



Carolina Power & Light Company

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

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BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & 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, 1993, through December 31, 1993.

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

Very truly yours,

J. Cowan
Acting Director - Site Operations

280049

SHC/shc (BSEP 94-0075.000)

Enclosure

cc: Mr. S. D. Ebnetter, Region II - Administrator
Mr. P. D. Milano, NRC/NRR Senior Project Manager - Brunswick
Mr. R. L. Prevatte, NRC Senior Resident Inspector - Brunswick

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PDR ADOCK 05000324
R PDR

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Brunswick Steam Electric Plant
Semiannual Radioactive Effluent Report
July 1, to December 31, 1993

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ATTACHMENT 1

Supplemental Information

July 1, to December 31, 1993

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: limit = 1 E-03 uCi/ml and
 - ** (2) Dissolved and entrained gases: limit = 2 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.

- 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:	2.27E+02
(2) Total time period for batch releases:	2.29E+04 Minutes
(3) Maximum time period for a batch release:	1.65E+02 Minutes
(4) Average time period for a batch release:	1.01E+02 Minutes
(5) Minimum time period for a batch release:	1.40E+01 Minutes
(6) Average stream flow during periods of release of effluent into a flowing stream :	6.01E+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 $1.67\text{E}+07$ gallons containing $1.31\text{E}+00$ 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.

ATTACHMENT 2

Effluent and Waste Disposal Data

Brunswick Steam Electric Plant

July 1, to December 31, 1993

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 1993
Gaseous Effluents - Summation of all Releases

	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>	<u>Est. Tot. Error %</u>
A. <u>FISSION AND ACTIVATION GASES</u>				
1. Total release	Ci	1.38E+02	1.06E+02	4.50E 01
2. Average release rate for period	uCi/sec	1.74E+01	1.33E+01	
3. Percent of technical specification limit	%	3.62E-02	2.16E-02	
B. <u>IODINES</u>				
1. Total I-131	Ci	1.37E-04	1.08E-04	3.50E 01
2. Average release rate for period	uCi/sec	1.72E-05	1.36E-05	
C. <u>PARTICULATES</u>				
1. Total release	Ci	7.57E-04	4.76E-03	3.50E 01
2. Average release rate for period	uCi/sec	9.52E-05	5.99E-04	
3. Gross alpha	Ci	1.17E-05	7.46E-06	
D. <u>Tritium</u>				
1. Total release	Ci	4.80E+00	1.34E+01	3.00E 01
2. Average release rate for period	uCi/sec	6.03E-01	1.69E+00	
E. <u>IODINE-131, IODINE-133, TRITIUM AND PARTICULATES</u>				
1. Total Release	Ci	4.80E+00	1.34E+01	
2. Average release rate for period	uCi/sec	6.03E-01	1.69E+00	
3. Percent of technical specification limit	%	5.42E-03	8.07E-03	
F. <u>PARTICULATES VIA BURNING CONTAMINATED OIL</u>				
1. Total Release	Ci	0.00E+00	0.00E+00	
2. Average release rate for period	uCi/sec	0.00E+00	0.00E+00	
3. Percent of technical specification limit	%	0.00E+00	0.00E+00	

TABLE 1B
 Effluent and Waste Disposal Semiannual Report for Year 1993
 Gaseous Effluents - Elevated Releases
 Continuous Release

<u>Nuclides Released</u>	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>
<u>1. FISSION GASES</u>			
krypton-85m	Ci	5.09E+00	6.04E+00
krypton-87	Ci	2.02E+01	1.55E+01
krypton-88	Ci	1.74E+01	1.62E+01
xenon-133	Ci	< LLD	6.87E-01
xenon-135	Ci	2.51E+01	2.26E+01
xenon-135m	Ci	1.11E+01	6.64E+00
<u>xenon-138</u>	<u>Ci</u>	<u>3.10E+01</u>	<u>1.72E+01</u>
total for period	Ci	1.10E+02	8.49E+01
<u>2. IODINES</u>			
iodine-131	Ci	1.35E-04	1.08E-04
<u>iodine-133</u>	<u>Ci</u>	<u>6.93E-04</u>	<u>6.37E-04</u>
total for period	Ci	8.27E-04	7.45E-04
<u>3. PARTICULATES</u>			
cobalt-60	Ci	5.20E-06	1.93E-04
strontium-89	Ci	2.20E-05	4.81E-05
strontium-90	Ci	3.85E-07	1.39E-06
cesium-137	Ci	6.50E-06	6.60E-04
barium-140	Ci	3.69E-05	5.96E-05
<u>lanthium-140</u>	<u>Ci</u>	<u>3.33E-05</u>	<u>2.65E-05</u>
total for period	Ci	1.04E-04	9.89E-04
<u>4. TRITIUM</u>			
hydrogen-3	Ci	4.08E+00	1.14E+01

TABLE 1C
 Effluent and Waste Disposal Semiannual Report for Year 1993
 Gaseous Effluents - Ground Level Releases
 Continuous Release

<u>Nuclides Released</u>	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>
<u>1. FISSION GASES</u>			
krypton-85m	Ci	3.23E-01	6.45E-01
xenon-135	Ci	2.43E+01	1.58E+01
<u>xenon-135m</u>	<u>Ci</u>	<u>3.56E+00</u>	<u>4.52E+00</u>
total for period	Ci	2.81E+01	2.09E+01
<u>2. IODINES</u>			
iodine-131	Ci	2.12E-06	9.36E-08
<u>iodine-133</u>	<u>Ci</u>	<u>6.07E-05</u>	<u>2.21E-05</u>
total for period	Ci	6.29E-05	2.22E-05
<u>3. PARTICULATES</u>			
chromium-51	Ci	1.62E-04	8.14E-04
manganese-54	Ci	2.31E-05	2.51E-05
cobalt-58	Ci	1.47E-05	4.65E-05
cobalt-60	Ci	4.44E-04	2.88E-03
strontium-89	Ci	2.63E-06	2.44E-06
cesium-137	Ci	2.80E-06	2.00E-06
<u>americium-241</u>	<u>Ci</u>	<u>2.84E-06</u>	<u>< LLD</u>
total for period	Ci	6.53E-04	3.77E-03
<u>4. TRITIUM</u>			
hydrogen-3	Ci	7.18E-01	1.95E+00

.....
 TABLE 1D
 Effluent and Waste Disposal Semiannual Report for Year 1993
 Gaseous Effluents - Ground Level Releases
 For Burning Contaminated Oil

<u>Nuclides Released</u>	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>
<u>1. PARTICULATES</u>			
total for period	Ci	0.00E+00	0.00E+00

TABLE 2A
Effluent and Waste Disposal Semiannual Report for Year 1993
Liquid Effluents - Summation of all Releases

	Unit	Qtr 3	Qtr 4	Est Tot % Error
A. FISSION AND ACTIVATION				
<u>PRODUCTS</u> <small>NOTE 1</small>				
1. Total release (excluding tritium gases, & alpha)	Ci	2.59E-02	4.94E-02	4.00E01
2. Avg. diluted conc.	uCi/ml	1.10E-09	1.74E-09	
3. Percent limit	%	5.89E-02	6.42E-02	
B. TRIIUM <small>NOTE 1</small>				
1. Total release	Ci	1.09E+01	2.71E+01	4.50E 01
2. Avg. diluted conc.	uCi/ml	4.61E-07	9.56E-07	
3. Percent limit	%	4.61E-02	9.56E-02	
C. DISSOLVED ENTRAINED GASES <small>NOTE 1</small>				
1. Total release	Ci	2.21E-03	3.30E-03	4.00E 01
2. Avg. diluted conc.	uCi/ml	9.36E-11	1.16E-10	
3. Percent limit	%	4.68E-05	5.80E-05	
D. GROSS ALPHA RADIOACTIVITY				
1. Total release	Ci	< LLD	< LLD	4.00E 01
E. VOLUME OF WASTE <small>NOTE 2</small>				
	liters	6.40E+06	7.13E+06	1.50E 01
F. TOTAL OF DILUTION WATER (used during release for average dil. conc.)				
	liters	2.36E+10	2.83E+10	1.30E 01
G. VOLUME OF COOLING WATER DISCHARGED FROM PLANT				
	liters	2.87E+11	3.28E+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 1993
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>			
sodium-24	Ci	5.80E-06	< LLD
chromium-51	Ci	4.05E-04	1.97E-02
manganese-54	Ci	2.29E-04	8.54E-04
iron-55	Ci	2.51E-03	< LLD
manganese-56	Ci	< LLD	7.99E-04
cobalt-58	Ci	< LLD	1.32E-03
cobalt-60	Ci	2.19E-02	2.44E-02
arsenic-76	Ci	4.47E-05	1.22E-04
strontium-92	Ci	< LLD	6.22E-06
technetium-99m	Ci	< LLD	6.97E-04
silver-110m	Ci	< LLD	2.83E-05
antimony-125	Ci	< LLD	1.77E-04
iodine-131	Ci	< LLD	1.18E-06
iodine-133	Ci	< LLD	3.54E-07
cesium-134	Ci	1.53E-04	2.92E-05
cesium-137	Ci	6.42E-04	2.65E-04
barium-140	Ci	4.28E-06	< LLD
cerium-144	Ci	< LLD	2.20E-05
<u>tungsten-187</u>	Ci	<u>< LLD</u>	<u>1.06E-03</u>
total for period	Ci	2.59E-02	4.94E-02

TABLE 2B (continued)
 Effluent and Waste Disposal Semiannual Report for Year 1993
 Liquid Effluents - Batch Mode

<u>Nuclides Released</u>	<u>Unit</u>	<u>Qtr 3</u>	<u>Qtr 4</u>
2. <u>GASES</u>			
krypton-85m	Ci	< LLD	4.23E-06
xe-133	Ci	3.80E-04	6.80E-04
xe-135m	Ci	< LLD	1.36E-05
<u>xe-135</u>	<u>Ci</u>	<u>1.83E-03</u>	<u>2.61E-03</u>
total for period	Ci	2.21E-03	3.30E-03

APPENDIX A

Lower Limits of Detection

July through December 1993

uCi/ml

1. Liquid Releases

Na-24	2.01E-08
Fe-55	2.02E-07
Mn-56	9.55E-08
Co-58	1.97E-08
Fe-59	3.90E-08
Zn-65	4.48E-08
Sr-89	2.21E-08
Sr-90	1.14E-08
Sr-92	4.45E-08
Mo-99	9.41E-08
Tc-99m	1.50E-08
Ag-110m	5.31E-08
Sb-125	6.36E-08
I-131	1.84E-08
I-133	1.59E-08
Ba-140	5.49E-08
Ce-141	2.48E-08
Ce-144	1.38E-07
W-187	7.05E-08
Alpha	2.43E-08
Kr-85m	2.18E-08
Kr-87	3.86E-08
Kr-88	6.38E-08
Xe-133m	1.33E-07
Xe-135m	7.28E-08
Xe-138	1.99E-07

2. Gaseous Releases

Xe-133	2.84E-08
Xe-133m	6.75E-08

3. Iodines and Particulates

Fe-59	7.81E-14
Zn-65	6.75E-14
Sr-89	2.40E-15
Sr-90	1.13E-15
Mo-99	8.01E-13
Cs-134	5.85E-14
Ce-141	3.98E-14
Ce-144	2.31E-13
Am-241	1.62E-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 1993
Solid Waste and Irradiated Fuel Shipments

<u>Waste Class A</u>		<u>July through December</u>		
1.	<u>Total volume shipped</u> (cubic meters)		2.24	E2
	Total Curie quantity (estimated)		1.05	E3
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 ³	1.08	E2
		Curies	1.05	E3
b.	Dry active waste, compacted	meters ³	1.16	E2
	noncompactd	Curies	4.32	E0
c.	Irradiated components	meters ³	0.00	E0
		Curies	0.00	E0
d.	Others (describe)	meters ³	0.00	E0
		Curies	0.00	E0
3.	<u>Estimate of major radionuclide composition</u>			
a.		Fe-55	6.46	E1%
		Co-60	2.37	E1%
		Ni-63	1.08	E0%
		Cs-137	1.15	E0%
b.		Fe-55	4.91	E1%
		Co-60	4.36	E1%
		Ni-63	2.25	E0%
c.		N/A		N/A
d.		N/A		N/A

TABLE 3A (cont.)

Effluent and Waste Disposal Semiannual Report for Year 1993
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	23/0
b.	Dry active waste	Compacted/non-compacted waste	STP	28
c.	Irradiated components		N/A	0
d.	Other		N/A	0
		* Solidification agent or absorbent (e.g., cement, urea formaldehyde)		N/A

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
51	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 1993
Solid Waste and Irradiated Fuel Shipments

<u>Waste Class B</u>	<u>July through December</u>		
1. <u>Total volume shipped</u> (cubic meters)			2.69 E1
Total Curie quantity (estimated)			7.58 E2
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 ³	0.00 E0	N/A
	Curies	0.00 E0	
b. Dry active waste, compacted, and noncompactd	meters ³	0.00 E0	N/A
	Curies	0.00 E0	
c. Irradiated components	meters ³	2.69 E1	1.00 E1
	Curies	7.58 E2	
d. Others (describe)	meters ³	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.	Fe-55	3.14 E1%	
	Co-60	6.57 E1%	
	Ni-63	2.84 E0%	
d.	N/A		N/A

TABLE 3B (cont.)

Effluent and Waste Disposal Semiannual Report for Year 1993
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	0 / 0
b. Dry active	Compacted/non-compacted waste	N/A	0
c. Irradiated components		Type B	7
d. Other		N/A	0
	* Solidification agent or absorbent (e.g., cement, urea formaldehyde)		N/A

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
7	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 1993
Solid Waste and Irradiated Fuel Shipments

<u>Waste Class C</u>	<u>July through December</u>		
1. <u>Total volume shipped</u> (cubic meters)			4.16 E0
Total Curie quantity (estimated)			2.73 E2
2. <u>Type of Waste</u>		Six-month	Est. Tot.
	<u>Units</u>	<u>Period</u>	<u>% Error</u>
a. Spent resins, filter sludges	meters ³	0.00 E0	N/A
	Curies	0.00 E0	
b. Dry active waste, compacted and noncompactd	meters ³	0.00 E0	N/A
	Curies	0.00 E0	
c. Irradiated components	meters ³	4.16 E0	1.00 E1
	Curies	2.73 E2	
d. Others (describe)	meters ³	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.	Fe-55	3.16 E1%	
	Co-60	6.56 E1%	
	Ni-63	2.81 E0%	
d.	N/A		N/A

TABLE 3C (cont.)

Effluent and Waste Disposal Semiannual Report for Year 1993
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	0/0
b. Dry active waste	Compacted/non-compacted	N/A	0
c. Irradiated components	(Noncompacted waste; solid oxides)	Type B	2
d. Others		N/A	0
	* Solidification agent or absorbent (e.g., cement, urea formaldehyde)		N/A

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
2	Type B Cask	CNSI/Barnwell, SC

b. Irradiated Fuel

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
8	Rail Car IF-300 Cask Sole Use	CP&L/SHNNP

ATTACHMENT 2 (cont.)

ENCLOSURE 2

Combustion of Waste Oil

July 1, to December 31, 1993

During this reporting period, there was no contaminated waste oil incinerated in the on site incinerator.

ATTACHMENT 3

Environmental Monitoring Program

July 1, to December 31, 1993

Enclosure 1: Milk and Vegetable Sample Locations

Enclosure 2: Land Use Census

ATTACHMENT 3 (cont.)

ENCLOSURE 1

Milk and Vegetation Sample Locations

July 1, to December 31, 1993

No milk animals were identified during the last Land Use Census, therefore, no milk sample locations were available during this time period.

Vegetation sample locations remained unchanged.

ATTACHMENT 3 (cont.)

ENCLOSURE 2

Land Use Census

July 1, to December 31, 1993

The 1993 Land Use Census was performed during the period of June 9 to June 10, 1993. No locations were identified that are reportable in the Semiannual Radioactive Effluent Release Report.

Land Use Census updates are included with the ODCM revision 15 in Attachment 8.

ATTACHMENT 4

Effluent Instrumentation

July 1, to December 31, 1993

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

ATTACHMENT 4 (cont.)

ENCLOSURE 1

July 1, to December 31, 1993

Radioactive Liquid Effluent Monitoring Instrumentation

No Radioactive Liquid Effluent Monitoring Instrumentation was inoperable for greater than 30 days.

ATTACHMENT 4 (cont.)

ENCLOSURE 2

July 1, to December 31, 1993

Radioactive Gaseous Effluent Monitoring Instrumentation

No Radioactive Gaseous Effluent Monitoring Instrumentation was inoperable for greater than 30 days.

ATTACHMENT 4 (cont.)

ENCLOSURE 3

Liquid Hold-Up Tank

July 1, to December 31, 1993

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, 1993

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, 1993

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, 1993

Attached is the annual dose assessment for the Brunswick Steam Electric Plant for the time period of January 1 to December 31, 1993.

Enclosure 1: Annual Liquid Dose Assessment

Enclosure 2: Annual Gaseous Dose Assessment

Enclosure 3: Dose Assessment Summary

ATTACHMENT 7 (cont.)

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 1993.

DISCHARGE=1.25E+03 CFS

SOURCE TERM MULTIPLIER=1.00E+00

SALTWATER SITE

NO RECONCENTRATION MODEL

50-MILE POPULATION=2.82E+05

FRACTION ---

ADULT=0.71

TEENAGER=0.11

CHILD=0.18

DOSE FACTOR LIBRARY CONTAINS 698 ENTRIES

Site Specific Data

* * * COST-BENEFIT ANALYSIS * * *

NUCLIDE	RELEASE CI/YR	PERSON-REM DOSE		PERSON-REM PER CURIE	
		TOTAL BODY	THYROID	TOTAL BODY	THYROID
1H 3	4.72E+01	1.87E-06	1.87E-06	3.96E-08	3.96E-08
11NA 24	5.80E-06	6.39E-10	6.39E-10	1.10E-04	1.10E-04
24CR 51	2.01E-02	1.19E-07	1.16E-07	5.94E-06	5.77E-06
25MN 54	2.11E-03	3.57E-06	3.11E-06	1.69E-03	1.47E-03
25MN 56	7.99E-04	3.27E-08	3.27E-08	4.10E-05	4.10E-05
26FE 55	3.65E-03	2.45E-06	2.92E-12	6.72E-04	8.00E-10
27CO 58	1.32E-03	6.54E-07	5.57E-07	4.96E-04	4.22E-04
27CO 60	7.22E-02	1.65E-03	1.64E-03	2.29E-02	2.26E-02
36KR 85M	4.23E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
38SR 92	6.22E-06	2.07E-10	2.07E-10	3.33E-05	3.33E-05
41NB 95	6.50E-06	1.19E-09	1.05E-09	1.83E-04	1.62E-04
43TC 99M	6.97E-04	2.23E-09	2.23E-09	3.19E-06	3.19E-06
47AG 110M	2.83E-05	1.08E-07	1.04E-07	3.82E-03	3.69E-03
51SB 125	1.77E-04	4.38E-07	4.37E-07	2.48E-03	2.47E-03
53I 131	1.18E-06	4.07E-11	4.53E-09	3.45E-05	3.84E-03
53I 133	3.54E-07	5.16E-12	5.37E-12	1.46E-05	1.52E-05
54XE 133	1.26E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
54XE 135	5.74E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
54XE 135M	1.36E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55CS 134	2.93E-04	2.64E-06	2.12E-06	9.02E-03	7.22E-03
55CS 137	1.72E-03	2.05E-05	1.87E-05	1.19E-02	1.08E-02
56BA 140	4.28E-06	1.35E-10	1.19E-10	3.16E-05	2.77E-05
58CE 144	2.20E-05	1.64E-09	1.63E-09	7.44E-05	7.42E-05
74W 187	1.06E-03	1.36E-08	1.36E-08	1.29E-05	1.29E-05
TOTAL		1.68E-03	1.66E-03		

* * * 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		3.16E-05	4.81E-05	4.43E-05	3.91E-06	7.97E-06	1.49E-05	2.96E-04
INVERT		4.44E-05	6.70E-05	8.36E-05	1.04E-06	1.68E-06	1.80E-05	6.63E-04
SHORELINE	1.80E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03
SWIMMING		1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06
BOATING		5.14E-07	5.14E-07	5.14E-07	5.14E-07	5.14E-07	5.14E-07	5.14E-07
TOTAL	1.80E-03	1.61E-03	1.65E-03	1.66E-03	1.54E-03	1.54E-03	1.57E-03	2.49E-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		4.35E-05	6.40E-05	5.51E-05	3.95E-06	9.39E-06	2.16E-05	2.71E-04
INVERT		6.11E-05	9.06E-05	1.12E-04	1.06E-06	1.92E-06	2.82E-05	6.06E-04
SHORELINE	1.80E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03
SWIMMING		1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06
BOATING		5.14E-07	5.14E-07	5.14E-07	5.14E-07	5.14E-07	5.14E-07	5.14E-07
TOTAL	1.80E-03	1.64E-03	1.69E-03	1.70E-03	1.54E-03	1.55E-03	1.58E-03	2.41E-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		1.31E-04	1.32E-04	1.31E-04	7.58E-06	1.79E-05	4.30E-05	2.23E-04
INVERT		1.86E-04	1.88E-04	2.79E-04	2.05E-06	3.65E-06	5.71E-05	4.90E-04
SHORELINE	1.80E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03	1.53E-03
SWIMMING		1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06
BOATING		5.14E-07	5.14E-07	5.14E-07	5.14E-07	5.14E-07	5.14E-07	5.14E-07
TOTAL	1.80E-03	1.85E-03	1.85E-03	1.94E-03	1.54E-03	1.56E-03	1.63E-03	2.25E-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	

As Low As Reasonably Achievable Maximum Individual Dose

Summary - Total Integrated and Recreation Population Dose

CP&L
LADTAP

SEMI-ANNUAL RADIOLOGICAL EFFLUENT REPORTING
RADIATION DOSES FROM LIQUID EFFLUENTS

RUN DATE: 02/14/94
RUN TIME: 10:09:08

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	1.776E-05	2.488E-05	2.305E-05	1.872E-06	3.952E-06	7.846E-06	1.290E-04	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	4.123E-07	5.736E-07	7.386E-07	8.095E-09	1.361E-08	1.600E-07	4.762E-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	1.656E-03	1.656E-03	1.656E-03	1.656E-03	1.656E-03	1.656E-03	1.656E-03	1.948E-03
SWIMMING	2.929E-06	2.929E-06	2.929E-06	2.929E-06	2.929E-06	2.929E-06	2.929E-06	0.000E+00
BOATING	1.387E-06	1.387E-06	1.387E-06	1.387E-06	1.387E-06	1.387E-06	1.387E-06	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	1.678E-03	1.686E-03	1.684E-03	1.662E-03	1.664E-03	1.668E-03	1.794E-03	1.948E-03

ATTACHMENT 7 (cont)

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 1993 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: 02/15/94
RUN TIME: 10:49:29

SOURCE TERM (GROUND LEVEL) 1993 BSEP UNITS 1 AND 2

1 H - 3	1.650E+00
25 MN- 54	1.670E-07
27 CO- 60	1.680E-05
36 KR- 85 M	9.680E-01
38 SR- 89	3.300E-06
38 SR- 90	6.500E-08
53 I -131	2.300E-06
53 I -133	1.360E-05
54 XE-135	7.760E+00
55 CS-137	3.840E-07

Source term for ground release mode

1993 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2

1 H - 3	1.680E+01
27 CO- 60	2.030E-04
36 KR- 85 M	1.580E+01
36 KR- 87	5.020E+01
36 KR- 88	4.450E+01
38 SR- 89	9.250E-05
38 SR- 90	2.020E-06
53 I -131	3.250E-04
53 I -133	1.840E-03
54 XE-133	9.670E-01
54 XE-135	6.910E+01
54 XE-135 M	2.570E+01
54 XE-138	5.280E+01
55 CS-137	6.680E-04
56 BA-140	9.830E-05
57 LA-140	5.980E-05

Source term for elevated release mode

BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1993

Source term for mixed release mode and site aggregate

1 H - 3	1.490E+00
24 CR- 51	9.760E-04
25 MN- 54	2.520E-04
27 CO- 58	6.120E-05
27 CO- 60	5.160E-03
38 SR- 89	2.850E-06
38 SR- 90	5.870E-07
53 I -133	7.010E-05
54 XE-133	4.040E+00
54 XE-135	5.730E+01
54 XE-135 M	1.170E+01
55 CS-137	2.950E-05
95 AM-241	1.140E-05

AGGREGATE SOURCE TERM

1 H - 3	1.9940E+01
24 CR- 51	9.7600E-04
25 MN- 54	2.5217E-04
27 CO- 58	6.1200E-05
27 CO- 60	5.3798E-03
36 KR- 85 M	1.6768E+01
36 KR- 87	5.0200E+01
36 KR- 88	4.4500E+01
38 SR- 89	9.8650E-05
38 SR- 90	2.6720E-06
53 I -131	3.2730E-04
53 I -133	1.9237E-03
54 XE-133	5.0070E+00
54 XE-135	1.3416E+02
54 XE-135 M	3.7400E+01
54 XE-138	5.2800E+01
55 CS-137	6.9788E-04
56 BA-140	9.8300E-05
57 LA-140	5.9800E-05
95 AM-241	1.1400E-05

SEMI-ANNUAL RADIOLOGICAL EFFLUENT REPORTING
ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (MANREM)

1993 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2
SOURCE TERM (GROUND LEVEL) 1993 BSEP UNITS 1 AND 2
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1993

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
** TOTAL **	2.943E-02	2.949E-02	3.255E-02	3.240E-02	3.051E-02	2.967E-02	3.060E-02	4.896E-02
PLUME	1.097E-02 37.27%	1.097E-02 37.18%	1.097E-02 33.69%	1.097E-02 33.85%	1.097E-02 35.94%	1.097E-02 36.97%	1.116E-02 36.46%	2.792E-02 57.03%
GROUND PLANE	1.666E-02 56.60%	1.666E-02 56.47%	1.666E-02 51.17%	1.666E-02 51.41%	1.666E-02 54.59%	1.666E-02 56.14%	1.666E-02 54.43%	1.959E-02 40.00%
INHALATION	1.215E-03 4.13%	1.063E-03 3.60%	4.664E-03 14.33%	4.123E-03 12.72%	2.388E-03 7.82%	1.231E-03 4.15%	2.332E-03 7.62%	1.018E-03 2.08%
VEGETATION	5.322E-04 1.81%	7.132E-04 2.42%	2.484E-04 0.76%	5.960E-04 1.84%	4.569E-04 1.50%	7.406E-04 2.50%	4.111E-04 1.34%	3.918E-04 0.80%
COW MILK	1.400E-05 0.05%	1.196E-05 0.04%	7.137E-06 0.02%	1.865E-05 0.06%	1.347E-05 0.04%	3.555E-05 0.12%	1.168E-05 0.04%	1.077E-05 0.02%
MEAT & POULTRY	4.194E-05 0.14%	8.297E-05 0.28%	6.292E-06 0.02%	4.088E-05 0.13%	3.286E-05 0.11%	3.760E-05 0.13%	3.123E-05 0.10%	3.040E-05 0.06%

Total 50 mile integrated population dose by pathways and organs

1993 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2
SOURCE TERM (GROUND LEVEL) 1993 BSEP UNITS 1 AND 2
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1993

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

ANNUAL BETA AIR DOSE = 8.323E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.060E-03 MILLRADS

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
ADULT	1.386E-03	1.460E-03	1.457E-03	1.511E-03	1.375E-03	1.537E-03	1.339E-03	1.499E-03
GROUND PLANE	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.403E-03
INHALATION	3.446E-05	2.959E-05	1.562E-04	1.331E-04	7.480E-05	3.381E-05	6.675E-05	2.792E-05
VEGETATION	1.092E-04	2.076E-04	7.136E-05	1.200E-04	7.282E-05	1.075E-04	5.663E-05	5.040E-05
COW MILK	4.887E-05	2.944E-05	3.578E-05	6.399E-05	3.358E-05	2.024E-04	2.218E-05	1.701E-05
TEENAGER	1.403E-03	1.480E-03	1.528E-03	1.601E-03	1.414E-03	1.851E-03	1.382E-03	1.511E-03
GROUND PLANE	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.403E-03
INHALATION	3.498E-05	2.963E-05	1.647E-04	1.399E-04	7.764E-05	3.572E-05	8.639E-05	2.810E-05
VEGETATION	1.207E-04	2.200E-04	1.048E-04	1.630E-04	9.120E-05	1.052E-04	6.901E-05	5.770E-05
COW MILK	5.344E-05	3.694E-05	6.456E-05	1.050E-04	5.146E-05	3.161E-04	3.284E-05	2.216E-05
CHILD	1.461E-03	1.459E-03	1.703E-03	1.739E-03	1.477E-03	2.010E-03	1.424E-03	1.553E-03
GROUND PLANE	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.403E-03
INHALATION	3.039E-05	2.542E-05	1.281E-04	1.043E-04	5.777E-05	3.416E-05	7.288E-05	2.485E-05
VEGETATION	1.752E-04	1.948E-04	2.263E-04	2.629E-04	1.419E-04	1.623E-04	1.064E-04	8.938E-05
COW MILK	6.191E-05	4.498E-05	1.548E-04	1.784E-04	8.365E-05	6.203E-04	5.142E-05	3.501E-05
INFANT	1.293E-03	1.270E-03	1.493E-03	1.574E-03	1.353E-03	2.692E-03	1.322E-03	1.471E-03
GROUND PLANE	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.194E-03	1.403E-03
INHALATION	1.652E-05	1.448E-05	5.152E-05	4.631E-05	2.730E-05	2.285E-05	4.609E-05	1.429E-05
COW MILK	8.270E-05	6.200E-05	2.483E-04	3.340E-04	1.317E-04	1.476E-03	8.281E-05	5.312E-05

Hypothetical maximum individual organ dose due to iodines, particulates, and tritium for a cow milk pathway at 4.75 miles

1993 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2
SOURCE TERM (GROUND LEVEL) 1993 BSEP UNITS 1 AND 2
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1993

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

ANNUAL BETA AIR DOSE = 4.655E-03 MILLRADS
ANNUAL GAMMA AIR DOSE = 5.115E-03 MILLRADS

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
ADULT	2.451E-02	2.498E-02	2.381E-02	2.569E-02	2.317E-02	2.856E-02	2.236E-02	2.917E-02
PLUME	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.457E-03	7.730E-03
GROUND PLANE	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	2.005E-02
INHALATION	2.960E-04	2.868E-04	3.084E-04	4.901E-04	3.753E-04	3.038E-04	3.701E-04	2.829E-04
VEGETATION	1.339E-03	2.763E-03	1.029E-03	1.479E-03	8.219E-04	1.324E-03	5.967E-04	5.106E-04
COW MILK	6.141E-04	3.500E-04	4.983E-04	8.227E-04	4.019E-04	2.810E-03	2.438E-04	1.724E-04
GOAT MILK	1.612E-03	4.169E-04	1.457E-03	2.262E-03	1.014E-03	3.517E-03	5.660E-04	3.516E-04
MEAT & POULTRY	1.905E-04	7.011E-04	5.411E-05	1.726E-04	9.615E-05	1.423E-04	8.075E-05	7.339E-05
TEENAGER	2.466E-02	2.502E-02	2.587E-02	2.834E-02	2.421E-02	3.201E-02	2.299E-02	2.937E-02
PLUME	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.457E-03	7.730E-03
GROUND PLANE	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	2.005E-02
INHALATION	2.984E-04	2.883E-04	3.253E-04	5.050E-04	3.824E-04	3.118E-04	4.153E-04	2.847E-04
VEGETATION	1.477E-03	2.910E-03	1.507E-03	2.049E-03	1.049E-03	1.261E-03	7.410E-04	5.846E-04
COW MILK	6.590E-04	4.359E-04	8.987E-04	1.371E-03	6.306E-04	4.408E-03	3.722E-04	2.245E-04
GOAT MILK	1.650E-03	5.411E-04	2.632E-03	3.828E-03	1.629E-03	5.479E-03	9.010E-04	4.580E-04
MEAT & POULTRY	1.210E-04	3.816E-04	4.432E-05	1.228E-04	6.217E-05	9.370E-05	5.075E-05	4.378E-05
CHILD	2.537E-02	2.463E-02	3.250E-02	3.324E-02	2.618E-02	4.222E-02	2.405E-02	3.006E-02
PLUME	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.457E-03	7.730E-03
GROUND PLANE	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	2.005E-02
INHALATION	2.628E-04	2.531E-04	2.533E-04	4.084E-04	3.167E-04	2.848E-04	3.593E-04	2.517E-04
VEGETATION	2.134E-03	2.416E-03	3.242E-03	3.318E-03	1.634E-03	1.944E-03	1.141E-03	9.055E-04
COW MILK	7.305E-04	4.972E-04	2.153E-03	2.339E-03	1.029E-03	8.686E-03	5.817E-04	3.547E-04
GOAT MILK	1.627E-03	7.853E-04	6.316E-03	6.565E-03	2.668E-03	1.072E-02	1.405E-03	7.236E-04
MEAT & POULTRY	1.545E-04	2.236E-04	8.045E-05	1.539E-04	7.617E-05	1.282E-04	6.107E-05	5.289E-05
INFANT	2.353E-02	2.243E-02	3.413E-02	3.761E-02	2.649E-02	6.681E-02	2.400E-02	2.956E-02
PLUME	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.410E-03	3.457E-03	7.730E-03
GROUND PLANE	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	2.005E-02
INHALATION	1.492E-04	1.452E-04	1.020E-04	2.081E-04	1.705E-04	1.752E-04	2.159E-04	1.448E-04
COW MILK	9.531E-04	6.652E-04	3.456E-03	4.427E-03	1.628E-03	2.079E-02	9.489E-04	5.382E-04
GOAT MILK	1.974E-03	1.157E-03	1.011E-02	1.252E-02	4.231E-03	2.539E-02	2.330E-03	1.098E-03

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

Estimated individual organ dose using the 1993 Land Use Census for the worst sector and existing pathways

CP&L
GASRPT

SEMI-ANNUAL RADIOLOGICAL EFFLUENT REPORTING
RADIATION DOSES AT SELECTED LOCATIONS

RUN DATE: 02/15/94
RUN TIME: 10:49:29

1993 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2
SOURCE TERM (GROUND LEVEL) 1993 BSEP UNITS 1 AND 2
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1993

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

ANNUAL BETA AIR DOSE = 1.550E-03 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.896E-03 MILLRADS

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
ADULT	8.342E-03	8.941E-03	8.312E-03	8.460E-03	8.198E-03	8.312E-03	8.136E-03	1.071E-02
PLUME	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.283E-03	2.755E-03
GROUND PLANE	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	7.754E-03
INHALATION	7.846E-05	7.254E-05	1.275E-04	1.568E-04	1.093E-04	7.933E-05	1.050E-04	7.102E-05
VEGETATION	4.045E-04	1.007E-03	3.234E-04	4.416E-04	2.275E-04	3.718E-04	1.544E-04	1.282E-04
TEENAGER	8.393E-03	8.988E-03	8.467E-03	8.642E-03	8.267E-03	8.293E-03	8.194E-03	1.073E-02
PLUME	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.283E-03	2.755E-03
GROUND PLANE	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	7.754E-03
INHALATION	7.716E-05	7.287E-05	1.345E-04	1.627E-04	1.119E-04	8.223E-05	1.225E-04	7.147E-05
VEGETATION	4.542E-04	1.054E-03	4.707E-04	6.184E-04	2.938E-04	3.494E-04	1.945E-04	1.468E-04
CHILD	8.601E-03	8.741E-03	8.970E-03	8.988E-03	8.407E-03	8.476E-03	8.281E-03	1.080E-02
PLUME	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.283E-03	2.755E-03
GROUND PLANE	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	7.754E-03
INHALATION	6.777E-05	6.373E-05	1.048E-04	1.281E-04	9.010E-05	7.634E-05	1.052E-04	6.320E-05
VEGETATION	6.718E-04	8.164E-04	1.003E-03	9.985E-04	4.559E-04	5.383E-04	2.992E-04	2.273E-04
INFANT	7.899E-03	7.898E-03	7.903E-03	7.924E-03	7.908E-03	7.910E-03	7.941E-03	1.055E-02
PLUME	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.268E-03	1.283E-03	2.755E-03
GROUND PLANE	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	6.594E-03	7.754E-03
INHALATION	3.819E-05	3.652E-05	4.220E-05	6.257E-05	4.700E-05	4.843E-05	6.416E-05	3.634E-05

1993 SOURCE TERM (ELEVATED MODE) BSEP UNITS 1&2
SOURCE TERM (GROUND LEVEL) 1993 BSEP UNITS 1 AND 2
BRUNSWICK UNITS 1 AND 2, MIXED MODE CONTINUOUS GASEOUS RELEASES, 1993

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 = 4.655E-03 MILLRADS
ANNUAL GAMMA AIR DOSE = 5.115E-03 MILLRADS

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
ADULT	1.734E-02	1.734E-02	1.736E-02	1.754E-02	1.742E-02	1.735E-02	1.742E-02	2.033E-02
GROUND PLANE	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	2.005E-02
INHALATION	2.960E-04	2.868E-04	3.084E-04	4.901E-04	3.753E-04	3.038E-04	3.701E-04	2.829E-04
TEENAGER	1.735E-02	1.734E-02	1.737E-02	1.755E-02	1.743E-02	1.736E-02	1.746E-02	2.033E-02
GROUND PLANE	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	2.005E-02
INHALATION	2.984E-04	2.883E-04	3.253E-04	5.050E-04	3.824E-04	3.118E-04	4.153E-04	2.847E-04
CHILD	1.731E-02	1.730E-02	1.730E-02	1.746E-02	1.737E-02	1.733E-02	1.741E-02	2.030E-02
GROUND PLANE	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	2.005E-02
INHALATION	2.628E-04	2.531E-04	2.533E-04	4.084E-04	3.167E-04	2.848E-04	3.593E-04	2.517E-04
INFANT	1.720E-02	1.719E-02	1.715E-02	1.726E-02	1.722E-02	1.722E-02	1.726E-02	2.019E-02
GROUND PLANE	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	1.705E-02	2.005E-02
INHALATION	1.492E-04	1.452E-04	1.020E-04	2.081E-04	1.705E-04	1.752E-04	2.159E-04	1.448E-04

Maximum site boundary dose due to iodines, particulates, and tritium for existing pathways

CP&L
GASRPT

SEMI-ANNUAL RADIOLOGICAL EFFLUENT REPORTING
INPUT SOURCE TERMS

RUN DATE: 02/15/94
RUN TIME: 17:51:21

SOURCE TERM (INCINERATED OIL 1993 DSEP UNITS 1 AND 2

25 MN- 54	1.670E-07
27 CO- 60	2.500E-06
55 CS-137	3.840E-07

Source term for incinerated waste oil

Integrated population dose by pathways and organs due to incinerated waste oil

CP&L
GASRPT

SEMI-ANNUAL RADIOLOGICAL EFFLUENT REPORTING
ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (MANREM)

RUN DATE: 02/15/94
RUN TIME: 17:51:21

SOURCE TERM (INCINERATED OIL 1993 BSEP UNITS 1 AND 2

	TOTAL BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
** TOTAL **	2.117E-05	2.143E-05	2.120E-05	2.127E-05	2.109E-05	2.101E-05	2.377E-05	2.470E-05
PLUME	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
GROUND PLANE	2.101E-05	2.101E-05	2.101E-05	2.101E-05	2.101E-05	2.101E-05	2.101E-05	2.470E-05
	99.23%	98.05%	99.08%	98.78%	99.63%	100.00%	88.38%	100.00%
INHALATION	3.027E-08	1.056E-07	3.687E-08	4.988E-08	1.577E-08	0.000E+00	2.740E-06	0.000E+00
	0.14%	0.49%	0.17%	0.23%	0.07%	0.00%	11.53%	0.00%
VEGETATION	1.196E-07	2.633E-07	1.452E-07	1.919E-07	5.773E-08	0.000E+00	1.995E-08	0.000E+00
	0.56%	1.23%	0.69%	0.90%	0.27%	0.00%	0.08%	0.00%
COW MILK	2.979E-09	9.694E-10	6.440E-09	7.434E-09	2.456E-09	0.000E+00	8.671E-10	0.000E+00
	0.01%	0.00%	0.03%	0.03%	0.01%	0.00%	0.00%	0.00%
MEAT & POULTRY	1.107E-08	4.751E-08	6.200E-09	1.079E-08	2.630E-09	0.000E+00	8.999E-10	0.000E+00
	0.05%	0.22%	0.03%	0.05%	0.01%	0.00%	0.00%	0.00%

SOURCE TERM (INCINERATED OIL 1993 BSEP UNITS 1 AND 2

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	5.205E-05	5.725E-05	5.134E-05	5.262E-05	5.017E-05	4.912E-05	5.102E-05	5.775E-05
GROUND PLANE	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	5.775E-05
INHALATION	2.077E-08	7.473E-08	1.885E-08	2.810E-08	8.933E-09	0.000E+00	1.558E-06	0.000E+00
VEGETATION	2.546E-06	6.283E-06	2.033E-06	3.145E-06	9.555E-07	0.000E+00	3.137E-07	0.000E+00
MEAT & POULTRY	3.626E-07	1.769E-06	1.737E-07	3.321E-07	8.087E-08	0.000E+00	2.681E-08	0.000E+00
TEENAGER	5.197E-05	5.662E-05	5.253E-05	5.427E-05	5.068E-05	4.912E-05	5.199E-05	5.775E-05
GROUND PLANE	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	5.775E-05
INHALATION	1.750E-08	6.798E-08	2.642E-08	3.818E-08	1.220E-08	0.000E+00	2.276E-06	0.000E+00
VEGETATION	2.602E-06	6.478E-06	3.239E-06	4.850E-06	1.483E-06	0.000E+00	5.697E-07	0.000E+00
MEAT & POULTRY	2.309E-07	9.517E-07	1.442E-07	2.652E-07	6.547E-08	0.000E+00	2.537E-08	0.000E+00
CHILD	5.270E-05	5.382E-05	5.707E-05	5.764E-05	5.162E-05	4.912E-05	5.185E-05	5.775E-05
GROUND PLANE	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	5.775E-05
INHALATION	1.103E-08	2.522E-08	3.573E-08	3.662E-08	1.130E-08	0.000E+00	1.844E-06	0.000E+00
VEGETATION	3.273E-06	4.193E-06	7.647E-06	8.141E-06	2.409E-06	0.000E+00	8.583E-07	0.000E+00
MEAT & POULTRY	2.925E-07	4.807E-07	2.656E-07	3.413E-07	8.304E-08	0.000E+00	2.981E-08	0.000E+00
INFANT	4.912E-05	4.913E-05	4.914E-05	4.915E-05	4.913E-05	4.912E-05	5.030E-05	5.775E-05
GROUND PLANE	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	4.912E-05	5.775E-05
INHALATION	4.899E-09	8.363E-09	2.163E-08	2.660E-08	6.872E-09	0.000E+00	1.177E-06	0.000E+00

Maximum site boundary dose due to incinerated waste oil

ATTACHMENT 7 (cont)

ENCLOSURE 3

Dose Assessment Summary

I. Liquid Effluents:

Maximum Dose to Individual: (mrem)

Adult GI-LLI 2.49E-03

Child Total Body 1.94E-03

II. Gaseous Effluents:

Noble Gas Air Dose at Site Boundary: (mrad)

Gamma 6.78E-03

Beta 8.38E-03

Iodine-131, Iodine 133, Tritium and Particulates: (mrem)

Maximum dose at site boundary: Infant thyroid 6.68E-02

Maximum hypothetical dose at 4.75 miles for cow pathway Infant thyroid 2.69E-03

Estimated dose for existing pathways Child skin 1.08E-02

ATTACHMENT 8

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

July 1, to December 31, 1993

Brunswick Steam Electric Plant

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

Revision 15 was made to the Off-Site Dose Calculation Manual during this time period. This revision included the following changes:

1. Pages 2-2 through 2-8 and page 2-10 were revised to delete references to MPC values for liquid effluents. Revision 14, approved prior to the end of 1992, incorporated Environmental Concentration (EC) limits to allow methodology for calculating discharge flow rates for batch liquid releases to comply with the new revision to 10CFR20. MPC values were maintained for use until the end of 1992 after which the new EC limits were used.
2. Pages 3-22 and 3-42 were revised to delete reference to incineration of scintillation vials. This practice is no longer necessary.
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 E-2 was updated to change the Reactor Building Ventilation Monitoring System sampler flow rate measurement device to match that designated in post modification plant drawings.
5. Page E-3 was updated to delete obsolete equipment designations for the Main Condenser Off-Gas Treatment System Explosive Gas Monitoring System -- Hydrogen Monitors. These designations were changed due to plant modifications.

A copy of Revision 15 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: 12/8/93 Rev. 15

Pages and Sections Revised: Section 2.0 (pages 2-2 thru 2-10), page
3-22, page 3-30, page 3-42, page E-2

Reason for Change: ① update Table 3.2-2 to include data from latest Land

Use Census: ② Delete obsolete reference to 'MPC' in section 2.0, ③

Delete reference to incineration of scintillation vials; ④ revise

equipment designation for RABID Vent sampler flow rate measurement
device. ⑤ revise equipment designation for Hydrogen monitors.

Safety Analysis Complete: Grant Raker Date: 12/8/93

REVIEWS:

Grant Raker Recommended/Not Recommended Date: 12/8/93
1st Safety Reviewer

James Thomas Recommended/Not Recommended Date: 12/14/93
2nd Safety Reviewer

Jim Davis Recommended/Not Recommended Date: 12/14/93
E&C Project Specialist

Bon Mayhew Recommended/Not Recommended Date: 12/14/93
Operations - Special Projects

Scott W. White Recommended/Not Recommended Date: 12/19/93
E&C Manager

APPROVALS:

Scott W. White for Recommended/Not Recommended Date: 12/20/93
Manager - E&RC

John J. ... Recommended/Not Recommended Date: 12/21/93
PNSC Chairman

CS Hennert Recommended/Not Recommended Date: 12-22-93
Plant General Manager

SAFETY REVIEW COVER SHEET

DOCUMENT NO. ODCM REV. NO. 15

DESCRIPTION OR TITLE: Offsite Dose Calculation Manual

1. Assigned Responsibilities:
 Safety Analysis Preparer: Grant Raker
 Lead 1st Safety Reviewer: Grant Raker
 2nd Safety Reviewer: Susan Szepietnick
2. Safety Analysis Preparer: Complete PART I, SAFETY ANALYSIS
 Safety Analysis Preparer Grant Raker / 12/8/93
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.

<u>DISCIPLINES Required:</u>	<u>(Print Name)</u>	<u>Signature/Date (Step</u>
<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>Grant Raker</u>	<u>Grant Raker/12-8-93</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.
 2nd Safety Reviewer Susan Szepietnick Date 12/14/93
 DISCIPLINE: Chem/Radiochem
9. PNSC review required? IF "yes," attach Part V and mark reason Yes No
 below: M

Potential UNREVIEWED SAFETY QUESTION
 Question 9 of Part IV answered "Yes"

Other (specify): ODCM revision requires PNSC review per Tech Spec requirements

REVISION 3

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

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Page 2 of 9PART I: SAFETY ANALYSIS
(See instructions in Section 8.4.1)
(Attach additional sheets as necessary.)DOCUMENT NO. DDCMREV. NO. 15

DESCRIPTION OF CHANGE: Updated Table 3.2-2 on page 3-50 to be consistent with latest Land Use Census. Revised portions of Section 2.0 to eliminate references to 'MPC' values. Remove obsolete reference to incineration of scintillation Vials. Revised equipment identification number for Reactor Building Effluent Sampler flow rate device.

ANALYSIS:

Table 3.2-2 "Distance to Controlling Locations as measured from the Brunswick Plant Center (mi)" was revised to include information from latest Land Use Census. Specifically, the changes include the following: meat animals were found in the SE/SSE sectors at 1.0 mile; the nearest residence in the NNE sector was 1.0 mile; the nearest residence in the ESE sector was 1.5 miles; No gardens were found in the ESE and SSE sectors, the garden location in the S and NNW sectors changed to 1.5 and 4.3 miles respectively. Updating these values does not effect any system, structure, or component that is important to safety. The values are updated to provide more accurate assessment of dose to the public from WNP effluents.

Changes to Section 2.0 are administrative only. Revision 14 incorporated EC values of the new 10CFR20 but also maintained MPC values to be used until end of 1992.

(cont)

REFERENCES:

FSAR - Table of Contents: Section 15, Section 12
Tech Spec Index; 3/4.11.1; 3/4.11.2; 3/4.12.2; 6.13

(cont)

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mpe values are no longer necessary for reference and were deleted. Deletion of reference to 'mpe' does not impact safety in any way

Pages 3-22 and 3-42 were revised to remove reference to incineration of scintillation vials. This practice is no longer necessary and the ODCM was revised to reflect. Deletion was administrative in nature and does not impact safety in any way.

page E-2 was updated to change the sampler flow rate measurement device for the Reactor Building Ventilation Monitoring System to match that designated in plant drawings. This change is administrative in nature and does not impact plant safety in any way.

page E-3 was updated to delete obsolete equipment designations for the Main Condenser Off-Gas Treatment System Explosive Gas Monitoring System - Hydrogen monitors. This change is administrative in nature and does not impact plant safety.

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PART II: ITEM CLASSIFICATION

DOCUMENT NO. ODCM

REV. NO. 15

- | | Yes | No |
|--|-----|-----|
| 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.

Tech Spec 8.13, ODCM

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PART III: UNREVIEWED SAFETY QUESTION DETERMINATION SCREEN

DOCUMENT NO. ODM REV. NO. 15Yes 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 I need not be completed.

PART IV: UNREVIEWED SAFETY QUESTION DETERMINATION

DOCUMENT NO. DDCM REV. NO. 15

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?
<i>See Attached</i> | [] | [X] |
| 2. May the proposed activity increase the consequences of an accident evaluated previously in the SAFETY ANALYSIS REPORT?
<i>See Attached</i> | [] | [X] |
| 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?
<i>See Attached</i> | [] | [X] |
| 4. May the proposed activity increase the consequence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT?
<i>See Attached</i> | [] | [X] |
| 5. May the proposed activity create the possibility of an accident of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT?
<i>See Attached</i> | [] | [X] |

PART IV: (Continued)

DOCUMENT NO. SDCM REV. NO. 15

- | | <u>Yes</u> | <u>No</u> |
|--|------------|-----------|
| 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] |
| <i>See Attached</i> | | |
| 7. Does the proposed activity reduce the margin of safety as defined in the basis of any Technical Specification? | [] | [X] |
| <i>See Attached</i> | | |
| 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? | [] | [X] |
- 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 is still within the NRC ACCEPTANCE LIMIT; then PNSC review is required.

REFERENCES:

SDCM; FSAR Table of Contents; Section 11, 12, 15
Technical Specifications Index, 2/4.11.1, 3/4.11.2, 3/4.16.2, 6.9
6.13 and Basis.

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 does not effect any safety related systems, structures, or components. The changes update the ODCM with data from the latest Land Use Census. Other changes were administrative only. Therefore the result of this revision will in no way increase the probability of occurrence of any accident previously evaluated for in the FSAR.
2. These changes do not alter in any way, the initial conditions of any accident or effect mitigating systems, structures, or components. Therefore, these changes will not increase the consequences of any accident previously evaluated in the FSAR.
3. This revision incorporates data from the latest Land Use Census that will result in more accurate dose assessment to the public from operation of the Brunswick Plant. Other changes made were administrative improvements to the Manual. This revision will not increase the probability of occurrence of a malfunction of equipment important to safety.
4. Equipment important to safety is in no way effected by revisions made to the ODCM. The consequences of a malfunction of equipment important to safety will not be increased.
5. The changes made to update Table 3.2-2 "Distance To Controlling Locations as Measured From the Brunswick Plant Center (Mi)" and other administrative changes will not increase the possibility of an accident of a different type than any evaluated previously in the SAR.
6. This revision does not effect any plant equipment important to safety and therefore will not create the possibility of a malfunction of equipment important to safety of a different type than evaluated previously in the FSAR.
7. These changes will not reduce the margin of safety as defined by Tech Specs. Updated information from the Land Use Census will enhance ability to assess dose to the public from BNP effluents, other changes remove obsolete information and one change was made to an equipment designation.

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002
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BRUNSWICK STEAM ELECTRIC PLANT
OFF-SITE DOSE CALCULATION MANUAL
(ODCM)

REVISION 15

DOCKET NOS. 50-324
50-325

CAROLINA POWER & LIGHT COMPANY

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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&G 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:

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

Where:

- DF₀ - 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, μCi/ml
- EC_i - Annual average effluent concentration limit of radionuclide i from Appendix B, Table 2, Column 2 of 10CFR20, μCi/ml.

$$DF_B = (10) (DF_0) \quad (\text{Eq. 2.1-2})$$

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
- DF₀ - 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 (DF₀) 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 of $2 \text{ E-}4 \text{ } \mu\text{Ci/ml}$ 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 - $3 \text{ E-}7 \text{ } \mu\text{Ci/ml}$; 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} - $1.357 \text{ E}5 \text{ GPM}$
- RPF_{SW} - $8 \text{ E}3 \text{ GPM}$
- RR - 200 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

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

d. Calculated concentration at unrestricted area:

$$\text{Conc}_1 = \frac{(C_1) (MRR)}{(n-1) (RPF_{CW}) + (p-1) (RPF_{SW})} \quad (\text{Eq. 2.1-6})$$

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:

$$\sum_i (\text{Conc}_i / \text{EC}_i) \leq 1 \quad (\text{Eq. 2.1-7})$$

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, $\mu\text{Ci/ml}$.

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:

a. Actual concentration at unrestricted area:

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

Where:

- 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} - 8 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:

$$\sum_i (\text{Conc}_{ik}/EC_i) \leq 1 \quad (\text{Eq. 2.1-9})$$

Where:

- Conc_{ik} - The actual concentration of radionuclide i during release k (from Equation 2.1-8), $\mu\text{Ci/ml}$
- EC_i - Annual average effluent concentration limit of radionuclide i from Appendix B, Table 2, Column 2 of 10CFR20, $\mu\text{Ci/ml}$.

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 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 $\frac{\mu\text{Ci/ml}}{\text{cps}}$

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

Where:

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

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

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

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

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)

TABLE 2.1-1

ECs FOR SELECTED RADIONUCLIDES

<u>Radionuclide</u>	<u>EC₁ (μCi/ml)**</u>
H-3	1 E-3
Na-24	5 E-5
Cr-51	5 E-4
Mn-54	3 E-5
Co-58	2 E-5
Fe-59	1 E-5
Co-60	3 E-6
Cu-64	2 E-4
Zn-69m	6 E-5
Sr-89	8 E-6
Sr-90	5 E-7
Sr-91	2 E-5
Zr-95	2 E-5
Mo-99	2 E-5
I-131	1 E-6
I-132	1 E-4
I-133	7 E-6
Cs-134	9 E-7
I-134	4 E-4
I-135	3 E-5
Cs-137	1 E-6
La-141	5 E-5
Np-239	2 E-5
Am-241	2 E-8
Noble Gases	2 E-4

- mrem/year per $\mu\text{Ci}/\text{sec m}^2$ for food and ground plane pathways
- Q_{iS} - The release rate of radionuclide i in gaseous effluents from free-standing stack, $\mu\text{Ci}/\text{sec}$
- Q_{iV} - The release rate of radionuclide i in gaseous effluents from all vents releases, $\mu\text{Ci}/\text{sec}$
- W_v - The highest calculated annual average dispersion parameter for estimating the dose to an individual at the controlling location due to all vent releases
 - W_v - sec/m^3 for the inhalation pathway
 - W_v - meters^{-2} for the food and ground plane pathways
- W_s - The highest calculated annual average dispersion parameter for estimating the dose to an individual at the controlling location due to stack releases
 - W_s - sec/m^3 for the inhalation pathway
 - W_s - meters^{-2} for the food and ground plane pathways

Radioiodines, particulates, and tritium may be released from the stack, Reactor Buildings, and Turbine Buildings at BSEP. Radioiodines, particulates, and tritium may also be released from decontamination operations in the Hot Shop and burning waste oil in the incinerator. Effluents from the Hot Shop roof vent and incinerator are combined with the Turbine Building's vent releases. To show compliance with 10CFR20, (see Appendix H for waste oil) Expression 3.2-9 is modified to incorporate the various release points for BSEP:

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	-	-	-	1.0	1.2
NE	0.7	4.75*	-	-	-	-
ENE	0.7	-	-	-	-	-
E	0.7	-	-	-	-	-
ESE	0.7	-	-	-	1.5	-
SE	0.7	-	-	1.0	0.9	-
SSE	0.7	-	-	1.0	1.0	-
S	0.8	-	-	-	1.5	1.5
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	4.3
N	0.7	-	-	-	0.9	-

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

- sec/m^3 for the inhalation pathway and tritium
 - meters^{-2} for the food and ground plane pathway
- w_v
- The dispersion parameter for estimating the dose to an individual at the controlling location for short-term vent releases (equal to or less than 500 hours/year)
 - sec/m^3 for the inhalation pathway and tritium
 - meters^{-2} for the food and ground plane pathway
- 3.17×10^{-4}
- The inverse of the number of seconds in a year
- R_i
- The dose factor for each identified radionuclide i of the organ of interest, $\text{mrem/yr per } \mu\text{Ci/sec per m}^2$ or $\text{mrem/yr per } \mu\text{Ci/m}^3$

Radioiodines, particulates, and tritium may be released from the stack, Reactor Buildings, and Turbine Buildings at BSEP. Radioiodines, particulates, and tritium may also be released from decontamination operations in the Hot Shop and burning waste oil in the incinerator. Effluents from the Hot Shop roof vent and incinerator are combined with the Turbine Building's vent releases. Burning waste oil in the incinerator is limited to 0.1% of 10CFR50 Appendix I (see Appendix H for methodology and calculations). At BSEP all releases are considered long-term in duration. Therefore, incorporating the various release points into Expression 3.3-13 results in the following expressions to show compliance with 10CFR50 for a particular organ:

$$3.17 \times 10^{-4} \sum_i R_i W_s Q_i + W_{rb} (Q_{rb1} + Q_{rb2}) + W_{tb} (Q_{tb1} + Q_{tb2})$$

≤ 15.0 mrem per quarter or 30 mrem per year

(3.3-14)

II. Gaseous Effluent Monitoring Instruments

1. Main Stack Monitoring System
 - a. Noble Gas Activity Monitor 2-D12-RM-23S
(2-D12-RE-4982)
 - b. Iodine Sampler Cartridge IRSH35 Prefilters A or B
 - c. Particulate Sampler Filter IRSH35 Prefilters A or B
 - d. System Effluent Flow Rate Measurement Device 2-VA-FIQ-5902-1 OR -2
 - e. Sampler Flow Rate Measurement Device 2-D12-FE-4597
2. Reactor Building Ventilation Monitoring System
 - a. Noble Gas Activity Monitor 1(2)-CAC-AQH-1264-3
 - b. Iodine Sampler Cartridge 1(2)-CAC-AQH-1264-2
(collection cartridge only)
 - c. Particulate Sampler Filter 1(2)-CAC-AQH-1264-1
(collection filter only)
 - d. System Effluent Flow Rate Measurement Device 1(2)-VA-FIQ-3356
 - e. Sampler Flow Rate Measurement Device 1(2)-CAC-FI-1264
3. Turbine Building Ventilation Monitoring System
 - a. Noble Gas Activity Monitor 1(2)-D12-RM-23
(1(2)-D12-RE-4563)
 - b. Iodine Sampler Cartridge 1(2)-IRTB32
Prefilters A or B
 - c. Particulate Sampler Filter 1(2)-IRTB32
Prefilters A or B
 - d. System Effluent Flow Rate Measurement Device 1(2)-VA-FIQ-3358
 - e. Sampler Flow Rate Measurement Device 1(2)-D12-FE-4542
4. Main Condenser Air Ejector Radioactivity Monitor
 - a. Noble Gas Activity Monitor 1(2)-D12-RM-K601 A and B

- 5. Main Condenser Off-Gas Treatment System (AOG) Monitor
 - a. Noble Gas Activity Monitor 1(2)-AOG-RM-103
- 6. Main Condenser Off-Gas Treatment System Explosive Gas Monitoring System
 - a. Recombiner Train A
 - 1. First Hydrogen Monitor 1(2)-OG-AIT-4284 - Stream 1
 - 2. Second Hydrogen Monitor 1(2)-OG-AIT-4324 - Stream 2
 - b. Recombiner Train B
 - 1. First Hydrogen Monitor 1(2)-OG-AIT-4324 - Stream 1
 - 2. Second Hydrogen Monitor 1(2)-OG-AIT-4284 - Stream 2
- 7. Hot Shop Ventilation Monitoring System
 - a. Iodine Sampler Cartridge
 - b. Particulate Sampler Filter