

LG-26-053

April 30, 2026

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Limerick Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352, 50-353, and 72-065

Subject: Annual Radioactive Effluent Release Report No. 51

The attachment to this letter satisfies the requirements of Section 6.9.1.8 of the Limerick Generating Station (LGS) Technical Specifications (TS) and Section 6.2 of the Offsite Dose Calculation Manual (ODCM). Attachment 1 is the 2025 Limerick Generating Station Annual Radioactive Effluent Release Report No. 51 Section 6.14.1.c of the LGS TS requires a copy of the ODCM to be submitted with the Annual Radioactive Effluent Release Report if the ODCM was revised during the period. There were no ODCM revisions from January 1, 2025, to December 31, 2025.

LGS has reviewed the Dosimeter of Legal Record (DLR) data for the nearest residence from the Independent Spent Fuel Storage Installation (ISFSI) modules currently loaded. In 2025, there was no facility-related dose to the nearest resident from the ISFSI.

There are no commitments contained in this letter.

If you have any questions or require additional information, please contact Andrew Kelliher at 267-533-5181.

Respectfully,



Martin A. Bonifanti
Site Vice President – Limerick Generating Station
Constellation Energy Generation, LLC

LG-26-053

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Attachment 1: 2025 Limerick Generating Station Annual Radioactive Effluent Release Report
No. 51

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Annual Radioactive Effluent Release Report 2025

Document Number: 51

Docket Nos. 50-352 and 50-353 and 72-065

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Company: Constellation

Plant: Limerick Generating Station

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. D/Q: The relative deposition factor (m^{-2}).
9. GI-Lil: Gastro intestinal lower lining
10. Grab Sample: A single discrete sample drawn at one point in time.
11. Indicator: A sampling location that is potentially affected by plant effluents due to its proximity and/or direction from the plant.
12. 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.
13. ISFSI: Independent Spent Fuel Storage Installation
14. 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.
15. LPM: Liter per minute.
16. 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.
17. MDC: Minimum Detectable Concentration. Essentially synonymous with MDA for the purposes of radiological monitoring.

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18. Mean: The sum of all the values in a distribution divided by the number of values in the distribution, synonymous with average.
19. Microcurie (μCi): 3.7×10^4 disintegrations per second, or 2.22×10^6 disintegrations per minute.
20. millirad (mrad): 1/1000 rad; a unit of radiation absorbed dose.
21. millirem (mrem): 1/1000 rem; a unit of radiation dose equivalent in tissue.
22. Milliroentgen (mR): 1/1000 Roentgen; a unit of exposure to X-ray or gamma radiation.
23. N/A: Not Applicable
24. ND: None Detected
25. NEI: Nuclear Energy Institute
26. NRC: Nuclear Regulatory Commission
27. ODCM: Offsite Dose Calculation Manual
28. OSLD: Optically Stimulated Luminescence Dosimeter
29. 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.
30. PWR: Pressurized Water Reactor
31. REC: Radiological Effluent Control
32. REMP: Radiological Environmental Monitoring Program
33. Restricted Area: A 10 CFR 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.
34. 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).
35. TLD: Thermoluminescent Dosimeter
36. TRM: Technical Requirements Manual
37. TS: Technical Specification
38. Unrestricted Area: An area, access to which is neither limited nor controlled by the licensee.
39. X/Q: The relative effluent concentration without plume depletion (sec/m^3).

2.0 EXECUTIVE SUMMARY

Limerick Generating Station (LGS) 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 40 CFR 190. Operational doses to the public during 2025 were calculated and found to be within the limits required by these regulations. 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 Limerick Generating Station is the Child GI-LI. This is due to the pathways of Inhalation, Ground Plane, and Vegetation located at the Vegetation location. The maximum Annual Organ Dose calculated for this receptor was 1.58E-0 mrem to the GI-LI of a child.

The maximum dose calculated to any organ due to radioactive liquid effluents was 2.83E-02 mrem, to the liver of the teenager age group, due to ingestion of fish and standing on contaminated sediment at the LGS Outfall.

The TLD at the 13E1 location (22,772 feet SE from site) had an abnormal reading with a direct radiation dose of 12.20 mrem. This was considered to be anomalous due to the distance from site and that no other TLDs had a positive result. However, this dose result was included to determine 40CFR190 limits compliance. This event was recorded in the company's corrective action program.

In 2025, LGS shipped offsite 52 shipments of solid radioactive waste for processing or direct disposal that had a total volume of 8.14E+02 m³ and 5.15E+02 Ci of radioactivity.

In addition to monitoring radioactive effluents, LGS has 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 Limerick Generating Station were well below regulatory limits, as summarized in Table 1 and Table 2.

Table 1, Limerick Generating Station Site Dose Summary¹

		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Liquid Effluents						
	Limit	3 mrem	3 mrem	3 mrem	3 mrem	6 mrem
	Total Body Dose	N/A	1.56E-03	6.22E-03	1.30E-02	2.08E-02
	% Of Limit	N/A	0.052	0.207	0.433	0.346
	Limit	10 mrem	10 mrem	10 mrem	10 mrem	20 mrem
	Maximum Organ Dose	N/A	1.84E-03	9.07E-03	1.75E-02	2.83E-02
	% Of Limit	N/A	0.018	0.091	0.175	0.142
Gaseous Effluents						
	Limit	10 mrad	10 mrad	10 mrad	10 mrad	20 mrad
	Gamma Air Dose	7.87E-05	1.42E-04	1.68E-04	2.00E-03	2.39E-03
	% Of Limit	0.001	0.001	0.002	0.020	0.012
	Limit	20 mrad	20 mrad	20 mrad	20 mrad	40 mrad
	Beta Air Dose	4.80E-05	8.26E-05	9.75E-05	1.16E-03	1.38E-03
	% Of Limit	<0.001	<0.001	<0.001	0.006	0.003
	Limit	5 mrem	5 mrem	5 mrem	5 mrem	10 mrem
	NG Total Body Dose	7.43E-05	1.36E-04	1.61E-04	1.91E-03	2.28E-03
	% Of Limit	0.001	0.003	0.003	0.038	0.023
	Limit	15 mrem	15 mrem	15 mrem	15 mrem	30 mrem
	NG Skin Dose	1.22E-04	2.26E-04	2.67E-04	3.17E-03	3.79E-03
	% Of Limit	0.001	0.002	0.002	0.021	0.013
	Limit	15 mrem	15 mrem	15 mrem	15 mrem	30 mrem
	Maximum Organ Dose	3.62E-04	7.02E-04	3.58E-04	2.59E-04	1.58E-03
	% Of Limit	0.002	0.005	0.002	0.002	0.005

¹ Table 1 demonstrates compliance with 10 CFR Part 50, App. I Limits. Carbon-14 dose is not included in this table.

Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS¹

	Whole Body	Thyroid	Max Other Organ
Limit	25 mrem	75 mrem	25 mrem
Gaseous - Noble Gas	2.28E-03	2.28E-03	3.79E-03
Gaseous - Particulates & Iodine	1.57E-03	1.55E-03	1.58E-03
Carbon-14	2.25E-01	2.25E-01	1.13E+00
Liquid	2.08E-02	8.61E-03	2.83E-02
Direct Shine ²	12.2	12.2	12.2
Total Site Dose	2.50E-01	2.37E-01	1.16
Nearby Facility	2.32E-02	1.30E-03	3.21E-02
Total w/Other Nearby Facility³	2.73E-01	2.39E-01	1.20
% of Limit⁴	1.09%	0.32	4.8%

¹ Table 2 is a summation of Units to show compliance with 40 CFR Part 190 Limits.

² Dose from 13E1 (22,772 feet SE of site) monitoring location, due to distance from site and historical data trending, this data is believed to be anomalous, but it was included as a conservative effort and trending purposes. Not added to calculations.

³ Other fuel cycle sources within 5 miles of the site are considered in this analysis.

⁴ % of limit including dose from 13E1: Whole body: 49.88%, Thyroid: 16.59%, Max other organ: 53.56%

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.

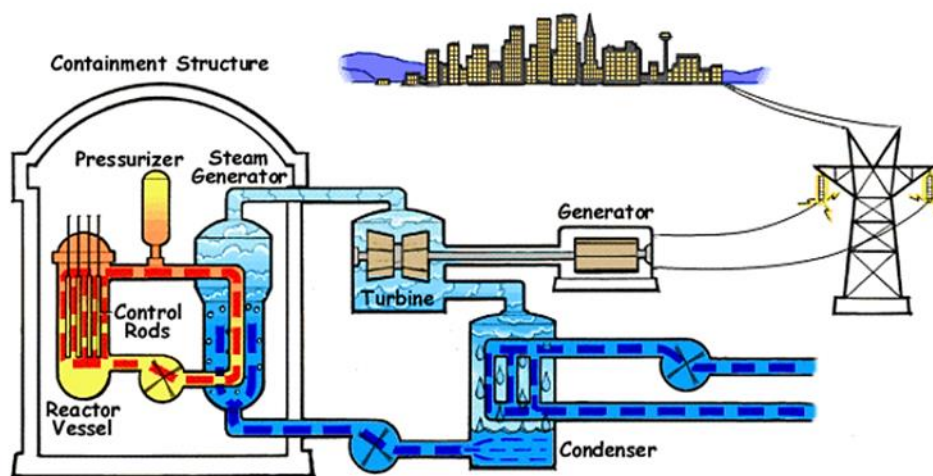


Figure 1, Pressurized Water Reactor (PWR) [1]

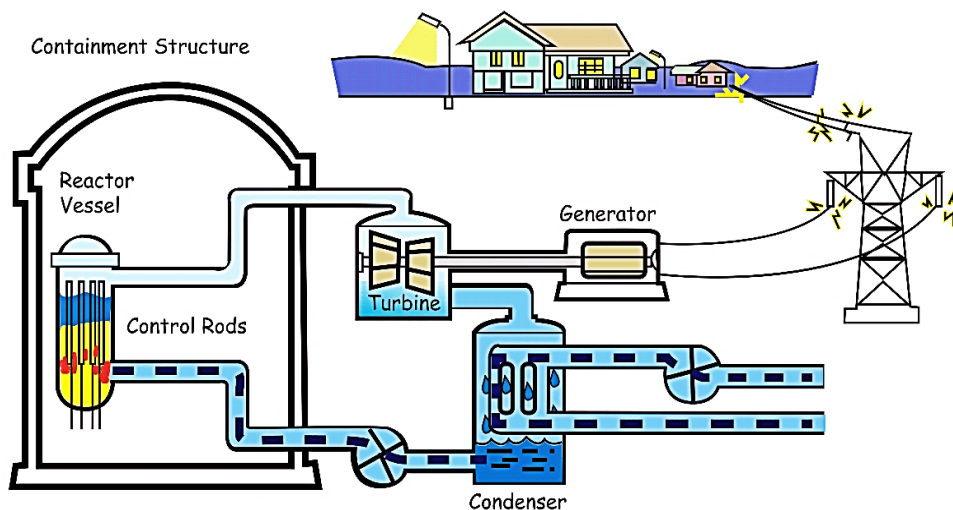


Figure 2, Boiling Water Reactor (BWR) [2]

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3.1 (Continued)

Electricity is generated by a nuclear power plant similarly to the way that electricity is generated at 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 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 that 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.

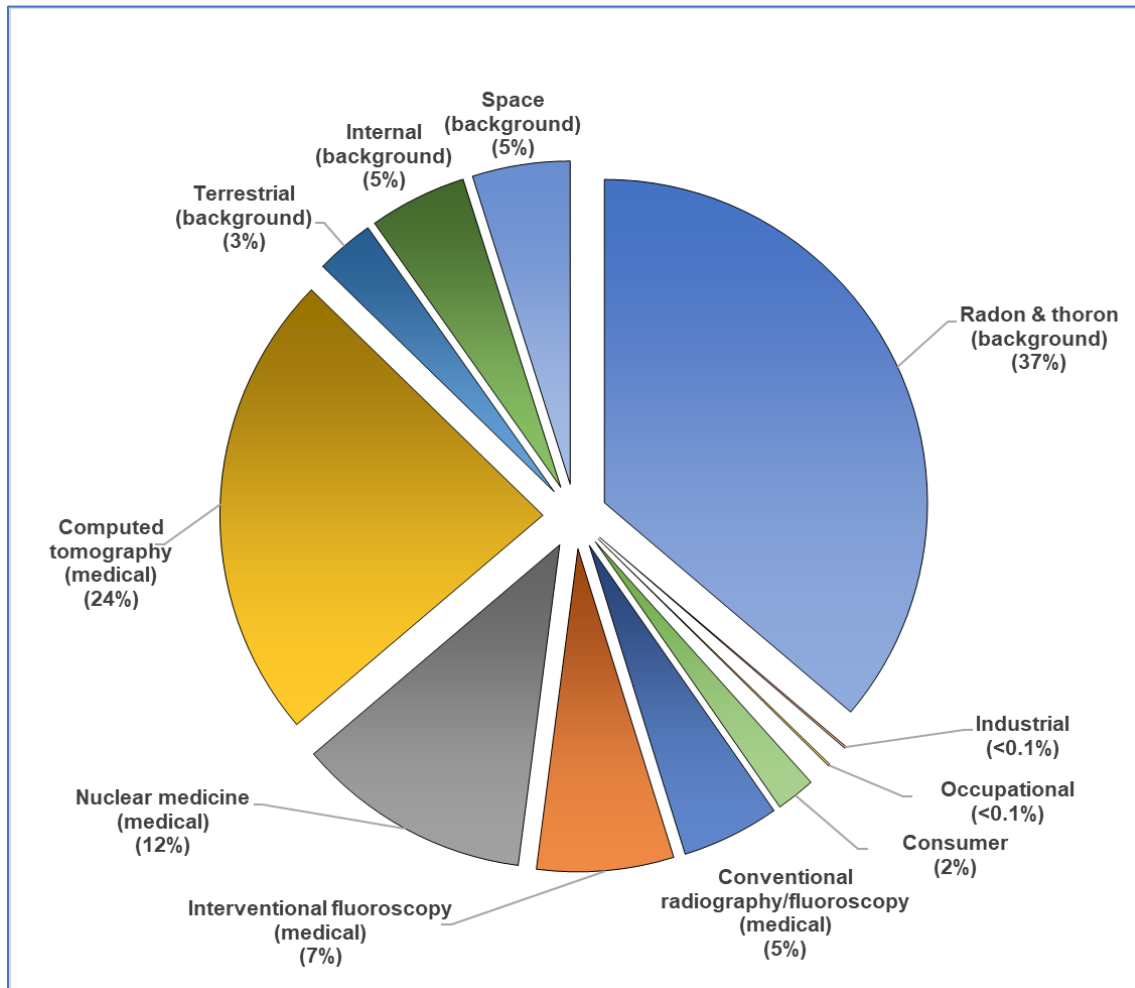


Figure 3, Sources of Radiation Exposure (NCRP Report No. 160) [3]

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 sources 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, cigarette smoking, and building materials. A small fraction of this 2% is due to industrial activities including generation of electricity by 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**

The 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.

3.3 (Continued)

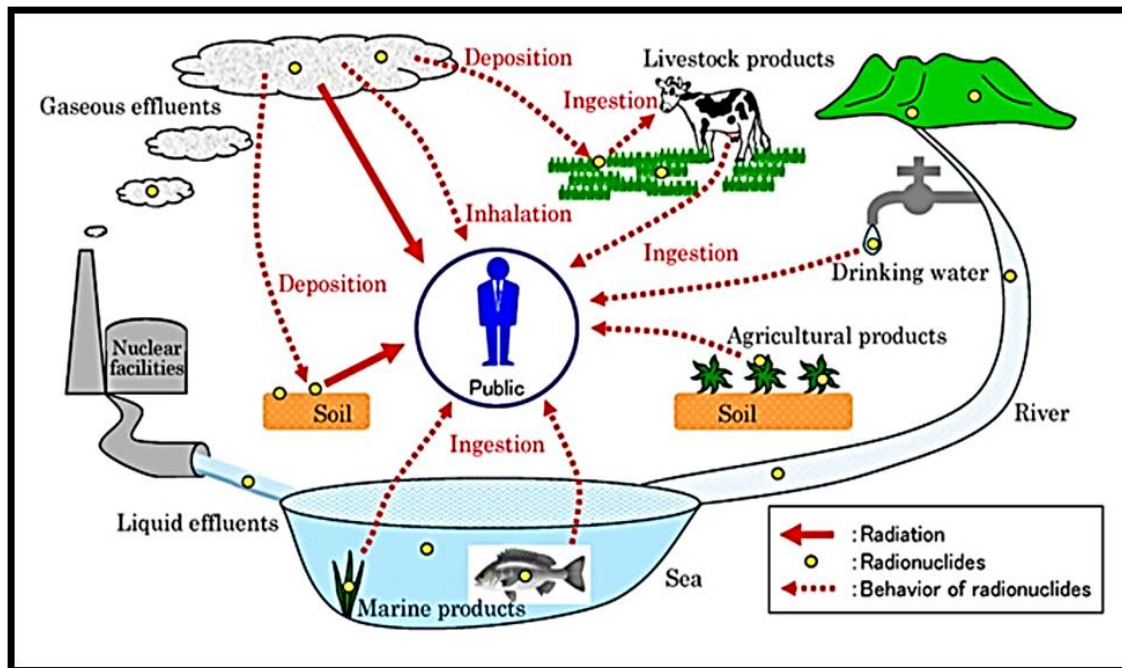


Figure 4, Potential exposure pathways to Members of the Public due to Plant Operations [6]

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, in 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.

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 pathways are determined by using concentration at the release point, bioaccumulation factors for the fish, and an estimate of the quantity of fish consumed.

3.3 (Continued)

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 most likely to be exposed to radiation dose because 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 is 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 effluent 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). These documents contain the limits to which LGS must adhere. LGS 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 LGS 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, Limerick Generating Station Site Dose Summary, and Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS.

Company: Constellation**Plant: Limerick Generating Station****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 the site to areas at and beyond the site boundary shall be limited to the following:
 - 1) Quarterly
 - a) Less than or equal to 10 mrad gamma
 - b) Less than or equal to 20 mrad beta
 - 2) Yearly
 - a) Less than or equal to 20 mrad gamma
 - b) Less than or equal to 40 mrad 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 the site to areas at and beyond the site boundary shall be limited to the following:
 - 1) Quarterly
 - a) Less than or equal to 15 mrem to any organ
 - 2) Yearly
 - a) Less than or equal to 30 mrem to any organ

Company: Constellation**Plant: Limerick Generating Station****4.3 Regulatory Limits for Liquid Effluent Doses**

1. The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released from the site to unrestricted areas shall be limited to the following:
 - a. Quarterly
 - 1) Less than or equal to 3 mrem total body
 - 2) Less than or equal to 10 mrem critical organ
 - b. Yearly
 - 1) Less than or equal to 6 mrem total body
 - 2) Less than or equal to 20 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.

4.5 Onsite Doses (Within Site Boundary)

LGS classifies individuals within the site boundary as either occupationally exposed individuals or members of the public. This section evaluates dose to non-occupationally exposed workers and members of the public that may be onsite for various reasons. The report must include any other information as may be required by the Commission to estimate maximum potential annual radiation doses to the public resulting from effluent releases as required by 10 CFR 50.36a(a)(2). While within controlled or restricted areas, the limits from Sections 4.1 through 4.4 do not apply; however, 10 CFR 20.1301 dose limit of 100 mrem per year TEDE and dose rate limit of 2 mrem per hour from external sources continue to apply. Occupancy times within the controlled areas are generally sufficiently low to compensate for the increase in the atmospheric dispersion factor above the site boundary. Groups of concern include the following receptor locations: National Guard, Railroad Tracks, and Fricks Lock. Use of a conservative assumption of 91 days/year (25%) spent inside the site boundary by these groups conservatively represents the most-exposed individual.

4.5 (Continued)

The maximum gaseous dose to members of the public at these locations is based on the following assumptions:

- Long term annual average meteorology data X/Q and D/Q, and actual effluent releases for the sectors encompassing the National Guard (NNE), Railroad Tracks (W), and Fricks Lock (WSW).
- Dose is from ground plane and inhalation only. No ingestion dose is included.
- The maximum calculated dose for activities on site was 6.74E-03 mrem at the Railroad Tracks in the West sector (Table 3).

All Doses calculated were a small fraction of the 10 CFR 20.1301 limits (100 mrem).

Table 3, 2025 Onsite Doses to Members of the Public

Location	Sector	Approx. Distance (Meters)	X/Q s/m ³	D/Q 1/m ²	Total Body Dose (mrem) ¹		Total
					Noble Gas	Iodine, Particulate, C-14 & H-3	
National Guard	NNE	556	4.00E-07	4.43E-09	2.29E-04	4.91E-04	7.20E-04
Railroad Tracks	W	225	2.66E-06	2.36E-08	1.52E-03	5.22E-03	6.74E-03
Fricks Lock	WSW	450	5.58E-07	4.78E-09	3.19E-04	1.09E-03	1.41E-03

5.0 SUPPLEMENTAL INFORMATION

5.1 Gaseous Batch Releases

5.1.1 LGS Site

Number of batch releases	1
Total time period for a batch release	4.72E+03 minutes
Maximum time period for a batch release	4.72E+03 minutes
Average time period for a batch release	4.72E+03 minutes
Minimum time period for a batch release	4.72E+03 minutes

¹ The limit for sum of the Total Body Dose and Organ Dose = 100 mrem (ref. 10 CFR 20.1301)

5.2 Liquid Batch Releases

5.2.1 LGS Site

Number of batch releases	50
Total time period for a batch release (min)	4.72E+03
Maximum time period for a batch release (min)	1.39E+02
Average time period for a batch release (min)	9.43E+01
Minimum time period for a batch release (min)	6.40E+01
Average stream flow (Schuylkill River) during periods of release of effluents into a flowing stream (LPM)	5.15E+06
Average Blowdown Flowrate (LPM)	2.40E+04

5.3 Abnormal Releases

5.3.1 Gaseous Abnormal Releases

Number of releases	1
Total activity released	1.43E-05 Ci

The Auxiliary Boiler Steam Drum Water 'C' was sampled for startup requirements on 1/5/25 for gamma isotopic and tritium. The gamma isotopic had no identified radioactive nuclides. The sample identified positive tritium at a concentration of 1,615 pCi/L (1.61E-06 uCi/ml), with an LLD of <1,458 pCi/L (1.46E-06 uCi/ml). The resample on 01/06/25 was <LLD for tritium.

The Auxiliary Boiler Deaerator Feedwater was sampled for startup requirements on 1/04/25 for gamma isotopic and tritium. The gamma isotopic had no identified radioactive nuclides. The sample was < LLD for tritium (distilled).

An abnormal release permit was created from boiler time in service per Operations logs until date and time of <LLD resample activity.

5.3.2 Liquid Abnormal Releases

None.

5.4 Insignificant Releases

In January of 2016, new pathways were identified and classified as a less significant Effluent Pathway. Gaseous effluents from the Main Turbine lubrication oil (MTLO) and Reactor Feed Pump Turbine (RFPT) lubrication oil vapor extractor exhaust vent to the Turbine Building roof. These pathways are not continuously monitored. Tritium analysis was performed in April of 2025, and the sample consisted of the water vapor exiting the vent. The tritium in the water is the result of condensation and direct deposition from the discharge of the entrained water vapor from the exhaust vents. This condensation does occur year-round but increases during seasonally cold weather.

The lube oil exhaust vents and associated systems were operating as designed to remove accumulated water from the lubricating and seal oil for the various turbine systems. The water was discharged as entrained vapor out the Turbine Building roof vent and a portion of it condensed on lower temperature surfaces. This water includes tritium, as the source is from the primary system.

Based on Regulatory Guide 1.21, Rev. 2, Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste, these release pathways are considered less significant. A significant release point is any location from which radioactive material is released that contributes greater than 1 percent of the activity discharged from all the release points for a particular type of effluent considered.

Regulatory Guide 1.109 lists the three types of effluent as (1) liquid effluents, (2) noble gases discharged to the atmosphere, and (3) all other radionuclides discharged to the atmosphere. The percentage of U1 and U2 MTLO exhaust vent activity in 2025 compared to the total tritium activity released from the site is calculated below.

Vent	Tritium Released, Ci	Site Gaseous Annual Release of Tritium, Ci	Percentage of Tritium Released Relative to Site Gaseous Annual Release of Tritium, Ci
		2025	2025
U1 MTLO extractor exhaust vent	6.25E-02	3.88E+01	0.161%
U2 MTLO extractor exhaust vent	4.38E-02		0.113%
U1 and U2 RFPT extractor exhaust vent	<LLD		N/A

5.5 Land Use Census Changes

During the 2023 annual Land Use Census review, the meat location in sector ESE at a distance from the plant of 1579 meters, had an increase in its meteorology D/Q values >20% higher than current default ODCM D/Q value of 1.14E-09 (1/m²) consecutively the last three years. During the 2024 annual review, the meat location in sector E at a distance 1186 meters had an increase >20% higher than current default ODCM D/Q value of 1.14E-09 (1/m²). This default D/Q change will be trended and evaluated for future ODCM revision. During the 2025 annual review, the meat location in sector ESE at a distance of 1579 meters from the plant had a >20% increase from the current ODCM values for X/Q and D/Q, the data will be trended for an additional year and will be included with the next ODCM revision as necessary.

During the 2024 annual Land Use Census review, the cow location in sector SW at a distance from the plant of 6099 meters, had an increase in its meteorology X/Q values >20% higher than current default ODCM X/Q value of 1.14E-07 (sec/m³) consecutively the last three years. During the 2025 annual review, the cow location in sector SW at a distance from the plant of 6099 meters, had an increase in its meteorology X/Q values >20% higher than current default ODCM X/Q value. This default X/Q change will be trended for an additional year and included in the next ODCM revision as necessary.

During the 2025 annual Land Use Census review, the vegetation location in sector ESE at a distance of 1047 meters from the plant, had a >20% increase from the current ODCM X/Q default value of 3.45E-07 (sec/m³) and D/Q value of 4.87E-09 (1/m²).

5.6 Meteorological Data

During 2025, the LGS meteorological program achieved a 97.7% joint frequency distribution data recovery.

In accordance with Regulatory Guide 1.21, the meteorological data does not need to be reported in the ARERR, but the data is summarized and maintained as documentation (records). An annual meteorological summary report that provides the joint frequency distributions of wind direction and wind speed by atmospheric stability class (see Regulatory Guide 1.23) is prepared and maintained in records for the life of the plant.

5.7 Effluent Radiation Monitors Out of Service Greater Than 30 Days

None.

Company: Constellation**Plant: Limerick Generating Station****5.8 Offsite Dose Calculation Manual (ODCM) Changes**

None.

5.9 Process Control Program (PCP) Changes

The last change made to RW-AA-100, Rev. 12, "Process Control Program for Radioactive Wastes," was in 2017.

5.10 Radioactive Waste Treatment System Changes

None.

5.11 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. C-14 production and release estimates were calculated using active core coolant mass, average neutron flux by energy, and reactor coolant nitrogen concentrations to determine C-14 generation based upon an effective full power year. The estimated generation for LGS during 2025 was 32.5 Curies.

Public dose estimates were performed using methodology from the ODCM, which is based on Regulatory Guide 1.109 methodology. C-14 is not included in the dose limits of Table 1. but is included in the dose calculation results of Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS.

5.12 Independent Spent Fuel Storage Installation (ISFSI) Monitoring Program

An ISFSI was placed in service starting July 21, 2008. Direct radiation exposure was determined using dosimetry measurements (minus background levels) obtained from the REMP for the nearest residence to the ISFSI. In 2025, there was no facility related dose detected to the nearest resident from the ISFSI. There were no gaseous or liquid releases from the ISFSI in 2025.

5.13 Errata/Corrections to Previous ARERRs**5.13.1 2023 ARERR**

The 2023 ARERR Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS, had a miscalculation on the "% Contribution of Carbon-14 to gaseous dose", where the value was calculated including the Liquid dose. The recalculated number considers the gaseous dose only.

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5.13.1 (Continued)

The corrections to the 2023 ARERR and their associated sections can be found in Attachment 3, ERRATA/Corrections to Previous ARERRs.

5.13.2 2024 ARERR

The 2024 ARERR Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS, had a miscalculation on the “% Contribution of Carbon-14 to gaseous dose”, where the value was calculated including the Liquid dose. The recalculated number considers the gaseous dose only.

The corrections to the 2024 ARERR and their associated sections can be found in Attachment 3, ERRATA/Corrections to Previous ARERRs.

5.14 Other Supplemental Information

5.14.1 Temporary Outside Tanks

In 2025, the LGS site did not use temporary outside tanks to hold radioactive materials more than 10 Curies. This requirement does not apply to tritium.

5.14.2 Program Deviations

- 04/04/25 - After submitting the Q1 radiochemistry crosschecks there was a disagreement of detector 3, 3.5L marinelli beaker crosscheck, when compared to EZA for all isotopes. Upon further investigation, it was discovered that the wrong geometry procedure was used when analyzing. After the sample was re-analyzed under the appropriate geometry the crosscheck passed.
- 8/18/25 - While performing ST-5-061-810-0 for Q2 2025 Liquid Radwaste Composite, the composite results for liquid radwaste effluent analyzed by Teledyne Brown Engineering was positive for Fe-55 with an activity of 9.17E-06 uCi/ml and a positive re-analysis of 7.04E-06 uCi/ml. Per CY-LG-170-301 control 3.2.1.1, the concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS shall be limited to 10 times the effluent concentration limits (ECL) specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. The required LLD for Fe-55 is 1E-06 uCi/ml and the limit is 1E-03 uCi/ml. Fe-55 at this concentration has been detected in liquid radwaste effluent composite samples at Limerick in past years. No ODCM limits were exceeded. These positive results are incorporated in the 2nd Quarter 2025 liquid releases.
- 10/31/25- Vendor laboratories that perform analysis of hard-to-detect nuclides for Constellation Nuclear sites are required to participate in a quarterly crosscheck program. While submitting results for Teledyne Brown Engineering (TBE), disagreements were discovered between TBE's analysis of Gross Beta and Ni-63, and the reference values provided by Eckert & Ziegler Analytics (EZA). TBE determined that the Ni-63 failure was due to incorrect sample preparation which resulted in the addition of more carrier than specified by the

5.14.2 (Continued)

method. This resulted in excess sample dilution that biased the reported activity low. Upon being notified of the disagreement, TBE performed calculations to account for this excess dilution, which demonstrated that the sample activity would have been consistent with EZA's stated value had the correct carrier amount been used. As a corrective action, TBE included a prompt in the Laboratory Information Management System (LIMS) used by Technicians when entering carrier volume to validate the correct value for the method is entered prior to continuing.

- 11/18/25 - While performing ST-5-061-810-0 for Q3 2025 Liquid Radwaste Composite, the composite results for liquid radwaste effluent analyzed by Teledyne Brown Engineering was positive for Fe-55 with an activity of 4.76E-06 uCi/ml and a positive re-analysis of 4.12E-06 uCi/ml. Per CY-LG-170-301 control 3.2.1.1, the concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS shall be limited to 10 times the effluent concentration limits (ECL) specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. The required LLD for Fe-55 is 1E-06 uCi/ml and the limit is 1E-03 uCi/ml. Fe-55 at this concentration have been detected in liquid radwaste effluent composite samples at Limerick in past years. No ODCM limits were exceeded. These positive results are incorporated in the 3rd Quarter 2025 liquid releases.

6.0 NEI 07-07 ONSITE RADIOLOGICAL GROUNDWATER MONITORING PROGRAM

Limerick Generating Station 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. It is important to note that samples and results taken in support of NEI 07-07 on-site groundwater monitoring program are separate from the Radiological Environmental Monitoring Program (REMP).

The Station conformed with its Radiological Groundwater Protection Program (RGPP) in 2025 with respect to sampling protocol. The 2025 RGPP sample locations effectively monitored Systems, Structures, and Components of the Station. Therefore, RGPP sample locations should continue to be sampled in accordance with site procedures. Based on precipitation recapture sample results, tritium present in precipitation is not likely to adversely affect groundwater conditions at the Station. Based on the evaluation of groundwater flow direction, the wells sampled effectively monitored groundwater conditions at the facility.

There were no spills to ground containing radioactive material in 2025.

Samples were collected from onsite wells throughout the year in accordance with the station RGPP. Analytical results and anomalies are discussed next:

6.0 (Continued)

RGPP Wells:

Tritium

Limerick Generating Station has two background, four perimeter, and seven source designated wells that are sampled as part of the RGPP. Samples collected from source designated wells are analyzed for tritium quarterly; and samples collected from background and perimeter designated wells are analyzed for tritium annually. Samples from 13 locations were analyzed for tritium activity. Tritium values ranged from non-detectable to 4,250 pCi/L. There is no drinking water pathway available from these groundwater sample locations.

Strontium

Samples were analyzed for Sr-89 and Sr-90 and were not detected at concentrations greater than their respective LLDs in samples collected in 2025.

Gross Alpha (dissolved and suspended)

Gross-alpha is collected on a 2-yr frequency and was not collected in 2025. Gross-alpha (dissolved) was detected in four samples collected during the 2nd quarter 2024 RGPP sampling round. The gross-alpha concentrations did not exceed the current Alert Levels (three times the historic average). The next Gross-alpha analysis will be performed in 2026.

Gamma Emitters

Gamma-radionuclide is collected on a 2-yr frequency and was not collected in 2025. Gamma-radionuclide analysis was performed during the 2nd quarter 2024 RGPP sampling round. Gamma radionuclides, associated with station radionuclides, were not detected at concentrations exceeding their respective LLDS in 2024. The next time gamma-radionuclide analysis will be performed is 2026.

Select Transuranics

No samples were analyzed for select transuranics in 2025.

Hard-To-Detect

Hard-to-detect (HTD) analyses were performed in 2021 on 7 groundwater locations. Hard to detect (Fe-55 and Ni-63) were not detected at concentrations greater than their respective LLDs. The next sampling event is scheduled to take place in 2026.

Precipitation Recapture:

Tritium

The Station collected precipitation recapture samples in January and July 2025. Eight samples were collected during the January and July 2025 sampling rounds. Tritium was

detected in two of the eight samples collected in January 2025 with detections ranging between 276 pCi/L (RS-7, northeast sector) and 693 pCi/L (RS-5, south-southeast sector). Tritium was not detected in the samples collected during the July 2025 precipitation sampling round.

Intermittent, low-level tritium detections in monitoring well MW-LR-9 are currently being investigated. since the Unit 1 Steam Seal Evaporator was temporarily repaired on December 17, 2023. As of the 4th quarter 2025, the tritium concentration ranged between 2.460 and 3,130 pCi/L (MW-LR-9). This is documented in issue report 04723730.

Table 4, Complete RGPP Results (pCi/L \pm 2- σ)

Location	Sample Date	Gross Alpha (dissolved)	Gross Alpha (suspended)	Sr89	Sr90	Gamma Emitters ¹
DW-LR-1	4/8/2025	N/A	N/A	<5.52	<0.871	<MDA
MW-LR-1	4/8/2025	N/A	N/A	N/A	N/A	<MDA
MW-LR-1	4/8/2025	N/A	N/A	N/A	N/A	<MDA
MW-LR-2	4/8/2025	N/A	N/A	N/A	N/A	<MDA
MW-LR-2	4/8/2025	N/A	N/A	N/A	N/A	<MDA
MW-LR-3	4/8/2025	N/A	N/A	N/A	N/A	<MDA
MW-LR-4	4/8/2025	N/A	N/A	<5.47	<0.790	<MDA
MW-LR-5	4/8/2025	N/A	N/A	N/A	N/A	<MDA
MW-LR-7	4/8/2025	N/A	N/A	N/A	N/A	<MDA
MW-LR-8	4/8/2025	N/A	N/A	<6.27	<0.914	<MDA
MW-LR-9	4/8/2025	N/A	N/A	<3.75	<0.854	<MDA
MW-LR-10	4/8/2025	N/A	N/A	<4.66	<0.995	<MDA
P11	4/8/2025	N/A	N/A	<5.70	<0.878	<MDA
P14	4/8/2025	N/A	N/A	<7.41	<0.884	<MDA
P17	4/8/2025	N/A	N/A	N/A	N/A	<MDA

¹ All non-natural gamma emitters less than minimum detectable activity.

Company: Constellation

Plant: Limerick Generating Station

Table 5, Concentration of tritium in ground water

Location	Quarter 1	Quarter 2	Quarter 3	Quarter 4
DW-LR-1	<178	<194	<193	<185
MW-LR-1	N/A	<188	N/A	N/A
MW-LR-1 (Dup) ¹	N/A	<192	N/A	N/A
MW-LR-1 (QA) ²	N/A	<155	N/A	N/A
MW-LR-2	N/A	<191	N/A	N/A
MW-LR-2 (Dup)	N/A	<189	N/A	N/A
MW-LR-2 (QA)	N/A	<162	N/A	N/A
MW-LR-3	N/A	<184	N/A	N/A
MW-LR-4	<179	<184	<196	<190
MW-LR-4 (Dup)	N/A	N/A	N/A	<191
MW-LR-4 (QA)	N/A	N/A	N/A	<129
MW-LR-5	N/A	<186	N/A	N/A
MW-LR-7	N/A	<189	N/A	N/A
MW-LR-8	580±138	548±142	520±141	529±142
MW-LR-8 (Dup)	N/A	N/A	520±137	N/A
MW-LR-8 (QA)	N/A	N/A	399±121	N/A
MW-LR-9	2460±311	3240±393	4250±494	3130±387
MW-LR-9(Dup)	2520±316	N/A	N/A	N/A
MW-LR-9 (QA)	2550±164	N/A	N/A	N/A
MW-LR-10	<180	<192	<193	<192
LR-P11	202±119	<193	<192	<189
LR-P14	<179	<190	<194	<186
LR-P17	N/A	<192	N/A	N/A

¹ (Dup) – Sample analyzed in duplicated by TBE² (QA) – Additional sample collected and analyzed for Quality assurance by GEL

Table 6, Concentration of tritium in recapture samples (pCi/L \pm 2 σ)

Location	1/24/2025	7/28/2025
RS-1	<180	<191
RS-2	<181	<197
RS-3	<177	<187
RS-4	<182	<195
RS-5	693 \pm 146	<190
RS-6	<179	<189
RS-7	276 \pm 125	<192
RS-8	<179	<189

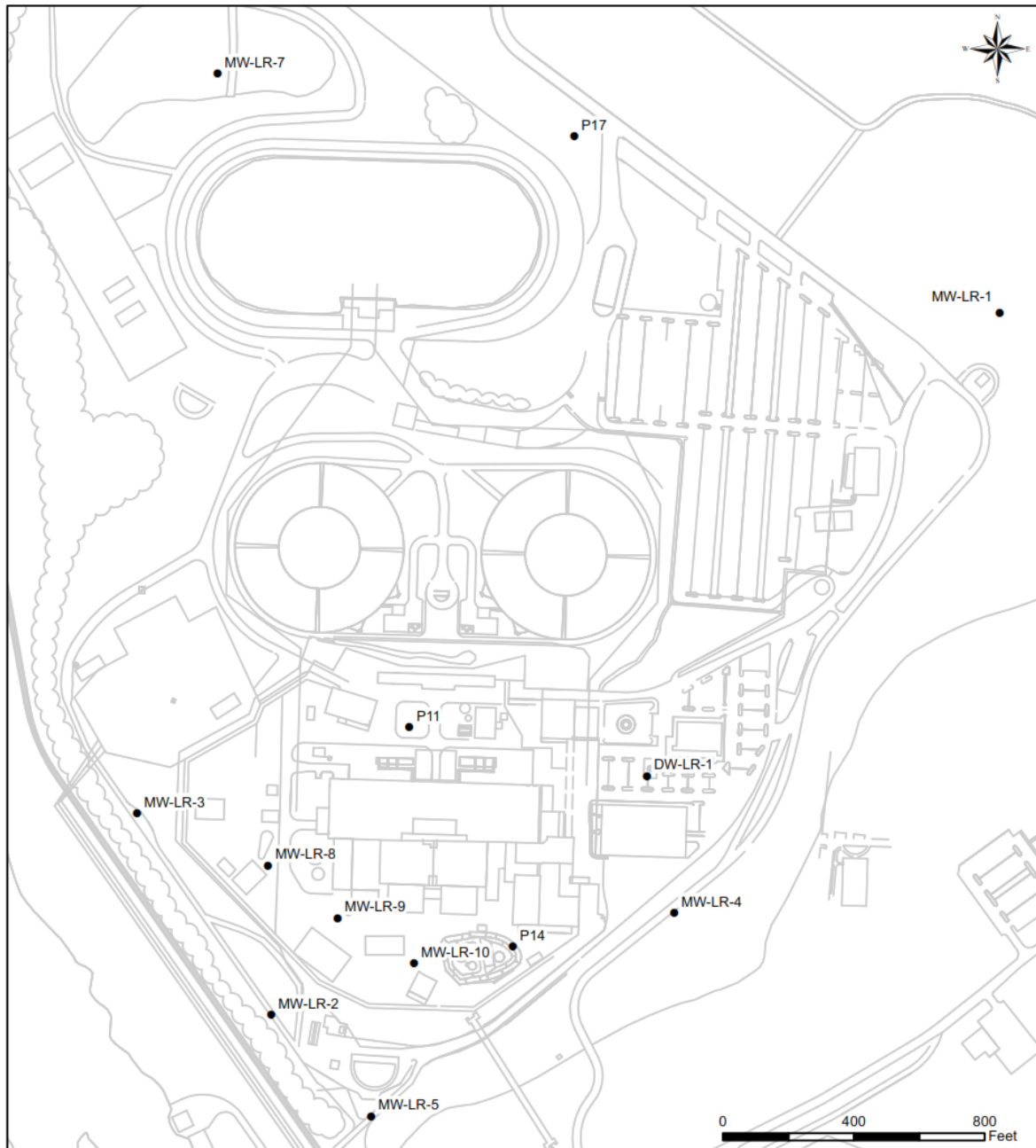


Figure 5: RGPP Sampling locations

Company: Constellation**Plant: Limerick Generating Station****6.1 Voluntary Notification**

During 2025, LGS did not make a voluntary NEI 07-07 notification to State/Local officials, NRC, and to other stakeholders required by site procedures.

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

1.0 GASEOUS EFFLUENTS

Table 7, Gaseous Effluents – Summation of All Releases from the LGS Site

A. Fission & Activation Gases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for Year	Est. Total Error %
1. Total Release	Ci	7.59E-01	8.40E-01	9.83E-01	1.14E+01	1.40E+01	36.6
2. Average release rate for the period	μCi/sec	9.76E-02	1.07E-01	1.24E-01	1.43E+00	4.43E-01	
B. Iodine							
1. Total Iodine – 131	Ci	N/A	N/A	N/A	N/A	N/A	N/A
2. Average release rate for the period	μCi/sec	N/A	N/A	N/A	N/A	N/A	
C. Particulates							
1. Particulates with half-lives > 8 days	Ci	4.65E-05	8.47E-05	N/A	N/A	1.31E-04	22.6
2. Average release rate for the period	μCi/sec	5.98E-06	1.08E-05	N/A	N/A	4.16E-06	
D. Tritium							
1. Total Release	Ci	9.66E+00	9.39E+00	1.15E+01	8.30E+00	3.88E+01	15.7
2. Average release rate for the period	μCi/sec	1.24E+00	1.19E+00	1.45E+00	1.04E+00	1.23E+00	
E. Gross Alpha							
1. Total Release	Ci	N/A	N/A	N/A	N/A	N/A	N/A
2. Average release rate for the period	μCi/sec	N/A	N/A	N/A	N/A	N/A	
F. Carbon-14							
1. Total Release	Ci	6.08E+00	6.79E+00	1.05E+01	6.78E+00	3.02E+01	
2. Average release rate for the period	μCi/sec	7.82E-01	8.64E-01	1.32E+00	8.53E-01	9.56E-01	

Company: Constellation

Plant: Limerick Generating Station

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

Table 8, Gaseous Effluents – Mixed Level Release Continuous Mode from the LGS Site

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission Gases						
Kr-85m	Ci	1.34E-02	1.61E-02	1.89E-02	2.20E-01	2.69E-01
Kr-85	Ci	8.92E-03	5.61E-02	6.71E-02	8.20E-01	9.52E-01
Kr-87	Ci	1.52E-02	2.73E-02	3.23E-02	3.84E-01	4.58E-01
Kr-88	Ci	1.83E-02	4.73E-02	5.62E-02	6.76E-01	7.98E-01
Ar-41	Ci	4.60E-02	5.39E-03	4.86E-03	1.39E-02	7.01E-02
Xe-131m	Ci	2.23E-04	1.41E-03	1.68E-03	2.05E-02	2.38E-02
Xe-133	Ci	2.40E-01	3.32E-02	3.15E-02	1.48E-01	4.53E-01
Xe-135m	Ci	1.90E-01	1.51E-01	1.74E-01	1.96E+00	2.47E+00
Xe-135	Ci	1.57E-01	2.20E-01	2.58E-01	3.03E+00	3.67E+00
Xe-138	Ci	7.03E-02	2.83E-01	3.38E-01	4.10E+00	4.79E+00
Total for Period	Ci	7.59E-01	8.40E-01	9.83E-01	1.14E+01	1.40E+01
Iodines						
I-131	Ci	N/A	N/A	N/A	N/A	N/A
I-133	Ci	N/A	N/A	N/A	N/A	N/A
Total for Period	Ci	N/A	N/A	N/A	N/A	N/A
Particulates						
Mn-54	Ci	N/A	2.62E-06	N/A	N/A	2.62E-06
Co-58	Ci	1.50E-05	6.72E-06	N/A	N/A	2.18E-05
Co-60	Ci	1.39E-05	7.54E-05	N/A	N/A	8.93E-05
Zn-65	Ci	1.76E-05	N/A	N/A	N/A	1.76E-05
Total for Period	Ci	4.65E-05	8.47E-05	N/A	N/A	1.31E-04
Tritium						
H-3	Ci	9.66E+00	9.39E+00	1.15E+01	8.30E+00	3.88E+01
Gross Alpha						
Alpha	Ci	N/A	N/A	N/A	N/A	N/A
Carbon-14						
C-14	Ci	6.08E+00	6.79E+00	1.05E+01	6.78E+00	3.02E+01

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

Table 9, Gaseous Effluents – Mixed Level Release Batch Mode from the LGS Site

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission Gases						
No nuclides found	Ci	N/A	N/A	N/A	N/A	N/A
Total for Period	Ci	N/A	N/A	N/A	N/A	N/A
Iodines						
No nuclides found	Ci	N/A	N/A	N/A	N/A	N/A
Total for Period	Ci	N/A	N/A	N/A	N/A	N/A
Particulates						
No nuclides found	Ci	N/A	N/A	N/A	N/A	N/A
Total for Period	Ci	N/A	N/A	N/A	N/A	N/A
Tritium						
H-3	Ci	1.43E-05	N/A	N/A	N/A	1.43E-05
Gross Alpha						
Alpha	Ci	N/A	N/A	N/A	N/A	N/A
Carbon-14						
C-14	Ci	N/A	N/A	N/A	N/A	N/A

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

2.0 LIQUID EFFLUENTS

Table 10, Liquid Effluents – Summation of All Releases from the LGS Site

A. Fission & Activation Products	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for Year	Est. Total Error %
1. Total Release	Ci	N/A	2.30E-02	8.19E-03	5.38E-03	3.66E-02	21.1
2. Average diluted concentration	μCi/mL	N/A	3.17E-07	2.86E-07	4.55E-07	3.24E-07	
B. Tritium							
1. Total Release	Ci	N/A	5.25E+00	3.04E+00	8.12E-01	9.10E+00	6.4
2. Average diluted concentration	μCi/mL	N/A	7.24E-05	1.06E-04	6.87E-05	8.06E-05	
C. Dissolved & Entrained Gases							
1. Total Release	Ci	N/A	1.97E-04	6.39E-05	7.69E-06	2.68E-04	21.1
2. Average diluted concentration	μCi/mL	N/A	2.71E-09	2.23E-09	6.51E-10	2.37E-09	
D. Gross Alpha Activity							
1. Total Release	Ci	N/A	N/A	N/A	N/A	N/A	N/A
2. Average diluted concentration	μCi/mL	N/A	N/A	N/A	N/A	N/A	
E. Volume of Waste Released (prior to dilution)							
	Liters	N/A	2.09E+06	8.05E+05	3.20E+05	3.21E+06	
F. Volume of Dilution Water Used During Period							
	Liters	N/A	7.25E+07	2.86E+07	1.18E+07	1.13E+08	

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

Table 11, Liquid Effluents – Continuous Mode from the LGS Site

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
None	Ci	N/A	N/A	N/A	N/A	N/A
Total for Period	Ci	N/A	N/A	N/A	N/A	N/A
Tritium						
H-3	Ci	N/A	N/A	N/A	N/A	N/A
Gross Alpha						
Alpha	Ci	N/A	N/A	N/A	N/A	N/A
Entrained Gases						
None	Ci	N/A	N/A	N/A	N/A	N/A
Total for Period	Ci	N/A	N/A	N/A	N/A	N/A

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

Table 12, Liquid Effluents – Batch Mode from the LGS Site

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
NA-24	Ci	N/A	N/A	N/A	5.22E-05	5.22E-05
CR-51	Ci	N/A	7.26E-04	N/A	N/A	7.26E-04
MN-54	Ci	N/A	2.38E-04	1.59E-04	9.39E-05	4.92E-04
FE-55	Ci	N/A	1.91E-02	6.66E-03	N/A	2.58E-02
CO-58	Ci	N/A	5.04E-04	3.30E-05	1.71E-04	7.09E-04
FE-59	Ci	N/A	1.24E-05	N/A	N/A	1.24E-05
CO-60	Ci	N/A	2.01E-03	5.19E-04	3.23E-03	5.76E-03
ZN-65	Ci	N/A	1.55E-04	3.31E-05	8.04E-04	9.92E-04
NB-97	Ci	N/A	N/A	N/A	3.01E-06	3.01E-06
AG-110m	Ci	N/A	N/A	3.36E-06	3.45E-05	3.78E-05
SB-122	Ci	N/A	6.16E-06	N/A	N/A	6.16E-06
SB-124	Ci	N/A	1.36E-04	3.03E-05	3.33E-05	2.00E-04
SB-125	Ci	N/A	3.86E-05	3.83E-04	5.12E-04	9.34E-04
CS-134	Ci	N/A	N/A	2.74E-05	3.10E-05	5.84E-05
CS-137	Ci	N/A	2.73E-06	3.42E-04	4.08E-04	7.53E-04
AU-199	Ci	N/A	4.41E-05	N/A	N/A	4.41E-05
Total for Period	Ci	N/A	2.30E-02	8.19E-03	5.38E-03	3.66E-02
Tritium						
H-3	Ci	N/A	5.25E+00	3.04E+00	8.12E-01	9.10E+00
Gross Alpha						
Alpha	Ci	N/A	N/A	N/A	N/A	N/A
Entrained Gases						
Kr-85m	Ci	N/A	N/A	N/A	9.50E-07	9.50E-07
Xe-133	Ci	N/A	1.25E-04	N/A	6.73E-06	1.32E-04
Xe-135	Ci	N/A	7.13E-05	6.39E-05	N/A	1.35E-04
Total for Period	Ci	N/A	1.97E-04	6.39E-05	7.69E-06	2.68E-04

Attachment 2, Solid Waste Information

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

Table 13, Resins, Filters, and Evaporator Bottoms Summary Shipped from the LGS Site

Waste	Volume		Curies	% Error
Class	ft ³	m ³	Shipped	(Activity)
A	4.35E+03	1.23E+02	1.38E+02	+/-25%
B	9.00E+01	2.55E+00	3.68E+02	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
Unclassified	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	4.44E+03	1.26E+02	5.06E+02	+/-25%
Major Nuclides for Above Table: H-3, C-14, Cr-51, Mn-54, Fe-55, Fe-59, Co-58, Co-60, Ni-59, Ni-63, Zn-65, Sr-89, Sr-90, Tc-99, Sb-124, Sb-125, I-129, Cs-137, Ce-144, Pu-238, Pu-239, Pu-241, Am-241, Cm-242, Cm-244				
Waste Class A ≥ 1% Abundance				
Nuclide Name	Abundance		Curies	
C-14	5.17%		7.12E+00	
Mn-54	8.22%		1.13E+01	
Fe-55	11.85%		1.63E+01	
Co-58	4.61%		6.34E+00	
Co-60	55.53%		7.65E+01	
Ni-63	1.98%		2.73E+00	
Zn-65	9.10%		1.25E+01	
Waste Class B ≥ 1% Abundance				
Nuclide Name	Abundance		Curies	
Mn-54	3.55%		1.31E+01	
Fe-55	42.61%		1.57E+02	
Co-60	48.33%		1.78E+02	
Ni-63	1.30%		4.79E+00	
Zn-65	3.96%		1.46E+01	
Total Combined ≥ 1% Abundance				
Nuclide Name	Abundance		Curies	
C-14	1.41%		7.13E+00	
Mn-54	4.82%		2.44E+01	
Fe-55	34.24%		1.73E+02	
Co-58	1.29%		6.52E+00	
Co-60	50.29%		2.54E+02	
Ni-63	1.49%		7.52E+00	
Zn-65	5.36%		2.71E+01	

Attachment 2, Solid Waste Information

Table 14, Dry Active Waste (DAW) Summary Shipped from the LGS Site

Waste Class	Volume		Curies Shipped	% Error (Activity)
	ft ³	m ³		
A	2.35E+04	6.66E+02	1.03E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
Unclassified	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.35E+04	6.66E+02	1.03E+00	+/-25%
Major Nuclides for Above Table: H-3, C-14, Mn-54, Fe-55, Co-58, Co-60, Ni-63, Zn-65, Tc-99, I-129, Cs-137, Ce-144				
Waste Class A ≥ 1% Abundance				
Nuclide Name	Abundance		Curies	
Mn-54	9.83%		1.01E-01	
Fe-55	23.25%		2.39E-01	
Co-58	2.10%		2.15E-02	
Co-60	58.85%		6.05E-01	
Ni-63	1.10%		1.13E-02	
Zn-65	4.03%		4.14E-02	
Total Combined ≥ 1% Abundance				
Nuclide Name	Abundance		Curies	
Mn-54	9.83%		1.01E-01	
Fe-55	23.25%		2.39E-01	
Co-58	2.10%		2.15E-02	
Co-60	58.85%		6.05E-01	
Ni-63	1.10%		1.13E-02	
Zn-65	4.03%		4.14E-02	

Attachment 2, Solid Waste Information

Table 15, Other Waste Summary Shipped from the LGS Site

Waste Class	Volume		Curies	% Error
	ft ³	m ³	Shipped	(Activity)
A	7.98E+02	2.26E+01	8.52E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
Unclassified	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	7.98E+02	2.26E+01	8.52E+00	+/-25%
Major Nuclides for Above Table: H-3, C-14, Mn-54, Fe-55, Co-58, Co-60, Ni-63, Zn-65, Tc-99, Sb-124, I-129, Cs-134, Cs-137, Ce-144, Pu-238, Pu-239, Pu-241, Am-241, Cm-242, Cm-244				
Waste Class A				
			≥ 1% Abundance	
Nuclide Name	Abundance		Curies	
Mn-54	14.30%		1.22E+00	
Fe-55	12.44%		1.06E+00	
Co-58	5.77%		4.92E-01	
Co-60	58.26%		4.97E+00	
Zn-65	7.16%		6.10E-01	
Total Combined				
			≥ 1% Abundance	
Nuclide Name	Abundance		Curies	
Mn-54	14.30%		1.22E+00	
Fe-55	12.44%		1.06E+00	
Co-58	5.77%		4.92E-01	
Co-60	58.26%		4.97E+00	
Zn-65	7.16%		6.10E-01	

Attachment 2, Solid Waste Information

Table 16, Sum of All Low-Level Waste Shipped from the LGS Site

Waste Class	Volume		Curies Shipped	% Error (Activity)
	ft ³	m ³		
A	2.87E+04	8.12E+02	1.47E+02	+/-25%
B	9.00E+01	2.55E+00	3.68E+02	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
Unclassified	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.88E+04	8.14E+02	5.15E+02	+/-25%
Major Nuclides for Above Table: H-3, C-14, Cr-51, Mn-54, Fe-55, Fe-59, Co-58, Co-60, Ni-59, Ni-63, Zn-65, Sr-89, Sr-90, Tc-99, Sb-124, Sb-125 I-129, Cs-134, Cs-137, Ce-144, Pu-238, Pu-239, Pu-241, Am-241, Cm-242, Cm-244				
Waste Class A ≥ 1% Abundance				
Nuclide Name	Abundance		Curies	
C-14	4.84%		7.12E+00	
Mn-54	8.58%		1.26E+01	
Fe-55	11.96%		1.76E+01	
Co-58	4.66%		6.86E+00	
Co-60	55.71%		8.20E+01	
Ni-63	1.91%		2.81E+00	
Zn-65	8.95%		1.32E+01	
Waste Class B ≥ 1% Abundance				
Nuclide Name	Abundance		Curies	
Mn-54	3.55%		1.31E+01	
Fe-55	42.61%		1.57E+02	
Co-60	48.33%		1.78E+02	
Ni-63	1.30%		4.79E+00	
Zn-65	3.96%		1.46E+01	
Total Combined ≥ 1% Abundance				
Nuclide Name	Abundance		Curies	
C-14	1.38%		7.13E+00	
Mn-54	4.99%		2.57E+01	
Fe-55	33.86%		1.74E+02	
Co-58	1.36%		7.03E+00	
Co-60	50.44%		2.60E+02	
Ni-63	1.48%		7.60E+00	
Zn-65	5.38%		2.77E+01	

Attachment 2, Solid Waste Information

2.0 SOLID WASTE DISPOSITION

Table 17, Solid Waste Disposition from the LGS Site

Number of Shipments	Mode of Transportation	Destination
18	Hittman Transport Services	"Energy Solutions - Bear Creek"
5	Hittman Transport Services	"Energy Solutions Services, Inc. (MPF)"
23	Hittman Transport Services	"Energy Solutions, LLC. Clive Disposal Site- Containerized Waste Facility"
2	Hittman Transport Services	" Energy Solutions, LLC. Clive Disposal Site- Bulk Waste Facility"
1	Hittman Transport Services	"Waste control Specialists LLC"
2	Landstar	"Energy Solutions - Bear Creek"
1	Landstar	"Energy Solutions Services, Inc (MPF)"
52	Total	

Attachment 3, ERRATA/Corrections to Previous ARERRs

1.0 ERRATA

1.1.1 2023 ARERR

1. Correction to Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS

Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS¹

	Whole Body	Thyroid	Max Other Organ
Limit	25 mrem	75 mrem	25 mrem
Gaseous ² - Noble Gas	1.08E-03	1.08E-03	1.81E-03
Gaseous - Particulates & Iodine	1.13E-04	1.79E-04	1.14E-04
Carbon-14	2.39E-01	2.39E-01	1.19E+00
Liquid	8.06E-03	4.91E-03	1.04E-02
Direct Shine	0	0	0
Total Site Dose	2.48E-01	2.45E-01	1.20E+00
% Contribution of Carbon-14 to Gaseous Dose	96 99.58	97 99.58	99 99.84
Nearby Facility	2.17E-02	2.17E-02	2.17E-02
Total w/Other Nearby Facility³	2.70E-01	2.66E-01	1.22E+00
% of Limit	1.08	0.36	4.90

¹ Table 2 is a summation of Units to show compliance with 40 CFR Part 190 Limits.

² Gaseous dose values in Table 2 include organ dose from Noble Gas, Iodine, Tritium, and particulates.

³ Other fuel cycle sources within 5 miles of the site are considered in this analysis.

Attachment 3, ERATTA/Corrections to Previous ARERRs

1.1.2 2024 ARERR

1. Correction to Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS

Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS¹

	Whole Body	Thyroid	Max Other Organ
Limit	25 mrem	75 mrem	25 mrem
Gaseous - Noble Gas	5.00E-03	5.00E-03	8.29E-03
Gaseous - Particulates & Iodine	1.50E-03	1.57E-03	1.50E-03
Carbon-14	2.43E-01	2.43E-01	1.21E+00
Liquid	7.32E-02	2.16E-02	1.05E-01
Direct Shine	0	0	0
Total Site Dose	3.23E-01	2.71E-01	1.32E+00
% Contribution of Carbon-14 to Gaseous Dose	75 97.20	90 97.20	92 99.18
Nearby Facility	1.79E-02	1.79E-02	1.79E-02
Total w/Other Nearby Facility²	3.41E-01	2.89E-01	1.34+00
% of Limit	1.36	0.36	5.37

¹ Table 2 is a summation of Units to show compliance with 40 CFR Part 190 Limits.

² Other fuel cycle sources within 5 miles of the site are considered in this analysis.