Constellation

James A. FitzPatrick NPP
P.O. Box 110
Lycoming, NY 13093

Mark R. Hawes
Regulatory Assurance

JAFP-23-0023
April 27, 2023

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

James A. FitzPatrick Nuclear Power Plant
Renewed Facility Operating License No. DPR-59
NRC Docket No. 50-333

Subject: 2022 Annual Radioactive Effluent Release Report

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, 2022 through December 31, 2022. The enclosure is submitted in accordance with 10 CFR 50.36a and the Reporting Requirements of Technical Specifications 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 1) includes, as an Addendum, an Assessment of the Radiation Doses to the Public due to the radioactive liquid and gaseous effluents released during the 2022 calendar year. The format used for the effluent data is outlined in Appendix B of Regulatory Guide 1.21, Revision 1. Distribution is in accordance with Regulatory Guide 10.1, Revision 4.

There are no new regulatory commitments contained in this letter. If you have any questions concerning the enclosed report, please contact Mr. Kevin Fowler, Chemistry Manager, at (315) 326-2275.

Sincerely,

Mark R. Hawes
Regulatory Assurance

MRH/KF/ts

Enclosure 1: Annual Radioactive Effluent Release Report, January 1 – December 31, 2022

cc: next page

cc:
NRC Regional Administrator, Region I
NRC Resident Inspector
NRC Project Manager

Supervisor, Town of Scriba
Route 8, Box 382
Oswego, NY 13126

JAFP-23-0023

Enclosure 1

Annual Radioactive Effluent Release Report

January 1, 2021 – December 31, 2022

(36 Pages)

CONSTELLATION FITZPATRICK, LLC

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY 1, 2022 - DECEMBER 31, 2022

DOCKET NO. 50-333

LICENSE NO. DPR-59

CONSTELLATION FITZPATRICK, LLC
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2022 - DECEMBER 2022
SUPPLEMENTAL INFORMATION

FACILITY: JAFNPP **LICENSEE: CONSTELLATION FITZPATRICK, LLC**

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 ODCM Part 1, Section 3.4 Specification 3.4.1.1 and 3.4.1.2 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).

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 offsite 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:	1.00E+00	No Release	No Release	2.00E+00
(2) Total time period for batch release: (min)	1.44E+03	No Release	No Release	5.80E+01
(3) Maximum time period for batch release: (min)	1.44E+03	No Release	No Release	4.80E+01
(4) Average time period for batch release: (min)	1.44E+03	No Release	No Release	2.90E+01
(5) Minimum time period for batch release: (min)	1.44E+03	No Release	No Release	1.00E+01
(6) Total Activity Released (Ci)	9.81E-05	No Release	No Release	7.51E-04
(7) Total Volume Released (liters)	2.73E+04	No Release	No Release	4.61E+03

b. Liquid: Non-Canal

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
(1) Number of batch releases:	9.00E+00	1.80E+01	8.10E+01	7.00E+01
(2) Total time period for batch release: (min)	2.46E+01	8.76E+01	2.92E+02	2.47E+02
(3) Maximum time period for batch release: (min)	6.60E+00	3.72E+00	1.02E+01	2.12E+02
(4) Average time period for batch release: (min)	2.73E+00	4.87E+00	3.61E+00	3.52E+01
(5) Minimum time period for batch release: (min)	6.00E-01	6.00E-01	6.00E-01	6.00E-01
(6) Total Activity Released (Ci)	1.02E-04	1.21E-04	**	**
(7) Total Volume Released (liters)	9.31E+03	3.32E+04	1.11E+05	9.33E+05

** Concentrations less than lower limit of detection of the counting system used are indicated with a double asterisk.

c. Gaseous

There were no gaseous batch releases for this report.

SUPPLEMENTAL INFORMATION (continued)

6. Continuous Releases

a. Liquid: Non-Canal	Quarter 1	Quarter 2	Quarter 3	Quarter 4
(1) Number of releases:	1.30E+01	1.30E+01	1.30E+01	1.30E+01
(2) Total Activity Released (Ci)	1.03E-02	5.24E-03	9.46E-03	8.92E-03
(3) Total Volume Released (liters)	8.55E+06	5.75E+06	6.17E+06	5.15E+06

b. Liquid: Canal	Quarter 1	Quarter 2	Quarter 3	Quarter 4
(1) Number of releases:	No Release	No Release	No Release	No Release
(2) Total Activity Released (Ci)	No Release	No Release	No Release	No Release

7.

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.

The latest revision of the ODCM became effective during calendar year 2021. There were no changes to the ODCM in 2022.

CONSTELLATION FITZPATRICK, LLC
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2022 - DECEMBER 2022

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	2.09E+01	3.17E+01	4.83E+01	6.39E+00	≤2.50E+01
2. Average release rate for period	µCi/sec	2.68E+00	4.03E+00	6.08E+00	8.03E-01	
3. Percentage ODCM Limit	%	*	*	*	*	
B. IODINE-131						
1. Total Iodine-131	Ci	1.24E-04	1.48E-04	2.57E-04	6.01E-05	≤2.50E+01
2. Average release rate for period	µCi/sec	1.59E-05	1.88E-05	3.23E-05	7.56E-06	
3. Percentage ODCM Limit	%	*	*	*	*	
C. PARTICULATES						
1. Particulates with half-lives >8 days	Ci	3.92E-06	1.51E-05	1.15E-04	4.58E-05	≤3.60E+01
2. Average release rate for period	µCi/sec	5.04E-07	1.92E-06	1.45E-05	5.76E-06	
3. Percentage ODCM Limit	%	*	*	*	*	
4. Gross alpha radioactivity	Ci	2.38E-07	2.36E-07	2.06E-07	3.03E-07	≤2.50E+01
D. TRITIUM						
1. Total Release	Ci	5.26E+00	5.05E+00	1.48E+00	1.59E+00	≤2.50E+01
2. Average release rate for period	µCi/sec	6.76E-01	6.42E-01	1.86E-01	1.99E-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	%	7.93E-03	1.42E-02	2.39E-02	4.19E-03	
2. Quarterly beta air dose limit	%	4.12E-04	7.08E-04	1.36E-03	1.82E-04	
3. Yearly gamma air dose limit	%	3.97E-03	1.11E-02	2.30E-02	2.51E-02	
4. Yearly beta air dose limit	%	2.06E-04	5.60E-04	1.24E-03	1.33E-03	
5. Whole body dose rate limit	%	3.08E-04	5.47E-04	9.10E-04	1.61E-04	
6. Skin dose rate limit	%	6.33E-05	1.12E-04	1.90E-04	3.30E-05	
HALOGENS, TRITIUM AND PARTICULATES WITH HALF-LIVES >8 DAYS						
7. Quarterly dose limit (organ)	%	2.52E-01	2.91E-01	5.10E-01	3.70E-02	
8. Yearly dose limit (organ)	%	1.26E-01	2.72E-01	5.26E-01	5.45E-01	
9. Organ dose rate limit	%	5.09E-03	5.82E-03	1.01E-02	7.40E-04	

CONSTELLATION FITZPATRICK, LLC
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2022 - DECEMBER 2022

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	4.11E+00	3.65E+00	6.57E+00	4.25E+00
	Krypton-85	Ci	**	**	**	**
	Krypton-85m	Ci	3.98E+00	8.76E+00	9.42E+00	1.04E+00
	Krypton-87	Ci	**	7.34E-01	2.49E-00	**
	Krypton-88	Ci	4.04E+00	9.21E+00	1.45E+01	1.09E+00
	Krypton-89	Ci	**	**	**	**
	Xenon-133	Ci	8.70E+00	9.16E+00	1.23E+01	**
	Xenon-133m	Ci	**	**	**	**
	Xenon-135	Ci	**	1.08E-01	5.21E-01	**
	Xenon-135m	Ci	**	**	4.57E-01	**
	Xenon-137	Ci	**	**	1.15E+00	**
	Xenon-138	Ci	**	**	7.39E-01	**
	TOTAL	Ci	2.08E+01	3.16E+01	4.81E+01	6.38E+00
2.	**Iodines**					
	Iodine-131	Ci	1.06E-05	1.79E-05	2.28E-05	5.28E-05
	Iodine-132	Ci	**	**	**	**
	Iodine-133	Ci	5.05E-05	6.88E-05	6.23E-05	1.57E-04
	Iodine-134	Ci	**	**	**	**
	Iodine-135	Ci	**	**	**	6.68E-05
	TOTAL	Ci	6.11E-05	8.67E-05	8.51E-05	2.77E-04
3.	**Particulates**					
	Barium-140	Ci	**	**	**	**
	Cobalt-60	Ci	**	**	3.83E-06	2.10E-06
	Cesium-137	Ci	**	**	**	**
	Manganese-54	Ci	**	**	2.57E-06	1.93E-06
	Strontium-89	Ci	**	**	8.81E-06	**
	Zinc-65	Ci	**	**	**	4.29E-07
	Chromium-51	Ci	**	**	3.22E-06	**
	Iron-59	Ci	**	**	9.57E-07	**
	Cobalt-58	Ci	**	**	3.69E-07	1.24E-07
TOTAL		Ci	**	**	1.98E-05	4.58E-06
4.	**Tritium**					
	Hydrogen-3	Ci	7.17E-02	3.11E-02	3.11E-01	2.17E-01

** Concentrations less than lower limit of detection of the counting system used are indicated with a double asterisk.

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

CONSTELLATION FITZPATRICK, LLC
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2022 - DECEMBER 2022

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	**	**	**	**
	Krypton-85	Ci	**	**	**	**
	Krypton-85m	Ci	**	**	**	**
	Krypton-87	Ci	**	**	**	**
	Krypton-88	Ci	**	**	**	**
	Xenon-133	Ci	2.48E-02	3.63E-02	1.06E-01	3.96E-03
	Xenon-133m	Ci	**	**	**	**
	Xenon-135	Ci	1.83E-02	1.07E-02	1.26E-02	3.07E-03
	Xenon-135m	Ci	**	1.42E-03	1.59E-03	**
	Xenon-137	Ci	**	**	**	**
	Xenon-138	Ci	**	**	**	**
	TOTAL	Ci	4.31E-02	4.84E-02	1.20E-01	7.03E-03
2.	**Iodines**					
	Iodine-131	Ci	1.13E-04	1.30E-04	2.34E-04	7.32E-06
	Iodine-132	Ci	**	1.07E-05	**	**
	Iodine-133	Ci	9.81E-04	1.03E-03	1.35E-03	**
	Iodine-134	Ci	**	**	**	**
	Iodine-135	Ci	**	**	**	**
	TOTAL	Ci	1.09E-03	1.17E-03	1.58E-03	7.32E-06
3.	**Particulates**					
	Chromium-51	Ci	**	**	**	**
	Cobalt-58	Ci	**	**	5.99E-06	2.37E-06
	Cobalt-60	Ci	**	**	3.18E-05	5.73E-06
	Manganese-54	Ci	3.92E-06	1.51E-05	4.20E-05	1.63E-05
	Iron-59	Ci	**	**	**	5.45E-06
	Strontium-89	Ci	**	**	**	**
	Zinc-65	Ci	**	**	1.55E-05	1.32E-05
	TOTAL	Ci	3.92E-06	1.51E-05	9.53E-05	4.31E-05
4.	**Tritium**					
	Hydrogen-3	Ci	5.18E+00	5.02E+00	1.17E+00	1.37E+00

** Concentrations less than lower limit of detection of the counting system used are indicated with a double asterisk.

CONSTELLATION FITZPATRICK, LLC
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2022 - DECEMBER 2022

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	**	**	**	**	NA
2. Average diluted concentration during period	µCi/ml	**	**	**	**	
3. Percentage ODCM Limit	%	NA	NA	NA	NA	
B. TRITIUM						
1. Total Release	Ci	1.05E-02	5.36E-03	9.46E-03	9.67E-03	≤2.50E+01
2. Average diluted concentration during period (Note 1)	µCi/ml	4.55E-09	9.30E-07	1.51E-06	1.05E-06	
3. Percentage ODCM Limit	%	*	*	*	*	
C. DISSOLVED AND ENTRAINED GASES						
1. Total Release	Ci	**	**	**	**	NA
2. Average diluted concentration during period	µCi/ml	**	**	**	**	
3. Percentage ODCM Limit	%	NA	NA	NA	NA	
D. GROSS ALPHA RADIOACTIVITY						
1. Total Release	Ci	**	**	**	**	NA
E. VOLUME OF WASTE RELEASED (PRIOR TO DILUTION)	liters	8.59E+07	5.77E+06	6.27E+06	5.15E+06	
F. VOLUME OF DILUTION WATER USED DURING PERIOD	liters	2.30E+09	0.00E+00	0.00E+00	4.03E+06	
***G. PERCENT OF APPLICABLE ODCM LIMITS**						
1. Quarterly Whole Body Dose	%	1.18E-04	4.45E-05	2.67E-05	2.64E-05	
2. Quarterly Organ Dose	%	3.52E-05	1.34E-05	8.01E-06	7.92E-06	
3. Annual Whole Body Dose	%	5.90E-05	2.23E-05	1.34E-05	1.32E-05	
4. Annual Organ Dose	%	1.76E-05	6.70E-06	4.01E-06	3.96E-06	

Note 1: Concentration includes summation from diluted and undiluted values from Canal and Non-Canal releases (Table 2B).
** Concentrations less than lower limit of detection of the counting system used are indicated with a double asterisk.

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	**	**	**	**
2. Tritium					
Hydrogen-3	Ci	9.81E-05	**	**	7.51E-04
3. Dissolved and Entrained Gases					
ND	Ci	**	**	**	**

TABLE 2B
LIQUID EFFLUENTS CANAL

CONTINUOUS MODE

NUCLIDES RELEASED	UNIT	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
1. Fission and Activation Products					
NR	Ci	No Release	No Release	No Release	No Release
2. Tritium					
Hydrogen-3	Ci	No Release	No Release	No Release	No Release
3. Dissolved and Entrained Gases					
NR	Ci	No Release	No Release	No Release	No Release

** Concentrations less than lower limit of detection of the counting system used are indicated with a double asterisk.

CONSTELLATION FITZPATRICK, LLC
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2022 - DECEMBER 2022

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	**	**	**	**
2. Tritium					
Hydrogen-3	Ci	1.03E-02	5.24E-03	9.46E-03	8.92E-03
3. Dissolved and Entrained Gases					
ND	Ci	**	**	**	**

** Concentrations less than lower limit of detection of the counting system used are indicated with a double asterisk.

CONSTELLATION FITZPATRICK, LLC
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2022 - DECEMBER 2022

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	**	**	**	**
2. Tritium					
Hydrogen-3	Ci	1.02E-04	1.21E-04	**	**
3. Dissolved and Entrained Gases					
ND	Ci	**	**	**	**

** Concentrations less than lower limit of detection of the counting system used are indicated with a double asterisk.

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					
NR	Ci	No Release	No Release	No Release	No Release
2. Tritium					
NR	Ci	No Release	No Release	No Release	No Release
3. Dissolved and Entrained Gases					
NR	Ci	No Release	No Release	No Release	No Release

CONSTELLATION FITZPATRICK, LLC
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2022 - DECEMBER 2022

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	2.73E+01	0.00E+00	0.00E+00	1.00E+01
evaporator bottoms, etc.	Ci	3.43E+01	0.00E+00	0.00E+00	1.00E+01
b. Dry compressible waste,	m^3	4.75E+02	0.00E+00	0.00E+00	1.00E+01
contaminated equipment, etc.	Ci	1.06E+00	0.00E+00	0.00E+00	1.00E+01
c. Irradiated components,	m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
control rods, etc.	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
d. Other: Dry compressible	m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
waste, contaminated equipment,	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
spent resins for volume reduction.					

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

Isotope Concentrations of less than 1 percent for this report are not reflected**.**

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

Isotope	Percent	Curies
Mn-54	1.35E+01	4.62E+00
Fe-55	5.30E+01	1.82E+01
Co-60	2.87E+01	9.84E+00
Ni-63	2.13E+00	7.31E-01
Zn-65	1.79E+00	6.14E-01

b. Dry compressible waste, contaminated equipment, etc.

Isotope	Percent	Curies
Cr-51	2.28E+00	2.41E-02
Mn-54	5.12E+01	5.41E-01
Fe-55	1.47E+01	1.55E-01
Fe-59	4.17E+00	4.41E-02
Co-58	1.14E+00	1.20E-02
Co-60	2.00E+01	2.11E-01
Zn-65	4.04E+00	4.27E-02

c. Irradiated components, control rods, etc.
None

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

3. Solid Waste Disposition

No. of Shipments	Mode of Transportation	Destination
10	Hittman Transport Services	Energy Solutions Oak Ridge, TN
7	Hittman Transport Services	Energy Solutions LLC Clive, Utah

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	2560.0 ft^3 (72.50m^3)	STC	2
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	2560.0 ft^3 (72.50m^3)	STC	2
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	2560.0 ft^3 (72.50m^3)	STC	2
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	2560.0 ft^3 (72.50m^3)	STC	2
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	2560.0 ft^3 (72.50m^3)	STC	2
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	2560.0 ft^3 (72.50m^3)	STC	2
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	2560.0 ft^3 (72.50m^3)	STC	2
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	2560.0 ft^3 (72.50m^3)	STC	2
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	206.1 ft^3 (5.84m^3)	STC	1
Dry compressible Waste (DAW), Contaminated Equipment, etc.	Non-compacted	206.0 ft^3 (5.84m^3)	STC	1

Spent Resins, Filter Sludges, evaporator Bottoms, etc.	Air Drying Non-compacted	205.8 ft^3 (5.80m^3)	HIC	1
Spent Resins, Filter Sludges, evaporator Bottoms, etc.	Air Drying Non-compacted	205.8 ft^3 (5.80m^3)	HIC	1
Spent Resins, Filter Sludges, evaporator Bottoms, etc.	Air Drying Non-compacted	205.8 ft^3 (5.80m^3)	HIC	1
Spent Resins, Filter Sludges, evaporator Bottoms, etc.	Air Drying Non-compacted	205.8 ft^3 (5.80m^3)	HIC	1
Spent Resins, Filter Sludges, evaporator Bottoms, etc.	Air Drying Non-compacted	205.8 ft^3 (5.80m^3)	HIC	1
Spent Resins, Filter Sludges, evaporator Bottoms, etc.	Air Drying Non-compacted	133.0 ft^3 (3.80m^3)	HIC	1
Spent Resins, Filter Sludges, evaporator Bottoms, etc.	Air Drying Non-compacted	133.0 ft^3 (3.80m^3)	HIC	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

None

HIC-High Integrity Container, STC-Strong Tight Container

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 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.

No change in PCP.

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 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.

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 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 5.1.3.1 allows for deviations from the program due to hazardous conditions, seasonal unavailability, theft, uncooperative residents, or to a malfunction of automatic sampling equipment.

A. ODCM Program Deviations

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

The Low Volume (Lovol) sampler on Turbine Building 272 northwest rollup door detected Magnesium-54 at a concentration of 1.277E-13 uCi/cc, which is well below the LLD (lower limit of detection) for Mn-54 in the ODCM (1E-11uCi/cc). Operations requested the sampler be put in service prior to opening the rollup door for R25 material staging (per OP-52 Turbine Building Ventilation section E.). Any radioactivity in the TB is accounted for during weekly stack and vent analysis. OP-52 section E directs installation of a Lovol to collect a sample of potential effluent in case the TB were to become positively pressurized with the rollup door open.

Oswego Steam Station (08, Control) composite sampler was unable to obtain samples due to pump being inoperable. Manual sampling occurred during the period of pump inoperability. For the dates of 08/19/22-08/26/22.

Offsite Air Station H-Off flow was above target range upon collection of routine cartridge changes. Adjustments made to lower flow. For the dates of 05/05/22, 08/01/22, 08/15/22 and 11/14/22.

Air Sampling Station Operability Assessment:

The ODCM required air sampling program consist of 5 individual sampling locations. The collective operable time peroid for the air monitoring stations was 43,800 hours out of a possible 43,800 hours. The air sampling availabitlty factor for the report period was 100%.

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 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 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, James A. FitzPatrick (JAF) instituted a groundwater monitoring program in 2007. JAF's Groundwater Monitoring Well Program consists of twenty-two wells which are sampled quarterly.

The current JAF RGPP sample location designations include Background, Long-Term Shutdown, Mid-Field, Perimeter, Source, and Idle wells. Sample frequency and analyses are outlined below:

- Background – Annually for tritium; and every two years for gamma-radionuclide analyses.
- Long-Term Shutdown – Quarterly for tritium; annually for Fe-55, Ni-63, Sr-89, and Sr-90 analyses; and every two years for gamma-radionuclide and gross-alpha (dissolved and suspended).
- Midfield – Semi-annually for tritium, and every two years for gamma-radionuclide analysis.
- Perimeter - Annually for tritium, and every two years for gamma-radionuclide analyses.
- Source – Quarterly for tritium analysis; annually for Sr- 89, and Sr-90 analyses; every two years for gamma-radionuclide, and gross-alpha (dissolved and suspended); and every five years for Fe-55 and Ni-63.
- Idle – Groundwater monitoring well locations that are currently not actively being sampled but are available for future use.

The JAF modified RGPP sampling network consists of twenty-two wells (seven Background wells, eleven Source wells, two Midfield wells, and two Perimeter wells). The changes account for historic tritium results, location of wells and SSCs, additional wells in close proximity, groundwater flow, and lithology.

All Groundwater Monitoring Well samples collected in 2022 yielded results less than the detection limits established in the JAF Offsite Dose Calculation Manual (ODCM) Part 1, Table 5.1-3 and results are reported in the tables on pages 24 and 25. Gross beta analysis is not required per EN-AA-408-4000 and EN-JF-408-4160.

A summary of the RGPP required analyses are below:

- The maximum tritium concentration reported in 2022 was 652 pCi/L (MW-7 in 1st quarter).

- Gamma-radionuclide, analysis was most recently performed during the 2nd quarter 2022 RGPP sampling round. Gamma radionuclides were not detected at concentrations exceeding their respective LLDs in 2022. The next time gamma-radionuclide and gross-alpha analysis will be performed is 2024.

- Sr-89 and Sr-90 analysis was performed on samples collected from source designated wells during the 3rd quarter 2022 RGPP sampling round. No detections of Sr-89 and Sr-90 were reported in the samples collected during the 3rd quarter 2022 RGPP sampling round.

- Gross-alpha analysis was most recently performed during the 1st quarter 2022 RGPP

sampling round. The gross-alpha (suspended) results for MW-4A (6.92 pCi/L) and MW-15 (27.3 pCi/L) exceeded the respective Alert Level for the two wells. Due to the gross-alpha alert level exceedances, samples from MW-4A and MW-15 were analyzed for select transuranics. Minor detections of U-233/234 were detected in both wells at 0.7498 pCi/L at MW-4A and 1.064 pCi/L (MW-15). A minor detection of U-238 was also detected in the sample collected from MW-15 at 0.6049 pCi/L. Based on the low uranium concentrations and lack of elevated tritium concentrations at the Station, the source of the U-233/234 and U-238 detections is likely due to regional background conditions. The next time gross-alpha analysis will be performed is 2024.

- American Nuclear Insurers (ANI) completed a corporate audit in 2020 and informed Exelon (now Constellation) that it needed to analyze a sample from the well with the highest gross-alpha result for select transuranics to ensure that the Alert Level is conservative enough that no unusual transuranics are present when the gross-alpha concentrations do not exceed the Alert Level. To satisfy the ANI request, the well with the highest average gross-alpha (dissolved) concentration (MW13) was analyzed for select transuranics during the 1st quarter 2022. U-233/234 was detected at 5.135 pCi/L and U-238 was detected at 3.069 pCi/L in the sample collected from MW-13. Based on the low uranium concentrations and lack of elevated tritium concentrations at the Station, the source of the U-233/234 and U-238 detections is likely due to regional background conditions.

- Samples collected from Source designated wells were analyzed for hard-to-detects (Fe-55 and Ni-63) in 2021. Hard-to-detects (Fe-55 and Ni-63) were not detected in the samples collected in 2021. Source designated wells will have Fe-55 and Ni-63 analysis performed again in 2026.

- There are no indications of an active source of tritium to groundwater.

No drinking water pathway exists at the JAF 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). There is no potential to influence any offsite drinking well.

In conclusion, there were no plant related isotopes detected in groundwater monitoring wells during 2022 that are attributable to James A. FitzPatrick, and all concentrations were below any reporting criteria.

ATTACHMENT NO. 7 (continued)

ONSITE GROUNDWATER MONITORING

A) Gamma Isotopic Monitoring

Monitoring wells were sampled for gamma emitting radionuclides in 2020, according to the modified RGPP. All sample results were below the required lower limits of detection in accordance with the Offsite Dose Calculation Manual (ODCM) Part 1, Table 5.1-3 as provided below.

Radionuclide	LLD Value (pCi/L)
Gross Beta	4
Tritium (H-3)	3000
Manganese-54	15
Cobalt-58	15
Iron-59	30
Cobalt-60	15

Radionuclide	LLD Value (pCi/L)
Zinc-65	30
Zirconium /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 2022 samples.

ATTACHMENT NO. 7 (continued)

ONSITE GROUNDWATER MONITORING

B) Tritium Summary

Well Name	# Samples in 2022	# Samples >3000 pCi/L in 2022	Minimum Positive Concentration	Maximum Positive Concentration
MW-1A	4	0	<180	218
MW-1B	1	0	<186	<186
MW-2A	4	0	203	474
MW-2B	2	0	262	277
MW-3A	4	0	340	627
MW-3B	2	0	287	288
MW-4A	4	0	336	359
MW-4B	4	0	<183	<190
MW-5	1	0	300	300
MW-6	4	0	263	336
MW-7	4	0	<182	652
MW-8	1	0	253	253
MW-9	1	0	283	283
MW-10A	1	0	<190	<190
MW-10B	1	0	<182	<182
MW-13	4	0	<184	222
MW-14	4	0	<178	268
MW-15	4	0	<182	208
MW-16	4	0	<177	353
MW-19	1	0	<191	<191
MW-20	1	0	<161	<161
MW-21	1	0	209	209

Note 1: All results are in pCi/L.
Note 2: A total of 57 samples were analyzed for H-3 in 2022, all results were <LLD in accordance with the ODCM limits in Table 5.1-3.

ATTACHMENT NO. 8

GASEOUS EFFLUENTS – CARBON-14

a) **Date:** January 01, 2022 – December 31, 2022

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

c) **Duration:** 365 Days

d) **Flow rate:** NA

e) **Volume Released:** NA

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

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

UNIT	QTR 1	QTR 2	QTR 3	QTR 4
Ci	2.67E+00	2.70E+00	2.33E+00	2.21E+00
μCi/sec	3.40E-01	3.40E-01	3.41E-01	3.41E-01

h) **Resultant Doses:** See Addendum 1—Assessment of Radiation Doses to the Public January-December 2022 Table 1, Section D

i) **Dose Calculations:** Doses were calculated in accordance with the Offsite Dose Calculation Manual (ODCM) Part 2, Section 11.4.1

[(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 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 2022

1. INTRODUCTION

The James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1 Radiological Effluent Controls, 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, Section 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.

Controls

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, Section 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)

Controls

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, Section 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.

Control

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, Section 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.

Controls

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 ODCM Part 1, Section 3.4, Specifications 3.4.1.1 and 3.4.1.2 as a result of burning contaminated oil.

E. TOTAL DOSE FROM URANIUM FUEL CYCLE (ODCM, Part 1, Section 4.1)

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.

Controls

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, 2022 to December 31, 2022. Historical meteorological data was used to generate tables of average dispersion factors. Locations of interest were identified from the 2022 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 2022

A. LIQUIDS

QUARTER	1	2	3	4	ANNUAL
	(a)	(a)	(a)	(a)	(a)
Organ (mrem)	1.76E-06	6.67E-07	4.01E-07	3.96E-07	3.23E-06
% of Limit	3.52E-05	1.34E-05	8.01E-06	7.92E-06	3.23E-05
	(b)	(b)	(b)	(b)	(b)
Whole Body (mrem)	1.76E-06	6.67E-07	4.01E-07	3.96E-07	3.23E-06
% of Limit	1.18E-04	4.45E-05	2.67E-05	2.64E-05	1.08E-04

(a) Dose to the Child Liver.
(b) Dose to the Child Whole Body.

ADDENDUM 1 (continued)

TABLE 1 (cont)
ANNUAL DOSE ASSESSMENT 2022

B. NOBLE GASES

QUARTER	1	2	3	4	ANNUAL
Total Body (mrem/yr)	3.96E-03	5.63E-03	8.56E-03	1.80E-03	2.00E-02
% of Limit	7.92E-04	1.13E-03	1.71E-03	3.60E-04	3.99E-03
Skin (mrem/yr)	8.84E-03	6.93E-03	2.02E-02	4.01E-03	4.00E-02
% of Limit	2.95E-04	2.31E-04	6.72E-04	1.34E-04	1.33E-03
Gamma (mrad)	3.96E-04	7.09E-04	1.19E-03	2.11E-04	2.51E-03
% of Limit	6.92E-03	1.42E-02	2.38E-02	4.22E-03	2.51E-02
Beta (mrad)	4.12E-05	7.08E-05	1.36E-04	1.84E-05	2.67E-04
% of Limit	4.12E-04	7.08E-04	1.36E-03	1.84E-04	1.33E-03

C. IODINES AND PARTICULATES

QUARTER	1	2	3	4	ANNUAL
	(a)	(a)	(a)	(a)	(a)
Organ (mrem)	1.89E-02	2.18E-02	3.82E-02	2.78E-03	8.17E-02
% of Limit	2.52E-01	2.91E-01	5.09E-01	3.71E-02	5.45E-01
	(a)	(a)	(a)	(a)	(a)
Organ Dose Rate (mrem/yr)	8.22E-02	1.22E-01	2.54E-01	6.17E-02	5.20E-01
% of Limit	5.48E-03	8.13E-03	1.69E-02	4.11E-03	3.47E-02

(a) Dose to the Child Thyroid.

ADDENDUM 1 (continued)

TABLE 1 (cont)
ANNUAL DOSE ASSESSMENT 2022

D. CARBON 14

QUARTER	1	2	3	4	ANNUAL
	(a)	(a)	(a)	(a)	(a)
Organ (mrem)	8.52E-03	8.62E-03	7.42E-03	7.05E-03	3.16E-02
% of Limit	1.14E-01	1.15E-01	9.89E-02	9.40E-02	2.11E-01
					(a)
Organ Dose Rate (mrem/yr)	NA	NA	NA	NA	3.16E-02
% of Limit	NA	NA	NA	NA	2.11E-03

(a) Dose to the Child Bone.