Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc.
James A. FitzPatrick NPP
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315-342-3840

William C Drews
Regulatory Assurance Manager - JAF

JAFP-16-0070
April 28, 2016

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

SUBJECT: 2015 Annual Radioactive Effluent Release Report
James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-59

Dear Sir or Madam:

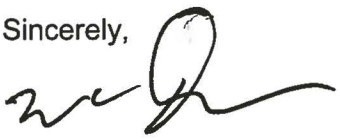
This letter transmits the James A. FitzPatrick Nuclear Power Plant's (JAF) Annual Radioactive Effluent Release Report, for the period of January 1, 2015 through December 31, 2015. The enclosure is submitted in accordance with the reporting requirements of Technical Specification Section 5.6.3 and Technical Requirements Manual Appendix H Offsite Dose Calculation Manual (ODCM) Part 1 Section 6.2 Radioactive Effluent Release Report.

This Report (Enclosure) includes, as an Addendum, an Assessment of the Radiation Doses to the Public due to the radioactive liquid and gaseous effluents released during the 2015 calendar year. The format used for the effluent data is outlined in Appendix B of Regulatory Guide 1.21 Revision 1.

There are no new regulatory commitments contained in this letter.

If you have any questions concerning the enclosed report, please contact Mr. Michael Ponzo, Chemistry Manager, at (315)349-6168.

Sincerely,



William C. Drews
Regulatory Assurance Manager - JAF

WCD/MP/dc

Enclosure: 2015 Annual Radioactive Effluent Release Report

cc: next page

cc:

USNRC Regional Administrator, Region I
USNRC Resident Inspector
USNRC NRR Project Manager
M. Ponzo (CHEM/JAF)
B. Landers (CHEM/JAF)
K. Stoffle (NMP)

JAFP-16-0070

Enclosure

2015 Annual Radioactive Effluent Release Report

(37 Pages)

ENTERGY NUCLEAR OPERATIONS, INC.

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY 1, 2015 - DECEMBER 31, 2015

DOCKET NO. 50-333

LICENSE NO. DPR-59

ENTERGY NUCLEAR OPERATIONS, INC.
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2015 - DECEMBER 2015

SUPPLEMENTAL INFORMATION

FACILITY: JAFNPP LICENSEE: ENTERGY NUCLEAR OPERATIONS, INC.

1. Offsite Dose Calculation Manual Part 1 Radiological Effluent Controls

a. Fission and Activation Gases:

(1) The dose rate at or beyond the site boundary due to radioactive materials released from the plant in gaseous effluent shall be limited as follows:

(a) Less than or equal to 500 mrem/year to the whole body and less than or equal to 3000 mrem/year to the skin from noble gases.

(2) The air dose to areas at or beyond the site boundary from noble gases released from the plant in gaseous effluent shall be limited:

(a) During any calendar quarter, to less than or equal to 5 mrad from gamma radiation, and less than or equal to 10 mrad from beta radiation; and,

(b) During any calendar year, to less than or equal to 10 mrad from gamma radiation and less than or equal to 20 mrad from beta radiation.

b. Tritium, Iodines and Particulates, Half Lives > 8 days:

(1) The dose to a member of the public at or beyond the site boundary from Iodine-131, Iodine-133, Tritium, and radionuclides in particulate form with half-lives greater than 8 days released from the plant in gaseous effluent shall be limited:

(a) During any calendar quarter to less than or equal to 7.5 mrem to any organ; and,

(b) During any calendar year to less than or equal to 15 mrem to any organ.

(c) Less than 0.1% of the limits of Specification 3.4.1.c.1.a and 3.4.1.c.1.b as a result of burning contaminated oil.

(2) The dose rate at or beyond the site boundary due to radioactive materials released from the plant in gaseous effluents shall be limited as follows:

(a) Less than or equal to 1500 mrem/year to any organ from Iodine-131, Iodine-133, Tritium and for radioactive materials in particulate form with half-lives greater than 8 days (inhalation pathway only).

SUPPLEMENTAL INFORMATION (continued)

c. Liquid Effluents:

(1) The concentration of radioactive materials released to the unrestricted areas shall not exceed ten times the values specified in 10 CFR 20.1001-20.2402, Appendix B, Table 2, column 2. For dissolved or entrained noble gases the concentration shall be limited to 2.00E-04 μCi/ml.

(2) The dose to a member of the public from radioactive materials released from the plant in liquid effluents to unrestricted areas shall be limited as follows:

(a) During any calendar quarter, limited to less than or equal to 1.5 mrem to the whole body and to less than or equal to 5 mrem to any organ; and,

(b) During any calendar year, limited to less than or equal to 3 mrem to the whole body and to less than or equal to 10 mrem to any organ.

2. 10X Effluent Concentrations

a. Fission and activation gases: (None specified)

b. Iodines: (None specified)

c. Particulates, half-lives >8 days: (None specified)

d. Liquid effluents:	Quarter 1	Quarter 2	Quarter 3	Quarter 4
(1) Fission and activation products (mixture EC) (μCi/ml)	None	None	None	None
(2) Tritium (μCi/ml)	1.00E-02	1.00E-02	1.00E-02	1.00E-02
(3) Dissolved and entrained gases (μCi/ml)	2.00E-04	2.00E-04	2.00E-04	2.00E-04

SUPPLEMENTAL INFORMATION (continued)

3. Average Energy (None specified)

4. Measurements and Approximations of Total Radioactivity

a. Fission and Activation Gases: Continuous monitor on each release path calibrated to a marinelli grab sample analyzed by gamma spectroscopy; bubbler grab sample analyzed for Tritium.

b. Iodines: Gamma spectral analysis of charcoal cartridge and particulate filter on each release path.

c. Particulates: Gamma spectral analysis of each particulate filter and charcoal cartridge for each release path. A four week per quarter composite of particulate filters for each release path for Strontium-89 and Strontium-90. One week per month particulate filter for each release path for gross alpha.

d. Liquid Effluents: Gamma spectral analysis of each batch discharged, except composite analysis for Strontium-89, Strontium-90, Iron-55, Tritium, and Alpha.

e. Solid Waste: Gamma spectral analysis of a representative sample of each waste shipment. Scaling factors established from off-site composite sample analyses to estimate concentration of non-gamma emitters. Low activity trash shipments curie content is estimated by dose rate measurement and application of appropriate scaling factors.

f. Error Estimation Method: Overall error for sampling and analysis estimated by combining individual errors using error propagation methods. This process is composed of determinate and undeterminate errors.

Determinate - Pump flowrates, volume measurements and analysis collection yields
Undeterminate - Random counting error estimated using accepted statistical calculations

SUPPLEMENTAL INFORMATION (continued)

5. Batch Releases

a. Liquid: Canal

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
(1) Number of batch releases:	4.00E+00	9.00E+00	5.00E+00	8.00E+00
(2) Total time period for batch release: (min)	4.80E+01	2.45E+02	1.88E+02	1.78E+02
(3) Maximum time period for batch release: (min)	3.40E+01	7.20E+01	9.00E+01	5.80E+01
(4) Average time period for batch release: (min)	1.20E+01	2.72E+01	3.76E+01	2.22E+01
(5) Minimum time period for batch release: (min)	1.00E+00	3.00E+00	2.00E+00	2.00E+00
(6) Total Activity Released (Ci)	1.31E-04	8.27E-04	1.85E-04	2.07E-04
(7) Total Volume Released (liters)	4.13E+03	5.85E+04	8.24E+03	2.75E+04

b. Liquid: Non-Canal

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
(1) Number of batch releases:	6.00E+00	1.10E+01	1.60E+01	2.00E+01
(2) Total time period for batch release: (min)	2.55E+02	6.73E+02	2.96E+02	6.10E+01
(3) Maximum time period for batch release: (min)	2.47E+02	3.89E+02	3.70E+01	7.00E+00
(4) Average time period for batch release: (min)	4.25E+01	6.12E+01	1.85E+01	3.15E+00
(5) Minimum time period for batch release: (min)	1.00E+00	1.00E+00	1.00E+00	1.00E+00
(6) Total Activity Released (Ci)	5.89E-03	7.48E-04	5.09E-04	4.69E-05
(7) Total Volume Released (liters)	9.58E+04	2.28E+05	1.12E+05	2.34E+04

c. Gaseous

There were no gaseous batch releases for this report period.

SUPPLEMENTAL INFORMATION (continued)

6. Continuous Releases

a. Liquid: Non-Canal	Quarter 1	Quarter 2	Quarter 3	Quarter 4
(1) Number of releases:	1.20E+01	1.40E+01	1.40E+01	1.30E+01
(2) Total Activity Released (Ci)	4.57E-03	6.76E-03	8.37E-03	8.59E-03
(3) Total Volume Released (liters)	3.16E+06	4.61E+06	4.31E+06	5.92E+06

b. Liquid: Canal	Quarter 1	Quarter 2	Quarter 3	Quarter 4
(1) Number of releases:	0	0	0	0
(2) Total Activity Released (Ci)	N/A	N/A	N/A	N/A

ENTERGY NUCLEAR OPERATIONS, INC.
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2015 - DECEMBER 2015

TABLE 1A
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	UNIT	QTR 1	QTR 2	QTR 3	QTR 4	EST TOTAL ERROR %
A. FISSION AND ACTIVATION GASES						
1. Total Release	Ci	9.07E+00	2.25E+01	1.07E+01	6.14E+00	≤2.50E+01
2. Average release rate for period	µCi/sec	1.17E+00	2.86E+00	1.34E+00	7.73E-01	
3. Percentage ODCM Limit	%	*	*	*	*	
B. IODINE-131						
1. Total Iodine-131	Ci	5.41E-05	3.50E-05	1.52E-04	1.82E-04	≤2.50E+01
2. Average release rate for period	µCi/sec	6.96E-06	4.45E-06	1.91E-05	2.28E-05	
3. Percentage ODCM Limit	%	*	*	*	*	
C. PARTICULATES						
1. Particulates with half-lives >8 days	Ci	4.64E-05	1.15E-06	7.94E-06	5.37E-06	≤3.60E+01
2. Average release rate for period	µCi/sec	5.96E-06	1.47E-07	9.99E-07	6.75E-07	
3. Percentage ODCM Limit	%	*	*	*	*	
4. Gross alpha radioactivity	Ci	3.94E-07	1.84E-07	3.52E-07	3.31E-07	≤2.50E+01
D. TRITIUM						
1. Total Release	Ci	3.28E+00	3.69E+00	4.52E+00	3.77E+00	≤2.50E+01
2. Average release rate for period	µCi/sec	4.22E-01	4.70E-01	5.69E-01	4.74E-01	
3. Percentage ODCM Limit	%	*	*	*	*	
E. CARBON-14 (See attachment 8)						

***F. PERCENT OF APPLICABLE ODCM LIMITS**					
FISSION AND ACTIVATION GASES	**UNIT**	**QTR 1**	**QTR 2**	**QTR 3**	**QTR 4**
1. Quarterly gamma air dose limit	%	5.32E-03	1.29E-02	6.03E-03	3.21E-03
2. Quarterly beta air dose limit	%	2.69E-04	5.86E-04	3.00E-04	1.71E-04
3. Yearly gamma air dose limit	%	2.66E-03	6.46E-03	3.02E-03	1.61E-03
4. Yearly beta air dose limit	%	1.34E-04	2.93E-04	1.50E-04	8.56E-05
5. Whole body dose rate limit	%	4.32E-03	2.70E-03	2.86E-03	1.22E-03
6. Skin dose rate limit	%	1.37E-03	7.86E-04	8.65E-04	4.23E-04
HALOGENS, TRITIUM AND PARTICULATES WITH HALF-LIVES >8 DAYS					
7. Quarterly dose limit (organ)	%	1.18E-02	8.23E-03	2.96E-02	3.49E-02
8. Yearly dose limit (organ)	%	5.89E-03	4.11E-03	1.48E-02	1.75E-02
9. Organ dose rate limit	%	2.04E-05	1.15E-05	3.03E-05	2.11E-05

ENTERGY NUCLEAR OPERATIONS, INC.
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2015 - DECEMBER 2015

TABLE 1B
GASEOUS EFFLUENTS - ELEVATED RELEASE

CONTINUOUS MODE

NUCLIDES RELEASED

1. Fission Gases	UNIT	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
Argon-41	Ci	6.65E+00	1.15E+01	5.61E+00	3.29E+00
Krypton-85	Ci	ND	ND	ND	ND
Krypton-85m	Ci	1.40E+00	3.16E+00	1.40E+00	8.11E-01
Krypton-87	Ci	ND	ND	ND	ND
Krypton-88	Ci	5.98E-01	4.02E+00	1.24E+00	2.98E-01
Xenon-133	Ci	3.49E-01	3.32E+00	1.25E+00	7.67E-01
Xenon-133m	Ci	ND	ND	ND	ND
Xenon-135	Ci	ND	ND	2.19E-02	ND
Xenon-135m	Ci	ND	ND	1.82E-01	1.89E-01
Xenon-137	Ci	ND	ND	ND	ND
Xenon-138	Ci	ND	4.31E-01	9.38E-01	7.69E-01
TOTAL	Ci	9.00E+00	2.24E+01	1.06E+01	6.12E+00
2. Iodines					
Iodine-131	Ci	3.05E-06	4.07E-06	1.75E-05	1.77E-05
Iodine-132	Ci	ND	ND	ND	ND
Iodine-133	Ci	2.68E-05	2.47E-05	7.34E-05	6.30E-05
Iodine-135	Ci	ND	ND	ND	ND
TOTAL	Ci	2.98E-05	2.88E-05	9.09E-05	8.07E-05
3. Particulates					
Cobalt-60	Ci	ND	ND	ND	ND
Cesium-137	Ci	ND	ND	ND	ND
Manganese-54	Ci	ND	ND	ND	ND
Strontium-89	Ci	3.80E-07	1.15E-06	2.61E-06	3.47E-06
Zinc-65	Ci	ND	ND	ND	ND
TOTAL	Ci	3.80E-07	1.15E-06	2.61E-06	3.47E-06
4. Tritium					
Hydrogen-3	Ci	2.39E-01	2.25E-01	4.06E-01	3.41E-01

Note: There were no batch releases for this report period.

ENTERGY NUCLEAR OPERATIONS, INC.
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2015 - DECEMBER 2015

TABLE 1C
GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

CONTINUOUS MODE

NUCLIDES RELEASED

1. Fission Gases	UNIT	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
Argon-41	Ci	ND	ND	ND	ND
Krypton-85	Ci	ND	ND	ND	ND
Krypton-85m	Ci	ND	ND	ND	ND
Krypton-87	Ci	ND	ND	ND	ND
Krypton-88	Ci	ND	ND	ND	ND
Xenon-133	Ci	2.04E-02	8.66E-03	9.72E-03	9.63E-03
Xenon-133m	Ci	ND	ND	ND	ND
Xenon-135	Ci	4.44E-02	3.71E-02	2.73E-02	1.02E-02
Xenon-135m	Ci	1.17E-02	1.51E-02	1.68E-02	2.21E-03
Xenon-137	Ci	ND	ND	ND	ND
Xenon-138	Ci	ND	ND	ND	ND
TOTAL	Ci	7.65E-02	6.09E-02	5.39E-02	2.21E-02
2. Iodines					
Iodine-131	Ci	5.11E-05	3.09E-05	1.34E-04	1.64E-04
Iodine-132	Ci	ND	ND	1.19E-04	ND
Iodine-133	Ci	4.48E-04	3.13E-04	1.03E-03	1.23E-03
Iodine-135	Ci	ND	ND	3.89E-04	ND
TOTAL	Ci	4.99E-04	3.44E-04	1.67E-03	1.39E-03
3. Particulates					
Silver-110M	Ci	ND	ND	ND	ND
Cobalt-58	Ci	ND	ND	ND	ND
Cobalt-60	Ci	ND	ND	1.59E-06	1.90E-06
Manganese-54	Ci	ND	ND	2.02E-06	ND
Selenium-75	Ci	ND	ND	ND	ND
Strontium-89	Ci	4.38E-05	ND	ND	ND
Zinc-65	Ci	2.13E-06	ND	1.72E-06	ND
TOTAL	Ci	4.60E-05	ND	5.33E-06	1.90E-06
4. Tritium					
Hydrogen-3	Ci	3.04E+00	3.47E+00	4.11E+00	3.43E+00

Note: There were no batch releases for this report period.

ENTERGY NUCLEAR OPERATIONS, INC.
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
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TABLE 2A
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	UNIT	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)	Ci	ND	ND	ND	ND	NA
2. Average diluted concentration during period	μCi/ml	ND	ND	ND	ND	
3. Percentage ODCM Limit	%	NA	NA	NA	NA	
B. TRITIUM						
1. Total Release	Ci	1.06E-02	8.33E-03	9.06E-03	8.84E-03	≤2.50E+01
2. Average diluted concentration during period (Note 1)	μCi/ml	3.20E-06	1.53E-06	2.01E-06	1.45E-06	
3. Percentage ODCM Limit	%	*	*	*	*	
C. DISSOLVED AND ENTRAINED GASES						
1. Total Release	Ci	ND	ND	ND	ND	NA
2. Average diluted concentration during period	μCi/ml	ND	ND	ND	ND	
3. Percentage ODCM Limit	%	NA	NA	NA	NA	
D. GROSS ALPHA RADIOACTIVITY						
1. Total Release	Ci	ND	ND	ND	2.39E-07	≤4.20E+01
E. VOLUME OF WASTE RELEASED (PRIOR TO DILUTION)	liters	3.26E+06	4.89E+06	4.43E+06	5.97E+06	
F. VOLUME OF DILUTION WATER USED DURING PERIOD	liters	7.07E+07	3.79E+08	3.04E+08	2.87E+08	
***G. PERCENT OF APPLICABLE ODCM LIMITS**						
1. Quarterly Whole Body Dose	%	9.11E-04	3.48E-04	5.69E-04	3.25E-04	
2. Quarterly Organ Dose	%	2.73E-04	1.04E-04	1.71E-04	9.74E-05	
3. Annual Whole Body Dose	%	4.55E-04	1.74E-04	2.85E-04	1.62E-04	
4. Annual Organ Dose	%	1.37E-04	5.22E-05	8.54E-05	4.87E-05	

Note 1: Concentration includes summation from diluted and undiluted values from Canal and Non-Canal releases (Table 2B).

TABLE 2B
LIQUID EFFLUENTS CANAL

BATCH MODE

NUCLIDES RELEASED	UNIT	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
1. Fission and Activation Products					
ND	Ci	ND	ND	ND	ND
2. Tritium					
Hydrogen-3	Ci	1.31E-04	8.27E-04	1.85E-04	2.07E-04
3. Dissolved and Entrained Gases					
ND	Ci	ND	ND	ND	ND

TABLE 2B
LIQUID EFFLUENTS CANAL

CONTINUOUS MODE

NUCLIDES RELEASED	UNIT	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
1. Fission and Activation Products					
ND	Ci	ND	ND	ND	ND
2. Tritium					
Hydrogen-3	Ci	ND	ND	ND	ND
3. Dissolved and Entrained Gases					
ND	Ci	ND	ND	ND	ND

TABLE 2B (SUPPLEMENT)
LIQUID EFFLUENTS NON-CANAL

CONTINUOUS MODE

NUCLIDES RELEASED	UNIT	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
1. Fission and Activation Products					
ND	Ci	ND	ND	ND	ND
2. Tritium					
Hydrogen-3	Ci	4.57E-03	6.76E-03	8.37E-03	8.59E-03
3. Dissolved and Entrained Gases					
ND	Ci	ND	ND	ND	ND

TABLE 2B (SUPPLEMENT)
LIQUID EFFLUENTS NON-CANAL

BATCH MODE

NUCLIDES RELEASED	UNIT	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
1. Fission and Activation Products					
ND	Ci	ND	ND	ND	ND
2. Tritium					
Hydrogen-3	Ci	5.89E-03	7.48E-04	5.09E-04	4.69E-05
3. Dissolved and Entrained Gases					
ND	Ci	ND	ND	ND	ND

TABLE 2B (continued)
ABNORMAL RELEASE
LIQUID EFFLUENTS CANAL

CONTINUOUS MODE

NUCLIDES RELEASED	UNIT	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
1. Fission and Activation Products					
ND	Ci	ND	ND	ND	ND
2. Tritium					
ND	Ci	ND	ND	ND	ND
3. Dissolved and Entrained Gases					
ND	Ci	ND	ND	ND	ND

ENTERGY NUCLEAR OPERATIONS, INC.
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
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TABLE 3A
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)

1. Type of Waste	UNIT	CLASS A	CLASS B	CLASS C	EST. TOTAL ERROR %
a. Spent resins, filter sludges,	m^3	6.51E+01	0.00E+00	0.00E+00	
evaporator bottoms, etc.	Ci	6.05E+01	0.00E+00	0.00E+00	1.00E+01
b. Dry compressible waste,	m^3	3.62E+02	0.00E+00	0.00E+00	
contaminated equipment, etc.	Ci	1.16E+00	0.00E+00	0.00E+00	1.00E+01
c. Irradiated components,	m^3	4.96E+00	0.00E+00	3.58E-01	
control rods, etc.	Ci	2.28E-01	0.00E+00	2.86E+04	1.00E+01
d. Other: Dry compressible	m^3	7.14E+00	0.00E+00	0.00E+00	
waste, contaminated equipment,	Ci	3.25E-02	0.00E+00	0.00E+00	1.00E+01
spent resins for volume reduction.					

2. Estimate of Major Nuclide Composition (by type of waste)

a. Spent resins, filter sludges, evaporator bottoms, etc.

Isotope	Percent	Curies		Isotope	Percent	Curies	
Ce-144	9.00E-02	5.16E-02	E	Co-58	7.00E-02	4.33E-02	E
Co-60	3.67E+01	2.23E+01	E	Fe-59	1.00E-02	3.89E-03	E
Cs-137	5.20E-01	3.16E-01	E	Fe-55	1.41E+01	8.53E+00	E
C-14	2.10E-01	1.28E-01	E	Mn-54	2.02E+01	1.22E+01	E
Ni-63	7.10E-01	4.28E-01	E	Tc-99	4.00E-02	2.18E-02	E
Zn-65	2.71E+01	1.64E+01	E	H-3	2.00E-01	1.19E-01	E
Sb-125	1.50E-01	9.23E-02	E				

(E- Estimated M- Measured)

b. Dry compressible waste, contaminated equipment, etc.

Isotope	Percent	Curies		Isotope	Percent	Curies	
Ce-144	1.00E-02	2.88E-04	E	Co-58	2.00E-02	1.18E-03	E
Co-60	2.62E+00	1.45E-01	E	Fe-59	6.00E-02	3.21E-03	E
Cs-137	3.10E-01	1.71E-02	E	Fe-55	1.36E+01	7.52E-01	E
C-14	2.76E+01	1.53E+00	E	Mn-54	1.15E+00	6.34E-02	E
Ni-63	6.10E-01	3.37E-02	E	I-129	7.90E-01	4.37E-02	E
Zn-65	2.03E+00	1.12E-01	E	H-3	4.11E+01	2.27E+00	E
Sb-124	1.00E-02	7.92E-04	E	Tc-99	1.01E+01	5.59E-01	E
Sb-125	1.00E-02	5.53E-04	E	Cr-51	5.00E-02	3.04E-03	E

(E- Estimated M- Measured)

TABLE 3A (continued)
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

c. Irradiated components, control rods, etc.

Isotope	Percent	Curies		Isotope	Percent	Curies	
C-14	1.00E-02	1.76E+00	E	Co-58	5.00E-02	1.43E+01	E
Co-60	6.01E+01	1.72E+04	E	Zn-65	2.00E-02	5.74E+00	E
Ni-59	7.00E-02	1.96E+01	E	Fe-55	3.47E+01	9.92E+03	E
Ni-63	4.19E+00	1.20E+03	E	Mn-54	8.60E-01	2.46E+02	E

(E- Estimated M- Measured)

d. Other: Dry compressible waste, contaminated equipment, spent resins contaminated oil, glycol and water for volume reduction.

Isotope	Percent	Curies		Isotope	Percent	Curies	
H-3	9.98E+01	3.25E-02	E	Cs-137	4.00E-02	1.25E-05	E
Fe-55	1.00E-01	3.33E-05	E	Co-60	1.00E-02	2.77E-06	E

(E- Estimated M- Measured)

Percentage of nuclides and total activities are based on a combination of direct measurements and scaling for non-gamma emitting nuclides.

TABLE 3A (continued)
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

3. Solid Waste Disposition

No. of Shipments	Mode of Transportation	Destination
19	Trucks	*Energy Solutions Oak Ridge, TN
3	Trucks	*Energy Solutions Kingston, TN
2	Trucks	*Energy Solutions Oak Ridge, TN
3	Trucks	Waste Control Specialists, LLC Andrews, TX
1	Truck	*Energy Solutions Oak Ridge, TN
1	Truck	*Energy Solutions Oak Ridge, TN

* Volume Reduction Facility

B. IRRADIATED FUEL SHIPMENTS (Disposition)

No. of Shipments	Mode of Transportation	Destination
None	----------	----------

TABLE 3B
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. NRC CLASS A

SOURCE OF WASTE	PROCESSING EMPLOYED	CONTAINER VOLUME	TYPE OF CONTAINER	NUMBER OF CONTAINERS
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	1280 ft^3(36.2 m^3)	STC	9
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	96 ft^3(2.72 m^3)	STC	12
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	1033 ft^3(29.3 m^3)	STC	4
Spent Resins, Filter Sludges, evaporator Bottoms, etc.	Air Drying Non-compacted	205.8 ft^3(5.83 m^3)	HIC	14
Spent Resins, Filter Sludges, evaporator Bottoms, etc.	Air Drying Non-compacted	120.3 ft^3(3.41 m^3)	HIC	2
Contaminated Oil/Water.	Non-compacted	1280 ft^3(36.2 m^3)	STC	1

B. NRC CLASS B

SOURCE OF WASTE	PROCESSING EMPLOYED	CONTAINER VOLUME	TYPE OF CONTAINER	NUMBER OF CONTAINERS
None				

C. NRC CLASS C

SOURCE OF WASTE	PROCESSING EMPLOYED	CONTAINER VOLUME	TYPE OF CONTAINER	NUMBER OF CONTAINERS
Irradiated Hardware	Non-compacted	58 ft^3(1.64 m^3)	HIC	3

HIC- High Integrity Container
STC- Strong Tight Container

ATTACHMENT NO. 1

CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM)

In accordance with the James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1 Radiological Effluent Controls (REC) Section 6.2.3, changes made to the Offsite Dose Calculation Manual (ODCM) during the reporting period shall be included in the Annual Radioactive Effluent Release Report.

There were no changes made to the ODCM during this reporting period.

ATTACHMENT NO. 2

SUMMARY OF CHANGES TO THE PROCESS CONTROL PROGRAM

In accordance with the James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1 Radiological Effluent Controls (REC) Section 6.2.3, changes made to the Process Control Program (PCP) during the reporting period shall be included in the Annual Radioactive Effluent Release Report.

EN-RW-105 Process Control Program Revision 5 became Headquarters effective 8/27/15. There were no changes to the James A. FitzPatrick Process Control Program (PCP) as a result of Revision 5. EN-RW-105 Process Control Program Revision 5 incorporates a temporary change for an Entergy Site.

ATTACHMENT NO. 3

SUMMARY OF CHANGES TO THE ENVIRONMENTAL MONITORING AND DOSE CALCULATION LOCATIONS

In accordance with the James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1, Radiological Effluent Controls (REC) Section 6.2.3 a listing of new locations for dose calculation and/or environmental monitoring identified by the land use census shall be included in the Annual Radioactive Effluent Release Report.

During the reporting period, no changes in Dose Calculation Receptor Locations and/or the Environmental Monitoring were required based on the results of the land use census.

There was one new milk location identified in the land use census, consisting of 20 milking cows and 15 heifers. The location is at address 6729 State Route 3 in the town of Richland. This location is outside the five-mile radius of the plant.

ATTACHMENT NO. 4

DEVIATIONS FROM THE REQUIRED ENVIRONMENTAL SAMPLING SCHEDULE

In accordance with the James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1, Radiological Effluent Controls (REC) Section 6.2.7, the cause for the unavailability of any environmental samples required during the report period shall be included in the Annual Radioactive Effluent Release Report.

The following reports samples that were a deviation from the requirements of ODCM Part 1, Table 5.1-1. ODCM Part Section 5.1.1.c.1 allows for deviations from the program due to hazardous conditions, seasonal unavailability, theft, uncooperative residents, or to a malfunction of automatic sampling equipment.

A. <u>ODCM Program Deviations</u>

The following are deviations from the program specified by the ODCM:

01/10/2015 – 01/14/2015 Air Station R-5 Offsite sample pump was inoperable for approximately 108 hours. Out of service time was determined based upon sample pump run time integrator. The inoperability was due to loss of power to the sample station. No corrective actions were required to restore power to the air station.

03/02/2015 – 03/10/2015 Air Station R-1 Offsite sample pump was inoperable for approximately 4 hours. Out of service time was determined based upon sample pump run time integrator. The inoperability was due to loss of power to the sample station. No corrective actions were required to restore power to the air station.

03/02/2015 – 03/10/2015 Air Station R-2 Offsite sample pump was inoperable for approximately 4 hours. Out of service time was determined based upon sample pump run time integrator. The inoperability was due to loss of power to the sample station. No corrective actions were required to restore power to the air station.

10/27/2015 – 11/03/2015 Air Station R-2 Offsite sample pump was inoperable for approximately 10 hours. Out of service time was determined based upon sample pump run time integrator. The inoperability was due to loss of power to the sample station. No corrective actions were required to restore power to the air station.

10/27/2015 – 11/03/2015 Air Station R-3 Offsite sample pump was inoperable for approximately 2 hours. Out of service time was determined based upon sample pump run time integrator. The inoperability was due to loss of power to the sample station. No corrective actions were required to restore power to the air station.

10/27/2015 – 11/03/2015 Air Station R-4 Offsite sample pump was inoperable for approximately 2 hours. Out of service time was determined based upon sample pump run time integrator. The inoperability was due to loss of power to the sample station. No corrective actions were required to restore power to the air station.

B. Air Sampling Station Operability Assessment

The ODCM required air sampling program consists of 5 individual sampling locations. The collective operable time period for the air monitoring stations was 43,670 hours out of a possible 43,800 hours. The air sampling availability factor for the report period was 99.7%. Air sampling equipment found inoperable was returned to service. Identification of locations for obtaining replacement samples was not required.

ATTACHMENT NO. 5

ANNUAL SUMMARY OF HOURLY METEOROLOGICAL DATA

The James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1, Radiological Effluent Controls (REC) Section 6.2 and 6.2.2 states in part: The Annual Radioactive Effluent Release Report submitted prior to May 1 of each year may include an annual summary of meteorological data collected over the previous year. If the meteorological data is not included, the licensee shall retain it on file and provide it to the U.S. Nuclear Regulatory Commission upon request.

In accordance with the aforementioned ODCM requirement, meteorological data is not included in this report. It is retained on file and is available upon request.

ATTACHMENT NO. 6

MAJOR MODIFICATIONS TO RADIOACTIVE LIQUID, GASEOUS AND SOLID WASTE TREATMENT SYSTEMS

In accordance with the James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1 Radiological Effluent Controls (REC) Section 7.0, Major Modifications to Radioactive Waste Treatment Systems (liquid, gaseous and solid) shall be reported in the Annual Radioactive Effluent Release Report for the period in which the modification is completed and made operational.

There were no major modifications to any liquid, gaseous, or solid radioactive waste treatment systems.

ATTACHMENT NO. 7

ONSITE GROUNDWATER MONITORING

In response to the Nuclear Energy Institute (NEI) Groundwater Protection Initiative, JAF instituted a groundwater monitoring program in 2007. Five monitoring wells were installed during the fourth quarter of 2007. The first samples were collected in November 2007. Starting in March 2010, 16 additional monitoring wells were drilled in the area of the Reactor Building and nearby SSCs. In August 2013, 3 additional wells and 2 piezometers were installed on site.

All samples collected were analyzed for tritium and gamma emitting radionuclides. The detection limits and results are reported in the following tables. Analysis results of tritium ranged from non-detectable, a minimum positive indication of 1149 pCi/L, and a maximum concentration of 4379 pCi/L for a CST-B sample from 11/04/15. Such levels are below the Reporting Level of the James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1, Table 5.1-2, for tritium. The Reporting Level for tritium is 30,000 pCi/L. No drinking water sources are affected by this tritium. All of the effected wells are onsite. As such, there is no potential to influence any off-site drinking well. No drinking water pathway exists at the James A. FitzPatrick site under normal operating conditions due to the direction and distance of the nearest water intake (Oswego, 8.5 miles west of the JAF discharge).

In conclusion, the only radionuclide detected in groundwater during the 2015 monitoring effort that is attributable to James A. FitzPatrick operations is tritium, and all concentrations were below any reporting criteria.

ATTACHMENT NO. 7 (continued)

ONSITE GROUNDWATER MONITORING

A) Gamma Isotopic Monitoring

For 2015, the 24 monitoring wells were sampled quarterly, providing enough water was present, and analyzed below the required lower limits of detection in accordance with the Offsite Dose Calculation Manual (ODCM) Part 1, Table 5.1-3.

Radionuclide	LLD Value (pCi/L)
Tritium (H-3)	3000
Manganese-54	15
Cobalt-58	15
Iron-59	30
Cobalt-60	15
Zinc-65	30

Radionuclide	LLD Value (pCi/L)
Zirconium-95	15
Niobium-95	15
Iodine-131	15
Cesium-134	15
Cesium-137	18
Barium/Lanthanum-140	15

There were no plant related gamma emitting nuclides detected in the samples. Gross Beta and Hard to Detect nuclide analysis not required.

Per Note 2 on page 27, 2 groundwater monitoring samples detected tritium (H-3). One of the 2 sample results was greater than the LLD value of 3,000 pCi/L for H-3.

ATTACHMENT NO. 7 (continued)

ONSITE GROUNDWATER MONITORING

B) Tritium Summary

Well Name	# Samples in 2015	# Positive Samples in 2015	Minimum Positive Concentration	Maximum Positive Concentration
MW-1A	3	0		
MW-1B	1	0		
MW-2A	4	0		
MW-2B	4	0		
MW-3A	4	0		
MW-3B	4	1	1149	1149
MW-4A	3	0		
MW-4B	3	0		
MW-5	4	0		
MW-6	4	0		
MW-7	4	0		
MW-8	3	0		
MW-9	3	0		
MW-10A	4	0		
MW-10B	4	0		
MW-13	4	0		
MW-14	3	0		
MW-15	4	0		
MW-16	3	0		
MW-19	4	0		
MW-20	3	0		
MW-21	3	0		
CST-A	0	0		
CST-B	1	1	4379	4379

Note 1: All results are in pCi/L.
Note 2: A total of 77 samples were analyzed for H-3 in 2015 with 2 positive results.

ATTACHMENT NO. 8

GASEOUS EFFLUENTS – CARBON-14

a) **Date:** January 01, 2015 – December 31, 2015

b) **Location:** Elevated Release – Main Stack

c) **Duration:** 365 Days

d) **Flow rate:** N/A

e) **Volume Released:** N/A

f) **Nuclides Released:** Carbon-14

g) **Curies Released[(1)]:**

UNIT	QTR 1	QTR 2	QTR 3	QTR 4
Ci	2.64E+00	2.67E+00	2.69E+00	2.70E+00
μCi/sec	3.40E-01	3.40E-01	3.40E-01	3.40E-01

h) **Resultant Doses:** See Addendum 1—Assessment of Radiation Doses to the Public January-December 2015 Table 1D

i) **Dose Calculations:** Doses were calculated in accordance with the Offsite Dose Calculation Manual (ODCM) Part 2, Section 4.4.1

[(1)]Curies released calculated using the methodology in EPRI Technical Report 1021106 **"Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents".**

ATTACHMENT NO. 9

EVENTS LEADING TO CONDITIONS WHICH RESULTED IN EXCEEDING RADIOACTIVITY LIMITS.

In accordance with the James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1 Radiological Effluent Controls (REC) Section 6.2.9, the report shall contain the events leading to the conditions which resulted in exceeding the radioactivity limits for the specified outdoor radioactive radwaste tanks specified in the Technical Requirements Manual, TRM 3.7.E

The radioactivity limits for the specified outdoor radioactive radwaste tanks were not exceeded.

ADDENDUM 1

ASSESSMENT OF RADIATION DOSES TO THE PUBLIC
JANUARY - DECEMBER 2015

1. INTRODUCTION

The James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1 Radiological Effluent Controls (REC), requires an assessment of the radiation doses to the likely most exposed member of the public due to radioactive liquid and gaseous effluents. This assessment of doses to the likely most exposed member of the public is based on accepted methodologies found in the Offsite Dose Calculation Manual (ODCM).

2. DOSE LIMITS

A. DOSE FROM LIQUID EFFLUENTS (ODCM, Part 1, REC 2.3)

Applicability

Applies to doses from radioactive material in liquid effluents.

Objective

To ensure that the dose limitations of 10 CFR 50, Appendix I, are met.

Specifications

The dose to a member of the public from radioactive materials released from the plant in liquid effluents to Unrestricted Areas shall be limited as follows:

1. During any calendar quarter, limited to less than or equal to 1.5 mrem to the whole body and to less than or equal to 5 mrem to any organ.

2. During any calendar year, limited to less than or equal to 3 mrem to the whole body and to less than or equal to 10 mrem to any organ.

B. GASEOUS DOSE RATES (ODCM, Part 1, REC 3.2)

Applicability

Applies to the radiation dose from radioactive material in gaseous effluents.

Objective

To ensure that the dose rates at or beyond the site boundary from gaseous effluents do not exceed the annual dose limits of 10 CFR 20 for Unrestricted Areas.

ADDENDUM 1 (continued)

Specifications

The dose rate at or beyond the Site Boundary due to radioactive materials released from the plant in gaseous effluents shall be limited as follows:

1. Less than or equal to 500 mrem/year to the whole body and less than or equal to 3000 mrem/year to the skin from noble gases; and,

2. Less than or equal to 1500 mrem/year to any organ from Iodine-131, Iodine-133, Tritium and for radioactive materials in particulate form with half-lives greater than 8 days (inhalation pathway only).

C. AIR DOSE, NOBLE GASES (ODCM, Part 1, REC 3.3)

Applicability

Applies to the air dose due to noble gases in gaseous effluents.

Objective

To ensure that the noble gas dose limitations of 10 CFR 50, Appendix I, are met.

Specifications

The air dose to areas at or beyond the Site Boundary from noble gases released from the plant in gaseous effluents shall be limited:

1. During any calendar quarter, to less than or equal to 5 mrad from gamma radiation, and less than or equal to 10 mrad from beta radiation; and,

2. During any calendar year, to less than or equal to 10 mrad from gamma radiation and less than or equal to 20 mrad from beta radiation.

ADDENDUM 1 (continued)

D. DOSE DUE TO IODINE-131, IODINE-133, TRITIUM AND RADIONUCLIDES IN PARTICULATE FORM (ODCM, Part 1, REC 3.4)

Applicability

Applies to the cumulative dose from Iodine-131, Iodine-133, Tritium, and radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents.

Objective

To ensure that the dose limitations of 10 CFR 50, Appendix I, are met.

Specifications

The dose to a member of the public at or beyond the Site Boundary from Iodine-131, Iodine-133, Tritium, and radionuclides in particulate form with half-lives greater than 8 days released from the plant in gaseous effluents shall be limited:

a. During any calendar quarter to less than or equal to 7.5 mrem to any organ; and,

b. During any calendar year to less than or equal to 15 mrem to any organ.

c. Less than 0.1% of the limits of Specifications 3.4.1.c.1.a and 3.4.1.c.1.b as a result of burning contaminated oil.

E. TOTAL DOSE FROM URANIUM FUEL CYCLE (ODCM, Part 1, REC 4.0)

Applicability

Applies to radiation dose from releases of radioactivity and radiation from uranium fuel cycle sources.

Objective

1. To assure that the requirements of 40 CFR 190 are met.

2. To assure that the requirements of 10 CFR 72.104 are met in accordance with Section 3.2.3, Required Action A.2, Certificate of Compliance 1014 Appendix A, Technical Specifications for the Hi-Storm 100 Cask System.

Specifications

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 as follows:

1. Less than or equal to 25 mrem/year to the whole body; and,

2. Less than or equal to 25 mrem/year to any organ except the thyroid which shall be limited to less than or equal to 75 mrem/year.

ADDENDUM 1 (continued)

3. DOSE ASSESSMENT

A. METHODOLOGY

The assessment of radiation doses to the public due to radioactive liquid and gaseous effluents is performed in accordance with the ODCM. The ODCM is based on methodologies and models suggested by the Guidance Manual For "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants" (NUREG-0133) and "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I" (Regulatory Guide 1.109).

B. ASSUMPTIONS

Dose calculations are performed using formulas and constants defined in the ODCM. Specific radioactive release activities used in the dose calculations are listed in the Annual Radioactive Effluent Release Report (1.21 Report) for the period of January 1, 2015 to December 31, 2015. Historical meteorological data was used to generate tables of average dispersion factors. Locations of interest were identified from the 2015 land use census. These tables are available upon request.

C. ASSESSMENT RESULTS SUMMARY

The calculated doses to the public due to radioactive effluents are listed in Table 1. The calculated doses are small fractions of their respective dose limits.

4. 40 CFR 190 DOSE ASSESSMENT

A. METHODOLOGY

Evaluation to demonstrate compliance with the 40 CFR 190 dose limits must be performed when the doses calculated for 10 CFR 50 compliance exceed twice their respective limits. When additional dose assessment is required to demonstrate compliance with 40 CFR 190 it is performed in accordance with the ODCM.

B. RESULTS SUMMARY

The cumulative dose contribution from liquid and gaseous effluents for this report period were calculated and are listed in Table 1. The cumulative dose contribution from direct radiation from the reactor unit and from radwaste storage tanks is measured by environmental thermoluminescent dosimeters for the report period. This data is contained in the Annual Environmental Operating Report. The calculated doses from liquid and gaseous effluents are less than twice their respective 10 CFR 50 limits; therefore, additional calculations are not necessary to demonstrate compliance with 40 CFR 190 dose limits.

ADDENDUM 1 (continued)

TABLE 1
ANNUAL DOSE ASSESSMENT 2015

A. LIQUIDS

QUARTER	1	2	3	4	ANNUAL
	(a)	(a)	(a)	(a)	(a)
Organ (mrem)	1.37E-05	5.22E-06	8.54E-06	4.87E-06	3.23E-05
% of Limit	2.73E-04	1.04E-04	1.71E-04	9.74E-05	3.23E-04
	(b)	(b)	(b)	(b)	(b)
Whole Body (mrem)	1.37E-05	5.22E-06	8.54E-06	4.87E-06	3.23E-05
% of Limit	9.11E-04	3.48E-04	5.69E-04	3.25E-04	1.08E-03

(a) Dose to the Child Liver primarily by the potable water pathway.
(b) Dose to the Child Whole Body primarily by the potable water pathway.

ADDENDUM 1 (continued)

TABLE 1 (cont)
ANNUAL DOSE ASSESSMENT 2015

B. NOBLE GASES

QUARTER	1	2	3	4	ANNUAL
Total Body (mrem/yr)	2.16E-02	1.35E-02	1.43E-02	6.12E-03	2.16E-02
% of Limit	4.32E-03	2.70E-03	2.86E-03	1.22E-03	4.32E-03
Skin (mrem/yr)	4.12E-02	2.36E-02	2.59E-02	1.27E-02	4.12E-02
% of Limit	1.37E-03	7.86E-04	8.65E-04	4.23E-04	1.37E-03
Gamma (mrad)	2.66E-04	6.46E-04	3.02E-04	1.61E-04	1.37E-03
% of Limit	5.32E-03	1.29E-02	6.03E-03	3.21E-03	1.37E-02
Beta (mrad)	2.69E-05	5.86E-05	3.00E-05	1.71E-05	1.33E-04
% of Limit	2.69E-04	5.86E-04	3.00E-04	1.71E-04	6.63E-04

C. IODINES AND PARTICULATES

QUARTER	1	2	3	4	ANNUAL
	(a)	(a)	(a)	(a)	(a)
Organ (mrem)	8.84E-04	6.17E-04	2.22E-03	2.67E-03	6.39E-03
% of Limit	1.18E-02	8.23E-03	2.96E-02	3.56E-02	4.26E-02
	(a)	(a)	(a)	(a)	(a)
Organ Dose Rate (mrem/yr)	3.07E-04	1.73E-04	4.55E-04	3.17E-04	4.55E-04
% of Limit	2.04E-05	1.15E-05	3.03E-05	2.11E-05	3.03E-05

(a) Dose to the Child Thyroid primarily by the vegetation pathway.

ADDENDUM 1 (continued)

TABLE 1 (cont)
ANNUAL DOSE ASSESSMENT 2015

D. CARBON 14

QUARTER	1	2	3	4	ANNUAL
	(a)	(a)	(a)	(a)	(a)
Organ (mrem)	8.43E-03	8.52E-03	8.59E-03	8.62E-03	3.42E-02
% of Limit	1.12E-01	1.14E-01	1.14E-01	1.15E-01	2.28E-01
					(a)
Organ Dose Rate (mrem/yr)	NA	NA	NA	NA	3.42E-02
% of Limit	NA	NA	NA	NA	2.28E-03

(a) Dose to the Child Bone primarily by the vegetation pathway.