

TENNESSEE VALLEY AUTHORITY
DIVISION OF NUCLEAR POWER
SEQUOYAH NUCLEAR PLANT

MONTHLY OPERATING REPORT
JANUARY 1, 1983 - JANUARY 31, 1983

UNIT 1

DOCKET NUMBER 50-327

LICENSE NUMBER DPR-77

UNIT 2

DOCKET NUMBER 50-328

LICENSE NUMBER DPR-79

Submitted By:


Power Plant Superintendent

TABLE OF CONTENTS

Operations Summary	1
Significant Operational Events	1-7
PORV's and Safety Valves Summary	7
Licensee Events and Special Reports	7-8
Offsite Dose Calculation Manual Changes	8
Operating Data	
Unit 1	9-11
Unit 2	12-14
Plant Maintenance Summary	15-16
Appendix A	17-40

Operations Summary

January 1983

The following summary describes the significant operational activities for the month of January. In support of this summary, a chronological log of significant events is included in this report.

Unit 1

Unit 1 was critical for 317.95 hours, produced 190,050 MWH (gross), resulting in an average hourly gross load of 787,609 kW during the month. There are 282.8 full power days estimated remaining until the end of cycle 2 fuel. With a capacity factor of 85 percent, the target EOC exposure would be reached December 29, 1983. The capacity factor for the month was 22.0 percent.

There were three reactor scrams, no manual shutdowns, and no power reductions during January. The unit had nine turbine trips during the month.

Unit 2

Unit 2 was critical for 731.22 hours, produced 753,910 MWH (gross), resulting in an average hourly gross load of 1,082,633 kW during the month. There are 154.97 full power days estimated remaining until the end of cycle 1 fuel. With a capacity factor of 85 percent the target EOC exposure would be reached August 1, 1983. The capacity factor for the month was 87.1 percent.

There were three reactor scrams, one manual shutdown, and two power reductions during January.

Significant Operational Events

Unit 1

<u>Date</u>	<u>Time</u>	<u>Event</u>
01/01/83	0001	Reactor in mode 5. Preparation to enter mode 4 in progress.
	2340	Reactor entered mode 4.
01/06/83	0350	Reactor entered mode 3.
01/09/83	2300	Due to high seal leakage on reactor coolant pump #1 began cooling down to mode 5 to make the necessary repairs.

Significant Operational Events

Unit 1

(Continued)

<u>Date</u>	<u>Time</u>	<u>Event</u>
01/10/83	0607	Reactor entered mode 4.
	1405	Reactor entered mode 5.
01/15/83	0325	Began heat-up.
	1027	Reactor entered mode 4.
	2030	Reactor entered mode 3.
01/17/83	2345	Reactor taken critical. Low power physic testing in progress.
01/19/83	1957	Reactor entered mode 1.
	2202	Generator tied on-line.
	2225	Turbine tripped due to feedwater regulator valve problems.
01/20/83	0032	Generator tied on-line.
	0134	Turbine tripped due to feedwater regulator valve problems.
	0242	Generator tied on line.
	0337	Turbine tripped again due to the feedwater regulator valve problems.
	1012	Generator tied on-line.
	1132	The reactor tripped due to a steam flow/feedwater flow mismatch in loop 4.
	1658	Reactor taken critical.
	2020	Generator tied on-line.
	2054	Turbine tripped. Turbine at \cong 210 MWe.
	2058	Reactor tripped. The sense lines to 1-FT-3-35 were found to be connected in reverse.

Significant Operational Events

Unit 1

(Continued)

<u>Date</u>	<u>Time</u>	<u>Event</u>
01/20/83	2359	Reactor taken critical.
01/21/83	0455	Generator tied on-line.
	1245	Reactor at 30% power and holding for the turbine overspeed trip test.
	2115	Turbine tripped during overspeed trip test.
01/22/83	0245	Began power ascension.
	0530	Reactor at 30% power.
	0700	Overspeed trip test complete.
	0733	Generator tied on-line and slowly increasing power.
01/23/83	1755	Reactor at 75% power producing 880 MWe and holding for start-up testing and xenon equilibrium.
01/24/83	1210	Reactor at 75% power, 880 MWe, IM's were performing SI-90.1 - Reactor Trip Instrumentation Monthly Functional Tests - and tripped a Lo-Lo level and a Hi level bi-stable. The unit operator switched to manual level control and as he did the feedwater regulator valve closed causing the level to drop. The reactor tripped on a Lo-Lo level in steam generator #2.
	2200	Reactor taken critical.
	2320	Reactor entered mode 1.
01/25/83	0013	Generator tied on-line.
	0620	Reactor at 30% power, producing 300 MWe and holding for secondary chemistry to come into specification.

Significant Operational Events

Unit 1

(Continued)

<u>Date</u>	<u>Time</u>	<u>Event</u>
01/25/83	1435	Began power ascension.
01/26/83	0700	Reactor at 75% power, producing 880 MWe. Incore/excore testing in progress.
01/28/83	2337	Began power ascension.
01/29/83	0340	Reactor at 87% power, producing 1020 MWe and holding due to P250 computer problems.
	0747	Began power ascension.
	1215	Reactor at 100% power, producing 1170 MWe.
01/31/83	2359	Reactor at 100% power, producing 1170 MWe.

Unit 2

01/01/83	0001	Reactor in mode 1 at 30% power, producing 290 MWe and holding for feedwater chemistry to come into specification.
	0800	Began power ascension.
	1420	Reactor at 40% power producing 380 MWe and holding while investigating a H ₂ leak on the generator.
	2244	Began load reduction to repair the H ₂ leak on the generator.
01/02/83	0034	Unit taken off-line. Reactor in mode 2.
	1118	H ₂ leak found and repaired.
01/03/83	0033	Reactor entered mode 1.
	0230	Generator tied on-line.

Significant Operational Events

Unit 2

(Continued)

<u>Date</u>	<u>Time</u>	<u>Event</u>
01/03/83	0340	Reactor at 29% power, producing 290 MWe when the turbine tripped when the #3 heater drain tank by-pass valve failed to open causing the steam and feedwater flows to swing. The reactor tripped on a Lo-Lo level in #4 steam generator.
01/03/83	1107	Reactor taken critical.
	1335	Reactor entered mode 1.
	1522	Generator tied on-line.
	1538	The turbine tripped when the feed-water pressure began to decrease and MFPT 2B didn't increase speed to maintain system pressure when all of a sudden MFPT 2B increased to maximum speed causing a Hi-Hi #3 steam generator level. The reactor was reduced to 2% power.
	1613	Generator tied on-line.
	1635	While increasing load, MFPT 2B regulator controller did not respond to the increase when all at once MFPT 2B did pick-up over-pressuring the feedwater system. The turbine tripped on a Hi-Hi #3 steam generator level.
	1637	Reactor tripped on a Lo-Lo #2 steam generator level.
	2021	Reactor taken critical.
	2050	Reactor entered mode 1.

Significant Operational Events

Unit 2

(Continued)

<u>Date</u>	<u>Time</u>	<u>Event</u>
01/03/83	2152	Reactor at 22% power, producing 255 MWe. The feedwater had been isolated to #1 steam generator but the steam generator level continued to rise indicating the valves were leaking thru resulting in a Hi-Hi steam generator level in loop #1 which tripped the turbine and MFPT.
	2154	Reactor tripped due to Lo-Lo #2 steam generator level.
	2330	Reactor taken critical.
01/04/83	0022	Reactor entered mode 1.
	0200	Generator tied on-line.
	0500	Reactor at 30% power, producing 280 MWe and holding waiting for feedwater chemistry to come into specifications.
	1315	Began power ascension.
01/05/83	0512	Reactor at 98% power, producing 1150 MWe. Unable to obtain 100% reactor power because #3 governor valve is closed.
01/07/83	1630	Began power reduction due to high steam generator chemistry.
	2130	Reactor at 30% power, producing 290 MWe.
01/08/83	0315	Began power ascension.
	1202	Reactor at 97% power, producing 1170 MWe with #3 governor valve closed.
01/13/83	0708	Reactor at 98% power. Began to reduce power to 90% to perform SI-90.102.

Significant Operational Events

Unit 2

(Continued)

<u>Date</u>	<u>Time</u>	<u>Event</u>
01/13/83	0810	Reactor at 90% power.
	1012	Began power ascension.
	1240	Reactor at 98% power, producing 1160 MWe.
01/27/83	0118	The turbine ran back to 70% due to the #3 heater drain tank pressure was swinging resulting from an erratic level controller on 2C heater.
	0250	Began power ascension.
	0700	Reactor at 98% power, producing 1160 MWe.
01/31/83	2359	Reactor in mode 1 at 98% power, producing 1163 MWe.

PORV's and Safety Valves Summary

No PORV's or safety valves were challenged during the month.

Licensee Events and Special Reports

The following Licensee Event Reports (LER's) were sent during January 1983, to the Assistant Director of Nuclear Power (Operations) for reporting to the Nuclear Regulatory Commission.

Unit 1

<u>LER</u>	<u>SUBJECT</u>
SQRO-50-327/82143	The oxygen concentration in the waste gas decay tanks exceeded allowable limits.
SQRO-50-327/82144	The auxiliary building rad monitor RM-90-101 failed due to loss of flow.
SQRO-5-327/82145	ESF containment ventilation isolation failed due to the slave relay latch mechanisms not latching.

Licensee Events and Special Reports

(Continued)

Unit 1

LER

SUBJECT

SQRO-50-327/83001

During the performance of SI-112, the pressurizer safety valve 68-565 failed to lift within the setpoint limits.

Unit 2

SQRO-50-328/82142

Containment isolation valve 2-FCV-68-305 failed to open due to a ruptured diaphragm.

Special Reports

There were two special reports transmitted during the month of January.

83-01 - Diesel Generator Report

83-02 - Inoperable Fire Damper for more than 7 days.

Offsite Dose Calculation Manual Changes

Changes in the Sequoyah Nuclear Plant ODCM are described in this section in accordance with Sequoyah Technical Specification 6.14.2.

These changes were officially approved by RARC on October 21, 1982. See Appendix A at the end of this report for the approved ODCM changes.

OPERATING DATA REPORT

DOCKET NO. 50-327
DATE FEBRUARY 8, 1983
COMPLETED BY M G EDDINGS
TELEPHONE (615) 751-0421

OPERATING STATUS

1. UNIT NAME: SEQUOYAH NUCLEAR PLANT, UNIT 1
2. REPORT PERIOD: JANUARY 1983
3. LICENSED THERMAL POWER(MWT): 3411.0
4. NAMEPLATE RATING (GROSS MWE): 1220.6
5. DESIGN ELECTRICAL RATING (NET MWE): 1148.0
6. MAXIMUM DEPENDABLE CAPACITY (GROSS MWE): 1163.0
7. MAXIMUM DEPENDABLE CAPACITY (NET MWE): 1128.0
8. IF CHANGES OCCUR IN CAPACITY RATINGS(ITEMS NUMBERS 3 THROUGH 7)SINCE LAST REPORT, GIVE REASONS:-----

9. POWER LEVEL TO WHICH RESTRICTED, IF ANY(NET MWE):-----

10. REASONS FOR RESTRICTIONS, IF ANY:-----

	THIS MONTH	YR.-TO-DATE	CUMULATIVE
11. HOURS IN REPORTING PERIOD	744.00	744.00	13921.00
12. NUMBER OF HOURS REACTOR WAS CRITICAL	317.95	317.95	7853.65
13. REACTOR RESERVE SHUTDOWN HOURS	0.00	0.00	0.00
14. HOURS GENERATOR ON-LINE	241.30	241.30	7560.80
15. UNIT RESERVE SHUTDOWN HOURS	0.00	0.00	0.00
16. GROSS THERMAL ENERGY GENERATED (MWH)	589085.17	589085.17	23871827.17
17. GROSS ELECTRICAL ENERGY GEN. (MWH)	190050.00	190050.00	7947586.00
18. NET ELECTRICAL ENERGY GENERATED (MWH)	177017.00	177017.00	7613021.00
19. UNIT SERVICE FACTOR	32.43	32.43	54.31
20. UNIT AVAILABILITY FACTOR	32.43	32.43	54.31
21. UNIT CAPACITY FACTOR(USING MDC NET)	21.09	21.09	48.48
22. UNIT CAPACITY FACTOR(USING DER NET)	20.73	20.73	47.64
23. UNIT FORCED OUTAGE RATE	67.11	67.11	21.57
24. SHUTDOWNS SCHEDULED OVER NEXT 6 MONTHS (TYPE, DATE, AND DURATION OF EACH):	-----		
25. IF SHUTDOWN AT END OF REPORT PERIOD, ESTIMATED DATE OF STARTUP:	-----		

NOTE: THAT THE THE YR.-TO-DATE AND CUMULATIVE VALUES HAVE BEEN UPDATED.

AVERAGE DAILY UNIT POWER LEVEL

DOCKET NO.	50-327
UNIT	One
DATE	February 8, 1983
COMPLETED BY	M. Eddings
TELEPHONE	(615) 751-0343

MONTH	January
-------	---------

DAY	AVERAGE DAILY POWER LEVEL (MWe-Net)	DAY	AVERAGE DAILY POWER LEVEL (MWe-Net)
1	Unit Down	17	Unit Down
2	Unit Down	18	Unit Down
3	Unit Down	19	0
4	Unit Down	20	0
5	Unit Down	21	377
6	Unit Down	22	623
7	Unit Down	23	649
8	Unit Down	24	413
9	Unit Down	25	313
10	Unit Down	26	800
11	Unit Down	27	836
12	Unit Down	28	835
13	Unit Down	29	1,041
14	Unit Down	30	1,130
15	Unit Down	31	1,132
16	Unit Down		

INSTRUCTIONS

On this format, list the average daily unit power level in MWe-Net for each day in the reporting month. Compute to the nearest whole megawatt.

(9/77)

UNIT SHUTDOWNS AND POWER REDUCTIONS

DOCKET NO.

50-327

UNIT NAME

Sequoyah One

DATE

January 1983

COMPLETED BY

M. Eddings

TELEPHONE

(615) 751-0341

REPORT MONTH January 1983

No.	Date	Type ¹	Duration (Hours)	Reason ²	Method Of Shutting Down Reactor ³	Licensee Event Report #	System Code ⁴	Component Code ⁵	Cause & Corrective Action to Prevent Recurrence
1	83/01/01	F	454	C*	4				*Refueling Outage Exceeded Scheduled Time Limit TVA Changed This To A Forced Outage At 2400C 12/31/82.
2	83/01/19	F	0.8	A	9				Turbine Trip Hi-Hi Level on #1 S/G.
3	83/01/19	F	1.0	A	9				Turbine Trip Hi-Hi Level on #3 S/G.
4	83/01/20	F	1.1	A	9				Turbine Trip Hi-Hi Level on #1 S/G.
5	83/01/20	F	6.6	A	9				Turbine Trip Hi-Hi Level on #2 S/G.
6	83/01/20	F	8.8	A	3				#4 Loop Steam Flow/Feedwater Flow Mismatch.
7	83/01/20	F	8.0	A	3				Turbine Trip #1 S/G Hi Level Rx Trip #2 S/G Lo-Lo Level.
8	83/01/21	S	10.3	B	9				Turbine Overspeed Trip Test.
9	83/01/24	F	12.1	A	3				Lo-Lo Level #2 S/G.

1

F: Forced
S: Scheduled

2

Reason:

A-Equipment Failure (Explain)

B-Maintenance or Test

C-Refueling

D-Regulatory Restriction

E-Operator Training & License Examination

F-Administrative

G-Operational Error (Explain)

H-Other (Explain)

3

Method:

1-Manual

2-Manual Scram.

3-Automatic Scram.

4-Cont. of Existing
Outage

5-Reduction

9-Other

4

Exhibit G-Instructions

for Preparation of Data

Entry Sheets for Licensee

Event Report (LER) File (NUREG-
0161)

5

Exhibit I-Same Source

(9/77)

OPERATING DATA REPORT

DOCKET NO. 50-328
DATE FEBRUARY 8, 1983
COMPLETED BY D C DUPREE
TELEPHONE (615) 751-0421

OPERATING STATUS

1. UNIT NAME: SEQUOYAH NUCLEAR PLANT, UNIT 2
2. REPORT PERIOD: JANUARY 1983
3. LICENSED THERMAL POWER(MWT): 3411.0
4. NAMEPLATE RATING (GROSS MWE): 1220.6
5. DESIGN ELECTRICAL RATING (NET MWE): 1148.0
6. MAXIMUM DEPENDABLE CAPACITY (GROSS MWE): 1163.0
7. MAXIMUM DEPENDABLE CAPACITY (NET MWE): 1128.0
8. IF CHANGES OCCUR IN CAPACITY RATINGS (ITEMS NUMBERS 3 THROUGH 7) SINCE LAST REPORT, GIVE REASONS: _____

9. POWER LEVEL TO WHICH RESTRICTED, IF ANY (NET MWE): _____

10. REASONS FOR RESTRICTIONS, IF ANY: _____

NOTES:

	THIS MONTH	YR.-TO-DATE	CUMULATIVE
11. HOURS IN REPORTING PERIOD	744.00	744.00	5881.00
12. NUMBER OF HOURS REACTOR WAS CRITICAL	731.22	731.22	4619.92
13. REACTOR RESERVE SHUTDOWN HOURS	0.00	0.00	0.00
14. HOURS GENERATOR ON-LINE	696.40	696.40	4503.15
15. UNIT RESERVE SHUTDOWN HOURS	0.00	0.00	0.00
16. GROSS THERMAL ENERGY GENERATED (MWH)	2203657.44	2203657.44	14358248.24
17. GROSS ELECTRICAL ENERGY GEN. (MWH)	753910.00	753910.00	4835760.00
18. NET ELECTRICAL ENERGY GENERATED (MWH)	725157.00	725157.00	4651447.60
19. UNIT SERVICE FACTOR	93.60	93.60	76.57
20. UNIT AVAILABILITY FACTOR	93.60	93.60	76.57
21. UNIT CAPACITY FACTOR (USING MDC NET)	86.41	86.41	70.12
22. UNIT CAPACITY FACTOR (USING DER NET)	84.90	84.90	68.90
23. UNIT FORCED OUTAGE RATE	6.40	6.40	15.40
24. SHUTDOWNS SCHEDULED OVER NEXT 6 MONTHS (TYPE, DATE, AND DURATION OF EACH):			

25. IF SHUTDOWN AT END OF REPORT PERIOD, ESTIMATED DATE OF STARTUP: _____

NOTE THAT THE THE YR.-TO-DATE AND CUMULATIVE VALUES HAVE BEEN UPDATED.

AVERAGE DAILY UNIT POWER LEVEL

DOCKET NO. 50-328
 UNIT Two
 DATE February 4, 1983
 COMPLETED BY David Dupree
 TELEPHONE (615) 751-0421

MONTH January

DAY	AVERAGE DAILY POWER LEVEL (MWe-Net)
1	<u>307</u>
2	<u>60</u>
3	<u>10</u>
4	<u>397</u>
5	<u>1,092</u>
6	<u>1,104</u>
7	<u>969</u>
8	<u>859</u>
9	<u>1,106</u>
10	<u>1,110</u>
11	<u>1,115</u>
12	<u>1,114</u>
13	<u>1,097</u>
14	<u>1,112</u>
15	<u>1,112</u>
16	<u>1,110</u>

DAY	AVERAGE DAILY POWER LEVEL (MWe-Net)
17	<u>1,113</u>
18	<u>1,114</u>
19	<u>1,114</u>
20	<u>1,026</u>
21	<u>959</u>
22	<u>1,114</u>
23	<u>1,117</u>
24	<u>1,116</u>
25	<u>1,117</u>
26	<u>1,115</u>
27	<u>1,074</u>
28	<u>1,116</u>
29	<u>1,119</u>
30	<u>1,121</u>
31	<u>1,122</u>

INSTRUCTIONS

On this format, list the average daily unit power level in MWe-Net for each day in the reporting month. Compute to the nearest whole megawatt.

(9/77)

UNIT SHUTDOWNS AND POWER REDUCTIONS

DOCKET NO. 50-328

UNIT NAME Sequoyah Two

DATE January 1983

COMPLETED BY David Dupree

TELEPHONE (615) 751-0421

REPORT MONTH January 1983

No.	Date	Type ¹	Duration (Hours)	Reason ²	Method Of Shutting Down Reactor ³	Licensee Event Report #	System Code ⁴	Component Code ⁵	Cause & Corrective Action to Prevent Recurrence
1	83/01/02	F	25.93	B	1				Manual shutdown. Repair hydrogen leak on the generator.
2	83/01/03	F	11.7	A	3				Turbine Trip: Hi-Hi #3 S/G Level. During Start-Up Rx Trip: Lo-Lo #4 S/G.
3	83/01/03	F	.58	A	9				Turbine Trip: Hi-Hi # S/G Level During Start-Up. Reduced reactor power to 2%.
4	83/01/03	F	9.42	A	3				Turbine Trip during startup, Hi-Hi #2 S/G level. Rx Trip: Lo-Lo #2 S/G.
5	83/01/07	F	0	F	5				S/G Chemistry out of specification, reduce load to 30%.
6	83/01/27	F	0	A	5				Turbine run back to 70% due to the level swinging in #3 heater drain tank.

1

F: Forced
S: Scheduled

2

Reason:
A-Equipment Failure (Explain)
B-Maintenance or Test
C-Refueling
D-Regulatory Restriction
E-Operator Training & License Examination
F-Administrative
G-Operational Error (Explain)
H-Other (Explain)

3

Method:
1-Manual
2-Manual Scram.
3-Automatic Scram.
4-Cont. of Existing
Outage
5-Reduction
9-Other

4

Exhibit G-Instructions
for Preparation of Data
Entry Sheets for Licensee
Event Report (LER) File (NUREG-
0161)

5

Exhibit I-Same Source

(9/77)

Plant Maintenance Summary

The following significant maintenance items were completed during the month of January 1983:

Mechanical Maintenance

1. Boric acid evaporator pumps 1-PMP-65-165 and -168 were replaced.
2. Reactor coolant pump 1-PMP-68-008 number 2 seal was replaced.
3. A new shaft was fabricated and installed on ERCW valve 1-FCV-67-67.

Electrical Maintenance

1. Installation of dimension 2000 telephone system continued.
2. Repaired the Unit 1 hydrogen recombiner.

Instrument Maintenance

There were no significant maintenance items.

Field Services Group

ECN 5200--Post-Accident Sampling Facility

Tubing and hanger work is in progress in the Unit 1 annulus. The core drilling for the installation of the heating ventilation and air conditioning duct is in progress in the auxiliary building. The installation of sampling panels is in progress.

ECN 5608--Pressurizer Enclosure Manway

All work is completed on Unit 1. The fabrication of the manway for Unit 2 is completed and will be installed during a Unit 2 outage with a sufficient duration.

ECN 5009--ERCW Piping Changeout (Units 1 and 2)

Changeout of carbon steel piping to stainless steel piping for the ERCW system serving Unit 1 safety-injection pump oil cooler 1A-A and the safety-injection pump room cooler 1A is complete. Final hanger installation and system hydrostatic pressure testing has been completed. Prefabrication of piping is continuing for the Unit 2 penetration room coolers 2A2 and 2B2.

Field Services Group

(Continued)

ECN 5417--Diesel Generator Air Start System Dryers

This modification adds air dryers between the air compressor and the air receiver tanks for each diesel generator engine air start system in order to remove water from the air being supplied to the air start motors. Work is continuing to modify hangers for the air start system due to the need to install flex piping at the air receiver tanks. The flex hose installation should start late this month.

ECN 5451--Diesel Generator Engine Lube Oil System

This modification to the diesel generator engine lube oil systems adds an auxiliary ac lube oil pump and a standby dc motor driven lube oil pump in order to prevent bearing damage during multiple hot restarts. Electrical connection of all dc motor-driven lube oil pumps and associated pressure switches is nearing completion. Functional testing of these pumps and pressure switches will follow this work.

ECN 5580--Plant Emergency Evacuation System Sirens

The installation of conduit, conduit hangers, sirens, and junction boxes has continued during this reporting period. Cable pulling has also started and the installation of transformer has also begun.

APPENDIX A

DOCUMENTATION FOR ODCM CHANGES

APPENDIX A

Change 1

Description of Change

The following typographical changes were made. No model changes are reflected in these changes, and therefore, no evaluations are necessary.

- a. Page 2, Wind speed class number 8 is added with a range of 8.3-10.9 (m/s) and a midpoint of 9.60 (m/s).
- b. Pages 11-15, Equation reference numbers are changed.

Change 2

Description of Change

Page 7, The value of λ_w is changed from $\lambda_w = 0.002 \text{ h}^{-1}$ to 0.0023 h^{-1} for particulates and 0.0017 for iodines.

Analysis or Evaluation Justifying Change

ODCM changes reflect the revision in gaseous dose methodology to incorporate NUREG/CR-1004 environmental transfer parameters.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

These changes will have no effect on dose calculations for noble gases. For iodine/particulate dose calculations, the dose from I-131 will be approximately 20 percent lower and the dose from Sr-90 will be approximately 10 times higher. However, because of the mix of nuclides, the changes should effectively cancel each other so that there will be little change in the total dose.

Set points will also be affected. For noble gases the set point will increase approximately 4 percent. For iodine and particulates, the set point will increase approximately 18 percent.

APPENDIX A

(Continued)

Change 3

Description of Change

Page 7, the value of Y_v , agricultural yield, changed from 1.18 kg/m^2 to 0.7 kg/m^2 .

Analysis or Evaluation Justifying Change

See Change 2.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 2.

Change 4

Description of Change

Page 8, Equation (1.8) for determination of concentration of C-14 in vegetation has been omitted.

Analysis or Evaluation Justifying Change

See Change 2.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 2.

Change 5

Description of Change

Page 9, Transport time of activity from feed to milk to receptor has been changed from two days to one day.

Analysis or Evaluation Justifying Change

See Change 2.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 2.

APPENDIX A

(Continued)

Change 6

Description of Change

Page 14, The following statements were omitted along with the reference to C-14 in Statement 5.

4. The highest annual - average X/Q's based on licensing meterology for ground level releases will be used for C-14 doses.
8. Releases of C-14 are based on the design source term.

Analysis or Evaluation Justifying Change

See Change 2.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 2.

Change 7

Description of Change

Page 15, The definition of "DF₁₃₁" is changed to read "DF₁₃₁ = I-131 milk ingestion dose factor to infant, 7.24×10^{-11} mrem/yr per $\mu\text{Ci}/\text{m}^2\text{-s}$ (Table 1.7)". A new constant 0.9 is the fraction of dose expected to be contributed by I-131. Equation 1.18 then reduces to $\text{DTH}_{131} = 75.1 \cdot Q_{131}$. The constant DF_S is given a new value of 1.36×10^{-13} mrem/yr per $\mu\text{Ci}/\text{m}^2\text{-s}$ (As per Regulatory Guide 1.109 and NUREG/CR-1004 methodologies). Equation 1.19 then reduces to $\text{DBC}_S = 3511.5 Q_S$. The determination of the thyroid dose from milk ingestion of C-14 and the determination of the total thyroid dose are deleted.

Analysis or Evaluation Justifying Change

See Change 2.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 2.

APPENDIX A

(Continued)

Change 8

Description of Change

Table 1.4A reflects the 1982 land-use survey update.

Analysis or Evaluation Justifying Change

See Change 2.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 2.

Change 9

Description of Change

Tables 1.6 and 1.7 have been revised.

Analysis or Evaluation Justifying Change

See Change 2.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 2.

APPENDIX A

(Continued)

Change 10

Description of Change

Pages 21 and 22, Equation 2.11, Factor I_i is replaced by I_{ij} which is defined on page 22 as the monthly activity ingested of the i th radionuclide by the critical age group for the j th organ, μCi . The new definition of DCF_{ij} is the critical ingestion dose commitment for the j th organ of adult or child from the i th radionuclide $\text{rem}/\mu\text{Ci}$.

In equation 2.12, factor V_i is replaced by V_{ij} which is defined as the maximum individual's water consumption rate corresponding to the age group selected for the critical DCF_{ij} above. (Adult: 200 mL/d, Child: 1400 mL/d; Regulatory Guide 1.109). Equation 2.13 then becomes $D_j = \frac{2.15 \times 10^{-6}}{F} \sum_{i=1}^{11} (V \times DCF)_{ij} \times A_i, \text{ rem.}$

Analysis or Evaluation Justifying Change

The child age group is included because analysis of past releases indicates that this age group might be the critical age group. The difference in projected doses for the adult and child age group is not large. Doses to the teenager and infant age groups are less than those to the child and adult groups for the significant pathways.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

These changes will serve to improve the accuracy of the calculations. They will also improve the documentation of both the methodology and parameters. These changes will not affect set point determinations.

Change 11

Description of Change

Page 23, factor M in equation 2.14 is replaced by M_{ij} defined as the amount of fish eaten monthly by maximum individual corresponding to age group selected for the critical DCF_{ij} above. (Adult: 1750g, Child: 575g; Regulatory Guide 1.109). Equation 2.15 becomes $D_j = \frac{7.7 \times 10^{-8}}{F} \sum_{i=1}^{11} A_i B_i (M DCF)_{ij}, \text{ mrem.}$

Analysis or Evaluation Justifying Change

See Change 10.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 10.

APPENDIX A

(Continued)

Change 12

Description of Change

Pages 23-27, Section 2.3.3, "Quarterly and Annual Analysis" has been revised as follows:

2.3.3 Quarterly and Annual Analysis

A complete analysis utilizing the total estimated liquid releases for each calendar quarter will be performed and reported as required in section 6.9 of the technical specifications. This analysis will replace values calculated using section 2.3.2 methodology and will also include an approximation of population doses.

2.3.3.1 Individual Doses

The dose to the the j^{th} organ of the maximum individual from m nuclides, D_j , is described by

$$D_j = \sum_{k=1}^5 \sum_{i=1}^m D_{ijk, \text{rem}} \quad (2.16)$$

$$= \sum_{i=1}^m \left\{ \sum_{k=1}^2 [(IDCF)_{ij} \times I_{ik}] + \sum_{k=3}^5 [(\text{RDCF})_{ijk} \cdot \xi_{ik} \cdot T_k \cdot \phi] \right\} \quad (2.17)$$

where:

D_{ijk} = dose to the j^{th} organ from the i^{th} radionuclide, via the k^{th} exposure pathway, rem.

j = the organ of interest (bone, GI tract, thyroid, liver, total body, and skin.)

k = exposure pathway of interest: (1) water ingestion, (2) fish ingestion, (3) shoreline recreation, (4) above-water recreation, (5) in-water recreation.

$(IDCF)_{ij}$ = ingestion dose commitment factor for the j^{th} organ from the i^{th} radionuclide, rem/ μCi . For the combination of pathways considered and the nuclide mix expected, the maximum exposed individual will be an adult or child. Table 2.1 is a list of ingestion dose factors for the two age groups.

I_{ik} = the activity ingested of the i^{th} radionuclide, via the k^{th} exposure pathway, μCi .

$$I_{i1} = C_i V_n \quad (2.18)$$

For the fish pathway

$$I_{i2} = C_i B_i M \quad (2.19)$$

C_i = concentration of the i^{th} radionuclide in the Tennessee River, $\mu\text{Ci/mL}$

$$C_i = A_i / (F_\ell d) \quad (2.20)$$

A_i = activity released of i^{th} radionuclide during the release period, μCi .

F_ℓ = total river flow at location ℓ during period, mL.

l = location of interest (for dose to the maximum individual the first down-river exposure point is used. For the population dose, various down-river locations are used to account for the total exposed population. Table 2.4a gives the river location of public water supplies; tables 2.4b and 2.4c give the boundaries of the various reaches in which concentrations are calculated for the fish and recreation pathways.)

d = fraction of river flow available for dilution (1/5 above Chickamauga Dam, 1 below the dam).

V = average rate of water consumption per Regulatory Guide 1.109.

For maximum individual:

Adult - 2000 mL/d
Child - 1400 mL/d

For average individual (population):

Adult - 1010 mL/d
Child - 710 mL/d

n = number of days during the release period, day.

B_i = bioaccumulation factor for the i^{th} radionuclide in fish, $\mu\text{Ci/g}$ per $\mu\text{Ci/mL}$, from table 2.2.

M = amount of fish consumed during the period (fraction of year times the annual consumption rate per Regulatory Guide 1.109.)

For maximum individual:

Adult - 21 kg/yr
Child - 6.9 kg/yr

For average individual (population):

Adult - 6.9 kg/yr
Child - 2.2 kg/yr

$(\text{RDCF})_{ijk}$ = recreation dose commitment factor for the j^{th} organ from the i^{th} radionuclide via the k^{th} pathway; mrem/yr per concentration (ξ_{ik}) in medium; from table 2.3.

ξ_{ik} = the concentration of the i^{th} radionuclide in the environmental medium pertaining to the k^{th} pathway.

For above-water and in-water pathways

$$\xi_{ik} = \xi_{i5} = C_i \quad (2.21)$$

For the shoreline pathway, a 15-year buildup in the sediment of the lake is assumed (per Regulatory Guide 1.109 equation A-5).

$$\xi_{i3} = 100 \cdot \text{RHL}_i \cdot C_i \cdot W [1 - \exp(-\lambda_i t)] \quad (2.22)$$

where

100 = transfer constant as defined in Regulatory Guide 1.109.

RHL_i = radiological half-life of the i^{th} isotope, days, from table 2.1.

W = shoreline width factor (0.3 for a lake shore, per table A-2 of Regulatory Guide 1.109.)

λ_i = decay constant of the i^{th} radionuclide
 $= 0.693/\text{RHL}_i$.

t = buildup time in sediment, assumed 15 years, per Regulatory Guide 1.109.

t_k = assumed exposure time of maximum individual for the k^{th} pathway

3) shoreline	500 h/yr	(~10 h/week)
4) above-water	1800 h/yr	(6 h/d, 300 d/yr)
5) in-water	920 h/yr	(6 h/d, for five summer months)

ϕ = fraction of annual exposure for each quarter

1st Quarter	Jan.-March	0.1
2nd Quarter	April-June	0.3
3rd Quarter	July-Sept.	0.4
4th Quarter	Oct.-Dec.	0.2

2.3.3.2 Population Doses

The total dose from all 5 pathways to the j^{th} organ of the population, Δ_j , from m nuclides at n locations is described by

$$\Delta_j = \sum_{\ell=1}^n \sum_{k=1}^5 \sum_{i=1}^m \Delta_{ijk\ell} \quad (2.23)$$

$$= \sum_{\ell=1}^n \sum_{k=1}^5 \sum_{i=1}^m D_{ijk\ell} \cdot P_{k\ell} \quad (2.24)$$

where

$\Delta_{ijk\ell}$ = dose to the j^{th} organ of the total population from the i^{th} radionuclide via the k^{th} pathway at location ℓ .

D_{ijkl} = dose to individual as described in section 2.3.3.1 at location l .

P_{kl} = number of people exposed via the k^{th} pathway at location l , from table 2.4.a-c. The population is assumed to consist of 71 percent adults and 29 percent children (from Appendix D, Regulatory Guide 1.109 - the value for children includes teenagers).

Analysis or Evaluation Justifying Change

The description of the quarterly dose analysis procedures was modified to include the recreation pathway. Although the calculations have been done all along, the methodology had not been placed in the ODCM.

Dose factors and concentration factors are expanded and updated. This was done to improve both the accuracy and the documentation for the values.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 10.

Change 13

Description of Change

Tables 2.1, 2.2, 2.3, and 2.4 a-c have been revised.

Analysis or Evaluation Justifying Change

See Change 12.

Evaluation of Accuracy of Dose Calculation or Setpoint Determination

See Change 10.

Table 1.4a

REAL RECEPTOR LOCATIONS

<u>SECTOR</u>	<u>NEAREST RESIDENT (m)</u>	<u>HOME-USE GARDEN (m)</u>	<u>MILCH^a ANIMAL (m)</u>
N	1344	1344	4219
NNE	2812	2812	4531
NE	3438	3438	5625
ENE	2187	2187	--
E	1812	2656	--
ESE	1812	2031	2344
SE	1719	2062	--
SSE	2250	2344	--
S	2375	2375	
SSW	2250	2750	3594
SW	2969	3438	--
WSW	1469	2062	--
W	938	938	--
WNW	1812	1812	1875
NW	1188	1188	2031, 5781 (goat)
NNW	781	1875	2438 (goat)

a. All are real cow locations except where noted otherwise.

TABLE 1.6
NUCLIDE SPECIFIC TRANSFER DATA*

	NUCLIDE	HALF-LIFE	RETENTION	$B_{iv} \left(\frac{\text{veg.}}{\text{soil}} \right)$	$FM_i \left(\frac{d}{L} \right)$
1	TRITIUM	4.49E+03	4.70E-01	4.80E+00	1.30E-02
2	C-14	2.09E+06	4.70E-01	5.50E+00	1.20E-02
3	N-13	6.94E-03	4.70E-01	7.50E+00	2.20E-02
4	O-19	3.36E-04	4.70E-01	1.60E+00	2.00E-02
5	F-18	7.62E-02	4.70E-01	6.50E-04	1.40E-02
6	NA-24	6.33E-01	4.70E-01	5.20E-02	4.00E-02
7	P-32	1.43E+01	4.70E-01	1.10E+00	2.50E-02
8	AR-41	7.63E-02	4.70E-01	6.00E-01	2.00E-02
9	CR-51	2.78E+01	4.70E-01	2.50E-04	2.20E-03
10	MN-54	3.03E+02	4.70E-01	2.90E-02	2.50E-04
11	MN-56	1.07E-01	4.70E-01	2.90E-02	2.50E-04
12	FE-59	4.50E+01	4.70E-01	6.60E-04	1.20E-03
13	CO-58	7.13E+01	4.70E-01	9.40E-03	1.00E-03
14	CO-60	1.92E+03	4.70E-01	9.40E-03	1.00E-03
15	ZN-69M	5.75E-01	4.70E-01	4.00E-01	3.90E-02
16	ZN-69	3.96E-02	4.70E-01	4.00E-01	3.90E-02
17	BR-84	2.21E-02	4.70E-01	7.60E-01	5.00E-02
18	BR-85	2.08E-03	4.70E-01	7.60E-01	5.00E-02
19	KR-85M	1.83E-01	4.70E-01	3.00E+00	2.00E-02
20	KR-85	3.93E+03	4.70E-01	3.00E+00	2.00E-02
21	KR-87	5.28E-02	4.70E-01	3.00E+00	2.00E-02
22	KR-88	1.17E-01	4.70E-01	3.00E+00	2.00E-02
23	KR-89	2.21E-03	4.70E-01	3.00E+00	2.00E-02
24	RB-88	1.24E-02	4.70E-01	1.30E-01	3.00E-02
25	RB-89	1.07E-02	4.70E-01	1.30E-01	3.00E-02
26	SR-89	5.20E+01	4.70E-01	1.70E-02	1.40E-03
27	SR-90	1.03E+04	4.70E-01	1.70E-02	1.40E-03
28	SR-91	4.03E-01	4.70E-01	1.70E-02	1.40E-03
29	SR-92	1.13E-01	4.70E-01	1.70E-02	1.40E-03
30	SR-93	5.56E-03	4.70E-01	1.70E-02	1.40E-03
31	Y-90	2.67E+00	4.70E-01	2.60E-03	1.00E-05
32	Y-91M	3.47E-02	4.70E-01	2.60E-03	1.00E-05
33	Y-91	5.88E+01	4.70E-01	2.60E-03	1.00E-05
34	Y-92	1.47E-01	4.70E-01	2.60E-03	1.00E-05
35	Y-93	4.29E-01	4.70E-01	2.60E-03	1.00E-05
36	ZR-95	6.50E+01	4.70E-01	1.70E-04	5.00E-06
37	NB-95M	3.75E+00	4.70E-01	9.40E-03	2.50E-03
38	NR-95	3.50E+01	4.70E-01	9.40E-03	2.50E-03
39	MO-99	2.79E+00	4.70E-01	1.20E-01	7.50E-03
40	TC-99M	2.50E-01	4.70E-01	2.50E-01	2.50E-02
41	TC-99	7.74E+07	4.70E-01	2.50E-01	2.50E-02
42	TC-104	1.25E-02	4.70E-01	2.50E-01	2.50E-02
43	RU-106	3.67E+02	4.70E-01	5.00E-02	1.00E-06
44	TE-132	3.24E+00	4.70E-01	1.30E+00	1.00E-03
45	I-129	6.21E+09	4.70E-01	2.00E-02	1.20E-02
46	I-131	8.05E+00	4.70E-01	2.00E-02	1.20E-02
47	MI-131	8.05E+00	4.70E-01	2.00E-02	1.20E-02
48	I-132	9.58E-02	4.70E-01	2.00E-02	1.20E-02
49	MI-132	9.58E-02	4.70E-01	2.00E-02	1.20E-02
50	I-133	8.75E-01	4.70E-01	2.00E-02	1.20E-02
51	MI-133	8.75E-01	4.70E-01	2.00E-02	1.20E-02
52	I-134	3.61E-02	4.70E-01	2.00E-02	1.20E-02
53	MI-134	3.61E-02	4.70E-01	2.00E-02	1.20E-02
54	I-135	2.79E-01	4.70E-01	2.00E-02	1.20E-02
55	MI-135	2.79E-01	4.70E-01	2.00E-02	1.20E-02
56	XE-131M	1.18E+01	4.70E-01	1.00E+01	2.00E-02
57	XE-133M	2.26E+00	4.70E-01	1.00E+01	2.00E-02
58	XE-133	5.27E+00	4.70E-01	1.00E+01	2.00E-02
59	XE-135M	1.08E-02	4.70E-01	1.00E+01	2.00E-02
60	XE-135	3.83E-01	4.70E-01	1.00E+01	2.00E-02
61	XE-137	2.71E-03	4.70E-01	1.00E+01	2.00E-02
62	XE-138	1.18E-02	4.70E-01	1.00E+01	2.00E-02
63	CS-134	7.48E+02	4.70E-01	1.00E-02	8.00E-03
64	CS-135	1.10E+09	4.70E-01	1.00E-02	8.00E-03
65	CS-136	1.30E+01	4.70E-01	1.00E-02	8.00E-03
66	CS-137	1.10E+04	4.70E-01	1.00E-02	8.00E-03
67	CS-138	2.24E-02	4.70E-01	1.00E-02	8.00E-03
68	BA-139	5.76E-02	4.70E-01	5.00E-03	4.00E-04
69	BA-140	1.28E+01	4.70E-01	5.00E-03	4.00E-04
70	LA-140	1.68E+00	4.70E-01	2.50E-03	5.00E-06
71	CE-144	2.84E+02	4.70E-01	2.50E-03	1.00E-04
72	PR-143	1.36E+01	4.70E-01	2.50E-03	5.00E-06
73	PR-144	1.20E-02	4.70E-01	2.50E-03	5.00E-06
74	NP-239	2.35E+00	4.70E-01	2.50E-03	5.00E-06

* Reference: NUREG/CR-1004

TABLE 1.7

INTERNAL DOSE FACTORS¹ - INFANT THYROID

Radionuclide	Inhalation ¹	Cow Milk Ingestion ²
	$\left(\frac{\text{mrem}}{\text{yr}} - \frac{\text{cm}^3}{\mu\text{Ci}} \right)$	$\left(\frac{\text{mrem}}{\text{yr}} - \frac{\text{m}^2\text{-s}}{\mu\text{Ci}} \right)$
H-3	6.47 (+8)	3.53 (+9)*
Te-132	2.79 (+8)	3.50 (+7)
I-131	1.48 (+13)	7.24 (+11)
I-133	3.56 (+12)	1.52 (+10)

*Unit for H-3 is mrem/yr per $\mu\text{Ci}/\text{cm}^3$.

1. Based on Regulatory Guide 1.109 methodology with an infant breathing rate of 1400 m^3/yr .
2. Based on Regulatory Guide 1.109 and NUREG/CR-1004 dose methodologies.

Revision 5

Table 2.1

NUCLIDE	HALF-LIFE (DAYS)	DOSE COMMITMENT FACTORS* --- (REM/UCI)									
		ADULT					CHILD				
		BONE	GI TRACT	TOTAL BODY	LIVER	PONE	GI TRACT	TOTAL BODY	THYROID	LIVER	
H-3	4.50E+03	1.05E-04	1.05E-04	1.05E-04	1.05E-04	2.03E-04	2.03E-04	2.03E-04	2.03E-04	2.03E-04	
C-14	2.09E+06	2.84E-03	5.68E-04	5.68E-04	5.68E-04	1.21E-02	2.42E-03	2.42E-03	2.42E-03	2.42E-03	
NA-22	9.49E+02	2.50E-02	1.70E-03	1.70E-03	1.70E-03	2.50E-02	1.35E-02	1.35E-02	1.35E-02	1.40E-02	
NA-24	6.26E+01	1.70E-03	1.70E-03	1.70E-03	1.70E-03	5.80E-03	5.80E-03	5.80E-03	5.80E-03	5.80E-03	
P-32	1.43E+01	1.93E-01	2.17E-02	7.46E-03	1.20E-02	8.25E-01	2.28E-02	3.18E-02	3.18E-02	3.86E-02	
CR-51	2.77E+01	2.66E-06	6.69E-04	1.59E-06	2.66E-06	8.90E-06	4.72E-04	4.94E-04	8.90E-06	8.90E-06	
MN-54	3.12E+02	8.72E-04	1.40E-02	8.72E-04	4.57E-03	2.85E-03	8.98E-03	2.85E-03	2.85E-03	1.07E-02	
MN-56	1.08E+01	2.04E-05	3.67E-03	2.04E-05	2.04E-05	7.54E-05	4.84E-02	7.54E-05	3.34E-04	3.34E-04	
FE-55	9.86E+02	2.75E-03	1.09E-03	4.83E-04	4.83E-04	1.15E-02	1.13E-03	1.89E-03	1.89E-03	6.10E-03	
FE-59	4.76E+01	3.34E-03	3.40E-02	3.91E-03	3.91E-03	1.65E-02	2.78E-02	1.33E-02	1.33E-02	2.67E-02	
CO-57	2.71E+02	3.57E-04	4.56E-03	1.10E-04	2.53E-04	4.56E-03	4.56E-03	1.10E-04	1.10E-04	2.53E-04	
CO-58	7.08E+01	1.67E-03	1.67E-03	1.67E-03	7.45E-04	5.51E-03	1.05E-02	5.51E-03	5.51E-03	1.80E-03	
CO-60	1.92E+03	4.72E-03	4.02E-02	4.72E-03	2.14E-03	1.56E-02	2.93E-02	1.56E-02	1.56E-02	5.29E-03	
NI-63	3.65E+04	1.30E-01	1.88E-03	4.36E-03	9.01E-03	5.34E-01	1.94E-03	1.83E-02	1.83E-02	2.88E-02	
NI-65	1.05E+01	5.22E-04	1.74E-03	3.13E-05	6.86E-05	4.38E-05	2.56E-02	1.22E-04	1.22E-04	2.09E-04	
CU-64	5.30E+01	3.91E-05	7.10E-03	3.91E-05	8.33E-05	1.48E-04	1.15E-02	1.48E-04	1.48E-04	2.45E-04	
ZN-65	2.44E+02	4.85E-03	9.70E-03	6.96E-03	1.54E-02	1.37E-02	6.41E-03	2.27E-03	2.27E-03	3.65E-02	
ZN-69	3.96E+02	1.03E-05	2.96E-06	1.37E-06	1.37E-06	1.97E-05	3.99E-03	5.85E-06	5.85E-06	6.33E-05	
AS-74	1.78E+01	2.90E-04	3.88E-02	2.90E-04	2.51E-04	2.90E-04	3.88E-02	2.90E-04	2.90E-04	2.51E-04	
S-76	1.10E+00	4.49E-05	9.70E-02	4.49E-05	4.70E-05	4.49E-05	9.70E-02	4.49E-05	4.49E-05	4.70E-05	
BR-83	1.00E+01	4.02E-05	5.79E-05	4.02E-05	4.02E-05	4.02E-05	0.00E+00	1.71E-04	1.71E-04	1.71E-04	
BR-84	2.21E+02	5.21E-05	4.09E-10	5.21E-05	5.21E-05	1.98E-04	0.00E+00	1.98E-04	1.98E-04	1.98E-04	
BR-85	1.99E+03	2.14E-06	2.14E-06	2.14E-06	2.14E-06	9.12E-06	0.00E+00	9.12E-06	9.12E-06	9.12E-06	
BR-83M	7.75E+02	0.00E+00	1.46E-04	0.00E+00	0.00E+00	0.00E+00	1.46E-04	0.00E+00	0.00E+00	0.00E+00	
BR-85M	1.87E+01	0.00E+00	3.30E-03	0.00E+00	0.00E+00	0.00E+00	3.30E-03	0.00E+00	0.00E+00	0.00E+00	
BR-88	3.91E+03	0.00E+00	4.62E-02	0.00E+00	0.00E+00	0.00E+00	4.62E-02	0.00E+00	0.00E+00	0.00E+00	
BR-86	1.87E+01	9.83E-03	4.16E-03	9.83E-03	2.11E-02	4.12E-02	4.31E-03	4.12E-02	4.12E-02	6.70E-02	
BR-88	1.23E-02	3.21E-05	8.36E-16	3.21E-05	6.05E-05	1.32E-04	9.32E-06	1.32E-04	1.32E-04	1.90E-04	
Y-91	1.07E-02	2.82E-05	2.33E-18	2.82E-05	4.01E-05	1.04E-04	1.02E-06	1.04E-04	1.04E-04	1.17E-04	
Y-92	5.05E+01	3.08E-01	4.94E-02	8.84E-03	8.84E-03	1.32E+00	5.11E-02	3.77E-02	3.77E-02	3.77E-02	
Y-90	1.06E+04	7.58E+00	2.19E-01	1.86E+00	1.86E+00	1.70E+01	2.29E-01	4.31E+00	4.31E+00	4.31E+00	
Y-91M	3.97E-01	5.67E-03	2.70E-02	2.29E-04	2.29E-04	2.40E-02	5.30E-02	9.05E-04	9.05E-04	9.05E-04	
Y-92	3.97E-01	2.15E-03	4.26E-02	9.30E-05	9.30E-05	9.03E-03	1.71E-01	3.62E-04	3.62E-04	3.62E-04	
Y-93	1.13E-01	9.62E-06	1.02E-01	2.58E-07	2.58E-07	4.11E-05	1.17E-01	1.10E-06	1.10E-06	1.10E-06	
Y-94	2.67E+00	1.41E-04	7.76E-02	3.77E-06	3.77E-06	6.02E-04	8.02E-02	1.61E-05	1.61E-05	1.61E-05	
Y-91M	5.86E+01	9.09E-08	2.67E-07	3.52E-09	3.52E-09	3.82E-07	7.48E-04	1.39E-08	1.39E-08	1.39E-08	
Y-92	3.45E-02	1.48E-02	2.47E-08	2.47E-08	2.47E-08	3.60E-06	1.04E-01	1.03E-07	1.03E-07	1.03E-07	
Y-93	1.48E-01	2.68E-06	8.50E-02	7.40E-08	7.40E-08	1.14E-05	1.70E-01	3.13E-07	3.13E-07	3.13E-07	
Y-94	4.21E-01	3.04E-05	3.09E-02	6.60E-06	6.60E-06	1.14E-04	2.66E-02	2.27E-05	2.27E-05	2.55E-05	
Y-95	6.40E+01	1.68E-06	1.05E-01	1.55E-07	1.55E-07	8.99E-06	1.53E-01	5.96E-07	5.96E-07	1.01E-06	
Y-96	6.40E+01	6.22E-06	2.10E-02	1.86E-06	1.86E-06	2.25E-05	1.62E-02	6.26E-06	6.26E-06	8.76E-06	
Y-97	7.00E+01	5.95E-07	2.43E-02	2.54E-07	2.54E-07	5.95E-07	2.43E-02	2.54E-07	2.54E-07	4.63E-07	
Y-98	7.00E+01	1.56E-05	1.43E-03	7.85E-07	1.62E-05	1.56E-05	1.43E-03	2.78E-07	2.90E-05	1.62E-05	
Y-99	3.50E+00	3.48E-07	2.71E-05	3.12E-08	4.73E-07	3.48E-07	2.71E-05	3.12E-08	6.28E-07	4.73E-07	
Y-100	3.61E+00	8.20E-04	9.99E-03	8.20E-04	4.31E-03	3.29E-03	1.1E-02	3.29E-03	3.29E-03	1.33E-02	
Y-101	5.11E-02	4.10E-04	3.20E-03	1.41E-02	2.14E-04	4.10E-04	3.20E-03	1.41E-02	2.14E-04	6.28E-04	
Y-102	6.25E-04	2.47E-07	4.13E-04	8.89E-06	6.93E-07	9.23E-07	1.03E-03	3.00E-05	3.00E-05	1.81E-04	
Y-103	2.75E+00	1.85E-04	2.16E-02	7.97E-05	7.97E-05	7.31E-04	1.89E-02	2.81E-04	2.81E-04	2.81E-04	
Y-104	1.54E-05	9.42E-05	6.08E-06	6.08E-06	6.08E-06	6.445E-05	4.21E-02	2.34E-05	2.34E-05	2.34E-05	
Y-105	7.77E+07	2.75E-03	1.78E-01	3.48E-04	3.48E-04	1.17E-02	1.82E-01	1.46E-03	1.46E-03	1.46E-03	
Y-106	2.51E-01	4.05E-08	9.27E-05	1.58E-08	8.94E-07	4.05E-09	9.27E-05	1.58E-08	8.94E-07	2.21E-08	
Y-107	3.94E+01	5.69E-05	1.41E-02	1.30E-05	1.02E-04	5.69E-05	1.41E-02	1.30E-05	1.02E-04	3.35E-05	
Y-108	1.85E-01	2.72E-08	7.78E-06	4.91E-09	2.00E-04	2.72E-08	7.78E-06	4.91E-09	2.00E-04	3.00E-08	
Y-109	1.85E-01	1.96E-08	7.20E-05	2.80E-09	3.57E-08	1.86E-08	7.20E-05	2.80E-09	3.57E-08	3.57E-08	
Y-110	3.68E+02	1.60E-04	6.04E-02	8.79E-05	1.43E-04	5.39E-04	4.33E-02	2.91E-04	2.91E-04	3.64E-04	
Y-111	3.89E-02	5.65E-05	4.85E-02	1.26E-05	2.46E-05	5.65E-05	4.85E-02	1.26E-05	1.26E-05	2.46E-05	
Y-112	1.48E+04	2.29E-04	6.47E-02	3.11E-06	4.51E-06	2.29E-04	6.47E-02	3.11E-06	3.11E-06	2.46E-05	
Y-113	4.40E-04	2.75E-03	9.70E-02	7.14E-06	1.16E-03	2.75E-03	9.70E-02	7.14E-06	7.14E-06	4.51E-06	

Table 2.1 (Continued)

[illegible]

Table 2.1 (Continued)

NUCLIDE	HALF-LIFE (DAYS)	DOSE COMMITMENT FACTORS --- (REM/UCI)									
		ADULT					CHILD				
		AA	GI TRACT	THYROID	TOTAL BODY	LIVER	CC	GI TRACT	THYROID	TOTAL BODY	LIVER
PB-210	1.10E+01	2.10E+01	2.03E-02	3.00E-01	1.70E+00	1.40E+00	2.10E+01	2.03E-02	3.00E-01	1.70E+00	1.40E+00
PB-212	9.57E+02	1.20E-01	7.57E-03	5.22E-04	2.57E-03	5.85E-03	1.20E-01	7.57E-03	5.22E-04	2.57E-03	5.85E-03
PB-214	2.21E+00	3.03E-04	3.14E-03	1.18E-05	5.64E-05	2.97E-05	3.03E-04	3.14E-03	1.18E-05	5.64E-05	2.97E-05
BI-212	3.94E+13	3.03E-04	5.90E-03	4.97E-05	1.26E-04	7.24E-05	3.03E-04	5.90E-03	4.97E-05	1.26E-04	7.24E-05
BI-214	3.39E+04	4.16E-05	3.18E-03	5.11E-06	2.97E-05	1.58E-05	4.16E-05	3.18E-03	5.11E-06	2.97E-05	1.58E-05
PO-212	1.95E+00	1.50E-33	9.17E-13	3.44E-34	1.94E-15	1.08E-33	1.50E-33	9.17E-13	3.44E-34	1.94E-15	1.08E-33
PO-214	1.74E+03	4.80E-12	4.24E-10	7.01E-14	1.30E-12	3.35E-13	4.80E-12	4.24E-10	7.01E-14	1.30E-12	3.35E-13
PO-216	1.15E+02	9.35E-07	3.68E-07	3.11E-09	1.85E-08	7.39E-08	9.35E-07	3.68E-07	3.11E-09	1.85E-08	7.39E-08
PO-218	9.96E-01	9.50E-05	6.84E-04	1.64E-06	8.62E-06	1.11E-05	9.60E-05	6.84E-04	1.64E-06	8.62E-06	1.11E-05
RA-224	8.14E+03	3.30E+00	6.60E-01	8.32E-02	7.47E-02	8.90E-02	3.30E+00	6.60E-01	8.32E-02	7.47E-02	8.90E-02
RA-226	4.43E-01	4.30E+01	3.30E-01	5.90E-01	3.40E+00	5.90E-01	4.30E+01	3.30E-01	5.90E-01	3.40E+00	5.90E-01
RA-228	1.85E-02	2.10E+01	7.14E-02	4.00E-01	1.70E+00	4.00E-01	2.10E+01	7.14E-02	4.00E-01	1.70E+00	4.00E-01
AC-228	4.21E-02	3.48E-03	8.07E-03	6.13E-06	1.99E-04	3.54E-04	3.48E-03	8.07E-03	6.13E-06	1.99E-04	3.54E-04
TH-228	1.38E-02	4.10E+00	4.70E-01	7.42E-03	3.40E-02	2.34E-02	4.10E+00	4.70E-01	7.42E-03	3.40E-02	2.34E-02
TH-230	3.50E-12	1.60E+01	1.80E-01	4.56E-03	9.24E-02	2.18E-02	1.60E+01	1.80E-01	4.56E-03	9.24E-02	2.18E-02
TH-232	1.89E-09	1.80E+01	1.50E-01	3.94E-03	9.63E-02	1.88E-02	1.80E+01	1.50E-01	3.94E-03	9.63E-02	1.88E-02
TH-234	1.74E-06	4.91E-05	1.60E-01	1.60E-06	6.39E-04	1.46E-05	4.91E-05	1.60E-01	1.60E-06	6.39E-04	1.46E-05
PA-234	2.12E-03	3.00E-04	1.11E-02	7.20E-06	3.12E-04	2.28E-04	3.00E-04	1.11E-02	7.20E-06	3.12E-04	2.28E-04
U-234	3.66E+00	3.10E+01	1.80E-01	6.32E-02	2.30E+00	6.32E-02	3.10E+01	1.80E-01	6.32E-02	2.30E+00	6.32E-02
U-235	5.84E+05	2.80E-01	1.70E-01	5.63E-02	2.00E+00	5.35E-02	2.80E-01	1.70E-01	5.63E-02	2.00E+00	5.35E-02
NP-238	2.10E+03	4.42E-03	3.21E-02	1.22E-05	4.03E-04	1.08E-03	4.42E-03	3.21E-02	1.22E-05	4.03E-04	1.08E-03
NP-239	2.55E-01	1.19E-06	2.40E-02	6.45E-08	6.45E-08	1.17E-07	5.25E-06	2.79E-02	2.65E-07	2.65E-07	3.77E-07
PU-238	6.98E+02	2.10E+00	2.10E-01	3.23E-03	2.83E-02	4.40E-01	2.10E+00	2.10E-01	3.23E-03	2.83E-02	4.40E-01
PU-239	2.81E+07	2.60E+00	2.00E-01	3.63E-03	3.13E-02	4.90E-01	2.60E+00	2.00E-01	3.63E-03	3.13E-02	4.90E-01
PU-240	5.11E+12	2.50E+00	2.00E-01	3.62E-03	3.13E-02	4.90E-01	2.50E+00	2.00E-01	3.62E-03	3.13E-02	4.90E-01
PU-241	2.41E+01	4.83E-02	9.92E-04	7.49E-05	6.19E-04	9.50E-03	4.83E-02	9.92E-04	7.49E-05	6.19E-04	9.50E-03
PU-242	2.79E-01	2.60E+00	1.90E-01	3.45E-03	2.98E-02	4.70E-01	2.60E+00	1.90E-01	3.45E-03	2.98E-02	4.70E-01
AM-241	8.91E+07	8.00E+01	2.10E-01	1.20E-01	1.00E+00	1.70E-01	8.00E+01	2.10E-01	1.20E-01	1.00E+00	1.70E-01
AM-242	1.63E+12	5.19E-03	9.26E-03	1.06E-05	1.44E-04	1.51E-03	5.19E-03	9.26E-03	1.06E-05	1.44E-04	1.51E-03
AM-243	2.12E+00	8.50E+01	2.20E-01	1.30E-01	1.00E+00	1.70E-01	8.50E+01	2.20E-01	1.30E-01	1.00E+00	1.70E-01
CM-242	2.35E+00	1.50E+00	2.30E-01	2.72E-03	2.58E-02	4.40E-01	1.50E+00	2.30E-01	2.72E-03	2.58E-02	4.40E-01
CM-243	3.20E+04	4.80E+01	2.50E-01	8.22E-02	7.10E-01	1.20E-01	6.00E+03	1.00E-03	1.01E-03	2.01E-03	1.00E+03
CM-244	8.88E+06	3.50E+01	2.20E-01	6.40E-02	5.60E-01	9.30E+00	3.80E+01	2.20E-01	6.40E-02	5.60E-01	9.30E+00

*Dose factors were taken from the following references in order of preference:

1. Regulatory Guide 1.109, USNRC, October 1977
2. NUREG/CR-0150, D. E. Dunning, ORNL, October 1981
3. ORNL-4992, G. G. Killough and L. R. McKay, March 1976

Table 2.2

FISH CONCENTRATION FACTORS *

NUCLIDE		NUCLIDE		NUCLIDE	
H-3	9.00E-01	TC-99M	1.50E+01	CE-144	1.00E+00
C-14	4.60E+03	HU-103	1.00E+01	PR-143	2.50E+01
NA-22	1.00E+02	RH-105	1.00E+01	PR-144	2.50E+01
NA-24	1.00E+02	RU-106	1.00E+01	PP-144M	2.50E+01
P-32	3.00E+03	RH103M	1.00E+01	ND-147	2.50E+01
CR-51	2.00E+02	RH-105	1.00E+01	PM-147	2.50E+01
MN-54	4.00E+02	RH105M	1.00E+01	PM-149	2.50E+01
MY-56	4.00E+02	RH-106	1.00E+01	SM-147	2.50E+01
FE-55	1.00E+02	AG110M	2.31E+00	SM-151	2.50E+01
FE-59	1.00E+02	AG-111	2.31E+00	SM-153	2.50E+01
CO-57	5.00E+01	SR-122	1.00E+00	EU-155	2.50E+01
CO-58	5.00E+01	SR-124	1.00E+00	TA-192	3.00E+04
CO-60	5.00E+01	SR-127	1.00E+00	W-187	1.20E+03
NI-63	1.00E+02	TE125M	4.00E+02	PR-210	3.00E+02
NI-65	1.00E+02	TE-127	4.00E+02	PB-212	3.00E+02
CU-64	5.00E+01	TE127M	4.00E+02	PB-214	3.00E+02
ZN-65	2.00E+03	TE-129	4.00E+02	BI-212	1.50E+01
ZN-69	2.00E+03	TE129M	4.00E+02	BI-214	1.50E+01
AS-74	1.00E+02	TE-131	4.00E+02	PO-212	5.00E+01
AS-76	1.00E+02	TE131M	4.00E+02	PO-214	5.00E+01
BR-83	4.20E+02	TE-132	4.00E+02	PO-216	5.00E+01
BR-84	4.20E+02	I-129	1.50E+01	PO-218	5.00E+01
BR-85	4.20E+02	I-130	1.50E+01	RA-224	5.00E+01
KR-83M	1.00E+00	I-131	1.50E+01	RA-226	5.00E+01
KR-85M	1.00E+00	I-132	1.50E+01	RA-228	5.00E+01
KR-85	1.00E+00	I-133	1.50E+01	AC-228	2.50E+01
Rb-86	2.00E+03	I-134	1.50E+01	TH-229	3.00E+01
Rb-88	2.00E+03	I-135	1.50E+01	TH-230	3.00E+01
Rb-89	2.00E+03	XE133M	1.00E+00	TH-232	3.00E+01
SR-89	3.00E+01	XE-133	1.00E+00	TH-234	3.00E+01
SR-90	3.00E+01	XE135M	1.00E+00	PA-234	1.13E+01
SR-91	3.00E+01	XE-135	1.00E+00	U-234	1.00E+01
SR-92	3.00E+01	CS-134	2.00E+03	U-238	1.00E+01
Y-90	2.50E+01	CS-135	2.00E+03	NP-238	1.00E+01
Y-91	2.50E+01	CS-136	2.00E+03	NP-239	1.00E+01
Y-91M	2.50E+01	CS-137	2.00E+03	PU-238	3.50E+02
Y-92	2.50E+01	CS-138	2.00E+03	PU-239	3.50E+02
Y-93	2.50E+01	BA137M	4.00E+00	PU-240	3.50E+02
ZR-95	3.33E+00	BA-139	4.00E+00	PU-241	3.50E+02
ZR-97	3.33E+00	BA-140	4.00E+00	PU-242	3.50E+02
NB-95	3.00E+04	BA-141	4.00E+00	AM-241	2.50E+01
NB-95M	3.00E+04	BA-142	4.00E+00	AM-242	2.50E+01
NB-97	3.00E+04	LA-140	2.50E+01	AM-243	2.50E+01
NB-97M	3.00E+04	LA-142	2.50E+01	CM-242	2.50E+01
MO-99	1.00E+01	CE-141	1.00E+00	CM-243	2.50E+01
TC-99	1.50E+01	CE-143	1.00E+00	CM-244	2.50E+01

* The source for the fish concentration factors, given in order of preference is:

NUREG/CR-1336, "The Bioaccumulation Factor for Phosphorus-32 in Edible Fish Tissue," B. Kahn and K. S. Turgeon, Georgia Institute of Technology, March 1980.

Regulatory Guide 1.109, October 1977.

UCRL-50564, "Concentration Factors of Chemical Elements in Edible Aquatic Organisms," S. E. Thompson, et al.; Lawrence Livermore Laboratory, October 1972.

UCRL-50163, "Prediction of the Maximum Dosage to Man from the Fallout of Nuclear Devices: IV. Handbook for Estimating the Maximum Internal Dose from Radionuclides Released to the Biosphere," Y.C. Ng et al.; Lawrence Livermore Laboratory, May 1968.

Regulatory Guide 1.109, Draft, March 1976.

TVA generated numbers for noble gases.

Table 2.3

Recreation Dose Factors*

NUCLIDE	BONE	GI	THYROID	TR	S H O R E L I N E PER UCI/SQUARE CENTIMETER	BONE	GI	THYROID	TR	S K I N	BONE	GI	THYROID	TR	L I V E R	S K I N
H-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA-22	3.14E+07	2.49E+07	2.30E+07	2.67E+07	2.30E+07	2.27E+07	3.16E+07	3.16E+07	3.16E+07	3.16E+07	2.76E+06	2.19E+06	2.01E+06	2.33E+06	1.99E+06	2.76E+06
NA-24	5.66E+07	5.92E+07	6.22E+07	5.39E+07	6.22E+07	4.80E+07	6.16E+07	6.16E+07	6.16E+07	6.16E+07	3.96E+06	4.10E+06	4.20E+06	3.76E+06	3.33E+06	4.29E+06
P-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR-51	5.43E+05	3.07E+05	3.34E+05	3.79E+05	3.34E+05	3.09E+05	4.56E+05	4.56E+05	4.56E+05	4.56E+05	5.45E+04	3.08E+04	3.39E+04	3.81E+04	3.10E+04	4.69E+04
MN-54	1.16E+07	8.57E+06	7.35E+06	9.68E+06	7.35E+06	8.26E+06	1.24E+07	1.24E+07	1.24E+07	1.24E+07	1.44E+06	7.69E+05	6.60E+05	8.69E+05	7.42E+05	1.11E+06
MN-56	2.33E+07	2.14E+07	1.82E+07	2.07E+07	1.82E+07	1.81E+07	2.54E+07	2.54E+07	2.54E+07	2.54E+07	1.44E+06	1.69E+06	1.44E+06	1.66E+06	1.45E+06	2.05E+06
FE-55	3.16E+01	3.47E+01	6.94E+01	1.68E+02	1.68E+02	1.47E+01	3.16E+03	3.16E+03	3.16E+03	3.16E+03	2.71E+01	2.98E+01	5.96E+01	1.44E+02	1.26E+01	2.71E+03
FE-59	1.64E+07	1.38E+07	1.23E+07	1.45E+07	1.23E+07	1.23E+07	1.75E+07	1.75E+07	1.75E+07	1.75E+07	1.36E+06	1.15E+06	1.02E+06	1.20E+06	1.02E+06	1.46E+06
CO-57	2.71E+06	9.80E+05	1.69E+06	1.48E+06	1.13E+06	1.13E+06	1.75E+06	1.75E+06	1.75E+06	1.75E+06	2.82E+05	1.02E+05	1.76E+05	1.55E+05	1.17E+05	1.94E+05
CO-58	1.34E+07	1.03E+07	9.78E+06	1.13E+07	9.78E+06	9.68E+06	1.43E+07	1.43E+07	1.43E+07	1.43E+07	1.25E+06	9.36E+05	8.00E+05	1.03E+06	8.82E+05	1.30E+06
CO-60	3.46E+07	3.02E+07	2.73E+07	3.11E+07	2.73E+07	2.62E+07	3.67E+07	3.67E+07	3.67E+07	3.67E+07	2.83E+06	2.46E+06	2.23E+06	2.54E+06	2.14E+06	3.00E+06
NI-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-65	7.65E+06	6.86E+06	6.50E+06	6.94E+06	6.50E+06	5.84E+06	7.93E+06	7.93E+06	7.93E+06	7.93E+06	6.18E+05	5.52E+05	5.22E+05	5.60E+05	4.71E+05	6.41E+05
CU-64	2.83E+06	2.20E+06	1.85E+06	2.23E+06	1.85E+06	1.92E+06	2.67E+06	2.67E+06	2.67E+06	2.67E+06	2.71E+05	2.11E+05	1.74E+05	2.14E+05	1.84E+05	2.59E+05
ZN-65	7.99E+06	6.49E+06	5.58E+06	6.96E+06	5.58E+06	5.90E+06	8.67E+06	8.67E+06	8.67E+06	8.67E+06	6.75E+05	5.48E+05	4.71E+05	5.84E+05	4.98E+05	7.40E+05
ZN-69	9.55E+01	6.49E+01	6.09E+01	7.12E+01	6.09E+01	6.00E+01	8.51E+01	8.51E+01	8.51E+01	8.51E+01	9.40E+00	6.39E+00	6.00E+00	7.01E+00	5.90E+00	8.38E+00
AS-74	1.70E+05	1.30E+05	1.40E+05	1.40E+05	1.40E+05	1.10E+05	1.60E+05	1.60E+05	1.60E+05	1.60E+05	1.36E+06	1.10E+06	1.16E+06	1.12E+06	9.40E+05	1.33E+06
AS-76	8.31E+04	6.38E+04	7.04E+04	6.83E+04	6.83E+04	5.73E+04	8.12E+04	8.12E+04	8.12E+04	8.12E+04	6.82E+05	5.44E+05	5.74E+05	5.60E+05	4.70E+05	6.66E+05
BR-83	1.12E+05	8.64E+04	7.24E+04	8.81E+04	7.24E+04	7.59E+04	1.06E+05	1.06E+05	1.06E+05	1.06E+05	1.07E+04	8.29E+03	6.95E+03	8.45E+03	7.28E+03	1.02E+04
BR-84	2.46E+07	2.42E+07	2.59E+07	2.28E+07	2.28E+07	2.03E+07	2.69E+07	2.69E+07	2.69E+07	2.69E+07	1.86E+06	1.73E+06	1.79E+06	1.65E+06	1.46E+06	1.96E+06
BR-85	5.21E+05	2.11E+05	1.81E+05	2.39E+05	2.04E+05	2.04E+05	3.07E+05	3.07E+05	3.07E+05	3.07E+05	2.55E+04	1.80E+04	1.61E+04	2.13E+04	1.82E+04	2.74E+04
KR-83M	5.24E+02	1.22E+02	1.22E+02	9.46E+02	3.71E+01	1.13E+04	2.30E+06	2.30E+06	2.30E+06	2.30E+06	4.33E+02	1.18E+02	5.97E+01	9.66E+02	1.12E+01	1.23E+04
KR-85M	3.21E+06	1.36E+06	1.97E+06	1.93E+06	1.50E+06	1.50E+06	2.30E+06	2.30E+06	2.30E+06	2.30E+06	3.30E+05	1.39E+05	2.02E+05	1.99E+05	1.54E+05	2.39E+05
KR-85	3.34E+04	2.59E+04	2.17E+04	2.62E+04	2.26E+04	2.26E+04	3.14E+04	3.14E+04	3.14E+04	3.14E+04	3.22E+03	2.49E+03	2.09E+03	2.53E+03	2.18E+03	3.03E+03
RB-86	1.29E+06	1.04E+06	8.73E+05	1.12E+06	9.50E+05	9.50E+05	1.42E+06	1.42E+06	1.42E+06	1.42E+06	1.10E+05	8.77E+04	7.40E+04	9.50E+04	8.06E+04	1.20E+05
RB-88	8.99E+06	9.16E+06	8.10E+06	8.32E+06	7.33E+06	7.33E+06	9.90E+06	9.90E+06	9.90E+06	9.90E+06	6.77E+05	6.02E+05	5.97E+05	6.24E+05	5.49E+05	7.46E+05
RB-89	2.89E+07	2.67E+07	2.41E+07	2.61E+07	2.27E+07	2.27E+07	3.17E+07	3.17E+07	3.17E+07	3.17E+07	2.27E+06	2.06E+06	1.85E+06	2.04E+06	1.77E+06	2.49E+06
SR-89	1.83E+03	1.41E+03	1.18E+03	1.58E+03	1.35E+03	1.35E+03	2.05E+03	2.05E+03	2.05E+03	2.05E+03	1.66E+02	1.24E+02	1.04E+02	1.40E+02	1.19E+02	1.81E+02
SR-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-91	9.71E+06	6.32E+06	6.32E+06	8.17E+06	6.96E+06	6.96E+06	1.04E+07	1.04E+07	1.04E+07	1.04E+07	8.56E+05	6.43E+05	5.54E+05	7.19E+05	6.13E+05	9.13E+05
SR-92	1.84E+07	1.68E+07	1.59E+07	1.70E+07	1.43E+07	1.43E+07	1.93E+07	1.93E+07	1.93E+07	1.93E+07	1.50E+06	1.35E+06	1.24E+06	1.37E+06	1.15E+06	1.55E+06
Y-90	1.10E+00	2.90E-01	1.11E-01	1.32E+00	2.77E-02	1.06E-01	7.97E-01	7.97E-01	7.97E-01	7.97E-01	7.97E-01	2.17E-01	7.64E-02	9.65E-01	1.91E-02	7.87E+00
Y-91	4.99E+04	4.25E+04	3.77E+04	4.43E+04	3.75E+04	3.75E+04	5.33E+04	5.33E+04	5.33E+04	5.33E+04	4.12E+03	3.51E+03	3.11E+03	3.66E+03	3.10E+03	4.41E+03
Y-92	7.83E+06	6.02E+06	5.06E+06	6.21E+06	5.34E+06	5.34E+06	7.53E+06	7.53E+06	7.53E+06	7.53E+06	7.48E+05	5.74E+05	4.83E+05	5.93E+05	5.10E+05	7.20E+05
Y-92M	3.51E+06	2.80E+06	2.49E+06	3.02E+06	2.57E+06	2.57E+06	3.72E+06	3.72E+06	3.72E+06	3.72E+06	3.02E+05	2.39E+05	2.17E+05	2.59E+05	2.20E+05	3.19E+05
Y-93	1.30E+06	1.05E+06	9.91E+05	1.10E+06	9.42E+05	9.42E+05	1.33E+06	1.33E+06	1.33E+06	1.33E+06	1.10E+05	8.91E+04	8.17E+04	9.13E+04	7.77E+04	1.10E+05
ZR-95	1.04E+07	7.78E+06	6.64E+06	8.56E+06	7.32E+06	7.32E+06	1.02E+07	1.02E+07	1.02E+07	1.02E+07	9.56E+05	7.13E+05	6.04E+05	7.84E+05	6.71E+05	9.88E+05
ZR-95M	2.57E+06	2.04E+06	1.87E+06	2.14E+06	1.86E+06	1.86E+06	2.62E+06	2.62E+06	2.62E+06	2.62E+06	2.23E+05	1.74E+05	1.60E+05	1.84E+05	1.60E+05	2.27E+05
NB-95M	1.08E+07	8.01E+06	6.83E+06	8.87E+06	7.59E+06	7.59E+06	1.12E+07	1.12E+07	1.12E+07	1.12E+07	9.82E+05	7.31E+05	6.24E+05	8.09E+05	6.92E+05	1.02E+06
NB-95M	1.17E+06	5.59E+05	7.04E+05	7.59E+05	5.90E+05	5.90E+05	9.51E+05	9.51E+05	9.51E+05	9.51E+05	1.22E+05	5.66E+04	7.17E+04	8.05E+04	5.98E+04	1.23E+05
NB-97	9.40E+06	7.11E+06	6.03E+06	7.61E+06	6.52E+06	6.52E+06	9.43E+06	9.43E+06	9.43E+06	9.43E+06	8.77E+05	6.63E+05	5.62E+05	7.10E+05	6.08E+05	8.79E+05
NO-99M	1.03E+07	7.67E+06	6.54E+06	8.44E+06	7.22E+06	7.22E+06	1.06E+07	1.06E+07	1.06E+07	1.06E+07	9.42E+05	7.03E+05	5.95E+05	7.73E+05	6.61E+05	9.74E+05
NO-99	2.41E+06	1.63E+06	1.52E+06	1.87E+06	1.57E+06	1.57E+06	2.34E+06	2.34E+06	2.34E+06	2.34E+06	2.27E+05	1.51E+05	1.43E+05	1.75E+05	1.47E+05	2.21E+05
TC-99M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC-99M	2.74E+06	1.03E+06	1.69E+06	1.55E+06	1.18E+06	1.18E+06	1.83E+06	1.83E+06	1.83E+06	1.83E+06	2.83E+05	1.07E+05	1.74E+05	1.60E+05	1.21E+05	1.93E+05
RU-103	7.05E+06	5.44E+06	4.57E+06	5.51E+06	4.75E+06	4.75E+06	6.60E+06	6.60E+06	6.60E+06	6.60E+06	6.81E+05	5.27E+05	4.41E+05	5.32E+05	4.58E+05	6.37E+05
RU-105	1.15E+07	8.32E+06	7.34E+06	9.16E+06	7.74E+06	7.74E+06	1.14E+07	1.14E+07	1.14E+07	1.14E+07	1.08E+06	7.70E+05	6.49E+05	8.57E+05	7.29E+05	1.06E+06
RU-106	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH103M	3.73E+03	4.88E+02	1.27E+03	2.82E+03	3.92E+02	3.92E+02	1.27E+04	1.27E+04	1.27E+04	1.27E+04	1.74E+03	2.10E+02	5.64E+02	1.36E+03	1.03E+02	6.42E+03
RH105	1.35E+06	7.56E+05	8.39E+05	9.39E+05	7.64E+05	7.64E+05	1.12E+06	1.12E+06	1.12E+06	1.12E+06	1.36E+05	7.59E+04	8.41E+04	9.43E+04	7.67E+04	1.13E+05
RH105M	6.12E+05	2.18E+05	3.75E+05	3.42E+05	2.51E+05	2.51E+05	4.51E+05	4.51E+05	4.51E+05	4.51E+05	7.05E+04	2.30E+04	4.10E+04	4.11E+04	2.66E+04	7.39E+04
RH106	2.99E+06	2.30E+06	1.94E+06	2.41E+06	2.07E+06	2.07E+06	2.93E+06	2.93E+06	2.93E+06	2.93E+06	2.81E+05	2.16E+05	1.84E+05	2.25E+05	1.74E+05	2.74E+05
AG110M	3.87E+07	2.97E+07	2.68E+07	3.28E+07	2.79E+07	2.79E+07	4.0									

Table 2.3 (Continued)

NUCLIDE	SHORELINE (MREM/YEAR PER UCI/SQUARE CENTIMETER)						SWIMMING (MREM/YEAR PER UCI/ML)					
	BONE	GI	THYROID	TR	LIVER	SKIN	BONE	GI	THYROID	TR	LIVER	SKIN
SB-122	8.06E+04	6.27E+04	6.58E+04	6.31E+04	5.26E+04	7.73E+04	6.83E+05	5.31E+05	5.57E+05	5.35E+05	4.46E+05	6.54E+05
SB-124	2.61E+07	2.28E+07	2.07E+07	2.29E+07	1.98E+07	2.71E+07	2.18E+06	1.86E+06	1.69E+06	1.90E+06	1.64E+06	2.25E+06
SB-127	1.01E+07	7.39E+06	6.47E+06	8.03E+06	6.85E+06	9.91E+06	9.52E+05	6.94E+05	6.09E+05	7.55E+05	6.43E+05	9.31E+05
TE125M	2.47E+05	2.93E+04	1.24E+05	1.35E+05	4.71E+04	3.39E+05	4.60E+04	9.08E+03	2.32E+04	2.50E+04	8.75E+03	6.29E+04
TE-127	7.84E+04	5.17E+04	4.98E+04	5.77E+04	4.83E+04	6.89E+04	7.74E+03	5.10E+03	4.92E+03	5.69E+03	4.77E+03	6.80E+03
TE127M	6.91E+04	1.33E+04	3.45E+04	3.82E+04	1.28E+04	9.89E+04	1.31E+04	2.54E+03	6.60E+03	7.21E+03	2.44E+03	1.86E+04
TE-129	8.68E+05	6.12E+05	5.58E+05	6.69E+05	5.60E+05	8.33E+05	8.52E+04	5.87E+04	5.43E+04	6.50E+04	5.37E+04	8.28E+04
TE129M	4.72E+05	3.23E+05	2.94E+05	3.71E+05	3.02E+05	5.03E+05	4.89E+04	3.09E+04	2.98E+04	3.71E+04	2.88E+04	5.38E+04
TE-131	6.79E+06	4.21E+06	4.37E+06	4.99E+06	4.13E+06	6.11E+06	6.49E+05	3.94E+05	4.16E+05	4.71E+05	3.84E+05	5.78E+05
TE131M	2.06E+07	1.53E+07	1.39E+07	1.70E+07	1.45E+07	2.12E+07	1.84E+06	1.35E+06	1.23E+06	1.51E+06	1.28E+06	1.89E+06
TE-132	4.27E+06	1.92E+06	2.54E+06	2.68E+06	2.04E+06	3.32E+06	4.55E+05	1.98E+05	2.68E+05	2.83E+05	2.12E+05	3.60E+05
I-129	2.25E+05	4.84E+04	1.19E+05	1.15E+05	4.75E+04	2.49E+05	5.02E+04	1.07E+04	2.67E+04	2.57E+04	1.05E+04	5.70E+04
I-130	3.09E+07	2.33E+07	2.00E+07	2.50E+07	2.14E+07	3.08E+07	2.88E+06	2.17E+06	1.86E+06	2.32E+06	1.99E+06	2.86E+06
I-131	6.22E+06	3.93E+06	3.92E+06	4.54E+06	3.77E+06	5.47E+06	6.16E+05	3.87E+05	3.88E+05	4.49E+05	3.72E+05	5.41E+05
I-132	3.23E+07	2.45E+07	2.16E+07	2.68E+07	2.29E+07	3.32E+07	2.91E+06	2.20E+06	1.93E+06	2.41E+06	2.06E+06	2.99E+06
I-133	8.96E+06	6.90E+06	5.89E+06	7.18E+06	6.16E+06	8.69E+06	8.44E+05	6.49E+05	5.54E+05	6.75E+05	5.79E+05	8.17E+05
I-134	3.67E+07	2.84E+07	2.49E+07	3.11E+07	2.65E+07	3.89E+07	3.22E+06	2.46E+06	2.16E+06	2.71E+06	2.32E+06	3.40E+06
I-135	2.19E+07	1.95E+07	1.75E+07	1.96E+07	1.67E+07	2.33E+07	1.78E+06	1.57E+06	1.41E+06	1.58E+06	1.35E+06	1.89E+06
XE133M	6.05E+05	2.38E+05	3.55E+05	3.71E+05	2.61E+05	5.27E+05	8.09E+04	2.81E+04	4.65E+04	4.77E+04	3.05E+04	7.71E+04
XE-133	8.52E+05	2.53E+05	4.84E+05	4.24E+05	2.74E+05	5.73E+05	1.11E+05	3.17E+04	6.28E+04	5.57E+04	3.39E+04	8.27E+04
XE135M	6.41E+06	4.94E+06	4.15E+06	5.04E+06	4.33E+06	6.08E+06	6.21E+05	4.75E+05	4.01E+05	4.87E+05	4.17E+05	5.90E+05
XE-135	4.54E+06	2.28E+06	2.76E+06	3.02E+06	2.40E+06	3.63E+06	4.59E+05	2.29E+05	2.79E+05	3.04E+05	2.41E+05	3.67E+05
CS-134	2.22E+07	1.67E+07	1.43E+07	1.81E+07	1.55E+07	2.26E+07	2.04E+06	1.54E+06	1.32E+06	1.67E+06	1.43E+06	2.08E+06
CS-135	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-136	3.10E+07	2.26E+07	2.03E+07	2.55E+07	2.15E+07	3.21E+07	2.77E+06	2.00E+06	1.81E+06	2.26E+06	1.91E+06	2.85E+06
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-138	3.29E+07	3.03E+07	2.86E+07	2.98E+07	2.56E+07	3.46E+07	2.62E+06	2.37E+06	2.23E+06	2.33E+06	2.02E+06	2.74E+06
BA137M	8.56E+06	6.45E+06	5.48E+06	6.92E+06	5.93E+06	8.59E+06	8.01E+05	6.02E+05	5.12E+05	6.47E+05	5.54E+05	8.04E+05
BA-139	7.49E+05	3.44E+05	4.73E+05	4.66E+05	3.60E+05	5.55E+05	7.61E+04	3.38E+04	4.75E+04	4.67E+04	3.57E+04	5.62E+04
BA-140	2.29E+06	1.60E+06	1.46E+06	1.73E+06	1.46E+06	2.10E+06	2.29E+05	1.56E+05	1.44E+05	1.71E+05	1.42E+05	2.13E+05
BA-141	1.31E+07	8.90E+06	8.96E+06	1.02E+07	8.49E+06	1.22E+07	1.21E+06	7.97E+05	8.15E+05	9.26E+05	7.70E+05	1.12E+06
BA-142	1.51E+07	1.11E+07	1.02E+07	1.24E+07	1.04E+07	1.54E+07	1.34E+06	9.38E+05	9.03E+05	1.10E+06	9.17E+05	1.36E+06
LA-140	3.20E+07	2.91E+07	2.73E+07	2.89E+07	2.46E+07	3.31E+07	2.60E+06	2.32E+06	2.18E+06	2.32E+06	1.98E+06	2.67E+06
LA-142	3.74E+07	3.80E+07	3.72E+07	3.47E+07	3.10E+07	4.10E+07	2.75E+06	2.73E+06	2.64E+06	2.53E+06	2.52E+06	3.00E+06
CE-141	1.59E+06	5.94E+05	9.70E+05	9.01E+05	6.75E+05	1.09E+06	1.69E+05	6.20E+04	1.02E+05	2.83E+05	3.24E+05	2.57E+05
CE-143	4.54E+06	2.64E+06	2.79E+06	3.22E+06	2.60E+06	4.00E+06	4.66E+05	2.61E+05	2.83E+05	3.24E+05	2.57E+05	4.07E+05
CE-144	4.18E+05	1.42E+05	2.51E+05	2.26E+05	1.63E+05	2.81E+05	4.64E+04	1.55E+04	2.76E+04	2.50E+04	1.76E+04	3.18E+04
PR-143	1.26E-01	9.38E-02	8.00E-02	1.03E-01	8.83E-02	1.30E-01	1.15E-02	8.60E-03	7.33E-03	9.45E-03	8.09E-03	1.19E-02
PR-144	4.40E+05	4.24E+05	3.74E+05	3.97E+05	3.50E+05	4.75E+05	3.46E+04	3.24E+04	2.87E+04	3.10E+04	2.72E+04	3.71E+04
PR144M	1.42E+05	3.32E+04	7.19E+04	6.95E+04	3.23E+04	1.25E+05	2.28E+04	5.33E+03	1.15E+04	1.12E+04	5.17E+03	2.06E+04
ND-147	2.33E+06	1.34E+06	1.44E+06	1.57E+06	1.25E+06	1.93E+06	2.47E+05	1.35E+05	1.50E+05	1.62E+05	1.27E+05	2.03E+05
PM-147	7.86E+01	2.76E+01	4.92E+01	4.26E+01	3.23E+01	4.98E+01	8.17E+00	2.92E+00	5.11E+00	4.43E+00	3.36E+00	5.17E+00
PM-149	1.98E+05	1.12E+05	1.23E+05	1.39E+05	1.13E+05	1.69E+05	1.98E+04	1.11E+04	1.22E+04	1.38E+04	1.12E+04	1.67E+04
SM-147	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM-151	1.69E+01	2.20E+00	5.68E+00	1.33E+01	1.61E+00	6.78E+01	7.60E+00	1.04E+00	2.56E+00	6.24E+00	7.22E+01	3.55E+01
SM-153	1.25E+06	3.89E+05	7.21E+05	6.33E+05	4.25E+05	8.08E+05	1.57E+05	4.71E+04	8.79E+04	7.83E+04	5.07E+04	1.04E+05
EU-155	1.35E+06	4.28E+05	7.98E+05	6.81E+05	4.78E+05	8.21E+05	1.54E+05	4.82E+04	8.98E+04	7.73E+04	5.35E+04	9.49E+04
TA-182	2.42E+05	1.90E+05	1.80E+05	2.04E+06	1.68E+05	2.44E+05	1.94E+06	1.41E+06	1.45E+06	1.63E+06	1.35E+06	1.96E+06
W-187	7.25E+06	5.09E+06	4.57E+06	5.55E+06	4.68E+06	6.81E+06	6.99E+05	4.84E+05	4.39E+05	5.30E+05	4.45E+05	6.52E+05

Table 2.3 (Continued)

NUCLIDE	BONE	GI	THYROID	SKIN	LIVER	THYROID	GI	THYROID	SKIN	LIVER	THYROID	GI	THYROID	SKIN
PU-210	3.69E+04	9.75E+03	1.71E+04	1.76E+04	9.16E+03	3.27E+04	5.31E+03	1.46E+03	2.42E+03	3.05E+03	1.28E+03	1.43E+04	1.28E+03	1.43E+04
PU-212	2.89E+06	1.26E+06	1.78E+06	1.36E+06	1.36E+06	2.13E+06	2.99E+05	1.29E+05	1.78E+05	1.83E+05	1.40E+05	2.25E+05	1.40E+05	2.25E+05
PU-214	4.20E+06	2.39E+06	2.85E+06	2.95E+06	2.39E+06	3.55E+06	4.32E+05	2.30E+05	2.66E+05	2.96E+05	2.39E+05	3.61E+05	2.39E+05	3.61E+05
BI-212	2.59E+06	2.08E+06	1.89E+06	2.22E+06	1.90E+06	2.69E+06	2.25E+05	1.78E+05	1.61E+05	1.92E+05	1.63E+05	2.36E+05	1.63E+05	2.36E+05
BI-214	2.10E+07	1.89E+07	1.87E+07	1.87E+07	1.62E+07	2.23E+07	1.71E+06	1.51E+06	1.35E+06	1.51E+06	1.31E+06	1.81E+06	1.31E+06	1.81E+06
PO-212	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO-214	1.54E+03	1.14E+03	9.75E+02	1.27E+03	1.09E+03	1.62E+03	1.39E+02	1.03E+02	8.84E+01	1.15E+02	9.85E+01	1.46E+02	9.85E+01	1.46E+02
PO-216	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO-218	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RA-224	1.67E+05	8.92E+04	1.13E+05	1.21E+05	9.45E+04	1.45E+05	1.90E+04	9.04E+03	1.15E+04	1.22E+04	9.58E+03	1.49E+04	9.58E+03	1.49E+04
RA-226	1.37E+05	5.79E+04	8.19E+04	8.21E+04	6.26E+04	9.83E+04	1.41E+04	5.94E+03	8.41E+03	8.45E+03	6.41E+03	1.05E+04	6.41E+03	1.05E+04
RA-228	8.53E+05	9.39E+05	1.88E+05	4.53E+04	3.98E+07	8.53E+03	7.89E+05	8.68E+05	1.74E+05	4.19E+04	3.68E+07	7.89E+03	3.68E+07	7.89E+03
AC-228	1.32E+07	9.95E+06	8.99E+06	1.10E+07	9.30E+06	1.37E+07	1.17E+06	8.65E+05	7.84E+05	9.64E+05	8.14E+05	1.23E+06	8.14E+05	1.23E+06
TH-228	4.33E+04	1.54E+04	2.54E+04	2.41E+04	1.74E+04	3.33E+04	4.75E+03	1.67E+03	2.74E+03	2.95E+03	1.44E+03	8.88E+03	1.44E+03	8.88E+03
TH-230	8.79E+03	2.85E+03	4.78E+03	4.83E+03	3.07E+03	1.00E+04	1.11E+03	3.53E+02	5.44E+02	8.92E+02	3.39E+02	5.86E+03	3.39E+02	5.86E+03
TH-232	3.91E+03	1.20E+03	2.03E+03	2.21E+03	1.23E+03	6.81E+03	5.93E+02	1.78E+02	2.53E+02	6.10E+02	1.45E+02	5.44E+03	1.45E+02	5.44E+03
TH-234	1.90E+05	6.00E+04	1.10E+05	9.53E+04	6.63E+04	1.18E+05	2.14E+04	6.70E+03	1.23E+04	1.23E+04	7.33E+03	1.94E+04	7.33E+03	1.94E+04
PA-234	2.89E+07	2.07E+07	1.92E+07	2.34E+07	1.98E+07	2.93E+07	2.61E+06	1.83E+06	1.72E+06	2.11E+06	1.77E+06	2.69E+06	1.77E+06	2.69E+06
U-234	2.77E+03	8.35E+02	1.38E+03	1.80E+03	8.36E+02	8.05E+03	5.71E+02	1.46E+02	1.85E+02	7.43E+02	1.00E+02	7.34E+03	1.00E+02	7.34E+03
U-238	9.69E+02	2.47E+02	3.65E+02	8.02E+02	1.97E+02	5.91E+03	3.32E+02	8.41E+01	7.05E+01	5.46E+02	2.97E+01	6.06E+03	2.97E+01	6.06E+03
NP-238	7.50E+06	5.78E+06	4.77E+06	6.38E+06	5.43E+06	8.32E+06	6.50E+05	4.99E+05	4.12E+05	5.54E+05	4.69E+05	7.45E+05	4.69E+05	7.45E+05
NP-239	3.44E+06	1.40E+06	2.14E+06	2.02E+06	1.57E+06	2.43E+06	3.59E+05	1.45E+05	2.22E+05	2.13E+05	1.62E+05	2.90E+05	1.62E+05	2.90E+05
PU-238	9.79E+02	2.32E+02	3.16E+02	1.00E+03	1.67E+02	8.46E+03	4.77E+02	1.42E+02	7.02E+01	7.97E+02	2.54E+01	8.55E+03	2.54E+01	8.55E+03
PU-239	1.39E+03	4.51E+02	7.98E+02	9.42E+02	5.05E+02	3.67E+03	2.83E+02	8.55E+01	9.52E+01	3.60E+02	5.44E+01	3.32E+03	5.44E+01	3.32E+03
PU-240	1.01E+03	2.33E+02	3.34E+02	9.90E+02	1.78E+02	8.10E+03	4.65E+02	1.36E+02	7.17E+01	7.64E+02	2.69E+01	8.14E+03	2.69E+01	8.14E+03
PU-241	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PU-242	8.25E+02	1.93E+02	2.83E+02	7.96E+02	1.52E+02	6.40E+03	3.68E+02	6.23E+01	5.81E+01	6.03E+02	2.22E+01	6.41E+03	2.22E+01	6.41E+03
AM-241	5.01E+05	1.43E+05	2.47E+05	2.37E+05	1.42E+05	3.12E+05	6.40E+04	1.81E+04	3.11E+04	3.16E+04	1.79E+04	5.77E+04	1.79E+04	5.77E+04
AM-242	3.08E+05	1.04E+05	1.95E+05	1.62E+05	1.21E+05	1.96E+05	3.32E+04	1.11E+04	2.07E+04	1.80E+04	1.29E+04	2.97E+04	1.29E+04	2.97E+04
AM-243	1.22E+06	3.71E+05	6.70E+05	5.97E+05	3.96E+05	7.28E+05	1.37E+05	4.16E+04	7.49E+04	6.79E+04	4.42E+04	9.30E+04	4.42E+04	9.30E+04
CM-242	1.08E+03	2.95E+02	2.97E+02	1.14E+03	1.56E+02	9.49E+03	6.08E+02	2.02E+02	7.14E+01	9.05E+02	2.57E+01	9.00E+03	2.57E+01	9.00E+03
CM-243	2.57E+06	1.06E+06	1.59E+06	1.53E+06	1.18E+06	1.85E+06	2.68E+05	1.09E+05	1.64E+05	1.62E+05	1.22E+05	2.33E+05	1.22E+05	2.33E+05
CM-244	6.91E+02	2.00E+02	1.25E+02	9.01E+02	5.13E+01	4.47E+03	5.22E+02	1.76E+02	4.96E+01	8.07E+02	1.34E+01	8.15E+03	1.34E+01	8.15E+03

*Dose factors taken from Kocher, D.C., "Dose-Rate Conversion Factors For External Exposure to Photon and Electron Radiation From Radionuclides Occurring in Routine Releases From Nuclear Fuel Cycle Facilities," Health Physics, Volume 38, Number 4, April 1980.

Table 2.4.a

Public Water Supply Information*

TRM	2020 POPULATION	WATER SUPPLY
484.5		SEQUOYAH NUCLEAR PLANT
473.0	2000	ICI AMERICA, INC. (VAAP)
473.0	900	C. F. INDUSTRIES, INC.
470.5	4000	E. I. DUPONT, COMPANY
465.3	610700	CHATTANOOGA
418.0	4400	SOUTH PITTSBURG
413.6	3400	BRIDGEPORT
407.6	500	WIDOWS CREEK STEAM PLANT
405.2	500	MEAD PAPER BOARD
392.0		BELLEFONTE NUCLEAR PLANT
385.8	38700	SCOTTSBORO
382.1	18600	SAND MOUNTAIN WATER AUTHORITY
368.2	125	CHRISTIAN YOUTH CAMP
358.0	14900	GUNTERSVILLE
334.5	4500	N.E. MORGAN CO., WATER AND FIRE
334.2	168600	HUNTSVILLE
330.2	10000	REDSTONE ARSENAL
324.2		REDSTONE ARSENAL
306.0	84600	DECATUR
294.0		BROWNS FERRY NUCLEAR PLANT
283.0	500	U.S. PLYWOOD-CHAMPION PAPER
274.9	50	WHEELER DAM
259.6	14100	MUSCLE SHOALS
259.5	2700	TVA-NFDC
254.3	21100	SHEFFIELD
245.0	520	COLBERT STEAM PLANT
239.3	3900	CHEROKEE
238.7	350	U.S. STEEL AGRI-CHEMICALS, INC.
217.4	1	YELLOW CREEK NUCLEAR PLANT
206.8	2400	HARDIN CO. WATER DISTRICT
193.5	1900	TRI-COUNTY UTILITY DISTRICT
158.0	1100	CLIFTON
101.9	170	FOOTE MINERAL CO.
100.5	6100	NEW JOHNSONVILLE
100.4	13300	CAMDEN
100.0	375	JOHNSONVILLE STEAM PLANT
98.5	900	E. I. DUPONT COMPANY
95.5	700	CONSOLIDATED ALUMINUM CORPORATION
94.5	250	INLAND CONTAINER CORPORATION
79.5	120	BASS BAY RESORT
39.3	4300	JONATHAN CREEK WATER DISTRICT
28.5	9100	NORTH MARSHALL WATER DISTRICT
23.6	650	GRAND RIVERS
17.8	600	B. F. GOODRICH CHEMICAL CO.
17.4	106	AIRCO CARBIDE
16.8	592	AIRCO ALLOYS
16.7	510	AIR PRODUCTS AND CHEMICALS
1.1	69800	PAUDUCAH

Revision 5

*From TVA Water Quality Branch, updated December 1979

Table 2.4.b

Fish Harvest Data

RIVER SPAN (TRM)	NAME OF REACH	FISH HARVEST (LBS/YR)	
		SPORT*	COMMERCIAL*
484.5 - 471.0	Chickamauga Lake below SQN	5.4×10^5	2.0×10^5
471.0 - 452.0	Nickajack Lake (Part 1 of 2)	1.2×10^5	4.6×10^4
452.0 - 424.7	Nickajack Lake (Part 2 of 2)	2.9×10^5	1.1×10^5
424.7 - 417.5	Guntersville Lake (Part 1 of 4)	2.6×10^5	9.5×10^4
417.5 - 392.0	Guntersville Lake above BLN	5.2×10^5	1.9×10^5
392.0 - 373.0	Guntersville Lake below BLN	7.8×10^5	2.9×10^5
373.0 - 349.0	Guntersville Lake (Part 4 of 4)	1.0×10^6	3.8×10^5
349.0 - 294.0	Wheeler Lake above BFN	1.0×10^6	3.8×10^5
294.0 - 274.9	Wheeler Lake below BFN	1.5×10^6	5.7×10^5
274.9 - 259.4	Wilson Lake	5.9×10^5	2.2×10^5
259.4 - 217.4	Pickwick Lake above YCN	1.3×10^6	4.9×10^5
217.4 - 206.7	Pickwick Lake below YCN	3.3×10^5	1.2×10^5
206.7 - 165.0	Kentucky Lake (Part 1 of 4)	6.1×10^5	2.3×10^5
165.0 - 121.0	Kentucky Lake (Part 2 of 4)	6.1×10^5	2.3×10^5
121.0 - 76.0	Kentucky Lake (Part 3 of 4)	1.8×10^6	6.8×10^5
76.0 - 22.4	Kentucky Lake (Part 4 of 4)	3.1×10^6	1.1×10^6

*Derived from "Situation Assessment and Planning Assumptions," Division of Forestry, Fisheries, and Wildlife, TVA, December 1978.

**Derived from "Estimated Commercial Fish and Mussel Harvest from the Tennessee Valley," Fisheries and Aquatic Ecology Branch, TVA, 1980.

Revision 5

Table 2.4.c

Recreation Usage Data*

RIVER SPAN (TRM)	NAME OF REACH	HOURS OF USAGE PER YEAR		
		SHORELINE	ABOVE-WATER	IN-WATER
484.5 - 471.0	Chickamauga Lake below SQN	5.5×10^6	1.0×10^6	4.9×10^6
471.0 - 452.0	Nickajack Lake (Part 1 of 2)	1.2×10^5	2.5×10^4	1.1×10^5
452.0 - 424.7	Nickajack Lake (Part 2 of 2)	2.0×10^5	4.0×10^4	1.8×10^5
424.7 - 417.5	Guntersville Lake (Part 1 of 4)	7.0×10^4	1.5×10^4	6.0×10^4
417.5 - 392.0	Guntersville Lake above BLN	5.2×10^5	1.0×10^5	4.7×10^5
392.0 - 373.0	Guntersville Lake below BLN	4.7×10^6	8.9×10^5	4.2×10^6
373.0 - 349.0	Guntersville Lake (Part 4 of 4)	1.1×10^7	2.1×10^6	9.8×10^6
349.0 - 294.0	Wheeler Lake above BFN	4.0×10^6	7.6×10^5	3.6×10^6
294.0 - 274.9	Wheeler Lake below BFN	5.2×10^6	1.0×10^6	4.7×10^4
274.9 - 259.4	Wilson Lake	3.9×10^6	7.4×10^5	3.5×10^6
259.4 - 217.4	Pickwick Lake above YCN	2.0×10^6	3.5×10^5	2.0×10^6
217.4 - 206.7	Pickwick Lake below YCN	2.0×10^6	4.0×10^5	1.8×10^6
206.7 - 165.0	Kentucky Lake (Part 1 of 4)	6.0×10^5	1.2×10^5	5.4×10^5
165.0 - 121.0	Kentucky Lake (Part 2 of 4)	1.2×10^6	2.3×10^5	1.1×10^6
121.0 - 76.0	Kentucky Lake (Part 3 of 4)	2.4×10^6	4.7×10^5	2.2×10^6
76.0 - 22.4	Kentucky Lake (Part 4 of 4)	2.6×10^7	4.9×10^6	2.3×10^7

*Based on "Extent of Recreation Development and Use of TVA Lake Frontage Property;" (unpublished data from 1974 Annual Recreation Survey); and Observations of Recreation Use of TVA Reservoirs, Division of Reservoir Properties, Recreation Resources Branch, TVA, 1975.