3.3 COMPLIANCE WITH 10CFR50 (GASEOUS)

3.3.1 Noble Gases

1. Cumulation of Doses

Section II.B.1 of Appendix I of 10CFR50 limits the releases of gaseous effluents from each reactor such that the estimated annual gamma air dose is limited to 10 millirad and the beta air dose is limited to 20 millirad. Based upon NUREG 0133, the air dose in the unrestricted area due to noble gases released in gaseous effluents can be determined by the following expressions:

During any calendar quarter, for gamma radiation:

$$3.17 \times 10^{-8} \Sigma_i \left\{ M_i \left[\overline{(\chi/Q)_v} Q_{i_v} + \overline{(\chi/q)_v} q_{i_v} \right] + B_i Q_{i_s} + b_i q_{i_s} \right\} \leq 5 \text{ mrad} \quad (3.3\text{-}1)$$

During any calendar quarter, for beta radiation:

$$3.17 \times 10^{-8} \Sigma_i N_i \left[\overline{(\chi/Q)_v} Q_{i_v} + \overline{(\chi/q)_v} q_{i_v} + \overline{(\chi/Q)_s} Q_{i_s} + \overline{(\chi/q)_s} q_{i_s} \right] \leq 10 \text{ mrad} \quad (3.3\text{-}2)$$

During any calendar year, for gamma radiation:

$$3.17 \times 10^{-8} \Sigma_i \left\{ M_i \left[\overline{(\chi/Q)_v} Q_{i_v} + \overline{(\chi/q)_v} q_{i_v} \right] + B_i Q_{i_s} + b_i q_{i_s} \right\} \leq 10 \text{ mrad} \quad (3.3\text{-}3)$$

During any calendar year, for beta radiation:

$$3.17 \times 10^{-8} \Sigma_i N_i \left[\overline{(\chi/Q)_v} Q_{i_v} + \overline{(\chi/q)_v} q_{i_v} + \overline{(\chi/Q)_s} Q_{i_s} + \overline{(\chi/q)_s} q_{i_s} \right] \leq 20 \text{ mrad} \quad (3.3\text{-}4)$$

Where:

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide i, mrad/year per $\mu Ci/m^3$

N_i = The air dose factor due to beta emissions for each identified noble gas radionuclide i, mrad/year per $\mu Ci/m^3$

$\overline{(\chi/Q)_v}$ = The annual average relative concentration for areas at or beyond the unrestricted area boundary for long-term vent releases (greater than 500 hrs/year), sec/m^3

$\overline{(\chi / q)_v}$ = The relative concentration for areas at or beyond the unrestricted area boundary for short-term vent releases (equal to or less than 500 hours/year), sec/m^3

$\overline{(\chi / Q)_s}$ = The annual average relative concentration for areas at or beyond the unrestricted area boundary for long-term, free-standing stack releases (greater than 500 hours/year), sec/m^3

$\overline{(\chi / q)_s}$ = The relative concentration for areas at or beyond the unrestricted area boundary for short-term, free-standing stack releases (equal to or less than 500 hours year), sec/m^3

q_{i_s} = The average release of noble gas radionuclide i in gaseous effluents for short-term stack releases (equal to or less than 500 hours/year), µCi

q_{i_v} = The average release of noble gas radionuclide i in gaseous effluents for short-term vent releases (equal to or less than 500 hours/year), µCi

Q_{i_s} = The average release of noble gas radionuclide i in gaseous effluents for long-term, free-standing stack releases (greater than 500 hours/year), µCi

Q_{i_v} = The average release of noble gas radionuclide i in gaseous effluents for long-term vent releases (greater than 500 hours/year), µCi

B_i = The constant for long-term releases (greater than 500 hours/year) for each identified noble gas radionuclide i accounting for the gamma radiation from the elevated finite plume, mrad/year per µCi/sec

b_i = The constant for short-term releases (equal to or less than 500 hours/year) for each identified noble gas radionuclide i accounting for the gamma radiation from the elevated finite plume, mrad/year per µCi/sec

3.17×10^{-8} = The inverse of the number of seconds in a year

For BSEP all releases are considered long-term. The incorporation of the stack, Reactor Building, and Turbine Building release points into Expressions 3.3-1 through 3.3-4 results in the following expressions for two units to show compliance with 10CFR50.

During any calendar quarter or year:

Gamma radiation:

$$3.17 \times 10^{-8} \Sigma_i \left\{ M_i \left[\overline{(\chi/Q)_{rb}} (Q_{i_{rb1}} + Q_{i_{rb2}}) + \overline{(\chi/Q)_{tb}} (Q_{i_{tb1}} + Q_{i_{tb2}}) \right] + B_i Q_{i_s} \right\}$$

$\leq$ 10 mrad per quarter or 20 mrad per year

(3.3-5)

Beta radiation:

$$3.17 \times 10^{-8} \Sigma_i N_i \left[\overline{(\chi/Q)_{rb}} (Q_{i_{rb1}} + Q_{i_{rb2}}) + \overline{(\chi/Q)_{tb}} (Q_{i_{tb1}} + Q_{i_{tb2}}) + \overline{(\chi/Q)_s} Q_{i_s} \right]$$

$\leq$ 20 mrad per quarter or 40 mrad per year

(3.3-6)

Where:

$\overline{(\chi/Q)_{rb}}$ = Annual average relative concentration for releases from the Reactor Building, sec/m^3

$\overline{(\chi/Q)_{tb}}$ = Annual average relative concentration for releases from the Turbine Building, sec/m^3

$\overline{(\chi/Q)_s}$ = Annual average relative concentration for releases from the stack, sec/m^3

$Q_{i\,rb1}$, $Q_{i\,rb2}$ = Release of radionuclide i from Reactor Buildings 1 and 2, respectively, µCi

$Q_{i\,tb1}$, $Q_{i\,tb2}$ = Release of radionuclide i from Turbine Buildings 1 and 2, respectively, µCi

Q_{i_s} = Release of radionuclide i from the stack, µCi

At BSEP, the limiting location for noble gases is 0.7 miles NE. Substitution of the appropriate χ/Q values into Expressions 3.3-5 and 3.3-6 results in the following:

During any calendar quarter or year:

Gamma radiation:

$$3.17 \times 10^{-8} \Sigma_i \left\{ M_i \left[2.0 \times 10^{-7} \left(Q_{i_{rb1}} + Q_{i_{rb2}}\right) + 2.9 \times 10^{-6} \left(Q_{i_{tb1}} + Q_{i_{tb2}}\right)\right] + B_i Q_{i_s} \right\}$$

$\leq$ 10 mrad per quarter or 20 mrad per year

(3.3-7)

Beta radiation:

$$3.17 \times 10^{-8} \Sigma_i N_i \left[2.0 \times 10^{-7} \left(Q_{i_{rb1}} + Q_{i_{rb2}}\right) + 2.9 \times 10^{-6} \left(Q_{i_{tb1}} + Q_{i_{tb2}}\right) + 2.5 \times 10^{-8} Q_{i_s}\right]$$

$\leq$ 20 mrad per quarter or 40 mrad per year

(3.3-8)

The determination of the controlling locations for implementation of 10CFR50 is a function of parameters such as radionuclide mix, isotopic release, and meteorology.

The incorporation of these parameters into Expressions 3.3-1 through 3.3-4 resulted in the expressions for the controlling locations as presented in Expressions 3.3-7 and 3.3-8. The radionuclide mix was based upon source terms calculated using the NRC GALE Code and is presented in Table 3.2-1 as a function of release point.

The two or three highest site boundary $\overline{(\chi / Q)}$ values for each release point were utilized in conjunction with the radionuclide mix and release for each release point to determine the controlling site boundary location. Since mixed mode and elevated releases occur from BSEP and their maximum χ/Q values may not decrease with distance (i.e., the site boundary may not have the highest χ/Q values); χ/Q values were calculated at the midpoint of 10 standard distance intervals out to a distance of 5 miles. The two or three highest χ/Q values were considered in conjunction with the radionuclide mix and releases to determine the controlling location.

In the determination of the controlling location, annual average χ/Q values are utilized. These values are presented in tables in Appendix A. χ/Q values at the limiting site boundary location for releases from the Turbine Buildings, Reactor Buildings, and stack were obtained from Tables A-1, A-7, and A-13, respectively, of Appendix A. A description of the derivation of χ/Q values is also presented in Appendix A.

A particular combination of release point mix and meteorology dominates in the determination of the controlling location. For BSEP the controlling release point is the stack. The dominate factor in determining a control location becomes the B_i values. The NE sector at the site boundary is the control location because of its higher B_i values.

Values for M_i and N_i, which were used in the determination of the controlling location and which are to be used by BSEP in Expressions 3.3-7 and 3.3-8 to show compliance with 10CFR50 were presented in Table 3.2-4. These values originate from NUREG 0472, Revision 0, and were taken from Table B-1 of NRC Regulatory Guide 1.109, Revision 1. The values have been multiplied by 10^6 to convert from picocuries to microcuries.

The following relationship should hold for BSEP to show compliance with ODCM Specification 7.3.8.

For the calendar quarter:

$$D\gamma \leq 10\text{mrad} \quad (3.3\text{-}9)$$

$$D\beta \leq 20\text{mrad} \quad (3.3\text{-}10)$$

For the calendar year:

$$D\gamma \leq 20\text{mrad} \quad (3.3\text{-}11)$$

$$D\beta \leq 40\text{mrad} \quad (3.3\text{-}12)$$

Where:

$D\gamma$ = The air dose from gamma radiation, mrad

$D\beta$ = The air dose from beta radiation, mrad

The quarterly limits given above represent one-half the annual design objective of Section II.B.1 of Appendix I of 10CFR50. If any of the limits of Expressions 3.3-9 through 3.3-12 are exceeded, a special report pursuant to Section IV.A of Appendix I of 10CFR50 must be filed with the NRC.

3.3.2 I-131, I-133, Particulates, and Tritium*

1. Cumulation of Doses

Section II.C of Appendix I of 10CFR50 limits the release of radioiodines and radioactive material in particulate form from each reactor such that estimated dose or dose commitment to an individual in an unrestricted area from all pathways of exposure is not in excess of 15 mrem to any organ. Based upon NUREG 0133, the dose to an organ of an individual from radioiodines and particulates, with half-lives greater than 8 days in gaseous effluents released to unrestricted areas, can be determined by the following expression:

During any calendar quarter or year:

$$3.17 \times 10^{-8} \Sigma_i R_i (W_s Q_{i_s} + w_s q_{i_s} + W_v Q_{v_s} + w_v q_{i_v}) \leq 7.5 \text{ mrem per quarter or } 15 \text{ mrem per calendar year} \quad (3.3\text{-}13)$$

Where:

Q_{i_s} = Release of radionuclide i for long-term, free-standing stack releases (greater than 500 hours/year), μCi

Q_{i_v} = Release of radionuclide i for long-term vent releases (greater than 500 hours/year), μCi

q_{i_s} = Release of radionuclide i for short-term, free-standing stack releases (equal to or less than 500 hours/year), μCi

q_{i_v} = Release of radionuclide i for short-term vent releases (equal to or less than 500 hours/year), μCi

W_s = Dispersion parameter for estimating dose to an individual at the controlling location for long-term, free-standing stack releases (greater than 500 hours/year)

= sec/m^3 for the inhalation pathway and tritium

= $meters^{-2}$ for the food and ground plane pathway

*For ODCM calculations performed to comply with ODCM TRs 7.3.7.2 and 7.3.9.1, the I-133 values used are determined by actual analysis.

W_v = The dispersion parameter for estimating the dose to an individual at the controlling location for long-term vent releases (greater than 500 hours/year)

= sec/m^3 for the inhalation pathway and tritium

= $meters^{-2}$ for the food and ground plane pathway

w_s = Dispersion parameter for estimating the dose to an individual at the controlling location for short-term stack 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

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^{-8} = 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, mrem/yr per $\mu Ci/sec$ per m^{-2} or mrem/yr per $\mu Ci/m^3$

Radioiodines, particulates, and tritium may be released from the stack, Reactor Buildings, and Turbine Buildings at BSEP. Radioiodines and particulates, may also be released from other sources such as decontamination facility in the Hot Shop and burning of waste oil in the incinerator. Effluents from the decontamination facilities in the Radioactive Materials Container and Storage Building and hot shop, incinerator and any building exfiltration 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 expression to show compliance with 10CFR50 for a particular organ:

$$3.17 \times 10^{-8} \Sigma_i R_i \left[W_s Q_{i_s} + W_{rb} (Q_{i_{rb1}} + Q_{i_{rb2}}) + W_{tb} (Q_{i_{tb1}} + Q_{i_{tb2}}) \right] \quad (3.3\text{-}14)$$

$\leq$ 15.0 mrem per quarter or 30 mrem per year

Where:

W_s = Dispersion parameter for releases from the stack

W_{rb} = Dispersion parameter for releases from the Reactor Building

W_{tb} = Dispersion parameter for releases from the Turbine Building

Q_{i_s} = Release of radionuclide i from the stack, μCi

$Q_{i\,rb1}$, $Q_{i\,rb2}$ = Release of radionuclide i from Reactor Buildings 1 and 2, respectively, μCi

$Q_{i\,tb1}$, $Q_{i\,tb2}$ = Release of radionuclide i from Turbine Buildings 1 and 2, respectively, μCi

In determining the dose at a particular location, W (as in Section 3.2.2) is a function of the pathway. For the food and ground plane pathway, W is in terms of D/Q. If the inhalation pathway is considered, W is in terms of χ/Q. Incorporation of the various pathways into Expression 3.3-14 results in the following:

$$3.17 \times 10^{-8} \Sigma_i$$
$$\{(R_{iG} + R_{iM} + R_{iV} + R_{iB}) [\overline{(D/Q)_s} Q_{i_s} + \overline{(D/Q)_{rb}} (Q_{i_{rb1}} + Q_{i_{rb2}}) + \overline{(D/Q)_{tb}} (Q_{i_{tb1}} + Q_{i_{tb2}})] +$$
$$R_{i_I} [\overline{(\chi/Q)_s} Q_{i_s} + \overline{(\chi/Q)_{rb}} (Q_{i_{rb1}} + Q_{i_{rb2}}) + \overline{(\chi/Q)_{tb}} (Q_{i_{tb1}} + Q_{i_{tb2}})]\}$$
$$\leq 15 \text{ mrem (per quarter) or } 30 \text{ mrem (per year)} \qquad (3.3\text{-}15)$$

Where:

R_{iG} = Dose factor for an organ for radionuclide i for the ground plane exposure pathway, mrem/yr per μCi/sec per m^{-2}

R_{iM} = Dose factor for an organ for radionuclide i for either the cow milk or goat milk pathway, mrem/yr per μCi/sec per m^{-2}

R_{iV} = Dose factor for an organ for radionuclide i for the vegetable pathway, mrem/yr per μCi/sec per m^{-2}

R_{iB} = Dose factor for an organ for radionuclide i for the meat pathway. mrem/yr per μCi/sec per m^{-2}

R_{iI} = Dose factor for an organ for radionuclide i for the inhalation pathway, mrem/yr per μCi/m^3

$\overline{(D/Q)_{rb}}$ = Annual average deposition for releases from the Reactor Buildings, m^{-2}

$\overline{(D/Q)_{tb}}$ = Annual average deposition for releases from the Turbine Buildings, m^{-2}

$\overline{(D/Q)_{s}}$ = Annual average deposition for releases from the stack, m^{-2}

As discussed in Section 3.2.2, for tritium the parameter W for the food pathway is based upon χ/Q. The ground plane pathway is not appropriate for tritium. Therefore, the left-hand portion of Expression 3.3-15 may be modified for tritium as:

For tritium:

$$D_T = \frac{3.17 \times 10^{-8}(R_{T_M} + R_{T_V} + R_{T_B} + R_{T_I})}{\left[\overline{(\chi/Q)_s} Q_{T_s} + \overline{(\chi/Q)_{rb}}(Q_{T_{rb1}} + Q_{T_{rb2}}) + \overline{(\chi/Q)_{tb}}(Q_{T_{tb1}} + Q_{T_{tb2}})\right]} \quad (3.3\text{-}16)$$

Where:

D_T = Dose resulting from tritium, mrem

R_{T_M} = Dose factor for an organ for tritium for the milk pathway, mrem/yr per μCi/m^3

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

R_{T_B} = Dose factor for an organ for tritium for the beef pathway, mrem/yr per $\mu Ci/m^3$

R_{T_I} = Dose factor for an organ for tritium for the inhalation pathway, mrem/yr per $\mu Ci/m^3$

Q_{T_S} = Release of tritium from the stack, μCi

$Q_{T_{rb1}}$, $Q_{T_{rb2}}$ = Release of tritium from Reactor Buildings 1 and 2, respectively, μCi

$Q_{T_{tb1}}$, $Q_{T_{tb2}}$ = Release of tritium from Turbine Buildings 1 and 2, respectively, μCi

To show compliance with 10CFR50, Expression 3.3-15 is evaluated at the controlling pathway location. At BSEP the controlling location is a milk cow 4.75 miles in the NE sector. Expression 3.3-15 becomes:

$$3.17 \times 10^{-8} \Sigma_i$$
$$\{(R_{i_G} + R_{i_M}) [2.2 \times 10^{-10} Q_{i_S} + 2.7 \times 10^{-10} (Q_{i_{rb1}} + Q_{i_{rb2}}) + 5.7 \times 10^{-10} (Q_{i_{tb1}} + Q_{i_{tb2}})] +$$
$$R_{i_I} [2.4 \times 10^{-8} Q_{i_S} + 4.1 \times 10^{-8} (Q_{i_{rb1}} + Q_{i_{rb2}}) + 1.4 \times 10^{-7} (Q_{i_{tb1}} + Q_{i_{tb2}})]\}$$
$$\leq 15 \text{ mrem / quarter or } 30 \text{ mrem / year}$$

(3.3-17)

For tritium, Equation 3.3-16 reduces to:

$$D_T = 3.17 \times 10^{-8} (R_{T_M} + R_{T_I}) \left[2.4 \times 10^{-8} Q_{T_S} + 4.1 \times 10^{-8} (Q_{T_{rb1}} + Q_{T_{rb2}}) + 1.4 \times 10^{-7} (Q_{T_{tb1}} + Q_{T_{tb2}})\right]$$

(3.3-18)

The determination of a controlling location for implementation of 10CFR50 for radioiodines and particulates is a function of:

a. Radionuclide mix and isotopic release

b. Meteorology

c. Exposure pathway

d. Receptor's age

The incorporation of these parameters into Expression 3.3-14 results in the respective equations at the controlling location.

In the determination of the controlling location, the radionuclide mix of radioiodines and particulates was based upon the source terms calculated using the GALE code. This mix was presented in Table 3.2-1 as a function of release point.

In the determination of the controlling location, all of the exposure pathways, as presented in Table 3.2-2, were evaluated. These include cow milk, goat milk, beef and vegetable ingestion, and inhalation ground plane exposure. An infant was assumed to be present at all milk pathway locations. A child was assumed to be present at all vegetable garden and beef animal locations. The ground plane exposure pathway was only considered to be present where an infant was not present. Naturally, inhalation was present everywhere an individual was present.

For the determination of the controlling location, the highest D/Q values for each release point and release mode for the vegetable garden, cow milk, and goat milk pathways were selected. At BSEP, no cow milk or goat milk pathways are present. In accordance with NUREG 0133, dose to a "hypothetical" cow milk pathway located 4.75 miles NE was evaluated against existing vegetable garden pathways. The thyroid dose was calculated at each of these locations using the radionuclide mix and releases of Table 3.2-1. Based upon these calculations, it was determined that the controlling receptor pathway is the "hypothetical" cow milk-infant pathway in the NE sector, at 4.75 miles.

Tables 3.3-1 through 3.3-19 present R_i values for the total body, GI tract, bone, liver, kidney, thyroid, and lung organs for the ground plane, inhalation, cow milk, goat milk, and vegetable and meat ingestion pathways for the infant, child, teen, and adult age groups as appropriate to the pathways. These values were calculated using the methodology described in NUREG 0133 using a grazing period of eight months. A discussion of their calculation is presented in Appendix C.

In the determination of the controlling location annual average $\overline{D/Q}$ and $\overline{\chi/Q}$ values are utilized. D/Q values at the limiting real pathway locations for releases from the Turbine Buildings, Reactor Buildings, and the stack were obtained from Tables A-3, A-9, and A-15, respectively, of Appendix A. χ/Q values at the same location for these same release points were obtained from Tables A-1, A-7, and A-13 of Appendix A. A description of the derivation of the various χ/Q and D/Q values is presented in Appendix A.

Long-term $\overline{D/Q}$ values for the stack, Reactor Buildings, and Turbine Buildings are provided for the midpoints of the following distances:

0.0-0.5 mi.	0.5-1.0 mi.	1.0-1.5 mi.	1.5-2.0 mi.
2.0-2.5 mi.	2.5-3.0 mi.	3.0-3.5 mi.	3.5-4.0 mi.
4.0-4.5 mi.	4.5-5.0 mi.		

These values appear in tables in Appendix A. These tables may be utilized if an additional special location arises which is different from one presented in the special locations of Appendix A.

The following relationships should hold for BSEP to show compliance with BSEP ODCM Specification 7.3.9.

For the calendar quarter:

$$D\tau \leq 15 \text{ mrem} \qquad (3.3\text{-}19)$$

For the calendar year:

$$D\tau \leq 30 \text{ mrem} \qquad (3.3\text{-}20)$$

Where:

$D\tau$ = The dose to any organ τ from radioiodines and particulates, mrem

The quarterly limits given above represent one-half the annual design objective of Section II.C of Appendix I of 10CFR50. If any of the limits of Expressions 3.3-19 or 3.3-20 are exceeded, a special report pursuant to Section IV.A of Appendix I of 10CFR50 must be filed with the NRC.

2. Projection of Doses

Dose projections for this section are required at least once per 31 days in ODCM TR 7.3.11.2.

The doses will be projected using Expressions 3.3-17. When the operational conditions are expected to be the same as for the current month, the source term inputs into the equation for the projection can be taken directly from the current month's data. Where possible, credit for expected operational evolutions (i.e., outages, etc.) should be taken in the dose projections. This may be accomplished by using projected reactor-days of operation. For example:

If Unit 1 had 28 reactor-days of operation and the dose to the bone was 0.05 mrem (remember there are 6 organs to consider) and Unit 2 was down at 0 reactor-days, then obtain from Planning & Scheduling the projected number of reactor-days for both Units 1 and 2 in the upcoming month. Suppose that the projected reactor-days for Unit 1 will be 10 reactor-days and for Unit 2, 21 reactor-days. To calculate the projected dose "x":

$$\frac{28/2 + 0/2}{0.05} = \frac{10/2 + 21/2}{x}$$

$x = 0.06$ mrem to the bone

This projected dose to the bone is less than 0.6 mrem dose limit to any organ. If the dose to the bone or any other organ exceeds 0.6 mrem, the Turbine Building ventilation exhaust treatment system must be operational in the ensuing month.

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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ for all others.

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

PATHWAY = Vegetable

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	0.00E01	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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ for all others.

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

PATHWAY = Vegetable

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	1.60E 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	4.34E09	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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ for all others.

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

PATHWAY = Vegetable

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	3.17E 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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ 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	0.00E01	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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ 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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ 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
CS 134	1.95E 08	4.93E 06	5.63E 08	9.23E 08	2.86E 08	0.00E 01	1.03E 08	0.00E 01
CS 136	1.80E 07	9.78E 05	1.01E 07	2.78E 07	1.48E 07	0.00E 01	2.21E 06	0.00E 01
CS 137	1.20E 08	5.10E 06	8.51E 08	8.15E 08	2.65E 08	0.00E 01	9.55E 07	0.00E 01
BA 140	1.63E 06	1.42E 07	2.80E 07	2.45E 04	7.97E 03	0.00E 01	1.46E 04	0.00E 01
CE 141	9.86E 02	8.28E 06	1.33E 04	6.64E 03	2.91E 03	0.00E 01	0.00E 01	0.00E 01
CE 144	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	2.01E07	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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ 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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ 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 04	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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ 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 08	4.13E 07	4.37E 08	3.66E 07	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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ 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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per μCi/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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ for all others.

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

PATHWAY = Goat Milk

AGE GROUP = Teen

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	2.69E 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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ 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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per μCi/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	6.56E 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	5.23E 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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ for all others.

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

PATHWAY = Inhalation

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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ for all others.

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

PATHWAY = Inhalation

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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per μCi/sec for all others.

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

PATHWAY = Inhalation

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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per $\mu Ci/sec$ for all others.

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

PATHWAY = Inhalation

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 $\mu Ci/m^3$ for inhalation and tritium, and in units of m^2-mrem/yr per μCi/sec for all others.

INDEX

LIST OF TABLES

4.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Table 4.0-1 contains the sample point description, sampling and collection frequency analysis, and analysis frequency for various exposure pathways in the vicinity of the BSEP for the radiological monitoring program. Figures 4.0-1a and 4.0-1b show the locations of the various points.

TABLE 4.0-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM*

Exposure Pathway and/or Sample	Sample ID No.	Sample Point Description, Approximate Distance, and Direction	Sampling and Collection Frequency	Analysis Frequency	Analysis [a]
DIRECT RADIATION	1	1.1 miles E	Q	Q	Gamma Dose
	2	1.0 miles ESE	Q	Q	Gamma Dose
	3	0.9 miles SE	Q	Q	Gamma Dose
	4	1.1 miles SSE	Q	Q	Gamma Dose
	5	1.1 miles S	Q	Q	Gamma Dose
	6	1.0 miles SSW	Q	Q	Gamma Dose
	7	1.0 miles SW	Q	Q	Gamma Dose
	8	1.2 miles W	Q	Q	Gamma Dose
	9	1.0 miles WNW	Q	Q	Gamma Dose
	10	0.9 miles NW	Q	Q	Gamma Dose
	11	0.9 miles NNW	Q	Q	Gamma Dose
	12	1.0 miles N	Q	Q	Gamma Dose
	13	1.2 miles NNE	Q	Q	Gamma Dose
	14	0.5 miles NE	Q	Q	Gamma Dose
	15	0.9 miles ENE	Q	Q	Gamma Dose
	16	1.0 miles WSW	Q	Q	Gamma Dose
	17	1.5 miles ESE	Q	Q	Gamma Dose

*Refer to Figure 4.0-1a and Figure 4.0-1b

TABLE 4.0-1 (Cont'd)

Exposure Pathway and/or Sample	Sample ID No.	Sample Point Description, Approximate Distance, and Direction	Sampling and Collection Frequency	Analysis Frequency	Analysis [a]
DIRECT RADIATION (Cont'd)	18	1.7 miles SE	Q	Q	Gamma Dose
	77	5.3 miles S	Q	Q	Gamma Dose
	75	4.5 miles S	Q	Q	Gamma Dose
	76	4.8 miles SSW	Q	Q	Gamma Dose
	22	5.3 miles SW	Q	Q	Gamma Dose
	23	4.6 miles WSW	Q	Q	Gamma Dose
	24	3.0 miles W	Q	Q	Gamma Dose
	25	8.7 miles WNW	Q	Q	Gamma Dose
	26	5.9 miles NW	Q	Q	Gamma Dose
	27	5.0 miles NNW	Q	Q	Gamma Dose
	79	9.5 miles N	Q	Q	Gamma Dose
	78	10.0 miles NNE	Q	Q	Gamma Dose
	30	2.0 miles NE	Q	Q	Gamma Dose
	31	2.6 miles ENE	Q	Q	Gamma Dose
	32	5.7 miles ENE	Q	Q	Gamma Dose
	33	4.0 miles E	Q	Q	Gamma Dose
	34	5.5 miles ENE	Q	Q	Gamma Dose
	81	10.0 miles WNW [c]	Q	Q	Gamma Dose

TABLE 4.0-1 (Cont'd)

Exposure Pathway and/or Sample	Sample ID No.	Sample Point Description, Approximate Distance, and Direction	Sampling and Collection Frequency	Analysis Frequency	Analysis [(a)]
DIRECT RADIATION (Cont'd)	36	9.3 miles NE	Q	Q	Gamma Dose
	37	5.5 miles NW	Q	Q	Gamma Dose
	38	11.0 miles W	Q	Q	Gamma Dose
	39	5.3 miles SW	Q	Q	Gamma Dose
	40	6.9 miles WSW	Q	Q	Gamma Dose
	20	2.0 miles S	Q	Q	Gamma Dose
	21	2.9 miles SSW	Q	Q	Gamma Dose
	28	4.2 miles NW	Q	Q	Gamma Dose
	29	2.6 miles SSW	Q	Q	Gamma Dose
	35	7.5 miles SSE	Q	Q	Gamma Dose

TABLE 4.0-1 (Cont'd)

Exposure Pathway and/or Sample	Sample ID No.	Sample Point Description, Approximate Distance, and Direction	Sampling and Collection Frequency	Analysis Frequency	Analysis [a]
AIRBORNE Radioiodine and Particulate	200	1.0 miles SW Visitors Center	Continuous sampler operation with sample collected weekly or as required by dust loading, whichever is more frequent	W	Radioiodine Canister I-131 analysis
				W	Particulate sampler
	201	0.6 miles NE PMAC			Gross beta radioactivity analysis following filter change [b]
	202	1.0 miles S Substation - Const. Rd.		Q	Gamma isotopic analysis of composite by location
	203	2.3 miles SSW Southport Substation			
	204	23 miles NNE Sutton Plant - Control [c]			
	205	0.6 SSE Spoil Pond			

TABLE 4.0-1 (Cont'd)

Exposure Pathway and/or Sample	Sample ID No.	Sample Point Description, Approximate Distance, and Direction	Sampling and Collection Frequency	Analysis Frequency	Analysis [a]
WATERBORNE a. Surface	400	0.7 miles NE Intake Canal - Control [c]	Composite sample [d] Collection-M	Monthly	Gamma Isotopic
	401	4.9 miles SSW Discharge Canal at OD Pumps		Q	Tritium
b. Sediment	500	4.9 miles SSW Discharge - Beach near OD Pumps	Semiannual	Semiannual	Gamma Isotopic
INGESTION a. Milk	600	To be identified as available	With animals on pasture - semi-monthly At other times - monthly	Semi-monthly	Gamma isotopic and I-131 analyses (animals on pasture)
	601				
	602			Monthly	Gamma isotopic and I-131 analysis (other times)
	603				
b. Fish and Invertebrates (shrimp)	700	5.5 mile SSW Atlantic Ocean [e] at Discharge	When in Season - Semiannual	Semiannual	Gamma isotopic on edible portions
	701				
	702				
	703-705	Not Specified - Atlantic Ocean [c][e]			

TABLE 4.0-1 (Cont'd)

Exposure Pathway and/or Sample	Sample ID No.	Sample Point Description, Approximate Distance, and Direction	Sampling and Collection Frequency	Analysis Frequency	Analysis [a]
c. Broadleaf Vegetation	800	0.7 miles NE Intake Canal	When available - Monthly	Monthly	Gamma Isotopic
	801	0.6 miles SW Discharge Canal		Monthly	I-131
	802	10 miles - Control - Location not Specified [c]			
	803	0.6 miles SSE Spoil Pond			

(a) The LLD for each analysis is specified in Table 7.3.15-3 of the ODCM Specifications for the Brunswick Steam Electric Plant.

(b) Particulate samples will be analyzed for gross beta radiation 24 hours or more following filter change. Perform gamma scan on each sample when gross beta activity is 10 times the mean of the control station.

(c) Control Station - These stations are presumed to be outside the influence of plant effluents.

(d) Composite samples shall be collected by collecting an aliquot at intervals not exceeding 6 hours.

(e) A sample of one free swimmer, one bottom feeder, and one shellfish (shrimp) will be collected if available. A control sample of each species collected will be obtained if available.

FIGURE 4.0-1a

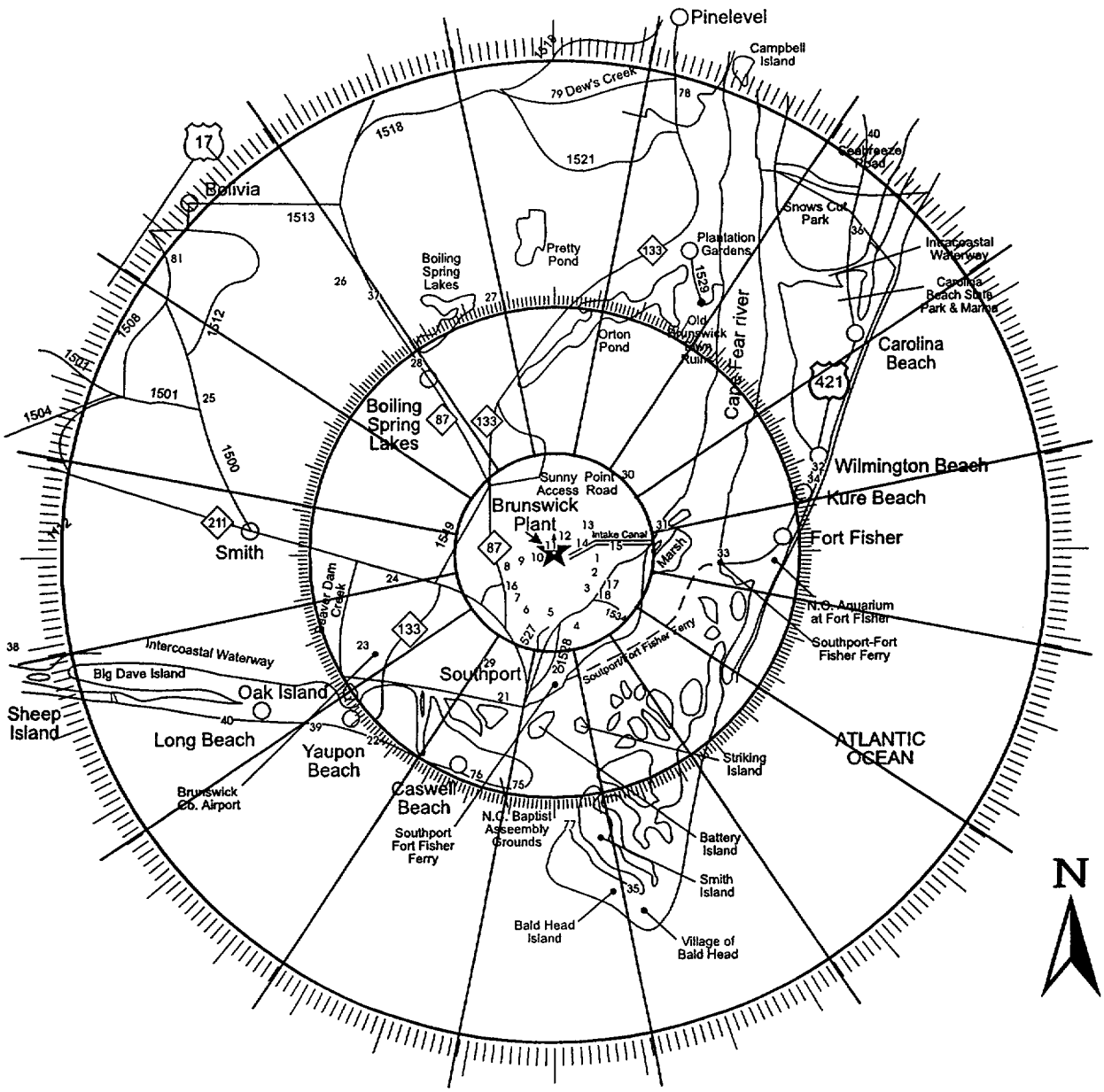
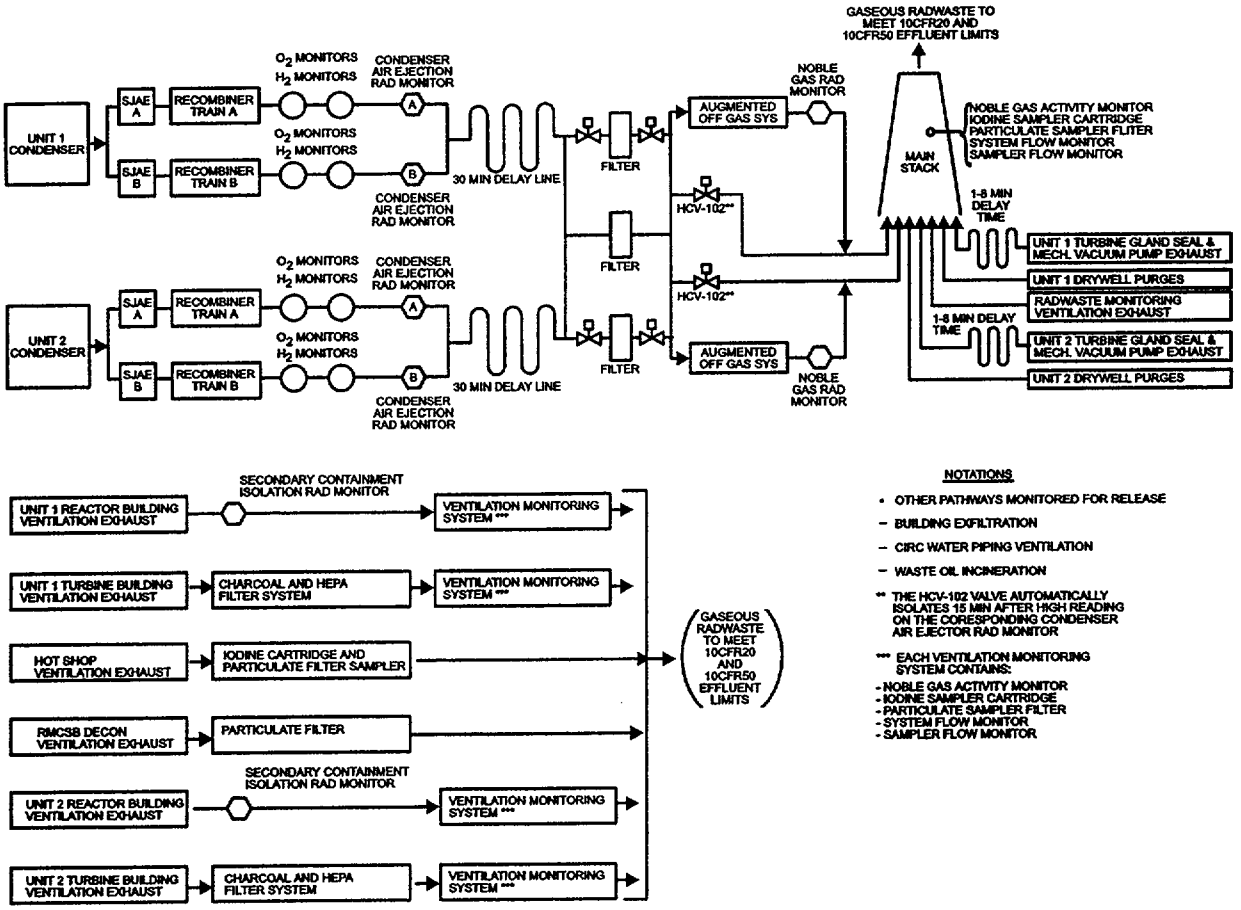

Pinelevel
Campbell Island
79 Dew's Creek
78
1518
1521
17
Bolivia
1513
Pretty Pond
133
Plantation Gardens
Snows Cut Park
Intracoastal Waterway
Boiling Spring Lakes
1529
Old Brunswick Town Ruins
Cape Fear river
Carolina Beach State Park & Marina
Orton Pond
Carolina Beach
421
1508
1512
1504
1501
1500
Boiling Spring Lakes
87
133
Sunny Point Access Road
Brunswick Plant
Intake Canal
Marsh
Wilmington Beach
Kure Beach
Fort Fisher
211
Smith
1519
Beaver Dam Creek
N.C. Aquarium at Fort Fisher
Southport-Fort Fisher Ferry
Intercoastal Waterway
Big Dave Island
Oak Island
Sheep Island
Long Beach
Yaupon Beach
Southport
Caswell Beach
Brunswick Co. Airport
Southport Fort Fisher Ferry
N.C. Baptist Asseembly Grounds
Striking Island
ATLANTIC OCEAN
Battery Island
Smith Island
Bald Head Island
Village of Bald Head
N

FIGURE 4.0-1b


GASEOUS RADWASTE TO MEET 10CFR20 AND 10CFR50 EFFLUENT LIMITS
UNIT 1 CONDENSER
SJAE A
SJAE B
RECOMBINER TRAIN A
RECOMBINER TRAIN B
O_2 MONITORS
H_2 MONITORS
CONDENSER AIR EJECTION RAD MONITOR
30 MIN DELAY LINE
FILTER
AUGMENTED OFF GAS SYS
NOBLE GAS RAD MONITOR
HCV-102**
MAIN STACK
NOBLE GAS ACTIVITY MONITOR
IODINE SAMPLER CARTRIDGE
PARTICULATE SAMPLER FLITER
SYSTEM FLOW MONITOR
SAMPLER FLOW MONITOR
1-8 MIN DELAY TIME
UNIT 1 TURBINE GLAND SEAL & MECH. VACUUM PUMP EXHAUST
UNIT 1 DRYWELL PURGES
RADWASTE MONITORING VENTILATION EXHAUST
UNIT 2 TURBINE GLAND SEAL & MECH. VACUUM PUMP EXHAUST
UNIT 2 DRYWELL PURGES
UNIT 2 CONDENSER
SECONDARY CONTAINMENT ISOLATION RAD MONITOR
UNIT 1 REACTOR BUILDING VENTILATION EXHAUST
VENTILATION MONITORING SYSTEM ***
UNIT 1 TURBINE BUILDING VENTILATION EXHAUST
CHARCOAL AND HEPA FILTER SYSTEM
HOT SHOP VENTILATION EXHAUST
IODINE CARTRIDGE AND PARTICULATE FILTER SAMPLER
RMCSB DECON VENTILATION EXHAUST
PARTICULATE FILTER
UNIT 2 REACTOR BUILDING VENTILATION EXHAUST
UNIT 2 TURBINE BUILDING VENTILATION EXHAUST
GASEOUS RADWASTE TO MEET 10CFR20 AND 10CFR50 EFFLUENT LIMITS
NOTATIONS
• OTHER PATHWAYS MONITORED FOR RELEASE
– BUILDING EXFILTRATION
– CIRC WATER PIPING VENTILATION
– WASTE OIL INCINERATION
** THE HCV-102 VALVE AUTOMATICALLY ISOLATES 15 MIN AFTER HIGH READING ON THE CORESPONDING CONDENSER AIR EJECTOR RAD MONITOR
*** EACH VENTILATION MONITORING SYSTEM CONTAINS:
- NOBLE GAS ACTIVITY MONITOR
- IODINE SAMPLER CARTRIDGE
- PARTICULATE SAMPLER FILTER
- SYSTEM FLOW MONITOR
- SAMPLER FLOW MONITOR

INDEX

5.0 INTERLABORATORY COMPARISON STUDIES

5.1 OBJECTIVE

The objective of this program is to evaluate the total laboratory analysis process by comparing results with results obtained by a separate laboratory or laboratories for an equivalent sample.

5.2 PROGRAM

5.2.1 Environmental Sample Analyses Comparison Program

Environmental samples from the BSEP environs will be analyzed by the Harris Energy & Environmental Center or by a qualified contracting laboratory. These laboratories will participate at least annually in a interlaboratory comparison study. The supplier of the interlabortory comparison samples will be a participant in the radioactivity measurements program conducted by the National Institute of Standards and Technology.

A minimum of 4 samples per year, two each of water and particulate filters will be analyzed under this program. These samples will contain radionuclides representative of those found in the plant effluent and environmental samples.

The results of the laboratories' performances in the study will be provided to BSEP E&RC. The results will be provided to the NRC upon request.

5.2.2 Effluent Release Analyses Program

BSEP E&RC will perform sample analyses for gamma-emitting radionuclides in effluent releases. The E&RC radiochemistry laboratory will participate annually in an interlaboratory comparison study or equivalent study. The results of these studies will be provided to the NRC upon request.

5.2.3 Abnormal Results

If the CP&L laboratory or vendor laboratory results lie at greater than three sigma from the "recognized value," an evaluation will be performed to identify any recommended remedial actions to reduce anomalous errors. Complete documentation of the evaluation will be available to BSEP and will be provided to the NRC upon request.

INDEX

6.0 TOTAL DOSE (40CFR190 CONFORMANCE)

6.1 INTRODUCTION

Compliance with 40CFR190 as prescribed by ODCM Specification 7.3.14 is to be demonstrated only when one or more of ODCM Specifications 7.3.4.a, 7.3.4.b, 7.3.8.a, 7.3.8.b, 7.3.9.a, 7.3.9.b is exceeded by a factor of 2. Once this occurs, the Company has 30 days to submit this report.

6.2 GENERAL

To perform the calculations to evaluate conformance with 40CFR190, an effort is made to develop doses that are realistic by removing assumptions that lead to overestimates of dose to a MEMBER OF THE PUBLIC (i.e., calculations for compliance with 10CR50, Appendix I). To accomplish this, the following calculational rules are used:

6.2.1 Doses to a MEMBER OF THE PUBLIC via the liquid release pathway are considered to be <1 mrem/yr. (Ref: NUREG 0543).

6.2.2 Doses to a MEMBER OF THE PUBLIC due to a milk pathway will be evaluated only as can be shown to exist. Otherwise, doses via this pathway will be estimated as <1 mrem/yr.

6.2.3 Environmental sampling data which demonstrates that no pathway exists may be used to delete a pathway to man from a calculation.

6.2.4 To sum numbers represented as "less than" (<), use the value of the largest number in the group.

(i.e., <5 + <1 + <1 + <3 = 5)

6.2.5 When doses via direct radiation are added to doses via inhalation pathway, they will be calculated for the same distance in the same sector.

6.2.6 The calculational locations for a MEMBER OF THE PUBLIC will only be at residences or places of employment.

NOTE: Additional assumptions may be used to provide situation-specific parameters, provided they are documented along with their concomitant bases.

6.3 CALCULATIONS OF TOTAL BODY DOSE

Estimates will be made for each of the following exposure pathways to the same location by age class. Only those age classes known to exist at a location are considered.

6.3.1 Direct Radiation

The component of dose to a MEMBER OF THE PUBLIC due to direct radiation will be determined by:

1. Determining the direct radiation dose at the plant boundary in each sector, D_B,θ.

2. Extrapolating that dose to the calculational location as follows:

$$D_L,\theta = \frac{D_B,\theta\ (1.49\ E\ +\ 6)}{(X_L^2,\theta)}$$

D_L,θ = dose at calculational location in sector θ

1.49E + 6 = square of mean distance to the site boundary (1220 m).

X_L,θ = distance to calculational locations in sector θ in meters.

6.3.2 Inhalation Dose

The inhalation dose will be determined at the calculational locations for each age class at risk according to the methods outlined in Section 3.3 of this manual.

6.3.3 Ingestion Pathway

The dose via the ingestion pathway will be calculated at the consumer locations for the consumers at risk. If no milk pathway exists in a sector, the dose via this pathway will be treated as <1 mrem/yr.

6.3.4 Other Uranium Fuel Cycle Sources

The dose from other fuel cycle sources will be treated as <1 mrem/yr.

6.4 THYROID DOSE

The dose to the thyroid will be calculated for each sector as the sum of inhalation dose and milk ingestion dose (if existing). The calculational methods will be those identified in Section 3.3 of this manual.

6.4.1 Dose projections can incorporate planned plant operations such as power reduction or outages for the projected period.

SECTION 7.0

RADIOACTIVE EFFLUENTS CONTROLS PROGRAM

CONTAINING

OFFSITE DOSE CALCULATION MANUAL
SPECIFICATIONS (ODCMS) AND BASES

FOR

BRUNSWICK STEAM ELECTRIC PLANT

UNITS 1 AND 2

(continued)

LIST OF TABLES

LIST OF FIGURES

7.1.0 USE AND APPLICATION

ODCMS 7.1.1 Definitions

NOTE
The defined terms of this section appear in capitalized type and are applicable throughout these Offsite Dose Calculation Manual Specifications and Bases.

Term	Definition
CHANNEL CALIBRATION	A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel, including the required sensor, alarm, display, and trip functions, and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by means of any series of sequential, overlapping, or total channel steps so that the entire channel is calibrated.
CHANNEL CHECK	A CHANNEL CHECK shall be the qualitative assessment, by observation, of channel behavior during operation. This determination shall include, where possible, comparison of the channel indication and status to other indications or status derived from independent instrument channels measuring the same parameter.
CHANNEL FUNCTIONAL TEST	A CHANNEL FUNCTIONAL TEST shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify OPERABILITY, including required alarm, interlock, display, and trip functions, and channel failure trips. The CHANNEL FUNCTIONAL TEST may be performed by means of any series of sequential, overlapping, or total channel steps so that the entire channel is tested.

(continued)

ODCMS 7.1.1 Definitions (continued)

GASEOUS RADWASTE TREATMENT SYSTEM	A GASEOUS RADWASTE TREATMENT SYSTEM is any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.
LIQUID RADWASTE TREATMENT SYSTEM	A LIQUID RADWASTE TREATMENT SYSTEM is any system designed and installed to collect, treat and process radioactive liquid waste streams for reuse or for controlled discharge from the restricted area in compliance with established regulatory requirements.
MEMBER(S) OF THE PUBLIC	MEMBER(S) OF THE PUBLIC shall include all persons who are not occupationally associated with the plant. This category does not include employees of the utility, its contractors or vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries. This category does include persons who use portions of the site for recreational, occupational or other purposes not associated with the plant.
MODE	A MODE shall be as required by Technical Specifications.
OPERABLE—OPERABILITY	A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).
PURGE-PURGING	PURGE or PURGING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is required to purify the containment.

(continued)

ODCMS 7.1.1 Definitions (continued)

RATED THERMAL POWER (RTP)	RTP shall be a total reactor core heat transfer rate to the reactor coolant of 2558 MWt.
SITE BOUNDARY	The SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased nor otherwise controlled by the licensee, as defined by Figure 7.1.1-1. For the purpose of effluent release calculations, the boundary for atmospheric releases is the SITE BOUNDARY and the boundary for liquid releases is the SITE BOUNDARY prior to dilution in the Atlantic Ocean.
SOURCE CHECK	A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to radiation.
THERMAL POWER	THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.
UNRESTRICTED AREA	An UNRESTRICTED AREA shall be any area at or beyond the SITE BOUNDARY access to which is not controlled by the licensee for purpose of protection of individuals from exposure to radiation and radioactive materials or any area within the SITE BOUNDARY used for residential quarters or industrial, commercial, institutional or recreational purposes.
VENTILATION EXHAUST TREATMENT SYSTEM	A VENTILATION EXHAUST TREATMENT SYSTEM is any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal adsorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any effect on noble gas effluents. Engineered Safety Feature (ESF) atmospheric cleanup systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

(continued)

ODCMS 7.1.1 Definitions (continued)

VENT-VENTING	VENT or VENTING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is not provided or required. Vent, used in system names, does not imply a VENTING process.

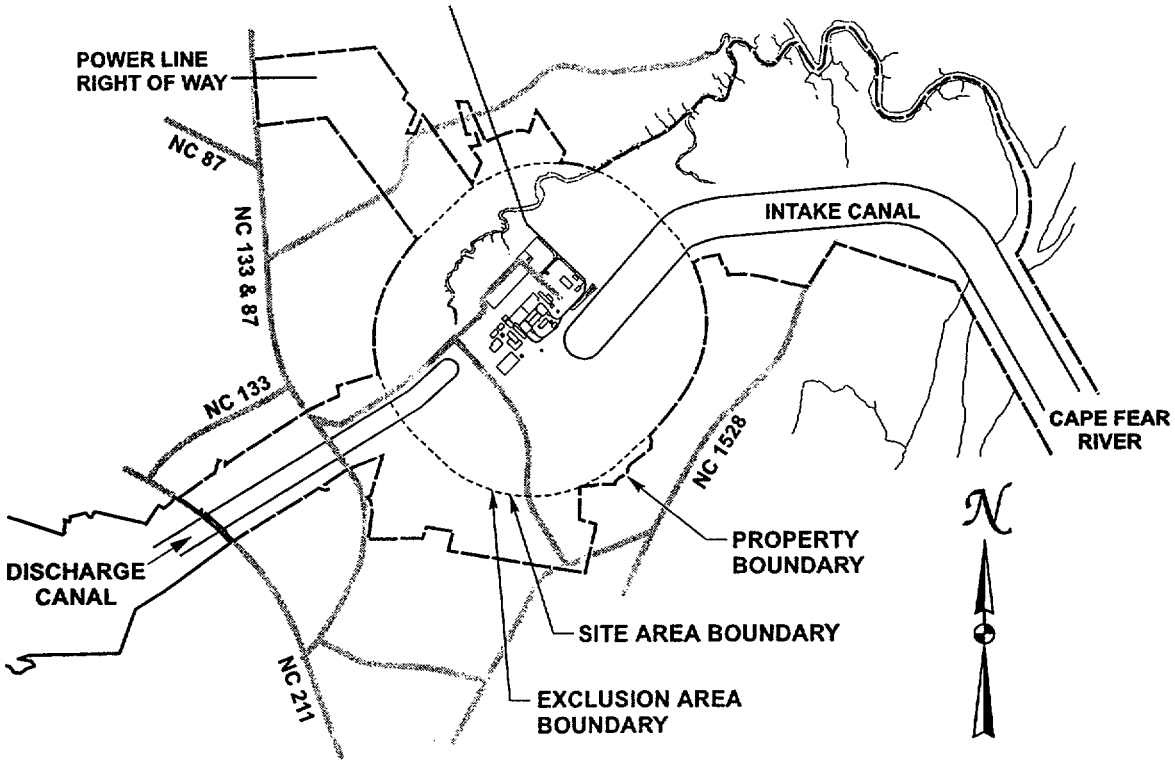


Figure 7.1.1-1 (page 1 of 1)
SITE BOUNDARY

7.1.0 USE AND APPLICATION

ODCMS 7.1.2 Logical Connectors

PURPOSE	The purpose of this section is to explain the meaning of logical connectors. Logical connectors are used in Offsite Dose Calculation Manual Specifications (ODCMS) to discriminate between, and yet connect, discrete Conditions, Required Compensatory Measures, Completion Times, Tests, and Frequencies. The only logical connectors that appear in ODCMS are AND and OR. The physical arrangement of these connectors constitutes logical conventions with specific meanings.
BACKGROUND	Several levels of logic may be used to state Required Compensatory Measures. These levels are identified by the placement (or nesting) of the logical connectors and by the number assigned to each Required Compensatory Measure. The first level of logic is identified by the first digit of the number assigned to a Required Compensatory Measure and the placement of the logical connector in the first level of nesting (i.e., left justified with the number of the Required Compensatory Measure). The successive levels of logic are identified by additional digits of the Required Compensatory Measure number and by successive indentions of the logical connectors. When logical connectors are used to state a Condition, Completion Time, Test, or Frequency, only the first level of logic is used, and the logical connector is left justified with the statement of the Condition, Completion Time, Test, or Frequency.
EXAMPLES	The following examples illustrate the use of logical connectors.

(continued)

ODCMS 7.1.2 Logical Connectors (continued)

EXAMPLES (continued)

EXAMPLE 7.1.2-1

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. ODCMS not met.	A.1 Verify . . . AND A.2 Restore . . .	

In this example the logical connector AND is used to indicate that when in Condition A, both Required Compensatory Measures A.1 and A.2 must be completed.

(continued)

ODCMS 7.1.2 Logical Connectors (continued)

EXAMPLES (continued)

EXAMPLE 7.1.2-2

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. ODCMS not met.	A.1 Trip . . . OR A.2.1 Verify . . . AND A.2.2.1 Reduce . . . OR A.2.2.2 Perform . . . OR A.3 Align . . .	

This example represents a more complicated use of logical connectors. Required Compensatory Measures A.1, A.2, and A.3 are alternative choices, only one of which must be performed as indicated by the use of the logical connector OR and the left justified placement. Any one of these three Compensatory Measures may be chosen. If A.2 is chosen, then both A.2.1 and A.2.2 must be performed as indicated by the logical connector AND. Required Compensatory Measure A.2.2 is met by performing A.2.2.1 or A.2.2.2. The indented position of the logical connector OR indicates that A.2.2.1 and A.2.2.2 are alternative choices, only one of which must be performed.

7.1.0 USE AND APPLICATION

ODCMS 7.1.3 Completion Times

PURPOSE	The purpose of this section is to establish the Completion Time convention and to provide guidance for its use.
BACKGROUND	Offsite Dose Calculation Manual Specifications (ODCMS) specify minimum requirements for unit systems or variables. The COMPENSATORY MEASURES associated with an ODCMS state Conditions that typically describe the ways in which the requirements of the ODCMS can fail to be met. Specified with each stated Condition are Required Compensatory Measure(s) and Completion Times(s).
DESCRIPTION	The Completion Time is the amount of time allowed for completing a Required Compensatory Measure. It is referenced to the time of discovery of a situation (e.g., inoperable equipment or variable not within limits) that requires entering a COMPENSATORY MEASURES Condition unless otherwise specified, providing the unit is in a MODE or specified condition stated in the Applicability of the ODCMS. Required Compensatory Measures must be completed prior to the expiration of the specified Completion Time. A COMPENSATORY MEASURES Condition remains in effect and the Required Compensatory Measures apply until the Condition no longer exists or the unit is not within the ODCMS Applicability. If situations are discovered that require entry into more than one Condition at a time within a single ODCMS (multiple Conditions), the Required Compensatory Measures for each Condition must be performed within the associated Completion Time. When in multiple Conditions, separate Completion Times are tracked for each Condition starting from the time of discovery of the situation that required entry into the Condition. Once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition unless specifically stated. The Required Compensatory Measures of the Condition continue to apply to each additional failure, with Completion Times based on initial entry into the Condition.

(continued)

ODCMS 7.1.3 Completion Times (continued)

DESCRIPTION (continued)

However, when a subsequent division, subsystem, component, or variable expressed in the Condition is discovered to be inoperable or not within limits, the Completion Time(s) may be extended. To apply this Completion Time extension, two criteria must first be met. The subsequent inoperability:

a. Must exist concurrent with the first inoperability; and

b. Must remain inoperable or not within limits after the first inoperability is resolved.

The total Completion Time allowed for completing a Required Compensatory Measure to address the subsequent inoperability shall be limited to the more restrictive of either:

a. The stated Completion Time, as measured from the initial entry into the Condition, plus an additional 24 hours; or

b. The stated Completion Time as measured from discovery of the subsequent inoperability.

The above Completion Time extension does not apply to those ODCMS that have exceptions that allow completely separate re-entry into the Condition (for each division, subsystem, component or variable expressed in the Condition) and separate tracking of Completion Times based on this re-entry. These exceptions are stated in individual ODCMS.

The above Completion Time extension does not apply to a Completion Time with a modified "time zero." This modified "time zero" may be expressed as a repetitive time (i.e., "once per 8 hours," where the Completion Time is referenced from a previous completion of the Required Compensatory Measures versus the time of Condition entry) or as a time modified by the phrase "from discovery . . ." Example 7.1.3-3 illustrates one use of this type of Completion Time. The 10 day Completion Time specified for Condition A and B in Example 7.1.3-3 may not be extended.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES

The following examples illustrate the use of Completion Times with different types of Conditions and changing Conditions.

EXAMPLE 7.1.3-1

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

Condition B has two Required Compensatory Measures. Each Required Compensatory Measure has its own separate Completion Time. Each Completion Time is referenced to the time that Condition B is entered.

The Required Compensatory Measures of Condition B are to be in MODE 3 within 12 hours AND in MODE 4 within 36 hours. A total of 12 hours is allowed for reaching MODE 3 and a total of 36 hours (**not 48 hours**) is allowed for reaching MODE 4 from the time that Condition B was entered. If MODE 3 is reached within 6 hours, the time allowed for reaching MODE 4 is the next 30 hours because the total time allowed for reaching MODE 4 is 36 hours.

If Condition B is entered while in MODE 3, the time allowed for reaching MODE 4 is the next 36 hours.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-2

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One pump inoperable.	A.1 Restore pump to OPERABLE status.	7 days
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

When a pump is declared inoperable, Condition A is entered. If the pump is not restored to OPERABLE status within 7 days, Condition B is also entered and the Completion Time clocks for Required Compensatory Measures B.1 and B.2 start. If the inoperable pump is restored to OPERABLE status after Condition B is entered, Condition A and B are exited, and therefore, the Required Compensatory Measures of Condition B may be terminated.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-3

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One Function X subsystem inoperable.	A.1 Restore Function X subsystem to OPERABLE status.	7 days AND 10 days from discovery of failure to meet the ODCMS
B. One Function Y subsystem inoperable.	B.1 Restore Function Y subsystem to OPERABLE status.	72 hours AND 10 days from discovery of failure to meet the ODCMS
C. One Function X subsystem inoperable. AND One Function Y subsystem inoperable.	C.1 Restore Function X subsystem to OPERABLE status. OR C.2 Restore Function Y subsystem to OPERABLE status.	72 hours 72 hours

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-3 (continued)

When one Function X subsystem and one Function Y subsystem are inoperable, Condition A and Condition B are concurrently applicable. The Completion Times for Condition A and Condition B are tracked separately for each subsystem, starting from the time each subsystem was declared inoperable and the Condition was entered. A separate Completion Time is established for Condition C and tracked from the time the second subsystem was declared inoperable (i.e., the time the situation described in Condition C was discovered).

If Required Compensatory Measure C.2 is completed within the specified Completion Time, Conditions B and C are exited. If the Completion Time for Required Compensatory Measure A.1 has not expired, operation may continue in accordance with Condition A. The remaining Completion Time in Condition A is measured from the time the affected subsystem was declared inoperable (i.e., initial entry into Condition A).

The Completion Times of Conditions A and B are modified by a logical connector, with a separate 10 day Completion Time measured from the time it was discovered the ODCMS was not met. In this example, without the separate Completion Time, it would be possible to alternate between Conditions A, B, and C in such a manner that operation could continue indefinitely without ever restoring systems to meet the ODCMS. The separate Completion Time modified by the phrase "from discovery of failure to meet the ODCMS" is designed to prevent indefinite continued operation while not meeting the ODCMS. This Completion Time allows for an exception to the normal "time zero" for beginning the Completion Time "clock". In this instance, the Completion Time "time zero" is specified as commencing at the time the ODCMS was initially not met, instead of at the time the associated Condition was entered.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-4

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One or more valves inoperable.	A.1 Restore valve(s) to OPERABLE status.	4 hours
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

A single Completion Time is used for any number of valves inoperable at the same time. The Completion Time associated with Condition A is based on the initial entry into Condition A and is not tracked on a per valve basis. Declaring subsequent valves inoperable, while Condition A is still in effect, does not trigger the tracking of separate Completion Times.

Once one of the valves has been restored to OPERABLE status, the Condition A Completion Time is not reset, but continues from the time the first valve was declared inoperable. The Completion Time may be extended if the valve restored to OPERABLE status was the first inoperable valve. The Condition A Completion Time may be extended for up to 4 hours provided this does not result in any subsequent valve being inoperable for > 4 hours.

If the Completion Time of 4 hours (plus the extension) expires while one or more valves are still inoperable, Condition B is entered.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-5

COMPENSATORY MEASURES

NOTE
Separate Condition entry is allowed for each inoperable valve.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One or more valves inoperable.	A.1 Restore valve to OPERABLE status.	4 hours
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

The Note above the COMPENSATORY MEASURES Table is a method of modifying how the Completion Time is tracked. If this method of modifying how the Completion Time is tracked was applicable only to a specific Condition, the Note would appear in that Condition rather than at the top of the COMPENSATORY MEASURES Table.

The Note allows Condition A to be entered separately for each inoperable valve, and Completion Times tracked on a per valve basis. When a valve is declared inoperable, Condition A is entered and its Completion Time starts. If subsequent valves are declared inoperable, Condition A is entered for each valve and separate Completion Times start and are tracked for each valve.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-5 (continued)

If the Completion Time associated with a valve in Condition A expires, Condition B is entered for that valve. If the Completion Times associated with subsequent valves in Condition A expire, Condition B is entered separately for each valve and separate Completion Times start and are tracked for each valve. If a valve that caused entry into Condition B is restored to OPERABLE status, Condition B is exited for that valve.

Since the Note in this example allows multiple Condition entry and tracking of separate Completion Times, Completion Time extensions do not apply.

EXAMPLE 7.1.3-6

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One channel inoperable.	A.1 Perform TR 7.3.x.x. OR A.2 Reduce THERMAL POWER to ≤ 50% RTP.	Once per 8 hours 8 hours
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-6 (continued)

Entry into Condition A offers a choice between Required Compensatory Measure A.1 or A.2. Required Compensatory Measure A.1 has a "once per" Completion Time, which qualifies for the 25% extension, per TR 7.3.0.2, to each performance after the initial performance. The initial 8 hour interval of Required Compensatory Measure A.1 begins when Condition A is entered and the initial performance of Required Compensatory Measure A.1 must be completed within the first 8 hour interval. If Required Compensatory Measure A.1 is followed and the Required Compensatory Measure is not met within the Completion Time (plus the extension allowed by TR 7.3.0.2), Condition B is entered. If Required Compensatory Measure A.2 is followed and the Completion Time of 8 hours is not met, Condition B is entered.

If after entry into Condition B, Required Compensatory Measure A.1 or A.2 is met, Condition B is exited and operation may then continue in Condition A.

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)

EXAMPLE 7.1.3-7

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. One subsystem inoperable.	A.1 Verify affected subsystem isolated. AND A.2 Restore subsystem to OPERABLE status.	1 hour AND Once per 8 hours thereafter 72 hours
B. Required Compensatory Measure and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours

Required Compensatory Measure A.1 has two Completion Times. The 1 hour Completion Time begins at the time the Condition is entered and each "Once per 8 hours thereafter" interval begins upon performance of Required Compensatory Measure A.1.

If after Condition A is entered, Required Compensatory Measure A.1 is not met within either the initial 1 hour or any subsequent 8 hour interval from the previous performance (plus the extension allowed by TR 7.3.0.2), Condition B is entered. The Completion Time clock for Condition A does not stop after Condition B is entered, but continues

(continued)

ODCMS 7.1.3 Completion Times (continued)

EXAMPLES (continued)	EXAMPLE 7.1.3-7 (continued) from the time Condition A was initially entered. If Required Compensatory Measure A.1 is met after Condition B is entered, Condition B is exited and operation may continue in accordance with Condition A, provided the Completion Time for Required Compensatory Measure A.2 has not expired.
IMMEDIATE COMPLETION TIME	When "Immediately" is used as a Completion Time, the Required Compensatory Measure should be pursued without delay and in a controlled manner.

7.1.0 USE AND APPLICATION

ODCMS 7.1.4 Frequency

PURPOSE

The purpose of this section is to define the proper use and application of Frequency requirements.

DESCRIPTION

Each Test Requirement (TR) of the Offsite Dose Calculation Manual has a specified Frequency in which the Test must be met in order to meet the associated Offsite Dose Calculation Manual Specification (ODCMS). An understanding of the correct application of the specified Frequency is necessary for compliance with the TR.

The "specified Frequency" is referred to throughout this section and each of the Specifications of Section 7.3.0, Test Requirement (TR) Applicability. The "specified Frequency" consists of the requirements of the Frequency column of each TR, as well as certain Notes in the Test column that modify performance requirements.

Sometimes special situations dictate when the requirements of a Test are to be met. They are "otherwise stated" conditions allowed by TR 7.3.0.1. They may be stated as clarifying Notes in the Test, as part of the Test, or both. Example 7.1.4-4 discusses these special situations.

Situations where a Test could be required (i.e., its Frequency could expire), but where it is not possible or not desired that it be performed until sometime after the associated ODCMS is within its Applicability, represent potential TR 7.3.0.4 conflicts. To avoid these conflicts, the TR (i.e., the Test or the Frequency) is stated such that it is only "required" when it can be and should be performed. With a TR satisfied, TR 7.3.0.4 imposes no restriction.

The use of "met or "performed" in these instances conveys specific meanings. A Test is "met" only when the acceptance criteria are satisfied. Known failure of the requirements of a Test, even without a Test specifically being "performed," constitutes a Test not "met." "Performance" refers only to the requirement to specifically determine the

(continued)

ODCMS 7.1.4 Frequency (continued)

DESCRIPTION (continued)

ability to meet the acceptance criteria. TR 7.3.0.4 restrictions would not apply if both the following conditions are satisfied:

a. The Test is not required to be performed; and

b. The Test is not required to be met or, even if required to be met, is not known to be failed.

EXAMPLES

The following examples illustrate the various ways that Frequencies are specified. In these examples, the Applicability of the ODCMS (ODCMS not shown) is MODES 1, 2, and 3.

EXAMPLE 7.1.4-1

TEST REQUIREMENTS

TEST	FREQUENCY
Perform CHANNEL CHECK.	12 hours

Example 7.1.4-1 contains the type of TR most often encountered in the ODCMS. The Frequency specifies an interval (12 hours) during which the associated Test must be performed at least one time. Performance of the Test initiates the subsequent interval. Although the Frequency is stated as 12 hours, an extension of the time interval to 1.25 times the interval specified in the Frequency is allowed by TR 7.3.0.2 for operational flexibility. The measurement of this interval continues at all times, even when the TR is not required to be met per TR 7.3.0.1 (such as when the equipment is inoperable, a variable is outside specified limits, or the unit is outside the Applicability of the ODCMS). If the interval specified by TR 7.3.0.2 is exceeded while the unit is in a MODE or other specified condition in the Applicability of the ODCMS, and the performance of the Test is not otherwise modified (refer to Examples 7.1.4-3 and 7.1.4-4), then TR 7.3.0.3 becomes applicable.

(continued)

ODCMS 7.1.4 Frequency (continued)

EXAMPLES (continued)

EXAMPLE 7.1.4-1 (continued)

If the interval as specified by TR 7.3.0.2 is exceeded while the unit is not in a MODE or other specified condition in the Applicability of the ODCMS for which performance of the TR is required, the Test must be performed within the Frequency requirements of TR 7.3.0.2 prior to entry into the MODE or other specified condition. Failure to do so would result in a violation of TR 7.3.0.4.

EXAMPLE 7.1.4-2

TEST REQUIREMENTS

TEST	FREQUENCY
Verify flow is within limits.	Once within 12 hours after ≥ 25% RTP AND 24 hours thereafter

Example 7.1.4-2 has two Frequencies. The first is a one time performance Frequency, and the second is of the type shown in Example 7.1.4-1. The logical connector "AND" indicates that both Frequency requirements must be met. Each time reactor power is increased from a power level < 25% RTP to≥ 25% RTP, the Test must be performed within 12 hours.

The use of "once" indicates a single performance will satisfy the specified Frequency (assuming no other Frequencies are connected by "AND"). This type of Frequency does not qualify for the extension allowed by TR 7.3.0.2.

(continued)

ODCMS 7.1.4 Frequency (continued)

EXAMPLES (continued)

EXAMPLE 7.1.4-2 (continued)

"Thereafter" indicates future performances must be established per TR 7.3.0.2, but only after a specified condition is first met (i.e., the "once" performance in this example). If reactor power decreases to < 25% RTP, the measurement of both intervals stops. New intervals start upon reactor power reaching 25% RTP.

EXAMPLE 7.1.4-3

TEST REQUIREMENTS

TEST	FREQUENCY
NOTE Not required to be performed until 12 hours after ≥ 25% RTP.	
Perform channel adjustment.	7 days

The interval continues whether or not the unit operation is < 25% RTP between performances.

As the Note modifies the required performance of the Test, it is construed to be part of the "specified Frequency." Should the 7 day interval be exceeded while operation is < 25% RTP, this Note allows 12 hours after power reaches ≥ 25% RTP to perform the Test. The Test is still considered to be within the "specified Frequency." Therefore, if the Test were not performed within the 7 day interval (plus the extension allowed by TR 7.3.0.2), but operation was < 25% RTP, it would not constitute a failure of the TR or failure to meet the ODCMS. Also, no violation of TR 7.3.0.4 occurs when changing MODES, even with the 7 day Frequency not met, provided operation does not exceed 12 hours with power ≥ 25% RTP.

(continued)

ODCMS 7.1.4 Frequency (continued)

EXAMPLES (continued)

EXAMPLE 7.1.4-3 (continued)

Once the unit reaches 25% RTP, 12 hours would be allowed for completing the Test. If the Test were not performed within this 12 hour interval, there would then be a failure to perform a Test within the specified Frequency, and the provisions of TR 7.3.0.3 would apply.

EXAMPLE 7.1.4-4

TEST REQUIREMENTS

TEST	FREQUENCY
NOTE Only required to be met in MODE 1.	
Verify leakage rates are within limits.	24 hours

Example 7.1.4-4 specifies that the requirements of this Test do not have to be met until the unit is in MODE 1. The interval measurement for the Frequency of this Test continues at all times, as described in Example 7.1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Test. Therefore, if the Test were not performed within the 24 hour (plus the extension allowed by TR 7.3.0.2) interval, but the unit was not in MODE 1, there would be no failure of the TR nor failure to meet the ODCMS. Therefore, no violation of TR 7.3.0.4 occurs when changing MODES, even with the 24 hour Frequency exceeded, provided the MODE change was not made into MODE 1. Prior to entering MODE 1 (assuming again that the 24 hour Frequency were not met), TR 7.3.0.4 would require satisfying the TR.

7.2.0 Not used.

7.3.0 OFFSITE DOSE CALCULATION MANUAL SPECIFICATION (ODCMS) APPLICABILITY

ODCMS 7.3.0.1	ODCMSs shall be met during the MODES or other specified conditions in the Applicability, except as provided in ODCMS 7.3.0.2.
ODCMS 7.3.0.2	Upon discovery of a failure to meet an ODCMS, the required Compensatory Measures of the associated Conditions shall be met, except as provided in ODCMS 7.3.0.5. If the ODCMS is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Compensatory measure(s) is not required, unless otherwise stated.
ODCMS 7.3.0.3	Not used.
ODCMS 7.3.0.4	When an ODCMS is not met, entry into a MODE or other specified condition in the Applicability shall not be made except when the associated COMPENSATORY MEASURES to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time. This ODCMS shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with COMPENSATORY MEASURES, or that are part of a shutdown of the unit. Exceptions to this ODCMS are stated in the individual ODCMSs. These exceptions allow entry into MODES or other specified conditions in the Applicability when the associated COMPENSATORY MEASURES to be entered allow unit operation in the MODE or other specified condition in the Applicability only for a limited period of time.
ODCMS 7.3.0.5	Equipment removed from service or declared inoperable to comply with COMPENSATORY MEASURES may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to ODCMS 7.3.0.2 for the system returned to service under administrative control to perform the required testing.

(continued)

7.3.0 ODCMS APPLICABILITY (continued)

ODCMS 7.3.0.6 ODCMSs and associated COMPENSATORY MEASURES shall apply to both units except as follows:

a. Whenever the ODCMS refers to systems or components which are not shared by both units, the ODCMS and associated Applicability and COMPENSATORY MEASURES shall apply to each unit individually (e.g., in the event of an inoperability in a non-shared system, the appropriate COMPENSATORY MEASURES will apply only to the unit with the inoperable system);

b. Whenever the ODCMS only applies to one unit, this will be identified in the Applicability of the ODCMS; and

c. Whenever certain portions of the ODCMS, Applicability, or COMPENSATORY MEASURES contain operating parameters, setpoints, etc., which are different for each unit, this will be identified in parentheses, notes, or the body of the requirement.

7.3.0 TEST REQUIREMENT (TR) APPLICABILITY

TR 7.3.0.1	TRs shall be met during the MODES or other specified conditions in the Applicability for individual ODCMSs, unless otherwise stated in the TR. Failure to meet a Test whether such failure is experienced during the performance of the Test or between performances of the Test, shall be failure to meet the ODCMS. Failure to perform a Test within the specified Frequency shall be failure to meet the TRMS except as provided in TR 7.3.0.3. Tests do not have to be performed on inoperable equipment or variables outside specified limits.
TR 7.3.0.2	The specified Frequency for each TR is met if the Test is performed within 1.25 times the interval specified in the Frequency, as measured from the previous performance or as measured from the time a specified condition of the Frequency is met. For Frequencies specified as "once," the above interval extension does not apply. If a Completion Time requires periodic performance on a "once per ..." basis, the above Frequency extension applies to each performance after the initial performance. Exceptions to this ODCMS are stated in the individual ODCMSs.
TR 7.3.0.3	If it is discovered that a Test was not performed within its specified Frequency, then compliance with the requirement to declare the ODCMS not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified Frequency, whichever is less. This delay period is permitted to allow performance of the Test. If the Test is not performed within the delay period, the ODCMS must immediately be declared not met, and the applicable Condition(s) must be entered. When the Test is performed within the delay period and the Test is not met, the ODCMS must immediately be declared not met, and the applicable Condition(s) must be entered.

(continued)

7.3.0 TR APPLICABILITY (continued)

TR 7.3.0.4 Entry into a MODE or other specified condition in the Applicability of an ODCMS shall not be made unless the ODCMS's Tests have been met within their specified Frequency. This provision shall not prevent entry into MODES or other specified conditions in the Applicability that are required to comply with COMPENSATORY MEASURES or that are part of a shutdown of the unit.

TR 7.3.0.5 TRs shall apply to both units (e.g., a single Test performed at the specified Frequency will satisfy the TR for both units) except as follows:

a. Whenever the ODCMS refers to systems or components which are not shared by both units, the associated TR shall apply to each unit individually (e.g., individual tests must be performed on each of the two units' non-shared systems or components; a single Test on a non-shared system of one unit performed at the specified Frequency will not satisfy the TR for the non-shared system of the other unit);

b. Whenever a TR only applies to one unit, this will be identified by a note to the TR; and

c. Whenever certain portions of the TRs, contain test parameters, acceptance criteria, or frequencies which are different for each unit, this will be identified in parentheses, notes, or the body of the requirement.

7.3.1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

ODCMS 7.3.1 The radioactive liquid effluent monitoring instrumentation channels in Table 7.3.1-1 shall be OPERABLE.

APPLICABILITY: In accordance with Table 7.3.1-1.

COMPENSATORY MEASURES

NOTE
Separate Condition entry is allowed for each required channel.

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. One or more radioactive liquid effluent monitoring instrumentation channels inoperable.	A.1	Enter the Condition referenced in Table 7.3.1-1 for the channel.	Immediately
B. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	B.1	Perform TR 7.3.3.1 on two independent samples of the batch to be released.	Prior to release through the liquid radwaste effluent line
	AND		
	B.2	Verify the associated release rate calculations and the discharge valve lineup using two qualified members of the technical staff.	Prior to release through the liquid radwaste effluent line
	AND		
	B.3	Restore the channel to OPERABLE status.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
C. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	C.1	Estimate the flow rate through the associated pathway using pump performance curves or tank level indicators.	Once per 4 hours during releases through the associated line
	AND		
	C.2	Restore the channel to OPERABLE status.	30 days
D. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	D.1	Collect and analyze a grab sample for gross radioactivity (beta or gamma) of the associated effluent. The LLD shall be ≤ 1.0 E-7 μCi/gm.	Once per 12 hours
	AND		
	D.2	Restore the channel to OPERABLE status.	30 days
E. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	E.1	Collect and analyze a grab sample for principal gamma emitters per Table 7.3.3-1.	Once per 24 hours
	AND		
	E.2	Restore the channel to OPERABLE status.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
F. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	F.1	Estimate the flow rate through the associated pathway using the V-notch weir or another acceptable method.	Once per 24 hours
	AND		
	F.2	Restore the channel to OPERABLE status.	30 days
G. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.1-1.	G.1	Estimate the tank liquid level.	Once per 8 hours during all liquid additions and deletions to and from the tank
	AND		
	G.2	Restore the channel to OPERABLE status.	30 days
H. Required Compensatory Measure B.1, B.2, C.1, D.1, E.1, F.1, or G.1 and associated Completion Time not met.	H.1	Suspend effluent releases via the associated pathway.	Immediately
	AND		
	H.2	NOTE Only applicable for Function 6.	
		Suspend liquid additions to the Condensate Storage Tank.	Immediately

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
I. Required Compensatory Measure B.3, C.2, D.2, E.2, F.2, or G.2 and associated Completion Time not met.	I.1 Prepare and submit, in the Radioactive Effluent Release Report, the reason the channel was not restored to OPERABLE status within 30 days.	Upon submittal of current calendar year Radioactive Effluent Release Report

TEST REQUIREMENTS

NOTE
Refer to Table 7.3.1-1 to determine which TRs apply for each Radioactive Liquid Effluent Monitoring Instrumentation Function.

TEST	FREQUENCY
TR 7.3.1.1 NOTE: For Function 6, only required to be met during liquid additions to the tank. Perform CHANNEL CHECK.	24 hours
TR 7.3.1.2 NOTE: Only required to be met during continuous, periodic, or batch releases. Verify indication of flow.	24 hours

(continued)

TEST REQUIREMENTS (continued)

TEST		FREQUENCY
TR 7.3.1.3	Perform SOURCE CHECK.	31 days
TR 7.3.1.4	Perform CHANNEL FUNCTIONAL TEST, including demonstration of automatic isolation of the pathway and control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Circuit failure (High—voltage low). c. Downscale failure. d. Instrument controls not set in "operate" mode.	92 days
TR 7.3.1.5	Perform CHANNEL FUNCTIONAL TEST.	92 days
TR 7.3.1.6	Perform CHANNEL FUNCTIONAL TEST, including demonstration of control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Circuit failure (High—voltage low). c. Downscale failure. d. Instrument controls not set in "operate" mode.	92 days

(continued)

TEST REQUIREMENTS (continued)

TEST		FREQUENCY
TR 7.3.1.7	NOTE For Functions 1 and 3, previously established calibration procedures or sources that have been related to the initial CHANNEL CALIBRATION shall be used.	
	Perform CHANNEL CALIBRATION.	24 months

Table 7.3.1-1 (page 1 of 1)
Radioactive Liquid Effluent Monitoring Instrumentation

	FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A.1	TEST REQUIREMENTS	ALARM/ TRIP SETPOINT VALUE
1.	Liquid Radwaste Radioactivity Effluent Monitor[b]	At all times	1	B	TR 7.3.1.1 TR 7.3.1.3 TR 7.3.1.4 TR 7.3.1.7	(c)
2.	Liquid Radwaste Effluent Flow Measurement Device	At all times	1	C	TR 7.3.1.2 TR 7.3.1.5 TR 7.3.1.7	NA
3.	Main Service Water System Effluent Radioactivity Monitor	At all times	1	D	TR 7.3.1.1 TR 7.3.1.3 TR 7.3.1.6 TR 7.3.1.7	(c)
4.	Stabilization Pond Effluent Composite Sampler	(d)	1	E	TR 7.3.1.1 TR 7.3.1.5 TR 7.3.1.7	NA[e]
5.	Stabilization Pond Effluent Flow Measurement Device	(d)	1	F	TR 7.3.1.1 TR 7.3.1.5 TR 7.3.1.7	NA
6.	Condensate Storage Tank Level Indicating Device	At all times	1	G	TR 7.3.1.1 TR 7.3.1.5 TR 7.3.1.7	NA[f]

(a) Specific instrumentation identification numbers are provided in Appendix E.

(b) Provides alarm and automatic termination of release.

(c) Alarm/trip setpoints shall be determined in accordance with ODCM methodology and set to ensure the limits of ODCMS 7.3.3, "Concentration—Liquid Effluents," are not exceeded.

(d) At all times other than when the line is valved out and locked.

(e) Flow Totalizer 2-DST-FQIS-5026 provides a trip signal to the composite sampler that will initiate sampling.

(f) 1(2) CO-LIT-1160 provides local level indication and also provides a signal to 1(2) CO-LI-1160A and 1(2) CO-LI-1160B.

7.3.2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

ODCMS 7.3.2 The radioactive gaseous effluent monitoring instrumentation channels in Table 7.3.2-1 shall be OPERABLE.

APPLICABILITY: In accordance with Table 7.3.2-1.

COMPENSATORY MEASURES

NOTE
Separate Condition entry is allowed for each required channel.

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. One or more radioactive gaseous effluent monitoring instrumentation channels inoperable.	A.1	Enter the Condition referenced in Table 7.3.2-1 for the channel.	Immediately
B. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	B.1	Take a grab sample at the associated sample location.	Once per 12 hours
	AND		
	B.2	Analyze the grab sample required by Required Compensatory Measure B.1 for gross noble gas activity.	24 hours after completion of Required Compensatory Measure B.1
	AND		
	B.3	Restore the channel to OPERABLE status.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
C. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	C.1.1	Initiate actions to establish auxiliary sampling equipment to continuously collect samples from the associated effluent release pathway as required by Table 7.3.7-1.	Immediately
	OR		
	C.1.2	NOTE Only applicable for ODCM test requirements, sample analysis, or system purging. Reference ODCMS 7.3.0.5 for post maintenance test requirements.	
		Initiate continuous sample collection from associated release pathway as required by Table 7.3.7-1 with auxiliary sampling equipment.	45 minutes
	AND		
	C.2	Restore the channel to OPERABLE status.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
D. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	D.1	Estimate the flow rate through the associated pathway.	Once per 8 hours
	AND		
	D.2	Restore the channel to OPERABLE status.	30 days
E. Required Compensatory Measure B.1, B.2, C.1.1, C.1.2, and D.1 and associated Completion Time not met.	E.1	Suspend effluent releases via the associated pathway.	Immediately

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
F. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	NOTE Required Compensatory Measures F.1 and F.2 are only applicable if two channels are inoperable in the operating recombiner train.		
	F.1	Take a grab sample from the operating recombiner train.	Once per 24 hours
	AND		
	F.2	Analyze the grab sample required by Required Compensatory Measure F.1.	4 hours after completion of Required Compensatory Measure F.1
	AND		
	F.3	Verify proper functioning of the operating recombiner train by monitoring recombiner temperature.	In accordance with approved procedures
	AND		
	F.4	Restore the channel(s) to OPERABLE status.	30 days
G. Required Compensatory Measure F.1, F.2, or F.3 and associated Completion Time not met.	G.1	Suspend operation of the associated recombiner train.	Immediately

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
H. Required Compensatory Measure B.3, C.2, D.2, or F.4 and associated Completion Time not met.	H.1	Prepare and submit in the Radioactive Effluent Release Report, the reason the channel was not restored to OPERABLE status within 30 days.	Upon submittal of current calendar year Radioactive Effluent Release Report
I. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	I.1	Verify GASEOUS RADWASTE TREATMENT SYSTEM is not bypassed.	Immediately
	AND		
	I.2	Verify the main stack effluent noble gas monitor is OPERABLE.	Immediately
	AND		
	I.3	Restore the channel to OPERABLE status.	72 hours
J. Required Compensatory Measure and associated Completion Time of Condition I not met.	J.1	Be in MODE 2.	12 hours
	AND		
	J.2	Prepare and submit in the Radioactive Effluent Release Report, the reason the channel was not restored to OPERABLE status within 72 hours.	Upon submittal of current calendar year Radioactive Effluent Release Report

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
K. As required by Required Compensatory Measure A.1 and referenced in Table 7.3.2-1.	K.1 Suspend effluent releases via the associated pathway.	Immediately

TEST REQUIREMENTS

NOTE
Refer to Table 7.3.2-1 to determine which TRs apply for each Radioactive Gaseous Effluent Monitoring Instrumentation Function.

TEST		FREQUENCY
TR 7.3.2.1	Perform CHANNEL CHECK.	24 hours
TR 7.3.2.2	Perform CHANNEL CHECK.	7 days
TR 7.3.2.3	Perform SOURCE CHECK.	31 days
TR 7.3.2.4	Perform CHANNEL FUNCTIONAL TEST.	31 days

(continued)

TEST REQUIREMENTS (continued)

	TEST	FREQUENCY
TR 7.3.2.5	Perform CHANNEL FUNCTIONAL TEST, including demonstration of control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Downscale failure. c. Instrument controls not set in "operate" mode.	92 days
TR 7.3.2.6	Perform CHANNEL FUNCTIONAL TEST.	92 days
TR 7.3.2.7	Perform CHANNEL FUNCTIONAL TEST; including demonstration of control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Downscale failure.	92 days
TR 7.3.2.8	Perform CHANNEL FUNCTIONAL TEST including control room annunciation in response to any of the following: a. Alarm/trip setpoint exceeded. b. Circuit failure (High—voltage low). c. Downscale failure. d. Instrument controls not set in "operate" mode.	92 days

(continued)

TEST REQUIREMENTS (continued)

	TEST	FREQUENCY
TR 7.3.2.9	Perform CHANNEL CALIBRATION. The CHANNEL CALIBRATION shall include the use of standard gas samples containing a nominal: a. Two volume percent hydrogen, balance nitrogen; and b. Four volume percent hydrogen, balance nitrogen.	92 days
TR 7.3.2.10	NOTE For Functions 1.a, 2.a, 3.a, 4, and 6, previously established calibration procedures or sources that have been related to the initial CHANNEL CALIBRATION shall be used. Perform CHANNEL CALIBRATION.	24 months

Table 7.3.2-1 (page 1 of 4)
Radioactive Gaseous Effluent Monitoring Instrumentation

	FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A.1	TEST REQUIREMENTS	ALARM/ TRIP SETPOINT VALUE
1.	Main Stack Monitoring System					
	a. Noble Gas Activity Monitor	At all times	1	B	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.5 TR 7.3.2.10	(b)
	b. Iodine Sampler Cartridge	At all times	1	C	TR 7.3.2.2	NA
	c. Particulate Sampler Filter	At all times	1	C	TR 7.3.2.2	NA
	d. System Effluent Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	NA
	e. Sampler Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	(c)
2.	Reactor Building Ventilation Monitoring System					
	a. Noble Gas Activity Monitor	At all times	1	B	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.7 TR 7.3.2.10	(b)
	b. Iodine Sampler Cartridge	At all times	1	C	TR 7.3.2.2	NA
	c. Particulate Sampler Filter	At all times	1	C	TR 7.3.2.2	NA
	d. System Effluent Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	NA

(continued)

(a) Specific instrumentation identification numbers are provided in Appendix E.

(b) Alarm/trip setpoints shall be determined in accordance with ODCM methodology and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents," are not exceeded.

(c) Alarm/trip setpoints shall be determined in accordance with associated design specification(s) and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents," are not exceeded.

Table 7.3.2-1 (page 2 of 4)
Radioactive Gaseous Effluent Monitoring Instrumentation

	FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A.1	TEST REQUIREMENTS	ALARM/ TRIP SETPOINT VALUE
2.	Reactor Building Ventilation Monitoring System (continued)					
	e. Sampler Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	(c)
3.	Turbine Building Ventilation Monitoring System					
	a. Noble Gas Activity Monitor	At all times	1	B	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.5 TR 7.3.2.10	(b)
	b. Iodine Sampler Cartridge	At all times	1	C	TR 7.3.2.2	NA
	c. Particulate Sampler Filter	At all times	1	C	TR 7.3.2.2	NA
	d. System Effluent Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	NA
	e. Sampler Flow Rate Measurement Device	At all times	1	D	TR 7.3.2.1 TR 7.3.2.6 TR 7.3.2.10	(c)
4.	Main Condenser Off-Gas Treatment System Noble Gas Activity Monitor[d] (Downstream of AOG Treatment System)	At all times	1	B	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.6 TR 7.3.2.10	(b)

(continued)

(a) Specific instrumentation identification numbers are provided in Appendix E.

(b) Alarm/trip setpoints shall be determined in accordance with ODCM methodology and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents," are not exceeded.

(c) Alarm/trip setpoints shall be determined in accordance with associated design specification(s) and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents," are not exceeded.

(d) Provides alarm.

Table 7.3.2-1 (page 3 of 4)
Radioactive Gaseous Effluent Monitoring Instrumentation

	FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A.1	TEST REQUIREMENTS	ALARM/ TRIP SETPOINT VALUE
5.	Main Condenser Off-Gas Treatment System Explosive Gas Monitoring System					
	a. Recombiner Train A	(e)	2	F	TR 7.3.2.1 TR 7.3.2.4 TR 7.3.2.9	(c)
	b. Recombiner Train B	(e)	2	F	TR 7.3.2.1 TR 7.3.2.4 TR 7.3.2.9	(c)
6.	Main Condenser Air Ejector Noble Gas Radioactivity Monitor[d] (Prior to input to Treatment System)	(f)	1	I	TR 7.3.2.1 TR 7.3.2.3 TR 7.3.2.8 TR 7.3.2.10	(b)
7.	Hot Shop Ventilation Monitoring System					
	a. Iodine Sampler Cartridge	At all times	1	C	TR 7.3.2.2	NA
	b. Particulate Sampler Filter	At all times	1	C	TR 7.3.2.2	NA

(continued)

(a) Specific instrumentation identification numbers are provided in Appendix E.

(b) Alarm/trip setpoints shall be determined in accordance with ODCM methodology and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents." are not exceeded.

(c) Alarm/trip setpoints shall be determined in accordance with associated design specification(s) and set to ensure the limits of ODCMS 7.3.7, "Dose Rate—Gaseous Effluents," are not exceeded.

(d) Provides alarm.

(e) During associated recombiner train operation.

(f) During operation of the main condenser air ejector.

Table 7.3.2-1 (page 4 of 4)
Radioactive Gaseous Effluent Monitoring Instrumentation

	FUNCTION[a]	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED COMPENSATORY MEASURES A.1	TEST REQUIREMENTS	ALARM/ TRIP SETPOINT VALUE
8.	Radioactive Materials Container and Storage Building Decontamination Facility					
	a. Iodine Sampler Cartridge	(g)	1	K	TR 7.3.2.1	NA
	b. Particulate Sampler Filter	(g)	1	K	TR 7.3.2.1	NA[h]

(a) Specific instrumentation identification numbers are provided in Appendix E.

(g) During operation of the Radioactive Materials Container and Storage Building Decontamination Facility.

(h) Local alarm.

7.3.3 CONCENTRATION—LIQUID EFFLUENTS

ODCMS 7.3.3 The concentration of radioactive material released to UNRESTRICTED AREAS after dilution in the discharge canal shall be limited to:

a. 10 times the concentrations specified in Appendix B, Table 2, Column 2 to 10 CFR 20.1001-20.2401 for radionuclides other than dissolved or entrained noble gases; and

b. 2×10^{-4} µCi/ml total activity concentration for all dissolved or entrained noble gases.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. Concentration of radioactive material released to UNRESTRICTED AREAS not within limits.	A.1	Initiate action to restore concentration to within limits.	Immediately

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.3.1	Verify the concentration of radioactive material released to UNRESTRICTED AREAS is within limits.	In accordance with Table 7.3.3-1

(continued)

TEST REQUIREMENTS (continued)

TEST		FREQUENCY
TR 7.3.3.2	NOTE Only required to be performed if stabilization pond or service water samples analyzed in accordance with Table 7.3.3-1 indicate concentrations of any gamma-emitting radionuclides greater than the trigger level of 5×10^{-6} μCi/ml.	
	Verify concentration of radioactive material released to UNRESTRICTED AREAS is within limits.	In accordance with Table 7.3.3-2 for liquid wastes exceeding the trigger level

Table 7.3.3-1 (page 1 of 3)
Radioactive Liquid Waste Sampling and Analysis Program

	LIQUID RELEASE TYPE	SAMPLE FREQUENCY	SAMPLE ANALYSIS FREQUENCY	SAMPLE ANALYSIS TYPE	SAMPLE LOWER LIMIT OF DETECTION (LLD)[a][e]
1.	Sample Tanks, Detergent Drain Tank, and Salt Water Release Tanks (Batch Release),[h]	Prior to release of each batch	Prior to release of each batch	Principal Gamma Emitters[g]	5×10^{-7}[b] µCi/ml
				I-131	1×10^{-6} µCi/ml
	AND	Prior to release of one batch once per 31 days	31 days	Dissolved and entrained gases (Gamma Emitters)	1×10^{-5} µCi/ml
	Circulating Water Pit	Prior to release of each batch	31 days Composite[c]	Gross Alpha	1×10^{-7} µCi/ml
				H-3	1×10^{-5} µCi/ml
		Prior to release of each batch	92 days Composite[c]	Sr-89, Sr-90	5×10^{-8} µCi/ml
				Fe-55	1×10^{-6} µCi/ml
2.	Stabilization Pond (d)	Prior to each release AND 24 hours during periods of release[f]	Prior to each release AND 24 hours during periods of release[f]	Principal Gamma Emitters (g)	5×10^{-7}[b] µCi/ml
3.	Service Water[d] (Potential Continuous Release)	7 days during system operation	7 days during system operation	Principal Gamma Emitters (g)	5×10^{-7}[b]

Table 7.3.3-1 (page 2 of 3)
Radioactive Liquid Waste Sampling and Analysis Program

(a) The detectability limits for activity analyses are based on technical feasibility limits and on the potential significance in the environment of the quantities released. For some nuclides, lower detection limits may be readily achievable; and when nuclides are measured below the stated limits, they should also be reported.

(b) When operational limitations preclude specific gamma radionuclide analysis of each batch, gross radioactivity measurements shall be made to estimate the quantity and concentrations of radioactive material released in the batch; and a weekly sample composited from proportional aliquots from each batch released during the week shall be analyzed for principal gamma-emitting radionuclides.

(c) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released.

(d) The stabilization pond and service water liquid release types represent potential release pathways and not actual release pathways. Test of these pathways is intended to alert the plant to a potential problem; analysis for principal gamma emitters should be sufficient to meet this intent. If analysis for principal gamma emitters indicates a problem (i.e., exceeds the trigger level of 5×10^{-6} μCi/ml), then complete sampling and analyses shall be performed as per Table 7.3.3-2.

(e) The lower limit of detectability (LLD) is the smallest concentration of a radioactive material in an unknown sample that will be detected with a 95% probability with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ \sigma_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot e^{-(\lambda_i t_e)}}$$

Where:

LLD is the "a priori" lower limit of detection as defined above (as microcuries per unit mass or volume)

σ_b = $(N/t_b)^{1/2}$

= standard deviation of background (cpm)

Table 7.3.3-1 (page 3 of 3)
Radioactive Liquid Waste Sampling and Analysis Program

N	=	background count rate (cpm)
t_b	=	time background counted for (min)
E	=	counting efficiency, as counts per disintegration
V	=	volume or mass of sample
2.22×10^6	=	conversion factor (dpm/microcurie)
Y	=	fractional radiochemical yield
λ_i	=	radioactive decay constant of ith nuclide (sec^{-1})
t_e	=	elapsed time between sample collection and counting (sec)

Typical values of E, V, Y, and t_e should be used in the calculation. It should be recognized that the LLD is defined as an "a priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular measurement.

(f) The stabilization pond is typically released over a several-day period. The pond is to be sampled and analyzed prior to commencing release. When composite sampling instrumentation becomes available and is OPERABLE, daily grab sampling of the stabilization pond effluent will not be required during release and the composite sample will be analyzed on a weekly basis.

(g) The principal gamma emitters for which the LLD specifications apply exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report.

(h) A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated and then thoroughly mixed to assure representative sampling.

Table 7.3.3-2 (page 1 of 3)
Radioactive Liquid Waste Sampling and Analysis Program
for Potential Release Pathways Which Have Exceeded Trigger Levels

	LIQUID RELEASE TYPE	SAMPLE FREQUENCY	SAMPLE ANALYSIS FREQUENCY	SAMPLE ANALYSIS TYPE	SAMPLE LOWER LIMIT OF DETECTION (LLD)[a][e]
1.	Stabilization Pond	Prior to each release	Prior to each release	Principal Gamma Emitters[g]	5×10^{-7}[b] µCi/ml
		AND	AND	I-131	1×10^{-6} µCi/ml
		24 hours during periods of release[f]	24 hours during periods of release[f]		
		Prior to one release once per 31 days	31 days	Dissolved and entrained gases (Gamma Emitters)	1×10^{-5} µCi/ml
		Prior to each release	31 days Composite[c]	Gross Alpha	1×10^{-7} µCi/ml
				H-3	1×10^{-5} µCi/ml
		Prior to each release	92 days Composite[c]	Sr-89, Sr-90	5×10^{-8} µCi/ml
				Fe-55	1×10^{-6} µCi/ml
2.	Service Water (Continuous Release)[h]	24 hours[d]	7 days Composite[c]	Principal Gamma Emitters (g)	5×10^{-7}[b] µCi/ml
				I-131	1×10^{-6} µCi/ml
		31 days Grab Sample	31 days	Dissolved and entrained gases (Gamma Emitters)	1×10^{-5} µCi/ml
		24 hours[d]	31 days Composite[c]	Gross Alpha	1×10^{-7} µCi/ml
				H-3	1×10^{-5} µCi/ml
		24 hours[d]	92 days Composite[c]	Sr-89, Sr-90	5×10^{-8} µCi/ml
				Fe-55	1×10^{-6} µCi/ml

Table 7.3.3-2 (page 2 of 3)
Radioactive Liquid Waste Sampling and Analysis Program
for Potential Release Pathways Which Have Exceeded Trigger Levels

(a) The detectability limits for activity analyses are based on technical feasibility limits and on the potential significance in the environment of the quantities released. For some nuclides, lower detection limits may be readily achievable; and when nuclides are measured below the stated limits, they should also be reported.

(b) When operational limitations preclude specific gamma radionuclide analysis of each batch, gross radioactivity measurements shall be made to estimate the quantity and concentrations of radioactive material released in the batch; and a weekly sample composited from proportional aliquots from each batch released during the week shall be analyzed for principal gamma-emitting radionuclides.

(c) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released.

(d) Until such time as continuous proportional composite samplers are installed on the service water discharge line, daily grab sampling of the service water effluent will be required for use in making up the composite.

(e) The lower limit of detectability (LLD) is the smallest concentration of a radioactive material in an unknown sample that will be detected with a 95% probability with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ \sigma_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot e^{-(\lambda_i t_e)}}$$

Where:

LLD is the "a priori" lower limit of detection as defined above (as microcuries per unit mass or volume)

σ_b = $(N/t_b)^{1/2}$

= standard deviation of background (cpm)

N = background count rate (cpm)

Table 7.3.3-2 (page 3 of 3)
Radioactive Liquid Waste Sampling and Analysis Program
for Potential Release Pathways Which Have Exceeded Trigger Levels

t_b = time background counted for (min)

E = counting efficiency, as counts per disintegration

V = volume or mass of sample

2.22×10^6 = conversion factor (dpm/microcurie)

Y = fractional radiochemical yield

λ_i = radioactive decay constant of ith nuclide (sec^{-1})

t_e = elapsed time between sample collection and counting (sec)

Typical values of E, V, Y, and t_e should be used in the calculation. It should be recognized that the LLD is defined as an "a priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular measurement.

(f) The stabilization pond is typically released over a several-day period. The pond is to be sampled and analyzed prior to commencing release. When composite sampling instrumentation becomes available and is OPERABLE, daily grab sampling of the stabilization pond effluent will not be required during release and the composite sample will be analyzed on a weekly basis.

(g) The principal gamma emitters for which the LLD specifications apply exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report.

(h) A continuous release is the discharge of liquid waste of a nondiscrete volume, e.g., from a volume or a system that has an input flow during the continuous release.

7.3.4 DOSE—LIQUID EFFLUENTS

ODCMS 7.3.4 The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released to UNRESTRICTED AREAS shall be limited to:

a. ≤ 3 mrem to the total body and ≤ 10 mrem to any organ during any calendar quarter; and

b. ≤ 6 mrem to the total body and ≤ 20 mrem to any organ during any calendar year.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

NOTE
Enter applicable Conditions and Required Compensatory Measures of ODCMS 7.3.14, "Total Dose (40 CFR 190)," when liquid effluent dose results in exceeding an annual total dose limit.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Calculated dose from the release of radioactive materials in liquid effluents to UNRESTRICTED AREAS not within limits.	A.1 Submit a Special Report to the NRC that identifies causes for exceeding limits, corrective actions taken to reduce releases, and corrective actions to assure that subsequent releases will be in compliance with the required limits.	30 days

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.4.1	Verify the cumulative dose contributions from liquid effluents for the current calendar quarter and current calendar year are within limits in accordance with the methodology and parameters in the ODCM.	31 days

7.3.5 LIQUID RADWASTE TREATMENT SYSTEM

ODCMS 7.3.5 The Liquid Radwaste Treatment System shall be used to reduce radioactive materials in liquid wastes prior to their discharge.

APPLICABILITY: During release of liquid radioactive water when the projected doses due to the liquid effluent, from the site to UNRESTRICTED AREAS, would exceed 0.12 mrem to the total body or 0.4 mrem to any organ in a 31 day period.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Liquid waste being discharged without treatment.	A.1 Submit a Special Report to the NRC that includes explanation of why liquid radwaste was being discharged without treatment, identification of any required inoperable equipment or subsystem and the reasons for the inoperability, the corrective actions taken to restore the required inoperable equipment to OPERABLE status, and a summary description of the corrective actions taken to prevent recurrence.	30 days

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.5.1	Verify required valve alignments to ensure Liquid Radwaste Treatment System is in use to reduce radioactive materials in liquid waste.	Prior to release of liquid effluents
TR 7.3.5.2	Determine the projected doses due to liquid releases from the site to UNRESTRICTED AREAS in accordance with the methodology and parameters in the ODCM.	31 days

7.3.6 LIQUID HOLDUP TANKS

ODCMS 7.3.6 The quantity of radioactive material, excluding tritium and dissolved or entrained gases, suspended in solution in the condensate storage tank, auxiliary surge tank and outdoor temporary tank shall be maintained within limits.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

NOTE
Separate Condition entry is allowed for each tank.

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. Quantity of radioactive material in one or more of the specified liquid holdup tanks not within limit.	A.1	Suspend addition of radioactive materials to the associated tank.	Immediately
	AND		
	A.2	Restore quantity of radioactive material in the tank to within limit.	48 hours
	AND		
	A.3	Prepare and submit in the Radioactive Effluent Release Report, a description of the events leading to the non-compliance.	Upon submittal of the current calendar year Radioactive Effluent Release Report

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.6.1	NOTE Only required to be performed when radioactive materials are being added to the tank. Verify the quantity of radioactive material, excluding tritium and dissolved or entrained gases, in the condensate storage tank is ≤ 10 Ci by analyzing a representative sample of the tank's contents.	7 days
TR 7.3.6.2	NOTE Only required to be performed when radioactive materials are being added to the tank. Verify the quantity of radioactive material, excluding tritium and dissolved or entrained gases, in the auxiliary surge tank is ≤ 10 Ci by calculation using dose measurement(s) of the tank area.	7 days
TR 7.3.6.3	NOTE Only required to be performed when radioactive materials are being added to the tank. Verify the quantity of radioactive material, excluding tritium and dissolved or entrained gases, in the outdoor temporary tank is ≤ 10 Ci by analyzing a representative sample of the tank's contents.	7 days

7.3.7 DOSE RATE—GASEOUS EFFLUENTS

ODCMS 7.3.7 The dose rate at and beyond the SITE BOUNDARY due to radioactive materials released in gaseous effluents from the site shall be limited to the following:

a. For nobles gases, ≤ 500 mrem per year to the total body and ≤ 3000 mrem per year to the skin; and

b. For iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives > 8 days, ≤ 1500 mrem per year to any organ.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. Dose rate from the release of radioactive materials in gaseous effluents from the site at or beyond the SITE BOUNDARY not within limits.	A.1 Initiate action to restore dose rate to within limits.	Immediately

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.7.1	Verify the dose rate due to noble gases in gaseous effluents is within limits in accordance with methodology and parameters in the ODCM.	In accordance with the ODCM
TR 7.3.7.2	Verify dose rate due to iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives > 8 days in gaseous effluents is within limits in accordance with the methodology and parameters in the ODCM.	In accordance with Table 7.3.7-1

Table 7.3.7-1 (page 1 of 4)
Radioactive Gaseous Waste Sampling and Analysis Program

	GASEOUS RELEASE TYPE	SAMPLE FREQUENCY	SAMPLE ANALYSIS FREQUENCY	SAMPLE ANALYSIS TYPE	SAMPLE LOWER LIMIT OF DETECTION (LLD)[a]
1.	Drywell Purge	Prior to each purge Grab Sample	Prior to each purge	Principal Gamma Emitters[b]	1×10^{-4} µCi/ml
2.	Environmental Release Points	31 days[c][d] Grab Sample	31 days[c]	Principal Gamma Emitters[b]	1×10^{-4} µCi/ml
	a. Continuous Release: Main Stack Reactor Building Vents Turbine Building Vents			H-3	1×10^{-6} µCi/ml
	Hot Shop[h] Building Vents	Continuous[e]	7 days[f][g] Charcoal Sample	I-131	1×10^{-12} µCi/ml
		Continuous[e]	7 days[f][g] Particulate Sample	Principal Gamma Emitters[b] (I-131, others)	1×10^{-11} µCi/ml
		Continuous[e]	31 days Composite Particulate Sample	Gross Alpha	1×10^{-11} µCi/ml
		Continuous[e]	92 days Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11} µCi/ml
		Continuous[e]	Noble Gas Monitor	Noble Gases, Gross Beta or Gamma	1×10^{-6} µCi/ml
	b. Batch Release: Radioactive Materials Container and Storage Building Decontamination Facility	During facility[e] operation	Each batch release: Charcoal Sample	I-131	1×10^{-12} µCi/ml
		During facility[e] operation	Each batch release: Particulate Sample	Principle Gamma Emitters[b] (I-131, others)	1×10^{-11} µCi/ml
		During facility[e] operation	31 days Composite Particulate Sample	Gross Alpha	1×10^{-11} µCi/ml
		During facility[e] operation	92 days Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11} µCi/ml
3.	Incinerated Oil[i]	Prior to each[j] batch release Grab Sample	Prior to each batch release[j]	Principal Gamma Emitters[b]	5×10^{-7} µCi/ml

Table 7.3.7-1 (page 2 of 4)
Radioactive Gaseous Waste Sampling and Analysis Program

(a) The lower limit of detectability (LLD) is the smallest concentration of a radioactive material in an unknown sample that will be detected with a 95% probability with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ \sigma_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot e^{-(\lambda_i t_e)}}$$

Where:

LLD is the "a priori" lower limit of detection as defined above (as microcuries per unit mass or volume)

σ_b = $(N/t_b)^{1/2}$

= standard deviation of background (cpm)

N = background count rate (cpm)

t_b = time background counted for (min)

E = counting efficiency, as counts per disintegration

V = volume or mass of sample

2.22×10^6 = conversion factor (dpm/microcurie)

Y = fractional radiochemical yield

λ_i = radioactive decay constant of ith nuclide (sec^{-1})

t_e = elapsed time between sample collection and counting (sec)

Typical values of E, V, Y, and t_e should be used in the calculation. It should be recognized that the LLD is defined as an "a priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular measurement.

Table 7.3.7-1 (page 3 of 4)
Radioactive Gaseous Waste Sampling and Analysis Program

(b) The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report.

(c) With a THERMAL POWER change exceeding 15 percent of RATED THERMAL POWER within one hour, or following shutdown or start-up, sampling and analyses shall also be performed unless (1) analysis shows that the Dose Equivalent I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the main condenser air ejector noble gas activity monitor shows that activity has not increased by more than a factor of 3.

(d) If during refueling, the tritium concentration in the spent fuel pool water exceeds 2×10^{-4} μCi/ml, tritium grab samples shall be taken at least once per 7 days from the ventilation exhaust from the spent fuel pool area whenever spent fuel is in the spent fuel pool. Spent fuel pool water will be sampled at least once per 7 days during refueling.

(e) The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with ODCMS 7.3.7, 7.3.8, and 7.3.9.

(f) Sample cartridges/filters shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing (or after removal from sampler).

(g) Sampling shall be performed at least once per 24 hours for at least 7 days following each shutdown, start-up, or THERMAL POWER change exceeding 15 percent of RATED THERMAL POWER in 1 hour, and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. This requirement does not apply if (1) analysis shows that the Dose Equivalent I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the main condenser air ejector noble gas monitor shows that activity has not increased more than a factor of 3. This footnote does not apply to the Hot Shop environmental release point.

(h) Monthly grab samples to be analyzed for principal gamma emitters and tritium are not applicable for the Hot Shop environmental release point. In addition, the Hot Shop release point does not have a noble gas monitor and, therefore, the noble gas activity analysis requirements of Table 7.3.7-1 are not applicable.

Table 7.3.7-1 (page 4 of 4)
Radioactive Gaseous Waste Sampling and Analysis Program

(i) Releases from incinerated oil may be discharged via points other than the main vent (e.g., incinerator). Release shall be accounted for based on pre-release grab sample data.

(j) Samples of waste oil to be incinerated shall be collected from and be representative of oil in liquid form.

7.3.8 DOSE—NOBLE GASES

ODCMS 7.3.8 The air dose at and beyond the SITE BOUNDARY due to noble gases in gaseous effluents from the site shall be limited to the following:

a. ≤ 10 mrads gamma radiation and ≤ 20 mrads beta radiation during any calendar quarter; and

b. ≤ 20 mrads gamma radiation and ≤ 40 mrads beta radiation during any calendar year.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

NOTE
Enter applicable Conditions and Required Compensatory Measures of ODCMS 7.3.14, "Total Dose (40 CFR 190)," when gaseous effluent (noble gases) dose results in exceeding an annual total dose limit.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Calculated air dose from radioactive noble gases in gaseous effluents at or beyond the SITE BOUNDARY not within limits.	A.1 Submit a Special Report to the NRC that identifies causes for exceeding the limits, corrective actions taken to reduce releases, and corrective actions to assure that subsequent releases are within limits.	30 days

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.8.1	Verify the cumulative dose contributions from noble gases in gaseous effluents for the current calendar quarter and current calendar year are within limits in accordance with the methodology and parameters in the ODCM.	31 days

7.3.9 DOSE—I-131, I-133, TRITIUM, AND RADIONUCLIDES IN PARTICULATE FORM

ODCMS 7.3.9 The dose to a MEMBER OF THE PUBLIC at and beyond the SITE BOUNDARY from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives > 8 days, in gaseous effluents released from the site shall be limited to the following:

a. ≤ 15 mrems to any organ during any calendar quarter;

b. ≤ 30 mrems to any organ during any calendar year; and

c. < 0.1% of the limits of ODCMS 7.3.9.a and ODCMS 7.3.9.b as a result of burning contaminated oil.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

NOTE
Enter applicable Conditions and Required Compensatory Measures of ODCMS 7.3.14, "Total Dose (40 CFR 190)," when gaseous effluent (I-131, I-133, tritium, radionuclides in particulate form) dose results in exceeding an annual total dose limit.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Calculated dose from the release of iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives > 8 days, in gaseous effluents at or beyond the SITE BOUNDARY not within limits.	A.1 Submit a Special Report to the NRC that identifies causes for exceeding the limits, corrective actions taken to reduce releases, and corrective actions to assure subsequent releases are within limits.	30 days

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.9.1	Verify the cumulative dose contributions from iodine-131, iodine-133, tritium, and radionuclides in particulate form with half lives > 8 days, in gaseous effluents for the current calendar quarter and current calendar year are within limits in accordance with the methodology and parameters in the ODCM.	31 days

7.3.10 GASEOUS RADWASTE TREATMENT SYSTEM

ODCMS 7.3.10 The GASEOUS RADWASTE TREATMENT SYSTEM shall be in operation.

APPLICABILITY: Whenever the Main Condenser Air Ejector (evacuation) System is in operation.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. GASEOUS RADWASTE TREATMENT SYSTEM not in operation.	A.1	Place GASEOUS RADWASTE TREATMENT SYSTEM in operation.	7 days
B. NOTE Required Compensatory Measure B.1 shall be completed if this Condition is entered. Required Compensatory measure and associated Completion Time not met.	B.1	Submit a Special Report to the NRC that identifies the required inoperable equipment and the reasons for the inoperability, corrective actions taken to restore the required inoperable equipment to OPERABLE status, and a summary description of the corrective actions taken to prevent recurrence.	30 days

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.10.1	Verify GASEOUS RADWASTE TREATMENT SYSTEM in operation by checking the readings of the relevant instruments.	12 hours

7.3.11 VENTILATION EXHAUST TREATMENT SYSTEM

ODCMS 7.3.11 The VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge.

APPLICABILITY: During release of gaseous radioactive wastes when the projected doses due to gaseous effluent, from the site to areas at or beyond the SITE BOUNDARY, when averaged over 31 days, would exceed 0.6 mrem to any organ in a 31 day period.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Gaseous waste being discharged without treatment.	A.1 Submit a Special Report to the NRC that identifies the inoperable equipment or subsystems and the reason for inoperability, the corrective actions taken to restore the inoperable equipment to OPERABLE status, and a summary description of the corrective actions taken to prevent recurrence.	30 days

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.11.1	Verify required valve alignment to ensure VENTILATION EXHAUST TREATMENT SYSTEM is in use to reduce radioactive materials in gaseous waste.	Prior to release of gaseous effluents

(continued)

TEST REQUIREMENTS (continued)

TEST		FREQUENCY
TR 7.3.11.2	NOTE Only required to be performed when the VENTILATION EXHAUST TREATMENT SYSTEM is not in use.	
	Determine the projected doses due to gaseous releases from the site to areas at or beyond the SITE BOUNDARY in accordance with the methodology and parameters in the ODCM.	31 days

7.3.12 EXPLOSIVE GAS MIXTURE

ODCMS 7.3.12 The concentration of hydrogen in the Main Condenser Offgas Treatment System shall be ≤ 4% by volume.

APPLICABILITY: When the Main Condenser Air Ejector System is in operation.

COMPENSATORY MEASURES

NOTE
ODCMS 3.0.4 is not applicable.

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. Hydrogen concentration in the Main Condenser Offgas Treatment System > 4% by volume.	A.1 Restore hydrogen concentration to within limit.	48 hours

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.12.1	Verify the concentration of hydrogen in the Main Condenser Offgas Treatment System is ≤ 4% by volume by monitoring waste gases with the required hydrogen monitors of ODCMS 7.3.2, "Radioactive Gaseous Effluent Monitoring Instrumentation."	Continuously

7.3.13 DRYWELL VENTING OR PURGING

ODCMS 7.3.13 The drywell shall be purged to the environment at a rate in conformance with ODCMS 7.3.7, "Dose Rate—Gaseous Effluents."

APPLICABILITY: When the drywell is being vented or purged.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. Requirements of ODCMS not met.	A.1 Suspend VENTING and PURGING of the drywell.	Immediately

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.13.1	Perform a sample analysis in accordance with Table 7.3.7-1.	Prior to each drywell PURGE

7.3.14 TOTAL DOSE (40 CFR PART 190)

ODCMS 7.3.14 The dose or dose commitment to any MEMBER OF THE PUBLIC over the calendar year due to releases of radioactivity and radiation from uranium fuel cycle sources shall be limited to:

a. ≤ 25 mrems to the total body or any organ (except the thyroid); and

b. ≤ 75 mrem to the thyroid.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measures A.1 and A.2 shall be completed if this Condition is entered. Calculated dose for uranium fuel cycle sources to any MEMBER OF THE PUBLIC not within limits.	A.1 NOTE: Estimates of radiation exposure from uranium fuel cycle sources shall include the effects of all effluent pathways and direct radiation, including releases covered by this Special Report. Submit a Special Report to the NRC that includes corrective actions taken to prevent recurrence, the schedule for achieving conformance with required limits, an analysis that estimates the radiation exposure to a MEMBER OF THE PUBLIC from uranium fuel cycle sources for the calendar year, descriptions of the levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. AND	30 days (continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. (continued)	A.2 NOTES 1. Only applicable if the release condition resulting in violation of 40 CFR 190 has not been corrected. 2. Special Report submitted is considered a timely request and a variance is granted until NRC action on the request is complete. Submit a request for a variance in accordance with 40 CFR 190 in the Special Report to the NRC.	30 days

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.14.1	Determine cumulative dose contributions from liquid and gaseous effluents in accordance with TR 7.3.4.1, TR 7.3.8.1 and TR 7.3.9.1, and the methodology and parameters in the ODCM.	In accordance with ODCM

(continued)

TEST REQUIREMENTS (continued)

TEST	FREQUENCY
TR 7.3.14.2	
NOTE Only required to be performed when calculated doses from the release of radioactive materials in liquid or gaseous effluents exceed twice the limits of ODCMSs 7.3.4.a, 7.3.4.b, 7.3.8.a, 7.3.8.b, 7.3.9.a., or 7.3.9.b.	
Determine cumulative dose contributions from direct radiation from the reactor units and from radwaste storage tanks in accordance with methodology and parameters in the ODCM.	In accordance with ODCM

7.3.15 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

ODCMS 7.3.15 The Radiological Monitoring Program shall be as follows:

a. Radiological environmental monitoring samples shall be collected at locations and analyzed as specified in Table 7.3.15-1.

b. Each sample location specified in Table 7.3.15-1 shall contain required milk or leafy vegetable samples

c. The level of radioactivity as the result of plant effluents for each radionuclide in each environmental sampling medium at a required location shall be less than the limits specified in Table 7.3.15-2, when averaged over the calendar quarter;

d. The total level of radioactivity as the result of plant effluents in each environmental sampling medium at a required location shall be less than the limit specified in Table 7.3.15-2, when averaged over the calendar quarter; and

e. The potential annual dose to a MEMBER OF THE PUBLIC from all radionuclides other than those in Table 7.3.15-2 in each environmental sampling medium at a required location shall be less than the calendar year limits of ODCMS 7.3.4, ODCMS 7.3.8, and ODCMS 7.3.9.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. One or more samples not collected or analyzed as specified in Table 7.3.15-1.	A.1 Prepare and submit, in the Annual Radiological Environmental Operating Report, a description for not conducting the Radiological Environmental Monitoring sampling and analysis requirements as required and the corrective actions to prevent recurrence.	Upon submittal of current calendar year Annual Radiological Environmental Operating Report

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
B. NOTES 1. Separate Condition entry is allowed for each sample location. 2. Required Compensatory Measure B.2 shall be completed if this Condition is entered. One or more sample locations required by Table 7.3.15-1 with required milk or fresh leafy vegetable samples unavailable.	B.1	Identify locations for obtaining replacement samples and replace, in the Radiological Environmental Monitoring Program, the location(s) from which samples are unavailable with the new location(s).	30 days
	AND		
	B.2	Prepare and submit, in the Radioactive Effluent Release Report, the cause of the unavailability of samples, the new locations for obtaining replacement samples, and the revised figure(s) and table for the ODCM reflecting the new locations.	Upon submittal of current calendar year Radioactive Effluent Release Report

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
C. NOTES 1. Separate Condition entry is allowed for each sample location. 2. Required Compensatory Measure C.1 shall be completed if this Condition is entered. One or more sample locations with the level of radioactivity for one or more radionuclides as the result of plant effluents in an environmental sampling medium not within the limits of Table 7.3.15-2 when averaged over the calendar quarter. OR One or more sample locations with the total level of radioactivity as a result of plant effluents in an environmental sampling medium not within the limits of Table 7.3.15-2 when averaged over the calendar quarter.	C.1 Submit a Special Report to the NRC which includes the cause(s) for exceeding the limit(s) and the corrective actions to reduce radioactive effluents so that the potential annual dose to a MEMBER OF THE PUBLIC is less than the calendar year reporting limits of ODCMS 7.3.4, ODCMS 7.3.8, and ODCMS 7.3.9.	30 days

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
D. One or more sample locations with the potential annual dose to a MEMBER OF THE PUBLIC from all radionuclides other than those in Table 7.3.15-2 not within limits. NOTES 1. Separate Condition entry is allowed for each sample location. 2. Required Compensatory Measures D.1 and D.2 shall be completed if this Condition is entered.	D.1 Submit a Special Report to the NRC which includes the methodology and parameters used for estimating the potential annual dose, the cause(s) for exceeding the limit(s) and the corrective actions to reduce radioactive effluents so that the potential annual dose to a MEMBER OF THE PUBLIC is less than the calendar year limits of ODCMS 7.3.4, ODCMS 7.3.8, and ODCMS 7.3.9. NOTE Only required if the radionuclides are the result of plant effluents. AND D.2 Describe the condition in the Annual Radiological Environmental Operating Report. NOTE Only required if the radionuclides are not the result of plant effluents.	30 days Upon submittal of the current calendar year Annual Radiological Environmental Operating Report

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.15.1	Verify radiological environmental monitoring samples collected at the locations given in the table and figure(s) in the ODCM and analyzed as specified in Table 7.3.15-1 are within limits. Detection capabilities for the analyses are specified in Table 7.3.15-3.	In accordance with Table 7.3.15-1

Table 7.3.15-1 (page 1 of 5)
Radiological Environmental Monitoring Program

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS(a)	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. Direct Radiation (b)	Forty locations, either with two or more dosimeters or with one or more instruments for measuring and recording dose rate continuously to be placed as follows: An inner ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY as is reasonably accessible and practical. An outer ring of stations, one in each of the meteorological sectors at distances of 8 km or greater from the site as is reasonably accessible and practical. The balance of the stations to be placed in special interest areas such as population centers, nearby residences, schools, and one or two areas to serve as control stations.	92 days	Gamma dose: 92 days
2. Airborne-Radioiodine and Particulate	Samples from the following five locations: Three samples from different sectors as close to the SITE BOUNDARY as is reasonably accessible, one of which being at the highest calculated annual average ground level D/Q. One sample from the vicinity of a nearby community. One sample from a control location, as for example greater than 15 km distant and in a less prevalent wind direction(c).	Continuous sampler operation Sample collection: 7 days or as required by dust loading, whichever is more frequent.	I-131 analysis of radioiodine canisters: 7 days AND Gross beta radioactivity analysis of particulate sampler: following filter change(d) AND Gamma isotopic analysis(e) of composite (by location): 92 days

(continued)

Table 7.3.15-1 (page 2 of 5)
Radiological Environmental Monitoring Program

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS[a]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
3. Waterborne			
a. Surface[f]	Two locations: One sample upstream. One sample downstream.	Composite[g] sample collection: 31 days	Gamma isotopic analysis[e]: 31 days AND Tritium analysis: 92 days
b. Sediment from Shoreline	One sample from downstream area with existing or potential recreational value.	184 days	Gamma isotopic analysis[e]: 184 days
4. Ingestion			
a. Milk	Samples from the following four locations: One sample from milking animals in each of three locations within 8 km of the site having the highest dose potential (when available).[h] One sample from milking animals at a control location greater than 15 km distance from the site and in a less prevalent wind direction.	With animals on pasture: 14 days At other times: 31 days	Gamma isotopic[e] and I-131 analyses: 14 days when animals are on pasture AND Gamma isotopic[e] and I-131 analyses: 31 days at other times

(continued)

Table 7.3.15-1 (page 3 of 5)
Radiological Environmental Monitoring Program

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS[a]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. (continued)			
b. Fish and Invertebrates	Four samples from the following locations: One sample of each of three recreationally important species in vicinity of plant discharge area (one free swimming species, one bottom feeding species, and one shellfish species). One sample of a similarly edible species from an area not influenced by plant discharge to serve as a control sample.	When in season: 184 days	Gamma isotopic analysis[e] on edible portion: 184 days
c. Broadleaf Vegetation	Samples from the following three locations: Samples of broadleaf vegetation grown in two sectors of historically high D/Q values at the SITE BOUNDARY if milk sampling is not performed. One sample of similar broadleaf vegetation grown at a distance of greater than 15 km from the site in a less prevalent wind direction if milk sampling is not performed.	When available: 31 days	Gamma isotopic[e] and I-131 analyses: 31 days when available

Table 7.3.15-1 (page 4 of 5)
Radiological Environmental Monitoring Program

(a) Specific parameters of distance and direction sector from the site, and additional description where pertinent, shall be provided for each and every sample location in Table 7.3.15-1 in a table and figure(s) in the ODCM. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment, and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the radiological environmental monitoring program. Identify the cause of the unavailability of samples for that pathway and identify the new location(s) for obtaining replacement samples in the next Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

(b) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation. The frequency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading.

(c) The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites that provide valid background data may be substituted.

(d) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

(e) Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

Table 7.3.15-1 (page 5 of 5)
Radiological Environmental Monitoring Program

(f) The "upstream" sample shall be taken at a distance beyond significant influence of the discharge. The "downstream" sample shall be taken in an area beyond but near the mixing zone. "Upstream" samples in an estuary must be taken far enough upstream to be beyond the plant influence. Salt water shall be sampled only when the receiving water is utilized for recreational activities.

(g) A composite sample is one in which the quantity (aliquot) of liquid sampled is proportional to the quantity of flowing liquid and in which the method of sampling employed results in a specimen that is representative of the liquid flow. Composite samples shall be collected with equipment that is capable of collecting an aliquot at time intervals that are short (e.g., once per 6 hours) relative to compositing period (e.g., monthly) in order to assure obtaining a representative sample.

(h) When less than three (3) milking animal locations are available for testing within an 8-km distance, sampling of broadleaf vegetation shall be performed as indicated in Table 7.3.15-1, 4.c, in lieu of milk sampling.

Table 7.3.15-2 (page 1 of 1)
Limits for the Level of Radioactivity in Environmental Samples(a)

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE AND GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/l)	BROADLEAF VEGETATION (pCi/kg)
H-3	30,000				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	400		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

(a) The Limits are for samples that have only one radionuclide detected. When a sample contains more than one radionuclide, the total level of radioactivity limit is

$$\frac{\text{concentration(1)}}{\text{limit}^{(1)}} + \frac{\text{concentration(2)}}{\text{limit}^{(2)}} + \ldots < 1.0.$$

Table 7.3.15-3 (page 1 of 3)
Detection Capabilities for Environmental Sample Analysis[a]

Lower Limit of detection (LLD)[b]

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/Kg, wet)	MILK (pCi/l)	BROADLEAF VEGETATION (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01				
H-3	3,000					
Mn-54	15		130			
Fe-59	30		260			
Co-58, 60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1[c]	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

Table 7.3.15-3 (page 2 of 3)
Detection Capabilities for Environmental Sample Analysis

(a) This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall be analyzed and reported in the Annual Radiological Environmental Operating Report.

(b) The LLD is defined for purposes of the specifications, as the smallest concentration of radioactive material in an unknown sample that will be detected with 95% probability with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\,\sigma_b}{E \cdot V \cdot 2.22 \cdot Y \cdot e^{-(\lambda_i t_e)}}$$

Where:

LLD is the "a priori" lower limit of detection as defined above, as picocuries per unit mass or volume.

σ_b = $(N/t_b)^{1/2}$

= standard deviation of background (cpm)

N = background count rate (cpm)

t_b = time background counted for (min)

E = counting efficiency, as counts per disintegration

V = volume or mass of sample

2.22 = conversion factor (dpm/pCi)

Y = fractional radiochemical yield

λ_i = radioactive decay constant of ith nuclide (sec^{-1})

t_e = elapsed time between sampling collection and counting (sec)

Table 7.3.15-3 (page 3 of 3)
Detection Capabilities for Environmental Sample Analysis

Typical values of E, V, Y, and t_e should be used in the calculation. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs shall be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report.

(c) The LLD of gamma isotopic analysis may be used.

7.3.16 LAND USE CENSUS

ODCMS 7.3.16 A land use census shall be conducted and:

a. Shall identify the location of the nearest milk animal, residence, and garden of greater than $50m^2$ (500 ft^2) producing broadleaf vegetation in each of the 16 meteorological sectors within a distance of 8 km (5 miles);

b. Shall identify (for elevated releases as defined in Regulator Guide 1.111, Revision 1, July 1977) the location of all milk animals and all gardens of greater than $50m^2$ producing broadleaf vegetation in each of the 16 meteorological sectors within a distance of 5 km (3 miles);

c. The calculated dose and dose commitment at each identified location shall be less than the most recent values calculated by TR 7.3.9.1; and

d. The calculated dose and dose commitment at each identified location, via the same exposure pathways, shall be ≤ 120% of the actual dose and dose commitment from the current sample location identified in Table 7.3.15-1, excluding the central station location.

NOTE

In lieu of the garden census of ODCMS 7.3.16.a, broadleaf vegetable sampling of at least 3 different kinds of vegetation may be performed at the SITE BOUNDARY in each of 2 different direction sectors with the highest D/Qs. Specifications for broadleaf vegetation sampling of Table 7.3.15-1 (item 4.c) shall be followed, including analysis of control samples.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Land use census not conducted. OR All required locations not identified.	A.1	Prepare and submit, in the Annual Radiological Environmental Operating Report, a description for not conducting the land use census and the corrective actions to prevent recurrence.	Upon submittal of current calendar year Annual Radiological Environmental Operating Report
B. NOTE: Required Compensatory Measure B.1 shall be completed if this Condition is entered. One or more identified locations with the calculated dose or dose commitment greater than the values calculated by TR 7.3.9.1.	B.1	Identify new location(s) in the Radioactive Effluent Release Report.	Upon submittal of the current calendar year Radioactive Effluent Release Report

(continued)

COMPENSATORY MEASURES (continued)

CONDITION	REQUIRED COMPENSATORY MEASURE		COMPLETION TIME
C. NOTE Required Compensatory Measure C.1 shall be completed if this Condition is entered.	C.1	Add the new location to the Radiological Environmental Monitoring Program.	30 days
	AND		
One or more identified locations with the calculated dose or dose commitment, via the same exposure pathway, > 120% of the actual dose or dose commitment from the current location identified in Table 7.3.15-1.	C.2	Delete the sampling location having the lowest calculated dose or dose commitment, via the same exposure pathway, from the Radiological Monitoring program.	After October 31 of the year in which land use census was conducted
	AND		
	C.3	Identify the new location(s) in the Radioactive Effluent Release Report, and the revised figure(s) and table for the ODCM reflecting the new location.	Upon submittal of the current calendar year Radioactive Effluent Release Report

TEST REQUIREMENTS

	TEST	FREQUENCY
TR 7.3.16.1	Conduct a land use census during the growing season using that information that will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities; identify all required locations, and verify the calculated dose and dose commitments at each identified location is within limits.	12 months

7.3.17 INTERLABORATORY COMPARISON PROGRAM

ODCMS 7.3.17 Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program approved by the NRC.

APPLICABILITY: At all times.

COMPENSATORY MEASURES

CONDITION	REQUIRED COMPENSATORY MEASURE	COMPLETION TIME
A. NOTE: Required Compensatory Measure A.1 shall be completed if this Condition is entered. Requirements of ODCMS 7.3.17 not met.	A.1 Prepare and submit, in the Annual Radiological Environmental Operating Report, corrective actions to prevent recurrence.	Upon submittal of current calendar year Annual Radiological Environmental Operating Report

TEST REQUIREMENTS

TEST		FREQUENCY
TR 7.3.17.1	Perform the analyses required by the Interlaboratory Comparison Program.	In accordance with the ODCM