

TENNESSEE VALLEY AUTHORITY

MASTER

RADIOLOGICAL HEALTH STAFF

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.



TVA/PUB--84/65

DE84 901750

NOTICE
PORTIONS OF THIS REPORT ARE ILLEGIBLE. It
has been reproduced from the best available
copy to permit the broadest possible avail-
ability.

PRECONSTRUCTION RADIOACTIVITY LEVELS IN THE VICINITY
OF THE PROPOSED CLINCH RIVER BREEDER REACTOR PROJECT
1983

MASTER

MAY 1984

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

pa

Contents

	Page
List of Tables	iii
List of Figures	iv
Introduction	1
Preconstruction-Construction Phase Monitoring Program	2
Surface Water Sampling	3
Sediment Sampling	3
Ground Water Sampling	4
Environmental Gamma Radiation Levels	4
Summary	4

List of Tables

	Page
Table 1 - Detection Capabilities for Environmental Sample Analyses: Nominal Lower Limit of Detection	6
Table 2 - Radioactivity in Automatic Surface Water Total - Listing . .	7
Table 3 - Radioactivity in Automatic Surface Water Total - Summary . .	15
Table 4 - Radioactivity in Sediment - Listing	16
Table 5 - Radioactivity in Sediment - Summary	22
Table 6 - Radioactivity in Automatic Well Water - Listing	23
Table 7 - Radioactivity in Automatic Well Water - Summary	25
Table 8 - Environmental Gamma Radiation Levels	26

List of Figures

	Page
Figure 1 - Tennessee Valley Region	28
Figure 2 - Clinch River Breeder Reactor Plant Clinch River Sampling Stations	29
Figure 3 - TLD Locations - CRBRP	30

PRECONSTRUCTION RADIOACTIVITY LEVELS IN THE VICINITY
OF THE PROPOSED CLINCH RIVER BREEDER REACTOR PROJECT

Introduction

The Clinch River Breeder Reactor Plant (CRBRP) site, at which the nation's first Liquid Metal Fast Breeder Reactor (LMFBR) was proposed to be built, is located in east central Tennessee approximately 25 miles west of Knoxville, Tennessee (figure 1). Although the 1,364-acre site, located on a peninsula formed by a meander of the Clinch River between river miles 14.5 and 18.6, is technically within the city limits of Oak Ridge, it is located in the southwestern section on undeveloped property which is owned by the U.S. Government and is in the custody of the Tennessee Valley Authority (TVA).

TVA was designated as the agency responsible for the planning and implementation of an environmental monitoring program in the vicinity of the site. In response to this responsibility, an environmental radiological monitoring program was developed for the preoperational-operational phase of the project. The program, as modified in accordance with regulatory requirements and state-of-the-art monitoring procedures, was to be implemented approximately two years prior to plant operation.

Because of the proximity of the site to Oak Ridge National Laboratory, a preconstruction-construction phase environmental radiological monitoring program was designed to identify any radiological impact of construction activities on the environment. Three special studies were conducted in 1974, 1975, and 1976. In addition, a preconstruction monitoring program was implemented in 1975. The results obtained in the special studies and in the routine monitoring program through 1976 were reported in TVA report No. RH-77-3-CR1, "Preconstruction Radioactivity Levels in the Vicinity of the

Proposed Clinch River Breeder Reactor Project," April 1977. The results obtained in the routine monitoring program in calendar year 1977 were reported in TVA report No. TVA/OMS/81/7, "Update of Preconstruction Radioactivity Levels in the Vicinity of the Proposed Clinch River Breeder Reactor Project," August 1981. A routine monitoring program was not conducted for the period January 1978 through January 1982. Results obtained from the monitoring program for the remainder of 1982 were contained in the TVA report, "Preconstruction Radioactivity Levels in the Vicinity of the Proposed Clinch River Breeder Reactor Project, 1982," issued in July 1983.

Preconstruction-Construction Phase Monitoring Program

General

In 1975 a routine program was initiated for monitoring radioactivity levels in ground and surface waters and in bottom sediment in the vicinity of the CRBRP. This program was discontinued in January 1978 after funding for the project was significantly reduced. It was reinstated in February 1982 and continued through September 1983. Approximately two years prior to plant operation, it was to be replaced by a more extensive preoperational-operational monitoring program. However, due to project cancellation, the environmental monitoring program was discontinued after September 1983. The results obtained in the routine preconstruction-construction monitoring program for the period January through September 1983, are reported herein.

Samples were analyzed in TVA's Eastern Area Radiological Laboratory in Vonore, Tennessee, and the Western Area Radiological Laboratory in Muscle Shoals, Alabama. Gross alpha and gross beta content were determined by use of a low-background proportional counter. Strontium isotopes were separated from the sample by ion exchange and precipitated for counting. Gamma-emitting radionuclides were identified and quantified by gamma spectral analysis

employing a Ge(Li) detector. All sediment samples were dried, pulverized, and thoroughly mixed prior to analysis. For each sample type, the data are listed for individual samples and are summarized for the sampling period.

Detection capabilities for environmental sample analyses, given as the nominal lower limits of detection (LLD), are listed in table 1. All photopeaks found in Ge(Li) spectra were identified and quantified. Many of the isotopes identified by Ge(Li) spectral analysis were naturally occurring or naturally produced radioisotopes, such as ^{40}K , ^{212}Bi , ^{214}Bi , ^{212}Pb , ^{214}Pb , ^{226}Ra , etc.

Surface Water Sampling

River water samples were taken automatically by a sequential-type sampling device at Clinch River Miles (CRMs) 14.4, 15.4, 18.6, and 23.1. The sampler at CRM 14.4 is located immediately upstream of the Department of Energy (DOE) potable water intake and is considered representative of the raw potable water supply, and the one at CRM 23.1 is located at Melton Hill Dam. Composite samples from each location were forwarded monthly to the radiological laboratory for analysis. One additional sample was taken at each station on September 1, 1983 following a release of iodine-131 upstream (Oak Ridge-DOE) from the site. These four samples were analyzed for iodine-131 only. The results are shown in tables 2 and 3.

Sediment Sampling

Sediment samples were taken quarterly by TVA's Field Operations personnel at CRMs 14.4, 15.4, 17.9, 19.0, and 24.0 (figure 2). Samples were taken from the right overbanks (horizontal location--99 percent from the left bank looking in a downstream direction) at CRMs 14.4, 15.4, 17.9, and 19.0 and midchannel at CRM 24.0 by Ponar dredge hauls. The results are shown in tables 4 and 5.

Ground Water Sampling

Ground water monitoring was the same type of automatic sampler used in the river water monitoring at a well located downgradient from the proposed plant site. Water from this well was collected automatically and forwarded monthly to the radiological laboratory for analysis. The results are shown in tables 6 and 7.

Environmental Gamma Radiation Levels

Bulb-type Victoreen manganese-activated calcium fluoride ($\text{CaF}_2:\text{Mn}$) thermoluminescent dosimeters (TLDs) are placed at 11 stations around the plant near the site boundary and at 2 control stations approximately 20 miles from the site to determine the gamma exposure rates at these locations. The dosimeters, in energy compensating shields to correct energy dependence, are placed at approximately one meter above the ground, with two TLDs at each station. They are annealed and read with a Victoreen Model 2810 TLD reader. The values are corrected for gamma response, self-irradiation, and fading, with individual gamma response calibrations and self-irradiation factors determined for each TLD. The TLDs are exchanged every three months. Because of weather conditions there was a delay in exchanging the TLDs at the beginning of the first quarter. The exchange took place approximately two weeks late, therefore, the first quarter TLDs were in the field for approximately two months. Also, because of project cancellation, the second quarter TLDs were allowed to remain in the field for an additional month. Data for these two periods were normalized to a standard quarter (2190 hours). The quarterly gamma radiation levels determined from these TLDs are given in table 8.

Summary

Routine samples of ground water, river water, and bottom sediment were collected from the Clinch River in 1983 in the preconstruction-construction

phase of the CRBRP environmental radiological monitoring program. The results obtained from the analysis of these samples are similar to those reported earlier. The water samples analyzed for iodine-131 yielded only a slight indication of the presence of I-131 at levels below the nominal lower limit of detection of 0.5 pCi/L. The only significant radioisotopes identified in sediment samples were ^{137}Cs , ^{60}Co , and the naturally occurring ^{40}K . The results for ^{137}Cs vary from 2.2 to 10.1 pCi/g (dry weight), while the results for ^{60}Co range from 0.35 to 1.2 pCi/g (dry weight).

With the exception of tritium, no significant radioactivity was detected in ground or surface water at the CRBRP site. Tritium concentrations ranging from 12667 to 12,823 pCi/L were found in samples of surface water taken from the Clinch River below Melton Hill Dam while samples taken at the dam exhibited tritium levels from 28 to 942 pCi/L. These elevated tritium levels in the Clinch River below Melton Hill Dam are attributable to DOE operations at Oak Ridge. The maximum value reported (12,823 pCi/L), is only 0.43 percent of the maximum permissible concentration (MPC) of 3,000,000 pCi/L specified in 10 CFR 20, for nonoccupational exposure and 64 percent of the Environmental Protection Agency's (EPA) National Interim Primary Drinking Water Regulations maximum contaminant level of 20,000 pCi/L as listed in 40 CFR 141. The maximum tritium concentration in ground water was 1,457 pCi/L, or 0.05 percent of MPC and 7.3 percent of the EPA maximum contaminant level. The external gamma radiation levels measured at the CRBRP site averaged 17.4 ± 3.2 mR/quarter for 1983(table 8). This is consistent with levels measured at TVA's nonoperating nuclear power plant construction sites. The average levels reported for Watts Bar and Bellefonte Nuclear Plants for 1983 were 19.6 ± 1.7 and 19.5 ± 2.7 mR/quarter, respectively.

Levels were generally higher at stations 3, 4, 5, and 11 (figure 3), located along Bear Creek Road which forms the northern boundary of the site. Gamma radiation levels at these stations averaged 20.8 ± 2.1 mR/quarter.

Table 1

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSESNOMINAL LOWER LIMIT OF DETECTION (LLD)

<u>Analysis</u>	<u>Water pCi/l</u>	<u>Sediment pCi/g, dry weight</u>
Gross alpha ^a	2.0	0.35
Gross beta ^a	2.4	0.70
³ H ^a	330	
¹⁴⁴ Ce ^b	33	0.06
¹³⁴ Cs ^b	26	0.08
¹³⁷ Cs ^b	5	0.02
⁹⁵ Zr ^b	10	0.03
⁹⁵ Nb ^b	5	0.01
⁵⁴ Mn ^b	5	0.01
⁶⁵ Zn ^b	9	0.02
⁶⁰ Co ^b	5	0.01
⁴⁰ K ^b	Not Established	Not Established
¹⁴⁰ Ba ^b	25	0.07
¹⁴⁰ La ^b	7	0.02
⁸⁹ Sr ^a	10	1.5
⁹⁰ Sr ^a	2	0.3

^aAll 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.

^bThe LLD values for the analysis of gamma-emitting radionuclides with Ge(Li) detection systems 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 3.5l Marinelli beaker. Sediment is counted in a 0.5-l Marinelli beaker as dry weight. The average dry-weight is 400-600 grams. The counting system consists of a ND-6620 multichannel analyzer and Ge(Li) detector. The counting time is normally 8 hours for sediment samples and 4 hours for water samples. All spectral analysis is performed using the data reduction program HYPERMET on the HP-1000 computer system. 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 2

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

8

RADIOACTIVITY IN AUTOMATIC SURFACE WATER TOTAL - LISTING

PCI/L - 0.037 BQ/L

26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO		
05140 CRM 14.4	CLINCH R MILE 14.4	GROSS ALPHA	+2.0720	+1.2944	27DEC82	300434	
			+0.7323	+1.3705	21JAN83	301278	
			-0.4911 ^b	+1.6289	18FEB83	302161	
			+0.3498	+0.8246	18MAR83	303062	
			+1.0056	+1.2096	15APR83	303805	
			+0.0011	+0.6884	13MAY83	304812	
			+0.0015	+0.9198	10JUN83	305733	
			-0.0542 ^b	+0.3252	08JUL83	306460	
			+0.6237	+0.5206	05AUG83	307413	
			+0.4359	+0.5139	02SEP83	308155	
			-0.0649 ^b	+0.3891	30SEP83	309144	
			GROSS BETA	+4.9835	+0.8364	27DEC82	300434
				+3.3027	+0.7809	21JAN83	301278
				+5.5426	+0.9302	18FEB83	302161
				+3.6111	+0.6996	18MAR83	303062
				+11.3265	+1.1296	15APR83	303805
				+5.3105	+0.7823	13MAY83	304812
				+3.7806	+0.7529	10JUN83	305733
	+2.9801	+0.7374		08JUL83	306460		
	+1.8489	+0.5836		05AUG83	307413		
	+3.6231	+0.6845		02SEP83	308155		
	+3.7741	+0.6895		30SEP83	309144		
	+0.0507	+0.0489		01SEP83	308076		
	IODINE-131 GAMMA SCAN (GELI) K-40	+2.4779		+23.9456	21JAN83	301278	
		+31.7395		+23.8647	18FEB83	302161	
		+47.2088		+26.4492	15APR83	303805	
		+3.9752		+24.8587	13MAY83	304812	
		+15.6597	+24.1824	05AUG83	307413		
		+15.3295	+22.4001	01SEP83	308076		
		BI-214	+8.0845	+3.8123	18FEB83	302161	
			+4.0887	+2.2502	30SEP83	309144	
		PB-214	+0.9383	+3.0043	18FEB83	302161	
			+2.1725	+2.9420	08JUL83	306460	
		PB-212	+3.2361	+2.6964	30SEP83	309144	
+1.9268			+2.2102	18FEB83	302161		
TL-208	+0.5417	+2.6734	08JUL83	306460			
	+0.7923	+1.7408	27DEC82	300434			
AC-228	+2.1170	+1.3430	08JUL83	306460			
	+2.0103	+4.2492	05AUG83	307413			
BACKGROUND ^c	+999999.0000	+99999.0000	18MAR83	303062			
	+999999.0000	+99999.0000	10JUN83	305733			

TABLE 2

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

RADIOACTIVITY IN AUTOMATIC SURFACE WATER TOTAL - LISTING

PCI/L - 0.037 BQ/L

26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO	
05140 CRM 14.4 CLINCH R MILE 14.4	L GAMMA SCAN (GELI) BACKGROUND	+999999.0000	+99999.0000	02SEP83	308155	
		SR 89	+2.6295	+2.6293	27DEC82	300434
		+0.4650	+1.4906	21JAN83	301278	
		-1.6556 ^b	+1.0889	18FEB83	302161	
		+0.5166	+1.1165	18MAR83	303062	
		+4.9582	+4.1897	15APR83	303805	
		+0.1275	+2.6696	13MAY83	304812	
		+6.0930	+2.4166	10JUN83	305733	
		+1.9744	+1.3063	08JUL83	306460	
		+3.1686	+1.8490	05AUG83	307413	
		+1.0557	+0.8743	02SEP83	308155	
		+1.1271	+1.8558	30SEP83	309144	
		SR 90	+0.9373	+0.4301	27DEC82	300434
			+1.1410	+0.4349	21JAN83	301278
			+2.1373	+0.4605	18FEB83	302161
			+1.3916	+0.4811	18MAR83	303062
			+2.5606	+0.7099	15APR83	303805
			+1.4442	+0.4081	13MAY83	304812
			+0.1341	+0.5091	10JUN83	305733
			+0.3537	+0.3877	08JUL83	306460
			+0.1038	+0.7464	05AUG83	307413
			+0.5980	+0.4463	02SEP83	308155
			+0.4569	+0.4125	30SEP83	309144
		TRITIUM	+1331.7803	+94.0318	27DEC82	300434
			+1354.4893	+95.1419	21JAN83	301278
			+2689.8821	+155.2034	18FEB83	302161
			+2664.1946	+154.4646	18MAR83	303062
			+8457.3633	+438.7190	15APR83	303805
			+2455.3538	+145.0777	13MAY83	304812
			+1425.8118	+98.6541	10JUN83	305733
		+638.3879	+66.8382	08JUL83	306460	
		+214.2434	+78.4285	05AUG83	307413	
		+148.4673	+62.4013	02SEP83	308155	
		+218.4035	+63.8008	30SEP83	309144	
05141 CRM 15.4 CLINCH R MILE 15.4	GROSS ALPHA	+1.2667	+1.2683	27DEC82	300435	
		+1.1023	+1.4242	21JAN83	301280	
		+10.2184	+1.9960	18FEB83	302162	
		+0.3128	+0.7375	18MAR83	303063	
		+0.9631	+1.1585	15APR83	303806	
		+0.4954	+0.8585	13MAY83	304813	
		+2.8725	+1.5301	10JUN83	305734	

TABLE 2

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

10

 RADIOACTIVITY IN AUTOMATIC SURFACE WATER TOTAL - LISTING
 PCI/L - 0.037 BQ/L
 26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT LAB NO		
05141 CRM 15.4	CLINCH R MILE 15.4	GROSS ALPHA	+0.1668	+0.4010	08JUL83 306461	
			+0.6297	+0.5256	05AUG83 307410	
			-0.0638 ^b	+0.3827	02SEP83 308154	
		GROSS BETA	+0.7166	+0.5982	30SEP83 309145	
			+6.0932	+0.8991	27DEC82 300435	
			+3.4838	+0.7902	21JAN83 301280	
			+6.0268	+0.8435	18FEB83 302162	
			+3.1584	+0.6637	18MAR83 303063	
			+10.9362	+1.1047	15APR83 303806	
			+6.6753	+0.8716	13MAY83 304813	
			+4.8081	+0.8626	10JUN83 305734	
			+3.8701	+0.7707	08JUL83 306461	
			+3.4413	+0.6688	05AUG83 307410	
			+3.5929	+0.6775	02SEP83 308154	
			+2.8480	+0.6544	30SEP83 309145	
			IODINE-131 GAMMA SCAN (GELI) K-40	-0.0562	+0.0493	01SEP83 308075
				+21.1893	+26.5335	15APR83 303806
				+7.3170	+25.2280	05AUG83 307410
				+26.8344	+34.5847	02SEP83 308154
				+27.4624	+22.6901	30SEP83 309145
		BI-214		+0.0797	+2.9248	18MAR83 303063
				+1.8534	+1.7918	30SEP83 309145
		PB-214		+5.2196	+4.5623	08JUL83 306461
				PB-212	+2.1729	+2.8496	21JAN83 301280
		+0.5652			+2.8313	13MAY83 304813
		+3.0485	+2.6637	10JUN83 305734		
		+0.2681	+2.0217	05AUG83 307410		
		+0.6065	+2.1885	01SEP83 308075		
		+0.2877	+3.0835	02SEP83 308154		
		AC-228 BACKGROUND ^c SR 89	+4.9191	+5.5120	18FEB83 302162	
			+999999.0000	+99999.0000	27DEC82 300435	
			+8.4156	+2.5852	27DEC82 300435	
+2.7870	+1.5182		21JAN83 301280			
+2.8309	+1.3882		18FEB83 302162			
+2.2698	+1.1582		18MAR83 303063			
+5.5422	+3.9293		15APR83 303806			
+1.7704	+3.1910		13MAY83 304813			
+2.1861	+2.0889		10JUN83 305734			
+1.7845	+1.3771		08JUL83 306461			
+0.3113	+1.1404	05AUG83 307410				
+4.3066	+0.8186	02SEP83 308154				

TABLE 2

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

RADIOACTIVITY IN AUTOMATIC SURFACE WATER TOTAL- LISTING

PCI/L - 0.037 BQ/L

26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE	
				COLLECT	LAB NO
05141 CRM 15.4 CLINCH R MILE 15.4	SR 89	+3.6504	+2.1507	30SEP83	309145
		+0.0533	+0.4184	27DEC82	300435
	SR 90	+0.3417	+0.4354	21JAN83	301280
		+0.3328	+0.5720	18FEB83	302162
		+0.7155	+0.4938	18MAR83	303063
		+2.0474	+0.6635	15APR83	303806
		+2.3570	+0.4867	13MAY83	304813
		+0.8969	+0.4498	10JUN83	305734
		+0.1562	+0.4025	08JUL83	306461
		+0.7353	+0.4822	05AUG83	307410
		-0.6521 ^b	+0.4123	02SEP83	308154
		+0.1344	+0.4690	30SEP83	309145
	TRITIUM	+1596.6365	+105.9003	27DEC82	300435
		+1222.8025	+89.6504	21JAN83	301280
		+1959.6819	+121.1503	18FEB83	302162
		+3582.5625	+198.7815	18MAR83	303063
		+8151.9062	+423.5383	15APR83	303806
		+3239.7930	+182.2977	13MAY83	304813
		+1234.8545	+90.6508	10JUN83	305734
		+650.9060	+67.2564	08JUL83	306461
		+369.0696	+82.8827	05AUG83	307410
		+254.5152	+64.4279	02SEP83	308154
		+126.8147	+62.1471	30SEP83	309145
05143 CRM 18.6 CLINCH R MILE 18.6	GROSS ALPHA	+0.3006	+1.0841	27DEC82	300436
		-1.5677 ^b	+1.1113	21JAN83	301281
		+0.0028	+1.6358	18FEB83	302163
		+0.3549	+0.8367	18MAR83	303064
		+2.5257	+1.3454	08APR83	303807
		+0.2756	+0.9142	13MAY83	304814
		+0.3098	+1.0276	10JUN83	305735
		-0.0572 ^b	+0.3435	08JUL83	306462
		-0.0525 ^b	+0.3149	05AUG83	307412
		+0.6961	+0.5810	02SEP83	308153
		+0.4424	+0.5217	30SEP83	309146
	GROSS BETA	+4.8853	+0.8335	27DEC82	300436
		+3.3495	+0.7920	21JAN83	301281
		+3.7992	+0.8393	18FEB83	302163
+7.5123		+0.8990	18MAR83	303064	
+13.2803		+1.2210	08APR83	303807	
+8.4483		+0.9800	13MAY83	304814	
+3.3354		+0.7435	10JUN83	305735	
+3.3118		+0.7383	08JUL83	306462	

TABLE 2

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

12

RADIOACTIVITY IN AUTOMATIC SURFACE WATER TOTAL - LISTING

PCI/L - 0.037 BQ/L
26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT LAB NO			
05143 CRM 18.6	CLINCH R MILE 18.6	GROSS BETA	+1.5583	+0.5454	05AUG83 307412		
			+2.8788	+0.6518	02SEP83 308153		
	IODINE-131 GAMMA SCAN (GELI) K-40		+3.9095	+0.7016	30SEP83 309146		
			+0.0821	+0.0384	01SEP83 308074		
			+12.0764	+31.7149	27DEC82 300436		
			+7.1825	+23.4386	18FEB83 302163		
			+11.6496	+27.6119	13MAY83 304814		
			+32.8146	+27.9428	10JUN83 305735		
			+13.9689	+30.1169	05AUG83 307412		
			+6.0357	+25.0615	02SEP83 308153		
			BI-214		+1.1437	+4.2363	10JUN83 305735
					+1.6745	+3.3339	05AUG83 307412
	+24.4470	+8.0943			30SEP83 309146		
	PB-212		+0.1674	+3.1101	08JUL83 306462		
			+0.6383	+1.2517	27DEC82 300436		
	TL-208		+1.7878	+1.1610	18FEB83 302163		
			BACKGROUND ^c	+999999.0000+99999.0000	21JAN83 301281		
	SR 89		+999999.0000+99999.0000	18MAR83 303064			
			+999999.0000+99999.0000	08APR83 303807			
			+999999.0000+99999.0000	01SEP83 308074			
			+4.1838	+2.4350	27DEC82 300436		
			+2.4812	+1.4905	21JAN83 301281		
			+0.5703	+1.1278	18FEB83 302163		
			-0.2700 ^b	+1.3152	18MAR83 303064		
			+6.0877	+5.4490	08APR83 303807		
			+6.1055	+3.0806	13MAY83 304814		
			-0.0647 ^b	+1.8443	10JUN83 305735		
+3.0052			+1.5325	08JUL83 306462			
+4.0995			+3.3885	05AUG83 307412			
-0.8644 ^b			+0.9306	02SEP83 308153			
+6.0834			+2.3581	30SEP83 309146			
SR 90				-0.0630 ^b	+0.3896	27DEC82 300436	
				+0.1963	+0.4249	21JAN83 301281	
				+0.6449	+0.4811	18FEB83 302163	
	+2.6563	+0.5636		18MAR83 303064			
	+4.0694	+0.8341		08APR83 303807			
	+1.3108	+0.4582		13MAY83 304814			
	+0.9767	+0.3950		10JUN83 305735			
	+0.0352	+0.4430		08JUL83 306462			
+0.0979	+1.3438	05AUG83 307412					
	+1.0815	+0.4798	02SEP83 308153				

TABLE 2

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

RADIOACTIVITY IN AUTOMATIC SURFACE WATER TOTAL - LISTING

PCI/L - 0.037 BQ/L

26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO			
05143 CRM 13.6	CLINCH R MILE 18.6	SR 90	-0.3952 ^b	+0.5053	30SEP83	309146		
		TRITIUM	+725.2888	+70.4301	27DEC82	300436		
			+545.5581	+64.7283	21JAN83	301281		
			+898.7083	+75.9023	18FEB83	302163		
			+7753.6875	+404.0112	18MAR83	303064		
			+12822.8672	+656.1975	08APR83	303807		
			+2748.7217	+158.8931	13MAY83	304814		
			+1069.3584	+83.9773	10JUN83	305735		
			+682.1995	+68.3157	08JUL83	306462		
			+303.9397	+81.3522	05AUG83	307412		
			+205.0261	+63.4350	02SEP83	308153		
			+218.4035	+63.8008	30SEP83	309146		
		05145 CRM 23.1	<u>CLINCH R MILE 23.1</u>	GROSS ALPHA	+0.8905	+1.1504	27DEC82	300437
					-0.3929 ^b	+1.3034	21JAN83	301279
					+0.4720	+1.7019	18FEB83	302164
					+0.9185	+0.8049	18MAR83	303065
					+1.2841	+1.2029	15APR83	303808
	-0.7206 ^b			+0.6365	13MAY83	304815		
	+0.6338			+1.0982	10JUN83	305736		
	+0.3891			+0.4588	08JUL83	306463		
	+0.3774			+0.4449	05AUG83	307414		
	+1.3034			+0.7417	02SEP83	308152		
	+0.1904			+0.4579	30SEP83	309147		
GROSS BETA	+2.7069			+0.7256	27DEC82	300437		
	+4.0156			+0.8248	21JAN83	301279		
	+3.6102			+0.8300	18FEB83	302164		
	+2.3700			+0.6210	18MAR83	303065		
	+2.6201			+0.6818	15APR83	303808		
	+2.2408			+0.6402	13MAY83	304815		
	+3.4866	+0.7566	10JUN83	305736				
	+3.8808	+0.7728	08JUL83	306463				
	+1.7238	+0.5668	05AUG83	307414				
	+0.7479	+0.5081	02SEP83	308152				
	+3.5337	+0.6781	30SEP83	309147				
	+0.0306	+0.0406	01SEP83	308073				
	IODINE-131							
	GAMMA SCAN (GELI)							
	K-40	+3.5510	+27.0323	21JAN83	301279			
		+38.8349	+20.1995	13MAY83	304815			
		+4.5372	+25.0142	05AUG83	307414			
		+8.7603	+15.3177	01SEP83	308073			
		+7.0728	+28.2870	02SEP83	308152			
	BI-214	+0.1300	+3.3513	21JAN83	301279			

TABLE 2

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

14

RADIOACTIVITY IN AUTOMATIC SURFACE WATER TOTAL - LISTING

PCI/L - 0.037 BQ/L

26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO		
05145 CRM 23.1	CLINCH R MILE 23.1	L GAMMA SCAN (GELI)	BI-214	+0.5755	+4.1356	08JUL83	306463
				+5.5804	+2.8951	30SEP83	309147
		PB-214	+0.0390	+4.0063	08JUL83	306463	
			+3.0704	+3.7545	30SEP83	309147	
		PB-212	+2.4001	+2.5090	13MAY83	304815	
			+1.1341	+1.5347	01SEP83	308073	
		BACKGROUND ^c	+0.4571	+3.1383	30SEP83	309147	
			+999999.0000	+99999.0000	27DEC82	300437	
			+999999.0000	+99999.0000	18FEB83	302164	
			+999999.0000	+99999.0000	18MAR83	303065	
			+999999.0000	+99999.0000	15APR83	303808	
			+999999.0000	+99999.0000	10JUN83	305736	
			SR 89	-5.7193 ^b	+2.6432	27DEC82	300437
				+4.0551	+1.5708	21JAN83	301279
		+0.9577		+1.0565	18FEB83	302164	
		-0.2897 ^b		+1.0126	18MAR83	303065	
		+6.0234		+3.6475	15APR83	303808	
		+0.0288		+2.7731	13MAY83	304815	
		-0.4510 ^b		+1.9731	10JUN83	305736	
		+0.5351		+1.1457	08JUL83	306463	
		+0.3750		+1.0010	05AUG83	307414	
		+0.5171		+0.8140	02SEP83	308152	
		SR 90	+2.3266	+2.3808	30SEP83	309147	
			+1.8143	+0.4304	27DEC82	300437	
			-0.2481 ^b	+0.4461	21JAN83	301279	
			+0.2143	+0.4507	18FEB83	302164	
			+0.6342	+0.4286	18MAR83	303065	
			+0.2126	+0.6018	15APR83	303808	
			+0.4197	+0.4074	13MAY83	304815	
			+0.8322	+0.4222	10JUN83	305736	
			+0.2420	+0.3371	08JUL83	306463	
			+0.4833	+0.4217	05AUG83	307414	
TRITIUM	+0.2082	+0.4205	02SEP83	308152			
	+0.4273	+0.5129	30SEP83	309147			
	+87.5350	+53.5275	27DEC82	300437			
	+75.2496	+53.5631	21JAN83	301279			
	+237.1502	+55.2656	18FEB83	302164			
	+236.7047	+56.9433	18MAR83	303065			
	+169.5592	+53.5181	15APR83	303808			
	+369.8972	+60.3080	13MAY83	304815			
	+942.0542	+79.0511	10JUN83	305736			

TABLE 2

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

RADIOACTIVITY IN AUTOMATIC SURFACE WATER TOTAL - LISTING

PCI/L - 0.037 BQ/L

26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT LAB NO
05145 CRM 23.1 CLINCH R MILE 23.1	TRITIUM	+168.9855	+54.1388	08JUL83 306463
		-53.5612 ^b	+73.9549	05AUG83 307414
		+49.4891	+60.8677	02SEP83 308152
		+28.1807	+60.7040	30SEP83 309147

a. The uncertainty reported is the 1-sigma counting error.

b. Negative value is an artifact of counting statistics and does not infer a negative activity.

c. Internal background check.

TABLE 3

RADIOACTIVITY IN AUTOMATIC SURFACE WATER TOTAL - SUMMARY

PCI/L - 0.037 BQ/L

16

NAME OF FACILITY		CLINCH RIVER BREEDER-CRBRP		DOCKET NO. 50-537			
LOCATION OF FACILITY		ROANE		TENNESSEE			
REPORTING PERIOD		1983					
TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION ^a (LLD)	ALL INDICATOR LOCATIONS		LOCATION WITH HIGHEST ANNUAL MEAN		CONTROL LOCATIONS MEAN (F) ^b RANGE ^b	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
		MEAN (F) ^b RANGE ^b	DISTANCE AND DIRECTION	NAME	MEAN (F) ^b RANGE ^b		
GROSS ALPHA	2.000	5.05(3/ 22)	CRM 15.4	6.55(2/ 11)	2.53(1/ 22)		
44		2.07- 10.22	CLINCH R MILE 15	2.87- 10.22	2.53- 2.53		
GROSS BETA	2.400	4.91(21/ 22)	CRM 15.4	4.99(11/ 11)	4.62(17/ 22)		
44		2.85- 11.33	CLINCH R MILE 15	2.85- 10.94	2.62- 13.28		
IODINE-131	NOT ESTAB	0.05(1/ 2)	CRM 14.4	0.05(1/ 1)	0.06(2/ 2)		
4		0.05- 0.05	CLINCH R MILE 14	0.05- 0.05	0.03- 0.08		
GAMMA (GELI)							
48							
K-40	NOT ESTAB	19.92(10/ 24)	CRM 15.4	20.70(4/ 12)	13.32(11/ 24)		
		2.48- 47.21	CLINCH R MILE 15	7.32- 27.46	3.55- 38.83		
BI-214	NOT ESTAB	3.53(4/ 24)	CRM 14.4	6.09(2/ 12)	5.59(6/ 24)		
		0.08- 8.08	CLINCH R MILE 14	4.09- 8.08	0.13- 24.45		
PB-214	NOT ESTAB	2.89(4/ 24)	CRM 15.4	5.22(1/ 12)	1.55(2/ 24)		
		0.94- 5.22	CLINCH R MILE 15	5.22- 5.22	0.04- 3.07		
PB-212	NOT ESTAB	1.18(8/ 24)	CRM 14.4	1.23(2/ 12)	1.04(4/ 24)		
		0.27- 3.05	CLINCH R MILE 14	0.54- 1.93	0.17- 2.40		
SR 89	10.000	22 VALUES <LLD			22 VALUES <LLD		
44		ANALYSIS PERFORMED					
SR 90	2.000	2.28(4/ 22)	CRM 14.4	2.35(2/ 11)	3.36(2/ 22)		
		2.05- 2.56	CLINCH R MILE 14	2.14- 2.56	2.66- 4.07		
TRITIUM	330.000	2530.91(17/ 22)	CRM 14.4	2627.16(8/ 11)	2855.83(10/ 22)		
44		369.07- 8457.36	CLINCH R MILE 14	638.39- 8457.36	369.90-12822.87		
44		369.07- 8457.36	CLINCH R MILE 14	638.39- 8457.36	369.90-12822.87		

a. Nominal LLD as described in table 1.

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

TABLE 4

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

RADIOACTIVITY IN SEDIMENT (SAMPLE 1) - LISTING

PCI/G - 0.037 BQ/G (DRY WEIGHT)

26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO	
0514J CRM 14.4	CLINCH R MILE 14.4	GROSS ALPHA	+1.0619	+0.3192	11JAN83	301623
			+1.2237	+0.3597	29APR83	304572
			+8.8898	+1.5017	29JUL83	309133
	GROSS BETA	+23.9467	+2.4924	11JAN83	301623	
		+23.2448	+2.4131	29APR83	304572	
		+50.8959	+5.2411	29JUL83	309133	
	GAMMA SCAN (GELI)	CO-60	+1.2154	+0.0523	11JAN83	301623
			+0.6706	+0.0335	29APR83	304572
			+0.3499	+0.0203	29JUL83	309133
	CS-134	+0.0051	+0.0045	29JUL83	309133	
		CS-137	+10.0182	+0.3799	11JAN83	301623
	K-40		+10.1078	+0.3742	29APR83	304572
		BI-214	+2.2139	+0.0916	29JUL83	309133
	BI-212		+11.2468	+0.5487	11JAN83	301623
		PB-214	+13.0862	+0.6500	29APR83	304572
	PB-212		+15.0224	+0.9207	29JUL83	309133
		RA-226	+0.5139	+0.0301	11JAN83	301623
	RA-224		+0.5448	+0.0406	29APR83	304572
		TL-208	+0.7302	+0.0446	29JUL83	309133
	AC-228		+0.6090	+0.0768	11JAN83	301623
		SR 89	+0.7075	+0.1163	29APR83	304572
	SR 89		+0.9606	+0.1239	29JUL83	309133
		SR 89	+0.5576	+0.0368	11JAN83	301623
	SR 89		+0.6539	+0.0380	29APR83	304572
		SR 89	+0.8108	+0.0552	29JUL83	309133
	SR 89		+0.5724	+0.0254	11JAN83	301623
		SR 89	+0.6298	+0.0451	29APR83	304572
	SR 89		+0.8328	+0.0497	29JUL83	309133
		SR 89	+0.5139	+0.0301	11JAN83	301623
	SR 89		+0.5448	+0.0406	29APR83	304572
		SR 89	+0.7302	+0.0446	29JUL83	309133
	SR 89		+0.7529	+0.0832	11JAN83	301623
		SR 89	+0.2016	+0.0118	11JAN83	301623
SR 89	+0.2128		+0.0182	29APR83	304572	
	SR 89	+0.3020	+0.0174	29JUL83	309133	
SR 89		+0.5996	+0.0496	11JAN83	301623	
	SR 89	+0.6341	+0.0419	29APR83	304572	
SR 89		+0.8185	+0.0536	29JUL83	309133	
	SR 89	+12.1371	+5.4059	11JAN83	301623	
SR 89		+2.5840	+1.2074	29APR83	304572	
	SR 89	+4.4769	+1.0594	29JUL83	309133	

TABLE 4

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

18

RADIOACTIVITY IN SEDIMENT (SAMPLE 1) - LISTING

PCI/G - 0.037 BQ/G (DRY WEIGHT)

26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO		
05140 CRM 14.4	CLINCH R MILE 14.4	SR 90	+0.0827	+0.0939	11JAN83 301623		
			-0.0188 ^b	+0.0894	29APR83 304572		
			-0.0450 ^b	+0.0720	29JUL83 309133		
05141 CRM 15.4	CLINCH R MILE 15.4	GROSS ALPHA	+1.4978	+0.3774	11JAN83 301621		
			+0.9260	+0.3304	29APR83 304574		
			+4.5707	+1.0043	29JUL83 309135		
		GROSS BETA	+17.0559	+1.8015	11JAN83 301621		
			+13.8262	+1.4747	29APR83 304574		
			+32.1793	+3.3711	29JUL83 309135		
		GAMMA SCAN (GELI)	CO-60	+0.6718	+0.0354	11JAN83 301621	
				+0.5505	+0.0311	29APR83 304574	
				+0.6252	+0.0352	29JUL83 309135	
				CS-137	+4.0828	+0.1574	11JAN83 301621
					+3.9344	+0.1544	29APR83 304574
					+5.1954	+0.1976	29JUL83 309135
				K-40	+8.8039	+0.4361	11JAN83 301621
					+8.2561	+0.4749	29APR83 304574
					+8.1093	+0.4380	29JUL83 309135
				BI-214	+0.4398	+0.0307	11JAN83 301621
					+0.4194	+0.0264	29APR83 304574
					+0.4691	+0.0287	29JUL83 309135
				BI-212	+0.5873	+0.0668	11JAN83 301621
					+0.6008	+0.0916	29APR83 304574
					+0.5236	+0.0872	29JUL83 309135
				PB-214	+0.5256	+0.0367	11JAN83 301621
					+0.4520	+0.0265	29APR83 304574
					+0.4982	+0.0399	29JUL83 309135
				PB-212	+0.4952	+0.0299	11JAN83 301621
					+0.4376	+0.0343	29APR83 304574
					+0.5027	+0.0359	29JUL83 309135
RA-226	+0.4398			+0.0307	11JAN83 301621		
	+0.4194			+0.0264	29APR83 304574		
	+0.4691			+0.0287	29JUL83 309135		
RA-224	+0.5494			+0.1234	11JAN83 301621		
	+0.1685			+0.0147	11JAN83 301621		
	+0.1666			+0.0113	29APR83 304574		
TL-208	+0.1757	+0.0104	29JUL83 309135				
	+0.5012	+0.0412	11JAN83 301621				
	+0.4739	+0.0372	29APR83 304574				
AC-228	+0.5556	+0.0413	29JUL83 309135				
	+1.2523	+0.6174	11JAN83 301621				
	SR 89						

TABLE 4

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

RADIOACTIVITY IN SEDIMENT (SAMPLE 1) - LISTING

PCI/G - 0.037 BQ/G (DRY WEIGHT)
26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO	
05141 CRM 15.4	CLINCH R MILE 15.4	SR 89	+2.2727	+1.2623	29APR83	304574
			+1.9616	+0.9951	29JUL83	309135
			+0.0495	+0.1308	11JAN83	301621
05142 CRM 17.9	CLINCH R MILE 17.9	SR 90	+0.0801	+0.0947	29APR83	304574
			-0.0116 ^b	+0.0668	29JUL83	309135
			+1.9144	+0.4210	11JAN83	301619
		GROSS ALPHA	+1.5748	+0.3955	29APR83	304576
			+6.4984	+1.2266	29JUL83	309137
			+12.4475	+1.3420	11JAN83	301619
		GROSS BETA	+25.5051	+2.6385	29APR83	304576
			+53.0281	+5.4502	29JUL83	309137
			GAMMA SCAN (GELI)			
		CO-60	+0.5042	+0.0282	11JAN83	301619
			+0.1427	+0.0131	29APR83	304576
		CS-137	+0.0652	+0.0096	29JUL83	309137
			+2.2456	+0.0895	11JAN83	301619
K-40	+0.9806	+0.0517	29APR83	304576		
	+0.6506	+0.0349	29JUL83	309137		
	+8.2847	+0.3966	11JAN83	301619		
BI-214	+14.5030	+0.6822	29APR83	304576		
	+16.6452	+0.7736	29JUL83	309137		
	+0.4465	+0.0335	11JAN83	301619		
BI-212	+0.6789	+0.0364	29APR83	304576		
	+0.7281	+0.0429	29JUL83	309137		
	+0.5072	+0.0759	11JAN83	301619		
PB-214	+0.8607	+0.1119	29APR83	304576		
	+0.9800	+0.1199	29JUL83	309137		
	+0.4436	+0.0591	11JAN83	301619		
PB-212	+0.7430	+0.0376	29APR83	304576		
	+0.8307	+0.0452	29JUL83	309137		
	+0.4659	+0.0263	11JAN83	301619		
RA-226	+0.7878	+0.0470	29APR83	304576		
	+0.8874	+0.0556	29JUL83	309137		
	+0.4465	+0.0335	11JAN83	301619		
RA-224	+0.6789	+0.0364	29APR83	304576		
	+0.7281	+0.0429	29JUL83	309137		
	+0.4744	+0.0970	11JAN83	301619		
TL-208	+1.0088	+0.1455	29APR83	304576		
	+0.1677	+0.0144	11JAN83	301619		
	+0.2681	+0.0199	29APR83	304576		
		+0.2967	+0.0188	29JUL83	309137	

TABLE 4

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

20

 RADIOACTIVITY IN SEDIMENT (SAMPLE 1) - LISTING
 PCI/G - 0.037 BQ/G (DRY WEIGHT)
 26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO	
05142 CRM 17.9	CLINCH R MILE 17.9	L GAMMA SCAN (GELI) AC-228	+0.5022	+0.0405	11JAN83	301619
			+0.8417	+0.0519	29APR83	304576
	SR 89	+0.9516	+0.0724	29JUL83	309137	
		-0.0120 ^b	+0.4037	11JAN83	301619	
		+2.2599	+1.2774	29APR83	304576	
		-0.5231 ^b	+0.9996	29JUL83	309137	
	SR 90	+0.1814	+0.0949	11JAN83	301619	
		+0.0905	+0.0980	29APR83	304576	
		+0.1316	+0.0671	29JUL83	309137	
		+2.5312	+0.4850	11JAN83	301617	
05144 CRM 19.0	CLINCH R MILE 19.0	GROSS ALPHA	+2.2683	+0.4654	29APR83	304578
			+8.2319	+1.4168	29JUL83	309139
	GROSS BETA	+30.1130	+3.1015	11JAN83	301617	
		+27.7990	+2.8669	29APR83	304578	
	GAMMA SCAN (GELI)	+56.9033	+5.8364	29JUL83	309139	
		CO-60	+0.4845	+0.0253	29APR83	304578
	CS-137	+0.2561	+0.0188	29JUL83	309139	
		+0.0930	+0.0220	11JAN83	301617	
	K-40	+2.8470	+0.1191	29APR83	304578	
		+12.8171	+0.4733	29JUL83	309139	
	BI-214	+16.1770	+1.6472	11JAN83	301617	
		+16.1027	+0.9656	29APR83	304578	
	BI-212	+13.7112	+0.7731	29JUL83	309139	
		+1.4411	+0.1584	11JAN83	301617	
	PB-214	+0.7954	+0.0477	29APR83	304578	
		+0.7990	+0.0470	29JUL83	309139	
	PB-212	+2.2399	+0.6363	11JAN83	301617	
		+1.1018	+0.1478	29APR83	304578	
	RA-226	+0.9576	+0.1132	29JUL83	309139	
		+1.4573	+0.1464	11JAN83	301617	
	RA-224	+0.9455	+0.0518	29APR83	304578	
		+0.8901	+0.0481	29JUL83	309139	
	TL-208	+1.0768	+0.1234	11JAN83	301617	
		+0.9808	+0.0592	29APR83	304578	
	TL-208	+0.9182	+0.0474	29JUL83	309139	
		+1.4411	+0.1584	11JAN83	301617	
	TL-208	+0.7954	+0.0477	29APR83	304578	
		+0.7990	+0.0470	29JUL83	309139	
TL-208	+1.2213	+0.1922	29JUL83	309139		
	+0.3002	+0.0567	11JAN83	301617		

TABLE 4

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

RADIOACTIVITY IN SEDIMENT (SAMPLE 1) - LISTING

PCI/G - 0.037 BQ/G (DRY WEIGHT)
26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO	
05144 CRM 19.0 CLINCH R MILE 19.0	L GAMMA SCAN (GELI)					
	TL-208	+0.3389	+0.0246	29APR83	304578	
		+0.3143	+0.0250	29JUL83	309139	
	AC-228	+0.9905	+0.2377	11JAN83	301617	
		+0.9767	+0.0781	29APR83	304578	
		+0.8867	+0.0587	29JUL83	309139	
	SR 89	+0.8696	+0.3475	11JAN83	301617	
		+1.5136	+1.2525	29APR83	304578	
		+7.0070	+1.2731	29JUL83	309139	
	SR 90	-0.0457 ^b	+0.0821	11JAN83	301617	
		+0.1740	+0.0961	29APR83	304578	
		-0.1183 ^b	+0.0823	29JUL83	309139	
	05146 CRM 24.0 CLINCH R MILE 24.0	GROSS ALPHA	+4.5272	+0.6853	11JAN83	301615
			+2.9837	+0.5211	29APR83	304580
		+12.6704	+1.8821	29JUL83	309141	
GROSS BETA		+40.0392	+4.0889	11JAN83	301615	
		+39.9285	+4.0723	29APR83	304580	
		+64.0255	+6.5459	29JUL83	309141	
GAMMA SCAN (GELI)						
CO-60		+0.3926	+0.0229	11JAN83	301615	
		+0.3852	+0.0633	29APR83	304580	
		+0.2510	+0.0183	29JUL83	309141	
CS-137		+0.7461	+0.0392	11JAN83	301615	
		+0.7215	+0.0894	29APR83	304580	
		+0.7551	+0.0386	29JUL83	309141	
K-40		+21.9729	+1.0084	11JAN83	301615	
		+18.6450	+1.8985	29APR83	304580	
		+17.9066	+0.7951	29JUL83	309141	
BI-214		+1.2805	+0.0643	11JAN83	301615	
		+0.8101	+0.1671	29APR83	304580	
		+1.1025	+0.0619	29JUL83	309141	
BI-212		+1.9478	+0.1861	11JAN83	301615	
		+1.6310	+0.1650	29JUL83	309141	
PB-214		+1.5114	+0.0717	11JAN83	301615	
		+0.9840	+0.1389	29APR83	304580	
	+1.2695	+0.0675	29JUL83	309141		
PB-212	+1.7406	+0.0818	11JAN83	301615		
	+1.2655	+0.1380	29APR83	304580		
	+1.4883	+0.0806	29JUL83	309141		
RA-226	+1.2805	+0.0643	11JAN83	301615		
	+0.8101	+0.1671	29APR83	304580		
	+1.1025	+0.0619	29JUL83	309141		

TABLE 4

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

22

RADIOACTIVITY IN SEDIMENT (SAMPLE 1) - LISTING

PCI/G - 0.037 BQ/G (DRY WEIGHT)
26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT LAB NO
05146 CRM 24.0	CLINCH R MILE 24.0	L GAMMA SCAN (GELI)		
	RA-224	+1.9946	+0.2521	11JAN83 301615
	TL-208	+0.5925	+0.0329	11JAN83 301615
		+0.4759	+0.0653	29APR83 304580
		+0.4844	+0.0272	29JUL83 309141
	AC-228	+1.7888	+0.1047	11JAN83 301615
		+2.1040	+0.3918	29APR83 304580
		+1.3477	+0.1009	29JUL83 309141
	PA-234M	+4.7799	+0.9627	11JAN83 301615
	SR 89	+0.7728	+0.1956	11JAN83 301615
		+3.7063	+1.4274	29APR83 304580
		+2.1000	+0.8895	29JUL83 309141
	SR 90	-0.0655 ^b	+0.0494	11JAN83 301615
		-0.0535 ^b	+0.1049	29APR83 304580
		+0.0153	+0.0588	29JUL83 309141

a. The uncertainty reported is the 1-sigma counting error.

b. Negative value is an artifact of counting statistics and does not infer a negative activity.

TABLE 5

RADIOACTIVITY IN SEDIMENT (SAMPLE 1) - SUMMARY

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY CLINCH RIVER BREEDER-CRBRB DOCKET NO. 50-532
 LOCATION OF FACILITY ROANE TENNESSEE REPORTING PERIOD 1983

TYPE AND TOTAL NUMBER OF ANALYSIS	LOWER LIMIT OF DETECTION ^a (LLD)	ALL INDICATOR LOCATIONS MEAN (F) ^b		LOCATION WITH HIGHEST ANNUAL MEAN NAME MEAN (F) ^b		CONTROL LOCATIONS MEAN (F) ^b		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
		RANGE ^b		DISTANCE AND DIRECTION RANGE ^b		RANGE ^b		
REFORMED GROSS ALPHA	NOT ESTAB	3.03(	6/ 6)	CRM 14.4	3.73(	3/ 3)	4.80(	9/ 9)
15		0.93-	8.89	CLINCH R MILE 14	1.06-	8.89	1.57-	12.67
GROSS BETA	NOT ESTAB	26.86(	6/ 6)	CRM 14.4	32.70(	3/ 3)	38.87(	9/ 9)
15		13.83-	50.90	CLINCH R MILE 14	23.24-	50.90	12.45-	64.03
GAMMA (GELI)								
15								
CO-60	NOT ESTAB	0.68(	6/ 6)	CRM 14.4	0.75(	3/ 3)	0.31(	8/ 9)
		0.35-	1.22	CLINCH R MILE 14	0.35-	1.22	0.07-	0.50
CS-134	NOT ESTAB	0.01(	1/ 6)	CRM 14.4	0.01(	1/ 3)	9 VALUES <LLD	
		0.01-	0.01	CLINCH R MILE 14	0.01-	0.01		
CS-137	NOT ESTAB	5.93(	6/ 6)	CRM 14.4	7.45(	3/ 3)	2.43(	9/ 9)
		2.21-	10.11	CLINCH R MILE 14	2.21-	10.11	0.09-	12.82
K-40	NOT ESTAB	10.75(	6/ 6)	CRM 14.4	13.12(	3/ 3)	15.99(	9/ 9)
		8.11-	15.02	CLINCH R MILE 14	11.25-	15.02	8.28-	21.97
BI-214	NOT ESTAB	0.52(	6/ 6)	CRM 14.4	0.60(	3/ 3)	0.90(	9/ 9)
		0.42-	0.73	CLINCH R MILE 14	0.51-	0.73	0.45-	1.44
BI-212	NOT ESTAB	0.66(	6/ 6)	CRM 14.4	0.76(	3/ 3)	1.28(	8/ 9)
		0.52-	0.96	CLINCH R MILE 14	0.61-	0.96	0.51-	2.24
PB-214	NOT ESTAB	0.58(	6/ 6)	CRM 14.4	0.68(	3/ 3)	1.01(	9/ 9)
		0.45-	0.81	CLINCH R MILE 14	0.56-	0.81	0.44-	1.51
PB-212	NOT ESTAB	0.58(	6/ 6)	CRM 14.4	0.68(	3/ 3)	1.07(	9/ 9)
		0.44-	0.83	CLINCH R MILE 14	0.57-	0.83	0.47-	1.74
RA-226	NOT ESTAB	0.52(	6/ 6)	CRM 14.4	0.60(	3/ 3)	0.90(	9/ 9)
		0.42-	0.73	CLINCH R MILE 14	0.51-	0.73	0.45-	1.44
RA-224	NOT ESTAB	0.65(	2/ 6)	CRM 14.4	0.75(	1/ 3)	1.17(	4/ 9)
		0.55-	0.75	CLINCH R MILE 14	0.75-	0.75	0.47-	1.99
TL-208	NOT ESTAB	0.20(	6/ 6)	CRM 14.4	0.24(	3/ 3)	0.36(	9/ 9)
		0.17-	0.30	CLINCH R MILE 14	0.20-	0.30	0.17-	0.59
AC-228	NOT ESTAB	0.60(	6/ 6)	CRM 14.4	0.68(	3/ 3)	1.15(	9/ 9)
		0.47-	0.82	CLINCH R MILE 14	0.60-	0.82	0.50-	2.10
PA-234M	NOT ESTAB	6 VALUES <LLD					4.78(	1/ 9)
							4.78-	4.78
SR 89	NOT ESTAB	4.11(	6/ 6)	CRM 14.4	6.40(	3/ 3)	2.60(	7/ 9)
15		1.25-	12.14	CLINCH R MILE 14	2.58-	12.14	0.77-	7.01
SR 90	NOT ESTAB	0.07(	3/ 6)	CRM 14.4	0.08(	1/ 3)	0.12(	5/ 9)
15		0.05-	0.08	CLINCH R MILE 14	0.08-	0.08	0.02-	0.18

a. Nominal LLD as described in table 1.

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

TABLE 6

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

24

RADIOACTIVITY IN AUTOMATIC WELL WATER - LISTING

PCI/L - 0.037 BQ/L

26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE COLLECT	LAB NO	
05130 WELL #1	GROSS ALPHA	-1.9216 ^b	+1.9240	27DEC82	300433	
		-2.5332 ^b	+1.7957	21JAN83	301282	
		+0.2481	+1.6827	18FEB83	302165	
		+0.2411	+1.6355	18MAR83	303066	
		+0.8917	+1.9269	15APR83	303809	
		+0.0018	+1.1082	09MAY83	304256	
		+1.1276	+1.3564	10JUN83	305732	
		+0.4937	+0.5822	08JUL83	306464	
		+0.4482	+0.5285	05AUG83	307411	
		+0.8269	+0.9750	01SEP83	308156	
		+0.6174	+0.7279	30SEP83	309143	
		GROSS BETA	+3.1261	+0.8523	27DEC82	300433
	+0.8462		+0.7474	21JAN83	301282	
	+1.6975		+0.6968	18FEB83	302165	
	+3.0589		+0.7620	18MAR83	303066	
	+4.2504		+0.9014	15APR83	303809	
	+1.6417		+0.6908	09MAY83	304256	
	+6.5272		+0.9744	10JUN83	305732	
	+2.7430		+0.8535	08JUL83	306464	
	+1.1444		+0.5398	05AUG83	307411	
	+3.8436		+0.7971	01SEP83	308156	
	+2.4790		+0.6819	30SEP83	309143	
	GAMMA SCAN (GELI)		K-40	+46.1068	+26.3961	27DEC82	300433
		+13.1022		+26.7157	18FEB83	302165
		+4.9992		+25.8817	09MAY83	304256
		BI-214	+21.6995	+23.9071	05AUG83	307411
			+25.9606	+26.1936	01SEP83	308156
			+3.0944	+3.7119	27DEC82	300433
		PB-212	+3.6547	+3.5961	18MAR83	303066
			+1.7962	+2.9342	05AUG83	307411
			+1.6150	+2.0917	30SEP83	309143
		TL-208	+0.0692	+2.6665	10JUN83	305732
			+0.1253	+3.1269	08JUL83	306464
+0.8585			+2.1962	01SEP83	308156	
BACKGROUND ^c	+1.2340	+1.1863	27DEC82	300433		
	+0.9779	+1.5117	08JUL83	306464		
	+999999.0000	+99999.0000	21JAN83	301282		
SR 89	+999999.0000	+99999.0000	15APR83	303809		
	+1.7483	+1.8277	27DEC82	300433		
	-0.2434 ^b	+1.1621	21JAN83	301282		
	+1.6404	+0.9129	18FEB83	302165		
		+19.3230	+5.0153	18MAR83	303066	

TABLE 6

ENVIRONMENTAL RADIOLOGICAL MONITORING AT CLINCH RIVER BREEDER-CRBRP

RADIOACTIVITY IN AUTOMATIC WELL WATER - LISTING

PCI/L - 0.037 BQ/L
26DEC82 TO 31DEC83

STATION CODE/LOCATION/DESCRIPTION	ANALYSIS (NUCLIDE)	ACTIVITY	ERROR TERM ^a	DATE		
				COLLECT	LAB NO	
05130 WELL #1	SR 89	+6.9435	+3.3231	15APR83	303809	
		+34.8284	+8.9241	09MAY83	304256	
		+2.3714	+1.5256	10JUN83	305732	
		+4.3145	+1.6411	08JUL83	306464	
		+0.8553	+0.7147	05AUG83	307411	
		+2.2279	+0.7775	01SEP83	308156	
		+1.9649	+1.5708	30SEP83	309143	
		SR 90	+0.2113	+0.3841	27DEC82	300433
			+0.6018	+0.3476	21JAN83	301282
			-0.0014 ^b	+0.3895	18FEB83	302165
			-0.3386 ^b	+0.4802	18MAR83	303066
			+0.2116	+0.4699	15APR83	303809
	-1.7187 ^b		+1.6252	09MAY83	304256	
	-0.0161 ^b		+0.3321	10JUN83	305732	
	-0.3173 ^b		+0.4657	08JUL83	306464	
	+0.1347		+0.3139	05AUG83	307411	
	-0.1203 ^b		+0.3899	01SEP83	308156	
	+0.0514		+0.3527	30SEP83	309143	
	TRITIUM		+1457.2471	+99.8631	27DEC82	300433
			+1109.9290	+85.0676	21JAN83	301282
			+1360.5435	+94.6026	18FEB83	302165
			+1228.3069	+90.2664	18MAR83	303066
		+1291.8323	+92.0350	15APR83	303809	
		+841.8357	+75.3039	09MAY83	304256	
	+38.7007	+54.3840	10JUN83	305732		
	+1132.8262	+85.3151	08JUL83	306464		
	+824.8367	+95.1358	05AUG83	307411		
+919.0825	+83.9342	01SEP83	308156			
+852.4780	+81.6422	30SEP83	309143			

- a. The uncertainty reported is the 1-sigma counting error.
b. Negative value is an artifact of counting statistics and does not infer a negative activity.
c. Internal background check.

TABLE 7

RADIOACTIVITY IN AUTOMATIC WELL WATER - SUMMARY

PCI/L - 0.037 BQ/L

NAME OF FACILITY CLINCH RIVER BREEDER-CRBRP DOCKET NO. 50-537
 LOCATION OF FACILITY ROANE TENNESSEE REPORTING PERIOD 1983

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION ^a (LLD)	ALL INDICATOR LOCATIONS MEAN (F) ^b		LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) ^b		CONTROL LOCATIONS MEAN (F) ^b	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
		RANGE ^b	11 VALUES <LLD ANALYSIS PERFORMED	DISTANCE AND DIRECTION	RANGE ^b		
GROSS ALPHA	2.000					0 VALUES <LLD	
GROSS BETA	2.400	3.72(7/ 11)	2.48- 6.53	WELL #1	3.72(7/ 11)		
GAMMA (GELI)							
K-40	NOT ESTAB	22.37(5/ 11)	5.00- 46.11	WELL #1	22.37(5/ 11)		
BI-214	NOT ESTAB	2.54(4/ 11)	1.62- 3.65	WELL #1	2.54(4/ 11)		
PB-212	NOT ESTAB	0.35(3/ 11)	0.07- 0.86	WELL #1	0.35(3/ 11)		
TL-208	NOT ESTAB	1.11(2/ 11)	0.98- 1.23	WELL #1	1.11(2/ 11)		
SR 89	10.000	27.08(2/ 11)	19.32- 34.83	WELL #1	27.08(2/ 11)		
SR 90	2.000		11 VALUES <LLD ANALYSIS PERFORMED			0 VALUES <LLD	
TRITIUM	330.000	1101.89(10/ 11)	824.84- 1457.25	WELL #1	1101.89(10/ 11)		

a. Nominal LLD as described in table 1.

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

Table 8

Environmental Gamma Radiation Levels

Average External Gamma Radiation Levels at Various Locations
Clinch River Breeder Reactor Project - 1983
mR/Quarter^a

<u>Station^b</u>	<u>Average External Gamma Radiation Levels^c</u>		
	<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>Average</u>
<u>Onsite</u>			
1 (N)	11.32 ± 0.01	15.77 ± 0.20	13.55 ± 3.15
2 (N)	12.00 ± 0.09	16.46 ± 0.23	14.23 ± 3.15
3 (N)	16.15 ± 0.66	23.01 ± 0.06	19.58 ± 4.85
4 (N)	15.55 ± 0.23	22.87 ± 0.46	19.21 ± 5.18
5 (NNE)	17.28 ± 0.76	24.06 ± 0.06	20.67 ± 4.79
6 (NE)	13.45 ± 0.45	18.72 ± 0.03	16.09 ± 3.73
7 (NE)	15.30 ± 0.02	21.06 ± 0.15	18.18 ± 4.07
8 (ENE)	11.92 ± 0.40	15.53 ± 0.37	13.73 ± 2.55
9 (SE)	14.27 ± 0.18	19.36 ± 0.19	16.82 ± 3.60
10 (WSW)	13.24 ± 0.28	18.53 ± 0.02	15.89 ± 3.74
11 (NNW)	20.36 ± 0.08	27.14 ± 0.08	23.75 ± 4.79
Average Onsite Stations	14.62 ± 2.69	20.23 ± 3.75	17.43 ± 3.20
<u>Offsite</u>			
12 (SSE)	27.90 ± 0.61	29.69 ± 0.11	28.80 ± 1.27
13 (WSW)	12.78 ± 0.61	16.79 ± 0.01	14.79 ± 2.84
Average Offsite Stations	20.34 ± 10.69	23.24 ± 9.12	21.80 ± 9.91

a. Data normalized to one quarter (2190 hours).

b. See figure 3.

c. All averages reported ± 1-sigma (68 percent confidence level).

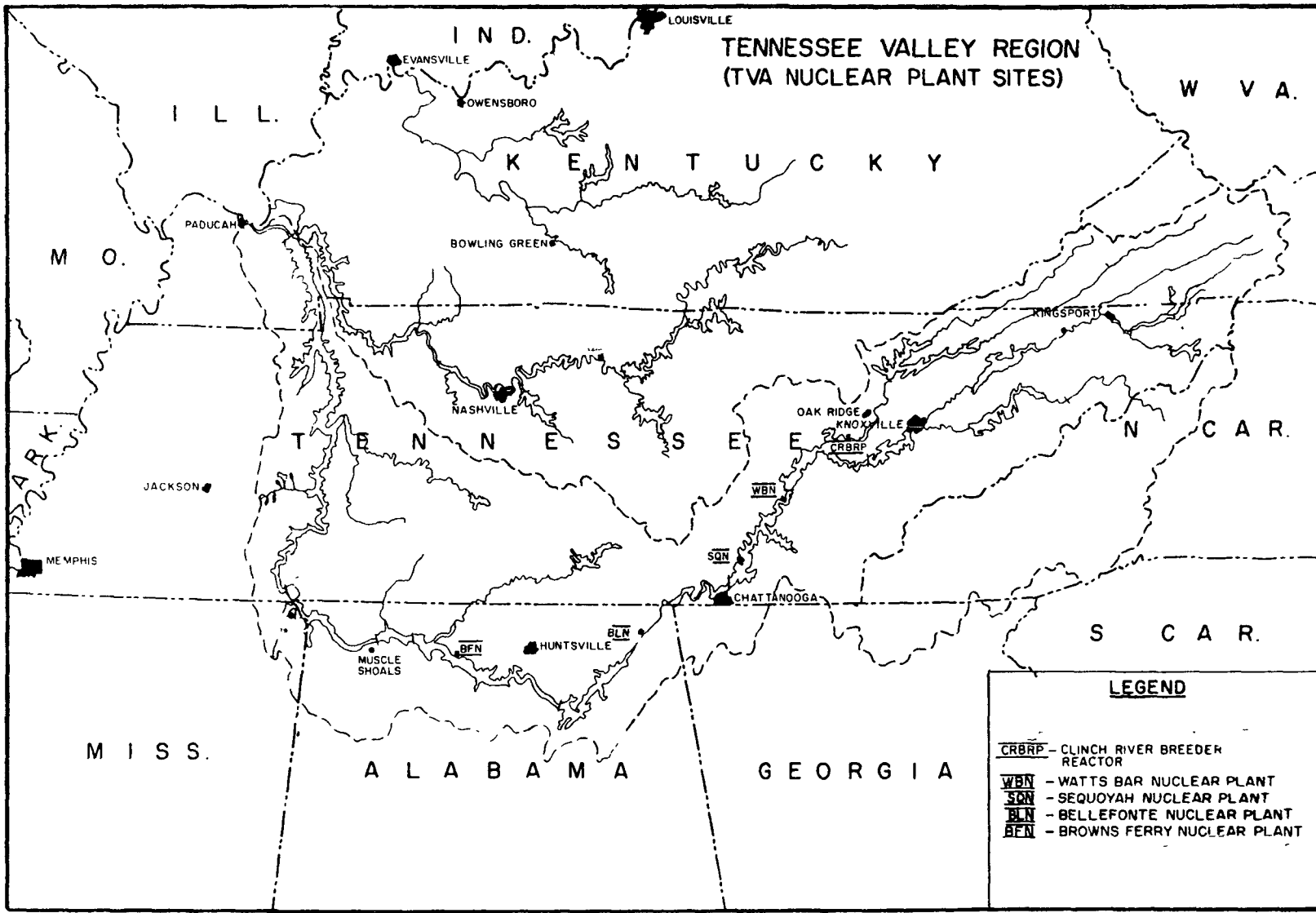


Figure 1

CLINCH RIVER BREEDER REACTOR PLANT CLINCH RIVER SAMPLING STATIONS

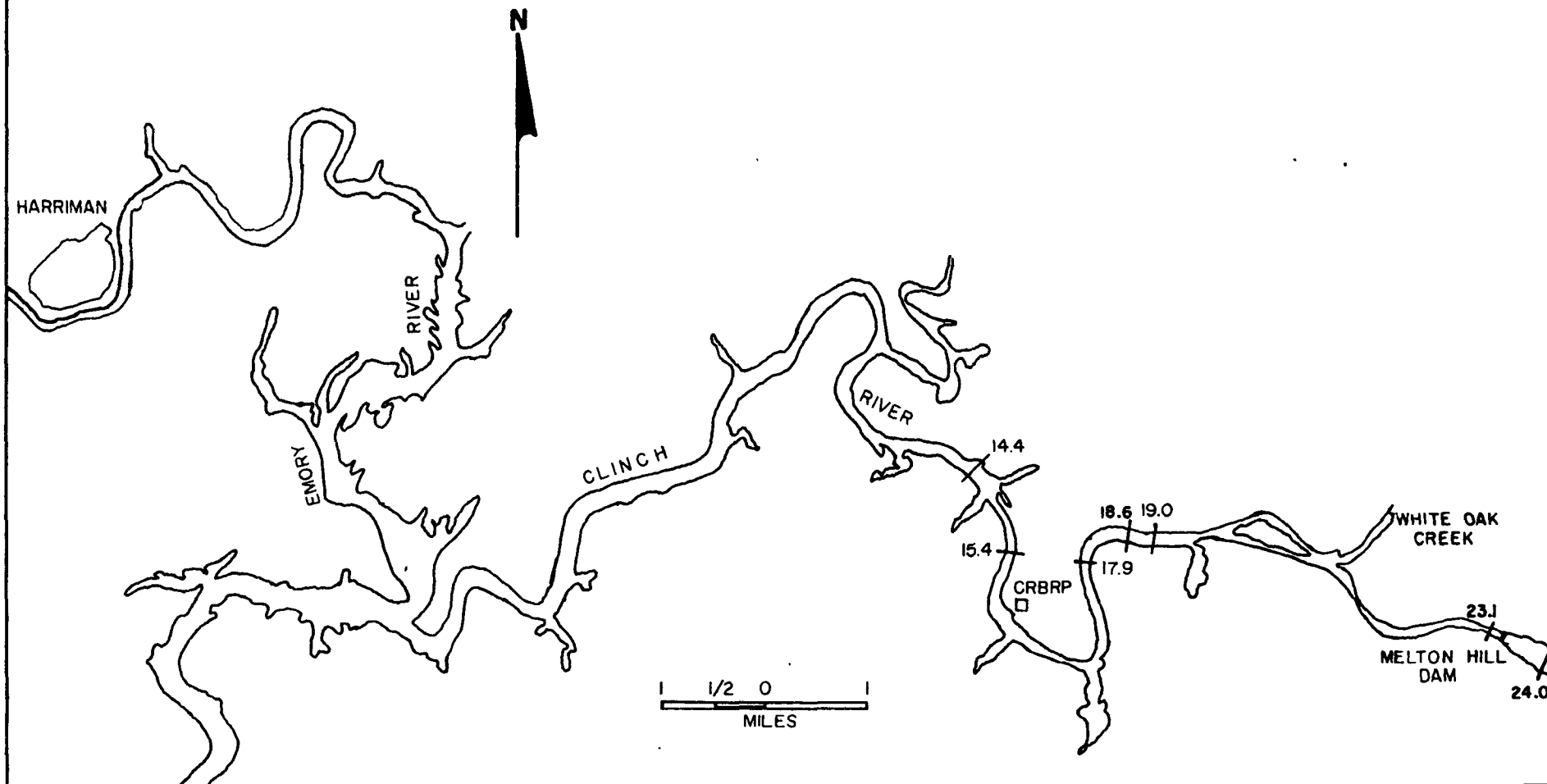


Figure 2

Figure 3

