288.78	0.32(1/ 2)	2 VALUES <LLD	
			0.32- 0.32		0.32- 0.32		
	CS-137	0.020	1.71(6/ 6)	TRM 277.98	2.10(2/ 2)	0.22(2/ 2)	
			0.72- 2.21		1.99- 2.21	0.20- 0.25	
	ZR-95	0.030	0.41(3/ 6)	TRM 288.78	0.68(1/ 2)	2 VALUES <LLD	
			0.15- 0.68		0.68- 0.68		
	NB-95	0.010	1.57(3/ 6)	TRM 288.78	2.75(1/ 2)	2 VALUES <LLD	
			0.56- 2.75		2.75- 2.75		
	BI-214	0.200	1.46(6/ 6)	TRM 277.98	1.67(2/ 2)	1.61(2/ 2)	
			1.00- 1.74		1.59- 1.74	1.56- 1.66	
	BI-212	0.100	2.07(6/ 6)	TRM 293.70	2.19(2/ 2)	1.76(2/ 2)	
			1.39- 3.00		1.39- 3.00	1.74- 1.78	
	RA-223	NOT ESTAB	0.52(2/ 6)	TRM 277.98	0.62(1/ 2)	0.51(1/ 2)	
			0.41- 0.62		0.62- 0.62	0.51- 0.51	
	TL-208	0.020	0.53(6/ 6)	TRM 277.98	0.59(2/ 2)	0.56(2/ 2)	
			0.36- 0.61		0.57- 0.61	0.54- 0.58	
	AC-228	0.060	2.04(6/ 6)	TRM 277.98	2.29(2/ 2)	2.22(2/ 2)	
			1.44- 2.39		2.29- 2.30	2.19- 2.26	
	PA-228	NOT ESTAB	0.10(3/ 6)	TRM 277.98	0.11(1/ 2)	2 VALUES <LLD	
			0.05- 0.13		0.11- 0.11		
	SR-89	1.500	5.30(1/ 6)	TRM 277.98	5.30(1/ 2)	2.90(2/ 2)	
			5.30- 5.30		5.30- 5.30	2.83- 2.96	
	SR-90	0.300	0.36(1/ 6)	TRM 293.70	0.36(1/ 2)	2 VALUES <LLD	
			0.36- 0.36		0.36- 0.36		

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 24

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN CLAM FLESH

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2
LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
CLAM FLESH AVG PCI/GM (DRY WEIGHT)	GAMMA (GELI) 8						
	BI-214	NOT ESTAB	1.07(2/ 6) 1.04- 1.10	TRM 277.98	1.10(1/ 2) 1.10- 1.10	0.31(1/ 2) 0.31- 0.31	
	TL-208	NOT ESTAB	0.35(1/ 6) 0.35- 0.35	TRM 277.98	0.35(1/ 2) 0.35- 0.35	2 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 25

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN CLAM SHELL

NAME OF FACILITY BROWNS FERRY — DOCKET NO. RH-78-3-BF2

LOCATION OF FACILITY LIMESTONE ALABAMA — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
CLAM SHELL AVG PCI/GM (DRY WEIGHT)	GAMMA (GELI)						
	CO-60	0.010	0.01(1/ 6)	TRM 293.70	0.01(1/ 2)	2 VALUES <LLD	
			0.01- 0.01		0.01- 0.01		
	CS-137	0.020	0.09(5/ 6)	TRM 277.98	0.13(1/ 2)	0.07(1/ 2)	
			0.04- 0.13		0.13- 0.13	0.07- 0.07	
	NB-95	0.010	6 VALUES <LLD			0.08(1/ 2)	
						0.08- 0.08	
	BI-214	0.020	0.51(6/ 6)	TRM 293.70	0.60(2/ 2)	0.80(2/ 2)	
			0.22- 0.68		0.54- 0.66	0.77- 0.83	
	BI-212	0.100	0.66(4/ 6)	TRM 293.70	0.84(2/ 2)	0.72(2/ 2)	
			0.36- 0.89		0.80- 0.89	0.58- 0.86	
	TL-208	0.020	0.16(6/ 6)	TRM 293.70	0.20(2/ 2)	0.13(2/ 2)	
			0.07- 0.23		0.17- 0.23	0.02- 0.24	
	AC-228	0.060	0.71(5/ 6)	TRM 293.70	0.95(2/ 2)	1.01(2/ 2)	
			0.33- 0.95		0.95- 0.95	0.97- 1.05	
	SR-89	5.000	5.03(1/ 6)	TRM 288.78	5.03(1/ 2)	2 VALUES <LLD	
			5.03- 5.03		5.03- 5.03		
	SR-90	1.000	3.76(6/ 6)	TRM 293.70	4.61(2/ 2)	3.29(2/ 2)	
			2.77- 5.79		3.42- 5.79	3.01- 3.57	

a. Nominal Lower Limit of Detection (LLD) as described in Table 2.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Quality Control

A quality control program has been established with the Alabama Department of Public Health Environmental Health Administration Laboratory and the Eastern Environmental Radiation Facility, Environmental Protection Agency, Montgomery, Alabama. Samples of air, water, milk, and vegetation collected around the BFNP are forwarded to these laboratories for analysis, and results are exchanged for comparison.

Data Analysis

Data measured at the control stations for each medium were averaged for each sampling period. In order to describe the distribution of control station data, a mean, standard deviation, and 3-sigma value were calculated. We can expect, with 99 percent confidence, that background concentrations would be distributed within these limits. This provides us the basis for comparing control and indicator data. If the indicator data fall within the limits defined for control data, we can say, with 99 percent confidence, that the indicator data were not significantly affected by the nuclear plant. If the data do not fall within the limits, we will perform further analyses to determine if the difference is attributable to the nuclear plant.

Conclusions

A vast majority of the indicator station data were found to be within the distribution defined by the control station data. The ALPHA-M least squares computer program identified concentrations slightly exceeding the limits of the control station data for a small number of radionuclides in samples from indicator stations. Many of these values may be discounted because the error reported by the ALPHA-M program was greater than the calculated concentration. The remaining isolated elevated concentrations may be the result of fallout, computer program artifacts, or analytical errors. The same type of isolated high values occurred in the control station data and may be attributed to the same sources.

Increased levels of radioactivity were observed in milk, rainwater, air particulates, heavy particle fallout, vegetation, and in atmospheric radioiodine in September and October following the atmospheric nuclear weapons testing conducted by the Peoples' Republic of China. This increase was seen in control stations as well as indicator stations, and was widely reported in the eastern portion of the United States. Levels of ^{131}I in milk as high as 117.2 pCi/l were observed. The primary radioisotopes identified in the atmospheric media were ^{95}Zr, ^{95}N, ^{131}I, ^{132}I, ^{140}Ba, ^{140}La, and ^{239}Np.

It is concluded from the above analysis of the data that there were no significant increases in environmental radioactivity attributable to the operation of Browns Ferry Nuclear Plant.