RH-78-5-WB1

ENVIRONMENTAL RADIOACTIVITY LEVELS
WATTS BAR NUCLEAR PLANT

1977

December 1978

CONTENTS

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1977

Introduction

The Watts Bar Nuclear Plant (WBNP), being constructed by the Tennessee Valley Authority, is located on a site owned by TVA containing 1770 acres of land in Rhea County, Tennessee, bounded on the east by Chickamauga Reservoir. See Figure 1. The site is approximately 50 miles (80 kilometers) northeast of Chattanooga, Tennessee, and 8 miles (13 kilometers) southeast of Spring City, Tennessee. The plant will consist of two pressurized water reactors; each unit is rated at 3,411 MWt and 1,160 MWe. Fuel load in unit 1 is scheduled for December 1979.

A preoperational environmental radiological monitoring program was implemented in December 1976. This program has the objective of establishing a baseline of data on the distribution of natural and manmade radioactivity in the environment near the plant site. This report presents the results obtained from that program during 1977.

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 16. 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 ^{131}I concentration 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 3. 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 3-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 instance 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.

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*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.

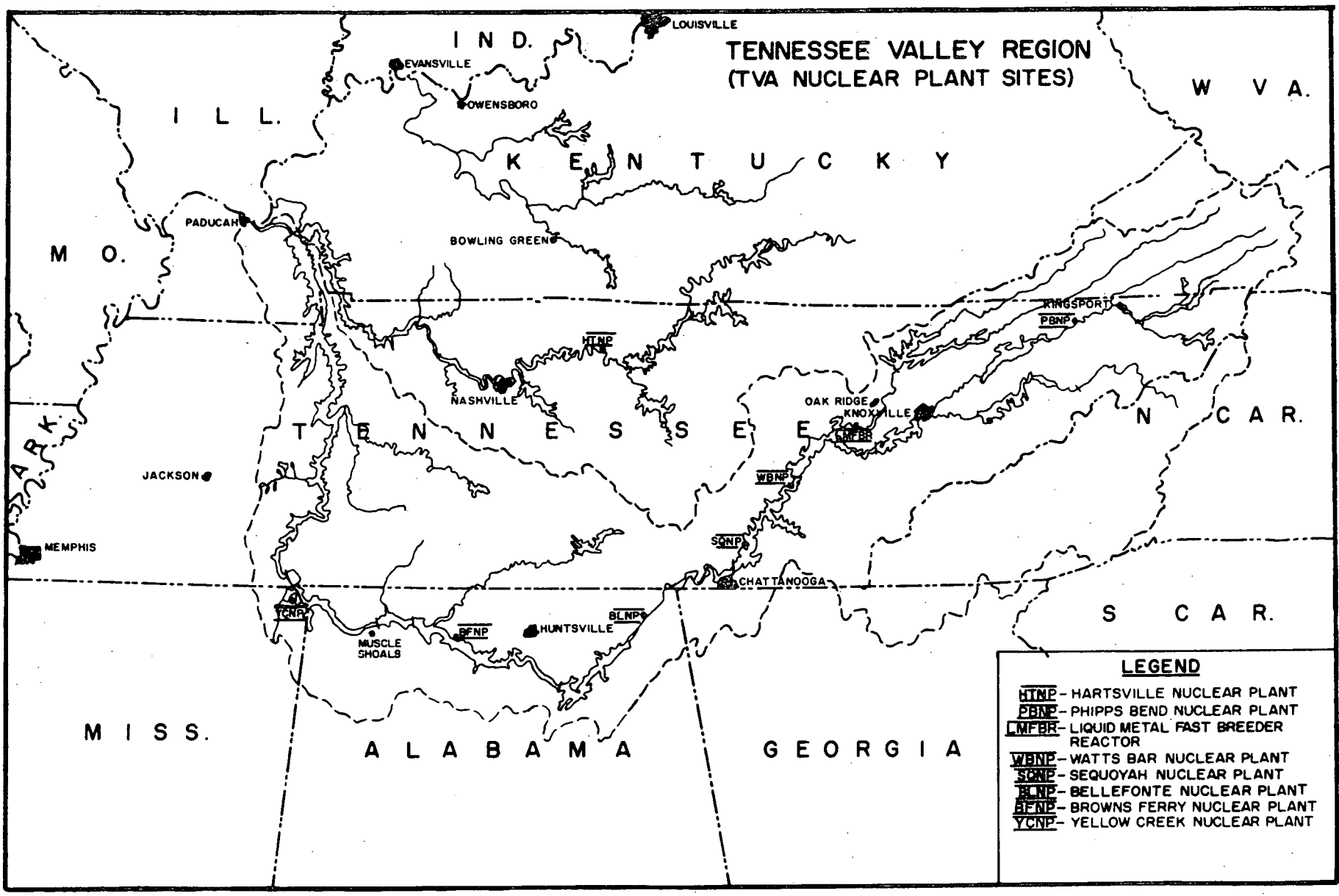

TENNESSEE VALLEY REGION
(TVA NUCLEAR PLANT SITES)
LOUISVILLE
IND.
EVANSVILLE
OWENSBORO
ILL.
KENTUCKY
W VA.
PADUCAH
BOWLING GREEN
MO.
KINGSPORT
PBNP
HTNP
NASHVILLE
OAK RIDGE
KNOXVILLE
LMFBR
ARK.
TENNESSEE
N CAR.
JACKSON
WBNP
SQNP
MEMPHIS
CHATTANOOGA
YCNP
BLNP
BFNP
HUNTSVILLE
MUSCLE SHOALS
S CAR.
MISS.
ALABAMA
GEORGIA
LEGEND
HTNP - HARTSVILLE NUCLEAR PLANT
PBNP - PHIPPS BEND NUCLEAR PLANT
LMFBR - LIQUID METAL FAST BREEDER REACTOR
WBNP - WATTS BAR NUCLEAR PLANT
SQNP - SEQUOYAH NUCLEAR PLANT
BLNP - 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	Well Water	Public Water	Aquatic Life and Sediment
Site SSW	W	W	M	M	S					
Site N	W	W	M	M	S					
Petty Farm	W	W	M	M	S	Q	M*	M		
Spring City	W	W	M	M	S				M	
Cedine	W	W	M	M	S					
Ten Mile	W	W	M	M	S					
Decatur	W	W	M	M	S					
Goodfield	W	W	M	M	S					
Rockwood	W	W	M	M	S					
Dayton	W	W	M	M	S				M	
Farm L						Q	M	M		
Farm M						Q		M		
Control Farm						Q	M	M		
Onsite Wells (6)								M		
Watts Bar Reservation									M	
C. F. Industries									M	
Chickamauga Reservoir										Q

*When available

W - Weekly M - Monthly Q - Quarterly S - Semiannually

Atmospheric Monitoring

The atmospheric monitoring network is divided into three subgroups. Two local air monitors are located within the plant boundary. Six perimeter air monitors are located at distances out to 11 miles (18 kilometers) from the plant in the towns of Spring City and Decatur, and four other densely populated areas. The remote air monitors are located at distances out to 17 miles (27 kilometers) from the plant in the towns of Dayton and Rockwood. See Table 2 and Figures 2 and 3.

At each monitor, air is continuously pulled through a Hollingsworth and Vose HV-70 particulate filter at a regulated flow of 3 ft^3/min (0.085 m^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 collect rainwater on a continuous basis, and a horizontal platform 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 and perimeter 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. These stations will detect any significant airborne release from WBNP.

Air filters are collected weekly and analyzed for gross beta activity. 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 presented in Table 5.

With reference to Table 4, which contains the maximum permissible concentrations (MPC) recommended by 10 CFR 20 for nonoccupational exposure, it is seen that the maximum beta concentration is 0.65 percent MPC.

Rainwater is collected and analyzed for specific gamma-emitting isotopes, and radiostrontium. A gamma scan is performed on a 3.5-liter monthly sample. The strontium isotopes are separated chemically and counted in a low background system. The results are shown in Table 6.

The gummed acetate that is used to collect heavy particle fallout is changed monthly. The sample is ashed and counted for gross beta activity. The results are given in Table 7.

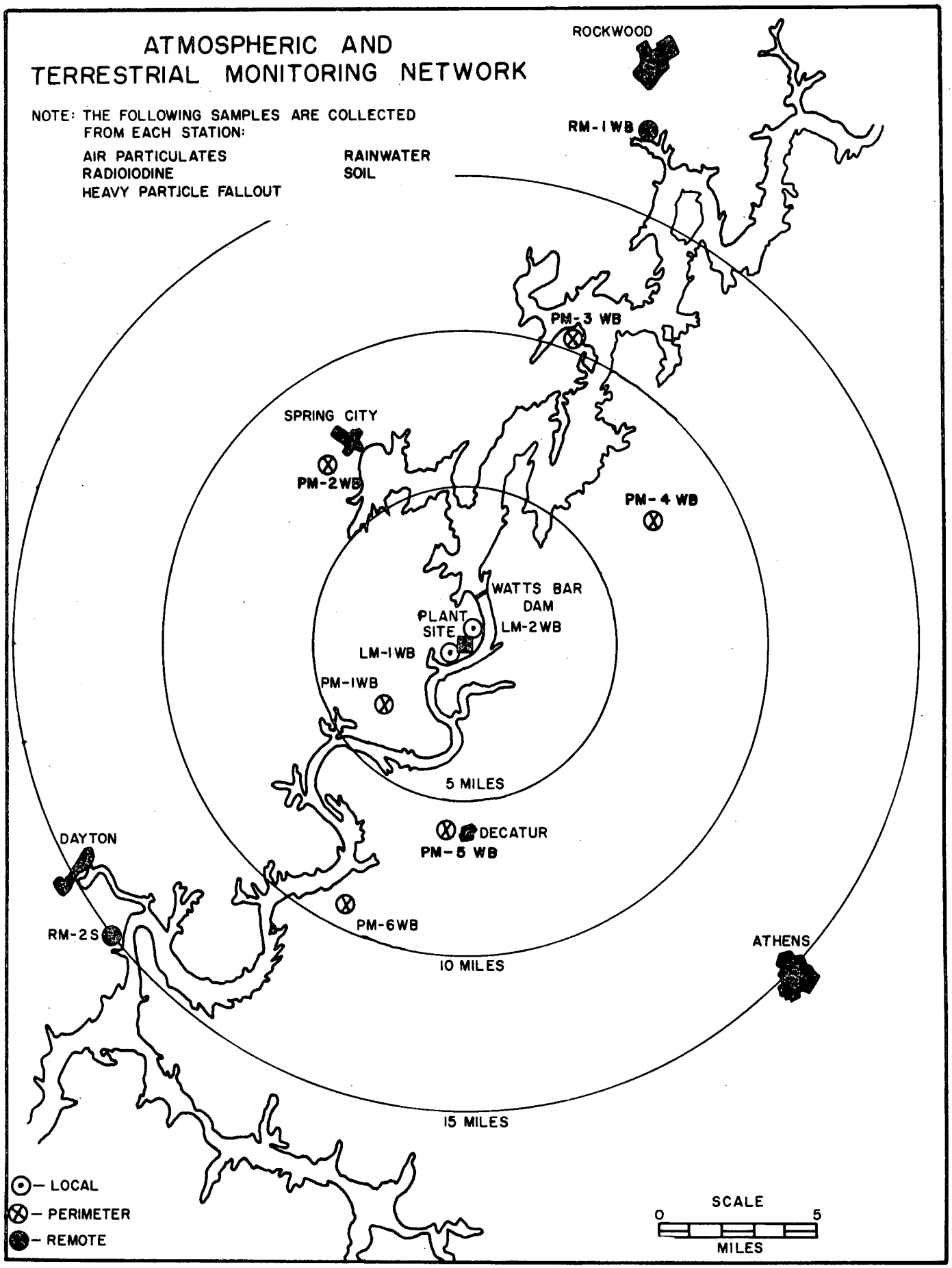
Charcoal filters are collected and analyzed for radioiodine. The filter is counted in a single channel analyzer system. The data are shown in Table 8, where the highest value reported is 0.12 percent MPC for ^{131}I.

Table 2

Atmospheric and Terrestrial Monitoring Stations Locations
Watts Bar Nuclear Plant

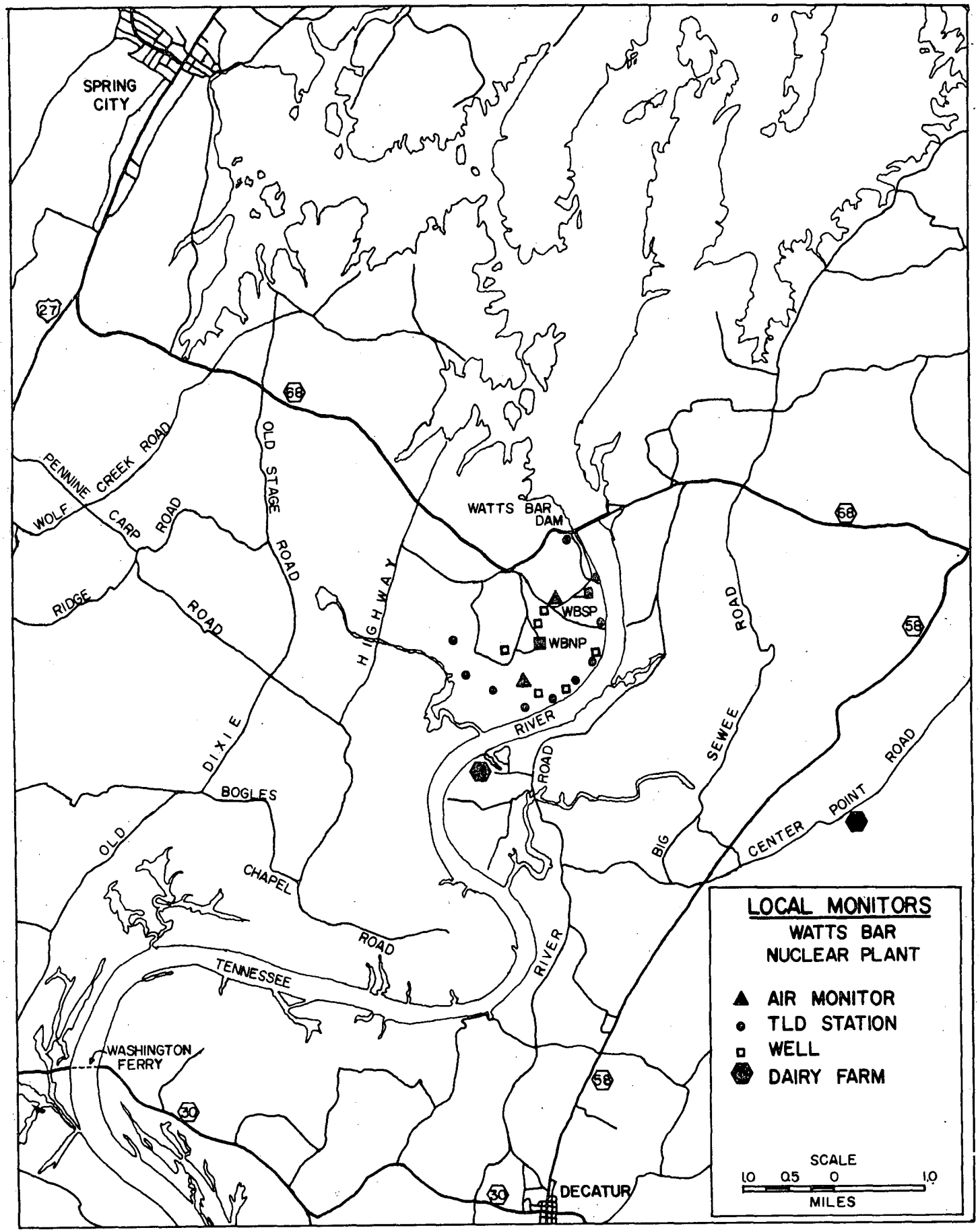
Sample Station	Tentative Location, Approximate Distance and Direction from Plant
LM - 1 WB	1/2 mile N (1-3/4 kilometers)
LM - 2 WB	1/2 mile SSW (3/4 kilometers)
PM - 1 WB (Smith Bend)	3-1/2 miles SW (5-1/2 kilometers)
PM - 2 WB (Spring City)	7 miles NW (11-1/4 kilometers)
PM - 3 WB	11-1/2 miles NNE (18-1/2 kilometers)
PM - 4 WB (Ten Mile)	7-3/4 miles NE (12-1/2 kilometers)
PM - 5 WB (Decatur)	6-1/4 miles S (10 kilometers)
PM - 6 WB (Goodfield)	9 miles SSW (14-1/2 kilometers)
RM - 1 WB (Rockwood)	17-1/4 miles NNE (27-3/4 kilometers)
RM - 2 WB (Dayton) (Identical with RM - 2S, Sequoyah Nuclear Plant)	15 miles SW (24-1/4 kilometers)

Figure 2



(1 mile - 1.6 kilometers)

Figure 3



(1 mile = 1.6 kilometers)

Table 3

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				0.4	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. Conversion factors: 1 pCi = 3.7×10^{-2} Bq; 1 mCi = 3.7×10^{7} Bq.

Table 3

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)	NaI	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		30		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-M. 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.
Conversion factor: 1 pCi = 3.7×10^{-2} Bq.

Table 4

MAXIMUM PERMISSIBLE CONCENTRATIONS

FOR NONOCCUPATIONAL EXPOSURE

	MPC	
	In Water pCi/l*	In Air pCi/m³ *
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

*1 pCi = 3.7×10^{-2} Bq.

TABLE 5

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN AIR

NAME OF FACILITY WAIIS BAR — DOCKET NO. BH-78-3-WB1

LOCATION OF FACILITY BUEA, TENNESSEE — 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 BETA	0.010	0.12(399/ 403)	PM-6WB GOODFIELD	0.13(49/ 49)	0.12(102/102)	
	505		0.02- 0.65	9.0 MILES SSW	0.02- 0.64	0.02- 0.49	
	GAMMA (NAI)						
	119						
	CE-141,144	0.030	0.06(59/ 95)	PM-6WB GOODFIELD	0.07(7/ 12)	0.06(17/ 24)	
(3.7 x 10^{-2} Bq/cubic meter)			0.03- 0.15	9.0 MILES SSW	0.04- 0.15	0.03- 0.10	
	BA-140,LA-140	0.020	0.04(14/ 95)	LM-2WB N(WBSP GATE)	0.06(2/ 12)	0.03(6/ 24)	
			0.02- 0.08	0.5 MILES SSW	0.04- 0.08	0.02- 0.04	
	RU-103,106	0.040	0.05(24/ 95)	PM-2WB SPRING CITY	0.06(3/ 12)	0.06(3/ 24)	
			0.04- 0.08	7.0 MILES NW	0.05- 0.07	0.04- 0.07	
	CS-134	0.010	95 VALUES <LLD			0.01(1/ 24)	
						0.01- 0.01	
	CS-137	0.010	0.01(1/ 95)	PM-2WB SPRING CITY	0.01(1/ 12)	24 VALUES <LLD	
			0.01- 0.01	7.0 MILES NW	0.01- 0.01		
	ZR-95,NB-95	0.010	0.06(74/ 95)	PM-6WB GOODFIELD	0.06(10/ 12)	0.05(18/ 24)	
			0.01- 0.14	9.0 MILES SSW	0.01- 0.12	0.01- 0.12	
	I-131	0.010	0.02(27/ 95)	PM-2WB SPRING CITY	0.04(2/ 12)	0.03(7/ 24)	
			0.01- 0.06	7.0 MILES NW	0.02- 0.06	0.01- 0.04	
	GAMMA (GELI)						
	1						
			1 VALUES <LLD			0 VALUES <LLD	
			ANALYSIS PERFORMED -- ALL BELOW LLD				
	SR-89	0.005	0.01(28/ 32)	LM-1WB ENV DATA STAT	0.01(2/ 4)	0.01(7/ 8)	
	40		0.01- 0.02	0.5 MILES N	0.01- 0.02	0.01- 0.02	
	SR-90	0.001	0.00(12/ 32)	PM-1WB E. FERRY RD	0.00(2/ 4)	0.00(4/ 8)	
	40		0.00- 0.00	3.75 MILES WSW	0.00- 0.00	0.00- 0.00	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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 RAIN

NAME OF FACILITY WATTS BAR — DOCKET NO. 50-390

LOCATION OF FACILITY RHEA TENNESSEE — 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	GROSS BETA 20	2,300	2,98(4/ 8)	LM-2WB N(WBSP GATE)	4.10(	1/ 1)	20,31(	12/ 12)	
			2,32- 4,10	0,5 MILES SSW	4,10-	4,10	3,40-	61,44	
	GAMMA (NAI) 90								
(3.7 x 10^{-2} Bq/l)	CE-141,144	30,000	37,48(1/ 71)	PM-5WB DECATUR	37,48(	1/ 8)	19 VALUES <LLD		
			37,48- 37,48	6,25 MILES S	37,48-	37,48			
	BA-140,LA-140	15,000	21,31(9/ 71)	PM-4WB TEN MILE	25,43(	2/ 9)	15,83(	1/ 19)	
			15,67- 28,44	7,75 MILES NE	22,41-	28,44	15,83-	15,83	
	CO-60	10,000	18,56(1/ 71)	PM-6WB GOODFIELD	18,56(	1/ 9)	19 VALUES <LLD		
			18,56- 18,56	9,0 MILES SSW	18,56-	18,56			
	RU-103,106	30,000	41,72(15/ 71)	PM-2WB SPRING CITY	50,47(	2/ 9)	37,93(	4/ 19)	
			32,73- 60,54	7,0 MILES NW	40,40-	60,54	30,30-	56,40	
	ZR-95,NB-95	10,000	21,08(29/ 71)	LM-1WB ENV DATA STAT	26,78(	2/ 10)	20,34(	8/ 19)	
			10,27- 34,60	0,5 MILES N	18,97-	34,60	10,49-	33,28	
	CR-51	60,000	72,14(1/ 71)	PM-3WB C. BIBLE CAMP	72,14(	1/ 8)	19 VALUES <LLD		
			72,14- 72,14	11,5 MILES NNE	72,14-	72,14			
	ZN-65	15,000	16,92(2/ 71)	PM-1WB E. FERRY RD	17,03(	1/ 9)	19 VALUES <LLD		
			16,81- 17,03	3,75 MILES WSW	17,03-	17,03			
	I-131	15,000	44,65(4/ 71)	PM-4WB TEN MILE	49,55(	1/ 9)	20,74(	3/ 19)	
			33,91- 49,55	7,75 MILES NE	49,55-	49,55	15,43-	24,95	
	GAMMA (GELI) 20								
	CE-141	NOT ESTAB	17 VALUES <LLD				14,28(	1/ 3)	
							14,28-	14,28	
	BA-140	25,000	50,42(1/ 17)	LM-1WB ENV DATA STAT	50,42(	1/ 1)	3 VALUES <LLD		
			50,42- 50,42	0,5 MILES N	50,42-	50,42			
	LA-140	7,000	20,43(6/ 17)	LM-1WB ENV DATA STAT	36,68(	1/ 1)	11,67(	2/ 3)	
			9,02- 36,68	0,5 MILES N	36,68-	36,68	9,54-	13,81	
	I-131	8,000	14,44(2/ 17)	LM-1WB ENV DATA STAT	17,50(	1/ 1)	17,61(	1/ 3)	
			11,37- 17,50	0,5 MILES N	17,50-	17,50	17,61-	17,61	
	TE-132	NOT ESTAB	3,37(2/ 17)	LM-1WB ENV DATA STAT	4,65(	1/ 1)	3 VALUES <LLD		
			2,09- 4,65	0,5 MILES N	4,65-	4,65			
	SR-89	10,000	15,96(21/ 88)	LM-1WB ENV DATA STAT	22,41(	3/ 11)	13,32(	6/ 22)	
	110		10,00- 33,62	0,5 MILES N	13,44-	33,62	10,29-	19,09	
	SR-90	2,000	2,90(2/ 88)	LM-2WB N(WBSP GATE)	3,48(	1/ 11)	3,22(	1/ 22)	
	110		2,31- 3,48	0,5 MILES SSW	3,48-	3,48	3,22-	3,22	
	TRITIUM	330,000	2 VALUES <LLD				2 VALUES <LLD		
	4		ANALYSIS PERFORMED -- ALL BELOW LLD						

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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 HEAVY PARTICLE FALLOUT

NAME OF FACILITY WAITS BAR — DOCKET NO. BH-78-5-WB1

LOCATION OF FACILITY BHEA — TENNESSEE — 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	2.35(86/ 86)	LM-2WB N(WBSP GATE)	3.67(11/ 11)	2.12(22/ 22)	
	108		0.22- 14.51	0.5 MILES SSW	0.71- 14.51	0.14- 8.69	

(3.7×10^7 Bq/sq. km)

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 8

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN CHARCOAL FILTERS

NAME OF FACILITY WATTS BAR DOCKET NO. 50-390

LOCATION OF FACILITY SPRING CITY, TENNESSEE 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 500	0.010	0.02(98/ 396) 0.01- 0.12	PM-3WB C. BIBLE CAMP 11.5 MILES NNE	0.03(11/ 51) 0.01- 0.11	0.03(19/102) 0.01- 0.10	

(3.7×10^{-2} Bq/cubic meter)

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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 two farms within a 10-mile radius of the plant (see Figure 3), and from one control farm. Raw milk is analyzed monthly for ^{131}I, gamma-emitting isotopes, and for radiostrontium. The results are shown in Table 9.

Vegetation

Vegetation samples were collected near each dairy farm to determine possible plant uptake of radioactive materials from the soil or from foliar deposition. Table 10 gives the results obtained from the laboratory analyses.

Soil

Soil samples were collected near each monitoring station. The results are given in Table 11.

Ground Water

Well water was obtained monthly from the dairy farms from which milk was sampled and from six onsite wells. All samples were analyzed for gamma-emitting radionuclide and a quarterly composite was analyzed for tritium. The results are shown in Table 12.

Public Water

Potable water supplies taken from the Tennessee River in the vicinity of Watts Bar Nuclear Plant are sampled and analyzed for gross beta, gamma-emitting radionuclides, $^{89,90}Sr$, and tritium. The results, shown in Table 13, indicate that the maximum beta concentration is 0.27 percent MPC.

Environmental Gamma Radiation Levels

Thermoluminescent dosimeters (TLD's) are placed at ten stations around the plant near the site boundary (see Figure 3) and at the perimeter and remote 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 14.

Food Crops

Food crops raised in the vicinity of Watts Bar Nuclear Plant are sampled annually as they become available during the growing season. During this sampling period, samples of cabbage, corn, green beans, potatoes, and tomatoes were collected and analyzed for specific gamma-emitting radionuclides. The results are given in Table 15.

TABLE 9

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN MILK

NAME OF FACILITY WATTS BAR — DOCKET NO. 50-390

LOCATION OF FACILITY DUEA TENNESSEE — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD)[a]	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	34.54(1/ 21)	MULLINS FARM	34.54(1/ 11)	7 VALUES <LLD	
	28		34.54- 34.54	3.75 MILES ESE	34.54- 34.54		
(3.7 x 10^{-2} Bq/l)	MILK SCAN						
	28		21 VALUES <LLD			7 VALUES <LLD	
			ANALYSIS PERFORMED -- ALL BELOW LLD				
	SR-89	10.000	10.56(1/ 21)	MULLINS FARM	10.56(1/ 11)	7 VALUES <LLD	
	28		10.56- 10.56	3.75 MILES ESE	10.56- 10.56		
	SR-90	2.000	5.06(19/ 21)	MULLINS FARM	5.28(9/ 11)	4.46(7/ 7)	
	28		3.47- 13.52	3.75 MILES ESE	3.47- 13.52	2.24- 5.91	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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 VEGETATION

NAME OF FACILITY WAIIS BAR — DOCKET NO. RH-78-5-081

LOCATION OF FACILITY BUEA TENNESSEE — 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
VEGETATION							
PCI/GM (DRY WEIGHT)	GROSS BETA 5	0.200	0 VALUES <LLD			42.43(5/ 5) 28.50- 59.88	
(3.7×10^{-2} Bq/gm)	TOTAL ALPHA 4	0.010	0 VALUES <LLD			0.06(4/ 4) 0.02- 0.16	
	GAMMA (NAI) 14						
	CE-141,144	0.550	2.91(8/ 9) 0.95- 5.78	LAYMAN FARM 1.5 MILES SSW	3.89(2/ 3) 2.01- 5.78	4.64(5/ 5) 2.31- 10.38	
	BA-140,LA-140	0.680	9 VALUES <LLD			1.46(1/ 5) 1.46- 1.46	
	CO-60	0.170	0.18(1/ 9) 0.18- 0.18	MULLINS FARM 3.75 MILES ESE	0.18(1/ 3) 0.18- 0.18	5 VALUES <LLD	
	RU-103,106	0.650	1.03(5/ 9) 0.71- 1.24	PETTY FARM 3.75 MILES WSW	1.18(2/ 3) 1.13- 1.24	1.42(3/ 5) 0.95- 1.66	
	CS-134	0.200	0.48(1/ 9) 0.48- 0.48	MULLINS FARM 3.75 MILES ESE	0.48(1/ 3) 0.48- 0.48	0.25(1/ 5) 0.25- 0.25	
	ZR-95,NB-95	0.200	3.27(9/ 9) 1.17- 7.97	MULLINS FARM 3.75 MILES ESE	3.97(3/ 3) 1.84- 7.97	4.72(5/ 5) 2.71- 6.31	
	CO-58	0.230	0.29(1/ 9) 0.29- 0.29	PETTY FARM 3.75 MILES WSW	0.29(1/ 3) 0.29- 0.29	5 VALUES <LLD	
	CR-51	1.100	9 VALUES <LLD			2.42(1/ 5) 2.42- 2.42	
	ZN-65	0.250	0.44(2/ 9) 0.32- 0.56	PETTY FARM 3.75 MILES WSW	0.56(1/ 3) 0.56- 0.56	0.29(1/ 5) 0.29- 0.29	
	I-131	0.350	9 VALUES <LLD			1.74(1/ 5) 1.74- 1.74	
	GAMMA (GELI) 3						
	CE-141	0.200	0.85(3/ 3) 0.55- 1.05	MULLINS FARM 3.75 MILES ESE	1.05(1/ 1) 1.05- 1.05	0 VALUES <LLD	
	CE-144	0.220	4.19(3/ 3) 3.49- 4.55	MULLINS FARM 3.75 MILES ESE	4.55(1/ 1) 4.55- 4.55	0 VALUES <LLD	
	RU-103	0.200	0.52(3/ 3) 0.27- 0.74	LAYMAN FARM 1.5 MILES SSW	0.74(1/ 1) 0.74- 0.74	0 VALUES <LLD	
	RU-106	0.510	1.11(1/ 3) 1.11- 1.11	MULLINS FARM 3.75 MILES ESE	1.11(1/ 1) 1.11- 1.11	0 VALUES <LLD	
	CS-137	0.060	0.37(3/ 3) 0.22- 0.54	LAYMAN FARM 1.5 MILES SSW	0.54(1/ 1) 0.54- 0.54	0 VALUES <LLD	
	ZR-95	0.110	1.57(3/ 3) 0.94- 2.02	MULLINS FARM 3.75 MILES ESE	2.02(1/ 1) 2.02- 2.02	0 VALUES <LLD	
	NB-95	0.050	3.12(3/ 3) 2.00- 3.90	MULLINS FARM 3.75 MILES ESE	3.90(1/ 1) 3.90- 3.90	0 VALUES <LLD	
	MN-54	0.050	0.13(1/ 3) 0.13- 0.13	MULLINS FARM 3.75 MILES ESE	0.13(1/ 1) 0.13- 0.13	0 VALUES <LLD	

TABLE 10 (CONTD)

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN VEGETATION

NAME OF FACILITY WATTS BAR DOCKET NO. 50-390 50-391

LOCATION OF FACILITY DAYTON TENNESSEE 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
	BI-214	0.100	0.33(3/ 3)	PETTY FARM	0.48(1/ 1)	0 VALUES <LLD	
			0.23- 0.48	3.75 MILES WSW	0.48- 0.48		
	SR-89	0.250	0.66(10/ 12)	MULLINS FARM	0.82(3/ 4)	1.13(5/ 5)	
	17		0.25- 1.33	3.75 MILES ESE	0.40- 1.10	0.48- 2.29	
	SR-90	0.050	0.21(12/ 12)	PETTY FARM	0.26(4/ 4)	0.83(4/ 5)	
	17		0.10- 0.34	3.75 MILES WSW	0.16- 0.34	0.11- 2.62	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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 SOIL

NAME OF FACILITY WATTS BAR DOCKET NO. 2H-78-5-W31
LOCATION OF FACILITY RHEA TENNESSEE 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	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SOIL PCI/GM (DRY WEIGHT)	GROSS BETA 2	0.700	0 VALUES <LLD			19.89(2/ 2) 17.80- 21.97	
(3.7 x 10^{-2} Bq/gm)	GAMMA (GELI) 20						
	CE-141	NOT ESTAB	0.26(1/ 16) 0.26- 0.26	PM-6WB GOODFIELD 9.0 MILES SSW	0.26(1/ 2) 0.26- 0.26	4 VALUES <LLD	
	CE-144	0.060	0.17(3/ 16) 0.14- 0.20	PM-5WB DECATUR 6.25 MILES S	0.20(1/ 2) 0.20- 0.20	0.17(3/ 4) 0.14- 0.22	
	RU-103	NOT ESTAB	0.07(5/ 16) 0.02- 0.13	PM-2WB SPRING CITY 7.0 MILES NW	0.13(1/ 2) 0.13- 0.13	0.05(3/ 4) 0.03- 0.07	
	CS-137	0.020	0.82(16/ 16) 0.33- 2.48	PM-2WB SPRING CITY 7.0 MILES NW	1.46(2/ 2) 0.44- 2.48	0.61(4/ 4) 0.36- 0.84	
	ZR-95	0.030	0.11(5/ 16) 0.09- 0.13	PM-6WB GOODFIELD 9.0 MILES SSW	0.13(1/ 2) 0.13- 0.13	0.09(3/ 4) 0.08- 0.10	
	NB-95	0.010	0.16(8/ 16) 0.05- 0.26	PM-5WB DECATUR 6.25 MILES S	0.26(1/ 2) 0.26- 0.26	0.22(3/ 4) 0.13- 0.28	
	BI-214	0.020	0.95(16/ 16) 0.76- 1.12	PM-1WB E. FERRY RD 3.75 MILES WSW	1.09(2/ 2) 1.07- 1.12	0.99(4/ 4) 0.80- 1.21	
	BI-212	0.100	1.18(16/ 16) 0.73- 1.80	PM-1WB E. FERRY RD 3.75 MILES WSW	1.56(2/ 2) 1.32- 1.80	0.70(4/ 4) 0.54- 0.94	
	RA-223	NOT ESTAB	0.36(3/ 16) 0.30- 0.39	PM-4WB TEN MILE 7.75 MILES NE	0.39(1/ 2) 0.39- 0.39	0.35(2/ 4) 0.26- 0.43	
	TL-208	0.020	0.35(16/ 16) 0.18- 0.46	PM-4WB TEN MILE 7.75 MILES NE	0.44(2/ 2) 0.42- 0.46	0.21(4/ 4) 0.18- 0.24	
	AC-228	0.060	1.30(16/ 16) 0.75- 1.77	PM-4WB TEN MILE 7.75 MILES NE	1.69(2/ 2) 1.62- 1.77	0.81(4/ 4) 0.64- 1.01	
	PA-228	NOT ESTAB	0.06(6/ 16) 0.04- 0.07	LM-1WB ENV DATA STAT 0.5 MILES N	0.07(1/ 2) 0.07- 0.07	0.02(1/ 4) 0.02- 0.02	
	SR-89 18	1.500	16 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			2 VALUES <LLD	
	SR-90 18	0.300	0.44(4/ 16) 0.31- 0.66	LM-1WB ENV DATA STAT 0.5 MILES N	0.66(1/ 2) 0.66- 0.66	2 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
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 WELL WATER

NAME OF FACILITY WATTS BAR — DOCKET NO. 50-390-OL-1
LOCATION OF FACILITY RHEA TENNESSEE — 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 19	2.300	4.40(4/ 9) 2.39- 8.19	WBNP WELL NO.2 ONSITE,SSE	8.19(1/ 2) 8.19- 8.19	3.54(5/ 10) 2.37- 5.71	
3.7 x 10^{-2} Bq/l)	GAMMA (NAI) 93						
	CS-137	10.000	56 VALUES <LLD			10.28(1/ 37) 10.28- 10.28	
	GAMMA (GELI) 4						
	BI-214	NOT ESTAB	7.44(1/ 1) 7.44- 7.44	WBNP WELL NO.3 ONSITE,SE	7.44(1/ 1) 7.44- 7.44	53.20(2/ 3) 14.71- 91.69	
	TRITIUM 24	330.000	15 VALUES <LLD			537.00(1/ 9) 537.00- 537.00	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 13

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN PUBLIC WATER

NAME OF FACILITY WATTS BAR — DOCKET NO. RH-TG-5-WB1

LOCATION OF FACILITY DAYTON TENNESSEE — 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 ALPHA 6	2.000	3 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			3 VALUES <LLD	
(3.7 x 10^{-2} Bq/l)	GROSS BETA 47	2.300	4.69(16/ 24) 2.63- 8.13	C.F. INDUSTRIES TRM 473.0	4.84(9/ 12) 3.59- 6.70	3.28(7/ 23) 2.39- 5.68	
	GAMMA (NAI) 40						
	BA-140,LA-140	15.000	19.39(2/ 18) 15.47- 23.31	C.F. INDUSTRIES TRM 473.0	19.39(2/ 9) 15.47- 23.31	22 VALUES <LLD	
	CS-134	10.000	18 VALUES <LLD			10.53(1/ 22) 10.53- 10.53	
	GAMMA (GELI) 7						
	BI-214	NOT ESTAB	17.11(5/ 6) 5.72- 27.50	C.F. INDUSTRIES TRM 473.0	19.37(3/ 3) 11.93- 27.50	34.25(1/ 1) 34.25- 34.25	
	SR-89 29	10.000	21 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			8 VALUES <LLD	
	SR-90 29	2.000	21 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			8 VALUES <LLD	
	TRITIUM 32	330.000	535.30(10/ 24) 341.00- 971.00	DAYTON TRM 503.8	547.00(4/ 12) 356.00- 971.00	374.00(1/ 8) 374.00- 374.00	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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

Table 14

ENVIRONMENTAL GAMMA RADIATION LEVELS

Quarter	Location	Environmental Gamma Radiation Levels mR/Hour	mR/Quarter
December 1976 - February 1977	On-Site (10)*		
	Maximum	0.010	21.2
	Minimum	0.008	16.6
	Average**	0.009±0.002	19.0±3.4
	Off-Site (7)		
	Maximum	0.010	21.0
	Minimum	0.006	12.9
	Average	0.007±0.002	15.9±5.4
March-May 1977	On-Site (10)		
	Maximum	0.012	27.3
	Minimum	0.007	16.0
	Average	0.009±0.004	19.9±8.4
	Off-Site (8)		
	Maximum	0.008	18.4
	Minimum	0.006	12.1
	Average	0.007±0.002	15.1±4.4
June-August 1977	On-Site (10)		
	Maximum	0.012	27.0
	Minimum	0.005	10.1
	Average	0.008±0.004	17.7±9.4
	Off-Site (8)		
	Maximum	0.011	25.1
	Minimum	0.007	14.9
	Average	0.008±0.003	17.1±6.6
September-November 1977	On-Site (10)		
	Maximum	0.012	26.4
	Minimum	0.005	11.7
	Average	0.008±0.004	18.6±8.4
	Off-Site (8)		
	Maximum	0.008	17.5
	Minimum	0.005	10.2
	Average	0.007±0.002	14.9±4.6

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

TABLE 15

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN FOOD CROPS

NAME OF FACILITY WATTS BAR — DOCKET NO. 50-390-OL
LOCATION OF FACILITY DAYTON TENNESSEE — 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)						
	CS-137	10.000	1 VALUES <LLD			16.09(1/ 1) 16.09- 16.09	
CORN							
PCI/KGM (WET WEIGHT)	GAMMA (GELI)						
	BI-214	NOT ESTAB	33.95(1/ 1) 33.95- 33.95	WBNP AREA	33.95(1/ 1) 33.95- 33.95	0 VALUES <LLD	
GREEN BEANS							
PCI/KGM (WET WEIGHT)	GAMMA (NAI)						
	CS-134	10.000	1 VALUES <LLD			13.56(1/ 1) 13.56- 13.56	
	CS-137	10.000	1 VALUES <LLD			11.14(1/ 1) 11.14- 11.14	
POTATOES							
PCI/KGM (WET WEIGHT)	GAMMA (NAI)						
	CS-137	10.000	10.23(1/ 1) 10.23- 10.23	WBNP AREA	10.23(1/ 1) 10.23- 10.23	0 VALUES <LLD	
TOMATOES							
PCI/KGM (WET WEIGHT)	GAMMA (NAI)						
			1 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Reservoir Monitoring

Samples of water and aquatic media are collected quarterly along five river stations in Chickamauga and Watts Bar Reservoirs--at Tennessee River miles (TRM) 496.5, 518.0, 527.4, 529.9, and 532.1. Samples collected for radiological analyses include sediment, plankton, and Asiatic clams from four stations; water from three of these stations; and fish from Watts Bar, Chickamauga and Nickajack Reservoirs (see Table 16). The locations of these stations are shown on the accompanying map (Figure 4) and conform to sediment and special ranges established and surveyed by the Data Services Branch, TVA. River station 532.1, the control station, is 5 miles (8 kilometers) upstream from the Watts Bar plant outfall diffuser.

Samples of water, net plankton, sediment, and Asiatic clams were collected quarterly and analyzed for radioactivity. In addition, samples of the flesh of two commercial and one game species of fish and the whole body of one commercial fish species were collected and analyzed semiannually.

Water

Grab water samples were collected quarterly from three locations in the Tennessee River; one upstream from the plant discharge area, one immediately downstream from the discharge area, and one approximately 9 miles downstream. The samples were analyzed for gamma-emitting radionuclides, ^{89}Sr, ^{90}Sr, and ^{3}H. Results are displayed in Table 17.

Fish

Radiological monitoring for fish was accomplished by analyses of composite samples of adult fish taken from each of three contiguous reservoirs--Watts Bar, Chickamauga, and Nickajack. 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. Three species, white crappie, channel catfish, and smallmouth buffalo, are collected representing both commercial and game species. Sufficient fish are collected in each reservoir to yield 250 or 300 grams oven-dry weight for analytical purposes. All samples were analyzed for gamma, gross alpha, and gross beta activity. Concentrations of ^{89}Sr and ^{90}Sr were determined on the whole fish and flesh of the buffalo only. The composite samples contained approximately the same quantity of flesh from each fish. For each composite a subsample of material was drawn for counting. Results are given in Tables 18, 19, 20, and 21.

Plankton

As indicated in Table 16, net plankton was collected for radiological analyses at four stations by vertical tows with a one-half meter, 100 micro-mesh net. For analytical accuracy, at least 50 grams (wet weight) of material is required; and collection of such amounts will probably be practical only during the period April to September because of seasonal variability in plankton abundance. Samples were analyzed for gross beta activity. Sample quantities were not sufficient for the analysis of specific gamma-emitting radionuclides, ^{89}Sr and ^{90}Sr. Sample results are given in Table 22.

Sediment

Sediment samples were collected from dredge hauls made for bottom fauna. Gamma activity and ^{89}Sr and ^{90}Sr content were determined in samples collected from points in four cross sections. Each sample was a composite obtained by combining equal volumes of sediment from each of three dredge hauls at a point in the cross section. Results are given in Table 23.

Asiatic Clams

Samples of Asiatic clams were collected with a Ponar dredge from four stations and analyzed for gamma activity. Results are given in Tables 24 and 25.

Table 16

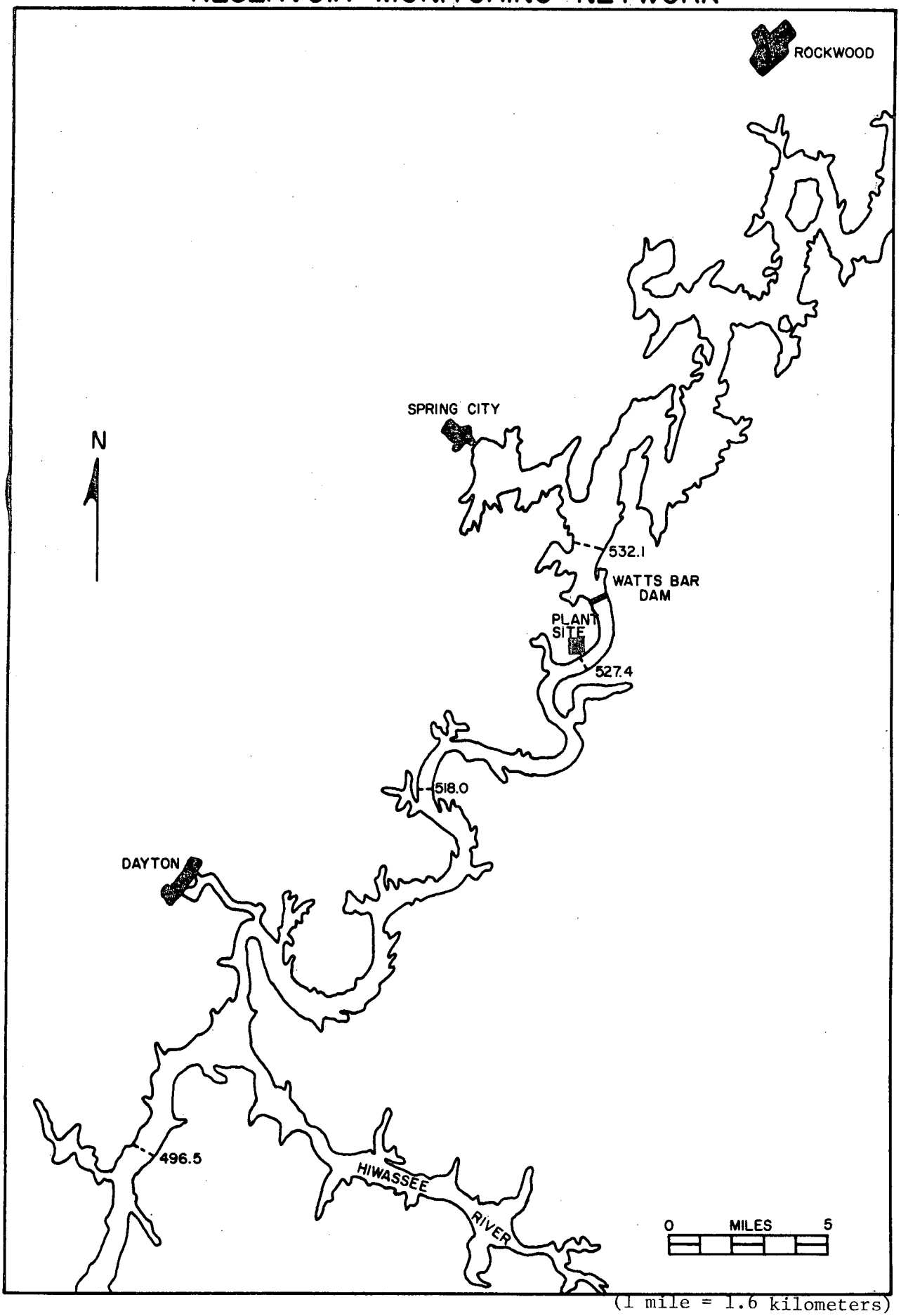
Sampling Schedule - Reservoir Monitoring

Tennessee River (Mile)	Biological Samples				Water Samples	
	Plankton	Benthic Fauna	Sediment	Fish*	Distance from Left Bank, %	Depths (Meters)
532.1	X	X	X			
529.9					90	1
527.4	X	X	X		67	1
518.0	X	X	X		67	0
496.5	X	X	X			

*Fish samples are taken from Watts Bar, Chickamauga, and Nickajack Reservoirs.

Figure 4

RESERVOIR MONITORING NETWORK



(1 mile = 1.6 kilometers)

TABLE 17

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN RESERVOIR WATER (TOTAL)

NAME OF FACILITY WATTS BAR — DOCKET NO. 50-390
LOCATION OF FACILITY DECATUR TENNESSEE — 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	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE	CONTROL LOCATIONS MEAN (F)[b] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENT
RESERVOIR WATER TOT							
PCI/L	GROSS ALPHA 3	2.000	2 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	
(3.7 x 10^{-2} Bq/1)	GROSS BETA 3	2.300	2.68(1/ 2) 2.68- 2.68	TRM 527.4-67-1	2.68(1/ 1) 2.68- 2.68	1 VALUES <LLD	
	GAMMA (NAI) 12						
			8 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			4 VALUES <LLD	
	SR-89 12	10.000	8 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			4 VALUES <LLD	
	SR-90 12	2.000	8 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			4 VALUES <LLD	
	TRITIUM 12	330.000	405.33(3/ 8) 369.00- 456.00	TRM 518.0-67-0	412.50(2/ 4) 369.00- 456.00	519.00(1/ 4) 519.00- 519.00	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 18

ENVIRONMENTAL MONITORING SUMMARY

RADIOACTIVITY IN FISH (CHANNEL CATFISH, FLESH)

NAME OF FACILITY WATTS BAR — DOCKET NO. 50-390
LOCATION OF FACILITY BRADLEY TENNESSEE — 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
CHANNEL CATFISH (FL)							
PCI/GM (DRY WEIGHT)	GROSS ALPHA 6	0.100	4 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD				2 VALUES <LLD
(3.7×10^{-2} Bq/gm)	GROSS BETA 6	0.100	28.32 (4/ 4) 17.97 - 33.16	NICKAJACK RESERVOIR TRM 425-471	32.27 (2/ 2) 31.38 - 33.16	28.44 (2/ 2) 21.94 - 34.94	
	GAMMA (NAI) 6						
	BA-140,LA-140	0.150	0.24 (3/ 4) 0.17 - 0.36	NICKAJACK RESERVOIR TRM 425-471	0.27 (2/ 2) 0.18 - 0.36	0.39 (1/ 2) 0.39 - 0.39	
	CS-137	0.120	0.14 (2/ 4) 0.12 - 0.17	NICKAJACK RESERVOIR TRM 425-471	0.17 (1/ 2) 0.17 - 0.17	0.28 (2/ 2) 0.24 - 0.32	
	CR-51	0.600	1.82 (1/ 4) 1.82 - 1.82	CHICKAMAUGA RES. TRM 471-530	1.82 (1/ 2) 1.82 - 1.82	2 VALUES <LLD	
	ZN-65	0.230	0.24 (1/ 4) 0.24 - 0.24	CHICKAMAUGA RES. TRM 471-530	0.24 (1/ 2) 0.24 - 0.24	2 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
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 WATTS BAR — DOCKET NO. 50-390
LOCATION OF FACILITY DECATUR TENNESSEE — REPORTING PERIOD 1977

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD)[a]	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)	GROSS ALPHA 6	0.100	4 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			2 VALUES <LLD	
(3.7×10^{-2} Bq/gm)	GROSS BETA 6	0.100	39.14 (4/ 4) 34.92 - 46.22	NICKAJACK RESERVOIR TRM 425-471	40.57 (2/ 2) 34.92 - 46.22	39.02 (2/ 2) 33.96 - 44.07	
	GAMMA (NAI) 6						
	BA-140,LA-140	0.150	0.31 (3/ 4) 0.26 - 0.39	NICKAJACK RESERVOIR TRM 425-471	0.33 (2/ 2) 0.26 - 0.39	0.48 (1/ 2) 0.48 - 0.48	
	CS-137	0.120	0.16 (4/ 4) 0.14 - 0.18	NICKAJACK RESERVOIR TRM 425-471	0.17 (2/ 2) 0.15 - 0.18	0.26 (2/ 2) 0.24 - 0.27	
	CR-51	0.600	0.72 (1/ 4) 0.72 - 0.72	CHICKAMAUGA RES. TRM 471-530	0.72 (1/ 2) 0.72 - 0.72	0.95 (1/ 2) 0.95 - 0.95	
	I-131	0.200	0.55 (1/ 4) 0.55 - 0.55	CHICKAMAUGA RES. TRM 471-530	0.55 (1/ 2) 0.55 - 0.55	0.72 (1/ 2) 0.72 - 0.72	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
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 WATTS BAR — DOCKET NO. BH-78-5-WB1
LOCATION OF FACILITY RHEA TENNESSEE — 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)	GROSS ALPHA 5	0.100	4 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	
(3.7×10^{-2} Bq/gm)	GROSS BETA 5	0.100	25.89(4/ 4) 20.75- 29.95	CHICKAMAUGA RES. TRM 471-530	26.43(2/ 2) 25.05- 27.80	39.15(1/ 1) 39.15- 39.15	
	GAMMA (NAI) 5						
	BA-140,LA-140	0.150	0.35(2/ 4) 0.29- 0.42	CHICKAMAUGA RES. TRM 471-530	0.42(1/ 2) 0.42- 0.42	0.60(1/ 1) 0.60- 0.60	
	CS-137	0.120	0.14(1/ 4) 0.14- 0.14	CHICKAMAUGA RES. TRM 471-530	0.14(1/ 2) 0.14- 0.14	0.16(1/ 1) 0.16- 0.16	
	CR-51	0.600	0.76(1/ 4) 0.76- 0.76	NICKAJACK RESERVOIR TRM 425-471	0.76(1/ 2) 0.76- 0.76	1 VALUES <LLD	
	SR-89 5	0.500	4 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	
	SR-90 5	0.100	4 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
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 WATTS BAR — DOCKET NO. 50-390-391

LOCATION OF FACILITY RHEA TENNESSEE — 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)	GROSS ALPHA 5	0.100	0.10(1/ 4) 0.10- 0.10	CHICKAMAUGA RES, TRM 471-530	0.10(1/ 2) 0.10- 0.10	0.33(1/ 1) 0.33- 0.33	
(3.7 x 10^{-2} Bq/gm)	GROSS BETA 5	0.100	21.56(4/ 4) 15.43- 29.68	NICKAJACK RESERVOIR TRM 425-471	23.39(2/ 2) 17.10- 29.68	33.59(1/ 1) 33.59- 33.59	
	GAMMA (NAI) 5						
	BA-140,LA-140	0.150	0.26(1/ 4) 0.26- 0.26	NICKAJACK RESERVOIR TRM 425-471	0.26(1/ 2) 0.26- 0.26	1 VALUES <LLD	
	CR-51	0.600	0.94(1/ 4) 0.94- 0.94	NICKAJACK RESERVOIR TRM 425-471	0.94(1/ 2) 0.94- 0.94	1 VALUES <LLD	
	I-131	0.200	0.29(2/ 4) 0.27- 0.31	NICKAJACK RESERVOIR TRM 425-471	0.31(1/ 2) 0.31- 0.31	1 VALUES <LLD	
	SR-89 5	0.500	4 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			1 VALUES <LLD	
	SR-90 5	0.100	0.21(3/ 4) 0.10- 0.30	CHICKAMAUGA RES, TRM 471-530	0.30(1/ 2) 0.30- 0.30	0.51(1/ 1) 0.51- 0.51	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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 WATTS BAR — DOCKET NO. 50-390, 391
LOCATION OF FACILITY RHEA TENNESSEE — 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 ALPHA	0.100	3.74(3/ 4)	TRM 496.5	3.74(3/ 4)	0 VALUES <LLD	
	4		1.96- 6.57		1.96- 6.57		
(3.7 x 10^{-2} Bq/gm)	GROSS BETA	0.100	32.57(12/ 12)	TRM 518.0	35.56(4/ 4)	18.80(4/ 4)	
	16		6.31- 53.49		25.68- 42.19	13.66- 21.01	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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 WAIIS BAR — DOCKET NO. BU-Z8-3-WB1

LOCATION OF FACILITY BUEA, TENNESSEE — 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) 16						
(3.7×10^{-2} Bq/gm)	CO-60	0.010	0.12(3/ 12) 0.09- 0.18	TRM 496.5	0.12(3/ 4) 0.09- 0.18	0.38(4/ 4) 0.21- 0.59	
	CS-137	0.020	0.44(12/ 12) 0.07- 2.05	TRM 496.5	1.01(4/ 4) 0.42- 2.05	4.85(4/ 4) 2.08- 7.33	
	ZR-95	0.030	0.04(1/ 12) 0.04- 0.04	TRM 518.0	0.04(1/ 4) 0.04- 0.04	4 VALUES <LLD	
	NB-95	0.010	0.23(3/ 12) 0.13- 0.39	TRM 518.0	0.39(1/ 4) 0.39- 0.39	0.10(1/ 4) 0.10- 0.10	
	BI-214	0.020	1.06(12/ 12) 0.86- 1.22	TRM 518.0	1.18(4/ 4) 1.10- 1.22	1.31(4/ 4) 1.02- 1.65	
	BI-212	0.100	1.36(12/ 12) 0.80- 1.90	TRM 518.0	1.51(4/ 4) 1.01- 1.90	1.60(4/ 4) 1.28- 2.17	
	RA-223	NOT ESTAB	0.35(1/ 12) 0.35- 0.35	TRM 496.5	0.35(1/ 4) 0.35- 0.35	4 VALUES <LLD	
	TL-208	0.020	0.41(12/ 12) 0.32- 0.50	TRM 518.0	0.46(4/ 4) 0.43- 0.50	0.50(4/ 4) 0.42- 0.61	
	AC-228	0.060	1.51(12/ 12) 1.14- 1.72	TRM 518.0	1.61(4/ 4) 1.54- 1.72	1.71(4/ 4) 1.38- 2.04	
	PA-228	NOT ESTAB	0.06(1/ 12) 0.06- 0.06	TRM 518.0	0.06(1/ 4) 0.06- 0.06	4 VALUES <LLD	
	SR-89 16	1.500	2.36(3/ 12) 1.79- 2.74	TRM 527.4	2.54(1/ 4) 2.54- 2.54	1.64(1/ 4) 1.64- 1.64	
	SR-90 16	0.300	0.31(1/ 12) 0.31- 0.31	TRM 496.5	0.31(1/ 4) 0.31- 0.31	4 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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 WATTS BAR — DOCKET NO. 50-390
LOCATION OF FACILITY DECATUR TENNESSEE — 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	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENT
CLAM FLESH AVG							
PCI/GM (DRY WEIGHT)	GROSS ALPHA 4	0.100	0.38(4/ 4) 0.10- 0.59	TRM 496.5	0.38(4/ 4) 0.10- 0.59	0 VALUES <LLD	
(3.7×10^{-2} Bq/gm)	GROSS BETA 4	0.100	4.49(4/ 4) 2.14- 7.03	TRM 496.5	4.49(4/ 4) 2.14- 7.03	0 VALUES <LLD	
	GAMMA (GELI) 16						
	CS-137	0.080	0.24(1/ 12) 0.24- 0.24	TRM 518.0	0.24(1/ 4) 0.24- 0.24	0.32(1/ 4) 0.32- 0.32	
	NB-95	0.070	0.28(1/ 12) 0.28- 0.28	TRM 518.0	0.28(1/ 4) 0.28- 0.28	4 VALUES <LLD	
	BI-214	NOT ESTAB	1.18(6/ 12) 0.52- 2.07	TRM 496.5	2.07(1/ 4) 2.07- 2.07	2.18(3/ 4) 1.30- 3.84	
	TL-208	NOT ESTAB	0.17(1/ 12) 0.17- 0.17	TRM 518.0	0.17(1/ 4) 0.17- 0.17	4 VALUES <LLD	
	AC-228	NOT ESTAB	0.56(1/ 12) 0.56- 0.56	TRM 518.0	0.56(1/ 4) 0.56- 0.56	1.77(1/ 4) 1.77- 1.77	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
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 WATTS BAR — DOCKET NO. 50-390

LOCATION OF FACILITY DECATUR TENNESSEE — 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)	GROSS ALPHA 4	0.700	4 VALUES <LLD ANALYSIS PERFORMED -- ALL BELOW LLD			0 VALUES <LLD	
(3.7 x 10^{-2} Bq/gm)	GROSS BETA 4	0.700	8.48 (4/ 4) 7.65- 9.92	TRM 496.5	8.48 (4/ 4) 7.65- 9.92	0 VALUES <LLD	
	GAMMA (GELI) 16						
	CO-60	0.010	0.02 (3/ 12) 0.02- 0.03	TRM 518.0	0.03 (1/ 4) 0.03- 0.03	0.04 (1/ 4) 0.04- 0.04	
	CS-137	0.020	0.05 (3/ 12) 0.03- 0.08	TRM 518.0	0.08 (1/ 4) 0.08- 0.08	0.17 (2/ 4) 0.06- 0.28	
	BI-214	0.020	0.16 (12/ 12) 0.09- 0.26	TRM 496.5	0.18 (4/ 4) 0.10- 0.26	0.18 (4/ 4) 0.10- 0.26	
	BI-212	0.100	0.36 (1/ 12) 0.36- 0.36	TRM 518.0	0.36 (1/ 4) 0.36- 0.36	4 VALUES <LLD	
	TL-208	0.020	0.05 (9/ 12) 0.02- 0.10	TRM 518.0	0.06 (2/ 4) 0.03- 0.10	0.05 (3/ 4) 0.03- 0.09	
	AC-228	0.060	0.27 (11/ 12) 0.11- 0.53	TRM 496.5	0.31 (4/ 4) 0.29- 0.35	0.33 (1/ 4) 0.33- 0.33	
	SR-89 4	5.000	5.95 (2/ 4) 5.23- 6.67	TRM 496.5	5.95 (2/ 4) 5.23- 6.67	0 VALUES <LLD	
	SR-90 4	1.000	1.90 (3/ 4) 1.32- 2.49	TRM 496.5	1.90 (3/ 4) 1.32- 2.49	0 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

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 Tennessee Department of Public Health Radiological Laboratory and the Eastern Environmental Radiation Facility, Environmental Protection Agency, Montgomery, Alabama. Samples of air, water, milk, fish, and soil collected around nuclear plants are forwarded to these laboratories for analysis, and results are exchanged for comparison.

Conclusions

Since Watts Bar Nuclear Plant has not achieved criticality, there has been no contribution of radioactivity from the plant to the environment. The levels of radioactivity being reported in this document are due to natural background radiation, nuclear weapons testing, or other nuclear operations in the area.

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 widely reported in the eastern portion of the United States. Levels of ^{131}I in milk as high as 34.54 pCi/l were observed. The primary radioisotopes identified in the atmospheric media were ^{95}Zr, ^{95}Nb, ^{131}I, ^{132}I, ^{140}Ba, ^{140}La, and ^{89}Sr.