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JAFP-26-0021
April 30, 2026

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
Docket No. 50-333

Subject: 2025 Annual Radioactive Effluent Release Report

This letter transmits the James A. FitzPatrick Nuclear Power Plant's (JAF) Annual Radioactive Effluent Release Report (ARERR) for the period of January 1, 2025 through December 31, 2025. 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) includes, as an Attachment, ARERR Release Summary Tables due to the radioactive liquid and gaseous effluents released during the 2025 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. Joseph Szczebak, Chemistry Supervisor, at (315) 349-6259.

Sincerely,

Mark R. Hawes
Regulatory Assurance

MRH/JS/CS

Enclosures: Annual Radioactive Effluent Release Report, January 1, 2025 – December 31, 2025

cc: next page

cc:
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JAFP-26-0021

Enclosure

Annual Radioactive Effluent Release Report

January 1, 2025 – December 31, 2025

(46 Pages)

James A. FitzPatrick

2025

Annual Radioactive Effluent Release Report

Docket No: 50-333
License No: DPR-59

TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

1.0 LIST OF ACRONYMS AND DEFINITIONS

1. Alpha Particle (α): A charged particle emitted from the nucleus of an atom having a mass and charge equal in magnitude of a helium nucleus.

2. BWR: Boiling Water Reactor

3. Composite Sample: A series of single collected portions (aliquots) analyzed as one sample. The aliquots making up the sample are collected at time intervals that are very short compared to the composite period.

4. Control: A sampling station in a location not likely to be affected by plant effluents due to its distance and/or direction from the Plant.

5. Counting Error: An estimate of the two-sigma uncertainty associated with the sample results based on total counts accumulated.

6. Curie (Ci): A measure of radioactivity; equal to 3.7×10^{10} disintegrations per second, or 2.22×10^{12} disintegrations per minute.

7. Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using thermoluminescent dosimeters (TLDs), optically stimulated luminescent dosimeters (OSLDs), and/or pressurized ionization chambers.

8. Grab Sample: A single discrete sample drawn at one point in time.

9. Indicator: A sampling location that is potentially affected by plant effluents due to its proximity and/or direction from the plant.

10. Ingestion Pathway: The ingestion pathway includes milk, fish, drinking water and garden produce. Also sampled (under special circumstances) are other media such as vegetation or animal products when additional information about particular radionuclides is needed.

11. ISFSI: Independent Spent Fuel Storage Installation

12. LLD: Lower Limit of Detection. An *a priori* measure of the detection capability of a radiochemistry measurement based on instrument setup, calibration, background, decay time, and sample volume. An LLD is expressed as an activity concentration. The MDA is used for reporting results. LLD are specified by a regulator, such as the NRC and are typically listed in the ODCM.

13. MDA: Minimum Detectable Activity. For radiochemistry instruments, the MDA is the *a posteriori* minimum concentration that a counting system detects. The smallest concentration or activity of radioactive material in a sample that will yield a net count above instrument background and that is detected with 95% probability, with only 5% probability of falsely concluding that a blank observation represents a true signal.

3.1 (Continued)

14. MDC: Minimum Detectable Concentration. Essentially synonymous with MDA for the purposes of radiological monitoring.

15. Mean: The sum of all of the values in a distribution divided by the number of values in the distribution, synonymous with average.

16. Microcurie (µCi): 3.7×10^4 disintegrations per second, or 2.22×10^6 disintegrations per minute.

17. millirem (mrem): 1/1000 rem; a unit of radiation dose equivalent in tissue.

18. Milliroentgen (mR): 1/1000 Roentgen; a unit of exposure to X- or gamma radiation.

19. N/A: Not Applicable

20. NEI: Nuclear Energy Institute

21. NRC: Nuclear Regulatory Commission

22. ODCM: Offsite Dose Calculation Manual

23. OSLD: Optically Stimulated Luminescence Dosimeter

24. Protected Area: A 10 CFR 73 security term is an area encompassed by physical barriers and to which access is controlled for security purposes. The fenced area immediately surrounding the plant and around ISFSI are commonly classified by the licensee as “Protected areas.” Access to the protected area requires a security badge or escort.

25. PWR: Pressurized Water Reactor

26. REC: Radiological Effluent Control

27. REMP: Radiological Environmental Monitoring Program

28. Restricted Area: A 10 CFRR 20 defined term where access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials.

29. TEDE: Total Effective Dose Equivalent (TEDE) means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

30. TLD: Thermoluminescent Dosimeter

31. TRM: Technical Requirements Manual

3.1 (Continued)

32. TS: Technical Specification

33. Unrestricted Area: An area, access to which is neither limited nor controlled by the licensee.

2.0 EXECUTIVE SUMMARY

James A FitzPatrick (JAF) Radiological Effluent Control (REC) Program was established to limit the quantities of radioactive material that may be released based on calculated radiation doses or dose rates. Dose to Members of the Public due to radioactive materials released from the plant is limited by Technical Specifications,10 CFR 20, and by 40 CFR 190. Operational doses to the public during 2025 were calculated to be within the limits required by regulation and compared to other sources of radiation dose and pose no health hazard. These doses are summarized and compared to the regulatory limits in Section 2.1 Comparison to Regulatory Limits below.

The Annual Radioactive Effluent Release Report (ARERR) is published per REC requirements and provides data related to plant operation, including: quantities of radioactive materials released in liquid and gaseous effluents; radiation doses to members of the public; solid radioactive waste shipped offsite for processing or direct disposal; and other information as required by site licensing documents.

In 2025, the gaseous effluent dose assessments for locations from the Land Use Census showed that the critical receptor for James A FitzPatrick is Child, due to Carbon-14. The maximum Annual Organ Dose calculated for this receptor was 3.41E-2 mRem, to the bone.

The maximum dose calculated to any organ due to radioactive liquid effluents was 5.36E-6 mRem, for Child Total Body.

Solid radioactive waste shipped offsite for processing or direct disposal included 1.12E+2 Curies and 3.57E+2 m^3, shipped in 23 shipments.

In addition to monitoring radioactive effluents, JAF and Nine Mile Point (NMP) Nuclear Power Plant share a Radiological Environmental Monitoring Program (REMP) that monitors for levels of radiation and radioactive materials in the local environment. Data from the REMP is published in the Annual Radiological Environmental Operating Report (AREOR).

2.1 Comparison to Regulatory Limits

During 2025 all solid, liquid, and gaseous radioactive effluents from James A FitzPatrick were well below regulatory limits, as summarized in Table 1 and Table 2.

Table 1, James A FitzPatrick Unit 1 Dose Summary[1]

		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Liquid Effluent Dose Limit, Total Body	Limit	1.5 mrem	1.5 mrem	1.5 mrem	1.5 mrem	3 mrem
	Total Body Dose	7.58E-7	1.60E-6	9.19E-7	7.98E-7	4.08E-6
	% of Limit	5.05E-5	1.07E-4	6.13E-5	5.32E-5	1.36E-4
Liquid Effluent Dose Limit, Any Organ	Limit	5 mrem	5 mrem	5 mrem	5 mrem	10 mrem
	Max Organ Dose	7.58E-7	1.60E-6	9.19E-7	7.98E-7	4.08E-6
	% of Limit	1.52E-5	3.20E-5	1.84E-5	1.60E-5	4.08E-5
Gaseous Effluent Dose Limit, Gamma Air (Noble Gas)	Limit	5 mrad	5 mrad	5 mrad	5 mrad	10 mrad
	Gamma Air Dose	7.33E-5	7.25E-5	1.04E-4	8.22E-5	3.32E-4
	% of Limit	1.47E-3	1.45E-3	2.08E-3	1.64E-3	3.32E-3
Gaseous Effluent Dose Limit, Beta Air (Noble Gas)	Limit	10 mrad	10 mrad	10 mrad	10 mrad	20 mrad
	Beta Air Dose	7.95E-6	7.69E-6	1.01E-5	7.48E-6	3.31E-5
	% of Limit	7.95E-5	7.69E-5	1.01E-4	7.48E-5	1.65E-4
Gaseous Effluent Organ Dose Limit (Iodine, Tritium, Particulates with > 8-day half-life)	Limit	7.5 mrem	7.5 mrem	7.5 mrem	7.5 mrem	15 mrem
	Max Organ Dose	9.79E-5	1.05E-4	2.10E-4	1.64E-4	5.77E-4
	% of Limit	1.31E-3	1.40E-3	2.80E-3	2.19E-3	3.85E-2

[1] Table 1 demonstrates compliance with 10 CFR Part 50, App. I Limits.

Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for JAF[2]

	Whole Body	**Thyroid**	**Max Other Organ**
Liquid Effluents	5.36E-6	5.36E-6	5.36E-6
Gaseous Effluents, excluding C-14[3]	6.61E-4	8.93E-4	6.62E-4
Carbon-14	6.82E-3	6.82E-3	3.41E-2
Direct Radiation	0.00E+0	0.00E+0	0.00E+0
Total Site Dose	7.49E-3	7.72E-3	3.48E-2
Total w/Other Nearby Facility[4]	**6.48E-2**	**2.62E-1**	**2.41E-1**
Limit	**25 mrem**	**75 mrem**	**25 mrem**
% of Limit	**2.59E-1**	**3.49E-1**	**9.62E-1**

[2] Table 2 is a summation of Units to show compliance with 40 CFR Part 190 Limits.
[3] Gaseous dose values in Table 2 include organ dose from Noble Gas, Iodine, Tritium, and particulates.
[4] Other fuel cycle sources within 5 miles of the site are considered in this analysis.

3.0 INTRODUCTION

3.1 About Nuclear Power

Commercial nuclear power plants are generally classified as either Boiling Water Reactors (BWRs) or Pressurized Water Reactors (PWRs), based on their design. A BWR includes a single coolant system where water used as reactor coolant boils as it passes through the core and the steam generated is used to turn the turbine generator for power production. A PWR, in contrast, includes two separate water systems: radioactive reactor coolant and a secondary system. Reactor coolant is maintained under high pressure, preventing boiling. The high-pressure coolant is passed through a heat exchanger called a steam generator where the secondary system water is boiled, and the steam is used to turn the turbine generator for power production.

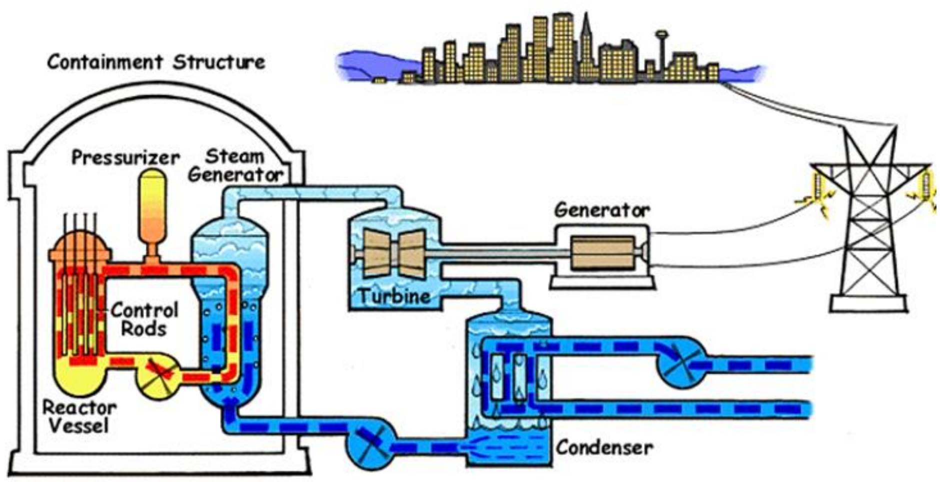

Figure 1, Pressurized Water Reactor (PWR) **[1]**

3.1 (Continued)

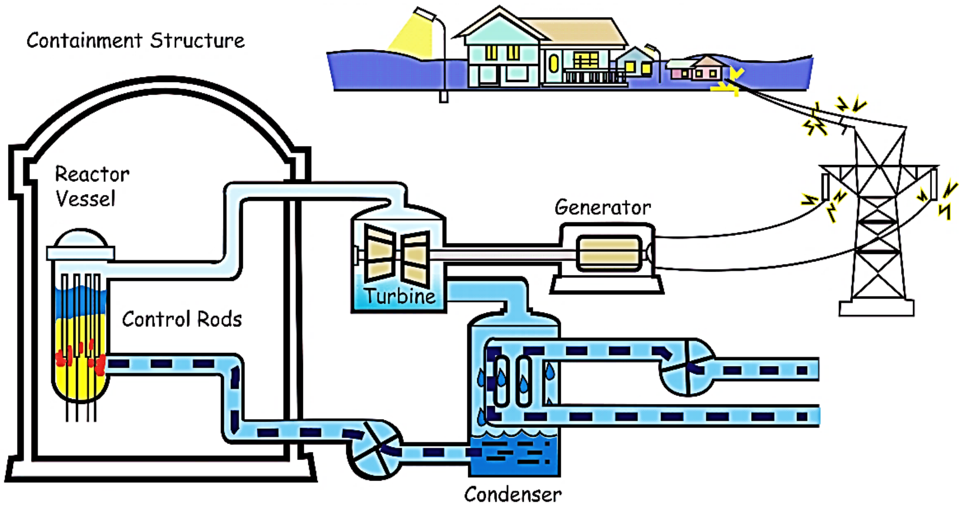

Figure 2, Boiling Water Reactor (BWR) **[2]**

Electricity is generated by a nuclear power plant similarly to the way that electricity is generated at other conventional types of power plants, such as those powered by coal or natural gas. Water is boiled to generate steam; the steam turns a turbine that is attached to a generator and the steam is condensed back into water to be returned to the boiler. What makes nuclear power different from these other types of power plants is that the heat is generated by fission and decay reactions occurring within and around the core containing fissionable uranium (U-235).

Nuclear fission occurs when certain nuclides (primarily U-233, U-235, or Pu-239) absorb a neutron and break into several smaller nuclides (called fission products) as well as producing some additional neutrons.

Fission results in production of radioactive materials including gases and solids that must be contained to prevent release or treated prior to release. These effluents are generally treated by filtration and/or hold-up prior to release. Releases are generally monitored by sampling and by continuously indicating radiation monitors. The effluent release data is used to calculate doses in order to ensure that dose to the public due to plant operation remains within required limits.

3.2 About Radiation Dose

Ionizing radiation, including alpha, beta, and gamma radiation from radioactive decay, has enough energy to break chemical bonds in tissues and result in damage to tissue or genetic material. The amount of ionization that will be generated by a given exposure to ionizing radiation is quantified as dose. Radiation dose is generally reported in units of millirem (mrem) in the US.

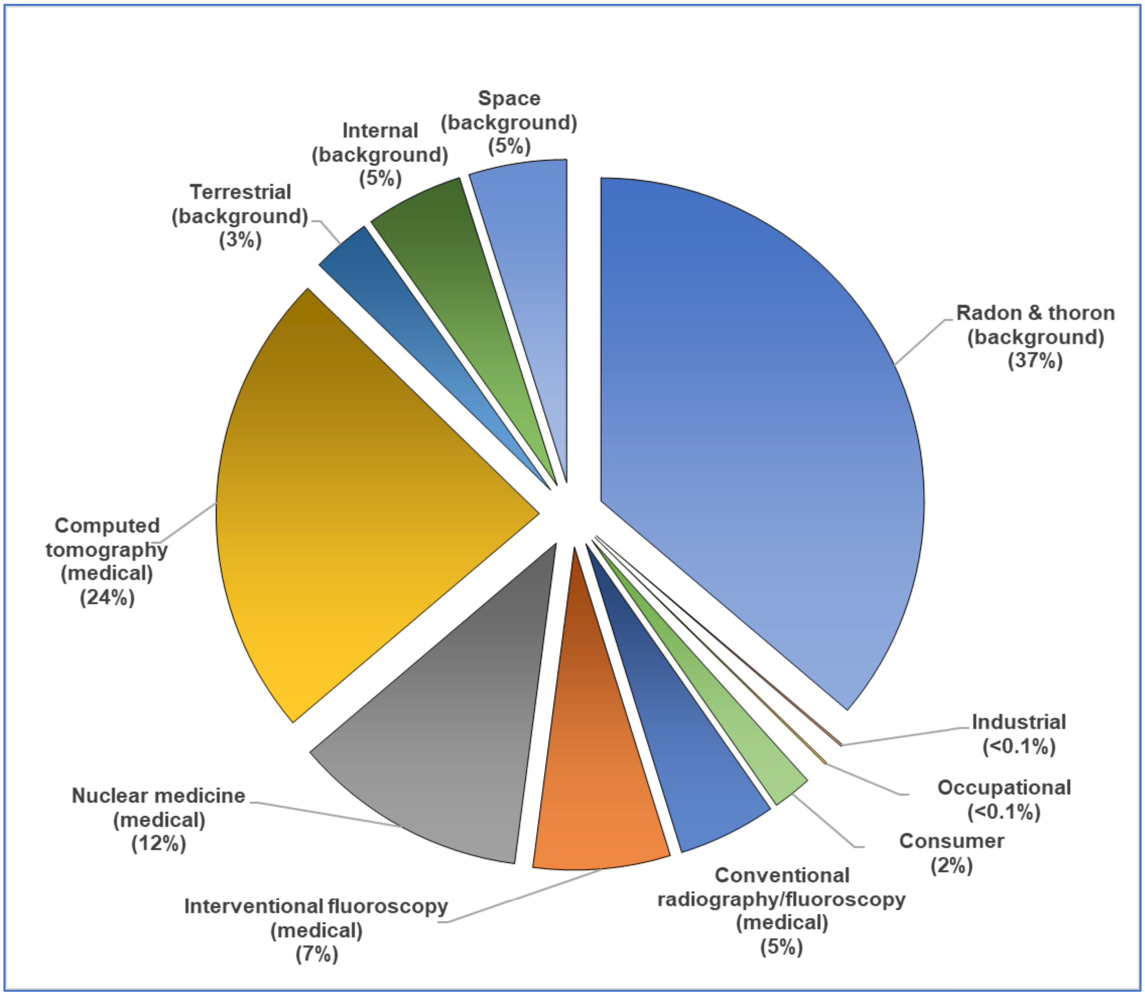

Figure 3, Sources of Radiation Exposure (NCRP Report No. 160) **[3]**

3.2 (Continued)

The National Council on Radiation Protection (NCRP) has evaluated the population dose for the US and determined that the average individual is exposed to approximately 620 mrem per year [3]. There are many sources for radiation dose, ranging from natural background sources to medical procedures, air travel, and industrial processes. Approximately half (310 mrem) of the average exposure is due to natural sources of radiation including exposure to radon, cosmic radiation, and internal radiation and terrestrial due to naturally occurring radionuclides. The remaining 310 mrem of exposure is due to man-made sources of exposure, with the most significant contributors being medical (48% of total mrem per year) due to radiation used in various types of medical scans and treatments. Of the remaining 2% of dose, most is due to consumer activities such as air travel, smoking cigarettes, and building materials. A small fraction of this 2% is due to industrial activities including generation of nuclear power.

Readers that are curious about common sources and effects of radiation dose that they may encounter can find excellent sources of information from the Health Physics Society, including the Radiation Fact Sheets [4], and from the US Nuclear Regulatory Commission website [5].

3.3 About Dose Calculation

Concentrations of radioactive material in the environment resulting from plant operations are very small and it is not possible to determine doses directly using measured activities of environmental samples. To overcome this, dose calculations based on measured activities of effluent streams are used to model the dose impact for Members of the Public due to plant operation and effluents. There are several mechanisms that can result in dose to Members of the Public, including: Ingestion of radionuclides in food or water; Inhalation of radionuclides in air; Immersion in a plume of noble gases; and Direct Radiation from the ground, the plant or from an elevated plume.

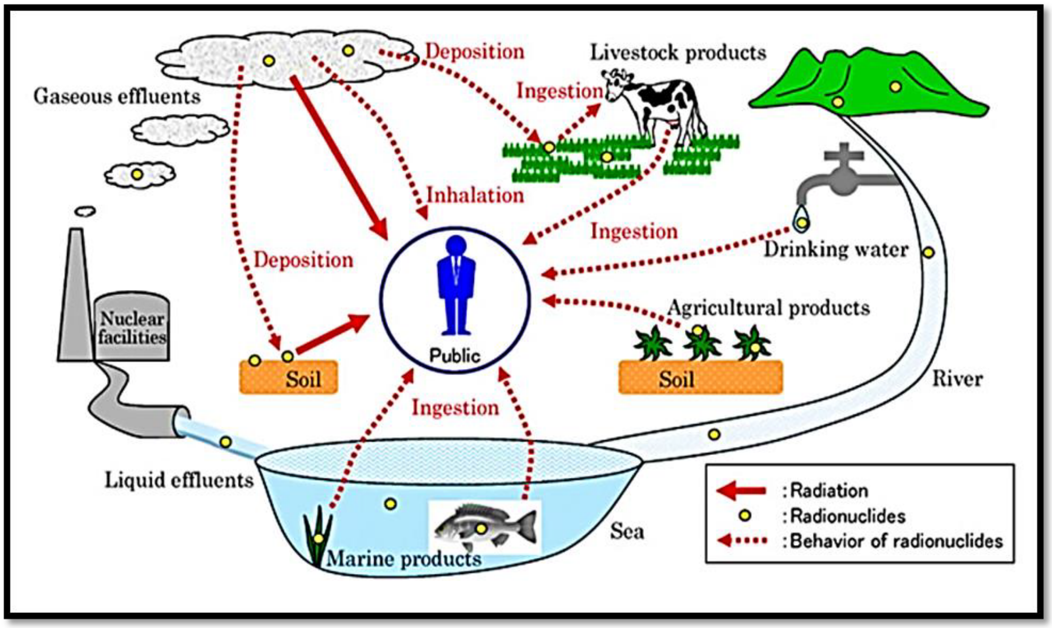

Figure 4, Potential exposure pathways to Members of the Public due to Plant Operations **[6]**

Each plant has an Offsite Dose Calculation Manual (ODCM) that specifies the methodology used to obtain the doses in the Dose Assessment section of this report. The dose assessment methodology in the ODCM is based on NRC Regulatory Guide 1.109 [7] and NUREG-0133 [8]. Doses are calculated by determining what the nuclide concentration will be in air, water, on the ground, or in food products based on plant effluent releases. Release points are continuously monitored to quantify what concentrations of nuclides are being released. For gaseous releases meteorological data is used to determine how much of the released activity will be present at a given location outside of the plant either deposited onto the ground or in gaseous form. Intake patterns and nuclide bio-concentration factors are used to determine how much activity will be transferred into animal milk or meat. Finally, human ingestion factors and dose factors are used to determine how much activity will be consumed and how much dose the consumer will receive. Inhalation dose is calculated by determining the concentration of nuclides and how much air is breathed by the individual.

3.3 (Continued)

For liquid releases, dilution and mixing factors are used to model the environmental concentrations in water. Drinking water pathways are modeled by determining the concentration of nuclides in the water at the point where the drinking water is sourced (e.g., taken from wells, rivers, or lakes). Fish and invertebrate pathways are determined by using concentration at the release point, bioaccumulation factors for the fish or invertebrate and an estimate of the quantity of fish consumed.

Each year a Land Use Census is performed to determine what potential dose pathways currently exist within a five-mile radius around the plant, the area most affected by plant operations. The Annual Land Use Census identifies the locations of vegetable gardens, nearest residences, milk animals and meat animals. The data from the census is used to determine who is the likely to be most exposed to radiation dose as a result of plant operation.

There is significant uncertainty in dose calculation results, due to modeling dispersion of material released and bioaccumulation factors, as well as assumptions associated with consumption and land-use patterns. Even with these sources of uncertainty, the calculations do provide a reasonable estimate of the order of magnitude of the exposure. Conservative assumptions are made in the calculation inputs such as the number of various foods and water consumed, the amount of air inhaled, and the amount of direct radiation exposure from the ground or plume, such that the actual dose received are likely lower than the calculated dose. Even with the built-in conservatism, doses calculated for the maximum exposed individual due to plant operation are a very small fraction of the annual dose that is received due to other sources. The calculated doses due to plant effluents, along with REMP results, serve to provide assurance that radioactive effluents releases are not exceeding safety standards for the environment or people living near the plant.

4.0 DOSE ASSESSMENT FOR PLANT OPERATIONS

4.1 Regulatory Limits

Regulatory limits are detailed in station licensing documents such as the plant Technical Specifications and the Offsite Dose Calculation Manual (ODCM) and Regulatory Guide 1.109, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents from the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I,” Revision 1, Regulatory Guide 1.113, “Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I,” Revision 1, and Regulatory Guide 1.111, “Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors,” Revision 1. These documents contain the limits to which JAF must adhere. JAF drives to maintain the philosophy to keep dose “as low as is reasonably achievable” (ALARA) and actions are taken to reduce the amount of radiation released to the environment. Liquid and gaseous release data show that the dose from JAF is well below the ODCM limits. The instantaneous concentration of liquid radioactive material released shall be limited to ten times the concentration specified in 10 CFR 20, Appendix B, Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the total concentration released shall be limited to 2.0×10^{-4} microcuries/ml.

The annual whole body, skin and organ dose was computed using the 2025 source term using the dose calculation methodology provided in the ODCM. The calculated doses due to gaseous effluents are used to demonstrate compliance with offsite dose limits are presented in Table 1, James A FitzPatrick Unit 1 Dose Summary and Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for JAF.

4.2 Regulatory Limits for Gaseous Effluent Doses

1. Fission and activation gases:

   a. Noble gases 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 the following:

      1) Less than or equal to 500 mrem/year to the total body

      2) Less than or equal to 3000 mrem/year to the skin

   b. Noble gas air dose due to noble gases released in gaseous effluents, from each reactor unit, to areas at and beyond the site boundary shall be limited to the following:

      1) Quarterly

         a) Less than or equal to 5 mrads gamma

4.2 (Continued)

b) Less than or equal to 10 mrads beta

2) Yearly

a) Less than or equal to 10 mrads gamma

b) Less than or equal to 20 mrads beta

2. Iodine, tritium, and all radionuclides in particulate form with half-lives greater than 8 days.

a. The dose rate for iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from the site to areas at and beyond the site boundary shall be limited to the following:

1) Less than or equal to 1500 mrem/yr to any organ

b. The dose to a 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, from each reactor unit, to areas at and beyond the site boundary shall be limited to the following:

1) Quarterly

a) Less than or equal to 7.5 mrem to any organ

2) Yearly

a) Less than or equal to 15 mrem to any organ

4.3 <u>Regulatory Limits for Liquid Effluent Doses</u>

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each reactor unit, to unrestricted areas shall be limited to the following:

1. Quarterly

   a. Less than or equal to 1.5 mrem total body

   b. Less than or equal to 5 mrem critical organ

2. Yearly

   a. Less than or equal to 3 mrem total body

   b. Less than or equal to 10 mrem critical organ

4.4 40 CFR 190 Regulatory Dose Limits for a Member of the Public

1. Total Dose (40 CFR 190)

   a. The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC in the unrestricted area due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to the following:

      1) Less than or equal to 25 mrem, Total Body or any Organ except Thyroid.

      2)Less than or equal to 75 mrem, Thyroid.

5.0 SUPPLEMENTAL INFORMATION

5.1 <u>Gaseous Batch Releases</u>

5.1.1 <u>JAF Unit 1</u>

Number of batch releases	38
Total time period for batch releases	2.25E+4 minutes
Maximum time period for a batch release	1.15E+4 minutes
Average time period for a batch release	5.92E+2 minutes
Minimum time period for a batch release	2.00E+1 minutes

5.2 Liquid Batch Releases

5.2.1 <u>JAF Unit 1</u>

Number of batch releases	7
Total time period for batch releases	1.85E+3 minutes
Maximum time period for a batch release	8.06E+2 minutes
Average time period for a batch release	2.64E+2 minutes
Minimum time period for a batch release	5.80E+1 minutes

5.3 Abnormal Releases

5.3.1 <u>Gaseous Abnormal Releases</u>

Number of releases	3
Total activity released	7.40E-11 Ci

The abnormal release occurred as a result of the roll-up door in the Turbine Building being opened to facilitate plant equipment staging. Sampling equipment was installed to ensure continuous collection of representative samples throughout the period the door remained open.

5.3.2 <u>Liquid Abnormal Releases</u>

Number of releases	0
Total activity released	0 Ci

There were no abnormal liquid releases.

5.4 Land Use Census Changes

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 lad use census shall be included in the Annual Radioactive Effluent 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.

5.5 Meteorological Data

The James A FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1, Radiological Effluent Controls Sections 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. Meteorological data is not included. The licensee shall retain it on file and provide it to the U.S. Nuclear Regulatory Commission upon Request.

5.6 Effluent Radiation Monitors Out of Service Greater Than 30 Days

In accordance with the James A FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1, Radiological Effluent Controls Sections 2.1.3.2.B and 3.1.3.1.A, corrective actions should be taken to return the operability of Effluent Monitoring Instrumentation within 30 days, otherwise report why the inoperability was not corrected.

No Effluent Radiation Monitors were out of service consecutively for the time listed in the ODCM or Technical Specification (30 Days).

5.7 Offsite Dose Calculation Manual (ODCM) Changes

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

During the reporting period, no changes were made to the Offsite Dose Calculation Manual (ODCM).

5.8 Process Control Program (PCP) Changes

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 changes were made to the PCP.

5.9 Radioactive Waste Treatment System Changes

In accordance with the James A FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part 1, Radiological Effluent Controls Sections 6.2.10 and 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.

5.10 Other Supplemental Information

5.10.1 <u>Outside Tanks</u>

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 radioactivity 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.

5.10.2 Independent Spent Fuel Storage Installation (ISFSI) Monitoring Program

Information concerning the ISFSI Monitoring Program and annual dose can be found in the appropriate reporting year JAF/NMP Annual Radiological Environmental Operating Report, which is published on the NRC's website.

5.10.3 Carbon-14

Carbon-14 (C-14) is a naturally occurring radionuclide with a 5,730-year half-life. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Nuclear power plants also produce C-14, but the amount is infinitesimal compared to what has been distributed in the environment due to weapons testing and what is produced by natural cosmic ray interactions.

In accordance with Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste," the NRC recommended re-evaluating "principal radionuclides" and reporting C-14 as appropriate. Carbon-14 production and release estimates were calculated using active core coolant mass, average neutron flux by energy and reactor coolant nitrogen concentrations to determine Carbon-14 generation based upon an effective full power year. The estimated generation for James A FitzPatrick during 2025 was 10.81 Curies.

Public dose estimates were performed using methodology from the ODCM which is based on Regulatory Guide 1.109 methodology. C-14 dose is included in dose calculation results in Table 2.

5.10.4 Errata/Corrections to Previous ARERRs

No errata or corrections for previous reporting periods are submitted by this report. In addition, no errata or corrections were submitted for previous reporting periods by a separate correspondence during this reporting period. A summary for previous Annual Radioactive Effluent Release Reports, including Corrections and Errata, can be found on the NRC's website: https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-specific-reports/fitz.html

5.10.5 <u>Laboratory cross-checks</u>

An external vendor performs analyses for gross beta and Nickel-63 (Ni-63) for NMP and participates in a quarterly crosscheck program. In the 4*th* Quarter of 2025, disagreements were identified between the results obtained by the vendor and the reference values for both gross beta and Ni-63. The gross beta crosscheck was supplied with a cover filter that was left on during analysis, which resulted in a lower result due to attenuation of beta emissions from the crosscheck sample. Following investigation, the vendor reanalyzed the sample with the cover filter removed and obtained a result that agreed with the reference value. As a corrective action, the vendor modified their procedure for analyzing these crosscheck samples to verify the absence of cover filters that could adversely affect results prior to analysis.

For the Ni-63 analysis, vendor personnel added more carrier to the sample than what was specified by the analysis method, which resulted in higher dilution of the crosscheck sample and a final result that was low in comparison to the reference value. Following investigation, the vendor performed calculations to account for this excess dilution, which demonstrated the final result would have agreed with the reference value had the correct dilution volume been used. As a corrective action, the vendor included a prompt in their analysis software for personnel to verify correct dilution volume prior to proceeding. These disagreements have been recorded in the Station's Corrective Action Program (CAP). All issues were not due to instrumentation failures.

6.0 NEI 07-07 ONSITE RADIOLOGICAL GROUNDWATER MONITORING PROGRAM

FitzPatrick has developed a Groundwater Protection Initiative (GPI) program in accordance with NEI 07-07, Industry Ground Water Protection Initiative – Final Guidance Document [9]. The purpose of the GPI is to ensure timely detection and an effective response to situations involving inadvertent radiological releases to groundwater in order to prevent migration of licensed radioactive material off-site and to quantify impacts on decommissioning. FitzPatrick Nuclear Power Plant has a total of 22 wells, (seven Background designated wells, two Mid-Field designated wells, two Perimeter designated wells, and eleven Source designated wells), and one Reactor Building Perimeter Drain Sump (RBPDS) (sampled as a Source designated sample point), that are sampled as part of the Radiological Groundwater Protection Program (RGPP). The RBPDS has historically been sampled weekly for tritium by site Chemistry per the ODCM and these results are also used for RGPP monitoring. During 2025, ABBREV collected and analyzed groundwater samples in accordance with the requirements of EN-JF-408-4160.

This section is included in this report to communicate results of NEI 07-07 Radiological Groundwater Monitoring Program. Monitoring wells installed as part of GPI program are sampled and analyzed as summarized in Table 3, Groundwater Protection Program Monitoring Well Sample Schedule. In addition to reporting results from NEI 07-07 monitoring wells, voluntary communications to offsite governmental agencies for onsite leaks or spills per NEI 07-07 Objective 2.2, are also reported as part of this report. It is important to note, samples and results taken in support of NEI 07-07 groundwater monitoring program are not part of the Radiological Environmental Monitoring Program (REMP) but should be reported as part of ARERR.

Table 3, Groundwater Protection Program Monitoring Well Sample Schedule

Well Name	Tritium	Gamma	HTD	Gross Alpha	Strontium
MW-1A MW-2A MW-3A MW-4A MW-4B MW-6 MW-7 MW-13 MW-14 MW-15 MW-16 RBPDS (Reactor Building Perimeter Drain Sump)	Quarterly	Every 2 years (Sampled in 2024)	Every 5 years (Sampled last in 2021) [1]	Every 2 years (Sampled in 2024)	Annually
MW-2B MW-3B	Semi-Annually	Every 2 years (Sampled in 2024)	Not Required	Not Required	Not Required
MW-1B MW-5 MW-8 MW-9 MW-10A MW-10B MW-19 MW-20 MW-21	Annually	Every 2 years (Sampled in 2024)	Not Required	Not Required	Not Required

[1] RBPDS sample was collected and analyzed in 2024 once added to the RGPP and will be collected on the same sampling frequency as the other samples going forward.

Radiological Groundwater Monitoring Program tritium results are summarized in Table 4, Groundwater Protection Program Monitoring Well Tritium Results.

Gamma-radionuclide analysis was most recently performed during the 2nd quarter 2024 RGPP sampling round. Gamma radionuclides were not detected at concentrations exceeding their respective LLDs in 2024.

The most recent hard-to-detects (Fe-55 and Ni-63) analyses were performed on samples collected from Source designated wells was in 2021. Hard-to-detects (Fe-55 and Ni-63) were not detected in the samples collected in 2021. The 3rd quarter 2024 sample collected from the RBPDS was analyzed for hard-to-detects (Fe-55 and Ni-63). Fe-55 and Ni-63 were not detected in the 3rd quarter RBPDS sample.

Gross-alpha analysis was most recently performed during the 1st quarter 2024 RGPP sampling round for the eleven Source designated monitoring wells, and 3rd quarter 2024 for the sample collected from the RBPDS. Gross-alpha (dissolved and suspended fractions) was not detected at concentrations greater than the established Alert Level in the samples collected in 2024.

Table 4, Groundwater Protection Program Monitoring Well Tritium Results

Well Name	Number of Positive Detections	Number of Analyses	Average Concentration[1] (pCi/L)	Maximum Concentration (pCi/L)
MW-1A	0	4	<LLD	<LLD
MW-1B	0	1	<LLD	<LLD
MW-2A	2	4	247	278
MW-2B	0	2	<LLD	<LLD
MW-3A	2	4	220	245
MW-3B	0	2	<LLD	<LLD
MW-4A	3	4	208	217
MW-4B	0	4	<LLD	<LLD
MW-5	1	1	199	199
MW-6	2	4	268	285
MW-7	0	4	<LLD	<LLD
MW-8	0	1	<LLD	<LLD
MW-9	0	1	<LLD	<LLD
MW-10A	0	1	<LLD	<LLD
MW-10B	0	1	<LLD	<LLD
MW-13	2	4	228	239
MW-14	0	4	<LLD	<LLD
MW-15	0	4	<LLD	<LLD

MW-16	1	4	330	330
MW-19	0	1	<LLD	<LLD
MW-20	0	1	<LLD	<LLD
MW-21	0	1	<LLD	<LLD
RBPDS	54	54	3704	6871

(Table 4 continued)

Sr-89 and Sr-90 analysis was performed on samples collected from Source designated wells and RBPDS during the 3rd quarter 2024 RGPP sampling round. No detections of Sr-89 and Sr-90 were reported in the samples collected during the 3rd quarter 2024 RGPP sampling round.

[1] Results <MDC are not included in the average concentration calculation.

6.1 Voluntary Notification

During 2025, James A FitzPatrick did not make any voluntary NEI 07-07 notifications to State/Local officials, NRC, and to other stakeholders required by site procedures.

7.0 BIBLIOGRAPHY

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[17] "Regulatory Guide 4.13 - Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry: Environmental Applications, Revision 2," Nuclear Regulatory Commision, June, 2019.

[18] "Regulatory Guide 4.15 - Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) -- Effluent Streams and the Environment," Nuclear Regulatory Commission, July, 2007.

Attachment 1, ARERR Release Summary Tables (RG-1.21 Tables)

**The following Tables utilize double asterisk to indicate concentrations lower than the limit of detection

I GASEOUS EFFLUENTS

Table 5, Gaseous Effluents Summation of All Releases JAF Unit 1 [5]

A.	Fission & Activation Gases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error %
1.	Total Release	Ci	2.16E+0	2.14E+0	3.42E+0	2.43E+0	≤2.50E+1
2.	Average release rate for the period	μCi/sec	2.78E-1	2.73E-1	4.30E-1	3.05E-1	
B.	**Iodine**						
1.	Total Iodine – 131	Ci	9.24E-6	1.68E-5	1.68E-5	1.81E-5	≤2.50E+1
2.	Average release rate for the period	μCi/sec	1.21E-6	2.14E-6	2.11E-6	2.28E-6	
C.	**Particulates**						
1.	Particulates with half-lives > 8 days	Ci	7.65E-7	1.18E-6	2.13E-5	**	≤3.60E+1
2.	Average release rate for the period	μCi/sec	9.84E-8	1.50E-7	2.68E-6	**	
D.	**Tritium**						
1.	Total Release	Ci	2.25E+0	1.87E+0	5.72E+0	2.97E+0	≤2.50E+1
2.	Average release rate for the period	μCi/sec	2.89E-1	2.38E-1	7.19E-1	3.73E-1	
E.	**Gross Alpha**						
1.	Total Release	Ci	2.95E-7	1.06E-7	2.28E-7	1.39E-7	≤2.50E+1
2.	Average release rate for the period	μCi/sec	3.79E-8	1.35E-8	2.86E-8	1.75E-8	
F.	**Carbon-14**						
1.	Total Release	Ci	2.67E+0	2.69E+0	2.72E+0	2.73E+0	
2.	Average release rate for the period	μCi/sec	3.44E-1	3.44E-1	3.44E-1	3.44E-1	

[5] % of limit is provided in Table 1, James A FitzPatrick Unit 1 Dose Summary

Table 6, Gaseous Effluents – Ground Level Release Batch Mode JAF Unit 1

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission Gases						
Ar-41	Ci	**	**	**	**	**
Kr-85	Ci	**	**	**	**	**
Kr-85m	Ci	**	**	**	**	**
Kr-87	Ci	**	**	**	**	**
Kr-88	Ci	**	**	**	**	**
Xe-133	Ci	2.25E-2	1.45E-2	3.78E-3	2.62E-3	4.34E-2
Xe-135	Ci	2.26E-2	2.03E-2	2.84E-3	3.45E-3	4.92E-2
Xe-135m	Ci	1.86E-3	3.20E-3	**	**	5.06E-3
Xe-138	Ci	**	**	**	**	**
Total for Period	**Ci**	**4.70E-2**	**3.81E-2**	**6.62E-3**	**6.06E-3**	**9.77E-2**
Iodines						
I-131	Ci	**	**	2.42E-12	4.48E-12	6.90E-12
I-133	Ci	**	**	**	**	**
I-135	Ci	**	**	**	**	**
Total for Period	**Ci**	**	**	**2.42E-12**	**4.48E-12**	**6.90E-12**
Particulates						
Co-58	Ci	**	**	**	**	**
Co-60	Ci	**	**	**	**	**
Sr-89	Ci	**	**	**	**	**
Sr-90	Ci	**	**	**	**	**
Cs-134	Ci	**	**	**	**	**
Mn-54	Ci	**	1.68E-12	2.02E-12	**	3.70E-12
Gross Beta	Ci	**	4.47E-11	1.86E-11	**	6.34E-11
Total for Period	**Ci**	**	**4.64E-11**	**2.07E-11**	**	**6.71E-11**
Tritium						
H-3	Ci	**	**	**	**	**
Gross Alpha						
Alpha	Ci	**	**	**	**	**
Carbon-14						
C-14	Ci	**	**	**	**	**

Table 7, Gaseous Effluents – Ground Level Release Continuous Mode JAF Unit 1

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission Gases						
Ar-41	Ci	**	**	**	**	**
Kr-85	Ci	**	**	**	**	**
Kr-85m	Ci	**	**	**	**	**
Kr-87	Ci	**	**	**	**	**
Kr-88	Ci	**	**	**	**	**
Xe-133	Ci	**	**	**	**	**
Xe-135	Ci	**	**	**	**	**
Xe-135m	Ci	**	**	**	**	**
Xe-138	Ci	**	**	**	**	**
Total for Period	**Ci**	**	**	**	**	**
Iodines						
I-131	Ci	**	**	2.60E-6	4.00E-6	6.60E-6
I-133	Ci	8.72E-6	2.45E-5	3.89E-5	7.41E-5	1.46E-4
I-135	Ci	**	**	**	**	**
Total for Period	**Ci**	**8.72E-6**	**2.45E-5**	**4.15E-5**	**7.81E-5**	**1.53E-4**
Particulates						
Co-58	Ci	**	**	2.60E-7	**	2.60E-7
Co-60	Ci	**	**	**	**	**
Sr-89	Ci	**	**	**	**	**
Sr-90	Ci	**	**	**	**	**
Cs-134	Ci	**	**	**	**	**
Mn-54	Ci	**	**	1.98E-5	**	1.98E-5
Zn-65		**	**	**	**	**
Total for Period	**Ci**	**	**	**2.01E-5**	**	**2.01E-5**
Tritium						
H-3	Ci	2.06E+0	1.73E+0	5.47E+0	2.73E+0	1.20E+1
Gross Alpha						
Alpha	Ci	2.77E-7	9.69E-8	2.10E-7	1.13E-7	6.98E-7
Carbon-14						
C-14	Ci	**	**	**	**	**

Table 8, Gaseous Effluents – Elevated Level Release Batch Mode JAF Unit 1

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission Gases						
Ar-41	Ci	**	**	**	**	**
Kr-85	Ci	**	**	**	**	**
Kr-85m	Ci	**	**	**	**	**
Kr-87	Ci	**	**	**	**	**
Kr-88	Ci	**	**	**	**	**
Xe-133	Ci	**	**	**	**	**
Xe-135	Ci	**	**	**	**	**
Xe-135m	Ci	**	**	**	**	**
Xe-138	Ci	**	**	**	**	**
Total for Period	**Ci**	**	**	**	**	**
Iodines						
I-131	Ci	**	**	**	**	**
I-133	Ci	**	**	**	**	**
I-135	Ci	**	**	**	**	**
Total for Period	**Ci**	**	**	**	**	**
Particulates						
Co-58	Ci	**	**	**	**	**
Co-60	Ci	**	**	**	**	**
Sr-89	Ci	**	**	**	**	**
Sr-90	Ci	**	**	**	**	**
Cs-134	Ci	**	**	**	**	**
Total for Period	**Ci**	**	**	**	**	**
Tritium						
H-3	Ci	**	**	**	**	**
Gross Alpha						
Alpha	Ci	**	**	**	**	**
Carbon-14						
C-14	Ci	**	**	**	**	**

Table 9, Gaseous Effluents – Elevated Level Release Continuous Mode JAF Unit 1

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission Gases						
Ar-41	Ci	2.11E+0	2.09E+0	2.77E+0	1.88E+0	8.86E+0
Kr-85	Ci	**	**	**	**	**
Kr-85m	Ci	**	1.55E-2	5.20E-1	2.30E-1	7.66E-1
Kr-87	Ci	**	**	**	**	**
Kr-88	Ci	**	**	1.26E-1	3.07E-1	4.33E-1
Xe-133	Ci	**	**	**	**	**
Xe-135	Ci	**	**	**	**	**
Xe-135m	Ci	**	**	**	**	**
Xe-138	Ci	**	**	**	**	**
Total for Period	**Ci**	**2.11E+0**	**2.11E+0**	**3.41E+0**	**2.42E+0**	**1.01E+1**
Iodines						
I-131	Ci	9.24E-6	1.68E-5	1.42E-5	1.41E-5	5.43E-5
I-133	Ci	3.65E-5	3.99E-5	4.59E-5	3.66E-5	1.59E-4
I-135	Ci	**	**	**	**	**
Total for Period	**Ci**	**4.57E-5**	**5.67E-5**	**6.01E-5**	**5.06E-5**	**2.13E-4**
Particulates						
Co-58	Ci	**	**	**	**	**
Co-60	Ci	**	**	**	**	**
Sr-89	Ci	7.65E-7	1.18E-6	1.22E-6	**	3.16E-6
Sr-90	Ci	**	**	**	**	**
Cs-134	Ci	**	**	**	**	**
Cr-51	Ci	**	**	**	**	**
Mn-54	Ci	**	**	**	**	**
Fe-59	Ci	**	**	**	**	**
Zn-65	Ci	**	**	**	**	**
Total for Period	**Ci**	**7.65E-7**	**1.18E-6**	**1.22E-6**	**	**3.16E-6**
Tritium						
H-3	Ci	1.90E-1	1.44E-1	2.44E-1	2.40E-1	8.17E-1
Gross Alpha						
Alpha	Ci	1.81E-8	9.01E-9	1.62E-8	2.62E-8	6.95E-8
Carbon-14						
C-14	Ci	**	**	**	**	**

II LIQUID EFFLUENTS

Table 10, Liquid Effluents – Summation of All Releases JAF Unit 1 [6]

A.	Fission & Activation Products	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error %
1.	Total Release	Ci	**	**	5.89E-5	**	NA
2.	Average diluted concentration	µCi/mL	**	**	2.38E-10	**	
B.	Tritium						
1.	Total Release	Ci	1.26E-2	1.49E-2	1.77E-2	1.73E-2	≤2.50E+1
2.	Average diluted concentration	µCi/mL	3.01E-6	2.47E-8	7.15E-8	4.25E-6	
C.	Dissolved & Entrained Gases						
1.	Total Release	Ci	**	**	**	**	NA
2.	Average diluted concentration	µCi/mL	**	**	**	**	
D.	Gross Alpha Activity						
1.	Total Release	Ci	**	**	**	**	NA
E.	Volume of Waste Released (prior to dilution)	Liters	4.17E+6	4.48E+6	3.77E+6	4.07E+6	
F.	Volume of Dilution Water Used During Period	Liters	**	5.97E+8	2.44E+8	**	

[6] % of limit is provided in Table 1, James A FitzPatrick Unit 1 Dose Summary

Table 11, Batch Mode Liquid Effluents Canal JAF Unit 1

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
Cr-51	Ci	**	**	**	**	**
Mn-54	Ci	**	**	**	**	**
Fe-55	Ci	**	**	**	**	**
Fe-59	Ci	**	**	**	**	**
Co-57	Ci	**	**	**	**	**
Co-58	Ci	**	**	**	**	**
Co-60	Ci	**	**	**	**	**
Sr-89	Ci	**	**	**	**	**
Sr-90	Ci	**	**	**	**	**
Nb-95	Ci	**	**	**	**	**
Zn-65	Ci	**	**	**	**	**
Ag-110m	Ci	**	**	**	**	**
I-131	Ci	**	**	**	**	**
I-133	Ci	**	**	**	**	**
Cs-134	Ci	**	**	**	**	**
Cs-137	Ci	**	**	**	**	**
(List Others)	Ci	**	**	**	**	**
Total for Period	Ci	**	**	**	**	**
Tritium						
H-3	Ci	**	**1.75E-3**	**1.84E-3**	**	**3.59E-3**
Gross Alpha						
Alpha	Ci	**	**	**	**	**
Entrained Gases						
Xe-133	Ci	**	**	**	**	**
Xe-135	Ci	**	**	**	**	**
(List Others)	Ci	**	**	**	**	**
Total for Period	Ci	**	**	**	**	**

Table 12, Batch Mode Liquid Effluents Non-Canal JAF Unit 1

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
Cr-51	Ci	**	**	**	**	**
Mn-54	Ci	**	**	**	**	**
Fe-55	Ci	**	**	**	**	**
Fe-59	Ci	**	**	**	**	**
Co-57	Ci	**	**	**	**	**
Co-58	Ci	**	**	**	**	**
Co-60	Ci	**	**	**	**	**
Sr-89	Ci	**	**	**	**	**
Sr-90	Ci	**	**	**	**	**
Nb-95	Ci	**	**	**	**	**
Zn-65	Ci	**	**	**	**	**
Ag-110m	Ci	**	**	**	**	**
I-131	Ci	**	**	**	**	**
I-133	Ci	**	**	**	**	**
Cs-134	Ci	**	**	**	**	**
Cs-137	Ci	**	**	**	**	**
Gross Beta	Ci	**	**	5.89E-5	**	**
Total for Period	Ci	**	**	**5.89E-5**	**	**
Tritium						
H-3	Ci	**1.10E-4**	**6.59E-4**	**6.90E-4**	**2.49E-4**	**1.71E-3**
Gross Alpha						
Alpha	Ci	**	**	**	**	**
Entrained Gases						
Xe-133	Ci	**	**	**	**	**
Xe-135	Ci	**	**	**	**	**
(List Others)	Ci	**	**	**	**	**
Total for Period	Ci	**	**	**	**	**

Table 13, Continuous Mode Liquid Effluents Canal JAF Unit 1

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
Cr-51	Ci	**	**	**	**	**
Mn-54	Ci	**	**	**	**	**
Fe-55	Ci	**	**	**	**	**
Fe-59	Ci	**	**	**	**	**
Co-57	Ci	**	**	**	**	**
Co-58	Ci	**	**	**	**	**
Co-60	Ci	**	**	**	**	**
Sr-89	Ci	**	**	**	**	**
Sr-90	Ci	**	**	**	**	**
Nb-95	Ci	**	**	**	**	**
Zn-65	Ci	**	**	**	**	**
Ag-110m	Ci	**	**	**	**	**
I-131	Ci	**	**	**	**	**
I-133	Ci	**	**	**	**	**
Cs-134	Ci	**	**	**	**	**
Cs-137	Ci	**	**	**	**	**
(List Others)	Ci	**	**	**	**	**
Total for Period	Ci	**	**	**	**	**
Tritium						
H-3	Ci	**	**	**	**	**
Gross Alpha						
Alpha	Ci	**	**	**	**	**
Entrained Gases						
Xe-133	Ci	**	**	**	**	**
Xe-135	Ci	**	**	**	**	**
(List Others)	Ci	**	**	**	**	**
Total for Period	Ci	**	**	**	**	**

Table 14, Continuous Mode Liquid Effluents Non-Canal JAF Unit 1

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
Cr-51	Ci	**	**	**	**	**
Mn-54	Ci	**	**	**	**	**
Fe-55	Ci	**	**	**	**	**
Fe-59	Ci	**	**	**	**	**
Co-57	Ci	**	**	**	**	**
Co-58	Ci	**	**	**	**	**
Co-60	Ci	**	**	**	**	**
Sr-89	Ci	**	**	**	**	**
Sr-90	Ci	**	**	**	**	**
Nb-95	Ci	**	**	**	**	**
Zn-65	Ci	**	**	**	**	**
Ag-110m	Ci	**	**	**	**	**
I-131	Ci	**	**	**	**	**
I-133	Ci	**	**	**	**	**
Cs-134	Ci	**	**	**	**	**
Cs-137	Ci	**	**	**	**	**
(List Others)	Ci	**	**	**	**	**
Total for Period	Ci	**	**	**	**	**
Tritium						
H-3	Ci	1.24E-2	1.24E-2	1.52E-2	1.70E-2	5.71E-2
Gross Alpha						
Alpha	Ci	**	**	**	**	**
Entrained Gases						
Xe-133	Ci	**	**	**	**	**
Xe-135	Ci	**	**	**	**	**
(List Others)	Ci	**	**	**	**	**
Total for Period	Ci	**	**	**	**	**

Attachment 2, Solid Waste Information

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream
During Period From: 01/01/2025 to 12/31/2025

5.0 **Resins, Filters, And Evaporator Bottoms**			
6.0 **Waste**	7.0 **Volume**		8.0 **Curies**
9.0 **Class**	10.0 **ft³**	**m³**	11.0 **Shipped**
12.0 A	13.0 1.34E+03	14.0 3.81E+01	15.0 4.89E+01
16.0 B	17.0 1.75E+02	18.0 4.96E+00	19.0 2.64E+01
20.0 C	21.0 0.00E+00	22.0 0.00E+00	23.0 0.00E+00
24.0 Unclassified	25.0 0.00E+00	26.0 0.00E+00	27.0 0.00E+00
28.0 All	29.0 1.52E+03	30.0 4.30E+01	31.0 7.53E+01

32.0 Major Nuclides for the Above Table:
33.0 H-3, C-14, Cr-51, Mn-54, Fe-55, Fe-59, Co-60, Ni-59, Ni-63, Zn-65, Sr-90, Tc-99, Ru-106, Sb-125, I-129,
34.0 Cs-134, Cs-137, Pu-238, Pu-239, Pu-241, Am-241, Cm-242, Cm-243, Cm-244

35.0 **Dry Active Waste (DAW)**			
36.0 **Waste**	37.0 **Volume**		38.0 **Curies**
39.0 **Class**	40.0 **ft³**	**m³**	41.0 **Shipped**
42.0 A	43.0 8.50E+03	44.0 2.41E+02	45.0 1.29E-01
46.0 B	47.0 0.00E+00	48.0 0.00E+00	49.0 0.00E+00
50.0 C	51.0 0.00E+00	52.0 0.00E+00	53.0 0.00E+00
54.0 Unclassified	55.0 0.00E+00	56.0 0.00E+00	57.0 0.00E+00
58.0 **All**	59.0 8.50E+03	60.0 2.41E+02	61.0 1.29E-01

62.0 Major Nuclides for the Above Table:
63.0 H-3, C-14, Cr-51, Mn-54, Fe-55, Fe-59, Co-58, Co-60, Ni-63, Zn-65, Tc-99, I-129, Cs-137, Hf-181

64.0 **Irradiated Components**			65.0
66.0 **Waste**	67.0 **Volume**		68.0 **Curies**
69.0 **Class**	70.0 **ft³**	**m³**	71.0 **Shipped**
72.0 A	73.0 0.00E+00	74.0 0.00E+00	75.0 0.00E+00
76.0 B	77.0 0.00E+00	78.0 0.00E+00	79.0 0.00E+00
80.0 C	81.0 0.00E+00	82.0 0.00E+00	83.0 0.00E+00

84.0 Unclassified	85.0 0.00E+00	86.0 0.00E+00	87.0 0.00E+00
88.0 **All**	89.0 0.00E+00	90.0 0.00E+00	91.0 0.00E+00
92.0 Major Nuclides for the Above Table: 93.0			

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream
During Period From: 01/01/2025 to 12/31/2025

94.0 **Other Waste**			
95.0 **Waste** 98.0 **Class**	96.0 **Volume** 99.0 **ft³**	**m³**	97.0 **Curies** 100.0 **Shipped**
101.0 A	102.0 2.58E+03	103.0 7.31E+01	104.0 3.65E+01
105.0 B	106.0 0.00E+00	107.0 0.00E+00	108.0 0.00E+00
109.0 C	110.0 0.00E+00	111.0 0.00E+00	112.0 0.00E+00
113.0 Unclassified	114.0 0.00E+00	115.0 0.00E+00	116.0 0.00E+00
117.0 **All**	118.0 2.58E+03	119.0 7.31E+01	120.0 3.65E+01
121.0 Major Nuclides for the Above Table: 122.0 H-3, C-14, Cr-51, Mn-54, Fe-55, Fe-59, Co-58, Co-60, Ni-63, Zn-65, Tc-99, Sb-125, I-129, Cs-137, Hf-181, 123.0 Pu-239			

124.0 **Sum Of All Low-Level Waste Shipped From Site**			
125.0 **Waste** 128.0 **Class**	126.0 **Volume** 129.0 **ft³**	**m³**	127.0 **Curies** 130.0 **Shipped**
131.0 A	132.0 1.24E+04	133.0 3.52E+02	134.0 8.55E+01
135.0 B	136.0 1.75E+02	137.0 4.96E+00	138.0 2.64E+01
139.0 C	140.0 0.00E+00	141.0 0.00E+00	142.0 0.00E+00
143.0 Unclassified	144.0 0.00E+00	145.0 0.00E+00	146.0 0.00E+00
147.0 **All**	148.0 1.26E+04	149.0 3.57E+02	150.0 1.12E+02
151.0 Major Nuclides for the Above Table: 152.0 H-3, C-14, Cr-51, Mn-54, Fe-55, Fe-59, Co-58, Co-60, Ni-59, Ni-63, Zn-65, Sr-90, Tc-99, Ru-106, Sb-125, 153.0 I-129, Cs-134, Cs-137, Hf-181, Pu-238, Pu-239, Pu-241, Am-241, Cm-242, Cm-243, Cm-244			

A. NRC Regulatory Guide 1.21 Activity Report

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Shipment, Package, and Category
During Period From: 01/01/2025 to 12/31/2025 Percent Cutoff: 1.0%

Dry Active Waste

Waste Class A

Nuclide Name	Abundance	Activity (Ci)
Cr-51	4.45%	5.74E-03
Mn-54	40.93%	5.28E-02
Fe-55	22.51%	2.90E-02
Fe-59	4.86%	6.27E-03
Co-58	1.21%	1.56E-03
Co-60	18.23%	2.35E-02
Ni-63	1.58%	2.04E-03
Zn-65	3.77%	4.86E-03
Hf-181	1.4%	1.81E-03

Total Combined

Nuclide Name	Abundance	Activity (Ci)
Cr-51	4.45%	5.74E-03
Mn-54	40.93%	5.28E-02
Fe-55	22.51%	2.90E-02
Fe-59	4.86%	6.27E-03
Co-58	1.21%	1.56E-03
Co-60	18.23%	2.35E-02
Ni-63	1.58%	2.04E-03
Zn-65	3.77%	4.86E-03
Hf-181	1.4%	1.81E-03

B. NRC Regulatory Guide 1.21 Activity Report

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Shipment, Package, and Category
During Period From: 01/01/2025 to 12/31/2025 Percent Cutoff: 1.0%

Other Waste			
Waste Class A			
	Nuclide Name	**Abundance**	**Activity (Ci)**
	Mn-54	12.72%	4.64E+00
	Fe-55	25.72%	9.39E+00
	Co-60	32.22%	1.18E+01
	Zn-65	26.28%	9.59E+00
	Sb-125	1.12%	4.08E-01
Total Combined			
	Nuclide Name	**Abundance**	**Activity (Ci)**
	Mn-54	12.72%	4.64E+00
	Fe-55	25.72%	9.39E+00
	Co-60	32.22%	1.18E+01
	Zn-65	26.28%	9.59E+00
	Sb-125	1.12%	4.08E-01

C. NRC Regulatory Guide 1.21 Activity Report

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Shipment, Package, and Category
During Period From: 01/01/2025 to 12/31/2025 Percent Cutoff: 1.0%

Resins, Filters, and Evap Bottoms

Waste Class A

Nuclide Name	Abundance	Activity (Ci)
Mn-54	4.43%	2.17E+00
Fe-55	31.44%	1.54E+01
Co-60	34.33%	1.68E+01
Ni-63	9.5%	4.65E+00
Zn-65	10.99%	5.37E+00
Cs-137	8.06%	3.94E+00

Waste Class B

Nuclide Name	Abundance	Activity (Ci)
Fe-55	11.62%	3.07E+00
Co-60	26.25%	6.94E+00
Ni-63	28.07%	7.42E+00
Sr-90	3.09%	8.17E-01
Cs-137	30.73%	8.12E+00

Total Combined

Nuclide Name	Abundance	Activity (Ci)
Mn-54	2.88%	2.17E+00
Fe-55	24.48%	1.84E+01
Co-60	31.49%	2.37E+01
Ni-63	16.02%	1.21E+01
Zn-65	7.13%	5.37E+00
Sr-90	1.1%	8.25E-01
Cs-137	16.01%	1.21E+01

D. NRC Regulatory Guide 1.21 Activity Report

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Shipment, Package, and Category

During Period From: 01/01/2025 to 12/31/2025 Percent Cutoff: 1.0%

Sum of All 4 Categories		
Waste Class A		
Nuclide Name	**Abundance**	**Activity (Ci)**
Mn-54	8.03%	6.86E+00
Fe-55	28.99%	2.48E+01
Co-60	33.41%	2.86E+01
Ni-63	5.73%	4.90E+00
Zn-65	17.5%	1.50E+01
Cs-137	4.95%	4.23E+00
Waste Class B		
Nuclide Name	**Abundance**	**Activity (Ci)**
Fe-55	11.62%	3.07E+00
Co-60	26.25%	6.94E+00
Ni-63	28.07%	7.42E+00
Sr-90	3.09%	8.17E-01
Cs-137	30.73%	8.12E+00
Total Combined		
Nuclide Name	**Abundance**	**Activity (Ci)**
Mn-54	6.13%	6.86E+00
Fe-55	24.88%	2.79E+01
Co-60	31.71%	3.55E+01
Ni-63	11.01%	1.23E+01
Zn-65	13.37%	1.50E+01
Cs-137	11.04%	1.24E+01

Total Shipments by Carrier

Number of Shipments per each carrier

Number of Shipments	Mode of Transportation	Destination
11	Hittman Transport Services	Energy Solutions Services Inc. - Bear Creek 1560 Bear Creek Road
6	Hittman Transport Services	EnergySolutions LLC. Clive Disposal Site - Bulk Waste Facility
4	Hittman Transport Services	EnergySolutions LLC. Clive Disposal Site - Containerized Waste Facility
1	Hittman Transport Services	Waste Control Specialists, LLC Compact Waste Disposal Facility
1	NAC Philotechnics, Ltd.	NAC Philotechnics, Ltd. 201 Renovare Blvd.

Solid Waste Shipped Offsite for Disposal

During Period from: 1/1/2025 to 12/31/2025

Shipment Date	Manifest ID	Destination	Package Name	Category Name	NRC Class	DOT Type
1/31/2025	1074-C-0022	EnergySolutions LLC.	PO709888-6	Resins, Filters, and Evap Bottoms	A	Type A
2/19/2025	JAF-2025-1964	Energy Solutions Services Inc. - Bear Creek	ESUU200587	Dry Active Waste	A	A LSA-II
			ESUU200590	Dry Active Waste	A	A LSA-II
3/6/2025	JAF-2025-1965	Energy Solutions Services Inc. - Bear Creek	ESUU300510	Dry Active Waste	A	A LSA-II
5/5/2025	1074-09-0051	EnergySolutions LLC.	PO711397-28	Resins, Filters, and Evap Bottoms	A	Type A
5/7/2025	JAF-2025-1967	Energy Solutions Services Inc. - Bear Creek	120L 24016	Resins, Filters, and Evap Bottoms	A	Type A
5/12/2025	JAF-2025-1968	Energy Solutions Services Inc. - Bear Creek	120L 24017	Resins, Filters, and Evap Bottoms	A	A LSA-II
5/14/2025	1074-C-0023	EnergySolutions LLC.	PO696570-5	Resins, Filters, and Evap Bottoms	A	Type A
5/28/2025	JAF-2025-1970	Energy Solutions Services Inc. - Bear Creek	120L 24018	Resins, Filters, and Evap Bottoms	A	Type A
6/2/2025	JAF-2025-1971	Energy Solutions Services Inc. - Bear Creek	GAC B	Other Waste	A	Type A
			GAC D	Other Waste	A	Type A
			GAC C	Other Waste	A	Type A
			GAC A	Other Waste	A	Type A
			1560-024-AP	Resins, Filters, and Evap Bottoms	A	Type A
6/4/2025	JAF-2025-1972	Energy Solutions Services Inc. - Bear Creek	GAC 7	Other Waste	A	Type A

Solid Waste Shipped Offsite for Disposal

During Period from: 1/1/2025 to 12/31/2025

			1560-024-AQ	Resins, Filters, and Evap Bottoms	A	Type A
			GAC 4	Other Waste	A	Type A
			GAC 1	Other Waste	A	Type A
			GAC 2	Other Waste	A	Type A
6/9/2025	1074-C-0024	EnergySolutions LLC.	PO711397-35	Resins, Filters, and Evap Bottoms	A	Type A
6/11/2025	1074-C-0025	EnergySolutions LLC.	MHF 4269-004	Resins, Filters, and Evap Bottoms	A	Type A
6/23/2025	1074-02-0013	EnergySolutions LLC.	PO711398-4	Resins, Filters, and Evap Bottoms	A	Type A
6/25/2025	1074-02-0014	EnergySolutions LLC.	PO708125-28	Resins, Filters, and Evap Bottoms	A	Type A
7/16/2025	JAF-2025-1977	Energy Solutions Services Inc. - Bear Creek	ESUU500029	Dry Active Waste	A	A LSA-II
8/11/2025	JAF-2025-1980	Energy Solutions Services Inc. - Bear Creek	ESUU200543	Dry Active Waste	A	A LSA-II
			ESUU200506	Dry Active Waste	A	A LSA-II
9/9/2025	0003-111025WCS	NAC Philotechnics, Ltd.	2025-050 ALL	Other Waste	A	Limited Quantity
9/11/2025	1074-02-0015	EnergySolutions LLC.	ESUU300745	Other Waste	A	Type A
9/23/2025	1074-03-0001	EnergySolutions LLC.	ESUU200936	Other Waste	A	A LSA-II
9/23/2025	1074-03-0002	EnergySolutions LLC.	ESUU200829	Other Waste	A	A LSA-II
10/28/2025	JAF-2025-1983	Energy Solutions Services Inc. - Bear Creek	ESUU600126	Other Waste	A	A LSA-II
10/30/2025	JAF-2025-1982	Waste Control Specialists, LLC	L502348-79	Resins, Filters, and Evap Bottoms	B	>A LSA-II

Solid Waste Shipped Offsite for Disposal During Period from: 1/1/2025 to 12/31/2025

12/17/2025	JAF-2025-1985	Energy Solutions Services Inc. - Bear Creek	200336	Dry Active Waste	A	A LSA-II
			ESUU200644	Dry Active Waste	A	A LSA-II