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W3F1-96-0063
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April 30, 1996

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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Annual Radioactive Effluent Release Report

Gentlemen:

Attached is the Annual Radioactive Effluent Release Report for the period January 1 through December 31, 1995. This report is submitted in accordance with Waterford 3 Technical Specification 6.9.1.8.

If you have any questions, please contact me at (504) 739-6242 or Don Vinci at (504) 739-6370.

Very truly yours,

James J. Fisicaro

J.J. Fisicaro
Director
Nuclear Safety

JJF/CJT/ssf
Attachment

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Annual Radioactive Effluent Release Report

January 1, 1995 - December 31, 1995

Waterford 3 SES
Entergy Operations, Inc.

Docket Number 50-382 License Number NPF-38

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1.0 SCOPE

This Annual Radioactive Effluent Release Report is submitted as required by Waterford 3's Technical Specification 6.9.1.8. It covers the period from January 1, 1995 through December 31, 1995. Information in this report is presented in the format outlined in Appendix B of Regulatory Guide 1.21.

The information contained in this report includes:

(1) A summary of the quantities of radioactive liquid and gaseous effluents and solid wastes released from the plant during the reporting period.

(2) A summary of the meteorological data collected during 1995.

(3) Assessment of radiation doses due to liquid and gaseous radioactive effluents released during 1995.

(4) A submittal of changes to the Offsite Dose Calculation Manual and Process Control Program during this reporting period.

(5) A discussion of why required monitoring instrumentation was not returned to service within the time specified.

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

The Limits applicable to the release of radioactive material in liquid and gaseous effluents are described in the following sections. These limits are addressed in UNT-005-014, Offsite Dose Calculation Manual.

2.1.1 Fission and Activation Gases (Noble Gases)

The dose rate due to radioactive noble gases released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to less than or equal to

***500 mrem/yr to the total body*; and**
3000 mrem/yr to the skin.

The air dose due to noble gases released in gaseous effluents from the site to areas at or beyond the site boundary shall be limited to the following:

- During any calendar quarter: Less than or equal to

  ***5 mrad for gamma radiation*; and**
  10 mrad for beta radiation

- During any calendar year: Less than or equal to

  10 mrad for gamma radiation; and
  20 mrad for beta radiation.

2.1.2 Iodines; Particulates, Half Lives > 8 Days; and Tritium

The dose rate due to Iodine-131 and 133, tritium, and all radionuclides in particulate form with half lives greater than eight (8) days, released in gaseous effluents from the site to

areas at and beyond the site boundary, shall be limited to less than or equal to

1500 mrem/yr to any organ.

The dose to a member of the public from Iodine 131 and 133, tritium, and all radionuclides in particulate form with half lives greater than eight (8) days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:

- During any calendar quarter: Less than or equal to

7.5 mrem to any organ; and

- During any calendar year: Less than or equal to

15 mrem to any organ.

2.1.3 Liquid Effluents

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to

2.0E-4 µCi/ml (Total Activity).

The dose or dose commitment to a member of the public from radioactive materials in liquid effluents released to unrestricted areas shall be limited to the following:

- During any calendar quarter to less than or equal to

1.5 mrem to the total body; and
5 mrem to any organ, and

- During any calendar year to less than or equal to

3 mrem to the whole body; and
10 mrem to any organ.

2.1.4 Uranium Fuel Cycle Sources

The dose or dose commitment to any member of the public due to releases of radioactivity and radiation from uranium fuel cycle sources over 12 consecutive months shall be limited to less than or equal to

25 mrem to the Total Body or any organ (except thyroid organ); and
75 mrem to the Thyroid

2.2 *Maximum Permissible Concentrations*

2.2.1 Fission and Activation Gases; Iodines; and Particulates, Half Lives > 8 Days

For gaseous effluents, maximum permissible concentrations are not directly used in release rate calculations since the applicable limits are expressed in terms of dose rate at the site boundary.

2.2.2 Liquid Effluents

The maximum permissible concentration (MPC) values specified in 10 CFR Part 20, Appendix B, Table II, Column 2 are used as the permissible concentrations of liquid radioactive effluents at the unrestricted area boundary. A value of 2.0E-4 µCi/ml is used as the MPC for dissolved and entrained noble gases in liquid effluents.

2.3 *Average Energy*

This is not applicable to Waterford 3's Effluent Specifications. E-Bars are not required to be calculated from effluent release data.

2.4 *Measurements and Approximations of Total Radioactivity*

The quantification of radioactivity in liquid and gaseous effluents was accomplished by performing the sampling and radiological analysis of effluents in accordance with the requirements of Tables 5.3-1 and 5.4-1 of UNT-005-014 Offsite Dose Calculation Manual.

2.4.1 Fission and Activation Gases (Noble Gases)

For continuous releases, a gas grab sample was analyzed monthly for noble gases. Each week a Gas Ratio (GR) was calculated according to the following equation:

$$GR = \frac{\text{Average Weekly Noble Gas Monitor Reading}}{\text{Monitor Reading During Noble Gas Sampling}}$$

The monthly sample analysis and weekly Gas Ratio were then used to determine noble gases discharged continuously for the previous week. For gas decay tank and containment purge batch releases, a gas grab sample was analyzed prior to release to determine noble gas concentrations in the batch. In all cases the total radioactivity in gaseous effluents was determined from measured concentrations of each radionuclide present and the total volume discharged.

2.4.2 Iodines and Particulates

Iodines and particulates discharged were sampled using a continuous sampler which contained a charcoal cartridge and a particulate filter. Each week the charcoal cartridge and particulate filter were analyzed for gamma emitters using

gamma spectroscopy. The determined radionuclide concentrations and effluent volume discharged were used to calculate the previous week's activity released. The particulate samples were composited and analyzed quarterly for Sr-89 and Sr-90 by a contract laboratory (Teledyne Isotopes). Particulate gross alpha activity was measured weekly using alpha scintillation counting techniques. The determined activities were used to estimate effluent concentrations in subsequent releases until the next scheduled analysis was performed.

Grab samples of continuous and batch releases were analyzed monthly for tritium. The determined concentrations were used to estimate tritium activity in subsequent releases until the next scheduled analysis was performed.

2.4.3 Liquid Effluents

For continuous releases, samples were collected weekly and analyzed using gamma spectroscopy. The measured concentrations were used to determine radionuclide concentrations in the following week's releases. For batch releases, gamma analysis was performed on the sample prior to release.

For both continuous and batch releases, composite samples were analyzed quarterly by a contract laboratory (Teledyne Isotopes) for Sr-89, Sr-90, and Fe-55. Samples were composited and analyzed monthly for tritium and gross alpha using liquid scintillation and gas flow proportional counting techniques, respectively. For radionuclides measured in the composite samples, the measured concentrations in the composite samples from the previous month or quarter were used to estimate released quantities of these isotopes in liquid effluents during the current month or quarter.

The total radioactivity in liquid effluent releases was determined from the measured and estimated concentrations of each radionuclide present and the total volume of the effluent discharged.

2.5 *Batch Releases*

A summary of information for gaseous and liquid batch releases is included in Table 1.

2.6 *Unplanned/Abnormal Releases*

There were no abnormal releases during this reporting period.

3.0 *GASEOUS EFFLUENTS*

The quantities of radioactive material released in gaseous effluents are summarized in Tables 1A, 1B, and 1C. Note that there were no elevated releases, since all Waterford 3 releases are considered to be at ground level. The estimated total error in % is based upon several statistical uncertainties due to sample counting, efficiency, volume, etc.

4.0 *LIQUID EFFLUENTS*

The quantities of radioactive material released in liquid effluents are summarized in Tables 2A and 2B. The estimated total error in % is based upon several statistical uncertainties due to sample counting, efficiency, volume, etc.

5.0 *SOLID WASTES*

The summary of radioactive solid wastes shipped offsite for disposal is listed in Table 3. For certain waste forms Waterford 3 is now using volume reduction services provided by Scientific Ecology Group, Inc. (SEG) and Alaron Corp. These waste forms are identified in Table 3 and volumes reported reflect the volume of waste shipped offsite, not final disposal volumes. Final disposal volumes are reported as they become available. The estimated total error in % is based upon several statistical uncertainties due to sample counting, efficiency, volume, etc.

6.0 *METEOROLOGICAL DATA*

In Table 4, the hourly meteorological data from January 1, 1995 through December 31, 1995, is presented in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability. The Waterford-3 data recovery results by parameter are as follows:

Parameter	Annual Data Recovery Rate
Delta T	**100.0%**
Wind Speed	**100.0%**
Wind Direction	**100.0%**
Overall *	**100.0%**

* Simultaneous occurrence of valid data for all three parameters.

7.0 ASSESSMENT OF DOSES

7.1 Dose Due to Gaseous Effluents

7.1.1 Air Doses at the Site Boundary

Air doses from gaseous effluents were evaluated at the closest offsite location that could be occupied continuously during the term of plant operation and that would result in the highest dose. This location was determined by examining the atmospheric dispersion parameters (χ/Q's) at the closest offsite locations that could be continuously occupied during plant operation in each of the meteorological sectors surrounding the plant. The location that would have the highest dose would be that location having the most restrictive (largest) χ/Q value.

Based on actual metecrological data collected during 1995, this location was determined to be in the

NE sector

at a distance of **966 meters** (0.6 miles) from the plant. Doses were assessed at this location in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual considering only beta and gamma exposures in air due to noble gas. The results of these assessments for the year 1995 are summarized as follows:

Beta air dose:	**1.191** mrad
Gamma air dose:	**0.431** mrad

The above Beta and Gamma air doses represent the following percentage of the Annual Dose limits:

5.96%	of the **Beta** air dose limit (20 mrad).
4.31%	of the **Gamma** air dose limit (10 mrad).

Dose calculation results are summarized by quarters in Table 5.

7.1.2 Maximum Organ Dose to the Critical Receptor

The maximum organ dose to a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the site boundary was determined for 1995.

An assessment of the maximum organ dose was performed for the critical receptor. The critical receptor was assumed to be located at the nearest residence to the plant having the most restrictive atmospheric dispersion (χ/Q) and deposition (D/Q) parameters. Furthermore, it was assumed that the receptor living at this residence consumed food products that were either raised or produced at this residence.

Using land use census and meteorological data for 1995, the residence with the highest χ/Q and D/Q values was determined to be in the

NE sector

at a distance of **1448** meters (0.9miles) from the plant. The dose calculation was performed in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual considering the inhalation, ground plane exposure, and ingestion pathways. The maximum organ dose to the critical receptor was determined to be

0.558 mrem to an **infant thyroid.**

and represents

3.72 % of the Annual **Organ** Dose limit (15 mrem).

Dose calculation results are summarized by quarters in Table 5.

7.2 *Doses Due to Liquid Effluents*

The annual doses to the maximum exposed individual resulting from exposure to liquid effluents released during 1995 from Waterford 3 were:

1.604 mrem	to the **Total Body**.
2.195 mrem	to the maximum exposed organ **(Liver)**.

The above doses represent the following percentage of the Annual Dose limits:

53.47%	of the **Total Body** Dose Limit (3 mrem).
21.95%	of the **Organ Dose** Limit (10 mrem).

Dose calculation results are summarized by quarters in Table 5. The doses were calculated in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual.

7.3 *40 CFR Part 190 Dose Evaluation*

In accordance with Waterford 3 Offsite Dose Calculation Manual, Section 5.5.2, dose evaluations to demonstrate compliance with Surveillance Requirements 5.5.1.a and 5.5.1.b of the ODCM, dealing with dose from the uranium fuel cycle, need to be performed only if quarterly doses exceed 3 mrem to the total body (liquid releases), 10 mrem to any organ (liquid releases), 10 mrad gamma air dose, 20 mrad beta air dose, or 15 mrem to any organ from radioiodines and particulates.

At no time during 1995 were any of these limits exceeded; therefore, no evaluations were required.

7.4 ***Doses to Public Inside the Site Boundary***

The Member of the Public inside the site boundary expected to have the maximum exposure due to gaseous effluents would be an employee at Waterford 1 and 2 fossil fuel plants, located in the NW sector at distance of approximately 670 meters (0.42 miles) from the plant.

Based on an assumed occupancy of 25% (40 hour work week) and the fact that all employees are adults, the calculated doses were determined to be less than:

1.10E-02 mrem	to the maximum exposed organ **(Thyroid)**
4.36E-02 mrem	to the **Total body**
1.11E-01 mrem	to the **skin**

Doses were calculated according to the methodology described in the Waterford 3 Offsite Dose Calculation Manual considering only the inhalation and ground plane exposure pathways.

8.0 *RELATED INFORMATION*

8.1 *Changes to the Process Control Program*

There was no change to the Process Control Program (procedure RW-001-210, Revision 6) during the reporting period.

8.2 *Changes to the Offsite Dose Calculation Manual*

There was a major change to the Offsite Dose Calculation Manual (ODCM) [procedure UNT-005-014]] and is listed in **Attachment 10.1** of this report. A copy of the ODCM Revision 4 is included in **Attachment 10.2** of this report.

8.3 *Unavailability of REMP Milk Samples*

Due to the unavailability of three milk sampling locations within five kilometers of the plant, Broad Leaf sampling is performed in accordance with ODCM Table 5.8-1. Milk is collected, when available, from the control location and two identified sampling locations as indicated in Waterford 3 Offsite Dose Calculation Manual, Attachment 6.14.

8.4 *Report of Required Effluent Instrument Inoperability*

ODCM Specification 5.6.1.b and 5.6.2.b require reporting in the Annual Radioactive Effluent Release Report of why designated inoperable effluent monitoring instrumentation was not restored to operability within the time specified in the Action Statement.

During the reporting period, there was one case when the instrument was not restored to operability within the time specified. This case is described in the following section.

8.4.1 Monitor: Waste Gas Holdup System (GWMS) Noble Gas Monitor (PRM-IRE-0648)

Time Required by Specifications to Restore Operability:

30 Days

Period of Inoperability: 10:00 on 03/14/1995 to 14:25 on 11/18/1995 (8 months, 4 Days, 4 Hours & 25 Minutes)

Cause of Inoperability:

At 10:00 on March 14, 1995, Gas Waste Holdup System (GWMS) noble gas monitor (PRM-IRE-0648) declared inoperable to perform the required channel calibration (WA 01132048) as per ODCM, Table 5.6-4. Due to the unavailability of the required calibration standard source, the GWMS noble gas monitor was out of service for more than 30 days. It was returned to service at 14:25 on November 18, 1995.

Reason Operability Not Restored Within Allotted Time:

As required by the Offsite Dose Calculation Manual UNT-005-014, Table 5.6-4 Notation 4, noble gas channel calibration work for the noble gas channel of GWMS monitor was delayed until a new certified standard source was ordered and received from the analytical laboratory supplier. When the required calibration was completed, the Waste Gas Uphold System Radiation Monitor (PRM-IRE-0648) returned to service at 14:25 on November 18, 1995.

8.5 *Activity Released Via Secondary Pathways*

8.5.1 The following secondary release paths were continuously monitored for radioactivity:

- The Hot Machine Shop Exhaust (AH-35),
- Decontamination Shop Exhaust (AH-34),
- The RAB H&V Equipment Room Ventilation system Exhaust (E-41A and E-41B); and
- The Switchgear/Cable Vault Area Ventilation System (AH-25).

Continuous sampling for these areas is maintained in order to demonstrate the operability of installed treatment systems and to verify integrity of barriers separating primary and secondary ventilation systems. Sampling for these areas was limited to continuous particulate and iodine sampling and monthly noble gas grab sampling. The activity released via these secondary pathways resulted from routine operations and remained below significant levels.

8.5.2 On June 10, 1995, the A2 Bus in the Turbine Generator Building Switchgear caught fire causing damage to the bus and surrounding cables and components. The reactor trip occurred and a radiological effluent release occurred via the Atmospheric Dump Valve (ADVs) during the plant cooldown with detectable activity in the steam generators. The release is considered a planned release via a secondary release pathway as addressed in the FSAR, section 11.3.2.6 and the ODCM procedure UNT- 005-014, section 5.11. Conservative dose calculations for the release were performed in according to the ODCM methodology and documented in Health Physics Calculation No. HP-CALC-95-007, *Atmospheric Dump Valve Steam Release Dose Assessment*.

In the referenced document, the calculated maximum dose rate at site boundary was **3.15 mrem/yr** to a child thyroid via inhalation pathway. (0.21% of the annual limit).
The maximum dose was **0.196 mrem** to an infant thyroid via all receptor's pathways (1.31% of the annual limit)

Thus, the calculation validated the release to be insignificant and well within the definition of a "Secondary Release Path" as defined in the FSAR and ODCM documents.

8.6 ***Missed Effluent Samples:***

8.6.2 **No gaseous effluent** samples were missed during this reporting period.

8.6.1 There was **one missed liquid effluent** sample for the Circulating Water Discharge-Steam Generator Blowdown Heat Exchanger Discharge (CWD-SGD) during this reporting period as documented in the Condition Report number **CR-95-0021** as follows:

Description of Event:

The Offsite Dose Calculation Manual (ODCM) procedure, UNT-005-014, Table 5.3-1 Section B. Note "I" requires surveillances to be conducted on the Circulating Water Discharge-Steam Generator Blowdown Heat Exchanger Discharge (CWD-SGB) whenever detectable activity exists in the secondary system. Contrary to this requirement, the required surveillance's on CWD-SGB have not been conducted despite the detection of tritium and some gamma emitting isotopes in the secondary plant during 1993 and 1994. This condition was discovered during the ODCM procedure revision 4 preparation.

Cause of Event:

The cause of this event was a mistaken interpretation of the ODCM's requirement to sample from this release point. It was incorrectly assumed that the sampling requirement was only needed during the release of either Steam Generator Blowdown (SGB) or Auxiliary Component Cooling Water (ACCW) to the Circulating Water System. The primary purpose of the CWD-SGB radiation monitor is to monitor and sample the cooling water outlet of the circulation water side of the Steam Generator Blowdown Heat Exchanger (SGBHX) in order to determine if SGB water is leaking into the Circulating Water System.

Secondary purpose of this radiation monitor is to monitor the SGB and ACCW releases to the Circulating Water System. There were several instances when gamma emitting radionuclides were detected in the Steam Generators over the two years period. They were infrequent and resulted in very low concentrations of I-131 and I-133. Recently, Tritium monitoring has been implemented on the Steam Generators and consistently indicates detectable H-3 activity. Since there was no activity detected (gamma emitter or H-3) in the CWD-SGB samples, assurance is provided that there has not been any leakage of SGB fluid into the circulating water system from the SGBHX.

Corrective Action:

The CWD-SGB was sampled on January 11, 1995 for Gamma emitting isotopes and tritium. The analyzed sample was found to be free of any radioactivity. Also, a sampling tickler card was initiated to obtain a weekly sample from the CWD-SGB until there is no detectable activity in the secondary system.

Action to Prevent Recurrence:

The Offsite Dose Calculation Manual was reviewed and the conditional sampling requirements identified in the revision 4 of UNT-005-014 procedure. Tickler cards were generated for release points having a conditional requirement and the possibility that sampling may or may not be in place during any instant. For some of the sampling requirements, notification that the condition exists will come from operations (i.e. >15% power change within one hour, etc.). Tickler cards are scheduled to be weekly items except for operation notifications (daily items).

8.7 *Major Changes to Radioactive Waste Systems*

During the reporting period, **no Major Changes** were made to any Radioactive Waste Systems.

8.8 *Additional Information*

The most recent Reactor Coolant System E-Bar calculation was 0.481 MeV/Disintegration from a sample obtained on December 4, 1995. Reactor Coolant System E-Bar is supplied for information only and is not used for effluent dose calculations.

9.0 *TABLES*

10.0 *ATTACHMENTS*

TABLE 1
(1 of 2)

BATCH RELEASE SUMMARY

Batch Release Summary information for 1995 Report Period.

Report Catagory	: Batch Release Summary
Release Point	: All
Type of Release	: Batch Liquid and Gaseous
Period Start Time	: 01-jan-1995 00:00:00
Period End Time	: 31-dec-1995 23:59:59

Liquid Releases

Number of Releases	:	261
Total Time for All Releases	:	70086.5 Minutes
Maximum Time for a Release	:	342.0 Minutes
Average Time for a Release	:	268.5 Minutes
Minimum Time for a Release	:	64.0 Minutes
Average Stream Flow	:	776410.5 GPM

Gaseous Releases

Number of Releases	:	15
Total Time for All Releases	:	4333.0 Minutes
Maximum Time for a Release	:	600.0 Minutes
Average Time for a Release	:	288.9 Minutes
Minimum Time for a Release	:	65.0 Minutes

TABLE 1
(2 of 2)

BATCH RELEASE SUMMARY

Batch Release Summary information for 1995 by Quarter.

Report Catagory : Batch Release Summary
Release Point : All
Type of Release : Batch Liquid and Gaseous
Period Start Time : 01-jan-1995 00:00:00
Period End Time : 31-dec-1995 23:59:59

Liquid Releases

	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
Number of Releases :	51	71	87	52	
Total Time for All Releases :	13467.0	19016.0	23859.0	13744.5	Minutes
Maximum Time for a Release :	295.0	321.0	342.0	312.0	Minutes
Average Time for a Release :	264.1	267.8	274.2	264.3	Minutes
Minimum Time for a Release :	231.0	145.0	204.0	64.0	Minutes
Average Stream Flow :	754705.9	688926.2	952640.7	612797.4	GPM

Gaseous Releases

	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
Number of Releases :	2	5	4	4	
Total Time for All Releases :	437.0	1705.0	969.0	1222.0	Minutes
Maximum Time for a Release :	221.0	490.0	600.0	504.0	Minutes
Average Time for a Release :	218.5	341.0	242.2	305.5	Minutes
Minimum Time for a Release :	216.0	65.0	80.0	182.0	Minutes

TABLE 1A
(1 of 1)

ANNUAL SUMMATION OF ALL RELEASES BY QUARTER
ALL AIRBORNE EFFLUENTS

Gaseous Release Summary information for 1995

Report Catagory : Summation of All Releases
Type of Activity : All Airborne Effluents
Period Start Time : 01-jan-1995 00:00:00
Period End Time : 31-dec-1995 23:59:59

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est.Total Error %
A. Fission and Activation Gases						
1. Total Release	Curies	2.46e+02	5.15e+02	5.90e+02	3.93e+02	1.50e+01
2. Average Release Rate for Period	uCi/sec	3.17e+01	6.54e+01	7.43e+01	4.95e+01	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
B. Radioiodines						
1. Total Iodine-131	Curies	3.12e-06	6.96e-06	1.87e-04	5.80e-04	1.50e+01
2. Average Release Rate for Period	uCi/sec	4.02e-07	8.85e-07	2.35e-05	7.30e-05	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
C. Particulates						
1. Particulates (Half-lives > 8 Days)	Curies	1.20e-06	2.70e-06	8.61e-07	9.16e-06	1.50e+01
2. Average Release Rate for Period	uCi/sec	1.55e-07	3.43e-07	1.08e-07	1.15e-06	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
1. Gross Alpha Radioactivity	Curies	2.83e-06	3.68e-06	7.04e-06	6.75e-06	1.50e+01
D. Tritium						
1. Total Release	Curies	2.35e+01	7.30e+01	8.96e+00	1.66e+01	1.50e+01
2. Average Release Rate for Period	uCi/sec	3.02e+00	9.29e+00	1.13e+00	2.09e+00	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	

TABLE 1B
(1 of 1)

ANNUAL AIRBORNE CONTINUOUS ELEVATED AND GROUND LEVEL RELEASES

Gaseous Release Summary information for 1995

Report Catagory : Airborne Continuous Elevated and Ground Level Releases.
: Totals for Each Nuclide Released.
Type of Activity : Fission Gases, Iodines, and Particulates
Period Start Time : 01-jan-1995 00:00:00
Period End Time : 31-dec-1995 23:59:59

		Elevated Releases				Ground Releases			
Nuclide	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fission and Activation Gases									
Kr-85m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.07e+00	1.95e+00	9.95e-01	0.00e+00
Kr-88	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.14e-01	0.00e+00
Xe-133	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.13e+02	3.68e+02	4.69e+02	2.61e+02
Xe-133m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.91e+00	0.00e+00
Xe-135	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.04e+01	2.49e+01	6.95e+00	3.44e+00
Xe-135m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.10e-01	6.31e+00	7.44e+00	0.00e+00
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.26e+02	4.02e+02	4.86e+02	2.65e+02
Radioiodines									
I-131	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.65e-08	4.95e-07	1.87e-04	5.80e-04
I-133	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.05e-06	6.46e-06	1.32e-07	0.00e+00
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.12e-06	6.96e-06	1.87e-04	5.80e-04
Particulates									
H-3	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.33e+01	7.30e+01	8.88e+00	1.65e+01
Cr-51	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.82e-07
Co-58	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.27e-08	3.01e-07	5.04e-06
Co-60	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.78e-07	3.22e-07	1.27e-06
Nb-95	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	6.55e-07
Ru-103	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.89e-07
Sb-125	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	6.87e-07	1.24e-06	0.00e+00	0.00e+00
Cs-134	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.25e-07	2.64e-07
Cs-137	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.15e-07	1.22e-06	1.40e-08	9.49e-07
Gralpha	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.83e-06	3.68e-06	7.04e-06	6.75e-06
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.33e+01	7.30e+01	8.88e+00	1.65e+01

TABLE 1C
(1 of 1)

ANNUAL AIRBORNE BATCH ELEVATED AND GROUND LEVEL RELEASES

Gaseous Release Summary information for 1995

Report Catagory : Airborne Batch Elevated and Ground Level Releases.
: Totals for Each Nuclide Released.
Type of Activity : Fission Gases, Iodines, and Particulates
Period Start Time : 01-jan-1995 00:00:00
Period End Time : 31-dec-1995 23:59:59

		Elevated Releases				Ground Releases			
Nuclide	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fission and Activation Gases									
Ar-41	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.46e-01	7.42e-02	3.02e-01	5.93e-02
Kr-85	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.64e+00	8.33e+00	1.60e+00	3.79e+00
Kr-85m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.87e-04	1.92e-02	0.00e+00
Xe-131m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.65e-01	2.20e+00	1.23e+00	1.82e+00
Xe-133	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.68e+01	8.73e+01	9.95e+01	1.22e+02
Xe-133m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.75e-02	2.55e-01	8.43e-01	5.06e-01
Xe-135	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.00e-02	4.33e-02	4.[illegible]e-01	3.92e-03
Xe-137	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.46e+01	0.00e+00	0.00e+00
Xe-138	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.25e-01	0.00e+00	0.00e+00
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.02e+01	1.13e+02	1.04e+02	1.29e+02
Radioiodines									
None									
Particulates									
H-3	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.87e-01	3.88e-02	8.43e-02	1.77e-01
Total for Period	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.87e-01	3.88e-02	8.43e-02	1.77e-01

TABLE 2A
(1 of 1)

ANNUAL SUMMATION OF ALL RELEASES BY QUARTER
ALL LIQUID EFFLUENTS

Liquid Release Summary information for 1995

Report Catagory : Summation of All Releases
Type of Activity : All Liquid Effluents
Period Start Time : 01-jan-1995 00:00:00
Period End Time : 31-dec-1995 23:59:59

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est.Total Error %
A. Fission and Activation Products						
1. Total Release (Not Including Tritium, Gases, and Alpha	Curies	3.19e-01	5.79e-01	1.36e+00	1.51e+00	1.50e+01
2. Average Diluted Concentration During Period	uCi/sec	8.63e-10	1.69e-09	2.84e-09	4.93e-09	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
B. Tritium						
1. Total Release	Curies	1.92e+02	3.20e+02	4.61e+02	2.09e+01	1.50e+01
2. Average Diluted Concentration During Period	uCi/sec	5.19e-07	9.35e-07	9.64e-07	6.80e-08	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
C. Dissolved and Entrained Gases						
1. Total Release	Curies	1.09e+00	3.49e+00	4.76e+00	1.08e+00	1.50e+01
2. Average Diluted Concentration During Period	uCi/sec	2.95e-09	1.02e-08	9.95e-09	3.51e-09	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
D. Gross Alpha Radioactivity						
1. Total Release	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.50e+01
E. Waste Volume Released (Pre-Dilution)	Liters	1.12e+07	1.39e+07	1.31e+07	9.24e+06	1.50e+01
F. Volume of Dilution Water Used	Liters	3.70e+11	3.42e+11	4.78e+11	3.07e+11	1.50e+01

TABLE 2B
(1 of 2)

ANNUAL LIQUID CONTINUOUS AND BATCH RELEASES

Liquid Release Summary information for 1995

Report Catagory : Liquid Continuous and Batch Releases.
: Totals for Each Nuclide Released.
Type of Activity : All Radionuclides
Period Start Time : 01-jan-1995 00:00:00
Period End Time : 31-dec-1995 23:59:59

		Continuous Releases				Batch Releases			
Nuclide	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
All Nuclides									
H-3	Curies	9.29e-02	1.31e-01	3.77e-02	9.66e-03	1.92e+02	3.20e+02	4.61e+02	2.09e+01
Na-24	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.64e-05	6.96e-05	1.37e-04	1.46e-04
Ar-41	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.91e-05	0.00e+00	7.20e-06
Sc-46	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.34e-05	2.88e-05	1.97e-04
Cr-51	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.09e-04	3.07e-02	1.79e-01	1.50e-01
Mn-54	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.10e-03	1.08e-03	4.08e-03	1.82e-02
Fe-55	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.83e-01	4.40e-03	1.49e-02	5.28e-02
Fe-59	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.56e-03	3.47e-02	1.06e-02
Co-57	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.68e-03
Co-58	Curies	0.00e+00	9.79e-06	1.02e-05	2.52e-05	6.94e-03	1.52e-01	7.18e-01	7.61e-01
Co-60	Curies	0.00e+00	5.63e-06	9.03e-07	3.86e-07	5.03e-03	5.09e-03	1.98e-02	5.70e-02
Ni-56	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.60e-04	2.85e-04	3.21e-05
Zn-65	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	9.85e-06	0.00e+00
Br-82	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.73e-04	1.23e-04	0.00e+00
Kr-85	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.75e-02	1.05e-01	4.37e-02	1.38e-02
Kr-85m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	9.98e-04	2.08e-03	9.03e-04	0.00e+00
Kr-88	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.73e-04	1.05e-03	4.09e-04	0.00e+00
Rb-88	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.41e-03	3.16e-01	4.82e-02	0.00e+00
Sr-89	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.44e-04	6.10e-05	1.12e-04	0.00e+00
Sr-92	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.64e-05	2.89e-04	2.76e-04
Y-91m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.29e-06	0.00e+00	0.00e+00
Zr-95	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.15e-03	1.29e-02	7.38e-02	9.81e-02
Zr-97	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.29e-05	0.00e+00
Nb-95	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.99e-03	1.56e-02	9.23e-02	1.60e-01
Nb-97	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.07e-04	2.22e-03	3.65e-04
Tc-99m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.10e-04	2.39e-05	0.00e+00
Ru-103	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.61e-05	1.00e-03
Ag-110m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.52e-04	6.38e-03	7.82e-04
Sn-113	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.21e-04	1.09e-03	8.13e-03	7.68e-03
Sb-122	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.98e-06	6.27e-05	6.40e-03	1.34e-03
Sb-124	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.15e-03	5.76e-03	1.18e-02
Sb-125	Curies	6.51e-06	7.86e-06	0.00e+00	0.00e+00	3.41e-03	9.33e-03	1.60e-02	5.21e-02
Sb-126	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.19e-05	6.37e-04	2.02e-04
Sb-127	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.53e-05	0.00e+00	0.00e+00
Te-132	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.04e-04	9.36e-05
I-131	Curies	0.00e+00	4.33e-07	1.78e-05	0.00e+00	2.32e-04	3.78e-03	6.06e-02	5.77e-02
I-132	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.89e-05	1.86e-03	2.74e-04
I-133	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.44e-04	6.35e-03	5.21e-03	5.43e-05
I-134	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.69e-04	0.00e+00	6.04e-03	7.26e-05
Xe-131m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.18e-02	5.51e-02	5.10e-02	1.70e-02
Xe-133	Curies	0.00e+00	0.00e+00	4.30e-06	0.00e+00	9.95e-01	3.28e+00	4.59e+00	1.04e+00
Xe-133m	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.24e-02	2.54e-02	3.66e-02	4.03e-03
Xe-135	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.39e-02	2.14e-02	3.27e-02	2.04e-04
Cs-134	Curies	1.75e-05	2.97e-05	3.43e-05	1.26e-05	1.95e-03	3.23e-03	1.21e-02	3.34e-02
Cs-136	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.[illegible]e-05	0.00e+00	1.04e-03

TABLE 2B
(2 of 2)

ANNUAL LIQUID CONTINUOUS AND BATCH RELEASES

Liquid Release Summary information for 1995

Report Catagory : Liquid Continuous and Batch Releases.
: Totals for Each Nuclide Released.
Type of Activity : All Radionuclides
Period Start Time : 01-jan-1995 00:00:00
Period End Time : 31-dec-1995 23:59:59

Nuclide	Units	Continuous Releases				Batch Releases			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
All Nuclides (continued)									
Cs-137	Curies	2.26e-05	6.38e-05	6.48e-05	2.48e-05	2.00e-03	3.69e-03	1.31e-02	2.97e-02
Cs-138	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.77e-03	0.00e+00	2.38e-02	0.00e+00
Ba-133	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.24e-04	0.00e+00	0.00e+00
Ba-140	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	6.65e-05	0.00e+00	3.45e-04
La-140	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.10e-04	1.36e-03	1.75e-03	4.54e-03
Ce-141	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.87e-05	1.50e-04
W-187	Curies	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.23e-05	2.52e-05	0.00e+00	0.00e+00
Total for Period	Curies	9.30e-02	1.31e-01	3.79e-02	9.72e-03	1.94e+02	3.24e+02	4.67e+02	2.35e+01

TABLE 3
(1 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

WASTE TYPE	*CONTAINER VOLUME (Ft3)*	*WASTE VOLUME (M3)*	*TOTAL ACTIVITY (Ci)*	*ERROR*
(B) Non Compacted Dry Activity Waste Shipped to SEG Corp for Volume Reduction. •	2080	58.91 2.68 Burial Volume	1.49E-01 ♣ 1.506E-01 Burial Activity	-+25% -+25%
(B) Non Compacted Dry Activity Waste Shipped to SEG Corp for Volume Reduction. •	2080	58.91 2.36 Burial Volume	3.95E-01 ♣ 3.398E-01 Burial Activity	-+25% -+25%

• Waste volume shipped for volume reduction do not reflect final burial waste volume unless otherwise stated.

♣ Activity determined by estimations.

♦ Activity determined by measurements.

TABLE 3
(2 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

WASTE TYPE	*CONTAINER VOLUME (Ft3)*	*WASTE VOLUME (M3)*	*TOTAL ACTIVITY (Ci)*	*ERROR*
(B) Non Compacted Dry Activity Waste Shipped to SEG Corp for Volume Reduction. •	2080	58.91 0.561 Burial Volume	2.72E-01 ♣ 1.61E-02 Burial Activity	-+25% -+25%
(B) Non Compacted Dry Activity Waste Shipped to SEG Corp for Volume Reduction. •	2080	58.91 2.09 Burial Volume	5.61E-01 ♣ 2.80E-01 Burial Activity	-+25% -+25%

• Waste volume shipped for volume reduction do not reflect final burial waste volume unless otherwise stated.

♣ Activity determined by estimations.

♦ Activity determined by measurements..

TABLE 3
(3 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

WASTE TYPE	*CONTAINER VOLUME (Ft3)*	*WASTE VOLUME (M3)*	*TOTAL ACTIVITY (Ci)*	*ERROR*
(A) Resin Waste Management Resin Dewatered in a High Integrity Container (Bead Resin) Shipped for Burial.	174.3	4.94	6.0E+01 ♦	-+25%
(A) Resin Waste Management Resin Dewatered in a High Integrity Container (Bead Resin) Shipped for Burial.	174.3	4.94	3.18E+02 ♦	-+25%

• Waste volume shipped for volume reduction do not reflect final burial waste volume unless otherwise stated.

♣ Activity determined by estimations.

♦ activity determined by measurements.

TABLE 3
(4 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

WASTE TYPE	CONTAINER VOLUME (Ft3)	WASTE VOLUME (M3)	TOTAL ACTIVITY (Ci)	ERROR
(A) Liquid Waste Management Resin Dewatered in a High Integrity Container (Bead Resin) Shipped for Burial.	202.1	5.72	3.97E+00 ♦	-+25%
(A) Liquid Waste Management Resin Dewatered in a High Integrity Container (Bead Resin) Shipped for Burial.	202.1	5.72	3.68E+00 ♦	-+25%

• Waste volume shipped for volume reduction do not reflect final burial waste volume unless otherwise stated.

♣ Activity determined by estimations.

♦ Activity determined by measurements.

TABLE 3
(5 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

WASTE TYPE	*CONTAINER VOLUME (Ft3)*	*WASTE VOLUME (M3)*	*TOTAL ACTIVITY (Ci)*	*ERROR*
(A) Liquid Waste Management Resin Dewatered in a High Integrity Container (Bead Resin) Shipped for Burial.	202.1	5.72	1.56E+01 ♦	-+25%
(A) Liquid Waste Management Resin Dewatered in a Strong Tight Container (Bead Resin) Shipped for Burial.	45.8	1.30	7.89E-01 ♦	-+25%

• Waste volume shipped for volume reduction do not reflect final burial waste volume unless otherwise stated.

♣ Activity determined by estimations.

♦ Activity determined by measurements.

TABLE 3
(6 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

WASTE TYPE	*CONTAINER VOLUME (Ft3)*	*WASTE VOLUME (M3)*	*TOTAL ACTIVITY (Ci)*	*ERROR*
(A) Spent Cartridge Filters in Integrity Container Shipped for Burial.	132.4	3.75	2.50E+01 ♦	-+25%
(A) Spent Cartridge Filters in Integrity Container Shipped for Burial.	132.4	3.75	1.03E+02 ♦	-+25%

- Waste volume shipped for volume reduction do not reflect final burial waste volume unless otherwise stated.

♣ Activity determined by estimations.
♦ Activity determined by measurements.

TABLE 3
(7 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

WASTE TYPE	*CONTAINER VOLUME (Ft3)*	*WASTE VOLUME (M3)*	*TOTAL ACTIVITY (Ci)*	*ERROR*
(D) Waste Oil Shipped to SEG Corp for Incineration in Six Strong Tight Containers.	270	7.64	5.59E-03 ♦	-+25%
(D) Waste Oil Shipped to SEG Corp for Incineration in Four Strong Tight Containers.	180	5.10	5.00E-07 ♦	-+25%
(C) Irradiated Components Shipped in Type B Container.	57.4	1.625	1.24E+04 ♣	-+25%

• Waste volume shipped for volume reduction do not reflect final burial waste volume unless otherwise stated.

♣ Activity determined by estimations.

♦ Activity determined by measurements.

TABLE 3
(8 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

NUMBER OF SHIPMENTS	MODE OF TRANSPORTATION	DISTINATION
9	Sole Use Cask	Barnwell, SC
6	Sole Use Flatbed	Oak Ridge, TN

WASTE CLASS	No. OF SHIPMENTS	TYPE	TYPE OF CONTAINER	MODE	DISTINATION
A	6	LSA	Strong Tight	Truck	Oak Ridge, TN
A	4	LSA	Strong Tight	Truck	Barnwell, SC
B	2	>A LSA	Strong Tight	Truck	Barnwell, SC
C	2	B	Type B	Truck	Barnwell, SC
C	1	>A LSA	Type A	Truck	Barnwell, SC

TABLE 3
(9 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

SUMMARY BY MAJOR WASTE TYPES

(A) Spend resins, Filter Sludges, Evaporator Bottoms, ect.

(B) Dry Compressible Waste, Contaminated Equipment, etc.

(C) Irradiated Components, Control Rods, etc.

(D) Other (Waste Oil).

WASTE TYPE	WASTE VOLUME (M3)	TOTAL ACTIVITY (Ci)	ERROR
(A)	35.83	5.30E+02	-+ 25%
(B)	235.64♠	1.377E+00	-+ 25%
(C)	1.625	1.24E+04	-+ 25%
(D)	12.74	5.59E-03	-+ 25%

♠ Includes all Type Waste Volume.

TABLE 3
(10 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

SUMMARY BY MAJOR WASTE TYPES (Cont'd)

WASTE TYPE	NUCLIDE NAME	CURIES	% ABUNDANCE
(A)			
	Co-58	2.22E+02	41.95
	Cs-137	1.00E+02	18.94
	Cs-134	9.49E+01	17.95
	Ni-63	3.92E+01	7.42
	Fe-55	3.58E+01	6.76
	Co-60	1.99E+01	3.76
	Mn-54	7.85E+00	1.48
	Cr-51	4.48E+00	0.85
	Zr-95	2.02E+00	0.38
	Nb-95	1.61E+00	0.30
	Fe-59	6.40E-01	0.12
	Ce-144	6.40E-01	0.12
	Ni-59	3.78E-01	0.07
	Sr-90	1.28E-01	0.02
	H-3	N.P.	0.00
	C-14	N.P.	0.00
	Tc-99	N.P.	0.00
	I-129	N.P.	0.00
	TOTAL	5.30E+02	

Note: N.P. means Not Present.

TABLE 3
(11 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

SUMMARY BY MAJOR WASTE TYPES (Cont'd)

WASTE TYPE	NUCLIDE NAME	CURIES	% ABUNDANCE
(B)			
	Fe-55	4.44E-01	32.27
	Cs-134	1.70E-01	12.33
	Ni-63	1.68E-01	12.18
	Co-60	1.62E-01	11.79
	Cs-137	1.58E-01	11.45
	Co-58	1.36E-01	9.85
	Mn-54	7.05E-02	5.12
	Ni-59	1.57E-03	0.11
	Pu-241	6.50E-04	0.05
	Cm-242	1.03E-08	0.001
	H-3	N.P.	0.00
	C-14	N.P.	0.00
	Tc-99	N.P.	0.00
	I-129	N.P.	0.00
	TOTAL	1.377E+00	

Note: N.P. means Not Present.

TABLE 3
(12 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

SUMMARY BY MAJOR WASTE TYPES (Cont'd)

WASTE TYPE	NUCLIDE NAME	CURIES	% ABUNDANCE
(C)			
	Co-60	6.82E+03	55.00
	Fe-55	2.06E+03	16.61
	Co-58	2.02E+03	16.29
	Cr-51	1.05E+03	8.47
	Ni-63	2.85E+02	2.30
	Mn-54	1.88E+02	1.52
	Fe-59	2.02E+01	0.16
	Ni-59	1.82E+00	0.015
	C-14	1.79E-01	0.001
	Nb-94	1.84E-03	0.00
	T-99	4.15E-04	0.00
	H-3	N.P.	
	I-129	N.P.	
	TOTAL	1.24E+04	

Note: N.P. means Not Present.

TABLE 3
(13 of 13)

SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL DURING PERIOD OF 01/01/95 THROUGH 12/31/95

SUMMARY BY MAJOR WASTE TYPES (Cont'd)

WASTE TYPE	NUCLIDE NAME	CURIES	% ABUNDANCE
(D)			
	Fe-55	2.24E-03	40.07
	Ni-60	1.21E-03	21.65
	Co-60	9.90E-04	17.71
	Cs-137	5.70E-04	10.20
	Cs-134	4.00E-04	7.16
	Mn-54	1.70E-04	3.04
	Ni-59	1.20E-05	0.21
	Pu-241	2.24E-06	0.04
	Co-58	0.00E+00	0.00
	Cm-242	0.00E+00	0.00
	H-3	N.P.	0.00
	C-14	N.P.	0.00
	Tc-99	N.P.	0.00
	I-129	N.P.	0.00
	TOTAL	5.59E-03	

Note: N.P. means Not Present.

TABLE 4
(1 of 4)
JOINT FREQUENCY DISTRIBUTION OF METEOROLOGICAL DATA

Joint frequency distribution of wind speed and direction in hours 01-01-95 00:00to 12-31-95 23:59 Pasquill Class A

Wind Direction	Wind Speed (M/S) at 10-m Level												
	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10	10.1-13	13.1-18.0	>18.0	Total
N	0	0	0	0	2	5	27	13	1	0	0	0	48
NNE	0	0	0	0	0	4	16	6	0	0	0	0	26
NE	0	0	0	0	0	17	136	13	1	0	0	0	167
ENE	0	0	0	0	0	7	19	6	0	0	0	0	32
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	1	5	3	0	0	0	0	9
SE	0	0	0	0	0	0	11	8	0	0	0	0	19
SSE	0	0	0	0	0	2	11	9	1	0	0	0	23
S	0	0	0	0	0	1	[illegible]	16	0	0	0	0	34
SSW	0	0	0	0	0	2	[illegible]	3	0	0	0	0	7
SW	0	0	0	0	2	4	13	21	0	0	0	0	40
WSW	0	0	0	0	0	2	8	2	0	0	0	0	12
W	0	0	0	0	1	2	1	3	0	0	0	0	7
WNW	0	0	0	0	0	0	9	1	0	0	0	0	10
NW	0	0	0	0	0	1	17	3	1	0	0	0	22
NNW	0	0	0	0	0	8	19	6	4	0	0	0	37
Total	0	0	0	0	5	56	311	113	8	0	0	0	493

Number of calms for A Stability: 0

Joint frequency distribution of wind speed and direction in hours 01-01-95 00:00to 12-31-95 23:59 Pasquill Class B

Wind Direction	Wind Speed (M/S) at 10-m Level												
	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10	10.1-13	13.1-18.0	>18.0	Total
N	0	0	0	1	4	8	18	7	1	0	0	0	39
NNE	0	0	0	0	1	7	14	10	0	0	0	0	32
NE	0	0	0	1	5	31	66	3	0	0	0	0	106
ENE	0	0	0	0	1	10	17	2	0	0	0	0	30
E	0	0	0	0	0	0	2	1	0	0	0	0	3
ESE	0	0	0	0	0	0	7	4	0	0	0	0	11
SE	0	0	0	0	1	1	7	3	0	0	0	0	12
SSE	0	0	0	0	0	4	14	3	1	0	0	0	22
S	0	0	0	0	1	3	23	13	4	0	0	0	44
SSW	0	0	0	0	0	6	6	5	2	0	0	0	19
SW	0	0	0	0	1	7	15	5	0	0	0	0	28
WSW	0	0	0	0	0	4	6	2	0	0	0	0	12
W	0	0	0	1	0	3	2	0	0	0	0	0	6
WNW	0	0	0	0	1	4	8	0	1	0	0	0	14
NW	0	0	0	0	0	4	5	0	0	0	0	0	9
NNW	0	0	0	0	6	1	21	5	1	0	0	0	34
Total	0	0	0	3	21	93	231	63	10	0	0	0	421

Number of calms for B Stability: 0

TABLE 4
(2 of 4)
JOINT FREQUENCY DISTRIBUTION OF METEOROLOGICAL DATA

Joint frequency distribution of wind speed and direction in hours 01-01-95 00:00to 12-31-95 23:59 Pasquill Class C

Wind Speed (M/S) at 10-m Level

Wind Direction	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10	10.1-13	13.1-18.0	>18.0	Total
N	0	0	0	0	8	12	26	8	4	0	0	0	58
NNE	0	0	0	3	6	17	17	5	0	0	0	0	48
NE	0	0	0	0	12	46	62	7	0	0	0	0	127
ENE	0	0	0	0	2	12	27	2	0	0	0	0	43
E	0	0	0	0	0	0	4	2	0	0	0	0	6
ESE	0	0	0	1	1	4	9	6	1	0	0	0	22
SE	0	0	0	0	0	2	12	9	0	0	0	0	23
SSE	0	0	0	0	2	11	33	4	0	0	0	0	50
S	0	0	0	0	2	12	28	9	7	0	0	0	58
SSW	0	0	0	1	2	5	12	8	2	0	0	0	30
SW	0	0	0	1	3	13	15	7	1	0	0	0	40
WSW	0	0	0	2	6	11	7	3	0	0	0	0	29
W	0	0	0	0	3	12	4	0	0	0	0	0	19
WNW	0	0	0	0	1	3	1	0	0	0	0	0	5
NW	0	0	0	0	0	6	7	0	0	0	0	0	13
NNW	0	0	0	0	4	11	27	6	0	0	0	0	48
Total	0	0	0	8	52	177	291	76	15	0	0	0	619

Number of calms for C Stability: 0

Joint frequency distribution of wind speed and direction in hours 01-01-95 00:00to 12-31-95 23:59 Pasquill Class D

Wind Speed (M/S) at 10-m Level

Wind Direction	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10	10.1-13	13.1-18.0	>18.0	Total
N	0	2	1	5	23	57	127	121	34	0	0	0	370
NNE	0	0	4	7	21	40	87	62	2	0	0	0	223
NE	0	1	5	10	30	101	150	32	1	0	0	0	330
ENE	0	0	2	8	9	33	115	27	1	0	0	0	195
E	0	1	0	3	5	6	67	29	1	0	0	0	112
ESE	0	0	1	0	2	7	83	26	6	0	0	0	125
SE	0	0	2	4	6	23	74	16	5	0	0	0	130
SSE	0	0	1	1	9	29	133	45	6	0	0	0	224
S	0	0	1	7	14	39	113	47	15	0	0	0	236
SSW	0	0	1	5	8	35	59	23	3	1	0	0	135
SW	0	0	0	7	8	22	46	20	0	0	0	0	103
WSW	0	0	0	8	12	42	24	1	1	0	0	0	88
W	0	0	2	9	12	19	32	7	0	0	0	0	81
WNW	0	0	1	6	5	20	17	3	0	0	0	0	52
NW	0	0	2	5	8	13	25	3	1	0	0	0	57
NNW	0	0	1	6	10	33	86	58	16	0	0	0	210
Total	0	4	24	91	182	519	1238	520	92	1	0	0	2671

Number of calms for D Stability: 0

TABLE 4
(3 of 4)
JOINT FREQUENCY DISTRIBUTION OF METEOROLOGICAL DATA

Joint frequency distribution of wind speed and direction in hours 01-01-95 00:00to 12-31-95 23:59 Pasquill Class E

Wind Direction	Wind Speed (M/S) at 10-m Level .35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10	10.1-13	13.1-18.0	>18.0	Total
N	0	1	6	19	42	76	100	27	3	0	0	0	274
NNE	0	2	2	17	26	67	79	12	0	0	0	0	205
NE	0	1	5	13	29	134	98	5	1	0	0	0	286
ENE	0	0	2	6	23	71	85	3	0	0	0	0	190
E	0	1	4	6	12	36	60	3	0	0	0	0	122
ESE	1	0	0	4	15	47	85	9	1	0	0	0	162
SE	0	3	2	10	14	49	65	3	0	0	0	0	146
SSE	0	1	4	14	50	127	74	5	1	0	0	0	276
S	0	3	18	27	43	95	68	12	2	0	0	0	268
SSW	0	2	3	23	37	54	42	11	1	1	0	0	174
SW	0	1	5	35	35	47	29	7	0	0	0	0	159
WSW	0	5	6	21	27	24	20	2	0	0	0	0	105
W	0	2	7	22	14	8	12	0	0	0	0	0	65
WNW	0	1	7	20	14	15	4	0	0	0	0	0	61
NW	1	2	6	18	15	18	9	1	1	0	0	0	71
NNW	0	2	0	14	27	47	43	4	1	0	0	0	138
Total	2	27	77	259	423	915	873	104	11	1	0	0	2702

Number of calms for E Stability: 2

Joint frequency distribution of wind speed and direction in hours 01-01-95 00:00to 12-31-95 23:59 Pasquill Class F

Wind Direction	Wind Speed (M/S) at 10-m Level .35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10	10.1-13	13.1-18.0	>18.0	Total
N	0	5	12	13	15	29	6	0	0	0	0	0	80
NNE	2	2	4	8	12	20	2	0	0	0	0	0	50
NE	0	3	3	6	9	29	7	0	0	0	0	0	57
ENE	0	2	4	4	6	12	7	0	0	0	0	0	35
E	0	1	2	1	2	2	2	0	0	0	0	0	10
ESE	0	2	5	2	3	3	1	0	0	0	0	0	16
SE	1	3	4	9	5	1	0	0	0	0	0	0	23
SSE	1	5	9	24	28	24	2	0	0	0	0	0	93
S	2	8	17	45	26	18	4	0	0	0	0	0	120
SSW	5	10	40	68	19	4	0	0	0	0	0	0	146
SW	1	19	32	48	15	10	0	0	0	0	0	0	125
WSW	2	13	21	30	10	7	0	0	0	0	0	0	83
W	4	8	31	46	10	1	0	0	0	0	0	0	100
WNW	0	4	16	36	14	1	1	0	0	0	0	0	72
NW	0	3	6	16	9	2	0	0	0	0	0	0	36
NNW	2	2	8	8	10	10	6	0	0	0	0	0	46
Total	20	90	214	364	193	173	38	0	0	0	0	0	1092

Number of calms for F Stability: 4

TABLE 4
(4 of 4)
JOINT FREQUENCY DISTRIBUTION OF METEOROLOGICAL DATA

Joint frequency distribution of wind speed and direction in hours 01-01-95 00:00to 12-31-95 23:59 Pasquill Class G

Wind Direction	Wind Speed (M/S) at 10-m Level												
	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10	10.1-13	13.1-18.0	>18.0	Total
N	3	5	6	6	1	0	0	0	0	0	0	0	21
NNE	0	4	4	3	2	0	0	0	0	0	0	0	13
NE	0	2	2	7	1	2	1	0	0	0	0	0	15
ENE	0	2	2	0	1	0	0	0	0	0	0	0	5
E	0	1	2	0	0	0	0	0	0	0	0	0	3
ESE	0	1	0	2	0	0	0	0	0	0	0	0	3
SE	2	2	5	2	0	1	0	0	0	0	0	0	12
SSE	1	4	5	9	8	3	0	0	0	0	0	0	30
S	4	8	15	23	7	2	0	0	0	0	0	0	59
SSW	1	8	35	52	12	0	0	0	0	0	0	0	108
SW	7	38	34	32	7	1	0	0	0	0	0	0	119
WSW	9	40	25	12	1	0	0	0	0	0	0	0	87
W	6	33	39	26	3	0	0	0	0	0	0	0	107
WNW	9	19	23	26	5	0	0	0	0	0	0	0	82
NW	1	11	14	2	7	4	0	0	0	0	0	0	39
NNW	2	7	10	5	4	1	0	0	0	0	0	0	29
Total	45	185	221	207	59	14	1	0	0	0	0	0	732

Number of calms for G Stability: 24

Total vaild hours for all stabilities = 8760
Total invaild hours for all stabilities = 0

TABLE 5
(1 of 2)
DOSE CALCULATION RESULTS FOR 1995
(DOSES DUE TO GASEOUS RADIOACTIVE EFFLUENTS)

Gaseous Effluent Dose Totals

Cumulative Dose Information for 1995
Doses due to Noble Gases (mRad or mrem)

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Total-body	5.2402e-02	1.2788e-01	1.2078e-01	6.8433e-02	3.6949e-01
Skin	1.2263e-01	3.8100e-01	2.7082e-01	1.6427e-01	9.3872e-01
Air Beta	1.5849e-01	4.3046e-01	3.6121e-01	2.4065e-01	1.1908e+00
Air Gamma	6.0998e-02	1.4662e-01	1.4175e-01	8.1674e-02	4.3104e-01

Cumulative Dose Information for 1995
Doses due to Radioiodines/Particulates/Tritium (mrem)

Age Group : Infant

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	1.8439e-05	4.6393e-05	3.0372e-04	9.6932e-04	1.3379e-03
Liver	1.8076e-02	5.6182e-02	7.2457e-03	1.3931e-02	9.5436e-02
Total-body	1.8060e-02	5.6142e-02	7.0448e-03	1.3293e-02	9.4540e-02
Thyroid	1.8124e-02	5.6480e-02	1.1988e-01	3.6389e-01	5.5837e-01
Kidney	1.8063e-02	5.6152e-02	7.2965e-03	1.4079e-02	9.5590e-02
Lung	1.8060e-02	5.6144e-02	6.8940e-03	1.2827e-02	9.3925e-02
Gi-lli	1.8058e-02	5.6139e-02	6.9050e-03	1.2858e-02	9.3961e-02
Skin	3.5427e-06	1.0995e-05	8.0743e-06	3.4436e-05	5.7047e-05

TABLE 5
(2 of 2)
DOSE CALCULATION RESULTS FOR 1995
(DOSES DUE TO LIQUID RADIOACTIVE EFFLUENTS)

Liquid Effluent Dose Totals

Cumulative Dose Information for 1995 (mrem)

Age Group : Adult

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	1.8600e-01	4.4069e-01	3.0923e-01	3.4991e-01	1.2858e+00
Liver	3.3291e-01	7.3567e-01	5.0989e-01	6.1646e-01	2.1949e+00
Total-body	2.4774e-01	5.3213e-01	3.6729e-01	4.5644e-01	1.6036e+00
Thyroid	8.6111e-03	1.4795e-02	4.1183e-02	3.8040e-02	1.0263e-01
Kidney	1.1574e-01	2.5237e-01	1.7225e-01	2.0568e-01	7.4604e-01
Lung	4.4539e-02	9.1369e-02	5.9565e-02	6.9624e-02	2.6510e-01
GI-LLI	1.5753e-02	2.9973e-02	2.8983e-02	5.2234e-02	1.2694e-01

ATTACHMENT 10.1

CHANGES
TO
OFFSITE DOSE CALCULATION MANUAL (ODCM)
PROCEDURE No. (UNT-005-014)

The following are the description of changes for **Offsite Dose Calculation Manual (UNT-005-014, Revision 4):**

1- **Purpose:**

1.1	Format change.
1.2 & 1.3	These two steps were changed to NOTES in pages 32 and 61 prior to the calculation methodology sections 5.3.4 and 5.4.5.

2- **References**:

2.1	All Technical Specifications that related to this manual are referenced in this step.
2.8, 2.9 &2.10	Re-arranged the step numbers.
2.12 & 2.13	Add two new references which were only referenced in the Liquid and Gaseous effluent Bases sections 5.3.8 and 5.4.10, but were not listed in section 2 of the manual

3- **Definitions**:

* Add the corresponding Technical Specification number to each definition.
* Deleted the OPERATIONAL MODE definition (step 3.8) and re-numbered the following steps.
* Defined Liquid Radwaste Treatment System, step 3.15.
* Revised the MAJOR CHANGE definition (step 3.16) to clarify that it is a Change to radioactive waste system requiring re-evaluation of the effluent source terms.
* Deleted the LLD definition from Tables 5.3.1, 5.4.1 & 5.8.3 notations and add the final LLD definition as step 3.17 in this section.

4- **Responsibilities:**

4.2 & 4.3	Steps were combined to reflect the new organizational change.

5- **Procedure**:

5.1	Site Characteristics Information is provided in the FSAR chapter 2 and is only referenced in this manual.
5.2.4	Administrative change
5.2.6	Add procedures titles.
5.3.1	Bolded some words to make it visible to the reader. **Table 5.3.1** was completely revised to be clear for the users the sampling and analysis requirements for each release type and avoid using the frequency abbreviation. Also, this change clearly reflects the site specific release points and numbers. The LLD limits were combined as notation a of this table. The Table notations were revised and stream lined with the release type to make it easier to use. The frequency of sample analysis were changed to 'prior to release' for some release type such as secondary holding tanks.
5.3.2	Format changes and add NOTE to specify the applicable condition for step 2 in ACTION for special report.
5.3.3	Format changes
5.3.4	Add two NOTES that were listed as steps 1.2 and 1.3 in Revision 3 of this manual.
5.3.4.1	Add change 1 of the procedure Revision 3.
5.3.4.2	Arranged the equation 3 items to be in order and revised NOTE to reference a new attachment 6.20 which was added In this revision, for the appropriate dose factors for the other liquid pathways.

5.3.5	Combined two equations (4 and 4a) into one equation (4) to calculate setpoints for any condition with or without additional dilution prior to withdrawal of the monitored fluid at the monitor location. Also revised the NOTE to state that F'= 0 if no additional dilution and defined its value for specified release types. The missing Cj definition is added.
5.3.7	Format changes
5.3.8	Format changes
5.4.1	Format changes **Table 5.4.1** was completely revised to be clear for the users what is the sampling and analysis requirements for each release type and avoid using the frequency abbreviation. Also, this change clearly reflects the site specific release points and numbers. The LLD limits were combined as notation "a"of this table. The Table notations were revised and stream lined with the release type to make it easier to use.
5.4.2	Format changes
5.4.5	Add two NOTES that were listed as steps 1.2 and 1.3 in Revision 3 of this manual.
5.4.5.1	Administrative Arrangement of the equations 5,6&7 items to be in order and refers to Attachment 6.2 for X/Q item. Add new Attachment 6.19 from R.G. 1.109 and refers to use it for P_{it}.
5.4.6.1	Format changes
5.4.7	Format changes
5.4.8.4 & 5.4.8.5	List effluent flow rate in CFM and use unit factor in equations 16 and 15 to convert it to cc/sec.

5.4.10 Format changes

5.5.1 Format changes

5.6.1 Add "during releases to the environment" to the Instrumentation Specification and Action. Also, add to Action "or change the setpoint so it is acceptable conservative". This change to assure that the limits of Specification 5.3.1 are met, during actual releases

Tables 5.6-1 is completely revised to be clear for the users what are the applicability requirements for each release type instrument and using the Action that represent the condition of the specific system. The Table notations were revised and stream lined with the release type to make it easier for use. 3 NOTES were added for specific monitors requirements.

Tables 5.6-2 is completely revised to be clear for the users what is the surveillance requirements for each release type instrument and avoid using the frequency abbreviation. Add a new column to specify the condition in which these surveillance's are required. The Table notations were revised and to make it easier for use with the specific release system.

5.6.2 Add "during releases to the environment" to the Instrumentation Specification and Action. Also, add to Action "or change the setpoint so it is acceptable conservative". This change to assure that the limits of Specification 5.4.1 are met, during actual releases

Tables 5.6-3 is completely revised to be clear for the users what are the applicability requirements for each release type instrument and using the Action that represent the condition of the specific system. The Table Actions were revised and stream lined with the specific sampler/monitor channels to make it easier for use. One NOTE was added for specific samplers requirements.

	Tables 5.6-4 is completely revised to be clear for the users what are the surveillance requirements for each release type instrument and avoid using the frequency abbreviation. Add a new column to specify the condition in which these surveillances are required. The Table notations were revised and to make it easier for use with the specific release system.
5.8.1	Format changes
Table 5.8-1	Format changes
Table 5.8-2	Format changes
Table 5.8-3	Format changes and changed the LLD for Ba-140 and Zr-95 to be as specified in the Radiological Assessment Branch Technical Position Revision 1 (November 1979) document. The LLD notation were transferred to definition section step 3.17
5.8.3	Format change,
5.9	Technical Specification cross-references and its Attachment have been deleted. All the following section are re-numbered.
5.10	Changed to 5.9 with Format changes,
5.9.1.7	Refers to Specification 5.4.1 and Technical Specification 3.11.1.4 which were only listed in Revision 3, steps 5.10.1.7 and 5.10.1.8 without indication to the specification sources.
5.9.1.11	Combined two steps from Revision 3 (5.10.1.12 and 5.10.1.13) for Liquid and Gaseous effluent monitoring instrumentation's.
5.11	Changed to 5.10 with Format changes, step 5.10.1 Consolidated special report actions for all specification requirements.

Attachments:

Attachment 6.4	Format change.
Attachment 6.11	Format change for clear flow charts.
Attachment 6.12	Format change for clear flow chart.
Attachment 6.13	Format change. Add sanitary system sample and notation 12 to indicate that it is not a REMP requirement but it represents possible environmental interface with the plant.
Attachment 6.14	Format change. Revised description for TLD sample location D-2. Add sewage sample SWR-1 and corresponding notation.
Attachment 6.16	Format change for clear map.
Attachment 6.17	Format change for clear map.
Attachment 6.18	Format change for clear map.
Attachment 6.19	Deleted.
Attachment 6.19	New Tables for dose factors Pi for radionuclides other than noble gases for all ages groups.
Attachment 6.20	New Tables for dose conversion factors (Inhalation and Ingestion factors) for all age groups. These Tables were obtained from Regulatory Guide 1.109 Tables E-7 through E-14.
Attachment 6.21	Old Attachment 6.20 was revised. The new Attachment lists all the site specific factors that are used in Waterford 3 effluent program and were obtained from Regulatory Guide 1.109.

ATTACHMENT 10.2

Copy of

OFFSITE DOSE CALCULATION MANUAL (ODCM) PROCEDURE UNT-005-014 Revision 4

(153 pages)

PORC/PORC-SC

UNT-005-014
REVISION 4
EFFECTIVE DATE _____

SAFETY-RELATED

ADMINISTRATIVE PROCEDURE

OFFSITE DOSE CALCULATION MANUAL

PORC AND PORC - S/C
REVIEW AND APPROVAL SHEET

REVIEW OF: UNT-005-014 - Offsite Dose Calculation Manual (Rev. 4)	PORC ☒ PORC - S/C ☐

The PORC or PORC S/C has reviewed this item and determined that a Safety/Commitment Review was performed (if applicable), that a Safety Evaluation was performed (if applicable), that an unreviewed safety question does not exist, and that nuclear safety is/was not adversely affected.

PORC MEMBER	MEMBER SIGNATURE	RECOMMENDED FOR APPROVAL YES	RECOMMENDED FOR APPROVAL NO
Maintenance Superintendent	Robert B Patterson	✓	
Operations Superintendent			
Radiation Protection Superintendent	SAMR RAMZY		
Quality Assurance Member		✓	
Mgmt Knowledgeable in Engineering	P. R. Phillon	✓	
Manager Operations & Maintenance			
PORC-S/C Member			
PORC-S/C Member			
PORC-S/C Member			

Meeting No. 95-017 Item No. VI-D Date: 4/6/95
This item is recommended for approval? ☒ YES ☐ NO
This item requires SRC/NRC review prior to implementation? ☐ YES ☒ NO
If yes, ensure documentation supporting review is attached.

	SIGNATURE	RECOMMENDED FOR APPROVAL YES	RECOMMENDED FOR APPROVAL NO	DATE
PORC-S/C Chairman				
PORC Chairman	[signature]	✓		4-6-95

Comments:

Approved by [signature] Date 4/12/95
General Manager Plant Operations

Check Block	
[X]	PORC
[ ]	PORC-S/C
[ ]	DEPT.

WATERFORD 3 SES
PLANT OPERATING MANUAL
REQUEST/APPROVAL PAGE

Procedure No.: UNT-005-014 Title: OFFSITE DOSE CALCULATION MANUAL

Effective Date: _____ (If different from approval date)

COMPLETE A, B, C, and D:

A. Change No.: N/A [ ] Permanent [ ] Deviation Expiration Date: _____

B. Revision No.: 4

C. Deletion: [ ] YES [X] NO

D. Temporary Procedure: [ ] YES [X] NO Expiration Date: _____

DESCRIPTION OF CHANGE, REVISION, OR DELETION:
THIS IS A MAJOR FORMAT CHANGE OF THE OFFSITE DOSE CALCULATION MANUAL (ODCM) PROCEDURE. CHANGES TO EACH SECTION OF THE ODCM PROCEDURE IN THIS REVISION ARE LISTED IN THE ATTACHED PAGES. NO MARGIN LINES ARE USED.

REASON FOR CHANGE, REVISION, OR DELETION:
THIS REVISION IS TO MAKE THE ODCM PROCEDURE FORMAT EASIER TO USE BY ALL PERSONNEL AND TO AVOID ANY CONFUSION WHEN WE APPLY THE RADIOLOGICAL EFFLUENT AND ENVIRONMENTAL SPECIFICATIONS REQUIREMENTS. IT WILL MAINTAIN THE SAME CURRENT CONTROL LEVEL OF THE RADIOLOGCAL EFFLUENT AND ENVIORONMENTAL MONITORING PROGRAMS AT WATERFORD 3 SITE.

AUTHOR\ORIGINATOR: Samir Ramzy SAMIR RAMZY DATE: 3/15/95

TECHNICAL REVIEW: Greg Hood Gregory L. Hood DATE: 3-15-95

GROUP HEAD REVIEW: Jerry Ridgel J R Ridgel DATE: 3/26/95

* TEMPORARY APPROVAL (SRO): N/A DATE: _____

* TEMPORARY APPROVAL: N/A DATE: _____

APPLICABLE CONDITIONS (Temporary procedures only): _____

* Refer to paragraphs 3.2.18 and 3.2.19 for temporary approval requirements.

TABLE OF CONTENTS

LIST OF EFFECTIVE PAGES

Title	Revision 4
1-301	Revision 4

1.0 PURPOSE

1.1 The Offsite Dose Calculation Manual (ODCM) is a supporting document of the Waterford 3 Technical Specifications. This document provides:

(1) The Radiological Effluent Specifications and Radiological Environmental Monitoring Program required by Technical Specification 6.8.3;
(3) The detailed Radiological Environmental Monitoring Program (REMP);
(4) the description of the Radiological Environmental Monitoring Interlaboratory Comparison Program;
(5) The liquid and gaseous radwaste block flow diagram;
(6) The Radioactive Liquid and Gaseous Waste Sampling and Analysis Programs;
(7) The general methodology to be used to calculate dose to individuals due to releases of radioactive gaseous and liquid effluents from the Waterford 3 site;
(8) The general methodology to be used to calculate effluent monitor setpoints and allowable release rates to ensure compliance with the Radiological Effluent Controls, 10CFR20, and 10CFR50 criteria;
(9) The methodology to be used to ensure representative sampling of liquids; and
(10) the methodology to be used to comply with 40CFR190 criteria.

2.0 REFERENCES

2.1 Waterford 3 SES Technical Specifications (T.S.), Chapter 16 of Waterford 3 FSAR.

2.1.1 T.S. 6.14, Offsite Dose Calculation Manual.

2.1.2 T.S. 6.9.1.7, Annual Radiological Environmental Operating Report.

2.1.3 T.S. 6.9.1.8, Annual Radioactive Effluent Release Report.

2.1.4 T.S. 3/4.11.1.4, Liquid Holdup Tanks.

2.1.5 T.S. 3/4.11.2.6, Gas Storage Tanks.

2.1.6 T.S. 5.1.3, Map Defining Unrestricted Areas for Radioactive Gaseous and Liquid Effluents.

2.1.7 T.S. 6.9.2, Special Reports

2.1.8 T.S. 6.10.3 (d, o & p), Record Retention.

2.1.9 T.S. 6.5.2.8, (m, n & o), Audits.

2.2 USNRC Regulatory Guide 1.111, Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Gaseous-Effluents from Light-Water-Cooled Reactors, July 1977.

2.3 USNRC Regulatory Guide 1.113, Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I, April 1977.

2.4 USNRC Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I, Revision 1, October, 1977.

2.5 USNRC NUREG 0133, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, October 1978.

2.6 Code of Federal Regulations: Title 10, Parts 20, 40, 50 and 100; Title 40, Part 190.

2.7 USNRC Generic Letter 89-01, Implementation of Programmatic Controls for Radiological Effluent Technical Specifications in the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of RETS to the Offsite Dose Calculation Manual or to the Process Control Program.

2.8 International Atomic Energy Agency (IAEA) Safety Series No.57, Generic Models and Parameters for Assessing the Environmental Transfer of Radionuclides from Routine Releases, Exposures of Critical Groups.

2.9 USNRC 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.

2.10 UNT-006-010, Event Notification and Reporting

2.11 UNT-006-011, Condition Report

2.12 HASL-300, HASL Procedures Manual; Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination Application to Radiochemistry", Anal Chem. 40, 586-93, (1968).

2.13 ARH-SA-215, Hartwell, J.K.,"Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hardford Company Report, (June 1975)

3.0 DEFINITIONS

3.1 ACTION (T.S. 1.1) shall be that part of a Specification which prescribes remedial measures required under designated conditions.

3.2 CHANNEL CALIBRATION (T.S. 1.4) shall be the adjustment, as necessary, of the channel output such that is responds within the necessary range and accuracy to known values of the parameter which the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel including the sensor and alarm and/or trip functions, and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping, and total channel steps such that the entire channel is calibrated.

3.3 CHANNEL CHECK (T.S. 1.5) shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrument channels measuring the same parameter.

3.4 CHANNEL FUNCTIONAL TEST (T.S. 1.6) shall be:

a. Analog channels - the injection of a simulated signal into channel as close to the sensor as practicable to verify OPERABILITY including alarm and/or trip functions.

b. Bistable channels - the injection of a simulated signal into the sensor to verify OPERABILITY including alarm and/or trip functions.

c. Digital computer channels - the exercising of the digital computer hardware using diagnostic programs and the injection of simulated process data into the channel to verify OPERABILITY including alarm and/or trip function.

3.5 The FREQUENCY NOTATION, (T.S. 1.13) specified for the performance of Surveillance Requirements shall correspond to the following intervals.

NOTATION	FREQUENCY
S	At least once per 12 hours.
D	At least once per 24 hours.
W	At least once per 7 days.
M	At least once per 31 days.
P	Completed prior to each release.
Q	At least once per 92 days.
SA	At least once per 184 days.
R	At least once per 18 months.
S/U	Prior to each reactor startup.
N.A	Not appliable.

3.6 MEMBER(S) OF THE PUBLIC (T.S. 1.15) shall include all persons who are not occupational associated with the plant. This category does not include employees of the licensee, its contractors, or vendor. Also excluded from this category are persons who enter the site to service equipment or make deliveries. This category does include persons who use portions of the site for recreational, occupational, or other purposes not associated with the plant.

3.7 A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY (T.S. 1.17) when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, required for the system, subsystem, train component, or device to perform its function(s) are also capable of performing their related support function(s).

3.8 PURGE or PURGING (T.S. 1.23) shall be the controlled process of discharging air or gas from a confinement to maintain temperature, presure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is required to purify the confinement.

3.9 The SITE BOUNDARY (T.S. 1.29) shall be that line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee.

3.10 SOURCE CHECK (T.S. 1.32) shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.

3.11 UNRESTRICTED AREA (T.S. 1.36) shall be any area at or beyond the SITE BOUNDARY, access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, or any area within the SITE BOUNDARY used for residential quarters or for industrial, commercial, institutional, and/or recreation purpose. This definition is applicable to areas established for effluent release limits. See Attachment 6.1.

3.12 VENTILATION EXHAUST TREATMENT SYSTEM (T.S. 1.37) 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 adsorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any effect on noble gas effluents. Engineered Safety Feature (ESF) atmospheric cleanup systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

3.13 VENTING (T.S. 1.38) shall be the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is not provided or required during VENTING. Vent, used in system names, does not imply a VENTING process.

3.14 WASTE GAS HOLDUP SYSTEM (T.S. 1.39) shall be any system designed and installed to reduce radioactive gaseous effluents by collecting coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

3.15 LIQUID RADWASTE TREATMENT SYSTEM, shall be any system designed and installed to reduce radioactive material in effluents by passing liquid waste through filters and/or absorption or exchange media (e.g. Ion Exchanger Resin, Charcoal etc) and/or other reduction processes (e.g. reverse osmosis, etc) for the purpose of removing radioactive materials from the liquid system prior to the release to the environment.

3.16 A MAJOR CHANGE to a radioactive waste system shall be any alteration or modification to the system that causes waste characteristics (e.g. chemical composition, pH, etc.), waste form or waste activity (e.g. equipment decontamination factor change) in liquid, gaseous, or solid effluents to change, thereby requiring a re-evaluation of the effluent source terms.

3.17 LOWER LIMITS OF DETECTION (LLD) is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

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

$$LLD = \frac{4.66\ s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot e^{-\lambda \Delta t}}$$

Where:
LLD is the "a priori" lower limit of detection as defined above, as microcuries per unit mass or volume,

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate, as counts per minute,

E is the counting efficiency, as counts per disintegration,

V is the sample size in units of mass or volume,

2.22×10^6 is the number of disintegrations per minute per microcurie,

Y is the fraction radiochemical yield, when applicable,

λ is the radioactive decay constant for the particular radionuclide, and

Δt for plant effluents is the elapsed time between the midpoint of sample collection and the time of counting. For environmental samples it is the elapsed time between sample collection, or end of the smaple collection period, and time of counting.

Typical values of E, V, Y, and Δt should be used in the calculation.

4.0 RESPONSIBILITIES

4.1 General Manager, Plant Operations has lead responsibility for ensuring implementation of the Radiological Effluent Specifications and Radiological Environmental Monitoring Program as required by Technical Specification 6.8.3 and as set forth in this procedure.

4.2 The Radiation Protection Superintendent is responsible for

a) ensuring Radiological Effluent Specifications, the Radiological Effluent Monitoring Program and Radiological Environmental Monitoring Program (REMP) are performed as required according to procedures and methodologies established by this document.

b) ensuring the Annual Effluent Release Report and Annual Environmental Report are performed and issued as required.

c) ensuring the Land Use Census is performed as required.

5.0 PROCEDURE

5.1 SITE CHARACTERISTICS

Waterford 3 SES Site Characteristics is provided in Chapter 2 of Waterford 3 FSAR (Sections 2.1.1, 2.1.2 and 2.1.3).

A map of the SITE BOUNDARIES for establishing effluent release limits along with radioactive effluent release points are given in Attachment 6.1. The release point elevations for gaseous effluents are also provided in Attachment 6.1. The nearest distances to the boundary line are shown in Attachment 6.2 of this procedure.

The Restricted Area, defined for the purpose of controlling access for the purpose of protecting individuals against undue risks from radiation and radioactive materials, coincides with the current or future Security Protected Area fence.

5.2 SPECIFICATIONS AND SURVEILLANCE REQUIREMENTS

5.2.1 Compliance with the SPECIFICATIONS contained in the succeeding sections is required during the conditions specified therein; except that failure to meet the SPECIFICATIONS requires that the associated ACTION requirements shall be met.

5.2.2 Noncompliance with this procedure shall exist when the requirements of the SPECIFICATION and/or associated ACTION requirements are not met within the specified time intervals. If the SPECIFICATION is restored prior to expiration of the specified time intervals, completion of the ACTION requirements is not required.

5.2.3 Surveillance Requirements shall be applicable during all conditions specified for individual systems unless otherwise stated in an individual Surveillance Requirement.

5.2.4 Each Surveillance Requirement shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval.

5.2 SPECIFICATIONS AND SURVEILLANCE REQUIREMENTS Cont'd

5.2.5 Failure to perform a Surveillance Requirement within the specified time interval shall constitute a failure to meet the OPERABILITY requirements for a Specific System for Operation. Exceptions to these requirements are stated in the individual specifications. Surveillance Requirements do not have to be performed on inoperable equipment.

5.2.6 Failure to comply with the compensatory ACTION requirements or failure to complete the surveillance requirements within the specified time shall be documented and evaluated in accordance with UNT-006-011, Condition Report and UNT-006-010, Event Notification and Reporting procedures.

5.3 LIQUID EFFLUENTS

5.3.1 Concentration Specification

The concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS (see Attachment 6.1) shall be limited to the concentrations specified in **10 CFR Part 20, Appendix B, Table II, 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} microcurie/ml** total activity.

APPLICABILITY: At all times

ACTION:

With the concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS exceeding the above limits, immediately restore the concentration to within the above limits, and describe the events leading to this condition in the next Annual Radioactive Effluent Release Report.

SURVEILLANCE REQUIREMENTS

a. Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 5.3-1.

b. The results of the radioactivity analyses shall be used in accordance with the methodology and parameters in section 5.3.5 to assure that the concentrations at the point of release are maintained within the limits of Specification 5.3.1.

TABLE 5.3-1
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE AND RELEASE POINT	SAMPLE TYPE AND FREQUENCY	ANALYSIS FREQUENCY	TYPE OF ANALYSIS [a]
BATCH RELEASES [d]			
1. Boric Acid Condensate Tanks (4 Tanks)	Grab sample from each batch to be released prior to release	Prior to release	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for this release point.	Quarterly	Sr-89 Sr-90 Fe-55
2. Liquid Waste Management Tanks [2 Waste Condensate Tanks 2 Laundry Tanks 3 Waste Tanks]	Grab sample from each batch to be released prior to release	Prior to release	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for this release point.	Quarterly	Sr-89 Sr-90 Fe-55

TABLE 5.3-1 (Continued)
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE AND RELEASE POINT	SAMPLE TYPE AND FREQUENCY	ANALYSIS FREQUENCY	TYPE OF ANALYSIS [a]
BATCH RELEASES [d,g]			
3. Secondary Plant Holding Tanks [f] [Regenerative Waste Tank and Filter Flush Tank]	Grab sample from each batch to be released prior to release	Prior to release	Gamma Emitters [b] I-131 Noble Gases H-3
4. Turbine Building Industrial Waste Sumps (2 Sumps) [TBIWS] For applicability, see note [i]	Grab sample from each batch to be released prior to release	Prior to release	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for this release point.	Quarterly	Sr-89 Sr-90 Fe-55

TABLE 5.3-1 (Continued)
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE AND RELEASE POINT	SAMPLE TYPE AND FREQUENCY	ANALYSIS FREQUENCY	TYPE OF ANALYSIS [a]
BATCH RELEASES [d,g]			
5. Dry Cooling Tower Sumps #1 and #2 [DCTS] For applicability, see note [j]	Grab sample from each batch to be released prior to release	Prior to release	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for this release point.	Quarterly	Sr-89 Sr-90 Fe-55
6. Steam Generator Blowdown For applicability, see notes [k &l]	Grab sample from each batch to be released prior to release	Prior to release	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for this release point.	Quarterly	Sr-89 Sr-90 Fe-55

TABLE 5.3-1 (Continued)
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE AND RELEASE POINT	SAMPLE TYPE AND FREQUENCY	ANALYSIS FREQUENCY	TYPE OF ANALYSIS [a]
BATCH RELEASES [d,g]			
7. Auxiliary Component Cooling Water System [ACCW] (2 Basins) For applicability, see note [n]	Grab sample from each batch to be released prior to release	Prior to release	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for this release point.	Quarterly	Sr-89 Sr-90 Fe-55

TABLE 5.3-1 (Continued)
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE AND RELEASE POINT	SAMPLE TYPE AND FREQUENCY	ANALYSIS FREQUENCY	TYPE OF ANALYSIS [a]
CONTINUOUS RELEASES[e,h]			
1. Turbine Building Industrial Waste Sumps (2 Sumps) [TBIWS] For applicability, see note [i]	Weekly grab sample	Weekly	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for this release point.	Quarterly	Sr-89 Sr-90 Fe-55
2. Dry Cooling Tower Sumps #1 and #2 [DCTS] For applicability, see note [j]	Weekly grab sample	Weekly	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for this release point.	Quarterly	Sr-89 Sr-90 Fe-55

TABLE 5.3-1 (Continued)
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE AND RELEASE POINT	SAMPLE TYPE AND FREQUENCY	ANALYSIS FREQUENCY	TYPE OF ANALYSIS [a]
CONTINUOUS RELEASES[e,h]			
3. Circulating Water Discharge- Stream Generator Blowdown Heat Exchanger Discharge [CWD] For applicability, see note [o]	Weekly grab sample	Weekly	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for each release point.	Quarterly	Sr-89 Sr-90 Fe-55
4. Auxiliary Component Cooling Water System [ACCW] (2 Basins) For applicability, see note [n]	Weekly grab sample	Weekly	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all grab samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all grab samples collected during the quarter for each release point.	Quarterly	Sr-89 Sr-90 Fe-55

TABLE 5.3-1 (Continued)
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE AND RELEASE POINT	SAMPLE TYPE AND FREQUENCY	ANALYSIS FREQUENCY	TYPE OF ANALYSIS [a]
CONTINUOUS RELEASES[e,h]			
5. Steam Generator Blowdown For applicability, see note [k &l]	Continuous [m] sample collected weekly	Weekly	Gamma Emitters [b] I-131 Noble Gases
	A Composite [c] of all weekly samples collected during the month for this release point.	Monthly	H-3 Gross Alpha
	A Composite [c] of all weekly samples collected during the quarter for this release point.	Quarterly	Sr-89 Sr-90 Fe-55

TABLE 5.3-1 (Continued)
TABLE NOTATIONS

a. The type of analysis and their associated **Lower Limits of Detection (LLD)** are:

Type of Analysis	LLD (μCi/ml)
Gamma Emitters	5E-07
I-131	1E-06
Noble Gases (Gamma Emitters)	1E-05
H-3	1E-05
Gross Alpha	1E-07
Fe-55	1E-06
Sr-89, Sr-90	5E-08

b. The **gamma emitters LLD specification** includes the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. The analysis for gamma emitters shall include an analysis for I-131 and gamma emitting noble gases dissolved or entrained in the sample at the LLD's specified above. This list does not mean that only these nuclides are to be considered. Other identifiable gamma peaks, together with the above nuclides, shall also be analyzed and reported in the **Annual Radioactive Effluent Release Report.**

c. A **composite sample** is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released. Prior to analyses, all samples taken for composites are to be thoroughly mixed in order for the composite sample to be representative of the effluent release.

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

e. A **continuous release** is the discharge of liquid wastes of a non-discrete volume, e.g., a system that has input flow during the release (in service sumps, etc).

TABLE 5.3-1 (Continued)
TABLE NOTATIONS

f. If the contents of the **Regenerative Waste Tank or Filter Flush Tank** contain detectable radioactivity, no discharges from these tanks shall be made to the UNRESTRICTED AREA, and the contents of these tanks shall be directed to the **Liquid Waste Management System**.

g. When release from this source is batch in nature.

h. When release from this source is continuous in nature.

i. The **Turbine Building Industrial Waste Sumps (TBIWS)** shall be sampled and analyzed in accordance with this table if any of the folowing conditions exist, and the release has NOT been directed to the **Liquid Waste Management System**:

(1) Primary to Secondary leakage is occurring; or,

(2) Activity is present in the secondary system as indicated by either the Steam Generator Blowdown (SGB) monitor or secondary sampling and analysis; or,

(3) Activity was present in the TBIWS during the previous FOUR Weeks.

j. The **Dry Cooling Tower Sump (DCTS)** shall be sampled and analyzed in accordance with this table if any of the folowing conditions exist, and the release has NOT been directed to the **Liquid Waste Management System**:

(1) Primary to Component Cooling Water (CCW) leakage is occurring or,

(2) Activity is present in the CCW/ACCW systems as indicated by either the CCW monitors or CCW/ACCW sampling and analysis; or,

(3) Activity was present in the DCTS during the previous FOUR Weeks.

k. Sampling and analysis of **Steam Generator Blowdown** will be required only when blowdown is directed to the Circulating Water System (CWS) or the Waterford Waste Ponds.

TABLE 5.3-1 (Continued)
TABLE NOTATIONS

l. **Steam Generator Blowdown discharge to the Waste Ponds** shall not be performed unless radiation monitoring and automatic isolation capabilities are added to the Waste Ponds discharge path. Steam Generator Blowdown to the Waste Ponds will be limited to situations requiring secondary chemistry control where the Circulating Water System is not available or the secondary chemistry is outside the requirements for Circulating Water System discharge. Blowdown to the Waste Ponds will be terminated upon detection of sample activity greater than the LLD levels in Notation [a].

m. To be representative of the quantities and concentration of radioactive materials in liquid effluents, samples shall be collected continuously in proportion to the rate of flow of the effluent stream.

n. Sampling and analysis of the **Auxiliary Component Cooling Water (ACCW)** system is required when detectable activity exists in the CCW system. Continued sampling and analysis of ACCW is required for a minimum of **FOUR Weeks** following non-detection of activity in CCW/ACCW systems.

o. Sampling and analysis of the **Circulating Water Discharge -Steam Generator Blowdown heat exchanger discharge (CWD)** is required when detectable activity exists in the secondary system, or the CCW/ACCW Systems.

5.3 LIQUID EFFLUENTS (cont'd)

5.3.2 Dose Specification

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released to UNRESTRICTED AREAS (see Attachment 6.1) shall be limited:

a. During any **calendar quarter** to less than or equal to **1.5 mrem** to the **total body** and to less than or equal to **5 mrem** to **any organ**, and

b. During any **calendar year** to less than or equal to **3 mrem** to the **total body** and to less than or equal to **10 mrem** to **any organ**.

APPLICABILITY: At all times.

5.3 LIQUID EFFLUENTS (cont'd)

ACTION:

a. With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report. This Special Report shall:

1) Identify the cause(s) for exceeding the limit(s) and define the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

NOTE
The following step is applicable only if drinking water supply is taken from the receiving water.

2) Include the results of radiological analyses of the drinking water source and the radiological impact on finished drinking water supplies with regard to the requirements of 40 CFR Part 141.

SURVEILLANCE REQUIREMENTS:

a. Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with methodology and parameters in Section 5.3.7 at least once per 31 days.

5.3 LIQUID EFFLUENTS (cont'd)

5.3.3 Liquid Radwaste Treatment System Specification

The LIQUID RADWASTE TREATMENT SYSTEM shall be OPERABLE and appropriate portions of the system shall be used to reduce releases of radioactivity when the projected doses due to the liquid effluent to UNRESTRICTED AREAS (see Attachment 6.1) would exceed in a 31 day period:

a) 0.06 mRem to the total body, or
b) 0.2 mRem to any organ

APPLICABILITY: At all times.

ACTION:

a. With radioactive liquid waste being discharged without treatment and in excess of the above limits and any portion of the LIQUID RADWASTE TREATMENT SYSTEM not in operation, prepare and submit to the Commission within 30 days pursuant to Technical Specification 6.9.2 a Special Report that includes the following information.

1. Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability,

2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and

3. Summary description of action (s) taken to prevent a recurrence.

5.3 LIQUID EFFLUENTS (cont'd)

SURVEILLANCE REQUIREMENTS

a. Doses due to liquid releases to UNRESTRICTED AREAS shall be projected at least once per 31 days in accordance with the methodology and parameters in Section 5.3.7.

b. The installed LIQUID RADWASTE TREATMENT SYSTEM shall be demonstrated OPERABLE by meeting Specifications 5.3.1 and 5.3.2.

5.3 LIQUID EFFLUENTS (cont'd)

5.3.4 Liquid Effluent Dose Calculation

NOTE

The Offsite Dose Calculation Manual (ODCM) follows the general models suggested by NUREG 0133 and Regulatory Guide 1.109. However, alternate calculation methods from those presented may be used provided the overall methodology is acceptable and consistent with regulation or provided the alternate methodology is conservative. In addition, the most up-to-date dose conversion factors and bioaccumulation factors may be substituted in lieu of Regulatory Guide 1.109 values.

NOTE

Actual step-by-step dose calculations will be performed by in-plant procedures which are consistent with the methodology presented in this document.

5.3.4.1 The dose commitment to an individual from radioactive materials in liquid effluents released to unrestricted areas are calculated for the purpose of implementing Section 5.3.2 using the following expression:

$$D_{t\ell} = \Delta t_\ell \, F_\ell \sum_{i=1}^{n} A_{it} \, C_{i\ell} \qquad (1)$$

$$D_t = \sum_{\ell=1}^{m} D_{t\ell} \qquad (2)$$

5.3 LIQUID EFFLUENTS (cont'd)

$D_{t\ell}$ = the cumulative dose commitment to the total body or any organ (t) from the liquid effluents for each liquid release in mrem during time period (ℓ);

D_t = the cumulative dose commitment to the total body or any organ (t) from the liquid effluents for all (ℓ) time periods;

Δt_ℓ = the length of the ℓ^{th} time period over which the release is made, in hours;

$C_{i\ell}$ = the concentration of radionuclide (i) in undiluted liquid effluent during time period Δt_ℓ from any liquid release, in μCi/ml;

A_{it} = the site-related liquid ingestion dose commitment factor to the total body or any organ (t) for each identified nuclide (i) in mrem-ml/hr- μCi (Attachment 6.3), and;

5.3 LIQUID EFFLUENTS (cont'd)

F_ℓ = the near field average dilution factor for $C_{i\ell}$ during any liquid effluent release. Defined as the ratio of the undiluted liquid waste flow during release to the average flow from the site discharge structure to site boundary receiving waters.

$$= \frac{\text{liquid radioactive waste flow}}{\text{discharge structure exit flow}}$$

The liquid radioactive waste flow is the maximum flow from the effluent release. The discharge structure exit flow is the flow during disposal from the discharge structure release point into the receiving water body. For radionuclides not determined in each batch or weekly composite, the dose contribution to the current calendar quarter cumulative summation may be approximated by using a ratio of concentrations based on the previous monthly or quarterly composite analyses.

5.3 LIQUID EFFLUENTS (cont'd)

5.3.4.2 Equation (1) above for calculating the dose contributions requires the use of a dose factor, A_{it}, for each nuclide (i) which embodies the dose factors and dilution factors for the points of pathway origin. The adult total body dose factor and the adult organ dose factor for each radionuclide will be used from Table E-11 of Regulatory Guide 1.109; thus the list contains critical organ dose factors for various organs. The dose factor is written:

$$A_{it} = K_o\left(\frac{U_w}{D_w} + U_f BF_i\right) DCF_{it} \qquad (3)$$

where:

A_{it} = Composite dose parameter for the total body or critical organ (t) of an adult for nuclide (i) for all appropriate pathways (mrem-ml/hr-μCi);

K_o = Unit conversion factor;

= $1.14e+5 = 10^6 \frac{pCi}{mCi} \cdot 10^3 \frac{ml}{l} \div 8760 \frac{hr}{yr}$

U_w = 730 l/yr adult water consumption (Reg. Guide 1.109, Table E-5);

5.3 LIQUID EFFLUENTS (cont'd)

D_w = Dilution factor from near field area to potable water intake;

= 220
for discharges from the circulating water discharge into the Mississippi River (based on the ratio of the average Mississippi River flow to the maximum discharge flow);

= 1
for discharges into the 40 Arpent Canal (based on the assumption that dilution from the near field area to a potable water intake is negligible);

U_f = 21 kg/yr, adult fish consumption (Reg. Guide 1.109, Table E-5);

BF_i = Bioaccumulation factor for nuclide (i) in fish (pCi/kg per pCi/l) from Attachment 6.21 and;

NOTE
For other liquid pathways, the appropriate dose factors will be utilized (Regulatory Guide 1.109 Tables E-7 through E-14, or Attachment 6.20).

DCF_{it} = Ingestion Dose conversion factor for nuclide (i) and organ (t) for adults (mrem/pCi), from Attachment 6.20.

5.3 LIQUID EFFLUENTS (cont'd)

5.3.5 Liquid Effluent Monitor Setpoint Calculation Methodology

Specifications 5.3.1 and 5.6.1 require that the liquid effluent monitoring instrumentation alarm/trip setpoints be set so that the concentration of radioactive material released from the site is limited to 10CFR20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For **dissolved or entrained noble gases**, the concentration shall be **limited to 2E-4 μCi/ml** total activity. This section presents the method to be used for determining setpoints in accordance with Surveillance Requirements 5.3.1 and 5.6.1.

5.3.5.1 The calculated setpoints for the liquid effluent monitors satisfy the following equation:

$$c = \frac{(SF)(RF)(F+f)\sum_{i=1}^{n} C_i}{(TMPC)(f+F')} \qquad (4)$$

5.3 LIQUID EFFLUENTS (cont'd)

where;

c = the Setpoint, in μCi/ml, of the liquid effluent monitor measuring the radioactivity concentration in the effluent line prior to complete dilution and subsequent release. This setpoint represents a value which, if exceeded would result in concentrations exceeding the limits of 10CFR20, Appendix B, Table II. Column 2, to an UNRESTRICTED AREA;

SF = Safety Factor to ensure that the effluent limit is not exceeded. Actual value is set by procedure (in the range 0.5 - 0.9);

RF = Release Fraction allocated to this release (to be used only in situations of simultaneous or concurrent release);

f = the undiluted liquid effluents flow as measured at the liquid effluent monitor location in gpm;

F = the dilution water flow as determined via pump curves or other appropriate measures that determine correct plant operating configuration in gpm;

NOTE

If F is large compared to f then F + f $\simeq$ F. If there is no additional dilution, F' = 0.

F' = additional dilution flow at the radiation monitor for liquid effluent radiation monitors that have additional dilution prior to actual withdrawal of the monitored fluid, in gpm.

= 1000 (maximum)
for Steam Generator Blowdown or Auxiliary Component Cooling Water releases to the circulating water system.

= 0
for all other liquid release points.

5.3 LIQUID EFFLUENTS (cont'd)

C_i = the undiluted concentration in μCi/ml for all gamma emitting radionuclides (i). The value will be derived from radioanalysis of liquid effluent to be released. This value will be supplied for each liquid release;

$$TMPC = \sum_{i=1}^{n} \frac{C_i}{MPC_i} + \sum_{j=1}^{m} \frac{C_j}{MPC_j}$$

Cj = the undiluted concentration, in μCi/ml, for all nongamma-emitting radionuclides (j). This value will be derived from radioanalysis of composite liquid effluents released. This value will be supplied for each liquid release based upon the most recent analysis results.

$\frac{C_i}{MPC_i}$ = undiluted gamma MPC_i fraction for all gamma emitting radionuclides (i);

$\frac{C_j}{MPC_j}$ = the undiluted nongamma MPC_j fraction for all nongamma emitting radionuclides (j);

MPC_i = Maximum Permissible Concentration for the applicable gamma-emitting isotope (i) from 10CFR20, Appendix B, Table II, Column 2; and

MPC_j = Maximum Permissible Concentration for the applicable nongamma-emitting isotope (j) from 10CFR20, Appendix B, Table II, Column 2

5.3 LIQUID EFFLUENTS (cont'd)

5.3.5.2 The values of C_i and C_j will be measured for each release as appropriate and the parameters for f, F' and F will be supplied based on current plant operating configurations. The setpoint will be calculated in terms of μCi/ml and the liquid effluent monitor will be adjusted as necessary to ensure that liquid releases are secured prior to exceeding limits specified in 10CFR20, Appendix B, Table II, Column 2 to an UNRESTRICTED AREA.

5.3 LIQUID EFFLUENTS (cont'd)

5.3.6 Representative Liquid Sampling

Prior to grab sampling liquid waste tanks, methods should be used to guarantee representative sampling. Large volumes of liquid waste should be mixed in as short a time as possible and uniformly distributed prior to sampling. To determine the minimum mixing time for tanks from which releases are made, the following tests were performed prior to initial use for release purposes.

a. The tank was filled to a known volume.

b. A specific quantity of a selected chemical and/or sediments was added to the tank.

c. Recirculation was initiated through the normal path.

d. Periodic samples were taken until equilibrium was reached.

e. The time observed to completely mix the tank is used as a minimum recirculation time prior to effluent sampling. Records of the test will be maintained.

5.3 LIQUID EFFLUENTS (cont'd)

5.3.7 Dose Projection for Liquid Effluents

Specification 5.3.3 requires that appropriate subsystems of the LIQUID RADWASTE TREATMENT SYSTEM be used to reduce releases of radioactivity when the projected doses due to the liquid effluent from each reactor unit to UNRESTRICTED AREAS would exceed in a 31 day period

a) **0.06 mrem total body, or**
b) 0.2 mrem to any organ

The following calculational method is provided for performing this dose projection.

At least once every 31 days, the total dose from all liquid releases for the quarter-to-date will be divided by the number of days into the quarter and multiplied by 31. If this projected dose exceeds 0.06 mrem total body or 0.2 mrem any organ, and the LIQUID RADWASTE TREATMENT SYSTEM has not been operating, it shall be operated, if operation would reduce **the monthly projected doses below 0.06 mrem total body or 0.2 mrem any organ**. (This is performed in accordance with the Surveillance Requirements of 5.3.3.)

5.3 LIQUID EFFLUENTS (cont'd)

5.3.8 Liquid Effluent Bases

a. CONCENTRATION (Section 5.3.1)

This specification is provided to ensure that the concentration of radioactive materials released in liquid waste effluents to UNRESTRICTED AREAS will be **less than the concentration levels specified in 10 CFR Part 20, Appendix B, Table II, Column 2.** This limitation provides additional assurance that the levels of radioactive materials in bodies of water in UNRESTRICTED AREAS will result in exposures within

(1) the Section II.A design objectives of Appendix I, 10 CFR Part 50, to a MEMBER OF THE PUBLIC and

(2) the limits of 10 CFR Part 20.106(e) to the population.

The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its MPC in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP) Publication 2.

5.3 LIQUID EFFLUENTS (cont'd)

The sampling and analysis of the contents of the regenerative waste tank and the filter flush tank is performed if primary to secondary leakage occurs in a steam generator. The contents of these tanks cannot be discharged to the UNRESTRICTED AREA if any radioactivity is detected in these tanks since the discharge from these tanks is unmonitored. When radioactivity is detected in these tanks, the contents from these tanks must be discharged to the liquid radwaste system where the contents may then be monitored upon discharge.

The required detection capabilities for radioactive materials in liquid waste samples are tabulated in terms of the LOWER LIMITS of DETECTION (LLDs). Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual, HASL-300 (Reference 2.12) and Report ARH-SA-215 (Reference 2.13).

5.3 LIQUID EFFLUENTS (cont'd)

b. DOSE (Section 5.3.2)

This specification is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." Also, for fresh water sites with drinking water supplies that can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 40 CFR 141.16.

5.3 LIQUID EFFLUENTS (cont'd)

b. DOSE (Section 5.3.2) (cont'd)

The dose calculation methodology and parameters implement the requirement in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The equations specified for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, (Reference 2.4) and Regulatory Guide 1.113, (Reference 2.3).

5.3 LIQUID EFFLUENTS (cont'd)

c. LIQUID RADWASTE TREATMENT SYSTEM (Section 5.3.3)

The OPERABILITY of the LIQUID RADWASTE TREATMENT SYSTEM ensures that this system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be used when specified provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable."

This specification implements the requirements of 10CFR Part 50.36a, General Design Criterion 60 of Appendix A 10 CFR Part 50 and the design objective given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the LIQUID RADWASTE TREATMENT SYSTEM were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents.

5.4 GASEOUS EFFLUENTS

5.4.1 Dose Rate Specification

The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY (see Attachment 6.1) shall be limited to the following:

a. For Noble Gases: Less than or equal to

   i) **500 mrem/yr** to the **total body**; and

   ii) **3000 mrem/yr** to the **skin**.

and

b. For Iodine-131, Iodine-133, Tritium, and all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to

   i) **1500 mrem/yr** to any **organ**.

5.4 GASEOUS EFFLUENTS (continued)

APPLICABILITY: At all times

ACTION:

With the dose rate(s) exceeding the above limits, immediately restore the release rate to within the above limit(s), and describe the events leading to this condition in the next Annual Radioactive Effluent Release Report.

SURVEILLANCE REQUIREMENTS:

a. The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in Section 5.4.5.

b. Representative samples and analysis of gaseous effluents shall be obtained in accordance with the sampling and analyses program specified in Table 5.4-1.

c. Based upon the sampling and analysis performed in Table 5.4-1 the dose rate due to I-131, I-133, H-3, and all other radionuclides in particulate form with half-lives greater than 8 days shall be determined to be within the above limits in accordance with the methodology and parameters in Section 5.4.5.

TABLE 5.4-1
RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE AND RELEASE POINT	SAMPLE TYPE AND FREQUENCY	ANALYSIS FREQUENCY	TYPE OF ANALYSIS [a]
1. Waste Gas Decay Tanks	Grab sample from each tank to be released prior to release	Prior to Release	Noble Gas Gamma Emitters [b]
2. Containment Purge (Plant Stack)	Grab sample from each purge prior to release	Prior to Release[g]	Noble Gas Gamma Emitters [b]
	Grab sample prior to purge	Monthly[i,g]	H-3
	Continuous noble gas monitor	Continuous	Noble Gases Gross Beta or Gamma
3. Plant Stack	Monthly grab sample	Monthly[g]	Noble Gas Gamma Emitters [b]
		Monthly[f,g]	H-3
	Continuous Charcoal Cartridge Sample [c]	Weekly [h]	I-131 I-133
	Continuous Particulate Sample [c]	Weekly [h]	Particulate Gamma Emitters [b], Gross Alpha
	Composite of all continuous particulate filters collected during the Quarter	Quarterly	Sr-89 Sr-90
	Continuous noble gas monitor	Continuous	Noble Gases Gross Beta or Gamma

TABLE 5.4-1 (Continued)
RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE AND RELEASE POINT	SAMPLE TYPE AND FREQUENCY	ANALYSIS FREQUENCY	TYPE OF ANALYSIS [a]
4. Fuel Handling Building Ventilation (Normal Exhaust) - Whenever irradiated fuel is in the storage pool, see note [e].	Monthly grab sample	Monthly	Noble Gas Gamma Emitters [b]
	Weekly grab sample	Weekly	H-3
	Continuous Charcoal Cartridge Sample [c]	Weekly	I-131 I-133
	Continuous Particulate Sample [c]	Weekly	Particulate Gamma Emitters [b], Gross Alpha
	Composite of all continuous particulate filters collected during the Quarter	Quarterly	Sr-89 Sr-90
	Continuous noble gas monitor	Continuous	Noble Gases Gross Beta or Gamma
5. Main Condenser Evacuation and Turbine Gland Sealing System (MCES) For applicability see note [d].	Monthly grab sample	Monthly [g]	Noble Gas Gamma Emitters [b]
		Monthly [g]	H-3
	Continuous Charcoal Cartridge Sample [c]	Weekly [h]	I-131 I-133
	Continuous Particulate Sample [c]	Weekly [h]	Particulate Gamma Emitters [b], Gross Alpha
	Composite of all continuous particulate filters collected during the Quarter	Quarterly	Sr-89 Sr-90
	Continuous noble gas monitor	Continuous	Noble Gases Gross Beta or Gamma

TABLE 5.4-1 (Continued)
TABLE NOTATIONS

a. The LLD values for the following types of analysis are:

Type of Analysis	LLD (μCi/cc)
Noble Gas Gamma Emitters	1E-04
H-3	1E-06
I-131	1E-12
I-133	1E-10
Particulate Gamma Emitters	1E-11
Gross Alpha	1E-11
Sr-89, Sr-90	1E-11
Gross Beta or Gamma Noble Gas Monitor	1E-06

b- The principal gamma emitters for which the LLD Specification applies include the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 in noble gas releases, and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, [illegible], I-133, Cs-134, Cs-137, Ce-141, and Ce-144 in iodine and particulate releases. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with the above nuclides, shall also be analyzed and reported in the Annual Radioactive Effluent Release Report.

c- Samples shall be changed <u>at least once per seven days</u> and <u>analyses</u> shall be completed <u>within 48 hours</u> after changing, or after removal from sampler. The ratio of the sample flow rate to the sampled stream (effluent stream) flow shall be known for the time period covered by each dose or dose rate calculation.

d- If no primary to secondary leakage exists, then only the gross beta or gamma analysis (installed radiation monitors) needs to be performed for the Main Condenser Evacuation and Turbine Gland Sealing System (MCES). Sampling and analysis shall be performed when a primary to secondary leak exists and the releases from the MCES have not been directed to the Plant Stack.

e- Fuel Handling Building sampling is required whenever irradiated fuel is in the storage pool.

TABLE 5.4-1 (Continued)
TABLE NOTATIONS

f- Tritium grab samples for the Plant Stack shall be taken at least once per 24 hours if purging containment with the refueling canal flooded.

g- Sampling shall also be performed within 24 hours following shutdown, startup, or a THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1-hour period. Analysis for radionuclides shall be completed within 48 hours of sampling. This sampling is not applicable if the noble gas monitor shows that effluent activity has not increased by a factor of 3. This sampling is not applicable to the MCES WRGM if the release has been directed to the Plant Stack, or no primary to secondary leakage exists.

h- Samples shall be changed at least once per 24 hours for at least Seven days following each Shutdown, Startup, or THERMAL POWER change exceeding 15% of RATED THERMAL POWER in 1-hour, and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. This requirement applies if:

1) Primary Coolant Dose Equivalent Iodine-131 concentration has increased by more than a factor of 3; AND

2) The noble gas monitor shows that effluent activity has increased by more than a factor of 3.

i- Sampling and analysis are required prior to first purge and monthly thereafter.

5.4 GASEOUS EFFLUENTS (cont'd)

5.4.2 Dose-Noble Gas Specification

The air dose due to noble gases released in gaseous effluents to areas at and beyond the SITE BOUNDARY (see Attachment 6.1) shall be limited to the following:

a. During any **calendar quarter**: Less than or equal to

i) **5 mrad** for **gamma** radiation, and
ii) **10 mrad** for **beta** radiation

and,

b. During any **calendar year**: Less than or equal to

i) **10 mrad** for **gamma** radiation, and
ii) **20 mrad** for **beta** radiation.

APPLICABILITY: At all times.

ACTION:

With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report.
This Special Report shall identify the cause(s) for exceeding the limit(s) and define the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

5.4 GASEOUS EFFLUENTS (cont'd)

SURVEILLANCE REQUIREMENTS:

Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodology and parameters in Section 5.4.6 at least once per 31 days.

5.4 GASEOUS EFFLUENTS (cont'd)

5.4.3 Dose - Iodine-131, Iodine-133, Tritium, and Radionuclides in Particulate Form Specification

The dose to MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the SITE BOUNDARY (see Attachment 6.1) shall be limited to the following:

a. During any **calendar quarter**: Less than or equal to **7.5 mrem** to any organ and,

b. During any **calendar year**: Less than or equal to **15 mrem** to any organ.

APPLICABILITY: At all times

5.4 GASEOUS EFFLUENTS (cont'd)

ACTION:

With the calculated dose from the release of iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days, in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report. This Special Report shall identify the cause(s) for exceeding the limit and define the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

SURVEILLANCE REQUIREMENTS:

Cumulative dose contributions for the current calendar quarter and current calendar year for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with the methodology and parameters in Section 5.4.7 at least once per 31 days.

5.4 GASEOUS EFFLUENTS (cont'd)

5.4.4 Gaseous Radwaste Treatment Specification

The VENTILATION EXHAUST TREATMENT SYSTEM and the WASTE GAS HOLDUP SYSTEM shall be OPERABLE and appropriate portions of these systems shall be used to reduce releases of radioactivity when the projected doses in 31 days due to gaseous effluent releases to areas at and beyond the SITE BOUNDARY (see Attachment 6.1) would exceed either:

a. 0.2 mrad to air from gamma radiation, or

b. 0.4 mrad to air from beta radiation, or

c. 0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

APPLICABILITY: At all times.

5.4 GASEOUS EFFLUENTS (cont'd)

ACTION:

With radioactive gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report. This Special Report shall include the following information:

a. Identification of any inoperable equipment or subsystems, and the reason for the inoperability,

b. Action(s) taken to restore the inoperable equipment to OPERABLE status, and

c. Summary description of action(s) taken to prevent a recurrence.

SURVEILLANCE REQUIREMENTS:

a. Doses due to gaseous releases to areas at and beyond the SITE BOUNDARY shall be projected at least once per 31 days in accordance with the methodology and parameters in Section 5.4.9.

b. The installed Gaseous Radwaste Treatment System shall be demonstrated operable by meeting Specifications 5.4.1, 5.4.2 and 5.4.3.

5.4 GASEOUS EFFLUENTS (cont'd)

NOTE

The Offsite Dose Calculation Manual (ODCM) follows the general models suggested by NUREG 0133 and Regulatory Guide 1.109. However, alternate calculation methods from those presented may be used provided the overall methodology is acceptable and consistent with regulation or provided the alternate methodology is conservative. In addition, the most up-to-date dose conversion factors and bioaccumulation factors may be substituted in lieu of Regulatory Guide 1.109 values.

NOTE

Actual step-by-step dose calculations will be performed by in-plant procedures which are consistent with the methodology presented in this document.

5.4.5 Calculational Methodology for Gaseous Effluent Dose Rate

This section presents the calculational methods used for calculating gaseous effluent doses in fulfillment of Specification 5.4.1.

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

5.4 GASEOUS EFFLUENTS (cont'd)

Release rate limit for Noble Gases:

$$K' \overline{(\chi/Q)}_v \sum_{i=1}^{n} K_i Q_{iv} \leq 500 \frac{mrem}{yr} \text{ total body} \quad (5)$$

$$K' \overline{(\chi/Q)}_v \sum_{i=1}^{n} (L_i + 1.1M_i)Q_{iv} \leq 3000 \frac{mrem}{yr} \text{ skin} \quad (6)$$

Release rate limit for Iodine-131, Iodine-133, Tritium and for all radionuclides in particulate form with half-lives greater than 8 days:

$$\overline{(\chi/Q)}_v \sum_{i=1}^{n} P_{it}Q_{iv} \leq 1500 \frac{mrem}{yr} \text{ any organ} \quad (7)$$

Where:

K' = a constant of unit conversion, 1E6 pCi/ μCi;

$\overline{(X/Q)}_V$ = 1.1E-5 sec/m^3 in the ESE sector at 0.6 mile for all vent releases (v) (the highest calculated annual average dispersion factor at the SITE BOUNDARY based on historical data Attachment 6.2). The actual X/Q for the time of release may be determined and used under certain circumstances;

$\sum_{i=1}^{n}$ = summation for all identified radionuclides;

5.4 GASEOUS EFFLUENTS (cont'd)

K_i = the total body dose factor due to gamma emissions for each identified radionuclide (i) in units of mrem/yr per $\rho Ci/m^3$ (Attachment 6.4);

L_i = the skin dose factor due to beta emissions for each identified radionuclide (i) in units of mrad/yr per $\rho Ci/m^3$ (Attachment 6.4);

M_i = the air dose factor due to gamma emissions for each identified radionuclide (i) in units of mrad/yr per $\rho Ci/m^3$ (Attachment 6.4). The constant 1.1 converts air dose to skin dose;

P_{it} = the thyroid dose parameter for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days (i) for the inhalation pathway only, in mrem/yr per $\mu Ci/m^3$ (Attachment 6.19). The dose factor is based on the most restrictive age group (child) and most restrictive organ at the SITE BOUNDARY; and

5.4 GASEOUS EFFLUENTS (cont'd)

NOTE
All radioiodines are assumed to be released in elemental form.

Q_{iv} = the average release rate of radionuclides (i) (either noble gas or Iodine-131, Iodine-133, tritium, and radionuclides in the particulate form with half-lives greater than 8 days, as appropriate) during the time of release from all vent releases (v). Value is averaged over one hour and is in units of μCi/sec.

5.4 GASEOUS EFFLUENTS (cont'd)

5.4.6 Calculational Methodology for Noble Gas Doses

This section presents the calculational methods used for calculating noble gas effluent dose in air in accordance with Surveillance Requirement 5.4.2.

5.4.6.1 The air dose due to noble gases released in gaseous effluents to areas at or beyond the SITE BOUNDARY will be determined by the following expressions:

a. During any calendar quarter, for gamma radiation:

$$D_\gamma = (1.14e+2)(\overline{\chi/Q})_v \sum_{i=1}^{n} M_i \sum_{j=1}^{m} \Delta t_j \, Q_{ijv} \qquad (8)$$

and for beta radiation:

$$D_\beta = (1.14e+2)(\overline{\chi/Q})_v \sum_{i=1}^{n} N_i \sum_{j=1}^{m} \Delta t_j \, Q_{ijv} \qquad (9)$$

b. During any calendar year, for gamma radiation:

$$D_\gamma = (1.14e+2)(\overline{\chi/Q})_v \sum_{i=1}^{n} M_i \sum_{j=1}^{m} \Delta t_j \, Q_{ijv} \qquad (10)$$

and for beta radiation:

$$D_\beta = (1.14e+2)(\overline{\chi/Q})_v \sum_{i=1}^{n} N_i \sum_{j=1}^{m} \Delta t_j \, Q_{ijv} \qquad (11)$$

5.4 GASEOUS EFFLUENTS (cont'd)

Where:

D_γ = the total gamma (γ) air dose from gaseous effluents for the total time period and not to exceed 5 mrad quarterly and 10 mrad yearly;

D_β = the total beta (β) air dose from gaseous effluents for the total time period and not to exceed 10 mrad quarterly and 20 mrad yearly;

1.14E+02 = a constant of (1 yr/8760 hr) (1E+6 ρCi/μCi);

$(\overline{\chi/Q})_v$ = 1.1E-5 sec/m^3 in the ESE sector at 0.6 mile for all vent releases (v). The actual X/Q for the time of release may be determined and used under certain circumstances;

5.4 GASEOUS EFFLUENTS (cont'd)

M_i and N_i = the gamma and beta air dose factors (respectively) for a uniform semi-infinite cloud of radionuclide (i) in mrad/yr per $\rho Ci/m^3$ (Attachment 6.4);

Δt_j = the length of the j^{th} time period over which Q_{ijv} are accumulated for all gaseous releases in hours; and

Q_{ijv} = the average release rate of radionuclides (i) in gaseous effluent from all vent releases (v) in $\mu Ci/sec$ during the time period Δt_j.

5.4 GASEOUS EFFLUENTS (cont'd)

5.4.7 Calculational Methodology for Doses Due to Radioiodines, Tritium, and Radioactive Materials in Particulate Form

This section presents the calculational methods used for calculating doses due to iodine-131, iodine-133, tritium, and radionuclides in particulate form in accordance with Surveillance Requirement 5.4.3.

5.4.7.1 The dose to an individual from iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the SITE BOUNDARY will be determined by the following expressions:

During any calendar quarter:

$$D_{ita} = 1.14e-4 \ \Delta t \sum_{i=1}^{n} R_{ita} \ W_v \ Q_{iv} \qquad (12)$$

During any calendar year:

$$D_{ita} = 1.14e-4 \ \Delta t \sum_{i=1}^{n} R_{ita} \ W_v \ Q_{iv} \qquad (13)$$

5.4 GASEOUS EFFLUENTS (cont'd)

Where:

D_{ita} = the cumulative dose to an organ (t), age group (a), due to radionuclides (i) in gaseous effluents; not to exceed 7.5 mrem quarterly or 15 mrem yearly;

1.14E-4 = a constant of unit conversion

= 1 yr/8760 hr;

Δt = the time required for the release in hours for all releases per quarter or per year.

W_v = the dispersion parameter for estimating the dose to an individual at the controlling location for long term vent releases (v);

= $\overline{(X/Q)}_v$

for the inhalation pathway from vent releases (v) in sec/m³, from historical data, at the location of the critical receptor (Attachment 6.2);

5.4 GASEOUS EFFLUENTS (cont'd)

$= \overline{(D/Q)}_v$

for the food and ground plane pathways from vent releases (v) in $1/m^2$, from historical data at the location of the critical receptor (Attachment 6.2), with the exception of tritium, which shall use $W_v = \overline{(X/Q)}_v$;

R_{ita} = the dose factor from each identified radionuclide (i), for each applicable organ (t), and age group (a), in **mrem/yr per uCi/m³** for the inhalation pathway (Attachment 6.5) and in **mrem/yr per uCi/m²-sec** for the food and ground plane pathways (Attachments 6.6, 6.7, 6.8, 6.9, and 6.10). For sectors with real pathways within 5 miles of the plant, the values of R_i are used based on these real pathways; for sectors with no real pathways within 5 miles from the plant, R_i is used assuming that the cow-grass-milk pathway exists at the 5-mile distance. (R_i's were calculated using the methodology found in NUREG 0133, Reference 2.5, pages 31-36.); and

Q_{iv} = the average release rate of radionuclides (i) in gaseous effluent from all vent releases (v) in **μCi/sec**.

5.4 GASEOUS EFFLUENTS (cont'd)

5.4.8 Gaseous Effluent Monitor Setpoint Calculational Methodology

5.4.8.1 Specification 5.6.2 requires that the radioactive gaseous effluent monitoring instrumentation alarm/trip setpoints be set to ensure the limits of Specification 5.4.1 are not exceeded.

5.4.8.2 The calculated high alarm/flow termination setpoint is the maximum value for that particular release. For conservatism, an administrative safety factor (SF) of usually 10% will be utilized in the setpoint calculation. To allow for simultaneous releases from common or different release points a Release Fraction (RF) may be used to allocate percentages of the total allowable release.

5.4.8.3 Since the noble gas dose rates are more limiting than the radioiodine dose rate, gaseous setpoints will be based on noble gas dose rates (less than or equal to 500 mrem/yr total body, and less than or equal to 3000 mrem/yr skin). Specifically, gaseous setpoints will be based on the most limiting of the following equations:

5.4 GASEOUS EFFLUENTS (cont'd)

a. Total body (Q_{tb}):

$$Q_{tb} = \frac{(500\,\frac{mrem}{yr})(RF)(SF)}{\overline{(\chi/Q)}_v \quad (1.0e+6\,\frac{pCi}{\mu Ci}) \dfrac{\sum_{i=1}^{n} K_i Q_{iv}}{\sum_{i=1}^{n} Q_{iv}}} \qquad (14)$$

Where:

Q_{tb} = maximum release rate allowed to give a limiting total body dose rate of 500 mrem/yr in **μCi/sec**;

$\sum_{i=1}^{n}$ =summation of all nuclides considered;

K_i = the total body dose factor due to gamma emissions for each identified radionuclide (i) in units of **mrem/yr per pCi/m³** (Attachment 6.4);

5.4 GASEOUS EFFLUENTS (cont'd)

Q_{iv} = average release rate of isotope (i) from the release point (v) in **µCi/sec**;

$\overline{(X/Q)}_v$ = 1.1E-5 **sec/m³** (in the ESE sector at 0.6 mile). The sector with highest value of annual average atmospheric dispersion factor at the site boundary for the release point (v) in question;

RF = release fraction allotted to release point in consideration; and

SF = administrative safety factor to account for uncontrollable variables (sampling, monitoring errors, etc.). Usually, the SF takes on a value of 0.9.

5.4 GASEOUS EFFLUENTS (cont'd)

b. For Skin (Q skin):

$$Q_{skin} = \frac{(3000\frac{mrem}{yr})(RF)(SF)}{\overline{(\chi/Q)}_v(1.0e+6\frac{pCi}{\mu Ci})\frac{\sum_{i=1}^{n}(L_i+1.1M_i)Q_{iv}}{\sum_{i=1}^{n}Q_{iv}}} \quad (15)$$

Where:

all terms are as defined in Step (a) for Qtb, except:

Q_{skin} = maximum release rate allowed to give a limiting skin dose of 3000 mrem/yr in μCi/sec;

L_i = skin dose factor due to beta emissions for each identified radionuclide (i) in units of mrem/yr per pCi/m³ (Attachment 6.4);

1.1 = conversion factor to convert from air to skin dose; and

M_i = air dose factor due to gamma emissions for identified noble gas isotope (i) in units of mrad/yr per pCi/m³ (Attachment 6.4).

5.4 GASEOUS EFFLUENTS (cont'd)

5.4.8.4 The monitor setpoint is calculated is the following manner:

$$SN = \frac{Q}{(F_{max})(472)} \qquad (16)$$

Where:

SN = maximum monitor setpoint in $\mu Ci/cm^3$;

Q = Minimum value of Q_{tb} or Q_{skin} ($\mu Ci/sec$).

F_{max} = maximum effluent flow rate (cfm); and

472 = Unit conversion, CFM to cm^3/sec

5.4.8.5 Since Kr-88 is the noble gas with the highest dose rate conversion factors, for conservatism, the preceeding calculations may be computed using Kr-88 only. Total body dose becomes more limiting than skin and the release limit is:

$$Q_{Kr-88} = \frac{(500\frac{mrem}{yr})(RF)(SF)}{(\overline{\chi/Q})_v(K_{Kr-88})\,(1.0e+6\frac{pCi}{\mu Ci})} \qquad (17)$$

5.4 GASEOUS EFFLUENTS (cont'd)

where:

Q_{Kr-88} = the maximum release rate, based on Kr-88, allowed to give a limiting total body dose rate of 500 mrem/yr in μci/sec; and

K_{Kr-88} = the total body dose factor due to Kr-88 in units of mrem/yr per ρCi/m³ (Attachment 6.4); and.

All other terms are as previously defined.

The monitor setpoint can be calculated as:

$$SN = \frac{Q_{Kr-88}}{(F_{max})(472)} \qquad (18)$$

All terms are previously defined

5.4 GASEOUS EFFLUENTS (cont'd)

5.4.9 Dose Projection due to Gaseous Effluents

5.4.9.1 Specification 5.4.4 requires that appropriate subsystems of the Gaseous Radwaste Treatment System be used to reduce releases of radioactivity when the projected doses due to the gaseous effluent to areas at and beyond the SITE BOUNDARY would exceed, in a 31-day period, any of the following:

0.2 mrad to air from **gamma** radiation; or
0.4 mrad to air from **beta** radiation; or
0.3 mrem to any **organ** of a MEMBER OF THE PUBLIC.

5.4.9.2 The following calculational method is provided for performing this dose projection.

At least once every 31 days the gamma air dose, beta air dose and the maximum organ dose for the month-to-quarter will be divided by the number of days into the quarter and multiplied by 31. If these projected doses exceed any of the values listed above and the VENTILATION EXHAUST TREATMENT SYSTEM OR WASTE GAS HOLDUP SYSTEM has not been operating, it shall be operated to reduce radioactivity levels prior to release. (This is performed in accordance with the Surveillance Requirements of Specification 5.4.4.)

5.4 GASEOUS EFFLUENTS (cont'd)

5.4.10 Gaseous Effluent Bases

a. DOSE RATE (Section 5.4.1)

This specification is provided to ensure that the dose at any time at and beyond the SITE BOUNDARY from gaseous effluents from all units on the site will be within the annual dose limits of 10 CFR Part 20 to UNRESTRICTED AREAS. The annual dose limits are the doses associated with the concentrations of 10 CFR Part 20, Appendix B, Table II, Column 1. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of a MEMBER OF THE PUBLIC in a UNRESTRICTED AREA, either within or outside the SITE BOUNDARY, to annual average concentrations exceeding the limits specified in Appendix B, Table II of 10 CFR Part 20 (10 CFR Part 20.106(b)). For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of that MEMBER OF THE PUBLIC will usually be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY. Examples of calculations for such MEMBERS OF THE PUBLIC, with the appropriate occupancy factors, shall be given in this manual. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrem/year to the total body and 3000 mrem/yr to the skin.

5.4 GASEOUS EFFLUENTS (cont'd)

These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrem/year.

The required detection capabilities for radioactive materials in gaseous waste samples are tabulated in terms of the lower limits of detection (LLDs). Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual, HASL-300 (Reference 2.12) and Report ARH-SA-215 (Reference 2.13).

b. DOSE - NOBLE GASES (Section 5.4.2)

The Specification is provided to implement the requirements of Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. It implements the guides set forth in Section II.B of Appendix I.

5.4 GASEOUS EFFLUENTS (cont'd)

The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents to assure that the releases of radioactive material in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable". The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109 (Reference 2.4) and Regulatory Guide 1.111 (Reference 2.2).

5.4 GASEOUS EFFLUENTS (cont'd)

Sections 5.4.2 and 5.4.3 equations provided for determining the air doses at and beyond the SITE BOUNDARY are based upon the historical average atmospheric conditions.

Grab sampling of effluents from the main condenser evacuation and turbine gland sealing system is not required when this source has been continuously discharging to the plant stack.

If no primary to secondary leakage in the steam generator exists, then there should be no radioactive release from the main condenser evacuation and turbine gland sealing system and the gross beta or gamma monitoring for noble gases will be sufficient to determine if any radioactivity is present in the release.

If a primary to secondary leak exists, then the release from the main condenser evacuation and turbine gland sealing systems will be sampled and analyzed in accordance with Table 5.4-1.

5.4 GASEOUS EFFLUENTS (cont'd)

c. IODINE-131, IODINE-133, TRITIUM, AND RADIONUCLIDES IN PARTICULATE FORM (Section 5.4.3)

This specification is provided to implement the requirements of Sections II.C, III.A and IV.A of Appendix I, 10 CFR Part 50. The Specifications are the guides set forth in Section II.C of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable.

"The calculational methods specified in the Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated.

5.4 GASEOUS EFFLUENTS (cont'd)

The calculational methodology and parameters for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology provided in Regulatory Guide 1.109, Reference 2.4 and Regulatory Guide 1.111, Reference 2.2. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions.

The release rate specifications for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days are dependent upon the existing radionuclide pathways to man in the areas at and beyond the SITE BOUNDARY. The pathways that were examined in the development of these calculations were:

(1) Individual inhalation of airborne radionuclides,
(2) Deposition of radionuclides onto green leafy vegetation with subsequent consumption by man,
(3) Deposition onto grassy areas where milk animals and meat-producing animals graze with consumption of the milk and meat by man, and
(4) Deposition on the ground with subsequent exposure of man.

5.4 GASEOUS EFFLUENTS (cont'd)

d. GASEOUS RADWASTE TREATMENT (Section 5.4.4)

The OPERABILITY of the WASTE GAS HOLDUP SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM ensures that the systems will be available for use whenever gaseous effluents require treatment prior to release to the environment. The requirement that the appropriate portions of these systems be used, when specified, provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable".

This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the dose design objectives set forth in Section II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

5.5 TOTAL DOSE

5.5.1 TOTAL DOSE SPECIFICATION

The annual (calander year) dose or dose commitment to any MEMBER OF THE PUBLIC due to release of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to **25 mrem** to the **total body** or **any organ, except the thyroid**, which shall be limited to less than or equal to **75 mrem**.

APPLICABILITY: At all times.

ACTION:

With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Specification 5.3.2.a, 5.3.2.b, 5.4.2.a, 5.4.2.b, 5.4.3.a, or 5.4.3.b calculations shall be made including direct radiation contributions from the reactor units and from outside storage tanks to determine whether the above limits of Specification 5.5.1 have been exceeded. This evaluation should be done in accordance with guidance in Section 5.5.2. If such is the case, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2 a Special Report.

5.5 TOTAL DOSE (cont'd)

This Special Report shall:

a) Define corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits.

b) As defined in 10 CFR 20.405c, shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report.

c) Describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations.

d) If the estimated dose(s) exceeds the specification 5.5.1 limits, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

5.5 TOTAL DOSE (cont'd)

SURVEILLANCE REQUIREMENTS:

a. Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with Specification 5.3.2, 5.4.2, and 5.4.3 and in accordance with the methodology and parameters in this manual.

b. Cumulative dose contributions from direct radiation from the reactor units and from radwaste storage tanks shall be determined in accordance with the methodology and parameters in this manual. This requirements is applicable only under condition set forth in Specification 5.5.1.

5.5 TOTAL DOSE (cont'd)

5.5.2 40 CFR 90 DOSE EVALUATION

This section demonstrates compliance with Specification 5.5.1 Surveillance Requirements. Specifically, the dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and radiation from uranium fuel cycle sources shall be limited to less than or equal to **25 mrem to the total body or any organ (except the thyroid**, which shall be limited to less than or equal to **75 mrem**) over **12 consecutive months**.

Dose evaluations to demonstrate compliance with the above dose limits need to be performed only if **quarterly doses exceed**:

(1) 3 mrem to the total body (liquid releases).
(2) 10 mrem to any organ (liquid releases).
(3) 15 mrem to the thyroid or any organ from radioiodines and particulates (gaseous releases).

otherwise no evaluations are required.

For the evaluation of doses to real individuals from liquid releases, the same calculational methods as employed in Section 5.3.4 will be used. However, more encompassing and realistic assumptions will be made concerning the dilution and ingestion of radionuclides by individuals who live and fish in the Waterford 3 area.

5.5 TOTAL DOSE (cont'd)

The results of the Radiological Environmental Monitoring Program will be used in determining the realistic dose based on actual measured radionuclide concentrations. For the evaluation of doses to real individuals from gaseous releases, the same calculational methods as employed in sections 5.4.6 and 5.4.7 will be used. The total body dose factor should be substituted for the gamma air dose factor (M_i) to determine the total body dose. Otherwise, the same calculational sequence applies. More realistic assumptions will be made concerning the actual location of real individuals, the meteorological conditions, and the consumption of food. Data obtained from the latest land use census should be used to determine locations for evaluating doses. The results of the Radiological Environmental Monitoring Program will be included in determining more realistic doses based on actual measured radionuclide concentrations.

Cumulative dose contributions from direct radiation, from the reactor unit, and from Radwaste Storage Tanks shall be determined utilizing the results of routine plant perimeter surveys, TLD data, or a combination of both when necessary.

5.5 TOTAL DOSE (cont'd)

5.5.3 Total Dose Bases

The specification is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR Part 20 by 46 Federal Register 18525. The specification requires the preparation and submittal of a Special Report whenever the calculated doses from plant generated radioactive effluents and direct radiation exceed 25 mrem to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the MEMBER OF THE PUBLIC from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 8 km must be considered.

5.5 TOTAL DOSE (cont'd)

5.5.3 Total Dose Bases

If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR Part 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR 190.11 and 10 CFR 20.405c, is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff action is completed.

The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR Part 20, as addressed in Specifications 5.3.1 and 5.4.1. An individual is not considered a MEMBER OF THE PUBLIC during in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.

5.6 INSTRUMENTATION

5.6.1 Radioactive Liquid Effluent Monitoring Instrumentation Specification

The radioactive liquid effluent monitoring instrumentation channels shown in Table 5.6-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 5.3.1 are not exceeded during releases to the environment. The alarm/trip setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in Section 5.3.5.

APPLICABILITY: At all times.

ACTION:

a. With radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above Specification, immediately suspend release to the environment of radioactive liquid effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

5.6 INSTRUMENTATION (Cont'd)

b. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 5.6-1. Restore the inoperable instrumentation to OPERABLE status within 30 days if release to the environment are in progress or, if unsuccessful, explain in the next Annual Radioactive Effluent Release Report, pursuant to Technical Specification 6.9.1.8, why this inoperability was not corrected within the time specified. Releases need not be terminated after 30 days provided the specified ACTIONS are continued.

SURVEILLANCE REQUIREMENT

Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 5.6-2.

TABLE 5.6-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
I- BORIC ACID CONDENSATE DISCHARGE (BWMS):			
a. Radioactivity Monitor Providing Alarm and Automatic Termination of Release **(PRM-IRE-0627)**	1	During Batch Release of Boric Acid Condensate Tanks	1
b. Waste (Process) Flow Rate Measurement Device **(PRM-IFT-0627)**	1		2
II- WASTE, WASTE CONDENSATE and LAUNDRY : DISCHARGE (LWMS)			
a. Radioactivity Monitor Providing Alarm and Automatic Termination of Release **(PRM-IRE-0647)**	1	During Batch Release of Liquid Waste Management Tanks	1
b. Waste (Process) Flow Rate Measurement Device **(PRM-IFT-0647)**	1		2
III- DRY COOLING TOWER SUMPS(DCTS):		Detectable(Note	
a. Radioactivity Monitor Providing Alarm and Automatic Termination of Release **[PRM-IRE-6775(DCTS#1) and PRM-IRE-6776(DCTS#2)]**	1/sump	#2) Activity in CCW/ACCW Systems and Release Path NOT Aligned	3
b. Waste (Process) Flow Rate Measurement Device (See Table Note. #1)	N/A	to LWMS	N/A

TABLE 5.6-1 (Continued)

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
IV- TURBINE BUILDING INDUSTRIAL WASTE SUMP (TBIWS):			
a. Radioactivity Monitor Providing Alarm and Automatic Termination of Release **(PRM-IRE-6778)**	1	Detectable(Note #2) Activity in Secondary Plant and Release Path NOT Aligned to LWMS	3
b. Waste (Process) Flow Rate Measurement Device (See Table Note. #1)	N/A		N/A
V- CIRCULATING WATER DISCHARGE- BLOWDOWN HEAT EXCHANGER DISCHARGE AND AUXILIARY COOLING WATER PUMPS (CWD):	1	1. Detectable Activity in Secondary Plant. 2. During Blowdown OF Steam Generators to CW System. 3. During Discharge of ACCW Basins to CW System.	4
a. Radioactivity Monitor Providing Alarm and Automatic Reduction of Blowdown Discharge Flow Rate. **(PRM-IRE-1900)**			
b. Waste (Process) Flow Rate Measurement Device (See Table Note. #1)	N/A		N/A
VI- STEAM GENERATOR BLOWDOWN EFFLUENT LINE		During Blowdown (Note#3) of S/Gs to CW System or Waste Ponds.	
a. Continuous Composite Sampler	1		4

TABLE 5.6-1 (Continued)
TABLE NOTATIONS

NOTE #1 - Waste (process) Flow Measurement Devices are not installed on the release paths for the **DCTS, TBIWS or CWD** monitors. For these release paths, pump performance curves generated in place or some form of volumetric estimate or measurement device may be used for effluent flow rate estimates.

NOTE #2 - **DCTS and TBIWS** monitor operation should be maximized during releases to the environment, even when detectable activity is not present in the CCW/ACCW or secondary systems, to provide capability for release termination in the event that Primary-to-Secondary or Primary-to-CCW leakage occurs.

NOTE #3 - The **Steam Generator Blowdown** Composite Sampler is capable of sampling blowdown discharge to either the CW System or Waste Ponds. Blowdown to the Waste Ponds is not allowed unless radiation monitoring capable of release termination is added to the release path.

ACTION STATEMENTS

ACTION 1 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided best efforts are made to repair the instrument and that prior to initiating a release:

a. At least two independent samples are analyzed in accordance with Specification 5.3.1, and

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

ACTION 2 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided best efforts are made to repair the instrument and that the flow rate is estimated at least once per **FOUR** hours during actual releases. Pump performance curves generated in place may be used to estimate flow.

TABLE 5.6-1 (Continued)
TABLE NOTATIONS

ACTION 3 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided best efforts are made to repair the instrument and that grab samples are collected and are analyzed within 24 hours of collection time for radioactivity at a lower limit of detection of at least 5 E-07 microcurie/ml. Sample collection and analysis is NOT required if the release path for the DCTS/TBIWS is aligned to the LWMS. The sample collection frequency is:

a. At least once per 12 hours when the specific activity of the secondary coolant is greater than 0.01 microcurie/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 microcurie/gram DOSE EQUIVALENT I-131.

ACTION 4 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided best efforts are made to repair the instrument and that grab samples are collected and are analyzed within 24 hours of collection time for radioactivity at a lower limit of detection of at least 5 E-07 microcurie/ml. Sample collection and analysis is NOT required if no detectable activity exists in either the secondary plant or CCW/ACCW systems. Sampling of Steam Generator Blowdown is required during blowdown to the CW System or Waste Ponds. The sample collection frequency is:

a. At least once per 12 hours when the specific activity of the secondary coolant is greater than 0.01 microcurie/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 microcurie/gram DOSE EQUIVALENT I-131.

TABLE 5.6-2

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	CHANNEL SOURCE CHECK	CHANNEL CALIBRATION	FUNCTIONAL TEST	CONDITIONS IN WHICH REQUIRED
I- BORIC ACID CONDENSATE DISCHARGE (BWMS):					During Batch Release of Boric Acid Condensate Tanks
a. Radioactivity Monitor Providing Alarm and Automatic Termination of Release **(PRM-IRE-0627)**	Prior to Release	Prior to Release	18 Months(3)	Quarterly(1)	
b. Waste (Process) Flow Rate Measurement Device (**PRM-IFT-0627**)	Daily (4)	N/A	18 Months	Quarterly	
II- WASTE, WASTE CONDENSATE and LAUNDRY DISCHARGE (LWMS):					During Batch Release of Liquid Waste Management Tanks
a. Radioactivity Monitor Providing Alarm and Automatic Termination of Release **(PRM-IRE-0647)**	Prior to Release	Prior to Release	18 Months(3)	Quarterly(1)	
b. Waste (Process) Flow Rate Measurement Device (**PRM-IFT-0647**)	Daily (4)	N/A	18 Months	Quarterly	
III- DRY COOLING TOWER SUMPS (DCTS):					Detectable Activity in CCW/ACCW Systems and Release Path NOT Aligned to LWMS
a. Radioactivity Monitor Providing Alarm and Automatic Termination of Release **(PRM-IRE-6775 and PRM-IRE-6776)**	Daily	Monthly	18 Months(3)	Quarterly(2)	
b. Waste (Process) Flow Rate Measurement	N/A	N/A	N/A	N/A	

TABLE 5.6-2 (Continued)

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	CHANNEL SOURCE CHECK	CHANNEL CALIBRATION	FUNCTIONAL TEST	CONDITIONS IN WHICH REQUIRED
IV- **TURBINE BUILDING INDUSTRIAL WASTE SUMP (TBIWS):**					Detectable Activity in Secondary Plant and Release Path NOT Aligned to LWMS
a. Radioactivity Monitor Providing Alarm and Automatic Termination of Release **(PRM-IRE-6778)**	Daily	Monthly	18 Months(3)	Quarterly(2)	
b. Waste (Process) Flow Rate Measurement	N/A	N/A	N/A	N/A	
V- **CIRCULATING WATER DISCHARGE- BLOWDOWN HEAT EXCHANGER DISCHARGE AND AUXILIARY COOLING WATER PUMPS (CWD): (TERMINATION OF BLOWDOWN DISCHARGE ONLY)**					-Detectable Activity in Secondary Plant. -During B/D of S/G to CW System -During Dischg. of ACCW Basins to CW System.
a. Radioactivity Monitor Providing Alarm and Automatic Reduction of Blowdown Discharge Flow Rate **(PRM-IRE-1900)**	Daily	Monthly	18 Months(3)	Quarterly(2)	
b. Waste (Process) Flow Rate Measurement	N/A	N/A	N/A	N/A	
VI- **STEAM GENERATOR BLOWDOWN EFFLUENT LINE:**	Daily(5)	N/A	18 Months	Quarterly	During B/D of S/Gs to CW System or Waste Ponds.
a. Continuous Composite Sampler					

TABLE 5.6-2 (Continued)

TABLE NOTATION

1. The CHANNEL FUNCTIONAL TEST for BWM and LWM shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation occur if any of the following conditions exists.

   1. Instrument indicates measured levels above the alarm/trip setpoint.

   2. Circuit failure

   3. Instrument indicates a downscale failure.

2. The CHANNEL FUNCTIONAL TEST for DCTS, TBIWS and CWD shall also demonstrate that automatic isolation of this pathway occurs if the instrument indicates measured levels above the alarm/trip setpoint and that control room alarm annunciation occurs if any of the following conditions exists:

   1. Instrument indicates measured levels above the alarm setpoint.

   2. Circuit failure.

   3. Instrument controls not set in operate mode.

3. The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology or using standards that have been obtained from suppliers that participate in measurement assurance activities with NIST. These standards shall permit calibrating the system for over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration shall be used.

4. CHANNEL CHECK for BWM and LWM shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once per 24 hours on days on which continuous, periodic, or batch releases are made.

5. CHANNEL CHECK for Steam Generator Blowdown Composite Sampler shall be made at least once per 24 hours on days on which releases are made to the Circulating Water System or Waterford 3 waste pond.

5.6 INSTRUMENTATION (cont'd)

5.6.2 Radioactive Gaseous Effluent Monitoring Instrumentation Specifications

The radioactive gaseous effluent monitoring instrumentation channels shown in Table 5.6.3 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 5.4.1 are not exceeded during releases to the environment. The alarm/trip setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in Section 5.4.8.

APPLICABILITY: As shown in Table 5.6-3

ACTION:

a. With a radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above Specification, immediately suspend release to the environment of radioactive gaseous effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

5.6 INSTRUMENTATION (cont'd)

b. With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 5.6-3. Restore the inoperable instrumentation to OPERABLE status within 30 days if releases to the environment are in progress or, if unsuccessful, explain in the next Annual Radioactive Effluent Release Report, pursuant to Technical Specification 6.9.1.8, why this inoperability was not corrected within the time specified. Releases need not be terminated after 30 days provided the specified ACTIONS are continued.

SURVEILLANCE REQUIREMENTS:

Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 5.6-4.

TABLE 5.6-3

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
I- WASTE GAS HOLDUP SYSTEM (GWMS):			
a. Noble Gas Activity Monitor Providing Alarm and Automatic Termination of Release **(PRM-IRE-0648)**	1	During Waste Gas Decay Tank Discharge	1
b. Waste (Process) Flow Rate Measurement Device **(GWM-IFIT-0648)**	1		5
II- MAIN CONDENSER EVACUATION AND TURBINE GLAND SEALING SYSTEM (MCES):			
a. Noble Gas Activity Monitor **(PRM-IRE-0002)**	1	When Main Condenser is Under a vacuum and Release has **not** been directed to the Plant Stack	3
b. Iodine Sampler (see NOTE 1)	1		4
c. Particulate Sampler (see NOTE 1)	1		4
d. Sampler Flow Rate Monitor (see NOTE 1)	1		6

TABLE 5.6-3 Continued)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
III- REACTOR AUXILIARY BUILDING VENTILATION SYSTEM (PLANT STACK):			
a1. Noble Gas Activity Monitor Providing Alarm and Automatic Termination of Containment Purge **(PRM-IRE-0100.1S & 2S)**	1	During Containment Purge	2
a2. Noble Gas Activity Monitor **(PRM-IRE-0100.1S , 2S or 0110)**	1	At	3
b. Iodine Sampler (see NOTE 1)	1	All	4
c. Particulate Sampler (see NOTE 1)	1	Times	4
d. Sampler Flow Rate Monitor (see NOTE 1)	1		6
e. Waste (Process) Flow Rate Monitor **(PRM-IFT-0100-12/22)**	1		5
IV- FUEL HANDLING BUILDING VENTILATION SYSTEM - (NORMAL):			
a. Noble Gas Activity Monitor **(PRM-IRE-5107 A or B)**	1	With Irradiated	3
b. Iodine Sampler (see NOTE 1)	1	Fuel in	4
c. Particulate Sampler (see NOTE 1)	1	the Storage	4
d. Sampler Flow Rate Monitor (see NOTE 1)	1	Pool	6
e. Waste (Process) Flow Rate Monitor **(PRM-IFT-5107 A or B)**	1		5

TABLE 5.6-3 (Continued)
TABLE NOTATIONS

NOTE 1 - The sampler flow rate monitor operability also satisfies the particulate and iodine sampler requirements as long as the filter media for the applicable sample pump is installed. For the MCES and Plant Stack WRGM's, the low range detector sample pump is normally used to satisfy these requirements. For the Plant Stack and Fuel Handling Building PIG's, the filter media necessary to satisfy the particulate and iodine sampler is normally applicable to the iodine/gas channel sample pump.

ACTION STATEMENTS

ACTION 1 - 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 provided best efforts are made to repair the instrument and that prior to initiating the 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;

ACTION 2 - With the number of channels operable less than required, containment purging of radioactive effluents must be immediately suspended. This ACTION only applies to the noble gas channels of the Plant Stack PIG's (PRM-IRE-0100.1S and PRM-IRM-0100.2S).

TABLE 5.6-3 (Continued)
TABLE NOTATIONS
ACTION STATEMENTS

ACTION 3 - With the number of Noble Gas activity monitor Channels OPERABLE less than the minimum channels OPERABLE requirement, effluent releases via this pathway may continue provided best efforts are made to repair the instrument and that grab samples are taken at least once per **12 hours** and these samples are analyzed for gross activity within **24 hours**. For the Main Condenser Evacuation and Turbine Gland Sealing Systems (MCES), this ACTION only applies during releases **NOT** directed to the Plant Stack with Turbine Gland Sealing System or Condenser Vacuum Pumps in OPERATION.

ACTION 4 - With the number of Particulate/ Iodine sampler Channels OPERABLE less than the minimum channels OPERABLE requirement, effluent releases via this pathway may continue provided best efforts are made to repair the instrument and that samples are continuously collected with auxiliary sampling equipment as required in Table 5.4-1. For the MCES WRGM, this ACTION only applies during periods of Primary to Secondary leakage and the release has **NOT** been directed to the Plant Stack.

ACTION 5 - With the number of Waste (Process) flow rate monitor channels OPERABLE less than the minimum channels OPERABLE requirement, effluent releases via this pathway may continue provided best efforts are made to repair the instrument and that flow rate is estimated at least once every four hours. **Waste (Process)** flow rate estimates may be in the form of a log of running ventilation equipment which is updated at four hour intervals. For the waste gas holdup tank, this ACTION is applicable only during periods of release.

ACTION 6 - With the number of Sampler Flow Rate Monitor Channels OPERABLE less than the minimum channels OPERABLE requirement, effluent releases via this pathway may continue provided best efforts are made to repair the instrument and flow rate is estimated at least once every four hours. For the MCES WRGM, this ACTION only applies during periods of Primary to Secondary leakage and the release has NOT been directed to the Plant Stack.

TABLE 5.6-4

RADIOACTIVE GASEOUS EFFLUENT MONITOPING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	CHANNEL SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	CONDITIONS IN WHICH REQUIRED
I- WASTE GAS HOLDUP SYSTEM (GWMS):					
a. Noble Gas Activity Monitor Providing Alarm and Automatic Termination of Release **(PRM-IRE-0648)**	Prior to Release	Prior to Release	18 Months(4)	Quarterly(1)	During Waste Gas Decay Tank Discharge
b. Waste (Process) Flow Rate Measurement Device **(GWM-IFIT-0648)**	Daily (5)	N/A	18 Months	Quarterly	
II- MAIN CONDENSER EVACUATION AND TURBINE GLAND SEALING SYSTEM (MCES):					When Main Condenser is Under a vacuum and Release has not been directed to Plant Stack
a. Noble Gas Activity Monitor **(PRM-IRE-0002)**	Daily	Monthly	18 Months(4)	Quarterly(2)	
b. Iodine Sampler	Weekly	N/A	N/A	N/A	
c. Particulate Sampler	Weekly	N/A	N/A	N/A	
d. Sampler Flow Rate Monitor	Daily	N/A	18 Months	Quarterly	

TABLE 5.6-4 (Continued)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	CHANNEL SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	CONDITIONS IN WHICH REQUIRED
III- REACTOR AUXILIARY BUILDING VENTILATION SYSTEM (PLANT STACK):					
a. Noble Gas Activity Monitor Providing Alarm and Automatic Termination of Release (PRM-IRE-0100.1S or 2S)	Daily	Monthly	18 Months(4)	Quarterly(3)	At All Times
b. Iodine Sampler	Weekly	N/A	N/A	N/A	
c. Particulate Sampler	Weekly	N/A	N/A	N/A	
d. Sampler Flow Rate Monitor	Daily	N/A	18 Months	Quarterly	
e. Waste (Process) Flow Rate Monitor (PRM-IFT-0100-12/22)	Daily	N/A	18 Months	Quarterly	
IV- FUEL HANDLING BUILDING VENTILATION SYSTEM - (NORMAL):					
a. Noble Gas Activity Monitor (PRM-IRE-5107 A or B)	Daily	Monthly	18 Months(4)	Quarterly(2)	With Irradiated Fuel in the Storage Pool
b. Iodine Sampler	Weekly	N/A	N/A	N/A	
c. Particulate Sampler	Weekly	N/A	N/A	N/A	
d. Sampler Flow Rate Monitor	Daily	N/A	18 Months	Quarterly	
e. Waste (Process) Flow Rate Monitor (PRM-IFT-5107 A or B)	Daily	N/A	18 Months	Quarterly	

TABLE 5.6-4 (Continued)
TABLE NOTATIONS

1. The CHANNEL FUNCTIONAL TEST for Waste Gas Holdup System shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation occurs if any of the following conditions exists:

   1. Instrument indicates measured levels above the alarm/trip setpoint.
   2. Circuit failure.
   3. Instrument indicates a downscale failure.

2. The CHANNEL FUNCTIONAL TEST for MCES and Fuel Handling Building shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exists:

   1. Instrument indicates measured levels above the alarm setpoint.
   2. Circuit failure.

3. The CHANNEL FUNCTION TEST shall for Plant Stack also demonstrate that automatic isolation of this pathway occurs if the instrument indicates measured levels above the alarm/trip setpoint and that control room alarm annunciation occurs if any of the following conditions exists:

   1. Instrument indicates measured levels above the alarm set.
   2. Circuit failure.
   3. Instrument controls not set in operate mode.

4. The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology (NIST) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NIST. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration shall be used.

5. CHANNEL CHECK for GWMS shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once per 24 hours on days on which continuous, periodic, or batch releases are made.

5.6 INSTRUMENTATION (Cont'd)

5.6.3 Instrumentation Bases

a. RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION (5.6.1)

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The alarm/trip setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in Section 5.3.5 to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

5.6 INSTRUMENTATION (Cont'd)

b. RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION (5.6.3)

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in Section 5.4.8 to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. This instrumentation also include provisions for monitoring (and controlling) the concentrations of potentially explosive gas mixtures in the WASTE GAS HOLDUP SYSTEM. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

5.7 LIQUID AND GASEOUS RADWASTE PROCESSES

The block flow diagrams of the radwaste systems are shown in Attachments 6.11 and 6.12. In order to obtain a more detailed description, see the appropriate sections of the FSAR.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS

5.8.1 Radiological Environmental Program Specification

The radiological environmental monitoring program shall be conducted as specified in Table 5.8-1.

APPLICABILITY: At all times.

ACTION:

a. With the radiological environmental monitoring program not being conducted as specified in Table 5.8-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report required by Technical Specification 6.9.1.7, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 5.8-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

This Special Report identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to a MEMBER OF THE PUBLIC is less than the calendar year limits of Specifications 5.3.2, 5.4.2, and 5.4.3.

When more than one of the radionuclides in Table 5.8-2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 5.8-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose to A MEMBER OF THE PUBLIC is equal to or greater than the calendar year limits of Specifications 5.3.2, 5.4.2, and 5.4.3. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

*The methodology and parameters used to estimate the potential annual dose to A MEMBER OF THE PUBLIC shall be indicated in this report.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

c. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 5.8-1, identify locations for obtaining replacement samples and add them to the radiological environmental monitoring program within 30 days.

The specific locations from which samples were unavailable may then be deleted from the monitoring program. Pursuant to Technical Specification 6.9.1.8, identify the cause of the unavailability of samples and identify the new location(s) for obtaining replacement samples in the next Annual Radioactive Effluent Release Report and also include in the report revisions of Attachments 6.13, 6.14, 6.16, 6.17 and 6.18 reflecting the new location(s).

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

SURVEILLANCE REQUIREMENTS:

The radiological environmental monitoring samples shall be collected pursuant to Table 5.8-1 from the specific locations given in Attachments 6.13 and 6.14, and shall be analyzed pursuant to the requirements of Table 5.8-1 and the detection capabilities required by Table 5.8-3.

TABLE 5.8-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM*

	EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS [1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FRQUENCY OF ANALYSIS
I.	DIRECT RADIATION [2]	31 routine monitoring stations either with 2 or more dosimeters or with one instrument for measuring and recording dose rate continuously, placed as follows: An inner ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY An outer ring stations, 1 in 10 of the meteorological sectors in the 6- to 8-km range from the site, The balance of the stations to be in special interest areas such as population centers, nearby residences, schools, and in 1 or 2 areas to serve as control stations	Quarterly	Gamma dose quarterly.

TABLE 5.8-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM*

	EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS [1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FRQUENCY OF ANALYSIS
II.	AIRBORNE Radioiodine and Particulates	Samples from five locations Three samples from close to the three SITE BOUNDARY locations, in different sectors, of the highest calculated annual average ground-level D/Q One sample from the vicinity of a community having the highest calculated annual average ground-level D/Q One sample from a control location, as for example 15-30 km distant and in the least prevalent wind direction. [3]	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	Radioiodine Canister I-131 analysis weekly. Particulate Sampler: Gross beta radioactivity analysis following filter change [4]; Gamma isotopic analysis of composite [5] (by location) quarterly.

TABLE 5.8-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM*

	EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS [1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
III.	WATERBORNE			
	a. Surface [6]	One sample upstream One sample downstream	Composite sample over one month period [7,11]	Gamma isotopic analysis monthly [5,11]. Composite for tritium analysis quarterly.
	b. Ground	Samples from one or two sources only if likely to be affected [8]	Quarterly	Gamma isotopic [5] and tritium analysis quarterly.
	c. Drinking	One sample of each of one of the three nearest water supplies that could be affected by its discharge.	Composite sample over two week period [7] when I-131 analysis is performed, monthly [11] composite otherwise	I-131 analysis on each composite when the dose calculated for the consumption of the water is greater than one mrem per year [9] Composite for gross beta and gamma isotopic analyses [5] monthly [11] Composite for tritium analysis quarterly.
	d. Sediment from shoreline	One sample from downstream area with existing or potential recreational value.	Semiannually	Gamma isotopic analysis [5] semiannally.

TABLE 5.8-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM*

	EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS [1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
IV.	INGESTION a. Milk	Samples from milking animals in the three locations within 5 km distance having the highest dose potential. If there are none, then, one sample from milking animals in each of the three areas between 5 to 8 km distant where doses are calculated to be greater than 1 mrem per yr.[9] One sample from milking animals at a control location 15-10 km distant and in the least prevalent wind direction.[3]	Semimonthly when animals are on pasture; monthly at other times.	Gamma isotopic[5] and I-131 analysis semimonthly when animals are on pasture; monthly at other times
	b. Fish and Invertebrates	One sample of each commercially and recreational important species in vicinity of plant discharge area. One sample of same species in areas not influenced by plant discharge.	Sample in season, or semiannually if they are not seasonal	Gamma isotopic analysis [5] on edible portions.

TABLE 5.8-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM*

	EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS [1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
	c. Food Products	One sample of each principal class of food products from any area that is irrigated by water in which liquid plant wastes have discharged.	At time of harvest[10]	Gamma isotopic analysis [5] on edible portion
		Samples of one to three different kinds of broad leaf vegetation grown nearest each of two different offsite locations of highest predicted annual average groundlevel D/Q if milk sampling is not perfomed.	Monthly when available	Gamma isotopic[5] and I-131 analysis.
		One sample of each of the similar broad leaf vegetation grown 15-30 km distant in the least prevalent wind direction if milk sampling is not performed.	Monthly when available	Gamma isotopic[5] and I-131 analysis

TABLE 5.8-1 (Continued)

TABLE NOTATIONS

*The number, media, frequency, and location of samples may vary from site to site. This table presents an acceptable minimum program for a site at which each entry is applicable. Local site characteristics must be examined to determine if pathways not covered by this table may significantly contribute to an individual's dose and should be included in the sampling program.

[1] Specific parameters of distance and direction sector from the centerline of one reactor, and additional description where pertinent, shall be provided for each and every sample location in Attachments 6.14, 6.16, 6.17 and 6.18. Refer to NUREG-0133 (Reference 2.5) and to Radiological Assessment Branch Technical Position, Revision 1, November 1979. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, corrective action shall be completed prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report pursuant to Specification 6.9.1.7. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the radiological environmental monitoring program. Pursuant to Specification 6.9.1.8, identify the cause of the unavailability of samples for that pathway and identify the new location(s) for obtaining replacement samples in the next Annual Radioactive Effluent Release Report and also include in the report a revised figure(s) and table reflecting the new location(s).

TABLE 5.8-1 (Continued)
TABLE NOTATIONS

[2] One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a thermoluminescent dosimeter (TLD) is considered to be one phosphor; two or more phosphors in a packet are considered as two or more dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation. The frequency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading.

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

[4] Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than 10 times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

[5] Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

TABLE 5.8-1 (Continued)
TABLE NOTATIONS

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

7 A composite sample is one in which the quantity (aliquot) of liquid sampled is proportional to the quantity of flowing liquid and in which the method of sampling employed results in a specimen that is representative of the liquid flow. In this program composite sample aliquots shall be collected at time intervals that are very short (e.g., hourly) relative to the compositing period (e.g., monthly) in order to assure obtaining a representative sample.

8 Groundwater samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

9 The dose shall be calculated for the maximum organ and age group, using the methodology and parameters in this document.

10 If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvest occurs continuously, sampling shall be monthly. Attention shall be paid to including samples of tuberous and root food products.

11 Composite samples for surface and/or Drinking Water gross beta and gamma isotopic analysis should be performed every four weeks. The maximum frequency is monthly.

TABLE 5.8-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS

IN ENVIRONMENTAL SAMPLES

Reporting Levels

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

TABLE 5.8-3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

Lower Limits of Detection (LLD) [abc]

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/M^3)	FISH (pCi/kg, wet)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01				
H-3	2,000					
Mn-54	15		130			
Fe-59	30		260			
Co-58	15		130			
Co-60	15		130			
Zn-65	30		260			
Zr-95	30					
Nb-95	15					
I-131	1 [d]	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-140	60			60		
La-140	15			15		

TABLE 5.8-3 (continued)
TABLE NOTATIONS

a This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 6.9.1.7.

b Required detection capabilities for thermoluminescent dosimeters used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13.

c Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 6.9.1.7.

d LLD for drinking water samples. If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

5.8.2 Interlaboratory Comparison Program Specification

Analyses shall be performed on all radioactive materials supplied as part of an Interlaboratory Comparison Program that has been approved by the Commission.

APPLICABILITY: At all times.

ACTION:

a. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 6.9.1.7.

SURVEILLANCE REQUIREMENTS

The Interlaboratory comparison Program shall be described in Section 5.8.5. A summary of the results obtained as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 6.9.1.7.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

5.8.3 Land Use Census Specification

A land use census shall be conducted and shall identify within a distance of 8 km (5 miles) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence, and the nearest garden* of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation.

APPLICABILITY: At all times.

ACTION:

a. With a land use census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Specification 5.4.3, identify the new location(s) in the next Annual Radioactive Effluent Release Report, pursuant to Specification 6.9.1.8.

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*Broad leaf vegetation sampling of different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census. Specifications for broad leaf vegetation sampling in Table 5.8-1 Part 4.c. shall be followed, including analysis of control samples.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

b. With a land use census identifying a location(s) that yields a calculated dose or dose commitment (via the same exposure pathway) 20% greater than at a location from which samples are currently being obtained in accordance with Specification 5.8.1, add the new location(s) to the radiological environmental monitoring program within 30 days. The sampling location(s), excluding the control station location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this land use census was conducted. Pursuant to Technical Specification 6.9.1.8 identify the new location(s) in the next Annual Radioactive Effluent Release Report and also include in the report revision of Attachments 6.13, 6.14, 6.16, 6.17, and 6.18 reflecting the new locations(s).

SURVEILLANCE REQUIREMENTS

The land use census shall be conducted during the growing season at least once per 12 months using that information that will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities. The results of the land use census shall be included in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 6.9.1.7.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

5.8.4 Description of the Radiological Environmental Monitoring Program

The Radiological Environmental Monitoring Program (REMP) is expounded on in Attachment 6.13, and the Sample Location Table, Attachment 6.14. Attachment 6.15 explains the sector and zone designations for the sample locations. Attachments 6.16, 6.17 and 6.18 show the sample locations within the 2,10, and 50 mile radius of Waterford 3.

Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report. It is recognized that, at times, it may not be possible or practical continue to obtain samples of the media of choice at the most desired location or time. In these instances, suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the Radiological Environmental Monitoring Programs.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

5.8.5 Description of the Interlaboratory Comparison Program

As described in Section 5.8.2 the quality assurance in radiological environmental sampling will be maintained through participation in the Environmental Protection Agency's Radiological Laboratory Quality Assurance Program. The summary of results will be presented in tabular form and will include the type of analysis, the preparation (collection) date, the date the results are returned, the mean of the analyses (usually triplicate), the standard deviation, the date the values are released for information, the known value, the three standard deviation limit, and a two standard deviation/three standard deviation warning/action flag. If the sample analysis indicates results outside the three standard deviation range, then the corrective actions taken to prevent a recurrence will be documented and submitted along with all results when the Annual Radiological Environmental Operating Report is submitted.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

5.8.6 Dispersion Parameters For Critical Locations

As per Requirements 5.8.3, the dispersion parameters for the site boundary and where necessary, as identified by the Annual Land Use Census, are listed in Attachment 6.2. This table will be subject to changes based on the Annual Land Use Census and historical data.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

5.8.7 Radiological Environmental Monitoring Bases

a. INTERLABORATORY COMPARISON PROGRAM (Section 5.8.2)

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

5.8 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS (Cont'd)

b. LAND USE CENSUS (Section 5.8.3)

This specification is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the radiological environmental monitoring program are made if required by the results of this census. The best information from the door-to-door survey, from aerial survey or from consulting with local agricultural authorities shall be used. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than 50 m^2 provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/yr) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made: (1) 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and (2) a vegetation yield of 2 kg/m^2.

5.9 ROUTINE EFFLUENT RELEASE REPORTS

5.9.1 Annual Radioactive Effluent Release Report

A routine radioactive effluent release report covering the operation of the unit during the previous Twelve months shall be submitted as specified in Waterford 3 SES, Technical Specification 6.9.1.8.

5.9.1.1 The radioactive effluent release report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the units as outlined in Regulatory Guide 1.21, Reference 2.10, with data summarized on a quarterly basis following the format of Appendix B thereof.

5.9.1.2 The Annual Radioactive Effluent Release Report 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 of wind speed, wind direction, and atmospheric stability, and precipitation (if measured) on magnetic tape, or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability.

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

In lieu of submission with the Radioactive Effluent Release Report, the summary of required meteorological data may be filed on site and provided to the NRC when requested. 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 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 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 this manual.

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

5.9.1.3 The Annual Radioactive Effluent Release Report shall also include an assessment of radiation doses to the likely most exposed member of the public from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year to show conformance with 40CFR190, Environmental Radiation Standards for Nuclear Power Operation. Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Rev. 1, October 1977.

5.9.1.4 The Annual Radioactive Effluent Release Report shall include the following information for each class of solid waste (as defined by 10CFR 61) shipped off site during the report period:

A. Container volume

B. Total curie quantity (specify whether determined by measurement or estimate),

C. Principal radionuclides (specify whether determined by measurement or estimate),

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

D. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),

E. Type of container (e.g., Type A, Type B), and

F. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

5.9.1.5 The Annual Radioactive Effluent Release Report shall include a list and description of unplanned releases from the site to unrestricted areas of radioactive materials in gaseous and liquid effluents made during the reporting period.

5.9.1.6 The Annual Radioactive Effluent Release Report shall include any changes to the Process Control Program (PCP) or the Offsite Dose Calculation Manual (ODCM), as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to ODCM Specification 5.8.3. The Annual Radioactive Release Report shall include information of Major Changes to Radioactive Waste Systems if the information is not submitted as part of the annual FSAR update.

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

A. The submittal providing information on ODCM changes shall contain:

1. Sufficiently detailed information to totally support the rationale for the change without benefit of additional or supplemental information. Information submitted should consist of a complete legible copy of the ODCM together with appropriate analyses or evaluations justifying the change(s), if applicable.

2. A determination that the change did not reduce the accuracy or reliability of dose calculations or setpoint determinations.

3. Documentation of the fact that the change has been reviewed and found acceptable by the Plant Operations Review Committee (PORC).

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

B. The submittal providing information on PCP changes shall contain:

1. Information submitted should consist of a complete legible copy of the PCP, together with appropriate analyses or evaluations, justifying the changes(s), if applicable.

2. Documentation of the fact that the change has been reviewed and found acceptable by the Plant Operations Review Committee (PORC).

NOTE

Radioactive Was e System change information may be submitted as part of the annual FSAR update in lieu of the Annual Radioactive Effluent Release Report.

C. The submittal providing information on licensee initiated major changes to the radioactive waste systems (liquid, gaseous, and solid) shall contain:

1. A summary of the evaluation that led to the the determination that the change could be made in accordance with 10CFR50.59

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

2. Sufficient detailed information to totally support the reason for the change without benefit of additional or supplemental information.

3. A detailed description of the equipment, components and processes involved and the interfaces with other plant systems.

4. An evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents and/or quantity of solid waste that differ from those previously predicted in the license application and amendments thereto.

5. An evaluation of the change which shows the expected maximum exposures a member of the Public in the unrestricted area and to the general population that differ from those previously estimated in the license application and amendments thereto.

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

6. A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents and in solid waste, to the actual releases for the period before the changes are to be made.

7. An estimate of the exposure to plant operating personnel as a result of the change.

8. Documentation of the fact that the change was reviewed and found acceptable by the Plant Operating Review Committee.

9. Changes to Radioactive Waste Systems performed using the plant design change process will be reported as per design change procedures.

5.9.1.7 The Annual Radioactive Effluent Release Report shall include, if applicable, a description of events which led to exceeding the following limiting condition for operation:

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

A. The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to specification 5.4.1.

B. The quantity of radioactive material contained in each **unprotected tank** shall be limited to Technical Specification 3.11.1.4.

5.9.1.8 The Annual Radioactive Effluent Release Report shall, if applicable, identify the cause of the unavailability of milk or fresh leafy vegetable samples at locations required by ODCM Spec. Table 5.8.1. The new location(s) for obtaining replacement samples shall be identified. Revised figure(s) and table for the ODCM reflecting the new locations shall be included in the report.

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

5.9.1.9 The Annual Radioactive Effluent Release Report shall identify the new location(s), if a land use census pursuant to ODCM Specification 5.8.3 identifies an environmental sampling location that yields a calculated dose or dose commitment greater than the values currently being calculated pursuant to ODCM Specification 5.4.3.

5.9.1.10 The Annual Radioactive Effluent Release Report shall identify the new location(s), and include a revised figure(s) and table for the ODCM reflecting the new location(s) if a land use census identifies an environmental sampling location(s) that yield a calculated dose or dose commitment (via the same exposure pathway) 20% greater than at a location from which samples are currently being obtained pursuant to ODCM Specification 5.7.1.

5.9 ROUTINE EFFLUENT RELEASE REPORTS (cont'd)

5.9.1.11 With less than the minimum number of radioactive liquid or gaseous effluent monitoring instrumentation channels operable for 30 days or longer, as required by ODCM Specification Table 5.6-3 or 5.6-1, explain in the next Annual Radioactive Effluent Release Report, pursuant to Technical Specification 6.9.1.8, why this inoperability was not corrected within the time specified.

NOTE

The Shift Supervisor shall be immediately notified and a Condition Report promptly initiated whenever an effluent sample is late or missing in accordance with applicable Specifications.

5.9.1.12 The Annual Radioactive Effluent Release Report shall identify any missing or late analysis results for radioactive effluent samples collected during the reporting period.

5.10 SPECIAL EFFLUENT REPORTS

5.10.1 The Shift Supervisor shall be immediately notified and a Condition Report promptly initiated whenever any of the following specifications have been exceeded. A Special Report shall be prepared for submittal to the NRC within 30 day period, as per the ACTION requirement of the specification that has been exceeded.

5.10.1.1 Radioactive Liquid Effluent Dose Specification 5.3.2

5.10.1.2 Radioactive Liquid Waste Treatment System Specification 5.3.3

5.10.1.3 Radioactive Gaseous Effluent Dose, Noble Gas Specification 5.4.2

5.10.1.4 Radioactive Gaseous Effluent Dose, Iodine 131, I-133, Tritium, and Radionuclides in Particulate Form Specification 5.4.3

5.10.1.5 Radioactive Gaseous Waste Treatment System Specification 5.4.4

5.10.1.6 Radioactive Effluent Total Dose Specification 5.5.1

5.10 SPECIAL EFFLUENT REPORTS (cont'd)

5.10.2 Environmental Protection Agency Reportable Quantities

5.10.2.1 If any of ODCM specifications, 5.3.1, 5.3.2, 5.4.1, 5.4.2, or 5.4.3 have been exceeded, an evaluation of the Radioactivity released verses EPA Reportable Quantities (RQ's) shall be performed as soon as practical.

The Shift Supervisor shall be immediately notified and a Condition Report promptly initiated whenever any radionuclide released over a 24 hour period is greater than or equal to the EPA RQ. Notification requirements shall be performed as per UNT-006-010, Event Evaluation and Reporting. Recipients of notification are: The National Response Center, the State Emergency Response Commission, and the Local Emergency Planning Committee. Methods for determination of reportability and the Reportable Quantities values for radionuclides are contained within 40CFR302.

5.11 SECONDARY RELEASE PATHS

5.11.1 This section addresses potential release pathways which should not contribute more than 10% of the doses evaluated in this manual. The ODCM methodology for calculation of doses will be applied to an applicable release path if a likely potential arises for contributing more than 10% of the doses evaluated in this manual.

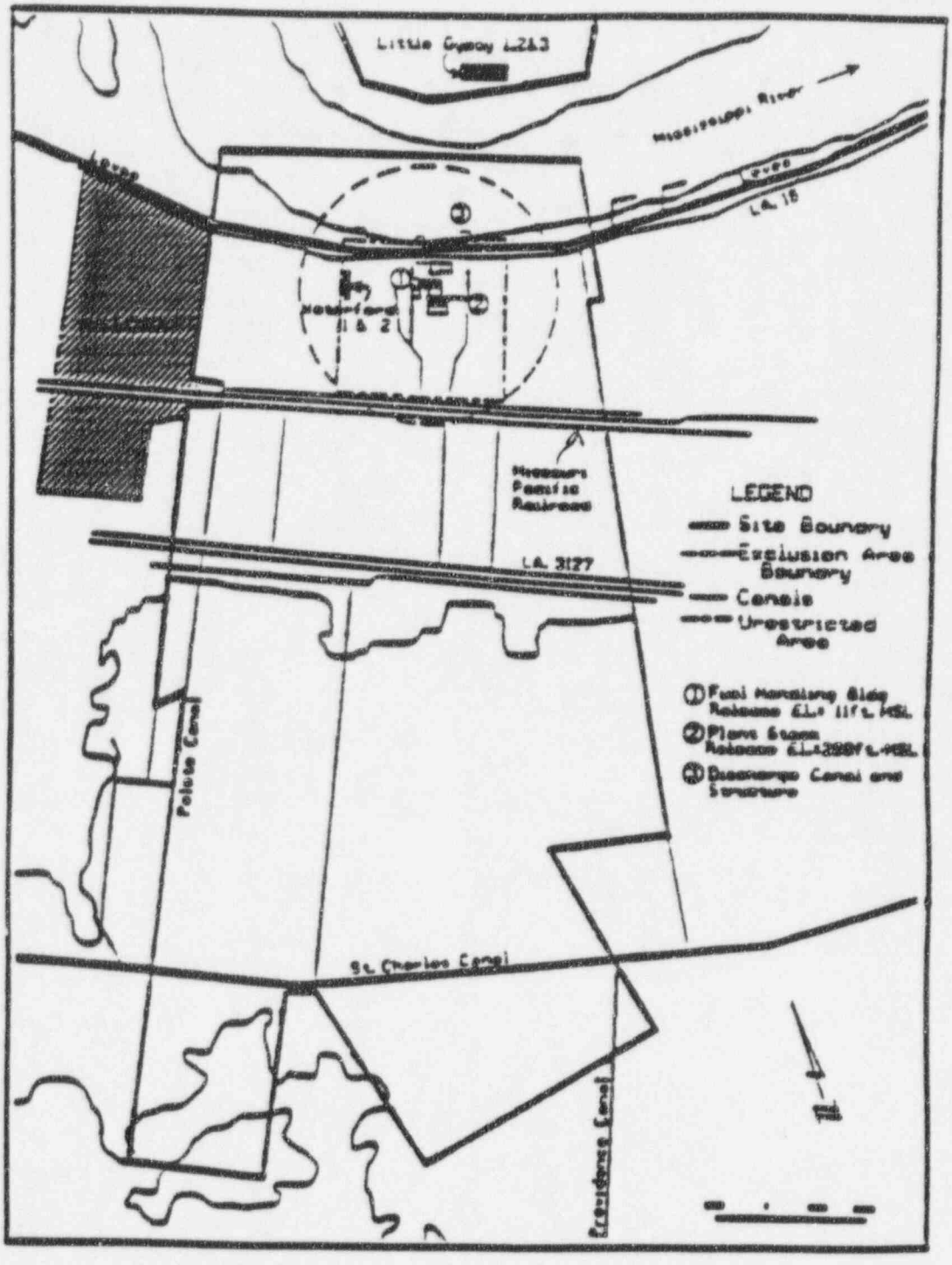
5.11.2 Secondary Release Paths are expected to release trivial quantities of radionuclides. Some examples of Secondary Release Paths are listed below:

- Unmonitored Secondary System Steam Vents/Reliefs
- Decon Shop/Hot Machine Shop Exhaust
- Turbine Building Ventilation Exhaust
- Unmonitored Tank Atmospheric Vents
- Radioactive Waste Compactor Building
- Radioactive Waste Solidification Building
- Cooling Tower Atmospheric Entrainment

6.0 ATTACHMENTS

Refer to Table of Contents

SITE BOUNDARY FOR
RADIOACTIVE GASEOUS AND LIQUID EFFLUENTS



HISTORICAL AVERAGE DISPERSION AND DEPOSITION PARAMETERS FOR AREAS AT OR BEYOND THE UNRESTRICTED AREA BOUNDARY

ANNUAL AVERAGE ATMOSPHERIC DISPERSION AND DEPOSITION PARAMETERS
BASED ON HISTORICAL METEOROLOGICAL DATA AND CURRENT LAND USE CENSUS

Receptor Type or Location	Direction from Site	Sector Location	Distance from Site (miles)	Distance from Site (meters)	X/Q No Decay Undepleted (sec/m3)	D/Q (1/m2)
Site Boundary	N[a]	A	0.8	1287	1.0e-05	2.4e-08
	NNE[a]	B	0.6	966	1.6e-05	3.4e-08
	NE[a]	C	0.6	966	1.5e-05	2.8e-08
	ENE[a]	D	0.6	966	1.6e-05	2.5e-08
	E	E	0.8	1287	6.9e-06	1.3e-08
	ESE	F	0.6	966	1.1e-05	2.3e-08
	SE	G	0.6	966	1.1e-05	3.1e-08
	SSE	H	0.8	1287	6.3e-06	2.4e-08
	S	J	1.6	2575	8.9e-07	2.7e-09
	SSW	K	3.1	4989	3.0e-07	7.9e-10
	SW	L	3.4	5472	3.3e-07	9.1e-10
	WSW	M	1.5	2414	1.7e-06	4.9e-09
	W	N	1.0	1609	2.3e-06	7.3e-09
	WNW	P	0.8	1287	7.5e-06	2.7e-08
	NW	Q	0.8	1287	1.0e-05	3.2e-08
	NNW	R	0.9	1448	9.4e-06	2.4e-08
Residence	N	A	0.9	1448	7.8e-06	1.8e-08
	NNE	B	1.3	2092	3.0e-06	5.8e-09
	NE	C	0.9	1448	6.3e-06	1.2e-08
	ENE	D	0.9	1448	6.8e-06	1.1e-08
	E	E	2.2	3541	7.4e-07	1.0e-09
	ESE	F	3.1	4989	3.7e-07	4.8e-10
	SE	G	4.0	6437	2.3e-07	3.6e-10
	W	N	1.0	1609	2.3e-06	7.3e-09
	WNW	P	0.9	1448	5.6e-06	2.0e-08
	NW	Q	0.9	1448	7.7e-06	2.3e-08
	NNW	R	3.0	4828	7.7e-07	1.3e-09
Milk Cow	NW[b]	Q	0.9	1448	7.7e-06	2.3e-08
	NW	Q	4.9	7886	2.6e-07	4.1e-10
Vegetable Garden	N	A	1.0	1609	6.1e-06	1.4e-08
	NNE	B	1.3	2092	3.0e-06	5.8e-09
	NE	C	0.9	1448	6.3e-06	1.2e-08
	ENE	D	0.9	1448	6.8e-06	1.1e-08
	E	E	2.2	3541	7.4e-07	1.0e-09
	ESE	F	2.2	3541	7.0e-07	1.1e-09
	SE	G	2.3	3701	6.2e-07	1.3e-09
	WSW	M	1.5	2414	1.7e-06	4.9e-09
	W	N	1.1	1770	1.9e-06	5.7e-09
	WNW	P	0.9	1448	5.6e-06	2.0e-08
	NW	Q	0.9	1448	7.7e-06	2.3e-08
	NNW	R	3.0	4828	7.7e-06	1.3e-09
Beef Cow	E	E	3.2	5150	3.7e-07	4.2e-10
	ESE	F	3.5	5633	3.0e-07	3.6e-10
	SE	G	4.5	7242	1.9e-07	2.8e-10
	WSW	M	1.2	1931	2.7e-06	8.6e-09
	WNW	P	0.9	1448	5.6e-06	2.0e-08
	NW	Q	0.9	1448	7.7e-06	2.3e-08
	NNW	R	2.3	3701	1.3e-06	2.4e-09

Notes:

[a] The site boundary in this sector is located over water. The location cannot be occupied continuously for the life of the plant.

[b] The animals at this location do not produce milk for human consumption.

SITE RELATED LIQUID INGESTION DOSE FACTORS (A_i) FOR INDIVIDUAL NUCLIDES

Ai factors for Adult age group by nuclide.
Waterford Steam Electric Station Unit III
Discharge point : Circulating Water Discharge to Mississippi River
Dilution Factor DW = 220.0

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	2.66e-01	2.66e-01	2.66e-01	2.66e-01	2.66e-01	2.66e-01
C-14	3.13e+04	6.26e+03	6.26e+03	6.26e+03	6.26e+03	6.26e+03	6.26e+03
Na-24	4.08e+02	4.08e+02	4.08e+02	4.08e+02	4.08e+02	4.08e+02	4.08e+02
P-32	4.62e+07	2.87e+06	1.79e+06	0.00e+00	0.00e+00	0.00e+00	5.19e+06
Cr-51	0.00e+00	0.00e+00	1.27e+00	7.62e-01	2.81e-01	1.69e+00	3.21e+02
Mn-54	0.00e+00	4.38e+03	8.35e+02	0.00e+00	1.30e+03	0.00e+00	1.34e+04
Mn-56	0.00e+00	1.10e+02	1.95e+01	0.00e+00	1.40e+02	0.00e+00	3.52e+03
Fe-55	6.59e+02	4.56e+02	1.06e+02	0.00e+00	0.00e+00	2.54e+02	2.61e+02
Fe-59	1.04e+03	2.45e+03	9.38e+02	0.00e+00	0.00e+00	6.83e+02	8.15e+03
Co-58	0.00e+00	8.95e+01	2.01e+02	0.00e+00	0.00e+00	0.00e+00	1.81e+03
Co-60	0.00e+00	2.57e+02	5.67e+02	0.00e+00	0.00e+00	0.00e+00	4.83e+03
Ni-63	3.12e+04	2.16e+03	1.05e+03	0.00e+00	0.00e+00	0.00e+00	4.51e+02
Ni-65	1.27e+02	1.64e+01	7.51e+00	0.00e+00	0.00e+00	0.00e+00	4.17e+02
Cu-64	0.00e+00	1.00e+01	4.70e+00	0.00e+00	2.52e+01	0.00e+00	8.53e+02
Zn-65	2.32e+04	7.37e+04	3.33e+04	0.00e+00	4.93e+04	0.00e+00	4.64e+04
Zn-69	4.93e+01	9.43e+01	6.56e+00	0.00e+00	6.13e+01	0.00e+00	1.42e+01
Br-83	0.00e+00	0.00e+00	4.04e+01	0.00e+00	0.00e+00	0.00e+00	5.82e+01
Br-84	0.00e+00	0.00e+00	5.24e+01	0.00e+00	0.00e+00	0.00e+00	4.11e-04
Br-85	0.00e+00	0.00e+00	2.15e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.01e+05	4.71e+04	0.00e+00	0.00e+00	0.00e+00	1.99e+04
Rb-88	0.00e+00	2.90e+02	1.54e+02	0.00e+00	0.00e+00	0.00e+00	4.00e-09
Rb-89	0.00e+00	1.92e+02	1.35e+02	0.00e+00	0.00e+00	0.00e+00	1.12e-11
Sr-89	2.22e+04	0.00e+00	6.38e+02	0.00e+00	0.00e+00	0.00e+00	3.57e+03
Sr-90	5.47e+05	0.00e+00	1.34e+05	0.00e+00	0.00e+00	0.00e+00	1.58e+04
Sr-91	4.09e+02	0.00e+00	1.65e+01	0.00e+00	0.00e+00	0.00e+00	1.95e+03
Sr-92	1.55e+02	0.00e+00	6.71e+00	0.00e+00	0.00e+00	0.00e+00	3.08e+03
Y-90	5.79e-01	0.00e+00	1.55e-02	0.00e+00	0.00e+00	0.00e+00	6.14e+03
Y-91	8.49e+00	0.00e+00	2.27e-01	0.00e+00	0.00e+00	0.00e+00	4.67e+03
Y-91m	5.47e-03	0.00e+00	2.12e-04	0.00e+00	0.00e+00	0.00e+00	1.61e-02
Y-92	5.09e-02	0.00e+00	1.49e-03	0.00e+00	0.00e+00	0.00e+00	8.91e+02

Conversion factors are in units of mrem/hr per uCi/ml.

SITE RELATED LIQUID INGESTION DOSE COMMITMENT FACTORS (A_i) FOR INDIVIDUAL NUCLIDES

Ai factors for Adult age group by nuclide.
Waterford Steam Electric Station Unit III
Discharge point : Circulating Water Discharge to Mississippi River
Dilution Factor DW = 220.0

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.61e-01	0.00e+00	4.46e-03	0.00e+00	0.00e+00	0.00e+00	5.12e+03
Zr-95	2.52e-01	8.07e-02	5.46e-02	0.00e+00	1.27e-01	0.00e+00	2.56e+02
Zr-97	1.39e-02	2.81e-03	1.28e-03	0.00e+00	4.24e-03	0.00e+00	8.69e+02
Nb-95	4.47e+00	2.49e+00	1.34e+00	0.00e+00	2.46e+00	0.00e+00	1.51e+04
Mo-99	0.00e+00	1.05e+02	1.99e+01	0.00e+00	2.37e+02	0.00e+00	2.43e+02
Tc-101	9.22e-03	1.33e-02	1.30e-01	0.00e+00	2.39e-01	6.79e-03	3.99e-14
Tc-99m	8.96e-03	2.53e-02	3.23e-01	0.00e+00	3.85e-01	1.24e-02	1.50e+01
Ru-103	4.50e+00	0.00e+00	1.94e+00	0.00e+00	1.72e+01	0.00e+00	5.25e+02
Ru-105	3.75e-01	0.00e+00	1.48e-01	0.00e+00	4.84e+00	0.00e+00	2.29e+02
Ru-106	6.69e+01	0.00e+00	8.46e+00	0.00e+00	1.29e+02	0.00e+00	4.33e+03
Ag-110m	8.27e-01	7.65e-01	4.54e-01	0.00e+00	1.50e+00	0.00e+00	3.12e+02
Te-125m	2.57e+03	9.30e+02	3.44e+02	7.72e+02	1.04e+04	0.00e+00	1.03e+04
Te-127	1.05e+02	3.78e+01	2.28e+01	7.81e+01	4.29e+02	0.00e+00	8.32e+03
Te-127m	6.49e+03	2.32e+03	7.90e+02	1.66e+03	2.63e+04	0.00e+00	2.17e+04
Te-129	3.01e+01	1.13e+01	7.33e+00	2.31e+01	1.26e+02	0.00e+00	2.27e+01
Te-129m	1.10e+04	4.11e+03	1.74e+03	3.78e+03	4.60e+04	0.00e+00	5.55e+04
Te-131	1.89e+01	7.88e+00	5.96e+00	1.55e+01	8.27e+01	0.00e+00	2.67e+00
Te-131m	1.66e+03	8.10e+02	6.75e+02	1.28e+03	8.21e+03	0.00e+00	8.05e+04
Te-132	2.41e+03	1.56e+03	1.47e+03	1.72e+03	1.50e+04	0.00e+00	7.39e+04
I-130	2.74e+01	8.09e+01	3.19e+01	6.86e+03	1.26e+02	0.00e+00	6.97e+01
I-131	1.51e+02	2.16e+02	1.24e+02	7.08e+04	3.70e+02	0.00e+00	5.70e+01
I-132	7.37e+00	1.97e+01	6.89e+00	6.89e+02	3.14e+01	0.00e+00	3.70e+00
I-133	5.15e+01	8.96e+01	2.73e+01	1.32e+04	1.56e+02	0.00e+00	8.06e+01
I-134	3.85e+00	1.05e+01	3.74e+00	1.81e+02	1.66e+01	0.00e+00	9.11e-03
I-135	1.61e+01	4.21e+01	1.55e+01	2.78e+03	6.75e+01	0.00e+00	4.75e+01
Cs-134	2.98e+05	7.09e+05	5.79e+05	0.00e+00	2.29e+05	7.61e+04	1.24e+04
Cs-136	3.12e+04	1.23e+05	8.86e+04	0.00e+00	6.85e+04	9.39e+03	1.40e+04
Cs-137	3.82e+05	5.22e+05	3.42e+05	0.00e+00	1.77e+05	5.89e+04	1.01e+04
Cs-138	2.64e+02	5.22e+02	2.59e+02	0.00e+00	3.84e+02	3.79e+01	2.23e-03
Ba-139	9.66e-01	6.88e-04	2.83e-02	0.00e+00	6.43e-04	3.90e-04	1.71e+00

Conversion factors are in units of mrem/hr per uCi/ml.

SITE RELATED LIQUID INGESTION DOSE COMMITMENT FACTORS (A_i) FOR INDIVIDUAL NUCLIDES

Ai factors for Adult age group by nuclide.
Waterford Steam Electric Station Unit III
Discharge point : Circulating Water Discharge to Mississippi River
Dilution Factor DW = 220.0

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.02e+02	2.54e-01	1.32e+01	0.00e+00	8.63e-02	1.45e-01	4.16e+02
Ba-141	4.69e-01	3.54e-04	1.58e-02	0.00e+00	3.29e-04	2.01e-04	2.21e-10
Ba-142	2.12e-01	2.18e-04	1.33e-02	0.00e+00	1.84e-04	1.23e-04	2.99e-19
La-140	1.51e-01	7.59e-02	2.01e-02	0.00e+00	0.00e+00	0.00e+00	5.57e+03
La-142	7.71e-03	3.51e-03	8.73e-04	0.00e+00	0.00e+00	0.00e+00	2.56e+01
Ce-141	2.59e-02	1.75e-02	1.99e-03	0.00e+00	8.15e-03	0.00e+00	6.71e+01
Ce-143	4.57e-03	3.38e+00	3.74e-04	0.00e+00	1.49e-03	0.00e+00	1.26e+02
Ce-144	1.35e+00	5.66e-01	7.26e-02	0.00e+00	3.35e-01	0.00e+00	4.57e+02
Pr-143	5.54e-01	2.22e-01	2.75e-02	0.00e+00	1.28e-01	0.00e+00	2.43e+03
Pr-144	1.81e-03	7.53e-04	9.21e-05	0.00e+00	4.25e-04	0.00e+00	2.61e-10
Nd-147	3.79e-01	4.38e-01	2.62e-02	0.00e+00	2.56e-01	0.00e+00	2.10e+03
W-187	2.96e+02	2.47e+02	8.65e+01	0.00e+00	0.00e+00	0.00e+00	8.10e+04
Np-239	2.89e-02	2.85e-03	1.57e-03	0.00e+00	8.88e-03	0.00e+00	5.84e+02

Conversion factors are in units of mrem/hr per uCi/ml.

SITE RELATED LIQUID INGESTION DOSE COMMITMENT FACTORS (A_i) FOR INDIVIDUAL NUCLIDES

Ai factors for Adult age group by nuclide.
Waterford Steam Electric Station Unit III
Discharge point : 40 Arpent Canal
Dilution Factor DW = 1.0

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	8.96e+00	8.96e+00	8.96e+00	8.96e+00	8.96e+00	8.96e+00
C-14	3.15e+04	6.30e+03	6.30e+03	6.30e+03	6.30e+03	6.30e+03	6.30e+03
Na-24	5.48e+02	5.48e+02	5.48e+02	5.48e+02	5.48e+02	5.48e+02	5.48e+02
P-32	4.62e+07	2.87e+06	1.79e+06	0.00e+00	0.00e+00	0.00e+00	5.20e+06
Cr-51	0.00e+00	0.00e+00	1.49e+00	8.94e-01	3.29e-01	1.98e+00	3.76e+02
Mn-54	0.00e+00	4.76e+03	9.08e+02	0.00e+00	1.42e+03	0.00e+00	1.46e+04
Mn-56	0.00e+00	1.20e+02	2.12e+01	0.00e+00	1.52e+02	0.00e+00	3.82e+03
Fe-55	8.87e+02	6.13e+02	1.43e+02	0.00e+00	0.00e+00	3.42e+02	3.52e+02
Fe-59	1.40e+03	3.29e+03	1.26e+03	0.00e+00	0.00e+00	9.19e+02	1.10e+04
Co-58	0.00e+00	1.51e+02	3.39e+02	0.00e+00	0.00e+00	0.00e+00	3.06e+03
Co-60	0.00e+00	4.34e+02	9.58e+02	0.00e+00	0.00e+00	0.00e+00	8.16e+03
Ni-63	4.19e+04	2.91e+03	1.41e+03	0.00e+00	0.00e+00	0.00e+00	6.07e+02
Ni-65	1.70e+02	2.21e+01	1.01e+01	0.00e+00	0.00e+00	0.00e+00	5.61e+02
Cu-64	0.00e+00	1.69e+01	7.93e+00	0.00e+00	4.26e+01	0.00e+00	1.44e+03
Zn-65	2.36e+04	7.50e+04	3.39e+04	0.00e+00	5.02e+04	0.00e+00	4.73e+04
Zn-69	5.02e+01	9.60e+01	6.67e+00	0.00e+00	6.24e+01	0.00e+00	1.44e+01
Br-83	0.00e+00	0.00e+00	4.38e+01	0.00e+00	0.00e+00	0.00e+00	6.30e+01
Br-84	0.00e+00	0.00e+00	5.67e+01	0.00e+00	0.00e+00	0.00e+00	4.45e-04
Br-85	0.00e+00	0.00e+00	2.33e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.03e+05	4.79e+04	0.00e+00	0.00e+00	0.00e+00	2.03e+04
Rb-88	0.00e+00	2.95e+02	1.56e+02	0.00e+00	0.00e+00	0.00e+00	4.07e-09
Rb-89	0.00e+00	1.95e+02	1.37e+02	0.00e+00	0.00e+00	0.00e+00	1.13e-11
Sr-89	4.78e+04	0.00e+00	1.37e+03	0.00e+00	0.00e+00	0.00e+00	7.66e+03
Sr-90	1.18e+06	0.00e+00	2.88e+05	0.00e+00	0.00e+00	0.00e+00	3.40e+04
Sr-91	8.79e+02	0.00e+00	3.55e+01	0.00e+00	0.00e+00	0.00e+00	4.19e+03
Sr-92	3.33e+02	0.00e+00	1.44e+01	0.00e+00	0.00e+00	0.00e+00	6.60e+03
Y-90	1.38e+00	0.00e+00	3.69e-02	0.00e+00	0.00e+00	0.00e+00	1.46e+04
Y-91	2.02e+01	0.00e+00	5.39e-01	0.00e+00	0.00e+00	0.00e+00	1.11e+04
Y-91m	1.30e-02	0.00e+00	5.04e-04	0.00e+00	0.00e+00	0.00e+00	3.82e-02
Y-92	1.21e-01	0.00e+00	3.53e-03	0.00e+00	0.00e+00	0.00e+00	2.12e+03

Conversion factors are in units of mrem/hr per uCi/ml.

SITE RELATED LIQUID INGESTION DOSE COMMITMENT FACTORS (A_i) FOR INDIVIDUAL NUCLIDES

Ai factors for Adult age group by nuclide.
Waterford Steam Electric Station Unit III
Discharge point : 40 Arpent Canal
Dilution Factor DW = 1.0

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	3.83e-01	0.00e+00	1.06e-02	0.00e+00	0.00e+00	0.00e+00	1.22e+04
Zr-95	2.77e+00	8.88e-01	6.01e-01	0.00e+00	1.39e+00	0.00e+00	2.82e+03
Zr-97	1.53e-01	3.09e-02	1.41e-02	0.00e+00	4.67e-02	0.00e+00	9.57e+03
Nb-95	4.98e+00	2.77e+00	1.49e+00	0.00e+00	2.74e+00	0.00e+00	1.68e+04
Mo-99	0.00e+00	4.62e+02	8.79e+01	0.00e+00	1.05e+03	0.00e+00	1.07e+03
Tc-101	3.03e-02	4.36e-02	4.28e-01	0.00e+00	7.85e-01	2.23e-02	1.31e-13
Tc-99m	2.94e-02	8.32e-02	1.06e+00	0.00e+00	1.26e+00	4.07e-02	4.92e+01
Ru-103	1.98e+01	0.00e+00	8.54e+00	0.00e+00	7.57e+01	0.00e+00	2.31e+03
Ru-105	1.65e+00	0.00e+00	6.52e-01	0.00e+00	2.13e+01	0.00e+00	1.01e+03
Ru-106	2.95e+02	0.00e+00	3.73e+01	0.00e+00	5.69e+02	0.00e+00	1.91e+04
Ag-110m	1.41e+01	1.30e+01	7.74e+00	0.00e+00	2.56e+01	0.00e+00	5.32e+03
Te-125m	2.79e+03	1.01e+03	3.74e+02	8.39e+02	1.13e+04	0.00e+00	1.11e+04
Te-127	1.14e+02	4.11e+01	2.48e+01	8.48e+01	4.66e+02	0.00e+00	9.03e+03
Te-127m	7.05e+03	2.52e+03	8.59e+02	1.80e+03	2.86e+04	0.00e+00	2.36e+04
Te-129	3.27e+01	1.23e+01	7.96e+00	2.51e+01	1.37e+02	0.00e+00	2.47e+01
Te-129m	1.20e+04	4.47e+03	1.89e+03	4.11e+03	5.00e+04	0.00e+00	6.03e+04
Te-131	2.05e+01	8.57e+00	6.47e+00	1.69e+01	8.98e+01	0.00e+00	2.90e+00
Te-131m	1.80e+03	8.81e+02	7.34e+02	1.39e+03	8.92e+03	0.00e+00	8.74e+04
Te-132	2.62e+03	1.70e+03	1.59e+03	1.87e+03	1.63e+04	0.00e+00	8.02e+04
I-130	9.01e+01	2.66e+02	1.05e+02	2.25e+04	4.15e+02	0.00e+00	2.29e+02
I-131	4.96e+02	7.09e+02	4.06e+02	2.32e+05	1.22e+03	0.00e+00	1.87e+02
I-132	2.42e+01	6.47e+01	2.26e+01	2.26e+03	1.03e+02	0.00e+00	1.22e+01
I-133	1.69e+02	2.94e+02	8.97e+01	4.32e+04	5.13e+02	0.00e+00	2.64e+02
I-134	1.26e+01	3.43e+01	1.23e+01	5.94e+02	5.46e+01	0.00e+00	2.99e-02
I-135	5.28e+01	1.38e+02	5.10e+01	9.11e+03	2.27e+02	0.00e+00	1.56e+02
Cs-134	3.03e+05	7.21e+05	5.89e+05	0.00e+00	2.33e+05	7.75e+04	1.26e+04
Cs-136	3.17e+04	1.25e+05	9.01e+04	0.00e+00	6.97e+04	9.55e+03	1.42e+04
Cs-137	3.88e+05	5.31e+05	3.48e+05	0.00e+00	1.10e+05	5.99e+04	1.03e+04
Cs-138	2.69e+02	5.31e+02	2.63e+02	0.00e+00	3.90e+02	3.85e+01	2.27e-03
Ba-139	9.00e+00	6.41e-03	2.64e-01	0.00e+00	5.99e-03	3.64e-03	1.60e+01

Conversion factors are in units of mrem/hr per uCi/ml.

SITE RELATED LIQUID INGESTION DOSE COMMITMENT FACTORS (A_i) FOR INDIVIDUAL NUCLIDES

Ai factors for Adult age group by nuclide.
Waterford Steam Electric Station Unit III
Discharge point : 40 Arpent Canal
Dilution Factor DW = 1.0

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	1.88e+03	2.37e+00	1.23e+02	0.00e+00	8.05e-01	1.35e+00	3.88e+03
Ba-141	4.37e+00	3.30e-03	1.48e-01	0.00e+00	3.07e-03	1.87e-03	2.06e-09
Ba-142	1.98e+00	2.03e-03	1.24e-01	0.00e+00	1.72e-03	1.15e-03	2.78e-18
La-140	3.58e-01	1.80e-01	4.76e-02	0.00e+00	0.00e+00	0.00e+00	1.32e+04
La-142	1.83e-02	8.33e-03	2.07e-03	0.00e+00	0.00e+00	0.00e+00	6.08e+01
Ce-141	8.01e-01	5.42e-01	6.15e-02	0.00e+00	2.52e-01	0.00e+00	2.07e+03
Ce-143	1.41e-01	1.04e+02	1.16e-02	0.00e+00	4.60e-02	0.00e+00	3.90e+03
Ce-144	4.18e+01	1.75e+01	2.24e+00	0.00e+00	1.04e+01	0.00e+00	1.41e+04
Pr-143	1.32e+00	5.28e-01	6.52e-02	0.00e+00	3.05e-01	0.00e+00	5.77e+03
Pr-144	4.31e-03	1.79e-03	2.19e-04	0.00e+00	1.01e-03	0.00e+00	6.19e-10
Nd-147	9.00e-01	1.04e+00	6.22e-02	0.00e+00	6.08e-01	0.00e+00	4.99e+03
W-187	3.04e+02	2.55e+02	8.90e+01	0.00e+00	0.00e+00	0.00e+00	8.34e+04
Np-239	1.28e-01	1.25e-02	6.91e-03	0.00e+00	3.91e-02	0.00e+00	2.57e+03

Conversion factors are in units of mrem/hr per uCi/ml.

DOSE FACTORS FOR EXPOSURE TO A SEMI- INFINITE CLOUD OF NOBLE GASES

Nuclide	(N_i) β-Air*	(L_i) β-Skin**	(M_i) γ-Air*	(K_i) γ-Body**
Ar-41	3.28E-03	2.69E-03	9.30E-03	8.84E-03
Kr-85m	1.97E-03	1.46E-03	1.23E-03	1.17E-03
Kr-85	1.95E-03	1.34E-03	1.72E-05	1.61E-05
Kr-87	1.03E-02	9.73E-03	6.17E-03	5.92E-03
Kr-88	2.93E-03	2.37E-03	1.52E-02	1.47E-02
Kr-89	1.06E-02	1.01E-02	1.73E-02	1.66E-02
Kr-90	7.83E-03	7.29E-03	1.63E-02	1.56E-02
Xe-131m	1.11E-03	4.76E-04	1.56E-04	9.15E-05
Xe-133m	1.48E-03	9.94E-04	3.27E-04	2.51E-04
Xe-133	1.05E-03	3.06E-04	3.53E-04	2.94E-04
Xe-135m	7.39E-04	7.11E-04	3.36E-03	3.12E-03
Xe-135	2.46E-03	1.86E-03	1.92E-03	1.81E-03
Xe-137	1.27E-02	1.22E-02	1.51E-03	1.42E-03
Xe138	4.75E-03	4.13E-03	9.21E-03	8.83E-03

* $\frac{mrad \cdot m^3}{pCi \cdot yr}$

** $\frac{mrem \cdot m^3}{pCi \cdot yr}$

Extracted from Table B-1 of Regulatory Guide 1.109, Revision 1, 1977.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.26e+03	1.26e+03	1.26e+03	1.26e+03	1.26e+03	1.26e+03
C-14	1.82e+04	3.41e+03	3.41e+03	3.41e+03	3.41e+03	3.41e+03	3.41e+03
Na-24	1.02e+04	1.02e+04	1.02e+04	1.02e+04	1.02e+04	1.02e+04	1.02e+04
P-32	1.32e+06	7.71e+04	5.01e+04	0.00e+00	0.00e+00	0.00e+00	8.64e+04
Cr-51	0.00e+00	0.00e+00	1.00e+02	5.95e+01	2.28e+01	1.44e+04	3.32e+03
Mn-54	0.00e+00	3.96e+04	6.30e+03	0.00e+00	9.84e+03	1.40e+06	7.74e+04
Mn-56	0.00e+00	1.24e+00	1.83e-01	0.00e+00	1.30e+00	9.44e+03	2.02e+04
Fe-55	2.46e+04	1.70e+04	3.94e+03	0.00e+00	0.00e+00	7.21e+04	6.03e+03
Fe-59	1.18e+04	2.78e+04	1.06e+04	0.00e+00	0.00e+00	1.02e+06	1.88e+05
Co-58	0.00e+00	1.58e+03	2.07e+03	0.00e+00	0.00e+00	9.28e+05	1.06e+05
Co-60	0.00e+00	1.15e+04	1.48e+04	0.00e+00	0.00e+00	5.97e+06	2.85e+05
Ni-63	4.32e+05	3.14e+04	1.45e+04	0.00e+00	0.00e+00	1.78e+05	1.34e+04
Ni-65	1.54e+00	2.10e-01	9.12e-02	0.00e+00	0.00e+00	5.60e+03	1.23e+04
Cu-64	0.00e+00	1.46e+00	6.15e-01	0.00e+00	4.62e+00	6.78e+03	4.90e+04
Zn-65	3.24e+04	1.03e+05	4.66e+04	0.00e+00	6.90e+04	8.64e+05	5.34e+04
Zn-69	3.46e-02	6.51e-02	4.52e-03	0.00e+00	4.22e-02	9.20e+02	1.63e+01
Br-83	0.00e+00	0.00e+00	2.41e+02	0.00e+00	0.00e+00	0.00e+00	2.32e+02
Br-84	0.00e+00	0.00e+00	3.13e+02	0.00e+00	0.00e+00	0.00e+00	1.64e-03
Br-85	0.00e+00	0.00e+00	1.28e+01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.35e+05	5.90e+04	0.00e+00	0.00e+00	0.00e+00	1.66e+04
Rb-88	0.00e+00	3.87e+02	1.93e+02	0.00e+00	0.00e+00	0.00e+00	3.34e-09
Rb-89	0.00e+00	2.56e+02	1.70e+02	0.00e+00	0.00e+00	0.00e+00	9.28e-12
Sr-89	3.04e+05	0.00e+00	8.72e+03	0.00e+00	0.00e+00	1.40e+06	3.50e+05
Sr-90	9.92e+07	0.00e+00	6.10e+06	0.00e+00	0.00e+00	9.60e+06	7.22e+05
Sr-91	6.19e+01	0.00e+00	2.50e+00	0.00e+00	0.00e+00	3.65e+04	1.91e+05
Sr-92	6.74e+00	0.00e+00	2.91e-01	0.00e+00	0.00e+00	1.65e+04	4.30e+04
Y-90	2.09e+03	0.00e+00	5.61e+01	0.00e+00	0.00e+00	1.70e+05	5.06e+05
Y-91	4.62e+05	0.00e+00	1.24e+04	0.00e+00	0.00e+00	1.70e+06	3.85e+05
Y-91m	2.61e-01	0.00e+00	1.02e-02	0.00e+00	0.00e+00	1.92e+03	1.33e+00
Y-92	1.03e+01	0.00e+00	3.02e-01	0.00e+00	0.00e+00	1.57e+04	7.35e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	9.44e+01	0.00e+00	2.61e+00	0.00e+00	0.00e+00	4.85e+04	4.22e+05
Zr-95	1.07e+05	3.44e+04	2.33e+04	0.00e+00	5.42e+04	1.77e+06	1.50e+05
Zr-97	9.68e+01	1.96e+01	9.04e+00	0.00e+00	2.97e+01	7.87e+04	5.23e+05
Nb-95	1.41e+04	7.82e+03	4.21e+03	0.00e+00	7.74e+03	5.05e+05	1.04e+05
Mo-99	0.00e+00	1.21e+02	2.30e+01	0.00e+00	2.91e+02	9.12e+04	2.48e+05
Tc-101	4.18e-05	6.02e-05	5.90e-04	0.00e+00	1.08e-03	3.99e+02	1.09e-11
Tc-99m	1.03e-03	2.91e-03	3.70e-02	0.00e+00	4.42e-02	7.64e+02	4.16e+03
Ru-103	1.53e+03	0.00e+00	6.58e+02	0.00e+00	5.83e+03	5.05e+05	1.10e+05
Ru-105	7.90e-01	0.00e+00	3.11e-01	0.00e+00	1.02e+00	1.10e+04	4.82e+04
Ru-106	6.91e+04	0.00e+00	8.72e+03	0.00e+00	1.34e+05	9.36e+06	9.12e+05
Ag-110m	1.08e+04	1.00e+04	5.94e+03	0.00e+00	1.97e+04	4.63e+06	3.02e+05
Te-125m	3.42e+03	1.58e+03	4.67e+02	1.05e+03	1.24e+04	3.14e+05	7.06e+04
Te-127	1.40e+00	6.42e-01	3.10e-01	1.06e+00	5.10e+00	6.51e+03	5.74e+04
Te-127m	1.26e+04	5.77e+03	1.57e+03	3.29e+03	4.58e+04	9.60e+05	1.50e+05
Te-129	4.98e-02	2.39e-02	1.24e-02	3.90e-02	1.87e-01	1.94e+03	1.57e+02
Te-129m	9.76e+03	4.67e+03	1.58e+03	3.44e+03	3.66e+04	1.16e+06	3.83e+05
Te-131	1.11e-02	5.95e-03	3.59e-03	9.36e-03	4.37e-02	1.39e+03	1.84e+01
Te-131m	6.99e+01	4.36e+01	2.90e+01	5.50e+01	3.09e+02	1.46e+05	5.56e+05
Te-132	2.60e+02	2.15e+02	1.62e+02	1.90e+02	1.46e+03	2.88e+05	5.10e+05
I-130	4.58e+03	1.34e+04	5.28e+03	1.14e+06	2.09e+04	0.00e+00	7.69e+03
I-131	2.52e+04	3.58e+04	2.05e+04	1.19e+07	6.13e+04	0.00e+00	6.28e+03
I-132	1.16e+03	3.26e+03	1.16e+03	1.14e+05	5.18e+03	0.00e+00	4.06e+02
I-133	8.64e+03	1.48e+04	4.52e+03	2.15e+06	2.58e+04	0.00e+00	8.88e+03
I-134	6.44e+02	1.73e+03	6.15e+02	2.98e+04	2.75e+03	0.00e+00	1.01e+00
I-135	2.68e+03	6.98e+03	2.57e+03	4.48e+05	1.11e+04	0.00e+00	5.25e+03
Cs-134	3.73e+05	8.48e+05	7.28e+05	0.00e+00	2.80e+05	9.76e+04	1.04e+04
Cs-136	3.90e+04	1.46e+05	1.10e+05	0.00e+00	8.56e+04	1.20e+04	1.17e+04
Cs-137	4.78e+05	6.21e+05	4.28e+05	0.00e+00	2.22e+05	7.52e+04	8.40e+03
Cs-138	3.31e+02	6.21e+02	3.24e+02	0.00e+00	4.80e+02	4.86e+01	1.86e-03
Ba-139	9.36e-01	6.66e-04	2.74e-02	0.00e+00	6.22e-04	3.76e+03	8.96e+02

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	3.90e+04	4.90e+01	2.57e+03	0.00e+00	1.67e+01	1.27e+06	2.18e+05
Ba-141	1.00e-01	7.53e-05	3.36e-03	0.00e+00	7.00e-05	1.94e+03	1.16e-07
Ba-142	2.63e-02	2.70e-05	1.66e-03	0.00e+00	2.29e-05	1.19e+03	1.57e-16
La-140	3.44e+02	1.74e+02	4.58e+01	0.00e+00	0.00e+00	1.36e+05	4.58e+05
La-142	6.83e-01	3.10e-01	7.72e-02	0.00e+00	0.00e+00	6.33e+03	2.11e+03
Ce-141	1.99e+04	1.35e+04	1.53e+03	0.00e+00	6.26e+03	3.62e+05	1.20e+05
Ce-143	1.86e+02	1.38e+02	1.53e+01	0.00e+00	6.08e+01	7.98e+04	2.26e+05
Ce-144	3.43e+06	1.43e+06	1.84e+05	0.00e+00	0.00e+00	7.78e+06	8.16e+05
Pr-143	9.36e+03	3.75e+03	4.64e+02	0.00e+00	2.16e+03	2.81e+05	2.00e+05
Pr-144	3.01e-02	1.25e-02	1.53e-03	0.00e+00	7.05e-03	1.02e+03	2.15e-08
Nd-147	5.27e+03	6.10e+03	3.65e+02	0.00e+00	3.56e+03	2.21e+05	1.73e+05
W-187	8.48e+00	7.08e+00	2.48e+00	0.00e+00	0.00e+00	2.90e+04	1.55e+05
Np-239	2.30e+02	2.26e+01	1.24e+01	0.00e+00	7.00e+01	3.76e+04	1.19e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.27e+03	1.27e+03	1.27e+03	1.27e+03	1.27e+03	1.27e+03
C-14	2.60e+04	4.87e+03	4.87e+03	4.87e+03	4.87e+03	4.87e+03	4.87e+03
Na-24	1.38e+04	1.38e+04	1.38e+04	1.38e+04	1.38e+04	1.38e+04	1.38e+04
P-32	1.89e+06	1.10e+05	7.16e+04	0.00e+00	0.00e+00	0.00e+00	9.28e+04
Cr-51	0.00e+00	0.00e+00	1.35e+02	7.50e+01	3.07e+01	2.10e+04	3.00e+03
Mn-54	0.00e+00	5.11e+04	8.40e+03	0.00e+00	1.27e+04	1.98e+06	6.68e+04
Mn-56	0.00e+00	1.70e+00	2.52e-01	0.00e+00	1.79e+00	1.52e+04	5.74e+04
Fe-55	3.34e+04	2.38e+04	5.54e+03	0.00e+00	0.00e+00	1.24e+05	6.39e+03
Fe-59	1.59e+01	3.70e+04	1.43e+04	0.00e+00	0.00e+00	1.53e+06	1.78e+05
Co-58	0.00e+00	2.07e+03	2.78e+03	0.00e+00	0.00e+00	1.34e+06	9.52e+04
Co-60	0.00e+00	1.51e+04	1.98e+04	0.00e+00	0.00e+00	8.72e+06	2.59e+05
Ni-63	5.80e+05	4.34e+04	1.98e+04	0.00e+00	0.00e+00	3.07e+05	1.42e+04
Ni-65	2.18e+00	2.93e-01	1.27e-01	0.00e+00	0.00e+00	9.36e+03	3.67e+04
Cu-64	0.00e+00	2.03e+00	8.48e-01	0.00e+00	6.41e+00	1.11e+04	6.14e+04
Zn-65	3.86e+04	1.34e+05	6.24e+04	0.00e+00	8.64e+04	1.24e+06	4.66e+04
Zn-69	4.83e-02	9.20e-02	6.66e-03	0.00e+00	6.02e-02	1.58e+03	2.85e+02
Br-83	0.00e+00	0.00e+00	3.44e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	4.33e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	1.83e+01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.90e+05	8.40e+04	0.00e+00	0.00e+00	0.00e+00	1.77e+04
Rb-88	0.00e+00	5.46e+02	2.72e+02	0.00e+00	0.00e+00	0.00e+00	2.92e-05
Rb-89	0.00e+00	3.52e+02	2.33e+02	0.00e+00	0.00e+00	0.00e+00	3.38e-07
Sr-89	4.34e+05	0.00e+00	1.25e+04	0.00e+00	0.00e+00	2.42e+06	3.71e+05
Sr-90	1.08e+08	0.00e+00	6.68e+06	0.00e+00	0.00e+00	1.65e+07	7.65e+05
Sr-91	8.80e+01	0.00e+00	3.51e+00	0.00e+00	0.00e+00	6.07e+04	2.59e+05
Sr-92	9.52e+00	0.00e+00	4.06e-01	0.00e+00	0.00e+00	2.74e+04	1.19e+05
Y-90	2.98e+03	0.00e+00	8.00e+01	0.00e+00	0.00e+00	2.93e+05	5.59e+05
Y-91	6.61e+05	0.00e+00	1.77e+04	0.00e+00	0.00e+00	2.94e+06	4.09e+05
Y-91m	3.70e-01	0.00e+00	1.42e-02	0.00e+00	0.00e+00	3.20e+03	3.02e+01
Y-92	1.47e+01	0.00e+00	4.29e-01	0.00e+00	0.00e+00	2.68e+04	1.65e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.35e+02	0.00e+00	3.72e+00	0.00e+00	0.00e+00	8.32e+04	5.79e+05
Zr-95	1.46e+05	4.58e+04	3.15e+04	0.00e+00	6.74e+04	2.69e+06	1.49e+05
Zr-97	1.38e+02	2.72e+01	1.26e+01	0.00e+00	4.12e+01	1.30e+05	6.30e+05
Nb-95	1.86e+04	1.03e+04	5.66e+03	0.00e+00	1.00e+04	7.51e+05	9.68e+04
Mo-99	0.00e+00	1.69e+02	3.22e+01	0.00e+00	4.11e+02	1.54e+05	2.69e+05
Tc-101	5.92e-05	8.40e-05	8.24e-04	0.00e+00	1.52e-03	6.67e+02	8.72e-07
Tc-99m	1.38e-03	3.86e-03	4.99e-02	0.00e+00	5.76e-02	1.15e+03	6.13e+03
Ru-103	2.10e+03	0.00e+00	8.96e+02	0.00e+00	7.43e+03	7.83e+05	1.09e+05
Ru-105	1.12e+00	0.00e+00	4.34e-01	0.00e+00	1.41e+00	1.82e+04	9.04e+04
Ru-106	9.84e+04	0.00e+00	1.24e+04	0.00e+00	1.90e+05	1.61e+07	9.60e+05
Ag-110m	1.38e+04	1.31e+04	7.99e+03	0.00e+00	2.50e+04	6.75e+06	2.73e+05
Te-125m	4.88e+03	2.24e+03	6.67e+02	1.40e+03	0.00e+00	5.36e+05	7.50e+04
Te-127	2.01e+00	9.12e-01	4.42e-01	1.42e+00	7.28e+00	1.12e+04	8.08e+04
Te-127m	1.80e+04	8.16e+03	2.18e+03	4.38e+03	6.54e+04	1.66e+06	1.59e+05
Te-129	7.10e-02	3.38e-02	1.76e-02	5.18e-02	2.66e-01	3.30e+03	1.62e+03
Te-129m	1.39e+04	6.58e+03	2.25e+03	4.58e+03	5.19e+04	1.98e+06	4.05e+05
Te-131	1.58e-02	8.32e-03	5.04e-03	1.24e-02	6.18e-02	2.[illegible]e+03	1.51e+01
Te-131m	9.84e+01	6.01e+01	4.02e+01	7.25e+01	4.39e+02	2.38e+05	6.21e+05
Te-132	3.60e+02	2.90e+02	2.19e+02	2.46e+02	1.95e+03	4.49e+05	4.63e+05
I-130	6.24e+03	1.79e+04	7.17e+03	1.49e+06	2.75e+04	0.00e+00	9.12e+03
I-131	3.54e+04	4.91e+04	2.64e+04	1.46e+07	8.40e+04	0.00e+00	6.49e+03
I-132	1.59e+03	4.38e+03	1.58e+03	1.51e+05	6.92e+03	0.00e+00	1.27e+03
I-133	1.22e+04	2.05e+04	6.22e+03	2.92e+06	3.59e+04	0.00e+00	1.03e+04
I-134	8.88e+02	2.32e+03	8.40e+02	3.95e+04	3.66e+03	0.00e+00	2.04e+01
I-135	3.70e+03	9.44e+03	3.49e+03	6.21e+05	1.49e+04	0.00e+00	6.95e+03
Cs-134	5.02e+05	1.13e+06	5.49e+05	0.00e+00	3.75e+05	1.46e+05	9.76e+03
Cs-136	5.15e+04	1.94e+05	1.37e+05	0.00e+00	1.10e+05	1.78e+04	1.09e+04
Cs-137	6.70e+05	8.48e+05	3.11e+05	0.00e+00	3.04e+05	1.21e+05	8.48e+03
Cs-138	4.66e+02	8.56e+02	4.46e+02	0.00e+00	6.62e+02	7.87e+01	2.70e-01
Ba-139	1.34e+00	9.44e-04	3.90e-02	0.00e+00	8.88e-04	6.46e+03	6.45e+03

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	5.47e+04	6.70e+01	3.52e+03	0.00e+00	2.28e+01	2.03e+06	2.29e+05
Ba-141	1.42e-01	1.06e-04	4.74e-03	0.00e+00	9.84e-05	3.29e+03	7.46e-04
Ba-142	3.70e-02	3.70e-05	2.27e-03	0.00e+00	3.14e-05	1.91e+03	4.79e-10
La-140	4.79e+02	2.36e+02	6.26e+01	0.00e+00	0.00e+00	2.14e+05	4.87e+05
La-142	9.60e-01	4.25e-01	1.06e-01	0.00e+00	0.00e+00	1.02e+04	1.20e+04
Ce-141	2.84e+04	1.90e+04	2.17e+03	0.00e+00	8.88e+03	6.14e+05	1.26e+05
Ce-143	2.66e+02	1.94e+02	2.16e+01	0.00e+00	8.64e+01	1.30e+05	2.55e+05
Ce-144	4.89e+06	2.02e+06	2.62e+05	0.00e+00	1.21e+06	1.34e+07	8.64e+05
Pr-143	1.34e+04	5.31e+03	6.62e+02	0.00e+00	3.09e+03	4.83e+05	2.14e+05
Pr-144	4.30e-02	1.76e-02	2.18e-03	0.00e+00	1.01e-02	1.75e+03	2.35e-04
Nd-147	7.86e+03	8.56e+03	5.13e+02	0.00e+00	5.02e+03	3.72e+05	1.82e+05
W-187	1.20e+01	9.76e+00	3.43e+00	0.00e+00	0.00e+00	4.74e+04	1.77e+05
Np-239	3.38e+02	3.19e+01	1.77e+01	0.00e+00	1.00e+02	6.49e+04	1.32e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.12e+03	1.12e+03	1.12e+03	1.12e+03	1.12e+03	1.12e+03
C-14	3.59e+04	6.73e+03	6.73e+03	6.73e+03	6.73e+03	6.73e+03	6.73e+03
Na-24	1.61e+04	1.61e+04	1.61e+04	1.61e+04	1.61e+04	1.61e+04	1.61e+04
P-32	2.60e+06	1.14e+05	9.88e+04	0.00e+00	0.00e+00	0.00e+00	4.22e+04
Cr-51	0.00e+00	0.00e+00	1.54e+02	8.55e+01	2.43e+01	1.70e+04	1.08e+03
Mn-54	0.00e+00	4.29e+04	9.51e+03	0.00e+00	1.00e+04	1.58e+06	2.29e+04
Mn-56	0.00e+00	1.66e+00	3.12e-01	0.00e+00	1.67e+00	1.31e+04	1.23e+05
Fe-55	4.74e+04	2.52e+04	7.77e+03	0.00e+00	0.00e+00	1.11e+05	2.87e+03
Fe-59	2.07e+04	3.34e+04	1.67e+04	0.00e+00	0.00e+00	1.27e+06	7.07e+04
Co-58	0.00e+00	1.77e+03	3.16e+03	0.00e+00	0.00e+00	1.11e+06	3.44e+04
Co-60	0.00e+00	1.31e+04	2.26e+04	0.00e+00	0.00e+00	7.07e+06	9.62e+04
Ni-63	8.21e+05	4.62e+04	2.80e+04	0.00e+00	0.00e+00	2.75e+05	6.33e+03
Ni-65	2.99e+00	2.96e-01	1.64e-01	0.00e+00	0.00e+00	8.18e+03	8.40e+04
Cu-64	0.00e+00	1.99e+00	1.07e+00	0.00e+00	6.03e+00	9.58e+03	3.67e+04
Zn-65	4.26e+04	1.13e+05	7.03e+04	0.00e+00	7.14e+04	9.95e+05	1.63e+04
Zn-69	6.70e-02	9.66e-02	8.92e-03	0.00e+00	5.85e-02	1.42e+03	1.02e+04
Br-83	0.00e+00	0.00e+00	4.74e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	5.48e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	2.53e+01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.98e+05	1.14e+05	0.00e+00	0.00e+00	0.00e+00	7.99e+03
Rb-88	0.00e+00	5.62e+02	3.66e+02	0.00e+00	0.00e+00	0.00e+00	1.72e+01
Rb-89	0.00e+00	3.45e+02	2.90e+02	0.00e+00	0.00e+00	0.00e+00	1.89e+00
Sr-89	5.99e+05	0.00e+00	1.72e+04	0.00e+00	0.00e+00	2.16e+06	1.67e+05
Sr-90	1.01e+08	0.00e+00	6.44e+06	0.00e+00	0.00e+00	1.48e+07	3.43e+05
Sr-91	1.21e+02	0.00e+00	4.59e+00	0.00e+00	0.00e+00	5.33e+04	1.74e+05
Sr-92	1.31e+01	0.00e+00	5.25e-01	0.00e+00	0.00e+00	2.40e+04	2.42e+05
Y-90	4.11e+02	0.00e+00	1.11e+02	0.00e+00	0.00e+00	2.62e+05	2.68e+05
Y-91	9.14e+05	0.00e+00	2.44e+04	0.00e+00	0.00e+00	2.63e+06	1.84e+05
Y-91m	5.07e-01	0.00e+00	1.84e-02	0.00e+00	0.00e+00	2.81e+03	1.72e+03
Y-92	2.03e+01	0.00e+00	5.81e-01	0.00e+00	0.00e+00	2.39e+04	2.39e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.86e+02	0.00e+00	5.11e+00	0.00e+00	0.00e+00	7.44e+04	3.88e+05
Zr-95	1.90e+05	4.18e+04	3.70e+04	0.00e+00	5.96e+04	2.23e+06	6.11e+04
Zr-97	1.88e+02	2.72e+01	1.60e+01	0.00e+00	3.89e+01	1.13e+05	3.51e+05
Nb-95	2.35e+04	9.18e+03	6.55e+03	0.00e+00	8.62e+03	6.14e+05	3.70e+04
Mo-99	0.00e+00	1.72e+02	4.26e+01	0.00e+00	3.92e+02	1.35e+05	1.27e+05
Tc-101	8.10e-05	8.51e-05	1.08e-03	0.00e+00	1.45e-03	5.85e+02	1.63e+01
Tc-99m	1.78e-03	3.48e-03	5.77e-02	0.00e+00	5.07e-02	9.51e+02	4.81e+03
Ru-103	2.79e+03	0.00e+00	1.07e+03	0.00e+00	7.03e+03	6.62e+05	4.48e+04
Ru-105	1.53e+00	0.00e+00	5.55e-01	0.00e+00	1.34e+00	1.59e+04	9.95e+04
Ru-106	1.36e+05	0.00e+00	1.69e+04	0.00e+00	1.84e+05	1.43e+07	4.29e+05
Ag-110m	1.69e+04	1.14e+04	9.14e+03	0.00e+00	2.12e+04	5.48e+06	1.00e+05
Te-125m	6.73e+03	2.33e+03	9.14e+02	1.92e+03	0.00e+00	4.77e+05	3.38e+04
Te-127	2.77e+00	9.51e-01	6.11e-01	1.96e+00	7.07e+00	1.00e+04	5.62e+04
Te-127m	2.49e+04	8.55e+03	3.02e+03	6.07e+03	6.36e+04	1.48e+06	7.14e+04
Te-129	9.77e-02	3.50e-02	2.38e-02	7.14e-02	2.57e-01	2.93e+03	2.55e+04
Te-129m	1.92e+04	6.84e+03	3.04e+03	6.33e+03	5.03e+04	1.76e+06	1.82e+05
Te-131	2.17e-02	8.44e-03	6.59e-03	1.70e-02	5.98e-02	2.05e+03	1.33e+03
Te-131m	1.34e+02	5.92e+01	5.07e+01	9.77e+01	4.00e+02	2.06e+05	3.08e+05
Te-132	4.81e+02	2.72e+02	2.63e+02	3.17e+02	1.77e+03	3.77e+05	1.38e+05
I-130	8.18e+03	1.64e+04	8.44e+03	1.85e+06	2.45e+04	0.00e+00	5.11e+03
I-131	4.81e+04	4.81e+04	2.73e+04	1.62e+07	7.88e+04	0.00e+00	2.84e+03
I-132	2.12e+03	4.07e+03	1.88e+03	1.94e+05	6.25e+03	0.00e+00	3.20e+03
I-133	1.66e+04	2.03e+04	7.70e+03	3.85e+06	3.38e+04	0.00e+00	5.48e+03
I-134	1.17e+03	2.16e+03	9.95e+02	5.07e+04	3.30e+03	0.00e+00	9.55e+02
I-135	4.92e+03	8.73e+03	4.14e+03	7.92e+05	1.34e+04	0.00e+00	4.44e+03
Cs-134	6.51e+05	1.01e+06	2.25e+05	0.00e+00	3.30e+05	1.21e+05	3.85e+03
Cs-136	6.51e+04	1.71e+05	1.16e+05	0.00e+00	9.55e+04	1.45e+04	4.18e+03
Cs-137	9.06e+05	8.25e+05	1.28e+05	0.00e+00	2.82e+05	1.04e+05	3.62e+03
Cs-138	6.33e+02	8.40e+02	5.55e+02	0.00e+00	6.22e+02	6.81e+01	2.70e+02
Ba-139	1.84e+00	9.84e-04	5.37e-02	0.00e+00	8.62e-04	5.77e+03	5.77e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	7.40e+04	6.48e+01	4.33e+03	0.00e+00	2.11e+01	1.74e+06	1.02e+05
Ba-141	1.96e-01	1.09e-04	6.36e-03	0.00e+00	9.47e-05	2.92e+03	2.75e+02
Ba-142	5.00e-02	3.60e-05	2.79e-03	0.00e+00	2.91e-05	1.64e+03	2.74e+00
La-140	6.44e+02	2.25e+02	7.55e+01	0.00e+00	0.00e+00	1.83e+05	2.26e+05
La-142	1.29e+00	4.11e-01	1.29e-01	0.00e+00	0.00e+00	8.70e+03	7.58e+04
Ce-141	3.92e+04	1.95e+04	2.90e+03	0.00e+00	8.55e+03	5.44e+05	5.66e+04
Ce-143	3.66e+02	1.99e+02	2.87e+01	0.00e+00	8.36e+01	1.15e+05	1.27e+05
Ce-144	6.77e+06	2.12e+06	3.61e+05	0.00e+00	1.17e+06	1.20e+07	3.88e+05
Pr-143	1.85e+04	5.55e+03	9.14e+02	0.00e+00	3.00e+03	4.33e+05	9.73e+04
Pr-144	5.96e-02	1.85e-02	3.00e-03	0.00e+00	9.77e-03	1.57e+03	1.97e+02
Nd-147	1.08e+04	8.73e+03	6.81e+02	0.00e+00	4.81e+03	3.28e+05	8.21e+04
W-187	1.63e+01	9.66e+00	4.33e+00	0.00e+00	0.00e+00	4.11e+04	9.10e+04
Np-239	4.66e+02	3.34e+01	2.35e+01	0.00e+00	9.73e+01	5.81e+04	6.40e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	6.47e+02	6.47e+02	6.47e+02	6.47e+02	6.47e+02	6.47e+02
C-14	2.65e+04	5.31e+03	5.31e+03	5.31e+03	5.31e+03	5.31e+03	5.31e+03
Na-24	1.06e+04	1.06e+04	1.06e+04	1.06e+04	1.06e+04	1.06e+04	1.06e+04
P-32	2.03e+06	1.12e+05	7.74e+04	0.00e+00	0.00e+00	0.00e+00	1.61e+04
Cr-51	0.00e+00	0.00e+00	8.95e+01	5.75e+01	1.32e+01	1.28e+04	3.57e+02
Mn-54	0.00e+00	2.53e+04	4.98e+03	0.00e+00	4.98e+03	1.00e+06	7.06e+03
Mn-56	0.00e+00	1.54e+00	2.21e-01	0.00e+00	1.10e+00	1.25e+04	7.17e+04
Fe-55	1.97e+04	1.17e+04	3.33e+03	0.00e+00	0.00e+00	8.69e+04	1.09e+03
Fe-59	1.36e+04	2.35e+04	9.48e+03	0.00e+00	0.00e+00	1.01e+06	2.48e+04
Co-58	0.00e+00	1.22e+03	1.82e+03	0.00e+00	0.00e+00	7.77e+05	1.11e+04
Co-60	0.00e+00	8.02e+03	1.18e+04	0.00e+00	0.00e+00	4.51e+06	3.19e+04
Ni-63	3.39e+05	2.04e+04	1.16e+04	0.00e+00	0.00e+00	2.09e+05	2.42e+03
Ni-65	2.39e+00	2.84e-01	1.23e-01	0.00e+00	0.00e+00	8.12e+03	5.01e+04
Cu-64	0.00e+00	1.88e+00	7.74e-01	0.00e+00	3.98e+00	9.30e+03	1.50e+04
Zn-65	1.93e+04	6.26e+04	3.11e+04	0.00e+00	3.25e+04	6.47e+05	5.14e+04
Zn-69	5.39e-02	9.67e-02	7.18e-03	0.00e+00	4.02e-02	1.47e+03	1.32e+04
Br-83	0.00e+00	0.00e+00	3.81e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	4.00e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	2.04e+01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.90e+05	8.82e+04	0.00e+00	0.00e+00	0.00e+00	3.04e+03
Rb-88	0.00e+00	5.57e+02	2.87e+02	0.00e+00	0.00e+00	0.00e+00	3.39e+02
Rb-89	0.00e+00	3.21e+02	2.06e+02	0.00e+00	0.00e+00	0.00e+00	6.82e+01
Sr-89	3.98e+05	0.00e+00	1.14e+04	0.00e+00	0.00e+00	2.03e+06	6.40e+04
Sr-90	4.09e+07	0.00e+00	2.59e+06	0.00e+00	0.00e+00	1.12e+07	1.31e+05
Sr-91	9.56e+01	0.00e+00	3.46e+00	0.00e+00	0.00e+00	5.26e+04	7.34e+04
Sr-92	1.05e+01	0.00e+00	3.91e-01	0.00e+00	0.00e+00	2.38e+04	1.40e+05
Y-90	3.29e+03	0.00e+00	8.82e+01	0.00e+00	0.00e+00	2.69e+05	1.04e+05
Y-91	5.88e+05	0.00e+00	1.57e+04	0.00e+00	0.00e+00	2.45e+06	7.03e+04
Y-91m	4.07e-01	0.00e+00	1.39e-02	0.00e+00	0.00e+00	2.79e+03	2.35e+03
Y-92	1.64e+01	0.00e+00	4.61e-01	0.00e+00	0.00e+00	2.45e+04	1.27e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.30e+02	0.00e+00	4.07e+00	0.00e+00	0.00e+00	7.64e+04	1.67e+05
Zr-95	1.15e+05	2.79e+04	2.03e+04	0.00e+00	3.11e+04	1.75e+06	2.17e+04
Zr-97	1.50e+02	2.56e+01	1.17e+01	0.00e+00	2.59e+01	1.10e+05	1.40e+05
Nb-95	1.57e+04	6.43e+03	3.78e+03	0.00e+00	4.72e+03	4.79e+05	1.27e+04
Mo-99	0.00e+00	1.65e+02	3.23e+01	0.00e+00	2.65e+02	1.35e+05	4.87e+04
Tc-101	6.51e-05	8.23e-05	8.12e-04	0.00e+00	9.79e-04	5.84e+02	8.44e+02
Tc-99m	1.40e-03	2.88e-03	3.72e-02	0.00e+00	3.11e-02	8.11e+02	2.03e+03
Ru-103	2.02e+03	0.00e+00	6.79e+02	0.00e+00	4.24e+03	5.52e+05	1.61e+04
Ru-105	1.22e+00	0.00e+00	4.10e-01	0.00e+00	8.99e-01	1.57e+04	4.84e+04
Ru-106	8.68e+04	0.00e+00	1.09e+04	0.00e+00	1.07e+05	1.16e+07	1.64e+05
Ag-110m	9.98e+03	7.22e+03	5.00e+03	0.00e+00	1.09e+04	3.67e+06	3.30e+04
Te-125m	4.76e+03	1.99e+03	6.58e+02	1.62e+03	0.00e+00	4.47e+05	1.29e+04
Te-127	2.23e+00	9.53e-01	4.89e-01	1.85e+00	4.86e+00	1.03e+04	2.44e+04
Te-127m	1.67e+04	6.90e+03	2.07e+03	4.87e+03	3.75e+04	1.31e+06	2.73e+04
Te-129	7.88e-02	3.47e-02	1.88e-02	6.75e-02	1.75e-01	3.00e+03	2.63e+04
Te-129m	1.41e+04	6.09e+03	2.23e+03	5.47e+03	3.18e+04	1.68e+06	6.90e+04
Te-131	1.74e-02	8.22e-03	5.00e-03	1.58e-02	3.99e-02	2.06e+03	8.22e+03
Te-131m	1.07e+02	5.50e+01	3.63e+01	8.93e+01	2.65e+02	1.99e+05	1.19e+05
Te-132	3.72e+02	2.37e+02	1.76e+02	2.79e+02	1.03e+03	3.40e+05	4.41e+04
I-130	6.36e+03	1.39e+04	5.57e+03	1.60e+06	1.53e+04	0.00e+00	1.99e+03
I-131	3.79e+04	4.44e+04	1.96e+04	1.48e+07	5.18e+04	0.00e+00	1.06e+03
I-132	1.69e+03	3.54e+03	1.26e+03	1.69e+05	3.95e+03	0.00e+00	1.90e+03
I-133	1.32e+04	1.92e+04	5.60e+03	3.56e+06	2.24e+04	0.00e+00	2.16e+03
I-134	9.21e+02	1.88e+03	6.65e+02	4.45e+04	2.09e+03	0.00e+00	1.29e+03
I-135	3.86e+03	7.60e+03	2.77e+03	6.96e+05	8.47e+03	0.00e+00	1.83e+03
Cs-134	3.96e+05	7.03e+05	7.45e+04	0.00e+00	1.90e+05	7.97e+04	1.33e+03
Cs-136	4.83e+04	1.35e+05	5.29e+04	0.00e+00	5.64e+04	1.18e+04	1.43e+03
Cs-137	5.49e+05	6.12e+05	4.55e+04	0.00e+00	1.72e+05	7.13e+04	1.33e+03
Cs-138	5.05e+02	7.81e+02	3.98e+02	0.00e+00	4.10e+02	6.54e+01	8.76e+02
Ba-139	1.48e+00	9.84e-04	4.30e-02	0.00e+00	5.72e-04	5.95e+03	5.10e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

INHALATION PATHWAY DOSES DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Inhalation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	5.60e+04	5.60e+01	2.90e+03	0.00e+00	1.34e+01	1.60e+06	3.84e+04
Ba-141	1.57e-01	1.08e-04	4.97e-03	0.00e+00	6.50e-05	2.97e+03	4.75e+03
Ba-142	3.98e-02	3.30e-05	1.96e-03	0.00e+00	1.90e-05	1.55e+03	6.93e+02
La-140	5.05e+02	2.00e+02	5.15e+01	0.00e+00	0.00e+00	1.68e+05	8.48e+04
La-142	1.03e+00	3.77e-01	9.04e-02	0.00e+00	0.00e+00	8.22e+03	5.95e+04
Ce-141	2.77e+04	1.67e+04	1.99e+03	0.00e+00	5.25e+03	5.17e+05	2.16e+04
Ce-143	2.93e+02	1.93e+02	2.21e+01	0.00e+00	5.64e+01	1.16e+05	4.97e+04
Ce-144	3.19e+06	1.21e+06	1.76e+05	0.00e+00	5.38e+05	9.84e+06	1.48e+05
Pr-143	1.40e+04	5.24e+03	6.99e+02	0.00e+00	1.97e+03	4.33e+05	3.72e+04
Pr-144	4.79e-02	1.85e-02	2.41e-03	0.00e+00	6.72e-03	1.61e+03	4.28e+03
Nd-147	7.94e+03	8.13e+03	5.00e+02	0.00e+00	3.15e+03	3.22e+05	3.12e+04
W-187	1.30e+01	9.02e+00	3.12e+00	0.00e+00	0.00e+00	3.96e+04	3.56e+04
Np-239	3.71e+02	3.32e+01	1.88e+01	0.00e+00	6.62e+01	5.95e+04	2.49e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

GROUND - PLANE DEPOSITION PATHWAY

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for all age groups by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Ground Plane Exposure Pathway Ri

Nuclide	Organ Dose Conversion Factors	
	T. Body	Skin
H-3	0.00e+00	0.00e+00
C-14	0.00e+00	0.00e+00
Na-24	1.19e+07	1.39e+07
P-32	0.00e+00	0.00e+00
Cr-51	4.66e+06	5.51e+06
Mn-54	1.39e+09	1.63e+09
Mn-56	9.02e+05	1.07e+06
Fe-55	0.00e+00	0.00e+00
Fe-59	2.73e+08	3.21e+08
Co-58	3.79e+08	4.44e+08
Co-60	2.15e+10	2.53e+10
Ni-63	0.00e+00	0.00e+00
Ni-65	2.97e+05	3.45e+05
Cu-64	6.07e+05	6.88e+05
Zn-65	7.47e+08	8.59e+08
Zn-69	0.00e+00	0.00e+00
Br-83	4.87e+03	7.08e+03
Br-84	2.03e+05	2.36e+05
Br-85	0.00e+00	0.00e+00
Rb-86	8.99e+06	1.03e+07
Rb-88	3.31e+04	3.78e+04
Rb-89	1.23e+05	1.48e+05
Sr-89	2.16e+04	2.51e+04
Sr-90	0.00e+00	0.00e+00
Sr-91	2.15e+06	2.51e+06
Sr-92	7.77e+05	8.63e+05
Y-90	4.49e+03	5.31e+03
Y-91	1.07e+06	1.21e+06
Y-91m	1.00e+05	1.16e+05
Y-92	1.80e+05	2.14e+05

Conversion factors are in units of square meter-mrem/yr per uCi/sec.

GROUND - PLANE DEPOSITION PATHWAY

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for all age groups by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Ground Plane Exposure Pathway Ri

Nuclide	Organ Dose Conversion Factors	
	T. Body	Skin
Y-93	1.83e+05	2.51e+05
Zr-95	2.45e+08	2.84e+08
Zr-97	2.96e+06	3.44e+06
Nb-95	1.37e+08	1.61e+08
Mo-99	3.99e+06	4.63e+06
Tc-101	2.04e+04	2.26e+04
Tc-99m	1.84e+05	2.11e+05
Ru-103	1.08e+08	1.26e+08
Ru-105	6.36e+05	7.21e+05
Ru-106	4.22e+08	5.07e+08
Ag-110m	3.44e+09	4.01e+09
Te-125m	1.55e+06	2.13e+06
Te-127	2.98e+03	3.28e+03
Te-127m	9.16e+04	1.08e+05
Te-129	2.62e+04	3.10e+04
Te-129m	1.98e+07	2.31e+07
Te-131	2.92e+04	3.45e+07
Te-131m	8.03e+06	9.46e+06
Te-132	4.23e+06	4.98e+06
I-130	5.51e+06	6.69e+06
I-131	1.72e+07	2.09e+07
I-132	1.25e+06	1.46e+06
I-133	2.45e+06	2.98e+06
I-134	4.47e+05	5.30e+05
I-135	2.53e+06	2.95e+06
Cs-134	6.86e+09	8.00e+09
Cs-136	1.51e+08	1.71e+08
Cs-137	1.03e+10	1.20e+10
Cs-138	3.59e+05	4.10e+05
Ba-139	1.06e+05	1.19e+05

Conversion factors are in units of square meter-mrem/yr per uCi/sec.

GROUND - PLANE DEPOSITION PATHWAY

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for all age groups by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Ground Plane Exposure Pathway Ri

Nuclide	Organ Dose Conversion Factors	
	T. Body	Skin
Ba-140	2.05e+07	2.35e+07
Ba-141	4.17e+04	4.75e+04
Ba-142	4.49e+04	5.11e+04
La-140	1.92e+07	2.18e+07
La-142	7.60e+05	9.11e+05
Ce-141	1.37e+07	1.54e+07
Ce-143	2.31e+06	2.63e+06
Ce-144	6.95e+07	8.04e+07
Pr-143	0.00e+00	0.00e+00
Pr-144	1.83e+03	2.11e+03
Nd-147	8.39e+06	1.01e+07
W-187	2.35e+06	2.73e+06
Np-239	1.71e+06	1.98e+06

Conversion factors are in units of square meter-mrem/yr per uCi/sec.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	7.63e+02	7.63e+02	7.63e+02	7.63e+02	7.63e+02	7.63e+02
C-14	2.63e+08	5.27e+07	5.27e+07	5.27e+07	5.27e+07	5.27e+07	5.27e+07
Na-24	2.44e+06	2.44e+06	2.44e+06	2.44e+06	2.44e+06	2.44e+06	2.44e+06
P-32	1.71e+10	1.06e+09	6.61e+08	0.00e+00	0.00e+00	0.00e+00	1.92e+09
Cr-51	0.00e+00	0.00e+00	2.86e+04	1.71e+04	6.30e+03	3.79e+04	7.19e+06
Mn-54	0.00e+00	8.41e+06	1.61e+06	0.00e+00	2.50e+06	0.00e+00	2.58e+07
Mn-56	0.00e+00	4.15e-03	7.37e-04	0.00e+00	5.27e-03	0.00e+00	1.33e-01
Fe-55	2.51e+07	1.73e+07	4.05e+06	0.00e+00	0.00e+00	9.68e+06	9.95e+06
Fe-59	2.97e+07	6.98e+07	2.68e+07	0.00e+00	0.00e+00	1.95e+07	2.33e+08
Co-58	0.00e+00	4.71e+06	1.06e+07	0.00e+00	0.00e+00	0.00e+00	9.55e+07
Co-60	0.00e+00	1.64e+07	3.62e+07	0.00e+00	0.00e+00	0.00e+00	3.08e+08
Ni-63	6.73e+09	4.66e+08	2.26e+08	0.00e+00	0.00e+00	0.00e+00	9.73e+07
Ni-65	3.76e-01	4.88e-02	2.23e-02	0.00e+00	0.00e+00	0.00e+00	1.24e+00
Cu-64	0.00e+00	2.39e+04	1.12e+04	0.00e+00	6.03e+04	0.00e+00	2.04e+06
Zn-65	1.37e+09	4.37e+09	1.97e+09	0.00e+00	2.92e+09	0.00e+00	2.75e+09
Zn-69	2.18e-12	4.17e-12	2.90e-13	0.00e+00	2.71e-12	0.00e+00	6.26e-13
Br-83	0.00e+00	0.00e+00	1.18e-02	0.00e+00	0.00e+00	0.00e+00	1.71e-02
Br-84	0.00e+00	0.00e+00	2.08e-24	0.00e+00	0.00e+00	0.00e+00	1.63e-29
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.59e+09	1.21e+09	0.00e+00	0.00e+00	0.00e+00	5.12e+08
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	1.45e+09	0.00e+00	4.16e+07	0.00e+00	0.00e+00	0.00e+00	2.33e+08
Sr-90	4.68e+10	0.00e+00	1.15e+10	0.00e+00	0.00e+00	0.00e+00	1.35e+09
Sr-91	2.90e+04	0.00e+00	1.17e+03	0.00e+00	0.00e+00	0.00e+00	1.38e+05
Sr-92	4.95e-01	0.00e+00	2.14e-02	0.00e+00	0.00e+00	0.00e+00	9.81e+00
Y-90	7.09e+01	0.00e+00	1.90e+00	0.00e+00	0.00e+00	0.00e+00	7.52e+05
Y-91	8.59e+03	0.00e+00	2.30e+02	0.00e+00	0.00e+00	0.00e+00	4.73e+06
Y-91m	6.27e-20	0.00e+00	2.43e-21	0.00e+00	0.00e+00	0.00e+00	1.84e-19
Y-92	5.64e-05	0.00e+00	1.65e-06	0.00e+00	0.00e+00	0.00e+00	9.88e-01

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	2.24e-01	0.00e+00	6.19e-03	0.00e+00	0.00e+00	0.00e+00	7.11e+03
Zr-95	9.43e+02	3.03e+02	2.05e+02	0.00e+00	4.75e+02	0.00e+00	9.59e+05
Zr-97	4.34e-01	8.76e-02	4.01e-02	0.00e+00	1.32e-01	0.00e+00	2.71e+04
Nb-95	8.26e+04	4.59e+04	2.47e+04	0.00e+00	4.54e+04	0.00e+00	2.79e+08
Mo-99	0.00e+00	2.48e+07	4.72e+06	0.00e+00	5.61e+07	0.00e+00	5.74e+07
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	3.34e+00	9.44e+00	1.20e+02	0.00e+00	1.43e+02	4.63e+00	5.59e+03
Ru-103	1.02e+03	0.00e+00	4.39e+02	0.00e+00	3.89e+03	0.00e+00	1.19e+05
Ru-105	8.64e-04	0.00e+00	3.41e-04	0.00e+00	1.12e-02	0.00e+00	5.29e-01
Ru-106	2.04e+04	0.00e+00	2.58e+03	0.00e+00	3.94e+04	0.00e+00	1.32e+06
Ag-110m	5.82e+07	5.39e+07	3.20e+07	0.00e+00	1.06e+08	0.00e+00	2.20e+10
Te-125m	1.63e+07	5.90e+06	2.18e+06	4.90e+06	6.63e+07	0.00e+00	6.50e+07
Te-127	6.56e+02	2.35e+02	1.42e+02	4.86e+02	2.67e+03	0.00e+00	5.17e+04
Te-127m	4.58e+07	1.64e+07	5.58e+06	1.17e+07	1.86e+08	0.00e+00	1.53e+08
Te-129	2.92e-10	1.10e-10	7.11e-11	2.24e-10	1.23e-09	0.00e+00	2.20e-10
Te-129m	6.02e+07	2.25e+07	9.53e+06	2.07e+07	2.51e+08	0.00e+00	3.03e+08
Te-131	3.95e-33	1.65e-33	1.25e-33	3.25e-33	1.73e-32	0.00e+00	5.60e-34
Te-131m	3.62e+05	1.77e+05	1.47e+05	2.80e+05	1.79e+06	0.00e+00	1.76e+07
Te-132	2.40e+06	1.55e+06	1.46e+06	1.72e+06	1.50e+07	0.00e+00	7.35e+07
I-130	4.21e+05	1.24e+06	4.90e+05	1.05e+08	1.94e+06	0.00e+00	1.07e+06
I-131	2.96e+08	4.24e+08	2.43e+08	1.39e+11	7.26e+08	0.00e+00	1.12e+08
I-132	1.67e-01	4.47e-01	1.56e-01	1.56e+01	7.12e-01	0.00e+00	8.39e-02
I-133	3.88e+06	6.74e+06	2.06e+06	9.91e+08	1.18e+07	0.00e+00	6.06e+06
I-134	2.11e-12	5.72e-12	2.05e-12	9.92e-11	9.10e-12	0.00e+00	4.99e-15
I-135	1.29e+04	3.38e+04	1.25e+04	2.23e+06	5.42e+04	0.00e+00	3.82e+04
Cs-134	5.65e+09	1.34e+10	1.10e+10	0.00e+00	4.35e+09	1.44e+09	2.35e+08
Cs-136	2.63e+08	1.04e+09	7.48e+08	0.00e+00	5.78e+08	7.93e+07	1.18e+08
Cs-137	7.38e+09	1.01e+10	6.61e+09	0.00e+00	3.43e+09	1.14e+09	1.95e+08
Cs-138	9.72e-24	1.92e-23	9.50e-24	0.00e+00	1.41e-23	1.39e-24	8.18e-29
Ba-139	4.54e-08	3.24e-11	1.33e-09	0.00e+00	3.03e-11	1.84e-11	8.06e-08

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.69e+07	3.38e+04	1.76e+06	0.00e+00	1.15e+04	1.93e+04	5.54e+07
[illegible]	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
[illegible]	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	4.52e+00	2.28e+00	6.01e-01	0.00e+00	0.00e+00	0.00e+00	1.67e+05
La-142	1.90e-11	8.66e-12	2.16e-12	0.00e+00	0.00e+00	0.00e+00	6.32e-08
Ce-141	4.84e+03	3.28e+03	3.72e+02	0.00e+00	1.52e+03	0.00e+00	1.25e+07
Ce-143	4.16e+01	3.08e+04	3.40e+00	0.00e+00	1.35e+01	0.00e+00	1.15e+06
Ce-144	3.58e+05	1.50e+05	1.92e+04	0.00e+00	8.87e+04	0.00e+00	1.21e+08
Pr-143	1.58e+02	6.33e+01	7.83e+00	0.00e+00	3.66e+01	0.00e+00	6.92e+05
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	9.42e+01	1.09e+02	6.51e+00	0.00e+00	6.36e+01	0.00e+00	5.22e+05
W-187	6.52e+03	5.45e+03	1.91e+03	0.00e+00	0.00e+00	0.00e+00	1.79e+06
Np-239	3.68e+00	3.61e-01	1.99e-01	0.00e+00	1.13e+00	0.00e+00	7.41e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Watsrford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	9.94e+02	9.94e+02	9.94e+02	9.94e+02	9.94e+02	9.94e+02
C-14	4.86e+08	9.72e+07	9.72e+07	9.72e+07	9.72e+07	9.72e+07	9.72e+07
Na-24	4.27e+06	4.27e+06	4.27e+06	4.27e+06	4.27e+06	4.27e+06	4.27e+06
P-32	3.15e+10	1.95e+09	1.22e+09	0.00e+00	0.00e+00	0.00e+00	2.65e+09
Cr-51	0.00e+00	0.00e+00	4.99e+04	2.77e+04	1.09e+04	7.13e+04	8.39e+06
Mn-54	0.00e+00	1.40e+07	2.78e+06	0.00e+00	4.18e+06	0.00e+00	2.87e+07
Mn-56	0.00e+00	7.36e-03	1.31e-03	0.00e+00	9.32e-03	0.00e+00	4.85e-01
Fe-55	4.45e+07	3.16e+07	7.36e+06	0.00e+00	0.00e+00	2.00e+07	1.37e+07
Fe-59	5.18e+07	1.21e+08	4.67e+07	0.00e+00	0.00e+00	3.81e+07	2.86e+08
Co-58	0.00e+00	7.94e+06	1.83e+07	0.00e+00	0.00e+00	0.00e+00	1.09e+08
Co-60	0.00e+00	2.78e+07	6.26e+07	0.00e+00	0.00e+00	0.00e+00	3.62e+08
Ni-63	1.18e+10	8.35e+08	4.01e+08	0.00e+00	0.00e+00	0.00e+00	1.33e+08
Ni-65	6.87e-01	8.78e-02	4.00e-02	0.00e+00	0.00e+00	0.00e+00	4.76e+00
Cu-64	0.00e+00	4.26e+04	2.00e+04	0.00e+00	1.08e+05	0.00e+00	3.30e+06
Zn-65	2.11e+09	7.32e+09	3.41e+09	0.00e+00	4.68e+09	0.00e+00	3.10e+09
Zn-69	4.01e-12	7.65e-12	5.35e-13	0.00e+00	5.00e-12	0.00e+00	1.41e-11
Br-83	0.00e+00	0.00e+00	2.18e-02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	3.71e-24	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	4.73e+09	2.22e+09	0.00e+00	0.00e+00	0.00e+00	7.00e+08
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	2.67e+09	0.00e+00	7.66e+07	0.00e+00	0.00e+00	0.00e+00	3.19e+08
Sr-90	6.61e+10	0.00e+00	1.63e+10	0.00e+00	0.00e+00	0.00e+00	1.86e+09
Sr-91	5.33e+04	0.00e+00	2.12e+03	0.00e+00	0.00e+00	0.00e+00	2.42e+05
Sr-92	9.07e-01	0.00e+00	3.86e-02	0.00e+00	0.00e+00	0.00e+00	2.31e+01
Y-90	1.30e+02	0.00e+00	3.51e+00	0.00e+00	0.00e+00	0.00e+00	1.07e+06
Y-91	1.58e+04	0.00e+00	4.24e+02	0.00e+00	0.00e+00	0.00e+00	6.48e+06
Y-91m	1.15e-19	0.00e+00	4.39e-21	0.00e+00	0.00e+00	0.00e+00	5.42e-18
Y-92	1.04e-04	0.00e+00	3.01e-06	0.00e+00	0.00e+00	0.00e+00	2.86e+00

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	4.13e-01	0.00e+00	1.13e-02	0.00e+00	0.00e+00	0.00e+00	1.26e+04
Zr-95	1.65e+03	5.20e+02	3.58e+02	0.00e+00	7.65e+02	0.00e+00	1.20e+06
Zr-97	7.90e-01	1.56e-01	7.20e-02	0.00e+00	2.37e-01	0.00e+00	4.23e+04
Nb-95	1.41e+05	7.81e+04	4.30e+04	0.00e+00	7.57e+04	0.00e+00	3.34e+08
Mo-99	0.00e+00	4.47e+07	8.53e+06	0.00e+00	1.02e+08	0.00e+00	8.01e+07
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	5.80e+00	1.62e+01	2.10e+02	0.00e+00	2.41e+02	8.97e+00	1.06e+04
Ru-103	[illegible]1e+03	0.00e+00	7.74e+02	0.00e+00	6.38e+03	0.00e+00	1.51e+05
Ru-105	1.5[illegible]	0.00e+00	6.13e-04	0.00e+00	1.99e-02	0.00e+00	1.27e+00
Ru-106	2.89e+04	0.[illegible]00	4.73e+03	0.00e+00	7.24e+04	0.00e+00	1.80e+06
Ag-110m	9.63e+07	9.11e+07	5.54e+07	0.00e+00	1.74e+08	0.00e+00	2.56e+10
Te-125m	3.00e+07	1.08e+07	4.02e+06	8.39e+06	0.00e+00	0.00e+00	8.86e+07
Te-127	1.22e+03	4.31e+02	2.61e+02	8.38e+02	4.92e+03	0.00e+00	9.38e+04
Te-127m	8.44e+07	2.99e+07	1.00e+07	2.01e+07	3.42e+08	0.00e+00	2.10e+08
Te-129	5.37e-10	2.00e-10	1.20e-10	3.84e-10	2.25e-09	0.00e+00	2.94e-09
Te-129m	1.10e+08	4.09e+07	1.74e+07	3.55e+07	4.61e+08	0.00e+00	4.13e+08
Te-131	7.22e-33	2.98e-33	2.26e-33	5.57e-33	3.16e-32	0.00e+00	5.93e-34
Te-131m	6.58e+05	3.15e+05	2.63e+05	4.75e+05	3.29e+06	0.00e+00	2.53e+07
Te-132	4.29e+06	2.72e+06	2.56e+06	2.87e+06	2.61e+07	0.00e+00	8.61e+07
I-130	7.41e+05	2.14e+06	8.56e+05	1.75e+08	3.30e+06	0.00e+00	1.65e+06
I-131	5.37e+08	7.52e+08	4.04e+08	2.20e+11	1.30e+09	0.00e+00	1.49e+08
I-132	2.96e-01	7.75e-01	2.78e-01	2.61e+01	1.22e+00	0.00e+00	3.38e-01
I-133	7.08e+06	1.20e+07	3.66e+06	1.68e+09	2.11e+07	0.00e+00	9.09e+06
I-134	3.74e-12	9.92e-12	3.56e-12	1.65e-10	1.56e-11	0.00e+00	1.31e-13
I-135	2.29e+04	5.90e+04	2.19e+04	3.80e+06	9.33e+04	0.00e+00	6.54e+04
Cs-134	9.81e+09	2.31e+10	1.07e+10	0.00e+00	7.34e+09	2.80e+09	2.87e+08
Cs-136	4.48e+08	1.76e+09	1.18e+09	0.00e+00	9.60e+08	1.51e+08	1.42e+08
Cs-137	1.34e+10	1.78e+10	6.20e+09	0.00e+00	6.06e+09	2.35e+09	2.53e+08
Cs-138	1.76e-23	3.38e-23	1.69e-23	0.00e+00	2.50e-23	2.91e-24	1.54e-26
Ba-139	8.40e-08	5.91e-11	2.45e-09	0.00e+00	5.57e-11	4.07e-11	7.50e-07

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. Ri

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	4.85e+07	5.95e+04	3.13e+06	0.00e+00	2.02e+04	4.00e+04	7.48e+07
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	8.11e+00	3.99e+00	1.06e+00	0.00e+00	0.00e+00	0.00e+00	2.29e+05
La-142	3.43e-11	1.53e-11	3.80e-12	0.00e+00	0.00e+00	0.00e+00	4.64e-07
Ce-141	8.88e+03	5.93e+03	6.81e+02	0.00e+00	2.79e+03	0.00e+00	1.70e+07
Ce-143	7.65e+01	5.56e+04	6.21e+00	0.00e+00	2.50e+01	0.00e+00	1.67e+06
Ce-144	6.58e+05	2.72e+05	3.54e+04	0.00e+00	1.63e+05	0.00e+00	1.66e+08
Pr-143	2.90e+02	1.16e+02	1.44e+01	0.00e+00	6.73e+01	0.00e+00	9.55e+05
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	1.81e+02	1.97e+02	1.18e+01	0.00e+00	1.16e+02	0.00e+00	7.11e+05
W-187	1.19e+04	9.73e+03	3.41e+03	0.00e+00	0.00e+00	0.00e+00	2.63e+06
Np-239	7.01e+00	6.62e-01	3.67e-01	0.00e+00	2.08e+00	0.00e+00	1.06e+05

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.57e+03	1.57e+03	1.57e+03	1.57e+03	1.57e+03	1.57e+03
C-14	1.19e+09	2.39e+08	2.39e+08	2.39e+08	2.39e+08	2.39e+08	2.39e+08
Na-24	8.88e+06	8.88e+07	8.88e+06	8.88e+06	8.88e+06	8.88e+06	8.88e+06
P-32	7.78e+10	3.64e+09	3.00e+09	0.00e+00	0.00e+00	0.00e+00	2.15e+09
Cr-51	0.00e+00	0.00e+00	1.02e+05	5.65e+04	1.54e+04	1.03e+05	5.40e+06
Mn-54	0.00e+00	2.10e+07	5.59e+06	0.00e+00	5.88e+06	0.00e+00	1.76e+07
Mn-56	0.00e+00	1.28e-02	2.90e-03	0.00e+00	1.55e-02	0.00e+00	1.86e+00
Fe-55	1.12e+08	5.93e+07	1.84e+07	0.00e+00	0.00e+00	3.35e+07	1.10e+07
Fe-59	1.20e+08	1.95e+08	9.69e+07	0.00e+00	0.00e+00	5.64e+07	2.03e+08
Co-58	0.00e+00	1.21e+07	3.71e+07	0.00e+00	0.00e+00	0.00e+00	7.07e+07
Co-60	0.00e+00	4.32e+07	1.27e+08	0.00e+00	0.00e+00	0.00e+00	2.39e+08
Ni-63	2.96e+10	1.59e+09	1.04e+09	0.00e+00	0.00e+00	0.00e+00	1.07e+08
Ni-65	1.68e+00	1.58e-01	9.24e-02	0.00e+00	0.00e+00	0.00e+00	1.94e+01
Cu-64	0.00e+00	7.49e+04	4.52e+04	0.00e+00	1.81e+05	0.00e+00	3.51e+06
Zn-65	4.13e+09	1.10e+10	6.85e+09	0.00e+00	6.94e+09	0.00e+00	1.93e+09
Zn-69	9.87e-12	1.43e-11	1.32e-12	0.00e+00	8.65e-12	0.00e+00	8.99e-10
Br-83	0.00e+00	0.00e+00	5.36e-02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	8.40e-24	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	8.77e+09	5.39e+09	0.00e+00	0.00e+00	0.00e+00	5.64e+08
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	6.62e+09	0.00e+00	1.89e+08	0.00e+00	0.00e+00	0.00e+00	2.56e+08
Sr-90	1.12e+11	0.00e+00	2.83e+10	0.00e+00	0.00e+00	0.00e+00	1.50e+09
Sr-91	1.31e+05	0.00e+00	4.94e+03	0.00e+00	0.00e+00	0.00e+00	2.89e+05
Sr-92	2.21e+00	0.00e+00	8.88e-02	0.00e+00	0.00e+00	0.00e+00	4.19e+01
Y-90	3.22e+02	0.00e+00	8.63e+00	0.00e+00	0.00e+00	0.00e+00	9.18e+05
Y-91	3.90e+04	0.00e+00	1.04e+03	0.00e+00	0.00e+00	0.00e+00	5.20e+06
Y-91m	2.80e-19	0.00e+00	1.02e-20	0.00e+00	0.00e+00	0.00e+00	5.49e-16
Y-92	2.56e-04	0.00e+00	7.32e-06	0.00e+00	0.00e+00	0.00e+00	7.39e+00

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.02e+00	0.00e+00	2.79e-02	0.00e+00	0.00e+00	0.00e+00	1.51e+04
Zr-95	3.83e+03	8.42e+02	7.50e+02	0.00e+00	1.21e+03	0.00e+00	8.79e+05
Zr-97	1.92e+00	2.78e-01	1.64e-01	0.00e+00	3.99e-01	0.00e+00	4.21e+04
Nb-95	3.18e+05	1.24e+05	8.84e+04	0.00e+00	1.16e+05	0.00e+00	2.29e+08
Mo-99	0.00e+00	8.14e+07	2.01e+07	0.00e+00	1.74e+08	0.00e+00	6.73e+07
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	1.33e+01	2.61e+01	4.32e+02	0.00e+00	3.79e+02	1.32e+01	1.48e+04
Ru-103	4.28e+03	0.00e+00	1.65e+03	0.00e+00	1.08e+04	0.00e+00	1.11e+05
Ru-105	3.85e-03	0.00e+00	1.40e-03	0.00e+00	3.39e-02	0.00e+00	2.51e+00
Ru-106	9.24e+04	0.00e+00	1.15e+04	0.00e+00	1.25e+05	0.00e+00	1.44e+06
Ag-110m	2.09e+08	1.41e+08	1.13e+08	0.00e+00	2.63e+08	0.00e+00	1.68e+10
Te-125m	7.38e+07	2.00e+07	9.84e+06	2.07e+07	0.00e+00	0.00e+00	7.12e+07
Te-127	2.99e+03	8.06e+02	6.41e+02	2.07e+03	8.30e+03	0.00e+00	1.17e+05
Te-127m	2.08e+08	5.60e+07	2.47e+07	4.97e+07	5.93e+08	0.00e+00	1.68e+08
Te-129	1.33e-09	3.70e-10	3.15e-10	9.46e-10	3.88e-09	0.00e+00	8.25e-08
Te-129m	2.71e+08	7.58e+07	4.21e+07	8.75e+07	7.97e+08	0.00e+00	3.31e+08
Te-131	1.77e-32	5.40e-33	5.27e-33	1.36e-32	5.36e-32	0.00e+00	9.31e-32
Te-131m	1.60e+06	5.54e+05	5.89e+05	1.14e+06	5.36e+06	0.00e+00	2.25e+07
Te-132	1.03e+07	4.54e+06	5.48e+06	6.61e+06	4.21e+07	0.00e+00	4.57e+07
I-130	1.73e+06	3.50e+06	1.80e+06	3.86e+08	5.23e+06	0.00e+00	1.64e+06
I-131	1.30e+09	1.31e+09	7.45e+08	4.33e+11	2.15e+09	0.00e+00	1.17e+08
I-132	7.01e-01	1.29e+00	5.92e-01	5.97e+01	1.97e+00	0.00e+00	1.52e+00
I-133	1.72e+07	2.13e+07	8.05e+06	3.95e+09	3.55e+07	0.00e+00	8.57e+06
I-134	8.87e-12	1.65e-11	7.57e-12	3.79e-10	2.52e-11	0.00e+00	1.09e-11
I-135	5.43e+04	9.77e+04	4.62e+04	8.66e+06	1.50e+05	0.00e+00	7.45e+04
Cs-134	2.26e+10	3.71e+10	7.84e+09	0.00e+00	1.15e+10	4.13e+09	2.00e+08
Cs-136	1.01e+09	2.86e+09	1.80e+09	0.00e+00	1.48e+09	2.21e+08	9.77e+07
Cs-137	3.22e+10	3.09e+10	4.55e+09	0.00e+00	1.01e+10	3.62e+09	1.93e+08
Cs-138	4.27e-23	5.94e-23	3.77e-23	0.00e+00	4.18e-23	4.50e-24	2.74e-23
Ba-139	2.06e-07	1.10e-10	5.98e-09	0.00e+00	9.62e-11	6.48e-11	1.19e-05

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	1.17e+08	1.03e+05	6.84e+06	0.00e+00	3.34e+04	6.12e+04	5.93e+07
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	1.94e+01	6.79e+00	2.12e+00	0.00e+00	0.00e+00	0.00e+00	1.89e+05
La-142	8.30e-11	2.64e-11	8.28e-12	0.00e+00	0.00e+00	0.00e+00	5.24e-06
Ce-141	2.19e+04	1.09e+04	1.62e+03	0.00e+00	4.78e+04	0.00e+00	1.36e+07
Ce-143	1.88e+02	1.02e+05	1.47e+01	0.00e+00	4.27e+01	0.00e+00	1.49e+06
Ce-144	1.62e+06	5.09e+05	8.66e+04	0.00e+00	2.82e+05	0.00e+00	1.33e+08
Pr-143	7.18e+02	2.16e+02	3.56e+01	0.00e+00	1.17e+02	0.00e+00	7.75e+05
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	4.45e+02	3.60e+02	2.79e+01	0.00e+00	1.98e+02	0.00e+00	5.71e+05
W-187	2.89e+04	1.71e+04	7.69e+03	0.00e+00	0.00e+00	0.00e+00	2.41e+06
Np-239	1.73e+01	1.24e+00	8.71e-01	0.00e+00	3.58e+00	0.00e+00	9.17e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	2.38e+03	2.38e+03	2.38e+03	2.38e+03	2.38e+03	2.38e+03
C-14	2.34e+09	5.00e+08	5.00e+08	5.00e+08	5.00e+08	5.00e+08	5.00e+08
Na-24	1.55e+07	1.55e+07	1.55e+07	1.55e+07	1.55e+07	1.55e+07	1.55e+07
P-32	1.60e+11	9.43e+09	6.21e+09	0.00e+00	0.00e+00	0.00e+00	2.17e+09
Cr-51	0.00e+00	0.00e+00	1.61e+05	1.05e+05	2.30e+04	2.05e+05	4.70e+06
Mn-54	0.00e+00	3.90e+07	8.84e+06	0.00e+00	8.64e+06	0.00e+00	1.43e+07
Mn-56	0.00e+00	3.14e-02	5.42e-03	0.00e+00	2.70e-02	0.00e+00	2.86e+00
Fe-55	1.35e+08	8.73e+07	2.33e+07	0.00e+00	0.00e+00	4.27e+07	1.11e+07
Fe-59	2.24e+08	3.92e+08	1.54e+08	0.00e+00	0.00e+00	1.16e+08	1.87e+08
Co-58	0.00e+00	2.42e+07	6.05e+07	0.00e+00	0.00e+00	0.00e+00	6.04e+07
Co-60	0.00e+00	8.81e+07	2.08e+08	0.00e+00	0.00e+00	0.00e+00	2.10e+08
Ni-63	3.49e+10	2.16e+09	1.21e+09	0.00e+00	0.00e+00	0.00e+00	1.07e+08
Ni-65	3.56e+00	4.03e-01	1.83e-01	0.00e+00	0.00e+00	0.00e+00	3.07e+01
Cu-64	0.00e+00	1.86e+05	8.62e+04	0.00e+00	3.15e+05	0.00e+00	3.82e+06
Zn-65	5.55e+09	1.90e+10	8.78e+09	0.00e+00	9.23e+09	0.00e+00	1.61e+10
Zn-69	2.10e-11	3.79e-11	2.82e-12	0.00e+00	1.57e-11	0.00e+00	3.09e-09
Br-83	0.00e+00	0.00e+00	1.14e-01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	1.62e-23	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.23e+10	1.10e+10	0.00e+00	0.00e+00	0.00e+00	5.69e+08
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	1.26e+10	0.00e+00	3.61e+08	0.00e+00	0.00e+00	0.00e+00	2.59e+08
Sr-90	1.22e+11	0.00e+00	3.10e+10	0.00e+00	0.00e+00	0.00e+00	1.52e+09
Sr-91	2.73e+05	0.00e+00	9.87e+03	0.00e+00	0.00e+00	0.00e+00	3.23e+05
Sr-92	4.71e+00	0.00e+00	1.75e-01	0.00e+00	0.00e+00	0.00e+00	5.08e+01
Y-90	6.82e+02	0.00e+00	1.83e+01	0.00e+00	0.00e+00	0.00e+00	9.41e+05
Y-91	7.33e+04	0.00e+00	1.95e+03	0.00e+00	0.00e+00	0.00e+00	5.25e+06
Y-91m	5.94e-19	0.00e+00	2.03e-20	0.00e+00	0.00e+00	0.00e+00	1.98e-15
Y-92	5.44e-04	0.00e+00	1.53e-05	0.00e+00	0.00e+00	0.00e+00	1.04e+01

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	2.16e+00	0.00e+00	5.90e-02	0.00e+00	0.00e+00	0.00e+00	1.71e+04
Zr-95	6.80e+03	1.66e+03	1.18e+03	0.00e+00	1.79e+03	0.00e+00	8.26e+05
Zr-97	4.07e+00	6.99e-01	3.19e-01	0.00e+00	7.04e-01	0.00e+00	4.46e+04
Nb-95	5.93e+05	2.44e+05	1.41e+05	0.00e+00	1.75e+05	0.00e+00	2.06e+08
Mo-99	0.00e+00	2.08e+08	4.06e+07	0.00e+00	3.11e+08	0.00e+00	6.86e+07
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	2.77e+01	5.70e+01	7.35e+02	0.00e+00	6.14e+02	2.98e+01	1.66e+04
Ru-103	8.67e+03	0.00e+00	2.90e+03	0.00e+00	1.80e+04	0.00e+00	1.05e+05
Ru-105	8.12e-03	0.00e+00	2.74e-03	0.00e+00	5.97e-02	0.00e+00	3.23e+00
Ru-106	1.90e+05	0.00e+00	2.38e+04	0.00e+00	2.25e+05	0.00e+00	1.44e+06
Ag-110m	3.86e+08	2.82e+08	1.36e+08	0.00e+00	4.03e+08	0.00e+00	1.46e+10
Te-125m	1.51e+08	5.04e+07	2.04e+07	5.07e+07	0.00e+00	0.00e+00	7.18e+07
Te-127	6.34e+03	2.13e+03	1.36e+03	5.16e+03	1.55e+04	0.00e+00	1.33e+05
Te-127m	4.21e+08	1.40e+08	5.10e+07	1.22e+08	1.04e+09	0.00e+00	1.70e+08
Te-129	2.81e-09	9.69e-10	6.56e-10	2.36e-09	7.00e-09	0.00e+00	2.25e-07
Te-129m	5.57e+08	1.91e+08	8.58e+07	2.14e+08	1.39e+09	0.00e+00	3.33e+08
Te-131	3.76e-32	1.39e-32	1.05e-32	3.35e-32	9.61e-32	0.00e+00	1.52e-30
Te-131m	3.38e+06	1.36e+06	1.12e+06	2.76e+06	9.36e+06	0.00e+00	2.29e+07
Te-132	2.11e+07	1.05e+07	9.75e+06	1.54e+07	6.54e+07	0.00e+00	3.87e+07
I-130	3.56e+06	7.83e+06	3.14e+06	8.78e+08	8.60e+06	0.00e+00	1.68e+06
I-131	2.72e+09	3.21e+09	1.41e+09	1.05e+12	3.74e+09	0.00e+00	1.14e+08
I-132	1.45e+00	2.95e+00	1.05e+00	1.38e+02	3.29e+00	0.00e+00	2.39e+00
I-133	3.63e+07	5.29e+07	1.55e+07	9.62e+09	6.22e+07	0.00e+00	8.95e+06
I-134	1.84e-11	3.77e-11	1.34e-11	8.78e-10	4.21e-11	0.00e+00	3.89e-11
I-135	1.13e+05	2.25e+05	8.19e+04	2.01e+07	2.50e+05	0.00e+00	8.13e+04
Cs-134	3.65e+10	6.80e+10	6.87e+09	0.00e+00	1.75e+10	7.18e+09	1.85e+08
Cs-136	1.98e+09	5.81e+09	2.17e+09	0.00e+00	2.32e+09	4.74e+08	8.83e+07
Cs-137	5.15e+10	6.02e+10	4.27e+09	0.00e+00	1.62e+10	6.55e+09	1.88e+08
Cs-138	9.01e-23	1.47e-22	7.10e-23	0.00e+00	7.31e-23	1.14e-23	2.34e-22
Ba-139	4.39e-07	2.91e-10	1.27e-08	0.00e+00	1.75e-10	1.77e-10	2.78e-05

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

COW's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Cow's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.41e+08	2.41e+05	1.24e+07	0.00e+00	5.72e+04	1.48e+05	5.92e+07
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	4.06e+01	1.60e+01	4.11e+00	0.00e+00	0.00e+00	0.00e+00	1.88e+05
La-142	1.74e-10	6.40e-11	1.53e-11	0.00e+00	0.00e+00	0.00e+00	1.09e-05
Ce-141	4.34e+04	2.64e+04	3.11e+03	0.00e+00	8.15e+03	0.00e+00	1.37e+07
Ce-143	3.97e+02	2.64e+05	3.01e+01	0.00e+00	7.68e+01	0.00e+00	1.54e+06
Ce-144	2.33e+06	9.52e+05	1.30e+05	0.00e+00	3.85e+05	0.00e+00	1.33e+08
Pr-143	1.49e+03	5.55e+02	7.36e+01	0.00e+00	2.06e+02	0.00e+00	7.84e+05
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	8.81e+02	9.05e+02	5.55e+01	0.00e+00	3.49e+02	0.00e+00	5.74e+05
W-187	6.09e+04	4.23e+04	1.46e+04	0.00e+00	0.00e+00	0.00e+00	2.49e+06
Np-239	3.65e+01	3.26e+00	1.84e+00	0.00e+00	6.51e+00	0.00e+00	9.44e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

MEAT PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Meat & Poultry Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	3.25e+02	3.25e+02	3.25e+02	3.25e+02	3.25e+02	3.25e+02
C-14	2.41e+08	4.83e+07	4.83e+07	4.83e+07	4.83e+07	4.83e+07	4.83e+07
Na-24	1.39e-03	1.39e-03	1.39e-03	1.39e-03	1.39e-03	1.39e-03	1.39e-03
P-32	4.66e+09	2.90e+08	1.80e+08	0.00e+00	0.00e+00	0.00e+00	5.24e+08
Cr-51	0.00e+00	0.00e+00	7.05e+03	4.21e+03	1.55e+03	9.36e+03	1.77e+06
Mn-54	0.00e+00	9.18e+06	1.75e+06	0.00e+00	2.73e+06	0.00e+00	2.81e+07
Mn-56	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Fe-55	2.93e+08	2.03e+08	4.72e+07	0.00e+00	0.00e+00	1.13e+08	1.16e+08
Fe-59	2.66e+08	6.24e+08	2.39e+08	0.00e+00	0.00e+00	1.74e+08	2.08e+09
Co-58	0.00e+00	1.82e+07	4.09e+07	0.00e+00	0.00e+00	0.00e+00	3.70e+08
Co-60	0.00e+00	7.52e+07	1.66e+08	0.00e+00	0.00e+00	0.00e+00	1.41e+09
Ni-63	1.89e+10	1.31e+09	6.33e+08	0.00e+00	0.00e+00	0.00e+00	2.73e+08
Ni-65	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Cu-64	0.00e+00	2.80e-07	1.31e-07	0.00e+00	7.05e-07	0.00e+00	2.38e-05
Zn-65	3.56e+08	1.13e+09	5.12e+08	0.00e+00	7.57e+08	0.00e+00	7.13e+08
Zn-69	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-83	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	4.88e+08	2.27e+08	0.00e+00	0.00e+00	0.00e+00	9.61e+07
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	3.02e+08	0.00e+00	8.66e+06	0.00e+00	0.00e+00	0.00e+00	4.84e+07
Sr-90	1.24e+10	0.00e+00	3.05e+09	0.00e+00	0.00e+00	0.00e+00	3.59e+08
Sr-91	.58e-10	0.00e+00	6.39e-12	0.00e+00	0.00e+00	0.00e+00	7.53e-10
Sr-92	.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Y-90	.08e+02	0.00e+00	2.90e+00	0.00e+00	0.00e+00	0.00e+00	1.15e+06
Y-91	1.13e+06	0.00e+00	3.03e+04	0.00e+00	0.00e+00	0.00e+00	6.23e+08
Y-91m	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Y-92	1.69e-39	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.96e-35

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

MEAT PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES
OTHER THAN NOBLE GASES. Ri

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Meat & Poultry Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	4.87e-12	0.00e+00	1.35e-13	0.00e+00	0.00e+00	0.00e+00	1.55e-07
Zr-95	1.87e+06	6.01e+05	4.07e+05	0.00e+00	9.43e+05	0.00e+00	1.90e+09
Zr-97	2.11e-05	4.27e-06	1.95e-06	0.00e+00	6.44e-06	0.00e+00	1.32e+00
Nb-95	2.30e+06	1.28e+06	6.87e+05	0.00e+00	1.26e+06	0.00e+00	7.76e+09
Mo-99	0.00e+00	1.01e+05	1.91e+04	0.00e+00	2.28e+05	0.00e+00	2.33e+05
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	4.74e-21	1.34e-20	1.71e-19	0.00e+00	2.04e-19	6.57e-21	7.93e-18
Ru-103	1.05e+08	0.00e+00	4.53e+07	0.00e+00	4.02e+08	0.00e+00	1.23e+10
Ru-105	6.30e-28	0.00e+00	2.49e-28	0.00e+00	8.14e-27	0.00e+00	3.85e-25
Ru-106	2.80e+09	0.00e+00	3.54e+08	0.00e+00	5.40e+09	0.00e+00	1.81e+11
Ag-110m	6.68e+06	6.18e+06	3.67e+06	0.00e+00	1.22e+07	0.00e+00	2.52e+09
Te-125m	3.59e+08	1.30e+08	4.81e+07	1.08e+08	1.46e+09	0.00e+00	1.43e+09
Te-127	2.21e-10	7.94e-11	4.78e-11	1.64e-10	9.01e-10	0.00e+00	1.74e-08
Te-127m	1.12e+09	3.99e+08	1.36e+08	2.85e+08	4.53e+09	0.00e+00	3.74e+09
Te-129	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Te-129m	1.13e+09	4.23e+08	1.80e+08	3.90e+08	4.74e+09	0.00e+00	5.71e+09
Te-131	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Te-131m	4.57e+02	2.23e+02	1.86e+02	3.54e+02	2.26e+03	0.00e+00	2.22e+04
Te-132	1.43e+06	9.23e+05	8.66e+05	1.02e+06	8.89e+06	0.00e+00	4.36e+07
I-130	2.18e-06	6.42e-06	2.53e-06	5.44e-04	1.00e-05	0.00e+00	5.52e-06
I-131	1.08e+07	1.54e+07	8.82e+06	5.04e+09	2.64e+07	0.00e+00	4.06e+06
I-132	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
I-133	3.72e-01	6.47e-01	1.97e-01	9.51e+01	1.13e+00	0.00e+00	5.82e-01
I-134	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
I-135	4.69e-17	1.23e-16	4.53e-17	8.10e-15	1.97e-16	0.00e+00	1.39e-16
Cs-134	6.58e+08	1.56e+09	1.28e+09	0.00e+00	5.06e+08	1.68e+08	2.74e+07
Cs-136	1.21e+07	4.76e+07	3.43e+07	0.00e+00	2.65e+07	3.63e+06	5.41e+06
Cs-137	8.72e+08	1.19e+09	7.81e+08	0.00e+00	4.05e+08	1.35e+08	2.31e+07
Cs-138	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-139	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

MEAT PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Meat & Poultry Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.88e+07	3.61e+04	1.88e+06	0.00e+00	1.23e+04	2.07e+04	5.92e+07
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	3.75e-02	1.89e-02	4.99e-03	0.00e+00	0.00e+00	0.00e+00	1.39e+03
La-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ce-141	1.41e+04	9.50e+03	1.08e+03	0.00e+00	4.41e+03	0.00e+00	3.63e+07
Ce-143	2.03e-02	1.50e+01	1.66e-03	0.00e+00	6.61e-03	0.00e+00	5.61e+02
Ce-144	1.46e+06	6.09e+05	7.83e+04	0.00e+00	3.61e+05	0.00e+00	4.93e+08
Pr-143	2.10e+04	8.42e+03	1.04e+03	0.00e+00	4.86e+03	0.00e+00	9.19e+07
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	7.08e+03	8.18e+03	4.90e+02	0.00e+00	4.78e+03	0.00e+00	3.93e+07
W-187	2.10e-02	1.76e-02	6.14e-03	0.00e+00	0.00e+00	0.00e+00	5.75e+00
Np-239	2.61e-01	2.57e-02	1.41e-02	0.00e+00	8.00e-02	0.00e+00	5.26e+03

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

MEAT PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Meat & Poultry Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.94e+02	1.94e+02	1.94e+02	1.94e+02	1.94e+02	1.94e+02
C-14	2.04e+08	4.08e+07	4.08e+07	4.08e+07	4.08e+07	4.08e+07	4.08e+07
Na-24	1.11e-03	1.11e-03	1.11e-03	1.11e-03	1.11e-03	1.11e-03	1.11e-03
P-32	3.94e+09	2.44e+08	1.53e+08	0.00e+00	0.00e+00	0.00e+00	3.31e+06
Cr-51	0.00e+00	0.00e+00	5.64e+03	3.13e+03	1.24e+03	8.05e+03	9.48e+05
Mn-54	0.00e+00	7.00e+06	1.39e+06	0.00e+00	2.09e+06	0.00e+00	1.44e+07
Mn-56	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Fe-55	2.38e+08	1.69e+08	3.94e+07	0.00e+00	0.00e+00	1.07e+08	7.31e+07
Fe-59	2.12e+08	4.95e+08	1.91e+08	0.00e+00	0.00e+00	1.56e+08	1.17e+09
Co-58	0.00e+00	1.41e+07	3.24e+07	0.00e+00	0.00e+00	0.00e+00	1.94e+08
Co-60	0.00e+00	5.83e+07	1.31e+08	0.00e+00	0.00e+00	0.00e+00	7.60e+08
Ni-63	1.52e+10	1.07e+09	5.15e+08	0.00e+00	0.00e+00	0.00e+00	1.71e+08
Ni-65	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Cu-64	0.00e+00	2.28e-07	1.07e-07	0.00e+00	5.77e-07	0.00e+00	1.77e-05
Zn-65	2.50e+08	8.69e+08	4.05e+08	0.00e+00	5.56e+08	0.00e+00	3.68e+08
Zn-69	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-83	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	4.07e+08	1.91e+08	0.00e+00	0.00e+00	0.00e+00	6.02e+07
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	2.55e+08	0.00e+00	7.29e+06	0.00e+00	0.00e+00	0.00e+00	3.03e+07
Sr-90	8.05e+09	0.00e+00	1.99e+09	0.00e+00	0.00e+00	0.00e+00	2.26e+08
Sr-91	1.33e-10	0.00e+00	5.29e-12	0.00e+00	0.00e+00	0.00e+00	6.03e-10
Sr-92	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Y-90	9.11e+01	0.00e+00	2.45e+00	0.00e+00	0.00e+00	0.00e+00	7.52e+05
Y-91	9.54e+05	0.00e+00	2.56e+04	0.00e+00	0.00e+00	0.00e+00	3.91e+08
Y-91m	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Y-92	1.43e-39	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.93e-35

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

MEAT PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Meat & Poultry Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	4.11e-12	0.00e+00	1.13e-13	0.00e+00	0.00e+00	0.00e+00	1.26e-07
Zr-95	1.50e+06	4.73e+05	3.25e+05	0.00e+00	6.95e+05	0.00e+00	1.09e+09
Zr-97	1.76e-05	3.49e-06	1.61e-06	0.00e+00	5.29e-06	0.00e+00	9.44e-01
Nb-95	1.79e+06	9.96e+05	5.48e+05	0.00e+00	9.65e+05	0.00e+00	4.26e+09
Mo-99	0.00e+00	8.31e+04	1.59e+04	0.00e+00	1.90e+05	0.00e+00	1.49e+05
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	3.77e-21	1.05e-20	1.36e-19	0.00e+00	1.57e-19	5.83e-21	6.90e-18
Ru-103	8.57e+07	0.00e+00	3.66e+07	0.00e+00	3.02e+08	0.00e+00	7.16e+09
Ru-105	5.27e-28	0.00e+00	2.04e-28	0.00e+00	6.65e-27	0.00e+00	4.25e-25
Ru-106	1.82e+09	0.00e+00	2.97e+08	0.00e+00	4.55e+09	0.00e+00	1.13e+11
Ag-110m	5.06e+06	4.79e+06	2.91e+06	0.00e+00	9.13e+06	0.00e+00	1.34e+09
Te-125m	3.03e+08	1.09e+08	4.05e+07	8.47e+07	0.00e+00	0.00e+00	8.94e+08
Te-127	1.88e-10	6.65e-11	4.04e-11	1.29e-10	7.60e-10	0.00e+00	1.45e-08
Te-127m	9.42e+08	3.34e+08	1.12e+08	2.24e+08	3.82e+09	0.00e+00	2.35e+09
Te-129	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Te-129m	9.50e+08	3.53e+08	1.50e+08	3.07e+08	3.98e+09	0.00e+00	3.57e+09
Te-131	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Te-131m	3.81e+02	1.83e+02	1.52e+02	2.75e+02	1.90e+03	0.00e+00	1.47e+04
Te-132	1.17e+06	7.39e+05	6.96e+05	7.79e+05	7.09e+06	0.00e+00	2.34e+07
I-130	1.75e-06	5.07e-06	2.02e-06	4.13e-04	7.80e-06	0.00e+00	3.89e-06
I-131	8.94e+06	1.25e+07	6.72e+06	3.65e+09	2.15e+07	0.00e+00	2.48e+06
I-132	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
I-133	3.11e-01	5.28e-01	1.61e-01	7.37e+01	9.26e-01	0.00e+00	3.99e-01
I-134	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
I-135	3.82e-17	9.82e-17	3.64e-17	6.32e-15	1.55e-16	0.00e+00	1.09e-16
Cs-134	5.23e+08	1.23e+09	5.71e+08	0.00e+00	3.91e+08	1.49e+08	1.53e+07
Cs-136	9.41e+06	3.70e+07	2.49e+07	0.00e+00	2.02e+07	3.18e+06	2.98e+06
Cs-137	7.24e+08	9.63e+08	3.36e+08	0.00e+00	3.28e+08	1.27e+08	1.37e+07
Cs-138	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-139	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

MEAT PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. Ri

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Meat & Poultry Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.33e+07	2.91e+04	1.53e+06	0.00e+00	9.88e+03	1.96e+04	3.67e+07
Ba-1(	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	3.08e-02	1.51e-02	4.03e-03	0.00e+00	0.00e+00	0.00e+00	8.69e+02
La-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ce-141	1.18e+04	7.88e+03	9.05e+02	0.00e+00	3.71e+03	0.00e+00	2.25e+07
Ce-143	1.71e-02	1.24e+01	1.39e-03	0.00e+00	5.58e-03	0.00e+00	3.74e+02
Ce-144	1.23e+06	5.08e+05	6.60e+04	0.00e+00	3.04e+05	0.00e+00	3.09e+08
Pr-143	1.77e+04	7.05e+03	8.79e+02	0.00e+00	4.10e+03	0.00e+00	5.81e+07
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	6.24e+03	6.78e+03	4.06e+02	0.00e+00	3.98e+03	0.00e+00	2.45e+07
W-187	1.76e-02	1.43e-02	5.03e-03	0.00e+00	0.00e+00	0.00e+00	3.88e+00
Np-239	2.28e-01	2.15e-02	1.19e-02	0.00e+00	6.75e-02	0.00e+00	3.46e+03

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

MEAT PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. Ri

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Meat & Poultry Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	2.34e+02	2.34e+02	2.34e+02	2.34e+02	2.34e+02	2.34e+02
C-14	3.83e+08	7.67e+07	7.67e+07	7.67e+07	7.67e+07	7.67e+07	7.67e+07
Na-24	1.77e-03	1.77e-02	1.77e-03	1.77e-03	1.77e-03	1.77e-03	1.77e-03
P-32	7.43e+09	3.47e+08	2.86e+08	0.00e+00	0.00e+00	0.00e+00	2.05e+08
Cr-51	0.00e+00	0.00e+00	8.79e+03	4.88e+03	1.33e+03	8.91e+03	4.66e+05
Mn-54	0.00e+00	8.01e+06	2.13e+06	0.00e+00	2.25e+06	0.00e+00	6.72e+06
Mn-56	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Fe-55	4.57e+08	2.42e+08	7.51e+07	0.00e+00	0.00e+00	1.37e+08	4.49e+07
Fe-59	3.76e+08	6.09e+08	3.03e+08	0.00e+00	0.00e+00	1.77e+08	6.34e+08
Co-58	0.00e+00	1.64e+07	5.03e+07	0.00e+00	0.00e+00	0.00e+00	9.58e+07
Co-60	0.00e+00	6.93e+07	2.04e+08	0.00e+00	0.00e+00	0.00e+00	3.84e+08
Ni-63	2.91e+10	1.56e+09	1.02e+09	0.00e+00	0.00e+00	0.00e+00	1.05e+08
Ni-65	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Cu-64	0.00e+00	3.07e-07	1.85e-07	0.00e+00	7.41e-07	0.00e+00	1.44e-05
Zn-65	3.75e+08	1.00e+09	6.22e+08	0.00e+00	6.30e+08	0.00e+00	1.76e+08
Zn-69	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-83	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	5.77e+08	3.55e+08	0.00e+00	0.00e+00	0.00e+00	3.71e+07
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	4.82e+08	0.00e+00	1.38e+07	0.00e+00	0.00e+00	0.00e+00	1.87e+07
Sr-90	1.04e+10	0.00e+00	2.64e+09	0.00e+00	0.00e+00	0.00e+00	1.40e+08
Sr-91	2.50e-10	0.00e+00	9.42e-12	0.00e+00	0.00e+00	0.00e+00	5.51e-10
Sr-92	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Y-90	1.72e+02	0.00e+00	4.61e+00	0.00e+00	0.00e+00	0.00e+00	4.91e+05
Y-91	1.80e+06	0.00e+00	4.82e+04	0.00e+00	0.00e+00	0.00e+00	2.40e+08
Y-91m	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Y-92	2.69e-39	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.76e-35

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

MEAT PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Meat & Poultry Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	7.73e-12	0.00e+00	2.12e-13	0.00e+00	0.00e+00	0.00e+00	1.15e-07
Zr-95	2.66e+06	5.86e+05	5.21e+05	0.00e+00	8.38e+05	0.00e+00	6.11e+08
Zr-97	3.28e-05	4.74e-06	2.80e-06	0.00e+00	6.80e-06	0.00e+00	7.18e-01
Nb-95	3.10e+06	1.21e+06	8.62e+05	0.00e+00	1.13e+06	0.00e+00	2.23e+09
Mo-99	0.00e+00	1.16e+05	2.86e+04	0.00e+00	2.47e+05	0.00e+00	9.57e+04
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	6.61e-21	1.30e-20	2.15e-19	0.00e+00	1.88e-19	6.58e-21	7.37e-18
Ru-103	1.55e+08	0.00e+00	5.96e+07	0.00e+00	3.90e+08	0.00e+00	4.01e+09
Ru-105	9.83e-28	0.00e+00	3.57e-28	0.00e+00	8.64e-27	0.00e+00	6.42e-25
Ru-106	4.44e+09	0.00e+00	5.54e+08	0.00e+00	5.99e+09	0.00e+00	6.90e+10
Ag-110m	8.39e+06	5.67e+06	4.53e+06	0.00e+00	1.06e+07	0.00e+00	6.74e+08
Te-125m	5.69e+08	1.54e+08	7.59e+07	1.60e+08	0.00e+00	0.00e+00	5.49e+08
Te-127	3.53e-10	9.51e-11	7.57e-11	2.44e-10	1.00e-09	0.00e+00	1.38e-08
Te-127m	1.77e+09	4.78e+08	2.11e+08	4.24e+08	5.06e+09	0.00e+00	1.44e+09
Te-129	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Te-129m	1.79e+09	5.00e+08	2.78e+08	5.77e+08	5.26e+09	0.00e+00	2.18e+09
Te-131	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Te-131m	7.09e+02	2.45e+02	2.61e+02	5.04e+02	2.37e+03	0.00e+00	9.94e+03
Te-132	2.13e+06	9.43e+05	1.14e+06	1.37e+06	8.76e+06	0.00e+00	9.49e+06
I-130	3.13e-06	6.33e-06	3.26e-06	6.97e-04	9.46e-06	0.00e+00	2.96e-06
I-131	1.66e+07	1.67e+07	9.48e+06	5.51e+09	2.74e+07	0.00e+00	1.48e+06
I-132	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
I-133	5.78e-01	7.15e-01	2.70e-01	1.33e+02	1.19e+00	0.00e+00	2.88e-01
I-134	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
I-135	6.91e-17	1.24e-16	5.88e-17	1.10e-14	1.91e-16	0.00e+00	9.47e-17
Cs-134	9.22e+08	1.51e+09	3.19e+08	0.00e+00	4.69e+08	1.68e+08	8.16e+06
Cs-136	1.62e+07	4.59e+07	2.89e+07	0.00e+00	2.38e+07	3.54e+06	1.57e+06
Cs-137	1.33e+09	1.28e+09	1.88e+08	0.00e+00	4.16e+08	1.50e+08	7.99e+06
Cs-138	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-139	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

MEAT PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Meat & Poultry Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	4.39e+07	3.85e+04	2.56e+06	0.00e+00	1.25e+04	2.29e+04	2.22e+07
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	5.64e-02	1.97e-02	6.14e-03	0.00e+00	0.00e+00	0.00e+00	5.49e+02
La-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ce-141	2.22e+04	1.11e+04	1.65e+03	0.00e+00	4.86e+04	0.00e+00	1.38e+07
Ce-143	3.21e-02	1.74e+01	2.52e-03	0.00e+00	7.29e-03	0.00e+00	2.55e+02
Ce-144	2.32e+06	7.26e+05	1.24e+05	0.00e+00	4.02e+05	0.00e+00	1.89e+08
Pr-143	3.34e+04	1.00e+04	1.66e+03	0.00e+00	5.43e+03	0.00e+00	3.61e+07
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	1.17e+04	9.48e+03	7.34e+02	0.00e+00	5.20e+03	0.00e+00	1.50e+07
W-187	3.26e-02	1.93e-02	8.67e-03	0.00e+00	0.00e+00	0.00e+00	2.71e+00
Np-239	4.29e-01	3.08e-02	2.17e-02	0.00e+00	8.91e-02	0.00e+00	2.28e+03

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

LEAFY VEGETABLE PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Leafy/Produce Vegetation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	2.26e+03	2.26e+03	2.26e+03	2.26e+03	2.26e+03	2.26e+03
C-14	2.28e+08	4.55e+07	4.55e+07	4.55e+07	4.55e+07	4.55e+07	4.55e+07
Na-24	2.68e+05	2.68e+05	2.68e+05	2.68e+05	2.68e+05	2.68e+05	2.68e+05
P-32	1.40e+09	8.73e+07	5.42e+07	0.00e+00	0.00e+00	0.00e+00	1.58e+08
Cr-51	0.00e+00	0.00e+00	4.64e+04	2.77e+04	1.02e+04	6.16e+04	1.17e+07
Mn-54	0.00e+00	3.13e+08	5.97e+07	0.00e+00	9.31e+07	0.00e+00	9.58e+08
Mn-56	0.00e+00	1.53e+01	2.72e+00	0.00e+00	1.94e+01	0.00e+00	4.89e+02
Fe-55	2.10e+08	1.45e+08	3.38e+07	0.00e+00	0.00e+00	8.08e+07	8.31e+07
Fe-59	1.26e+08	2.96e+08	1.14e+08	0.00e+00	0.00e+00	8.28e+07	9.88e+08
Co-58	0.00e+00	3.07e+07	6.89e+07	0.00e+00	0.00e+00	0.00e+00	6.23e+08
Co-60	0.00e+00	1.67e+08	3.69e+08	0.00e+00	0.00e+00	0.00e+00	3.14e+09
Ni-63	1.04e+10	7.21e+08	3.49e+08	0.00e+00	0.00e+00	0.00e+00	1.50e+08
Ni-65	5.96e+01	7.75e+00	3.54e+00	0.00e+00	0.00e+00	0.00e+00	1.97e+02
Cu-64	0.00e+00	9.15e+03	4.29e+03	0.00e+00	2.31e+04	0.00e+00	7.79e+05
Zn-65	3.17e+08	1.01e+09	4.56e+08	0.00e+00	6.75e+08	0.00e+00	6.36e+08
Zn-69	5.06e-06	9.67e-06	6.72e-07	0.00e+00	6.28e-06	0.00e+00	1.45e-06
Br-83	0.00e+00	0.00e+00	3.01e+00	0.00e+00	0.00e+00	0.00e+00	4.33e+00
Br-84	0.00e+00	0.00e+00	2.14e-11	0.00e+00	0.00e+00	0.00e+00	1.68e-16
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.19e+08	1.02e+08	0.00e+00	0.00e+00	0.00e+00	4.32e+07
Rb-88	0.00e+00	2.64e-22	1.40e-22	0.00e+00	0.00e+00	0.00e+00	3.65e-33
Rb-89	0.00e+00	2.88e-26	2.03e-26	0.00e+00	0.00e+00	0.00e+00	1.67e-39
Sr-89	9.96e+09	0.00e+00	2.86e+08	0.00e+00	0.00e+00	0.00e+00	1.60e+09
Sr-90	6.05e+11	0.00e+00	1.48e+11	0.00e+00	0.00e+00	0.00e+00	1.75e+10
Sr-91	3.02e+05	0.00e+00	1.22e+04	0.00e+00	0.00e+00	0.00e+00	1.44e+06
Sr-92	4.15e+02	0.00e+00	1.79e+01	0.00e+00	0.00e+00	0.00e+00	8.21e+03
Y-90	1.33e+04	0.00e+00	3.56e+02	0.00e+00	0.00e+00	0.00e+00	1.41e+08
Y-91	5.11e+06	0.00e+00	1.37e+05	0.00e+00	0.00e+00	0.00e+00	2.81e+09
Y-91m	4.76e-09	0.00e+00	1.84e-10	0.00e+00	0.00e+00	0.00e+00	1.40e-08
Y-92	8.96e-01	0.00e+00	2.62e-02	0.00e+00	0.00e+00	0.00e+00	1.57e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

LEAFY VEGETABLE PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Leafy/Produce Vegetation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.68e+02	0.00e+00	4.65e+00	0.00e+00	0.00e+00	0.00e+00	5.34e+06
Zr-95	1.17e+06	3.77e+05	2.52e+05	0.00e+00	5.91e+05	0.00e+00	1.19e+09
Zr-97	3.36e+02	6.77e+01	3.10e+01	0.00e+00	1.02e+02	0.00e+00	2.10e+07
Nb-95	1.42e+05	7.91e+04	4.25e+04	0.00e+00	7.82e+04	0.00e+00	4.80e+08
Mo-99	0.00e+00	6.14e+06	1.17e+06	0.00e+00	1.39e+07	0.00e+00	1.42e+07
Tc-101	5.93e-31	8.55e-31	8.39e-30	0.00e+00	1.54e-29	4.37e-31	0.00e+00
Tc-99m	3.06e+00	8.66e+00	1.10e+02	0.00e+00	1.31e+02	4.24e+00	5.12e+03
Ru-103	4.77e+06	0.00e+00	2.05e+06	0.00e+00	1.82e+07	0.00e+00	5.57e+08
Ru-105	5.29e+01	0.00e+00	2.09e+01	0.00e+00	6.84e+02	0.00e+00	3.24e+04
Ru-106	1.93e+08	0.00e+00	2.44e+07	0.00e+00	3.72e+08	0.00e+00	1.25e+10
Ag-110m	1.05e+07	9.74e+06	5.79e+06	0.00e+00	1.92e+07	0.00e+00	3.98e+09
Te-125m	9.65e+07	3.50e+07	1.29e+07	2.90e+07	3.93e+08	0.00e+00	3.85e+08
Te-127	5.61e+03	2.02e+03	1.21e+03	4.16e+03	2.29e+04	0.00e+00	4.43e+05
Te-127m	3.49e+08	1.25e+08	4.25e+07	8.92e+07	1.42e+09	0.00e+00	1.17e+09
Te-129	7.13e-04	2.68e-04	1.74e-04	5.48e-04	3.00e-03	0.00e+00	5.38e-04
Te-129m	2.51e+08	9.37e+07	3.98e+07	8.63e+07	1.05e+09	0.00e+00	1.26e+09
Te-131	1.25e-15	5.21e-16	3.94e-16	1.03e-15	5.47e-15	0.00e+00	1.77e-16
Te-131m	9.10e+05	4.45e+05	3.71e+05	7.05e+05	4.51e+06	0.00e+00	4.42e+07
Te-132	4.30e+06	2.78e+06	2.61e+06	3.07e+06	2.68e+07	0.00e+00	1.31e+08
I-130	3.90e+05	1.15e+06	4.54e+05	9.75e+07	1.79e+06	0.00e+00	9.90e+05
I-131	8.07e+07	1.15e+08	6.62e+07	3.78e+10	1.98e+08	0.00e+00	3.05e+07
I-132	5.57e+01	1.49e+02	5.21e+01	5.21e+03	2.37e+02	0.00e+00	2.80e+01
I-133	2.08e+06	3.61e+06	1.10e+06	5.31e+08	6.31e+06	0.00e+00	3.25e+06
I-134	8.84e-05	2.40e-04	8.59e-05	4.16e-03	3.82e-04	0.00e+00	2.09e-07
I-135	3.85e+04	1.01e+05	3.72e+04	6.65e+06	1.62e+05	0.00e+00	1.14e+05
Cs-134	4.67e+09	1.11e+10	9.08e+09	0.00e+00	3.59e+09	1.19e+09	1.94e+08
Cs-136	4.26e+07	1.68e+08	1.21e+08	0.00e+00	9.37e+07	1.28e+07	1.91e+07
Cs-137	6.36e+09	8.70e+09	5.70e+09	0.00e+00	2.95e+09	9.81e+08	1.68e+08
Cs-138	3.39e-11	6.70e-11	3.32e-11	0.00e+00	4.92e-11	4.86e-12	2.86e-16
Ba-139	2.70e-02	1.92e-05	7.91e-04	0.00e+00	1.80e-05	1.09e-05	4.79e-02

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

LEAFY VEGETABLE PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Leafy/Produce Vegetation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	1.28e+08	1.61e+05	8.41e+06	0.00e+00	5.48e+04	9.23e+04	2.64e+08
Ba-141	8.94e-22	6.76e-25	3.02e-23	0.00e+00	6.28e-25	3.83e-25	4.21e-31
Ba-142	3.88e-39	0.00e+00	2.44e-40	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	1.97e+03	9.95e+02	2.63e+02	0.00e+00	0.00e+00	0.00e+00	7.30e+07
La-142	1.92e-04	8.75e-05	2.18e-05	0.00e+00	0.00e+00	0.00e+00	6.39e-01
Ce-141	1.97e+05	1.33e+05	1.51e+04	0.00e+00	6.19e+04	0.00e+00	5.09e+08
Ce-143	9.95e+02	7.36e+05	8.14e+01	0.00e+00	3.24e+02	0.00e+00	2.75e+07
Ce-144	3.29e+07	1.38e+07	1.77e+06	0.00e+00	8.16e+06	0.00e+00	1.11e+10
Pr-143	6.26e+04	2.51e+04	3.10e+03	0.00e+00	1.45e+04	0.00e+00	2.74e+08
Pr-144	2.36e-26	9.81e-27	1.20e-27	0.00e+00	5.53e-27	0.00e+00	3.40e-33
Nd-147	3.33e+04	3.85e+04	2.30e+03	0.00e+00	2.25e+04	0.00e+00	1.85e+08
W-187	3.79e+04	3.17e+04	1.11e+04	0.00e+00	0.00e+00	0.00e+00	1.04e+07
Np-239	1.43e+03	1.40e+02	7.73e+01	0.00e+00	4.37e+02	0.00e+00	2.88e+07

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

LEAFY VEGETABLE PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Leafy/Produce Vegetation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	2.59e+03	2.59e+03	2.59e+03	2.59e+03	2.59e+03	2.59e+03
C-14	3.69e+08	7.38e+07	7.38e+07	7.38e+07	7.38e+07	7.38e+07	7.38e+07
Na-24	2.38e+05	2.38e+05	2.38e+05	2.38e+05	2.38e+05	2.38e+05	2.38e+05
P-32	1.61e+09	9.96e+07	6.23e+07	0.00e+00	0.00e+00	0.00e+00	1.35e+08
Cr-51	0.00e+00	0.00e+00	6.16e+04	3.42e+04	1.35e+04	8.80e+04	1.04e+07
Mn-54	0.00e+00	4.54e+08	9.01e+07	0.00e+00	1.36e+08	0.00e+00	9.32e+08
Mn-56	0.00e+00	1.38e+01	2.46e+00	0.00e+00	1.75e+01	0.00e+00	9.09e+02
Fe-55	3.26e+08	2.31e+08	5.39e+07	0.00e+00	0.00e+00	1.47e+08	1.00e+08
Fe-59	1.79e+08	4.18e+08	1.62e+08	0.00e+00	0.00e+00	1.32e+08	9.90e+08
Co-58	0.00e+00	4.36e+07	1.00e+08	0.00e+00	0.00e+00	0.00e+00	6.01e+08
Co-60	0.00e+00	2.49e+08	5.60e+08	0.00e+00	0.00e+00	0.00e+00	3.24e+09
Ni-63	1.61e+10	1.13e+09	5.45e+08	0.00e+00	0.00e+00	0.00e+00	1.81e+08
Ni-65	5.55e+01	7.09e+00	3.23e+00	0.00e+00	0.00e+00	0.00e+00	3.85e+02
Cu-64	0.00e+00	8.29e+03	3.90e+03	0.00e+00	2.10e+04	0.00e+00	6.43e+05
Zn-65	4.24e+08	1.47e+09	6.86e+08	0.00e+00	9.42e+08	0.00e+00	6.23e+08
Zn-69	4.73e-06	9.02e-06	6.31e-07	0.00e+00	5.89e-06	0.00e+00	1.66e-05
Br-83	0.00e+00	0.00e+00	2.82e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	1.95e-11	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.73e+08	1.28e+08	0.00e+00	0.00e+00	0.00e+00	4.05e+07
Rb-88	0.00e+00	2.44e-22	1.30e-22	0.00e+00	0.00e+00	0.00e+00	2.09e-29
Rb-89	0.00e+00	2.59e-26	1.83e-26	0.00e+00	0.00e+00	0.00e+00	3.98e-35
Sr-89	1.51e+10	0.00e+00	4.33e+08	0.00e+00	0.00e+00	0.00e+00	1.80e+09
Sr-90	7.51e+11	0.00e+00	1.85e+11	0.00e+00	0.00e+00	0.00e+00	2.11e+10
Sr-91	2.82e+05	0.00e+00	1.12e+04	0.00e+00	0.00e+00	0.00e+00	1.28e+06
Sr-92	3.86e+02	0.00e+00	1.65e+01	0.00e+00	0.00e+00	0.00e+00	9.83e+03
Y-90	1.24e+04	0.00e+00	3.34e+02	0.00e+00	0.00e+00	0.00e+00	1.02e+08
Y-91	7.83e+06	0.00e+00	2.10e+05	0.00e+00	0.00e+00	0.00e+00	3.21e+09
Y-91m	4.43e-09	0.00e+00	1.69e-10	0.00e+00	0.00e+00	0.00e+00	2.09e-07
Y-92	8.42e-01	0.00e+00	2.43e-02	0.00e+00	0.00e+00	0.00e+00	2.31e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

LEAFY VEGETABLE PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Leafy/Produce Vegetation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.58e+02	0.00e+00	4.33e+00	0.00e+00	0.00e+00	0.00e+00	4.82e+06
Zr-95	1.72e+06	5.43e+05	3.73e+05	0.00e+00	7.98e+05	0.00e+00	1.25e+09
Zr-97	3.11e+02	6.15e+01	2.83e+01	0.00e+00	9.33e+01	0.00e+00	1.67e+07
Nb-95	1.92e+05	1.07e+05	5.87e+04	0.00e+00	1.03e+05	0.00e+00	4.56e+08
Mo-99	0.00e+00	5.64e+06	1.08e+06	0.00e+00	1.29e+07	0.00e+00	1.01e+07
Tc-101	5.52e-31	7.85e-31	7.71e-30	0.00e+00	1.42e-29	4.78e-31	1.34e-37
Tc-99m	2.70e+00	7.54e+00	9.77e+01	0.00e+00	1.12e+02	4.18e+00	4.95e+03
Ru-103	6.82e+06	0.00e+00	2.91e+06	0.00e+00	2.40e+07	0.00e+00	5.69e+08
Ru-105	4.92e+01	0.00e+00	1.91e+01	0.00e+00	6.20e+02	0.00e+00	3.97e+04
Ru-106	2.38e+08	0.00e+00	3.90e+07	0.00e+00	5.97e+08	0.00e+00	1.48e+10
Ag-1[illegible]	1.52e+07	1.43e+07	8.72e+06	0.00e+00	2.73e+07	0.00e+00	4.03e+09
Te-12[illegible]m	1.48e+08	5.34e+07	1.98e+07	4.14e+07	0.00e+00	0.00e+00	4.37e+08
Te-127	5.29e+03	1.88e+03	1.14e+03	3.65e+03	2.14e+04	0.00e+00	4.09e+05
Te-127m	5.51e+08	1.96e+08	6.56e+07	1.31e+08	2.23e+09	0.00e+00	1.37e+09
Te-129	6.68e-04	2.49e-04	1.49e-04	4.77e-04	2.80e-03	0.00e+00	3.65e-03
Te-129m	3.61e+08	1.34e+08	5.72e+07	1.17e+08	1.51e+09	0.00e+00	1.36e+09
Te-131	1.16e-15	4.78e-16	3.62e-16	8.93e-16	5.07e-15	0.00e+00	9.52e-17
Te-131m	8.42e+05	4.04e+05	3.37e+05	6.07e+05	4.21e+06	0.00e+00	3.24e+07
Te-132	3.90e+06	2.47e+06	2.33e+06	2.61e+06	2.37e+07	0.00e+00	7.83e+07
I-130	3.49e+05	1.01e+06	4.03e+05	8.22e+07	1.55e+06	0.00e+00	7.75e+05
I-131	7.68e+07	1.08e+08	5.78e+07	3.14e+10	1.85e+08	0.00e+00	2.13e+07
I-132	5.02e+01	1.31e+02	4.72e+01	4.43e+03	2.07e+02	0.00e+00	5.72e+01
I-133	1.93e+06	3.27e+06	9.99e+05	4.57e+08	5.74e+06	0.00e+00	2.48e+06
I-134	7.99e-05	2.12e-04	7.61e-05	3.53e-03	3.34e-04	0.00e+00	2.79e-06
I-135	3.48e+04	8.96e+04	3.32e+04	5.76e+06	1.42e+05	0.00e+00	9.93e+04
Cs-134	7.10e+09	1.67e+10	7.75e+09	0.00e+00	5.31e+09	2.03e+09	2.08e+08
Cs-136	4.37e+07	1.72e+08	1.15e+08	0.00e+00	9.36e+07	1.48e+07	1.38e+07
Cs-137	1.01e+10	1.35e+10	4.69e+09	0.00e+00	4.59e+09	1.75e+09	1.92e+08
Cs-138	3.13e-11	6.01e-11	3.00e-11	0.00e+00	4.44e-11	5.16e-12	2.73e-14
Ba-139	2.54e-02	1.79e-05	7.40e-04	0.00e+00	1.69e-05	1.23e-05	2.27e-01

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

LEAFY VEGETABLE PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Leafy/Produce Vegetation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	1.38e+08	1.69e+05	8.89e+06	0.00e+00	5.73e+04	1.14e+05	2.13e+08
Ba-141	8.36e-22	6.24e-25	2.79e-23	0.00e+00	5.79e-25	4.27e-25	1.78e-27
Ba-142	3.57e-39	0.00e+00	2.20e-40	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	1.80e+03	8.86e+02	2.36e+02	0.00e+00	0.00e+00	0.00e+00	5.09e+07
La-142	1.77e-04	7.84e-05	1.95e-05	0.00e+00	0.00e+00	0.00e+00	2.39e+00
Ce-141	2.83e+05	1.89e+05	2.17e+04	0.00e+00	8.89e+04	0.00e+00	5.40e+08
Ce-143	9.30e+02	6.77e+05	7.56e+01	0.00e+00	3.04e+02	0.00e+00	2.04e+07
Ce-144	5.27e+07	2.18e+07	2.83e+06	0.00e+00	1.30e+07	0.00e+00	1.33e+10
Pr-143	7.00e+04	2.79e+04	3.48e+03	0.00e+00	1.62e+04	0.00e+00	2.30e+08
Pr-144	2.22e-26	9.07e-27	1.12e-27	0.00e+00	5.20e-27	0.00e+00	2.44e-29
Nd-147	3.62e+04	3.93e+04	2.36e+03	0.00e+00	2.31e+04	0.00e+00	1.42e+08
W-187	3.53e+04	2.87e+04	1.01e+04	0.00e+00	0.00e+00	0.00e+00	7.78e+06
Np-239	1.38e+03	1.31e+02	7.25e+01	0.00e+00	4.10e+02	0.00e+00	2.10e+07

Conversion factors are in units of square meter-mrem/yr per uCi/sec fo[illegible] nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

LEAFY VEGETABLE PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Leafy/Produce Vegetation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	4.01e+03	4.01e+03	4.01e+03	4.01e+03	4.01e+03	4.01e+03
C-14	8.89e+08	1.78e+08	1.78e+08	1.78e+08	1.78e+08	1.78e+08	1.78e+08
Na-24	3.71e+05	3.71e+06	3.71e+05	3.71e+05	3.71e+05	3.71e+05	3.71e+05
P-32	3.37e+09	1.58e+08	1.30e+08	0.00e+00	0.00e+00	0.00e+00	9.30e+07
Cr-51	0.00e+00	0.00e+00	1.17e+05	6.50e+04	1.78e+04	1.19e+05	6.21e+06
Mn-54	0.00e+00	6.65e+08	1.77e+08	0.00e+00	1.86e+08	0.00e+00	5.58e+08
Mn-56	0.00e+00	1.81e+01	4.08e+00	0.00e+00	2.19e+01	0.00e+00	2.62e+03
Fe-55	8.01e+08	4.25e+08	1.32e+08	0.00e+00	0.00e+00	2.40e+08	7.87e+07
Fe-59	3.97e+08	6.43e+08	3.20e+08	0.00e+00	0.00e+00	1.86e+08	6.69e+08
Co-58	0.00e+00	6.44e+07	1.97e+08	0.00e+00	0.00e+00	0.00e+00	3.75e+08
Co-60	0.00e+00	3.78e+08	1.12e+09	0.00e+00	0.00e+00	0.00e+00	2.10e+09
Ni-63	3.95e+10	2.11e+09	1.38e+09	0.00e+00	0.00e+00	0.00e+00	1.42e+08
Ni-65	1.02e+02	9.59e+00	5.60e+00	0.00e+00	0.00e+00	0.00e+00	1.17e+03
Cu-64	0.00e+00	1.09e+04	6.60e+03	0.00e+00	2.64e+04	0.00e+00	5.13e+05
Zn-65	8.12e+08	2.16e+09	1.35e+09	0.00e+00	1.36e+09	0.00e+00	3.80e+08
Zn-69	8.73e-06	1.26e-05	1.17e-06	0.00e+00	7.66e-06	0.00e+00	7.96e-04
Br-83	0.00e+00	0.00e+00	5.20e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	3.30e-11	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	4.52e+08	2.78e+08	0.00e+00	0.00e+00	0.00e+00	2.90e+07
Rb-88	0.00e+00	3.37e-22	2.34e-22	0.00e+00	0.00e+00	0.00e+00	1.65e-23
Rb-89	0.00e+00	3.42e-26	3.04e-26	0.00e+00	0.00e+00	0.00e+00	2.98e-28
Sr-89	3.59e+10	0.00e+00	1.03e+09	0.00e+00	0.00e+00	0.00e+00	1.39e+09
Sr-90	1.24e+12	0.00e+00	3.15e+11	0.00e+00	0.00e+00	0.00e+00	1.67e+10
Sr-91	5.20e+05	0.00e+00	1.96e+04	0.00e+00	0.00e+00	0.00e+00	1.15e+06
Sr-92	7.07e+02	0.00e+00	2.84e+01	0.00e+00	0.00e+00	0.00e+00	1.34e+04
Y-90	2.30e+04	0.00e+00	6.17e+02	0.00e+00	0.00e+00	0.00e+00	6.56e+07
Y-91	1.86e+07	0.00e+00	4.98e+05	0.00e+00	0.00e+00	0.00e+00	2.48e+09
Y-91m	8.12e-09	0.00e+00	2.95e-10	0.00e+00	0.00e+00	0.00e+00	1.59e-05
Y-92	1.55e+00	0.00e+00	4.43e-02	0.00e+00	0.00e+00	0.00e+00	4.48e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

LEAFY VEGETABLE PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Leafy/Produce Vegetation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	2.91e+02	0.00e+00	7.98e+00	0.00e+00	0.00e+00	0.00e+00	4.34e+06
Zr-95	3.86e+06	8.48e+05	7.54e+05	0.00e+00	1.21e+06	0.00e+00	8.84e+08
Zr-97	5.68e+02	8.20e+01	4.84e+01	0.00e+00	1.18e+02	0.00e+00	1.24e+07
Nb-95	4.10e+05	1.60e+05	1.14e+05	0.00e+00	1.50e+05	0.00e+00	2.95e+08
Mo-99	0.00e+00	7.70e+06	1.91e+06	0.00e+00	1.64e+07	0.00e+00	6.37e+06
Tc-101	1.02e-30	1.06e-30	1.35e-29	0.00e+00	1.81e-29	5.62e-31	3.38e-30
Tc-99m	4.65e+00	9.12e+00	1.51e+02	0.00e+00	1.32e+02	4.63e+00	5.19e+03
Ru-103	1.53e+07	0.00e+00	5.89e+06	0.00e+00	3.86e+07	0.00e+00	3.96e+08
Ru-105	9.01e+01	0.00e+00	3.27e+01	0.00e+00	7.92e+02	0.00e+00	5.88e+04
Ru-106	7.45e+08	0.00e+00	9.30e+07	0.00e+00	1.01e+09	0.00e+00	1.16e+10
Ag-110m	3.21e+07	2.17e+07	1.73e+07	0.00e+00	4.04e+07	0.00e+00	2.58e+09
Te-125m	3.50e+08	9.50e+07	4.67e+07	9.83e+07	0.00e+00	0.00e+00	3.38e+08
Te-127	9.76e+03	2.63e+03	2.09e+03	6.76e+03	2.78e+04	0.00e+00	3.81e+05
Te-127m	1.32e+09	3.56e+08	1.57e+08	3.16e+08	3.77e+09	0.00e+00	1.07e+09
Te-129	1.24e-03	3.45e-04	2.94e-04	8.82e-04	3.62e-03	0.00e+00	7.70e-02
Te-129m	8.40e+08	2.35e+08	1.30e+08	2.71e+08	2.47e+09	0.00e+00	1.03e+09
Te-131	2.14e-15	6.51e-16	6.35e-16	1.63e-15	6.46e-15	0.00e+00	1.12e-14
Te-131m	1.54e+06	5.32e+05	5.66e+05	1.09e+06	5.15e+06	0.00e+00	2.16e+07
Te-132	6.99e+06	3.10e+06	3.74e+06	4.51e+06	2.87e+07	0.00e+00	3.12e+07
I-130	6.12e+05	1.24e+06	6.37e+05	1.36e+08	1.85e+06	0.00e+00	5.78e+05
I-131	1.43e+08	1.44e+08	8.16e+07	4.75e+10	2.36e+08	0.00e+00	1.28e+07
I-132	8.91e+01	1.64e+02	7.53e+01	7.60e+03	2.51e+02	0.00e+00	1.93e+02
I-133	3.52e+06	4.35e+06	1.65e+06	8.08e+08	7.25e+06	0.00e+00	1.75e+06
I-134	1.42e-04	2.64e-04	1.21e-04	6.07e-03	4.03e-04	0.00e+00	1.75e-04
I-135	6.18e+04	1.11e+05	5.26e+04	9.86e+06	1.71e+05	0.00e+00	8.48e+04
Cs-134	1.60e+10	2.63e+10	5.55e+09	0.00e+00	8.15e+09	2.93e+09	1.42e+08
Cs-136	8.23e+07	2.33e+08	1.46e+08	0.00e+00	1.21e+08	1.80e+07	7.95e+06
Cs-137	2.39e+10	2.29e+10	3.38e+09	0.00e+00	7.46e+09	2.68e+09	1.43e+08
Cs-138	5.69e-11	7.91e-11	5.02e-11	0.00e+00	5.57e-11	5.99e-12	3.64e-11
Ba-139	4.69e-02	2.50e-05	1.36e-03	0.00e+00	2.18e-05	1.47e-05	2.70e+00

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

LEAFY VEGETABLE PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Leafy/Produce Vegetation Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.76e+08	2.42e+05	1.61e+07	0.00e+00	7.88e+04	1.44e+05	1.40e+08
Ba-141	1.54e-21	8.64e-25	5.02e-23	0.00e+00	7.47e-25	5.07e-24	8.79e-22
Ba-142	6.46e-39	0.00e+00	3.61e-40	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	3.24e+03	1.13e+03	3.53e+02	0.00e+00	0.00e+00	0.00e+00	3.16e+07
La-142	3.20e-04	1.02e-04	3.19e-05	0.00e+00	0.00e+00	0.00e+00	2.02e+01
Ce-141	6.55e+05	3.27e+05	4.85e+04	0.00e+00	1.43e+06	0.00e+00	4.08e+08
Ce-143	1.71e+03	9.29e+05	1.35e+02	0.00e+00	3.90e+02	0.00e+00	1.36e+07
Ce-144	1.27e+08	3.98e+07	6.78e+06	0.00e+00	2.21e+07	0.00e+00	1.04e+10
Pr-143	1.45e+05	4.37e+04	7.22e+03	0.00e+00	2.36e+04	0.00e+00	1.57e+08
Pr-144	4.11e-26	1.27e-26	2.07e-27	0.00e+00	6.73e-27	0.00e+00	2.74e-23
Nd-147	7.14e+04	5.78e+04	4.48e+03	0.00e+00	3.17e+04	0.00e+00	9.16e+07
W-187	6.41e+04	3.80e+04	1.70e+04	0.00e+00	0.00e+00	0.00e+00	5.34e+06
Np-239	2.56e+03	1.24e+02	1.29e+02	0.00e+00	5.31e+02	0.00e+00	1.36e+07

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.56e+03	1.56e+03	1.56e+03	1.56e+03	1.56e+03	1.56e+03
C-14	2.63e+08	5.27e+07	5.27e+07	5.27e+07	5.27e+07	5.27e+07	5.27e+07
Na-24	2.93e+05	2.93e+05	2.93e+05	2.93e+05	2.93e+05	2.93e+05	2.93e+05
P-32	2.05e+10	1.28e+09	7.93e+08	0.00e+00	0.00e+00	0.00e+00	2.31e+09
Cr-51	0.00e+00	0.00e+00	3.43e+03	2.05e+03	7.55e+02	4.55e+03	8.62e+05
Mn-54	0.00e+00	1.01e+06	1.93e+05	0.00e+00	3.00e+05	0.00e+00	3.09e+06
Mn-56	0.00e+00	4.98e-04	8.84e-05	0.00e+00	6.33e-04	0.00e+00	1.59e-02
Fe-55	3.26e+05	2.26e+05	5.26e+04	0.00e+00	0.00e+00	1.26e+05	1.29e+05
Fe-59	3.86e+05	9.07e+05	3.48e+05	0.00e+00	0.00e+00	2.54e+05	3.02e+06
Co-58	0.00e+00	5.66e+05	1.27e+06	0.00e+00	0.00e+00	0.00e+00	1.15e+07
Co-60	0.00e+00	1.97e+06	4.34e+06	0.00e+00	0.00e+00	0.00e+00	3.70e+07
Ni-63	8.07e+08	5.60e+07	2.71e+07	0.00e+00	0.00e+00	0.00e+00	1.17e+07
Ni-65	4.51e-02	5.86e-03	2.67e-03	0.00e+00	0.00e+00	0.00e+00	1.49e-01
Cu-64	0.00e+00	2.66e+03	1.25e+03	0.00e+00	6.72e+03	0.00e+00	2.27e+05
Zn-65	1.65e+08	5.24e+08	2.37e+08	0.00e+00	3.50e+08	0.00e+00	3.30e+08
Zn-69	2.62e-13	5.00e-13	3.48e-14	0.00e+00	3.25e-13	0.00e+00	7.52e-14
Br-83	0.00e+00	0.00e+00	1.42e-03	0.00e+00	0.00e+00	0.00e+00	2.05e-03
Br-84	0.00e+00	0.00e+00	2.49e-25	0.00e+00	0.00e+00	0.00e+00	1.96e-30
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	3.11e+08	1.45e+08	0.00e+00	0.00e+00	0.00e+00	6.14e+07
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	3.05e+09	0.00e+00	8.74e+07	0.00e+00	0.00e+00	0.00e+00	4.89e+08
Sr-90	9.83e+10	0.00e+00	2.41e+10	0.00e+00	0.00e+00	0.00e+00	2.84e+09
Sr-91	6.10e+04	0.00e+00	2.46e+03	0.00e+00	0.00e+00	0.00e+00	2.90e+05
Sr-92	1.04e+00	0.00e+00	4.50e-02	0.00e+00	0.00e+00	0.00e+00	2.06e+01
Y-90	8.51e+00	0.00e+00	2.28e-01	0.00e+00	0.00e+00	0.00e+00	9.02e+04
Y-91	1.03e+03	0.00e+00	2.76e+01	0.00e+00	0.00e+00	0.00e+00	5.67e+05
Y-91m	7.52e-21	0.00e+00	2.91e-22	0.00e+00	0.00e+00	0.00e+00	2.21e-20
Y-92	6.77e-06	0.00e+00	1.98e-07	0.00e+00	0.00e+00	0.00e+00	1.19e-01

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	2.69e-02	0.00e+00	7.43e-04	0.00e+00	0.00e+00	0.00e+00	8.53e+02
Zr-95	1.13e+02	3.63e+01	2.46e+01	0.00e+00	5.70e+01	0.00e+00	1.15e+05
Zr-97	5.21e-02	1.05e-02	4.81e-03	0.00e+00	1.59e-02	0.00e+00	3.26e+03
Nb-95	9.91e+03	5.51e+03	2.96e+03	0.00e+00	5.45e+03	0.00e+00	3.34e+07
Mo-99	0.00e+00	2.97e+06	5.66e+05	0.00e+00	6.73e+06	0.00e+00	6.89e+06
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	4.01e-01	1.13e+00	1.44e+01	0.00e+00	1.72e+01	5.55e-01	6.71e+02
Ru-103	1.22e+02	0.00e+00	5.26e+01	0.00e+00	4.66e+02	0.00e+00	1.43e+04
Ru-105	1.04e-04	0.00e+00	4.09e-05	0.00e+00	1.34e-03	0.00e+00	6.34e-02
Ru-106	2.45e+03	0.00e+00	3.10e+02	0.00e+00	4.73e+03	0.00e+00	1.58e+05
Ag-110m	6.99e+06	6.46e+06	3.84e+06	0.00e+00	1.27e+07	0.00e+00	2.64e+09
Te-125m	1.95e+06	7.08e+05	2.62e+05	5.88e+05	7.95e+05	0.00e+00	7.80e+06
Te-127	7.87e+01	2.82e+01	1.70e+01	5.83e+01	3.20e+02	0.00e+00	6.21e+03
Te-127m	5.49e+06	1.96e+06	6.69e+05	1.40e+06	2.23e+07	0.00e+00	1.84e+07
Te-129	3.50e-11	1.32e-11	8.53e-12	2.69e-11	1.47e-10	0.00e+00	2.64e-11
Te-129m	7.22e+06	2.69e+06	1.14e+06	2.48e+06	3.02e+07	0.00e+00	3.64e+07
Te-131	4.74e-34	1.98e-34	1.50e-34	3.90e-34	2.08e-33	0.00e+00	6.72e-35
Te-131m	4.34e+04	2.12e+04	1.77e+04	3.36e+04	2.15e+05	0.00e+00	2.11e+06
Te-132	2.88e+05	1.86e+05	1.75e+05	2.06e+05	1.80e+06	0.00e+00	8.82e+06
I-130	5.06e+05	1.49e+06	5.89e+05	1.26e+08	2.33e+06	0.00e+00	1.28e+06
I-131	3.55e+08	5.08e+08	2.91e+08	1.67e+11	8.71e+08	0.00e+00	1.34e+08
I-132	2.00e-01	5.36e-01	1.88e-01	1.88e+01	8.54e-01	0.00e+00	1.01e-01
I-133	4.65e+06	8.09e+06	2.47e+06	1.19e+09	1.41e+07	0.00e+00	7.27e+06
I-134	2.53e-12	6.87e-12	2.46e-12	1.19e-10	1.09e-11	0.00e+00	5.99e-15
I-135	1.55e+04	4.06e+04	1.50e+04	2.68e+06	6.51e+04	0.00e+00	4.58e+04
Cs-134	1.70e+10	4.03e+10	3.30e+10	0.00e+00	1.31e+10	4.33e+09	7.06e+08
Cs-136	7.90e+08	3.12e+09	2.24e+09	0.00e+00	1.73e+09	2.38e+08	3.54e+08
Cs-137	2.21e+10	3.03e+10	1.98e+10	0.00e+00	1.03e+10	3.42e+09	5.86e+08
Cs-138	2.91e-23	5.76e-23	2.85e-23	0.00e+00	4.23e-23	4.18e-24	2.46e-28
Ba-139	5.45e-09	3.88e-12	1.60e-10	0.00e+00	3.63e-12	2.20e-12	9.67e-09

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	3.23e+06	4.05e+03	2.11e+05	0.00e+00	1.38e+03	2.32e+03	6.64e+06
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	5.42e-01	2.73e-01	7.22e-02	0.00e+00	0.00e+00	0.00e+00	2.00e+04
La-142	2.28e-12	1.04e-12	2.59e-13	0.00e+00	0.00e+00	0.00e+00	7.58e-09
Ce-141	5.81e+02	3.93e+02	4.46e+01	0.00e+00	1.83e+02	0.00e+00	1.50e+06
Ce-143	4.99e+00	3.69e+03	4.09e-01	0.00e+00	1.63e+00	0.00e+00	1.38e+05
Ce-144	4.29e+04	1.79e+04	2.30e+03	0.00e+00	1.06e+04	0.00e+00	1.45e+07
Pr-143	1.89e+01	7.60e+00	9.39e-01	0.00e+00	4.39e+00	0.00e+00	8.30e+04
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	1.13e+01	1.31e+01	7.81e-01	0.00e+00	7.63e+00	0.00e+00	6.27e+04
W-187	7.83e+02	6.54e+02	2.29e+02	0.00e+00	0.00e+00	0.00e+00	2.14e+05
Np-239	4.41e-01	4.34e-02	2.39e-02	0.00e+00	1.35e-01	0.00e+00	8.89e+03

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	2.03e+03	2.03e+03	2.03e+03	2.03e+03	2.03e+03	2.03e+03
C-14	4.86e+08	9.72e+07	9.72e+07	9.72e+07	9.72e+07	9.72e+07	9.72e+07
Na-24	5.12e+05	5.12e+05	5.12e+05	5.12e+05	5.12e+05	5.12e+05	5.12e+05
P-32	3.79e+10	2.35e+09	1.47e+09	0.00e+00	0.00e+00	0.00e+00	3.18e+09
Cr-51	0.00e+00	0.00e+00	5.99e+03	3.33e+03	1.31e+03	8.55e+03	1.01e+06
Mn-54	0.00e+00	1.68e+06	3.34e+05	0.00e+00	5.02e+05	0.00e+00	3.45e+06
Mn-56	0.00e+00	8.83e-04	1.57e-04	0.00e+00	1.12e-03	0.00e+00	5.81e-02
Fe-55	5.79e+05	4.10e+05	9.57e+04	0.00e+00	0.00e+00	2.60e+05	1.78e+05
Fe-59	6.74e+05	1.57e+06	6.07e+05	0.00e+00	0.00e+00	4.96e+05	3.72e+06
Co-58	0.00e+00	9.52e+05	2.19e+06	0.00e+00	0.00e+00	0.00e+00	1.31e+07
Co-60	0.00e+00	3.34e+06	7.51e+06	0.00e+00	0.00e+00	0.00e+00	4.34e+07
Ni-63	1.42e+09	1.00e+08	4.81e+07	0.00e+00	0.00e+00	0.00e+00	1.59e+07
Ni-65	8.25e-02	1.05e-02	4.80e-03	0.00e+00	0.00e+00	0.00e+00	5.72e-01
Cu-64	0.00e+00	4.75e+03	2.23e+03	0.00e+00	1.20e+04	0.00e+00	3.68e+05
Zn-65	2.53e+08	8.78e+08	4.09e+08	0.00e+00	5.62e+08	0.00e+00	3.72e+08
Zn-69	4.82e-13	9.18e-13	6.42e-14	0.00e+00	6.00e-13	0.00e+00	1.69e-12
Br-83	0.00e+00	0.00e+00	2.62e-03	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	4.45e-25	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	5.67e+08	2.67e+08	0.00e+00	0.00e+00	0.00e+00	8.40e+07
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	5.62e+09	0.00e+00	1.61e+08	0.00e+00	0.00e+00	0.00e+00	6.69e+08
Sr-90	1.39e+11	0.00e+00	3.43e+10	0.00e+00	0.00e+00	0.00e+00	3.90e+09
Sr-91	1.12e+05	0.00e+00	4.46e+03	0.00e+00	0.00e+00	0.00e+00	5.08e+05
Sr-92	1.90e+00	0.00e+00	8.11e-02	0.00e+00	0.00e+00	0.00e+00	4.85e+01
Y-90	1.56e+01	0.00e+00	4.21e-01	0.00e+00	0.00e+00	0.00e+00	1.29e+05
Y-91	1.90e+03	0.00e+00	5.08e+01	0.00e+00	0.00e+00	0.00e+00	7.77e+05
Y-91m	1.38e-20	0.00e+00	5.26e-22	0.00e+00	0.00e+00	0.00e+00	6.50e-19
Y-92	1.25e-05	0.00e+00	3.62e-07	0.00e+00	0.00e+00	0.00e+00	3.43e-01

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	4.96e-02	0.00e+00	1.36e-03	0.00e+00	0.00e+00	0.00e+00	1.52e+03
Zr-95	1.98e+02	6.25e+01	4.30e+01	0.00e+00	9.18e+01	0.00e+00	1.44e+05
Zr-97	9.48e-02	1.88e-02	8.64e-03	0.00e+00	2.84e-02	0.00e+00	5.08e+03
Nb-95	1.69e+04	9.37e+03	5.16e+03	0.00e+00	9.08e+03	0.00e+00	4.01e+07
Mo-99	0.00e+00	5.37e+06	1.02e+06	0.00e+00	1.23e+07	0.00e+00	9.62e+06
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	6.96e-01	1.94e+00	2.51e+01	0.00e+00	2.89e+01	1.08e+00	1.27e+03
Ru-103	2.17e+02	0.00e+00	9.29e+01	0.00e+00	7.66e+02	0.00e+00	1.81e+04
Ru-105	1.89e-04	0.00e+00	7.35e-05	0.00e+00	2.39e-03	0.00e+00	1.53e-01
Ru-106	3.47e+03	0.00e+00	5.67e+02	0.00e+00	8.68e+03	0.00e+00	2.16e+05
Ag-110m	1.16e+07	1.09e+07	6.65e+06	0.00e+00	2.08e+07	0.00e+00	3.07e+09
Te-125m	3.60e+06	1.30e+06	4.82e+05	1.01e+06	0.00e+00	0.00e+00	1.06e+07
Te-127	1.46e+02	5.17e+01	3.14e+01	1.01e+02	5.91e+02	0.00e+00	1.13e+04
Te-127m	1.01e+07	3.59e+06	1.20e+06	2.41e+06	4.10e+07	0.00e+00	2.52e+07
Te-129	6.45e-11	2.40e-11	1.44e-11	4.61e-11	2.71e-10	0.00e+00	3.53e-10
Te-129m	1.32e+07	4.90e+06	2.09e+06	4.26e+06	5.53e+07	0.00e+00	4.96e+07
Te-131	8.67e-34	3.57e-34	2.71e-34	6.68e-34	3.79e-33	0.00e+00	7.11e-35
Te-131m	7.89e+04	3.79e+04	3.16e+04	5.69e+04	3.95e+05	0.00e+00	3.04e+06
Te-132	5.15e+05	3.26e+05	3.07e+05	3.44e+05	3.13e+06	0.00e+00	1.03e+07
I-130	8.89e+05	2.57e+06	1.03e+06	2.10e+08	3.96e+06	0.00e+00	1.98e+06
I-131	6.45e+08	9.03e+08	4.85e+08	2.63e+11	1.55e+09	0.00e+00	1.79e+08
I-132	3.55e-01	9.30e-01	3.34e-01	3.13e+01	1.47e+00	0.00e+00	4.05e-01
I-133	8.50e+06	1.44e+07	4.40e+06	2.01e+09	2.53e+07	0.00e+00	1.09e+07
I-134	4.49e-12	1.19e-11	4.28e-12	1.98e-10	1.88e-11	0.00e+00	1.57e-13
I-135	2.75e+04	7.09e+04	2.63e+04	4.56e+06	1.12e+05	0.00e+00	7.85e+04
Cs-134	2.94e+10	6.93e+10	3.22e+10	0.00e+00	2.20e+10	8.41e+09	8.62e+08
Cs-136	1.34e+09	5.29e+09	3.55e+09	0.00e+00	2.88e+09	4.54e+08	4.26e+08
Cs-137	4.02e+10	5.34e+10	1.86e+10	0.00e+00	1.82e+10	7.06e+09	7.60e+08
Cs-138	5.29e-23	1.02e-22	5.08e-23	0.00e+00	7.49e-23	8.72e-24	4.61e-26
Ba-139	1.01e-08	7.09e-12	2.94e-10	0.00e+00	6.69e-12	4.89e-12	8.99e-08

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Be-140	5.82e+06	7.14e+03	3.75e+05	0.00e+00	2.42e+03	4.80e+03	8.98e+06
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Be-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	9.73e-01	4.78e-01	1.27e-01	0.00e+00	0.00e+00	0.00e+00	2.75e+04
La-142	4.12e-12	1.83e-12	4.56e-13	0.00e+00	0.00e+00	0.00e+00	5.57e-08
Ce-141	1.07e+03	7.12e+02	8.17e+01	0.00e+00	3.35e+02	0.00e+00	2.04e+06
Ce-143	9.18e+00	6.68e+03	7.46e-01	0.00e+00	2.99e+00	0.00e+00	2.01e+05
Ce-144	7.90e+04	3.27e+04	4.24e+03	0.00e+00	1.95e+04	0.00e+00	1.99e+07
Pr-143	3.48e+01	1.39e+01	1.73e+00	0.00e+00	8.08e+00	0.00e+00	1.15e+05
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	2.17e+01	2.36e+01	1.42e+00	0.00e+00	1.39e+01	0.00e+00	8.53e+04
W-187	1.43e+03	1.17e+03	4.09e+02	0.00e+00	0.00e+00	0.00e+00	3.16e+05
Np-239	8.42e-01	7.94e-02	4.41e-02	0.00e+00	2.49e-01	0.00e+00	1.28e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	3.20e+03	3.20e+03	3.20e+03	3.20e+03	3.20e+03	3.20e+03
C-14	1.19e+09	2.39e+08	2.39e+08	2.39e+08	2.39e+08	2.39e+08	2.39e+08
Na-24	1.07e+06	1.07e+07	1.07e+06	1.07e+06	1.07e+06	1.07e+06	1.07e+06
P-32	9.33e+10	4.37e+09	3.60e+09	0.00e+00	0.00e+00	0.00e+00	2.58e+09
Cr-51	0.00e+00	0.00e+00	1.22e+04	6.78e+03	1.85e+03	1.24e+04	6.48e+05
Mn-54	0.00e+00	2.52e+06	6.70e+05	0.00e+00	7.06e+05	0.00e+00	2.11e+06
Mn-56	0.00e+00	1.54e-03	3.48e-04	0.00e+00	1.86e-03	0.00e+00	2.23e-01
Fe-55	1.45e+06	7.71e+05	2.39e+05	0.00e+00	0.00e+00	4.36e+05	1.43e+05
Fe-59	1.56e+06	2.53e+06	1.26e+06	0.00e+00	0.00e+00	7.33e+05	2.63e+06
Co-58	0.00e+00	1.45e+06	4.45e+06	0.00e+00	0.00e+00	0.00e+00	8.49e+06
Co-60	0.00e+00	5.18e+06	1.53e+07	0.00e+00	0.00e+00	0.00e+00	2.87e+07
Ni-63	3.56e+09	1.90e+08	1.24e+08	0.00e+00	0.00e+00	0.00e+00	1.28e+07
Ni-65	2.02e-01	1.90e-02	1.11e-02	0.00e+00	0.00e+00	0.00e+00	2.33e+00
Cu-64	0.00e+00	8.34e+03	5.04e+03	0.00e+00	2.02e+04	0.00e+00	3.92e+05
Zn-65	4.96e+08	1.32e+09	8.22e+08	0.00e+00	8.33e+08	0.00e+00	2.32e+08
Zn-69	1.18e-12	1.71e-12	1.58e-13	0.00e+00	1.04e-12	0.00e+00	1.08e-10
Br-83	0.00e+00	0.00e+00	6.44e-03	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	1.01e-24	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.05e+09	6.47e+08	0.00e+00	0.00e+00	0.00e+00	6.77e+07
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	1.39e+10	0.00e+00	3.97e+08	0.00e+00	0.00e+00	0.00e+00	5.38e+08
Sr-90	2.35e+11	0.00e+00	5.95e+10	0.00e+00	0.00e+00	0.00e+00	3.16e+09
Sr-91	2.75e+05	0.00e+00	1.04e+04	0.00e+00	0.00e+00	0.00e+00	6.07e+05
Sr-92	4.65e+00	0.00e+00	1.86e-01	0.00e+00	0.00e+00	0.00e+00	8.81e+01
Y-90	3.87e+01	0.00e+00	1.04e+00	0.00e+00	0.00e+00	0.00e+00	1.10e+05
Y-91	4.68e+03	0.00e+00	1.25e+02	0.00e+00	0.00e+00	0.00e+00	6.24e+05
Y-91m	3.36e-20	0.00e+00	1.22e-21	0.00e+00	0.00e+00	0.00e+00	6.59e-17
Y-92	3.07e-05	0.00e+00	8.78e-07	0.00e+00	0.00e+00	0.00e+00	8.87e-01

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.22e-01	0.00e+00	3.35e-03	0.00e+00	0.00e+00	0.00e+00	1.82e+03
Zr-95	4.60e+02	1.01e+02	9.00e+01	0.00e+00	1.45e+02	0.00e+00	1.05e+05
Zr-97	2.31e-01	3.33e-02	1.97e-02	0.00e+00	4.79e-02	0.00e+00	5.05e+03
Nb-95	3.81e+04	1.49e+04	1.06e+04	0.00e+00	1.40e+04	0.00e+00	2.75e+07
Mo-99	0.00e+00	9.77e+06	2.42e+06	0.00e+00	2.09e+07	0.00e+00	8.08e+06
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	1.60e+00	3.13e+00	5.19e+01	0.00e+00	4.55e+01	1.59e+00	1.78e+03
Ru-103	5.14e+02	0.00e+00	1.98e+02	0.00e+00	1.29e+03	0.00e+00	1.33e+04
Ru-105	4.62e-04	0.00e+00	1.68e-04	0.00e+00	4.06e-03	0.00e+00	3.02e-01
Ru-106	1.11e+04	0.00e+00	1.38e+03	0.00e+00	1.50e+04	0.00e+00	1.72e+05
Ag-110m	2.51e+07	1.69e+07	1.35e+07	0.00e+00	3.15e+07	0.00e+00	2.01e+09
Te-125m	8.85e+06	2.40e+06	1.18e+06	2.48e+06	0.00e+00	0.00e+00	8.54e+06
Te-127	3.59e+02	9.67e+01	7.69e+01	2.48e+02	1.02e+03	0.00e+00	1.40e+04
Te-127m	2.50e+07	6.72e+06	2.96e+06	5.97e+06	7.12e+07	0.00e+00	2.02e+07
Te-129	1.59e-10	4.44e-11	3.78e-11	1.14e-10	4.65e-10	0.00e+00	9.90e-09
Te-129m	3.26e+07	9.09e+06	5.06e+06	1.05e+07	9.56e+07	0.00e+00	3.97e+07
Te-131	2.13e-33	6.48e-34	6.33e-34	1.63e-33	6.43e-33	0.00e+00	1.12e-32
Te-131m	1.92e+05	6.65e+04	7.07e+04	1.37e+05	6.43e+05	0.00e+00	2.70e+06
Te-132	1.23e+06	5.44e+05	6.58e+05	7.93e+05	5.05e+06	0.00e+00	5.48e+06
I-130	2.08e+06	4.20e+06	2.16e+06	4.63e+08	6.28e+06	0.00e+00	1.97e+06
I-131	1.56e+09	1.57e+09	8.94e+08	5.20e+11	2.58e+09	0.00e+00	1.40e+08
I-132	8.41e-01	1.54e+00	7.10e-01	7.17e+01	2.36e+00	0.00e+00	1.82e+00
I-133	2.06e+07	2.55e+07	9.66e+06	4.74e+09	4.25e+07	0.00e+00	1.03e+07
I-134	1.06e-11	1.98e-11	9.09e-12	4.54e-10	3.02e-11	0.00e+00	1.31e-11
I-135	6.52e+04	1.17e+05	5.55e+04	1.04e+07	1.80e+05	0.00e+00	8.94e+04
Cs-134	6.79e+10	1.11e+11	2.35e+10	0.00e+00	3.45e+10	1.24e+10	6.01e+08
Cs-136	3.04e+09	8.58e+09	5.40e+09	0.00e+00	4.44e+09	6.63e+08	2.93e+08
Cs-137	9.67e+10	9.26e+10	1.37e+10	0.00e+00	3.02e+10	1.09e+10	5.80e+08
Cs-138	1.28e-22	1.78e-22	1.13e-22	0.00e+00	1.25e-22	1.35e-23	8.21e-23
Ba-139	2.48e-08	1.32e-11	7.18e-10	0.00e+00	1.15e-11	7.78e-12	1.43e-06

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	1.41e+07	1.23e+04	8.20e+05	0.00e+00	4.01e+03	7.34e+03	7.12e+06
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	2.33e+00	8.15e-01	2.54e-01	0.00e+00	0.00e+00	0.00e+00	2.27e+04
La-142	9.95e-12	3.17e-12	9.94e-13	0.00e+00	0.00e+00	0.00e+00	6.29e-07
Ce-141	2.62e+03	1.31e+03	1.94e+02	0.00e+00	5.74e+03	0.00e+00	1.63e+06
Ce-143	2.25e+01	1.22e+04	1.77e+00	0.00e+00	5.12e+00	0.00e+00	1.79e+05
Ce-144	1.95e+05	6.10e+04	1.04e+04	0.00e+00	3.38e+04	0.00e+00	1.59e+07
Pr-143	8.62e+01	2.59e+01	4.28e+00	0.00e+00	1.40e+01	0.00e+00	9.30e+04
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	5.34e+01	4.32e+01	3.35e+00	0.00e+00	2.37e+01	0.00e+00	6.85e+04
W-187	3.47e+03	2.06e+03	9.22e+02	0.00e+00	0.00e+00	0.00e+00	2.89e+05
Np-239	2.07e+00	1.49e-01	1.05e-01	0.00e+00	4.30e-01	0.00e+00	1.10e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	4.86e+03	4.86e+03	4.86e+03	4.86e+03	4.86e+03	4.86e+03
C-14	2.34e+09	5.00e+08	5.00e+08	5.00e+08	5.00e+08	5.00e+08	5.00e+08
Na-24	1.85e+06	1.85e+06	1.85e+06	1.85e+06	1.85e+06	1.85e+06	1.85e+06
P-32	1.92e+11	1.13e+10	7.46e+09	0.00e+00	0.00e+00	0.00e+00	2.60e+09
Cr-51	0.00e+00	0.00e+00	1.94e+04	1.26e+04	2.76e+03	2.46e+04	5.64e+05
Mn-54	0.00e+00	4.68e+06	1.06e+06	0.00e+00	1.04e+06	0.00e+00	1.72e+06
Mn-56	0.00e+00	3.77e-03	6.50e-04	0.00e+00	3.24e-03	0.00e+00	3.43e-01
Fe-55	1.76e+06	1.13e+06	3.03e+05	0.00e+00	0.00e+00	5.55e+05	1.44e+05
Fe-59	2.92e+06	5.10e+06	2.01e+06	0.00e+00	0.00e+00	1.51e+06	2.43e+06
Co-58	0.00e+00	2.91e+06	7.26e+06	0.00e+00	0.00e+00	0.00e+00	7.25e+06
Co-60	0.00e+00	1.06e+07	2.50e+07	0.00e+00	0.00e+00	0.00e+00	2.52e+07
Ni-63	4.19e+09	2.59e+08	1.45e+08	0.00e+00	0.00e+00	0.00e+00	1.29e+07
Ni-65	4.27e-01	4.83e-02	2.20e-02	0.00e+00	0.00e+00	0.00e+00	3.68e+00
Cu-64	0.00e+00	2.07e+04	9.60e+03	0.00e+00	3.51e+04	0.00e+00	4.26e+05
Zn-65	6.66e+08	2.28e+09	1.05e+09	0.00e+00	1.11e+09	0.00e+00	1.93e+09
Zn-69	2.52e-12	4.54e-12	3.38e-13	0.00e+00	1.89e-12	0.00e+00	3.70e-10
Br-83	0.00e+00	0.00e+00	1.37e-02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	1.94e-24	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.67e+09	1.32e+09	0.00e+00	0.00e+00	0.00e+00	6.83e+07
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	2.64e+10	0.00e+00	7.58e+08	0.00e+00	0.00e+00	0.00e+00	5.43e+08
Sr-90	2.55e+11	0.00e+00	6.50e+10	0.00e+00	0.00e+00	0.00e+00	3.19e+09
Sr-91	5.73e+05	0.00e+00	2.07e+04	0.00e+00	0.00e+00	0.00e+00	6.78e+05
Sr-92	9.89e+00	0.00e+00	3.67e-01	0.00e+00	0.00e+00	0.00e+00	1.07e+02
Y-90	8.18e+01	0.00e+00	2.19e+00	0.00e+00	0.00e+00	0.00e+00	1.13e+05
Y-91	8.79e+03	0.00e+00	2.34e+02	0.00e+00	0.00e+00	0.00e+00	6.30e+05
Y-91m	7.13e-20	0.00e+00	2.43e-21	0.00e+00	0.00e+00	0.00e+00	2.38e-16
Y-92	6.52e-05	0.00e+00	1.83e-06	0.00e+00	0.00e+00	0.00e+00	1.24e+00

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

Ri factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	2.60e-01	0.00e+00	7.08e-03	0.00e+00	0.00e+00	0.00e+00	2.05e+03
Zr-95	8.16e+02	1.99e+02	1.41e+02	0.00e+00	2.14e+02	0.00e+00	9.91e+04
Zr-97	4.89e-01	8.38e-02	3.83e-02	0.00e+00	8.45e-02	0.00e+00	5.35e+03
Nb-95	7.12e+04	2.93e+04	1.70e+04	0.00e+00	2.10e+04	0.00e+00	2.48e+07
Mo-99	0.00e+00	2.50e+07	4.87e+06	0.00e+00	3.73e+07	0.00e+00	8.23e+06
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	3.32e+00	6.84e+00	8.82e+01	0.00e+00	7.36e+01	3.58e+00	1.99e+03
Ru-103	1.04e+03	0.00e+00	3.48e+02	0.00e+00	2.17e+03	0.00e+00	1.27e+04
Ru-105	9.75e-04	0.00e+00	3.28e-04	0.00e+00	7.17e-03	0.00e+00	3.88e-01
Ru-106	2.28e+04	0.00e+00	2.85e+03	0.00e+00	2.70e+04	0.00e+00	1.73e+05
Ag-110m	4.63e+07	3.38e+07	2.24e+07	0.00e+00	4.83e+07	0.00e+00	1.75e+09
Te-125m	1.81e+07	6.05e+06	2.45e+06	6.09e+06	0.00e+00	0.00e+00	8.62e+06
Te-127	7.61e+02	2.55e+02	1.64e+02	6.20e+02	1.86e+03	0.00e+00	1.60e+04
Te-127m	5.05e+07	1.68e+07	6.12e+06	1.46e+07	1.24e+08	0.00e+00	2.04e+07
Te-129	3.37e-10	1.16e-10	7.87e-11	2.83e-10	8.40e-10	0.00e+00	2.70e-08
Te-129m	6.69e+07	2.29e+07	1.03e+07	2.57e+07	1.67e+08	0.00e+00	3.99e+07
Te-131	4.51e-33	1.67e-33	1.27e-33	4.02e-33	1.15e-32	0.00e+00	1.82e-31
Te-131m	4.06e+05	1.63e+05	1.35e+05	3.31e+05	1.12e+06	0.00e+00	2.75e+06
Te-132	2.53e+06	1.25e+06	1.17e+06	1.85e+06	7.84e+06	0.00e+00	4.64e+06
I-130	4.27e+06	9.40e+06	3.77e+06	1.05e+09	1.03e+07	0.00e+00	2.01e+06
I-131	3.26e+09	3.85e+09	1.69e+09	1.26e+12	4.49e+09	0.00e+00	1.37e+08
I-132	1.74e+00	3.54e+00	1.26e+00	1.66e+02	3.95e+00	0.00e+00	2.87e+00
I-133	4.36e+07	6.35e+07	1.86e+07	1.15e+10	7.46e+07	0.00e+00	1.07e+07
I-134	2.21e-11	4.52e-11	1.61e-11	1.05e-09	5.05e-11	0.00e+00	4.67e-11
I-135	1.36e+05	2.70e+05	9.83e+04	2.42e+07	3.00e+05	0.00e+00	9.76e+04
Cs-134	1.09e+11	2.04e+11	2.06e+10	0.00e+00	5.25e+10	2.15e+10	5.54e+08
Cs-136	5.93e+09	1.74e+10	6.51e+09	0.00e+00	6.95e+09	1.42e+09	2.65e+08
Cs-137	1.54e+11	1.81e+11	1.28e+10	0.00e+00	4.85e+10	1.96e+10	5.65e+08
Cs-138	2.70e-22	4.40e-22	2.13e-22	0.00e+00	2.19e-22	3.42e-23	7.03e-22
Ba-139	5.27e-08	3.49e-11	1.53e-09	0.00e+00	2.10e-11	2.12e-11	3.34e-06

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

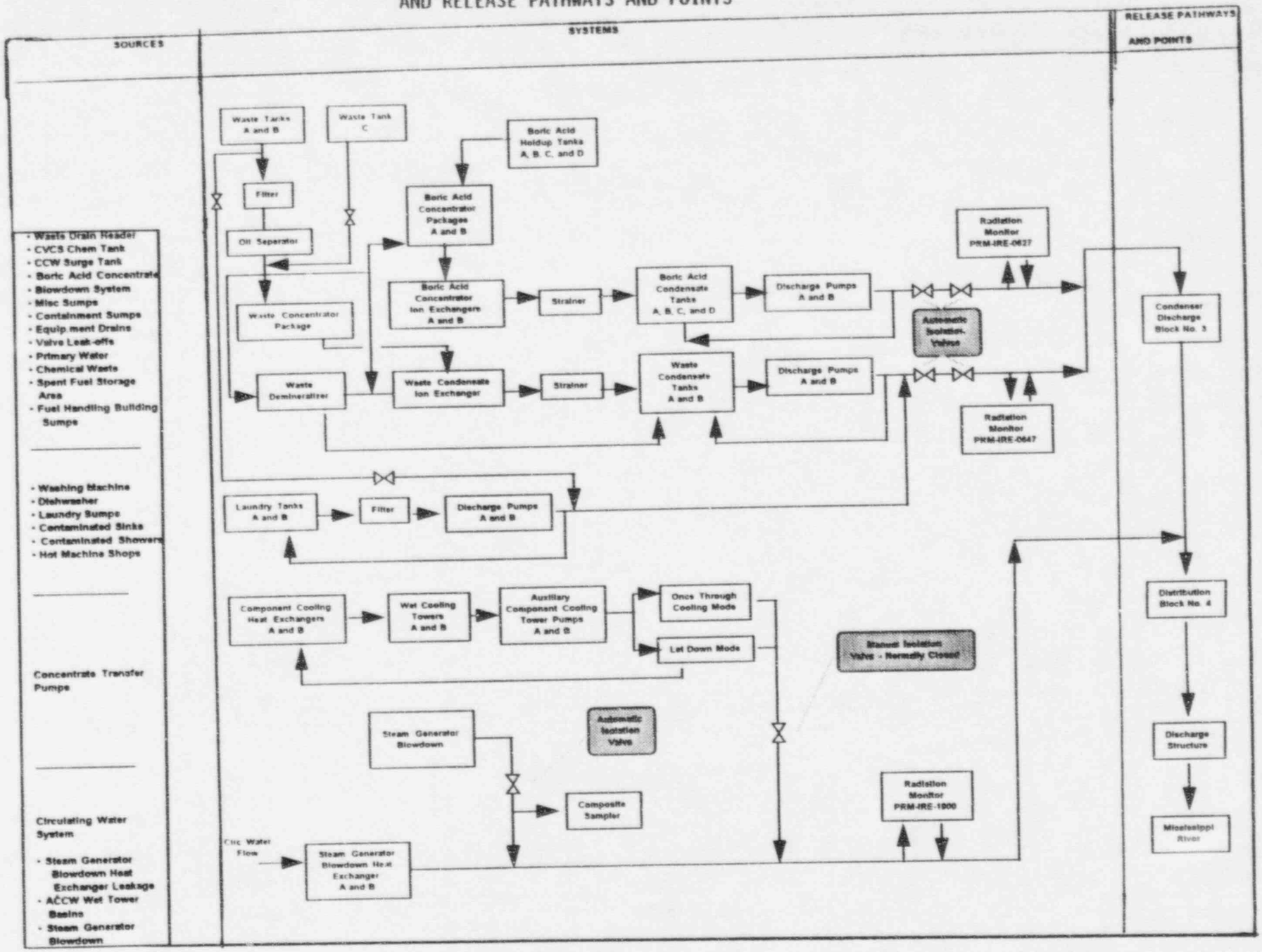
GOAT's MILK PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES. R_i

Ri factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Gaseous Release Goat's Milk Pathway Ri

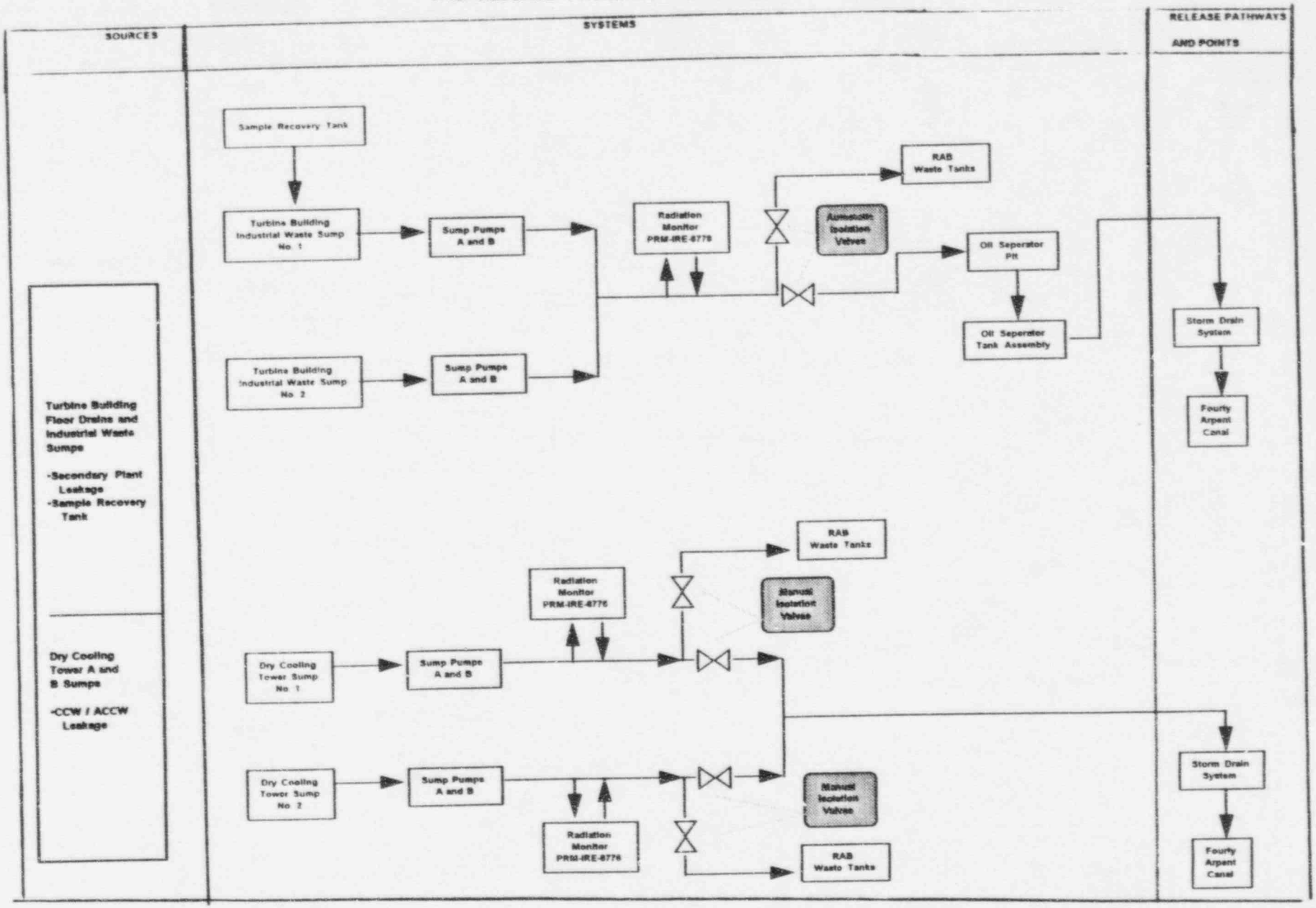
Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.89e+07	2.89e+04	1.49e+06	0.00e+00	6.87e+03	1.78e+04	7.10e+06
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	4.87e+00	1.92e+00	4.94e-01	0.00e+00	0.00e+00	0.00e+00	2.25e+04
La-142	2.09e-11	7.67e-12	1.84e-12	0.00e+00	0.00e+00	0.00e+00	1.30e-06
Ce-141	5.20e+03	3.17e+03	3.74e+02	0.00e+00	9.79e+02	0.00e+00	1.64e+06
Ce-143	4.77e+01	3.16e+04	3.61e+00	0.00e+00	9.21e+00	0.00e+00	1.85e+05
Ce-144	2.79e+05	1.14e+05	1.56e+04	0.00e+00	4.62e+04	0.00e+00	1.60e+07
Pr-143	1.78e+02	6.67e+01	8.84e+00	0.00e+00	2.48e+01	0.00e+00	9.41e+04
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	1.06e+02	1.09e+02	6.65e+00	0.00e+00	4.19e+01	0.00e+00	6.88e+04
W-187	7.31e+03	5.08e+03	1.76e+03	0.00e+00	0.00e+00	0.00e+00	2.99e+05
Np-239	4.38e+00	3.92e-01	2.21e-01	0.00e+00	7.81e-01	0.00e+00	1.13e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

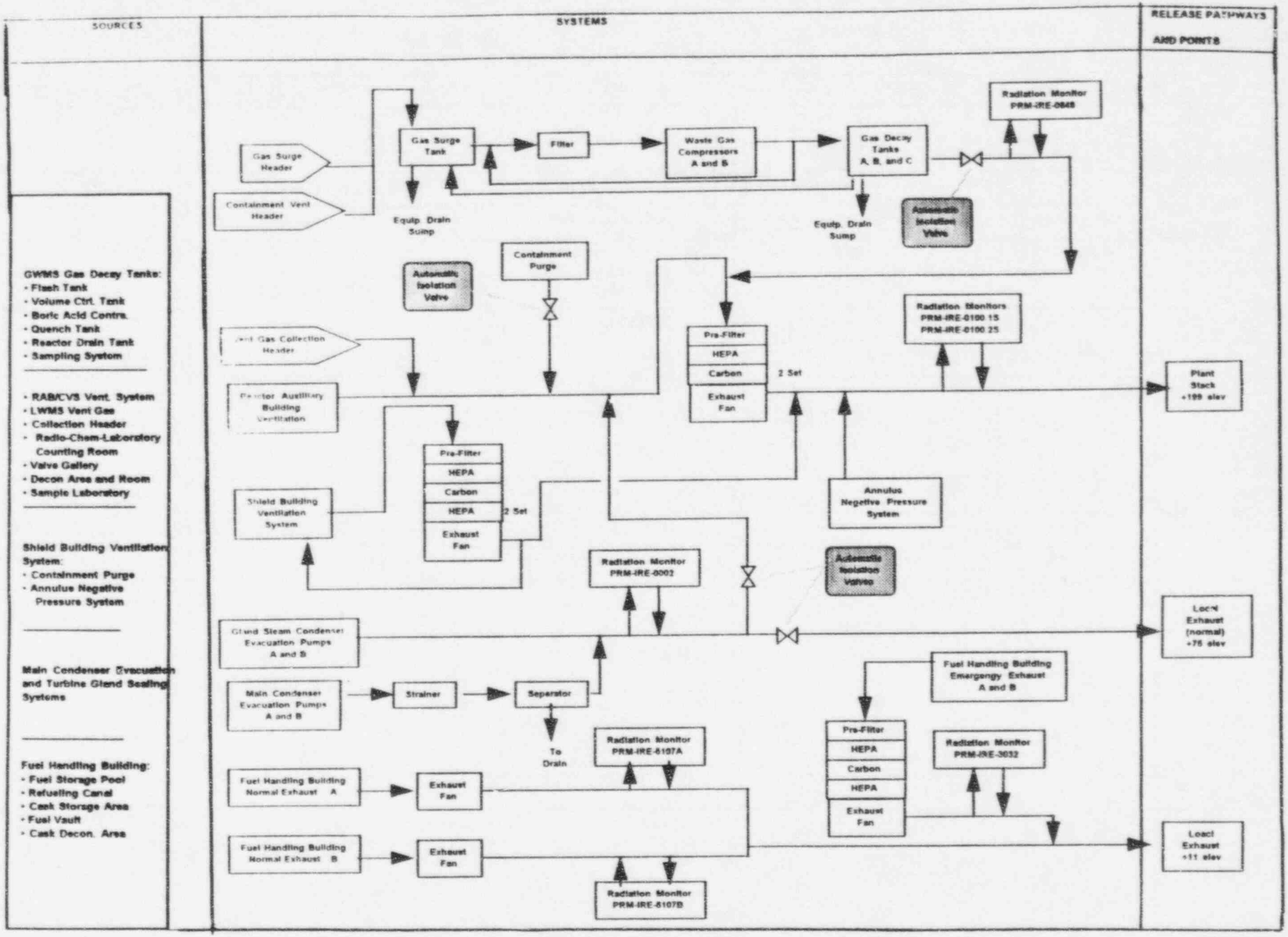
LIQUID WASTE MANAGEMENT SYSTEM EFFLUENT SOURCES AND RELEASE PATHWAYS AND POINTS



LIQUID WASTE MANAGEMENT SYSTEM EFFLUENT SOURCES AND RELEASE PATHWAYS AND POINTS



GASEOUS EFFLUENT SOURCES, GASEOUS WASTE MANAGEMENT SYSTEM EFFLUENT SOURCES AND EXHAUST RELEASE POINTS



RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SAMPLE	LOCATION	ANALYSIS	FREQUENCY	VOLUME
TLD	A-2, B-1, C-1, D-2, E-1, F-2, G-2, H-2, J-2, K-1, L-1, M-1, N-1, P-1, Q-1, R-1, A-5, B-4, D-5, E-5, F-4, G-4, H-6, P-6, Q-5, R-6, F-9, G-9, E-15,J-15, E-30	TLD (1)	Quarterly	N/A
Radioiodine and Particulates	APP-1, APQ-1, APG-1, APC-1, APE-30	Gross Beta, I-131	Weekly	285 m3/Wk
		Gamma Isotopic (2)	Quarterly Composite	3700 m3/Qrt
Ground Water (6)	GWK-1	Gamma Isotopic , H-3	Quarterly	4 Liters
Drinking Water (3)	DWG-2, DWE-5 (4), DWP-7	H-3	Quarterly Composite	Homogeneous 4 Liters
		Gross Beta, Gamma Isotopic	Monthly Composite (11)	
		I-131 (7)	Semi-Monthly Composite	
Surface Water (3)	SWG-2, SWE-5 (4) ,SWP-7	H-3	Quarterly Composite	Homogeneous 4 Liters
		Gamma Isotopic	Monthly Composite (11)	
Shoreline Sediment	SHWE-3, SHWK-1	Gamma Isotopic	Semi-Annually	2 Kilograms
Milk	MKQ-5, MKQ-45, MKQ-1	Gamma Isotopic, I-131	Semi-Monthly / Monthly (8)	4 Liters
Fish	FH-1, FH-2	Gamma Isotopic	In Season or Semi-Annually (9)	500 Grams
Food products	* FPP-1, FPG-1	Gamma Isotopic	At Harvest Time (10)	500 Grams
Broad Leaf	BLQ-1, BLB-1, BLK-15	Gamma Isotopic, I-131	Monthly (When milk samples are not collected)	500 Grams
Sanitary System(12)	SWR-1	Gamma Isotopic	Monthly Composite (11)	Homogeneous 4 Liters

* Irrigated Food Pathway does not Exist However, Food Products grown within the site boundary are sampled and analyzed.

1. One or more instrument, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. A TLD is considered one phosphor, two or more phosphors in a packet are considered two or more dosimeters. Geographical limitations affect siting of dosimeters.

2. Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopes analysis shall be performed on the individual samples. Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

3. Drinking Water and Surface Water samples are identical samples.

4. The downstream sample is beyond the mixing zone.

5. A composite sample will contain aliquots of sample taken proportional to the quantity of flowing liquid that results in a specimen representative of the liquid flow.

6. Ground water samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

7. This analysis will be performed when the dose calculated for the consumption of water is greater than 1 mrem per year as calculated for maximum organ and age group.

8. Milk will be collected semimonthly when animals are on pasture, monthly otherwise. If milk sampling is not performed, broad leafy vegetation will be sampled.

9. Striped mullet, gizzard shad, freshwater drum, and catfish will be collected. If they are not available, substitute species will be collected and identified in reporting.

10. One sample of each principal class of food products will be sampled in an area irrigated by water in which plant wastes have been inadvertently discharged. If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvesting occurs continuously, sampling shall be monthly. Tuberous and root products will be sampled when available.

11. An anaylsis frequency of Every 4 Weeks satisfies this requirement. The maximum frequency is monthly.

12. Sanitary System Sampling and analysis performed additionally for this location. This sampling requirement is not derived directly from REMP requirements, but it represents another possible environmental interface with the plant. Information from this sample location will not normally be included in the Annual Radiological Environmental Operating Report.

SAMPLE LOCATION TABLE

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	DIRECT RADIATION (TLD)		
A-2	(Eastbank) Located on a utility pole on River Road (La. 628) at the south corner of the Laprin L. Perriloux Fire Station (Station 5) in Montz, La.	1.1	N
B-1	(Eastbank) On fence enclosing the transmission tower 0.3 miles west (up river) from Little Gyspy. Access from River Road (LA 628). TLD's are located at SW corner of fence enclosure.	0.8	NNE
C-1	(Eastbank) On fence enclosing the Little Gyspy Cooling Water Intake. Access is from River Road (LA 628) across from Little Gypsy Power Station entrance. TLD's are on the south side (inside) of the Cooling Water Intake fence enclosure, directly opposite the entrance gate.	0.8	NE
D-2	(Eastbank) Located approximately 0.3 miles east of Little Gypsy Power Station. Access from River Road (LA 628). TLD's are attached to a stop sign post located at the peak of the levee on the west entrance road through the Bonne Carre Spillway.	1.1	ENE

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	DIRECT RADIATION (TLD) (continued)		
E-1	(Westbank) Located on utility pole along River Road (LA 18) approximately 0.3 miles east of Waterford 3 plant entrance. Access from LA 18. TLD's are on the third utility pole east of the construction entrance road.	0.2	E
F-2	(Westbank) Located on fence enclosure surrounding the LP&L substation on LA 3142. Access from LA 3142 approximately 0.2 miles south of LA 18. TLD's are on the southeast corner of the fence enclosure.	1.1	ESE
G-2	(Westbank) Located on fence near utility pole on East side of LA 3142 (Next to Union Carbide Star Plant Gate 3). Access from LA 3142 approximately 0.2 miles north of railroad overpass.	1.2	SE
H-2	(Westbank) Located on fence enclosure to shell road off of LA 3142. Access from LA 3142 south of railroad overpass on east side of LA 3142. TLD's are on the south side of the gate for shell road. (Just south of Texaco pipeline station).	1.2	SSE

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	DIRECT RADIATION (TLD) (continued)		
J-2	(Westbank) Located on northeast corner of fence enclosing Texaco valve station south of LA 3127. Access from LA 3127, approxmiately 0.6 miles west of LA 3127/3142 intersection.	1.3	S
K-1	(Westbank) Located on fence at Gate 92 entrance off of LA 3127. Access from LA 3127, approximately 1.3 miles west of LA 3127/3142 intersection. (Gate 92 is the access to the Waterford 3 switchyard station and Training Center).	1.0	SSW
L-1	(Westbank) Located next to "Private Road" sign at Gate 97 entrance off of LA 3127, approximtely 1.6 miles west of LA 3127/3142 intersection. (Gate 97 is an access road for Waterford 3).	1.0	SW
M-1	(Westbank) Located on south gate of the Waterford 1 and 2 fuel oil storage tank enclosure. Access is either thru LP&L Gate 92, Gate 97 off of LA 3127, the shell access road from LA 18 between Waterford 3, or thru the Waterford 1 and 2 access road.	0.7	WSW
N-1	(Westbank) Located behind the "No Trespassing sign off on Short Street, in Killona just south of the Killona Elementary School.	0.9	W

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	DIRECT RADIATION (TLD) (continued)		
P-1	(Westbank) Located on Short Street, TLD is inside fence at air sample station APP-1	0.8	WNW
Q-1	(Westbank) Located on fence enclosing air sample station approximately 0.5 miles west of Waterford 1 and 2 on River Road (LA 18).	0.8	NW
R-1	(Westbank) Located on fence enclosure for Waterford 1 and 2 Cooling Water Intake Structure. Access is from River Road (LA 18) opposite Waterford 1 and 2. TLD's are on the southwest corner of fence.	0.5	NNW
A-5	(Eastbank) Located on utility pole just east of the Shady Nook Trailer Park on Hwy 61 in LaPlace. TLD's are on second utility pole east of trailer park on north side of Hwy 61 (eastern end of LaPlace)	4.5	N
B-4	(Eastbank) Located on utility pole guidewire west of shell access road to South Central Bell transmission tower on south side of Hwy 61. Transmission tower is just east of Weigh Station at St. John/St. Charles Parish line. TLD's are on first utility pole west of access road.	3.8	NNE

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	DIRECT RADIATION (TLD) (continued)		
D-5	(Eastbank) Located on fence gate on shell access road to Big 3 Chemical Plant. Shell access road is approximately 0.1 miles west of Hwy 61/48 intersection (at black and yellow gate). TLD's are on fence gate 0.1 miles north on shell access road from Hwy 61.	4.2	ENE
E-5	(Eastbank) Located on the Norco Substation fence enclosure. Access from River Road (LA 48) onto Wesco St. (adjacent to Norco Shell Chemical Plant), take Wesco St. to the dead end. TLD's are located on fence beside of the north substation gate.	4.2	E
F-4	(Westbank) Located on utility pole behind blonde brick house on Aquarius St. in Hahnville. Access from River Road (LA 18) and turn onto Oak St. Follow Oak St. to Hickory St., turn right on Hickory St. and follow to Aquarius St. and turn left. Blonde brick house is second house on right (west) side of Aquarius St. heading south.	3.5	ESE
G-4	(Westbank) Located on railroad sign northwest side of LA 3160/railroad track intersection. Access from either LA 3127 or River Road (LA 18) onto LA 3160.	3.2	SE

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	DIRECT RADIATION (TLD) (continued)		
H-6	(Westbank) Located on a road sign on the Northwest side of the second canal bridge east of LA 3160 along LA 3127.	5.7	SSE
P-6	(Westbank) Located on a fence surrounding the Union Pacific communications tower at the LA 640/railroad track intersection. Tower is located approximately 500 feet west of LA 640.	5.5	WNW
Q-5	(Westbank) Located on fence surrounding (green) river marker on levee just east of Edgard. Fence post is located along River Road (LA 18) across from the Webre's house.	5.0	NW
R-6	(Eastbank) Located on fence enclosing LP&L Laydown Yard on LA 3223 in LaPlace. Access from Hwy 61 onto Elm St. (LA 3223), take Elm St. to the northeast corner of LA 3223/railroad intersection. TLD's are located at the entrance of the fence enclosure.	5.3	NNW
F-9	(Eastbank) Located on entrance gate to Destrehan Substation. Access from River Road (LA 48), approximate 1.5 miles east of Luling-Destrehan Bridge, onto Jonathan Street (west of Bunge Corp. Grain Elevator), and proceed to substation gate.	8.2	ESE

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	DIRECT RADIATION (TLD) (continued)		
G-9	(Westbank) Located on back fence of LP&L District Office in Luling. Access via Ellington St. from either River Road (LA 18); or Second or Third S. from Paul Mallard Rd. (LA 52) to Ellington St.	8.1	SE
E-15	(Eastbank) Located on Kenner Substation fence enclosure. Access from either River Road (LA 48) or Hwy 61, turn onto Alliance Ave. TLD's are located at the entrance of the fence enclosure.	11.8	E
J-15	(Westbank) Located on fence enclosure surrounding LP&L switchyard at LA 631/Hwy 90 intersection in Des Allemands. TLD's are on the northwest corner of fence. Access from LA 631 via shell road.	12.0	S
E-30*	(Westbank) Located at LP&L General Office or Delaronde St. in Algiers. TLD's are on a tree in the courtyard at the south entrance to the building.	27.0	E

* DENOTES CONTROL LOCATIONS

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	AIRBORNE		
APP-1	(Westbank) Located in soybean/sugarcane field at northwest corner of Short St. in Killona.	0.8	WNW
APQ-1	(Westbank) Located at northwest corner of soybean/sugarcane field on east side of Killona Access from River Road (LA 18) approximately 0.6 miles east of LA 18/3141 intersection.	0.8	NW
APG-1	(Westbank) Located at the north side of the Secondary Meteorological Tower.	0.5	SE
APC-1	(Eastbank) Located inside the Little Gypsy Cooling Water Intake Structure fence enclosure.	0.8	NE
APE-30*	(Westbank) Located on the roof of the LP&L General Office building on Delaronde St. in Algiers.	27.0	E

* DENOTES CONTROL LOCATIONS

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	FOOD PRODUCTS		
FPP-1	(Westbank) Located in field on eastern edge of Killona, between air sample stations APP-1 and APQ-1. The crops grown alternate between soybeans and sugar cane.	0.8	WNW
FPG-1	(Westbank) Located in field east of Waterford 3 near the Back-up Meteorological Tower and air sample station APG-1. The crops grown alternate between soybeans and sugar-cane.	0.4	SE
	BROAD LEAF		
BLQ-1	(Westbank) Located between LA 18 and soybean field on eastern edge Killona, near air sample station APQ-1.	0.8	NW
BLB-1	(Eastbank) Located at wooded area at the southwestern corner of the LP&L Little Gypsy plant along River Road.	0.8	NNE
BLK-15*	(Westbank) Located 3.5 miles SSW of Des Allemands on Hwy. 90.	15.0	SSW

* DENOTES CONTROL LOCATIONS

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	INGESTION		
	MILK		
MKQ-5	(Westbank) Located at the Webre's house, just across LA 18 from river marker, at the eastern end of Edgard.	5.0	NW
MKQ-45*	(Eastbank) Located off of I-12 in Denham Springs. Take LA 3002 south of LA 1034 then right to LA 1032. Turn left and go to farm 1 mile on the right.	42	NW
MKQ-1	(Westbank) 1.0 miles west of Waterford 3 at the corner of River Road and Post Street in Killona.	1.0	NW
	FISH		
FH-1*	Upstream of the plant intake structure.	N/A	N/A
FH-2	Downstream of the plant discharge structure.	N/A	N/A

* DENOTES CONTROL LOCATIONS

N/A - Not Applicable for this sampling location.

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	WATERBORNE		
GWK-1	(Westbank) Located at 40 Arpent Canal south of the plant. Access from LA 3127 through LP&L Gate 92 which is at the Waterford-3 Training Center. The canal is northwest of the shell access road/ railroad track intersection.	0.5	SSW
DWG-2 SWG-2	(Westbank) Located at the Union Carbide drinking water canal. Access from LA 3142 through Gate 28.	2.0	SE
SHWE-3	(Westbank) Located at the Foot Ferry Landing off of LA 18 in Taft.	3.0	E
SHWK-1	(Westbank) Located at 40 arpent canal south of plant. Access thru LP&L gate 92 off of LA 3127.	0.5	SSW
DWE-5 SWE-5	(Eastbank) Located at the St. Charles Parish Waterworks off of River Road (LA 48) near New Sarpy.	4.5	E
DWP-7* SWP-7*	(Westbank) Located at the St. John Parish Waterworks off of LA 18 in Edgard.	6.5	WNW

* DENOTES CONTROL LOCATIONS

SAMPLE LOCATION TABLE (Continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
	SANITARY SYSTEM		
SWR-1**	Sewage lift station NW of MSB between Protected Area Fence and the river road 0.1 miles from the plant	0.1	R

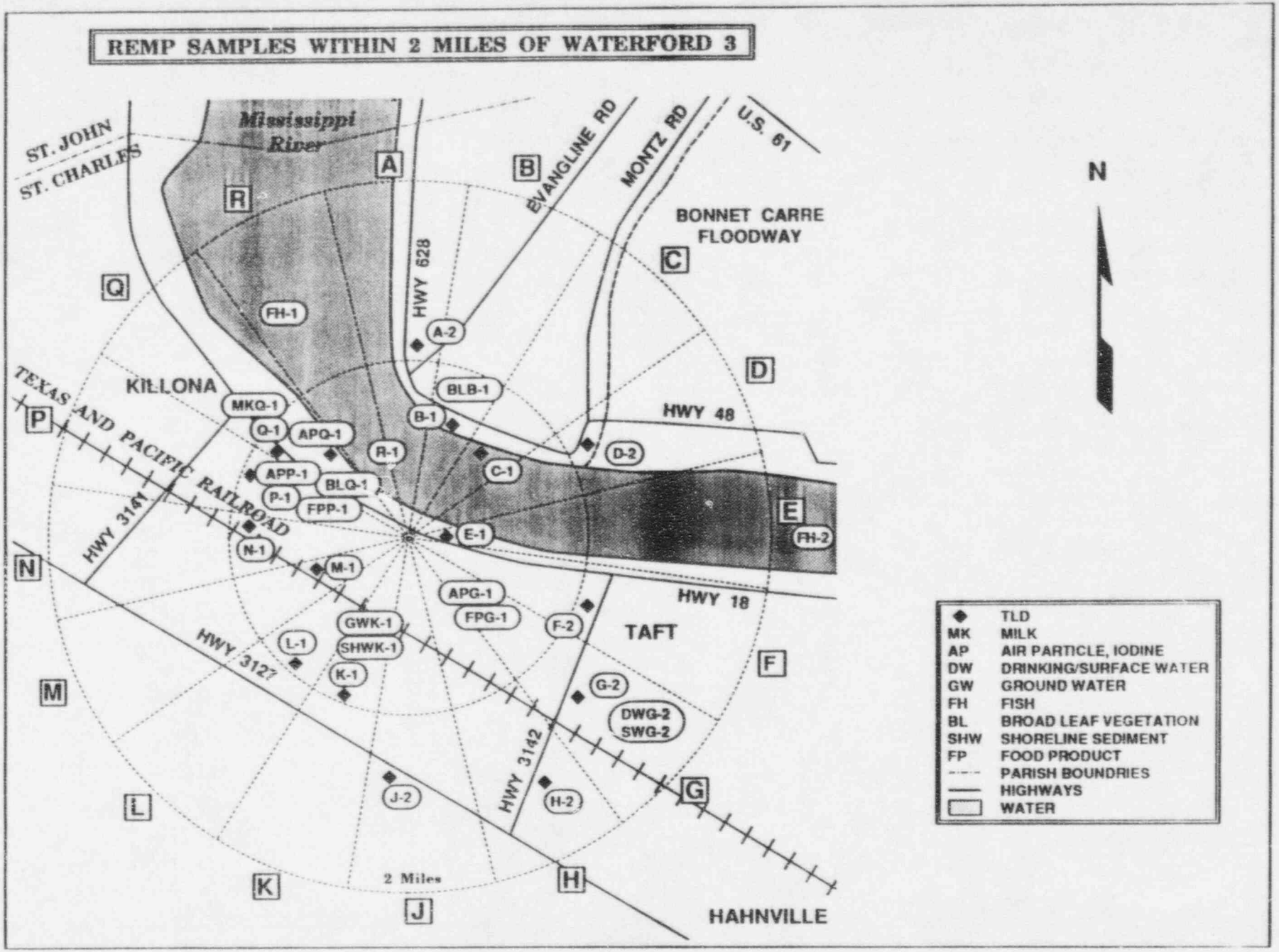
** Sampling requirements is not derived directly from REMP requirements therefore results will not appear in the annual report however; it represents another possible environmental interface with the plant.

SECTOR AND ZONE DESIGNATORS FOR RADIOLOGICAL SAMPLING
AND MONITORING POINTS

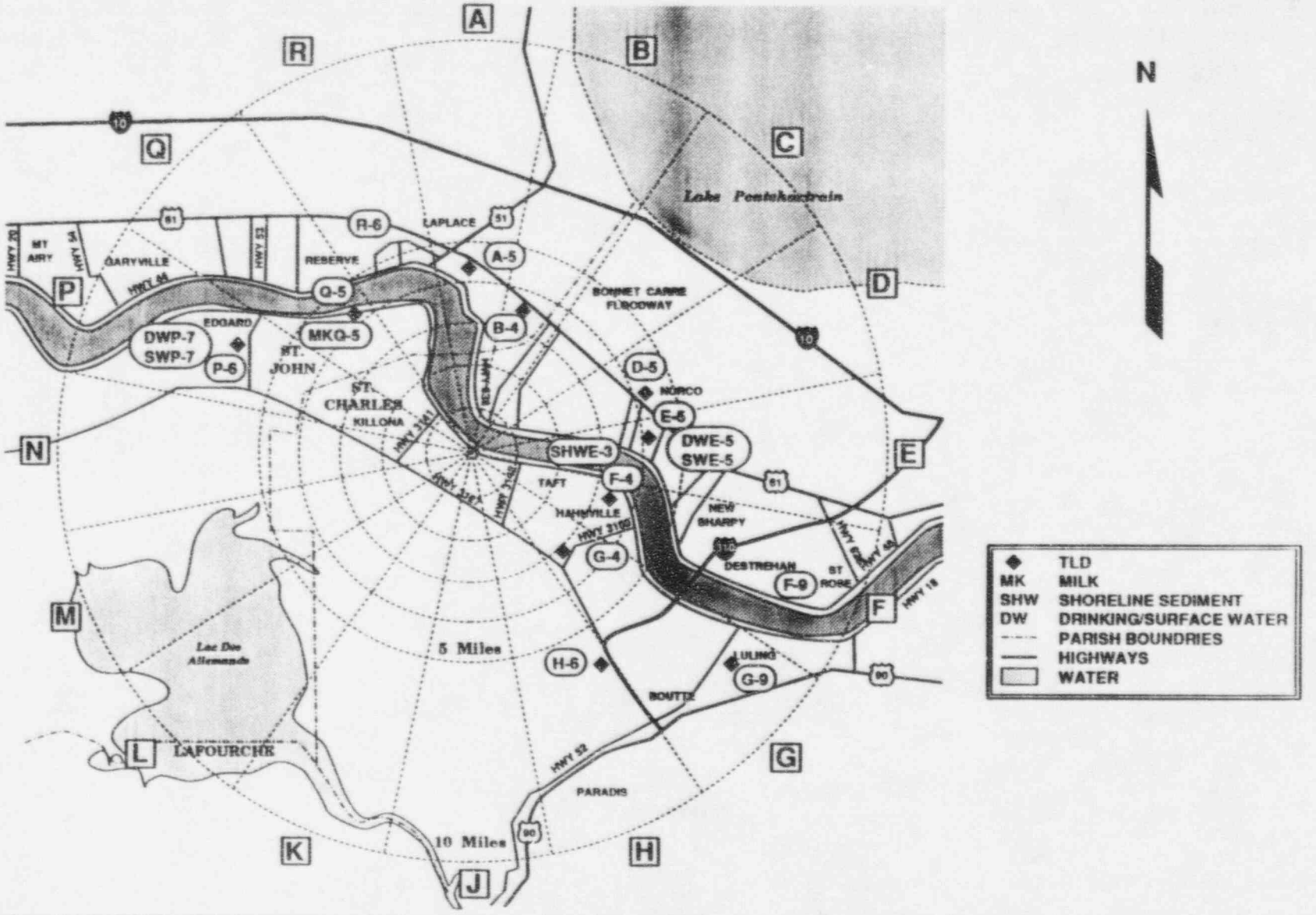
SECTOR NOMENCLATURE		ZONE NOMENCLATURE	
CENTERLINE OF SECTOR IN DEGREES TRUE NORTH FROM FACILITY	22 1/2° SECTOR	MILES FROM FACILITY	ZONE
0 & 360	*A N	0-1	1
22 1/2	B NNE	1-2	2
45	C NE	2-3	3
67 1/2	D ENE	3-4	4
90	E E	4-5	5
112 1/2	F ESE	5-6	6
135	G SE	6-7	7
157 1/2	H OR SSE	7-8	8
180	J S	8-9	9
202 1/2	K SSW	9-10	10
225	L SW	10-15	15
247 1/2	M WSW	15-20	20
270	N W	20-25	25
292 1/2	P WNW	25-30	30
315	Q NW	30-35	35
337 1/2	R NNW	35-40	40
		40-45	45
		45-50	50

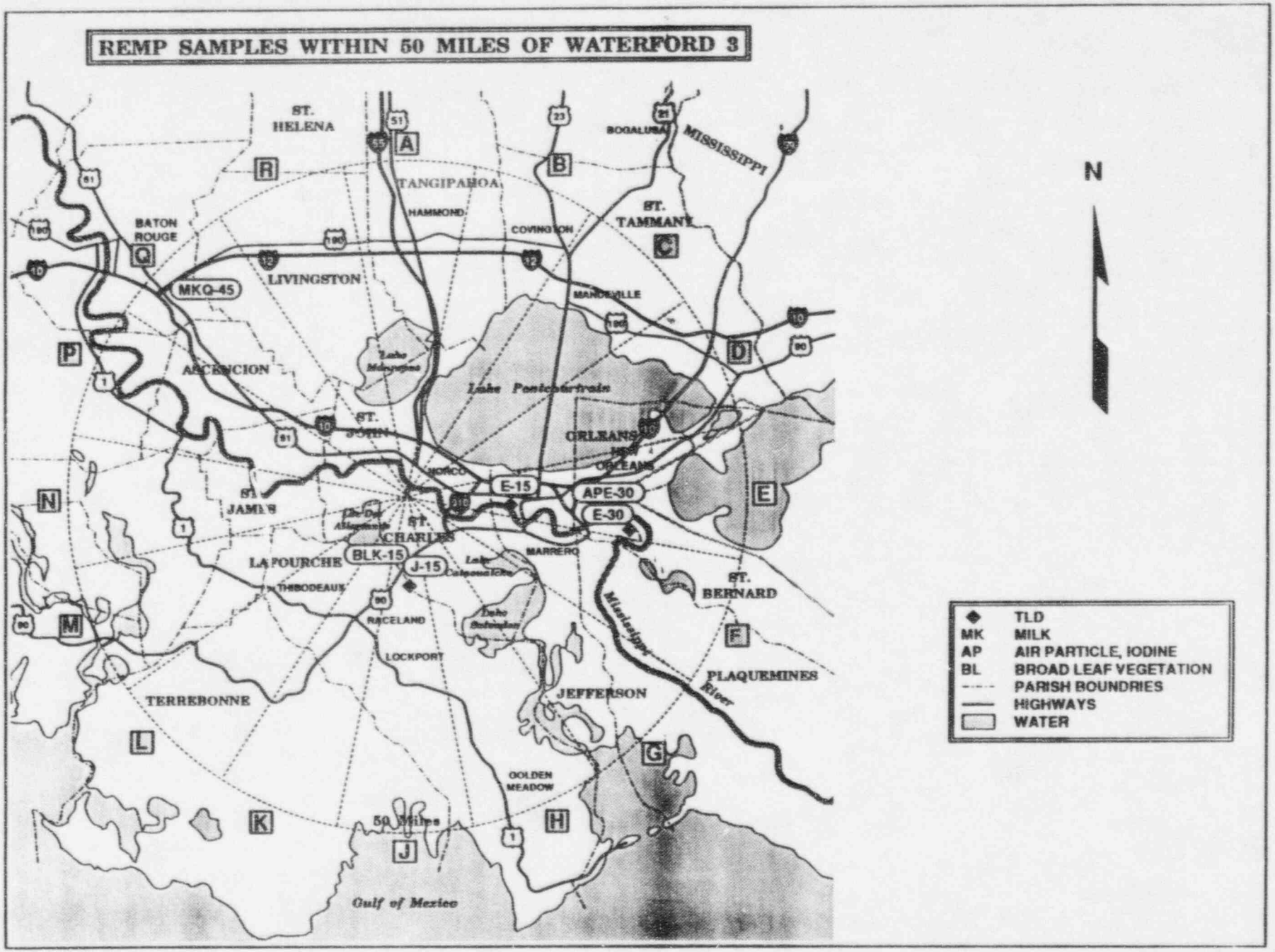
AREA SEGMENT - An area is identified by a Sector and Zone designator. Thus, area N-1 is that area which lies between 348 3/4 and 11¼ degrees true north from the facility out to a radius of 1 mile. Area G-4 would be that area between 123 3/4 to 146¼ degrees and the 3- and 4-mile arcs from the facility. For Airborne, Ingestion (milk), and Food Products pathways, the sector designator will be preceded by acronyms AP, MK, and FP, respectively.

* The letters I and O have been omitted from these sector designators so as to eliminate possible confusion between letters and numbers.


REMP SAMPLES WITHIN 2 MILES OF WATERFORD 3
Mississippi River
ST. JOHN
ST. CHARLES
EVANGLINE RD
MONTZ RD
U.S. 61
BONNET CARRE FLOODWAY
HWY 628
KILLONA
TEXAS AND PACIFIC RAILROAD
HWY 3141
HWY 48
HWY 18
TAFT
HWY 3127
HWY 3142
HAHNVILLE
2 Miles
A
B
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
FH-1
A-2
BLB-1
B-1
C-1
D-2
FH-2
E-1
R-1
MKQ-1
Q-1
APQ-1
APP-1
BLQ-1
P-1
FPP-1
N-1
M-1
APG-1
FPG-1
F-2
GWK-1
SHWK-1
L-1
K-1
G-2
DWG-2
SWG-2
H-2
J-2
N
TLD
MK MILK
AP AIR PARTICLE, IODINE
DW DRINKING/SURFACE WATER
GW GROUND WATER
FH FISH
BL BROAD LEAF VEGETATION
SHW SHORELINE SEDIMENT
FP FOOD PRODUCT
PARISH BOUNDRIES
HIGHWAYS
WATER

REMP SAMPLES WITHIN 10 MILES OF WATERFORD 3




REMP SAMPLES WITHIN 50 MILES OF WATERFORD 3
ST. HELENA
TANGIPAHOA
HAMMOND
COVINGTON
BOGALUSA
MISSISSIPPI
ST. TAMMANY
BATON ROUGE
LIVINGSTON
MANDEVILLE
MKQ-45
ASCENSION
Lake Maurepas
Lake Pontchartrain
ST. JOHN
ORLEANS
NEW ORLEANS
ST. JAMES
E-15
APE-30
E-30
ST. CHARLES
MARRERO
BLK-15
J-15
LAFOURCHE
THIBODEAUX
RACELAND
Lake Cataouatche
Lake Salvador
ST. BERNARD
Mississippi River
LOCKPORT
PLAQUEMINES
JEFFERSON
TERREBONNE
GOLDEN MEADOW
50 Miles
Gulf of Mexico
N
TLD
MK MILK
AP AIR PARTICLE, IODINE
BL BROAD LEAF VEGETATION
PARISH BOUNDRIES
HIGHWAYS
WATER

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.26e+03	1.26e+03	1.26e+03	1.26e+03	1.26e+03	1.26e+03
C-14	1.82e+04	3.41e+03	3.41e+03	3.41e+03	3.41e+03	3.41e+03	3.41e+03
Na-24	1.02e+04	1.02e+04	1.02e+04	1.02e+04	1.02e+04	1.02e+04	1.02e+04
P-32	1.32e+06	7.71e+04	5.01e+04	0.00e+00	0.00e+00	0.00e+00	8.64e+04
Cr-51	0.00e+00	0.00e+00	1.00e+02	5.95e+01	2.28e+01	1.44e+04	3.32e+03
Mn-54	0.00e+00	3.96e+04	6.30e+03	0.00e+00	9.84e+03	1.40e+06	7.74e+04
Mn-56	0.00e+00	1.24e+00	1.83e-01	0.00e+00	1.30e+00	9.44e+03	2.02e+04
Fe-55	2.46e+04	1.70e+04	3.94e+03	0.00e+00	0.00e+00	7.21e+04	6.03e+03
Fe-59	1.18e+04	2.78e+04	1.06e+04	0.00e+00	0.00e+00	1.02e+06	1.88e+05
Co-58	0.00e+00	1.58e+03	2.07e+03	0.00e+00	0.00e+00	9.28e+05	1.06e+05
Co-60	0.00e+00	1.15e+04	1.48e+04	0.00e+00	0.00e+00	5.97e+06	2.85e+05
Ni-63	4.32e+05	3.14e+04	1.45e+04	0.00e+00	0.00e+00	1.78e+05	1.34e+04
Ni-65	1.54e+00	2.10e-01	9.12e-02	0.00e+00	0.00e+00	5.60e+03	1.23e+04
Cu-64	0.00e+00	1.46e+00	6.15e-01	0.00e+00	4.62e+00	6.78e+03	4.90e+04
Zn-65	3.24e+04	1.03e+05	4.66e+04	0.00e+00	6.90e+04	8.64e+05	5.34e+04
Zn-69	3.46e-02	6.51e-02	4.52e-03	0.00e+00	4.22e-02	9.20e+02	1.63e+01
Br-83	0.00e+00	0.00e+00	2.41e+02	0.00e+00	0.00e+00	0.00e+00	2.32e+02
Br-84	0.00e+00	0.00e+00	3.13e+02	0.00e+00	0.00e+00	0.00e+00	1.64e-03
Br-85	0.00e+00	0.00e+00	1.28e+01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.35e+05	5.90e+04	0.00e+00	0.00e+00	0.00e+00	1.66e+04
Rb-88	0.00e+00	3.87e+02	1.93e+02	0.00e+00	0.00e+00	0.00e+00	3.34e-09
Rb-89	0.00e+00	2.56e+02	1.70e+02	0.00e+00	0.00e+00	0.00e+00	9.28e-12
Sr-89	3.04e+05	0.00e+00	8.72e+03	0.00e+00	0.00e+00	1.40e+06	3.50e+05
Sr-90	9.92e+07	0.00e+00	6.10e+06	0.00e+00	0.00e+00	9.60e+06	7.22e+05
Sr-91	6.19e+01	0.00e+00	2.50e+00	0.00e+00	0.00e+00	3.65e+04	1.91e+05
Sr-92	6.74e+00	0.00e+00	2.91e-01	0.00e+00	0.00e+00	1.65e+04	4.30e+04
Y-90	2.09e+03	0.00e+00	5.61e+01	0.00e+00	0.00e+00	1.70e+05	5.06e+05
Y-91	4.62e+05	0.00e+00	1.24e+04	0.00e+00	0.00e+00	1.70e+06	3.85e+05
Y-91m	2.61e-01	0.00e+00	1.02e-02	0.00e+00	0.00e+00	1.92e+03	1.33e+00
Y-92	1.03e+01	0.00e+00	3.02e-01	0.00e+00	0.00e+00	1.57e+04	7.35e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	9.44e+01	0.00e+00	2.61e+00	0.00e+00	0.00e+00	4.85e+04	4.22e+05
Zr-95	1.07e+05	3.44e+04	2.33e+04	0.00e+00	5.42e+04	1.77e+06	1.50e+05
Zr-97	9.68e+01	1.96e+01	9.04e+00	0.00e+00	2.97e+01	7.87e+04	5.23e+05
Nb-95	1.41e+04	7.82e+03	4.21e+03	0.00e+00	7.74e+03	5.05e+05	1.04e+05
Mo-99	0.00e+00	1.21e+02	2.30e+01	0.00e+00	2.91e+02	9.12e+04	2.48e+05
Tc-101	4.18e-05	6.02e-05	5.90e-04	0.00e+00	1.08e-03	3.99e+02	1.09e-11
Tc-99m	1.03e-03	2.91e-03	3.70e-02	0.00e+00	4.42e-02	7.64e+02	4.16e+03
Ru-103	1.53e+03	0.00e+00	6.58e+02	0.00e+00	5.83e+03	5.05e+05	1.10e+05
Ru-105	7.90e-01	0.00e+00	3.11e-01	0.00e+00	1.02e+00	1.10e+04	4.82e+04
Ru-106	6.91e+04	0.00e+00	8.72e+03	0.00e+00	1.34e+05	9.36e+06	9.12e+05
Ag-110m	1.08e+04	1.00e+04	5.94e+03	0.00e+00	1.97e+04	4.63e+06	3.02e+05
Te-125m	3.42e+03	1.58e+03	4.67e+02	1.05e+03	1.24e+04	3.14e+05	7.06e+04
Te-127	1.40e+00	6.42e-01	3.10e-01	1.06e+00	5.10e+00	6.51e+03	5.74e+04
Te-127m	1.26e+04	5.77e+03	1.57e+03	3.29e+03	4.58e+04	9.60e+05	1.50e+05
Te-129	4.98e-02	2.39e-02	1.24e-02	3.90e-02	1.87e-01	1.94e+03	1.57e+02
Te-129m	9.76e+03	4.67e+03	1.58e+03	3.44e+03	3.66e+04	1.16e+06	3.83e+05
Te-131	1.11e-02	5.95e-03	3.59e-03	9.36e-03	4.37e-02	1.39e+03	1.84e+01
Te-131m	6.99e+01	4.36e+01	2.90e+01	5.50e+01	3.09e+02	1.46e+05	5.56e+05
Te-132	2.60e+02	1.15e+02	1.62e+02	1.90e+02	1.46e+03	2.88e+05	5.10e+05
I-130	4.58e+03	1.34e+04	5.28e+03	1.14e+06	2.09e+04	0.00e+00	7.69e+03
I-131	2.52e+04	3.58e+04	2.05e+04	1.19e+07	6.13e+04	0.00e+00	6.28e+03
I-132	1.16e+03	3.26e+03	1.16e+03	1.14e+05	5.18e+03	0.00e+00	4.06e+02
I-133	8.64e+03	1.48e+04	4.52e+03	2.15e+06	2.58e+04	0.00e+00	8.88e+03
I-134	6.44e+02	1.73e+03	6.15e+02	2.98e+04	2.75e+03	0.00e+00	1.01e+00
I-135	2.68e+03	6.98e+03	2.57e+03	4.48e+05	1.11e+04	0.00e+00	5.25e+03
Cs-134	3.73e+05	8.48e+05	7.28e+05	0.00e+00	2.80e+05	9.76e+04	1.04e+04
Cs-136	3.90e+04	1.46e+05	1.10e+05	0.00e+00	8.56e+04	1.20e+04	1.17e+04
Cs-137	4.78e+05	6.21e+05	4.28e+05	0.00e+00	2.22e+05	7.52e+04	8.40e+03
Cs-138	3.31e+02	6.21e+02	3.24e+02	0.00e+00	4.80e+02	4.86e+01	1.86e-03
Ba-139	9.36e-01	6.66e-04	2.74e-02	0.00e+00	6.22e-04	3.76e+03	8.96e+02

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	3.90e+04	4.90e+01	2.57e+03	0.00e+00	1.67e+01	1.27e+06	2.18e+05
Ba-141	1.00e-01	7.53e-05	3.36e-03	0.00e+00	7.00e-05	1.94e+03	1.16e-07
Ba-142	2.63e-02	2.70e-05	1.66e-03	0.00e+00	2.29e-05	1.19e+03	1.57e-16
La-140	3.44e+02	1.74e+02	4.58e+01	0.00e+00	0.00e+00	1.36e+05	4.58e+05
La-142	6.83e-01	3.10e-01	7.72e-02	0.00e+00	0.00e+00	6.33e+03	2.11e+03
Ce-141	1.99e+04	1.35e+04	1.53e+03	0.00e+00	6.26e+03	3.62e+05	1.20e+05
Ce-143	1.86e+02	1.38e+02	1.53e+01	0.00e+00	6.08e+01	7.98e+04	2.26e+05
Ce-144	3.43e+06	1.43e+06	1.84e+05	0.00e+00	0.00e+00	7.78e+06	8.16e+05
Pr-143	9.36e+03	3.75e+03	4.64e+02	0.00e+00	2.16e+03	2.81e+05	2.00e+05
Pr-144	3.01e-02	1.25e-02	1.53e-03	0.00e+00	7.05e-03	1.02e+03	2.15e-08
Nd-147	5.27e+03	6.10e+03	3.65e+02	0.00e+00	3.56e+03	2.21e+05	1.73e+05
W-187	8.48e+00	7.08e+00	2.48e+00	0.00e+00	0.00e+00	2.90e+04	1.55e+05
Np-239	2.30e+02	2.26e+01	1.24e+01	0.00e+00	7.00e+01	3.76e+04	1.19e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.27e+03	1.27e+03	1.27e+03	1.27e+03	1.27e+03	1.27e+03
C-14	2.80e+04	4.87e+03	4.87e+03	4.87e+03	4.87e+03	4.87e+03	4.87e+03
Na-24	1.38e+04	1.38e+04	1.38e+04	1.38e+04	1.38e+04	1.38e+04	1.38e+04
P-32	1.89e+06	1.10e+05	7.16e+04	0.00e+00	0.00e+00	0.00e+00	9.28e+04
Cr-51	0.00e+00	0.00e+00	1.35e+02	7.50e+01	3.07e+01	2.10e+04	3.00e+03
Mn-54	0.00e+00	5.11e+04	8.40e+03	0.00e+00	1.27e+04	1.98e+06	6.68e+04
Mn-56	0.00e+00	1.70e+00	2.52e-01	0.00e+00	1.79e+00	1.52e+04	5.74e+04
Fe-55	3.34e+04	2.38e+04	5.54e+03	0.00e+00	0.00e+00	1.24e+05	6.39e+03
Fe-59	1.59e+01	3.70e+04	1.43e+04	0.00e+00	0.00e+00	1.53e+06	1.78e+05
Co-58	0.00e+00	2.07e+03	2.78e+03	0.00e+00	0.00e+00	1.34e+06	9.52e+04
Co-60	0.00e+00	1.51e+04	1.98e+04	0.00e+00	0.00e+00	8.72e+06	2.59e+05
Ni-63	5.80e+05	4.34e+04	1.98e+04	0.00e+00	0.00e+00	3.07e+05	1.42e+04
Ni-65	2.18e+00	2.93e-01	1.27e-01	0.00e+00	0.00e+00	9.36e+03	3.67e+04
Cu-64	0.00e+00	2.03e+00	8.48e-01	0.00e+00	6.41e+00	1.11e+04	6.14e+04
Zn-65	3.86e+04	1.34e+05	6.24e+04	0.00e+00	8.64e+04	1.24e+06	4.66e+04
Zn-69	4.83e-02	9.20e-02	6.46e-03	0.00e+00	6.02e-02	1.58e+03	2.85e+02
Br-83	0.00e+00	0.00e+00	3.44e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	4.33e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	1.83e+01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.90e+05	8.40e+04	0.00e+00	0.00e+00	0.00e+00	1.77e+04
Rb-88	0.00e+00	5.46e+02	2.72e+02	0.00e+00	0.00e+00	0.00e+00	2.92e-05
Rb-89	0.00e+00	3.52e+02	2.33e+02	0.00e+00	0.00e+00	0.00e+00	3.38e-07
Sr-89	4.34e+05	0.00e+00	1.25e+04	0.00e+00	0.00e+00	2.42e+06	3.71e+05
Sr-90	1.08e+08	0.00e+00	6.68e+06	0.00e+00	0.00e+00	1.65e+07	7.65e+05
Sr-91	8.80e+01	0.00e+00	3.51e+00	0.00e+00	0.00e+00	6.07e+04	2.59e+05
Sr-92	9.52e+00	0.00e+00	4.06e-01	0.00e+00	0.00e+00	2.74e+04	1.19e+05
Y-90	2.98e+03	0.00e+00	8.00e+01	0.00e+00	0.00e+00	2.93e+05	5.59e+05
Y-91	6.61e+05	0.00e+00	1.77e+04	0.00e+00	0.00e+00	2.94e+06	4.09e+05
Y-91m	3.70e-01	0.00e+00	1.42e-02	0.00e+00	0.00e+00	3.20e+03	3.02e+01
Y-92	1.47e+01	0.00e+00	4.29e-01	0.00e+00	0.00e+00	2.68e+04	1.65e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.35e+02	0.00e+00	3.72e+00	0.00e+00	0.00e+00	8.32e+04	5.79e+05
Zr-95	1.46e+05	4.58e+04	3.15e+04	0.00e+00	6.74e+04	2.69e+06	1.49e+05
Zr-97	1.38e+02	2.72e+01	1.26e+01	0.00e+00	4.12e+01	1.30e+05	6.30e+05
Nb-95	1.86e+04	1.03e+04	5.66e+03	0.00e+00	1.00e+04	7.51e+05	9.68e+04
Mo-99	0.00e+00	1.69e+02	3.22e+01	0.00e+00	4.11e+02	1.54e+05	2.69e+05
Tc-101	5.92e-05	8.40e-05	8.24e-04	0.00e+00	1.52e-03	6.67e+02	8.72e-07
Tc-99m	1.38e-03	3.86e-03	4.99e-02	0.00e+00	5.76e-02	1.15e+03	6.13e+03
Ru-103	2.10e+03	0.00e+00	8.96e+02	0.00e+00	7.43e+03	7.83e+05	1.09e+05
Ru-105	1.12e+00	0.00e+00	4.34e-01	0.00e+00	1.41e+00	1.82e+04	9.04e+04
Ru-106	9.84e+04	0.00e+00	1.24e+04	0.00e+00	1.90e+05	1.61e+07	9.60e+05
Ag-110m	1.38e+04	1.31e+04	7.99e+03	0.00e+00	2.50e+04	6.75e+06	2.73e+05
Te-125m	4.88e+03	2.24e+03	6.67e+02	1.40e+03	0.00e+00	5.36e+05	7.50e+04
Te-127	2.01e+00	9.12e-01	4.42e-01	1.42e+00	7.28e+00	1.12e+04	8.08e+04
Te-127m	1.80e+04	8.16e+03	2.18e+03	4.38e+03	6.54e+04	1.66e+06	1.59e+05
Te-129	7.10e-02	3.38e-02	1.76e-02	5.18e-02	2.66e-01	3.30e+03	1.62e+03
Te-129m	1.39e+04	6.58e+03	2.25e+03	4.58e+03	5.19e+04	1.98e+06	4.05e+05
Te-131	1.58e-02	8.32e-03	5.04e-03	1.24e-02	6.18e-02	2.34e+03	1.51e+01
Te-131m	9.84e+01	6.01e+01	4.02e+01	7.25e+01	4.39e+02	2.38e+05	6.21e+05
Te-132	3.60e+02	2.90e+02	2.19e+02	2.46e+02	1.95e+03	4.49e+05	4.63e+05
I-130	6.24e+03	1.79e+04	7.17e+03	1.49e+06	2.75e+04	0.00e+00	9.12e+03
I-131	3.54e+04	4.91e+04	2.64e+04	1.46e+07	8.40e+04	0.00e+00	6.49e+03
I-132	1.59e+03	4.38e+03	1.58e+03	1.51e+05	6.92e+03	0.00e+00	1.27e+03
I-133	1.22e+04	2.05e+04	6.22e+03	2.92e+06	3.59e+04	0.00e+00	1.03e+04
I-134	8.88e+02	2.32e+03	8.40e+02	3.95e+04	3.66e+03	0.00e+00	2.04e+01
I-135	3.70e+03	9.44e+03	3.49e+03	6.21e+05	1.49e+04	0.00e+00	6.95e+03
Cs-134	5.02e+05	1.13e+06	5.49e+05	0.00e+00	3.75e+05	1.46e+05	9.76e+03
Cs-136	5.15e+04	1.94e+05	1.37e+05	0.00e+00	1.10e+05	1.78e+04	1.09e+04
Cs-137	6.70e+05	8.48e+05	3.11e+05	0.00e+00	3.04e+05	1.21e+05	8.48e+03
Cs-138	4.66e+02	8.56e+02	4.46e+02	0.00e+00	6.62e+02	7.87e+01	2.70e-01
Ba-139	1.34e+00	9.44e-04	3.90e-02	0.00e+00	8.88e-04	6.46e+03	6.45e+03

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	5.47e+04	6.70e+01	3.52e+03	0.00e+00	2.28e+01	2.03e+06	2.29e+05
Ba-141	1.42e-01	1.06e-04	4.74e-03	0.00e+00	9.84e-05	3.29e+03	7.46e-04
Ba-142	3.70e-02	3.70e-05	2.27e-03	0.00e+00	3.14e-05	1.91e+03	4.79e-10
La-140	4.79e+02	2.36e+02	6.26e+01	0.00e+00	0.00e+00	2.14e+05	4.87e+05
La-142	9.60e-01	4.25e-01	1.06e-01	0.00e+00	0.00e+00	1.02e+04	1.20e+04
Ce-141	2.84e+04	1.90e+04	2.17e+03	0.00e+00	8.88e+03	6.14e+05	1.26e+05
Ce-143	2.66e+02	1.94e+02	2.16e+01	0.00e+00	8.64e+01	1.30e+05	2.55e+05
Ce-144	4.89e+06	2.02e+06	2.62e+05	0.00e+00	1.21e+06	1.34e+07	8.64e+05
Pr-143	1.34e+04	5.31e+03	6.62e+02	0.00e+00	3.09e+03	4.83e+05	2.14e+05
Pr-144	4.30e-02	1.76e-02	2.18e-03	0.00e+00	1.01e-02	1.75e+03	2.35e-04
Nd-147	7.86e+03	8.56e+03	5.13e+02	0.00e+00	5.02e+03	3.72e+05	1.82e+05
W-187	1.20e+01	9.76e+00	3.43e+00	0.00e+00	0.00e+00	4.74e+04	1.77e+05
Np-239	3.38e+02	3.19e+01	1.77e+01	0.00e+00	1.00e+02	6.49e+04	1.32e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.12e+03	1.12e+03	1.12e+03	1.12e+03	1.12e+03	1.12e+03
C-14	3.59e+04	6.73e+03	6.73e+03	6.73e+03	6.73e+03	6.73e+03	6.73e+03
Na-24	1.61e+04	1.61e+04	1.61e+04	1.61e+04	1.61e+04	1.61e+04	1.61e+04
P-32	2.60e+06	1.14e+05	9.88e+04	0.00e+00	0.00e+00	0.00e+00	4.22e+04
Cr-51	0.00e+00	0.00e+00	1.54e+02	8.55e+01	2.43e+01	1.70e+04	1.08e+03
Mn-54	0.00e+00	4.29e+04	9.51e+03	0.00e+00	1.00e+04	1.58e+06	2.29e+04
Mn-56	0.00e+00	1.66e+00	3.12e-01	0.00e+00	1.67e+00	1.31e+04	1.23e+05
Fe-55	4.74e+04	2.52e+04	7.77e+03	0.00e+00	0.00e+00	1.11e+05	2.87e+03
Fe-59	2.07e+04	3.34e+04	1.67e+04	0.00e+00	0.00e+00	1.27e+06	7.07e+04
Co-58	0.00e+00	1.77e+03	3.16e+03	0.00e+00	0.00e+00	1.11e+06	3.44e+04
Co-60	0.00e+00	1.31e+04	2.26e+04	0.00e+00	0.00e+00	7.07e+06	9.62e+04
Ni-63	8.21e+05	4.62e+04	2.80e+04	0.00e+00	0.00e+00	2.75e+05	6.33e+03
Ni-65	2.99e+00	2.96e-01	1.64e-01	0.00e+00	0.00e+00	8.18e+03	8.40e+04
Cu-64	0.00e+00	1.99e+00	1.07e+00	0.00e+00	6.03e+00	9.58e+03	3.67e+04
Zn-65	4.26e+04	1.13e+05	7.03e+04	0.00e+00	7.14e+04	9.95e+05	1.63e+04
Zn-69	6.70e-02	9.66e-02	8.92e-03	0.00e+00	5.85e-02	1.42e+03	1.02e+04
Br-83	0.00e+00	0.00e+00	4.74e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	5.48e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	2.53e+01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.98e+05	1.14e+05	0.00e+00	0.00e+00	0.00e+00	7.99e+03
Rb-88	0.00e+00	5.62e+02	3.66e+02	0.00e+00	0.00e+00	0.00e+00	1.72e+01
Rb-89	0.00e+00	3.45e+02	2.90e+02	0.00e+00	0.00e+00	0.00e+00	1.89e+00
Sr-89	5.99e+05	0.00e+00	1.72e+04	0.00e+00	0.00e+00	2.16e+06	1.67e+05
Sr-90	1.01e+08	0.00e+00	6.44e+06	0.00e+00	0.00e+00	1.48e+07	3.43e+05
Sr-91	1.21e+02	0.00e+00	4.59e+00	0.00e+00	0.00e+00	5.33e+04	1.74e+05
Sr-92	1.31e+01	0.00e+00	5.25e-01	0.00e+00	0.00e+00	2.40e+04	2.42e+05
Y-90	4.11e+03	0.00e+00	1.11e+02	0.00e+00	0.00e+00	2.62e+05	2.68e+05
Y-91	9.14e+05	0.00e+00	2.44e+04	0.00e+00	0.00e+00	2.63e+06	1.84e+05
Y-91m	5.07e-01	0.00e+00	1.84e-02	0.00e+00	0.00e+00	2.81e+03	1.72e+03
Y-92	2.03e+01	0.00e+00	5.81e-01	0.00e+00	0.00e+00	2.39e+04	2.39e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.86e+02	0.00e+00	5.11e+00	0.00e+00	0.00e+00	7.44e+04	3.88e+05
Zr-95	1.90e+05	4.18e+04	3.70e+04	0.00e+00	5.96e+04	2.23e+06	6.11e+04
Zr-97	1.88e+02	2.72e+01	1.60e+01	0.00e+00	3.89e+01	1.13e+05	3.51e+05
Nb-95	2.35e+04	9.18e+03	6.55e+03	0.00e+00	8.62e+03	6.14e+05	3.70e+04
Mo-99	0.00e+00	1.72e+02	4.26e+01	0.00e+00	3.92e+02	1.35e+05	1.27e+05
Tc-101	8.10e-05	8.51e-05	1.08e-03	0.00e+00	1.45e-03	5.85e+02	1.63e+01
Tc-99m	1.78e-03	3.48e-03	5.77e-02	0.00e+00	5.07e-02	9.51e+02	4.81e+03
Ru-103	2.79e+03	0.00e+00	1.07e+03	0.00e+00	7.03e+03	6.62e+05	4.48e+04
Ru-105	1.53e+00	0.00e+00	5.55e-01	0.00e+00	1.34e+00	1.59e+04	9.95e+04
Ru-106	1.36e+05	0.00e+00	1.69e+04	0.00e+00	1.84e+05	1.43e+07	4.29e+05
Ag-110m	1.69e+04	1.14e+04	9.14e+03	0.00e+00	2.12e+04	5.48e+06	1.00e+05
Te-125m	6.73e+03	2.33e+03	9.14e+02	1.92e+03	0.00e+00	4.77e+05	3.38e+04
Te-127	2.77e+00	9.51e-01	6.11e-01	1.96e+00	7.07e+00	1.00e+04	5.62e+04
Te-127m	2.49e+04	8.55e+03	3.02e+03	6.07e+03	6.36e+04	1.48e+06	7.14e+04
Te-129	9.77e-02	3.50e-02	2.38e-02	7.14e-02	2.57e-01	2.93e+03	2.55e+04
Te-129m	1.92e+04	6.84e+03	3.04e+03	6.33e+03	5.03e+04	1.76e+06	1.82e+05
Te-131	2.17e-02	8.44e-03	6.39e-03	1.70e-02	5.88e-02	2.05e+03	1.33e+03
Te-131m	1.34e+02	5.92e+01	5.07e+01	9.77e+01	4.00e+02	2.06e+05	3.08e+05
Te-132	4.81e+02	2.72e+02	2.63e+02	3.17e+02	1.77e+03	3.77e+05	1.38e+05
I-130	8.18e+03	1.64e+04	8.44e+03	1.85e+06	2.45e+04	0.00e+00	5.11e+03
I-131	4.81e+04	4.81e+04	2.73e+04	1.62e+07	7.88e+04	0.00e+00	2.84e+03
I-132	2.12e+03	4.07e+03	1.88e+03	1.94e+05	6.25e+03	0.00e+00	3.20e+03
I-133	1.66e+04	2.03e+04	7.70e+03	3.85e+06	3.38e+04	0.00e+00	5.48e+03
I-134	1.17e+03	2.16e+03	9.95e+02	5.07e+04	3.30e+03	0.00e+00	9.55e+02
I-135	4.92e+03	8.73e+03	4.14e+03	7.92e+05	1.34e+04	0.00e+00	4.44e+03
Cs-134	6.51e+05	1.01e+06	2.25e+05	0.00e+00	3.30e+05	1.21e+05	3.85e+03
Cs-136	6.51e+04	1.71e+05	1.16e+05	0.00e+00	9.55e+04	1.45e+04	4.18e+03
Cs-137	9.06e+05	8.25e+05	1.28e+05	0.00e+00	2.82e+05	1.04e+05	3.62e+03
Cs-138	6.33e+02	8.40e+02	5.55e+02	0.00e+00	6.22e+02	6.81e+01	2.70e+02
Ba-139	1.84e+00	9.84e-04	5.37e-02	0.00e+00	8.62e-04	5.77e+03	5.77e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES
OTHER THAN NOBLE GASES: P_i

Pi factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	7.40e+04	6.48e+01	4.33e+03	0.00e+00	2.11e+01	1.74e+06	1.02e+05
Ba-141	1.96e-01	1.09e-04	6.36e-03	0.00e+00	9.47e-05	2.92e+03	2.75e+02
Ba-142	5.00e-02	3.60e-05	2.79e-03	0.00e+00	2.91e-05	1.64e+03	2.74e+00
La-140	6.44e+02	2.25e+02	7.55e+01	0.00e+00	0.00e+00	1.83e+05	2.26e+05
La-142	1.29e+00	4.11e-01	1.29e-01	0.00e+00	0.00e+00	8.70e+03	7.58e+04
Ce-141	3.92e+04	1.95e+04	2.90e+03	0.00e+00	8.55e+03	5.44e+05	5.66e+04
Ce-143	3.66e+02	1.99e+02	2.87e+01	0.00e+00	8.36e+01	1.15e+05	1.27e+05
Ce-144	6.77e+06	2.12e+06	3.61e+05	0.00e+00	1.17e+06	1.20e+07	3.88e+05
Pr-143	1.85e+04	5.55e+03	9.14e+02	0.00e+00	3.00e+03	4.33e+05	9.73e+04
Pr-144	5.96e-02	1.85e-02	3.00e-03	0.00e+00	9.77e-03	1.57e+03	1.97e+02
Nd-147	1.08e+04	8.73e+03	6.81e+02	0.00e+00	4.81e+03	3.28e+05	8.21e+04
W-187	1.63e+01	9.66e+00	4.33e+00	0.00e+00	0.00e+00	4.11e+04	9.10e+04
Np-239	4.66e+02	3.34e+01	2.35e+01	0.00e+00	9.73e+01	5.81e+04	6.40e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	6.47e+02	6.47e+02	6.47e+02	6.47e+02	6.47e+02	6.47e+02
C-14	2.65e+04	5.31e+03	5.31e+03	5.31e+03	5.31e+03	5.31e+03	5.31e+03
Na-24	1.06e+04	1.06e+04	1.06e+04	1.06e+04	1.06e+04	1.06e+04	1.06e+04
P-32	2.03e+06	1.12e+05	7.74e+04	0.00e+00	0.00e+00	0.00e+00	1.61e+04
Cr-51	0.00e+00	0.00e+00	8.95e+01	5.75e+01	1.32e+01	1.28e+04	3.57e+02
Mn-54	0.00e+00	2.53e+04	4.98e+03	0.00e+00	4.98e+03	1.00e+06	7.06e+03
Mn-56	0.00e+00	1.54e+00	2.21e-01	0.00e+00	1.10e+00	1.25e+04	7.17e+04
Fe-55	1.97e+04	1.17e+04	3.33e+03	0.00e+00	0.00e+00	8.69e+04	1.09e+03
Fe-59	1.36e+04	2.35e+04	9.48e+03	0.00e+00	0.00e+00	1.01e+06	2.48e+04
Co-58	0.00e+00	1.22e+03	1.82e+03	0.00e+00	0.00e+00	7.77e+05	1.11e+04
Co-60	0.00e+00	8.02e+03	1.18e+04	0.00e+00	0.00e+00	4.51e+06	3.19e+04
Ni-63	3.39e+05	2.04e+04	1.16e+04	0.00e+00	0.00e+00	2.09e+05	2.42e+03
Ni-65	2.39e+00	2.84e-01	1.23e-01	0.00e+00	0.00e+00	8.12e+03	5.01e+04
Cu-64	0.00e+00	1.88e+00	7.74e-01	0.00e+00	3.98e+00	9.30e+03	1.50e+04
Zn-65	1.93e+04	6.26e+04	3.11e+04	0.00e+00	3.25e+04	6.47e+05	5.14e+04
Zn-69	5.39e-02	9.67e-02	7.18e-03	0.00e+00	4.02e-02	1.47e+03	1.32e+04
Br-83	0.00e+00	0.00e+00	3.81e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	4.00e+02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	2.04e+01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.90e+05	8.82e+04	0.00e+00	0.00e+00	0.00e+00	3.04e+03
Rb-88	0.00e+00	5.57e+02	2.87e+02	0.00e+00	0.00e+00	0.00e+00	3.39e+02
Rb-89	0.00e+00	3.21e+02	2.06e+02	0.00e+00	0.00e+00	0.00e+00	6.82e+01
Sr-89	3.98e+05	0.00e+00	1.14e+04	0.00e+00	0.00e+00	2.03e+06	6.40e+04
Sr-90	4.09e+07	0.00e+00	2.59e+06	0.00e+00	0.00e+00	1.12e+07	1.31e+05
Sr-91	9.56e+01	0.00e+00	3.46e+00	0.00e+00	0.00e+00	5.26e+04	7.34e+04
Sr-92	1.05e+01	0.00e+00	3.91e-01	0.00e+00	0.00e+00	2.38e+04	1.40e+05
Y-90	3.29e+03	0.00e+00	8.82e+01	0.00e+00	0.00e+00	2.69e+05	1.04e+05
Y-91	5.88e+05	0.00e+00	1.57e+04	0.00e+00	0.00e+00	2.45e+06	7.03e+04
Y-91m	4.07e-01	0.00e+00	1.39e-02	0.00e+00	0.00e+00	2.79e+03	2.35e+03
Y-92	1.64e+01	0.00e+00	4.61e-01	0.00e+00	0.00e+00	2.45e+04	1.27e+05

Conversion factors are in units of mrem/yr per uCi/cubic meter.

Pi factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.50e+02	0.00e+00	4.07e+00	0.00e+00	0.00e+00	7.64e+04	1.67e+05
Zr-95	1.15e+05	2.79e+04	2.03e+04	0.00e+00	3.11e+04	1.75e+06	2.17e+04
Zr-97	1.50e+02	2.56e+01	1.17e+01	0.00e+00	2.59e+01	1.10e+05	1.40e+05
Nb-95	1.57e+04	6.43e+03	3.78e+03	0.00e+00	4.72e+03	4.79e+05	1.27e+04
Mo-99	0.00e+00	1.65e+02	3.23e+01	0.00e+00	2.65e+02	1.35e+05	4.87e+04
Tc-101	6.51e-05	8.23e-05	8.12e-04	0.00e+00	9.79e-04	5.84e+02	8.44e+02
Tc-99m	1.40e-03	2.88e-03	3.72e-02	0.00e+00	3.11e-02	8.11e+02	2.03e+03
Ru-103	2.02e+03	0.00e+00	6.79e+02	0.00e+00	4.24e+03	5.52e+05	1.61e+04
Ru-105	1.22e+00	0.00e+00	4.10e-01	0.00e+00	8.99e-01	1.57e+04	4.84e+04
Ru-106	8.68e+04	0.00e+00	1.09e+04	0.00e+00	1.07e+05	1.16e+07	1.64e+05
Ag-110m	9.98e+03	7.22e+03	5.00e+03	0.00e+00	1.09e+04	3.67e+06	3.30e+04
Te-125m	4.76e+03	1.99e+03	6.58e+02	1.62e+03	0.00e+00	4.47e+05	1.29e+04
Te-127	2.23e+00	9.53e-01	4.89e-01	1.85e+00	4.86e+00	1.03e+04	2.44e+04
Te-127m	1.67e+04	6.90e+03	2.07e+03	4.87e+03	3.75e+04	1.31e+06	2.73e+04
Te-129	7.88e-02	3.47e-02	1.88e-02	6.75e-02	1.75e-01	3.00e+03	2.63e+04
Te-129m	1.41e+04	6.09e+03	2.23e+03	5.47e+03	3.18e+04	1.68e+06	6.90e+04
Te-131	1.74e-02	8.22e-03	5.00e-03	1.58e-02	3.99e-02	2.06e+03	8.22e+03
Te-131m	1.07e+02	5.50e+01	3.63e+01	8.93e+01	2.65e+02	1.99e+05	1.19e+05
Te-132	3.72e+02	2.37e+02	1.76e+02	2.79e+02	1.03e+03	3.40e+05	4.41e+04
I-130	6.36e+03	1.39e+04	5.57e+03	1.60e+06	1.53e+04	0.00e+00	1.99e+03
I-131	3.79e+04	4.44e+04	1.96e+04	1.48e+07	5.18e+04	0.00e+00	1.06e+03
I-132	1.69e+03	3.54e+03	1.26e+03	1.69e+05	3.95e+03	0.00e+00	1.90e+03
I-133	1.32e+04	1.92e+04	5.60e+03	3.56e+06	2.24e+04	0.00e+00	2.16e+03
I-134	9.21e+02	1.88e+03	6.65e+02	4.45e+04	2.09e+03	0.00e+00	1.29e+03
I-135	3.26e+03	7.60e+03	2.77e+03	6.96e+05	8.47e+03	0.00e+00	1.83e+03
Cs-134	5.96e+05	7.03e+05	7.45e+04	0.00e+00	1.90e+05	7.97e+04	1.33e+03
Cs-136	4.83e+04	1.35e+05	5.29e+04	0.00e+00	5.64e+04	1.18e+04	1.43e+03
Cs-137	5.49e+05	6.12e+05	4.55e+04	0.00e+00	1.72e+05	7.13e+04	1.33e+03
Cs-138	5.05e+02	7.81e+02	3.98e+02	0.00e+00	4.10e+02	6.54e+01	8.76e+02
Ba-139	1.48e+00	9.84e-04	4.30e-02	0.00e+00	5.92e-04	5.95e+03	5.10e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Inhalation Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	5.60e+04	5.60e+01	2.90e+03	0.00e+00	1.34e+01	1.60e+06	3.84e+04
Ba-141	1.57e-01	1.08e-04	4.97e-03	0.00e+00	6.50e-05	2.97e+03	4.75e+03
Ba-142	3.98e-02	3.30e-05	1.96e-03	0.00e+00	1.90e-05	1.55e+03	6.93e+02
La-140	5.05e+02	2.00e+02	5.15e+01	0.00e+00	0.00e+00	1.68e+05	8.48e+04
La-142	1.03e+00	3.77e-01	9.04e-02	0.00e+00	0.00e+00	8.22e+03	5.95e+04
Ce-141	2.77e+04	1.67e+04	1.99e+03	0.00e+00	5.25e+03	5.17e+05	2.16e+04
Ce-143	2.93e+02	1.93e+02	2.21e+01	0.00e+00	5.64e+01	1.16e+05	4.97e+04
Ce-144	3.19e+06	1.21e+06	1.76e+05	0.00e+00	5.38e+05	9.84e+06	1.48e+05
Pr-143	1.40e+04	5.24e+03	6.99e+02	0.00e+00	1.97e+03	4.33e+05	3.72e+04
Pr-144	4.79e-02	1.85e-02	2.41e-03	0.00e+00	6.72e-03	1.61e+03	4.28e+03
Nd-147	7.94e+03	8.13e+03	5.00e+02	0.00e+00	3.15e+03	3.22e+05	3.12e+04
W-187	1.30e+01	9.02e+00	3.12e+00	0.00e+00	0.00e+00	3.96e+04	3.56e+04
Np-239	3.71e+02	3.32e+01	1.88e+01	0.00e+00	6.62e+01	5.95e+04	2.49e+04

Conversion factors are in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	7.63e+02	7.63e+02	7.63e+02	7.63e+02	7.63e+02	7.63e+02
C-14	2.63e+08	5.27e+07	5.27e+07	5.27e+07	5.27e+07	5.27e+07	5.27e+07
Na-24	2.44e+06	2.44e+06	2.44e+06	2.44e+06	2.44e+06	2.44e+06	2.44e+06
P-32	1.71e+10	1.06e+09	6.61e+08	0.00e+00	0.00e+00	0.00e+00	1.92e+09
Cr-51	0.00e+00	0.00e+00	2.86e+04	1.71e+04	6.30e+03	3.79e+04	7.19e+06
Mn-54	0.00e+00	8.41e+06	1.61e+06	0.00e+00	2.50e+06	0.00e+00	2.58e+07
Mn-56	0.00e+00	4.15e-03	7.37e-04	0.00e+00	5.27e-03	0.00e+00	1.33e-01
Fe-55	2.51e+07	1.73e+07	4.05e+06	0.00e+00	0.00e+00	9.68e+06	9.95e+06
Fe-59	2.97e+07	6.98e+07	2.68e+07	0.00e+00	0.00e+00	1.95e+07	2.33e+08
Co-58	0.00e+00	4.71e+06	1.06e+07	0.00e+00	0.00e+00	0.00e+00	9.55e+07
Co-60	0.00e+00	1.64e+07	3.62e+07	0.00e+00	0.00e+00	0.00e+00	3.08e+08
Ni-63	6.73e+09	4.66e+08	2.26e+08	0.00e+00	0.00e+00	0.00e+00	9.73e+07
Ni-65	3.76e-01	4.88e-02	2.23e-02	0.00e+00	0.00e+00	0.00e+00	1.24e+00
Cu-64	0.00e+00	2.39e+04	1.12e+04	0.00e+00	6.03e+04	0.00e+00	2.04e+06
Zn-65	1.37e+09	4.37e+09	1.97e+09	0.00e+00	2.92e+09	0.00e+00	2.75e+09
Zn-69	2.18e-12	4.17e-12	2.90e-13	0.00e+00	2.71e-12	0.00e+00	6.26e-13
Br-83	0.00e+00	0.00e+00	1.18e-02	0.00e+00	0.00e+00	0.00e+00	1.71e-02
Br-84	0.00e+00	0.00e+00	2.08e-24	0.00e+00	0.00e+00	0.00e+00	1.63e-29
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.59e+09	1.21e+09	0.00e+00	0.00e+00	0.00e+00	5.12e+08
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	1.45e+09	0.00e+00	4.16e+07	0.00e+00	0.00e+00	0.00e+00	2.33e+08
Sr-90	4.68e+10	0.00e+00	1.15e+10	0.00e+00	0.00e+00	0.00e+00	1.35e+09
Sr-91	2.90e+04	0.00e+00	1.17e+03	0.00e+00	0.00e+00	0.00e+00	1.38e+05
Sr-92	4.95e-01	0.00e+00	2.14e-02	0.00e+00	0.00e+00	0.00e+00	9.81e+00
Y-90	7.09e+01	0.00e+00	1.20e+00	0.00e+00	0.00e+00	0.00e+00	7.52e+05
Y-91	8.59e+03	0.00e+00	2.30e+02	0.00e+00	0.00e+00	0.00e+00	4.73e+06
Y-91m	6.27e-20	0.00e+00	2.43e-21	0.00e+00	0.00e+00	0.00e+00	1.84e-19
Y-92	5.64e-05	0.00e+00	1.65e-06	0.00e+00	0.00e+00	0.00e+00	9.88e-01

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: Pi

Pi factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	2.24e-01	0.00e+00	6.19e-03	0.00e+00	0.00e+00	0.00e+00	7.11e+03
Zr-95	9.43e+02	3.03e+02	2.05e+02	0.00e+00	4.75e+02	0.00e+00	9.59e+05
Zr-97	4.34e-01	8.76e-02	4.01e-02	0.00e+00	1.32e-01	0.00e+00	2.71e+04
Nb-95	8.26e+04	4.59e+04	2.47e+04	0.00e+00	4.54e+04	0.00e+00	2.79e+08
Mo-99	0.00e+00	2.48e+07	4.72e+06	0.00e+00	5.61e+07	0.00e+00	5.74e+07
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	3.34e+00	9.44e+00	1.20e+02	0.00e+00	1.43e+02	4.63e+00	5.59e+03
Ru-103	1.02e+03	0.00e+00	4.39e+02	0.00e+00	3.89e+03	0.00e+00	1.19e+05
Ru-105	8.64e-04	0.00e+00	3.41e-04	0.00e+00	1.12e-02	0.00e+00	5.29e-01
Ru-106	2.04e+04	0.00e+00	2.58e+03	0.00e+00	3.94e+04	0.00e+00	1.32e+06
Ag-110m	5.82e+07	5.39e+07	3.20e+07	0.00e+00	1.06e+08	0.00e+00	2.20e+10
Te-125m	1.63e+07	5.90e+06	2.18e+06	4.90e+06	6.63e+07	0.00e+00	6.50e+07
Te-127	6.56e+02	2.35e+02	1.42e+02	4.86e+02	2.67e+03	0.00e+00	5.17e+04
Te-127m	4.58e+07	1.64e+07	5.58e+06	1.17e+07	1.86e+08	0.00e+00	1.53e+08
Te-129	2.92e-10	1.10e-10	7.11e-11	2.24e-10	1.23e-09	0.00e+00	2.20e-10
Te-129m	6.02e+07	2.25e+07	9.53e+06	2.07e+07	2.51e+08	0.00e+00	3.03e+08
Te-131	3.95e-33	1.65e-33	1.25e-33	3.25e-33	1.73e-32	0.00e+00	5.60e-34
Te-131m	3.62e+05	1.77e+05	1.47e+05	2.80e+05	1.79e+06	0.00e+00	1.76e+07
Te-132	2.40e+06	1.55e+06	1.46e+06	1.72e+06	1.50e+07	0.00e+00	7.35e+07
I-130	4.21e+05	1.24e+06	4.90e+05	1.05e+08	1.94e+06	0.00e+00	1.07e+06
I-131	2.96e+08	4.24e+08	2.43e+08	1.39e+11	7.26e+08	0.00e+00	1.12e+08
I-132	1.67e-01	4.47e-01	1.56e-01	1.56e+01	7.12e-01	0.00e+00	8.39e-02
I-133	3.88e+06	6.74e+06	2.06e+06	9.91e+08	1.18e+07	0.00e+00	6.06e+06
I-134	2.11e-12	5.72e-12	2.05e-12	9.92e-11	9.10e-12	0.00e+00	4.99e-15
I-135	1.29e+04	3.38e+04	1.25e+04	2.23e+06	5.42e+04	0.00e+00	3.82e+04
Cs-134	5.65e+09	1.34e+10	1.10e+10	0.00e+00	4.35e+09	1.44e+09	2.35e+08
Cs-136	2.63e+08	1.04e+09	7.48e+08	0.00e+00	5.78e+08	7.93e+07	1.18e+08
Cs-137	7.38e+09	1.01e+10	6.61e+09	0.00e+00	3.43e+09	1.14e+09	1.95e+08
Cs-138	9.72e-24	1.92e-23	9.50e-24	0.00e+00	1.41e-23	1.39e-24	8.18e-29
Ba-139	4.54e-08	3.24e-11	1.33e-09	0.00e+00	3.03e-11	1.84e-11	8.06e-08

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES
OTHER THAN NOBLE GASES: Pi

Pi factors for Adult age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.69e+07	3.38e+04	1.76e+06	0.00e+00	1.15e+04	1.93e+04	5.54e+07
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	4.52e+00	2.28e+00	6.01e-01	0.00e+00	0.00e+00	0.00e+00	1.67e+05
La-142	1.90e-11	8.66e-12	2.15e-12	0.00e+00	0.00e+00	0.00e+00	6.32e-08
Ce-141	4.64e+03	3.28e+03	3.72e+02	0.00e+00	1.52e+03	0.00e+00	1.25e+07
Ce-143	4.16e+01	3.08e+04	3.40e+00	0.00e+00	1.35e+01	0.00e+00	1.15e+06
Ce-144	3.58e+05	1.50e+05	1.92e+04	0.00e+00	8.87e+04	0.00e+00	1.21e+08
Pr-143	1.58e+02	6.33e+01	7.83e+00	0.00e+00	3.66e+01	0.00e+00	6.92e+05
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	9.42e+01	1.09e+02	6.51e+00	0.00e+00	6.36e+01	0.00e+00	5.22e+05
W-187	6.52e+03	5.45e+03	1.91e+03	0.00e+00	0.00e+00	0.00e+00	1.79e+06
Np-239	3.68e+00	3.61e-01	1.99e-01	0.00e+00	1.13e+00	0.00e+00	7.41e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	9.94e+02	9.94e+02	9.94e+02	9.94e+02	9.94e+02	9.94e+02
C-14	4.86e+08	9.72e+07	9.72e+07	9.72e+07	9.72e+07	9.72e+07	9.72e+07
Na-24	4.27e+06	4.27e+06	4.27e+06	4.27e+06	4.27e+06	4.27e+06	4.27e+06
P-32	3.15e+10	1.95e+09	1.22e+09	0.00e+00	0.00e+00	0.00e+00	2.65e+09
Cr-51	0.00e+00	0.00e+00	4.99e+04	2.77e+04	1.09e+04	7.13e+04	8.39e+06
Mn-54	0.00e+00	1.40e+07	2.78e+06	0.00e+00	4.18e+06	0.00e+00	2.87e+07
Mn-56	0.00e+00	7.36e-03	1.31e-03	0.00e+00	9.32e-03	0.00e+00	4.85e-01
Fe-55	4.45e+07	3.16e+07	7.36e+06	0.00e+00	0.00e+00	2.00e+07	1.37e+07
Fe-59	5.18e+07	1.21e+08	4.67e+07	0.00e+00	0.00e+00	3.81e+07	2.86e+08
Co-58	0.00e+00	7.94e+06	1.83e+07	0.00e+00	0.00e+00	0.00e+00	1.09e+08
Co-60	0.00e+00	2.78e+07	6.26e+07	0.00e+00	0.00e+00	0.00e+00	3.62e+08
Ni-63	1.18e+10	8.35e+08	4.01e+08	0.00e+00	0.00e+00	0.00e+00	1.33e+08
Ni-65	6.87e-01	8.78e-02	4.00e-02	0.00e+00	0.00e+00	0.00e+00	4.76e+00
Cu-64	0.00e+00	4.26e+04	2.00e+04	0.00e+00	1.08e+05	0.00e+00	3.30e+06
Zn-65	2.11e+09	7.32e+09	3.41e+09	0.00e+00	4.68e+09	0.00e+00	3.10e+09
Zn-69	4.01e-12	7.65e-12	5.35e-13	0.00e+00	5.00e-12	0.00e+00	1.41e-11
Br-83	0.00e+00	0.00e+00	2.18e-02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	3.71e-24	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	4.73e+09	2.22e+09	0.00e+00	0.00e+00	0.00e+00	7.00e+08
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	2.67e+09	0.00e+00	7.66e+07	0.00e+00	0.00e+00	0.00e+00	3.19e+08
Sr-90	6.61e+10	0.00e+00	1.63e+10	0.00e+00	0.00e+00	0.00e+00	1.86e+09
Sr-91	5.33e+04	0.00e+00	2.12e+03	0.00e+00	0.00e+00	0.00e+00	2.42e+05
Sr-92	9.07e-01	0.00e+00	3.86e-02	0.00e+00	0.00e+00	0.00e+00	2.31e+01
Y-90	1.30e+02	0.00e+00	3.51e+00	0.00e+00	0.00e+00	0.00e+00	1.07e+06
Y-91	1.58e+04	0.00e+00	4.24e+02	0.00e+00	0.00e+00	0.00e+00	6.48e+06
Y-91m	1.15e-19	0.00e+00	4.39e-21	0.00e+00	0.00e+00	0.00e+00	5.42e-18
Y-92	1.04e-04	0.00e+00	3.01e-06	0.00e+00	0.00e+00	0.00e+00	2.86e+00

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES
OTHER THAN NOBLE GASES: P_i

Pi factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	4.13e-01	0.00e+00	1.13e-02	0.00e+00	0.00e+00	0.00e+00	1.26e+04
Zr-95	1.65e+03	5.20e+02	3.58e+02	0.00e+00	7.65e+02	0.00e+00	1.20e+06
Zr-97	7.90e-01	1.56e-01	7.20e-02	0.00e+00	2.37e-01	0.00e+00	4.23e+04
Nb-95	1.41e+05	7.81e+04	4.30e+04	0.00e+00	7.57e+04	0.00e+00	3.34e+08
Mo-99	0.00e+00	4.47e+07	8.53e+06	0.00e+00	1.02e+08	0.00e+00	8.01e+07
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	5.80e+00	1.62e+01	2.10e+02	0.00e+00	2.41e+02	8.97e+00	1.06e+04
Ru-103	1.81e+03	0.00e+00	7.74e+02	0.00e+00	6.38e+03	0.00e+00	1.51e+05
Ru-105	1.58e-03	0.00e+00	6.13e-04	0.00e+00	1.99e-02	0.00e+00	1.27e+00
Ru-106	2.89e+04	0.00e+00	4.73e+03	0.00e+00	7.24e+04	0.00e+00	1.80e+06
Ag-110m	9.63e+07	9.11e+07	5.54e+07	0.00e+00	1.74e+08	0.00e+00	2.56e+10
Te-125m	3.00e+07	1.08e+07	4.02e+06	8.39e+06	0.00e+00	0.00e+00	8.86e+07
Te-127	1.22e+03	4.31e+02	2.61e+02	8.38e+02	4.92e+03	0.00e+00	9.38e+04
Te-127m	8.44e+07	2.99e+07	1.00e+07	2.01e+07	3.42e+08	0.00e+00	2.10e+08
Te-129	5.37e-10	2.00e-10	1.20e-10	3.84e-10	2.25e-09	0.00e+00	2.94e-09
Te-129m	1.10e+08	4.09e+07	1.74e+07	3.55e+07	4.61e+08	0.00e+00	4.13e+08
Te-131	7.22e-33	2.98e-33	2.26e-33	5.57e-33	3.16e-32	0.00e+00	5.93e-34
Te-131m	6.58e+05	3.15e+05	2.63e+05	4.75e+05	3.29e+06	0.00e+00	2.53e+07
Te-132	4.29e+06	2.72e+06	2.56e+06	2.87e+06	2.61e+07	0.00e+00	8.61e+07
I-130	7.41e+05	2.14e+06	8.56e+05	1.75e+08	3.30e+06	0.00e+00	1.65e+06
I-131	5.37e+08	7.52e+08	4.04e+08	2.20e+11	1.30e+09	0.00e+00	1.49e+08
I-132	2.96e-01	7.75e-01	2.78e-01	2.61e+01	1.22e+00	0.00e+00	3.38e-01
I-133	7.08e+06	1.20e+07	3.66e+06	1.68e+09	2.11e+07	0.00e+00	9.09e+06
I-134	3.74e-12	9.92e-12	3.56e-12	1.65e-10	1.56e-11	0.00e+00	1.31e-13
I-135	2.29e+04	5.90e+04	2.19e+04	3.80e+06	9.33e+04	0.00e+00	6.54e+04
Cs-134	9.81e+09	2.31e+10	1.07e+10	0.00e+00	7.34e+09	2.80e+09	2.87e+08
Cs-136	4.48e+08	1.76e+09	1.18e+09	0.00e+00	9.60e+08	1.51e+08	1.42e+08
Cs-137	1.34e+10	1.78e+10	6.20e+09	0.00e+00	6.06e+09	2.35e+09	2.53e+08
Cs-138	1.76e-23	3.38e-23	1.69e-23	0.00e+00	2.50e-23	2.91e-24	1.54e-26
Ba-139	8.40e-08	5.91e-11	2.45e-09	0.00e+00	5.57e-11	4.07e-11	7.50e-07

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Teen age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	4.85e+07	5.95e+04	3.13e+06	0.00e+00	2.02e+04	4.00e+04	7.48e+07
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	8.11e+00	3.99e+00	1.06e+00	0.00e+00	0.00e+00	0.00e+00	2.29e+05
La-142	3.43e-11	1.53e-11	3.80e-12	0.00e+00	0.00e+00	0.00e+00	4.64e-07
Ce-141	8.88e+03	5.93e+03	6.81e+02	0.00e+00	2.79e+03	0.00e+00	1.70e+07
Ce-143	7.65e+01	5.56e+04	6.21e+00	0.00e+00	2.50e+01	0.00e+00	1.67e+06
Ce-144	6.58e+05	2.72e+05	3.54e+04	0.00e+00	1.63e+05	0.00e+00	1.66e+08
Pr-143	2.90e+02	1.16e+02	1.44e+01	0.00e+00	6.73e+01	0.00e+00	9.55e+05
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	1.81e+02	1.97e+02	1.18e+01	0.00e+00	1.16e+02	0.00e+00	7.11e+05
W-187	1.19e+04	9.73e+03	3.41e+03	0.00e+00	0.00e+00	0.00e+00	2.63e+06
Np-239	7.01e+00	6.62e-01	3.67e-01	0.00e+00	2.08e+00	0.00e+00	1.06e+05

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.57e+03	1.57e+03	1.57e+03	1.57e+03	1.57e+03	1.57e+03
C-14	1.19e+09	2.39e+08	2.39e+08	2.39e+08	2.39e+08	2.39e+08	2.39e+08
Na-24	8.88e+06	8.88e+07	8.88e+06	8.88e+06	8.88e+06	8.88e+06	8.88e+06
P-32	7.78e+10	3.64e+09	3.00e+09	0.00e+00	0.00e+00	0.00e+00	2.15e+09
Cr-51	0.00e+00	0.00e+00	1.02e+05	5.65e+04	1.54e+04	1.03e+05	5.40e+06
Mn-54	0.00e+00	2.10e+07	5.59e+06	0.00e+00	5.88e+06	0.00e+00	1.76e+07
Mn-56	0.00e+00	1.28e-02	2.90e-03	0.00e+00	1.55e-02	0.00e+00	1.86e+00
Fe-55	1.12e+08	5.93e+07	1.84e+07	0.00e+00	0.00e+00	3.35e+07	1.10e+07
Fe-59	1.20e+08	1.95e+08	9.69e+07	0.00e+00	0.00e+00	5.64e+07	2.03e+08
Co-58	0.00e+00	1.21e+07	3.71e+07	0.00e+00	0.00e+00	0.00e+00	7.07e+07
Co-60	0.00e+00	4.32e+07	1.27e+08	0.00e+00	0.00e+00	0.00e+00	2.39e+08
Ni-63	2.96e+10	1.59e+09	1.04e+09	0.00e+00	0.00e+00	0.00e+00	1.07e+08
Ni-65	1.68e+00	1.58e-01	9.24e-02	0.00e+00	0.00e+00	0.00e+00	1.94e+01
Cu-64	0.00e+00	7.49e+04	4.52e+04	0.00e+00	1.81e+05	0.00e+00	3.51e+06
Zn-65	4.13e+09	1.10e+10	6.85e+09	0.00e+00	6.94e+09	0.00e+00	1.93e+09
Zn-69	9.87e-12	1.43e-11	1.32e-12	0.00e+00	8.65e-12	0.00e+00	8.99e-10
Br-83	0.00e+00	0.00e+00	5.36e-02	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	8.40e-24	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	8.77e+09	5.39e+09	0.00e+00	0.00e+00	0.00e+00	5.64e+08
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	6.62e+09	0.00e+00	1.89e+08	0.00e+00	0.00e+00	0.00e+00	2.56e+08
Sr-90	1.12e+11	0.00e+00	2.83e+10	0.00e+00	0.00e+00	0.00e+00	1.50e+09
Sr-91	1.31e+05	0.00e+00	4.94e+03	0.00e+00	0.00e+00	0.00e+00	2.89e+05
Sr-92	2.21e+00	0.00e+00	8.88e-02	0.00e+00	0.00e+00	0.00e+00	4.19e+01
Y-90	3.22e+02	0.00e+00	8.63e+00	0.00e+00	0.00e+00	0.00e+00	9.18e+05
Y-91	3.90e+04	0.00e+00	1.04e+03	0.00e+00	0.00e+00	0.00e+00	5.20e+06
Y-91m	2.80e-19	0.00e+00	1.02e-20	0.00e+00	0.00e+00	0.00e+00	5.49e-16
Y-92	2.56e-04	0.00e+00	7.32e-06	0.00e+00	0.00e+00	0.00e+00	7.39e+00

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.02e+00	0.00e+00	2.79e-02	0.00e+00	0.00e+00	0.00e+00	1.51e+04
Zr-95	3.83e+03	8.42e+02	7.50e+02	0.00e+00	1.21e+03	0.00e+00	8.79e+05
Zr-97	1.92e+00	2.78e-01	1.64e-01	0.00e+00	3.99e-01	0.00e+00	4.21e+04
Nb-95	3.18e+05	1.24e+05	8.84e+04	0.00e+00	1.16e+05	0.00e+00	2.29e+08
Mo-99	0.00e+00	8.14e+07	2.01e+07	0.00e+00	1.74e+08	0.00e+00	6.73e+07
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	1.33e+01	2.61e+01	4.32e+02	0.00e+00	3.79e+02	1.32e+01	1.48e+04
Ru-103	4.28e+03	0.00e+00	1.65e+03	0.00e+00	1.08e+04	0.00e+00	1.11e+05
Ru-105	3.85e-03	0.00e+00	1.40e-03	0.00e+00	3.39e-02	0.00e+00	2.51e+00
Ru-106	9.24e+04	0.00e+00	1.15e+04	0.00e+00	1.25e+05	0.00e+00	1.44e+06
Ag-110m	2.09e+08	1.41e+08	1.13e+08	0.00e+00	2.63e+08	0.00e+00	1.68e+10
Te-125m	7.38e+07	2.00e+07	9.84e+06	2.07e+07	0.00e+00	0.00e+00	7.12e+07
Te-127	2.99e+03	8.06e+02	6.41e+02	2.07e+03	8.50e+03	0.00e+00	1.17e+05
Te-127m	2.08e+08	5.60e+07	2.47e+07	4.97e+07	5.93e+08	0.00e+00	1.68e+08
Te-129	1.33e-09	3.70e-10	3.15e-10	9.46e-10	3.88e-09	0.00e+00	8.25e-08
Te-129m	2.71e+08	7.58e+07	4.21e+07	8.75e+07	7.97e+08	0.00e+00	3.31e+08
Te-131	1.77e-32	5.40e-33	5.27e-33	1.36e-32	5.36e-32	0.00e+00	9.31e-32
Te-131m	1.60e+06	5.54e+05	5.89e+05	1.14e+06	5.36e+06	0.00e+00	2.25e+07
Te-132	1.03e+07	4.54e+06	5.48e+06	6.61e+06	4.21e+07	0.00e+00	4.57e+07
I-130	1.73e+06	3.50e+06	1.80e+06	3.86e+08	5.23e+06	0.00e+00	1.64e+06
I-131	1.30e+09	1.31e+09	7.45e+08	4.33e+11	2.15e+09	0.00e+00	1.17e+08
I-132	7.01e-01	1.29e+00	5.92e-01	5.97e+01	1.97e+00	0.00e+00	1.52e+00
I-133	1.72e+07	2.13e+07	8.05e+06	3.95e+09	3.55e+07	0.00e+00	8.57e+06
I-134	8.87e-12	1.65e-11	7.57e-12	3.79e-10	2.52e-11	0.00e+00	1.09e-11
I-135	5.43e+04	9.77e+04	4.62e+04	8.66e+06	1.50e+05	0.00e+00	7.45e+04
Cs-134	2.26e+10	3.71e+10	7.84e+09	0.00e+00	1.15e+10	4.13e+09	2.00e+08
Cs-136	1.01e+09	2.86e+09	1.80e+09	0.00e+00	1.48e+09	2.21e+08	9.77e+07
Cs-137	3.22e+10	3.09e+10	4.55e+09	0.00e+00	1.01e+10	3.62e+09	1.93e+08
Cs-138	4.27e-23	5.94e-23	3.77e-23	0.00e+00	4.18e-23	4.50e-24	2.74e-23
Ba-139	2.06e-07	1.10e-10	5.98e-09	0.00e+00	9.62e-11	6.48e-11	1.19e-05

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Child age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	1.17e+08	1.03e+05	6.84e+06	0.00e+00	3.34e+04	6.12e+04	5.93e+07
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	1.94e+01	6.79e+00	2.12e+00	0.00e+00	0.00e+00	0.00e+00	1.89e+05
La-142	8.30e-11	2.64e-11	8.28e-12	0.00e+00	0.00e+00	0.00e+00	5.24e-06
Ce-141	2.19e+04	1.09e+04	1.62e+03	0.00e+00	4.78e+04	0.00e+00	1.36e+07
Ce-143	1.88e+02	1.02e+05	1.47e+01	0.00e+00	4.27e+01	0.00e+00	1.49e+06
Ce-144	1.62e+06	5.09e+05	8.66e+04	0.00e+00	2.82e+05	0.00e+00	1.33e+08
Pr-143	7.18e+02	2.16e+02	3.56e+01	0.00e+00	1.17e+02	0.00e+00	7.75e+05
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	4.45e+02	3.60e+02	2.79e+01	0.00e+00	1.98e+02	0.00e+00	5.71e+05
W-187	2.89e+04	1.71e+04	7.69e+03	0.00e+00	0.00e+00	0.00e+00	2.41e+06
Np-239	1.73e+01	1.24e+00	8.71e-01	0.00e+00	3.58e+00	0.00e+00	9.17e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	2.38e+03	2.38e+03	2.38e+03	2.38e+03	2.38e+03	2.38e+03
C-14	2.34e+09	5.00e+08	5.00e+08	5.00e+08	5.00e+08	5.00e+08	5.00e+08
Na-24	1.55e+07	1.55e+07	1.55e+07	1.55e+07	1.55e+07	1.55e+07	1.55e+07
P-32	1.60e+11	9.43e+09	6.21e+09	0.00e+00	0.00e+00	0.00e+00	2.17e+09
Cr-51	0.00e+00	0.00e+00	1.61e+05	1.05e+05	2.30e+04	2.05e+05	4.70e+06
Mn-54	0.00e+00	3.90e+07	8.84e+06	0.00e+00	8.64e+06	0.00e+00	1.43e+07
Mn-56	0.00e+00	3.14e-02	5.42e-03	0.00e+00	2.70e-02	0.00e+00	2.86e+00
Fe-55	1.35e+08	8.73e+07	2.33e+07	0.00e+00	0.00e+00	4.27e+07	1.11e+07
Fe-59	2.24e+08	3.92e+08	1.54e+08	0.00e+00	0.00e+00	1.16e+08	1.87e+08
Co-58	0.00e+00	2.42e+07	6.05e+07	0.00e+00	0.00e+00	0.00e+00	6.04e+07
Co-60	0.00e+00	8.81e+07	2.08e+08	0.00e+00	0.00e+00	0.00e+00	2.10e+08
Ni-63	3.49e+10	2.16e+09	1.21e+09	0.00e+00	0.00e+00	0.00e+00	1.07e+08
Ni-65	3.56e+00	4.03e-01	1.83e-01	0.00e+00	0.00e+00	0.00e+00	3.07e+01
Cu-64	0.00e+00	1.86e+05	8.62e+04	0.00e+00	3.15e+05	0.00e+00	3.82e+06
Zn-65	5.55e+09	1.90e+10	8.78e+09	0.00e+00	9.23e+09	0.00e+00	1.61e+10
Zn-69	2.10e-11	3.79e-11	2.82e-12	0.00e+00	1.57e-11	0.00e+00	3.09e-09
Br-83	0.00e+00	0.00e+00	1.14e-01	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	1.62e-23	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.23e+10	1.10e+10	0.00e+00	0.00e+00	0.00e+00	5.69e+08
Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Sr-89	1.26e+10	0.00e+00	3.61e+08	0.00e+00	0.00e+00	0.00e+00	2.59e+08
Sr-90	1.22e+11	0.00e+00	3.10e+10	0.00e+00	0.00e+00	0.00e+00	1.52e+09
Sr-91	2.73e+05	0.00e+00	9.87e+03	0.00e+00	0.00e+00	0.00e+00	3.23e+05
Sr-92	4.71e+00	0.00e+00	1.75e-01	0.00e+00	0.00e+00	0.00e+00	5.08e+01
Y-90	6.82e+02	0.00e+00	1.83e+01	0.00e+00	0.00e+00	0.00e+00	9.41e+05
Y-91	7.33e+04	0.00e+00	1.95e+03	0.00e+00	0.00e+00	0.00e+00	5.25e+06
Y-91m	5.94e-19	0.00e+00	2.03e-20	0.00e+00	0.00e+00	0.00e+00	1.98e-15
Y-92	5.44e-04	0.00e+00	1.53e-05	0.00e+00	0.00e+00	0.00e+00	1.04e+01

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	2.16e+00	0.00e+00	5.90e-02	0.00e+00	0.00e+00	0.00e+00	1.71e+04
Zr-95	6.80e+03	1.66e+03	1.18e+03	0.00e+00	1.79e+03	0.00e+00	8.26e+05
Zr-97	4.07e+00	6.99e-01	3.19e-01	0.00e+00	7.04e-01	0.00e+00	4.46e+04
Nb-95	5.93e+05	2.44e+05	1.41e+05	0.00e+00	1.75e+05	0.00e+00	2.06e+08
Mo-99	0.00e+00	2.08e+08	4.06e+07	0.00e+00	3.11e+08	0.00e+00	6.86e+07
Tc-101	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tc-99m	2.77e+01	5.70e+01	7.35e+02	0.00e+00	6.14e+02	2.98e+01	1.66e+04
Ru-103	8.67e+03	0.00e+00	2.90e+03	0.00e+00	1.80e+04	0.00e+00	1.05e+05
Ru-105	8.12e-03	0.00e+00	2.74e-03	0.00e+00	5.97e-02	0.00e+00	3.23e+00
Ru-106	1.90e+05	0.00e+00	2.38e+04	0.00e+00	2.25e+05	0.00e+00	1.44e+06
Ag-110m	3.86e+08	2.82e+08	1.86e+08	0.00e+00	4.03e+08	0.00e+00	1.46e+10
Te-125m	1.51e+08	5.04e+07	2.04e+07	5.07e+07	0.00e+00	0.00e+00	7.18e+07
Te-127	6.34e+03	2.13e+03	1.36e+03	5.16e+03	1.55e+04	0.00e+00	1.33e+05
Te-127m	4.21e+08	1.40e+08	5.10e+07	1.22e+08	1.04e+09	0.00e+00	1.70e+08
Te-129	2.81e-09	9.69e-10	6.56e-10	2.36e-09	7.00e-09	0.00e+00	2.25e-07
Te-129m	5.57e+08	1.91e+08	8.58e+07	2.14e+08	1.39e+09	0.00e+00	3.33e+08
Te-131	3.76e-32	1.39e-32	1.05e-32	3.35e-32	9.61e-32	0.00e+00	1.52e-30
Te-131m	3.38e+06	1.36e+06	1.12e+06	2.76e+06	9.36e+06	0.00e+00	2.29e+07
Te-132	2.11e+07	1.05e+07	9.75e+06	1.54e+07	6.54e+07	0.00e+00	3.87e+07
I-130	3.56e+06	7.83e+06	3.14e+06	8.78e+08	8.60e+06	0.00e+00	1.68e+06
I-131	2.72e+09	3.21e+09	1.41e+09	1.05e+12	3.74e+09	0.00e+00	1.14e+08
I-132	1.45e+00	2.95e+00	1.05e+00	1.38e+02	3.29e+00	0.00e+00	2.39e+00
I-133	3.63e+07	5.29e+07	1.55e+07	9.62e+09	6.22e+07	0.00e+00	8.95e+06
I-134	1.84e-11	3.77e-11	1.34e-11	8.78e-10	4.21e-11	0.00e+00	3.89e-11
I-135	1.13e+05	2.25e+05	8.19e+04	2.01e+07	2.50e+05	0.00e+00	8.13e+04
Cs-134	3.65e+10	6.80e+10	6.87e+09	0.00e+00	1.75e+10	7.18e+09	1.85e+08
Cs-136	1.98e+09	5.81e+09	2.17e+09	0.00e+00	2.32e+09	4.74e+08	8.83e+07
Cs-137	5.15e+10	6.02e+10	4.27e+09	0.00e+00	1.62e+10	6.55e+09	1.88e+08
Cs-138	9.01e-23	1.47e-22	7.10e-23	0.00e+00	7.31e-23	1.14e-23	2.34e-22
Ba-139	4.39e-07	2.91e-10	1.27e-08	0.00e+00	1.75e-10	1.77e-10	2.78e-05

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for Infant age group by nuclide.
Waterford Steam Electric Station
Pathway : Cow's Milk (food) Pathway for Pi

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.41e+08	2.41e+05	1.24e+07	0.00e+00	5.72e+04	1.48e+05	5.92e+07
Ba-141	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ba-142	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
La-140	4.06e+01	1.60e+01	4.11e+00	0.00e+00	0.00e+00	0.00e+00	1.88e+05
La-142	1.74e-10	6.40e-11	1.53e-11	0.00e+00	0.00e+00	0.00e+00	1.09e-05
Ce-141	4.34e+04	2.64e+04	3.11e+03	0.00e+00	8.15e+03	0.00e+00	1.37e+07
Ce-143	3.97e+02	2.64e+05	3.01e+01	0.00e+00	7.68e+01	0.00e+00	1.54e+06
Ce-144	2.33e+06	9.52e+05	1.30e+05	0.00e+00	3.85e+05	0.00e+00	1.33e+08
Pr-143	1.49e+03	5.55e+02	7.36e+01	0.00e+00	2.06e+02	0.00e+00	7.84e+05
Pr-144	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Nd-147	8.81e+02	9.05e+02	5.55e+01	0.00e+00	3.49e+02	0.00e+00	5.74e+05
W-187	6.09e+04	4.23e+04	1.46e+04	0.00e+00	0.00e+00	0.00e+00	2.49e+06
Np-239	3.65e+01	3.26e+00	1.84e+00	0.00e+00	6.51e+00	0.00e+00	9.44e+04

Conversion factors are in units of square meter-mrem/yr per uCi/sec for all nuclides except H-3, which is in units of mrem/yr per uCi/cubic meter.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for all age groups by nuclide.
Waterford Steam Electric Station
Pathway : Ground Plane Pathway for Pi

Nuclide	Organ Dose Conversion Factors	
	T. Body	Skin
H-3	0.00e+00	0.00e+00
C-14	0.00e+00	0.00e+00
Na-24	1.71e+07	1.98e+07
P-32	0.00e+00	0.00e+00
Cr-51	6.65e+06	7.86e+06
Mn-54	1.10e+09	1.29e+09
Mn-56	1.29e+06	1.52e+06
Fe-55	0.00e+00	0.00e+00
Fe-59	3.89e+08	4.57e+08
Co-58	5.26e+08	6.16e+08
Co-60	4.40e+09	5.18e+09
Ni-63	0.00e+00	0.00e+00
Ni-65	4.24e+05	4.93e+05
Cu-64	8.67e+05	9.82e+05
Zn-65	6.88e+08	7.92e+08
Zn-69	0.00e+00	0.00e+00
Br-83	6.96e+03	1.01e+04
Br-84	2.89e+05	3.38e+05
Br-85	0.00e+00	0.00e+00
Rb-86	1.28e+07	1.47e+07
Rb-88	4.72e+04	5.40e+04
Rb-89	1.76e+05	2.11e+05
Sr-89	3.07e+04	3.56e+04
Sr-90	0.00e+00	0.00e+00
Sr-91	3.07e+06	3.59e+06
Sr-92	1.11e+06	1.23e+06
Y-90	6.42e+03	7.58e+03
Y-91	1.51e+06	1.70e+06
Y-91m	1.43e+05	1.66e+05
Y-92	2.58e+05	3.06e+05

Conversion factors are in units of square meter-mrem/yr per uCi/sec.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: P_i

Pi factors for all age groups by nuclide.
Waterford Steam Electric Station
Pathway : Ground Plane Pathway for Pi

Nuclide	Organ Dose Conversion Factors	
	T. Body	Skin
Y-93	2.62e+05	3.58e+05
Zr-95	3.43e+08	3.98e+08
Zr-97	4.23e+06	4.92e+06
Nb-95	1.95e+08	2.30e+08
Mo-99	5.71e+06	6.61e+06
Tc-101	2.91e+04	3.23e+04
Tc-99m	2.63e+05	3.01e+05
Ru-103	1.54e+08	1.80e+08
Ru-105	9.09e+05	1.03e+06
Ru-106	3.00e+08	3.60e+08
Ag-110m	3.13e+09	3.65e+09
Te-125m	2.19e+06	3.00e+06
Te-127	4.25e+03	4.68e+03
Te-127m	1.18e+05	1.40e+05
Te-129	3.75e+04	4.43e+04
Te-129m	2.82e+07	3.30e+07
Te-131	4.17e+04	4.93e+07
Te-131m	1.15e+07	1.35e+07
Te-132	6.05e+06	7.12e+06
I-130	7.87e+06	9.36e+06
I-131	2.46e+07	2.98e+07
I-132	1.78e+06	2.09e+06
I-133	3.50e+06	4.26e+06
I-134	6.38e+05	7.58e+05
I-135	3.61e+06	4.21e+06
Cs-134	2.82e+09	3.28e+09
Cs-136	2.16e+08	2.44e+08
Cs-137	1.15e+09	1.34e+09
Cs-138	5.13e+05	5.86e+05
Ba-139	1.51e+05	1.70e+05

Conversion factors are in units of square meter-mrem/yr per uCi/sec.

DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES: Pi

Pi factors for all age groups by nuclide.
Waterford Steam Electric Station
Pathway : Ground Plane Pathway for Pi

Nuclide	Organ Dose Conversion Factors	
	T. Body	Skin
Ba-140	2.93e+07	3.35e+07
Ba-141	5.96e+04	6.79e+04
Ba-142	6.41e+04	7.30e+04
La-140	2.74e+07	3.11e+07
La-142	1.09e+06	1.30e+06
Ce-141	1.95e+07	2.20e+07
Ce-143	3.30e+06	3.75e+06
Ce-144	5.85e+07	6.77e+07
Pr-143	0.00e+00	0.00e+00
Pr-144	2.62e+03	3.01e+03
Nd-147	1.20e+07	1.44e+07
W-187	3.36e+06	3.90e+06
Np-239	2.44e+06	2.83e+06

Conversion factors are in units of square meter-mrem/yr per uCi/sec.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Adult age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.58e-07	1.58e-07	1.58e-07	1.58e-07	1.58e-07	1.58e-07
C-14	2.27e-06	4.26e-07	4.26e-07	4.26e-07	4.26e-07	4.26e-07	4.26e-07
Na-24	1.28e-06	1.28e-06	1.28e-06	1.28e-06	1.28e-06	1.28e-06	1.28e-06
P-32	1.65e-04	9.64e-06	6.26e-06	0.00e+00	0.00e+00	0.00e+00	1.08e-05
Cr-51	0.00e+00	0.00e+00	1.25e-08	7.44e-09	2.85e-09	1.80e-06	4.15e-07
Mn-54	0.00e+00	4.95e-06	7.87e-07	0.00e+00	1.23e-06	1.75e-04	9.67e-06
Mn-56	0.00e+00	1.55e-10	2.29e-11	0.00e+00	1.63e-10	1.18e-06	2.53e-06
Fe-55	3.07e-06	2.12e-06	4.93e-07	0.00e+00	0.00e+00	9.01e-06	7.54e-07
Fe-59	1.47e-06	3.47e-06	1.32e-06	0.00e+00	0.00e+00	1.27e-04	2.35e-05
Co-58	0.00e+00	1.98e-07	2.59e-07	0.00e+00	0.00e+00	1.16e-04	1.33e-05
Co-60	0.00e+00	1.44e-06	1.85e-06	0.00e+00	0.00e+00	7.46e-04	3.56e-05
Ni-63	5.40e-05	3.93e-06	1.81e-06	0.00e+00	0.00e+00	2.23e-05	1.67e-06
Ni-65	1.92e-10	2.62e-11	1.14e-11	0.00e+00	0.00e+00	7.00e-07	1.54e-06
Cu-64	0.00e+00	1.83e-10	7.69e-11	0.00e+00	5.78e-10	8.48e-07	6.12e-06
Zn-65	4.05e-06	1.29e-05	5.82e-06	0.00e+00	8.62e-06	1.08e-04	6.68e-06
Zn-69	4.32e-12	8.14e-12	5.65e-13	0.00e+00	5.27e-12	1.15e-07	2.04e-09
Br-83	0.00e+00	0.00e+00	3.01e-08	0.00e+00	0.00e+00	0.00e+00	2.90e-08
Br-84	0.00e+00	0.00e+00	3.91e-08	0.00e+00	0.00e+00	0.00e+00	2.05e-13
Br-85	0.00e+00	0.00e+00	1.60e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.69e-05	7.37e-06	0.00e+00	0.00e+00	0.00e+00	2.08e-06
Rb-88	0.00e+00	4.84e-08	2.41e-08	0.00e+00	0.00e+00	0.00e+00	4.18e-19
Rb-89	0.00e+00	3.20e-08	2.12e-08	0.00e+00	0.00e+00	0.00e+00	1.16e-21
Sr-89	3.80e-05	0.00e+00	1.09e-06	0.00e+00	0.00e+00	1.75e-04	4.37e-05
Sr-90	1.24e-02	0.00e+00	7.62e-04	0.00e+00	0.00e+00	1.20e-03	9.02e-05
Sr-91	7.74e-09	0.00e+00	3.13e-10	0.00e+00	0.00e+00	4.56e-06	2.39e-05
Sr-92	8.43e-10	0.00e+00	3.64e-11	0.00e+00	0.00e+00	2.06e-06	5.38e-06
Y-90	2.61e-07	0.00e+00	7.01e-09	0.00e+00	0.00e+00	2.12e-05	6.32e-05
Y-91	5.78e-05	0.00e+00	1.55e-06	0.00e+00	0.00e+00	2.13e-04	4.81e-05
Y-91m	3.26e-11	0.00e+00	1.27e-12	0.00e+00	0.00e+00	2.40e-07	1.66e-10
Y-92	1.39e-09	0.00e+00	3.77e-11	0.00e+00	0.00e+00	1.96e-06	9.19e-06

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Adult age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.18e-08	0.00e+00	3.26e-10	0.00e+00	0.00e+00	6.06e-06	5.27e-05
Zr-95	1.34e-05	4.30e-06	2.91e-06	0.00e+00	6.77e-06	2.21e-04	1.88e-05
Zr-97	1.21e-08	2.45e-09	1.13e-09	0.00e+00	3.71e-09	9.84e-06	6.54e-05
Nb-95	1.76e-06	9.77e-07	5.26e-07	0.00e+00	9.67e-07	6.31e-05	1.30e-05
Mo-99	0.00e+00	1.51e-08	2.87e-09	0.00e+00	3.64e-08	1.14e-05	3.10e-05
Tc-101	5.22e-15	7.52e-15	7.38e-14	0.00e+00	1.35e-13	4.99e-08	1.36e-21
Tc-99m	1.29e-13	3.64e-13	4.63e-12	0.00e+00	5.52e-12	9.55e-08	5.20e-07
Ru-103	1.91e-07	0.00e+00	8.23e-08	0.00e+00	7.29e-07	6.31e-05	1.38e-05
Ru-105	9.88e-11	0.00e+00	3.89e-11	0.00e+00	1.27e-10	1.37e-06	6.02e-06
Ru-106	8.64e-06	0.00e+00	1.09e-06	0.00e+00	1.67e-05	1.17e-03	1.14e-04
Ag-110m	1.35e-06	1.25e-06	7.43e-07	0.00e+00	2.46e-06	5.79e-04	3.78e-05
Te-125m	4.27e-07	1.98e-07	5.84e-08	1.31e-07	1.55e-06	3.92e-05	8.83e-06
Te-127	1.75e-10	8.03e-11	3.87e-11	1.32e-10	6.37e-10	8.14e-07	7.17e-06
Te-127m	1.58e-06	7.21e-07	1.96e-07	4.11e-07	5.72e-06	1.20e-04	1.87e-05
Te-129	6.22e-12	2.99e-12	1.55e-12	4.87e-12	2.34e-11	2.42e-07	1.96e-08
Te-129m	1.22e-06	5.84e-07	1.98e-07	4.30e-07	4.57e-06	1.45e-04	4.79e-05
Te-131	1.39e-12	7.44e-13	4.49e-13	1.17e-12	5.46e-12	1.74e-07	2.30e-09
Te-131m	8.74e-09	5.45e-09	3.63e-09	6.88e-09	3.86e-08	1.82e-05	6.95e-05
Te-132	3.25e-08	2.69e-08	2.02e-08	2.37e-08	1.82e-07	3.60e-05	6.37e-05
I-130	5.72e-07	1.68e-06	6.60e-07	1.42e-04	2.61e-06	0.00e+00	9.61e-07
I-131	3.15e-06	4.47e-06	2.56e-06	1.49e-03	7.66e-06	0.00e+00	7.85e-07
I-132	1.45e-07	4.07e-07	1.45e-07	1.43e-05	6.48e-07	0.00e+00	5.08e-08
I-133	1.08e-06	1.85e-06	5.65e-07	2.69e-04	3.23e-06	0.00e+00	1.11e-06
I-134	8.05e-08	2.16e-07	7.69e-08	3.73e-06	3.44e-07	0.00e+00	1.26e-10
I-135	3.35e-07	8.73e-07	3.21e-07	5.60e-05	1.39e-06	0.00e+00	6.56e-07
Cs-134	4.66e-05	1.06e-04	9.10e-05	0.00e+00	3.50e-05	1.22e-05	1.30e-06
Cs-136	4.88e-06	1.83e-05	1.38e-05	0.00e+00	1.07e-05	1.50e-06	1.46e-06
Cs-137	5.98e-05	7.76e-05	5.35e-05	0.00e+00	2.78e-05	9.40e-06	1.05e-06
Cs-138	4.14e-08	7.76e-08	4.05e-08	0.00e+00	6.00e-08	6.07e-09	2.33e-13
Ba-139	1.17e-10	8.32e-14	3.42e-12	0.00e+00	7.78e-14	4.70e-07	1.12e-07

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Adult age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	4.88e-06	6.13e-09	3.21e-07	0.00e+00	2.09e-09	1.59e-04	2.73e-05
Ba-141	1.25e-11	9.41e-15	4.20e-13	0.00e+00	8.75e-15	2.42e-07	1.45e-17
Ba-142	3.29e-12	3.38e-15	2.07e-13	0.00e+00	2.86e-15	1.49e-07	1.96e-26
La-140	4.30e-08	2.17e-08	5.73e-09	0.00e+00	0.00e+00	1.7ue-05	5.73e-05
La-142	8.54e-11	3.88e-11	9.65e-12	0.00e+00	0.00e+00	7.91e-07	2.64e-07
Ce-141	2.49e-06	1.69e-06	1.91e-07	0.00e+00	7.83e-07	4.52e-05	1.50e-05
Ce-143	2.33e-08	1.72e-08	1.91e-09	0.00e+00	7.60e-09	9.97e-06	2.83e-05
Ce-144	4.29e-04	1.79e-04	2.30e-05	0.00e+00	0.00e+00	9.72e-04	1.02e-04
Pr-143	1.17e-06	4.69e-07	5.80e-08	0.00e+00	2.70e-07	3.51e-05	2.50e-05
Pr-144	3.76e-12	1.56e-12	1.91e-13	0.00e+00	8.81e-13	1.27e-07	2.69e-18
Nd-147	6.59e-07	7.62e-07	4.56e-08	0.00e+00	4.45e-07	2.76e-05	2.16e-05
W-187	1.06e-09	8.85e-10	3.10e-10	0.00e+00	0.00e+00	3.63e-06	1.94e-05
Np-239	2.87e-08	2.82e-09	1.55e-09	0.00e+00	8.75e-09	4.70e-06	1.49e-05

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Teen age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.59e-07	1.59e-07	1.59e-07	1.59e-07	1.59e-07	1.59e-07
C-14	3.25e-06	6.09e-07	6.09e-07	6.09e-07	6.09e-07	6.09e-07	6.09e-07
Na-24	1.72e-06	1.72e-06	1.72e-06	1.72e-06	1.72e-06	1.72e-06	1.72e-06
P-32	2.36e-04	1.37e-05	8.95e-06	0.00e+00	0.00e+00	0.00e+00	1.16e-05
Cr-51	0.00e+00	0.00e+00	1.69e-08	9.37e-09	3.84e-09	2.62e-06	3.75e-07
Mn-54	0.00e+00	6.39e-06	1.05e-06	0.00e+00	1.59e-06	2.48e-04	8.35e-06
Mn-56	0.00e+00	2.12e-10	3.15e-11	0.00e+00	2.24e-10	1.90e-06	7.18e-06
Fe-55	4.18e-06	2.98e-06	6.93e-07	0.00e+00	0.00e+00	1.55e-05	7.99e-07
Fe-59	1.99e-09	4.62e-06	1.79e-06	0.00e+00	0.00e+00	1.91e-04	2.23e-05
Co-58	0.00e+00	2.59e-07	3.47e-07	0.00e+00	0.00e+00	1.68e-04	1.19e-05
Co-60	0.00e+00	1.89e-06	2.48e-06	0.00e+00	0.00e+00	1.09e-03	3.24e-05
Ni-63	7.25e-05	5.43e-06	2.47e-06	0.00e+00	0.00e+00	3.84e-05	1.77e-06
Ni-65	2.73e-10	3.66e-11	1.59e-11	0.00e+00	0.00e+00	1.17e-06	4.59e-06
Cu-64	0.00e+00	2.54e-10	1.06e-10	0.00e+00	8.01e-10	1.39e-06	7.68e-06
Zn-65	4.82e-06	1.67e-05	7.80e-06	0.00e+00	1.08e-05	1.55e-04	5.83e-06
Zn-69	6.04e-12	1.15e-11	8.07e-13	0.00e+00	7.53e-12	1.98e-07	3.56e-08
Br-83	0.00e+00	0.00e+00	4.30e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	5.41e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	2.29e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.38e-05	1.05e-05	0.00e+00	0.00e+00	0.00e+00	2.21e-06
Rb-88	0.00e+00	6.82e-08	3.40e-08	0.00e+00	0.00e+00	0.00e+00	3.65e-15
Rb-89	0.00e+00	4.40e-08	2.91e-08	0.00e+00	0.00e+00	0.00e+00	4.22e-17
Sr-89	5.43e-05	0.00e+00	1.56e-06	0.00e+00	0.00e+00	3.02e-04	4.64e-05
Sr-90	1.35e-02	0.00e+00	8.35e-04	0.00e+00	0.00e+00	2.06e-03	9.56e-05
Sr-91	1.10e-08	0.00e+00	4.39e-10	0.00e+00	0.00e+00	7.59e-06	3.24e-05
Sr-92	1.19e-09	0.00e+00	5.08e-11	0.00e+00	0.00e+00	3.43e-06	1.49e-05
Y-90	3.73e-07	0.00e+00	1.00e-08	0.00e+00	0.00e+00	3.66e-05	6.99e-05
Y-91	8.26e-05	0.00e+00	2.21e-06	0.00e+00	0.00e+00	3.67e-04	5.11e-05
Y-91m	4.63e-11	0.00e+00	1.77e-12	0.00e+00	0.00e+00	4.00e-07	3.77e-09
Y-92	1.84e-09	0.00e+00	5.36e-11	0.00e+00	0.00e+00	3.35e-06	2.06e-05

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Teen age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.69e-08	0.00e+00	4.65e-10	0.00e+00	0.00e+00	1.04e-05	7.24e-05
Zr-95	1.82e-05	5.73e-06	3.94e-06	0.00e+00	8.42e-06	3.36e-04	1.86e-05
Zr-97	1.72e-08	3.40e-09	1.57e-09	0.00e+00	5.15e-09	1.62e-05	7.88e-05
Nb-95	2.32e-06	1.29e-06	7.08e-07	0.00e+00	1.25e-06	9.39e-05	1.21e-05
Mo-99	0.00e+00	2.11e-08	4.03e-09	0.00e+00	5.14e-08	1.92e-05	3.36e-05
Tc-101	7.40e-15	1.05e-14	1.03e-13	0.00e+00	1.90e-13	8.34e-08	1.09e-16
Tc-99m	1.73e-13	4.83e-13	6.24e-12	0.00e+00	7.20e-12	1.44e-07	7.66e-07
Ru-103	2.63e-07	0.00e+00	1.12e-07	0.00e+00	9.29e-07	9.79e-05	1.36e-05
Ru-105	1.40e-10	0.00e+00	5.42e-11	0.00e+00	1.76e-10	2.27e-06	1.13e-05
Ru-106	1.23e-05	0.00e+00	1.55e-06	0.00e+00	2.38e-05	2.01e-03	1.20e-04
Ag-110m	1.73e-06	1.64e-06	9.99e-07	0.00e+00	3.13e-06	8.44e-04	3.41e-05
Te-125m	6.10e-07	2.80e-07	8.34e-08	1.75e-07	0.00e+00	6.70e-05	9.38e-06
Te-127	2.51e-10	1.14e-10	5.52e-11	1.77e-10	9.10e-10	1.40e-06	1.01e-05
Te-127m	2.25e-06	1.02e-06	2.73e-07	5.48e-07	8.17e-06	2.07e-04	1.99e-05
Te-129	8.87e-12	4.22e-12	2.20e-12	6.48e-12	3.32e-11	4.12e-07	2.02e-07
Te-129m	1.74e-06	8.23e-07	2.81e-07	5.72e-07	6.49e-06	2.47e-04	5.06e-05
Te-131	1.97e-12	1.04e-12	6.30e-13	1.55e-12	7.72e-12	2.92e-07	1.89e-09
Te-131m	1.23e-08	7.51e-09	5.03e-09	9.06e-09	5.49e-08	2.97e-05	7.76e-05
Te-132	4.50e-08	3.63e-08	2.74e-08	3.07e-08	2.44e-07	5.61e-05	5.79e-05
I-130	7.80e-07	2.24e-06	8.96e-07	1.86e-04	3.44e-06	0.00e+00	1.14e-06
I-131	4.43e-06	6.14e-06	3.30e-06	1.83e-03	1.05e-05	0.00e+00	8.11e-07
I-132	1.99e-07	5.47e-07	1.97e-07	1.89e-05	8.65e-07	0.00e+00	1.59e-07
I-133	1.52e-06	2.56e-06	7.78e-07	3.65e-04	4.49e-06	0.00e+00	1.29e-06
I-134	1.11e-07	2.90e-07	1.05e-07	4.94e-06	4.58e-07	0.00e+00	2.55e-09
I-135	4.62e-07	1.18e-06	4.36e-07	7.76e-05	1.86e-06	0.00e+00	8.69e-07
Cs-134	6.28e-05	1.41e-04	6.86e-05	0.00e+00	4.69e-05	1.83e-05	1.22e-06
Cs-136	6.44e-06	2.42e-05	1.71e-05	0.00e+00	1.38e-05	2.22e-06	1.36e-06
Cs-137	8.38e-05	1.06e-04	3.89e-05	0.00e+00	3.80e-05	1.51e-05	1.06e-06
Cs-138	5.82e-08	1.07e-07	5.58e-08	0.00e+00	8.28e-08	9.84e-09	3.38e-11
Ba-139	1.67e-10	1.18e-13	4.87e-12	0.00e+00	1.11e-13	8.08e-07	8.06e-07

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Teen age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	6.84e-06	8.38e-09	4.40e-07	0.00e+00	2.85e-09	2.54e-04	2.86e-05
Ba-141	1.78e-11	1.32e-14	5.93e-13	0.00e+00	1.23e-14	4.11e-07	9.33e-14
Ba-142	4.62e-12	4.63e-15	2.84e-13	0.00e+00	3.92e-15	2.39e-07	5.99e-20
La-140	5.99e-08	2.95e-08	7.82e-09	0.00e+00	0.00e+00	2.68e-05	6.09e-05
La-142	1.20e-10	5.31e-11	1.32e-11	0.00e+00	0.00e+00	1.27e-06	1.50e-06
Ce-141	3.55e-06	2.37e-06	2.71e-07	0.00e+00	1.11e-06	7.67e-05	1.38e-05
Ce-143	3.32e-08	2.42e-08	2.70e-09	0.00e+00	1.08e-08	1.63e-05	3.19e-05
Ce-144	6.11e-04	2.53e-04	3.28e-05	0.00e+00	1.51e-04	1.67e-03	1.08e-04
Pr-143	1.67e-06	6.64e-07	8.28e-08	0.00e+00	3.86e-07	6.04e-05	2.67e-05
Pr-144	5.37e-12	2.20e-12	2.72e-13	0.00e+00	1.26e-12	2.19e-07	2.94e-14
Nd-147	9.83e-07	1.07e-06	6.41e-08	0.00e+00	6.28e-07	4.65e-05	2.28e-05
W-187	1.50e-09	1.22e-09	4.29e-10	0.00e+00	0.00e+00	5.92e-06	2.21e-05
Np-239	4.23e-08	3.99e-09	2.21e-09	0.00e+00	1.25e-08	8.11e-06	1.65e-05

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Child age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	3.04e-07	3.04e-07	3.04e-07	3.04e-07	3.04e-07	3.04e-07
C-14	9.70e-06	1.82e-06	1.82e-06	1.82e-06	1.82e-06	1.82e-06	1.82e-06
Na-24	4.35e-06	4.35e-06	4.35e-06	4.35e-06	4.35e-06	4.35e-06	4.35e-06
P-32	7.04e-04	3.09e-05	2.67e-05	0.00e+00	0.00e+00	0.00e+00	1.14e-05
Cr-51	0.00e+00	0.00e+00	4.17e-08	2.31e-08	6.57e-09	4.59e-06	2.93e-07
Mn-54	0.00e+00	1.16e-05	2.57e-06	0.00e+00	2.71e-06	4.26e-04	6.19e-06
Mn-56	0.00e+00	4.48e-10	8.43e-11	0.00e+00	4.52e-10	3.55e-06	3.33e-05
Fe-55	1.28e-05	6.80e-06	2.10e-06	0.00e+00	0.00e+00	3.00e-05	7.75e-07
Fe-59	5.59e-06	9.04e-06	4.51e-06	0.00e+00	0.00e+00	3.43e-04	1.91e-05
Co-58	0.00e+00	4.79e-07	8.55e-07	0.00e+00	0.00e+00	2.99e-04	9.29e-06
Co-60	0.00e+00	3.55e-06	6.12e-06	0.00e+00	0.00e+00	1.91e-03	2.60e-05
Ni-63	2.22e-04	1.25e-05	7.56e-06	0.00e+00	0.00e+00	7.43e-05	1.71e-06
Ni-65	8.08e-10	7.99e-11	4.44e-11	0.00e+00	0.00e+00	2.21e-06	2.27e-05
Cu-64	0.00e+00	5.39e-10	2.90e-10	0.00e+00	1.63e-09	2.59e-06	9.92e-06
Zn-65	1.15e-05	3.06e-05	1.90e-05	0.00e+00	1.93e-05	2.69e-04	4.41e-06
Zn-69	1.81e-11	2.61e-11	2.41e-12	0.00e+00	1.58e-11	3.84e-07	2.75e-06
Br-83	0.00e+00	0.00e+00	1.28e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	1.48e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	6.84e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	5.36e-05	3.09e-05	0.00e+00	0.00e+00	0.00e+00	2.16e-06
Rb-88	0.00e+00	1.52e-07	9.90e-08	0.00e+00	0.00e+00	0.00e+00	4.66e-09
Rb-89	0.00e+00	9.33e-08	7.85e-08	0.00e+00	0.00e+00	0.00e+00	5.11e-10
Sr-89	1.62e-04	0.00e+00	4.66e-06	0.00e+00	0.00e+00	5.83e-04	4.52e-05
Sr-90	2.73e-02	0.00e+00	1.74e-03	0.00e+00	0.00e+00	3.99e-03	9.28e-05
Sr-91	3.28e-08	0.00e+00	1.24e-09	0.00e+00	0.00e+00	1.44e-05	4.70e-05
Sr-92	3.54e-09	0.00e+00	1.42e-10	0.00e+00	0.00e+00	6.49e-06	6.55e-05
Y-90	1.11e-06	0.00e+00	2.99e-08	0.00e+00	0.00e+00	7.07e-05	7.24e-05
Y-91	2.47e-04	0.00e+00	6.59e-06	0.00e+00	0.00e+00	7.10e-04	4.97e-05
Y-91m	1.37e-10	0.00e+00	4.98e-12	0.00e+00	0.00e+00	7.60e-07	4.64e-07
Y-92	5.50e-09	0.00e+00	1.57e-10	0.00e+00	0.00e+00	6.46e-06	6.46e-05

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Child age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	5.04e-08	0.00e+00	1.38e-09	0.00e+00	0.00e+00	2.01e-05	1.05e-04
Zr-95	5.13e-05	1.13e-05	1.00e-05	0.00e+00	1.61e-05	6.03e-04	1.65e-05
Zr-97	5.07e-08	7.34e-09	4.32e-09	0.00e+00	1.05e-08	3.06e-05	9.49e-05
Nb-95	6.35e-06	2.48e-06	1.77e-06	0.00e+00	2.33e-06	1.66e-04	1.00e-05
Mo-99	0.00e+00	4.66e-08	1.15e-08	0.00e+00	1.06e-07	3.66e-05	3.42e-05
Tc-101	2.19e-14	2.30e-14	2.91e-13	0.00e+00	3.92e-13	1.58e-07	4.41e-09
Tc-99m	4.81e-13	9.41e-13	1.56e-11	0.00e+00	1.37e-11	2.57e-07	1.30e-06
Ru-103	7.55e-07	0.00e+00	2.90e-07	0.00e+00	1.90e-06	1.79e-04	1.21e-05
Ru-105	4.13e-10	0.00e+00	1.50e-10	0.00e+00	3.63e-10	4.30e-06	2.69e-05
Ru-106	3.68e-05	0.00e+00	4.57e-06	0.00e+00	4.97e-05	3.87e-03	1.16e-04
Ag-110m	4.56e-06	3.08e-06	2.47e-06	0.00e+00	5.74e-06	1.48e-03	2.71e-05
Te-125m	1.82e-06	6.29e-07	2.47e-07	5.20e-07	0.00e+00	1.29e-04	9.13e-06
Te-127	7.49e-10	2.57e-10	1.65e-10	5.30e-10	1.91e-09	2.71e-06	1.52e-05
Te-127m	6.72e-06	2.31e-06	8.16e-07	1.64e-06	1.72e-05	4.00e-04	1.93e-05
Te-129	2.64e-11	9.45e-12	6.44e-12	1.93e-11	6.94e-11	7.93e-07	6.89e-06
Te-129m	5.19e-06	1.85e-06	8.22e-07	1.71e-06	1.36e-05	4.76e-04	4.91e-05
Te-131	5.87e-12	2.28e-12	1.78e-12	4.59e-12	1.59e-11	5.55e-07	3.60e-07
Te-131m	3.63e-08	1.60e-08	1.37e-08	2.64e-08	1.08e-07	5.56e-05	8.32e-05
Te-132	1.30e-07	7.36e-08	7.12e-08	8.58e-08	4.79e-07	1.02e-04	3.72e-05
I-130	2.21e-06	4.43e-06	2.28e-06	4.99e-04	6.61e-06	0.00e+00	1.38e-06
I-131	1.30e-05	1.30e-05	7.37e-06	4.39e-03	2.13e-05	0.00e+00	7.68e-07
I-132	5.72e-07	1.10e-06	5.07e-07	5.23e-05	1.69e-06	0.00e+00	8.65e-07
I-133	4.48e-06	5.49e-06	2.08e-06	1.04e-03	9.13e-06	0.00e+00	1.48e-06
I-134	3.17e-07	5.84e-07	2.69e-07	1.37e-05	8.92e-07	0.00e+00	2.58e-07
I-135	1.33e-06	2.36e-06	1.12e-06	2.14e-04	3.62e-06	0.00e+00	1.20e-06
Cs-134	1.76e-04	2.74e-04	6.07e-05	0.00e+00	8.93e-05	3.27e-05	1.04e-06
Cs-136	1.76e-05	4.62e-05	3.14e-05	0.00e+00	2.58e-05	3.93e-06	1.13e-06
Cs-137	2.45e-04	2.23e-04	3.47e-05	0.00e+00	7.63e-05	2.81e-05	9.78e-07
Cs-138	1.71e-07	2.27e-07	1.50e-07	0.00e+00	1.68e-07	1.84e-08	7.29e-08
Ba-139	4.98e-10	2.66e-13	1.45e-11	0.00e+00	2.33e-13	1.56e-06	1.56e-05

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Child age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.00e-05	1.75e-08	1.17e-06	0.00e+00	5.71e-09	4.71e-04	2.75e-05
Ba-141	5.29e-11	2.95e-14	1.72e-12	0.00e+00	2.56e-14	7.89e-07	7.44e-08
Ba-142	1.35e-11	9.73e-15	7.54e-13	0.00e+00	7.87e-15	4.44e-07	7.41e-10
La-140	1.74e-07	6.08e-08	2.04e-08	0.00e+00	0.00e+00	4.94e-05	6.10e-05
La-142	3.50e-10	1.11e-10	3.49e-11	0.00e+00	0.00e+00	2.35e-06	2.05e-05
Ce-141	1.06e-05	5.28e-06	7.83e-07	0.00e+00	2.31e-06	1.47e-04	1.53e-05
Ce-143	9.89e-08	5.37e-08	7.77e-09	0.00e+00	2.26e-08	3.12e-05	3.44e-05
Ce-144	1.83e-03	5.72e-04	9.77e-05	0.00e+00	3.17e-04	3.23e-03	1.05e-04
Pr-143	4.99e-06	1.50e-06	2.47e-07	0.00e+00	8.11e-07	1.17e-04	2.63e-05
Pr-144	1.61e-11	4.99e-12	8.10e-13	0.00e+00	2.64e-12	4.23e-07	5.32e-08
Nd-147	2.92e-06	2.36e-06	1.84e-07	0.00e+00	1.30e-06	8.87e-05	2.22e-05
W-187	4.41e-09	2.61e-09	1.17e-09	0.00e+00	0.00e+00	1.11e-05	2.46e-05
Np-239	1.26e-07	9.04e-09	6.35e-09	0.00e+00	2.63e-08	1.57e-05	1.73e-05

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DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Infant age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	4.62e-07	4.62e-07	4.62e-07	4.62e-07	4.62e-07	4.62e-07
C-14	1.89e-05	3.79e-06	3.79e-06	3.79e-06	3.79e-06	3.79e-06	3.79e-06
Na-24	7.54e-06	7.54e-06	7.54e-06	7.54e-06	7.54e-06	7.54e-06	7.54e-06
P-32	1.45e-03	8.03e-05	5.53e-05	0.00e+00	0.00e+00	0.00e+00	1.15e-05
Cr-51	0.00e+00	0.00e+00	6.39e-08	4.11e-08	9.45e-09	9.17e-06	2.55e-07
Mn-54	0.00e+00	1.81e-05	3.56e-06	0.00e+00	3.56e-06	7.14e-04	5.04e-06
Mn-56	0.00e+00	1.10e-09	1.58e-10	0.00e+00	7.86e-10	8.95e-06	5.12e-05
Fe-55	1.41e-05	8.39e-06	2.38e-06	0.00e+00	0.00e+00	6.21e-05	7.82e-07
Fe-59	9.69e-06	1.68e-05	6.77e-06	0.00e+00	0.00e+00	7.25e-04	1.77e-05
Co-58	0.00e+00	8.71e-07	1.30e-06	0.00e+00	0.00e+00	5.55e-04	7.95e-06
Co-60	0.00e+00	5.73e-06	8.41e-06	0.00e+00	0.00e+00	3.22e-03	2.28e-05
Ni-63	2.42e-04	1.46e-05	8.29e-06	0.00e+00	0.00e+00	1.49e-04	1.73e-06
Ni-65	1.71e-09	2.03e-10	8.79e-11	0.00e+00	0.00e+00	5.80e-06	3.58e-05
Cu-64	0.00e+00	1.34e-09	5.53e-10	0.00e+00	2.84e-09	6.64e-06	1.07e-05
Zn-65	1.38e-05	4.47e-05	2.22e-05	0.00e+00	2.32e-05	4.62e-04	3.67e-05
Zn-69	3.85e-11	6.91e-11	5.13e-12	0.00e+00	2.87e-11	1.05e-06	9.44e-06
Br-83	0.00e+00	0.00e+00	2.72e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	2.86e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	1.46e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.36e-04	6.30e-05	0.00e+00	0.00e+00	0.00e+00	2.17e-06
Rb-88	0.00e+00	3.98e-07	2.05e-07	0.00e+00	0.00e+00	0.00e+00	2.42e-07
Rb-89	0.00e+00	2.29e-07	1.47e-07	0.00e+00	0.00e+00	0.00e+00	4.87e-08
Sr-89	2.84e-04	0.00e+00	8.15e-06	0.00e+00	0.00e+00	1.45e-03	4.57e-05
Sr-90	2.92e-02	0.00e+00	1.85e-03	0.00e+00	0.00e+00	8.03e-03	9.36e-05
Sr-91	6.83e-08	0.00e+00	2.47e-09	0.00e+00	0.00e+00	3.76e-05	5.24e-05
Sr-92	7.50e-09	0.00e+00	2.79e-10	0.00e+00	0.00e+00	1.70e-05	1.00e-04
Y-90	2.35e-06	0.00e+00	6.30e-08	0.00e+00	0.00e+00	1.92e-04	7.43e-05
Y-91	4.20e-04	0.00e+00	1.12e-05	0.00e+00	0.00e+00	1.75e-03	5.02e-05
Y-91m	2.91e-10	0.00e+00	9.90e-12	0.00e+00	0.00e+00	1.99e-06	1.68e-06
Y-92	1.17e-08	0.00e+00	3.29e-10	0.00e+00	0.00e+00	1.75e-05	9.04e-05

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Infan. age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.07e-07	0.00e+00	2.91e-09	0.00e+00	0.00e+00	5.46e-05	1.19e-04
Zr-95	8.24e-05	1.99e-05	1.45e-05	0.00e+00	2.22e-05	1.25e-03	1.55e-05
Zr-97	1.07e-07	1.83e-08	8.36e-09	0.00e+00	1.85e-08	7.88e-05	1.00e-04
Nb-95	1.12e-05	4.59e-06	2.70e-06	0.00e+00	3.37e-06	3.42e-04	9.05e-06
Mo-99	0.00e+00	1.18e-07	2.31e-08	0.00e+00	1.89e-07	9.63e-05	3.48e-05
Tc-101	4.65e-14	5.88e-14	5.80e-13	0.00e+00	6.99e-13	4.17e-07	6.03e-07
Tc-99m	9.98e-13	2.06e-12	2.66e-11	0.00e+00	2.22e-11	5.79e-07	1.45e-06
Ru-103	1.44e-06	0.00e+00	4.85e-07	0.00e+00	3.03e-06	3.94e-04	1.15e-05
Ru-105	8.74e-10	0.00e+00	2.93e-10	0.00e+00	6.42e-10	1.12e-05	3.46e-05
Ru-106	6.20e-05	0.00e+00	7.77e-06	0.00e+00	7.61e-05	8.26e-03	1.17e-04
Ag-110m	7.13e-06	5.16e-06	3.57e-06	0.00e+00	7.80e-06	2.62e-03	2.36e-05
Te-125m	3.40e-06	1.42e-06	4.70e-07	1.16e-06	0.00e+00	3.19e-04	9.22e-06
Te-127	1.59e-09	6.81e-10	3.49e-10	1.32e-09	3.47e-09	7.39e-06	1.74e-05
Te-127m	1.19e-05	4.93e-06	1.48e-06	3.48e-06	2.68e-05	9.37e-04	1.95e-05
Te-129	5.63e-11	2.48e-11	1.34e-11	4.82e-11	1.25e-10	2.14e-06	1.88e-05
Te-129m	1.01e-05	4.35e-06	1.59e-06	3.91e-06	2.27e-05	1.20e-03	4.93e-05
Te-131	1.24e-11	5.87e-12	3.57e-12	1.13e-11	2.85e-11	1.47e-06	5.87e-06
Te-131m	7.62e-06	3.93e-08	2.59e-08	6.38e-08	1.89e-07	1.42e-04	8.51e-05
Te-132	2.66e-07	1.69e-07	1.26e-07	1.99e-07	7.39e-07	2.43e-04	3.15e-05
I-130	4.54e-06	9.91e-06	3.98e-06	1.14e-03	1.09e-05	0.00e+00	1.42e-06
I-131	2.71e-05	3.17e-05	1.40e-05	1.06e-02	3.70e-05	0.00e+00	7.56e-07
I-132	1.21e-06	2.53e-06	8.97e-07	1.21e-04	2.82e-06	0.00e+00	1.36e-06
I-133	9.46e-06	1.37e-05	4.00e-06	2.54e-03	1.60e-05	0.00e+00	1.54e-06
I-134	6.58e-07	1.34e-06	4.75e-07	3.18e-05	1.49e-06	0.00e+00	9.21e-07
I-135	2.76e-06	5.43e-06	1.98e-06	4.97e-04	6.[illegible]-06	0.00e+00	1.31e-06
Cs-134	2.83e-04	5.02e-04	5.32e-05	0.00e+00	1.36e-04	5.69e-05	9.53e-07
Cs-136	3.45e-05	9.61e-05	3.78e-05	0.00e+00	4.03e-05	8.40e-06	1.02e-06
Cs-137	3.92e-04	4.37e-04	3.25e-05	0.00e+00	1.23e-04	5.09e-05	9.53e-07
Cs-138	3.61e-07	5.58e-07	2.84e-07	0.00e+00	2.93e-07	4.67e-08	6.26e-07
Ba-139	1.06e-09	7.03e-13	3.07e-11	0.00e+00	4.23e-13	4.25e-06	3.64e-05

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DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Inhalation Dose Conversion factors for Infant age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	4.00e-05	4.00e-08	2.07e-06	0.00e+00	9.59e-09	1.14e-03	2.74e-05
Ba-141	1.12e-10	7.70e-14	3.55e-12	0.00e+00	4.64e-14	2.12e-06	3.39e-06
Ba-142	2.84e-11	2.36e-14	1.40e-12	0.00e+00	1.36e-14	1.11e-06	4.95e-07
La-140	3.61e-07	1.43e-07	3.68e-08	0.00e+00	0.00e+00	1.20e-04	1.04e-05
La-142	7.36e-10	2.69e-10	6.46e-11	0.00e+00	0.00e+00	5.87e-06	4.25e-05
Ce-141	1.98e-05	1.19e-05	1.42e-06	0.00e+00	3.75e-06	3.69e-04	1.54e-05
Ce-143	2.09e-07	1.38e-07	1.58e-08	0.00e+00	4.03e-08	8.30e-05	3.55e-05
Ce-144	2.28e-03	8.65e-04	1.26e-04	0.00e+00	3.84e-04	7.03e-03	1.06e-04
Pr-143	1.00e-05	3.74e-06	4.99e-07	0.00e+00	1.41e-06	3.09e-04	2.66e-05
Pr-144	3.42e-11	1.32e-11	1.72e-12	0.00e+00	4.80e-12	1.15e-06	3.06e-06
Nd-147	5.67e-06	5.81e-06	3.57e-07	0.00e+00	2.25e-06	2.30e-04	2.23e-05
W-187	9.26e-09	6.44e-09	2.23e-09	0.00e+00	0.00e+00	2.83e-05	2.54e-05
Np-239	2.65e-07	2.37e-08	1.34e-08	0.00e+00	4.73e-08	4.25e-05	1.78e-05

Conversion factors are in units of mrem per pCi inhaled.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Ingestion Dose Conversion factors for Adult age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.05e-07	1.05e-07	1.05e-07	1.05e-07	1.05e-07	1.05e-07
C-14	2.84e-06	5.68e-07	5.68e-07	5.68e-07	5.68e-07	5.68e-07	5.68e-07
Na-24	1.70e-06	1.70e-06	1.70e-06	1.70e-06	1.70e-06	1.70e-06	1.70e-06
P-32	1.93e-04	1.20e-05	7.46e-06	0.00e+00	0.00e+00	0.00e+00	2.17e-05
Cr-51	0.00e+00	0.00e+00	2.66e-09	1.59e-09	5.86e-10	3.53e-09	6.69e-07
Mn-54	0.00e+00	4.57e-06	8.72e-07	0.00e+00	1.36e-06	0.00e+00	1.40e-05
Mn-56	0.00e+00	1.15e-07	2.04e-08	0.00e+00	1.46e-07	0.00e+00	3.67e-06
Fe-55	2.75e-06	1.90e-06	4.43e-07	0.00e+00	0.00e+00	1.06e-06	1.09e-06
Fe-59	4.34e-06	1.02e-05	3.91e-06	0.00e+00	0.00e+00	2.35e-06	3.40e-05
Co-58	0.00e+00	7.45e-07	1.67e-06	0.00e+00	0.00e+00	0.00e+00	1.51e-05
Co-60	0.00e+00	2.14e-06	4.72e-06	0.00e+00	0.00e+00	0.00e+00	4.02e-05
Ni-63	1.30e-04	9.01e-06	4.36e-06	0.00e+00	0.00e+00	0.00e+00	1.88e-06
Ni-65	5.28e-07	6.86e-08	3.13e-08	0.00e+00	0.00e+00	0.00e+00	1.74e-06
Cu-64	0.00e+00	8.33e-08	3.91e-08	0.00e+00	2.10e-07	0.00e+00	7.10e-06
Zn-65	4.84e-06	1.54e-05	6.96e-06	0.00e+00	1.03e-05	0.00e+00	9.70e-06
Zn-69	1.03e-08	1.97e-08	1.37e-09	0.00e+00	1.28e-08	0.00e+00	2.96e-09
Br-83	0.00e+00	0.00e+00	4.02e-08	0.00e+00	0.00e+00	0.00e+00	5.79e-08
Br-84	0.00e+00	0.00e+00	5.21e-08	0.00e+00	0.00e+00	0.00e+00	4.09e-13
Br-85	0.00e+00	0.00e+00	2.14e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.11e-05	9.83e-06	0.00e+00	0.00e+00	0.00e+00	4.16e-06
Rb-88	0.00e+00	6.05e-08	3.21e-08	0.00e+00	0.00e+00	0.00e+00	8.36e-19
Rb-89	0.00e+00	4.01e-08	2.82e-08	0.00e+00	0.00e+00	0.00e+00	2.33e-21
Sr-89	3.08e-04	0.00e+00	8.84e-06	0.00e+00	0.00e+00	0.00e+00	4.94e-05
Sr-90	7.58e-03	0.00e+00	1.86e-03	0.00e+00	0.00e+00	0.00e+00	2.19e-04
Sr-91	5.67e-06	0.00e+00	2.29e-07	0.00e+00	0.00e+00	0.00e+00	2.70e-05
Sr-92	2.15e-06	0.00e+00	9.30e-08	0.00e+00	0.00e+00	0.00e+00	4.26e-05
Y-90	9.62e-09	0.00e+00	2.58e-10	0.00e+00	0.00e+00	0.00e+00	1.02e-04
Y-91	1.41e-07	0.00e+00	3.77e-09	0.00e+00	0.00e+00	0.00e+00	7.76e-05
Y-91m	9.09e-11	0.00e+00	3.52e-12	0.00e+00	0.00e+00	0.00e+00	2.67e-10
Y-92	8.45e-10	0.00e+00	2.47e-11	0.00e+00	0.00e+00	0.00e+00	1.48e-05

Conversion factors are in units of mrem per pCi ingested.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Ingestion Dose Conversion factors for Adult age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	2.68e-09	0.00e+00	7.40e-11	0.00e+00	0.00e+00	0.00e+00	8.50e-05
Zr-95	3.04e-08	9.75e-09	6.60e-09	0.00e+00	1.53e-08	0.00e+00	3.09e-05
Zr-97	1.68e-09	3.39e-10	1.55e-10	0.00e+00	5.12e-10	0.00e+00	1.05e-04
Nb-95	6.22e-09	3.46e-09	1.86e-09	0.00e+00	3.42e-09	0.00e+00	2.10e-05
Mo-99	0.00e+00	4.31e-06	8.20e-07	0.00e+00	9.76e-06	0.00e+00	9.99e-06
Tc-101	2.54e-10	3.66e-10	3.59e-09	0.00e+00	6.59e-09	1.87e-10	1.10e-21
Tc-99m	2.47e-10	6.98e-10	8.89e-09	0.00e+00	1.06e-08	3.42e-10	4.13e-07
Ru-103	1.85e-07	0.00e+00	7.97e-08	0.00e+00	7.06e-07	0.00e+00	2.16e-05
Ru-105	1.54e-08	0.00e+00	6.08e-09	0.00e+00	1.99e-07	0.00e+00	9.42e-06
Ru-106	2.75e-06	0.00e+00	3.48e-07	0.00e+00	5.31e-06	0.00e+00	1.78e-04
Ag-110m	1.60e-07	1.48e-07	8.79e-08	0.00e+00	2.91e-07	0.00e+00	6.04e-05
Te-125m	2.68e-06	9.71e-07	3.59e-07	8.06e-07	1.09e-05	0.00e+00	1.07e-05
Te-127	1.10e-07	3.95e-08	2.38e-08	8.15e-08	4.48e-07	0.00e+00	8.68e-06
Te-127m	6.77e-06	2.42e-06	8.25e-07	1.73e-06	2.75e-05	0.00e+00	2.27e-05
Te-129	3.14e-08	1.18e-08	7.65e-09	2.41e-08	1.32e-07	0.00e+00	2.37e-08
Te-129m	1.15e-05	4.29e-06	1.82e-06	3.95e-06	4.80e-05	0.00e+00	5.79e-05
Te-131	1.97e-08	8.23e-09	6.22e-09	1.62e-08	8.63e-08	0.00e+00	2.79e-09
Te-131m	1.73e-06	8.46e-07	7.05e-07	1.34e-06	8.57e-06	0.00e+00	8.40e-05
Te-132	2.52e-06	1.63e-06	1.53e-06	1.80e-06	1.57e-05	0.00e+00	7.71e-05
I-130	7.56e-07	2.23e-06	8.80e-07	1.89e-04	3.48e-06	0.00e+00	1.92e-06
I-131	4.16e-06	5.95e-06	3.41e-06	1.95e-03	1.02e-05	0.00e+00	1.57e-06
I-132	2.03e-07	5.43e-07	1.90e-07	1.90e-05	8.65e-07	0.00e+00	1.02e-07
I-133	1.42e-06	2.47e-06	7.53e-07	3.63e-04	4.31e-06	0.00e+00	2.22e-06
I-134	1.06e-07	2.88e-07	1.03e-07	4.99e-06	4.58e-07	0.00e+00	2.51e-10
I-135	4.43e-07	1.16e-06	4.28e-07	7.65e-05	1.86e-06	0.00e+00	1.31e-06
Cs-134	6.22e-05	1.48e-04	1.21e-04	0.00e+00	4.79e-05	1.59e-05	2.59e-06
Cs-136	6.51e-06	2.57e-05	1.85e-05	0.00e+00	1.43e-05	1.96e-06	2.92e-06
Cs-137	7.97e-05	1.09e-04	7.14e-05	0.00e+00	3.70e-05	1.23e-05	2.11e-06
Cs-138	5.52e-08	1.09e-07	5.40e-08	0.00e+00	8.01e-08	7.91e-09	4.65e-13
Ba-139	9.70e-08	6.91e-11	2.84e-09	0.00e+00	6.46e-11	3.92e-11	1.72e-07

Conversion factors are in units of mrem per pCi ingested.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Ingestion Dose Conversion factors for Adult age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.03e-05	2.55e-08	1.33e-06	0.00e+00	8.67e-09	1.46e-08	4.18e-05
Ba-141	4.71e-08	3.56e-11	1.59e-09	0.00e+00	3.31e-11	2.02e-11	2.22e-17
Ba-142	2.13e-08	2.19e-11	1.34e-09	0.00e+00	1.85e-11	1.24e-11	3.00e-26
La-140	2.50e-09	1.26e-09	3.33e-10	0.00e+00	0.00e+00	0.00e+00	9.25e-05
La-142	1.28e-10	5.82e-11	1.45e-11	0.00e+00	0.00e+00	0.00e+00	4.25e-07
Ce-141	9.36e-09	6.33e-09	7.18e-10	0.00e+00	2.94e-09	0.00e+00	2.42e-05
Ce-143	1.65e-09	1.22e-06	1.35e-10	0.00e+00	5.37e-10	0.00e+00	4.56e-05
Ce-144	4.88e-07	2.04e-07	2.62e-08	0.00e+00	1.21e-07	0.00e+00	1.65e-04
Pr-143	9.20e-09	3.69e-09	4.56e-10	0.00e+00	2.13e-09	0.00e+00	4.03e-05
Pr-144	3.01e-11	1.25e-11	1.53e-12	0.00e+00	7.05e-12	0.00e+00	4.33e-18
Nd-147	6.29e-09	7.27e-09	4.35e-10	0.00e+00	4.25e-09	0.00e+00	3.49e-05
W-187	1.03e-07	8.61e-08	3.01e-08	0.00e+00	0.00e+00	0.00e+00	2.82e-05
Np-239	1.19e-09	1.17e-10	6.45e-11	0.00e+00	3.65e-10	0.00e+00	2.40e-05

Conversion factors are in units of mrem per pCi ingested.

DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Ingestion Dose Conversion factors for Teen age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	1.06e-07	1.06e-07	1.06e-07	1.06e-07	1.06e-07	1.06e-07
C-14	4.06e-06	8.12e-07	8.12e-07	8.12e-07	8.12e-07	8.12e-07	8.12e-07
Na-24	2.30e-06	2.30e-06	2.30e-06	2.30e-06	2.30e-06	2.30e-06	2.30e-06
P-32	2.76e-04	1.71e-05	1.07e-05	0.00e+00	0.00e+00	0.00e+00	2.32e-05
Cr-51	0.00e+00	0.00e+00	3.60e-09	2.00e-09	7.89e-10	5.14e-09	6.05e-07
Mn-54	0.00e+00	5.90e-06	1.17e-06	0.00e+00	1.76e-06	0.00e+00	1.21e-05
Mn-56	0.00e+00	1.58e-07	2.81e-08	0.00e+00	2.00e-07	0.00e+00	1.04e-05
Fe-55	3.78e-06	2.68e-06	6.25e-07	0.00e+00	0.00e+00	1.70e-06	1.16e-06
Fe-59	5.87e-06	1.37e-05	5.29e-06	0.00e+00	0.00e+00	4.32e-06	3.24e-05
Co-58	0.00e+00	9.72e-07	2.24e-06	0.00e+00	0.00e+00	0.00e+00	1.34e-05
Co-60	0.00e+00	2.81e-06	6.33e-06	0.00e+00	0.00e+00	0.00e+00	3.66e-05
Ni-63	1.77e-04	1.25e-05	6.00e-06	0.00e+00	0.00e+00	0.00e+00	1.99e-06
Ni-65	7.49e-07	9.57e-08	4.36e-08	0.00e+00	0.00e+00	0.00e+00	5.19e-06
Cu-64	0.00e+00	1.15e-07	5.41e-08	0.00e+00	2.91e-07	0.00e+00	8.92e-06
Zn-65	5.78e-06	2.00e-05	9.33e-06	0.00e+00	1.28e-05	0.00e+00	8.47e-06
Zn-69	1.47e-08	2.80e-08	1.96e-09	0.00e+00	1.83e-08	0.00e+00	5.16e-08
Br-83	0.00e+00	0.00e+00	5.74e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	7.22e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	3.05e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	2.98e-05	1.40e-05	0.00e+00	0.00e+00	0.00e+00	4.41e-06
Rb-88	0.00e+00	8.52e-08	4.54e-08	0.00e+00	0.00e+00	0.00e+00	7.30e-15
Rb-89	0.00e+00	5.50e-08	3.89e-08	0.00e+00	0.00e+00	0.00e+00	8.43e-17
Sr-89	4.40e-04	0.00e+00	1.26e-05	0.00e+00	0.00e+00	0.00e+00	5.24e-05
Sr-90	8.30e-03	0.00e+00	2.05e-03	0.00e+00	0.00e+00	0.00e+00	2.33e-04
Sr-91	8.07e-06	0.00e+00	3.21e-07	0.00e+00	0.00e+00	0.00e+00	3.66e-05
Sr-92	3.05e-06	0.00e+00	1.30e-07	0.00e+00	0.00e+00	0.00e+00	7.77e-05
Y-90	1.37e-08	0.00e+00	3.69e-10	0.00e+00	0.00e+00	0.00e+00	1.13e-04
Y-91	2.01e-07	0.00e+00	5.39e-09	0.00e+00	0.00e+00	0.00e+00	8.24e-05
Y-91m	1.29e-10	0.00e+00	4.93e-12	0.00e+00	0.00e+00	0.00e+00	6.09e-09
Y-92	1.21e-09	0.00e+00	3.50e-11	0.00e+00	0.00e+00	0.00e+00	3.32e-05

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DOSE CONVERSION FACTORS ALL AGE GROUPS BY NUCLIDE (INHALATION AND INGESTION)

Ingestion Dose Conversion factors for Teen age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	3.83e-09	0.00e+00	1.05e-10	0.00e+00	0.00e+00	0.00e+00	1.17e-04
Zr-95	4.12e-08	1.30e-08	8.94e-09	0.00e+00	1.91e-08	0.00e+00	3.00e-05
Zr-97	2.37e-09	4.69e-10	2.16e-10	0.00e+00	7.11e-10	0.00e+00	1.27e-04
Nb-95	8.22e-09	4.56e-09	2.51e-09	0.00e+00	4.42e-09	0.00e+00	1.95e-05
Mo-99	0.00e+00	6.03e-06	1.15e-06	0.00e+00	1.38e-05	0.00e+00	1.08e-05
Tc-101	3.60e-10	5.12e-10	5.03e-09	0.00e+00	9.26e-09	3.12e-10	8.75e-17
Tc-99m	3.32e-10	9.26e-10	1.20e-08	0.00e+00	1.38e-08	5.14e-10	6.08e-07
Ru-103	2.55e-07	0.00e+00	1.09e-07	0.00e+00	8.99e-07	0.00e+00	2.13e-05
Ru-105	2.18e-08	0.00e+00	8.46e-09	0.00e+00	2.75e-07	0.00e+00	1.76e-05
Ru-106	3.02e-06	0.00e+00	4.94e-07	0.00e+00	7.56e-06	0.00e+00	1.88e-04
Ag-110m	2.05e-07	1.94e-07	1.18e-07	0.00e+00	3.70e-07	0.00e+00	5.45e-05
Te-125m	3.83e-06	1.38e-06	5.12e-07	1.07e-06	0.00e+00	0.00e+00	1.13e-05
Te-127	1.58e-07	5.60e-08	3.40e-08	1.09e-07	6.40e-07	0.00e+00	1.22e-05
Te-127m	9.67e-06	3.43e-06	1.15e-06	2.30e-06	3.92e-05	0.00e+00	2.41e-05
Te-129	4.48e-08	1.67e-08	1.00e-08	3.20e-08	1.88e-07	0.00e+00	2.45e-07
Te-129m	1.63e-05	6.05e-06	2.58e-06	5.26e-06	6.82e-05	0.00e+00	6.12e-05
Te-131	2.79e-08	1.15e-08	8.72e-09	2.15e-08	1.22e-07	0.00e+00	2.29e-09
Te-131m	2.44e-06	1.17e-06	9.76e-07	1.76e-06	1.22e-05	0.00e+00	9.39e-05
Te-132	3.49e-06	2.21e-06	2.08e-06	2.33e-06	2.12e-05	0.00e+00	7.00e-05
I-130	1.03e-06	2.98e-06	1.19e-06	2.43e-04	4.59e-06	0.00e+00	2.29e-06
I-131	5.85e-06	8.19e-06	4.40e-06	2.39e-03	1.41e-05	0.00e+00	1.62e-06
I-132	2.79e-07	7.30e-07	2.62e-07	2.46e-05	1.15e-06	0.00e+00	3.18e-07
I-133	2.01e-06	3.41e-06	1.04e-06	4.76e-04	5.98e-06	0.00e+00	2.58e-06
I-134	1.46e-07	3.87e-07	1.39e-07	6.45e-06	6.10e-07	0.00e+00	5.10e-09
I-135	6.10e-07	1.37e-06	5.82e-07	1.01e-04	2.48e-06	0.00e+00	1.74e-06
Cs-134	8.37e-05	1.97e-04	9.14e-05	0.00e+00	6.26e-05	2.39e-05	2.45e-06
Cs-136	8.59e-06	3.38e-05	2.27e-05	0.00e+00	1.84e-05	2.90e-06	2.72e-06
Cs-137	1.12e-04	1.49e-04	5.19e-05	0.00e+00	5.07e-05	1.97e-05	2.12e-06
Cs-138	7.76e-08	1.49e-07	7.45e-08	0.00e+00	1.10e-07	1.28e-08	6.76e-11
Ba-139	1.39e-07	9.78e-11	4.05e-09	0.00e+00	9.22e-11	6.74e-11	1.24e-06

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DOSE CONVERSION FACTORS ALL AGE GROUPS
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Ingestion Dose Conversion factors for Teen age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	2.84e-05	3.48e-08	1.83e-06	0.00e+00	1.18e-08	2.34e-08	4.38e-05
Ba-141	6.71e-08	5.01e-11	2.24e-09	0.00e+00	4.65e-11	3.43e-11	1.43e-13
Ba-142	2.99e-08	2.99e-11	1.84e-09	0.00e+00	2.53e-11	1.99e-11	9.18e-20
La-140	3.48e-09	1.71e-09	4.55e-10	0.00e+00	0.00e+00	0.00e+00	9.82e-05
La-142	1.79e-10	7.95e-11	1.98e-11	0.00e+00	0.00e+00	0.00e+00	2.42e-06
Ce-141	1.33e-08	8.88e-09	1.02e-09	0.00e+00	4.18e-09	0.00e+00	2.54e-05
Ce-143	2.35e-09	1.71e-06	1.91e-10	0.00e+00	7.67e-10	0.00e+00	5.14e-05
Ce-144	6.96e-07	2.88e-07	3.74e-08	0.00e+00	1.72e-07	0.00e+00	1.75e-04
Pr-143	1.31e-08	5.23e-09	6.52e-10	0.00e+00	3.04e-09	0.00e+00	4.31e-05
Pr-144	4.30e-11	1.76e-11	2.18e-12	0.00e+00	1.01e-11	0.00e+00	4.74e-14
Nd-147	9.38e-09	1.02e-08	6.11e-10	0.00e+00	5.99e-09	0.00e+00	3.68e-05
W-187	1.46e-07	1.19e-07	4.17e-08	0.00e+00	0.00e+00	0.00e+00	3.22e-05
Np-239	1.76e-09	1.66e-10	9.22e-11	0.00e+00	5.21e-10	0.00e+00	2.67e-05

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DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Ingestion Dose Conversion factors for Child age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	2.03e-07	2.03e-07	2.03e-07	2.03e-07	2.03e-07	2.03e-07
C-14	1.21e-05	2.42e-06	2.42e-06	2.42e-06	2.42e-06	2.42e-06	2.42e-06
Na-24	5.80e-06	5.80e-05	5.80e-06	5.80e-06	5.80e-06	5.80e-06	5.80e-06
P-32	8.25e-04	3.86e-05	3.18e-05	0.00e+00	0.00e+00	0.00e+00	2.28e-05
Cr-51	0.00e+00	0.00e+00	8.90e-09	4.94e-09	1.35e-09	9.02e-09	4.72e-07
Mn-54	0.00e+00	1.07e-05	2.85e-06	0.00e+00	3.00e-06	0.00e+00	8.98e-06
Mn-56	0.00e+00	3.34e-07	7.54e-08	0.00e+00	4.04e-07	0.00e+00	4.84e-05
Fe-55	1.15e-05	6.10e-06	1.89e-06	0.00e+00	0.00e+00	3.45e-06	1.13e-06
Fe-59	1.65e-05	2.67e-05	1.33e-05	0.00e+00	0.00e+00	7.74e-06	2.78e-05
Co-58	0.00e+00	1.80e-06	5.51e-06	0.00e+00	0.00e+00	0.00e+00	1.05e-05
Co-60	0.00e+00	5.29e-06	1.56e-05	0.00e+00	0.00e+00	0.00e+00	2.93e-05
Ni-63	5.38e-04	2.88e-05	1.88e-05	0.00e+00	0.00e+00	0.00e+00	1.94e-06
Ni-65	2.22e-06	2.09e-07	1.22e-07	0.00e+00	0.00e+00	0.00e+00	2.56e-05
Cu-64	0.00e+00	2.45e-07	1.48e-07	0.00e+00	5.92e-07	0.00e+00	1.15e-05
Zn-65	1.37e-05	3.65e-05	2.27e-05	0.00e+00	2.30e-05	0.00e+00	6.41e-06
Zn-69	4.38e-08	6.33e-08	5.85e-09	0.00e+00	3.84e-08	0.00e+00	3.99e-06
Br-83	0.00e+00	0.00e+00	1.71e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	1.98e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	9.12e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	6.70e-05	4.12e-05	0.00e+00	0.00e+00	0.00e+00	4.31e-06
Rb-88	0.00e+00	1.90e-07	1.32e-07	0.00e+00	0.00e+00	0.00e+00	9.32e-09
Rb-89	0.00e+00	1.17e-07	1.04e-07	0.00e+00	0.00e+00	0.00e+00	1.02e-09
Sr-89	1.32e-03	0.00e+00	3.77e-05	0.00e+00	0.00e+00	0.00e+00	5.11e-05
Sr-90	1.70e-02	0.00e+00	4.31e-03	0.00e+00	0.00e+00	0.00e+00	2.29e-04
Sr-91	2.40e-05	0.00e+00	9.06e-07	0.00e+00	0.00e+00	0.00e+00	5.30e-05
Sr-92	9.03e-06	0.00e+00	3.62e-07	0.00e+00	0.00e+00	0.00e+00	1.71e-04
Y-90	4.11e-08	0.00e+00	1.40e-09	0.00e+00	0.00e+00	0.00e+00	1.17e-04
Y-91	6.02e-07	0.00e+00	1.61e-08	0.00e+00	0.00e+00	0.00e+00	8.02e-05
Y-91m	3.82e-10	0.00e+00	1.39e-11	0.00e+00	0.00e+00	0.00e+00	7.48e-07
Y-92	3.60e-09	0.00e+00	1.03e-10	0.00e+00	0.00e+00	0.00e+00	1.04e-04

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DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Ingestion Dose Conversion factors for Child age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	1.14e-08	0.00e+00	3.13e-10	0.00e+00	0.00e+00	0.00e+00	1.70e-04
Zr-95	1.16e-07	2.55e-08	2.27e-08	0.00e+00	3.65e-08	0.00e+00	2.66e-05
Zr-97	6.99e-09	1.01e-09	5.96e-10	0.00e+00	1.45e-09	0.00e+00	1.53e-04
Nb-95	2.25e-08	8.76e-09	6.26e-09	0.00e+00	8.23e-09	0.00e+00	1.62e-05
Mo-99	0.00e+00	1.33e-05	3.29e-06	0.00e+00	2.84e-05	0.00e+00	1.10e-05
Tc-101	1.07e-09	1.12e-09	1.42e-08	0.00e+00	1.91e-08	5.92e-10	3.56e-09
Tc-99m	9.23e-10	1.81e-09	3.00e-08	0.00e+00	2.63e-08	9.19e-10	1.03e-06
Ru-103	7.31e-07	0.00e+00	2.81e-07	0.00e+00	1.84e-06	0.00e+00	1.89e-05
Ru-105	6.45e-08	0.00e+00	2.34e-08	0.00e+00	5.67e-07	0.00e+00	4.21e-05
Ru-106	1.17e-05	0.00e+00	1.46e-06	0.00e+00	1.58e-05	0.00e+00	1.82e-04
Ag-110m	5.39e-07	3.64e-07	2.91e-07	0.00e+00	6.78e-07	0.00e+00	4.33e-05
Te-125m	1.14e-05	3.09e-06	1.52e-06	3.20e-06	0.00e+00	0.00e+00	1.10e-05
Te-127	4.71e-07	1.27e-07	1.01e-07	3.26e-07	1.34e-06	0.00e+00	1.84e-05
Te-127m	2.89e-05	7.78e-06	3.43e-06	6.91e-06	8.24e-05	0.00e+00	2.34e-05
Te-129	1.34e-07	3.74e-08	3.18e-08	9.56e-08	3.92e-07	0.00e+00	8.34e-06
Te-129m	4.67e-05	1.36e-05	7.56e-06	1.57e-05	1.43e-04	0.00e+00	5.94e-05
Te-131	8.30e-08	2.53e-08	2.47e-08	6.35e-08	2.51e-07	0.00e+00	4.36e-07
Te-131m	7.20e-06	2.49e-06	2.65e-06	5.12e-06	2.41e-05	0.00e+00	1.01e-04
Te-132	1.01e-05	4.47e-06	5.40e-06	6.51e-06	4.15e-05	0.00e+00	4.50e-05
I-130	2.92e-06	5.90e-06	3.04e-06	6.50e-04	8.82e-06	0.00e+00	2.76e-06
I-131	1.72e-05	1.73e-05	9.83e-06	5.72e-03	2.84e-05	0.00e+00	1.54e-06
I-132	8.00e-07	1.47e-06	6.76e-07	6.82e-05	2.25e-06	0.00e+00	1.73e-06
I-133	5.92e-06	7.32e-06	2.77e-06	1.36e-03	1.22e-05	0.00e+00	2.95e-06
I-134	4.19e-07	7.78e-07	3.58e-07	1.79e-05	1.19e-06	0.00e+00	5.16e-07
I-135	1.75e-06	3.15e-06	1.49e-06	2.79e-04	4.83e-06	0.00e+00	2.40e-06
Cs-134	2.34e-04	3.84e-04	8.10e-05	0.00e+00	1.19e-04	4.27e-05	2.07e-06
Cs-136	2.35e-05	6.64e-05	4.18e-05	0.00e+00	3.44e-05	5.13e-06	2.27e-06
Cs-137	3.27e-04	3.13e-04	4.62e-05	0.00e+00	1.02e-04	3.67e-05	1.96e-06
Cs-138	2.28e-07	3.17e-07	2.01e-07	0.00e+00	2.23e-07	2.40e-08	1.46e-07
Ba-139	4.14e-07	2.21e-10	1.20e-08	0.00e+00	1.93e-10	1.30e-10	2.39e-05

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Ingestion Dose Conversion factors for Child age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	8.31e-05	7.28e-08	4.85e-06	0.00e+00	2.37e-08	4.34e-08	4.21e-05
Ba-141	2.00e-07	1.12e-10	6.51e-09	0.00e+00	9.69e-11	6.58e-10	1.14e-07
Ba-142	8.74e-08	6.29e-11	4.88e-09	0.00e+00	5.09e-11	3.70e-11	1.14e-09
La-140	1.01e-08	3.53e-09	1.10e-09	0.00e+00	0.00e+00	0.00e+00	9.84e-05
La-142	5.24e-10	1.67e-10	5.23e-11	0.00e+00	0.00e+00	0.00e+00	3.31e-05
Ce-141	3.97e-08	1.98e-08	2.94e-09	0.00e+00	8.68e-08	0.00e+00	2.47e-05
Ce-143	6.99e-09	3.79e-06	5.49e-10	0.00e+00	1.59e-09	0.00e+00	5.55e-05
Ce-144	2.08e-06	6.52e-07	1.11e-07	0.00e+00	3.61e-07	0.00e+00	1.70e-04
Pr-143	3.93e-08	1.18e-08	1.95e-09	0.00e+00	6.39e-09	0.00e+00	4.24e-05
Pr-144	1.29e-10	3.99e-11	6.49e-12	0.00e+00	2.11e-11	0.00e+00	8.59e-08
Nd-147	2.79e-08	2.26e-08	1.75e-09	0.00e+00	1.24e-08	0.00e+00	3.58e-05
W-187	4.29e-07	2.54e-07	1.14e-07	0.00e+00	0.00e+00	0.00e+00	3.57e-05
Np-239	5.25e-09	3.77e-10	2.65e-10	0.00e+00	1.09e-09	0.00e+00	2.79e-05

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DOSE CONVERSION FACTORS ALL AGE GROUPS
BY NUCLIDE (INHALATION AND INGESTION)

Ingestion Dose Conversion factors for Infant age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
H-3	0.00e+00	3.08e-07	3.08e-07	3.08e-07	3.08e-07	3.08e-07	3.08e-07
C-14	2.37e-05	5.06e-06	5.06e-06	5.06e-06	5.06e-06	5.06e-06	5.06e-06
Na-24	1.01e-05	1.01e-05	1.01e-05	1.01e-05	1.01e-05	1.01e-05	1.01e-05
P-32	1.70e-03	1.00e-04	6.59e-05	0.00e+00	0.00e+00	0.00e+00	2.30e-05
Cr-51	0.00e+00	0.00e+00	1.41e-08	9.20e-09	2.01e-09	1.79e-08	4.11e-07
Mn-54	0.00e+00	1.99e-05	4.51e-06	0.00e+00	4.41e-06	0.00e+00	7.31e-06
Mn-56	0.00e+00	8.18e-07	1.41e-07	0.00e+00	7.03e-07	0.00e+00	7.43e-05
Fe-55	1.39e-05	8.98e-06	2.40e-06	0.00e+00	0.00e+00	4.39e-06	1.14e-06
Fe-59	3.08e-05	5.38e-05	2.12e-05	0.00e+00	0.00e+00	1.59e-05	2.57e-05
Co-58	0.00e+00	3.60e-06	8.98e-06	0.00e+00	0.00e+00	0.00e+00	8.97e-06
Co-60	0.00e+00	1.08e-05	2.55e-05	0.00e+00	0.00e+00	0.00e+00	2.57e-05
Ni-63	6.34e-04	3.92e-05	2.20e-05	0.00e+00	0.00e+00	0.00e+00	1.95e-06
Ni-65	4.70e-06	5.32e-07	2.42e-07	0.00e+00	0.00e+00	0.00e+00	4.05e-05
Cu-64	0.00e+00	6.09e-07	2.82e-07	0.00e+00	1.03e-06	0.00e+00	1.25e-05
Zn-65	1.84e-05	6.31e-05	2.91e-05	0.00e+00	3.06e-05	0.00e+00	5.33e-05
Zn-69	9.33e-08	1.68e-07	1.25e-08	0.00e+00	6.98e-08	0.00e+00	1.37e-05
Br-83	0.00e+00	0.00e+00	3.63e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-84	0.00e+00	0.00e+00	3.82e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Br-85	0.00e+00	0.00e+00	1.94e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Rb-86	0.00e+00	1.70e-04	8.40e-05	0.00e+00	0.00e+00	0.00e+00	4.35e-06
Rb-88	0.00e+00	4.98e-07	2.73e-07	0.00e+00	0.00e+00	0.00e+00	4.85e-07
Rb-89	0.00e+00	2.86e-07	1.97e-07	0.00e+00	0.00e+00	0.00e+00	9.74e-08
Sr-89	2.51e-03	0.00e+00	7.20e-05	0.00e+00	0.00e+00	0.00e+00	5.16e-05
Sr-90	1.85e-02	0.00e+00	4.71e-03	0.00e+00	0.00e+00	0.00e+00	2.31e-04
Sr-91	5.00e-05	0.00e+00	1.81e-06	0.00e+00	0.00e+00	0.00e+00	5.92e-05
Sr-92	1.92e-05	0.00e+00	7.13e-07	0.00e+00	0.00e+00	0.00e+00	2.07e-04
Y-90	8.69e-08	0.00e+00	2.33e-09	0.00e+00	0.00e+00	0.00e+00	1.20e-04
Y-91	1.13e-06	0.00e+00	3.01e-08	0.00e+00	0.00e+00	0.00e+00	8.10e-05
Y-91m	8.10e-10	0.00e+00	2.76e-11	0.00e+00	0.00e+00	0.00e+00	2.70e-06
Y-92	7.65e-09	0.00e+00	2.15e-10	0.00e+00	0.00e+00	0.00e+00	1.46e-04

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Ingestion Dose Conversion factors for Infant age group by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Y-93	2.43e-08	0.00e+00	6.62e-10	0.00e+00	0.00e+00	0.00e+00	1.92e-04
Zr-95	2.06e-07	5.02e-08	3.56e-08	0.00e+00	5.41e-08	0.00e+00	2.50e-05
Zr-97	1.48e-08	2.54e-09	1.16e-09	0.00e+00	2.56e-09	0.00e+00	1.62e-04
Nb-95	4.20e-08	1.73e-08	1.00e-08	0.00e+00	1.24e-08	0.00e+00	1.46e-05
Mo-99	0.00e+00	3.40e-05	6.63e-06	0.00e+00	5.08e-05	0.00e+00	1.12e-05
Tc-101	2.27e-09	2.86e-09	2.83e-08	0.00e+00	3.40e-08	1.56e-09	4.86e-07
Tc-99m	1.92e-09	3.96e-09	5.10e-08	0.00e+00	4.26e-08	2.07e-09	1.15e-06
Ru-103	1.48e-06	0.00e+00	4.95e-07	0.00e+00	3.08e-06	0.00e+00	1.80e-05
Ru-105	1.36e-07	0.00e+00	4.58e-08	0.00e+00	1.00e-06	0.00e+00	5.41e-05
Ru-106	2.41e-05	0.00e+00	3.01e-06	0.00e+00	2.85e-05	0.00e+00	1.83e-04
Ag-110m	9.96e-07	7.27e-07	4.81e-07	0.00e+00	1.04e-06	0.00e+00	3.77e-05
Te-125m	2.33e-05	7.79e-06	3.15e-06	7.84e-06	0.00e+00	0.00e+00	1.11e-05
Te-127	1.00e-06	3.35e-07	2.15e-07	8.14e-07	2.44e-06	0.00e+00	2.10e-05
Te-127m	5.85e-05	1.94e-05	7.08e-06	1.69e-05	1.44e-04	0.00e+00	2.36e-05
Te-129	2.84e-07	9.79e-08	6.63e-08	2.38e-07	7.07e-07	0.00e+00	2.27e-05
Te-129m	1.00e-04	3.43e-05	1.54e-05	3.84e-05	2.50e-04	0.00e+00	5.97e-05
Te-131	1.76e-07	6.50e-08	4.94e-08	1.57e-07	4.50e-07	0.00e+00	7.11e-06
Te-131m	1.52e-05	6.12e-06	5.05e-06	1.24e-05	4.21e-05	0.00e+00	1.03e-04
Te-132	2.08e-05	1.03e-05	9.61e-06	1.52e-05	6.44e-05	0.00e+00	3.81e-05
I-130	6.00e-06	1.32e-05	5.30e-06	1.48e-03	1.45e-05	0.00e+00	2.83e-06
I-131	3.59e-05	4.23e-05	1.86e-05	1.39e-02	4.94e-05	0.00e+00	1.51e-06
I-132	1.66e-06	3.37e-06	1.20e-06	1.58e-04	3.76e-06	0.00e+00	2.73e-06
I-133	1.25e-05	1.82e-05	5.33e-06	3.31e-03	2.14e-05	0.00e+00	3.08e-06
I-134	8.69e-07	1.78e-06	6.33e-07	4.15e-05	1.99e-06	0.00e+00	1.84e-06
I-135	3.64e-06	7.24e-06	2.64e-06	6.49e-04	8.07e-06	0.00e+00	2.62e-06
Cs-134	3.77e-04	7.03e-04	7.10e-05	0.00e+00	1.81e-04	7.42e-05	1.91e-06
Cs-136	4.59e-05	1.35e-04	5.06e-05	0.00e+00	5.38e-05	1.10e-05	2.05e-06
Cs-137	5.22e-04	6.11e-04	4.33e-05	0.00e+00	1.64e-04	6.64e-05	1.91e-06
Cs-138	4.81e-07	7.82e-07	3.79e-07	0.00e+00	3.90e-07	6.09e-08	1.25e-06
Ba-139	8.81e-07	5.84e-10	2.55e-08	0.00e+00	3.51e-10	3.54e-10	5.58e-07

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Nuclide	Organ Dose Conversion Factors						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Ba-140	1.71e-04	1.71e-07	8.81e-06	0.00e+00	4.06e-08	1.05e-07	4.20e-05
Ba-141	4.25e-07	2.91e-10	1.34e-08	0.00e+00	1.75e-10	1.77e-10	5.19e-06
Ba-142	1.84e-07	1.53e-10	9.06e-09	0.00e+00	8.81e-11	9.26e-11	7.59e-07
La-140	2.11e-08	8.32e-09	2.14e-09	0.00e+00	0.00e+00	0.00e+00	9.77e-05
La-142	1.10e-09	4.04e-10	9.67e-11	0.00e+00	0.00e+00	0.00e+00	6.86e-05
Ce-141	7.87e-08	4.80e-08	5.65e-09	0.00e+00	1.48e-08	0.00e+00	2.48e-05
Ce-143	1.48e-08	9.82e-06	1.12e-09	0.00e+00	2.86e-09	0.00e+00	5.73e-05
Ce-144	2.98e-06	1.22e-06	1.67e-07	0.00e+00	4.93e-07	0.00e+00	1.71e-04
Pr-143	8.13e-08	3.04e-08	4.03e-09	0.00e+00	1.13e-08	0.00e+00	4.29e-05
Pr-144	2.74e-10	1.06e-10	1.38e-11	0.00e+00	3.84e-11	0.00e+00	4.93e-06
Nd-147	5.53e-08	5.68e-08	3.48e-09	0.00e+00	2.19e-08	0.00e+00	3.60e-05
W-187	9.03e-07	6.28e-07	2.17e-07	0.00e+00	0.00e+00	0.00e+00	3.69e-05
Np-239	1.11e-08	9.93e-10	5.61e-10	0.00e+00	1.98e-09	0.00e+00	2.87e-05

Conversion factors are in units of mrem per pCi ingested.

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Values for A_i, P_i, and R_i were calculated as per NUREG-0133. Recommended values for various factors in the calculations were as specified in NUREG-0133. The location of most of the recommended factors are contained in Regulatory Guide 1.109. All factors used in Waterford-3 SES's calculations are for the maximum individual and are not site specific. The various factors are discussed below.

- Stable element transfer coefficients for vegetation, cow's milk, goat's milk and meat were obtained from Regulatory Guide 1.109 Tables E-1 and E-2 (Attachment 6.21, page 2).

- Animal consumption rates were obtained from Regulatory Guide 1.109 Table E-3, (Attachment 6.21, page 3).

- Usage or consumption rates for adult, teen, child, and infant age groups were obtained from Regulatory Guide 1.109 Table E-5. These values are for the maximum exposed individual, (Attachment 6.21, page 4).

- External dose factors for standing on contaminated ground were obtained from Regulatory Guide 1.109 Table E-6, (Attachment 6.21, pages 5-7).

- Other factors used were obtained from Regulatory Guide 1.109 Table E-15 for various parameters, (Attachment 6.21, page 8-9).

- Bioaccumulation factors for freshwater and saltwater vertebrates and invertebrates (Attachment 6.21, page 10).

- Inhalation and ingestion dose factors for adult, teen, child, and infant age groups were obtained from Regulatory Guide 1.109 Tables E-7 through E-14. (Attachment 6.20).

- Radionuclide half lifes and decay constants parameters (Attachment 6.21, p.11-13).

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Stable Element Transfer Coefficients by nuclide.
Waterford Steam Electric Station

Element	Stable Element Transfer Data			
	Biv Veg/Soil	Fm Cow Milk	Ff Meat	Fm Goat Milk
H	4.80e+00	1.00e-02	1.20e-02	1.70e-01
C	5.50e+00	1.20e-02	3.10e-02	1.00e-01
Na	5.20e-02	4.00e-02	3.00e-02	4.00e-02
P	1.10e+00	3.50e-02	4.60e-02	2.50e-01
Cr	2.50e-04	2.20e-03	2.40e-03	2.20e-03
Mn	2.90e-03	2.50e-04	8.00e-04	2.50e-04
Fe	6.60e-04	1.20e-03	4.00e-02	1.30e-04
Co	9.40e-03	1.00e-03	1.30e-02	1.00e-03
Ni	1.90e-02	6.70e-03	5.30e-02	6.70e-03
Cu	1.20e-01	1.40e-02	8.00e-03	1.30e-02
Zn	4.00e-01	3.90e-02	3.00e-02	3.90e-02
Br	2.00e-02	6.00e-03	2.90e-03	6.00e-03
Rb	1.30e-01	3.00e-02	3.10e-02	3.00e-02
Sr	1.70e-02	8.00e-04	6.00e-04	1.40e-02
Y	2.60e-03	1.00e-05	4.60e-03	1.00e-05
Zr	1.70e-04	5.00e-06	3.40e-02	5.00e-06
Nb	9.40e-03	2.50e-03	2.80e-01	2.50e-03
Mo	1.20e-01	7.50e-03	8.00e-03	7.50e-03
Tc	2.50e-01	2.50e-02	4.00e-01	2.50e-02
Ru	5.00e-02	1.00e-06	4.00e-01	1.00e-06
Rh	1.30e+01	1.00e-02	1.50e-03	1.00e-02
Ag	1.50e-01	5.00e-02	1.70e-02	5.00e-02
Te	1.30e+00	1.00e-03	7.70e-02	1.00e-03
I	2.00e-02	6.00e-03	2.90e-03	6.00e-02
Cs	1.00e-02	1.20e-02	4.00e-03	3.00e-01
Ba	5.00e-03	4.00e-04	3.20e-03	4.00e-04
La	2.50e-03	5.00e-06	2.00e-04	5.00e-06
Ce	2.50e-03	1.00e-04	1.20e-03	1.00e-04
Pr	2.50e-03	5.00e-06	4.70e-03	5.00e-06
Nd	2.40e-03	5.00e-06	3.30e-03	5.00e-06
W	1.80e-02	5.00e-04	1.30e-03	5.00e-04
Np	2.50e-03	5.00e-06	2.00e-04	5.00e-06

Units for transfer data are derived as follows:
Biv -> pCi/kg in vegetation per pCi/kg in soil (no units),
Fm -> pCi/liter in milk per pCi/day ingested by animal (days/liter),
Ff -> pCi/kg in meat per pCi/day ingested by animal (days/kg).

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Animal Consumption rates.
Waterford Steam Electric Station

Milk cow's feed intake rate	:	50.00 kg/day
Milk cow's water intake rate	:	60.00 l/day
Beef cow's feed intake rate	:	50.00 kg/day
Beef cow's water intake rate	:	50.00 l/day
Goat's feed intake rate	:	6.00 kg/day
Goat's water intake rate	:	8.00 l/day

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Consumption rates for MAXIMAL individuals.
Waterford Steam Electric Station

produce veg	usage rate for the Adult :	520.0	kg/yr
produce veg	usage rate for the Teen :	630.0	kg/yr
produce veg	usage rate for the Child :	520.0	kg/yr
produce veg	usage rate for the Infant :	0.0	kg/yr
leafy veg	usage rate for the Adult :	64.0	kg/yr
leafy veg	usage rate for the Teen :	42.0	kg/yr
leafy veg	usage rate for the Child :	26.0	kg/yr
leafy veg	usage rate for the Infant :	0.0	kg/yr
milk	usage rate for the Adult :	310.0	l/yr
milk	usage rate for the Teen :	400.0	l/yr
milk	usage rate for the Child :	330.0	l/yr
milk	usage rate for the Infant :	330.0	l/yr
meat/poultry	usage rate for the Adult :	110.0	kg/yr
meat/poultry	usage rate for the Teen :	65.0	kg/yr
meat/poultry	usage rate for the Child :	41.0	kg/yr
meat/poultry	usage rate for the Infant :	0.0	kg/yr
fish	usage rate for the Adult :	21.0	kg/yr
fish	usage rate for the Teen :	16.0	kg/yr
fish	usage rate for the Child :	6.9	kg/yr
fish	usage rate for the Infant :	0.0	kg/yr
seafood	usage rate for the Adult :	5.0	kg/yr
seafood	usage rate for the Teen :	3.8	kg/yr
seafood	usage rate for the Child :	1.7	kg/yr
seafood	usage rate for the Infant :	0.0	kg/yr
drink h2o	usage rate for the Adult :	730.0	l/yr
drink h2o	usage rate for the Teen :	510.0	l/yr
drink h2o	usage rate for the Child :	510.0	l/yr
drink h2o	usage rate for the Infant :	330.0	l/yr
shore rec	usage rate for the Adult :	12.0	hr/yr
shore rec	usage rate for the Teen :	67.0	hr/yr
shore rec	usage rate for the Child :	14.0	hr/yr
shore rec	usage rate for the Infant :	0.0	hr/yr
inhalation	usage rate for the Adult :	8000.0	m3/yr
inhalation	usage rate for the Teen :	8000.0	m3/yr
inhalation	usage rate for the Child :	3700.0	m3/yr
inhalation	usage rate for the Infant :	1400.0	m3/yr

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Ground Plane Dose Conversion factors for all age groups by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors	
	T. Body	Skin
H-3	0.00e+00	0.00e+00
C-14	0.00e+00	0.00e+00
Na-24	2.50e-08	2.90e-08
P-32	0.00e+00	0.00e+00
Cr-51	2.20e-10	2.60e-10
Mn-54	5.80e-09	6.80e-09
Mn-56	1.10e-08	1.30e-08
Fe-55	0.00e+00	0.00e+00
Fe-59	8.00e-09	9.40e-09
Co-58	7.00e-09	8.20e-09
Co-60	1.70e-08	2.00e-08
Ni-63	0.00e+00	0.00e+00
Ni-65	3.70e-09	4.30e-09
Cu-64	1.50e-09	1.70e-09
Zn-65	4.00e-09	4.60e-09
Zn-69	0.00e+00	0.00e+00
Br-83	6.40e-11	9.30e-11
Br-84	1.20e-08	1.40e-08
Br-85	0.00e+00	0.00e+00
Rb-86	6.30e-10	7.20e-10
Rb-88	3.50e-09	4.00e-09
Rb-89	1.50e-08	1.80e-08
Sr-89	5.60e-13	6.50e-13
Sr-90	0.00e+00	0.00e+00
Sr-91	7.10e-09	8.30e-09
Sr-92	9.00e-09	1.00e-08
Y-90	2.20e-12	2.60e-12
Y-91	2.40e-11	2.70e-11
Y-91m	3.80e-09	4.40e-09
Y-92	1.60e-09	1.90e-09

Conversion factors are in units of mrem/hr per pCi/square meter.

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Ground Plane Dose Conversion factors for all age groups by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors	
	T. Body	Skin
Y-93	5.70e-10	7.80e-10
Zr-95	5.00e-09	5.80e-09
Zr-97	5.50e-09	6.40e-09
Nb-95	5.10e-09	6.00e-09
Mo-99	1.90e-09	2.20e-09
Tc-101	2.70e-09	3.00e-09
Tc-99m	9.60e-10	1.10e-09
Ru-103	3.60e-09	4.20e-09
Ru-105	4.50e-09	5.10e-09
Ru-106	1.50e-09	1.80e-09
Ag-110m	1.80e-08	2.10e-08
Te-125m	3.50e-11	4.80e-11
Te-127	1.00e-11	1.10e-11
Te-127m	1.10e-12	1.30e-12
Te-129	7.10e-10	8.40e-10
Te-129m	7.70e-10	9.00e-10
Te-131	2.20e-09	2.60e-06
Te-131m	8.40e-09	9.90e-09
Te-132	1.70e-09	2.00e-09
I-130	1.40e-08	1.70e-08
I-131	2.80e-09	3.40e-09
I-132	1.70e-08	2.00e-08
I-133	3.70e-09	4.50e-09
I-134	1.60e-08	1.90e-08
I-135	1.20e-08	1.40e-08
Cs-134	1.20e-08	1.40e-08
Cs-136	1.50e-08	1.70e-08
Cs-137	4.20e-09	4.90e-09
Cs-138	2.10e-08	2.40e-08
Ba-139	2.40e-09	2.70e-09

Conversion factors are in units of mrem/hr per pCi/square meter.

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Ground Plane Dose Conversion factors for all age groups by nuclide.
Waterford Steam Electric Station

Nuclide	Organ Dose Conversion Factors	
	T. Body	Skin
Ba-140	2.10e-09	2.40e-09
Ba-141	4.30e-09	4.90e-09
Ba-142	7.90e-09	9.00e-09
La-140	1.50e-08	1.70e-08
La-142	1.50e-08	1.80e-08
Ce-141	5.50e-10	6.20e-10
Ce-143	2.20e-09	2.50e-09
Ce-144	3.20e-10	3.70e-10
Pr-143	0.00e+00	0.00e+00
Pr-144	2.00e-10	2.30e-10
Nd-147	1.00e-09	1.20e-09
W-187	3.10e-09	3.60e-09
Np-239	9.50e-10	1.10e-09

Conversion factors are in units of mrem/hr per pCi/square meter.

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Site Specific Parameters used.

Parameter No. : 1
Description : fraction of ingested produce grown in region
Formula Symbol : fg
Value : 0.760
Units : none

Parameter No. : 2
Description : fraction of leafy vegetables grown in region
Formula Symbol : fL
Value : 1.000
Units : none

Parameter No. : 4
Description : fraction of activity retained on crops for airborne particulates
Formula Symbol : r
Value : 0.200
Units : none

Parameter No. : 5
Description : fraction of activity retained on crops for airborne radioiodines
Formula Symbol : r
Value : 1.000
Units : none

Parameter No. : 6
Description : building shielding factor for maximum individuals
Formula Symbol : SF
Value : 0.700
Units : none

Parameter No. : 11
Description : period of long term buildup of activity in soil or sediment
Formula Symbol : t
Value : 131400.000
Units : hr

Parameter No. : 12
Description : transport time from animal feed-milk-man max individuals
Formula Symbol : tf
Value : 2.000
Units : days

Parameter No. : 15
Description : time delay for harvest of veg/crops and ingestion by animals - stored feed
Formula Symbol : th
Value : 2160.000
Units : hr

Parameter No. : 16
Description : time delay for harvest of veg/crops and ingestion by man - leafy veg max indivd
Formula Symbol : tL
Value : 24.000
Units : hr

Parameter No. : 17
Description : time delay for harvest of veg/crops and ingestion by man - produce veg max ind
Formula Symbol : th
Value : 1440.000
Units : hr

Parameter No. : 37
Description : agricultural productivity by unit area stored feed feed-animal-man
Formula Symbol : Ys
Value : 2.000
Units : kg/m2

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Paramater No. : 38
Description : agricultural productivity by unit area pasture grass feed-animal-man
Formula Symbol : Yp
Value : 0.700
Units : kg/m2

Paramater No. : 41

Description : time from slaughter of meat animal to consumption
Formula Symbol : tf
Value : 20.000
Units : days

Paramater No. : 43
Description : agricultural productivity by unit area crops/veg-man
Formula Symbol : Yv
Value : 2.000
Units : kg/m2

Paramater No. : 44
Description : rate constant for removal of activity on plants by weathering
Formula Symbol : lambda-w
Value : 2.062938e-3
Units : hr-1

Paramater No. : 69
Description : fraction of year that milk cows are on pasture
Formula Symbol : fp
Value : 1.000
Units : none

Paramater No. : 70
Description : fraction of year that milk goats are on pasture
Formula Symbol : fp
Value : 1.000
Units : none

Paramater No. : 71
Description : fraction of year that beef cows are on pasture
Formula Symbol : fp
Value : 1.000
Units : none

Paramater No. : 73
Description : fraction of milk cow's intake from pasture
Formula Symbol : fs
Value : 1.000
Units : none

Paramater No. : 74
Description : fraction of milk goat's intake from pasture
Formula Symbol : fs
Value : 1.000
Units : none

Paramater No. : 75
Description : fraction of beef cow's intake from pasture
Formula Symbol : fs
Value : 1.000
Units : none

Paramater No. : 88
Description : absolute relative humidity in the atmosphere
Formula Symbol : H
Value : 8.000
Units : g/m3

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

BIOACCUMULATION FACTORS FOR VARIOUS ELEMENTS IN AN AQUATIC ENVIRONMENT

Element	Fresh-water Fish	Fresh-water Inverterbrates	Salt-water Fish	Salt-water Inverterbrates
H	9.00e-1	9.00e-1	9.00e-1	9.30e-1
C	4.60e+3	9.10e+3	1.80e+3	1.40e+3
Na	1.00e+2	2.00e+2	6.70e-2	1.90e-1
P	1.00e+5	2.00e+4	2.90e+4	3.00e+4
Cr	2.00e+2	2.00e+3	4.00e+2	2.00e+3
Mn	4.00e+2	9.00e+4	5.50e+2	4.00e+2
Fe	1.00e+2	3.20e+3	3.00e+3	2.00e+4
Co	5.00e+1	2.00e+2	1.00e+2	1.00e+3
Ni	1.00e+2	1.00e+2	1.00e+2	2.50e+2
Cu	5.00e+1	4.00e+2	6.70e+2	1.70e+3
Zn	2.00e+3	1.00e+4	2.00e+3	5.00e+4
Br	4.20e+2	3.30e+2	1.50e-2	3.10e+0
Rb	2.00e+3	1.00e+3	8.30e+0	1.70e+1
Sr	3.00e+1	1.00e+2	2.00e+0	2.00e+1
Y	2.50e+1	1.00e+3	2.50e+1	1.00e+3
Zr	3.30e+0	6.70e+0	2.00e+2	8.00e+1
Nb	3.00e+2	1.00e+2	3.00e+2	1.00e+2
Mo	1.00e+1	1.00e+1	1.00e+1	1.00e+1
Tc	1.50e+1	5.00e+0	1.00e+1	5.00e+1
Ru	1.00e+1	3.00e+2	3.00e+0	1.00e+3
Ag	2.00e+0	8.00e+2	3.00e+3	3.00e+3
Te	4.00e+2	6.10e+3	1.00e+1	1.00e+2
I	1.50e+1	5.00e+0	1.00e+1	5.00e+1
Cs	2.00e+3	1.00e+3	4.00e+1	2.50e+1
Ba	4.00e+0	2.00e+2	1.00e+1	1.00e+2
La	2.50e+1	1.00e+3	2.50e+1	1.00e+3
Ce	1.00e+0	1.00e+3	1.00e+1	6.00e+2
Pr	2.50e+1	1.00e+3	2.50e+1	1.00e+3
Nd	2.50e+1	1.00e+3	2.50e+1	1.00e+3
W	1.20e+3	1.00e+1	3.00e+1	3.00e+1
Np	1.00e+1	4.00e+2	1.00e+1	1.00e+1

Data obtained from Regulatory Guide 1.109 Table A-1 for all elements except Silver(Ag) which is from "Models and Parameters for Environmental Radiological Assessments" (DOE/TIC-11468) and Niobium(Nb) which is from the International Atomic Energy Agency(IAEA) Safety Series No. 57, Generic Models and Parameters for Assessing the Environmental Transfer of Radionuclides from Routine Releases, Exposures of Critical Groups.

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Radionuclide Parameters used.
Waterford Steam Electric Station

Nuclide	Parameters	
	Half-life	Decay constant
H-3	1.2280e+01 years	1.7899e-09 1/seconds
C-14	5.7300e+03 years	3.8359e-12 1/seconds
Na-24	1.5000e+01 hours	1.2836e-05 1/seconds
P-32	1.4290e+01 days	5.6141e-07 1/seconds
Cr-51	2.7704e+01 days	2.8958e-07 1/seconds
Mn-54	3.1270e+02 days	2.5656e-08 1/seconds
Mn-56	2.5758e+00 hours	7.4750e-05 1/seconds
Fe-55	2.7000e+00 years	8.1406e-09 1/seconds
Fe-59	4.4630e+01 days	1.7976e-07 1/seconds
Co-58	7.0800e+01 days	1.1331e-07 1/seconds
Co-60	5.2710e+00 years	4.1699e-09 1/seconds
Ni-63	1.0010e+02 years	2.1958e-10 1/seconds
Ni-65	2.5200e+00 hours	7.6405e-05 1/seconds
Cu-64	1.2701e+01 hours	1.5160e-05 1/seconds
Zn-65	2.4440e+02 days	3.2825e-08 1/seconds
Zn-69	5.5600e+01 minutes	2.0778e-04 1/seconds
Br-83	2.3900e+00 hours	8.0561e-05 1/seconds
Br-84	3.1800e+01 minutes	3.6328e-04 1/seconds
Br-85	1.7200e+02 seconds	4.0299e-03 1/seconds
Rb-86	1.8660e+01 days	4.2993e-07 1/seconds
Rb-88	1.7800e+01 minutes	6.4901e-04 1/seconds
Rb-89	1.5440e+01 minutes	7.4822e-04 1/seconds
Sr-89	5.0550e+01 days	1.5870e-07 1/seconds
Sr-90	2.8600e+01 years	7.6852e-10 1/seconds
Sr-91	9.5000e+00 hours	2.0267e-05 1/seconds
Sr-92	2.7100e+00 hours	7.1048e-05 1/seconds
Y-90	6.4100e+01 hours	3.0038e-06 1/seconds
Y-91	5.8510e+01 days	1.3711e-07 1/seconds
Y-91m	4.9710e+01 minutes	2.3240e-04 1/seconds
Y-92	3.5400e+00 hours	5.4390e-05 1/seconds

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Radionuclide Parameters used.
Waterford Steam Electric Station

Nuclide	Parameters	
	Half-life	Decay constant
Y-93	1.0100e+01 hours	1.9063e-05 1/seconds
Zr-95	6.4020e+01 days	1.2531e-07 1/seconds
Zr-97	1.6900e+01 hours	1.1393e-05 1/seconds
Nb-95	3.5060e+01 days	2.2882e-07 1/seconds
Mo-99	6.6020e+01 hours	2.9164e-06 1/seconds
Tc-101	1.4200e+01 minutes	8.1355e-04 1/seconds
Tc-99m	6.0200e+00 hours	3.1984e-05 1/seconds
Ru-103	3.9350e+01 days	2.0388e-07 1/seconds
Ru-105	4.4400e+00 hours	4.3365e-05 1/seconds
Ru-106	3.6820e+02 days	2.1789e-08 1/seconds
Ag-110m	2.4985e+02 days	3.2109e-08 1/seconds
Te-125m	5.8000e+01 days	1.3832e-07 1/seconds
Te-127	9.3500e+00 hours	2.0593e-05 1/seconds
Te-127m	1.0900e+02 days	7.3601e-08 1/seconds
Te-129	6.9600e+01 minutes	1.6598e-04 1/seconds
Te-129m	3.3600e+01 days	2.3877e-07 1/seconds
Te-131	2.5000e+01 minutes	4.6210e-04 1/seconds
Te-131m	3.0000e+01 hours	6.4180e-06 1/seconds
Te-132	7.8200e+01 hours	2.4622e-06 1/seconds
I-130	1.2360e+01 hours	1.5578e-05 1/seconds
I-131	8.0400e+00 days	9.9783e-07 1/seconds
I-132	2.3000e+00 hours	8.3713e-05 1/seconds
I-133	2.0800e+01 hours	9.2568e-06 1/seconds
I-134	5.2600e+01 minutes	2.1963e-04 1/seconds
I-135	6.6100e+00 hours	2.9129e-05 1/seconds
Cs-134	2.0620e+00 years	1.0659e-08 1/seconds
Cs-136	1.3160e+01 days	6.0962e-07 1/seconds
Cs-137	3.0170e+01 years	7.2852e-10 1/seconds
Cs-138	3.2200e+01 minutes	3.5877e-04 1/seconds
Ba-139	8.3100e+01 minutes	1.3902e-04 1/seconds

SPECIFIC FACTORS USED TO DETERMINE A_i, P_i and R_i VALUES FOR THE OFFSITE DOSE CALCULATION MANUAL

Radionuclide Parameters used.
Waterford Steam Electric Station

Nuclide	Parameters	
	Half-life	Decay constant
Ba-140	1.2789e+01 days	6.2730e-07 1/seconds
Ba-141	1.8270e+01 minutes	6.3232e-04 1/seconds
Ba-142	1.0700e+01 minutes	1.0797e-03 1/seconds
La-140	4.0220e+01 hours	4.7872e-06 1/seconds
La-142	9.5400e+01 minutes	1.2109e-04 1/seconds
Ce-141	3.2500e+01 days	2.4685e-07 1/seconds
Ce-143	3.3000e+01 hours	5.8346e-06 1/seconds
Ce-144	2.8430e+02 days	2.8219e-08 1/seconds
Pr-143	1.3560e+01 days	5.9163e-07 1/seconds
Pr-144	1.7280e+01 minutes	6.6854e-04 1/seconds
Nd-147	1.0980e+01 days	7.3065e-07 1/seconds
W-187	2.3830e+01 hours	8.0798e-06 1/seconds
Np-239	2.3550e+00 days	3.4066e-06 1/seconds