

**CP&L**

Carolina Power & Light Company

Company Correspondence

Brunswick Nuclear Plant  
P.O. Box 10429  
Southport, N. C. 28461-0249

FEB 26 1993

File: B09-13510C  
Serial: BSF 03-0022

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

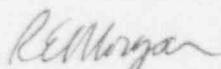
BRUNSWICK STEAM ELECTRIC PLANT UNITS 1 AND 2  
DOCKET NOS. 50-325 AND 50-324  
LICENSE NOS. DPR-71 AND DPR-62  
SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Gentlemen:

Enclosed is the Semiannual Radioactive Effluent Release Report for Brunswick Steam Electric Plant, covering the period from July 1, 1992, through December 31, 1992.

This report is submitted for the Brunswick Steam Electric Plant in accordance with Technical Specification 6.9.1.8.

Very truly yours,



R. E. Morgan, Plant Manager  
Unit 1

Enclosure

cc: Mr. S. D. Ebnetter  
Mr. P. D. Milano  
BSEP NRC Resident Office

281020  
9303030041 921231  
PDR ADOCK 05000324  
R PDR

JE48

Brunswick Steam Electric Plant  
Semiannual Radioactive Effluent Report  
July 1, to December 31, 1992

ATTACHMENTS:

PAGES:

1. Supplemental Information	2 - 6
2. Effluent and Waste Disposal Data	7 - 21
3. Environmental Monitoring Program	22 - 24
4. Effluent Instrumentation	25 - 28
5. Major Modification to Radioactive Waste Treatment Systems	29
6. Meteorological Data	30
7. Annual Dose Assessment	31 - 48
8. ODCM and PCP Revisions	49 - 119

ATTACHMENT 1

Supplemental Information

July 1, to December 31, 1992

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT  
Supplemental Information

Facility: Brunswick Steam Electric Plant  
Licensee: Carolina Power and Light Company

1. Regulatory Limits

A. Fission and activation gases (Technical Spec. 3.11.2.2)

- \*(1) Calendar Quarter
  - (a) 10 mrad gamma
  - (b) 20 mrad beta

(2) Calendar Year

- (a) 20 mrad gamma
- (b) 40 mrad beta

B. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days (Technical Spec. 3.11.2.3)

- \*(1) Calendar Quarter
  - (a) 15 mrem to any organ

(2) Calendar Year

- (a) 30 mrem to any organ

\*(3) Calendar Quarter for Burning Contaminated Oil

- (a) 436 uCi

(4) Calendar Year for Burning Contaminated Oil

- (a) 872 uCi

C. Liquid effluents (Technical Specification 3.11.1.2)

\*\* (1) Calendar Quarter

- (a) 3 mrem to total body
- (b) 10 mrem to any organ

(2) Calendar Year

- (a) 6 mrem to total body
- (b) 20 mrem to any organ

NOTE: Dose calculations are determined in accordance with the  
Off-Site Dose Calculation Manual (ODCM)

\* Used for percent of Technical Specification limit determinations in Table 1A.

\*\*Used for percent of Technical Specification limit determinations in Table 2A.



2. Maximum permissible concentrations and dose rates which determine maximum instantaneous release rates.
  - A. Fission and activation gases (Technical Specification 3.11.2.1.a)
    - (1) 500 mrem/year to total body
    - (2) 3000 mrem/year to the skin
  - B. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days (Technical Specification 3.11.2.1.b)
    - (1) 1500 mrem/year to any organ
  - C. Liquid effluents (Technical Specification 3.11.1.1)

The concentration of radioactive material released in liquid effluents to unrestricted areas after dilution in the discharge canal shall be limited to the concentrations specified in 10CFR20, Appendix B.

\*\* (1) Tritium: MPC =  $3 \text{ E-03 uCi/ml}$  and

\*\* (2) Dissolved and entrained gases: MPC =  $2 \text{ E-04 uCi/ml}$

3. Measurements and Approximations of Total Radioactivity

- A. Fission and activation gases

Analysis for specific radionuclides in representative grab samples by gamma spectroscopy. Though analysis of grab samples indicated less than detectable activity, noble gas discharge was attributed to minimal count rates measured by the noble gas effluent radiation monitors.

- B. Iodines

Analysis for specific radionuclides collected on charcoal cartridges by gamma spectroscopy.

- C. Particulates

Analysis for specific radionuclides collected on filter papers by gamma spectroscopy.

- D. Particulates for Burning Oil

Analysis for specific radionuclides by grab samples of each batch of oil to be burned.

- E. Liquids Effluents

Analysis for specific radionuclides of individual releases by gamma spectroscopy.

\*\* Used as applicable limits for Table 2A

Nuclear counting statistics are reported utilizing 1-sigma error. Total error where reported represents a best effort to approximate the total of all individual and sampling errors.

#### 4. Batch Releases

##### A. Liquid

(1) Number of batch releases:	2.55E+02
(2) Total time period for batch releases:	2.60E+04 Minutes
(3) Maximum time period for a batch release:	1.70E+02 Minutes
(4) Average time period for a batch release:	1.02E+02 Minutes
(5) Minimum time period for a batch release:	1.70E+01 Minutes
(6) Average stream flow during periods of release of effluent into a flowing stream :	6.66E+05 GPM

##### B. Gaseous

(1) Number of batch releases:	0.00E+00 Minutes
(2) Total time period for a batch release:	0.00E+00 Minutes
(3) Maximum time period for a batch release:	0.00E+00 Minutes
(4) Average time period for a batch release:	0.00E+00 Minutes
(5) Minimum time period for a batch release:	0.00E+00 Minutes

#### 5. Abnormal releases \*

##### A. Liquid

(1) Number of releases:	0.00E+00
(2) Total activity released:	0.00E+00 Curies

##### B. Gaseous

(1) Number of releases:	0.00E+00
(2) Total activity released:	0.00E+00 Curies

\* There were no abnormal releases that exceeded 10CFR20 or 10CFR50 limits. See Page 6 for a discussion of release events that occurred.

## 1. Discussion of Tritium in the Storm Drain Collection Pond

Approximately  $1.84\text{E}+07$  gallons containing  $1.06\text{E}+00$  curies of tritium were released from the Storm Drain Collection Pond (SDCP) to the Intake Canal during this reporting period. The SDCP is a permitted release point.

NOTE 1: Curie totals are included in the quarterly summaries in Table 2A and 2B.

NOTE 2: The quantity of rainwater released from the Storm Drain Collection Basin and/or the Storm Drain Collection Pond is not included in VOLUME OF WASTE on Table 2A.

## 2. Discussion of Turbine Building Leakage

The Turbine Building was intermittently at positive pressure during this reporting period which caused air from the building to escape from openings at variable rates. This air was monitored continuously for activity. Curie totals are included in the quarterly summaries in Tables 1A and 1C.

## ATTACHMENT 2

### Effluent and Waste Disposal Data

Brunswick Steam Electric Plant

July 1, to December 31, 1992

#### Enclosure 1

Table 1A: Gaseous Effluents - Summation of all Releases

Table 1B: Gaseous Effluents - Elevated Releases

Table 1C: Gaseous Effluents - Ground Level Releases

Table 1D: Gaseous Effluents - Ground Level Releases for  
Burning Contaminated Oil

Table 2A: Liquid Effluents - Summation of all Releases

Table 2B: Liquid Effluents - Batch Mode

Appendix A: Lower Limits of Detection

Table 3: Solid Waste and Irradiated Fuel Shipments

#### Enclosure 2

Combustion of Waste Oil

TABLE 1A  
Effluent and Waste Disposal Semiannual Report for Year 1992  
Gaseous Effluents - Summation of all Releases NOTE 1

	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Est. Tot. Error %</u>
<u>A. FISSION AND ACTIVATION GASES</u>				
1. Total release	Ci	2.48E+01	1.23E+01	1.15E 02
2. Average release rate for period	uCi/sec	3.12E+00	1.55E+00	
3. Percent of technical specification limit	%	1.66E-03	2.68E-03	
<u>B. IODINES</u>				
1. Total I-131	Ci	< LLD	< LLD	7.00E 01
2. Average release rate for period	uCi/sec	< LLD	< LLD	
<u>C. PARTICULATES</u> <u>NOTE 2</u>				
1. Total release	Ci	5.76E-04	5.87E-04	7.00E 01
2. Average release rate for period	uCi/sec	7.25E-05	7.39E-05	
3. Gross alpha	Ci	2.34E-04	7.32E-05	
<u>D. Tritium</u>				
1. Total release	Ci	8.85E-01	2.81E-01	7.00E 01
2. Average release rate for period	uCi/sec	1.11E-01	3.53E-02	
<u>E. IODINE-131, IODINE-133, TRITIUM AND PARTICULATES</u>				
1. Total Release	Ci	8.86E-01	2.81E-01	
2. Average release rate for period	uCi/sec	1.11E-01	3.54E-02	
3. Percent of technical specification limit	%	6.80E-03	4.53E-03	
<u>F. PARTICULATES VIA BURNING CONTAMINATED OIL</u>				
1. Total Release	Ci	4.03E-06	0.00E+00	
2. Average release rate for period	uCi/sec	5.07E-07	0.00E+00	
3. Percent of technical specification limit	%	9.24E-01	0.00E+00	

NOTE 1: This includes the number of curies released via Turbine Building leakage.

NOTE 2: This includes the number of curies released via incineration.

TABLE 1B  
Effluent and Waste Disposal Semiannual Report for Year 1992  
Gaseous Effluents - Elevated Releases  
Continuous Release

<u>Nuclides Released</u>	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>
1. <u>FISSION GASES</u>			
<u>xenon-133</u>	<u>Ci</u>	<u>2.18E+00</u>	<u>1.06E+00</u>
total for period	Ci	2.18E+00	1.06E+00
2. <u>IODINES</u>			
total for period	Ci	< LLD	< LLD
3. <u>PARTICULATES</u>			
cobalt-60	Ci	7.16E-06	9.06E-06
<u>cesium-137</u>	<u>Ci</u>	<u>1.98E-06</u>	<u>1.03E-05</u>
total for period	Ci	9.14E-06	1.94E-05
4. <u>TRITIUM</u>			
hydrogen-3	Ci	5.34E-01	1.29E-01

TABLE 1C  
Effluent and Waste Disposal Semiannual Report for Year 1992  
Gaseous Effluents - Ground Level Releases  
Continuous Release NOTE 1

<u>Nuclides Released</u>	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>
1. <u>FISSION GASES</u>			
xenon-133	Ci	1.36E+01	5.09E+00
<u>xenon-135</u>	<u>Ci</u>	<u>9.04E+00</u>	<u>6.17E+00</u>
total for period	Ci	2.26E+01	1.13E+01
2. <u>IODINES</u>			
total for period	Ci	< LLD	< LLD
3. <u>PARTICULATES</u> <u>NOTE 2</u>			
manganese-54	Ci	9.37E-05	9.27E-05
cobalt-60	Ci	3.00E-04	3.65E-04
strontium-90	Ci	9.58E-09	< LLD
cesium-137	Ci	4.40E-06	4.59E-06
cerium-141	Ci	6.36E-07	< LLD
<u>americium-241</u>	<u>Ci</u>	<u>1.68E-04</u>	<u>1.05E-04</u>
total for period	Ci	5.67E-04	5.68E-04
4. <u>TRITIUM</u>			
hydrogen-3	Ci	3.51E-01	1.52E-01

NOTE 1: This includes the number of curies released via Turbine Building leakage.

NOTE 2: This includes the number of curies released via incineration.

.....  
TABLE 1D  
Effluent and Waste Disposal Semiannual Report for Year 1992  
Gaseous Effluents - Ground Level Releases  
For Burning Contaminated Oil

<u>Nuclides Released</u>	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>
1. <u>PARTICULATES</u> *			
cobalt-60	Ci	2.29E-06	0.00E+00
cesium-137	Ci	3.17E-07	0.00E+00
<u>manganese-54</u>	<u>Ci</u>	<u>1.42E-06</u>	<u>0.00E+00</u>
total for period	Ci	4.03E-06	0.00E+00

\*No contaminated oil was incinerated during the fourth quarter.

TABLE 2A  
Effluent and Waste Disposal Semiannual Report for Year 1992  
Liquid Effluents - Summation of all Releases

	Unit	Qtr 3	Qtr 4	Est Tot ± Error
<u>A. FISSION AND ACTIVATION PRODUCTS</u> <small>NOTE 1</small>				
1. Total release (excluding tritium, gases, & alpha)	Ci	8.25E-03	1.55E-02	3.50E01
2. Avg. diluted conc. <small>NOTE 2</small>	uCi/ml	5.29E-10	3.11E-10	
3. Percent limit	%	3.04E-02	6.22E-02	
<u>B. TRITIUM</u> <small>NOTE 1</small>				
1. Total release	Ci	7.66E+00	7.25E+00	4.00E 01
2. Avg. diluted conc. <small>NOTE 2</small>	uCi/ml	4.91E-07	1.45E-07	
3. Percent limit	%	1.64E-02	4.85E-03	
<u>C. DISSOLVED AND ENTRAINED GASES</u> <small>NOTE 1</small>				
1. Total release	Ci	< LLD	< LLD	3.50E 01
2. Avg. diluted conc. <small>NOTE 2</small>	uCi/ml	< LLD	< LLD	
3. Percent limit	%	0.00E+00	0.00E+00	
<u>D. GROSS ALPHA RADIOACTIVITY</u>				
1. Total release	Ci	5.35E-05	< LLD	4.00E 01
<u>E. VOLUME OF WASTE</u> <small>NOTE 2</small>				
	liters	5.65E+06	1.03E+07	1.25E 01
<u>F. TOTAL OF DILUTION WATER (used during release for average dil. conc.)</u>				
	liters	1.56E+10	4.99E+10	1.30E 01
<u>G. VOLUME OF COOLING WATER DISCHARGED FROM PLANT</u>				
	liters	1.90E+11	2.21E+11	

NOTE 1: Includes radionuclides released via abnormal and/or non-routine release.

NOTE 2: Does not include rainwater released (ie. Storm Drain Collection Basin and/or Storm Drain Collection Pond).



TABLE 2B  
Effluent and Waste Disposal Semiannual Report for Year 1992  
Liquid Effluents - Batch Mode

<u>Nuclides Released</u>	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>
<u>1. FISSION AND ACTIVATION PRODUCTS</u>			
chromium-51	Ci	8.00E-05	< LLD
manganese-54	Ci	1.18E-03	1.07E-03
cobalt-58	Ci	4.21E-05	9.78E-05
cobalt-60	Ci	6.43E-03	1.39E-02
technetium-99m	Ci	< LLD	1.43E-06
antimony-125	Ci	< LLD	4.06E-05
cesium-134	Ci	4.35E-05	4.15E-05
cesium-137	Ci	4.69E-04	3.84E-04
barium-139	Ci	< LLD	5.65E-06
<u>americium-241</u>	Ci	<u>&lt; LLD</u>	<u>1.51E-05</u>
total for period	Ci	8.25E-03	1.55E-02

TABLE 2B (continued)  
 Effluent and Waste Disposal Semiannual Report for Year 1992  
 Liquid Effluents - Batch Mode

<u>Nuclides Released</u>	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>
2. <u>GASES</u>			
total for period	Ci	< LLD	< LLD

## APPENDIX A

### Lower Limits of Detection

July through December 1992

uCi/ml

#### 1. Liquid Releases

Cr-51	1.76E-07
Fe-55	1.68E-07
Fe-59	5.56E-08
Zn-65	5.47E-08
Sr-89	2.36E-08
Sr-90	6.02E-09
Mo-99	1.70E-07
Tc-99m	1.77E-08
Sb-125	5.90E-08
I-131	2.07E-08
Ba-139	1.03E-07
Ce-141	2.89E-08
Ce-144	1.21E-07
Am-241	1.74E-07
Alpha	9.45E-08
Kr-87	5.75E-08
Kr-88	5.40E-08
Xe-133	5.13E-08
Xe-133m	1.65E-07
Xe-135	1.75E-08
Xe-138	2.30E-07

#### 2. Gaseous Releases

Kr-87	3.26E-08
Kr-88	2.63E-08
Xe-133	2.02E-08
Xe-133m	8.00E-08
Xe-135	7.30E-09
Xe-138	3.36E-07

#### 3. Iodines and Particulates

Co-58	1.06E-14
Fe-59	6.48E-14
Zn-65	8.01E-14
Sr-89	2.36E-15
Sr-90	5.98E-16
Mo-99	3.45E-13
I-131	3.93E-14
I-133	2.68E-14
Cs-134	3.45E-14
Ce-141	4.44E-14
Ce-144	1.58E-13

#### NOTES

- 1: The above values represent typical "a priori" LLDs for isotopes where values of "<LLD" are indicated in Tables 1A, 1B, 1C, 2A, and 2B. Also included are isotopes specified in Technical Specifications.
- 2: Where activity for any nuclide is reported as " Less than LLD", that nuclide is considered not present and the LLD activity listed is not considered in summary data.

Table 3A  
Effluent and Waste Disposal Semiannual Report for Year 1992  
Solid Waste and Irradiated Fuel Shipments

<u>Waste Class A</u>		<u>July through December</u>		
1. <u>Total volume shipped</u> (cubic meters)		2.54 E2		
Total Curie quantity (estimated)		4.15 E2		
2. <u>Type of Waste</u>	<u>Units</u>	<u>Six-month Period</u>	<u>Est. Total % Error</u>	
a. Spent resins, filter sludges	meters <sup>3</sup>	9.36 E1	1.00E1	
	Curies <sub>3</sub>	3.37 E2		
b. Dry active waste, compacted	meters <sup>3</sup>	1.56 E2	1.00E1	
noncompactd	Curies <sub>3</sub>	6.02 E0		
c. Irradiated components	meters <sup>3</sup>	0.00 E0	N/A	
	Curies <sub>3</sub>	0.00 E0		
d. Others (cartridge filters encapsulated in cement)	meters <sup>3</sup>	3.54 E0	1.00E1	
	Curies	7.16 E1		
3. <u>Estimate of major radionuclide composition</u>				
a.	Mn-54	6.09 E0%		
	Fe-55	6.21 E1%		
	Co-60	2.48 E1%		
	Ni-63	2.78 E0%		
	Cs-137	2.30 E0%		
b.	Mn-54	6.12 E0%		
	Fe-55	6.57 E1%		
	Co-60	2.19 E1%		
	Co-58	3.17 E0%		
	Ni-63	1.69 E0%		
	Fe-59	8.40 E-1%		
c.	N/A	N/A		
d.	Cr-51	9.60 E0%		
	Mn-54	6.50 E0%		
	Fe-55	5.87 E1%		
	Co-58	2.20 E0%		
	CO-60	2.24 E1%		

Table 3A (cont.)

Effluent and Waste Disposal Semiannual Report for Year 1992  
Solid Waste and Irradiated Fuel Shipments

4. Cross reference table, waste stream, form, and container type.

	<u>Stream</u>	<u>Form</u>	<u>Container type</u>	<u>No. of shipments</u>
a.	Resin	Dewatered & Solidified*	Type A/Type B	10/8
b.	Dry active waste	Compacted/non- compacted waste	STP	25
c.	Irradiated components		N/A	0
d.	*Other		Type A	1
		*solidification agent or absorbent (e.g., cement, urea formaldehyde)		
				Cement

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
44	Sole Use	CNSI/Barnwell SC

b. Irradiated Components

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0	N/A	N/A

TABLE 3B

Effluent and Waste Disposal Semiannual Report for Year 1992  
Solid Waste and Irradiated Fuel Shipments

Waste Class BJuly through December

1. <u>Total volume shipped</u> (cubic meters)		3.55 E0	
Total Curie quantity (estimated)		9.28 E1	
2. <u>Type of Waste</u>		Six-month	Est.Total
	<u>Units</u>	<u>Period</u>	<u>% Error</u>
a. Spent resins, filter sludges	meters <sup>3</sup>	0.00 E0	N/A
	Curies	0.00 E0	
b. Dry active waste, compacted, and noncompactd	meters <sup>3</sup>	0.00 E0	N/A
	Curies	0.00 E0	
c. Irradiated components	meters <sup>3</sup>	3.55 E0	1.00 E1
	Curies	9.28 E1	
d. Others (describe)	meters <sup>3</sup>	0.00 E0	N/A
	Curies	0.00 E0	
3. <u>Estimate of major radionuclide composition</u>			
a.	N/A	N/A	
b.	N/A	N/A	
c.	Cr-51	8.20 E0%	
	Mn-54	6.60 E0%	
	Fe-55	5.97 E1%	
	Co-58	2.10 E0%	
	Co-60	2.28 E1%	
	Ni-63	4.00 E-1%	
d.	N/A	N/A	
4. <u>Cross reference table, waste stream, form and container type</u>			
<u>Stream</u>	<u>Form</u>	<u>Container type</u>	<u>No. of shipments</u>
a. Resin	Dewatered & Solidified	Type A/Type B	0 / 0
b. Dry active	Compacted/non- compacted waste	N/A	0
c.*Irradiated components		Type B	1
d. Other		N/A	0
* Solidification agent or absorbent (e.g., cement, urea formaldehyde)			Cement

Table 3B (cont.)  
Effluent and Waste Disposal Semiannual Report for Year 1992  
Solid Waste and Irradiated Fuel Shipments

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
1	SOLE USE	CNSI/BARNWELL S.C.

b. Irradiated Fuel

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0	N/A	N/A

TABLE 3C

Effluent and Waste Disposal Semiannual Report for Year 1992  
Solid Waste and Irradiated Fuel Shipments

<u>Waste Class C</u>		<u>July through December</u>		
1. <u>Total volume shipped</u> (cubic meters)		3.30 E0		
Total Curie quantity (estimated)		3.23 E4		
2. <u>Type of Waste</u>		Six-month	Est. Tot.	
		<u>Units</u> <sup>3</sup>	<u>Period</u>	<u>% Error</u>
a. Spent resins, filter sludges		meters <sup>3</sup>	0.00 E0	N/A
		Curies <sup>3</sup>	0.00 E0	
b. Dry active waste, compacted and noncompact		meters <sup>3</sup>	0.00 E0	N/A
		Curies	0.00 E0	
c. Irradiated components		meters <sup>3</sup>	3.30 E0	1.00 E1
		Curies <sup>3</sup>	3.23 E4	
d. Others (describe)		meters <sup>3</sup>	0.00 E0	N/A
		Curies	0.00 E0	
3. <u>Estimate of major radionuclide composition</u>				
a.		N/A	N/A	
b.		N/A	N/A	
c.		Mn-54	6.00 E-1%	
		Fe-55	5.14 E1%	
		Co-60	4.38 E1%	
		Ni-63	3.10 E0%	
d.		N/A	N/A	
4. <u>Cross reference table, waste stream, form and container type</u>				
<u>Stream</u>	<u>Form</u>	<u>Container Type</u>	<u>No. of shipments</u>	
a. Resin	Dewatered & Solidified *	Type A/Type B	0/0	
b. Dry active waste	Compacted/non-compacted	N/A	0	
c. Irradiated components	(Noncompact waste; solid oxides)	Type B	3	
d. Others		N/A	0	
* Solidification agent or absorbent (e.g., cement, urea formaldehyde)			NONE	



Table 3C (cont.)  
Effluent and Waste Disposal Semiannual Report for Year 1992  
Solid Waste and Irradiated Fuel Shipments

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
3	Sole Use	CNSI/Barnwell, SC

b. Irradiated Fuel

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0	N/A	N/A

ENCLOSURE 2

Combustion of Waste Oil

July 1, to December 31, 1992

During this reporting period, approximately  $1.49\text{E}+03$  gallons of contaminated waste oil was incinerated in the on site incinerator. The total activity contained in this quantity of waste oil included  $2.29\text{E}-06$  curies of Co-60,  $1.42\text{E}-06$  curies of Mn-54 and  $3.17\text{E}-07$  curies of Cs-137.

ATTACHMENT 3

Environmental Monitoring Program

July 1, to December 31, 1992

Enclosure 1: Milk and Vegetable Sample Locations

Enclosure 2: Land Use Census

ENCLOSURE 1

Milk and Vegetation Sample Locations

July 1, to December 31, 1992

No milk sample locations were available during this time period.

Vegetation sample locations remained unchanged.

ENCLOSURE 2

Land Use Census

July 1, to December 31, 1992

The 1992 Land Use Census was performed during the period of July 27 to July 31, 1992. No locations were identified that are reportable in the Semiannual Radioactive Effluent Release Report.

Land Use Census updates are included with the ODCM revision 14 in Attachment 8.

ATTACHMENT 4

Effluent Instrumentation

July 1, to December 31, 1992

- Enclosure 1: Radioactive Liquid Effluent Monitoring Instrumentation.
- Enclosure 2: Radioactive Gaseous Effluent Monitoring
- Enclosure 3: Liquid Hold-Up Tank

ENCLOSURE 1

July 1, to December 31, 1992

Radioactive Liquid Effluent Monitoring Instrumentation

The Unit #1 Condensate Storage Tank Level Indicating Device (1-CO-LIT-1160) was inoperable for greater than 30 days during this report period. Temporary power was supplied to this instrument for approximately 6 weeks before it was determined that this condition caused instrument inoperability. It was not realized in the development of the temporary power package that this would effect instrument operability. Local indication was monitored routinely during this time. This item is being addressed in ACR 92-992.

ENCLOSURE 2

July 1, to December 31, 1992

Radioactive Gaseous Effluent Monitoring Instrumentation

The Unit 1 Main Condenser Off-Gas treatment system explosive gas monitors 1-OG-AIT-4284 (SJAE A H<sub>2</sub> Analyzer), 1-OG-AIT-4285 (SJAE A H<sub>2</sub> Analyzer), 1-OG-AIT-4324 (SJAE B H<sub>2</sub> Analyzer) and 1-OG-AIT-4325 (SJAE B H<sub>2</sub> Analyzer) were inoperable for greater than 30 days. Design problems precluded operability. However, Unit 1 was in cold shutdown during the entire reporting period and the monitors were not required to be operable.



ENCLOSURE 3

Liquid Hold-Up Tank

July 1, to December 31, 1992

No liquid hold-up tank exceeded the 10 Ci limit during this reporting period.

ATTACHMENT 5

Major Modifications to the Radioactive Waste Treatment System

July 1, to December 31, 1992

As per footnote 7 to Technical Specification 6.15, a discussion of any major modifications to the radioactive waste treatment systems will be submitted with the Final Safety Analysis Report update.

ATTACHMENT 6

Meteorological Data

July 1, to December 31, 1992

As per Technical Specification 6.9.1.10.a footnote 6, the annual summary of meteorological data collected over the calendar year will be submitted to a file and will be available for NRC review upon request.

ATTACHMENT 5

Major Modifications to the Radioactive Waste Treatment System

July 1, to December 31, 1992

As per footnote 7 to Technical Specification 6.15, a discussion of any major modifications to the radioactive waste treatment systems will be submitted with the Final Safety Analysis Report update.

ATTACHMENT 6

Meteorological Data

July 1, to December 31, 1992

As per Technical Specification 6.9.1.10.a footnote 6, the annual summary of meteorological data collected over the calendar year will be submitted to a file and will be available for NRC review upon request.

ATTACHMENT 7

Annual Dose Assessment

January 1, to December 31, 1992

Attached is the annual dose assessment for the Brunswick Steam Electric Plant for the time period of January 1, to December 31, 1992.

Enclosure 1: Annual Liquid Dose Assessment

Enclosure 2: Annual Gaseous Dose Assessment

Enclosure 1

Annual Liquid Dose Assessment

INCLUDED ARE:

Site Specific Data

Source Term

As Low As Reasonably Achievable Maximum Individual Dose

Summary - Total Integrated and Recreation Population Dose

BSEP UNITS 1 AND 2 LIQUID RELEASES (1992)

DISCHARGE=1.26E+03 CFS

SOURCE TERM MULTIPLIER=1.00E+00

SALTWATER SITE

NO RECONCENTRATION MODEL

50-MILE POPULATION=2.82E+01

FRACTION ---

ADULT=0.71

TEENAGER=0.11

CHILD=0.18

DOSE FACTOR LIBRARY CONTAINS 698 ENTRIES



\* \* \* COST-BENEFIT ANALYSIS \* \* \*

NUCLIDE	RELEASE CI/YR	PERSON-REM DOSE		PERSON-REM PER CURIE	
		TOTAL BODY	THYROID	TOTAL BODY	THYROID
1H 3	4.24E+01	1.68E-06	1.68E-06	3.95E-08	3.95E-08
11NA 24	1.98E-05	2.17E-09	2.17E-09	1.10E-04	1.10E-04
24CR 51	1.84E-03	1.09E-08	1.06E-08	5.92E-06	5.75E-06
25MN 54	6.32E-03	1.07E-05	9.28E-06	1.69E-03	1.47E-03
26FE 55	3.31E-03	2.22E-06	2.64E-12	6.70E-04	7.98E-10
26FE 59	1.12E-05	5.77E-08	3.51E-09	5.15E-03	3.13E-04
27CO 58	1.02E-03	5.04E-07	4.29E-07	4.94E-04	4.21E-04
27CO 60	3.55E-02	8.09E-04	8.01E-04	2.28E-02	2.26E-02
30ZN 69M	1.75E-06	1.87E-11	1.87E-11	1.07E-05	1.07E-05
38SR 90	5.92E-06	9.87E-09	3.98E-14	1.67E-03	6.73E-09
38SR 92	6.54E-06	2.17E-10	2.17E-10	3.32E-05	3.32E-05
41NB 95	2.06E-05	3.76E-09	3.32E-09	1.83E-04	1.61E-04
43TC 99M	5.22E-06	1.66E-11	1.66E-11	3.18E-06	3.18E-06
47AG 110M	7.17E-05	2.73E-07	2.64E-07	3.81E-03	3.68E-03
51SB 125	4.06E-05	1.00E-07	9.99E-08	2.47E-03	2.46E-03
55CS 134	1.04E-04	9.35E-07	7.49E-07	8.99E-03	7.20E-03
55CS 137	1.10E-03	1.31E-05	1.19E-05	1.19E-02	1.08E-02
56BA 139	5.65E-06	6.04E-12	6.04E-12	1.07E-06	1.07E-06
56BA 140	5.09E-06	1.60E-10	1.41E-10	3.15E-05	2.76E-05
95AM 241	1.51E-05	1.81E-08	8.17E-09	1.20E-03	5.41E-04
TOTAL		8.39E-04	8.26E-04		

\* \* \* AS LOW AS REASONABLY ACHIEVABLE \* \* \*

A D U L T D O S E S (MREM PER YEAR INTAKE)

DOSE

PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		2.74E-05	4.54E-05	2.79E-05	3.47E-06	9.34E-06	1.32E-05	2.05E-04
INVERT		4.28E-05	5.08E-05	4.53E-05	8.98E-07	3.24E-06	1.63E-05	3.42E-04
SHORELINE	8.95E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04
SWIMMING		5.24E-07	5.24E-07	5.24E-07	5.24E-07	5.24E-07	5.24E-07	5.24E-07
BOATING		2.62E-07	2.62E-07	2.62E-07	2.62E-07	2.62E-07	2.62E-07	2.62E-07
TOTAL	8.95E-04	8.32E-04	8.58E-04	8.35E-04	7.66E-04	7.74E-04	7.91E-04	1.31E-03

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR=0.5
FISH	29.2	30.0	24.00	
INVERT	7.3	30.0	24.00	
SHORELINE	500.0	30.0	0.00	
SWIMMING	100.0	30.0	0.00	
BOATING	100.0	30.0	0.00	

T E E N D O S E S (MREM PER YEAR INTAKE)

DOSE

PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		3.76E-05	6.01E-05	3.46E-05	3.51E-06	1.12E-05	1.91E-05	1.86E-04
INVERT		5.80E-05	6.85E-05	6.05E-05	9.07E-07	3.64E-06	2.56E-05	3.14E-04
SHORELINE	8.95E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04
SWIMMING		5.24E-07	5.24E-07	5.24E-07	5.24E-07	5.24E-07	5.24E-07	5.24E-07
BOATING		2.62E-07	2.62E-07	2.62E-07	2.62E-07	2.62E-07	2.62E-07	2.62E-07
TOTAL	8.95E-04	8.57E-04	8.90E-04	8.57E-04	7.66E-04	7.77E-04	8.07E-04	1.26E-03

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR=0.5
FISH	29.2	30.0	24.00	
INVERT	7.3	30.0	24.00	
SHORELINE	500.0	30.0	0.00	
SWIMMING	100.0	30.0	0.00	
BOATING	100.0	30.0	0.00	

C H I L D D O S E S (MREM PER YEAR INTAKE)

DOSE

PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		1.13E-04	1.22E-04	8.26E-05	6.71E-06	2.04E-05	3.82E-05	1.53E-04
INVERT		1.73E-04	1.43E-04	1.53E-04	1.74E-06	6.12E-06	5.18E-05	2.55E-04
SHORELINE	8.95E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04	7.61E-04
SWIMMING		5.24E-07	5.24E-07	5.24E-07	5.24E-07	5.24E-07	5.24E-07	5.24E-07
BOATING		2.62E-07	2.62E-07	2.62E-07	2.62E-07	2.62E-07	2.62E-07	2.62E-07
TOTAL	8.95E-04	1.05E-03	1.03E-03	9.97E-04	7.70E-04	7.88E-04	8.52E-04	1.17E-03

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR=0.5
FISH	29.2	30.0	24.00	
INVERT	7.3	30.0	24.00	
SHORELINE	500.0	30.0	0.00	
SWIMMING	100.0	30.0	0.00	
BOATING	100.0	30.0	0.00	

TOTAL INTEGRATED AND RECREATION POPULATION DOSES FROM LIQUID EFFLUENTS  
(PERSON-REM)

PATHWAY	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI	SKIN
SPORT FISH	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
COM FISH	1.537E-05	2.331E-05	1.449E-05	1.669E-06	4.596E-06	6.951E-06	8.859E-05	0.000E+00
SPORT INVERT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
COM INVERT	3.931E-07	4.342E-07	4.006E-07	7.092E-09	2.564E-08	1.450E-07	2.458E-06	0.000E+00
DRINKING WATER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
SHORELINE	8.219E-04	8.219E-04	8.219E-04	8.219E-04	8.219E-04	8.219E-04	8.219E-04	9.668E-04
SWIMMING	1.495E-06	1.495E-06	1.495E-06	1.495E-06	1.495E-06	1.495E-06	1.495E-06	0.000E+00
BOATING	7.080E-07	7.080E-07	7.080E-07	7.080E-07	7.080E-07	7.080E-07	7.080E-07	0.000E+00
IRRI VEG	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
IRRI LEAFY VEG	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
IRRI MILK	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
IRRI MEAT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ALL PATHWAYS	8.399E-04	8.479E-04	8.390E-04	8.258E-04	8.288E-04	8.312E-04	9.152E-04	9.668E-04

Enclosure 2

Annual Gaseous Dose Assessment

INCLUDED ARE:

Source term for the three release modes and the site aggregate.

Total 50 mile Integrated Population Dose by pathways and organs.

Hypothetical maximum individual organ dose due to Iodines, Particulates, and Tritium for a cow milk pathway at 4.75 miles Northeast.

Maximum site boundary dose by age group and organs for all pathways.

Estimated individual organ dose using the 1992 Land Use Census for the worst sector and existing pathways.

Maximum site boundary dose due to Iodines, Particulates, and Tritium for existing pathways.

Source term for incinerated waste oil.

Integrated Population Dose by pathways and organs due to incinerated waste oil.

Maximum site boundary dose due to incinerated waste oil.

CP&L  
GASRPT

SEMI-ANNUAL RADIOLOGICAL EFFLUENT REPORTING  
INPUT SOURCE TERMS

RUN DATE: 02/10/93  
RUN TIME: 07:13:54

SOURCE TERM (GROUND LEVEL) 1992 BSEP UNITS 1 AND 2

1 H - 3	1.410E+00
25 MN- 54	1.420E-06
27 CO- 60	6.300E-06
38 SR- 89	3.850E-06
38 SR- 90	1.350E-07
53 I -131	1.890E-04
53 I -132	2.460E-04
53 I -133	6.410E-04
53 I -135	4.080E-04
54 XE-135	1.210E+01
55 CS-137	4.870E-07
56 BA-140	4.930E-06
57 LA-140	8.680E-06
3 CE-141	1.090E-06

CP&L  
GASRPT

SEMI-ANNUAL RADIOLOGICAL EFFLUENT REPORTING  
INPUT SOURCE TERMS

RUN DATE: 02/10/93  
RUN TIME: 07:13:54

1992 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2

1 H - 3	7.520E+00
18 AR- 41	4.060E+01
24 CR- 51	1.200E-05
25 MN- 54	2.560E-06
27 CO- 60	4.580E-05
36 KR- 85 M	5.800E+01
36 KR- 87	4.310E+00
36 KR- 88	5.230E+01
38 SR- 89	1.620E-04
38 SR- 90	4.570E-07
53 I -131	2.700E-03
53 I -132	3.820E-04
53 I -133	5.890E-03
53 I -135	3.410E-04
54 XE-133	2.310E+02
54 XE-135	1.990E+01
54 XE-135 M	1.010E+01
54 XE-137	3.140E+00
54 XE-138	1.440E+00
55 CS-137	1.990E-05
56 BA-140	2.320E-04
57 LA-140	3.440E-04

## BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1992

1 H - 3	1.850E+00
24 CR- 51	3.540E-04
25 MN- 54	3.390E-04
27 CO- 58	2.540E-05
27 CO- 60	1.110E-03
38 SR- 89	5.040E-06
53 I -131	1.930E-03
53 I -132	1.570E-02
53 I -133	1.040E-02
53 I -135	1.450E-02
54 XE-133	2.830E+01
54 XE-133 M	4.940E+00
54 XE-135	2.260E+01
55 CS-134	1.040E-05
55 CS-137	1.310E-05
95 AM-241	2.730E-04

## AGGREGATE SOURCE TERM

1 H - 3	1.0780E+01
18 AR- 41	4.0600E+01
24 CR- 51	3.6600E-04
25 MN- 54	3.4298E-04
27 CO- 58	2.5400E-05
27 CO- 60	1.1621E-03
36 KR- 85 M	5.8000E+01
36 KR- 87	4.3100E+00
36 KR- 88	5.2300E+01
38 SR- 89	1.7089E-04
38 SR- 90	5.9200E-07
53 I -131	4.8190E-03
53 I -132	1.6328E-02
53 I -133	1.6931E-02
53 I -135	1.5249E-02
54 XE-133	2.5930E+02
54 XE-133 M	4.9400E+00
54 XE-135	5.4500E+01
54 XE-135 M	1.0100E+01
54 XE-137	3.1400E+00
54 XE-138	1.4400E+00
55 CS-134	1.0400E-05
55 CS-137	3.3487E-05
56 BA-140	2.3693E-04
57 LA-140	3.5268E-04
58 CE-141	1.0900E-06
95 AM-241	2.7300E-04

1992 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2  
SOURCE TERM (GROUND LEVEL) 1992 BSEP UNITS 1 AND 2  
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1992

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
** TOTAL **	2.221E-02	1.707E-02	1.457E-01	1.034E-01	5.517E-02	2.575E-02	2.312E-02	3.311E-02
PLUME	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.297E-02	1.317E-02	2.864E-02
	58.38%	75.95%	8.90%	12.54%	23.50%	50.36%	56.98%	86.50%
GROUND PLANE	2.807E-03	2.807E-03	2.807E-03	2.807E-03	2.807E-03	2.807E-03	2.807E-03	3.306E-03
	12.64%	16.44%	1.93%	2.71%	5.09%	10.90%	12.14%	9.99%
INHALATION	6.061E-03	8.695E-04	1.295E-01	8.702E-02	3.889E-02	4.931E-03	6.812E-03	8.395E-04
	27.29%	5.09%	88.91%	84.15%	70.50%	19.15%	29.47%	2.54%
VEGETATION	3.417E-04	3.902E-04	3.754E-04	5.793E-04	4.655E-04	4.621E-03	2.959E-04	2.949E-04
	1.54%	2.29%	0.26%	0.56%	0.84%	17.95%	1.28%	0.89%
COW MILK	8.321E-06	7.972E-06	1.422E-06	8.944E-06	9.280E-06	3.088E-04	7.612E-06	7.563E-06
	0.04%	0.05%	0.00%	0.01%	0.02%	1.20%	0.03%	0.02%
MEAT & POULTRY	2.464E-05	3.245E-05	1.658E-06	2.471E-05	2.378E-05	1.124E-04	2.285E-05	2.281E-05
	0.11%	0.19%	0.00%	0.02%	0.04%	0.44%	0.10%	0.07%



1992 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2  
SOURCE TERM (GROUND LEVEL) 1992 BSEP UNITS 1 AND 2  
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1992

SPECIAL LOCATION METERS DIR PL GR IN V CM GM M  
#43 COW MILK 7644.0 NE 0 1 1 1 1 0 0

ANNUAL BETA AIR DOSE = 8.210E-04 MILLRADS  
ANNUAL GAMMA AIR DOSE = 1.176E-03 MILLRADS

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
ADULT	5.202E-04	3.745E-04	4.806E-03	3.428E-03	1.734E-03	3.736E-03	4.880E-04	3.604E-04
GROUND PLANE	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.761E-04
INHALATION	2.012E-04	2.580E-05	4.412E-03	2.993E-03	1.349E-03	1.478E-04	1.933E-04	2.468E-05
VEGETATION	6.274E-05	9.424E-05	1.512E-04	1.749E-04	1.206E-04	8.128E-04	4.492E-05	4.455E-05
COW MILK	2.185E-05	2.009E-05	9.074E-06	2.601E-05	2.966E-05	2.541E-03	1.535E-05	1.504E-05
TEENAGER	5.485E-04	3.905E-04	5.085E-03	3.660E-03	1.845E-03	5.129E-03	6.208E-04	3.715E-04
GROUND PLANE	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.761E-04
INHALATION	2.117E-04	2.601E-05	4.648E-03	3.177E-03	1.423E-03	1.833E-04	3.146E-04	2.484E-05
VEGETATION	7.294E-05	1.041E-04	1.857E-04	2.100E-04	1.417E-04	6.893E-04	5.167E-05	5.101E-05
COW MILK	2.952E-05	2.603E-05	1.637E-05	3.898E-05	4.562E-05	4.022E-03	2.023E-05	1.959E-05
CHILD	5.678E-04	4.083E-04	4.162E-03	2.838E-03	1.445E-03	9.474E-03	6.250E-04	4.080E-04
GROUND PLANE	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.761E-04
INHALATION	1.730E-04	2.255E-05	3.608E-03	2.257E-03	9.501E-04	2.128E-04	2.787E-04	2.196E-05
VEGETATION	1.131E-04	1.156E-04	2.800E-04	2.819E-04	1.863E-04	1.053E-03	7.999E-05	7.900E-05
COW MILK	4.735E-05	3.576E-05	3.942E-05	6.446E-05	7.417E-05	7.974E-03	3.192E-05	3.095E-05
INFANT	3.838E-04	2.988E-04	1.759E-03	1.268E-03	7.346E-04	1.977E-02	4.897E-04	3.357E-04
GROUND PLANE	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.344E-04	2.761E-04
INHALATION	7.315E-05	1.286E-05	1.448E-03	9.096E-04	3.785E-04	1.872E-04	2.067E-04	1.263E-05
COW MILK	7.629E-05	5.153E-05	7.665E-05	1.242E-04	1.217E-04	1.935E-02	4.870E-05	4.695E-05

1992 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2  
SOURCE TERM (GROUND LEVEL) 1992 BSEP UNITS 1 AND 2  
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1992

SPECIAL LOCATION METERS DIR PL GR IN V CM GM M  
# 3 SITE BOUNDARY 1127.0 NE 1 1 1 1 1 1 1

ANNUAL BETA AIR DOSE = 5.400E-03 MILLRADS  
ANNUAL GAMMA AIR DOSE = 6.289E-03 MILLRADS

ADULT	TOTAL BODY 9.623E-03	GI-TRACT 9.707E-03	BONE 1.645E-02	LIVER 1.554E-02	KIDNEY 1.238E-02	THYROID 1.070E-01	LUNG 9.171E-03	SKIN 1.475E-02
PLUME	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.226E-03	9.562E-03
GROUND PLANE	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.566E-03
INHALATION	6.079E-04	3.348E-04	6.906E-03	4.976E-03	2.408E-03	1.133E-03	6.024E-04	3.303E-04
VEGETATION	8.444E-04	1.239E-03	1.973E-03	2.240E-03	1.563E-03	1.230E-02	6.010E-04	5.961E-04
COW MILK	3.006E-04	2.725E-04	1.349E-04	1.621E-04	4.220E-04	3.868E-02	2.054E-04	2.012E-04
GOAT MILK	5.751E-04	4.669E-04	2.273E-04	6.685E-04	6.976E-04	4.659E-02	4.230E-04	4.105E-04
MEAT & POULTRY	1.045E-04	2.032E-04	1.707E-05	1.058E-04	9.634E-05	1.107E-03	8.611E-05	8.568E-05
TEENAGER	1.002E-02	9.975E-03	1.756E-02	1.675E-02	1.331E-02	1.547E-01	9.625E-03	1.499E-02
PLUME	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.226E-03	9.562E-03
GROUND PLANE	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.566E-03
INHALATION	6.266E-04	3.373E-04	7.277E-03	5.268E-03	2.528E-03	1.363E-03	7.981E-04	3.324E-04
VEGETATION	9.813E-04	1.368E-03	2.429E-03	2.686E-03	1.832E-03	1.041E-02	6.913E-04	6.826E-04
COW MILK	4.090E-04	3.535E-04	2.425E-04	5.466E-04	6.553E-04	6.122E-02	2.706E-04	2.621E-04
GOAT MILK	7.522E-04	6.107E-04	4.077E-04	9.902E-04	1.045E-03	7.369E-02	5.601E-04	5.347E-04
MEAT & POULTRY	6.489E-05	1.146E-04	1.245E-05	6.591E-05	5.904E-05	7.911E-04	5.151E-05	5.111E-05
CHILD	1.115E-02	1.050E-02	1.812E-02	1.722E-02	1.419E-02	2.933E-01	1.040E-02	1.580E-02
PLUME	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.226E-03	9.562E-03
GROUND PLANE	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.566E-03
INHALATION	5.323E-04	2.965E-04	5.650E-03	3.795E-03	1.753E-03	1.529E-03	7.059E-04	2.939E-04
VEGETATION	1.524E-03	1.530E-03	3.700E-03	3.617E-03	2.418E-03	1.591E-02	1.070E-03	1.057E-03
COW MILK	6.600E-04	4.829E-04	5.819E-04	9.064E-04	1.067E-03	1.214E-01	4.270E-04	4.141E-04
GOAT MILK	1.165E-03	9.057E-04	9.758E-04	1.630E-03	1.692E-03	1.460E-01	8.835E-04	8.448E-04
MEAT & POULTRY	8.164E-05	9.396E-05	1.906E-05	7.912E-05	7.089E-05	1.179E-03	6.220E-05	6.174E-05
INFANT	1.035E-02	9.397E-03	1.241E-02	1.356E-02	1.244E-02	6.573E-01	9.736E-03	1.521E-02
PLUME	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.164E-03	4.226E-03	9.562E-03
GROUND PLANE	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.566E-03
INHALATION	2.651E-04	1.700E-04	2.269E-03	1.576E-03	7.458E-04	1.300E-03	4.802E-04	1.690E-04
COW MILK	1.070E-03	6.941E-04	1.133E-03	1.771E-03	1.759E-03	2.947E-01	6.514E-04	6.283E-04
GOAT MILK	1.828E-03	1.342E-03	1.821E-03	3.027E-03	2.740E-03	3.542E-01	1.351E-03	1.282E-03

1992 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2  
SOURCE TERM (GROUND LEVEL) 1992 BSEP UNITS 1 AND 2  
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1992

SPECIAL LOCATION METERS DIR PL GR IN V CM GM M  
#24 RESIDENCE 1609.0 SW 1 1 1 1 0 0 0

ANNUAL BETA AIR DOSE = 2.855E-03 MILLRADS

ANNUAL GAMMA AIR DOSE = 2.920E-03 MILLRADS

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
ADULT	3.656E-03	3.711E-03	6.133E-03	5.657E-03	4.534E-03	8.138E-03	3.593E-03	6.080E-03
PLUME	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.963E-03	4.345E-03
GROUND PLANE	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.324E-03
INHALATION	2.408E-04	1.484E-04	2.341E-03	1.722E-03	8.512E-04	4.919E-04	2.398E-04	1.465E-04
VEGETATION	3.563E-04	5.035E-04	7.336E-04	8.766E-04	6.241E-04	4.588E-03	2.663E-04	2.645E-04
TEENAGER	3.720E-03	3.766E-03	6.429E-03	5.928E-03	4.682E-03	7.543E-03	3.700E-03	6.119E-03
PLUME	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.963E-03	4.345E-03
GROUND PLANE	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.324E-03
INHALATION	2.474E-04	1.496E-04	2.467E-03	1.821E-03	8.923E-04	5.901E-04	3.069E-04	1.475E-04
VEGETATION	4.133E-04	5.577E-04	9.034E-04	1.049E-03	7.305E-04	3.895E-03	3.061E-04	3.028E-04
CHILD	3.912E-03	3.835E-03	6.352E-03	5.799E-03	4.660E-03	9.672E-03	3.832E-03	6.268E-03
PLUME	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.963E-03	4.345E-03
GROUND PLANE	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.324E-03
INHALATION	2.114E-04	1.315E-04	1.916E-03	1.318E-03	6.256E-04	6.604E-04	2.714E-04	1.304E-04
VEGETATION	6.414E-04	6.450E-04	1.378E-03	1.422E-03	9.754E-04	5.952E-03	4.740E-04	4.691E-04
INFANT	3.167E-03	3.134E-03	3.828E-03	3.611E-03	3.330E-03	3.619E-03	3.268E-03	5.744E-03
PLUME	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.935E-03	1.963E-03	4.345E-03
GROUND PLANE	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.124E-03	1.324E-03
INHALATION	1.077E-04	7.541E-05	7.696E-04	5.523E-04	2.710E-04	5.603E-04	1.814E-04	7.499E-05

1992 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2  
SOURCE TERM (GROUND LEVEL) 1992 BSEP UNITS 1 AND 2  
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1992

SPECIAL LOCATION METERS DIR PL GR IN V CM GM M  
# 3 SITE BOUNDARY 1127.0 NE 0 1 1 0 0 0 0

ANNUAL BETA AIR DOSE = 6.400E-03 MILLRADS  
ANNUAL GAMMA AIR DOSE = 6.289E-03 MILLRADS

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
ADULT	3.635E-03	3.362E-03	9.933E-03	8.003E-03	5.435E-03	4.160E-03	3.629E-03	3.896E-03
GROUND PLANE	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.566E-03
INHALATION	6.079E-04	3.348E-04	6.906E-03	4.976E-03	2.408E-03	1.133E-03	6.024E-04	3.303E-04
TEENAGER	3.654E-03	3.364E-03	1.030E-02	8.295E-03	5.555E-03	4.390E-03	3.825E-03	3.898E-03
GROUND PLANE	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.566E-03
INHALATION	6.266E-04	3.373E-04	7.277E-03	5.268E-03	2.528E-03	1.363E-03	7.981E-04	3.324E-04
CHILD	3.559E-03	3.323E-03	8.677E-03	6.822E-03	4.780E-03	4.556E-03	3.733E-03	3.860E-03
GROUND PLANE	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.566E-03
INHALATION	5.323E-04	2.965E-04	5.650E-03	3.795E-03	1.753E-03	1.529E-03	7.059E-04	2.939E-04
INFANT	3.292E-03	3.197E-03	5.296E-03	4.603E-03	3.773E-03	4.327E-03	3.507E-03	3.735E-03
GROUND PLANE	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.027E-03	3.566E-03
INHALATION	2.651E-04	1.700E-04	2.269E-03	1.576E-03	7.458E-04	1.300E-03	4.802E-04	1.690E-04

CP&L  
GASRPT

SEMI-ANNUAL RADIOLOGICAL EFFLUENT REPORTING  
INPUT SOURCE TERMS

RUN DATE: 02/12/93  
RUN TIME: 07:39:07

WASTE INCINERATED OIL BNP 1992

25 MN- 54	1.420E-06
27 CO- 60	5.860E-06
55 CS-137	4.870E-07

WASTE INCINERATED OIL BNP 1992

** TOTAL **	TOTAL BODY 4.590E-05	GI-TRACT 4.670E-05	BONE 4.587E-05	LIVER 4.602E-05	KIDNEY 4.573E-05	THYROID 4.561E-05	LUNG 5.412E-05	SKIN 5.364E-05
PLUME	0.000E+00 0.00%	0.000E+00 0.00%	0.000E+00 0.00%	0.000E+00 0.00%	0.000E+00 0.00%	0.000E+00 0.00%	0.000E+00 0.00%	0.000E+00 0.00%
GROUND PLANE	4.561E-05 99.37%	4.561E-05 97.68%	4.561E-05 99.44%	4.561E-05 99.12%	4.561E-05 99.75%	4.561E-05 100.00%	4.561E-05 84.28%	5.364E-05 100.00%
INHALATION	6.017E-08 0.13%	3.284E-07 0.70%	5.944E-08 0.13%	9.796E-08 0.21%	2.802E-08 0.06%	0.000E+00 0.00%	8.481E-06 15.67%	0.000E+00 0.00%
VEGETATION	2.043E-07 0.45%	6.425E-07 1.38%	1.828E-07 0.40%	2.793E-07 0.61%	7.777E-08 0.17%	0.000E+00 0.00%	2.511E-08 0.05%	0.000E+00 0.00%
COW MILK	3.929E-09 0.01%	2.176E-09 0.00%	8.078E-09 0.02%	9.416E-09 0.02%	3.085E-09 0.01%	0.000E+00 0.00%	1.088E-09 0.00%	0.000E+00 0.00%
MEAT & POULTRY	2.120E-08 0.05%	1.097E-07 0.23%	7.727E-09 0.02%	1.676E-08 0.04%	3.328E-09 0.01%	0.000E+00 0.00%	1.122E-09 0.00%	0.000E+00 0.00%

## WASTE INCINERATED OIL BNP 1992

SPECIAL LOCATION METERS DIR PL GR IN V CM GM M  
# 3 SITE BOUNDARY 1127.0 NE 1 1 1 1 0 0 1

ANNUAL BETA AIR DOSE = 0.000E+00 MILLRADS

ANNUAL GAMMA AIR DOSE = 0.000E+00 MILLRADS

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
ADULT	1.260E-04	1.422E-04	1.239E-04	1.265E-04	1.224E-04	1.208E-04	1.271E-04	1.421E-04
GROUND PLANE	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.421E-04
INHALATION	4.734E-08	2.775E-07	3.627E-08	6.632E-08	1.904E-08	0.000E+00	5.759E-06	0.000E+00
VEGETATION	4.373E-06	1.663E-05	2.780E-06	4.990E-06	1.400E-06	0.000E+00	4.290E-07	0.000E+00
MEAT & POULTRY	7.370E-07	4.480E-06	2.376E-07	5.689E-07	1.123E-07	0.000E+00	3.666E-08	0.000E+00
TEENAGER	1.263E-04	1.406E-04	1.255E-04	1.290E-04	1.231E-04	1.208E-04	1.301E-04	1.421E-04
GROUND PLANE	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.421E-04
INHALATION	4.355E-08	2.519E-07	5.082E-08	8.938E-08	2.586E-08	0.000E+00	8.402E-06	0.000E+00
VEGETATION	4.912E-06	1.710E-05	4.430E-06	7.647E-06	2.164E-06	0.000E+00	7.791E-07	0.000E+00
MEAT & POULTRY	5.068E-07	2.410E-06	1.973E-07	4.516E-07	9.087E-08	0.000E+00	3.470E-08	0.000E+00
CHILD	1.287E-04	1.332E-04	1.317E-04	1.341E-04	1.245E-04	1.208E-04	1.289E-04	1.421E-04
GROUND PLANE	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.421E-04
INHALATION	3.249E-08	9.309E-08	6.872E-08	8.402E-08	2.362E-08	0.000E+00	6.803E-06	0.000E+00
VEGETATION	7.171E-06	1.102E-05	1.046E-05	1.265E-05	3.481E-06	0.000E+00	1.174E-06	0.000E+00
MEAT & POULTRY	6.970E-07	1.217E-06	3.633E-07	5.722E-07	1.150E-07	0.000E+00	4.078E-08	0.000E+00
INFANT	1.209E-04	1.209E-04	1.209E-04	1.209E-04	1.209E-04	1.208E-04	1.252E-04	1.421E-04
GROUND PLANE	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.208E-04	1.421E-04
INHALATION	1.529E-08	3.078E-08	4.160E-08	5.930E-08	1.416E-08	0.000E+00	4.339E-06	0.000E+00

ATTACHMENT 8

Off-Site Dose Calculation Manual (ODCM) and  
Process Control Program (PCP) Revisions

July 1, to December 31, 1992

Brunswick Steam Electric Plant

There were no revisions made to the Process Control Program during this reporting period.

Revision 14 was made to the Off-Site Dose Calculation Manual during this time period. This revision included the following changes:

1. Pages 2-1 through 2-15 were revised to include new Environmental Concentration (EC) limits to allow methodology for calculating discharge flow rates for batch liquid releases to comply with the new revision to 10CFR20.
2. Page 15 was revised to include  $A_1$  value for Am-241.
3. Page 3-30 was revised to update Table 3.2-2 to include new garden locations determined from the most recent Land Use Census.
4. Page 3-33 was revised to include  $P_1$  value for Am-241.
5. Pages 3-50 through 3-68 were revised to include R values for Am-241.
6. Pages C-1 through C-16 of Appendix C were revised to include references used in the calculation of  $P_1$  and  $R_1$  values for Am-241. Also included were minor clerical changes.

A copy of Revision 14 to the ODCM is included as a part of this attachment.



ATTACHMENT A

REQUEST FOR OFF SITE DOSE CALCULATION MANUAL CHANGE

Originator: Grant Raker Date: 12/19/92 Rev. 14

Pages and Sections Revised: (cover sheet, pages i - viii,  
Section 2.0 (pages 2-1 through 2-15), Table 3 2-2 (page 3-31),  
Table 3 2-5 (page 3-33), Tables 3 3-1 through 3 3-19 (pages 3-50  
through 3-6E) and Appendix C (pages C-1 through C-16)

Reason for Change: Included Environmental Concentration limits to be  
consistent with new revision to 10CFR20; included dose factors for  
Americium 241 for liquid gaseous effluents and incorporated new  
land use census data

Safety Analysis Complete: Susan Thompson Date: 12/10/92

REVIEWS:

Susan Thompson Recommended/Not Recommended Date: 12/10/92  
 1st Safety Reviewer

Jim Davis Recommended/Not Recommended Date: 12-15-92  
 2nd Safety Reviewer

Jim Davis Recommended/Not Recommended Date: 12-15-92  
 E&C Project Specialist

W. M. Mohr Recommended/Not Recommended Date: 12/16/92  
 Operations - Special Projects

Scott Watson Recommended/Not Recommended Date: 12/17/92  
 E&C Manager

APPROVALS:

B. J. B. B. B. Recommended/Not Recommended Date: 12/21/92  
 Manager - E&RC

R. E. H. H. H. Recommended/Not Recommended Date: 12-22-92  
 PNSC Chairman

R. E. H. H. H. Recommended/Not Recommended Date: 12-22-92  
 Plant General Manager

REVISION 3

10CFR50.59 PROGRAM MANUAL

Page 55

ATTACHMENT A

CP&amp;L SAFETY REVIEW PACKAGE

Page 1 of 2

## SAFETY REVIEW COVER SHEET

DOCUMENT NO. ODCMREV. NO. 14DESCRIPTION OR TITLE: Offsite Dose Calculation Manual

## 1. Assigned Responsibilities:

Safety Analysis Preparer: Grant RakerLead 1st Safety Reviewer: Susan Fitzpatrick2nd Safety Reviewer: Jim Davis

## 2. Safety Analysis Preparer: Complete PART I, SAFETY ANALYSIS

Safety Analysis Preparer Grant Raker 12/19/92  
SIGNATURE DATE

## 3. Lead 1st Safety Reviewer: Complete Part II, Item Classification.

## 4. Lead 1st Safety Reviewer: Part III may be completed. If either question 1 or 2 is "yes," then Part IV is not required.

## 5. Lead 1st Safety Reviewer: Determine which DISCIPLINES are required for review of this item (including own) and mark the appropriate block(s) below.

DISCIPLINES Required:	(Print Name)	Signature/Date (Step 7)
<input type="checkbox"/> Nuclear Plant Operations		
<input type="checkbox"/> Nuclear Engineering		
<input type="checkbox"/> Mechanical		
<input type="checkbox"/> Electrical		
<input type="checkbox"/> Instrumentation & Control		
<input type="checkbox"/> Structural		
<input type="checkbox"/> Metallurgy		
<input checked="" type="checkbox"/> Chemistry/Radiochemistry	<u>Susan Fitzpatrick</u>	<u>Susan Fitzpatrick 12/19/92</u>
<input type="checkbox"/> Health Physics		
<input type="checkbox"/> Administrative Controls		

## 6. A QUALIFIED SAFETY REVIEWER will be assigned for each DISCIPLINE marked in step 5 and his/her name printed in the space provided. Each person listed shall perform a SAFETY REVIEW and provide input into the Safety Review Package.

## 7. The Lead 1st Safety Reviewer will assure that a Part III or Part IV is completed (see step 4 above) and a Part VI if required (see 9.d of Part II). Each person listed in step 5 shall sign and date next to his/her name in step 5, indicating completion of a SAFETY REVIEW.

## 8. 2nd Safety Reviewer: Perform a SAFETY REVIEW in accordance with Section 8.0.

2nd Safety Reviewer James A. Davis Date 12-19-92DISCIPLINE: Chem / Radiochem9. PNSC review required? If "yes," attach Part V and mark reason below: Yes No☐ Potential UNREVIEWED SAFETY QUESTION☒ Question 9 of Part IV answered "Yes"☒ Other (specify): ODCM revisions require PNSC review per Tech Spec

REVISION 3

10CFR50.59 PROGRAM MANUAL  
ATTACHMENT A  
CP&L SAFETY REVIEW PACKAGE

Page 56

Page 2 of 8PART I: SAFETY ANALYSIS  
(See instructions in Section 8.4.1)  
(Attach additional sheets as necessary.)DOCUMENT NO. ODCMREV. NO. 14

DESCRIPTION OF CHANGE: Revised Environmental Concentration limits to be  
consistent with new revision to 10CFR20. included dose factors  
for Americium 241 for liquid, gaseous effluents and incorpo-  
rate new Land Use Census data.

ANALYSIS: Revision of the ODCM does not impact any  
system, structure or component that is important to  
safety.

- Changes were made to Section 2.0 to incorporate new  
Environmental Concentration limits to allow methodology for  
calculating discharge flow rates for batch liquid released to  
the environment to comply with new revision of 10CFR20
- Dose factors for Americium 241 were incorporated to allow  
for more accurate determination of dose to the public from  
liquid and gaseous effluents from GNP.
- New garden locations determined from the most recent  
Land Use Census were incorporated to allow for more accurate  
estimation of dose to the public resulting from gaseous  
and liquid effluents.
- Correction of geographical errors - will not pose a safety issue.

## REFERENCES:

Technical Specifications 3/4.11.1, 3/4.11.2, 3/4.12.2,  
6.9 & 6.13; FSAR Table of Contents and Sections 11, 12,  
13 and 15 and 50CFR revision 13.

REVISION 3

10CFR50.59 PROGRAM MANUAL

Page 57

ATTACHMENT A

CP&amp;L SAFETY REVIEW PACKAGE

Page 3 of 8

## PART II: ITEM CLASSIFICATION

DOCUMENT NO. ODCM REV. NO. 14

- |  | <u>Yes</u> | <u>No</u> |
|--|------------|-----------|
| 1. Does this item represent:   |            |           |
| a. A change to the facility as described in the SAFETY ANALYSIS REPORT?  | [ ]        | [X]       |
| b. A change to the procedures as described in the SAFETY ANALYSIS REPORT?  | [ ]        | [X]       |
| c. A test or experiment not described in the SAFETY ANALYSIS REPORT?   | [ ]        | [X]       |
| 2. Does this item involve a change to the individual plant Operating License or to its Technical Specifications?   | [ ]        | [X]       |
| 3. Does this item require a revision to the FSAR?  | [ ]        | [X]       |
| 4. Does this item involve a change to the Off-Site Dose Calculation Manual?  | [X]        | [ ]       |
| 5. Does this item constitute a change to the Process Control Program?  | [ ]        | [X]       |
| 6. Does this item involve a major change to a Radwaste Treatment System?   | [ ]        | [X]       |
| 7. Does this item involve a change to the Technical Specification Equipment List (BSEP and SHNPP only)?  | [ ]        | [X]       |
| 8. Does this item impact the NPDES Permit (all 3 sites) or constitute an "unreviewed environmental question" (SHNPP Environmental Plan, Section 3.1) or a "significant environmental impact" (BSEP)? | [ ]        | [X]       |
| 9. Does this item involve a change to a previously accepted:   |            |           |
| a. Quality Assurance Program   | [ ]        | [X]       |
| b. Security Plan (including Training, Qualification, and Contingency Plans)?   | [ ]        | [X]       |
| c. Emergency Plan?   | [ ]        | [X]       |
| d. Independent Spent Fuel Storage Installation license? (If "yes," refer to Section 8.4.2, "Question 9," for special considerations. Complete Part VI in accordance with Section 8.4.6)              | [ ]        | [X]       |

SEE SECTION 8.4.2 FOR INSTRUCTIONS FOR EACH "YES" ANSWER.

REFERENCES. List FSAR and Technical Specification references used to answer questions 1-9 above. Identify specific reference sections used for any "Yes" answer.

Technical Specification: 3/4.11.1; 3/4.11.2; 3/4.12.2  
 6.9.2.6.12; FSAR Technical Specifications: 11, 12, 15  
 ODCM Section 11

REVISION 3

10CFR50.59 PROGRAM MANUAL  
ATTACHMENT A  
CP&L SAFETY REVIEW PACKAGE

Page 58

Page 4 of 8

## PART III: UNREVIEWED SAFETY QUESTION DETERMINATION SCREEN

DOCUMENT NO. DDM REV. NO. 14Yes No

1. Is this change fully addressed by another completed UNREVIEWED SAFETY QUESTION determination? (See Sections 7.2.1, 7.2.2.5, and 7.9.1.1)

☐ ☒

REFERENCE DOCUMENT: \_\_\_\_\_ REV. NO. \_\_\_\_\_

Yes No

2. For procedures, is the change a non-intent change which only (check all that apply): (See Section 7.2.2.3)

☐ ☒

- ☐ Corrects typographical errors which do not alter the meaning or intent of the procedure; or,
- ☐ Adds or revises steps for clarification (provided they are consistent with the original purpose or applicability of the procedure); or,
- ☐ Changes the title of an organizational position; or,
- ☐ Changes names, addresses, or telephone numbers of persons; or,
- ☐ Changes the designation of an item of equipment where the equipment is the same as the original equipment or is an authorized replacement; or,
- ☐ Changes a specified tool or instrument to an equivalent substitute; or,
- ☐ Changes the format of a procedure without altering the meaning, intent, or content; or
- ☐ Deletes a part or all of a procedure, the deleted portions of which are wholly covered by approved plant procedures?

If the answer to either Question 1 or Question 2 in PART III is "Yes," then PART IV need not be completed.

REVISION 3

10CFR50.59 PROGRAM MANUAL  
ATTACHMENT A  
CP&L SAFETY REVIEW PACKAGE

Page 59

Page 5 of 8

## PART IV: UNREVIEWED SAFETY QUESTION DETERMINATION

DOCUMENT NO. ODCM REV. NO. 14

Using the SAFETY ANALYSIS developed for the change, test or experiment, as well as other required references (LICENSING BASIS DOCUMENTATION, Design Drawings, Design Basis Documents, codes, etc.), the preparer of the Unreviewed Safety Question Determination must directly answer each of the following seven questions and make a determination of whether an UNREVIEWED SAFETY QUESTION exists.

## A WRITTEN BASIS IS REQUIRED FOR EACH ANSWER

- |  | <u>Yes</u>               | <u>No</u>                           |
|--|--------------------------|-------------------------------------|
| 1. May the proposed activity increase the probability of occurrence of an accident evaluated previously in the SAFETY ANALYSIS REPORT?<br><u>see attached</u>                                    | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2. May the proposed activity increase the consequences of an accident evaluated previously in the SAFETY ANALYSIS REPORT?<br><u>see attached</u>   | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 3. May the proposed activity increase the probability of occurrence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT?<br><u>see attached</u> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 4. May the proposed activity increase the consequence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT?<br><u>see attached</u>               | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 5. May the proposed activity create the possibility of an accident of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT?<br><u>see attached</u>                       | <input type="checkbox"/> | <input checked="" type="checkbox"/> |



REVISION 3

10CFR50.59 PROGRAM MANUAL  
ATTACHMENT A  
CP&L SAFETY REVIEW PACKAGE

Page 60

Page 6 of 8

## PART IV: (Continued)

DOCUMENT NO. 00cmREV. NO. 14

- |   | Yes | No  |
|---|-----|-----|
| 6. May the proposed activity create the possibility of a malfunction of equipment important to safety of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT?  | [ ] | [X] |
| <u>see attached</u>   |     |     |
| 7. Does the proposed activity reduce the margin of safety as defined in the basis of any Technical Specification?   | [ ] | [X] |
| <u>see attached</u>   |     |     |
| 8. Based on the answers to questions 1 - 7, does this item result in an UNREVIEWED SAFETY QUESTION? If the answer to any of the questions 1-7 is "Yes," then the item is considered to constitute an UNREVIEWED SAFETY QUESTION.  | [ ] | [X] |
| 9. Is PNSC review required for any of the following reasons?  | [ ] | [ ] |
| If, in answering question 1 or 3 "No," it was determined that the probability increase was small relative to the uncertainties; or, in answering question 4 "No," it was determined that the doses increased, but the dose was still less than the NRC ACCEPTANCE LIMIT; or, in answering question 7 "No," a parameter would be closer to the NRC ACCEPTANCE LIMIT, but the end result was still within the NRC ACCEPTANCE LIMIT; then PNSC review is required. |     |     |

## REFERENCES:

Offsite Dose Calculation Manual; Technical Specifications Index  
Section 2/4.11.1, 2/4.11.2, 3/4.12.2; 6.9, 6.13 & corresponding basis  
ES&E Table of Contents, Section 11, Section 12 and Section 15

This Unreviewed Safety Question Determination is for the following DISCIPLINE(s):  
 (Additional Part IV forms may be included as appropriate.)

- [ ] Nuclear Plant Operations
- [ ] Nuclear Engineering
- [ ] Mechanical
- [ ] Electrical
- [ ] Instrumentation & Control

- [ ] Structural
- [ ] Metallurgy
- [X] Chemistry/Radiochemistry
- [ ] Health Physics
- [ ] Administrative Controls

# UNREVIEWED SAFETY QUESTION DETERMINATION

1. This revision will not increase the probability of occurrence of an accident evaluated previously in the SAFETY ANALYSIS REPORT (SAR). The changes made were to update the methodology to calculate allowed release rates for liquid radwaste released to the environment to be consistent with the new revision of 10CFR20. In addition, changes were made to incorporate dose factors due to release of Americium-241 in liquid and gaseous effluents. This revision also incorporates information from the latest Land Use Census. These changes (and the ODCM in general) do not involve the operation of safety equipment.
2. The changes made will not increase the consequences of an accident evaluated previously in the SAR. These changes do not impact in any way safety systems used to mitigate accident conditions.
3. This revision will not increase the probability of an occurrence of a malfunction of equipment important to safety previously evaluated in the SAR. Changes made do not effect safety systems.
4. This revision will not increase the consequence of a malfunction of equipment important to safety evaluated previously in the SAR. Changes made will not effect safety systems.
5. This revision will not create the possibility of an accident of a different type than previously evaluated in the SAR. The changes made include new environmental concentration (EC) limits for radioactive liquid effluents, add dose factor values for Americium-241 (liquid and gas) and update the location of the nearest garden from the latest Land Use Census. These changes do not make previously non-credible events credible nor do they make previously bounded events no longer bounded.
6. This revision will not create the possibility of a malfunction of equipment important to safety of a different type than any evaluated in the SAR. These changes do not effect equipment important to safety.
7. The proposed activity does not reduce the margin of safety as defined in the Technical Specifications. The changes incorporate EC values for liquid effluents contained in the new revision to 10CFR20. The changes to update the land use census are required by Tech Spec 3.12.2. Adding the dose factors for Americium-241 allows more accurate dose projection from BNP effluents. These changes will not reduce the margin of safety defined by the Technical Specifications.



ATTACHMENT 2 (Cont'd)

REVISION 3

10CFR50.59 PROGRAM MANUAL  
ATTACHMENT A  
CP&L SAFETY REVIEW PACKAGE

Page 61

Page 8 of 8

PART V: PNSC REVIEW

DOCUMENT NO. DDCM

REV. NO. 14

Determination/Evaluation:

Action Taken:

Basis:

PNSC Chairman: R. E. Morgan

Date: 12-12-92

BRUNSWICK STEAM ELECTRIC PLANT  
OFF-SITE DOSE CALCULATION MANUAL  
(ODCM)

REVISION 14

DOCKET NOS. 50-324  
50-325

CAROLINA POWER & LIGHT COMPANY

LIST OF EFFECTIVE PAGES

ODCM

<u>Page(s)</u>	<u>Revision</u>
i-viii	14
1-1	8
2-1 - 2-15	14
3-1 - 3-12	4
3-13	1
3-14	4
3-15	5
3-16 - 3-18	4
3-19	6
3-20	1
3-21	8
3-22	9
3-23	1
3-24	4
3-25	1
3-26	4
3-27	6
3-28	8
3-29	1
3-30	14
3-31	4
3-32	1
3-33	14
3-34 - 3-36	1
3-37 - 3-38	4
3-39	6
3-40	7
3-41	1
3-42	9
3-43 - 3-45	1
3-46 - 3-48	4
3-49	1
3-50 - 3-68	14
4-1 - 4-3	11
4-4	7
4-5 - 4-6	11
5-1	0
6-1 - 6-2	0
6-3	4

LIST OF EFFECTIVE PAGES  
(Continued)

ODCM

<u>Page(s)</u>	<u>Revision</u>
A-1	0
A-2	4
A-3 - A-4	0
A-5 - A-7	4
A-8 - A-9	0
A-10 - A-13	4
A-14 - A-15	0
A-16 - A-19	4
A-20 - A-21	0
A-22	4
A-23 - A-28	0
B-1 - B-33	0
C-1 - C-16	14
D-1 - D-2	1
E-1	13
E-2	11
E-3	10
F-1 - F-3	0
G-1	1
H-1 - H-5	9

# TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
List of Effective Pages . . . . .	i
Table of Contents . . . . .	iii
List of Tables . . . . .	iv
List of Figures . . . . .	viii
1.0 INTRODUCTION . . . . .	1-1
2.0 LIQUID EFFLUENTS . . . . .	2-1
2.1 Compliance with 10CFR20 (Liquids) . . . . .	2-3
(Alarm/Trip Setpoint Determination)	
2.2 Compliance with 10CFR50 (Liquids) . . . . .	2-11
3.0 GASEOUS EFFLUENTS . . . . .	3-1
3.1 Monitor Alarm Setpoint Determination . . . . .	3-1
3.2 Compliance with 10CFR20 (Gaseous) . . . . .	3-15
3.3 Compliance with 10CFR50 (Gaseous) . . . . .	3-34
4.0 RADIOLOGICAL ENVIRONMENTAL . . . . .	4-1
MONITORING PROGRAM	
5.0 INTERLABORATORY COMPARISON PROGRAM . . . . .	5-1
6.0 TOTAL DOSE (40CFR190 CONFORMANCE) . . . . .	6-1
APPENDIX A      METEOROLOGICAL DISPERSION FACTOR COMPUTATIONS . . . . .	A-1
APPENDIX B      CALCULATIONS OF $V_1$ AND $B_1$ VALUES FOR THE ELEVATED PLUME . . . . .	B-1
APPENDIX C      DOSE PARAMETERS FOR RADIOIODINES, PARTICULATES AND TRITIUM . . . . .	C-2
APPENDIX D      LOWER LIMIT OF DETECTION (LLD) . . . . .	D-1
APPENDIX E      RADIOACTIVE LIQUID AND GASEOUS EFFLUENT MONITORING INSTRUMENTATION NUMBERS . . . . .	E-1
APPENDIX F      LIQUID AND GASEOUS EFFLUENT SYSTEM DIAGRAMS . . . . .	F-1
APPENDIX G      ODCM SOFTWARE PACKAGE . . . . .	G-1
APPENDIX H      METHODOLOGY AND CALCULATIONS FOR BURNING WASTE OIL . . . . .	H-1

# LIST OF TABLES

<u>Table No.</u>	<u>Title</u>	<u>Page</u>
2.1-1	MPCS AND ECS FOR SELECTED RADIONUCLIDES . . . . .	2-10
2.2-1	$A_1$ VALUES FOR THE ADULT . . . . .	2-13
3.1-1	GASEOUS SOURCE TERM . . . . .	3-13
3.1-2	DOSE FACTORS AND CONSTANTS . . . . .	3-14
3.2-1	RELEASES FROM BRUNSWICK STEAM ELECTRIC PLANT . . . . .	3-29
3.2-2	DISTANCES TO CONTROLLING LOCATIONS AS MEASURED FROM THE BRUNSWICK PLANT CENTER . . . . .	3-30
3.2-3	DISTANCE TO SITE BOUNDARIES BASED UPON BRUNSWICK PLANT CENTER AND DIRECTION FROM THE STACK . . . . .	3-31
3.2-4	DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS . . . . .	3-32
3.2-5	$P_1$ VALUES FOR AN INFANT FOR THE BRUNSWICK STEAM ELECTRIC PLANT . . . . .	3-33
3.3-1 THRU 3.3-19	R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT . . . . .	3-50
4.0-1	RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM . . . . .	4-2
A-1	X/Q VALUES AT THE SPECIAL LOCATIONS FOR RELEASES FROM THE TURBINE BUILDINGS . . . . .	A-5
A-2	DEPLETED X/Q VALUES AT THE SPECIAL LOCATIONS FOR RELEASES FROM THE TURBINE BUILDINGS . . . . .	A-6
A-3	D/Q VALUES AT THE SPECIAL LOCATIONS FOR RELEASES FROM THE TURBINE BUILDINGS . . . . .	A-7
A-4	X/Q VALUES AT THE STANDARD DISTANCES FOR RELEASES FROM THE TURBINE BUILDINGS . . . . .	A-8
A-5	DEPLETED X/Q VALUES AT THE STANDARD DISTANCES FOR RELEASES FROM THE TURBINE BUILDINGS . . . . .	A-9
A-6	D/Q VALUES AT THE STANDARD DISTANCES FOR RELEASES FROM THE TURBINE BUILDINGS . . . . .	A-10
A-7	X/Q VALUES AT THE SPECIAL LOCATIONS FOR RELEASES FROM THE REACTOR BUILDINGS . . . . .	A-11

# LIST OF TABLES (Continued)

<u>Table No.</u>	<u>Title</u>	<u>Page</u>
A-8	DEPLETED X/Q VALUES AT THE SPECIAL LOCATIONS FOR RELEASES FROM THE REACTOR BUILDINGS . . .	A-12
A-9	D/Q VALUES AT THE SPECIAL LOCATIONS FOR RELEASES FROM THE REACTOR BUILDINGS . .	A-13
A-10	X/Q VALUES AT THE STANDARD DISTANCES FOR RELEASES FROM THE REACTOR BUILDINGS .	A-14
A-11	DEPLETED X/Q VALUES AT THE STANDARD DISTANCES FOR RELEASES FROM THE REACTOR BUILDINGS . . .	A-15
A-12	D/Q VALUES AT THE STANDARD DISTANCES FOR RELEASES FROM THE REACTOR BUILDINGS .	A-16
A-13	X/Q VALUES AT THE SPECIAL LOCATIONS FOR RELEASES FROM THE STACK . .	A-17
A-14	DEPLETED X/Q VALUES AT THE SPECIAL LOCATIONS FOR RELEASES FROM THE STACK .	A-18
A-15	D/Q VALUES AT THE SPECIAL LOCATIONS FOR RELEASES FROM THE STACK . .	A-19
A-16	X/Q VALUES AT THE STANDARD DISTANCES FOR RELEASES FROM THE STACK .	A-20
A-17	DEPLETED X/Q VALUES AT THE STANDARD DISTANCES FOR RELEASES FROM THE STACK . . .	A-21
A-18	D/Q VALUES AT THE STANDARD DISTANCES FOR RELEASES FROM THE STACK .	A-22
A-19	BRUNSWICK PLANT SITE INFORMATION TO BE USED FOR GROUND LEVEL CALCULATIONS WITH NRC "XOQDOQ" PROGRAM . .	A-23
A-20	BRUNSWICK PLANT SITE INFORMATION TO BE USED FOR ELEVATED RELEASE CALCULATIONS WITH NRC "XOQDOQ" PROGRAM .	A-26
B-1	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES ENE SITE BOUNDARY . . .	B-2
B-2	JOINT FREQUENCY DISTRIBUTION FOR ENE SECTOR (*) PERIOD 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT .	B-3
B-3	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES N SITE BOUNDARY .	B-4
B-4	JOINT FREQUENCY DISTRIBUTION FOR N SECTOR (*) PERIOD 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT . .	B-5

# LIST OF TABLES (Continued)

<u>Table No.</u>	<u>Title</u>	<u>Page</u>
B-5	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES NNE SITE . . . BOUNDARY	B-6
B-6	JOINT FREQUENCY DISTRIBUTION FOR THE NNE SECTOR (*) . . . PERIOD 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-7
B-7	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES NE SITE . . . BOUNDARY	B-8
B-8	JOINT FREQUENCY DISTRIBUTION FOR NE SECTOR (*) PERIOD . . . 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-9
B-9	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES E SITE . . . BOUNDARY	B-10
B-10	JOINT FREQUENCY DISTRIBUTION FOR E SECTOR (*) PERIOD . . . 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-11
B-11	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES ESE SITE . . . BOUNDARY	B-12
B-12	JOINT FREQUENCY DISTRIBUTION FOR ESE SECTOR (*) PERIOD . . . 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-13
B-13	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES SE SITE . . . BOUNDARY	B-14
B-14	JOINT FREQUENCY DISTRIBUTION FOR SE SECTOR (*) PERIOD . . . 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-15
B-15	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES SSE SITE . . . BOUNDARY	B-16
B-16	JOINT FREQUENCY DISTRIBUTION FOR SSE SECTOR (*) PERIOD . . . 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-17
B-17	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES S SITE . . . BOUNDARY	B-18
B-18	JOINT FREQUENCY DISTRIBUTION FOR S SECTOR (*) PERIOD . . . 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-19
B-19	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES SSW SITE . . . BOUNDARY	B-20
B-20	JOINT FREQUENCY DISTRIBUTION FOR SSW SECTOR (*) PERIOD . . . 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-21
B-21	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES SW SITE . . . BOUNDARY	B-22



# LIST OF TABLES (Continued)

<u>Table No.</u>	<u>Title</u>	<u>Page</u>
B-22	JOINT FREQUENCY DISTRIBUTION FOR SW SECTOR (*) PERIOD 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-23
B-23	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES WSW SITE BOUNDARY	B-24
B-24	JOINT FREQUENCY DISTRIBUTION FOR WSW SECTOR (*) PERIOD 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-25
B-25	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES W SITE BOUNDARY	B-26
B-26	JOINT FREQUENCY DISTRIBUTION FOR W SECTOR (*) PERIOD 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-27
B-27	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES WNW SITE BOUNDARY	B-28
B-28	JOINT FREQUENCY DISTRIBUTION FOR WNW SECTOR (*) PERIOD 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-29
B-29	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES NW SITE BOUNDARY	B-30
B-30	JOINT FREQUENCY DISTRIBUTION FOR NW SECTOR (*) PERIOD 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-31
B-31	DOSE PARAMETERS FOR FINITE ELEVATED PLUMES NNW SITE BOUNDARY	B-32
B-32	JOINT FREQUENCY DISTRIBUTION FOR NNW SECTOR (*) PERIOD 1-1-77 THROUGH 12-31-77, BRUNSWICK STEAM ELECTRIC PLANT	B-33
C-1	PARAMETERS FOR COW AND GOAT MILK PATHWAYS	C-14
C-2	PARAMETERS FOR THE MEAT PATHWAY	C-15
C-3	PARAMETERS FOR VEGETABLE PATHWAY	C-16

## LIST OF FIGURES

<u>No.</u>	<u>Title</u>	<u>Page</u>
4.0-1a	BSEP Sample Point Locations . . . . .	4-5
4.0-1b	BSEP Sample Point Locations . . . . .	4-6
F-1	Liquid Radwaste Effluent System . . . . .	F-2
F-2	Gaseous Radwaste Effluent System . . . . .	F-3

## INDEX

2.1	<u>COMPLIANCE WITH 10CFR PART 20 (LIQUIDS)</u>	2-3
2.1.1	Batch Releases	2-3
2.1.2	Continuous Releases	2-8
2.1.3	Stabilization Pond Releases	2-9
2.2	<u>COMPLIANCE WITH 10CFR PART 50 (LIQUIDS)</u>	2-11
2.2.1	Cumulation of Doses	2-11
2.2.2	Projection of Doses	2-12

## LIST OF TABLES

<u>Table No.</u>		<u>Page</u>
SECTION 2		
2.1-1	MPCs and ECs FOR SELECTED RADIONUCLIDES . . . . .	2-10
2.2-1	A <sub>it</sub> VALUES FOR THE ADULT . . . . .	2-13

## LIQUID EFFLUENT

### 2.1 COMPLIANCE WITH 10CFR PART 20 (LIQUIDS)

#### 2.1.1 Batch Releases

A batch release is the discharge of liquid waste of a discrete volume. Batch releases from the BSEP liquid radwaste system may occur from the waste sample tank, floor drain sample tank, detergent drain tank and the salt water tanks. The maximum release rate possible due to pump capacity is 200 GPM from all release tanks except the detergent drain tank, which has a maximum release rate of 50 GPM. All of the above liquid radwaste discharges go to the circulating water discharge canal. Batch releases can also be made from the circulating water pits. After the volume of the pit is computed, two independent samples are analyzed and must be within 15% of each other before the release is approved. The two samples may differ by more than 15% upon approval of the E&C Supervisor or equivalent. The maximum release rate is determined such that 10CFR Part 20 limits are not exceeded after dilution in the discharge canal.

The sampling and analysis frequency and the type of analysis required by the BSEP Technical Specifications is given in Table 4.11.1-1. All applicable instrument numbers may be found in Appendix E.

##### 2.1.1.1 Prerelease

The radioactive content of each batch release will be determined prior to release in accordance with Table 4.11.1-1 of the BSEP Technical Specifications. Compliance with 10CFR Part 20 will be shown in the following manner:

- a. Minimum acceptable dilution factor:

$$DF_0 = \sum_i \left( \frac{C_i}{MPC_i} \right) \text{ or } \sum_i \left( \frac{C_i}{EC_i} \right)^* \quad (\text{Eq. 2.1-1})$$

Where:

- $DF_0$  = Minimum acceptable dilution factor determined from analysis of liquid effluent to be released
- $C_i$  = Concentration of radionuclide  $i$  in the batch to be released,  $\mu\text{Ci/ml}$
- $*EC_i$  = Annual average effluent concentration limit of radionuclide  $i$  from Appendix B, Table 2, Column 2 of 10CFR20,  $\mu\text{Ci/ml}$ .

\*To be used upon implementation of new revision of 10CFR20 after 1/1/93.

- $MPC_i$  - Maximum permissible concentration of radionuclide i from Appendix B, Table II, Column 2 of 10CFR Part 20,  $\mu\text{Ci/ml}$
- $DF_B$  -  $(10) (DF_o)$  (Eq. 2.1-2)

Where:

- $DF_B$  - Conservative dilution factor used by BSEP to calculate maximum release rate prior to release in order to assure compliance with 10CFR Part 20
- 10 - A factor of 10 less than 10CFR Part 20 limits as specified in Appendix B. This factor represents one layer of conservatism for all releases at BSEP
- $DF_o$  - Minimum acceptable dilution factor per Equation 2.1-1

b Maximum release rate:

$$MRR = \frac{n-1 (RPF_{CW}) + p-1 (RPF_{SW})}{2 (DF_B)} \quad (\text{Eq. 2.1-3})$$

Where:

- MRR - Maximum release rate of the batch to be released, GPM
- n - Number of operating circulating water pumps
- p - Number of operating service water pumps
- $RPF_{CW}$  - Minimum rated pump flow of each circulating water pump  
- 1.357 E5 GPM
- $RPF_{SW}$  - Rated pump flow of each service water pump  
- 8 E3 GPM
- 2 - Engineering factor to prevent spurious alarms caused by deviations in the mixtures of radionuclides which affect the monitor response
- $DF_B$  - Minimum acceptable dilution factor ( $DF_o$ ) made conservative by a factor of 10 per Equation 2.1-2

c. Monitor Alarm/Trip Setpoint:

Monitor alarm/trip setpoints are determined to ensure that the concentration of radionuclides in the liquid effluent released from the site to unrestricted areas does not exceed the limits specified in 10CFR Part 20, Appendix B, for radionuclides other than dissolved or entrained noble gases. An EC or MPC of  $2 \text{ E-4 } \mu\text{Ci/ml}$  has been established for noble gases dissolved or entrained in liquid effluents, based on the assumption that Xenon-135 is the controlling radionuclide.

$$SP = \frac{C_T (E_m) [(n-1) (RPF_{CW}) + (p-1) (RPF_{SW})]}{RR} + Bkg \quad (\text{Eq. 2.1-4})$$

Where:

- SP - Monitor alarm/trip setpoint, cps
- $E_m$  - The monitor efficiency for the mixture of radionuclides in the liquid effluent prior to dilution, cps/ $\mu\text{Ci/ml}$
- $C_T$  -  $3 \text{ E-7 } \mu\text{Ci/ml}$ ; engineering factor to ensure that the final concentration for the mixture of radionuclides will be less than 10CFR Part 20 limits at unrestricted areas
- n - Number of operating circulating water pumps
- p - Number of operating service water pumps
- $RPF_{CW}$  -  $1.357 \text{ E5 GPM}$
- $RPF_{SW}$  -  $8 \text{ E3 GPM}$
- RR -  $200 \text{ GPM}$ ; maximum design release rate
- Bkg - Background count rate due to internal contamination and the radiation levels in the area in which the monitor is installed when the detector sample chamber is filled with an uncontaminated fluid, cps

$$SP = \frac{3 \text{ E-7 } (E_m) [(n-1) (1.357 \text{ E5}) + (p-1) (8.0 \text{ E3})]}{200} + Bkg \quad (\text{Eq. 2.1-5})$$

d. Calculated concentration at unrestricted area:

$$\text{Conc}_1 = \frac{(C_d) (MRR)}{(n-1) (RPF_{CW}) + (p-1) (RPF_{SW})} \quad (\text{Eq. 2.1-6})$$

Where:

$Conc_i$	-	Calculated concentration of radionuclide i at the unrestricted area, $\mu\text{Ci/ml}$
$C_i$	-	Concentration of radionuclide i in the batch to be released, $\mu\text{Ci/ml}$
MRR	-	Maximum release rate of the batch to be released (see Equation 2.1-3), GPM
n	-	Number of operating circulating water pumps
p	-	Number of operating service water pumps
$RPF_{CW}$	-	1.357 E5 GPM
$RPF_{SW}$	-	8 E3 GPM

e. 10CFR Part 20 Prerelease Compliance Check:

Before initiating the batch release, one final check for compliance with 10CFR Part 20 will be performed. If the calculated dilution factor at the unrestricted area is less than or equal to 1, then 10CFR Part 20 limits have been met. The following equation must be true:

$$\sum_i (Conc_i / MPC_i) \leq 1 \text{ OR } \sum_i (Conc_i / EC_i) \leq 1^* \quad (\text{Eq. 2.1-7})$$

Where:

$Conc_i$	-	Concentration of radionuclide i at the unrestricted area per Equation 2.1-6, $\mu\text{Ci/ml}$
$EC_i^*$	-	Annual average effluent concentration limit of radionuclide i, from Appendix B, Table 2, Column 2 of 10CFR20, $\mu\text{Ci/ml}$ .
$MPC_i$	-	Maximum permissible concentration of radionuclide i from Appendix B, Table II, Column 2, of 10CFR Part 20, $\mu\text{Ci/ml}$

2.1.1.2 Postrelease

The actual concentration of each radionuclide following release from a batch tank will be calculated to show final compliance with 10CFR Part 20 as follows:

\*To be used upon implementation of new revision of 10CFR20 after 1/1/93.



a. Actual concentration at unrestricted area:

$$\text{Conc}_{ik} = \frac{(C_i) (V_{eff})}{V_{dil}} \quad (\text{Eq. 2.1-8})$$

Where:

- $\text{Conc}_{ik}$  - The actual concentration of radionuclide i at the unrestricted area during release k,  $\mu\text{Ci/ml}$
- $C_i$  - Concentration of radionuclide i in the batch released,  $\mu\text{Ci/ml}$
- $V_{eff}$  - Actual volume of liquid effluent released, gal
- $V_{dil}$  - Actual volume of dilution water during release k, gal
- $[n (RPF_{CW}) + p (RPF_{SW})] (t_k)$

Where:

- n - Number of operating circulating water pumps
- p - Number of operating service water pumps
- $RPF_{CW}$  - 1.357 E5 GPM
- $RPF_{SW}$  - 6 E3 GPM
- $t_k$  - Total release time, min

b. 10CFR Part 20 Postrelease Compliance Check:

To show final compliance with 10CFR Part 20, the following relationship must hold:

$$\sum_i (\text{Conc}_{ik}/\text{MPC}_i) \leq 1 \text{ OR } \sum_i (\text{Conc}_{ik}/\text{EC}_i) \leq 1^* \quad (\text{Eq. 2.1-9})$$

Where:

- $\text{Conc}_{ik}$  - The actual concentration of radionuclide i during release k (from Equation 2.1-8),  $\mu\text{Ci/ml}$
- $^*\text{EC}_i$  - Annual average effluent concentration limit of radionuclide i from Appendix B, Table 2, Column 2 of 10CFR20,  $\mu\text{Ci/ml}$ .
- $\text{MPC}_i$  - Maximum permissible concentration of radionuclide i from Appendix B, Table II, Column 2, of 10CFR Part 20,  $\mu\text{Ci/ml}$

\*To be used upon implementation of new revision of 10CFR20 after 1/1/93.

## 2.1.2 Continuous Releases

A continuous release is the discharge of liquid wastes of a nondiscrete volume; e.g., from a volume or system that has an input flow during the continuous release. Planned continuous releases do not presently occur at BSEP, although the potential does exist in the service water system. Weekly tests are performed during system operation as specified in Table 4.11.1-1 of the BSEP Technical Specifications. If a continuous release does occur, the concentration of various radionuclides in the unrestricted area would be calculated using Equation 2.1-8 with  $C_i$  being the concentration of radionuclide  $i$  in the continuous release stream. To show compliance with 10CFR Part 20, the sum of the concentration of radionuclide  $i$  in the unrestricted area due to both continuous and batch releases divided by that isotope's MPC or EC must again be less than 1.

### 2.1.2.1 Service Water Effluent Monitor Setpoint Determination

This procedure determines the monitor alarm setpoints that indicate the abnormal presence of radionuclides in the service water liquid effluents released from the site to unrestricted areas. This procedure is applicable to any service water effluent monitor.

- a. Determine the monitor efficiency factor, EF, in  $\frac{\mu\text{Ci/ml}}{\text{cps}}$

$$EF = (E_m) (C_f) \quad (\text{Eq. 2.1-10})$$

Where:

$E_m$  = The detector efficiency (dpm/ml/cps) from the appropriate RST

$C_f$  = Conversion factor, ( $1 \mu\text{Ci}/2.22 \times 10^6 \text{ dpm}$ )

- b. Determine the monitor trigger level setpoint, TLS, in cps

$$TLS = TL/EF + Bkg \quad (\text{Eq. 2.1-11})$$

Where:

TL = The alarm trigger level ( $\mu\text{Ci/ml}$ ) as per Technical Specification 3/4.11.1.1.

=  $5.0 \times 10^{-6} \mu\text{Ci/ml}$

Bkg = Monitor background, (cps)

Prerelease and post-release compliance checks similar to those of Section 2.1.1 may be performed for releases from the stabilization pond. Prerelease calculations will be based on a gamma isotopic assay of a grab sample prior to release. Post-release calculations will be based on a composite sample that is collected in proportion to flow during the release period (if possible). Dilution flow will be estimated from the minimum number of circulating water and service water pumps that were in use during the release period. Typical release times are on the order of days. (Note: Calculated doses as in Section 2.2 will be compiled along with those resulting from normal radwaste discharges.)

TABLE 2.1-1

## MPCs AND ECs FOR SELECTED RADIONUCLIDES

<u>Radionuclide</u>	<u>MPC<sub>1</sub>(<math>\mu</math>Ci/ml)*</u>	<u>EC<sub>1</sub>(<math>\mu</math>Ci/ml)**</u>
H-3	3 E-3	1 E-3
Na-24	3 E-5	5 E-5
Cr-51	2 E-3	5 E-4
Mn-54	1 E-4	3 E-5
Co-58	9 E-5	2 E-5
Fe-59	5 E-5	1 E-5
Co-60	3 E-5	3 E-6
Cu-64	2 E-4	2 E-4
Zn-69m	6 E-5	6 E-5
Sr-89	3 E-6	8 E-6
Sr-90	3 E-7	5 E-7
Sr-91	5 E-5	2 E-5
Zr-95	6 E-5	2 E-5
Mo-99	4 E-5	2 E-5
I-131	3 E-7	1 E-6
I-132	8 E-6	1 E-4
I-133	1 E-6	7 E-6
Cs-134	9 E-6	9 E-7
I-134	2 E-5	4 E-4
I-135	4 E-6	3 E-5
Cs-137	2 E-5	1 E-6
La-141	3 E-6	5 E-5
Np-239	1 E-4	2 E-5
Am-241	4 E-6	2 E-8
Noble Gases	2 E-4	2 E-4

\*Soluble or insoluble whichever is most restrictive.

\*\*To be used upon implementation of new revision of 10CFR20 after 1/1/93.

## 2.2 COMPLIANCE WITH 10CFR PART 50 (LIQUIDS)

### 2.2.1 Cumulation of Doses

Technical Specification, 4.11.1.2 requires that the cumulative dose contributions from liquid effluents be determined at least once per 31 days, and a cumulative summation of these total body and any organ doses should be maintained for each calendar quarter. The cumulative dose contributions will consider the dose contributions from the maximum exposed individual's consumption of fish and invertebrates. At BSEP the adult is considered as the maximum exposed individual. The dose or dose commitment limits based on 10CFR Part 50, Appendix I, are defined in Technical Specification, 3.11.1.2 a and b. Since only batch releases occur at BSEP, the equations in the following sections pertain only to batch releases. The dose contribution for all batch releases for the quarter will be calculated using the following equation:

$$D_r = \sum_k \left[ \sum_i (A_i \tau t_k C_{ik} F_k) \right] \quad (\text{Eq. 2.2-1})$$

Where:

- $D_r$  - The cumulative dose commitment to the total body or any organ  $\tau$ , from the liquid effluents releases, mrem
- $t_k$  - The length of time of release  $k$  over which  $C_{ik}$  and  $F_k$  are averaged for each liquid release, hours
- $C_{ik}$  - The concentration of radionuclide  $i$  in the undiluted liquid effluent during release  $k$  from any liquid release,  $\mu\text{Ci/ml}$
- $A_i \tau$  - The ingestion dose commitment factor to the total body or any organ  $\tau$  for each identified gamma and beta emitter  $i$  (as presented in Table 2.2-1). Values are for an adult, mrem-ml per hr- $\mu\text{Ci}$
- $1.14 \text{ E5 } (5 \text{ BI}_i + 21 \text{ BF}_i) \text{ DCF}_i \tau$

Where:

- $1.14 \text{ E5}$  -  $\left( 10^6 \frac{\text{pCi}}{\text{uCi}} \right) \left( 10^3 \frac{\text{ml}}{1} \right) \left( \frac{1 \text{ yr}}{8760 \text{ hr}} \right)$
- 5 - Maximum adult invertebrate consumption rate from Table E-5 of Regulatory Guide 1.109, Rev. 1, kg/yr

- BI<sub>i</sub> - Bioaccumulation factor for radionuclide i in invertebrates from Table A-1 of Regulatory Guide 1.109, Rev. 1, pCi/kg per pCi/l
- 21 - Maximum adult fish consumption rate from Table E-5 of Regulatory Guide 1.109, Rev. 1, kg/yr
- BF<sub>i</sub> - Bioaccumulation factor for radionuclide i in fish from Table A-1 of Regulatory Guide 1.109, Rev. 1, pCi/kg per pCi/l
- DCF<sub>i</sub>τ - Dose conversion factor for radionuclide i for adults for a particular organ τ from Table E-11 of Regulatory Guide 1.109, Rev. 1, BSEP File: B10-10530, Letter to J. W. Davis, "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for Am-241, mrem/pCi.
- F<sub>k</sub> - The near-field average dilution factor for C<sub>ik</sub> during any liquid effluent release. It is defined as the ratio of the volume of undiluted liquid waste released to the product of the dilution volume from the site discharge to unrestricted receiving water times 1. (1 is the site-specific applicable factor for the mixing effect of the BSEP discharge structure as defined in NUREG 0133.)
- $\frac{V_{eff}}{V_{dil}}$  (See Equation 2.1-8).

#### 2.2.2 Projection of Doses

Dose projections for this section are required at least once per 31 days in Technical Specification, 4.11.1.3.

The projection of doses for liquid effluents can be accomplished by projecting the dose(s) computed for the current month into the next month. The doses will be projected using Equation 2.2-1. Where possible, credit for expected operational evolutions (i.e., major planned liquid releases, etc.), can be taken in the dose projections. This may be accomplished by using the source-term data from similar historical operating experiences where practical.

TABLE 2.2-1  
A<sub>1</sub>r VALUES FOR THE ADULT  
(MREM/HR PER MICRO-CI/ML)

Note: Nuclides not listed in this table are assigned a value of zero.

Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
H 3	0.00E-01	2.82E-01	2.82E-01	2.82E-01	2.82E-01	2.82E-01	2.82E-01
C 14	1.45E 04	2.90E 03	2.90E 03	2.90E 03	2.90E 03	2.90E 03	2.90E 03
NA 24	4.57E-01	4.57E-01	4.57E-01	4.57E-01	4.57E-01	4.57E-01	4.57E-01
P 32	1.67E 07	1.04E 06	6.45E 05	0.00E-01	0.00E-01	0.00E-01	1.89E 06
CR 51	0.00E-01	0.00E-01	5.58E 00	3.34E 00	1.23E 00	7.40E 00	1.40E 03
MN 54	0.00E-01	7.06E 03	1.35E 03	0.00E-01	2.10E 03	0.00E-01	2.16E 04
MN 56	0.00E-01	1.78E 02	3.15E 01	0.00E-01	2.26E 02	0.00E-01	5.67E 03
FE 55	5.11E 04	3.53E 04	8.23E 03	0.00E-01	0.00E-01	1.97E 04	2.03E 04
FE 59	8.06E 04	1.90E 05	7.27E 04	0.00E-01	0.00E-01	5.30E 04	6.32E 05
CO 57	0.00E-01	1.42E 02	2.36E 02	0.00E-01	0.00E-01	0.00E-01	3.59E 03
CO 58	0.00E-01	6.03E 02	1.35E 03	0.00E-01	0.00E-01	0.00E-01	1.22E 04
CO 60	0.00E-01	1.73E 03	3.82E 03	0.00E-01	0.00E-01	0.00E-01	3.25E 04
NI 63	4.96E 04	3.44E 03	1.67E 03	0.00E-01	0.00E-01	0.00E-01	7.18E 02
NI 65	2.02E 02	2.62E 01	1.20E 01	0.00E-01	0.00E-01	0.00E-01	6.65E 02
CU 64	0.00E-01	2.14E 02	1.01E 02	0.00E-01	5.40E 02	0.00E-01	1.83E 04
ZN 65	1.61E 05	5.13E 05	2.32E 05	0.00E-01	3.43E 05	0.00E-01	3.23E 05
ZN 69	3.43E 02	6.56E 02	4.56E 01	0.00E-01	4.26E 02	0.00E-01	9.35E 01
BR 83	0.00E-01	0.00E-01	7.25E-02	0.00E-01	0.00E-01	0.00E-01	1.04E-01
BR 84	0.00E-01	0.00E-01	9.39E-02	0.00E-01	0.00E-01	0.00E-01	7.37E-07
BR 85	0.00E-01	0.00E-01	3.86E-03	0.00E-01	0.00E-01	0.00E-01	1.80E-18
RB 86	0.00E-01	6.24E 02	2.91E 02	0.00E-01	0.00E-01	0.00E-01	1.23E 02
RB 88	0.00E-01	1.79E 00	9.49E-01	0.00E-01	0.00E-01	0.00E-01	2.47E-11
RB 89	0.00E-01	1.19E 00	8.34E-01	0.00E-01	0.00E-01	0.00E-01	6.89E-14
SR 89	4.99E 03	0.00E-01	1.43E 02	0.00E-01	0.00E-01	0.00E-01	8.00E 02
SR 90	1.23E 05	0.00E-01	3.01E 04	0.00E-01	0.00E-01	0.00E-01	3.55E 03
SR 91	9.18E 01	0.00E-01	3.71E 00	0.00E-01	0.00E-01	0.00E-01	4.37E 02
SR 92	3.48E 01	0.00E-01	1.51E 00	0.00E-01	0.00E-01	0.00E-01	6.90E 02
Y 90	6.06E 00	0.00E-01	1.63E-01	0.00E-01	0.00E-01	0.00E-01	6.42E 04
Y 91M	5.73E-02	0.00E-01	2.22E-03	0.00E-01	0.00E-01	0.00E-01	1.68E-01



Table 2.2-1 (Cont'd)

Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
Y 91	8.88E 01	0.00E-01	2.37E 00	0.00E-01	0.00E-01	0.00E-01	4.89E 04
Y 92	5.32E-01	0.00E-01	1.56E-02	0.00E-01	0.00E-01	0.00E-01	9.32E 03
Y 93	1.69E 00	0.00E-01	4.66E-02	0.00E-01	0.00E-01	0.00E-01	5.35E 04
ZR 95	1.59E 01	5.11E 00	3.46E 00	0.00E-01	8.02E 00	0.00E-01	1.62E 04
ZR 97	8.81E-01	1.78E-01	8.13E-02	0.00E-01	2.68E-01	0.00E-01	5.51E 04
NB 95	4.47E 02	2.49E 02	1.34E 02	0.00E-01	2.46E 02	0.00E-01	1.51E 06
MO 99	0.00E-01	1.28E 02	2.43E 01	0.00E-01	2.89E 02	0.00E-01	2.96E 02
TC 99M	1.30E-02	3.66E-02	4.66E-01	0.00E-01	5.56E-01	1.79E-02	2.17E 01
TC 101	1.33E-02	1.92E-02	1.88E-01	0.00E-01	3.46E-01	9.81E-03	5.77E-14
RU 103	1.07E 02	0.00E-01	4.60E 01	0.00E-01	4.07E 02	0.00E-01	1.25E 04
RU 105	8.89E 00	0.00E-01	3.51E 00	0.00E-01	1.15E 02	0.00E-01	5.44E 03
RU 106	1.59E 03	0.00E-01	2.01E 02	0.00E-01	3.06E 03	0.00E-01	1.03E 05
AG 110M	1.56E 03	1.45E 03	8.60E 02	0.00E-01	2.85E 03	0.00E-01	5.91E 05
SN 113	2.18E 03	8.43E 01	2.05E 03	2.96E 01	6.16E 01	0.00E-01	3.80E 04
TE 125M	2.17E 02	7.86E 01	2.91E 01	6.52E 01	8.82E 02	0.00E-01	8.66E 02
TE 127M	5.48E 02	1.96E 02	6.68E 01	1.40E 02	2.23E 03	0.00E-01	1.84E 03
TE 127	8.90E 00	3.20E 00	1.93E 00	6.60E 00	3.63E 01	0.00E-01	7.03E 02
TE 129M	9.31E 02	3.47E 02	1.47E 02	3.20E 02	3.89E 03	0.00E-01	4.69E 03
TE 129	2.54E 00	9.55E-01	6.19E-01	1.95E 00	1.07E 01	0.00E-01	1.92E 00
TE 131M	1.40E 02	6.85E 01	5.71E 01	1.08E 02	6.94E 02	0.00E-01	6.80E 03
TE 131	1.59E 00	6.66E-01	5.03E-01	1.31E 00	6.99E 00	0.00E-01	2.26E-01
TE 132	2.04E 02	1.32E 02	1.24E 02	1.46E 02	1.27E 03	0.00E-01	6.24E 03
I 130	3.96E 01	1.17E 02	4.61E 01	9.91E 03	1.82E 02	0.00E-01	1.01E 02
I 131	2.18E 02	3.12E 02	1.79E 02	1.02E 05	5.35E 02	0.00E-01	8.23E 01
I 132	1.06E 01	2.85E 01	9.96E 00	9.96E 02	4.54E 01	0.00E-01	5.35E 00
I 133	7.45E 01	1.30E 02	3.95E 01	1.90E 04	2.26E 02	0.00E-01	1.16E 02
I 134	5.56E 00	1.51E 01	5.40E 00	2.62E 02	2.40E 01	0.00E-01	1.32E-02
I 135	2.32E 01	6.08E 01	2.24E 01	4.01E 03	9.75E 01	0.00E-01	6.87E 01
CS 134	6.84E 03	1.63E 04	1.33E 04	0.00E-01	5.27E 03	1.75E 03	2.85E 02
CS 136	7.16E 02	2.83E 03	2.04E 03	0.00E-01	1.57E 03	2.16E 02	3.21E 02
CS 137	8.77E 03	1.20E 04	7.85E 03	0.00E-01	4.07E 03	1.35E 03	2.32E 02
CS 138	6.07E 00	1.20E 01	5.94E 00	0.00E-01	8.81E 00	8.70E-01	5.12E-05



Table 2.2-1 (Cont'd)

<u>Nuclide</u>	<u>Bone</u>	<u>Liver</u>	<u>T.Body</u>	<u>Thyroid</u>	<u>Kidney</u>	<u>Lung</u>	<u>GI-LLI</u>
BA 139	7.85E 00	5.59E-03	2.30E-01	0.00E-01	5.23E-03	3.17E-03	1.39E 01
BA 140	1.64E 03	2.06E 00	1.08E 02	0.00E-01	7.02E-01	1.18E 00	3.38E 03
BA 141	3.81E 00	2.88E-03	1.29E-01	0.00E-01	2.68E-03	1.63E-03	1.80E-09
BA 142	1.72E 00	1.77E-03	1.08E-01	0.00E-01	1.50E-03	1.00E-03	2.43E-18
LA 140	1.57E 00	7.94E-01	2.10E-01	0.00E-01	0.00E-01	0.00E-01	5.83E 04
LA 142	8.06E-02	3.67E-02	9.13E-03	0.00E-01	0.00E-01	0.00E-01	2.68E 02
CE 141	3.43E 00	2.32E 00	2.63E-01	0.00E-01	1.08E 00	0.00E-01	8.86E 03
CE 143	6.04E-01	4.46E 02	4.94E-02	0.00E-01	1.97E-01	0.00E-01	1.67E 04
CE 144	1.79E 02	7.47E 01	9.59E 00	0.00E-01	4.43E 01	0.00E-01	6.04E 04
PR 143	5.79E 00	2.32E 00	2.87E-01	0.00E-01	1.34E 00	0.00E-01	2.54E 04
PR 144	1.90E-02	7.87E-03	9.64E-04	0.00E-01	4.44E-03	0.00E-01	2.73E-09
ND 147	3.96E 00	4.58E 00	2.74E-01	0.00E-01	2.68E 00	0.00E-01	2.20E 04
HF 181	1.72E 02	9.66E-01	1.94E 01	6.14E-01	8.08E-01	0.00E-01	1.27E 04
W 187	9.16E 00	7.66E 00	2.68E 00	0.00E-01	0.00E-01	0.00E-01	2.51E 03
NP 239	3.53E-02	3.47E-03	1.91E-03	0.00E-01	1.08E-02	0.00E-01	7.11E 02
AM 241	4.76E 05	4.44E 05	3.41E 04	0.00E-01	2.56E 05	0.00E 01	4.67E 04
F 18	6.66E 00	0.00E-01	7.38E-01	0.00E-01	0.00E-01	0.00E-01	1.97E-01
SB 124	2.76E 02	5.22E 00	1.09E 02	6.70E-01	0.00E-01	2.15E 02	7.84E 03

TABLE 3.2-2

DISTANCE TO CONTROLLING LOCATIONS AS MEASURED FROM THE  
BRUNSWICK PLANT CENTER (Mi)

Sector	Site Boundary	Milk Cow	Milk Goat	Meat Animal	Nearest Resident	Nearest Garden
NNE	0.7	-	-	-	1.2	1.2
NE	0.7	4.75*	-	-	-	-
ENE	0.7	-	-	-	-	-
E	0.7	-	-	-	-	-
ESE	0.7	-	-	-	1.6	1.6
SE	0.7	-	-	-	0.9	-
SSE	0.7	-	-	-	1.0	1.0
S	0.8	-	-	-	1.5	1.6
SSW	0.8	-	-	-	1.2	1.5
SW	0.7	-	-	-	1.0	1.0
WSW	0.7	-	-	-	1.1	1.1
W	0.7	-	-	-	0.8	0.8
WNW	0.6	-	-	-	0.9	0.9
NW	0.6	-	-	-	0.9	0.9
NNW	0.6	-	-	-	0.8	3.7
N	0.7	-	-	-	0.9	-

\*A "hypothetical" cow milk pathway is located at this point in accordance with 5.3.1 of NUREG 0133.

TABLE 3.2-5  
P<sub>1</sub> VALUES FOR AN INFANT FOR THE  
BRUNSWICK STEAM ELECTRIC PLANT\*

Isotope	Inhalation	Ground Plane	Cow Milk	Goat Milk
H-3	6.47E2	0	2.38E3	4.86E3
P-32	2.03E6	0	1.60E11	1.93E11
Cr-51	1.28E4	6.67E6	4.79E6	5.65E5
Mn-54	1.00E6	1.09E9	3.89E7	4.68E6
Fe-59	1.02E6	3.92E8	3.93E8	5.11E6
Co-58	7.77E5	5.29E8	6.06E7	7.28E6
Co-60	4.51E6	4.40E9	2.10E8	2.52E7
Zn-65	6.47E5	6.89E8	1.90E10	2.29E9
Rb-86	1.90E5	1.28E7	2.22E10	2.67E9
Sr-89	2.03E6	3.16E4	1.27E10	2.66E10
Sr-90	4.09E7	-	1.21E11	2.55E11
Y-91	2.45E6	1.52E6	5.26E6	6.32E5
Zr-95	1.75E6	3.48E8	8.28E5	9.95E4
Nb-95	4.79E5	1.95E8	2.06E8	2.48E7
Ru-103	5.52E5	1.55E8	1.05E5	1.27E4
Ru-106	1.16E7	2.99E8	1.44E6	1.73E5
Ag-110m	3.67E6	3.14E9	1.46E10	1.75E9
Sn-113	2.30E5	5.19E7	2.25E7	2.25E6
Te-127m	1.31E6	1.18E5	1.04E9	1.24E8
Te-129m	1.68E6	2.86E7	1.40E9	1.68E8
Cs-134	7.03E5	2.81E9	6.79E10	2.04E11
Cs-136	1.35E5	2.13E8	5.76E9	1.73E10
Cs-137	6.12E5	1.15E9	6.02E10	1.81E11
Ba-140	1.60E6	2.94E7	2.41E8	2.89E7
Ce-141	5.17E5	1.98E7	1.37E7	1.65E6
Ce-144	9.84E6	5.84E7	1.33E8	1.60E7
I-131	1.48E7	2.46E7	1.06E12	1.27E12
I-132	1.69E5	1.78E6	1.39E2	1.64E2
I-133	3.56E6	3.54E6	9.80E9	1.18E10
I-135	6.96E5	3.67E6	2.27E7	2.68E7
Hf-181	6.73E5	4.02E8	6.55E5	7.86E4
Am-241	4.41E5	4.96E7	6.01E7	7.21E6

\*Units are mrem/yr per  $\mu\text{Ci}/\text{m}^3$  for H-3 and the inhalation pathway and mrem/yr per  $\mu\text{Ci}/\text{sec}$  per  $\text{m}^{-2}$  for the food and ground plane pathways.

TABLE 3.3-1 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*  
PATHWAY - Ground

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
CR 51	4.66E 06	4.66E 06	4.66E 06	4.66E 06	4.66E 06	4.66E 06	4.66E 06	5.51E 06
MN 54	1.34E 09	1.34E 09	1.34E 09	1.34E 09	1.34E 09	1.34E 09	1.34E 09	1.57E 09
FE 59	2.75E 08	2.75E 08	2.75E 08	2.75E 08	2.75E 08	2.75E 08	2.75E 08	3.23E 08
CO 58	3.79E 08	3.79E 08	3.79E 08	3.79E 08	3.79E 08	3.79E 08	3.79E 08	4.44E 09
CO 60	2.15E 10	2.15E 10	2.15E 10	2.15E 10	2.15E 10	2.15E 10	2.15E 10	2.52E 10
ZN 65	7.49E 08	7.49E 08	7.49E 08	7.49E 08	7.49E 08	7.49E 08	7.49E 08	8.61E 08
RB 86	8.99E 06	8.99E 06	8.99E 06	8.99E 06	8.99E 06	8.99E 06	8.99E 06	1.03E 07
SR 89	2.23E 04	2.23E 04	2.23E 04	2.23E 04	2.23E 04	2.23E 04	2.23E 04	2.58E 04
Y 91	1.08E 06	1.08E 06	1.08E 06	1.08E 06	1.08E 06	1.08E 06	1.08E 06	1.22E 06
ZR 95	2.49E 08	2.49E 08	2.49E 08	2.49E 08	2.49E 08	2.49E 08	2.49E 08	2.89E 08
NB 95	1.36E 08	1.36E 08	1.36E 08	1.36E 08	1.36E 08	1.36E 08	1.36E 08	1.60E 08
RU103	1.09E 08	1.09E 08	1.09E 08	1.09E 08	1.09E 08	1.09E 08	1.09E 08	1.27E 08
RU106	4.19E 08	4.19E 08	4.19E 08	4.19E 08	4.19E 08	4.19E 08	4.19E 08	5.03E 08
AG110M	3.48E 09	3.48E 09	3.48E 09	3.48E 09	3.48E 09	3.48E 09	3.48E 09	4.06E 09
SN113	1.44E 07	6.28E 06	1.22E 07	6.21E 06	1.00E 07	1.33E 07	8.14E 06	4.09E 07
TE127M	9.15E 04	9.15E 04	9.15E 04	9.15E 04	9.15E 04	9.15E 04	9.15E 04	1.08E 05
TE129M	2.00E 07	2.00E 07	2.00E 07	2.00E 07	2.00E 07	2.00E 07	2.00E 07	2.34E 07
I 131	1.72E 07	1.72E 07	1.72E 07	1.72E 07	1.72E 07	1.72E 07	1.72E 07	2.09E 07
I 132	1.24E 06	1.24E 06	1.24E 06	1.24E 06	1.24E 06	1.24E 06	1.24E 06	1.46E 06
I 133	2.47E 06	2.47E 06	2.47E 06	2.47E 06	2.47E 06	2.47E 06	2.47E 06	3.00E 06
I 135	2.56E 06	2.56E 06	2.56E 06	2.56E 06	2.56E 06	2.56E 06	2.56E 06	2.99E 06
CS134	6.82E 09	6.82E 09	6.82E 09	6.82E 09	6.82E 09	6.82E 09	6.82E 09	7.96E 09
CS136	1.49E 08	1.49E 08	1.49E 08	1.49E 08	1.49E 08	1.49E 08	1.49E 08	1.69E 08
CS137	1.03E 10	1.03E 10	1.03E 10	1.03E 10	1.03E 10	1.03E 10	1.03E 10	1.20E 10
BA140	2.05E 07	2.05E 07	2.05E 07	2.05E 07	2.05E 07	2.05E 07	2.05E 07	2.34E 07
CE141	1.36E 07	1.36E 07	1.36E 07	1.36E 07	1.36E 07	1.36E 07	1.36E 07	1.53E 07
CE144	6.95E 07	6.95E 07	6.95E 07	6.95E 07	6.95E 07	6.95E 07	6.95E 07	8.03E 07
HF181	1.97E 08	1.63E 08	2.30E 08	1.70E 08	1.76E 08	2.33E 08	1.82E 08	2.82E 08
AM-241	5.16E 08	5.16E 08	5.16E 08	5.16E 08	5.16E 08	5.16E 08	5.16E 08	7.45E 08

\*R Values in units of mrem/yr per micro-Ci/m\*\*3 for inhalation and tritium, and in units of m\*\*2-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-2 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Veget

AGE GROUP - Adult

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	2.28E 03	2.28E 03	0.00E 01	2.28E 03	2.28E 03	2.28E 03	2.28E 03	2.28E 03
P 32	5.91E 07	1.72E 08	1.53E 09	9.51E 07	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CR 51	4.60E 04	1.16E 07	0.00E 01	0.00E 01	1.01E 04	2.75E 04	6.10E 04	0.00E 01
MN 54	5.83E 07	9.36E 08	0.00E 01	3.05E 08	9.09E 07	0.00E 01	0.00E 01	0.00E 01
FE 59	1.12E 08	9.75E 08	1.24E 08	2.93E 08	0.00E 01	0.00E 01	8.17E 07	0.00E 01
CO 58	6.71E 07	6.07E 08	0.00E 01	2.99E 07	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CO 60	3.67E 08	3.12E 09	0.00E 01	1.66E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZN 65	5.77E 08	8.04E 08	4.01E 08	1.28E 09	8.54E 08	0.00E 01	0.00E 01	0.00E 01
RB 86	1.03E 08	4.36E 07	0.00E 01	2.21E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 89	2.87E 08	1.60E 09	1.00E 10	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 90	1.64E 11	1.93E 10	6.70E 11	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
Y 91	1.34E 05	2.76E 09	5.01E 06	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZR 95	2.51E 05	1.17E 09	1.16E 06	3.71E 05	5.82E 05	0.00E 01	0.00E 01	0.00E 01
NB 95	4.19E 04	4.73E 08	1.40E 05	7.79E 04	7.70E 04	0.00E 01	0.00E 01	0.00E 01
RU103	2.04E 06	5.53E 08	4.74E 06	0.00E 01	1.81E 07	0.00E 01	0.00E 01	0.00E 01
RU106	2.46E 07	1.26E 10	1.94E 08	0.00E 01	3.75E 08	0.00E 01	0.00E 01	0.00E 01
AG110M	6.23E 06	4.28E 09	1.13E 07	1.05E 07	2.06E 07	0.00E 01	0.00E 01	0.00E 01
SN 113	1.36E 07	2.53E 08	1.44E 07	5.60E 05	4.09E 05	1.96E 05	0.00E 01	0.00E 01
TE127M	6.12E 07	1.68E 09	5.02E 08	1.80E 08	2.04E 09	1.28E 08	0.00E 01	0.00E 01
TE129M	4.71E 07	1.50E 09	2.98E 08	1.11E 08	1.24E 09	1.02E 08	0.00E 01	0.00E 01
I 131	6.61E 07	3.04E 07	8.07E 07	1.15E 08	1.98E 08	3.78E 10	0.00E 01	0.00E 01
I 132	5.21E 01	2.80E 01	5.57E 01	1.49E 02	2.37E 02	5.21E 03	0.00E 01	0.00E 01
I 133	1.12E 06	3.30E 06	2.11E 06	3.67E 06	6.40E 06	5.39E 08	0.00E 01	0.00E 01
I 135	3.91E 04	1.20E 05	4.05E 04	1.06E 05	1.70E 05	7.00E 06	0.00E 01	0.00E 01
CS134	8.83E 09	1.89E 08	4.54E 09	1.08E 10	3.49E 09	0.00E 01	1.16E 09	0.00E 01
CS136	1.19E 08	1.88E 07	4.19E 07	1.66E 08	9.21E 07	0.00E 01	1.26E 07	0.00E 01
CS137	5.94E 09	1.76E 08	6.63E 09	9.07E 09	3.08E 09	0.00E 01	1.02E 09	0.00E 01
BA140	8.40E 06	2.64E 08	1.28E 08	1.61E 05	5.47E 04	0.00E 01	9.22E 04	0.00E 01
CE141	1.48E 04	4.99E 08	1.93E 05	1.31E 05	6.07E 04	0.00E 01	0.00E 01	0.00E 01
CE144	1.69E 06	1.06E 10	3.15E 07	1.32E 07	7.80E 06	0.00E 01	0.00E 01	0.00E 01
HF 181	1.08E 06	7.06E 08	9.51E 06	5.36E 04	4.48E 04	3.41E 04	0.00E 01	0.00E 01
AM 241	4.12E 09	5.65E 09	5.75E 10	5.37E 10	3.10E 10	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.



TABLE 3.3-3 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Veget

AGE GROUP - Teen

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	2.61E 03	2.61E 03	0.00E 01	2.61E 03	2.61E 03	2.61E 03	2.61E 03	2.61E 03
P 32	6.80E 07	1.47E 08	1.75E 09	1.09E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CR 51	6.11E 04	1.03E 07	0.00E 01	0.00E 01	1.34E 04	3.39E 04	8.72E 04	0.00E 01
MN 54	8.79E 07	9.09E 08	0.00E 01	4.43E 08	1.32E 08	0.00E 01	0.00E 01	0.00E 01
FE 59	1.50E 08	9.78E 08	1.77E 08	4.14E 08	0.00E 01	0.00E 01	1.30E 08	0.00E 01
CO 58	9.79E 07	5.85E 08	0.00E 01	4.25E 07	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CO 60	5.57E 08	3.22E 09	0.00E 01	2.47E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZN 65	8.68E 08	7.88E 08	5.36E 08	1.86E 09	1.19E 09	0.00E 01	0.00E 01	0.00E 01
RB 86	1.30E 08	4.09E 07	0.00E 01	2.76E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 89	4.36E 08	1.81E 09	1.52E 10	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 90	2.05E 11	2.33E 10	8.32E 11	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
Y 91	2.06E 05	3.15E 09	7.68E 06	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZR 95	3.68E 05	1.23E 09	1.69E 06	5.35E 05	7.86E 05	0.00E 01	0.00E 01	0.00E 01
NB 95	5.77E 04	4.48E 08	1.89E 05	1.05E 05	1.02E 05	0.00E 01	0.00E 01	0.00E 01
RU103	2.90E 06	5.66E 08	6.78E 06	0.00E 01	2.39E 07	0.00E 01	0.00E 01	0.00E 01
RU106	3.93E 07	1.50E 10	3.12E 08	0.00E 01	6.02E 08	0.00E 01	0.00E 01	0.00E 01
AG110M	9.39E 06	4.34E 09	1.63E 07	1.54E 07	2.95E 07	0.00E 01	0.00E 01	0.00E 01
SN 113	2.02E 07	2.29E 08	1.91E 07	8.03E 05	5.65E 05	2.63E 05	0.00E 01	0.00E 01
TE127M	9.44E 07	1.98E 09	7.93E 08	2.81E 08	3.22E 09	1.89E 08	0.00E 01	0.00E 01
TE129M	6.79E 07	1.61E 09	4.29E 08	1.59E 08	1.79E 08	1.38E 08	0.00E 01	0.00E 01
I 131	5.77E 07	2.13E 07	7.68E 07	1.07E 08	1.85E 08	3.14E 10	0.00E 01	0.00E 01
I 132	4.72E 01	5.72E 01	5.02E 01	1.31E 02	2.07E 02	4.43E 03	0.00E 01	0.00E 01
I 133	1.01E 06	2.51E 06	1.96E 06	3.32E 06	5.83E 06	4.64E 08	0.00E 01	0.00E 01
I 135	3.49E 04	1.04E 05	3.66E 04	9.42E 04	1.49E 05	6.06E 06	0.00E 01	0.00E 01
CS134	7.54E 09	2.02E 08	6.90E 09	1.62E 10	5.16E 09	0.00E 01	1.97E 09	0.00E 01
CS136	1.13E 08	1.35E 07	4.28E 07	1.68E 08	9.16E 07	0.00E 01	1.44E 07	0.00E 01
CS137	4.90E 09	2.00E 08	1.06E 10	1.41E 10	4.78E 09	0.00E 01	1.86E 09	0.00E 01
BA140	8.88E 06	2.12E 08	1.38E 08	1.69E 05	5.72E 04	0.00E 01	1.14E 05	0.00E 01
CE141	2.12E 04	5.29E 08	2.77E 05	1.85E 05	8.70E 04	0.00E 01	0.00E 01	0.00E 01
CE144	2.71E 06	1.27E 10	5.04E 07	2.09E 07	1.25E 07	0.00E 01	0.00E 01	0.00E 01
HF 181	1.54E 06	6.90E 08	1.38E 07	7.58E 04	6.32E 04	4.63E 04	0.00E 01	0.00E 01
AM 241	4.97E 09	6.80E 09	6.89E 10	6.50E 10	3.72E 10	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/r per micro-Ci/sec for all others.

TABLE 3.3-4 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Veget

AGE GROUP - Child

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	4.04E 03	4.04E 03	0.00E 01	4.04E 03	4.04E 03	4.04E 03	4.04E 03	4.04E 03
P 32	1.42E 08	1.01E 08	3.67E 09	1.72E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CR 51	1.16E 05	6.15E 06	0.00E 01	0.00E 01	1.76E 04	6.44E 04	1.18E 05	0.00E 01
MN 54	1.73E 08	5.44E 08	0.00E 01	6.49E 08	1.82E 08	0.00E 01	0.00E 01	0.00E 01
FE 59	3.17E 08	6.62E 08	3.93E 08	6.36E 08	0.00E 01	0.00E 01	1.84E 08	0.00E 01
CO 58	1.92E 08	3.66E 08	0.00E 01	6.27E 07	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CO 60	1.11E 09	2.08E 09	0.00E 01	3.76E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZN 65	1.70E 09	4.81E 08	1.03E 09	2.74E 09	1.73E 09	0.00E 01	0.00E 01	0.00E 01
RB 86	2.81E 08	2.94E 07	0.00E 01	4.56E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 89	1.03E 09	1.40E 09	3.62E 10	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 90	3.49E 11	1.86E 10	1.38E 12	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
Y 91	4.89E 05	2.44E 09	1.83E 07	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZR 95	7.44E 05	8.71E 08	3.80E 06	8.35E 05	1.20E 06	0.00E 01	0.00E 01	0.00E 01
NB 95	1.12E 05	2.91E 08	4.04E 05	1.57E 05	1.48E 05	0.00E 01	0.00E 01	0.00E 01
RU103	5.86E 06	3.94E 08	1.52E 07	0.00E 01	3.84E 07	0.00E 01	0.00E 01	0.00E 01
RU106	9.38E 07	1.17E 10	7.52E 08	0.00E 01	1.02E 09	0.00E 01	0.00E 01	0.00E 01
AG110M	1.87E 07	2.78E 09	3.46E 07	2.34E 07	4.35E 07	0.00E 01	0.00E 01	0.00E 01
SN 113	3.98E 07	1.46E 08	3.64E 07	1.18E 06	8.09E 05	4.82E 05	0.00E 01	0.00E 01
TE127M	2.26E 08	1.54E 09	1.90E 09	5.12E 08	5.42E 09	4.55E 08	0.00E 01	0.00E 01
TE129M	1.55E 08	1.22E 09	9.98E 08	2.79E 08	2.93E 09	3.22E 08	0.00E 01	0.00E 01
I 131	8.16E 07	1.23E 07	1.43E 08	1.44E 08	2.36E 08	4.75E 10	0.00E 01	0.00E 01
I 132	7.53E 01	1.93E 02	8.91E 01	1.64E 02	2.51E 02	7.60E 03	0.00E 01	0.00E 01
I 133	1.67E 06	1.78E 06	3.57E 06	4.42E 06	7.36E 06	8.21E 08	0.00E 01	0.00E 01
I 135	5.54E 04	8.92E 04	6.50E 04	1.17E 05	1.79E 05	1.04E 07	0.00E 01	0.00E 01
CS134	5.40E 09	1.38E 08	1.56E 10	2.56E 10	7.93E 09	0.00E 01	2.84E 09	0.00E 01
CS136	1.43E 08	7.77E 06	8.04E 07	2.21E 08	1.18E 08	0.00E 01	1.76E 07	0.00E 01
CS137	3.52E 09	1.50E 08	2.49E 10	2.39E 10	7.78E 09	0.00E 01	2.80E 09	0.00E 01
BA140	1.61E 07	1.40E 08	2.76E 08	2.42E 05	7.87E 04	0.00E 01	1.44E 05	0.00E 01
CE141	4.75E 04	3.99E 08	6.42E 05	3.20E 05	1.40E 05	0.00E 01	0.00E 01	0.00E 01
CE144	6.49E 06	9.94E 09	1.22E 08	3.81E 07	2.11E 07	0.00E 01	0.00E 01	0.00E 01
HF 181	3.15E 06	5.17E 08	3.13E 07	1.22E 05	9.78E 04	1.03E 05	0.00E 01	0.00E 01
AM 241	7.12E 09	5.34E 09	9.50E 10	8.17E 10	4.35E 10	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-5 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Meat

AGE GROUP - Adult

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	3.27E 02	3.27E 02	0.00E 01	3.27E 02	3.27E 02	3.27E 02	3.27E 02	3.27E 02
P 32	1.18E 08	3.43E 08	3.05E 09	1.89E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CR 51	4.27E 03	1.08E 06	0.00E 01	0.00E 01	9.42E 02	2.56E 03	5.67E 03	0.00E 01
MN 54	1.06E 06	1.71E 07	0.00E 01	5.57E 06	1.66E 06	0.00E 01	0.00E 01	0.00E 01
FE 59	1.43E 08	1.25E 09	1.59E 08	3.74E 08	0.00E 01	0.00E 01	1.04E 08	0.00E 01
CO 58	2.43E 07	2.20E 08	0.00E 01	1.08E 07	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CO 60	1.03E 08	8.76E 08	0.00E 01	4.66E 07	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZN 65	3.58E 08	4.98E 08	2.49E 08	7.91E 08	5.29E 08	0.00E 01	0.00E 01	0.00E 01
RB 86	1.42E 08	6.00E 07	0.00E 01	3.04E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 89	5.23E 06	2.92E 07	1.82E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 90	2.02E 09	2.38E 08	8.22E 09	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
Y 91	1.80E 04	3.71E 08	6.75E 05	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZR 95	2.43E 05	1.14E 09	1.12E 06	3.59E 05	5.64E 05	0.00E 01	0.00E 01	0.00E 01
NB 95	4.12E 05	4.65E 09	1.38E 06	7.66E 05	7.58E 05	0.00E 01	0.00E 01	0.00E 01
RU103	2.72E 07	7.38E 09	6.32E 07	0.00E 01	2.41E 08	0.00E 01	0.00E 01	0.00E 01
RU106	2.19E 08	1.12E 11	1.73E 09	0.00E 01	3.35E 09	0.00E 01	0.00E 01	0.00E 01
AG110M	2.34E 06	1.61E 09	4.27E 06	3.95E 06	7.76E 06	0.00E 01	0.00E 01	0.00E 01
SN 113	2.80E 07	5.19E 08	2.97E 07	1.15E 06	8.40E 05	4.03E 05	0.00E 01	0.00E 01
TE127M	1.00E 08	2.76E 09	8.22E 08	2.94E 08	3.34E 09	2.10E 08	0.00E 01	0.00E 01
TE129M	1.17E 08	3.73E 09	7.40E 08	2.76E 08	3.09E 09	2.54E 08	0.00E 01	0.00E 01
I 131	5.77E 06	2.66E 06	7.04E 06	1.01E 07	1.73E 07	3.30E 09	0.00E 01	0.00E 01
I 133	1.51E-01	4.46E-01	2.85E-01	4.96E-01	8.66E-01	7.29E 01	0.00E 01	0.00E 01
I 135	6.07E-17	1.86E-16	6.28E-17	1.64E-16	2.64E-16	1.08E-14	0.00E 01	0.00E 01
CS134	7.81E 08	1.67E 07	4.01E 08	9.55E 08	3.09E 08	0.00E 01	1.03E 08	0.00E 01
CS136	2.14E 07	3.33E 06	7.53E 06	2.97E 07	1.65E 07	0.00E 01	2.27E 06	0.00E 01
CS137	4.99E 08	1.47E 07	5.57E 08	7.61E 08	2.58E 08	0.00E 01	8.59E 07	0.00E 01
BA140	1.20E 06	3.77E 07	1.83E 07	2.30E 04	7.82E 03	0.00E 01	1.32E 04	0.00E 01
CE141	6.46E 02	2.18E 07	8.42E 03	5.69E 03	2.65E 03	0.00E 01	0.00E 01	0.00E 01
CE144	4.70E 04	2.96E 08	8.75E 05	3.66E 05	2.17E 05	0.00E 01	0.00E 01	0.00E 01
HF 181	1.52E 06	9.97E 08	1.34E 07	7.57E 04	6.33E 04	4.81E 04	0.00E 01	0.00E 01
AM 241	1.80E 07	2.47E 07	2.52E 08	2.35E 08	1.36E 08	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.



TABLE 3.3-6 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Meat

AGE GROUP - Teen

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	1.95E 02	1.95E 02	0.00E 01	1.95E 02	1.95E 02	1.95E 02	1.95E 02	1.95E 02
P 32	9.98E 07	2.16E 08	2.58E 09	1.60E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CR 51	3.42E 03	5.75E 05	0.00E 01	0.00E 01	7.49E 02	1.90E 03	4.88E 03	0.00E 01
MN 54	8.43E 05	8.72E 06	0.00E 01	4.25E 06	1.27E 06	0.00E 01	0.00E 01	0.00E 01
FE 59	1.15E 08	7.02E 08	1.27E 08	2.97E 08	0.00E 01	0.00E 01	9.36E 07	0.00E 01
CO 58	1.93E 07	1.15E 08	0.00E 01	8.36E 06	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CO 60	8.15E 07	4.71E 08	0.00E 01	3.62E 07	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZN 65	2.83E 08	2.57E 08	1.75E 08	6.07E 08	3.89E 08	0.00E 01	0.00E 01	0.00E 01
RB 86	1.19E 08	3.76E 07	0.00E 01	2.54E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 89	4.40E 06	1.83E 07	1.54E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 90	1.31E 09	1.49E 08	5.32E 09	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
Y 91	1.52E 04	2.33E 08	5.68E 05	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZR 95	1.95E 05	6.53E 08	8.97E 05	2.83E 05	4.16E 05	0.00E 01	0.00E 01	0.00E 01
NB 95	3.29E 05	2.55E 09	1.08E 06	5.97E 05	5.79E 05	0.00E 01	0.00E 01	0.00E 01
RU103	2.20E 07	4.30E 09	5.15E 07	0.00E 01	1.82E 08	0.00E 01	0.00E 01	0.00E 01
RU106	1.84E 08	7.00E 10	1.46E 09	0.00E 01	2.81E 09	0.00E 01	0.00E 01	0.00E 01
AG110M	1.86E 06	8.59E 08	3.23E 06	3.06E 06	5.83E 06	0.00E 01	0.00E 01	0.00E 01
SN 113	2.22E 07	2.51E 08	2.09E 07	8.80E 05	6.19E 05	2.89E 05	0.00E 01	0.00E 01
TE127M	8.25E 07	1.73E 09	6.94E 08	2.46E 08	2.81E 09	1.65E 08	0.00E 01	0.00E 01
TE129M	9.81E 07	2.33E 09	6.20E 08	2.30E 08	2.59E 09	2.00E 08	0.00E 01	0.00E 01
I 131	4.40E 06	1.62E 06	5.85E 06	8.20E 06	1.41E 07	2.39E 09	0.00E 01	0.00E 01
I 133	1.23E-01	3.06E-01	2.39E-01	4.05E-01	7.10E-01	5.65E 01	0.00E 01	0.00E 01
I 135	4.88E-17	1.46E-16	5.11E-17	1.32E-16	2.08E-16	8.46E-15	0.00E 01	0.00E 01
CS134	3.48E 08	9.34E 06	3.19E 08	7.51E 08	2.39E 08	0.00E 01	9.11E 07	0.00E 01
CS136	1.55E 07	1.86E 06	5.87E 06	2.31E 07	1.26E 07	0.00E 01	1.98E 06	0.00E 01
CS137	2.14E 08	8.75E 06	4.62E 08	6.15E 08	2.09E 08	0.00E 01	8.13E 07	0.00E 01
BA140	9.76E 05	2.34E 07	1.51E 07	1.86E 04	6.29E 03	0.00E 01	1.25E 04	0.00E 01
CE141	5.42E 02	1.35E 07	7.07E 03	4.72E 03	2.22E 03	0.00E 01	0.00E 01	0.00E 01
CE144	3.96E 04	1.85E 08	7.37E 05	3.05E 05	1.82E 05	0.00E 01	0.00E 01	0.00E 01
HF 181	1.23E 06	5.50E 08	1.10E 07	6.05E 04	5.04E 04	3.69E 04	0.00E 01	0.00E 01
AM 241	1.13E 07	1.55E 07	1.57E 08	1.48E 08	8.49E 07	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m\*\*3 for inhalation and tritium, and in units of M\*\*2-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-7 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Meat

AGE GROUP - Child

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	2.36E 02	2.36E 02	0.00E 01	2.36E 02	2.36E 02	2.36E 02	2.36E 02	2.36E 02
P 32	1.87E 08	1.34E 08	4.86E 09	2.27E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CR 51	5.33E 03	2.83E 05	0.00E 01	0.00E 01	8.09E 02	2.96E 03	5.40E 03	0.00E 01
MN 54	1.30E 06	4.08E 06	0.00E 01	4.86E 06	1.36E 06	0.00E 01	0.00E 01	0.00E 01
FE 59	1.82E 08	3.80E 08	2.25E 08	3.65E 08	0.00E 01	0.00E 01	1.06E 08	0.00E 01
CO 58	2.99E 07	5.70E 07	0.00E 01	9.76E 06	0.00E 01	0.00E 01	0.00E 01	0.00E 01
CO 60	1.27E 08	2.38E 08	0.00E 01	4.30E 07	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZN 65	4.35E 08	1.23E 08	2.62E 08	6.99E 08	4.40E 08	0.00E 01	0.00E 01	0.00E 01
RB 86	2.21E 08	2.32E 07	0.00E 01	3.60E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 89	8.31E 06	1.13E 07	2.91E 08	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
SR 90	1.74E 09	9.26E 07	6.87E 09	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
Y 91	2.87E 04	1.43E 08	1.07E 06	0.00E 01	0.00E 01	0.00E 01	0.00E 01	0.00E 01
ZR 95	3.12E 05	3.65E 08	1.59E 06	3.50E 05	5.01E 05	0.00E 01	0.00E 01	0.00E 01
NB 95	5.17E 05	1.34E 09	1.86E 06	7.23E 05	6.80E 05	0.00E 01	0.00E 01	0.00E 01
RU103	3.58E 07	2.41E 09	9.31E 07	0.00E 01	2.34E 08	0.00E 01	0.00E 01	0.00E 01
RU106	3.43E 08	4.27E 10	2.75E 09	0.00E 01	3.71E 09	0.00E 01	0.00E 01	0.00E 01
AG110M	2.89E 06	4.30E 08	5.36E 06	3.62E 06	6.74E 06	0.00E 01	0.00E 01	0.00E 01
SN 113	3.43E 07	1.25E 08	3.14E 07	1.01E 06	6.97E 05	4.15E 05	0.00E 01	0.00E 01
TE127M	1.55E 08	1.06E 09	1.31E 09	3.52E 08	3.73E 09	3.13E 08	0.00E 01	0.00E 01
TE129M	1.81E 08	1.42E 09	1.17E 09	3.26E 08	3.43E 09	3.77E 08	0.00E 01	0.00E 01
I 131	6.20E 06	9.72E 05	1.09E 07	1.09E 07	1.79E 07	3.61E 09	0.00E 01	0.00E 01
I 133	2.07E-01	2.21E-01	4.43E-01	5.48E-01	9.13E-01	1.02E 02	0.00E 01	0.00E 01
I 135	7.87E-17	1.27E-16	9.25E-17	1.66E-16	2.55E-16	1.47E-14	0.00E 01	0.00E 01
CS134	1.95E 08	4.93E 06	5.63E 08	9.23E 08	2.86E 08	0.00E 01	1.03E 08	0.00E 01
CS136	1.80E 07	9.78E 05	1.01E 07	2.78E 07	1.48E 07	0.00E 01	2.21E 06	0.00E 01
CS137	1.20E 08	5.10E 06	8.51E 08	8.15E 08	2.65E 08	0.00E 01	9.55E 07	0.00E 01
BA140	1.63E 06	1.42E 07	2.80E 07	2.45E 04	7.97E 03	0.00E 01	1.46E 04	0.00E 01
CE141	9.86E 02	8.28E 06	1.33E 04	6.64E 03	2.91E 03	0.00E 01	0.00E 01	0.00E 01
CE144	7.42E 04	1.14E 08	1.39E 06	4.36E 05	2.41E 05	0.00E 01	0.00E 01	0.00E 01
HF 181	2.02E 06	3.31E 08	2.005E 07	7.79E 04	6.26E 04	6.56E 04	0.00E 01	0.00E 01
AM 241	1.27E 07	9.49E 06	1.69E 08	1.45E 08	7.74E 07	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m\*\*3 for inhalation and tritium, and in units of M\*\*2-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-8 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Cow Milk

AGE GROUP - Adult

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	7.69E 02	7.69E 02	0.00E-01	7.69E 02	7.69E 02	7.69E 02	7.69E 02	7.69E 02
P 32	4.32E 08	1.26E 09	1.12E 10	6.95E 08	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	1.73E 04	4.36E 06	0.00E-01	0.00E-01	3.82E 03	1.04E 04	2.30E 04	0.00E-01
MN 54	9.76E 05	1.57E 07	0.00E-01	5.11E 06	1.52E 06	0.00E-01	0.00E-01	0.00E-01
FE 59	1.60E 07	1.39E 08	1.77E 07	4.17E 07	0.00E-01	0.00E-01	1.17E 07	0.00E-01
CO 58	6.28E 06	5.68E 07	0.00E-01	2.80E 06	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO 60	2.24E 07	1.91E 08	0.00E-01	1.02E 07	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN 65	1.38E 09	1.92E 09	9.59E 08	3.05E 09	2.04E 09	0.00E-01	0.00E-01	0.00E-01
RB 86	7.54E 08	3.19E 08	0.00E-01	1.62E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	2.50E 07	1.40E 08	8.70E 08	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 90	7.59E 09	8.94E 08	3.09E 10	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y 91	1.37E 02	2.81E 06	5.11E 03	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR 95	1.22E 02	5.71E 05	5.62E 02	1.80E 02	2.83E 02	0.00E-01	0.00E-01	0.00E-01
NB 95	1.48E 04	1.67E 08	4.95E 04	2.75E 04	2.72E 04	0.00E-01	0.00E-01	0.00E-01
RU 103	2.63E 02	7.14E 04	6.11E 02	0.00E-01	2.33E 03	0.00E-01	0.00E-01	0.00E-01
RU 106	1.60E 03	8.17E 05	1.26E 04	0.00E-01	2.44E 04	0.00E-01	0.00E-01	0.00E-01
AG110M	2.04E 07	1.40E 10	3.71E 07	3.44E 07	6.76E 07	0.00E-01	0.00E-01	0.00E-01
SN 113	1.32E 06	2.44E 07	1.40E 06	5.41E 04	3.96E 04	1.90E 04	0.00E 01	0.00E 01
TE127M	4.11E 06	1.13E 08	3.37E 07	1.21E 07	1.37E 08	8.62E 06	0.00E-01	0.00E-01
TE129M	6.19E 06	1.97E 08	3.91E 07	1.46E 07	1.63E 08	1.34E 07	0.00E-01	0.00E-01
I 131	1.59E 08	7.32E 07	1.94E 08	2.77E 08	4.76E 08	9.09E 10	0.00E-01	0.00E-01
I 132	1.03E-01	5.51E-02	1.10E-01	2.93E-01	4.67E-01	1.03E 01	0.00E-01	0.00E-01
I 133	1.40E 06	4.13E 06	2.64E 06	4.59E 06	8.01E 06	6.75E 08	0.00E-01	0.00E-01
I 135	9.03E 03	2.76E 04	9.34E 03	2.45E 04	3.92E 04	1.61E 06	0.00E-01	0.00E-01
CS 134	6.71E 09	1.44E 08	3.45E 09	3.21E 09	2.66E 09	0.00E-01	8.82E 08	0.00E-01
CS 136	4.73E 08	7.46E 07	1.66E 08	6.57E 08	3.65E 08	0.00E-01	5.01E 07	0.00E-01
CS 137	4.22E 09	1.25E 08	4.71E 09	6.44E 09	2.19E 09	0.00E-01	7.27E 08	0.00E-01
BA 140	1.12E 06	3.53E 07	1.71E 07	2.15E 04	7.32E 03	0.00E-01	1.23E 04	0.00E-01
CE 141	2.23E 02	7.52E 06	2.91E 03	1.97E 03	9.14E 02	0.00E-01	0.00E-01	0.00E-01
CE 144	1.15E 04	7.26E 07	2.15E 05	8.97E 04	5.32E 04	0.00E-01	0.00E-01	0.00E-01
HF 181	6.68E 02	4.39E 05	5.91E 03	3.33E 01	2.79E 01	2.12E 01	0.00E 01	0.00E 01
AM 241	1.27E 06	1.74E 06	1.77E 07	1.66E 07	9.56E 06	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m\*\*3 for inhalation and tritium, and in units of M\*\*2-mrem/yr per micro-Ci/sec for all others.



TABLE 3.3-9 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Cow Milk

AGE GROUP - Teen

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	1.00E 03	1.00E 03	0.00E-01	1.00E 03	1.00E 03	1.00E 03	1.00E 03	1.00E 03
P 32	8.00E 08	1.73E 09	2.06E 10	1.28E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	3.02E 04	5.08E 06	0.00E-01	0.00E-01	6.63E 03	1.68E 04	4.32E 04	0.00E-01
MN 54	1.69E 06	1.75E 07	0.00E-01	8.52E 06	2.54E 06	0.00E-01	0.00E-01	0.00E-01
FE 59	2.79E 07	1.71E 08	3.10E 07	7.23E 07	0.00E-01	0.00E-01	2.28E 07	0.00E-01
CO 58	1.09E 07	6.50E 07	0.00E-01	4.72E 06	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO 60	3.88E 07	2.25E 08	0.00E-01	1.72E 07	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN 65	2.38E 09	2.16E 09	1.47E 09	5.11E 09	3.27E 09	0.00E-01	0.00E-01	0.00E-01
RB 86	1.39E 09	4.37E 08	0.00E-01	2.95E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	4.59E 07	1.91E 08	1.60E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 90	1.08E 10	1.23E 09	4.37E 10	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y 91	2.52E 02	3.85E 06	9.40E 03	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR 95	2.13E 02	7.16E 06	9.83E 02	3.10E 02	4.56E 02	0.00E-01	0.00E-01	0.00E-01
NB 95	2.58E 04	2.00E 08	8.45E 04	4.68E 04	4.54E 04	0.00E-01	0.00E-01	0.00E-01
RU 103	4.65E 02	9.08E 04	1.09E 03	0.00E-01	3.83E 03	0.00E-01	0.00E-01	0.00E-01
RU 106	2.93E 03	1.11E 06	2.32E 04	0.00E-01	4.48E 04	0.00E-01	0.00E-01	0.00E-01
AG110M	3.53E 07	1.63E 10	6.14E 07	5.81E 07	1.11E 08	0.00E-01	0.00E-01	0.00E-01
SN 113	2.28E 06	2.58E 07	2.15E 06	9.06E 04	6.37E 04	2.97E 04	0.00E-01	0.00E-01
TE127M	7.39E 06	1.55E 08	6.22E 07	2.21E 07	2.52E 08	1.48E 07	0.00E-01	0.00E-01
TE129M	1.13E 07	2.69E 08	7.15E 07	2.65E 07	2.99E 08	2.31E 07	0.00E-01	0.00E-01
I 131	2.65E 08	9.75E 07	3.52E 08	4.93E 08	8.48E 08	1.44E 11	0.00E-01	0.00E-01
I 132	1.83E-01	2.22E-01	1.94E-01	5.09E-01	8.02E-01	1.71E 01	0.00E-01	0.00E-01
I 133	2.49E 06	6.19E 06	4.82E 06	8.18E 06	1.43E 07	1.14E 09	0.00E-01	0.00E-01
I 135	1.58E 04	4.74E 04	1.66E 04	4.27E 04	6.75E 04	2.75E 06	0.00E-01	0.00E-01
CS 134	6.54E 09	1.75E 08	5.99E 09	1.41E 10	4.48E 09	0.00E-01	1.71E 09	0.00E-01
CS 136	7.48E 08	8.97E 07	2.83E 08	1.11E 09	6.07E 08	0.00E-01	9.56E 07	0.00E-01
CS 137	3.96E 09	1.62E 08	8.54E 09	1.14E 10	3.87E 09	0.00E-01	1.50E 09	0.00E-01
BA 140	1.99E 06	4.77E 07	3.09E 07	3.79E 04	1.28E 04	0.00E-01	2.55E 04	0.00E-01
CE 141	4.09E 02	1.02E 07	6.33E 03	3.56E 03	1.68E 03	0.00E-01	0.00E-01	0.00E-01
CE 144	2.12E 04	9.93E 07	3.95E 05	1.63E 05	9.76E 04	0.00E-01	0.00E-01	0.00E-01
HF 181	1.18E 03	5.28E 05	1.06E 04	5.81E 01	4.84E 01	3.55E 01	0.00E 01	0.00E 01
AM 241	1.74E 06	2.38E 06	2.42E 07	2.28E 07	1.31E 07	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-10 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Cow Milk

AGE GROUP - Child

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	1.58E 03	1.58E 03	0.00E-01	1.58E 03	1.58E 03	1.58E 03	1.58E 03	1.58E 03
P 32	1.96E 09	1.41E 09	5.09E 10	2.38E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	6.17E 04	3.27E 06	0.00E-01	0.00E-01	9.36E 03	3.42E 04	6.25E 04	0.00E-01
MN 54	3.39E 06	1.07E 07	0.00E-01	1.27E 07	3.57E 06	0.00E-01	0.00E-01	0.00E-01
FE 59	5.79E 07	1.21E 08	7.18E 07	1.16E 08	0.00E-01	0.00E-01	3.37E 07	0.00E-01
CO 58	2.21E 07	4.20E 07	0.00E-01	7.21E 06	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO 60	7.90E 07	1.48E 08	0.00E-01	2.68E 07	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN 65	4.79E 09	1.35E 09	2.89E 09	7.70E 09	4.85E 09	0.00E-01	0.00E-01	0.00E-01
RB 86	3.36E 09	3.52E 08	0.00E-01	5.47E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	1.13E 08	1.54E 08	3.97E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 90	1.87E 10	9.95E 08	7.38E 10	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y 91	6.21E 02	3.09E 06	2.32E 04	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR 95	4.47E 02	5.23E 05	2.28E 03	5.02E 02	7.18E 02	0.00E-01	0.00E-01	0.00E-01
NB 95	5.31E 04	1.37E 08	1.91E 05	7.42E 04	6.98E 04	0.00E-01	0.00E-01	0.00E-01
RU 103	9.88E 02	6.65E 04	2.57E 03	0.00E-01	6.47E 03	0.00E-01	0.00E-01	0.00E-01
RU 106	7.14E 03	8.90E 05	5.72E 04	0.00E-01	7.72E 04	0.00E-01	0.00E-01	0.00E-01
AG110M	7.19E 07	1.07E 10	1.33E 08	9.00E 07	1.68E 08	0.00E-01	0.00E-01	0.00E-01
SN 113	4.61E 06	1.69E 07	4.22E 06	1.36E 05	9.38E 04	5.59E 04	0.00E 01	0.00E 01
TE127M	1.82E 07	1.24E 08	1.53E 08	4.13E 07	4.37E 08	3.66E 07	0.00E-01	0.00E-01
TE129M	2.74E 07	2.15E 08	1.76E 08	4.92E 07	5.18E 08	5.68E 07	0.00E-01	0.00E-01
I 131	4.88E 08	7.64E 07	8.54E 08	8.59E 08	1.41E 09	2.84E 11	0.00E-01	0.00E-01
I 132	3.89E-01	9.95E-01	4.60E-01	8.45E-01	1.29E 00	3.92E 01	0.00E-01	0.00E-01
I 133	5.48E 06	5.84E 06	1.17E 07	1.45E 07	2.41E 07	2.69E 09	0.00E-01	0.00E-01
I 135	3.35E 04	5.39E 04	3.93E 04	7.07E 04	1.08E 05	6.26E 06	0.00E-01	0.00E-01
CS 134	4.78E 09	1.22E 08	1.38E 10	2.27E 10	7.03E 09	0.00E-01	2.52E 09	0.00E-01
CS 136	1.14E 09	6.17E 07	6.39E 08	1.76E 09	9.36E 08	0.00E-01	1.40E 08	0.00E-01
CS 137	2.91E 09	1.23E 08	2.06E 10	1.97E 10	6.42E 09	0.00E-01	2.31E 09	0.00E-01
BA 140	4.36E 06	3.78E 07	7.47E 07	6.54E 04	2.13E 04	0.00E-01	3.90E 04	0.00E-01
CE 141	9.73E 02	8.17E 06	1.31E 04	6.55E 03	2.87E 03	0.00E-01	0.00E-01	0.00E-01
CE 144	5.20E 04	7.96E 07	9.74E 05	3.05E 05	1.69E 05	0.00E-01	0.00E-01	0.00E-01
HF 181	2.53E 03	4.16E 05	2.51E 04	9.79E 01	7.86E 01	8.24E 01	0.00E 01	0.00E 01
AM 241	2.55E 06	1.91E 06	3.40E 07	2.92E 07	1.56E 07	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m\*\*3 for inhalation and tritium, and in units of M\*\*2-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-11 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Cow Milk

AGE GROUP - Infant

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	2.40E 03	2.40E 03	0.00E-01	2.40E 03	2.40E 03	2.40E 03	2.40E 03	2.40E 03
P 32	4.06E 09	1.42E 09	1.05E 11	6.17E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	9.77E 04	2.85E 06	0.00E-01	0.00E-01	1.39E 04	6.38E 04	1.24E 05	0.00E-01
MN 54	5.37E 06	8.71E 06	0.00E-01	2.37E 07	5.25E 06	0.00E-01	0.00E-01	0.00E-01
FE 59	9.23E 07	1.12E 08	1.34E 08	2.34E 08	0.00E-01	0.00E-01	6.92E 07	0.00E-01
CO 58	3.60E 07	3.59E 07	0.00E-01	1.44E 07	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO 60	1.29E 08	1.30E 08	0.00E-01	5.47E 07	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN 65	6.14E 09	1.12E 10	3.88E 09	1.33E 10	6.45E 09	0.00E-01	0.00E-01	0.00E-01
RB 86	6.86E 09	3.55E 08	0.00E-01	1.39E 10	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	2.17E 08	1.55E 08	7.55E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 90	2.05E 10	1.00E 09	8.04E 10	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y 91	1.16E 08	3.12E 06	4.36E 04	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR 95	7.01E 02	4.92E 05	4.05E 03	9.88E 02	1.06E 03	0.00E-01	0.00E-01	0.00E-01
NB 95	8.48E 04	1.24E 08	3.56E 05	1.47E 05	1.05E 05	0.00E-01	0.00E-01	0.00E-01
RU 103	1.74E 03	6.33E 04	5.21E 03	0.00E-01	1.08E 04	0.00E-01	0.00E-01	0.00E-01
RU 106	1.47E 04	8.95E 05	1.18E 05	0.00E-01	1.39E 05	0.00E-01	0.00E-01	0.00E-01
AG110M	1.19E 08	9.32E 09	2.46E 08	1.80E 08	2.57E 08	0.00E-01	0.00E-01	0.00E-01
SN 113	6.66E 06	1.37E 07	6.46E 06	2.45E 05	1.32E 05	9.34E 04	0.00E 01	0.00E 01
TE127M	3.75E 07	1.25E 08	3.10E 08	1.03E 08	7.64E 08	8.96E 07	0.00E-01	0.00E-01
TE129M	5.57E 07	2.16E 08	3.62E 08	1.24E 08	9.05E 08	1.39E 08	0.00E-01	0.00E-01
I 131	9.23E 08	7.49E 07	1.78E 09	2.10E 09	2.45E 09	6.90E 11	0.00E-01	0.00E-01
I 132	6.90E-01	1.57E-00	9.55E-01	1.94E 00	2.16E 00	9.09E 01	0.00E-01	0.00E-01
I 133	1.05E 07	6.09E 06	2.47E 07	3.60E 07	4.23E 07	6.55E 09	0.00E-01	0.00E-01
I 135	5.93E 04	5.83E 04	8.17E 04	1.63E 05	1.81E 05	1.46E 07	0.00E-01	0.00E-01
CS 134	4.19E 09	1.13E 08	2.23E 10	4.15E 10	1.07E 10	0.00E-01	4.38E 09	0.00E-01
CS 136	1.37E 09	5.58E 07	1.25E 09	3.67E 09	1.46E 09	0.00E-01	2.99E 08	0.00E-01
CS 137	2.72E 09	1.20E 08	3.28E 10	3.84E 10	1.03E 10	0.00E-01	4.18E 09	0.00E-01
BA 140	7.91E 06	3.77E 07	1.54E 08	1.54E 05	3.65E 04	0.00E-01	9.43E 04	0.00E-01
CE 141	1.87E 03	3.21E 06	2.60E 04	1.59E 04	4.90E 03	0.00E-01	0.00E-01	0.00E-01
CE 144	7.82E 04	8.01E 07	1.40E 06	5.71E 05	2.31E 05	0.00E-01	0.00E-01	0.00E-01
HF 181	4.23E 03	3.94E 05	4.78E 04	2.26E 02	1.32E 02	1.91E 02	0.00E 01	0.00E 01
AM 241	2.72E 06	1.92E 06	3.65E 07	3.17E 07	1.64E 07	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.



TABLE 3.3-12 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Goat Milk

AGE GROUP - Adult

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	1.57E 03	1.57E 03	0.00E-01	1.57E 03	1.57E 03	1.57E 03	1.57E 03	1.57E 03
P 32	5.19E 08	1.51E 09	1.34E 10	8.34E 08	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	2.08E 03	5.23E 05	0.00E-01	0.00E-01	4.58E 02	1.24E 03	2.76E 03	0.00E-01
MN 54	1.17E 05	1.88E 06	0.00E-01	6.14E 05	1.83E 05	0.00E-01	0.00E-01	0.00E-01
FE 59	2.08E 05	1.81E 06	2.31E 05	5.42E 05	0.00E-01	0.00E-01	1.51E 05	0.00E-01
CO 58	7.54E 05	6.82E 06	0.00E-01	3.36E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO 60	2.69E 06	2.29E 07	0.00E-01	1.22E 06	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN 65	1.65E 08	2.31E 08	1.15E 08	3.66E 08	2.45E 08	0.00E-01	0.00E-01	0.00E-01
RB 86	9.05E 07	3.83E 07	0.00E-01	1.94E 08	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	5.24E 07	2.93E 08	1.83E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 90	1.59E 10	1.88E 09	6.49E 10	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y 91	1.64E 01	3.37E 05	6.13E 02	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR 95	1.46E 01	6.85E 04	6.74E 01	2.16E 01	3.39E 01	0.00E-01	0.00E-01	0.00E-01
NB 95	1.78E 03	2.01E 07	5.94E 03	3.31E 03	3.27E 03	0.00E-01	0.00E-01	0.00E-01
RU 103	3.16E 01	8.56E 03	7.33E 01	0.00E-01	2.80E 02	0.00E-01	0.00E-01	0.00E-01
RU 106	1.92E 02	9.81E 04	1.52E 03	0.00E-01	2.93E 03	0.00E-01	0.00E-01	0.00E-01
AG110M	2.45E 06	1.68E 09	4.46E 06	4.12E 06	8.11E 06	0.00E-01	0.00E-01	0.00E-01
SN 113	1.32E 05	2.44E 06	1.40E 05	5.41E 03	3.96E 03	1.90E 03	0.00E 01	0.00E 01
TE127M	4.93E 05	1.36E 07	4.05E 06	1.45E 06	1.64E 07	1.03E 06	0.00E-01	0.00E-01
TE129M	7.43E 05	2.36E 07	4.69E 06	1.75E 06	1.96E 07	1.61E 06	0.00E-01	0.00E-01
I 131	1.91E 08	8.78E 07	2.33E 08	3.33E 08	5.71E 08	1.09E 11	0.00E-01	0.00E-01
I 132	1.23E-01	6.61E-02	1.32E-01	3.52E-01	5.61E-01	1.23E 01	0.00E-01	0.00E-01
I 133	1.68E 06	4.95E 06	3.17E 06	5.51E 06	9.61E 06	8.10E 08	0.00E-01	0.00E-01
I 135	1.08E 04	3.32E 04	1.12E 04	2.94E 04	4.71E 04	1.94E 06	0.00E-01	0.00E-01
CS 134	2.01E 10	4.31E 08	1.03E 10	2.46E 10	7.97E 09	0.00E-01	2.65E 09	0.00E-01
CS 136	1.42E 09	2.24E 08	4.99E 08	1.97E 09	1.10E 09	0.00E-01	1.50E 08	0.00E-01
CS 137	1.27E 10	3.74E 08	1.41E 10	1.93E 10	6.56E 09	0.00E-01	2.18E 09	0.00E-01
BA 140	1.35E 05	4.23E 06	2.06E 06	2.58E 03	8.78E 02	0.00E-01	1.48E 03	0.00E-01
CE 141	2.68E 01	9.03E 05	3.49E 02	2.36E 02	1.10E 02	0.00E-01	0.00E-01	0.00E-01
CE 144	1.38E 03	8.71E 06	2.58E 04	1.08E 04	6.39E 03	0.00E-01	0.00E-01	0.00E-01
HF 181	8.02E 01	5.26E 04	7.09E 02	3.99E 00	3.34E 00	2.54E 00	0.00E 01	0.00E 01
AM 241	1.52E 05	2.09E 05	2.12E 06	1.99E 06	1.15E 06	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-13 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Goat Milk

AGE GROUP - Teer

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	2.04E 03	2.04E 03	0.00E-01	2.04E 03	2.04E 03	2.04E 03	2.04E 03	2.04E 03
P 32	9.60E 08	2.08E 09	2.48E 10	1.53E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	3.63E 03	6.10E 05	0.00E-01	0.00E-01	7.95E 02	2.02E 03	5.18E 03	0.00E-01
MN 54	2.03E 05	2.10E 06	0.00E-01	1.02E 06	3.05E 05	0.00E-01	0.00E-01	0.00E-01
FE 59	3.63E 05	2.22E 06	4.03E 05	9.40E 05	0.00E-01	0.00E-01	2.96E 05	0.00E-01
CO 58	1.30E 06	7.80E 06	0.00E-01	5.66E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO 60	4.66E 06	2.59E 07	0.00E-01	2.07E 06	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN 65	2.86E 08	2.60E 08	1.77E 08	6.13E 08	3.93E 08	0.00E-01	0.00E-01	0.00E-01
RB 86	1.66E 08	5.24E 07	0.00E-01	3.54E 08	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	9.65E 07	4.01E 08	3.37E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 90	2.27E 10	2.58E 09	9.18E 10	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y 91	3.02E 01	4.62E 05	1.13E 03	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR 95	2.56E 01	8.59E 04	1.18E 02	3.72E 01	5.47E 01	0.00E-01	0.00E-01	0.00E-01
NB 95	3.09E 03	2.40E 07	1.01E 04	5.62E 03	5.45E 03	0.00E-01	0.00E-01	0.00E-01
RU 103	5.58E 01	1.09E 04	1.30E 02	0.00E-01	4.60E 02	0.00E-01	0.00E-01	0.00E-01
RU 106	3.51E 02	1.34E 05	2.79E 03	0.00E-01	5.38E 03	0.00E-01	0.00E-01	0.00E-01
AG110M	4.24E 06	1.96E 09	7.37E 06	6.97E 06	1.33E 07	0.00E-01	0.00E-01	0.00E-01
SN 113	2.28E 05	2.58E 06	2.15E 05	9.06E 03	6.37E 03	2.97E 03	0.00E 01	0.00E 01
TE127M	8.87E 05	1.86E 07	7.46E 06	2.65E 06	3.02E 07	1.77E 06	0.00E-01	0.00E-01
TE129M	1.36E 06	3.22E 07	8.58E 06	3.19E 06	3.59E 07	2.77E 06	0.00E-01	0.00E-01
I 131	3.18E 08	1.17E 08	4.22E 08	5.91E 08	1.02E 09	1.73E 11	0.00E-01	0.00E-01
I 132	2.19E-01	2.66E-01	2.33E-01	6.11E-01	9.62E-01	2.06E 01	0.00E-01	0.00E-01
I 133	2.99E 06	7.43E 06	5.79E 06	9.81E 06	1.72E 07	1.37E 09	0.00E-01	0.00E-01
I 135	1.90E 04	5.63E 04	1.99E 04	5.13E 04	8.10E 04	3.30E 06	0.00E-01	0.00E-01
CS 134	1.96E 10	5.26E 08	1.80E 10	4.23E 10	1.34E 10	0.00E-01	5.13E 09	0.00E-01
CS 136	2.25E 09	2.69E 07	8.50E 08	3.34E 09	1.82E 09	0.00E-01	2.87E 08	0.00E-01
CS 137	1.19E 10	4.85E 08	2.56E 10	3.41E 10	1.16E 10	0.00E-01	4.51E 09	0.00E-01
BA 140	2.39E 05	5.72E 06	3.71E 06	4.55E 03	1.54E 03	0.00E-01	3.06E 03	0.00E-01
CE 141	4.91E 01	1.22E 06	6.40E 02	4.27E 02	2.01E 02	0.00E-01	0.00E-01	0.00E-01
CE 144	2.55E 03	1.19E 07	4.74E 04	1.96E 04	1.17E 04	0.00E-01	0.00E-01	0.00E-01
HF 181	1.41E 02	6.34E 04	1.27E 03	6.97E 00	5.81E 00	4.26E 00	0.00E 01	0.00E 01
AM 241	2.09E 05	2.86E 05	2.90E 06	2.74E 06	1.57E 06	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.



TABLE 3.3-14 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*  
PATHWAY - Goat Milk

AGE GROUP - Child

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	3.23E 03	3.23E 03	0.00E-01	3.23E 03	3.23E 03	3.23E 03	3.23E 03	3.23E 03
P 32	2.35E 09	1.69E 09	6.11E 10	2.86E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	7.40E 03	3.93E 05	0.00E-01	0.00E-01	1.12E 03	4.11E 03	7.50E 03	0.00E-01
MN 54	4.07E 05	1.28E 06	0.00E-01	1.53E 06	4.29E 05	0.00E-01	0.00E-01	0.00E-01
FE 59	7.52E 05	1.57E 06	9.34E 05	1.51E 06	0.00E-01	0.00E-01	4.38E 05	0.00E-01
CO 58	2.65E 06	5.05E 06	0.00E-01	8.65E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO 60	9.48E 06	1.78E 07	0.00E-01	3.21E 06	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN 65	5.74E 08	1.62E 08	3.47E 08	9.24E 08	5.82E 08	0.00E-01	0.00E-01	0.00E-01
RB 86	4.04E 08	4.22E 07	0.00E-01	6.57E 08	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	2.38E 08	3.23E 08	8.34E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 90	3.93E 10	2.09E 09	1.55E 11	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y 91	7.45E 01	3.71E 05	2.79E 03	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR 95	5.36E 01	6.28E 04	2.74E 02	6.02E 01	8.62E 01	0.00E-01	0.00E-01	0.00E-01
NB 95	6.37E 03	1.65E 07	2.29E 04	8.91E 03	8.37E 03	0.00E-01	0.00E-01	0.00E-01
RU 103	1.19E 02	7.98E 03	3.09E 02	0.00E-01	7.77E 02	0.00E-01	0.00E-01	0.00E-01
RU 106	8.56E 02	1.07E 05	6.86E 03	0.00E-01	9.27E 03	0.00E-01	0.00E-01	0.00E-01
AG110M	8.63E 06	1.28E 09	1.60E 07	1.08E 07	2.01E 07	0.00E-01	0.00E-01	0.00E-01
SN 113	4.61E 05	1.69E 06	4.22E 05	1.36E 04	9.38E 03	5.59E 03	0.00E 01	0.00E 01
TE127M	2.18E 06	1.49E 07	1.84E 07	4.95E 06	5.24E 07	4.40E 06	0.00E-01	0.00E-01
TE129M	3.28E 06	2.58E 07	2.12E 07	5.91E 06	6.21E 07	6.82E 06	0.00E-01	0.00E-01
I 131	5.85E 08	9.17E 07	1.02E 09	1.03E 09	1.69E 09	3.41E 11	0.00E-01	0.00E-01
I 132	4.67E-01	1.19E 00	5.52E-01	1.01E 00	1.55E 00	4.71E 01	0.00E-01	0.00E-01
I 133	6.58E 06	7.00E 06	1.41E 07	1.74E 07	2.90E 07	3.23E 09	0.00E-01	0.00E-01
I 135	4.01E 04	6.47E 04	4.72E 04	8.49E 04	1.30E 05	7.52E 06	0.00E-01	0.00E-01
CS 134	1.43E 10	3.67E 08	4.14E 10	6.80E 10	2.11E 10	0.00E-01	7.56E 09	0.00E-01
CS 136	3.41E 09	1.85E 08	1.92E 09	5.27E 09	2.81E 09	0.00E-01	4.19E 08	0.00E-01
CS 137	8.72E 09	3.70E 08	6.17E 10	5.91E 10	1.93E 10	0.00E-01	6.93E 09	0.00E-01
BA 140	5.23E 05	4.54E 05	8.96E 06	7.85E 03	2.56E 03	0.00E-01	4.68E 03	0.00E-01
CE 141	1.17E 02	9.81E 05	1.53E 03	7.36E 02	3.45E 02	0.00E-01	0.00E-01	0.00E-01
CE 144	6.24E 03	9.55E 06	1.17E 05	3.66E 04	2.03E 04	0.00E-01	0.00E-01	0.00E-01
HF 181	3.04E 02	4.99E 04	3.02E 03	1.17E 01	9.43E 00	9.89E 00	0.00E 01	0.00E 01
AM 241	3.06E 05	2.29E 05	4.08E 06	3.50E 06	1.87E 06	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m\*\*3 for inhalation and tritium, and in units of M\*\*2-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-15 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Goat Milk

AGE GROUP - Infant

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	4.90E 03	4.90E 03	0.00E-01	4.90E 03	4.90E 03	4.90E 03	4.90E 03	4.90E 03
P 32	4.88E 09	1.70E 09	1.26E 11	7.40E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	1.17E 04	3.42E 05	0.00E-01	0.00E-01	1.67E 03	7.65E 03	1.49E 04	0.00E-01
MN 54	6.45E 05	1.04E 06	0.00E-01	2.84E 06	6.30E 05	0.00E-01	0.00E-01	0.00E-01
FE 59	1.20E 06	1.45E 06	1.74E 06	3.04E 06	0.00E-01	0.00E-01	9.00E 05	0.00E-01
CO 58	4.31E 06	4.31E 06	0.00E-01	1.73E 06	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO 60	1.55E 07	1.56E 07	0.00E-01	6.16E 06	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN 65	7.36E 08	1.35E 09	4.66E 08	1.60E 09	7.74E 08	0.00E-01	0.00E-01	0.00E-01
RB 86	8.23E 08	4.26E 07	0.00E-01	1.67E 09	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	4.55E 08	3.26E 08	1.59E 10	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 90	4.30E 10	2.11E 09	1.69E 11	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y 91	1.39E 02	3.75E 05	5.25E 03	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR 95	8.41E 01	5.90E 04	4.85E 02	1.19E 02	1.28E 02	0.00E-01	0.00E-01	0.00E-01
NB 95	1.02E 04	1.48E 07	4.27E 04	1.76E 04	1.26E 04	0.00E-01	0.00E-01	0.00E-01
RU 103	2.09E 02	7.60E 03	6.25E 02	0.00E-01	1.30E 03	0.00E-01	0.00E-01	0.00E-01
RU 106	1.77E 03	1.07E 05	1.41E 04	0.00E-01	1.67E 04	0.00E-01	0.00E-01	0.00E-01
AG110M	1.43E 07	1.12E 09	2.95E 07	2.16E 07	3.08E 07	0.00E-01	0.00E-01	0.00E-01
SN 113	6.66E 05	1.37E 06	6.46E 05	2.45E 04	1.32E 04	9.34E 03	0.00E 01	0.00E 01
TE127M	4.51E 06	1.50E 07	3.72E 07	1.23E 07	9.16E 07	1.08E 07	0.00E-01	0.00E-01
TE129M	6.69E 06	2.59E 07	4.34E 07	1.49E 07	1.09E 08	1.67E 07	0.00E-01	0.00E-01
I 131	1.11E 09	8.99E 07	2.14E 09	2.52E 09	2.94E 09	8.28E 11	0.00E-01	0.00E-01
I 132	8.28E-01	1.88E 00	1.15E 00	2.33E 00	2.59E 00	1.09E 02	0.00E-01	0.00E-01
I 133	1.27E 07	7.31E 06	2.97E 07	4.32E 07	5.08E 07	7.86E 09	0.00E-01	0.00E-01
I 135	7.11E 04	7.06E 04	9.81E 04	1.95E 05	2.17E 05	1.75E 07	0.00E-01	0.00E-01
CS 134	1.26E 10	3.38E 08	6.68E 10	1.25E 11	3.21E 10	0.00E-01	1.31E 10	0.00E-01
CS 136	4.11E 09	1.67E 08	3.75E 09	1.10E 10	4.39E 09	0.00E-01	8.98E 08	0.00E-01
CS 137	8.17E 09	3.61E 08	9.85E 10	1.15E 11	3.10E 10	0.00E-01	1.25E 10	0.00E-01
BA 140	9.50E 05	4.53E 06	1.84E 07	1.84E 04	4.38E 03	0.00E-01	1.13E 04	0.00E-01
CE 141	2.24E 02	9.85E 05	3.13E 03	1.91E 03	5.88E 02	0.00E-01	0.00E-01	0.00E-01
CE 144	9.39E 03	9.61E 06	1.67E 05	6.86E 04	2.77E 04	0.00E-01	0.00E-01	0.00E-01
HF 181	5.08E 02	4.72E 04	5.74E 03	2.71E 01	1.58E 01	2.30E 01	0.00E 01	0.00E 01
AM 241	3.26E 05	2.30E 05	4.38E 06	3.80E 06	1.97E 06	0.00E 01	0.00E 01	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-arem/yr per micro-Ci/sec for all others.

TABLE 3.3-16 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Inhal

AGE GROUP - Adult

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	1.26E 03	1.26E 03	0.00E-01	1.26E 03	1.26E 03	1.26E 03	1.26E 03	1.26E 03
P 32	5.00E 04	8.63E 04	1.32E 06	7.70E 04	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	9.99E 01	3.32E 03	0.00E-01	0.00E-01	2.28E 01	5.94E 01	1.44E 04	0.00E-01
MN 54	6.29E 03	7.72E 04	0.00E-01	3.95E 04	9.83E 03	0.00E-01	1.40E 06	0.00E-01
FE 59	1.05E 04	1.88E 05	1.17E 04	2.77E 04	0.00E-01	0.00E-01	1.01E 06	0.00E-01
CO 58	2.07E 03	1.06E 05	0.00E-01	1.58E 03	0.00E-01	0.00E-01	9.27E 05	0.00E-01
CO 60	1.48E 04	2.84E 05	0.00E-01	1.15E 04	0.00E-01	0.00E-01	5.96E 06	0.00E-01
ZN 65	4.65E 04	5.34E 04	3.24E 04	1.03E 05	6.89E 04	0.00E-01	8.63E 05	0.00E-01
RB 86	5.89E 04	1.66E 04	0.00E-01	1.35E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	8.71E 03	3.49E 05	3.04E 05	0.00E-01	0.00E-01	0.00E-01	1.40E 06	0.00E-01
SR 90	6.09E 06	7.21E 05	9.91E 07	0.00E-01	0.00E-01	0.00E-01	9.59E 06	0.00E-01
Y 91	1.24E 04	3.84E 05	4.62E 05	0.00E-01	0.00E-01	0.00E-01	1.70E 06	0.00E-01
ZR 95	2.32E 04	1.50E 05	1.07E 05	3.44E 04	5.41E 04	0.00E-01	1.77E 06	0.00E-01
NB 95	4.20E 03	1.04E 05	1.41E 04	7.80E 03	7.72E 03	0.00E-01	5.04E 05	0.00E-01
RU 103	6.57E 02	1.10E 05	1.53E 03	0.00E-01	5.82E 03	0.00E-01	5.04E 05	0.00E-01
RU 106	8.71E 03	9.11E 05	6.90E 04	0.00E-01	1.33E 05	0.00E-01	9.35E 06	0.00E-01
AG110M	5.94E 03	3.02E 05	1.08E 04	9.99E 03	1.97E 04	0.00E-01	4.63E 06	0.00E-01
SN 113	6.48E 03	2.48E 04	6.87E 03	2.66E 02	1.97E 02	9.33E 01	2.99E 05	0.00E 01
TE127M	1.57E 03	1.49E 05	1.26E 04	5.76E 03	4.57E 04	3.28E 03	9.59E 05	0.00E-01
TE129M	1.58E 03	3.83E 05	9.75E 03	4.67E 03	3.65E 04	3.44E 03	1.16E 06	0.00E-01
I 131	2.05E 04	6.27E 03	2.52E 04	3.57E 04	6.12E 04	1.19E 07	0.00E-01	0.00E-01
I 132	1.16E 03	4.06E 02	1.16E 03	3.25E 03	5.18E 03	1.14E 05	0.00E-01	0.00E-01
I 133	4.51E 03	8.87E 03	8.63E 03	1.48E 04	2.58E 04	2.15E 06	0.00E-01	0.00E-01
I 135	2.56E 03	5.24E 03	2.68E 03	6.97E 03	1.11E 04	4.47E 05	0.00E-01	0.00E-01
CS 134	7.27E 05	1.04E 04	3.72E 05	8.47E 05	2.87E 05	0.00E-01	9.75E 04	0.00E-01
CS 136	1.10E 05	1.17E 04	3.90E 04	1.46E 05	8.55E 04	0.00E-01	1.20E 04	0.00E-01
CS 137	4.27E 05	8.39E 03	4.78E 05	6.20E 05	2.22E 05	0.00E-01	7.51E 04	0.00E-01
BA 140	2.56E 03	2.18E 05	3.90E 04	4.90E 01	1.67E 01	0.00E-01	1.27E 06	0.00E-01
CE 141	1.53E 03	1.20E 05	1.99E 04	1.35E 04	6.25E 03	0.00E-01	3.61E 05	0.00E-01
CE 144	1.84E 05	8.15E 05	3.43E 06	1.43E 06	8.47E 05	0.00E-01	7.76E 06	0.00E-01
HF 181	5.16E 03	1.29E 05	4.56E 04	2.57E 02	2.15E 02	1.63E 02	5.99E 05	0.00E 01
AM 241	5.37E 08	3.68E 05	1.34E 10	9.04E 09	4.03E 09	0.00E 01	4.85E 08	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.



TABLE 3.3-17 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY = Inhal

AGE GROUP = Teen

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	1.27E 03	1.27E 03	0.00E-01	1.27E 03	1.27E 03	1.27E 03	1.27E 03	1.27E 03
P 32	7.15E 04	9.27E 04	1.89E 06	1.09E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	1.35E 02	3.00E 03	0.00E-01	0.00E-01	3.07E 01	7.49E 01	2.09E 04	0.00E-01
MN 54	8.39E 03	6.67E 04	0.00E-01	5.10E 04	1.27E 04	0.00E-01	1.98E 06	0.00E-01
FE 59	1.43E 04	1.78E 05	1.59E 04	3.69E 04	0.00E-01	0.00E-01	1.53E 06	0.00E-01
CO 58	2.77E 03	9.51E 04	0.00E-01	2.07E 03	0.00E-01	0.00E-01	1.34E 06	0.00E-01
CO 60	1.98E 04	2.59E 05	0.00E-01	1.51E 04	0.00E-01	0.00E-01	8.71E 06	0.00E-01
ZN 65	6.23E 04	4.66E 04	3.85E 04	1.33E 05	8.63E 04	0.00E-01	1.24E 06	0.00E-01
RB 86	8.39E 04	1.77E 04	0.00E-01	1.90E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	1.25E 04	3.71E 05	4.34E 05	0.00E-01	0.00E-01	0.00E-01	2.41E 06	0.00E-01
SR 90	6.67E 06	7.64E 05	1.08E 08	0.00E-01	0.00E-01	0.00E-01	1.65E 07	0.00E-01
Y 91	1.77E 04	4.08E 05	6.60E 05	0.00E-01	0.00E-01	0.00E-01	2.93E 06	0.00E-01
ZR 95	3.15E 04	1.49E 05	1.45E 05	4.58E 04	6.73E 04	0.00E-01	2.68E 06	0.00E-01
NB 95	5.66E 03	9.67E 04	1.85E 04	1.03E 04	9.99E 03	0.00E-01	7.50E 05	0.00E-01
RU 103	8.95E 02	1.09E 05	2.10E 03	0.00E-01	7.42E 03	0.00E-01	7.82E 05	0.00E-01
RU 106	1.24E 04	9.59E 05	9.83E 04	0.00E-01	1.90E 05	0.00E-01	1.61E 07	0.00E-01
AG110M	7.98E 03	2.72E 05	1.38E 04	1.31E 04	2.50E 04	0.00E-01	6.74E 06	0.00E-01
SN 113	8.69E 03	2.03E 04	8.19E 03	3.45E 02	2.46E 02	1.13E 02	4.27E 05	0.00E 01
TE127M	2.18E 03	1.59E 05	1.80E 04	8.15E 03	6.53E 04	4.38E 03	1.65E 06	0.00E-01
TE129M	2.24E 03	4.04E 05	1.39E 04	6.57E 03	5.18E 04	4.57E 03	1.97E 06	0.00E-01
I 131	2.64E 04	6.48E 03	3.54E 04	4.90E 04	8.39E 04	1.46E 07	0.00E-01	0.00E-01
I 132	1.57E 03	1.27E 03	1.59E 03	4.37E 03	6.91E 03	1.51E 05	0.00E-01	0.00E-01
I 133	6.21E 03	1.03E 04	1.21E 04	2.05E 04	3.59E 04	2.92E 06	0.00E-01	0.00E-01
I 135	3.48E 03	6.94E 03	3.69E 03	9.43E 03	1.49E 04	6.20E 05	0.00E-01	0.00E-01
CS 134	5.48E 05	9.75E 03	5.02E 05	1.13E 06	3.75E 05	0.00E-01	1.46E 05	0.00E-01
CS 136	1.37E 05	1.09E 04	5.14E 04	1.93E 05	1.10E 05	0.00E-01	1.77E 04	0.00E-01
CS 137	3.11E 05	8.48E 03	6.69E 05	8.47E 05	3.04E 05	0.00E-01	1.21E 05	0.00E-01
BA 140	3.51E 03	2.28E 05	5.46E 04	6.69E 01	2.28E 01	0.00E-01	2.03E 06	0.00E-01
CE 141	2.16E 03	1.26E 05	2.84E 04	1.89E 04	8.87E 03	0.00E-01	6.13E 05	0.00E-01
CE 144	2.62E 05	8.63E 05	4.88E 06	2.02E 06	1.21E 06	0.00E-01	1.33E 07	0.00E-01
HF 181	7.05E 03	1.21E 05	6.32E 04	3.48E 02	2.90E 02	2.12E 02	9.39E 05	0.00E 01
AM 241	5.68E 08	3.90E 05	1.42E 10	9.60E 09	4.26E 09	0.00E 01	8.40E 08	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-18 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Inhal

AGE GROUP - Child

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	1.12E 03	1.12E 03	0.00E-01	1.12E 03	1.12E 03	1.12E 03	1.12E 03	1.12E 03
P 32	9.86E 04	4.21E 04	2.60E 06	1.14E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	1.54E 02	1.08E 03	0.00E-01	0.00E-01	2.43E 01	8.53E 01	1.70E 04	0.00E-01
MN 54	9.50E 03	2.29E 04	0.00E-01	4.29E 04	1.00E 04	0.00E-01	1.57E 06	0.00E-01
FE 59	1.67E 04	7.06E 04	2.07E 04	3.34E 04	0.00E-01	0.00E-01	1.27E 06	0.00E-01
CO 58	3.16E 03	3.43E 04	0.00E-01	1.77E 03	0.00E-01	0.00E-01	1.10E 06	0.00E-01
CO 60	2.26E 04	9.61E 04	0.00E-01	1.31E 04	0.00E-01	0.00E-01	7.06E 06	0.00E-01
ZN 65	7.02E 04	1.63E 04	4.25E 04	1.13E 05	7.13E 04	0.00E-01	9.94E 05	0.00E-01
RB 86	1.14E 05	7.98E 03	0.00E-01	1.98E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	1.72E 04	1.67E 05	5.99E 05	0.00E-01	0.00E-01	0.00E-01	2.15E 06	0.00E-01
SR 90	6.43E 06	3.43E 05	1.01E 08	0.00E-01	0.00E-01	0.00E-01	1.47E 07	0.00E-01
Y 91	2.43E 04	1.84E 05	9.13E 05	0.00E-01	0.00E-01	0.00E-01	2.62E 06	0.00E-01
ZR 95	3.69E 04	6.10E 04	1.90E 05	4.17E 04	5.95E 04	0.00E-01	2.23E 06	0.00E-01
NB 95	6.54E 03	3.69E 04	2.35E 04	9.16E 03	8.61E 03	0.00E-01	6.13E 05	0.00E-01
RU 103	1.07E 03	4.47E 04	2.79E 03	0.00E-01	7.02E 03	0.00E-01	6.61E 05	0.00E-01
RU 106	1.69E 04	4.29E 05	1.36E 05	0.00E-01	1.84E 05	0.00E-01	1.43E 07	0.00E-01
AG110M	9.13E 03	1.00E 05	1.68E 04	1.14E 04	2.12E 04	0.00E-01	5.47E 06	0.00E-01
SN 113	9.84E 03	7.45E 03	9.01E 03	2.91E 02	2.03E 02	1.19E 02	3.40E 05	0.00E 01
TE127M	3.01E 03	7.13E 04	2.48E 04	8.53E 03	6.35E 04	6.06E 03	1.48E 06	0.00E-01
TE129M	3.04E 03	1.81E 05	1.92E 04	6.84E 03	5.02E 04	6.32E 03	1.76E 06	0.00E-01
I 131	2.72E 04	2.84E 03	4.80E 04	4.80E 04	7.87E 04	1.62E 07	0.00E-01	0.00E-01
I 132	1.87E 03	3.20E 03	2.11E 03	4.06E 03	6.24E 03	1.93E 05	0.00E-01	0.00E-01
I 133	7.68E 03	5.47E 03	1.66E 04	2.03E 04	3.37E 04	3.84E 06	0.00E-01	0.00E-01
I 135	4.14E 03	4.43E 03	4.91E 03	8.72E 03	1.34E 04	7.91E 05	0.00E-01	0.00E-01
CS 134	2.24E 05	3.84E 03	6.50E 05	1.01E 06	3.30E 05	0.00E-01	1.21E 05	0.00E-01
CS 136	1.16E 05	4.17E 03	6.50E 04	1.71E 05	9.53E 04	0.00E-01	1.45E 04	0.00E-01
CS 137	1.28E 05	3.61E 03	9.05E 05	8.24E 05	2.82E 05	0.00E-01	1.04E 05	0.00E-01
BA 140	4.32E 03	1.02E 05	7.39E 04	6.47E 01	2.11E 01	0.00E-01	1.74E 06	0.00E-01
CE 141	2.89E 03	5.65E 04	3.92E 04	1.95E 04	8.53E 03	0.00E-01	5.43E 05	0.00E-01
CE 144	3.61E 05	3.88E 05	6.76E 06	2.11E 06	1.17E 06	0.00E-01	1.19E 07	0.00E-01
HF 181	8.50E 03	5.31E 04	8.44E 04	3.28E 02	2.64E 02	2.76E 02	7.95E 05	0.00E 01
AM 241	4.59E 08	1.75E 05	1.10E 10	6.81E 09	2.82E 09	0.00E 01	7.47E 08	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m\*\*3 for inhalation and tritium, and in units of M\*\*2-mrem/yr per micro-Ci/sec for all others.

TABLE 3.3-19 R VALUES FOR THE BRUNSWICK STEAM ELECTRIC PLANT\*

PATHWAY - Inhal

AGE GROUP - Infant

Nuclide	T. Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
H 3	6.46E 02	6.46E 02	0.00E-01	6.46E 02	6.46E 02	6.46E 02	6.46E 02	6.46E 02
P 32	7.73E 04	1.61E 04	2.03E 06	1.12E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR 51	8.93E 01	3.56E 02	0.00E-01	0.00E-01	1.32E 01	5.75E 01	1.28E 04	0.00E-01
MN 54	4.98E 03	7.05E 03	0.00E-01	2.53E 04	4.98E 03	0.00E-01	9.98E 05	0.00E-01
FE 59	9.46E 03	2.47E 04	1.35E 04	2.35E 04	0.00E-01	0.00E-01	1.01E 06	0.00E-01
CO 58	1.82E 03	1.11E 04	0.00E-01	1.22E 03	0.00E-01	0.00E-01	7.76E 05	0.00E-01
CO 60	1.18E 04	3.19E 04	0.00E-01	8.01E 03	0.00E-01	0.00E-01	4.50E 06	0.00E-01
ZN 65	3.10E 04	5.13E 04	1.93E 04	6.25E 04	3.24E 04	0.00E-01	6.46E 05	0.00E-01
RB 86	8.81E 04	3.03E 03	0.00E-01	1.90E 05	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR 89	1.14E 04	6.39E 04	3.97E 05	0.00E-01	0.00E-01	0.00E-01	2.03E 06	0.00E-01
SR 90	2.59E 06	1.31E 05	4.08E 07	0.00E-01	0.00E-01	0.00E-01	1.12E 07	0.00E-01
Y 91	1.57E 04	7.02E 04	5.87E 05	0.00E-01	0.00E-01	0.00E-01	2.45E 06	0.00E-01
ZR 95	2.03E 04	2.17E 04	1.15E 05	2.78E 04	3.10E 04	0.00E-01	1.75E 06	0.00E-01
NB 95	3.77E 03	1.27E 04	1.57E 04	6.42E 03	4.71E 03	0.00E-01	4.78E 05	0.00E-01
RU 103	6.78E 02	1.61E 04	2.01E 03	0.00E-01	4.24E 03	0.00E-01	5.51E 05	0.00E-01
RU 106	1.09E 04	1.64E 05	8.67E 04	0.00E-01	1.06E 05	0.00E-01	1.15E 07	0.00E-01
AG110M	4.99E 03	3.30E 04	9.97E 03	7.21E 03	1.09E 04	0.00E-01	3.66E 06	0.00E-01
SN 113	4.89E 03	2.29E 03	4.68E 03	1.74E 02	9.94E 01	6.73E 01	2.30E 05	0.00E 01
TE127M	2.07E 03	2.73E 04	1.66E 04	6.89E 03	3.75E 04	4.86E 03	1.31E 06	0.00E-01
TE129M	2.22E 03	6.89E 04	1.41E 04	6.08E 03	3.17E 04	5.47E 03	1.68E 06	0.00E-01
I 131	1.96E 04	1.06E 03	3.79E 04	4.43E 04	5.17E 04	1.48E 07	0.00E-01	0.00E-01
I 132	1.26E 03	1.90E 03	1.69E 03	3.54E 03	3.94E 03	1.69E 05	0.00E-01	0.00E-01
I 133	5.59E 03	2.15E 03	1.32E 04	1.92E 04	2.24E 04	3.55E 06	0.00E-01	0.00E-01
I 135	2.77E 03	1.83E 03	3.86E 03	7.59E 03	8.46E 03	6.95E 05	0.00E-01	0.00E-01
CS 134	7.44E 04	1.33E 03	3.96E 05	7.02E 05	1.90E 05	0.00E-01	7.95E 04	0.00E-01
CS 136	5.28E 04	1.43E 03	4.82E 04	1.34E 05	5.63E 04	0.00E-01	1.17E 04	0.00E-01
CS 137	4.54E 04	1.33E 03	5.48E 05	6.11E 05	1.72E 05	0.00E-01	7.12E 04	0.00E-01
BA 140	2.89E 03	3.83E 04	5.59E 04	5.59E 01	1.34E 01	0.00E-01	1.59E 06	0.00E-01
CE 141	1.99E 03	2.15E 04	2.77E 04	1.66E 04	5.24E 03	0.00E-01	5.16E 05	0.00E-01
CE 144	1.76E 05	1.48E 05	3.19E 06	1.21E 06	5.37E 05	0.00E-01	9.83E 06	0.00E-01
HF 181	5.05E 03	1.90E 04	5.65E 04	2.66E 02	1.59E 02	2.26E 02	6.73E 05	0.00E 01
AM 241	1.83E 08	6.69E 04	4.41E 09	2.73E 09	1.11E 09	0.00E 01	5.68E 08	0.00E 01

\*R Values in units of mrem/yr per micro-Ci/m<sup>3</sup> for inhalation and tritium, and in units of M<sup>2</sup>-mrem/yr per micro-Ci/sec for all others.

LIST OF TABLES

<u>Table No.</u>	<u>Title</u>	<u>Page</u>
APPENDIX C		
C-1	PARAMETERS FOR COW AND GOAT MILK PATHWAYS . . . . .	C-14
C-2	PARAMETERS FOR THE MEAT PATHWAY . . . . .	C-15
C-3	PARAMETERS FOR VEGETABLE PATHWAY . . . . .	C-16

## APPENDIX C

### DOSE PARAMETERS FOR RADIOIODINES, PARTICULATES AND TRITIUM

This appendix contains the methodology which was used to calculate the dose parameters for radioiodines, particulates, and tritium to show compliance with 10CFR 20 and Appendix I of 10CFR50 for gaseous effluents. These dose parameters  $P_i$  and  $R_i$  were calculated using the methodology outlined in NUREG 0133, Regulatory Guide 1.109 Revision 1, and letter to J. W. Davis, "Dose Factors for Hf-181 and SN-113", BSEP File: B10-10530, May 24, 1988. The following sections provide the specific methodology which was utilized in calculating the  $P_i$  and  $R_i$  values for the various exposure pathways.

#### C.1 CALCULATION OF $P_i$

The parameter  $P_i$  contained in the radioiodine and particulate portion of Section 3.2, includes pathway transport parameters of the  $i$ th radionuclide, the receptor's usage of the pathway media and the dosimetry of the exposure. Pathway usage rates and the internal dosimetry are functions of the receptor's age; however, the youngest age group, the infant, will always receive the maximum dose under the exposure conditions for Technical Specification, 3.11.2.1(b). For the infant exposure, separate values of  $P_i$  may be calculated for the inhalation pathway which is combined with a  $W$  parameter based on  $(\chi/Q)$ , and the food (milk) and ground pathway which is combined with a  $W$  parameter normally based on  $(D/Q)$ , except for tritium. The following sections provide in detail the methodology which was used in calculating the  $P_i$  values for inclusion into this ODCM.

##### C.1.1 INHALATION PATHWAY

$$P_{iI} = K' (BR) DFA_i \quad (C.1-1)$$

where:

- |          |   |   |
|----------|---|---|
| $P_{iI}$ | - | dose parameter for radionuclide $i$ for the inhalation pathway, mrem/yr per $\mu\text{Ci}/\text{m}^3$ |
| $K'$     | - | a constant of unit conversion   |
|          | - | $10^6 \text{ pCi}/\mu\text{Ci}$   |
| $BR$     | - | the breathing rate of the infant age group, $\text{m}^3/\text{yr}$                                    |
| $DFA_i$  | - | the maximum organ inhalation dose factor for the infant age group for radionuclide $i$ , mrem/pCi     |



The age group considered is the infant group. The infant's breathing rate is taken as 1400 m<sup>3</sup>/yr from Table E-5 of Regulatory Guide 1.109 Revision 1. The inhalation dose factors for the infant, DFA<sub>i</sub>, are presented in Table E-10 of Regulatory Guide 1.109, BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241, in units of mrem/pCi. The total body is considered as an organ in the selection of DFA<sub>i</sub>.

The incorporation of breathing rate of an infant and the unit conversion factor results in the following:

$$P_{I_I} = 1.4 \times 10^8 DFA_i \quad (C.1-2)$$

#### C.1.2 Ground Plane Pathway

$$P_{I_G} = K'K''DFG_i (1 - e^{-\lambda_i t}) / \lambda_i \quad (C.1-3)$$

where:

- $P_{I_G}$  - Dose parameter for radionuclide i for the ground plane pathway, mrem/yr per  $\mu\text{Ci/sec per m}^{-2}$
- $K'$  - A constant of unit conversion  
-  $10^6 \text{pCi}/\mu\text{Ci}$
- $K''$  - A constant of unit conversion  
- 8760 hr/yr
- $\lambda_i$  - The radiological decay constant for radionuclide i,  $\text{sec}^{-1}$
- $t$  - The exposure period  
-  $3.15 \times 10^7 \text{ sec (1 year)}$
- $DFG_i$  - The ground plane dose conversion factor for radionuclide i, mrem/hr per  $\text{pCi/m}^2$

The deposition rate onto the ground plane results in a ground plane concentration that is assumed to persist over a year with radiological decay the only operating removal mechanism for each radionuclide. The ground plane dose conversion factors for radionuclide i, DFG<sub>i</sub>, are presented in Table E-6 of Regulatory Guide 1.109, Revision 1, BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241.

Resolution of the units yields:

$$P_{jG} = 8.76 \times 10^9 DFG_j (1 - e^{-\lambda_j t}) / \lambda_j \quad (C.1-4)$$

### C.1.3 Milk

$$P_{jM} = \frac{K' r Q_F (U_{sp}) F_m}{Y_p (\lambda_j + \lambda_w)} DFL_j e^{-\lambda_j t} \quad (C.1-5)$$

where:

- $P_{jM}$  - Dose parameter for radionuclide i for the cow milk or goat milk pathway, mrem/yr per  $\mu\text{Ci/sec per m}^2$
- $K'$  - A constant of unit conversion  
 $- 10^6 \text{ pCi}/\mu\text{Ci}$
- $Q_F$  - The cow's or goat's consumption rate of feed, kg/day (wet weight)
- $U_{sp}$  - The infant's milk consumption rate, liters/yr
- $Y_p$  - The agricultural productivity by unit area, kg/m<sup>2</sup>
- $F_m$  - The stable element transfer coefficient, pCi/liter per pCi/day
- $r$  - Fraction of deposited activity retained on cow's or goat's feed grass
- $DFL_j$  - The maximum organ ingestion dose factor for radionuclide i, mrem/pCi
- $\lambda_j$  - The radiological decay constant for radionuclide i, sec<sup>-1</sup>
- $\lambda_w$  - The decay constant for removal of activity on leaf and plant surfaces by weathering, sec<sup>-1</sup>  
 $- 5.73 \times 10^{-7} \text{ sec}^{-1}$  (corresponding to a 14 day half-life)
- $t_f$  - The transport time from pasture to cow or goat to milk to infant, sec

A fraction of the airborne deposition is captured by the ground plant vegetation cover. The captured material is removed from the vegetation (grass) by both radiological decay and weathering processes.

Various parameters which were utilized to determine the  $P_i$  values for the cow and goat milk pathways are provided in Table C-1. Table E-1 of Regulatory Guide 1.109, Revision 1, provides the stable element transfer coefficients,  $F_m$ , and Table E-14 of the same regulatory guide provides the ingestion dose factors,  $DFL_i$ , BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241, for the infant's organs. The organ with the maximum value of  $DFL_i$  was used in the determination of  $P_i$  for this pathway. The incorporation of the various constants of Table C-1 into Equation C.1-5 results in the following:

For cow's milk for radioiodines and particulates:

$$P_{iM} = 2.4 \times 10^{10} \frac{IF_m}{\lambda_i + \lambda_w} DFL_i e^{-\lambda_i t_i} \quad (C.1-6)$$

For the goat milk pathway for radioiodines and particulates:

$$P_{iM} = 2.8 \times 10^9 \frac{IF_m}{\lambda_i + \lambda_w} DFL_i e^{-\lambda_i t_i} \quad (C.1-7)$$

For tritium, the concentration of tritium in milk is based on its airborne concentration rather than the deposition rate.

$$P_{TM} = K'K''F_m Q_F U_{sp} DFL_T 0.75 (0.5/H) \quad (C.1-8)$$

where:

- $P_{TM}$  = Dose parameter for tritium for the cow milk and goat milk pathways, mrem/yr per  $\mu\text{Ci}/\text{m}^3$
- $K''$  = A constant of unit conversion
- =  $10^3 \text{ gm/kg}$
- $H$  = Absolute humidity of the atmosphere,  $\text{gm}/\text{m}^3$
- 0.75 = The fraction of total feed that is water
- 0.5 = The ratio of the specific activity of the feed grass water to the atmospheric water
- $DFL_T$  = Maximum organ ingestion dose factor for tritium, mrem/pCi

## C.2 Calculation of $R_i$

The Radioiodine and Particulate Technical Specification, 3.11.2.3 is applicable to the location in the unrestricted area where the combination of existing pathways and receptor age groups indicates the maximum potential exposure occurs. The inhalation and ground plane exposure pathways shall be considered to exist at all locations. The grass-goat-milk, the grass-cow-milk, grass-cow-meat, and vegetation pathways are considered based on their existence at the various locations.  $R_i$  values have been calculated for the adult, teen, child, and infant age groups for the ground plane, cow milk, goat milk, vegetable and beef ingestion pathways. The methodology which was utilized to calculate these values is presented below.

### C.2.1 Inhalation Pathway

$$R_{iI} = K' (BR)_a (DFA_i)_a \quad (C.2-1)$$

where:

- $R_{iI}$  - Dose factor for each identified radionuclide  $i$  of the organ of interest, mrem/yr per  $\mu\text{Ci}/\text{m}^3$
- $K'$  - A constant of unit conversion
  - $10^6 \text{ pCi}/\mu\text{Ci}$
- $(BR)_a$  - Breathing rate of the receptor of age group  $a$ ,  $\text{m}^3/\text{yr}$
- $(DFA_i)_a$  - Organ inhalation dose factor for radionuclide  $i$  for the receptor of age group  $a$ , mrem/pCi

The breathing rates (BR)<sub>a</sub> for the various age groups are tabulated below, as given in Table E-5 of the Regulatory Guide 1.109, Revision 1.

Age Group (a)	Breathing Rate (m <sup>3</sup> /yr)
Infant	1400
Child	3700
Teen	8000
Adult	8000

Inhalation dose factors (DFA<sub>i</sub>)<sub>a</sub> for the various age groups are given in Tables E-7 through E-10 of Regulatory Guide 1.109, Revision 1, BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241.

#### C.2.2 Ground Plane Pathway

$$R_{iG} = I_i K' K'' (SF) DFG_i (1 - e^{-\lambda_i t}) / \lambda_i \quad (C.2-2)$$

where:

- $R_{iG}$  - Dose factor for the ground plane pathway for each identified radionuclide  $i$  for the organ of interest, mrem/yr per  $\mu$ Ci/sec per m<sup>-2</sup>
- $K'$  - A constant of unit conversion  
-  $10^6$  pCi/uCi
- $K''$  - A constant of unit conversion  
- 8760 hr/year
- $\lambda_i$  - The radiological decay constant for radionuclide  $i$ , sec<sup>-1</sup>
- $t$  - The exposure time, sec  
-  $4.73 \times 10^8$  sec (15 years)
- $DFG_i$  - The ground plane dose conversion factor for radionuclide  $i$ ; mrem/hr per pCi/m<sup>2</sup>

- SF - The shielding factor (dimensionless)
- $I_i$  - Factor to account for fractional deposition of radionuclide i

For radionuclides other than iodine, the factor  $I_i$  is equal to one. For radioiodines, the value of  $I_i$  may vary. However, a value of 1.0 was used in calculating the R values in Table 3.3-2.

A shielding factor of 0.7 is suggested in Table E-15 of Regulatory Guide 1.109 Revision 1. A tabulation of DFG<sub>i</sub> values is presented in Table E-6 of Regulatory Guide 1.109, Revision 1.

### C.2.3 Grass-Cow or Goat-Milk Pathway

$$R_{iM} = I_i K' Q_F U_{ap} F_m (DFL_i) e^{-\lambda_i t_r} \left\{ f_p f_s \left[ \frac{r(1-e^{-\lambda_i t_s})}{Y_p \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P \lambda_i} \right] + (1-f_p f_s) \left[ \frac{r(1-e^{-\lambda_i t_s})}{Y_s \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P \lambda_i} \right] e^{-\lambda_i t_b} \right\} \quad (C.2-3)$$

where:

- $R_{iM}$  - Dose factor for the cow milk or goat milk pathway, for each identified radionuclide i for the organ of interest, mrem/yr per  $\mu\text{Ci/sec}$  per  $\text{m}^2$
- $K'$  - A constant of unit conversion  
 $10^6 \text{ pCi}/\mu\text{Ci}$
- $Q_F$  - The cow's or goat's feed consumption rate, kg/day (wet weight)
- $U_{ap}$  - The receptor's milk consumption rate for age group a, liters/yr
- $Y_p$  - The agricultural productivity by unit area of pasture feed grass,  $\text{kg}/\text{m}^2$
- $Y_s$  - The agricultural productivity by unit area of stored feed,  $\text{kg}/\text{m}^2$
- $F_m$  - The stable element transfer coefficients, pCi/liter per pCi/day

$r$	-	Fraction of deposited activity retained on cow's feed grass
$(DFL_i)_a$	-	The organ ingestion dose factor for radionuclide $i$ for the receptor in age group $a$ , mrem/pCi
$\lambda_{Bi}$	-	$\lambda_i + \lambda_w$
$\lambda_i$	-	The radiological decay constant for radionuclide $i$ , $\text{sec}^{-1}$
$\lambda_w$	-	The decay constant for removal of activity on leaf and plant surfaces by weathering, $\text{sec}^{-1}$
	-	$5.73 \times 10^{-7} \text{ sec}^{-1}$ (corresponding to a 14 day half-life)
$t_f$	-	The transport time from feed to cow or goat to milk, to receptor, sec
$t_h$	-	The transport time from harvest to cow or goat consumption, sec
$t_b$	-	Period of time that soil is exposed to gaseous effluents, sec
$B_{iv}$	-	Concentration factor for uptake of radionuclide $i$ from the soil by the edible parts of crops, pCi/Kg (wet weight) per pCi/Kg (dry soil)
$P$	-	Effective surface density for soil, Kg (dry soil)/ $\text{m}^2$
$f_p$	-	Fraction of the year that the cow or goat is on pasture
$f_s$	-	Fraction of the cow feed that is pasture grass while the cow is on pasture
$t_e$	-	Period of pasture grass and crop exposure during the growing season, sec
$I_i$	-	Factor to account for fractional deposition of radionuclide $i$

For radionuclides other than iodine, the factor  $I_i$  is equal to one. For radioiodines, the value of  $I_i$  may vary. However, a value of 1.0 was used in calculating the R values Tables 3.3-9 through 3.3-16.

Milk cattle and goats are considered to be fed from two potential sources, pasture grass and stored feeds. Following the development in Regulatory Guide 1.109, Revision 1, the value of  $f_s$  was considered unity in lieu of site-specific information. The value of  $f_p$  was 0.667 based upon an 8-month grazing period.

Table C-1 contains the appropriate parameter values and their source in Regulatory Guide 1.109, Revision 1.

The concentration of tritium in milk is based on the airborne concentration rather than the deposition. Therefore, the  $R_i$  is based on  $X/Q$ :

$$R_{T_M} = K' K''' F_{\text{air}} Q_{\text{air}} U_{\text{air}} (DFL_i) e^{-0.75 \left( \frac{0.5}{H} \right)} \quad (\text{C.2-4})$$

where:

- $R_{T_M}$  = Dose factor for the cow or goat milk pathway for tritium for the organ of interest, mrem/yr per  $\mu\text{Ci}/\text{m}^3$
- $K' K'''$  = A constant unit of conversion
- $10^3 \text{ gm/kg}$
- $H$  = Absolute humidity of the atmosphere,  $\text{gm}/\text{m}^3$
- $0.75$  = The fraction of total feed that is water
- $0.5$  = The ratio of the specific activity of the feed grass water to the atmospheric water

And other parameters and values are give above. A value for  $H$  of 8 grams/meter<sup>3</sup>, was used in lieu of site-specific information.

#### C.2.4 Grass-Cow-Meat Pathway

The integrated concentration in meat follows in a similar manner to the development for the milk pathway, therefore:

$$R_{i_B} = I_i K' Q_{\text{air}} U_{\text{air}} F_{\text{air}} (DFL_i) e^{-\lambda_i t_e}$$

$$\left\{ f_p f_s \left[ \frac{I (1 - e^{-\lambda_{s_i} t_e})}{Y_p \lambda_{s_i}} + \frac{B_{i_v} (1 - e^{-\lambda_{s_i} t_e})}{P \lambda_{s_i}} \right] + (1 - f_p f_s) \left[ \frac{I (1 - e^{-\lambda_{s_i} t_e})}{Y_s \lambda_{s_i}} + \frac{B_{i_v} (1 - e^{-\lambda_{s_i} t_e})}{P \lambda_{s_i}} \right] e^{-\lambda_{s_i} t_b} \right\} \quad (\text{C.2-5})$$

where:

- $R_{i_B}$  = Dose factor for the meat ingestion pathway for radionuclide  $i$  for any organ of interest, mrem/yr per  $\mu\text{Ci}/\text{sec}$  per  $\text{m}^{-2}$
- $F_{\text{air}}$  = The stable element transfer coefficients,  $\text{pCi}/\text{Kg}$  per  $\text{pCi}/\text{day}$



- $U_{ap}$  - The receptor's meat consumption rate for age group a, kg/yr  
 $t_s$  - The transport time from slaughter to consumption, sec  
 $t_h$  - The transport time from harvest to animal consumption, sec  
 $t_e$  - Period of pasture grass and crop exposure during the growing season, sec  
 $I_i$  - Factor to account for fractional deposition of radionuclide i

For radionuclides other than iodine, the factor  $I_i$  is equal to one. For radioiodines, the value of  $I_i$  may vary. However, a value of 1.0 was used in calculating the R values in Tables 3.3-6 through 3.3-8.

All other terms remain the same as defined in Equation C.2-3. Table C-2 contains the values which were used in calculating  $R_i$  for the meat pathway.

The concentration of tritium in meat is based on its airborne concentration rather than the deposition. Therefore,  $R_i$  is based on  $X/Q$ .

$$R_{TB} = K' K''' F_f Q_p U_{ap} (DFL_i) \cdot 0.75 \left( \frac{0.5}{H} \right) \quad (C.2-6)$$

where:

$$R_{TB} = \text{Dose factor for the meat ingestion pathway for tritium for any organ of interest, mrem/yr per } \mu\text{Ci/m}^3$$

All other terms are defined in Equation C.2-4 and C.2-5, above.

#### C.2.5 Vegetation Pathway

The integrated concentration in vegetation consumed by man follows the expression developed in the derivation of the milk factor. Man is considered to consume two types of vegetation (fresh and stored) that differ only in the time period between harvest and consumption, therefore:

$$R_{iV} = I_i K' (DFL_i) \cdot \left\{ U_{afL} e^{-\lambda_i t_s} \left[ \frac{I(1-e^{-\lambda_i t_e})}{Y_i \lambda_{E_i}} + \frac{B_{iV}(1-e^{-\lambda_i t_s})}{P \lambda_i} \right] + U_{as} f_g e^{-\lambda_i t_h} \left[ \frac{I(1-e^{-\lambda_i t_e})}{Y_i \lambda_{E_i}} + \frac{B_{iV}(1-e^{-\lambda_i t_s})}{P \lambda_i} \right] \right\} \quad (C.2-7)$$

where:

$R_i$	-	Dose factor for vegetable pathway for radionuclide i for the organ of interest mrem/yr per $\mu\text{Ci}/\text{sec}$ per $\text{m}^{-2}$
$K'$	-	a constant of unit conversion
	-	$10^6 \text{ pCi}/\mu\text{Ci}$
$U_a^L$	-	The consumption rate of fresh leafy vegetation by the receptor in age group a, kg/yr
$U_a^S$	-	The consumption rate of stored vegetation by the receptor in age group a, kg/yr
$f_s$	-	The fraction of the annual intake of stored vegetation grown locally
$f_L$	-	The fraction of annual intake of fresh, leafy vegetables grown locally
$t_L$	-	The average time between harvest of leafy vegetation and its consumption, sec
$t_h$	-	The average time between harvest of stored vegetation and its consumption, sec
$Y_v$	-	The vegetation area density, $\text{kg}/\text{m}^2$
$t_e$	-	Period of leafy vegetable exposure during growing season, sec
$I_i$	-	Factor to account for fractional deposition of radionuclide i

For radionuclides other than iodine, the factor  $I_i$  is equal to one. For radioiodines, the value of  $I_i$  may vary. However, a value of 1.0 was used in Tables 3.3-3 through 3.3-5.

All other factors were defined above.

Table C-3 presents the appropriate parameter values and their course in Regulatory Guide 1.109, Revision 1.

In lieu of site-specific data default values for  $f_L$  and  $f_s$ , 1.0 and 0.76, respectively, were used in the calculation of  $R_i$ . These values were obtained from Table E-15 of Regulatory Guide 1.109, Revision 1.

The concentration of tritium in vegetation is based on the airborne concentration rather than the deposition. Therefore, the  $R_i$  is based on  $\chi/Q$ :

$$R_{TV} = K'K''' [U_e^L f_L + U_e^S f_g] (DFL_i) \approx 0.075 \left( \frac{0.5}{H} \right) \quad (C.2-8)$$

where:

$$R_{TV} = \text{Dose factor for the vegetable pathway for tritium for the organ of interest, mrem/yr per } \mu\text{Ci/m}^3$$

All other terms remain the same as those in Equations C.2-4 and C.2-7.

TABLE C-1

## PARAMETERS FOR COW AND GOAT MILK PATHWAYS

<u>Parameter</u>	<u>Value</u>	<u>Reference</u> (Reg. Guide 1.109, Rev. 1)
$Q_F$ (kg/day)	50 (cow) 6 (goat)	Table E-3 Table E-3
$Y_p$ (kg/m <sup>2</sup> )	0.7	Table E-15
$t_f$ (seconds)	$1.73 \times 10^5$ (2 days)	Table E-15
$r$	1.0 (radioiodines) 0.2 (particulates)	Table E-15 Table E-15
$(DFL_1)_A$ (mrem/pCi)	Each radionuclide	Tables E-11 to E-14*
$F_m$ (pCi/l per pCi/day)	Each stable element	Table E-1 (cow)* Table E-2 (goat)**
$t_b$ (seconds)	$4.73 \times 10^6$ (15 yr)	Table E-15
$Y_s$ (kg/m <sup>2</sup> )	2.0	Table E-15
$Y_p$ (kg/m <sup>2</sup> )	0.7	Table E-15
$t_h$ (seconds)	$7.78 \times 10^6$ (90 days)	Table E-15
$U_{sp}$ (liters/yr)	330 infant 330 child 400 teen 310 adult	Table E-5 Table E-5 Table E-5 Table E-5
$t_e$ (seconds)	$2.59 \times 10^6$ (pasture) $5.18 \times 10^6$ (stored feed)	Table E-15
$B_{iv}$ pCi/Kg (wet weight) per pCi/Kg (dry soil)	Each stable element	Table E-1
$P$ Kg (dry soil)/m <sup>2</sup>	240	Table E-15

\*Reference: BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241.

\*\*Where goat data was not available, cow value  $F_m$  was assumed.

TABLE C-2  
PARAMETERS FOR THE MEAT PATHWAY

<u>Parameter</u>	<u>Value</u>	<u>Reference</u> (Reg. Guide 1.109, Rev. 1)
r	1.0 (radioiodines) 0.2 (particulates)	Table E-15 Table E-15
$r_f$ (pCi/Kg per pCi/day)	Each stable element	Table E-1*
$U_{sp}$ (Kg/yr)	0 infant 41 child 65 teen 110 adult	Table E-5 Table E-5 Table E-5 Table E-5
$(DFL_i)_s$ (mrem/pCi)	Each radionuclide	Tables E-11 to E-14
$Y_p$ (kg/m <sup>2</sup> )	0.7	Table E-15
$Y_s$ (kg/m <sup>2</sup> )	2.0	Table E-15
$t_b$ (seconds)	$4.73 \times 10^8$ (15 yr)	Table E-15
$t_s$ (seconds)	$1.73 \times 10^6$ (20 days)	Table E-15
$t_h$ (seconds)	$7.78 \times 10^5$ (90 days)	Table E-15
$t_e$ (seconds)	$2.59 \times 10^6$ (pasture) $5.18 \times 10^6$ (stored feed)	Table E-15
$Q_f$ (kg/day)	50	Table E-3
$B_{iv}$ pCi/Kg (wet weight) per pCi/Kg (dry soil)	Each stable element	Table E-1*
P kg (dry soil)/m <sup>2</sup>	240	Table E-15

\*Reference: BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241.

TABLE C-3

## PARAMETERS FOR THE VEGETABLE PATHWAY

Parameter	Value	Reference (Reg. Guide 1.109, Rev. 1)
r (dimensionless)	1.0 (radioiodines) 0.2 (particulates)	Table E-1 Table E-1
(DFL <sub>1</sub> ) <sub>a</sub> (mrem/Ci)	Each radionuclide	Tables E-11 to E-14*
$U_a^L$ (kg/yr)		
-Infant	0	Table E-5
-Child	26	Table E-5
-Teen	42	Table E-5
-Adult	64	Table E-5
$U_a^S$ (kg/yr)		
-Infant	0	Table E-5
-Child	520	Table E-5
-Teen	630	Table E-5
-Adult	520	Table E-5
t <sub>L</sub> (seconds)	8.6 x 10 <sup>4</sup> (1 day)	Table E-15
t <sub>h</sub> (seconds)	5.18 x 10 <sup>6</sup> (60 days)	Table E-15
Y <sub>v</sub> (kg/m <sup>2</sup> )	2.0	Table E-15
t <sub>e</sub> (seconds)	5.18 x 10 <sup>6</sup> (60 days)	Table E-15
t <sub>b</sub> (seconds)	4.73 x 10 <sup>8</sup> (15 yr)	Table E-15
P (Kg[dry soil]/m <sup>2</sup> )	240	Table E-15
B <sub>iv</sub> (pCi/Kg[wet weight] per pCi/kg [dry soil])	Each stable element	Table E-1*

\*Reference: BSEP File: B10-10530, Letter to J. W. Davis "Dose Factors for Hf-181 and Sn-113," May 24, 1988, and NUREG CR4653 for AM-241.