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2.3 Determining the Radioiodine & Particulate Dose Rate to Any Organ From Gaseous Releases

Discussion - Control 3.11.2.1 limits the dose rate from I-131, I-133, tritium and all radionuclides in particulate form with half lives >eight days to ≤1500 mrem/yr to any organ. The following calculation method is provided for determining the dose rate from radioiodines (see 2.1) and particulates and is based on Section 5.2.1 and 5.2.1.1 through 5.2.1.3 in NUREG-0133, November 1978. The Infant is the controlling age group in the inhalation, ground plane and cow/goat milk pathways, which are the only pathways considered for releases. The long term $(X/Q)_D$ (depleted) and (D/Q) values are based on historical MET data prior to implementing Appendix I. Only those nuclides that appear on their respective table will be considered. The equations are:

For Inhalation Pathway (excluding H-3):

$$DR_{I\&8DP_T} = \sum_i^n R^*_{i_T} (X/Q)_D \, (Q \; DOT)_i$$

For Ground Plane:

$$DR_{I\&8DP_T} = \sum_i^n P_{i_T} (D/Q)(Q \; DOT)_i$$

For Grass-Cow/Goat-Milk:

$$DR_{I\&8DP_T} = \sum_i^n R^*_{i_T} (D/Q)(Q \; DOT)_i$$

For Tritium Releases (Inhalation & Grass-Cow/Goat-Milk):

$$DR_{H3_T} = R^*_{H\text{-}3_T} (X/Q)_D \, (Q \; DOT)_{H\text{-}3}$$

* Normally should be Pi_T, but Ri_T values are the same, thus use Ri_T tables in Appendix A.

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2.3 (continued)

For Total Dose Rate from I & 8DP and H-3 To An Infant Organ T:

$$DR_T = \sum_Z [DR_{I\&8DP_T} + DR_{H\text{-}3_T}]$$

Where:

T = The organ of interest for the infant age group

z = The applicable pathways

$DR_{I\&8DP_T}$ = Dose Rate in mrem/yr to the organ T from iodines and 8 day particulates

$DR_{H\text{-}3T}$ = Dose Rate in mrem/yr to organ T from Tritium

DR_T = Total Dose Rate in mrem/yr to organ T from all pathways under consideration

$\sum_i^n$ = A mathematical symbol to signify the operations to the right of the symbol are to be performed for each nuclide (i) through (n) and the individual nuclide dose rates are summed to arrive at the total dose rate from the pathway.

$\sum_Z$ = A mathematical symbol to indicate that the total dose rate D_T to organ T is the sum of each of the pathways dose rates

R_i = The dose factor for nuclide (i) for organ T for the pathway specified (units vary by pathway)

P_i = The dose factor for instantaneous ground plane pathway in units of $\frac{\text{mrem-m}^2 \text{ sec}}{\mu\text{Ci-yr}}$

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2.3 (continued)

From an evaluation of the radioactive releases and environmental pathways, the grass-cow/goat-milk pathway has been identified as the most limiting pathway with the infant's thyroid being the critical organ. This pathway typically contributes >90% of the total dose received by the infant's thyroid and the radioiodine contribute essentially all of this dose. Therefore, it is possible to demonstrate compliance with the release rate limit of Control 3.11.2.1 for radioiodines and particulates by only evaluating the infant's thyroid dose for the release of radioiodines via the grass-cow/goat-milk pathway. The calculation method of Section 2.3.3 is used for this determination. If this limited analysis approach is used, the dose calculations for other radioactive particulate matter and other pathways need not be performed. Only the calculations of Section 2.3.3 for the radioiodines need be performed to demonstrate compliance with the Control dose rate limit.

The calculations of Sections 2.3.1, 2.3.2, 2.3.4 and 2.3.5 may be omitted. The dose rate calculations as specified in these sections are included for completeness and are to be used only for evaluating unusual circumstances where releases of particulate materials other than radioiodines in airborne releases are abnormally high. The calculations of Sections 2.3.1, 2.3.2, 2.3.4 and 2.3.5 will typically be used to demonstrate compliance with the dose rate limit of Control 3.11.2.1 for radioiodines and particulates when the measured releases of particulate material (other than radioiodines and with half lives >8 days) are >10 times the measured releases of radioiodines.

1. The Inhalation Dose Rate Method:

NOTE
The H-3 dose is calculated as per 2.3.4.

A. The controlling location is assumed to be an Infant located in the _____ sector at the _____ mile range. The $(X/Q)_D$ for this location is _____ sec/m^3. This value is common to all nuclides. (See Table M-2 for value, sector and range.)

B. Enter the release rate in ft^3/min of the release source and convert to cc/sec.

$$= \frac{ft^3}{\text{min}} \times \frac{2.8317 \times 10^4 cc}{ft^3} \times \frac{\text{min}}{60 \text{ sec.}} = cc/\text{sec}$$

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2.3 (continued)

1. (continued)

C. Solve for $(Q\ DOT)_i$ for nuclide (i) by obtaining the µCi/cc assay value of the release source activity and multiplying it by the product of 2.3.1.B above.

$$(Q\ DOT)_i = \frac{(nuclide\ [i]\ assay)\ \mu Ci}{cc} \times \frac{(Value\ 2.3.1.B)\ cc}{\text{sec}}$$

$(Q\ DOT)_i$ = µCi/sec for nuclide (i)

D. Obtain the R_i value from Table G-5 for the organ T.

E. Solve for DR_i

$$DR_{iT} = R_{iT}\ (X/Q)_D\ (Q\ DOT)_i = \frac{mrem\text{-}m^3}{\mu Ci\text{-}yr} \times \frac{\text{sec}}{m^3} \times \frac{\mu Ci}{\text{sec}}$$

DR_{iT} = $\frac{\text{mrem}}{\text{yr}}$ The Dose Rate to organ T from nuclide (i)

F. Repeat steps 2.3.1.C through 2.3.1.E for each nuclide (i) reported in the assay of the release source.

G. The Dose Rate to the Infants organ T from the Inhalation Pathway is:

$$DR_{Inhalation_T} = DR_1 + DR_2 + \_\_\_\_\_ + DR_n$$

for all nuclides except H-3. This dose rate shall be added to the other pathways as per 2.3.5 - Total Organ Dose.

NOTE
Steps 2.3.1.C through 2.3.1.G need to be completed for each organ T of the Infant.

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2.3 (continued)

2. The Ground Plane Dose Rate Method:

NOTE
Tritium dose via the ground plane is zero.

A. The controlling location is assumed to be an Infant located in the _____ sector at the _____ mile range. The (D/Q) for this location is _____ $1/m^2$. This value is common to all nuclides. (See Table M-2 for sector, range and value.)

B. Enter the release rate in ft^3/min of the release source and convert to cc/sec.

$$= \frac{ft^3}{\text{min}} \times \frac{2.8317 \times 10^4 cc}{ft^3} \times \frac{\text{min}}{60 \text{ sec.}} = cc/\text{sec}$$

C. Solve for $(Q\ DOT)_i$ for nuclide (i) by obtaining the µCi/cc assay value from the release source activity and multiplying it by the product of 2.3.2.B above.

$$(Q\ DOT)_i = \frac{(nuclide\ [i]\ assay)\ \mu Ci}{cc} \times \frac{(Value\ 2.3.2.B)\ cc}{\text{sec}}$$

$(Q\ DOT)_i$ = µCi/sec for nuclide (i)

D. Obtain the P_i value from Table G-3

E. Solve for DR_i

$$DR_i = P_{iT}\ (D/Q)\ (Q\ DOT)_i = \frac{mrem\text{-}m^2 - \text{sec}}{\mu Ci\text{-}yr} \times \frac{1}{m^2} \times \frac{\mu Ci}{\text{sec}}$$

DR_i = $\frac{\text{mrem}}{\text{yr}}$ The Dose Rate to organ T from nuclide (i)

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2.3 (continued)

2. (continued)

F. Repeat steps 2.3.2.C through 2.3.2.E for each nuclide (i) reported in the assay of the release source.

G. The Dose Rate to the Infant's Whole Body from the Ground Plane Pathway is:

$DR_{Gr\ Pl} = DR_1 + DR_2 + \_\_\_\_\_ + DR_n$

for all nuclides. This dose rate shall be added to the other pathways as per 2.3.5.

3. The Grass-Cow/Goat-Milk Dose Rate Method:

NOTE
H-3 dose is calculated as per 2.3.4.

A. The controlling animal was established as a _____ located in the _____ sector at _____ miles. The (D/Q) for this location is _____ $1/m^2$. This value is common to all nuclides. (See Table M-3 for sector, range and value.)

B. Enter the anticipated release rate in ft^3/min of the release source and convert to cc/sec.

$$= \frac{\_\_\_\_\_ ft^3}{\text{min}} X \frac{2.8317\ X\ 10^4 cc}{ft_3} X \frac{\text{min}}{60\ \text{sec.}} = cc/\text{sec}$$

C. Solve for $(Q\ DOT)_i$ for nuclide (i) by obtaining the µCi/cc assay value of the release source activity and multiplying it by the product of 2.3.3.B above.

$$(Q\ DOT)_i = \frac{(nuclide\ [i]\ assay)\ \mu Ci}{cc} X \frac{(value\ 2.3.3.B)\ cc}{\text{sec}}$$

$(Q\ DOT)_i$ = µCi/sec for nuclide (i)

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2.3 (continued)

3. (continued)

D. Obtain the R_i value from Table G-6(7) (whichever is the controlling animal, cow/goat, for infant).

If the limited analysis approach is being used, limit the calculation to the infant thyroid.

E. Solve for DR_{iT}

$$DR_{iT} = R_{iT}\ (D/Q)\ (Q\ DOT)_i = \frac{mrem\text{-}m^2\ \text{-}\ \text{sec}}{\mu Ci\text{-}yr} \times \frac{1}{m^2} \times \frac{\mu Ci}{\text{sec}}$$

$DR_{iT} = \frac{\text{mrem}}{\text{yr}}$ the Dose Rate to organ T from nuclide (i)

F. Repeat steps 2.3.3.C through 2.3.3.E for each nuclide (i) reported in the assay of the release source.

Only the radioiodines need to be included if the limited analysis approach is being used.

G. The Dose Rate to the Infant's organ T from Grass-_____-Milk pathway is:

DR_{grass}-_____-$Milk_T$ = $DR_1 + DR_2 +$ _____ + DR_n

for all nuclides. This dose rate shall be added to the other pathways as per 2.3.5 - Total Organ Dose.

NOTE
Steps 2.3.3.C through 2.3.3.G need to be completed for each organ of the Infant. Limit the calculation to the infant thyroid if the limited analysis approach is being used.

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2.3 (continued)

4. The H-3 Dose Rate Method:

A. The controlling locations and their $(X/Q)_D$ values for each pathway are:

Inhalation - Infant at _____ range in the _____ sector.

$(X/Q)_D$ = sec/m^3 (See Table M-2 for range, sector and value)

Ground Plane - Does not apply to H-3

Grass-Cow/Goat-Milk-_____ located in the _____ sector at _____miles with an Infant at the exclusion area in the _____ sector drinking the milk. The $(X/Q)_D$ for the _____ location is $(X/Q)_D$ = _____ sec/m^3. (From Table M-6 at the range and sector corresponding to the location of the Milk Animal above.)

B. Enter the anticipated release rate in ft^3/min of the release source and convert it to cc/sec.

$$= \frac{\quad ft^3}{\text{min}} \times \frac{2.8317 \times 10^4\ cc}{ft^3} \times \frac{\text{min}}{60\ \text{sec.}}$$

= cc/sec volume release rate

C. Solve for $(Q\ DOT)_{H\text{-}3}$ for Tritium, by obtaining the µCi/cc assay value of the release source and multiplying it by the product of 2.3.4.B above.

$$(Q\ DOT)_{H\text{-}3} = \frac{(H\text{-}3)\ \mu Ci}{cc} \times \frac{(2.3.4.B\ value)\ cc}{\text{sec}}$$

$(Q\ DOT)_{H\text{-}3}$ = µCi/sec activity release rate

D. Obtain the Tritium dose factor (R_i) for Infant organ T from:

PATH	TABLE #
Inhalation	G-5
Grass-Cow/Goat-Milk	G-6(7)

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2.3 (continued)

4. (continued)

E. Solve for D_{H-3} (Inhalation) using the $(X/Q)_D$ for inhalation from 2.3.4.A and R_{H-3} (Inhalation) from 2.3.4.D.

$$DR_{H\text{-}3_{Inh_T}} = R_{H\text{-}3}\ (X/Q)_D\ (Q\ DOT)_{H\text{-}3}$$

$DR_{H\text{-}3_{Inh_T}}$ = *mrem/yr from H-3 Infant Inhalation for organ T*

F. Solve for D_{H-3} (Grass-_____-Milk) using the $(X/Q)_D$ for Grass-_____-Milk from 2.3.4.A and R_{H-3} (Grass-_____-Milk) from 2.3.4.D

$$DR_{H\text{-}3_{G\ M_T}} = R_{H\text{-}3_{G\ M_T}}\ (X/Q)_D\ (Q\ DOT)_{H\text{-}3}$$

$DR_{H\text{-}3_{G\ M_T}}$ = *mrem/yr from H-3 Infant*

G. Repeat steps 2.3.4.D through 2.3.4.F for each Infant organ T of interest.

H. The individual organ dose rates from H-3 shall be added to the other organ pathway dose rates as per 2.3.5.

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2.3 (continued)

5. Determining the Total Organ Dose Rate from Iodines, 8D-Particulates, and H-3 from Release Source(s)

A. The following table describes all the pathways that must be summed to arrive at the total dose rate to an organ T:

PATHWAY	DOSE RATE	STEP # REF.
Inhalation (I&8DP)		2.3.1.G
Ground Plane (I&8DP)	(Whole Body only)	2.3.2.G
Gr-_____Milk (I&8DP)		2.3.3.G
Inhalation (H-3)		2.3.4.E
Gr-_____-Milk (H-3)		2.3.4.F
DR_T=	(sum of above)	

B. Repeat the above summation for each Infant organ T.

C. The DR_T above shall be added to all other release sources on the site that will be in progress at any instant. Refer to in-plant procedures and logs to determine the Total DR_T to each organ.

2.4 Determining the Gamma Air Dose for Radioactive Noble Gas Release Source(s)

Discussion - Control 3.11.2.2 limits the air dose due to noble gases in gaseous effluents for gamma radiation to <5 mrads for the quarter and to <10 mrads in any calendar year. The following calculation method is provided for determining the noble gas gamma air dose and is based on section 5.3.1 of NUREG-0133, November 1978. The dose calculation is independent of any age group. The equation may be used for Control dose calculation, the dose calculation for the annual report or for projecting dose, provided that the appropriate value of (X/Q) is used as outlined in the detailed explanation that follows. The equation for gamma air dose is:

$$D_\gamma\text{-}air = \sum_{i}^{n} 3.17\ X\ 10^{-8}\ M_i\ (X/Q)\ Q_i$$

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2.4 (continued)

Where:

D_γ-air = gamma air dose in mrad from radioactive noble gases.

Σ = A mathematical symbol to signify the operations to the right side of the symbol are to be performed for each nuclide (i) through (n) and summed to arrive at the total dose, from all nuclides reported during the interval. No units apply.

3.17×10^{-8} = the inverse of the number of seconds per year with units of year/sec.

M_i = the gamma air dose factor for radioactive noble gas nuclide (i) in units of $\frac{\text{mrad-m}^3}{\mu\text{Ci-yr}}$

(X/Q) = the long term atmospheric dispersion factor for ground level releases in units of sec/m^3. The value of (X/Q) is the same for all nuclides (i) in the dose calculation, but the value of (X/Q) does vary depending on the Limiting Sector the Control is based on, etc.

Q_i = the number of micro-curies of nuclide (i) released (or projected) during the dose calculation exposure period. (e.g., month, quarter or year)

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2.4 (continued)

The following steps provide a detailed explanation of how the radionuclide specific dose is calculated.

1. To determine the applicable (X/Q) refer to Table M-1 to obtain the value for the type of dose calculation being performed. (i.e., Quarterly Control or Dose Projection for examples). This value of (X/Q) applies to each nuclide (i).

2. Determine (M_i) the gamma air dose factor for nuclide (i) from Table G-2.

3. Obtain the micro-Curies of nuclide (i) from the in-plant radioactive gaseous waste management logs for the sources under consideration during the time interval.

4. Solve for D_i as follows:

$$D_i = \frac{3.17 \times 10^{-8}\ yr}{\text{sec}} \times \frac{M_i\ mrad\text{-}m^3}{\mu Ci\text{-}yr} \times \frac{(X/Q)\ \text{sec}}{m^3} \times \frac{Q_i\ \mu Ci}{1}$$

D_i = mrad = the dose from nuclide (i)

5. Perform steps 2.4.2 through 2.4.4 for each nuclide (i) reported during the time interval in the source.

6. The total gamma air dose for the pathway is determined by summing the D_i dose of each nuclide (i) to obtain D_γ-air dose.

$D_{\gamma\text{-air}} = D_1 + D_2 + \_\_\_\_\_ + D_n$ = mrad

7. Refer to in-plant procedures for comparing the calculated dose to any applicable limits that might apply.

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2.5 Determining the Beta Air Dose for Radioactive Noble Gas Releases

Discussion - Control 3.11.2.2 limits the quarterly air dose due to beta radiation from noble gases in gaseous effluents to <10 mrads in any calendar quarter and <20 mrads in any calendar year. The following calculation method is provided for determining the beta air dose and is based on Section 5.3.1 of NUREG-0133, November 1978. The dose calculation is independent of any age group. The equation may be used for Control dose calculation, dose calculation for annual reports or for projecting dose, provided that the appropriate value of (X/Q) is used as outlined in the detailed explanation that follows.

The equation for beta air dose is:

$$D_{B\text{-}air} \sum_{i}^{n} = 3.17 \; X \; 10^{-8} N_i (X/Q) \; Q_i$$

Where:

$D_{B\text{-}air}$ = beta air dose in mrad from radioactive noble gases.

$\sum_{i}^{n}$ = a mathematical symbol to signify the operations to the right side of the symbol are to be performed for each nuclide (i) through (n) and summed to arrive at the total dose, from all nuclides reported during the interval. No units apply.

3.17×10^{-8} = the inverse of the number of seconds per year with units of year/sec.

N_i = the beta air dose factor for radioactive noble gas nuclide (i) in units of $\frac{\text{mrad-m}^3}{\mu\text{Ci-yr}}$

(X/Q) = the long term atmospheric dispersion factor for ground level releases in units of sec/m^3. The value of (X/Q) is the same for all nuclides (i) in the dose calculation, but the value of (X/Q) does vary depending on the Limiting Sector the Control is based on, etc.

Q_i = the number of micro-Curies of nuclide (i) released (or projected) during the dose calculation exposure period

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2.5 (continued)

The following steps provide a detailed explanation of how the dose is calculated.

1. To determine the applicable (X/Q) refer to Table M-1 to obtain the value for the type of dose calculation being performed (i.e., quarterly Control or Dose projection for examples). This value of (X/Q) applies to each nuclide (i).

2. Determine (N_i) the beta air dose factor for nuclide (i) from Table G-2.

3. Obtain the micro-curies of nuclide (i) from the in-plant radioactive gaseous waste management logs for the source under consideration during the time interval.

4. Solve for D_i as follows:

$$D_i = \frac{3.17 \times 10^{-8}\ yr}{\text{sec}} \times \frac{N_i\ mrad\text{-}m^3}{\mu Ci\text{-}yr} \times \frac{(X/Q)\ \text{sec}}{M^3} \times \frac{Q_i\ \mu Ci}{1}$$

D_i = mrad = the dose from nuclide (i)

5. Perform steps 2.5.2 through 2.5.4 for each nuclide (i) reported during the time interval in the release source.

6. The total beta air dose for the pathway is determined by summing the D_i dose of each nuclide (i) to obtain $D_{B\text{-}air}$ dose.

$D_{B\text{-}air} = D_1 + D_2$ _____ $+ D_n$ = mrad

7. Refer to in-plant procedures for comparing the calculated dose to any applicable limits that might apply.

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2.6 Determining the Radioiodine and Particulate Dose To Any Age Group's Organ From Cumulative Releases

Discussion - Control 3.11.2.3 limits the dose to the whole body or any organ resulting from the release of I-131, I-133, tritium and particulates with half-lives >8 days to ≤7.5 mrem during any calendar quarter and ≤15 mrem during any calendar year. The following calculation method is provided for determining the critical organ dose due to releases of radioiodines and particulates and is based on Section 5.3.1 of NUREG-0133, November 1978. The equations can be used for any age group provided that the appropriate dose factors are used and the total dose reflects only those pathways that are applicable to the age group. The Effluent Supervisor will track which age group is the controlling (most restrictive) age group (see control 3.11.2.6.c). The $(X/Q)_D$ symbol represents a DEPLETED-(X/Q) which is different from the Noble Gas (X/Q) in that $(X/Q)_D$ takes into account the loss of I&8DP and H-3 from the plume as the semi-infinite cloud travels over a given distance. The (D/Q) dispersion factor represents the rate of fallout from the cloud that affects a square meter of ground at various distances from the site. The I&8DP and H-3 notations refer to I-131, I-133 Particulates having half-lives >8 days and Tritium. For ease of calculations, dose from other Iodine nuclides may be included (see 2.1). Tritium calculations are always based on $(X/Q)_D$. The first step is to calculate the I&8DP and H-3 dose for each pathway that applies to a given age group. The total dose to an organ can then be determined by summing the pathways that apply to the receptor in the sector. The infant age group does not apply to Grass-Cow-Meat or Vegetation pathway dose since they are assumed to eat only milk.

The equations are:

For Inhalation Pathway (excluding H-3):

$$D_{I\&8DP_T} = \sum_{i}^{n} 3.17\ X\ 10^{-8} R_i\ (X/Q)_D Q_i$$

For Ground Plane, Grass-Cow/Goat-Milk, Grass-Cow/Goat-Milk, or Vegetation

$$D_{I\&8DP_T} = \sum_{i}^{n} 3.17\ X\ 10^{-8} R_i\ (D/Q) Q_i$$

For each pathway above (excluding Ground Plane) For Tritium:

$$D_{H\text{-}3_T} = 3.17\ X\ 10^{-8} R_{H\text{-}3T} (X/Q)_D Q_i$$

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2.6 (continued)

For Total Dose from Particulate Gaseous effluent to organ T of a specified age group:

$$D_T = \sum_Z [D_{I\&8DP} + D_{H\text{-}3}]$$

Where:

T = the organ of interest of a specified age group

z = the applicable pathways for the age group of interest

$D_{I\&8DP}$ = Dose in mrem to the organ T of a specified age group from radioiodines and 8D Particulates

$D_{H\text{-}3}$ = Dose in mrem to the organ T of a specified age group from Tritium

D_T = Total Dose in mrem to the organ T of a specified age group from Gaseous particulate Effluents

$\sum_i^n$ = A mathematical symbol to signify the operations to the right of the symbol are to be performed for each nuclide (i) through (n) and the individual nuclide doses are summed to arrive at the total dose from the pathway of interest to organ T.

$\sum_Z$ = A mathematical symbol to indicate that the total dose D_T to organ T is the sum of each of the pathway doses of I&8DP and H-3 from gaseous particulate effluents.

3.17×10^{-8} = The inverse of the number of seconds per year with units of year/sec.

R_i = The dose factor for nuclide (i) (or H-3) for pathway Z to organ T of the specified age group. The units are either

$$\frac{mrem\text{-}m^3}{yr\text{-}\mu Ci} \text{ for pathways using } (X/Q)_D \quad OR \quad \frac{mrem\text{-}m^2 \text{ - sec}}{yr\text{-}\mu Ci} \text{ for pathways using } (D/Q)$$

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2.6 (continued)

$(X/Q)_D$ = The depleted-(X/Q) value for a specific location where the receptor is located (see discussion). The units are sec/m^3

(D/Q) = the deposition value for a specific location where the receptor is located (see discussion). The units are $1/m^2$ where m=meters.

Q_i = The number of micro-Curies of nuclide (i) released (or projected) during the dose calculation exposure period.

Q_{H-3} = the number of micro-Curies of H-3 released (or projected) during the dose calculation exposure period.

1. The Inhalation Dose Pathway Method:

NOTE
The H-3 dose should be calculated as per 2.6.4.

A. Determine the applicable $(X/Q)_D$ from Table M-2 for the location where the receptor is located. This value is common to each nuclide (i)

B. For the age group(s) of interest, determine the R_i factor of nuclide (i) for the organ T and age group from the appropriate table number.

Age Group	Inhalation Dose Factor Table Number
Infant	G-5
Child	G-8
Teen	G-13
Adult	G-18

C. Obtain the micro-Curies (Q_i) of nuclide (i) from the radioactive gas waste management logs for the release source(s) under consideration during the time interval.

D. Solve for D_i

$D_i = 3.17 \times 10^{-8} Ri(X/Q)_D Q_i$

D_i = mrem from nuclide (i)

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2.6 (continued)

1. (continued)

   E. Perform steps 2.6.1.B through 2.6.1.D for each nuclide (i) reported during the time interval for each organ.

   F. The Inhalation dose to organ T of the specified age group is determined by summing the D_i Dose of each nuclide (i)

$$D_{Inhalation\ (Age\ Group)} = D_1 + D_2 + \_\_\_\_\_ + D_n = \qquad mrem$$

   Refer to 2.6.5 to determine the total dose to organ T from radioiodines & 8D Particulates

2. The Ground Plane Dose Pathway Method:

NOTE
Tritium dose via the ground plane is zero. The Whole Body is the only organ considered for the Ground Plane pathway dose.

   A. Determine the applicable (D/Q) from Table M-2 for the location where the receptor is located. This (D/Q) value is common to each nuclide (i)

   B. Determine the Ri factor of nuclide (i) for the whole body from Table G-4. The ground plane pathway dose is the same for all age groups.

   C. Obtain the micro-Curies (Q_i) of nuclide (i) from the radioactive gas waste management logs for the source under consideration.

   D. Solve for D_i

$$D_i = 3.17\ X\ 10^{-8} R_i\ (D/Q) Q_i$$

   D_i = mrem for nuclide (i)

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2.6 (continued)

2. (continued)

E. Perform steps 2.6.2.B through 2.6.2.D for each nuclide (i) reported during the time interval.

F. The Ground Plane dose to the whole body is determined by summing the Di Dose of each nuclide (i)

$D_{Gr.Pl.-WBody} = D_1 + D_2 + \_\_\_\_\_ + D_n =$ mrem

Refer to step 2.6.5 to calculate total dose to the Whole Body.

3. The Grass-Cow/Goat-Milk Dose Pathway Method:

NOTE
Tritium dose is calculated as per 2.6.4.

A. A cow or a goat, will be the controlling animal; (i.e., dose will not be the sum of each animal), as the human receptor is assumed to drink milk from only the most restrictive animal. Refer to Table M-3 to determine which animal is controlling based on its (D/Q).

B. For the age group(s) of interest, determine the dose factor R_i for nuclide (i), for organ T, from the appropriate table number for the applicable milk animal.

Age Group	Cow Milk Dose Factor Table Number	Goat Milk Dose Factor Table Number
Infant	G-6	G-7
Child	G-9	G-10
Teen	G-14	G-15
Adult	G-19	G-20

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2.6 (continued)

3. (continued)

C. Obtain the micro-Curies (Q_i) of nuclide (i) from the radioactive gas waste management logs for the release source under consideration during the time interval.

D. Solve for D_i

$D_i = 3.17 \times 10^{-8} R_i (D/Q) Q_i$

D_i = mrem from nuclide (i)

E. Perform steps 2.6.3.B through 2.6.3.D for each nuclide (i) reported during the time interval. Only the radioiodines need to be included if the limited analysis approach is used.

F. The Grass-Cow-Milk (or Grass-Goat-Milk) pathway dose to organ T is determined by summing the Di dose of each nuclide(i).

$D_{G\text{-}C\text{-}M}$ (or $D_{G\text{-}G\text{-}M}$) = $D_1 + D_2 +$ _____ $+ D_n =$ mrem

The dose to each organ should be calculated in the same manner with steps 2.6.3.B through 2.6.3.F. Refer to step 2.6.5 to determine the total dose to organ T from radioiodines &8D Particulates. If the limited analysis approach is being used the infant thyroid dose via the grass-cow(goat)-milk pathway is the only dose that needs to be determined. Section 2.6.5 can be omitted.

4. The Grass-Cow/Goat-Meat Dose Pathway method:

NOTE
Tritium dose is calculated as per 2.6.6.

A. Determine the controlling herd location by:

1. For dose calculations (other than the annual report) the historical herd was determined to be located in Sector _____ at _____ miles. This herd shall be used for all ODCM Control required dose calculations.

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2.6 (continued)

4. (continued)

A. (continued)

2. For annual report dose calculations the herd from the Land Use Census having the highest (D/Q) at its location will be the reporting herd. The Land Use Census for 1978 (for example) shall apply to the calendar year 1979 (for example) and will locate the nearest herd in each sector over land. The real (D/Q) will be determined from actual met data that occurred during the reporting period.

B. Determine the applicable (D/Q) from Table M-3 for the location(s) of the herd as determined in 2.6.4.A above.

C. Determine the dose factor Ri for nuclide (i) for organ tau from the Table specified below:

Age	Meat Dose Factor Table No.
Infant	N/A *
Child	G-11
Teen	G-16
Adult	G-21

* The infant does not eat meat and therefore dose does not apply to this pathway.

D. Obtain the micro-Curies (Qi) of nuclide (i) from the radioactive gas waste management logs (for projected doses - the micro-Curies of nuclide (i) to be projected) for the release source(s) under consideration during the time interval. The dose can be calculated from a single release source, but the total dose for ODCM Control Limits or annual reports shall be from all gaseous release sources.

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2.6 (continued)

4. (continued)

E. Solve for Di

Di = 3.17 X 10 Ri (D/Q) Qi

Di = _____ mrem from nuclide (i)

F. Perform Steps 2.6.4.C through 2.8.4.E for each nuclide (i) reported during the time interval.

G. The Grass-Cow-Meat pathway dose to organ tau is determined by summing the Di dose of each nuclide (i).

Dose = D1 + D2 + D3 + ... + Dn = _____mrem

Grass-Cow-Meat
Excluding Tritium
(Child, Teen, or Adult)

5. The Vegetation (Garden) Dose Pathway method:

A. Determine the controlling garden location by:

1. For dose calculations (other than annual reports) the historical garden was determined to be located in Sector _____ at _____miles. This garden shall be used for all ODCM Control dose calculations.

2. For annual report dose calculations the Land Census Garden having the highest real (D/Q) at its location will be the reporting garden. The Land Use Census for 1978 (for example) shall apply to the calendar year 1979 (for example) and will locate the nearest garden in each sector. The real (D/Q) will be determined from actual met data that occurred during the reporting period.

B. Determine the applicable (D/Q) from Table M-3 for the location(s) of the garden(s) as determined above.

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2.6 (continued)

5. (continued)

C. Determine the dose factor Ri for nuclide (i) for organ tau from the Table specified below:

Age	Vegetation Dose Factor Table No.
Infant	N/A *
Child	G-12
Teen	G-17
Adult	G-22

* denotes the infant does not eat vegetation and therefore does not apply to this pathway.

D. Obtain the micro-Curies (Qi) of nuclide (i) from the radioactive gas waste management logs (for projected doses - the micro-Curies of nuclide (i) to be projected) for the release source(s) under consideration during the time interval. The dose can be calculated from a single release source, but the total dose for ODCM Control Limits or annual reports shall be from all gaseous release sources.

E. Solve for Di

$Di = 3.17 \times 10^{-8} Ri (D/Q) Qi$

Di = _____ mrem from nuclide (i)

F. Perform Steps 2.6.5.C through 2.6.5.E for each nuclide (i) reported during the time interval.

G. The Vegetation pathway dose to organ tau is determined by summing the Di dose of each nuclide (i).

Dose = D1 + D2 + D3 + ... + Dn = _____mrem

Vegetation
(Excluding Tritium)
(Child, Teen, or Adult)

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2.6 (continued)

6. The Gaseous Tritium Dose (Each Pathway) Method:

A. The controlling locations for the pathway(s) has already been determined by:
Inhalation - as per 2.6.1.A
Ground Plane - not applicable for H-3
Grass-Cow/Goat-Milk - as per 2.6.3.A
Grass-Cow/Goat-Milk - as per 2.6.4.A
Vegetation (Garden) - as per 2.6.5.A

B. Tritium dose calculations use the depleted $(X/Q)_D$ instead of (D/Q). Table M-2 describes where the $(X/Q)_D$ value should be obtained from.

C. For the age group(s) of interest, determine the Pathway Tritium dose factor (R_{H-3}) for the organ T of interest from the Table specified below:

AGE	INHALATION	MILK	
		COW	GOAT
Infant	G-5	G-6	G-7
Child	G-8	G-9	G-10
Teen	G-13	G-14	G-15
Adult	G-18	G-19	G-20

D. Obtain the micro-Curies (Q) of Tritium from the radioactive gas waste management logs (for projected doses - the micro-Curies of nuclide (i) to be projected) for the release source(s) under consideration during the time interval. The dose can be calculated from a single release source, but the total dose for Control limits or quarterly reports shall be from all gaseous release sources.

E. Solve for D_{H-3}

$$D_{H-3} = 3.17 \times 10^{-8} R_{H-3}(X/Q)_D Q$$

D_{H-3} = mrem from Tritium in the specified pathway for organ T of the specified age group

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2.6 (continued)

7. Determining the Total Organ Dose From Iodines, 8D-Particulates and H-3 From Cumulative Gaseous Releases

NOTE
Control dose limits for I&8DP shall consider dose from all release sources from the reactor unit of interest.

A. The following pathways shall be summed to arrive at the total dose to organ T from a release source or if applicable to Control, from all release sources:

Age Group: INFANT CHILD TEEN ADULT Organ: BONE LIVER THYROID KIDNEY LUNG GI-LLI WHOLE BODY			
PATHWAY	DOSE	Reference to STEP No.	Remark
Inhalation (I&8DP)		2.6.1.F	
Inhalation (Tritium)		2.6.6.E	
Ground Plane (I&8DP)		2.6.2.F	
Grass-_____-Milk (I&8DP)		2.6.3.F	
Grass-_____-Milk (Tritium)		2.6.6.E	
Grass-_____-Meat (I&8DP)		2.6.4.G	N/A for INFANT
Grass-_____-Meat (Tritium)		2.6.6.E	N/A for INFANT
Vegetable Garden (I&8DP)		2.6.5.G	N/A for INFANT
Vegetable Garden (Tritium)		2.6.6.E	N/A for INFANT
$Dose_T$ =	(sum of above)		

B. The dose to each of the applicable age group's ORGANS shall be calculated:

BONE, LIVER, THYROID, KIDNEY, LUNG, WHOLE BODY, & GI-LLI

The age group organ receiving the highest exposure relative to its Control Limit is the most critical organ for that age group resulting from the radioiodine & 8D Particulates gaseous effluents.

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2.7 Projecting Dose for Radioactive Gaseous Effluents

Discussion - Control 3.11.2.4 requires that the waste gas holdup system be used to reduce releases of radioactivity when the projected doses in 31 days due to gaseous effluent releases, from each unit, to areas at and beyond the SITE BOUNDARY (see TS Figure 5-1-1) would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation. The following calculation method is provided for determining the projected doses. This method is based on using the results of the calculations performed in Sections 2.4 and 2.5.

1. Obtain the latest results of the monthly calculations of the gamma air dose (Section 2.4) and the beta air dose if performed (Section 2.5). These doses can be obtained from the in-plant records.

2. Divide these doses by the number of days the plant was operational during the month.

3. Multiply the quotient by the number of days the plant is projected to be operational during the next month. The product is the projected dose for the next month. The value should be adjusted as needed to account for any changes in failed-fuel or other identifiable operating conditions that could significantly alter the actual releases.

4. If the projected doses are >0.2 mrads gamma air dose or > 0.4 mrads beta air dose, the appropriate subsystems of the waste gas holdup system shall be used.

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3.0 40 CFR 190 Dose Evaluation

Discussion - Dose or dose commitment to a real individual from all uranium fuel cycle sources be limited to ≤25 mrem to the whole body or any organ (except thyroid, which is limited to ≤75 mrem) over a period of 12 consecutive months. The following approach should be used to demonstrate compliance with these dose limits. This approach is based on NUREG-0133, Section 3.8.

3.1 Evaluation Bases

Dose evaluations to demonstrate compliance with the above dose limits need only be performed if the quarterly doses calculated in Sections 1.4, 2.4 and 2.6 exceed twice the dose limits of Controls 3.11.1.2.a, 3.11.1.2.b, 3.11.2.2a, 3.1.2.2b, 3.11.2.3a and 3.11.2.3b respectively; i.e., quarterly doses exceeding 3 mrem to the whole body (liquid releases), 10 mrem to any organ (liquid releases), 10 mrads gamma air dose, 20 mrads beta air dose or 15 mrem to the thyroid or any organ from radioiodines and particulates (atmospheric releases). Otherwise, no evaluations are required and the remainder of this section can be omitted.

3.2 Doses From Liquid Releases

For the evaluation of doses to real individuals from liquid releases, the same calculation method as employed in Section 1.4 will be used. However, more realistic assumptions will be made concerning the dilution and ingestion of fish and shellfish by individuals who live and fish in the area. Also, the results of the Radiological Environmental Monitoring program will be included in determining more realistic dose to these real people by providing data on actual measured levels of plant related radionuclides in the environment.

3.3 Doses From Atmospheric Releases

For the evaluation of doses to real individuals from the atmospheric releases, the same calculation methods as employed in Section 2.4 and 2.6 will be used. In Section 2.4, the total body dose factor (K_i) should be substituted for the gamma air dose factor (M_i) to determine the total body dose. Otherwise the same calculation sequence applies. However, more realistic assumptions will be made concerning the actual location of real individuals, the meteorological conditions and the consumption of food (e.g., milk). Data obtained from the latest land use census (Control 3.12.2) should be used to determine locations for evaluating doses. Also, the results of the Radiological Environmental Monitoring program will be included in determining more realistic doses to these real people by providing data on actual measured levels of radioactivity and radiation at locations of interest.

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4.0 Annual Radioactive Effluent Report

Discussion - The information contained in a annual report shall not apply to any Control. The reported values are based on actual release conditions instead of historical conditions that the Control dose calculations are based on. The Control dose limits are therefore included in item 1 of the report, for information only. The ECLs in item 2 of the report shall be those listed in Tables L-1 and G-1 of this manual. The average energy in item 3 of the report is not applicable to the St. Lucie Plant. The format, order of nuclides and any values shown as an example in Tables 3.3 through 3.8 are samples only. Other formats are acceptable if they contain equivalent information. A table of contents should also accompany the report. The following format should be used:

RADIOACTIVE EFFLUENTS - SUPPLEMENTAL INFORMATION

1. Regulatory Limits:

1.1 For Radioactive liquid waste effluents:

a. The concentration of radioactive material released from the site (see TS Figure 5.1-1) shall be limited to ten times the concentrations specified in 10 CFR Part 20.1001-20.2401, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2×10^{-4} μCi/ml total activity.

b. The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released from each reactor unit to unrestricted areas (See TS Fig. 5.1-1) shall be limited during any calendar quarter to ≤1.5 mrem to the whole body and to ≤5 mrem to any organ and ≤3 mrem to the whole body and ≤10 mrem to any organ during any calendar year.

1.2 For Radioactive Gaseous Waste Effluents:

a. The dose rate resulting from radioactive materials released in gaseous effluents to areas at or beyond the SITE BOUNDARY (See TS Figure 5.1-1) shall be limited to the following values:

The dose rate limit for noble gases shall be ≤500 mrem/yr to the total body and ≤3000 mrem/yr to the skin and

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4.0 (continued)

1. (continued)

1.2 (continued)

a. (continued)

The dose rate limit from I-131, I-133, Tritium and particulates with half-lives >8 days shall be ≤1500 mrem/yr to any organ.

b. The air dose (see TS Figure 5.1-1) due to noble gases released in gaseous effluents, from each reactor unit, to areas at and beyond the SITE BOUNDARY shall be limited to the following:

During any calendar quarter, to ≤5 mrad for gamma radiation and ≤10 mrad for beta radiation and during any calendar year to ≤10 mrad for gamma radiation and ≤20 mrad for beta radiation

c. The dose to a MEMBER OF THE PUBLIC from I-131, I-133, Tritium and all radionuclide in particulate form, with half-lives >8 days in gaseous effluents released from each reactor unit to areas at and beyond the SITE BOUNDARY (see Figure 5.1-1 in the TS-A) shall be limited to the following:

During any calendar quarter to ≤7.5 mrem to any organ and during any calendar year to ≤15 mrem to any organ.

2. Effluent Limiting Concentrations:

Air - as per attached Table G-1

Water - as per attached Table L-1

3. Average energy of fission and activation gases in gaseous effluents is not applicable to the St. Lucie Plant.

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4.0 (continued)

4. Measurements and Approximations of Total Radioactivity:

A summary of liquid effluent accounting methods is described in Table 3.1.

A summary of gaseous effluent accounting methods is described in Table 3.2.

Estimate of Errors:

Error Topic	LIQUID		GASEOUS	
	Avg. %	Max. %	Avg. %	Max. %
Release Point Mixing	2	5	NA	NA
Sampling	1	5	2	5
Sample Preparation	1	5	1	5
Sample Analysis	3	10	3	10
Release Volume	2	5	4	15
Total %	9	30	10	35

(above values are examples only)

The predictability of error for radioactive releases can only be applied to nuclides that are predominant in sample spectrums. Nuclides that are near background relative to the predominant nuclides in a given sample could easily have errors greater than the above listed maximums.

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4.0 (continued)

4. (continued)

TABLE 3.1
RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS

LIQUID SOURCE	SAMPLING FREQUENCY	TYPE OF ANALYSIS	METHOD OF ANALYSIS
MONITOR TANK RELEASES	EACH BATCH	PRINCIPAL GAMMA EMITTERS	p.h.a.
	MONTHLY COMPOSITE	TRITIUM	L.S.
		GROSS ALPHA	G.F.P.
	QUARTERLY COMPOSITE	Sr-89, Sr-90, Fe-55	C.S.
STEAM GENERATOR BLOWDOWN RELEASES	FOUR PER MONTH	PRINCIPAL GAMMA EMITTERS AND DISSOLVED GASES	p.h.a.
	MONTHLY COMPOSITE	TRITIUM	L.S.
		GROSS ALPHA	G.F.P.
	QUARTERLY COMPOSITE	Sr-89, Sr-90, Fe-55	C.S.

TABLE NOTATION:

p.h.a. - gamma spectrum pulse height analysis using Lithium Germanium detectors. All peaks are identified and quantified.

L.S. - Liquid Scintillation counting

C.S. - Chemical Separation

G.F.P. - Gas Flow Proportional Counting

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4.0 (continued)

4. (continued)

TABLE 3.2
RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS

GASEOUS SOURCE	SAMPLING FREQUENCY	TYPE OF ANALYSIS	METHOD OF ANALYSIS
Waste Gas Decay Tank Releases	Each Tank	Principal Gamma Emitters	G, p.h.a.
Containment Purge Releases	Each Purge	Principal Gamma Emitters	G, p.h.a.
		H-3	L.S.
Plant Vent	Four per Month	Principal Gamma Emitters	(G, C, P) - p.h.a.
		H-3	L.S.
	Monthly Composite (Particulates)	Gross Alpha	P - G. F. P.
	Quarterly Composite (Particulates)	Sr-90 Sr-89	C.S.

G - Gaseous Grab Sample

C - Charcoal Filter Sample

P - Particulate Filter Sample

L.S. - Liquid Scintillation Counting

C.S. - Chemical Separation

p.h.a. - Gamma spectrum pulse height analysis using Lithium Germanium detectors. All peaks are identified and quantified.

G.F.P. - Gas Flow Proportional Counting

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4.0 (continued)

5. Batch Releases

A. Liquid

1. Number of batch releases: _____
2. Total time period of batch releases: _____minutes
3. Maximum time period for a batch release: _____minutes
4. Average time period for a batch release: _____minutes
5. Minimum time period for a batch release: _____minutes
6. Average dilution stream flow during the period (see Note 1 on Table 3.3): _____GPM

All liquid releases are summarized in tables

B. Gaseous

1. Number of batch releases: _____
2. Total time period for batch releases: _____minutes
3. Maximum time period for a batch release: _____minutes
4. Average time period for batch releases: _____minutes
5. Minimum time period for a batch release: _____minutes

All gaseous waste releases are summarized in tables

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4.0 (continued)

6. Unplanned Releases

   A. Liquid

      1. Number of releases: _____

      2. Total activity releases: _____Curies

   B. Gaseous

      1. Number of releases: _____

      2. Total activity released: _____Curies

   C. See attachments (if applicable) for:

      1. A description of the event and equipment involved.

      2. Cause(s) for the unplanned release.

      3. Actions taken to prevent a recurrence

      4. Consequences of the unplanned release

7. Description of dose assessment of radiation dose from radioactive effluents to the general public due to their activities inside the site are reported on the January annual report.

8. Offsite dose calculation manual revisions initiated during this reporting period. See Control 3.11.2.6 for required attachments to the Annual Report.

9. Solid waste and irradiated fuel shipments as per requirements of Control 3.11.2.6.

10. Process Control Program (PCP) revisions as per requirements of TS 6.13.

11. Major changes to Radioactive Liquid, Gaseous and Solid Waste Treatment Systems as per requirements of Control 3.11.2.5.

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FLORIDA POWER & LIGHT COMPANY

ST. LUCIE UNIT #_____

ANNUAL REPORT - ____/____/____ THROUGH ____/____/____

TABLE 3.3: LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

		UNIT	QUARTER #	QUARTER #
A.	Fission and Activation Products			
	1. Total Release - (Not including Tritium, Gases, Alpha)	Ci	_____E	_____E
	2. Average Diluted Concentration During Period	µCi/ml	_____E	_____E
B.	Tritium			
	1. Total Release	Ci	_____E	_____E
	2. Average Diluted Concentration During Period	µCi/ml	_____E	_____E
C.	Dissolved and Entrained Gases			
	1. Total Release	Ci	_____E	_____E
	2. Average Diluted Concentration During Period	µCi/ml	_____E	_____E
D.	Gross Alpha Radioactivity			
	1. Total Release	Ci	_____E	_____E

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TABLE 3.3: LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
(continued)

		UNIT	QUARTER #	QUARTER #
E.	Volume of Waste Released (Prior to Dilution)	LITERS	_____E	_____E
F.	Volume of Dilution Water Used During Period[1]	LITERS	_____E	_____E

1 - The volume reported should be for the entire interval of the reporting period, not just during release intervals. This volume should also be used to calculate average dilution stream flow during the period.

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ST. LUCIE UNIT #_____

ANNUAL REPORT - ____/____/____ THROUGH ____/____/____

TABLE 3.4: LIQUID EFFLUENTS (EXAMPLE FORMAT)

NUCLIDES RELEASED*	UNIT	CONTINUOUS MODE		BATCH MODE	
		QUARTER #	QUARTER #	QUARTER #	QUARTER #
I-131	CI	E	E	E	E
I-133	CI	E	E	E	E
I-135	CI	E	E	E	E
NA-24	CI	E	E	E	E
CR-51	CI	E	E	E	E
MN-54	CI	E	E	E	E
CO-57	CI	E	E	E	E
CO-58	CI	E	E	E	E
FE-59	CI	E	E	E	E
CO-60	CI	E	E	E	E
ZN-65	CI	E	E	E	E
NI-65	CI	E	E	E	E
AG-110	CI	E	E	E	E
SN-113	CI	E	E	E	E
SB-122	CI	E	E	E	E
SB-124	CI	E	E	E	E
W-187	CI	E	E	E	E
NP-239	CI	E	E	E	E
ZR-95	CI	E	E	E	E
MO-99	CI	E	E	E	E
RU-103	CI	E	E	E	E
CS-134	CI	E	E	E	E
CS-136	CI	E	E	E	E
CS-137	CI	E	E	E	E
BA-140	CI	E	E	E	E
CE-141	CI	E	E	E	E
BR-82	CI	E	E	E	E
ZR-97	CI	E	E	E	E
SB-125	CI	E	E	E	E

* All nuclides that were detected should be added to the partial list of the example format.

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TABLE 3.4: LIQUID EFFLUENTS (EXAMPLE FORMAT)
(continued)

NUCLIDES RELEASED	UNIT	CONTINUOUS MODE		BATCH MODE	
		QUARTER #	QUARTER #	QUARTER #	QUARTER #
CE-144	CI	E	E	E	E
SR-89	CI	E	E	E	E
SR-90	CI	E	E	E	E
UNIDENTIFIED	CI	E	E	E	E
TOTAL FOR PERIOD (ABOVE)	CI	E	E	E	E
AR-41	CI	E	E	E	E
KR-85	CI	E	E	E	E
XE-131M	CI	E	E	E	E
XE-133	CI	E	E	E	E
XE-133M	CI	E	E	E	E
XE-135	CI	E	E	E	E

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FLORIDA POWER & LIGHT COMPANY
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TABLE 3.5
LIQUID EFFLUENTS - DOSE SUMMATION

Age Group: _____ Location: _____

Exposure Interval: From_____ Through_____

Fish & Shellfish Pathway to Organ	CALENDAR YEAR DOSE (mrem)
BONE	
LIVER	
THYROID	
KIDNEY	
LUNG	
GI-LLI	
WHOLE BODY	

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FLORIDA POWER & LIGHT COMPANY

ST. LUCIE UNIT #_____

ANNUAL REPORT - ____/____/____ THROUGH ____/____/____

TABLE 3.6: GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	UNIT	QUARTER #	QUARTER #
A. Fission and Activation Gases			
1. Total Release	Ci	_____E	_____E
2. Average Release Rate For Period	µCi/SEC	_____E	_____E
B. Iodines			
1. Total Iodine-131	Ci	_____E	_____E
2. Average Release Rate for Period	µCi/SEC	_____E	_____E
C. Particulates			
1. Particulates T-1/2 > 8 Days	Ci	_____E	_____E
2. Average Release Rate for Period	µCi/SEC	_____E	_____E
3. Gross Alpha Radioactivity	Ci	_____E	_____E
D. Tritium			
1. Total Release	Ci	_____E	_____E
2. Average Release Rate for Period	µCi/SEC	_____E	_____E

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FLORIDA POWER & LIGHT COMPANY

ST. LUCIE UNIT #_____

ANNUAL REPORT - ____/____/____ THROUGH ____/____/____

TABLE 3.7 GASEOUS EFFLUENTS - GROUND LEVEL RELEASES
(EXAMPLE FORMAT)

NUCLIDES RELEASED*	UNIT	CONTINUOUS MODE		BATCH MODE	
		QUARTER #	QUARTER #	QUARTER #	QUARTER #
1. Fission Gases					
AR-41	CI	E	E	E	E
KR-85	CI	E	E	E	E
KR-85M	CI	E	E	E	E
KR-87	CI	E	E	E	E
KR-88	CI	E	E	E	E
XE-131M	CI	E	E	E	E
XE-133	CI	E	E	E	E
XE-133M	CI	E	E	E	E
XE-135	CI	E	E	E	E
XE-135M	CI	E	E	E	E
XE-138	CI	E	E	E	E
UNIDENTIFIED	CI	E	E	E	E
TOTAL FOR PERIOD (ABOVE)	CI	E	E	E	E
2. Iodines					
I-131	CI	E	E	E	E
I-133	CI	E	E	E	E
I-135	CI	E	E	E	E
TOTAL FOR PERIOD (ABOVE)	CI	E	E	E	E
3. Particulates					
CO-58	CI	E	E	E	E
SR-89	CI	E	E	E	E
SR-90	CI	E	E	E	E

*All nuclides that were detected should be added to the partial list of the example format.

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT #_____
TABLE 3.8
GASEOUS EFFLUENTS - DOSE SUMMATION - CALENDAR YEAR
AGE GROUP: INFANT EXPOSURE INTERVAL: FROM_____ THROUGH_____

PATHWAY	BONE (mrem)	LIVER (mrem)	THYROID (mrem)	KIDNEY (mrem)	LUNG (mrem	GI-LLI (mrem)	WHOLE BODY (mrem)
Ground Plane (A)							
Grass- -Milk (B)							
Inhalation (A)							
TOTAL							

(A)	SECTOR:	RANGE: miles

(B)	COW / GOAT	SECTOR:	RANGE: miles

NOBLE GASES	CALENDAR YEAR (mrad)
Gamma Air Dose	
Beta Air Dose	
Sector:	Range: 0.97 miles

NOTE
The dose values above were calculated using actual meteorological data during the specified time interval with MET data reduced as per Reg. Guide 1.111, March 1976.

APPENDIX A

ECL, DOSE FACTOR

AND

HISTORICAL METEOROLOGICAL TABLES

ST. LUCIE PLANT
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TABLE L-1
EFFLUENT CONCENTRATION LIMITS IN WATER
IN UNRESTRICTED AREAS

NOTE
If a nuclide is not listed below, refer to 10 CFR Part 20, Appendix B, Table 2 Effluent Concentrations Column 2 and use the most conservative ECL listed for the nuclide.

Nuclide	ECL (μCi/ml)	Nuclide	ECL (μCi/ml)	Nuclide	ECL (μCi/ml)
H-3	1 E-3	Sr-92	4 E-5	Te-129	4 E-4
C-14	3 E-5	Y-90	7 E-6	Te-131m	8 E-6
Na-24	5 E-5	Y-91m	2 E-3	Te-131	8 E-5
P-32	9 E-6	Y-91	8 E-6	Te-132	9 E-6
Cr-51	5 E-4	Y-92	4 E-5	I-130	2 E-5
Mn-54	3 E-5	Y-93	2 E-5	I-131	1 E-6
Mn-56	7 E-5	Zr-95	2 E-5	I-132	1 E-4
Fe-55	1 E-4	Zr-97	9 E-6	I-133	7 E-6
Fe-59	1 E-5	Nb-95	3 E-5	I-134	4 E-4
Co-57	6 E-5	Nb-97	3 E-4	I-135	3 E-5
Co-58	2 E-5	Mo-99	2 E-5	Cs-134	9 E-7
Co-60	3 E-6	Tc-99m	1 E-3	Cs-136	6 E-6
Ni-63	1 E-4	Tc-101	2 E-3	Cs-137	1 E-6
Ni-65	1 E-4	Ru-103	3 E-5	Cs-138	4 E-4
Cu-64	2 E-4	Ru-105	7 E-5	Ba-139	2 E-4
Zn-65	5 E-6	Ru-106	3 E-6	Ba-140	8 E-6
Zn-69	8 E-4	Ag-110	6 E-6	Ba-141	3 E-4
Br-82	4 E-5	Sn-113	3 E-5	Ba-142	7 E-4
Br-83	9 E-4	In-113m	7 E-4	La-140	9 E-6
Br-84	4 E-4	Sb-122	1 E-5	La-142	1 E-4
Rb-86	7 E-6	Sb-124	7 E-6	Ce-141	3 E-5
Rb-88	4 E-4	Sb-125	3 E-5	Ce-143	2 E-5
Rb-89	9 E-4	Te-125m	2 E-5	Ce-144	3 E-6
Sr-89	8 E-6	Te-127m	9 E-6	Pr-144	6 E-4
Sr-90	5 E-7	Te-127	1 E-4	W-187	3 E-5
Sr-91	2 E-5	Te-129m	7 E-6	Np-239	2 E-5

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TABLE L-2
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - ADULT
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H-3	0.	3.60E-01	3.60E-01	3.60E-01	3.60E-01	3.60E-01	3.60E-01
C-14	1.45E+04	2.91E+03	2.91E+03	2.91E+03	2.91E+03	2.91E+03	2.91E+03
NA-24	6.08E-01	6.08E-01	6.08E-01	6.08E-01	6.08E-01	6.08E-01	6.08E-01
P-32	1.67E+07	1.05E+06	0.	0.	0.	1.88E+06	6.47E+05
CR-51	0.	0.	3.34E+00	1.23E+00	7.42E+00	1.41E+03	5.59E+00
MN-54	0.	7.07E+03	0.	2.10E+03	0.	2.17E+04	1.35E+03
MN-56	0.	1.78E+02	0.	2.26E+02	0.	5.68E+03	3.17E+01
FE-55	1.15E+05	5.19E+05	0.	0.	6.01E+05	2.03E+05	1.36E+05
FE-59	8.08E+04	1.92E+05	0.	0.	5.32E+04	6.33E+05	7.29E+04
CO-57	0.	1.42E+02	0.	0.	0.	3.60E+03	2.36E+02
CO-58	0.	6.05E+02	0.	0.	0.	1.22E+04	1.35E+03
CO-60	0.	1.74E+03	0.	0.	0.	3.26E+04	3.83E+03
Ni-63	4.97E+04	3.45E+03	0.	0.	0.	7.19E+02	1.67E+03
NI-65	2.02E+02	2.63E+01	0.	0.	0.	6.65E+02	1.20E+01
CU-64	0.	2.15E+02	0.	5.41E+02	0.	1.83E+04	1.01E+02
ZN-65	1.62E+05	5.13E+05	0.	3.43E+05	0.	3.23E+05	2.32E+05
ZN-69	3.43E+02	6.60E+02	0.	4.27E+02	0.	9.87E+01	4.57E+01

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Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

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TABLE L-2
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - ADULT
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
BR-82	0.	0.	0.	0.	0.	4.68E+00	4.08E+00
BR-83	0.	0.	0.	0.	0.	1.05E-01	7.26E-02
BR-84	0.	0.	0.	0.	0.	7.38E-07	9.42E-02
BR-85	0.	0.	0.	0.	0.	0.	3.86E-03
RB-86	0.	6.25E+02	0.	0.	0.	1.23E+02	2.91E+02
RB-88	0.	1.79E+00	0.	0.	0.	0.	9.50E-01
RB-89	0.	1.19E+00	0.	0.	0.	0.	8.38E-01
SR-89	5.01E+03	0.	0.	0.	0.	8.01E+02	1.44E+02
SR-90	1.23E+05	0.	0.	0.	0.	1.65E+03	3.02E+04
SR-91	9.43E+01	0.	0.	0.	0.	4.75E+02	4.15E+00
SR-92	3.50E+01	0.	0.	0.	0.	6.91E+02	1.51E+00
Y-90	6.07E+00	0.	0.	0.	0.	6.43E+04	1.63E-01
Y-91M	5.74E-02	0.	0.	0.	0.	1.68E-01	2.23E-03
Y-91	8.89E+01	0.	0.	0.	0.	4.89E+04	2.38E+00
Y-92	5.34E-01	0.	0.	0.	0.	9.33E+03	1.56E-02

Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

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TABLE L-2
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - ADULT
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
Y-93	1.69E+00	0.	0.	0.	0.	5.36E+04	4.67E-02
ZR-95	1.60E+01	5.13E+00	0.	8.09E+00	0.	1.59E+04	3.47E+00
ZR-97	8.82E-01	1.78E-01	0.	2.69E-01	0.	5.51E+04	8.19E-02
NB-95	4.48E+02	2.49E+02	0.	2.47E+02	0.	1.51E+06	9.79E+01
NB-97	3.76E+00	9.50E-01	0.	1.11E+00	0.	3.51E+03	3.47E-01
MO-99	0.	1.28E+02	0.	2.90E+02	0.	2.97E+02	2.43E+01
TC-99M	1.30E-02	3.67E-02	0.	5.57E-01	1.80E-02	2.17E+01	4.67E-01
TC-101	1.33E-02	1.93E-02	0.	3.47E-01	9.82E-03	0.	1.89E-01
RU-103	1.07E+02	0.	0.	4.09E+02	0.	1.25E+04	4.61E+01
RU-105	8.90E+00	0.	0.	1.15E+02	0.	5.44E+03	3.51E+00
RU-106	1.59E+03	0.	0.	3.08E+03	0.	1.03E+05	2.01E+02
AG-110	1.57E+03	1.45E+03	0.	2.85E+03	0.	5.92E+05	8.62E+02
SB-124	2.78E+02	5.23E+00	6.71E-01	0.	2.15E+02	7.85E+03	1.10E+02
SB-125	2.20E+02	2.37E+00	1.96E-01	0.	2.30E+04	1.95E+03	4.42E+01
TE-125M	2.17E+02	7.89E+01	6.54E+01	8.83E+02	0.	8.67E+02	2.91E+01

Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

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TABLE L-2
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - ADULT
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
TE-127M	5.50E+02	1.92E+02	1.40E+02	2.23E+03	0.	1.84E+03	6.70E+01
TE-127	8.92E+00	3.20E+00	6.61E+00	3.63E+01	0.	7.04E+02	1.93E+00
TE-129M	9.32E+02	3.49E+02	3.20E+02	3.89E+03	0.	4.69E+03	1.48E+02
TE-129	2.55E+00	9.65E-01	1.95E+00	1.07E+01	0.	1.92E+00	6.21E-01
TE-131M	1.41E+02	6.87E+01	1.09E+02	6.95E+02	0.	6.81E+03	5.72E+01
TE-131	1.60E+00	6.68E-01	1.31E+00	7.00E+00	0.	2.39E-01	5.04E-01
TE-132	2.05E+03	1.33E+02	1.46E+02	1.28E+03	0.	6.25E+03	1.24E+02
I-130	3.98E+01	1.18E+02	1.50E+04	1.83E+02	0.	1.01E+02	4.63E+01
I-131	2.18E+02	3.13E+02	1.02E+05	5.36E+02	0.	8.24E+01	1.79E+02
I-132	1.07E+01	2.85E+01	3.76E+03	4.55E+01	0.	5.36E+00	1.01E+01
I-133	7.51E+01	1.30E+02	2.51E+04	2.27E+02	0.	1.15E+02	3.98E+01
I-134	5.57E+00	1.51E+01	1.96E+03	2.41E+01	0.	1.32E-02	5.41E+00
I-135	2.33E+01	6.14E+01	8.03E+03	9.77E+01	0.	6.88E+01	2.25E+01
CS-134	6.85E+03	1.63E+04	0.	5.29E+03	1.75E+03	2.85E+02	1.33E+04
CS-136	7.17E+02	2.83E+03	0.	1.58E+03	2.16E+02	3.22E+02	2.04E+03

Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

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TABLE L-2
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - ADULT
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
CS-137	8.79E+03	1.20E+04	0.	4.09E+03	1.36E+03	2.31E+02	7.88E+03
CS-138	6.08E+00	1.20E+01	0.	8.84E+00	8.73E-01	5.12E-05	5.96E+00
BA-139	7.87E+00	5.61E-03	0.	5.24E-03	3.18E-03	1.39E+01	2.30E-01
BA-140	1.65E+03	2.07E+00	0.	7.04E-01	1.18E+00	3.39E+03	1.09E+02
BA-141	0.	2.89E-03	0.	2.68E-03	1.64E-03	1.80E-09	1.29E-01
BA-142	1.73E+00	1.78E-03	0.	1.50E-03	1.01E-03	0.	1.09E-01
LA-140	1.58E+00	7.95E-01	0.	0.	0.	5.83E+04	2.11E-01
LA-142	8.07E-02	3.67E-02	0.	0.	0.	2.68E+02	9.15E-03
CE-141	3.43E+00	2.32E+00	0.	1.08E+00	0.	8.87E+03	2.63E-01
CE-143	6.05E-01	4.47E+02	0.	1.97E-01	0.	1.67E+04	4.95E-02
CE-144	1.79E+02	7.48E+01	0.	4.43E+01	0.	6.05E+04	9.60E+00
PR-144	1.91E-02	7.88E-03	0.	4.45E-03	0.	2.73E-09	9.65E-04
W-187	9.17E+00	7.68E+00	0.	0.	0.	2.51E+03	2.69E+00
NP-239	3.56E-02	3.50E-03	0.	1.08E-02	0.	7.12E+02	1.92E-03

Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

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TABLE L-3
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	2.17E-01	2.17E-01	2.74E-01	2.17E-01	2.17E-01	2.17E-01
C-14	2.94E+03	2.94E+03	2.94E+03	2.22E+03	2.94E+03	2.94E+03	2.94E+03
NA--24	4.63E-01	4.63E-01	4.63E-01	4.63E-01	4.63E-01	4.63E-01	4.63E-01
P---32	1.27E+07	7.98E+05	0.	0.	0.	1.43E+06	4.93E+05
CR--51	0.	0.	2.54E+00	9.38E-01	5.64E+00	1.07E+03	4.25E+00
MN--54	0.	5.38E+03	0.	1.60E+03	0.	1.65E+04	1.03E+03
MN--56	0.	1.36E+02	0.	1.72E+02	0.	4.32E+03	2.42E+01
FE--55	8.78E+04	3.95E+05	0.	0.	4.57E+05	1.54E+05	1.04E+05
FE--59	6.14E+04	1.46E+05	0.	0.	4.05E+04	4.81E+05	5.55E+04
CO--57	0.	1.08E+02	0.	0.	0.	2.74E+03	1.79E+02
CO--58	0.	6.12E+02	0.	0.	0.	8.26E+03	1.39E+03
CO--60	0.	1.70E+03	0.	0.	0.	2.04E+04	3.88E+03
Ni-63	3.78E+04	2.63E+03	0.	0.	0.	5.47E+02	1.27E+03
NI--65	1.54E+02	2.00E+01	0.	0.	0.	5.07E+02	9.11E+00
CU--64	0.	1.64E+02	0.	4.12E+02	0.	1.39E+04	7.69E+01
ZN--65	1.23E+05	3.90E+05	0.	2.61E+05	0.	2.46E+05	1.77E+05
ZN--69	2.61E+02	5.02E+02	0.	3.24E+02	0.	7.50E+01	3.47E+01
BR--82	0.	0.	0.	0.	0.	3.55E+00	3.10E+00
BR--83	0.	0.	0.	0.	0.	7.95E-02	5.52E-02
BR--84	0.	0.	0.	0.	0.	5.61E-07	7.16E-02
BR--85	0.	0.	0.	0.	0.	0.	2.94E-03

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Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

TABLE L-3
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
RB--86	0.	4.76E+02	0.	0.	0.	9.37E+01	2.22E+02
RB--88	0.	1.37E+00	0.	0.	0.	0.	7.23E-01
RB--89	0.	9.04E-01	0.	0.	0.	0.	6.38E-01
SR--89	5.67E+03	0.	0.	0.	0.	6.15E+02	1.63E+02
SR--90	1.28E+05	0.	0.	0.	0.	2.71E+03	3.17E+04
SR--91	7.18E+01	0.	0.	0.	0.	3.61E+02	3.16E+00
SR--92	2.66E+01	0.	0.	0.	0.	5.25E+02	1.15E+00
Y---90	1.58E+01	0.	0.	0.	1.80E+04	5.23E+04	4.25E-01
Y--91M	4.36E-02	0.	0.	0.	0.	1.28E-01	1.69E-03
Y---91	9.40E+01	0.	0.	0.	0.	3.61E+04	2.51E+00
Y---92	4.06E-01	0.	0.	0.	0.	7.10E+03	1.18E-02
Y---93	1.29E+00	0.	0.	0.	0.	4.08E+04	3.55E-02
ZR--95	1.49E+01	4.96E+00	0.	6.16E+00	0.	1.07E+04	3.46E+00
ZR--97	6.72E-01	1.36E-01	0.	2.05E-01	0.	4.20E+04	6.24E-02
NB--95	3.97E+02	2.39E+02	0.	1.88E+02	0.	9.76E+05	1.35E+02
NB--97	2.87E+00	7.24E-01	0.	8.45E-01	0.	2.67E+03	2.64E-01
MO--99	0.	9.74E+01	0.	2.21E+02	0.	2.26E+02	1.85+01
TC-99M	9.87E-03	2.79E-02	0.	4.24E-01	1.37E-02	1.65E+01	3.56E-01
TC-101	1.02E-02	1.47E-02	0.	2.64E-01	7.47E-03	0.	1.44E-01

Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

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TABLE L-3
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
RU-103	1.04E+02	0.	0.	3.11E+02	0.	8.13E+03	4.66E+01
RU-105	6.77E+00	0.	0.	8.74E+01	0.	4.14E+03	2.67E+00
RU-106	1.76E+03	0.	0.	2.34E+03	0.	7.95E+04	2.21E+02
AG110	1.19E+03	1.10E+03	0.	2.17E+03	0.	4.51E+05	6.56E+02
SB-124	2.11E+02	3.99E+00	5.11E-01	0.	1.64E+02	5.98E+03	8.35E+01
SB-125	1.68E+02	1.81E+00	1.49E-01	0.	1.75E+04	1.48E+03	3.37E+01
TE 125M	2.36E+02	8.45E+01	6.66E+01	6.72E+02	0.	6.60E+02	3.13E+01
TE 127M	4.18E+02	1.46E+02	1.07E+02	1.70E+03	0.	1.40E+03	5.09E+01
TE-127	9.31E+00	3.28E+00	6.35E+00	2.76E+01	0.	7.52E+02	1.99E+00
TE 129M	1.02E+03	3.79E+02	3.27E+02	2.96E+03	0.	3.58E+03	1.61E+02
TE-129	1.94E+00	7.34E-01	1.49E+00	8.14E+00	0.	1.46E+00	4.72E-01
TE 131M	1.07E+02	5.22E+01	8.26E+01	5.29E+02	0.	5.18E+03	4.35E+01
TE-131	1.21E+00	5.08E-01	9.99E-01	5.33E+00	0.	1.82E-01	3.83E-01
TE-132	2.19E+02	1.37E+02	1.46E+02	9.74E+02	0.	4.93E+03	1.30E+02
I--130	3.03E+01	8.95E+01	1.14E+04	1.39E+02	0.	7.67E+01	3.52E+01
I--131	2.23E+02	3.14E+02	9.07E+04	4.08E+02	0.	5.95E+01	1.87E+02
I--132	8.11E+00	2.17E+01	2.86E+03	3.46E+01	0.	4.08E+00	7.71E+00
I--133	8.11E+01	1.37E+02	2.50E+04	1.73E+02	0.	9.99E+01	4.24E+01
I--134	4.24E+00	1.15E+01	1.49E+03	1.83E+01	0.	1.00E-02	4.12E+00

Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

ST. LUCIE PLANT
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TABLE L-3
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (MREM/HR PER µCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
I--135	1.77E+01	4.68E+01	6.11E+03	7.43E+01	0.	5.23E+01	1.71E+01
CS-134	6.75E+03	1.63E+04	0.	4.03E+03	1.97E+03	1.88E+02	7.60E+03
CS-136	5.46E+02	2.16E+03	0.	1.20E+03	1.65E+02	2.45E+02	1.55E+03
CS-137	8.98E+03	1.21E+04	0.	3.11E+03	1.60E+03	1.61E+02	4.24E+03
CS-138	4.63E+00	9.15E+00	0.	6.73E+00	6.65E-01	3.90E-05	4.54E+00
BA-139	5.99E+00	4.27E-03	0.	3.99E-03	2.42E-03	1.06E+01	1.75E-01
BA-140	1.75E+03	2.15E+00	0.	5.35E-01	1.44E+00	2.55E+02	1.12E+02
BA-141	0.	2.20E-03	0.	2.04E-03	1.25E-03	1.37E-09	9.80E-02
BA-142	1.31E+00	1.35E-03	0.	1.14E-03	7.64E-04	0.	8.26E-02
LA-140	1.67E+00	8.25E-01	0.	0.	0.	4.55E+04	2.18E-01
LA-142	6.14E-02	2.79E-02	0.	0.	0.	2.04E+02	6.95E-03
CE-141	3.51E+00	2.36E+00	0.	8.19E-01	0.	6.38E+03	2.70E-01
CE-143	4.60E-01	3.40E+02	0.	1.50E-01	0.	1.27E+04	3.76E-02
CE-144	2.01E+02	8.25E+01	0.	3.37E+01	0.	4.74E+04	1.07E+01
PR-144	1.45E-02	5.99E-03	0.	3.39E-03	0.	2.08E-09	7.34E-04
W--187	6.98E+00	5.85E+00	0.	0.	0.	1.91E+03	2.05E+00
NP-239	2.71E-02	2.67E-03	0.	8.25E-03	0.	5.43E+02	1.46E-03

Based on 1 µCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

ST. LUCIE PLANT
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TABLE L-4
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - CHILD
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	1.81E-01	1.81E-01	1.19E-01	1.81E-01	1.81E-01	1.81E-01
C-14	3.82E+03	3.82E+03	3.82E+03	9.61E+02	3.82E+03	3.82E+03	3.82E+03
NA--24	2.03E-01	2.03E-01	2.03E-01	2.03E-01	2.03E-01	2.03E-01	2.03E-01
P---32	5.53E+06	3.47E+05	0.	0.	0.	6.22E+05	2.14E+05
CR--51	0.	0.	1.12E+00	4.13E-01	2.48E+00	4.70E+02	1.87E+00
MN--54	0.	2.34E+03	0.	6.95E+02	0.	7.15E+03	4.46E+02
MN--56	0.	5.88E+01	0.	7.46E+01	0.	1.88E+03	1.05E+01
FE--55	3.87E+04	1.74E+05	0.	0.	2.02E+05	6.81E+04	4.58E+04
FE--59	2.71E+04	6.43E+04	0.	0.	1.79E+04	2.12E+05	2.45E+04
CO--57	0.	4.78E+01	0.	0.	0.	1.21E+03	7.94E+01
CO--58	0.	5.05E+02	0.	0.	0.	3.00E+03	1.52E+03
CO--60	0.	1.41E+03	0.	0.	0.	7.80E+03	4.23E+03
Ni-63	1.66E+04	1.15E+03	0.	0.	0.	2.39E+02	5.55E+02
NI--65	6.73E+01	8.74E+00	0.	0.	0.	2.22E+02	3.98E+00
CU--64	0.	7.15E+01	0.	1.80E+02	0.	6.09E+03	3.36E+01
ZN--65	5.47E+04	1.74E+05	0.	1.16E+05	0.	1.09E+05	7.86E+04
ZN--69	1.16E+02	2.23E+02	0.	1.44E+02	0.	3.34E+01	1.55E+01
BR--82	0.	0.	0.	0.	0.	1.59E+00	1.39E+00
BR--83	0.	0.	0.	0.	0.	3.55E-02	2.47E-02
BR--84	0.	0.	0.	0.	0.	2.51E-07	3.20E-02
BR--85	0.	0.	0.	0.	0.	0.	1.31E-03

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Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

TABLE L-4
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - CHILD
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
RB--86	0.	2.08E+02	0.	0.	0.	4.09E+01	9.68E+01
RB--88	0.	5.96E-01	0.	0.	0.	0.	3.16E-01
RB--89	0.	3.95E-01	0.	0.	0.	0.	2.78E-01
SR--89	7.53E+03	0.	0.	0.	0.	2.81E+02	2.16E+02
SR--90	9.39E+04	0.	0.	0.	0.	1.25E+03	2.38E+04
SR--91	3.18E+01	0.	0.	0.	0.	1.60E+02	1.40E+00
SR--92	1.18E+01	0.	0.	0.	0.	2.33E+02	5.08E-01
Y---90	9.00E+00	0.	0.	0.	0.	2.57E+04	2.42E-01
Y--91M	1.95E-02	0.	0.	0.	0.	5.71E-02	7.55E-04
Y---91	1.25E+02	0.	0.	0.	0.	1.66E+04	3.34E+00
Y---92	1.81E-01	0.	0.	0.	0.	3.16E+03	5.28E-03
Y---93	5.73E-01	0.	0.	0.	0.	1.82E+04	1.58E-02
ZR--95	1.80E+01	4.19E+00	0.	2.67E+00	0.	4.33E+03	3.81E+00
ZR--97	2.91E-01	5.87E-02	0.	8.86E-02	0.	1.82E+04	2.70E-02
NB--95	4.61E+02	1.97E+02	0.	8.11E+01	0.	3.41E+05	1.45E+02
NB--97	1.24E+00	3.12E-01	0.	3.64E-01	0.	1.15E+03	1.14E-01
MO--99	0.	4.23E+01	0.	9.59E+01	0.	9.81E+01	8.05E+00
TC-99M	4.34E-03	1.23E-02	0.	1.86E-01	6.01E-03	7.26E+00	1.57E-01
TC-101	4.47E-03	6.45E-03	0.	1.16E-01	3.29E-03	0.	6.33E-02

Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

ST. LUCIE PLANT
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TABLE L-4
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - CHILD
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
RU-103	1.33E+02	0.	0.	1.39E+02	0.	3.50E+03	5.38E+01
RU-105	3.03E+00	0.	0.	3.91E+01	0.	1.85E+03	1.19E+00
RU-106	2.34E+03	0.	0.	1.05E+03	0.	3.63E+04	2.91E+02
AG110	5.18E+02	4.80E+02	0.	9.43E+02	0.	1.96E+05	2.85E+02
SB-124	9.13E+01	1.72E+00	2.21E-01	0.	7.08E+01	2.58E+03	3.61E+01
SB-125	7.24E+01	7.80E-01	6.43E-02	0.	7.57E+03	6.40E+02	1.46E+01
TE 125M	3.11E+02	8.43E+01	8.73E+01	2.97E+02	0.	3.00E+02	4.15E+01
TE 127M	1.85E+02	6.47E+01	4.72E+01	7.50E+02	0.	6.19E+02	2.25E+01
TE-127	1.23E+01	3.27E+00	8.46E+00	1.22E+01	0.	5.24E+02	2.63E+00
TE129M	1.35E+03	3.77E+02	4.31E+02	1.31E+03	0.	1.63E+03	2.09E+02
TE-129	8.59E-01	3.25E-01	6.58E-01	3.60E+00	0.	6.47E-01	2.09E-01
TE131M	4.75E+01	2.31E+01	3.66E+01	2.34E+02	0.	2.29E+03	1.93E+01
TE-131	5.38E-01	2.25E-01	4.42E-01	2.36E+00	0.	8.05E-02	1.70E-01
TE-132	2.78E+02	1.23E+02	1.81E+02	4.31E+02	0.	2.15E+03	1.48E+02
I--130	1.33E+01	3.94E+01	5.01E+03	6.12E+01	0.	3.38E+01	1.55E+01
I--131	2.87E+02	2.94E+02	9.55E+04	1.79E+02	0.	2.51E+01	2.22E+02
I--132	3.57E+00	9.55E+00	1.26E+03	1.52E+01	0.	1.79E+00	3.39E+00
I--133	1.05E+02	1.30E+02	3.13E+04	7.61E+01	0.	5.26E+01	5.10E+01
I--134	1.86E+00	5.06E+00	6.58E+02	8.07E+00	0.	4.41E-03	1.81E+00

Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

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TABLE L-4
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - CHILD
ORGAN DOSE FACTOR (MREM/HR PER μCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
I--135	7.79E+00	2.06E+01	2.69E+03	3.27E+01	0.	2.30E+01	7.54E+00
CS-134	8.14E+03	1.37E+04	0.	1.75E+03	1.52E+03	7.42E+01	2.92E+03
CS-136	2.37E+02	9.34E+02	0.	5.20E+02	7.13E+01	1.06E+02	6.73E+02
CS-137	1.13E+04	1.10E+04	0.	1.35E+03	1.29E+03	6.69E+01	1.64E+03
CS-138	2.01E+00	3.96E+00	0.	2.92E+00	2.88E-01	1.69E-05	1.97E+00
BA-139	2.65E+00	1.89E-03	0.	1.77E-03	1.07E-03	4.69E+00	7.75E-02
BA-140	2.25E+03	1.98E+00	0.	2.37E-01	1.18E+00	1.15E+02	1.32E+02
BA-141	0.	9.71E-04	0.	9.03E-04	5.51E-04	6.06E-10	4.34E-02
BA-142	5.81E-01	5.98E-04	0.	5.05E-04	3.38E-04	0.	3.66E-02
LA-140	2.16E+00	7.52E-01	0.	0.	0.	2.14E+04	2.54E-01
LA-142	2.74E-02	1.24E-02	0.	0.	0.	9.09E+01	3.10E-03
CE-141	4.67E+00	2.34E+00	0.	3.66E-01	0.	2.93E+03	3.48E-01
CE-143	2.05E-01	1.52E+02	0.	6.69E-02	0.	5.67E+03	1.68E-02
CE-144	2.66E+02	8.33E+01	0.	1.50E+01	0.	2.16E+04	1.42E+01
PR-144	6.46E-03	2.67E-03	0.	1.51E-03	0.	9.26E-10	3.27E-04
W--187	3.03E+00	2.54E+00	0.	0.	0.	8.31E+02	8.90E-01
NP-239	1.18E-02	1.16E-03	0.	3.58E-03	0.	2.36E+02	6.34E-04

Based on 1 μCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

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TABLE G-1
EFFLUENT CONCENTRATION LIMITS IN AIR IN UNRESTRICTED AREAS

NOTE
If a nuclide is not listed below, refer to 10 CFR Part 20, Appendix B, Table 2 Effluent Concentrations Column 1 and use the most conservative ECL listed for the nuclide.

Nuclide	ECL µCi/ml	Nuclide	ECL µCi/ml	Nuclide	ECL µCi/ml
Ar-41	1 E-8	Co-57	9 E-10	Sb-124	3 E-10
Kr-83m	5 E-5	Co-58	1 E-9	Sb-125	7 E-10
Kr-85m	1 E-7	Fe-59	5 E-10	Te-125m	1 E-9
Kr-85	7 E-7	Co-60	5 E-11	Te-127m	4 E-10
Kr-87	2 E-8	Zn-65	4 E-10	Te-129m	3 E-10
Kr-88	9 E-9	Rb-86	1 E-9	I-130	3 E-9
Kr-89	None	Rb-88	9 E-8	I-131	2 E-10
Kr-90	None	Sr-89	2 E-10	I-132	2 E-8
Xe-131m	2 E-6	Sr-90	6 E-12	I-133	1 E-9
Xe-133m	6 E-7	Y-91	2 E-10	I-134	6 E-8
Xe-133	5 E-7	Zr-95	4 E-10	I-135	6 E-9
Xe-135m	4 E-8	Nb-95	2 E-9	Cs-134	2 E-10
Xe-135	7 E-8	Ru-103	9 E-10	Cs-136	9 E-10
Xe-137	None	Ru-106	2 E-11	Cs-137	2 E-10
Xe-138	2 E-8	Ag-110	1 E-10	Ba-140	2 E-9
H-3	1 E-7	Sn-113	8 E-10	La-140	2 E-9
P-32	1 E-9	In-113m	2 E-7	Ce-141	8 E-10
Cr-51	3 E-8	Sn-123	2 E-10	Ce-144	2 E-11
Mn-54	1 E-9	Sn-126	8 E-11		

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TABLE G-2
DOSE FACTORS FOR NOBLE GASES*

RADIONUCLIDE	TOTAL BODY DOSE FACTOR K_i (mrem/yr per μCi/m^3)	SKIN DOSE FACTOR L_i (mrem/yr per μCi/m^3)	GAMMA AIR DOSE FACTOR M_i (mrad/yr per μCi/m^3)	BETA AIR DOSE FACTOR N_i (mrad/yr per μCi/m^3)
Kr-83m	7.56E-02**	--------	1.93E+01	2.88E+02
Kr-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

* The listed dose factors are for radionuclides that may be detected in gaseous effluents.

** 7.56E-02 = 7.56 X 10^{-2}

TABLE G-3
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS P (I) FOR GASEOUS DISCHARGES
PATHWAY - GROUND PLANE DEPOSITION AGE GROUP - INFANT
ORGAN DOSE FACTOR (SQ. METER - MREM/YR PER μCi/Sec)

NUCLIDE	WHOLE BODY
H-3	0.
CR-51	6.68E+06
MN-54	1.10E+09
FE-59	3.92E+08
CO-57	1.64E+08
CO-58	5.27E+08
CO-60	4.40E+09
ZN-65	6.87E+08
RB-86	1.29E+07
SR-89	3.07E+04
SR-90	5.94E+05
Y-91	1.53E+06
ZR-95	6.94E+08
NB-95	1.95E+08
RU-103	1.57E+08
RU-106	2.99E+08
AG-110	3.18E+09

Based on 1 μCi/sec release rate of each isotope in and a Value of 1. for X/Q, depleted X/Q and Relative Deposition

TABLE G-3
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS P (I) FOR GASEOUS DISCHARGES
PATHWAY - GROUND PLANE DEPOSITION AGE GROUP - INFANT
ORGAN DOSE FACTOR (SQ. METER - MREM/YR PER μCi/Sec)

NUCLIDE	WHOLE BODY
SN-126	4.80E+09
SB-124	8.42E+08
SB-125	7.56E+08
TE-125M	2.19E+06
TE-127M	1.15E+06
TE-129M	5.49E+07
I-130	7.90E+06
I-131	2.46E+07
I-132	1.78E+06
I-133	3.54E+06
I-134	6.43E+05
I-135	3.66E+06
CS-134	2.82E+09
CS-136	2.13E+08
CS-137	1.15E+09
BA-140	2.39E+08
CE-141	1.95E+07
CE-144	9.52E+07

Based on 1 μCi/sec release rate of each isotope in and a Value of 1. for X/Q, depleted X/Q and Relative Deposition

TABLE G-4
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R (I) FOR GASEOUS DISCHARGES
PATHWAY - GROUND PLANE DEPOSITION AGE GROUP - CHILD - TEEN-ADULT & INFANT
ORGAN DOSE FACTOR (SQ. METER - MREM/YR PER μCi/Sec)

NUCLIDE	WHOLE BODY
H-3	0.
CR-51	4.68E+06
MN-54	1.38E+09
FE-59	2.75E+08
CO-57	1.89E+08
CO-58	3.80E+08
CO-60	2.15E+10
ZN-65	7.43E+08
RB-86	9.01E+06
SR-89	2.17E+04
SR-90	5.35E+06
Y-91	1.08E+06
ZR-95	5.01E+08
NB-95	1.36E+08
RU-103	1.10E+08
RU-106	4.19E+08
AG-110	3.58E+09

Based on 1 μCi/sec release rate of each isotope in and a Value of 1. for X/Q, depleted X/Q and Relative Deposition

TABLE G-4
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R (I) FOR GASEOUS DISCHARGES
PATHWAY - GROUND PLANE DEPOSITION AGE GROUP - CHILD - TEEN-ADULT & INFANT
ORGAN DOSE FACTOR (SQ. METER - MREM/YR PER μCi/Sec)

NUCLIDE	WHOLE BODY
SN-126	5.16E+10
SB-124	5.98E+08
SB-125	2.30E+09
TE-125M	1.55E+06
TE-127M	8.79E+05
TE-129M	3.85E+07
I-130	5.53E+06
I-131	1.72E+07
I-132	1.25E+06
I-133	2.48E+06
I-134	4.50E+05
I-135	2.56E+06
CS-134	6.99E+09
CS-136	1.49E+08
CS-137	1.03E+10
BA-140	1.68E+08
CE-141	1.37E+07
CE-144	1.13E+08

Based on 1 μCi/sec release rate of each isotope in and a Value of 1. for X/Q, depleted X/Q and Relative Deposition

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TABLE G-5
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I)/P(I) FOR GASEOUS DISCHARGES
PATHWAY - INHALATION AGE GROUP - INFANT
ORGAN DOSE FACTOR (MREM/YR PER μCi/Cu Meter)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H-3	0.	4.30E+02	4.30E+02	1.88E+02	4.30E+02	4.30E+02	4.30E+02
P-32	2.31E+05	1.35E+04	0.	0.	0.	1.51E+04	8.78E+03
CR-51	0.	0.	1.40E+01	3.99E+00	2.52E+03	5.81E+02	1.75E+01
MN-54	0.	6.93E+03	0.	1.72E+03	2.45E+05	1.35E+04	1.10E+03
FE-59	2.06E+03	4.86E+06	0.	0.	1.78E+05	3.29E+04	1.85E+03
CO-57	0.	1.21E+02	0.	0.	6.47E+04	5.50E+03	1.18E+02
CO-58	0.	1.18E+02	0.	0.	8.79E+05	1.21E+04	1.68E+02
CO-60	0.	8.40E+02	0.	0.	5.57E+06	3.28E+04	1.17E+03
ZN-65	5.67E+03	1.81E+04	0.	1.21E+04	1.53E+05	9.35E+03	8.15E+03
RB-86	0.	2.37E+04	0.	0.	0.	2.91E+03	1.03E+04
SR-89	4.31E+04	0.	0.	0.	2.31E+06	6.80E+04	1.24E+03
SR-90	1.32E+07	0.	0.	0.	1.53E+07	1.39E+05	8.06E+05
Y-91	5.98E+04	0.	0.	0.	2.63E+06	7.17E+04	1.60E+03
ZR-95	1.08E+04	2.73E+03	0.	9.48E+03	1.81E+06	1.41E+04	1.95E+03
NB-95	1.28E+03	5.75E+02	0.	1.35E+03	4.77E+05	1.21E+04	3.37E+02
RU-103	1.69E+02	0.	0.	1.02E+03	5.66E+05	1.58E+04	5.85E+01
RU-106	9.31E+03	0.	0.	2.34E+04	1.50E+07	1.76E+05	1.14E+03
AG-110	1.89E+03	1.75E+03	0.	3.44E+03	8.12E+05	5.29E+04	1.04E+03

Based on 1 μCi/sec release rate of each isotope in and a Value of 1. for X/Q, depleted X/Q and Relative Deposition

TABLE G-5
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I)/P(I) FOR GASEOUS DISCHARGES
PATHWAY - INHALATION AGE GROUP - INFANT
ORGAN DOSE FACTOR (MREM/YR PER μCi/Cu Meter)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	3.11E+04	6.45E+02	6.45E+02	0.	3.61E+06	5.99E+04	1.02E+03
SN-126	2.21E+05	5.85E+03	1.72E+03	0.	1.64E+06	2.23E+04	8.40E+03
SB-124	5.46E+03	1.03E+02	1.32E+01	0.	4.34E+05	7.11E+04	2.17E+03
SB-125	1.16E+04	1.25E+02	1.03E+01	0.	3.85E+05	1.76E+04	2.32E+03
TE-125M	4.54E+02	1.95E+02	1.53E+02	2.17E+03	4.96E+05	1.36E+04	6.16E+01
TE-127M	2.21E+03	9.83E+02	5.75E+02	8.01E+03	1.68E+05	2.62E+04	2.74E+02
TE-129M	1.32E+03	5.80E+02	5.08E+02	6.40E+03	1.83E+06	7.32E+04	2.06E+02
I-130	8.02E+02	2.35E+03	3.05E+05	3.65E+03	0.	1.35E+03	9.25E+02
I-131	3.63E+04	4.27E+04	1.41E+07	1.07E+04	0.	1.07E+03	2.51E+04
I-132	2.03E+02	5.70E+02	7.67E+04	9.09E+02	0.	7.11E+01	2.03E+02
I-133	1.34E+04	1.93E+04	4.66E+06	4.55E+03	0.	2.28E+03	5.87E+03
I-134	1.13E+02	3.02E+02	4.02E+04	4.82E+02	0.	1.76E-01	1.08E+02
I-135	4.70E+02	1.22E+03	1.64E+05	1.95E+03	0.	9.18E+02	4.51E+02
CS-134	4.80E+05	8.25E+05	0.	5.04E+04	1.01E+05	1.37E+03	7.32E+04
CS-136	6.85E+03	2.56E+04	0.	1.50E+04	2.10E+03	2.04E+03	1.95E+04
CS-137	6.86E+05	7.31E+05	0.	3.89E+04	9.45E+04	1.32E+03	4.41E+04
BA-140	5.70E+03	4.27E+00	0.	2.93E+00	1.64E+06	3.88E+03	2.95E+02
CE-141	2.52E+03	1.55E+03	0.	1.10E+03	5.24E+05	2.06E+04	1.81E+02
CE-144	4.68E+05	1.82E+05	0.	1.48E+05	1.27E+07	1.61E+05	2.49E+04

Based on 1 μCi/sec release rate of each isotope in and a Value of 1. for X/Q, depleted X/Q and Relative Deposition

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TABLE G-6
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I)/P(I) FOR GASEOUS DISCHARGES
PATHWAY - COWS MILK (CONTAMINATED FORAGE) AGE GROUP - INFANT
ORGAN DOSE FACTOR (SQ. METER - MREM/YR PER μCi/Sec)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H-3	0.	2.37E+03	2.37E+03	1.04E+03	2.37E+03	2.37E+03	2.37E+03
P-32	1.82E+10	1.14E+09	0.	0.	0.	2.05E+09	7.05E+08
CR-51	0.	0.	1.82E+04	6.72E+03	4.04E+04	7.66E+06	3.05E+04
MN-54	0.	8.96E+06	0.	2.67E+06	0.	2.74E+07	1.71E+06
FE-59	3.17E+07	7.52E+07	0.	0.	2.09E+07	2.48E+08	2.86E+07
CO-57	0.	1.36E+06	0.	0.	0.	3.46E+07	2.27E+06
CO-58	0.	2.55E+07	0.	0.	0.	6.60E+07	6.24E+07
CO-60	0.	8.73E+07	0.	0.	0.	2.16E+08	2.09E+08
ZN-65	1.46E+09	4.65E+09	0.	3.11E+09	0.	2.93E+09	2.10E+09
RB-86	0.	2.77E+09	0.	0.	0.	5.45E+08	1.29E+09
SR-89	1.47E+10	0.	0.	0.	0.	2.75E+08	4.22E+08
SR-90	1.65E+11	0.	0.	0.	0.	1.61E+09	4.21E+10
Y-91	8.12E+04	0.	0.	0.	0.	5.37E+06	2.16E+03
ZR-95	2.12E+05	9.41E+04	0.	1.86E+04	0.	7.47E+07	5.56E+04
NB-95	5.49E+05	2.47E+05	0.	4.84E+04	0.	1.98E+08	1.45E+05
RU-103	8.30E+03	0.	0.	4.16E+03	0.	1.04E+05	2.86E+03
RU-106	2.01E+05	0.	0.	4.20E+04	0.	1.56E+06	2.46E+04
AG-110	6.21E+07	5.75E+07	0.	1.13E+08	0.	2.35E+10	3.42E+07

Based on 1 μCi/sec release rate of each isotope in and a Value of 1. for X/Q, depleted X/Q and Relative Deposition
Note: The units for C-14 and H-3 are (MREM/YR Per μCi/Cu. Meter)

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TABLE G-6
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I)/P(I) FOR GASEOUS DISCHARGES
PATHWAY - COWS MILK (CONTAMINATED FORAGE) AGE GROUP - INFANT
ORGAN DOSE FACTOR (SQ. METER - MREM/YR PER μCi/Sec)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-126	1.75E+09	3.48E+07	1.01E+07	0.	4.97E+06	1.16E+09	5.25E+07
SB-124	2.75E+07	5.19E+05	6.64E+04	0.	2.13E+07	7.78E+08	1.09E+07
SB-125	3.59E+07	3.27E+06	2.93E+06	3.96E+06	2.83E+09	2.43E+08	6.62E+06
TE-125M	1.57E+08	5.30E+07	5.18E+07	7.05E+07	0.	7.57E+07	2.10E+07
TE-127M	5.54E+07	1.93E+07	1.79E+07	2.00E+08	0.	3.24E+08	7.38E+06
TE-129M	5.87E+08	2.02E+08	2.21E+08	2.70E+08	0.	3.54E+08	8.95E+07
I-130	4.54E+05	1.35E+06	1.71E+08	2.09E+06	0.	1.15E+06	5.29E+05
I-131	2.59E+09	3.09E+09	9.94E+11	7.24E+08	0.	1.16E+08	1.81E+09
I-132	1.78E-01	4.76E-01	6.26E+01	7.58E-01	0.	8.93E-02	1.69E-01
I-133	3.75E+07	5.48E+07	1.30E+10	1.29E+07	0.	9.74E+06	1.66E+07
I-134	0.	0.	1.06E-09	0.	0.	0.	0.
I-135	1.49E+04	3.94E+04	5.15E+06	6.26E+04	8.07E-02	4.41E+04	1.44E+04
CS-134	4.43E+10	7.97E+10	0.	4.65E+09	9.12E+09	1.90E+08	6.75E+09
CS-136	2.78E+08	1.10E+09	0.	6.11E+08	8.37E+07	1.25E+08	7.90E+08
CS-137	6.44E+10	7.21E+10	0.	3.66E+09	8.69E+09	1.86E+08	4.14E+09
BA-140	2.45E+08	2.47E+05	0.	1.22E+04	1.51E+05	8.13E+06	1.27E+07
CE-141	2.65E+05	1.62E+05	0.	9.72E+03	0.	7.87E+07	1.90E+04
CE-144	2.10E+07	8.29E+06	0.	5.67E+05	0.	8.66E+08	1.13E+06

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition.
Note: The units for C-14 and H-3 are (MREM/YR Per μCi/Cu. Meter)

TABLE G-7
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I)/P(I) FOR GASEOUS DISCHARGES
PATHWAY - GOATS MILK (CONTAMINATED FORAGE) AGE GROUP - INFANT
ORGAN DOSE FACTOR (SQ. METER - MREM/YR PER μCi/Sec)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H-3	0.	4.84E+03	4.84E+03	2.11E+03	4.84E+03	4.84E+03	4.84E+03
P-32	2.19E+10	1.37E+09	0.	0.	0.	2.46E+09	8.46E+08
CR-51	0.	0.	2.19E+03	8.07E+02	4.85E+03	9.19E+05	3.66E+03
MN-54	0.	1.08E+06	0.	3.20E+05	0.	3.29E+06	2.05E+05
FE-59	4.12E+05	9.78E+05	0.	0.	2.72E+05	3.23E+06	3.72E+05
CO-57	0.	1.64E+05	0.	0.	0.	4.15E+06	2.72E+05
CO-58	0.	3.06E+06	0.	0.	0.	7.92E+06	7.49E+06
CO-60	0.	1.05E+07	0.	0.	0.	2.59E+07	2.51E+07
ZN-65	1.76E+08	5.57E+08	0.	3.73E+08	0.	3.51E+08	2.52E+08
RB-86	0.	3.32E+08	0.	0.	0.	6.54E+07	1.55E+08
SR-89	3.09E+10	0.	0.	0.	0.	5.77E+08	8.87E+08
SR-90	3.46E+11	0.	0.	0.	0.	3.35E+09	8.83E+10
Y-91	9.74E+03	0.	0.	0.	0.	6.45E+05	2.60E+02
ZR-95	2.54E+04	1.13E+04	0.	2.23E+03	0.	8.95E+06	6.67E+03
NB-95	6.59E+04	2.97E+04	0.	5.81E+03	0.	2.37E+07	1.75E+04
RU-103	9.96E+02	0.	0.	4.99E+02	0.	1.24E+04	3.43E+02
RU-106	2.41E+04	0.	0.	5.04E+03	0.	1.87E+05	2.96E+03
AG-110	7.45E+06	6.90E+06	0.	1.36E+07	0.	2.81E+09	4.10E+06

Based on 1 μCi/sec release rate of each isotope in and a Value of 1. for X/Q, depleted X/Q and Relative Deposition

Note: The units for C-14 and H-3 are 1MREM/Yr per μCi/Cu meter.

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TABLE G-7
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I)/P(I) FOR GASEOUS DISCHARGES
PATHWAY - GOATS MILK (CONTAMINATED FORAGE) AGE GROUP - INFANT
ORGAN DOSE FACTOR (SQ. METER - MREM/YR PER μCi/Sec)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-126	2.10E+08	4.17E+06	1.22E+06	0.	5.97E+05	1.40E+08	6.30E+06
SB-124	3.30E+06	6.22E+04	7.97E+03	0.	2.56E+06	9.33E+07	1.30E+06
SB-125	4.31E+06	3.92E+05	3.52E+05	4.76E+05	3.40E+08	2.92E+07	7.94E+05
TE-125M	1.89E+07	6.36E+06	6.21E+06	8.46E+06	0.	9.09E+06	2.52E+06
TE-127M	6.64E+06	2.31E+06	2.15E+06	2.40E+07	0.	3.88E+07	8.85E+05
TE-129M	7.05E+07	2.42E+07	2.66E+07	3.23E+07	0.	4.25E+07	1.07E+07
I-130	5.45E+05	1.61E+06	2.05E+08	2.51E+06	0.	1.38E+06	6.35E+05
I-131	3.11E+09	3.70E+09	1.19E+12	9.28E+08	0.	1.39E+08	2.17E+09
I-132	2.13E-01	5.71E-01	7.51E+01	9.10E-01	0.	1.07E-01	2.03E-01
I-133	4.50E+07	6.57E+07	1.55E+10	1.55E+07	0.	1.17E+07	1.99E+07
I-134	0.	0.	1.27E-09	0.	0.	0.	0.
I-135	1.79E+04	4.72E+04	6.18E+06	7.51E+04	2.42E-01	5.29E+04	1.73E+04
CS-134	1.33E+11	2.39E+11	0.	1.39E+10	2.74E+10	5.69E+08	2.02E+10
CS-136	8.34E+08	3.29E+09	0.	1.83E+09	2.51E+08	3.74E+08	2.37E+09
CS-137	1.93E+11	2.16E+11	0.	1.10E+10	2.61E+10	5.59E+08	1.24E+10
BA-140	2.95E+07	2.96E+04	0.	1.47E+03	1.81E+04	9.76E+05	1.52E+06
CE-141	3.17E+04	1.95E+04	0.	1.17E+03	0.	9.44+06	2.28E+03
CE-144	2.52E+06	9.95E+05	0.	6.80E+04	0.	1.04E+08	1.36E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition.

Note: The units for C-14 and H-3 are 1MREM/Yr per μCi/Cu meter.

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TABLE G-8
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - INHALATION AGE GROUP - CHILD
ORGAN DOSE FACTOR (MREM/YR PER μCi/CU. METER)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	7.51E+02	7.51E+02	4.96E+02	7.51E+02	7.51E+02	7.51E+02
P---32	6.11E+05	3.57E+04	0.	0.	0.	4.00E+04	2.32E+04
CR--51	0.	0.	2.75E+01	1.06E+01	6.66E+03	1.54E+03	4.63E+01
MN--54	0.	1.83E+04	0.	4.55E+03	6.48E+05	3.58E+04	2.91E+03
FE--59	5.44E+03	1.28E+07	0.	0.	4.70E+05	8.70E+04	4.88E+03
CO--57	0.	3.20E+02	0.	0.	1.71E+05	1.45E+04	3.10E+02
CO--58	0.	1.52E+02	0.	0.	1.13E+06	3.62E+04	2.68E+02
CO--60	0.	1.07E+03	0.	0.	6.92E+06	9.36E+04	1.88E+03
ZN--65	1.50E+04	4.77E+04	0.	3.19E+04	4.03E+05	2.47E+04	2.15E+04
RB--86	0.	6.25E+04	0.	0.	0.	7.70E+03	2.73E+04
SR--89	5.37E+04	0.	0.	0.	2.24E+06	1.69E+05	1.54E+03
SR--90	1.64E+07	0.	0.	0.	1.48E+07	3.45E+05	9.99E+05
Y---91	7.44E+04	0.	0.	0.	2.55E+06	1.78E+05	1.98E+03
ZR--95	1.41E+04	3.28E+03	0.	2.51E+04	2.12E+06	5.74E+04	2.98E+03
NB--95	1.70E+03	7.25E+02	0.	3.58E+03	5.85E+05	3.32E+04	5.33E+02
RU-103	2.16E+02	0.	0.	2.70E+03	6.33E+05	4.22E+04	8.73E+01
RU-106	1.15E+04	0.	0.	6.18E+04	1.45E+07	4.37E+05	1.44E+03
AG110	5.00E+03	4.63E+03	0.	9.10E+03	2.15E+06	1.40E+05	2.75E+03

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

TABLE G-8
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - INHALATION AGE GROUP - CHILD
ORGAN DOSE FACTOR (MREM/YR PER μCi/CU. METER)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	3.85E+04	6.44E+02	6.81E+02	0.	3.50E+06	1.49E+05	1.27E+03
SN-126	5.85E+05	1.55E+04	4.55E+03	0.	4.33E+06	5.88E+04	2.22E+04
SB-124	1.44E+04	2.72E+02	3.49E+01	0.	1.15E+06	1.88E+05	5.74E+03
SB-125	3.06E+04	3.30E+02	2.72E+01	0.	1.02E+06	4.66E+04	6.14E+03
TE 125M	5.62E+02	1.94E+02	1.61E+02	5.74E+03	4.81E+05	3.38E+04	7.62E+01
TE 127M	5.85E+03	2.60E+03	1.52E+03	2.12E+04	4.44E+05	6.92E+04	7.25E+02
TE 129M	1.64E+03	5.85E+02	5.40E+02	1.69E+04	1.80E+06	1.82E+05	2.60E+02
I--130	2.12E+03	6.22E+03	8.07E+05	9.66E+03	0.	3.56E+03	2.45E+03
I--131	4.55E+04	4.63E+04	1.54E+07	2.84E+04	0.	2.65E+03	3.50E+04
I--132	5.37E+02	1.51E+03	2.03E+05	2.40E+03	0.	1.88E+02	5.37E+02
I--133	1.68E+04	2.05E+04	5.03E+06	1.20E+04	0.	5.55E+03	8.03E+03
I--134	2.98E+02	7.99E+02	1.06E+05	1.27E+03	0.	4.66E-01	2.85E+02
I--135	1.24E+03	3.23E+03	4.33E+05	5.14E+03	0.	2.43E+03	1.19E+03
CS-134	6.22E+05	9.95E+05	0.	1.33E+05	1.19E+05	3.77E+03	2.23E+05
CS-136	1.81E+04	6.77E+04	0.	3.96E+04	5.55E+03	5.40E+03	5.14E+04
CS-137	8.66E+05	7.99E+05	0.	1.03E+05	1.00E+05	3.41E+03	1.25E+05
BA-140	7.14E+03	4.66E+00	0.	7.73E+00	1.74E+06	9.92E+03	4.22E+02
CE-141	3.13E+03	1.57E+03	0.	2.90E+03	5.14E+05	5.44E+04	2.33E+02
CE-144	5.81E+05	1.82E+05	0.	3.92E+05	1.23E+07	4.00E+05	3.10E+04

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

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TABLE G-9
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - COWS MILK (CONTAMINATED FORAGE) AGE GROUP - CHILD
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	1.57E+03	1.57E+03	1.04E+03	1.57E+03	1.57E+03	1.57E+03
P---32	1.82E+10	1.14E+09	0.	0.	0.	2.05E+09	7.05E+08
CR--51	0.	0.	1.82E+04	6.72E+03	4.04E+04	7.66E+06	3.05E+04
MN--54	0.	8.96E+06	0.	2.67E+06	0.	2.74E+07	1.71E+06
FE--59	3.17E+07	7.52E+07	0.	0.	2.09E+07	2.48E+08	2.86E+07
CO--57	0.	1.36E+06	0.	0.	0.	3.46E+07	2.27E+06
CO--58	0.	1.25E+07	0.	0.	0.	7.41E+07	3.76E+07
CO--60	0.	4.22E+07	0.	0.	0.	2.33E+08	1.27E+08
ZN--65	1.46E+09	4.65E+09	0.	3.11E+09	0.	2.93E+09	2.10E+09
RB--86	0.	2.77E+09	0.	0.	0.	5.45E+08	1.29E+09
SR--89	6.92E+09	0.	0.	0.	0.	2.58E+08	1.98E+08
SR--90	1.13E+11	0.	0.	0.	0.	1.52E+09	2.87E+10
Y---91	3.80E+04	0.	0.	0.	0.	5.05E+06	1.01E+03
ZR--95	1.06E+05	4.47E+04	0.	1.86E+04	0.	7.68E+07	3.29E+04
NB--95	2.75E+05	1.18E+05	0.	4.84E+04	0.	2.03E+08	8.63E+04
RU-103	3.99E+03	0.	0.	4.16E+03	0.	1.05E+05	1.61E+03
RU-106	9.39E+04	0.	0.	4.20E+04	0.	1.46E+06	1.17E+04
AG110	6.21E+07	5.75E+07	0.	1.13E+08	0.	2.35E+10	3.42E+07

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

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TABLE G-9
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - COWS MILK (CONTAMINATED FORAGE) AGE GROUP - CHILD
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	0.	0.	0.	0.	0.	0.	0.
SN-126	1.75E+09	3.48E+07	1.01E+07	0.	4.97E+06	1.16E+09	5.25E+07
SB-124	2.75E+07	5.19E+05	6.64E+04	0.	2.13E+07	7.78E+08	1.09E+07
SB-125	3.13E+07	1.41E+06	1.18E+06	3.96E+06	2.83E+09	2.43E+08	5.99E+06
TE 125M	7.38E+07	2.00E+07	2.07E+07	7.05E+07	0.	7.12E+07	9.84E+06
TE 127M	5.18E+07	1.78E+07	1.46E+07	2.00E+08	0.	2.99E+08	6.60E+06
TE 129M	2.77E+08	7.73E+07	8.85E+07	2.70E+08	0.	3.33E+08	4.28E+07
I--130	4.54E+05	1.35E+06	1.71E+08	2.09E+06	0.	1.15E+06	5.29E+05
I--131	1.24E+09	1.27E+09	4.12E+11	7.74E+08	0.	1.09E+08	9.56E+08
I--132	1.78E-01	4.76E-01	6.26E+01	7.58E-01	0.	8.93E-02	1.69E-01
I--133	1.78E+07	2.20E+07	5.30E+09	1.29E+07	0.	8.90E+06	8.63E+06
I--134	0.	0.	1.06E-09	0.	0.	0.	0.
I--135	1.49E+04	3.94E+04	5.15E+06	6.26E+04	8.07E-02	4.41E+04	1.44E+04
CS-134	2.17E+10	3.65E+10	0.	4.65E+09	4.06E+09	1.97E+08	7.76E+09
CS-136	2.78E+08	1.10E+09	0.	6.11E+08	8.37E+07	1.25E+08	7.90E+08
CS-137	3.08E+10	2.98E+10	0.	3.66E+09	3.49E+09	1.81E+08	4.44E+09
BA-140	1.17E+08	1.02E+05	0.	1.22E+04	6.09E+04	7.75E+06	6.84E+06
CE-141	1.24E+05	6.22E+04	0.	9.72E+03	0.	7.80E+07	9.26E+03
CE-144	1.00E+07	3.14E+06	0.	5.67E+05	0.	8.15E+08	5.34E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

TABLE G-10
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - GOATS MILK (CONTAMINATED FORAGE) AGE GROUP - CHILD
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	3.20E+03	3.20E+03	2.11E+03	3.20E+03	3.20E+03	3.20E+03
P---32	2.19E+10	1.37E+09	0.	0.	0.	2.46E+09	8.46E+08
CR--51	0.	0.	2.19E+03	8.07E+02	4.85E+03	9.19E+05	3.66E+03
MN--54	0.	1.08E+06	0.	3.20E+05	0.	3.29E+06	2.05E+05
FE--59	4.12E+05	9.78E+05	0.	0.	2.72E+05	3.23E+06	3.72E+05
CO--57	0.	1.64E+05	0.	0.	0.	4.15E+06	2.72E+05
CO--58	0.	1.50E+06	0.	0.	0.	8.90E+06	4.51E+06
CO--60	0.	5.06E+06	0.	0.	0.	2.80E+07	1.52E+07
ZN--65	1.76E+08	5.57E+08	0.	3.73E+08	0.	3.51E+08	2.52E+08
RB--86	0.	3.32E+08	0.	0.	0.	6.54E+07	1.55E+08
SR--89	1.45E+10	0.	0.	0.	0.	5.43E+08	4.16E+08
SR--90	2.37E+11	0.	0.	0.	0.	3.16E+09	6.02E+10
Y---91	4.56E+03	0.	0.	0.	0.	6.06E+05	1.22E+02
ZR--95	1.27E+04	5.37E+03	0.	2.23E+03	0.	9.22E+06	3.96E+03
NB--95	3.30E+04	1.41E+04	0.	5.81E+03	0.	2.44E+07	1.04E+04
RU-103	4.79E+02	0.	0.	4.99E+02	0.	1.26E+04	1.94E+02
RU-106	1.13E+04	0.	0.	5.04E+03	0.	1.75E+05	1.40E+03
AG110	7.45E+06	6.90E+06	0.	1.36E+07	0.	2.81E+09	4.10E+06

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

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TABLE G-10
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - GOATS MILK (CONTAMINATED FORAGE) AGE GROUP - CHILD
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	0.	0.	0.	0.	0.	0.	0.
SN-126	2.10E+08	4.17E+06	1.22E+06	0.	5.97E+05	1.40E+08	6.30E+06
SB-124	3.30E+06	6.22E+04	7.97E+03	0.	2.56E+06	9.33E+07	1.30E+06
SB-125	3.75E+06	1.70E+05	1.43E+05	4.76E+05	3.40E+08	2.92E+07	7.19E+05
TE 125M	8.85E+06	2.40E+06	2.49E+06	8.46E+06	0.	8.54E+06	1.18E+06
TE 127M	6.21E+06	2.14E+06	1.75E+06	2.40E+07	0.	3.58E+07	7.92E+05
TE 129M	3.32E+07	9.27E+06	1.06E+07	3.23E+07	0.	4.00E+07	5.15E+06
I--130	5.45E+05	1.61E+06	2.05E+08	2.51E+06	0.	1.38E+06	6.35E+05
I--131	1.48E+09	1.52E+09	4.94E+11	9.28E+08	0.	1.30E+08	1.15E+09
I--132	2.13E-01	5.71E-01	7.51E+01	9.10E-01	0.	1.07E-01	2.03E-01
I--133	2.14E+07	2.64E+07	6.36E+09	1.55E+07	0.	1.07E+07	1.04E+07
I--134	0.	0.	1.27E-09	0.	0.	0.	0.
I--135	1.79E+04	4.72E+04	6.18E+06	7.51E+04	2.42E-01	5.29E+04	1.73E+04
CS-134	6.50E+10	1.10E+11	0.	1.39E+10	1.22E+10	5.92E+08	2.33E+10
CS-136	8.34E+08	3.29E+09	0.	1.83E+09	2.51E+08	3.74E+08	2.37E+09
CS-137	9.23E+10	8.93E+10	0.	1.10E+10	1.05E+10	5.44E+08	1.33E+10
BA-140	1.40E+07	1.23E+04	0.	1.47E+03	7.31E+03	9.30E+05	8.21E+05
CE-141	1.49E+04	7.46E+03	0.	1.17E+03	0.	9.36E+06	1.11E+03
CE-144	1.20E+06	3.76E+05	0.	6.80E+04	0.	9.78E+07	6.41E+04

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

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TABLE G-11
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - MEAT (CONTAMINATED FORAGE) AGE GROUP - CHILD
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	2.33E+02	2.33E+02	1.54E+02	2.33E+02	2.33E+02	2.33E+02
P---32	1.74E+09	1.09E+08	0.	0.	0.	1.96E+08	6.73E+07
CR--51	0.	0.	1.58E+03	5.82E+02	3.50E+03	6.63E+05	2.64E+03
MN--54	0.	3.42E+06	0.	1.02E+06	0.	1.05E+07	6.54E+05
FE--59	9.95E+07	2.36E+08	0.	0.	6.55E+07	7.79E+08	8.98E+07
CO--57	0.	2.10E+06	0.	0.	0.	5.33E+07	3.50E+06
CO--58	0.	1.69E+07	0.	0.	0.	1.00E+08	5.10E+07
CO--60	0.	6.77E+07	0.	0.	0.	3.75E+08	2.03E+08
ZN--65	1.33E+08	4.22E+08	0.	2.82E+08	0.	2.66E+08	1.91E+08
RB--86	0.	1.82E+08	0.	0.	0.	3.59E+07	8.50E+07
SR--89	5.04E+08	0.	0.	0.	0.	1.88E+07	1.44E+07
SR--90	1.05E+10	0.	0.	0.	0.	7.02E+08	2.67E+09
Y---91	1.76E+06	0.	0.	0.	0.	2.33E+08	4.69E+04
ZR--95	4.62E+06	1.51E+06	0.	7.47E+05	0.	2.22E+09	1.20E+06
NB--95	2.68E+06	1.15E+06	0.	4.72E+05	0.	1.98E+09	8.41E+05
RU-103	1.45E+08	0.	0.	1.51E+08	0.	3.81E+09	5.87E+07
RU-106	4.51E+09	0.	0.	2.02E+09	0.	7.01E+10	5.61E+08
AG110	2.50E+06	2.31E+06	0.	4.55E+06	0.	9.44E+08	1.38E+06

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

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TABLE G-11
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - MEAT (CONTAMINATED FORAGE) **AGE GROUP - CHILD**
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	0.	0.	0.	0.	0.	0.	0.
SN-126	6.92E+09	1.37E+08	4.02E+07	0.	2.41E+06	2.31E+09	1.98E+08
SB-124	7.40E+06	1.40E+05	1.79E+04	0.	5.74E+06	2.10E+08	2.93E+06
SB-125	7.66E+07	1.84E+07	1.90E+07	6.47E+07	9.26E+08	1.44E+08	1.08E+07
TE 125M	5.69E+08	1.54E+08	1.60E+08	5.44E+08	0.	5.49E+08	7.59E+07
TE 127M	4.40E+08	1.51E+08	1.24E+08	1.70E+09	0.	2.54E+09	5.61E+07
TE 129M	1.84E+09	5.12E+08	5.87E+08	1.78E+09	0.	2.21E+09	2.84E+08
I--130	8.87E-07	2.63E-06	3.34E-04	4.08E-06	0.	2.25E-06	1.03E-06
I--131	1.58E+07	1.62E+07	5.25E+09	9.86E+06	0.	1.38E+06	1.22E+07
I--132	0.	0.	0.	0.	0.	0.	0.
I--133	6.86E-01	8.47E-01	2.04E+02	4.97E-01	0.	3.43E-01	3.33E-01
I--134	0.	0.	0.	0.	0.	0.	0.
I--135	3.21E-02	2.96E-02	0.	1.12E-02	3.37E-03	6.92E-04	1.32E-02
CS-134	8.83E+08	1.49E+09	0.	1.89E+08	1.65E+08	8.04E+06	3.16E+08
CS-136	4.41E+06	1.74E+07	0.	9.69E+06	1.33E+06	1.98E+06	1.25E+07
CS-137	1.27E+09	1.23E+09	0.	1.51E+08	1.44E+08	7.50E+06	1.84E+08
BA-140	4.37E+07	3.84E+04	0.	4.59E+03	2.29E+04	6.03E+06	2.57E+06
CE-141	2.10E+04	1.05E+04	0.	1.65E+03	0.	1.32E+07	1.57E+03
CE-144	2.38E+06	7.46E+05	0.	1.35E+05	0.	1.94E+08	1.27E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

ST. LUCIE PLANT
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TABLE G-12
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - FRESH FRUITS AND VEGETABLES AGE GROUP - CHILD
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	2.47E+02	2.47E+02	1.63E+02	2.47E+02	2.47E+02	2.47E+02
P---32	4.22E+08	2.64E+07	0.	0.	0.	4.74E+07	1.63E+07
CR--51	0.	0.	4.68E+03	1.73E+03	1.04E+04	1.97E+06	7.83E+03
MN--54	0.	1.98E+07	0.	5.89E+06	0.	6.07E+07	3.78E+06
FE--59	1.48E+07	3.51E+07	0.	0.	9.75E+06	1.16E+08	1.34E+07
CO--57	0.	7.53E+05	0.	0.	0.	1.91E+07	1.25E+06
CO--58	0.	6.94E+06	0.	0.	0.	4.13E+07	2.09E+07
CO--60	0.	2.33E+07	0.	0.	0.	1.29E+08	6.98E+07
ZN--65	2.08E+07	6.59E+07	0.	4.41E+07	0.	4.15E+07	2.98E+07
RB--86	0.	5.28E+07	0.	0.	0.	1.04E+07	2.46E+07
SR--89	4.84E+09	0.	0.	0.	0.	1.81E+08	1.39E+08
SR--90	7.79E+10	0.	0.	0.	0.	1.52E+09	1.98E+10
Y---91	2.12E+06	0.	0.	0.	0.	2.82E+08	5.65E+04
ZR--95	4.06E+05	9.87E+04	0.	6.07E+04	0.	1.08E+08	8.81E+04
NB--95	6.20E+04	2.64E+04	0.	1.09E+04	0.	4.58E+07	1.94E+04
RU-103	2.24E+06	0.	0.	2.34E+06	0.	5.88E+07	9.05E+05
RU-106	5.19E+07	0.	0.	2.32E+07	0.	8.07E+08	6.46E+06
AG110	6.87E+05	6.36E+05	0.	1.25E+06	0.	2.59E+08	3.78E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

ST. LUCIE PLANT
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TABLE G-12
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - FRESH FRUITS AND VEGETABLES AGE GROUP - CHILD
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	1.71E-05	2.14E-07	2.26E-07	0.	0.	8.50E-06	4.21E-07
SN-126	3.87E+08	7.68E+06	2.25E+06	0.	1.75E+06	3.44E+08	1.19E+07
SB-124	1.02E+07	1.93E+05	2.47E+04	0.	7.93E+06	2.89E+08	4.04E+06
SB-125	1.22E+07	6.99E+05	6.22E+05	2.09E+06	1.04E+09	9.02E+07	2.29E+06
TE 125M	4.12E+07	1.12E+07	1.16E+07	3.94E+07	0.	3.97E+07	5.49E+06
TE 127M	2.88E+07	9.90E+06	8.09E+06	1.11E+08	0.	1.65E+08	3.67E+06
TE 129M	1.56E+08	4.35E+07	4.99E+07	1.51E+08	0.	1.88E+08	2.41E+07
I--130	1.60E+05	4.73E+05	6.02E+07	7.35E+05	0.	4.05E+05	1.86E+05
I--131	1.24E+08	1.27E+08	4.13E+10	7.75E+07	0.	1.09E+07	9.58E+07
I--132	2.26E+01	6.05E+01	7.97E+03	9.65E+01	0.	1.14E+01	2.15E+01
I--133	3.61E+06	4.46E+06	1.08E+09	2.62E+06	0.	1.81E+06	1.75E+06
I--134	4.18E-05	1.14E-04	1.47E-02	1.81E-04	0.	9.89E-08	4.06E-05
I--135	1.64E+04	4.33E+04	5.67E+06	6.89E+04	3.51E-03	4.85E+04	1.59E+04
CS-134	9.97E+08	1.68E+09	0.	2.14E+08	1.87E+08	9.08E+06	3.57E+08
CS-136	1.35E+07	5.32E+07	0.	2.96E+07	4.06E+06	6.05E+06	3.83E+07
CS-137	1.41E+09	1.37E+09	0.	1.68E+08	1.60E+08	8.34E+06	2.04E+08
BA-140	1.70E+08	1.56E+05	0.	1.78E+04	8.87E+04	2.08E+08	9.96E+06
CE-141	1.17E+05	5.84E+04	0.	9.13E+03	0.	7.33E+07	8.69E+03
CE-144	9.23E+06	2.89E+06	0.	5.22E+05	0.	7.51E+08	4.92E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

ST. LUCIE PLANT
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TABLE G-13
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - INHALATION **AGE GROUP - TEENAGER**
ORGAN DOSE FACTOR (MREM/YR PER μCI/CU. METER)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	8.48E+02	8.48E+02	1.07E+03	8.48E+02	8.48E+02	8.48E+02
P---32	1.32E+06	7.72E+04	0.	0.	0.	8.64E+04	5.02E+04
CR--51	0.	0.	5.95E+01	2.28E+01	1.44E+04	3.32E+03	1.00E+02
MN--54	0.	3.96E+04	0.	9.84E+03	1.40E+06	7.74E+04	6.30E+03
FE--59	1.18E+04	2.78E+07	0.	0.	1.02E+06	1.88E+05	1.06E+04
CO--57	0.	6.92E+02	0.	0.	3.70E+05	3.14E+04	6.71E+02
CO--58	0.	1.76E+02	0.	0.	1.37E+06	9.52E+04	2.34E+02
CO--60	0.	1.24E+03	0.	0.	8.56E+06	2.35E+05	1.65E+03
ZN--65	3.24E+04	1.03E+05	0.	6.90E+04	8.72E+05	5.34E+04	4.66E+04
RB--86	0.	1.35E+05	0.	0.	0.	1.66E+04	5.90E+04
SR--89	3.87E+04	0.	0.	0.	2.50E+06	3.54E+05	1.11E+03
SR--90	1.18E+07	0.	0.	0.	1.66E+07	7.24E+05	7.23E+05
Y---91	5.38E+04	0.	0.	0.	2.86E+06	3.74E+05	1.44E+03
ZR--95	1.09E+04	3.63E+03	0.	5.42E+04	2.56E+06	1.33E+05	2.54E+03
NB--95	1.36E+03	8.24E+02	0.	7.74E+03	7.17E+05	8.80E+04	4.62E+02
RU-103	1.63E+02	0.	0.	5.83E+03	7.51E+05	9.44E+04	7.32E+01
RU-106	8.40E+03	0.	0.	1.34E+05	1.64E+07	9.28E+05	1.06E+03
AG110	1.08E+04	1.00E+04	0.	1.97E+04	4.64E+06	3.02E+05	5.94E+03

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

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TABLE G-13
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - INHALATION **AGE GROUP - TEENAGER**
ORGAN DOSE FACTOR (MREM/YR PER μCI/CU. METER)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	2.79E+04	6.14E+02	4.92E+02	0.	3.91E+06	3.13E+05	9.20E+02
SN-126	1.26E+06	3.34E+04	9.84E+03	0.	9.36E+06	1.27E+05	4.80E+04
SB-124	3.12E+04	5.89E+02	7.55E+01	0.	2.48E+06	4.06E+05	1.24E+04
SB-125	6.61E+04	7.13E+02	5.87E+01	0.	2.20E+06	1.01E+05	1.33E+04
TE 125M	4.07E+02	1.86E+02	1.17E+02	1.24E+04	5.36E+05	7.08E+04	5.53E+01
TE 127M	1.26E+04	5.62E+03	3.29E+03	4.58E+04	9.60E+05	1.50E+05	1.57E+03
TE 129M	1.19E+03	5.64E+02	3.90E+02	3.66E+04	2.03E+06	3.84E+05	1.92E+02
I--130	4.58E+03	1.34E+04	1.74E+06	2.09E+04	0.	7.69E+03	5.29E+03
I--131	3.37E+04	4.72E+04	1.39E+07	6.14E+04	0.	5.96E+03	2.82E+04
I--132	1.16E+03	3.26E+03	4.38E+05	5.19E+03	0.	4.06E+02	1.16E+03
I--133	1.23E+04	2.06E+04	3.83E+06	2.60E+04	0.	1.00E+04	6.34E+03
I--134	6.45E+02	1.73E+03	2.30E+05	2.75E+03	0.	1.01E+00	6.16E+02
I--135	2.69E+03	6.99E+03	9.36E+05	1.11E+04	0.	5.25E+03	2.58E+03
CS-134	4.83E+05	1.10E+06	0.	2.88E+05	1.44E+05	8.96E+03	5.44E+05
CS-136	3.91E+04	1.46E+05	0.	8.56E+04	1.20E+04	1.17E+04	1.11E+05
CS-137	6.42E+05	8.24E+05	0.	2.22E+05	1.18E+05	7.68E+03	3.03E+05
BA-140	5.30E+03	4.85E+00	0.	1.67E+01	2.02E+06	2.12E+04	3.42E+02
CE-141	2.27E+03	1.52E+03	0.	6.26E+03	5.83E+05	1.14E+05	1.74E+02
CE-144	4.19E+05	1.74E+05	0.	8.48E+05	1.38E+07	8.40E+05	2.24E+04

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

ST. LUCIE PLANT
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TABLE G-14
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - COWS MILK (CONTAMINATED FORAGE) AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	9.93E+02	9.93E+02	1.26E+03	9.93E+02	9.93E+02	9.93E+02
P---32	2.21E+10	1.38E+09	0.	0.	0.	2.48E+09	8.54E+08
CR--51	0.	0.	2.21E+04	8.15E+03	4.90E+04	9.29E+06	3.69E+04
MN--54	0.	1.09E+07	0.	3.23E+06	0.	3.33E+07	2.07E+06
FE--59	3.84E+07	9.12E+07	0.	0.	2.53E+07	3.01E+08	3.47E+07
CO--57	0.	1.65E+06	0.	0.	0.	4.19E+07	2.75E+06
CO--58	0.	8.10E+06	0.	0.	0.	1.10E+08	1.85E+07
CO--60	0.	2.73E+07	0.	0.	0.	3.27E+08	6.23E+07
ZN--65	1.77E+09	5.63E+09	0.	3.77E+09	0.	3.55E+09	2.55E+09
RB--86	0.	3.35E+09	0.	0.	0.	6.61E+08	1.56E+09
SR--89	2.80E+09	0.	0.	0.	0.	3.03E+08	8.03E+07
SR--90	8.29E+10	0.	0.	0.	3.38E+06	1.76E+09	2.05E+10
Y---91	1.54E+04	0.	0.	0.	0.	5.93E+06	4.12E+02
ZR--95	4.78E+04	2.84E+04	0.	2.25E+04	0.	1.15E+08	1.60E+04
NB--95	1.24E+05	7.46E+04	0.	5.87E+04	0.	3.05E+08	4.21E+04
RU-103	1.69E+03	0.	0.	5.04E+03	0.	1.32E+05	7.56E+02
RU-106	3.83E+04	0.	0.	5.09E+04	0.	1.73E+06	4.81E+03
AG-110	7.53E+07	6.97E+07	0.	1.37E+08	0.	2.84E+10	4.14E+07

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

TABLE G-14
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - COWS MILK (CONTAMINATED FORAGE) AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	0.	0.	0.	0.	0.	0.	0.
SN-126	2.12E+09	4.21E+07	1.24E+07	0.	6.03E+06	1.41E+09	6.37E+07
SB-124	3.33E+07	6.29E+05	8.05E+04	0.	2.59E+07	9.43E+08	1.32E+07
SB-125	3.45E+07	9.58E+05	5.05E+05	4.80E+06	3.43E+09	2.95E+08	6.82E+06
TE 125M	3.00E+07	1.08E+07	8.47E+06	8.55E+07	0.	8.39E+07	3.98E+06
TE 127M	6.02E+07	2.11E+07	1.59E+07	2.43E+08	0.	3.02E+08	7.45E+06
TE 129M	1.13E+08	4.18E+07	3.61E+07	3.27E+08	0.	3.93E+08	1.78E+07
I--130	5.51E+05	1.63E+06	2.07E+08	2.53E+06	0.	1.40E+06	6.41E+05
I--131	5.12E+08	7.24E+08	2.09E+11	9.38E+08	0.	1.37E+08	4.31E+08
I--132	2.16E-01	5.76E-01	7.59E+01	9.19E-01	0.	1.08E-01	2.05E-01
I--133	7.33E+06	1.24E+07	2.26E+09	1.56E+07	0.	9.02E+06	3.83E+06
I--134	0.	0.	1.29E-09	0.	0.	0.	0.
I--135	1.81E+04	4.77E+04	6.24E+06	7.58E+04	9.79E-02	5.34E+04	1.75E+04
CS-134	9.44E+09	2.28E+10	0.	5.63E+09	2.76E+09	2.63E+08	1.06E+10
CS-136	3.37E+08	1.33E+09	0.	7.41E+08	1.02E+08	1.51E+08	9.58E+08
CS-137	1.28E+10	1.72E+10	0.	4.43E+09	2.28E+09	2.29E+08	6.04E+09
BA-140	4.84E+07	5.95E+04	0.	1.48E+04	3.98E+04	9.16E+06	3.11E+06
CE-141	5.05E+04	3.39E+04	0.	1.18E+04	0.	9.18E+07	3.89E+03
CE-144	4.10E+06	1.68E+06	0.	6.87E+05	0.	9.65E+08	2.17E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

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TABLE G-15
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - GOATS MILK (CONTAMINATED FORAGE) AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	2.03E+03	2.03E+03	2.56E+03	2.03E+03	2.03E+03	2.03E+03
P---32	2.65E+10	1.66E+09	0.	0.	0.	2.98E+09	1.03E+09
CR--51	0.	0.	2.65E+03	9.78E+02	5.88E+03	1.11E+06	4.43E+03
MN--54	0.	1.30E+06	0.	3.88E+05	0.	3.99E+06	2.49E+05
FE--59	4.99E+05	1.19E+06	0.	0.	3.29E+05	3.91E+06	4.51E+05
CO--57	0.	1.98E+05	0.	0.	0.	5.03E+06	3.30E+05
CO--58	0.	9.72E+05	0.	0.	0.	1.31E+07	2.22E+06
CO--60	0.	3.28E+06	0.	0.	0.	3.93E+07	7.48E+06
ZN--65	2.13E+08	6.76E+08	0.	4.52E+08	0.	4.26E+08	3.06E+08
RB--86	0.	4.02E+08	0.	0.	0.	7.93E+07	1.88E+08
SR--89	5.87E+09	0.	0.	0.	0.	6.37E+08	1.69E+08
SR--90	1.74E+11	0.	0.	0.	4.05E+05	3.68E+09	4.30E+10
Y---91	1.85E+03	0.	0.	0.	0.	7.11E+05	4.94E+01
ZR--95	5.74E+03	3.41E+03	0.	2.70E+03	0.	1.38E+07	1.93E+03
NB--95	1.49E+04	8.96E+03	0.	7.05E+03	0.	3.66E+07	5.05E+03
RU-103	2.03E+02	0.	0.	6.05E+02	0.	1.58E+04	9.08E+01
RU-106	4.59E+03	0.	0.	6.11E+03	0.	2.08E+05	5.78E+02
AG110	9.04E+06	8.36E+06	0.	1.64E+07	0.	3.41E+09	4.97E+06

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

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TABLE G-15
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - GOATS MILK (CONTAMINATED FORAGE) AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	0.	0.	0.	0.	0.	0.	0.
SN-126	2.54E+08	5.05E+06	1.48E+06	0.	7.23E+05	1.69E+08	7.64E+06
SB-124	4.00E+06	7.54E+04	9.66E+03	0.	3.10E+06	1.13E+08	1.58E+06
SB-125	4.14E+06	1.15E+05	6.06E+04	5.77E+05	4.12E+08	3.54E+07	8.19E+05
TE 125M	3.61E+06	1.29E+06	1.02E+06	1.03E+07	0.	1.01E+07	4.78E+05
TE 127M	7.23E+06	2.52E+06	1.91E+06	2.92E+07	0.	3.63E+07	8.94E+05
TE 129M	1.35E+07	5.02E+06	4.34E+06	3.92E+07	0.	4.72E+07	2.13E+06
I--130	6.61E+05	1.96E+06	2.49E+08	3.04E+06	0.	1.68E+06	7.69E+05
I--131	6.15E+08	8.68E+08	2.50E+11	1.13E+09	0.	1.64E+08	5.17E+08
I--132	2.59E-01	6.92E-01	9.11E+01	1.10E+00	0.	1.30E-01	2.46E-01
I--133	8.79E+06	1.49E+07	2.71E+09	1.88E+07	0.	1.08E+07	4.59E+06
I--134	0.	0.	1.55E-09	0.	0.	0.	0.
I--135	2.17E+04	5.73E+04	7.49E+06	9.10E+04	2.94E-01	6.41E+04	2.10E+04
CS-134	2.83E+10	6.83E+10	0.	1.69E+10	8.27E+09	7.88E+08	3.19E+10
CS-136	1.01E+09	3.99E+09	0.	2.22E+09	3.05E+08	4.54E+08	2.87E+09
CS-137	3.84E+10	5.16E+10	0.	1.33E+10	6.85E+09	6.88E+08	1.81E+10
BA-140	5.81E+06	7.14E+03	0.	1.78E+03	4.78E+03	1.10E+06	3.73E+05
CE-141	6.06E+03	4.07E+03	0.	1.41E+03	0.	1.10E+07	4.66E+02
CE-144	4.92E+05	2.02E+05	0.	8.24E+04	0.	1.16E+08	2.61E+04

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

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TABLE G-16
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - MEAT (CONTAMINATED FORAGE) **AGE GROUP - TEENAGER**
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	1.93E+02	1.93E+02	2.44E+02	1.93E+02	1.93E+02	1.93E+02
P---32	2.76E+09	1.73E+08	0.	0.	0.	3.10E+08	1.07E+08
CR--51	0.	0.	2.50E+03	9.22E+02	5.55E+03	1.05E+06	4.18E+03
MN--54	0.	5.42E+06	0.	1.61E+06	0.	1.66E+07	1.04E+06
FE--59	1.58E+08	3.74E+08	0.	0.	1.04E+08	1.24E+09	1.42E+08
CO--57	0.	3.33E+06	0.	0.	0.	8.45E+07	5.54E+06
CO--58	0.	1.44E+07	0.	0.	0.	1.94E+08	3.27E+07
CO--60	0.	5.73E+07	0.	0.	0.	6.87E+08	1.31E+08
ZN--65	2.11E+08	6.69E+08	0.	4.47E+08	0.	4.21E+08	3.03E+08
RB--86	0.	2.89E+08	0.	0.	0.	5.69E+07	1.35E+08
SR--89	2.66E+08	0.	0.	0.	0.	2.89E+07	7.64E+06
SR--90	1.01E+10	0.	0.	0.	2.79E+08	1.02E+09	2.49E+09
Y---91	9.34E+05	0.	0.	0.	0.	3.59E+08	2.49E+04
ZR--95	2.67E+06	1.24E+06	0.	1.18E+06	0.	4.20E+09	7.61E+05
NB--95	1.58E+06	9.51E+05	0.	7.48E+05	0.	3.88E+09	5.37E+05
RU-103	8.05E+07	0.	0.	2.40E+08	0.	6.28E+09	3.60E+07
RU-106	2.40E+09	0.	0.	3.20E+09	0.	1.09E+11	3.02E+08
AG110	3.97E+06	3.67E+06	0.	7.21E+06	0.	1.50E+09	2.18E+06

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

TABLE G-16
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - MEAT (CONTAMINATED FORAGE) **AGE GROUP - TEENAGER**
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER µCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	0.	0.	0.	0.	0.	0.	0.
SN-126	1.10E+10	2.18E+08	6.38E+07	0.	3.82E+06	3.66E+09	3.14E+08
SB-124	1.17E+07	2.21E+05	2.84E+04	0.	9.11E+06	3.32E+08	4.64E+06
SB-125	5.01E+07	1.31E+07	1.02E+07	1.03E+08	1.47E+09	2.25E+08	7.60E+06
TE 125M	3.03E+08	1.08E+08	8.55E+07	8.63E+08	0.	8.47E+08	4.02E+07
TE 127M	6.68E+08	2.34E+08	1.77E+08	2.69E+09	0.	3.35E+09	8.28E+07
TE 129M	9.78E+08	3.63E+08	3.13E+08	2.83E+09	0.	3.41E+09	1.53E+08
I--130	1.41E-06	4.16E-06	5.30E-04	6.47E-06	0.	3.57E-06	1.64E-06
I--131	8.54E+06	1.21E+07	3.48E+09	1.56E+07	0.	2.28E+06	7.19E+06
I--132	0.	0.	0.	0.	0.	0.	0.
I--133	3.69E-01	6.26E-01	1.14E+02	7.88E-01	0.	4.55E-01	1.93E-01
I--134	0.	0.	0.	0.	0.	0.	0.
I--135	5.08E-02	4.69E-02	0.	1.78E-02	5.34E-03	1.10E-03	2.08E-02
CS-134	5.03E+08	1.21E+09	0.	3.00E+08	1.47E+08	1.40E+07	5.66E+08
CS-136	6.99E+06	2.76E+07	0.	1.54E+07	2.11E+06	3.14E+06	1.99E+07
CS-137	6.92E+08	9.31E+08	0.	2.40E+08	1.24E+08	1.24E+07	3.27E+08
BA-140	2.37E+07	2.93E+04	0.	7.28E+03	1.95E+04	9.19E+06	1.53E+06
CE-141	1.12E+04	7.51E+03	0.	2.61E+03	0.	2.03E+07	8.61E+02
CE-144	1.28E+06	5.23E+05	0.	2.14E+05	0.	3.00E+08	6.76E+04

Based on 1 µCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per µCi/cu. meter)

TABLE G-17
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - FRESH FRUITS AND VEGETABLES AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	2.09E+02	2.09E+02	2.64E+02	2.09E+02	2.09E+02	2.09E+02
P---32	6.81E+08	4.27E+07	0.	0.	0.	7.66E+07	2.64E+07
CR--51	0.	0.	7.56E+03	2.79E+03	1.68E+04	3.18E+06	1.27E+04
MN--54	0.	3.20E+07	0.	9.52E+06	0.	9.80E+07	6.11E+06
FE--59	2.39E+07	5.67E+07	0.	0.	1.57E+07	1.87E+08	2.16E+07
CO--57	0.	1.22E+06	0.	0.	0.	3.09E+07	2.02E+06
CO--58	0.	6.01E+06	0.	0.	0.	8.12E+07	1.37E+07
CO--60	0.	2.01E+07	0.	0.	0.	2.41E+08	4.58E+07
ZN--65	3.35E+07	1.06E+08	0.	7.12E+07	0.	6.70E+07	4.82E+07
RB--86	0.	8.52E+07	0.	0.	0.	1.68E+07	3.97E+07
SR--89	2.61E+09	0.	0.	0.	0.	2.83E+08	7.48E+07
SR--90	7.61E+10	0.	0.	0.	2.41E+08	2.31E+09	1.88E+10
Y---91	1.15E+06	0.	0.	0.	0.	4.41E+08	3.06E+04
ZR--95	2.35E+05	8.19E+04	0.	9.81E+04	0.	1.92E+08	5.61E+04
NB--95	3.72E+04	2.24E+04	0.	1.76E+04	0.	9.14E+07	1.26E+04
RU-103	1.27E+06	0.	0.	3.77E+06	0.	9.87E+07	5.66E+05
RU-106	2.82E+07	0.	0.	3.75E+07	0.	1.28E+09	3.54E+06
AG110	1.11E+06	1.03E+06	0.	2.02E+06	0.	4.19E+08	6.10E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

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TABLE G-17
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - FRESH FRUITS AND VEGETABLES AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	9.25E-06	1.53E-07	1.22E-07	0.	0.	1.33E-05	2.28E-07
SN-126	6.25E+08	1.24E+07	3.64E+06	0.	2.83E+06	5.55E+08	1.94E+07
SB-124	1.65E+07	3.12E+05	3.99E+04	0.	1.28E+07	4.67E+08	6.53E+06
SB-125	1.73E+07	5.97E+05	3.48E+05	3.38E+06	1.68E+09	1.45E+08	3.40E+06
TE 125M	2.23E+07	7.99E+06	6.30E+06	6.36E+07	0.	6.24E+07	2.96E+06
TE 127M	4.46E+07	1.55E+07	1.18E+07	1.80E+08	0.	2.23E+08	5.51E+06
TE 129M	8.46E+07	3.14E+07	2.71E+07	2.45E+08	0.	2.95E+08	1.33E+07
I--130	2.58E+05	7.64E+05	9.72E+07	1.19E+06	0.	6.55E+05	3.00E+05
I--131	6.84E+07	9.66E+07	2.79E+10	1.25E+08	0.	1.83E+07	5.76E+07
I--132	3.65E+01	9.77E+01	1.29E+04	1.56E+02	0.	1.84E+01	3.47E+01
I--133	1.98E+06	3.36E+06	6.10E+08	4.23E+06	0.	2.44E+06	1.04E+06
I--134	6.75E-05	1.83E-04	2.38E-02	2.92E-04	0.	1.60E-07	6.56E-05
I--135	2.65E+04	7.00E+04	9.15E+06	1.11E+05	5.67E-03	7.84E+04	2.57E+04
CS-134	5.79E+08	1.40E+09	0.	3.45E+08	1.69E+08	1.61E+07	6.52E+08
CS-136	2.18E+07	8.60E+07	0.	4.78E+07	6.56E+06	9.77E+06	6.19E+07
CS-137	7.83E+08	1.05E+09	0.	2.72E+08	1.40E+08	1.41E+07	3.70E+08
BA-140	9.38E+07	1.21E+05	0.	2.88E+04	7.73E+04	3.19E+08	6.04E+06
CE-141	6.32E+04	4.24E+04	0.	1.47E+04	0.	1.15E+08	4.86E+03
CE-144	5.03E+06	2.06E+06	0.	8.43E+05	0.	1.19E+09	2.67E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

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TABLE G-18
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - INHALATION AGE GROUP - ADULT
ORGAN DOSE FACTOR (MREM/YR PER μCI/CU. METER)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	1.07E+03	1.07E+03	1.07E+03	1.07E+03	1.07E+03	1.07E+03
P---32	1.32E+06	7.72E+04	0.	0.	0.	8.64E+04	5.02E+04
CR--51	0.	0.	5.95E+01	2.28E+01	1.44E+04	3.32E+03	1.00E+02
MN--54	0.	3.96E+04	0.	9.84E+03	1.40E+06	7.74E+04	6.30E+03
FE--59	1.18E+04	2.78E+07	0.	0.	1.02E+06	1.88E+05	1.06E+04
CO--57	0.	6.92E+02	0.	0.	3.70E+05	3.14E+04	6.71E+02
CO--58	0.	1.58E+03	0.	0.	9.28E+05	1.06E+05	2.07E+03
CO--60	0.	1.15E+04	0.	0.	5.98E+06	2.85E+05	1.48E+04
ZN--65	3.24E+04	1.03E+05	0.	6.90E+04	8.72E+05	5.34E+04	4.66E+04
RB--86	0.	1.35E+05	0.	0.	0.	1.66E+04	5.90E+04
SR--89	3.04E+05	0.	0.	0.	1.40E+06	3.50E+05	8.72E+03
SR--90	9.92E+07	0.	0.	0.	9.60E+06	7.22E+05	6.10E+06
Y---91	4.62E+05	0.	0.	0.	1.70E+06	3.85E+05	1.24E+04
ZR--95	1.07E+05	3.44E+04	0.	5.42E+04	1.78E+06	1.50E+05	2.33E+04
NB--95	1.41E+04	7.82E+03	0.	7.74E+03	5.06E+05	1.04E+05	4.21E+03
RU-103	1.53E+03	0.	0.	5.83E+03	5.06E+05	1.10E+05	6.58E+02
RU-106	6.91E+04	0.	0.	1.34E+05	9.44E+06	9.12E+05	8.72E+03
AG110	1.08E+04	1.00E+04	0.	1.97E+04	4.64E+06	3.02E+05	5.94E+03

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

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TABLE G-18
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - INHALATION AGE GROUP - ADULT
ORGAN DOSE FACTOR (MREM/YR PER μCI/CU. METER)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	2.42E+05	5.33E+03	4.53E+03	0.	2.30E+06	3.14E+05	7.86E+03
SN-126	1.26E+06	3.34E+04	9.84E+03	0.	9.36E+06	1.27E+05	4.80E+04
SB-124	3.12E+04	5.89E+02	7.55E+01	0.	2.48E+06	4.06E+05	1.24E+04
SB-125	6.61E+04	7.13E+02	5.87E+01	0.	2.20E+06	1.01E+05	1.33E+04
TE 125M	3.42E+03	1.58E+03	1.05E+03	1.24E+04	3.14E+05	7.06E+04	4.67E+02
TE 127M	1.26E+04	5.62E+03	3.29E+03	4.58E+04	9.60E+05	1.50E+05	1.57E+03
TE 129M	9.76E+03	4.67E+03	3.44E+03	3.66E+04	1.16E+06	3.83E+05	1.58E+03
I--130	4.58E+03	1.34E+04	1.74E+06	2.09E+04	0.	7.69E+03	5.29E+03
I--131	2.52E+04	3.58E+04	1.19E+07	6.14E+04	0.	6.28E+03	2.05E+04
I--132	1.16E+03	3.26E+03	4.38E+05	5.19E+03	0.	4.06E+02	1.16E+03
I--133	8.64E+03	1.49E+04	2.93E+06	2.60E+04	0.	8.72E+03	4.54E+03
I--134	6.45E+02	1.73E+03	2.30E+05	2.75E+03	0.	1.01E+00	6.16E+02
I--135	2.69E+03	6.99E+03	9.36E+05	1.11E+04	0.	5.25E+03	2.58E+03
CS-134	3.74E+05	8.48E+05	0.	2.88E+05	9.76E+04	1.04E+04	7.29E+05
CS-136	3.91E+04	1.46E+05	0.	8.56E+04	1.20E+04	1.17E+04	1.11E+05
CS-137	4.78E+05	6.22E+05	0.	2.22E+05	7.53E+04	8.40E+03	4.29E+05
BA-140	3.90E+04	4.90E+01	0.	1.67E+01	1.27E+06	2.18E+05	2.57E+03
CE-141	1.99E+04	1.35E+04	0.	6.26E+03	3.62E+05	1.20E+05	1.53E+03
CE-144	3.43E+06	1.43E+06	0.	8.48E+05	7.78E+06	8.16E+05	1.84E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

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TABLE G-19
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - COWS MILK (CONTAMINATED FORAGE) AGE GROUP - ADULT
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	9.73E+02	9.73E+02	9.73E+02	9.73E+02	9.73E+02	9.73E+02
P---32	1.71E+10	1.07E+09	0.	0.	0.	1.92E+09	6.62E+08
CR--51	0.	0.	1.71E+04	6.32E+03	3.80E+04	7.20E+06	2.86E+04
MN--54	0.	8.41E+06	0.	2.50E+06	0.	2.58E+07	1.61E+06
FE--59	2.98E+07	7.06E+07	0.	0.	1.96E+07	2.33E+08	2.69E+07
CO--57	0.	1.28E+06	0.	0.	0.	3.25E+07	2.13E+06
CO--58	0.	4.72E+06	0.	0.	0.	9.56E+07	1.06E+07
CO--60	0.	1.65E+07	0.	0.	0.	3.08E+08	3.62E+07
ZN--65	1.37E+09	4.36E+09	0.	2.92E+09	0.	2.75E+09	1.98E+09
RB--86	0.	2.60E+09	0.	0.	0.	5.12E+08	1.21E+09
SR--89	1.46E+09	0.	0.	0.	0.	2.33E+08	4.17E+07
SR--90	4.70E+10	0.	0.	0.	0.	6.37E+08	1.15E+10
Y---91	8.60E+03	0.	0.	0.	0.	4.73E+06	2.31E+02
ZR--95	3.18E+04	1.75E+04	0.	1.75E+04	0.	1.05E+08	6.95E+03
NB--95	8.26E+04	4.59E+04	0.	4.55E+04	0.	2.79E+08	1.80E+04
RU-103	1.02E+03	0.	0.	3.91E+03	0.	1.19E+05	4.41E+02
RU-106	2.04E+04	0.	0.	3.95E+04	0.	1.32E+06	2.58E+03
AG110	5.84E+07	5.40E+07	0.	1.06E+08	0.	2.20E+10	3.21E+07

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

TABLE G-19
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - COWS MILK (CONTAMINATED FORAGE) AGE GROUP - ADULT
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	0.	0.	0.	0.	0.	0.	0.
SN-126	1.65E+09	3.27E+07	9.56E+06	0.	4.67E+06	1.09E+09	4.94E+07
SB-124	2.58E+07	4.87E+05	6.24E+04	0.	2.00E+07	7.31E+08	1.02E+07
SB-125	2.64E+07	6.06E+05	2.99E+05	3.72E+06	2.66E+09	2.29E+08	5.23E+06
TE 125M	1.63E+07	5.91E+06	4.91E+06	6.63E+07	0.	6.50E+07	2.18E+06
TE 127M	4.63E+07	1.63E+07	1.21E+07	1.88E+08	0.	2.11E+08	5.72E+06
TE 129M	6.06E+07	2.27E+07	2.09E+07	2.53E+08	0.	3.04E+08	9.61E+06
I--130	4.27E+05	1.26E+06	1.61E+08	1.96E+06	0.	1.08E+06	4.97E+05
I--131	2.96E+08	4.25E+08	1.39E+11	7.27E+08	0.	1.12E+08	2.43E+08
I--132	1.67E-01	4.47E-01	5.88E+01	7.12E-01	0.	8.39E-02	1.59E-01
I--133	4.00E+06	6.94E+06	1.33E+09	1.21E+07	0.	6.10E+06	2.12E+06
I--134	0.	0.	9.98E-10	0.	0.	0.	0.
I--135	1.40E+04	3.70E+04	4.84E+06	5.88E+04	7.58E-02	4.14E+04	1.36E+04
CS-134	5.66E+09	1.35E+10	0.	4.36E+09	1.45E+09	2.36E+08	1.10E+10
CS-136	2.61E+08	1.03E+09	0.	5.74E+08	7.87E+07	1.17E+08	7.43E+08
CS-137	7.39E+09	1.01E+10	0.	3.44E+09	1.14E+09	1.95E+08	6.62E+09
BA-140	2.69E+07	3.38E+04	0.	1.15E+04	1.93E+04	5.70E+07	1.78E+06
CE-141	2.91E+04	1.97E+04	0.	9.13E+03	0.	7.52E+07	2.23E+03
CE-144	2.15E+06	8.97E+05	0.	5.32E+05	0.	7.26E+08	1.15E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

TABLE G-20
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - GOATS MILK (CONTAMINATED FORAGE) AGE GROUP - ADULT
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	1.99E+03	1.99E+03	1.99E+03	1.99E+03	1.99E+03	1.99E+03
P---32	2.05E+10	1.29E+09	0.	0.	0.	2.31E+09	7.94E+08
CR--51	0.	0.	2.05E+03	7.58E+02	4.56E+03	8.64E+05	3.43E+03
MN--54	0.	1.01E+06	0.	3.00E+05	0.	3.09E+06	1.93E+05
FE--59	3.87E+05	9.18E+05	0.	0.	2.55E+05	3.03E+06	3.50E+05
CO--57	0.	1.54E+05	0.	0.	0.	3.90E+06	2.55E+05
CO--58	0.	5.67E+05	0.	0.	0.	1.15E+07	1.27E+06
CO--60	0.	1.98E+06	0.	0.	0.	3.70E+07	4.34E+06
ZN--65	1.65E+08	5.24E+08	0.	3.50E+08	0.	3.30E+08	2.37E+08
RB--86	0.	3.12E+08	0.	0.	0.	6.15E+07	1.45E+08
SR--89	3.06E+09	0.	0.	0.	0.	4.89E+08	8.76E+07
SR--90	9.87E+10	0.	0.	0.	0.	1.32E+09	2.41E+10
Y---91	1.03E+03	0.	0.	0.	0.	5.68E+05	2.77E+01
ZR--95	3.82E+03	2.10E+03	0.	2.10E+03	0.	1.26E+07	8.34E+02
NB--95	9.92E+03	5.51E+03	0.	5.46E+03	0.	3.34E+07	2.17E+03
RU-103	1.23E+02	0.	0.	4.69E+02	0.	1.43E+04	5.30E+01
RU-106	2.45E+03	0.	0.	4.73E+03	0.	1.58E+05	3.10E+02
AG110	7.00E+06	6.48E+06	0.	1.27E+07	0.	2.64E+09	3.85E+06

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

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TABLE G-20
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - GOATS MILK (CONTAMINATED FORAGE) AGE GROUP - ADULT
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	0.	0.	0.	0.	0.	0.	0.
SN-126	1.97E+08	3.92E+06	1.15E+06	0.	5.61E+05	1.31E+08	5.92E+06
SB-124	3.10E+06	5.85E+04	7.49E+03	0.	2.40E+06	8.77E+07	1.22E+06
SB-125	3.16E+06	7.28E+04	3.58E+04	4.47E+05	3.19E+08	2.74E+07	6.29E+05
TE 125M	1.96E+06	7.10E+05	5.89E+05	7.95E+06	0.	7.81E+06	2.62E+05
TE 127M	5.57E+06	1.94E+06	1.47E+06	2.26E+07	0.	2.52E+07	6.86E+05
TE 129M	7.27E+06	2.72E+06	2.51E+06	3.04E+07	0.	3.65E+07	1.15E+06
I--130	5.12E+05	1.52E+06	1.93E+08	2.36E+06	0.	1.30E+06	5.96E+05
I--131	3.56E+08	5.10E+08	1.67E+11	8.72E+08	0.	1.34E+08	2.92E+08
I--132	2.00E-01	5.36E-01	7.06E+01	8.55E-01	0.	1.01E-01	1.91E-01
I--133	4.80E+06	8.32E+06	1.60E+09	1.45E+07	0.	7.32E+06	2.54E+06
I--134	0.	0.	1.20E-09	0.	0.	0.	0.
I--135	1.68E+04	4.44E+04	5.80E+06	7.05E+04	2.28E-01	4.97E+04	1.63E+04
CS-134	1.70E+10	4.04E+10	0.	1.31E+10	4.34E+09	7.06E+08	3.30E+10
CS-136	7.84E+08	3.09E+09	0.	1.72E+09	2.36E+08	3.52E+08	2.23E+09
CS-137	2.22E+10	3.03E+10	0.	1.03E+10	3.42E+09	5.83E+08	1.99E+10
BA-140	3.23E+06	4.05E+03	0.	1.38E+03	2.32E+03	6.84E+06	2.13E+05
CE-141	3.49E+03	2.36E+03	0.	1.10E+03	0.	9.02E+06	2.68E+02
CE-144	2.58E+05	1.08E+05	0.	6.39E+04	0.	8.71E+07	1.38E+04

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

TABLE G-21
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - MEAT (CONTAMINATED FORAGE) **AGE GROUP - ADULT**
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	4.13E+02	4.13E+02	4.13E+02	4.13E+02	4.13E+02	4.13E+02
P---32	4.67E+09	2.93E+08	0.	0.	0.	5.25E+08	1.81E+08
CR--51	0.	0.	4.23E+03	1.56E+03	9.38E+03	1.78E+06	7.07E+03
MN--54	0.	9.18E+06	0.	2.73E+06	0.	2.81E+07	1.75E+06
FE--59	2.67E+08	6.33E+08	0.	0.	1.76E+08	2.09E+09	2.41E+08
CO--57	0.	5.64E+06	0.	0.	0.	1.43E+08	9.38E+06
CO--58	0.	1.83E+07	0.	0.	0.	3.70E+08	4.09E+07
CO--60	0.	7.55E+07	0.	0.	0.	1.41E+09	1.66E+08
ZN--65	3.56E+08	1.13E+09	0.	7.57E+08	0.	7.13E+08	5.12E+08
RB--86	0.	4.89E+08	0.	0.	0.	9.64E+07	2.28E+08
SR--89	3.03E+08	0.	0.	0.	0.	4.84E+07	8.67E+06
SR--90	1.25E+10	0.	0.	0.	0.	1.45E+09	3.05E+09
Y---91	1.14E+06	0.	0.	0.	0.	6.26E+08	3.05E+04
ZR--95	3.78E+06	1.67E+06	0.	2.01E+06	0.	8.30E+09	8.26E+05
NB--95	2.30E+06	1.28E+06	0.	1.27E+06	0.	7.75E+09	5.02E+05
RU-103	1.06E+08	0.	0.	4.06E+08	0.	1.24E+10	4.59E+07
RU-106	2.80E+09	0.	0.	5.41E+09	0.	1.81E+11	3.54E+08
AG110	6.71E+06	6.21E+06	0.	1.22E+07	0.	2.53E+09	3.69E+06

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

TABLE G-21
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - MEAT (CONTAMINATED FORAGE) **AGE GROUP - ADULT**
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	0.	0.	0.	0.	0.	0.	0.
SN-126	1.86E+10	3.69E+08	1.08E+08	0.	6.46E+06	6.19E+09	5.33E+08
SB-124	1.99E+07	3.75E+05	4.80E+04	0.	1.54E+07	5.62E+08	7.85E+06
SB-125	6.65E+07	1.58E+07	1.29E+07	1.74E+08	2.49E+09	3.80E+08	1.05E+07
TE 125M	3.59E+08	1.30E+08	1.08E+08	1.46E+09	0.	1.43E+09	4.81E+07
TE 127M	1.13E+09	3.93E+08	2.96E+08	4.56E+09	0.	5.11E+09	1.39E+08
TE 129M	1.14E+09	4.29E+08	3.95E+08	4.79E+09	0.	5.76E+09	1.82E+08
I--130	2.38E-06	7.05E-06	8.96E-04	1.10E-05	0.	6.04E-06	2.77E-06
I--131	1.08E+07	1.55E+07	5.06E+09	2.65E+07	0.	4.07E+06	8.85E+06
I--132	0.	0.	0.	0.	0.	0.	0.
I--133	4.40E-01	7.63E-01	1.47E+02	1.33E+00	0.	6.71E-01	2.33E-01
I--134	0.	0.	0.	0.	0.	0.	0.
I--135	8.60E-02	7.94E-02	0.	3.01E-02	9.04E-03	1.86E-03	3.53E-02
CS-134	6.58E+08	1.57E+09	0.	5.08E+08	1.68E+08	2.74E+07	1.28E+09
CS-136	1.18E+07	4.67E+07	0.	2.60E+07	3.56E+06	5.31E+06	3.36E+07
CS-137	8.73E+08	1.19E+09	0.	4.06E+08	1.35E+08	2.30E+07	7.82E+08
BA-140	2.88E+07	3.63E+04	0.	1.23E+04	2.07E+04	6.87E+07	1.90E+06
CE-141	1.41E+04	9.52E+03	0.	4.41E+03	0.	3.63E+07	1.08E+03
CE-144	1.46E+06	6.10E+05	0.	3.62E+05	0.	4.93E+08	7.83E+04

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

Note - the units for C---14 and H----3 are (mrem/yr per μCi/cu. meter)

TABLE G-22
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - FRESH FRUITS AND VEGETABLES AGE GROUP - ADULT
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H----3	0.	4.02E+02	4.02E+02	4.02E+02	4.02E+02	4.02E+02	4.02E+02
P---32	1.04E+09	6.51E+07	0.	0.	0.	1.17E+08	4.02E+07
CR--51	0.	0.	1.15E+04	4.25E+03	2.56E+04	4.85E+06	1.93E+04
MN--54	0.	4.87E+07	0.	1.45E+07	0.	1.49E+08	9.31E+06
FE--59	3.64E+07	8.64E+07	0.	0.	2.40E+07	2.85E+08	3.29E+07
CO--57	0.	1.85E+06	0.	0.	0.	4.70E+07	3.08E+06
CO--58	0.	6.89E+06	0.	0.	0.	1.40E+08	1.54E+07
CO--60	0.	2.38E+07	0.	0.	0.	4.46E+08	5.23E+07
ZN--65	5.11E+07	1.62E+08	0.	1.09E+08	0.	1.02E+08	7.34E+07
RB--86	0.	1.30E+08	0.	0.	0.	2.56E+07	6.06E+07
SR--89	2.67E+09	0.	0.	0.	0.	4.26E+08	7.64E+07
SR--90	8.49E+10	0.	0.	0.	0.	2.14E+09	2.07E+10
Y---91	1.26E+06	0.	0.	0.	0.	6.92E+08	3.37E+04
ZR--95	2.93E+05	9.82E+04	0.	1.49E+05	0.	3.34E+08	6.38E+04
NB--95	4.87E+04	2.71E+04	0.	2.68E+04	0.	1.64E+08	1.06E+04
RU-103	1.50E+06	0.	0.	5.75E+06	0.	1.76E+08	6.49E+05
RU-106	2.95E+07	0.	0.	5.71E+07	0.	1.91E+09	3.74E+06
AG110	1.69E+06	1.56E+06	0.	3.08E+06	0.	6.38E+08	9.30E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

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TABLE G-22
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES
PATHWAY - FRESH FRUITS AND VEGETABLES AGE GROUP - ADULT
ORGAN DOSE FACTOR (SQ. METER-MREM/YR PER μCI/SEC)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
SN-123	1.00E-05	1.66E-07	1.41E-07	0.	0.	2.04E-05	2.45E-07
SN-126	9.52E+08	1.89E+07	5.54E+06	0.	4.31E+06	8.46E+08	2.94E+07
SB-124	2.52E+07	4.75E+05	6.08E+04	0.	1.95E+07	7.12E+08	9.94E+06
SB-125	2.58E+07	7.23E+05	4.03E+05	5.14E+06	2.56E+09	2.22E+08	5.10E+06
TE 125M	2.38E+07	8.65E+06	7.17E+06	9.69E+07	0.	9.51E+07	3.19E+06
TE 127M	6.75E+07	2.36E+07	1.77E+07	2.73E+08	0.	3.06E+08	8.32E+06
TE 129M	8.93E+07	3.34E+07	3.08E+07	3.73E+08	0.	4.49E+08	1.42E+07
I--130	3.93E+05	1.16E+06	1.48E+08	1.81E+06	0.	9.98E+05	4.58E+05
I--131	7.78E+07	1.12E+08	3.65E+10	1.91E+08	0.	2.94E+07	6.38E+07
I--132	5.57E+01	1.49E+02	1.96E+04	2.38E+02	0.	2.80E+01	5.29E+01
I--133	2.13E+06	3.69E+06	7.10E+08	6.44E+06	0.	3.24E+06	1.13E+06
I--134	1.03E-04	2.79E-04	3.63E-02	4.45E-04	0.	2.43E-07	9.99E-05
I--135	4.04E+04	1.07E+05	1.40E+07	1.70E+05	8.65E-03	1.19E+05	3.91E+04
CS-134	6.82E+08	1.62E+09	0.	5.26E+08	1.74E+08	2.84E+07	1.33E+09
CS-136	3.32E+07	1.31E+08	0.	7.29E+07	9.99E+06	1.49E+07	9.43E+07
CS-137	8.90E+08	1.22E+09	0.	4.14E+08	1.37E+08	2.34E+07	7.98E+08
BA-140	1.03E+08	1.35E+05	0.	4.39E+04	7.38E+04	6.65E+08	6.77E+06
CE-141	7.16E+04	4.85E+04	0.	2.25E+04	0.	1.85E+08	5.49E+03
CE-144	5.19E+06	2.17E+06	0.	1.29E+06	0.	1.75E+09	2.78E+05

Based on 1 μCi/sec release rate of each isotope in and a value of 1. for X/Q, depleted X/Q and relative deposition

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TABLE M-1

Selecting the Appropriate Long Term (X/Q) for Dose Calculations Involving Noble Gases for:

(1) Total Body dose from instantaneous releases

(2) Skin dose from instantaneous releases

(3) Gamma air dose (cumulative)

(4) Beta air dose (cumulative)

<table>
<tr><th>TYPE OF DOSE CALCULATION</th><th>LIMITING RANGE (miles)</th><th>LIMITING Sector</th><th>(X/Q) VALUE sec/m^3</th></tr>
<tr><td>Instantaneous</td><td>0.97</td><td>NW</td><td>1.6 X 10^{-6}</td></tr>
<tr><td>1/31 days</td><td>0.97</td><td colspan="2" rowspan="3">1. Normally (X/Q) = 1.6 X 10^{-6} sec/m^3

2. May use option of actual meteorological data for time of concern.</td></tr>
<tr><td>Quarterly
Yearly</td><td>0.97</td></tr>
<tr><td>12 Consecutive months</td><td>0.97</td></tr>
<tr><td>Annual Report</td><td>0.97</td><td>N/A</td><td>Note-1</td></tr>
</table>

NOTE 1
The (X/Q) has to be calculated based on actual meteorological data that occurred during the period of interest. The sector of interest is N/A because the limiting (X/Q) will be determined from the actual meteorological data and may occur in any sector.

0.97 miles Corresponds to the minimum site boundary distance in the north direction and 0.97 miles was chosen for all other sectors for ease of calculations when the averaging is done for quarterly reports.

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TABLE M-2

Selecting the Appropriate Long Term $(X/Q)_D$ or (D/Q) for Dose

Calculations Involving Radioiodines & 8 D Particulates for:

(1) Inhalation (2) Tritium (All gas pathways) (3) Ground Plane

TYPE OF DOSE CALCULATION	LIMITING RANGE (miles)	LIMITING SECTOR (OL)	$(X/Q)_D$ sec/m^3	(D/Q) 1/m^2
Instantaneous	0.97	NW	B 1.3×10^{-6}	
		WNW		8.2×10^{-9}
Annual Report	0.97	A	A, B	
	0.97	A		A
1/31 days, Qtr. yearly, Annual Total Dose	0.97	NW	B 1.3×10^{-6}	
	0.97	WNW		8.2×10^{-9}

(OL) Over land areas only

(A) To be determined by reduction of actual met data occurring during each quarter

(B) For Tritium in the Milk Animal Pathway, the $(X/Q)_D$ value should be that of the respective controlling sector and range where the Milk Animal is located as per Table M-3. Example: If a cow was located at 4.25 miles in NW sector, use the $(X/Q)_D$ for 4.25 miles NW.

ST. LUCIE PLANT
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TABLE M-3

Selecting the Appropriate Long Term (D/Q) for Dose Calculations Involving Radioiodines and 8D Particulates for Grass-Cow-Milk or Grass-Goat-Milk:

TYPE OF DOSE CALCULATION	LIMITING RANGE	LIMITING SECTOR	(D/Q) Value $1/m^2$
Release Rate	A	A	A
1/31 Days	B	B	B
Quarterly - Yearly	B	B	B
Annual (Calendar Year)	B	B	B
Annual Report	C	C	C

A. The worst cow or goat as per locations from land census. If no milk animal in any sector, assume a cow at 4.25 miles in the highest (D/Q) sector over land.

B. The historical (D/Q) of all land sectors with the worst cow or goat from each sector as reported in the Land Census. A 4.25 mile cow should be assumed in the worst sector over land when no milk animal is reported.

C. The highest (D/Q) at a milk animal location of all milk animals reported in the Land Census Report. (If no milk animals within 5 miles a 4.25 mile cow should be assumed in the sector having the highest (D/Q) at 4.25 miles over land). Actual Met Data should be used for the selection of the worst case milk animal and for the dose calculations. If both goat and milk animals are reported inside 5 miles, dose calculations should be performed on each animal and the higher dose animal contribution should be used.

The historical wind frequency fractions for each sector are listed in Table M-8.

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TABLE M-4
TERRAIN CORRECTION FACTORS

Florida Power & Light Company
St. Lucie Unit 1
Hutchinson Island, Florida
Dames and Moore Job No: 4598 - 112

Terrain Correction Factors (PUFF / STRAIGHT LINE)
Period of Record: 8/29/77 to 8/31/78
Base Distance in Miles/Kilometers

AFFECTED SECTOR	DESIGN DISTANCE MILES	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	1.906	1.576	1.465	1.404	1.338	1.318	1.334	1.386	1.346	1.338
NE	0.	1.887	1.581	1.461	1.391	1.310	1.259	1.164	1.128	1.101	1.116
ENE	0.	1.452	1.230	1.122	1.081	1.047	1.033	.941	.941	.906	.902
E	0.	1.662	1.425	1.277	1.193	1.151	1.123	1.097	1.121	1.123	1.122
ESE	0.	1.690	1.483	1.328	1.260	1.246	1.190	1.134	1.094	1.032	.968
SE	0.	1.818	1.691	1.470	1.427	1.435	1.361	1.366	1.331	1.279	1.239
SSE	0.	1.812	1.586	1.370	1.302	1.270	1.263	1.229	1.193	1.171	1.151
S	0.	1.398	1.321	1.125	1.083	1.108	1.127	1.073	1.063	1.047	1.024
SSW	0.	1.534	1.411	1.296	1.192	1.205	1.132	1.135	1.116	1.077	1.060
SW	0.	1.685	1.492	1.294	1.233	1.200	1.222	1.160	1.160	1.198	1.196
WSW	0.	1.620	1.333	1.210	1.173	1.082	1.091	1.099	1.056	1.034	1.004
W	0.	1.651	1.415	1.290	1.218	1.154	1.099	1.081	1.067	1.093	1.083
WNW	0.	1.720	1.430	1.267	1.185	1.150	1.133	1.125	1.085	1.033	1.045
NW	0.	1.681	1.407	1.257	1.173	1.119	1.078	1.063	.995	.998	.978
NNW	0.	1.739	1.488	1.316	1.212	1.172	1.122	1.135	1.080	1.099	1.091
N	0.	1.816	1.524	1.389	1.285	1.257	1.263	1.285	1.267	1.231	1.213

Note 1: Any interpolations between stated mileages will be done by log-log

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TABLE M-5
HISTORICAL LONG TERM - (X/Q) (Frequency corrected)

Terrain / Recirculation Adjusted Program ANNXOQ9 Version - 11/18/76

Florida Power & Light Company
St. Lucie Unit 1 Average Annual Relative Concentration (sec/cubic meter)
Hutchinson Island, Florida Period of Record: 9/1/76 to 8/31/78
Dames and Moore Job No: 1.4598 - 112 Base Distance in Miles/Kilometers

AFFECTED SECTOR	DESIGN DISTANCE MILES	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	1.1E-05	1.7E-06	7.8E-07	4.5E-07	3.1E-07	2.2E-07	1.7E-07	1.5E-07	1.2E-07	1.0E-07
NE	0.	1.3E-05	2.1E-06	8.9E-07	5.1E-07	3.4E-07	2.4E-07	1.7E-07	1.4E-07	1.1E-07	9.8E-08
ENE	0.	9.3E-06	1.4E-06	6.2E-07	3.7E-07	2.5E-07	1.9E-07	1.3E-07	1.1E-07	8.8E-08	7.5E-08
E	0.	9.8E-06	1.6E-06	6.5E-07	3.7E-07	2.5E-07	1.8E-07	1.4E-07	1.2E-07	9.9E-08	8.4E-08
ESE	0.	1.2E-05	1.9E-06	8.1E-07	4.8E-07	3.2E-07	2.4E-07	1.8E-07	1.4E-07	1.1E-07	9.0E-08
SE	0.	1.4E-05	2.4E-06	9.7E-07	5.7E-07	4.0E-07	2.9E-07	2.3E-07	1.9E-07	1.4E-07	1.2E-07
SSE	0.	1.1E-05	1.7E-06	7.3E-07	4.3E-07	2.9E-07	2.1E-07	1.6E-07	1.3E-07	1.1E-07	9.1E-08
S	0.	6.2E-06	1.0E-06	4.2E-07	2.5E-07	1.8E-07	1.4E-07	1.0E-07	8.0E-08	6.6E-08	5.5E-08
SSW	0.	5.7E-06	9.0E-07	4.0E-07	2.3E-07	1.6E-07	1.1E-07	8.9E-08	7.0E-08	5.7E-08	4.8E-08
SW	0.	6.1E-06	9.4E-07	3.9E-07	2.2E-07	1.6E-07	1.1E-07	8.6E-08	7.0E-08	6.0E-08	5.1E-08
WSW	0.	7.3E-06	1.1E-06	4.6E-07	2.7E-07	1.7E-07	1.3E-07	1.0E-07	8.0E-08	6.5E-08	5.4E-08
W	0.	7.6E-06	1.2E-06	5.2E-07	2.9E-07	2.0E-07	1.3E-07	1.0E-07	8.4E-08	7.2E-08	6.1E-08
WNW	0.	1.4E-05	2.1E-06	9.1E-07	5.2E-07	3.4E-07	2.6E-07	2.0E-07	1.5E-07	1.2E-07	1.0E-07
NW	0.	1.6E-05	2.4E-06	1.0E-06	5.9E-07	3.9E-07	2.8E-07	2.1E-07	1.7E-07	1.4E-07	1.2E-07
NNW	0.	1.5E-05	2.2E-06	9.6E-07	5.5E-07	3.6E-07	2.6E-07	2.0E-07	1.6E-07	1.3E-07	1.2E-07
N	0.	9.1E-06	1.4E-06	6.3E-07	3.6E-07	2.4E-07	1.8E-07	1.4E-07	1.2E-07	9.4E-08	7.9E-08

Number of Valid Observations = 17135 Number of Calms Lower Level = 95
Number of Invalid Observations = 385 Number of Calms Upper Level = 0
Note 1 - Any interpolations between stated mileages will be done by log-log

ST. LUCIE PLANT
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OFFSITE DOSE CALCULATION MANUAL (ODCM)

TABLE M-6
HISTORICAL LONG TERM DEPLETED - $(X/Q)_D$ (Frequency corrected)
Terrain / Recirculation Adjusted Program ANNXOQ9 Version - 11/18/76

Florida Power & Light Company
St. Lucie Unit 1 Average Annual Relative Concentration Depleted (sec/cubic meter)
Hutchinson Island, Florida Period of Record: 9/1/76 to 8/31/78
Dames and Moore Job No: 4598 - 112 Base Distance in Miles/Kilometers

AFFECTED SECTOR	DESIGN DISTANCE MILES	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	1.1E-05	1.6E-06	6.6E-07	3.8E-07	2.4E-07	1.7E-07	1.3E-07	1.1E-07	9.2E-08	7.6E-08
NE	0.	1.2E-05	1.7E-06	7.6E-07	4.3E-07	2.8E-07	1.9E-07	1.4E-07	1.1E-07	8.6E-08	7.4E-08
ENE	0.	8.9E-06	1.2E-06	5.3E-07	3.0E-07	2.0E-07	1.4E-07	1.0E-07	8.4E-08	6.6E-08	5.6E-08
E	0.	9.1E-06	1.3E-06	5.6E-07	3.1E-07	2.1E-07	1.5E-07	1.1E-07	9.1E-08	7.5E-08	6.3E-08
ESE	0.	1.2E-05	1.6E-06	6.9E-07	3.9E-07	2.6E-07	1.9E-07	1.4E-07	1.1E-07	8.5E-08	6.7E-08
SE	0.	1.3E-05	2.0E-06	8.2E-07	4.7E-07	3.3E-07	2.3E-07	1.8E-07	1.3E-07	1.1E-07	9.0E-08
SSE	0.	1.1E-05	1.6E-06	6.3E-07	3.5E-07	2.4E-07	1.8E-07	1.4E-07	1.0E-07	8.2E-08	6.8E-08
S	0.	5.9E-06	9.1E-07	3.6E-07	2.1E-07	1.4E-07	1.1E-07	7.7E-08	6.2E-08	5.0E-08	4.1E-08
SSW	0.	5.4E-06	8.0E-07	3.4E-07	1.9E-07	1.3E-07	8.9E-08	6.9E-08	5.5E-08	4.3E-08	3.6E-08
SW	0.	5.7E-06	8.4E-07	3.4E-07	1.8E-07	1.2E-07	9.2E-08	6.7E-08	5.3E-08	4.6E-08	3.8E-08
WSW	0.	7.0E-06	9.6E-07	4.0E-07	2.2E-07	1.4E-07	1.0E-07	8.0E-08	6.1E-08	5.0E-08	4.0E-08
W	0.	7.3E-06	1.1E-06	4.4E-07	2.4E-07	1.6E-07	1.1E-07	8.2E-08	6.4E-08	5.5E-08	4.4E-08
WNW	0.	1.3E-05	1.9E-06	7.9E-07	4.4E-07	2.9E-07	2.0E-07	1.6E-07	1.2E-07	9.3E-08	7.8E-08
NW	0.	1.5E-05	2.1E-06	8.9E-07	4.9E-07	3.1E-07	2.3E-07	1.7E-07	1.3E-07	1.0E-07	8.5E-08
NNW	0.	1.4E-05	2.1E-06	8.3E-07	4.5E-07	2.9E-07	2.0E-07	1.6E-07	1.2E-07	1.0E-07	8.6E-08
N	0.	8.7E-06	1.3E-06	5.4E-07	3.0E-07	2.0E-07	1.4E-07	1.1E-07	8.9E-08	7.0E-08	5.8E-08

Number of Valid Observations = 17135 Number of Calms Lower Level = 95
Number of Invalid Observations = 385 Number of Calms Upper Level = 0
Note 1 - Any interpolations between stated mileages will be done by log-log

ST. LUCIE PLANT
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OFFSITE DOSE CALCULATION MANUAL (ODCM)

TABLE M-7
HISTORICAL LONG TERM - (D/Q) (Frequency corrected)
TERRAIN / RECIRCULATION ADJUSTED PROGRAM ANNXOQ9 VERSION - 11/18/76

Florida Power & Light Company
St. Lucie Unit 1
Hutchinson Island, Florida
Dames and Moore Job No: 4598 - 112

Average Annual Relative Deposition Rate (square meter - 1)
Period of Record: 9/1/76 to 8/31/78
Base Distance in Miles/Kilometers

AFFECTED SECTOR	DESIGN DISTANCE MILES	.25 .40	.75 1.21	1.25 2.01	1.75 2.82	2.25 3.62	2.75 4.42	3.25 5.23	3.75 6.03	4.25 6.84	4.75 7.64
NNE	0.	6.5E-08	9.3E-09	3.7E-09	2.1E-09	1.3E-09	9.0E-10	6.8E-10	5.5E-10	4.3E-10	3.5E-10
NE	0.	6.0E-08	8.9E-09	3.5E-09	1.9E-09	1.2E-09	8.1E-10	5.6E-10	4.3E-10	3.3E-10	2.8E-10
ENE	0.	3.2E-08	4.8E-09	1.9E-09	1.0E-09	6.6E-10	4.6E-10	3.2E-10	2.4E-10	1.9E-10	1.5E-10
E	0.	3.0E-08	4.6E-09	1.8E-09	9.5E-10	6.0E-10	4.2E-10	3.1E-10	2.5E-10	2.0E-10	1.6E-10
ESE	0.	3.7E-08	5.8E-09	2.3E-09	1.2E-09	8.0E-10	5.4E-10	3.9E-10	3.0E-10	2.2E-10	1.7E-10
SE	0.	6.4E-08	1.0E-08	4.0E-09	2.1E-09	1.4E-09	9.7E-10	7.2E-10	5.6E-10	4.3E-10	3.5E-10
SSE	0.	6.2E-08	9.5E-09	3.6E-09	2.0E-09	1.2E-09	8.7E-10	6.4E-10	4.9E-10	3.9E-10	3.1E-10
S	0.	4.2E-08	7.0E-09	2.6E-09	1.4E-09	9.5E-10	6.9E-10	4.9E-10	3.8E-10	3.0E-10	2.5E-10
SSW	0.	3.4E-08	5.4E-09	2.2E-09	1.1E-09	7.5E-10	5.0E-10	3.7E-10	2.9E-10	2.3E-10	1.8E-10
SW	0.	4.5E-08	7.0E-09	2.6E-09	1.5E-09	9.0E-10	6.6E-10	4.6E-10	3.6E-10	3.0E-10	2.5E-10
WSW	0.	5.3E-08	7.7E-09	3.0E-09	1.6E-09	1.0E-09	7.3E-10	5.5E-10	4.1E-10	3.3E-10	2.6E-10
W	0.	5.0E-08	7.5E-09	3.0E-09	1.6E-09	9.8E-10	6.7E-10	5.0E-10	3.8E-10	3.2E-10	2.6E-10
WNW	0.	8.8E-08	1.3E-08	4.9E-09	2.6E-09	1.7E-09	1.1E-09	8.7E-10	6.6E-10	5.1E-10	4.2E-10
NW	0.	8.2E-08	1.2E-08	4.7E-09	2.5E-09	1.6E-09	1.1E-09	7.9E-10	5.8E-10	4.7E-10	3.8E-10
NNW	0.	8.2E-08	1.2E-08	4.6E-09	2.4E-09	1.5E-09	1.1E-09	8.1E-10	5.9E-10	4.8E-10	4.0E-10
N	0.	5.1E-08	7.3E-09	2.9E-09	1.5E-09	9.8E-10	7.1E-10	5.4E-10	4.2E-10	3.2E-10	2.7E-10

Number of Valid Observations = 17135 Number of Calms Lower Level = 95
Number of Invalid Observations = 385 Number of Calms Upper Level = 0
Note 1 - Any interpolations between stated mileages will be done by log-log

ST. LUCIE PLANT
CHEMISTRY OPERATING PROCEDURE NO. C-200, REVISION 23A
OFFSITE DOSE CALCULATION MANUAL (ODCM)

TABLE M-8

Joint Wind Frequency Distribution Data Period: September 1, 1976 - August 31, 1978

All Winds
Data Source: On-Site
Wind Sensor Height 10.00 Meters
Table Generated: 12/05/78. 07.42.18.

St. Lucie Unit 2
Hutchinson Island, Florida
Florida Power & Light Co.
Dames and Moore Job No: 4598 - 112 - 27

Wind Speed Categories (Meters per Second)

WIND SECTOR	0.0-1.5	1.5-3.0	3.0-5.0	5.0-7.5	7.5-10.0	>10.0	TOTAL[1]	MEAN SPEED
NNE	71 .43	206 1.25	318 1.92	71 .43	3 .02	0 0.00	669 4.05	3.32
NE	62 .38	292 1.77	385 2.33	128 .77	0 0.00	0 0.00	867 5.25	3.43
ENE	60 .36	334 2.02	505 3.06	158 .96	0 0.00	0 0.00	1057 6.40	3.51
E	69 .42	355 2.15	510 3.09	76 .46	0 0.00	0 0.00	1010 6.11	3.25
ESE	115 .70	684 4.14	744 4.50	72 .44	1 .01	0 0.00	1616 9.78	3.04
SE	183 1.11	660 3.99	749 4.53	28 .17	0 0.00	0 0.00	1620 9.81	2.88
SSE	129 .78	579 3.50	656 3.97	93 .56	1 .01	0 0.00	1458 8.82	3.10
S	72 .44	310 1.88	407 2.46	99 .60	8 .05	1 .01	897 5.43	3.36
SSW	84 .51	372 2.25	446 2.70	105 .64	33 .20	4 .02	1044 6.32	3.48
SW	129 .78	440 2.66	336 2.03	106 .64	14 .08	0 0.00	1025 6.20	3.10
WSW	155 .94	320 1.94	186 1.13	29 .18	5 .03	0 0.00	695 4.21	2.59
W	174 1.05	267 1.62	119 .72	37 .22	2 .01	0 0.00	599 3.63	2.43
WNW	203 1.23	304 1.84	172 1.04	17 .10	0 0.00	0 0.00	696 4.21	2.34
NW	143 .87	518 3.14	424 2.57	50 .30	0 0.00	0 0.00	1135 6.87	2.85
NNW	85 .51	379 2.29	535 3.24	70 .42	1 .01	0 0.00	1070 6.46	3.22
N	91 .55	194 1.17	531 3.21	148 .90	5 .03	0 0.00	969 5.86	3.69
CALM	95 .57						95 .57	CALM
TOTAL	1920 11.62	6214 37.61	7023 42.51	1287 7.79	73 .44	5 .03	16522 100.00	3.10

NUMBER OF VALID OBSERVATIONS	16522	94.30 PCT.	Key	XXX Number of Occurrences
NUMBER OF INVALID OBSERVATIONS	988	5.70 PCT.		XXX Percent Occurrences
TOTAL NUMBER OF OBSERVATIONS	17520	100.00 PCT.		

[1] - Totals below are given in hours & percent for wind frequency by sectors

ST. LUCIE PLANT
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OFFSITE DOSE CALCULATION MANUAL (ODCM)

APPENDIX B
RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE
ST. LUCIE PLANT
Key to Sample Locations

PATHWAY	LOCATION	DESCRIPTION	SAMPLES COLLECTED	SAMPLE COLLECTION FREQUENCY	APPROXIMATE DISTANCE (miles)	DIRECTION SECTOR
Direct Radiation	N-1	North of Blind Creek	TLD	Quarterly	1	N
Direct Radiation	NNW-5	South of Pete Stone Creek	TLD	Quarterly	5	NNW
Direct Radiation	NNW-10	C. G. Station	TLD	Quarterly	9	NNW
Direct Radiation	NW-5	Indian River Drive at Rio Vista Drive	TLD	Quarterly	6	NW
Direct Radiation	NW-10	Intersection of SR 68 and SR 607	TLD	Quarterly	10	NW
Direct Radiation	WNW-2	Cemetery South of 7107 Indian River Drive	TLD	Quarterly	3	WNW
Direct Radiation	WNW-5	US-1 at SR 712	TLD	Quarterly	5	WNW
Direct Radiation	WNW-10	SR 70, West of Turnpike	TLD	Quarterly	10	WNW
Direct Radiation	W-2	7609 Indian River Drive	TLD	Quarterly	2	W
Direct Radiation	W-5	Oleander and Sager Streets	TLD	Quarterly	5	W
Direct Radiation	W-10	I-95 and SR 709	TLD	Quarterly	9	W
Direct Radiation	WSW-2	8503 Indian River Drive	TLD	Quarterly	2	WSW
Direct Radiation	WSW-5	Prima Vista Blvd. at Yacht Club	TLD	Quarterly	5	WSW
Direct Radiation	WSW-10	Del Rio and Davis Streets	TLD	Quarterly	10	WSW
Direct Radiation	SW-2	9207 Indian River Drive	TLD	Quarterly	2	SW
Direct Radiation	SW-5	US 1 and Village Green Drive	TLD	Quarterly	5	SW
Direct Radiation	SW-10	Port St. Lucie Blvd. and Cairo Road	TLD	Quarterly	10	SW
Direct Radiation	SSW-2	10307 Indian River Drive	TLD	Quarterly	3	SSW

ST. LUCIE PLANT
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OFFSITE DOSE CALCULATION MANUAL (ODCM)

APPENDIX B
RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE
(continued)
ST. LUCIE PLANT
Key to Sample Locations

PATHWAY	LOCATION	DESCRIPTION	SAMPLES COLLECTED	SAMPLE COLLECTION FREQUENCY	APPROXIMATE DISTANCE (miles)	DIRECTION SECTOR
Direct Radiation	SSW-5	Port St. Lucie Blvd. and US 1	TLD	Quarterly	6	SSW
Direct Radiation	SSW-10	Pine Valley and Westmoreland Roads	TLD	Quarterly	8	SSW
Direct Radiation	S-5	13179 Indian River Drive	TLD	Quarterly	5	S
Direct Radiation	S-10	US 1 and SR 714	TLD	Quarterly	10	S
Direct Radiation	S/SSE-10	Indian River Drive and Quail Run Lane	TLD	Quarterly	10	SSE
Direct Radiation	SSE-5	Entrance of Nettles Island	TLD	Quarterly	5	SSE
Direct Radiation	SSE-10	Elliot Museum	TLD	Quarterly	10	SSE
Direct Radiation	SE-1	South of Cooling Canal	TLD	Quarterly	1	SE
Direct Radiation	*H-32	U. of Florida - 1FAS Entomology Lab Vero Beach	TLD	Quarterly	19	NNW
Airborne	H08	FPL Substation - Weatherby Road	Radioiodine & Particulates	Weekly	6	WNW
Airborne	*H12	FPL Substation - SR 76, Stuart	Radioiodine & Particulates	Weekly	12	S
Airborne	H14	Onsite - near south property line	Radioiodine & Particulates	Weekly	1	SE
Airborne	H30	Power Line - 7609 Indian River Drive	Radioiodine & Particulates	Weekly	2	W

*Denotes Control Sample

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APPENDIX B
RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE
(continued)
ST. LUCIE PLANT
Key to Sample Locations

PATHWAY	LOCATION	DESCRIPTION	SAMPLES COLLECTED	SAMPLE COLLECTION FREQUENCY	APPROXIMATE DISTANCE (miles)	DIRECTION SECTOR
Airborne	H34	Onsite - At Meteorological Tower	Radioiodine & Particulates	Weekly	0.5	N
Waterborne	H15	Atlantic Ocean vicinity of public beaches east side of Route A1A	Surface Water (ocean) Sediment from shoreline	Weekly Semi-Annually	< 1	ENE/E/ESE
Waterborne	*H59	Near south end of Hutchinson Island	Surface Water (ocean) Sediment from shoreline	Monthly Semi-Annually	10-20	S/SSE
Food Products	H15	Ocean side vicinity of St. Lucie Plant (NOTE 1)	Crustacea Fish	Semi-Annually Semi-Annually	<1	ENE/E/ESE
Food Products	H51	Offsite near north property line	Broad Leaf vegetation (mangrove)	Monthly (when available)	1	N/NNW

*Denotes control sample

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APPENDIX B
RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE
(continued)
ST. LUCIE PLANT
Key to Sample Locations

PATHWAY	LOCATION	DESCRIPTION	SAMPLES COLLECTED	SAMPLE COLLECTION FREQUENCY	APPROXIMATE DISTANCE (miles)	DIRECTION SECTOR
Food Products	H52	Offsite near south property line	Broad leaf vegetation (mangrove)	Monthly (when available)	1	S/SSE
Food Products	*H59	Near south end of Hutchinson Island	Crustacea Fish Broad leaf vegetation (mangrove)	Semi-Annually Semi-Annually Monthly	10-20	S/SSE
Food Products	WSW 3.5	Goat Milk per land use census (2000) off east end of Tilton Road	Milk	Quarterly (when available)	3.5	WSW

/R23

*Denotes control sample

It is the policy of Florida Power & Light Company (FPL) that the St. Lucie 1 & 2 Radiological Environmental Monitoring Programs are conducted by the State of Florida Department of Health and Rehabilitative Services (DHRS), pursuant to an Agreement between FPL and DHRS and; that coordination of the Radiological Environmental Monitoring Programs with DHRS and compliance with the Radiological Environmental Monitoring Program Controls are the responsibility of the Nuclear Energy Services Department.

NOTE 1
These samples may be collected from or supplemented by samples collected from the plant intake canal if the required analyses are unable to be performed due to unavailability or inadequate quantity of sample from the ocean side location.

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FIGURE 1-1
SITE AREA MAP & ENVIRONMENTAL SAMPLE LOCATIONS

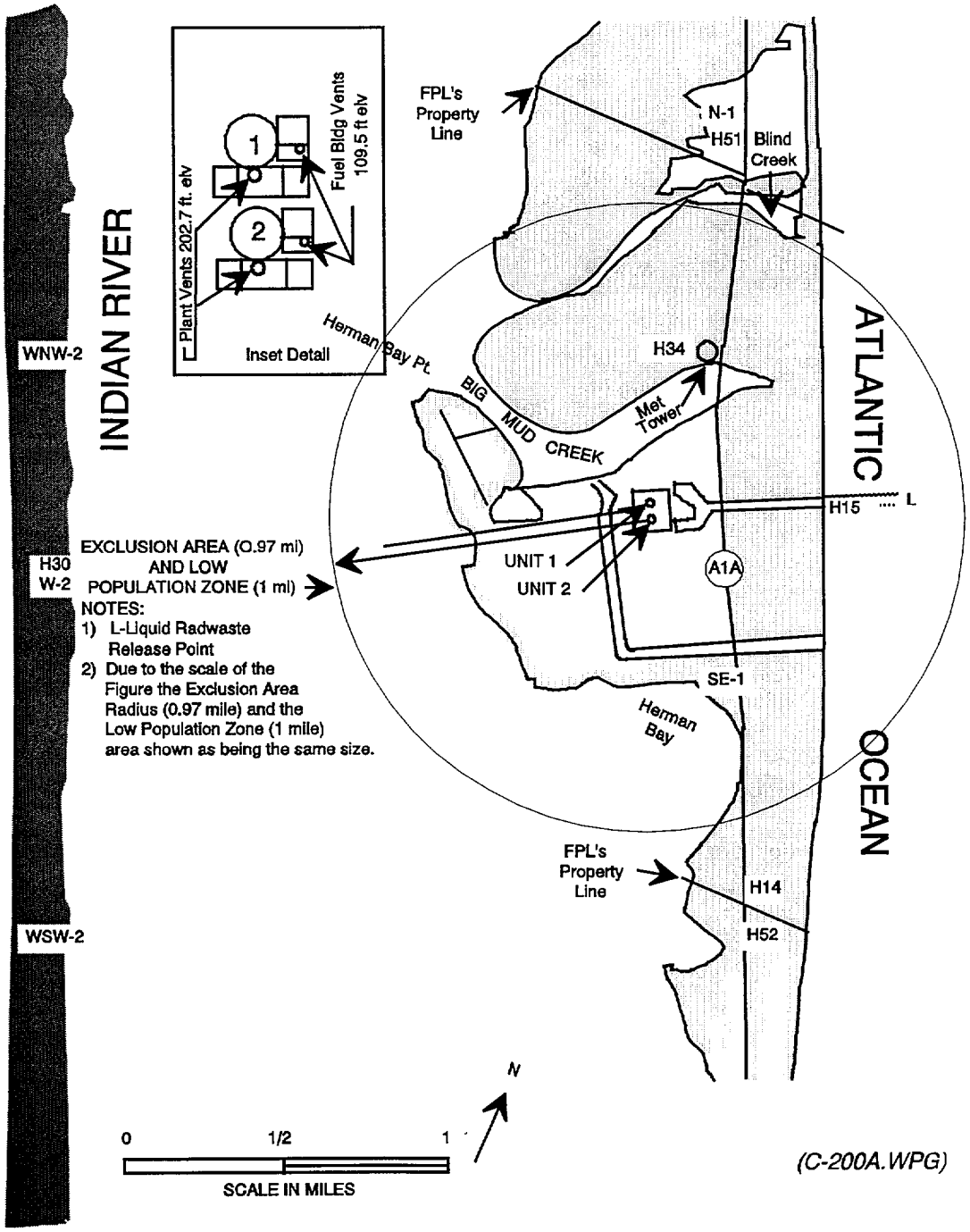

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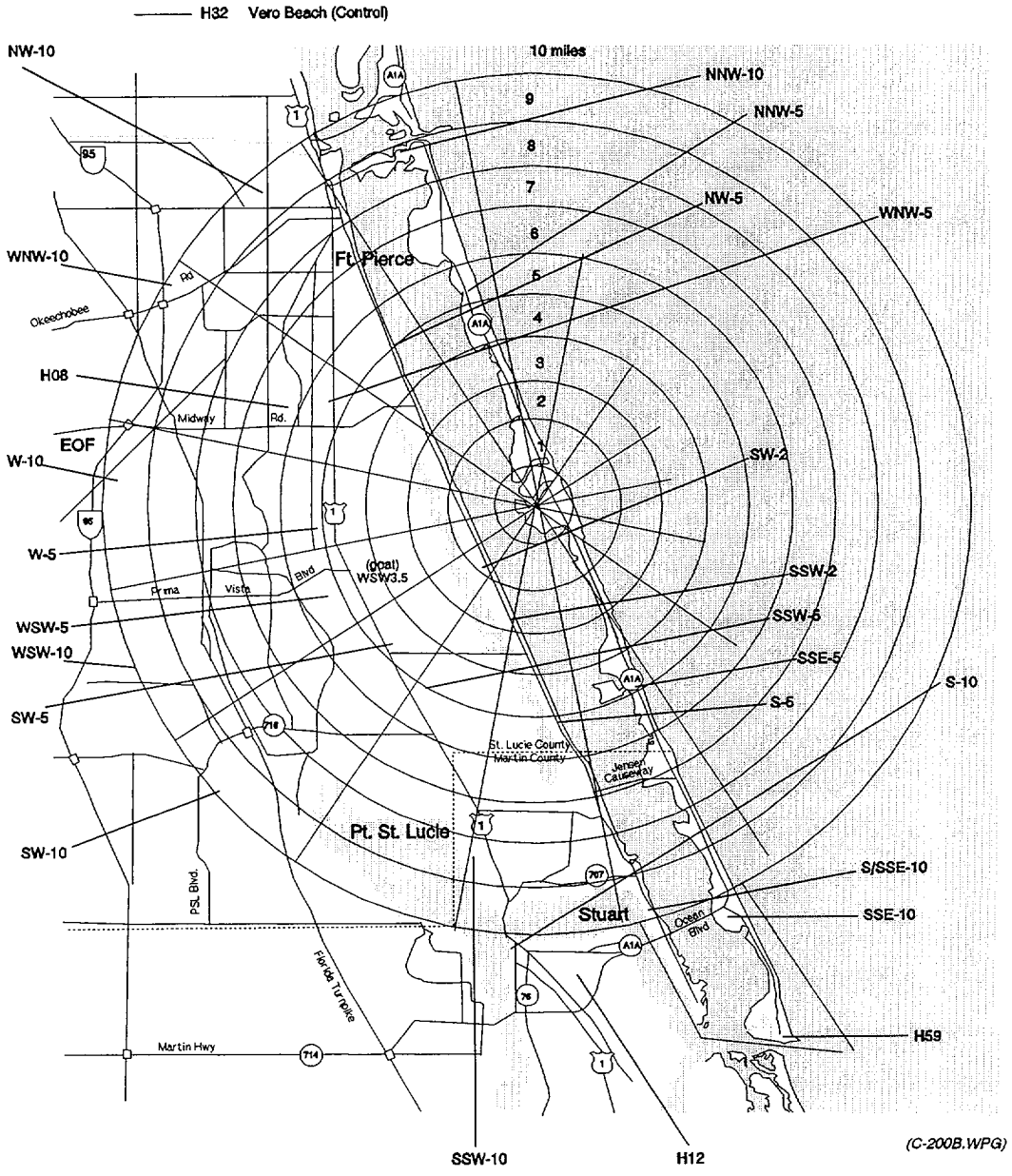
FIGURE 1-2
ENVIRONMENTAL SAMPLE LOCATIONS (10 MILES)



/R23

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APPENDIX C
METEOROLOGICAL DISPERSION FORMULAS*

For X/Q:

$$X/Q = \frac{2.032}{\bar{(u)}D\sqrt{(\sigma_z^2 + \frac{cV^2}{\pi})}} \qquad \text{EQ (1)}$$

$$X/Q = \frac{2.032}{\sqrt{3}\ \sigma_z\ \bar{(u)}D} \qquad \text{EQ (2)}$$

Where:

C = .5

V = 207.5 ft. (63.2 meters)

$(\bar{u})$ = a name for one term

X/Q was calculated using each of the above EQs for each hour. The highest X/Q from EQ (1) or EQ (2) was selected. The total integrated relative concentration at each sector and distance was then divided by the total number of hours in the data base.

* Terrain correction factors given by Table M-4 were also applied to Dispersion Formulas

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APPENDIX C
METEOROLOGICAL DISPERSION FORMULAS*
(continued)

For Depleted X/Q:

$(X/Q)_D$ = (X/Q) X (Depletion factor of Figure 2 of R.G. 1.111-R1)

For Deposition (D/Q):

D/Q = RDep/(2 sin [11.25] X) X (Freq. distribution)

Where:

D/Q = Ground deposition rate

X = Calculation distance

RDep = Relative ground deposition rate from Figure 6 of R.G. 1.111, R1

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APPENDIX D
DESCRIPTION OF THE INTERLABORATORY COMPARISON PROGRAM (ICP)

(Page 1 of 2)

The State of Florida, Department of Health-Bureau of Radiation Control (BRC) Laboratory shall participate in an INTERLABORATORY COMPARISON PROGRAM.

1. The sample matrices and analytical methods shall be:

   A. Gamma isotopic on a filter sample simulating airborne radioiodine and particulate collection.

   B. Gamma isotopic on a water sample simulating a surface water grab sample.

   C. Gamma isotopic on either sediment (or soil) or broad leaf vegetation.

NOTE
Steps D, E and F reference NRC IR 99-04, PMAI 99-0716.

   D. Gross Beta on an Air Filter matrix.

   E. Tritium in water, using method employed in REMP.

   F. Strontium-89 and Strontium-90 in water medium if milk samples are being obtained per land use census identified milk animals within 5 miles of the plant site.

2. The source of samples for this program:

   A. A Federal Government Laboratory Program (e.g., DOE-LAP, EPA Safe Drinking Water Program)

   B. A State, Federal, or private (commercial) laboratory capable of providing NIST traceable samples. To be eligible, a Commercial Laboratory shall meet the FPL Quality Assurance criteria of "Quality Related".

   C. For Gamma Analysis only, a FPL Nuclear Site Laboratory may prepare sample matrices using known quantities of radioactivity from isotopes provided by a FPL Contract Laboratory currently approved as PC-1 Level vendor. These prepared matrices may be prepared by the vendor, or by FPL personnel, but shall not exceed the participant(s) form and/or license quantities for allowed radioactivity.

APPENDIX D
DESCRIPTION OF THE INTERLABORATORY COMPARISON PROGRAM (ICP)

(Page 2 of 2)

3. Analysis of Matrix samples shall be capable of achieving ODCM Table 4.12-1 prescribed LLDs on a blank sample.

4. Results within 20% of expected shall be considered acceptable. Results exceeding 20% but within 35% require a description of probable cause and actions performed to bring the analysis into conformance. Results exceeding 35% are considered Not Acceptable; the Matrix shall be replaced and reanalyzed.

5. The frequency for performing the interlaboratory comparison program shall be annually with a maximum of 15 months between comparisons of similar matrices.

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT # 1 & 2
ANNUAL REPORT
JANUARY 1, 2001 THROUGH DECEMBER 31, 2001

ATTACHMENT - C

ODCM Revision 22 and 23
(Marked Up Pages)

FPL	ST. LUCIE PLANT CHEMISTRY OPERATING PROCEDURE SAFETY RELATED	Procedure No. C-200 Current Rev. No. 23 Effective Date: 02/20/01

Title:

OFFSITE DOSE CALCULATION MANUAL (ODCM)

Responsible Department: CHEMISTRY

MASTER COPY

Revision Summary

Revision 23 - Specified presure loss criteria, added actions 37 for the S/G Blowdown Radioactivity Monitor to meet the expectation of the new EPRI industry standard, ensured grab samples will be taken, included Carbon-14 & Nickel-63 in liquid sampling/analysis, changed gaseous continuous vent release pathway, standardized St. Lucie with Turkey Points ODCM wording, included gaot (milk) animal to the Radiological Environmental Monitoring Program, and included new dose conversion factors. (R. E. Cox, 01/19/01)

Revision 22 - Unit 2 Tech Spec Amendment 105 adopting the same Dose Equivalent Iodine-131 definition as Unit 1. (R.E. Cox, 04/20/00)

Revision 21 - Changed C-72 to COP-01.06, changed definition of Dose Equivalent I-131, explained why certain checks are not performed and identified rain run off, overflow of settling basins and storm preparation as NPDES permitted pathways. (R. E. Cox, 09/30/99)
AND
Changed C-72 to COP-01.06. (Jim George, 09/30/99)

Revision 20B - Changed C-70 to COP-01.05. (R. Cox, 07/13/99)

Revision 20A - Changed reference of C-70 to COP-01.05. (Ed Meyer, 05/21/99)

Revision	FRG Review Date	Approved By	Approval Date
0	04/22/82	C. M. Wethy Plant General Manager	04/27/82
23	01/18/01	R. G. West Plant General Manager	01/19/01
		N/A Designated Approver	
		N/A Designated Approver (minor correction)	

S 1 OPS
DATE
DOCT PROCEDURE
DOCN C-200
SYS
COMP ~~COMPLETED~~
ITM 23

Attachment – A
Explanation of Changes to C-200 ODCM
(Page 1 of 2)

Page 13 and 14
Specifying pressure loss criteria that define an Unplanned Release for a Gas Decay Tank is based on a leak that occurred over 5 months at varying pressure rate drops from 0.4 to 2.3 psig in an 8 hour interval. Since the activity concentration was low, normal plant monitoring channels could not detect these leaks. Implementing the pressure loss limits provides a measurable indicator to attempt to prevent a reoccurrence. Administrative limits are being implemented in Operations procedures that require action(leak searching) prior to reaching the GDT Unplanned Release Limit for pressure drop rate. The implementation of the limit provides clarification of the current ODCM Definition of what constitutes an Unplanned Release with regard to Gas Decay Tanks, and help ensure operation of the Gas Waste System will meet the FUSAR's design criteria for adequate hold up decay of waste gas.

Page 19, 20, and 20A
The addition of ACTIONs 37 for the Steam Generator(S/G) Blowdown Radioactivity Monitor is to meet the expectation of the new EPRI Industry Standard for detection of primary-to secondary leaks if a monitor is INOPERABLE. The MODE and S/G conditions are specified to denote the instances when there is water and driving force available to obtain a grab sample.

Page 24, 26, and 26A
ACTION 48 for the Air Ejector(Aej)Monitor OOS ensures that grab samples will be taken even when the Aej exhaust is aligned to the Plant Vent(Monitored pathway), which is very conservative exemption currently allowed by the ODCM. The purpose is to ensure that grab samples will be exemption currently allowed by the ODCM. The purpose is to ensure that grab samples will be able to able to compared to the provide detection of a primary-to-secondary leak of 5 gallons per day when the Aej Monitor is OOS. This meets the new EPRI Industry Standard which is the only reason this ACTION statement is being added. The MODES are specified to exempt sampling requirements when there is no Steam flow to the condenser.

Page 34
Including Carbon-14 and Nickel-63 in liquid sampling/analysis and dose accounting is voluntary to respond to an INPO assist visit observation. Dose factors for these nuclides were originally calculated with the existing ODCM nuclides. The assumptions used for these dose factors were included with the Rev 0 documentation to Nuclear Records in 1982. Since ODCM Rev 0 used NUREG 0133 allowed site ODCM default values for pathways, there are no site specific factors to evaluate.

Page 40
Changing Gaseous Continuous Vent release pathway alpha analysis from a composite sample to a four times per month(4/M) analysis eliminates the need for compositing the sampling medium(filter paper). Monthly compositing is deferring weekly analysis to perform a single analysis from proportional parts of the weekly filters. Requiring 4 per month sampling and analysis dictates that the analysis will be performed on the weekly sample. This is more conservative than performing a deferred monthly composite analysis.

Attachment – A
Explanation of Changes to C-200 ODCM
(Page 2 of 2)

Page 51
The Met Data usage revision standardizes St. Lucie with Turkey Points ODCM wording. This allows historical Met Data usage for annual reports when it can be shown that a reporting year is analyzed and found to be similar to previously calculated years, including the existing historical met data in the ODCM tables. The ODCM Annual Report Control requires that the source of the met data, used to calculate dose, be identified in the Annual Report.

Page 55
The inclusion of a Goat (milk) animal to the Radiological Environmental Monitoring Program is a result of a ODCM Control required surveillance(Land Use Census) to annually survey within the 5 mile radius of the plant. When animals are located in a sector, they are required to be identified, in the ODCM. This revision is required by the ODCM itself.

Page 96
Same as Page 51, to have consistent wording.

Page 154
Include new nuclides (from Page 34) in appropriate table with 10CFR20 Effluent Concentration Limits.

Page 155, 160, and 164
Include new dose conversion factors for new nuclides(from page 34) into ADULT, TEEN, and CHILD liquid pathway tables.

Page 221 and 222
Same as Page 55, but put animal in Sample Location Table, and show location on Page 222 map.

ST. LUCIE PLANT
CHEMISTRY OPERATING PROCEDURE NO. C-200, REVISION 22
OFFSITE DOSE CALCULATION MANUAL (ODCM)

1.0 DEFINITIONS for CONTROLS SECTION OF ODCM

SITE BOUNDARY

1.30 SITE BOUNDARY means that line beyond which the land or property is not owned, leased or otherwise controlled by the licensee.

SOURCE CHECK

1.31 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

THERMAL POWER

1.33 THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

UNPLANNED RELEASE

1.34 **UNPLANNED RELEASE** is the unintended discharge of a volume of liquid or airborne radioactivity to the environment. The following guidance is presented to classify differences between unplanned releases and other releases that are not considered as an **UNPLANNED RELEASE**:

Is an **UNPLANNED RELEASE** if:

1. The wrong waste gas decay tank or liquid radwaste release tank is released off site.

2. Failure of process system to automatically divert a process stream to a radioactive treatment system upon radioactivity being present in the process at the detection level or at a certain level of activity, and the result is a discharge off site occurs.

3. Large losses from unexpected pipe or valve leaks where the resulting loss of radioactive material to off site such that a 10 CFR Part 50.72 or 10 CFR Part 50.73 report is required.

4. For Gas Decay Tanks, If a Gas Decay Tank loses greater than 2 psig per 8 hours for 3 consecutive shifts, or 18 psig in 72 hours, AND the losses were determined to be to the Reactor Auxiliary Building Atmosphere then declare the losses as an UNPLANNED RELEASE (Reference ~~CR-2038~~) CR 00-2038)

ST. LUCIE PLANT
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1.0 DEFINITIONS for CONTROLS SECTION OF ODCM

UNPLANNED RELEASE (continued)

1.34 (continued)

Is not an **UNPLANNED RELEASE** if:

1. It cannot be shown that the release went off site, i.e., gas went to another part of the system(s) that contained the loss.

2. Normal losses through the Plant Vent due to valve and pipe leakage and purging activities to make the system safe for maintenance activities. ~~Pressures drops in Gas Decay Tank(s) due to thermal cooling, shifting the Gas Analyzer sampling point, Chemistry Grab Sampling, or planned maintenance activities are not an UNPLANNED RELEASE.~~ Rev

UNRESTRICTED AREA

1.35 UNRESTRICTED AREA means an area, access to which is neither limited nor controlled by the licensee.

VENTILATION EXHAUST TREATMENT SYSTEM

1.39 A VENTILATION EXHAUST TREATMENT SYSTEM shall be 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 absorbers 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 Features Atmospheric Cleanup Systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

ST. LUCIE PLANT
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OFFSITE DOSE CALCULATION MANUAL (ODCM)

TABLE 3.3-12

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	ACTION
1. Radioactivity Monitors Providing Alarm and Automatic Termination of Release		
a) Liquid Radwaste Effluent Line	1	35
b) Steam Generator Blowdown Effluent Line	1/SG	36, 37
2. Flow Rate Measurement Devices		
a) Liquid Radwaste Effluent Line	N.A.	38
b) Discharge Canal	N.A.	38
c) Steam Generator Blowdown Effluent Lines	N.A.	38

Rev

SG - Denotes Steam Generator

ST. LUCIE PLANT
CHEMISTRY OPERATING PROCEDURE NO. C-200, REVISION 22
OFFSITE DOSE CALCULATION MANUAL (ODCM)

TABLE 3.3-12 (Continued)

ACTION STATEMENTS

ACTION 35 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may continue for up to 14 days provided that prior to initiating a release:

a. At least two independent samples are analyzed in accordance with the Surveillance Requirement for concentration limit of Control 4.11.1.1.1. and

b. At least two technically qualified members of the Facility Staff independently verify the release rate calculations and discharge line valving.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 36 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided grab samples are analyzed for gross radioactivity (beta or gamma) at a limit of detection of at least 2.E-07 micro-Curie/ml:

a. At least once per 8 hours when the specific activity of the secondary coolant is greater than 0.01 micro-Curies/gram DOSE EQUIVALENT I-131 or

b. At least once per 24 hours when the specific activity of the secondary coolant is less than or equal to 0.01 micro-Curies/gram DOSE EQUIVALENT I-131.

ACTION 38 - Minimum system design flow of required running pumps shall be utilized for ECL calculations for discharge canal flow and maximum system design flow be utilized for ECL calculations for effluent line flow.

insert ACTION 37 per attached page 20A

Insert for page 20 new ACTION 37

ACTION 37 – With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, isotopic grab samples shall be obtained and analyzed at a Lower Limit of Detection for I-131, Co-58, Co-60, Cs-134, and Cs-137 to achieve detection sensitivity capable of detecting a primary-to-secondary leak rate of 5 gallons per day, provided that the Reactor Coolant System has sufficient activity present.

The applicable frequency shall be:
In MODES 1, 2, 3, 4

a. At least once per day for isotopic activity on the affected Steam Generator, provided that the Air Ejector Gas Activity Monitor is OPERABLE,

OR

b. At least every 8 hours for isotopic activity on the affected Steam Generator, If the Air Ejector Gas Activity Monitor is INOPERABLE.

This requirement is intended to meet EPRI PWR Primary-To-Secondary Leak Guidelines(TR-104788-R2), per reference PMAI 00-08-109.

ST. LUCIE PLANT
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TABLE 3.3-13

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1. Waste Gas Holdup System			
a) Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release	1/Rx	*	45
2. Condenser Evacuation System			
a) Noble Gas Activity Monitor	1/Rx	**	47
3. Plant Vent System			
a) Noble Gas Activity Monitor (Low Range)	1/Rx	*	47
b) Iodine Sampler	1/Rx	*	51
c) Particulate Sampler	1/Rx	*	51
d) Flow Rate Monitor	N.A.	*	53
e) Sampler Flow Rate Monitor	1/Rx	*	46
4. Fuel Storage Area Ventilation System			
a) Noble Gas Activity Monitor (Low Range)	1/Rx	*	47
b) Iodine Sampler	1/Rx	*	51
c) Particulate Sampler	1/Rx	*	51
d) Flow Rate Monitor	N.A.	*	53
e) Sampler Flow Rate Monitor	1/Rx	*	46

← Rev

**	47
Modes 1,2,3,4	48

Add Modes 1,2,3,4 and 48 as shown for a) Noble Gas Activity Monitor etc

ST. LUCIE PLANT
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OFFSITE DOSE CALCULATION MANUAL (ODCM)

TABLE 3.3-13 (Continued)
TABLE NOTATIONS

* - At all times while making releases via this pathway
** - At all times when air ejector exhaust is not directed to plant vent.
Rx - Denotes reactor

ACTION STATEMENTS

ACTION 45 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment for up to 14 days provided that prior to initiating a release:

a. At least two independent samples of the tank's contents are analyzed and

b. At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge valve lineup.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 46 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided the flow rate is estimated at least once per 4 hours.

ACTION 47 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE, effluent releases via this pathway may continue for up to 30 days provided:

a. If channel inoperability is due to loss of activity indication, Then grab samples are taken at least once per 8 hours and these samples are analyzed for isotopic activity within 24 hours.

OR

b. If channel inoperability is due to loss of Control Room alarm annunciation discovered during a channel functional test because of any one or more of the following reasons listed, Then channel checks are performed once per hour to verify normal indication and current assigned setpoints are NOT exceeded.

1. Failure to annunciate when testing alarm/trip setpoints.
2. Circuit failure.
3. Downscale failure.
4. Controls NOT set in OPERATE mode.

St. Lucie Plant ODCM Controls
Insert ACTION 48 per attached page 26A

01-1054a 1593

Insert for Page 26 new ACTION 48

ACTION 48 – With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, noble gas isotopic grab samples shall be obtained and analyzed at a Lower Limit of Detection for Ar-41, Kr-88, Xe-133, Xe-133m, and Xe-135 to achieve detection sensitivity capable of detecting a primary-to-secondary leak rate of 5 gallons per day, provided that the Reactor Coolant System has sufficient activity present.

The applicable frequency shall be:

a. At least once per 12 hours for noble gas isotopic activity on the Air Ejector Exhaust provided that each affected Unit's Steam Generator Blowdown Monitor is OPERABLE,

OR

b. At least once per 8 hours for noble gas isotopic activity on the Air Ejector Exhaust if either of the affected Unit's Steam Generator Blowdown Monitors is INOPERABLE.

This requirement is intended to meet EPRI PWR Primary-To-Secondary Leak Guidelines(TR-104788-R2), therefore grab samples shall be taken regardless of the Alignment of the Air Ejector Exhaust while in Modes 1, 2, 3, 4. (Reference PMAI 00-08-109).

ST. LUCIE PLANT
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TABLE 4.11-1 RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection LLD (1) (µCi/ml)	
A. Batch Waste Release Tanks (2)	P Each Batch	Each Batch	P.G.E. (3)	5.E-07	
			I-131	1.E-06	
	P One Batch/M	M	Dissolved and Entrained Gases (Gamma Emitters)	1.E-05	
	P Each Batch	M Composite (4)	H-3	1.E-05	
			Gross Alpha	1.E-07	
	P Each Batch	Q Composite (4)	Sr-89, Sr-90	5.E-08	
			~~Fe-55~~	1.E-06	Rev
B. Continuous Releases (5, 6)	Daily	4/M Composite	P.G.E.(3)	5.E-07	
			I-131	1.E-06	
	Daily Grab Sample	4/M Composite	Dissolved and Entrained Gases (Gamma Emitters)	1.E-05	
	Daily	M Composite	H-3	1.E-05	
			Gross Alpha	1.E-07	
	Daily	Q Composite	Sr-89, Sr-90	5.E-08	
			~~Fe-55~~	1.E-06	Rev
C. Settling Basin (7)	W Grab Sample	W	P.G.E. (3)	5.E-07	
			I-131	1.E-06	
D. Settling Basin as a Batch Release Pathway. (Reference CR 99-1165 PMAI 99-08-084	P Each Batch (8)	Each Batch	P.G.E. (3)	5.E-07	
			I-131	1.E-06	
			Dissolved and Entrained Gases (Gamma Emitters)	1.E-05	
	Each Batch	Each Batch	H-3	1.E-05	
			Gross Alpha	1.E-07	
			Sr-89, Sr-90	5.E-08	
			~~Fe-55~~	1.E-06	Rev

C-14, Fe-55, Ni-63
C-14, Fe-55, Ni-63
C-14, Fe-55, Ni-63

P.G.E. - Denotes Principal Gamma Emitter

ST. LUCIE PLANT
CHEMISTRY OPERATING PROCEDURE NO. C-200, REVISION 22
OFFSITE DOSE CALCULATION MANUAL (ODCM)

TABLE 4.11-2 RADIOACTIVE GASEOUS WASTE SAMPLING & ANALYSIS PROGRAM

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (1) (μCi/cc)
1. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Noble Gas P.G.E. (2)	1.E-04
2. Containment Purge	P Each Purge (6) Grab Sample	P Each Purge (6) (7)	Noble Gas P.G.E. (2)	1.E-04
			H-3	1.E-06
3. Vents: a. Plant b. Fuel Bldg (5) c. Laundry d. S/G Blowdown Bldg.	4/M Grab Sample	4/M (7)	Noble Gas P.G.E. (2)	1.E-04
			H-3	1.E-06
4. All Release Types as listed in 3. above	Continuous (3)	4/M Charcoal Sample (4)	I-131	1.E-12
		4/M Particulate Sample (4)	P.G.E.	1.E-11
		4/M ~~Composite~~ Particulate Sample	Gross Alpha	1.E-11
		Q Composite Particulate Sample	Sr-89, Sr-90	1.E-11
		Noble Gas Monitor	Noble Gases Gross Beta or Gamma	1.E-06

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P.G.E. - Denotes Principal Gamma Emitters

ST. LUCIE PLANT
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RADIOACTIVE EFFLUENTS

3/4.11.6 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT TO THE COMMISSION*

ADMINISTRATIVE CONTROLS

3.11.2.6 As per Technical Specification 6.9.1.7, a Annual Radioactive Effluent Release Report covering the operation of each unit during the previous 12 months of operation shall be submitted within 60 days after January 1 of each year. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from each unit. The material provided shall be (1) consistent with the objectives outlined in by items a) through f) below, using the example report format in the ODCM and (2) be in conformance with 10 CFR 50.36a and Section IV.B.1 of Appendix I to 10 CFR Part 50.

a. The Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit as outlined in Regulatory Guide 1.21, Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants, Revision 1, June 1974, with data summarized on a quarterly basis following the format of Appendix B thereof.

b. The Radioactive Effluent Release Report to be submitted within 60 days after January 1 of each year shall include an annual summary of hourly meteorological data collected over the previous year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability and precipitation (if measured) or in the form of joint frequency distributions of wind speed, wind direction and atmospheric stability.** This same report shall include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the unit or station during the

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* - A single submittal may be made for a multiple unit station. The submittal should combine those sections that are common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

** - In lieu of submission with the Radioactive Effluent Release Report, the licensee has the option of retaining this summary of required meteorological data on site in a file that shall be provided to the NRC upon request.

page included for information only for FRG review

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RADIOACTIVE EFFLUENTS

3/4.11.6 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT TO THE COMMISSION (Continued)

ADMINISTRATIVE CONTROLS

3.11.2.6 (Continued)

b. (Continued)

previous calendar year. This same report shall also include an assessment of the radiation doses from radioactive liquid and gaseous effluents to MEMBERS OF THE PUBLIC due to their activities inside the SITE BOUNDARY (see TS Figure 5.1-1) during the report period. All assumptions used in making these assessments, i.e., specific activity, exposure time and location, shall be included in these reports. The meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents, as determined by sampling frequency and measurement, shall be used for determining the gaseous pathway doses. The assessment of radiation doses shall be performed in accordance with the methodology and parameters in the ODCM.

OR an approximate and conservative method may be used in lieu of actual meteorological measurements.

c. Every 2 years using the previous 6 months release history for isotopes, determine the controlling age group for liquid pathways. Every 2 years using the previous 1 year or longer interval (to include a refueling outage) and historical meteorological data determine the controlling age group for gaseous pathways. If changed from current submit change to ODCM to reflect new tables for these groups and use the new groups in subsequent dose calculations.

d. The Radioactive Effluent Release Report to be submitted 60 days after January 1 of each year shall also include an assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from reactor releases for the previous calendar year. Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109 March 1976.

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TABLE 3.12-1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM[a)]

EXPOSURE PATHWAY and/or SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[b) c)]	SAMPLING AND COLLECTION FREQUENCY[d)]	TYPE AND FREQUENCY [d)] OF ANALYSIS
1. Direct Radiation[e)]	27 Monitoring Locations	Continuous monitoring with sample collection quarterly [f)]	Gamma exposure rate - quarterly
2. Airborne Radioiodine and Particulates	5 Locations	Continuous sampler operation with sample collection weekly or more frequently if required by dust loading	Radioiodine filter: I-131 analysis weekly Particulate Filter: Gross beta radioactivity analysis ≥24 hours following a filter change[g)] Gamma isotopic[h)] analysis of composite [g)] (by location) quarterly
3. Waterborne			
a) Surface[k)]	1 Location[m)]	Weekly	Gamma isotopic[h)] & tritium analyses weekly
	1 Location[n)]	Monthly	Gamma isotopic[h)] & tritium analyses monthly
b) Sediment from shoreline	2 Locations	Semiannually	Gamma isotopic[h)] analyses semiannually
4. Ingestion			
a) Fish and Invertebrates			
1) Crustacea	2 Locations	Semiannually	Gamma isotopic[h)] analyses semiannually
2) Fish	2 Locations	Semiannually	Gamma isotopic [h)] analyses semiannually
b) Food Products			
1) Broad leaf vegetation	3 Locations[p)]	Monthly when available	Gamma isotopic[h)] and I-131 analyses monthly
2) Milk	1 Location	Quarterly when available	Gamma isotopic[h)]

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OFFSITE DOSE CALCULATION MANUAL (ODCM)
METHODOLOGY SECTION

2.1 Gaseous Effluent Model Assumptions

Description of Site - (The FUSAR contains the official description of the site characteristics. The description that follows is a brief summary for dose calculation purposes only). The St. Lucie Plant is located on an island surrounded on two sides by the Atlantic Ocean and the Indian River, an estuary of the Atlantic Ocean. Private property adjoins the plant site in the north and south directions. A meteorological tower is located north of the plant near the site property line. There are 16 sectors, for dose calculation purposes, divided into 22.5° each. The MET tower is calibrated such that a zero degree bearing coincides with TRUE NORTH. A bearing of zero degrees dissects the north sector such that bearings of 348.75° and 11.25° define the boundaries of the north sector. The nearest distance to private property occurs in the north sector at approximately 0.97 miles. For ease of calculation, this 0.97 mile radius is assumed in all directions, although the real Unrestricted Area Boundary is defined in Figure 5.1-1 of the TS. Doses calculated over water areas do not apply to Controls or the annual report and may be listed as O.W. (over water) in lieu of performing calculations. The 0.97 mile range in the NW sector is O.W., but it was chosen as the worst sector for conservative dose calculations using the historical MET data.

Historical MET Data - MET data, between September 1, 1976 and August 31, 1978, from the St. Lucie MET Tower was analyzed by Dames & Moore of Washington, D.C. The methodology used by Dames & Moore was consistent with methods suggested by Regulatory Guide 1.111, Revision 1. Recirculation correction factors were also calculated for the St. Lucie Site and are incorporated into the historical MET tables (Tables M5, M6 and M7) in Appendix A of this manual. It was determined that these two years are representative data for this locale.

Dose Calculations - Dose calculations for Control dose limits are normally calculated using historical MET data and receptor location(s) which yield calculated doses no lower than the real location(s) experiencing the most exposure. Actual MET data factors are calculated and used in dose calculations for the annual reports. Approximate and conservative methods may be used in lieu of actual meteorological measurements.

Live MET data and hour-by-hour dose calculations are beyond the scope of this manual. Historical information and conservative receptor locations, etc., are only used for ease of Control dose limit calculations. Dose calculations for Control dose limits may be performed using actual MET data and real receptor locations. Any dose calculations performed with actual data should note the source of the data in the annual report. Actual MET data reduction should be performed in accordance with Regulatory Guide 1.111, Revision 1 and should incorporate Recirculation Correction Factors from Table M-4 of this manual.

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TABLE L-1
EFFLUENT CONCENTRATION LIMITS IN WATER
IN UNRESTRICTED AREAS

NOTE
If a nuclide is not listed below, refer to 10 CFR Part 20, Appendix B, Table 2 Effluent Concentrations Column 2 and use the most conservative ECL listed for the nuclide.

Nuclide	ECL (µCi/ml)	Nuclide	ECL (µCi/ml)	Nuclide	ECL (µCi/ml)
H-3	1 E-3	Y-90	7 E-6	Te-129	4 E-4
Na-24	5 E-5	Y-91m	2 E-3	Te-131m	8 E-6
P-32	9 E-6	Y-91	8 E-6	Te-131	8 E-5
Cr-51	5 E-4	Y-92	4 E-5	Te-132	9 E-6
Mn-54	3 E-5	Y-93	2 E-5	I-130	2 E-5
Mn-56	7 E-5	Zr-95	2 E-5	I-131	1 E-6
Fe-55	1 E-4	Zr-97	9 E-6	I-132	1 E-4
Fe-59	1 E-5	Nb-95	3 E-5	I-133	7 E-6
Co-57	6 E-5	Nb-97	3 E-4	I-134	4 E-4
Co-58	2 E-5	Mo-99	2 E-5	I-135	3 E-5
Co-60	3 E-6	Tc-99m	1 E-3	Cs-134	9 E-7
Ni-65	1 E-4	Tc-101	2 E-3	Cs-136	6 E-6
Cu-64	2 E-4	Ru-103	3 E-5	Cs-137	1 E-6
Zn-65	5 E-6	Ru-105	7 E-5	Cs-138	4 E-4
Zn-69	8 E-4	Ru-106	3 E-6	Ba-139	2 E-4
Br-82	4 E-5	Ag-110	6 E-6	Ba-140	8 E-6
Br-83	9 E-4	Sn-113	3 E-5	Ba-141	3 E-4
Br-84	4 E-4	In-113m	7 E-4	Ba-142	7 E-4
Rb-86	7 E-6	Sb-122	1 E-5	La-140	9 E-6
Rb-88	4 E-4	Sb-124	7 E-6	La-142	1 E-4
Rb-89	9 E-4	Sb-125	3 E-5	Ce-141	3 E-5
Sr-89	8 E-6	Te-125m	2 E-5	Ce-143	2 E-5
Sr-90	5 E-7	Te-127m	9 E-6	Ce-144	3 E-6
Sr-91	2 E-5	Te-127	1 E-4	Pr-144	6 E-4
Sr-92	4 E-5	Te-129m	7 E-6	W-187	3 E-5
				Np-239	2 E-5

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Ni-63	1 E-4

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C-14	3 E-5

ST. LUCIE PLANT
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TABLE L-2
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - ADULT
ORGAN DOSE FACTOR (MREM/HR PER µCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H-3	0.	3.60E-01	3.60E-01	3.60E-01	3.60E-01	3.60E-01	3.60E-01
NA-24	6.08E-01	6.08E-01	6.08E-01	6.08E-01	6.08E-01	6.08E-01	6.08E-01
P-32	1.67E+07	1.05E+06	0.	0.	0.	1.88E+06	6.47E+05
CR-51	0.	0.	3.34E+00	1.23E+00	7.42E+00	1.41E+03	5.59E+00
MN-54	0.	7.07E+03	0.	2.10E+03	0.	2.17E+04	1.35E+03
MN-56	0.	1.78E+02	0.	2.26E+02	0.	5.68E+03	3.17E+01
FE-55	1.15E+05	5.19E+05	0.	0.	6.01E+05	2.03E+05	1.36E+05
FE-59	8.08E+04	1.92E+05	0.	0.	5.32E+04	6.33E+05	7.29E+04
CO-57	0.	1.42E+02	0.	0.	0.	3.60E+03	2.36E+02
CO-58	0.	6.05E+02	0.	0.	0.	1.22E+04	1.35E+03
CO-60	0.	1.74E+03	0.	0.	0.	3.26E+04	3.83E+03
NI-65	2.02E+02	2.63E+01	0.	0.	0.	6.65E+02	1.20E+01
CU-64	0.	2.15E+02	0.	5.41E+02	0.	1.83E+04	1.01E+02
ZN-65	1.62E+05	5.13E+05	0.	3.43E+05	0.	3.23E+05	2.32E+05
ZN-69	3.43E+02	6.60E+02	0.	4.27E+02	0.	9.87E+01	4.57E+01

Based on 1 µCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

Ni-63	4.97E+04	3.45E+03	0	0	0	7.19E+02	1.67E+03
C-14	1.45E+04	2.91E+03	2.91E+03	2.91E+03	2.91E+03	2.91E+03	2.91E+03

ST. LUCIE PLANT
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TABLE L-3
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - TEENAGER
ORGAN DOSE FACTOR (MREM/HR PER µCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H---3	0.	2.17E-01	2.17E-01	2.74E-01	2.17E-01	2.17E-01	2.17E-01
NA--24	4.63E-01	4.63E-01	4.63E-01	4.63E-01	4.63E-01	4.63E-01	4.63E-01
P---32	1.27E+07	7.98E+05	0.	0.	0.	1.43E+06	4.93E+05
CR--51	0.	0.	2.54E+00	9.38E-01	5.64E+00	1.07E+03	4.25E+00
MN--54	0.	5.38E+03	0.	1.60E+03	0.	1.65E+04	1.03E+03
MN--56	0.	1.36E+02	0.	1.72E+02	0.	4.32E+03	2.42E+01
FE--55	8.78E+04	3.95E+05	0.	0.	4.57E+05	1.54E+05	1.04E+05
FE--59	6.14E+04	1.46E+05	0.	0.	4.05E+04	4.81E+05	5.55E+04
CO--57	0.	1.08E+02	0.	0.	0.	2.74E+03	1.79E+02
CO--58	0.	6.12E+02	0.	0.	0.	8.26E+03	1.39E+03
CO--60	0.	1.70E+03	0.	0.	0.	2.04E+04	3.88E+03
NI--65	1.54E+02	2.00E+01	0.	0.	0.	5.07E+02	9.11E+00
CU--64	0.	1.64E+02	0.	4.12E+02	0.	1.39E+04	7.69E+01
ZN--65	1.23E+05	3.90E+05	0.	2.61E+05	0.	2.46E+05	1.77E+05
ZN--69	2.61E+02	5.02E+02	0.	3.24E+02	0.	7.50E+01	3.47E+01
BR--82	0.	0.	0.	0.	0.	3.55E+00	3.10E+00
BR--83	0.	0.	0.	0.	0.	7.95E-02	5.52E-02
BR--84	0.	0.	0.	0.	0.	5.61E-07	7.16E-02
BR--85	0.	0.	0.	0.	0.	0.	2.94E-03

Based on 1 µCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

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Ni-63	3.78E+04	2.63E+03	0.	0.	0.	5.47E+02	1.27E+03

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C-14	2.94E+03	2.94E+03	2.94E+03	2.22E+03	2.94E+03	2.94E+03	2.94E+03

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TABLE L-4
ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS FOR LIQUID DISCHARGES
PATHWAY - SALT WATER FISH AND SHELLFISH AGE GROUP - CHILD
ORGAN DOSE FACTOR (MREM/HR PER µCi/ML)

NUCLIDE	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	WHOLE BODY
H---3	0.	1.81E-01	1.81E-01	1.19E-01	1.81E-01	1.81E-01	1.81E-01
NA--24	2.03E-01	2.03E-01	2.03E-01	2.03E-01	2.03E-01	2.03E-01	2.03E-01
P---32	5.53E+06	3.47E+05	0.	0.	0.	6.22E+05	2.14E+05
CR--51	0.	0.	1.12E+00	4.13E-01	2.48E+00	4.70E+02	1.87E+00
MN--54	0.	2.34E+03	0.	6.95E+02	0.	7.15E+03	4.46E+02
MN--56	0.	5.88E+01	0.	7.46E+01	0.	1.88E+03	1.05E+01
FE--55	3.87E+04	1.74E+05	0.	0.	2.02E+05	6.81E+04	4.58E+04
FE--59	2.71E+04	6.43E+04	0.	0.	1.79E+04	2.12E+05	2.45E+04
CO--57	0.	4.78E+01	0.	0.	0.	1.21E+03	7.94E+01
CO--58	0.	5.05E+02	0.	0.	0.	3.00E+03	1.52E+03
CO--60	0.	1.41E+03	0.	0.	0.	7.80E+03	4.23E+03
NI--65	6.73E+01	8.74E+00	0.	0.	0.	2.22E+02	3.98E+00
CU--64	0.	7.15E+01	0.	1.80E+02	0.	6.09E+03	3.36E+01
ZN--65	5.47E+04	1.74E+05	0.	1.16E+05	0.	1.09E+05	7.86E+04
ZN--69	1.16E+02	2.23E+02	0.	1.44E+02	0.	3.34E+01	1.55E+01
BR--82	0.	0.	0.	0.	0.	1.59E+00	1.39E+00
BR--83	0.	0.	0.	0.	0.	3.55E-02	2.47E-02
BR--84	0.	0.	0.	0.	0.	2.51E-07	3.20E-02
BR--85	0.	0.	0.	0.	0.	0.	1.31E-03

Based on 1 µCi/sec release rate of each isotope in discharge flow of 1 cc/sec with no additional dilution

Ni-63	1.66E+04	1.15E+03	0.	0.	0.	2.39E+02	5.55E+02
C-14	3.82E+03	3.82E+03	3.82E+03	9.61E+02	3.82E+03	3.82E+03	3.82E+03

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ST. LUCIE PLANT
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OFFSITE DOSE CALCULATION MANUAL (ODCM)

APPENDIX B
RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE
(continued)
ST. LUCIE PLANT
Key to Sample Locations

PATHWAY	LOCATION	DESCRIPTION	SAMPLES COLLECTED	SAMPLE COLLECTION FREQUENCY	APPROXIMATE DISTANCE (miles)	DIRECTION SECTOR
Food Products	H52	Offsite near south property line	Broad leaf vegetation (mangrove)	Monthly (when available)	1	S/SSE
Food Products	*H59	Near south end of Hutchinson Island	Crustacea Fish Broad leaf vegetation (mangrove)	Semi-Annually Semi-Annually Monthly	10-20	S/SSE
Food Products	~~H5~~ WSW 3.5	Goat Milk (per Land Use Census (2000) Off east end of Tilton Road)	Milk	Quarterly (when available)	3.5	WSW

*Denotes control sample

It is the policy of Florida Power & Light Company (FPL) that the St. Lucie 1 & 2 Radiological Environmental Monitoring Programs are conducted by the State of Florida Department of Health and Rehabilitative Services (DHRS), pursuant to an Agreement between FPL and DHRS and; that coordination of the Radiological Environmental Monitoring Programs with DHRS and compliance with the Radiological Environmental Monitoring Program Controls are the responsibility of the Nuclear Energy Services Department.

NOTE 1
These samples may be collected from or supplemented by samples collected from the plant intake canal if the required analyses are unable to be performed due to unavailability or inadequate quantity of sample from the ocean side location.

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ST. LUCIE PLANT
CHEMISTRY OPERATING PROCEDURE NO. C-200, REVISION 22
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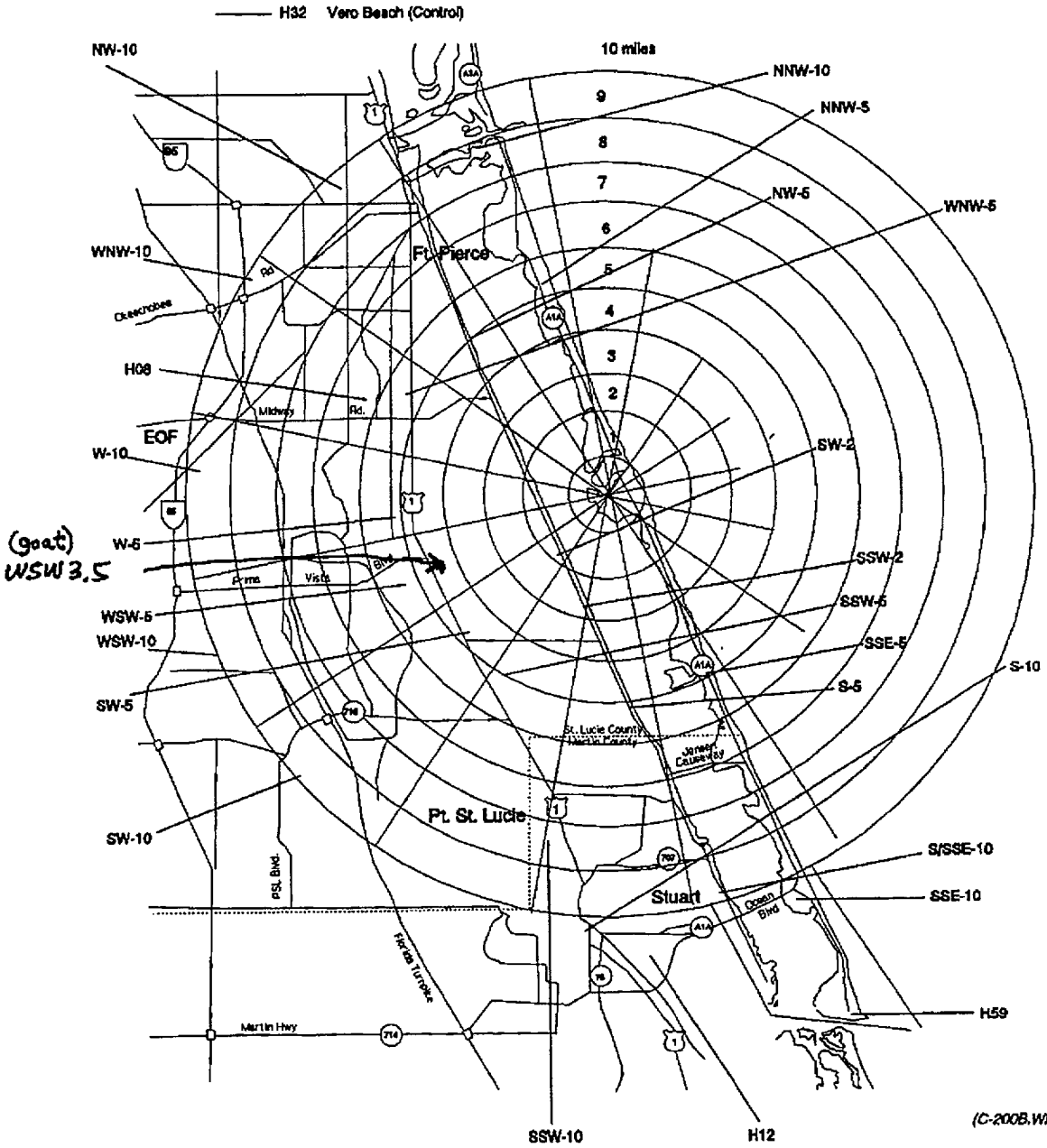
FIGURE 1-2
ENVIRONMENTAL SAMPLE LOCATIONS (10 MILES)



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FPL

ST. LUCIE PLANT CHEMISTRY OPERATING PROCEDURE

SAFETY RELATED

Procedure No. **C-200**

Current Rev. No. **23**

Effective Date: **02/20/01**

Title:

OFFSITE DOSE CALCULATION MANUAL (ODCM)

Responsible Department: **CHEMISTRY**

MASTER COPY

Revision Summary

Revision 23 - Specified presure loss criteria, added actions 37 for the S/G Blowdown Radioactivity Monitor to meet the expectation of the new EPRI industry standard, ensured grab samples will be taken, included Carbon-14 & Nickel-63 in liquid sampling/analysis, changed gaseous continuous vent release pathway, standardized St. Lucie with Turkey Points ODCM wording, included gaot (milk) animal to the Radiological Environmental Monitoring Program, and included new dose conversion factors. (R. E. Cox, 01/19/01)

Revision 22 - Unit 2 Tech Spec Amendment 105 adopting the same Dose Equivalent Iodine-131 definition as Unit 1. (R.E. Cox, 04/20/00)

Revision 21 - Changed C-72 to COP-01.06, changed definition of Dose Equivalent I-131, explained why certain checks are not performed and identified rain run off, overflow of settling basins and storm preparation as NPDES permitted pathways. (R. E. Cox, 09/30/99)
AND
Changed C-72 to COP-01.06. (Jim George, 09/30/99)

Revision 20B - Changed C-70 to COP-01.05. (R. Cox, 07/13/99)

Revision 20A - Changed reference of C-70 to COP-01.05. (Ed Meyer, 05/21/99)

Revision	FRG Review Date	Approved By	Approval Date
0	04/22/82	C. M. Wethy Plant General Manager	04/27/82
23	01/18/01	R. G. West Plant General Manager	01/19/01
		N/A Designated Approver	
		N/A Designated Approver (minor correction)	

S 1 OPS
DATE
DOCT PROCEDURE
DOCN C-200
SYS
COMP ~~COMPLETED~~
ITM 23