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April 30, 2026

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

Ref 10 CFR 50.36(a)
TS 5.6.3

Subject: Comanche Peak Nuclear Power Plant (CPNPP)
Docket Nos. 50-445 and 50-446
2025 Annual Radiological Effluents Release Report

Dear Sir or Madam:

Vistra Operations Company LLC (Vistra OpCo) hereby submits the Comanche Peak Nuclear Power Plant (CPNPP) 2025 Annual Radioactive Effluents Release Report (ARERR). The enclosed report is provided pursuant to 10 CFR 50.36(a) and CPNPP Technical Specification 5.6.3. The report covers the period from January 1, 2025 to December 31, 2025.

This letter contains no new regulatory commitments for CPNPP Unit 1 and Unit 2.

If you have any questions regarding this submittal, please contact Marianne Burnett at (254) 897-5424 or Marianne.Burnett@vistracorp.com.

Sincerely,

Deborah Farnsworth
Deborah Farnsworth (Apr 29, 2026 07:35:03 CDT)
Deborah Farnsworth

Enclosure: CPNPP 2025 Annual Radioactive Effluent Release Report

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COMANCHE PEAK NUCLEAR POWER PLANT

2025 ANNUAL RADIOLOGICAL EFFLUENTS RELEASE REPORT

January 1, 2025 - December 31, 2025

Preparer:	Donald E. Rebstock	Date: 3/4/2026
Reviewer:	Garrick Kinchen	Date: 3/10/2026
Approver:	Kerry Cooper Chemistry Manager	Date: 3/12/2026

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ACRONYMS AND ABBREVIATIONS

AREOR	Annual Radiological Environmental Operating Report
CFR	Code of Federal Regulations
CPNPP	Comanche Peak Nuclear Power Plant
ECL	Effluent Concentration Limit
HIC	High Integrity Containers
ISFSI	Independent Spent Fuel Storage Installation
LDCR	Licensing Document Change Request
LHMT	Laundry Holdup and Monitor Tanks
LVW	Low Volume Waste
ODCM	Offsite Dose Calculation Manual
OOS	Out of Service
PET	Primary Effluent Tanks
pCi	Pico-Curie
REC	Radiological Effluent Control
SORC	Station Operations Review Committee
μCi	Micro-Curie
WMT	Waste Monitor Tanks
WWHT	Waste Water Holdup Tanks

1.0 Introduction

This Radioactive Effluent Release Report, for Comanche Peak Nuclear Power Plant (CPNPP) Unit 1 and Unit 2, is submitted as required by Technical Specification 5.6.3 and Offsite Dose Calculation Manual (ODCM) Administrative Control 6.9.1.4 for the period January 1, 2025 through December 31, 2025. Data in this report were calculated in accordance with the CPNPP ODCM using the OpenEMS software.

1.1 Executive Summary

The radioactive effluent monitoring program for 2025 was conducted as described in the following report. Results of the monitoring program indicate continued effort to maintain the release of radioactive effluents to the environment as low as reasonably achievable (ALARA).

In June 2009, the NRC provided revised guidance in Regulatory Guide 1.21, *Measuring, Evaluating and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste, Revision 2*, establishing an updated approach for identifying principal radionuclides. Because the overall quantity of radioactive releases has steadily decreased due to improvements in power plant operations, Carbon-14 (C-14) now qualifies as a “principal radionuclide” (anything greater than one percent of overall radioactivity in effluents) under federal regulations at many plants. In other words, C-14 has not increased and C-14 is not a new nuclear plant emission. Rather, improvements in the mitigation of other isotopes have made C-14 more prominent. Attachment 10.3 provides more detail about C-14.

1.1 Executive Summary (continued)

Gaseous Effluents:

Two-year summary of all the radioactive gaseous releases to the environment:

Gaseous Waste	2024	2025	Comments
Tritium (Ci)	39.8	44.5	1
C-14 (Ci)	24.9	24.9	2
Total Fission and Activation Products (Ci)	0.46	0.50	
Total Particulate (Ci)	0	0	3
Gross Alpha (Ci)	0	0	3
Iodine (Ci)	0	0	3
Calculated Gamma Air Dose (mRad)	4.01E-04	4.74E-04	4
Calculated Beta Air Dose (mRad)	1.47E-04	1.70E-04	4
Total Body Dose (mRem)	0.095	0.101	

Comments:

1. The major contributor to gaseous tritium activity is evaporation from the spent fuel pools. Factors that contribute to the tritium activity in the pools are related to the type of fuel used (i.e., 18-month fuel) the core life, power output, and number of core cycles. Gaseous tritium activity released can vary from year to year.

2. C-14 activity released from the site is estimated using reactor power in accordance with EPRI document "Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents".

3. No detectable particulate, gross alpha, or iodine activity was released during 2024 and 2025.

4. Calculated air dose will vary from year to year based on the nuclides and their quantities being released. Each nuclide has a different dose factor. Therefore, annual air dose may change based on the nuclide mix and activity released.

Overall the gaseous radioactivity releases from CPNPP are well controlled and maintained ALARA. CPNPP is well below all applicable limits for gaseous releases. Neither unit had any fuel defects during the year of this report.

1.1 Executive Summary (continued)

Liquid Effluents:

Two-year summary of all the radioactive liquid releases to the environment:

Liquid Waste	2024	2025	Comments
Total Activity Excluding Tritium (Ci)	4.60E-04	2.02E-04	2
Tritium Activity (Ci)	1,810	1,290	1, 3
Total Body Dose (mRem)	0.13	0.13	2
Total Volume Released (Gallons)	940,453	13,684,155	4

Comments:

1. Tritium released values may vary significantly from year to year due to fuel burnup characteristics which affects reactor coolant tritium production. Tritium activity increases following reactor startup, then plateaus mid-cycle, and begins to decline towards the end of cycle due to required dilutions. Its activity is also dependent upon how many unit outages there were during a calendar year. More liquid waste is processed and released during outages.

2. Total body dose is dependent upon the nuclide mix within the liquid releases. Some nuclides contribute to lower doses even though their activities may be higher.

3. Tritium released was lower due to only one refueling outage during 2025.

4. Very small amount of tritium activity above background detected in the Low Volume Waste Pond (LVW). Therefore, releases from the LVW were required to be included in the total liquid release volume.

Meteorological Data

During 2025, CPNPP meteorological monitoring system data were unavailable due to modifications and upgrades to the system. Therefore, the goal of > 90% joint data recovery for the calendar year was not met (references: TR-2020-001904 and FDA-2025-000010-01).

Monitors OOS >30 Days

During 2025, there were no Technical Specification/ODCM effluent radiation monitors out of service (OOS) for greater than 30 days.

1.1 Executive Summary (continued)

ODCM Changes

There was one minor administrative change (revision 35) to the ODCM during 2025 documented in LDCR-OD-2025-001. Section 6.14 was revised to change the ODCM changes approval authority from “Vice President of Nuclear Operations to “Plant Manager”.

Solid Waste

Two-year summary of the solid waste production:

Total Waste	2024	2025	% Error
Shipped (m^3)	204	388	±25%
Shipped (Ci)	0.05	371	±25%
Buried (m^3)	204	331	±25%
Buried (Ci)	0.05	371	±25%

Comments:

Volume: The waste volume increase over the previous year was due to an effort to reduce onsite waste inventory and to free up storage vault availability. In 2024 there were no resins / filters shipped offsite for disposal and during 2025 there were eight shipments of resins for disposal. Additionally, during 2024 there were only four shipments of Dry Active Waste shipped offsite and in 2025 there were seven shipments of Dry Active Waste for disposal.

Activity: The activity shipped offsite was over 8,000 times greater than activity shipped offsite during 2024 primarily due to the eight resin shipments made in 2025 which are exponentially higher in activity as compared to Dry Active Waste shipment activity.

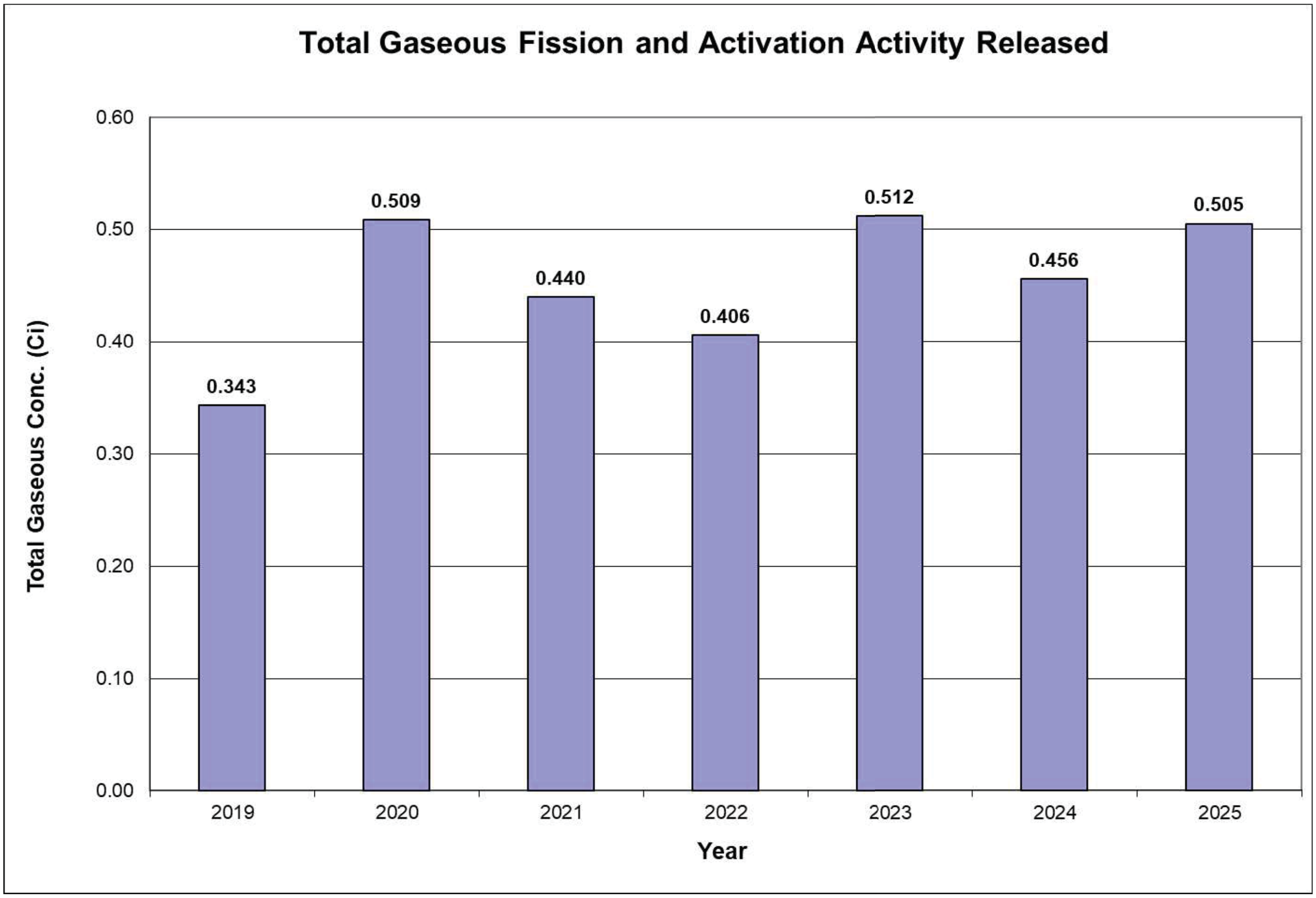
Groundwater Tritium

Water wells used to monitor CPNPP for tritium leaks into groundwater all had results that were less than the minimum detectable activity (MDA), with the exception of Monitoring Wells 11 and 24 during 2025 as indicated in Table 1. MW-11 rendered positive results for first three quarters of 2025. Tracking Report TR-2024-002038 documented a historical data review that concluded that the likely source of tritium is lake water leakage from the Unit 1 Circulating Water Tunnel that is in proximity to MW-11 screening position. During the last Unit 1 Circulating Water Tunnel inspection it was observed that it experiences groundwater ingress. Since the tunnel experiences in-leakage it could also leak water out. Reservoir water pumped through the tunnel is consistently above 12,000 pCi/L. MW-24 had a positive tritium sample result which was not above a threshold to initiate follow-up action. All of these sample results were much less than the drinking water limit of 20,000 pCi/L. See Section 8.8 for details.

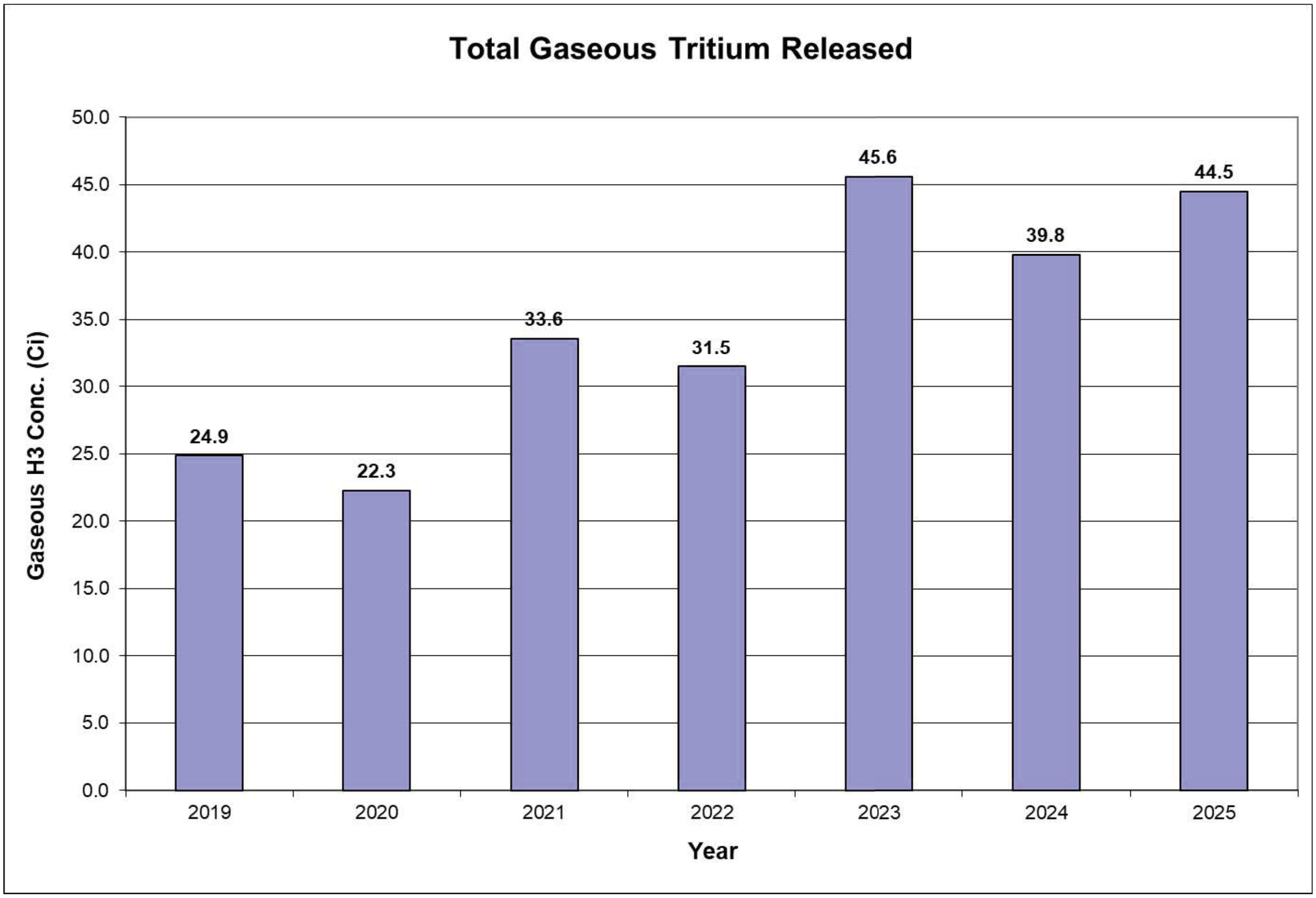
Conclusion

During 2025, the radiological effluent monitoring program was conducted in an appropriate manner to ensure the activity released and associated dose to the public has been maintained as low as reasonably achievable (ALARA).

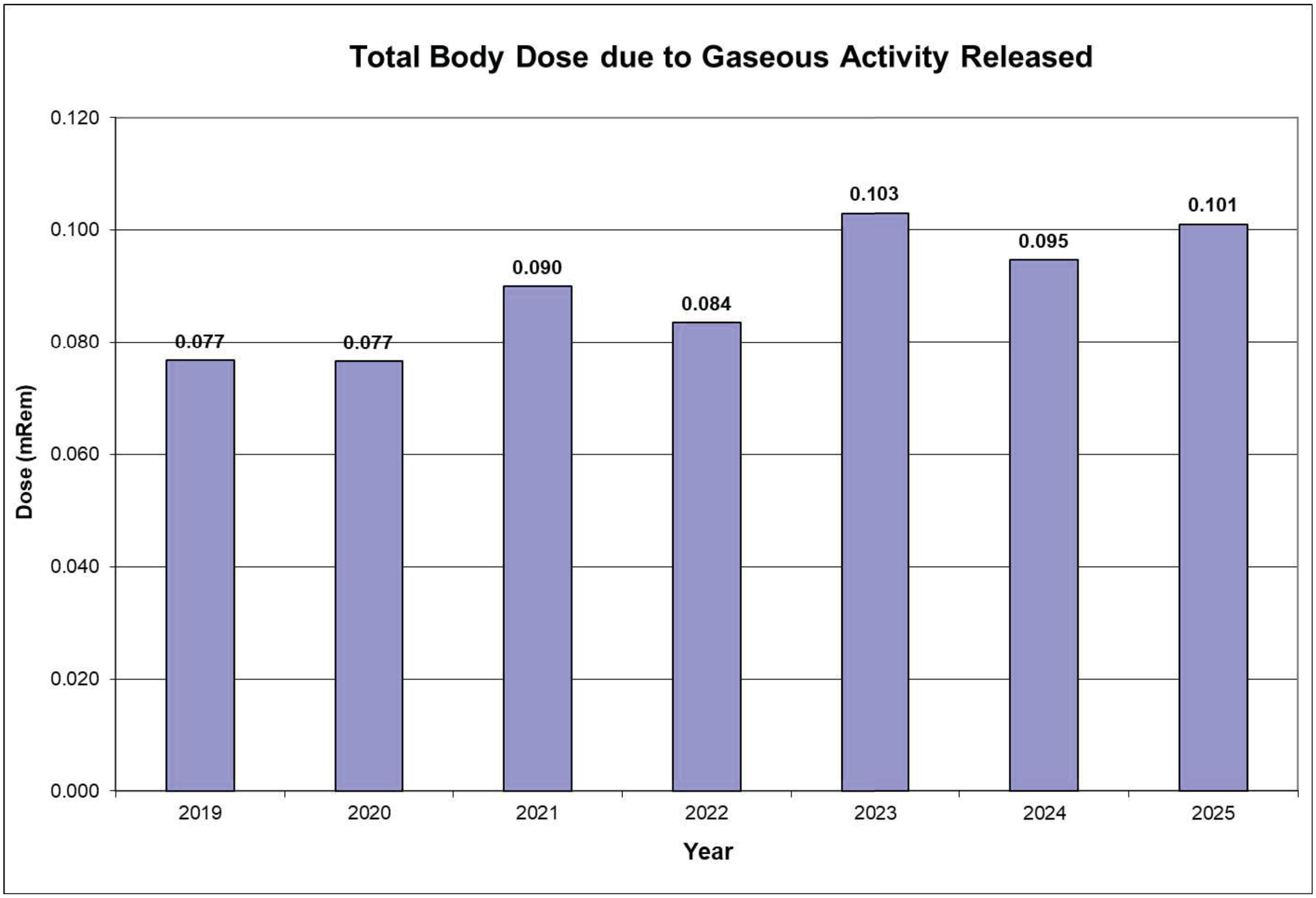
1.2 Historical Trend Graphs



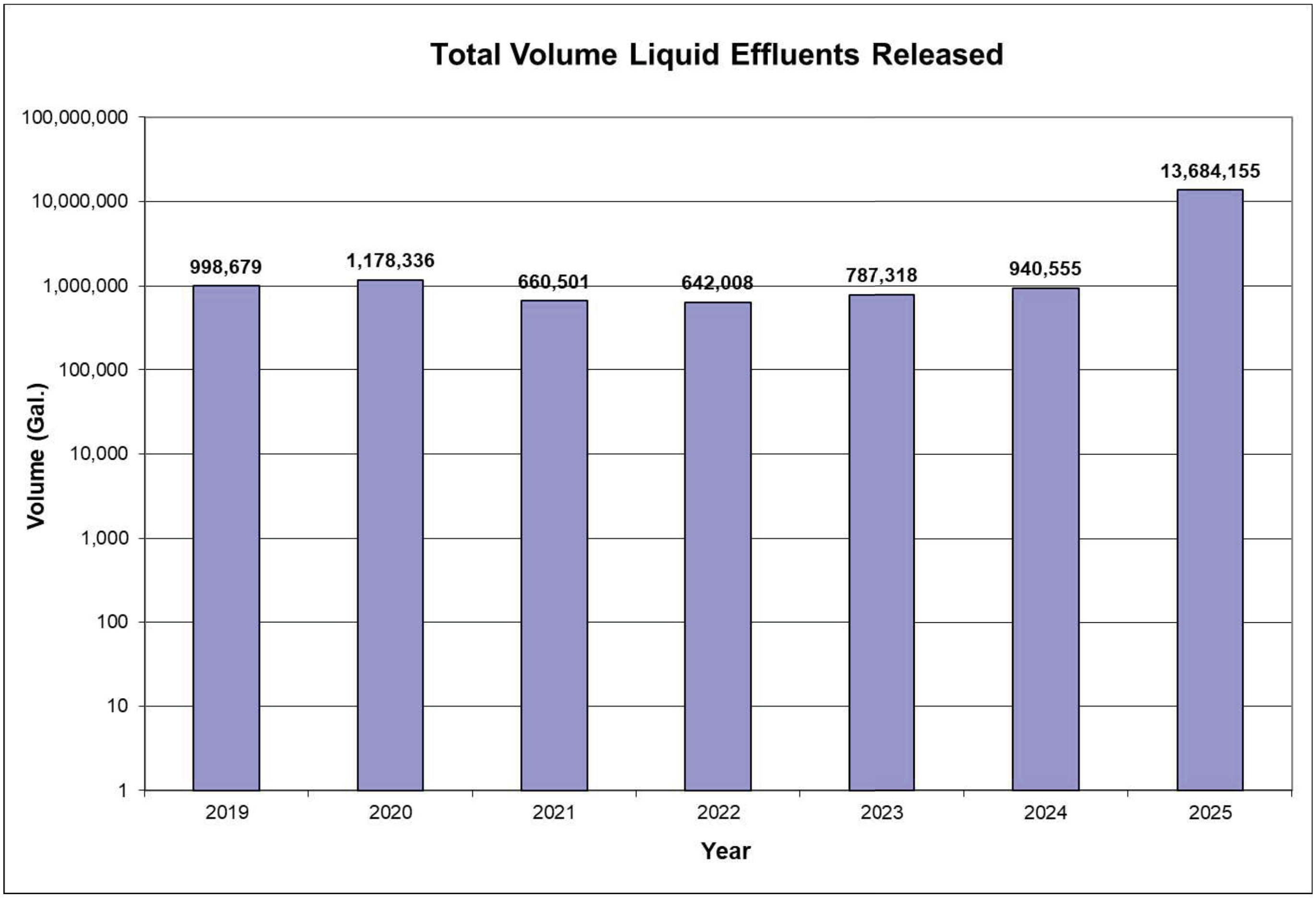
Year	Total Gaseous Fission and Activation Activity Released Comments
All	Total activity released in gaseous effluents can vary year to year depending on the number of refueling and maintenance outages, as well as other factors.



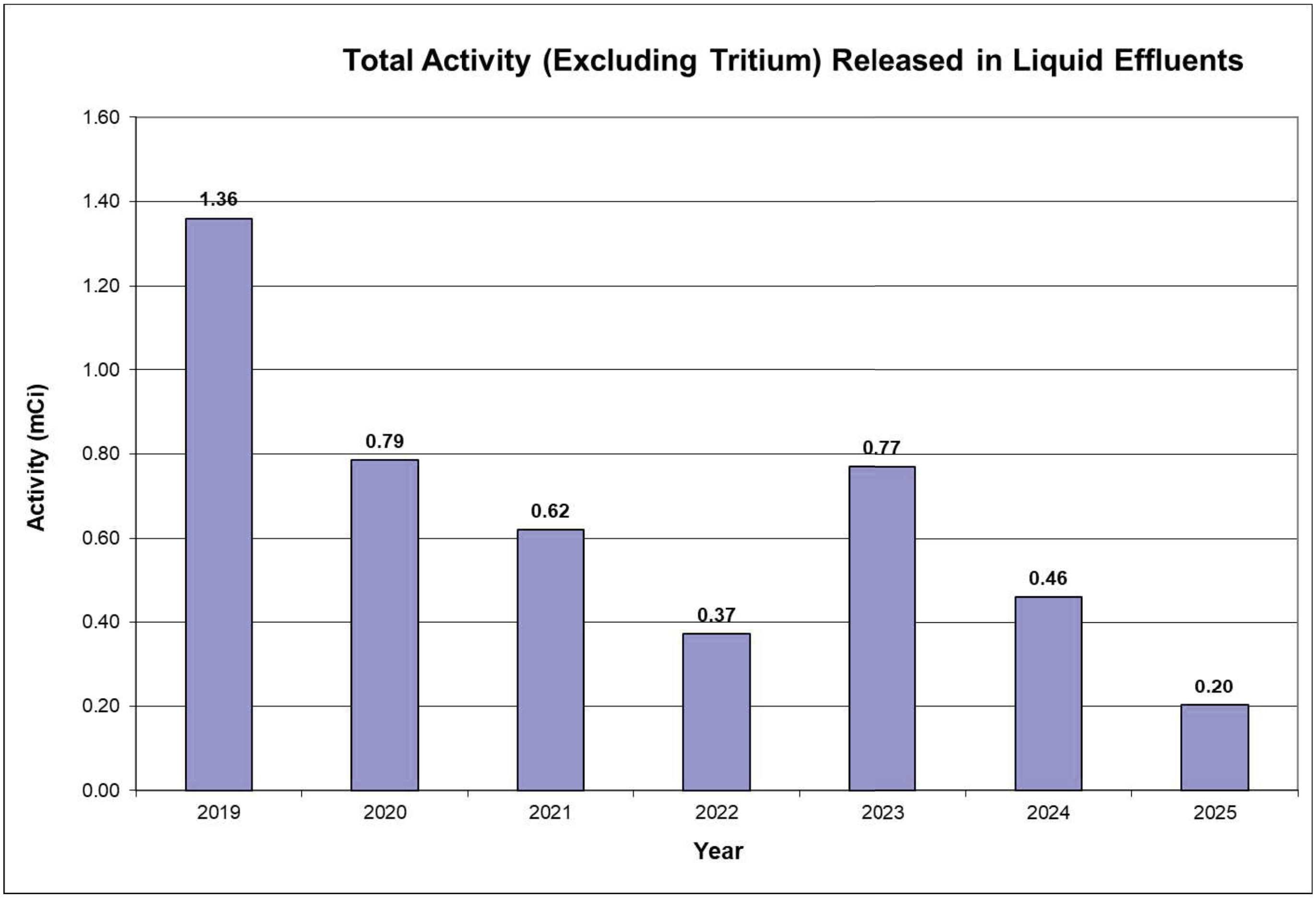
Year	Total Gaseous Tritium Released Comments
All	A major contributor to gaseous tritium activity is evaporation from the spent fuel pools. Variables contributing to the tritium activity in the pools are based on the type of fuel used (i.e., 18-month fuel), the core life, power output, and number of core cycles.



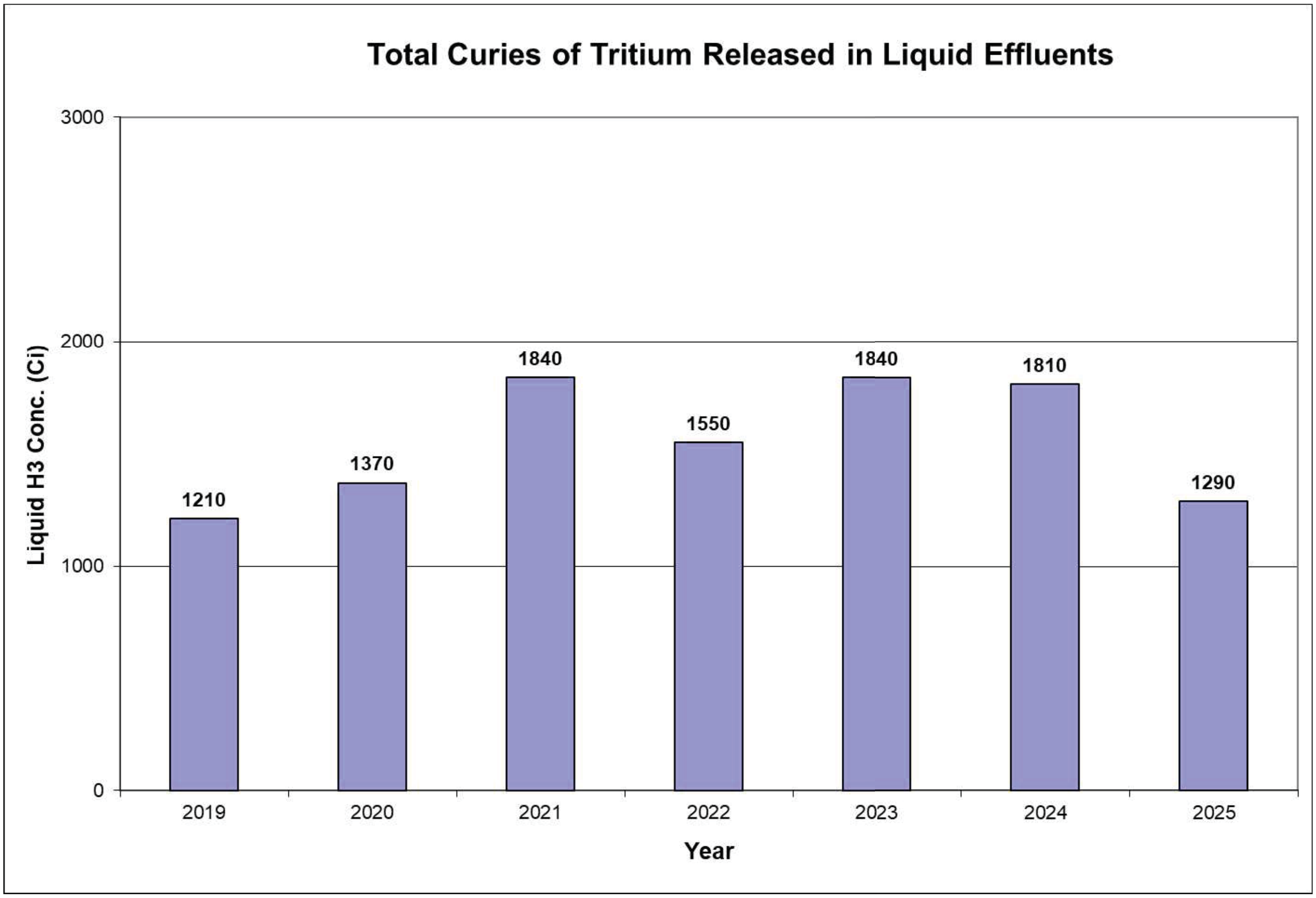
Year	Total Body Dose due to Gaseous Activity Released Comments
2023	Increase due to higher noble gas and tritium activity released during 2023.



Year	Total Volume Liquid Effluents Released Comments
All	Total volume of liquid effluents released can vary significantly from year to year depending on the number of refueling and maintenance outages. More liquid waste is processed and released during these outages.
2025	Very small amount of tritium activity above background detected in the Low Volume Waste Pond (LVW). Therefore, releases from the LVW were required to be included in the total liquid release volume.



Year	Total Activity (Excluding Tritium) Released in Liquid Effluents Comments
All	Total activity released in liquid effluents can vary year to year depending on the number of refueling and maintenance outages, as well as other factors.



Year	Total Curies of Tritium Released in Liquid Effluents Comments
All	Tritium released values can vary significantly from year to year based on a couple of reasons. First, reactor coolant tritium production changes based on fuel burnup characteristics. Tritium activity increases following reactor startup, then plateaus mid-cycle, and begins to decline towards the end of cycle. Second, the tritium released value is dependent upon on how many outages there were during a calendar year. More liquid waste is processed and released during unit outages.

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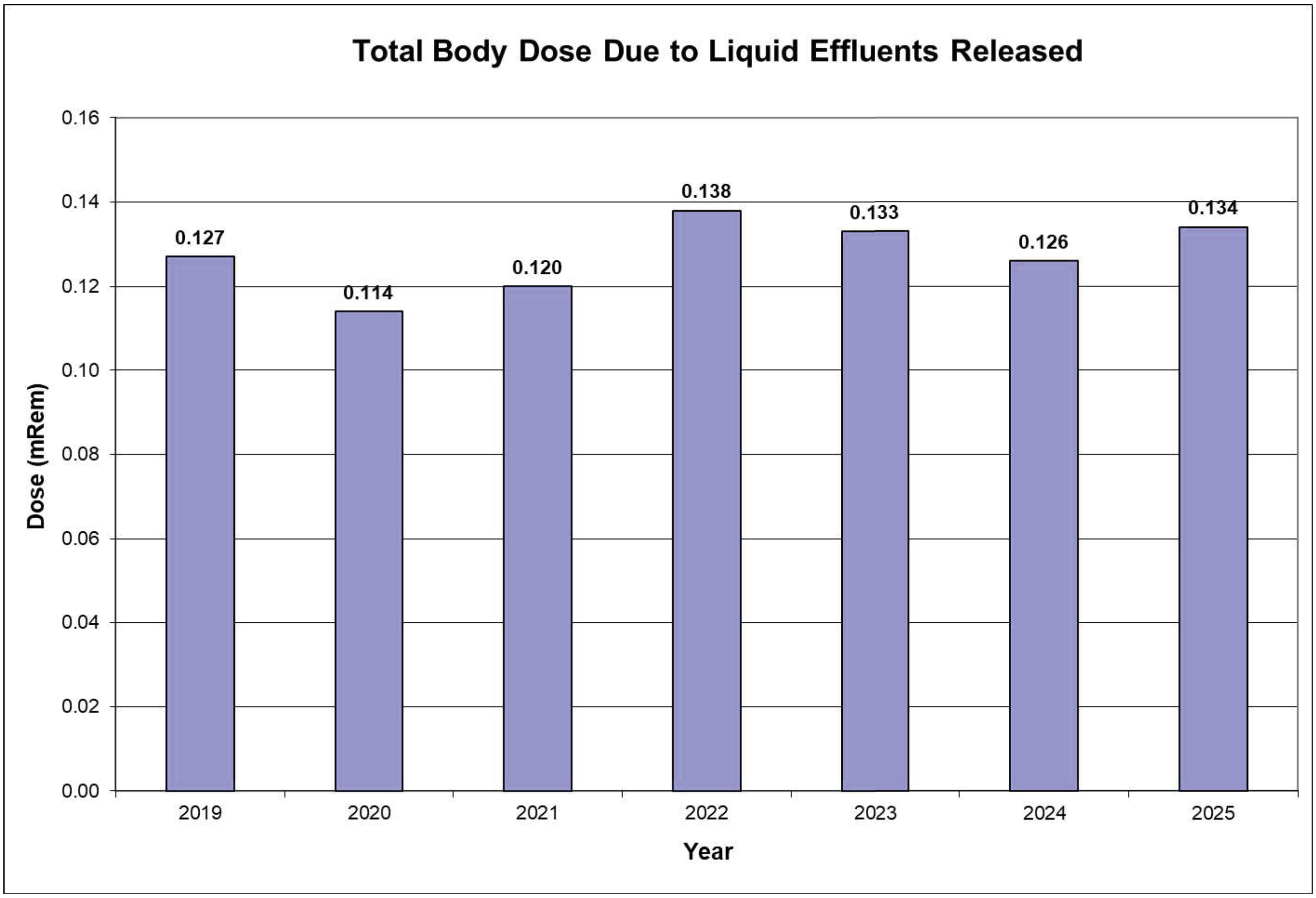
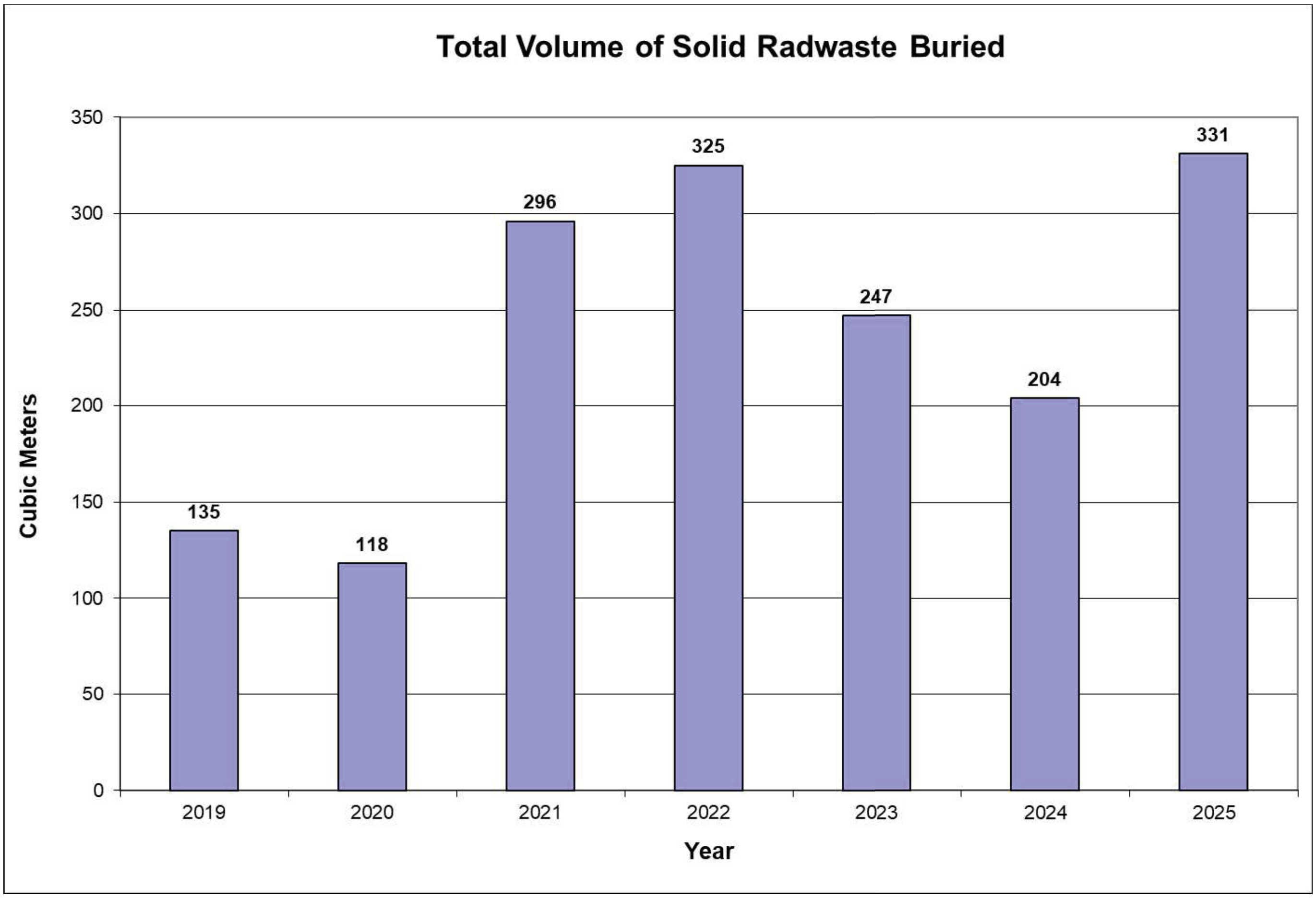
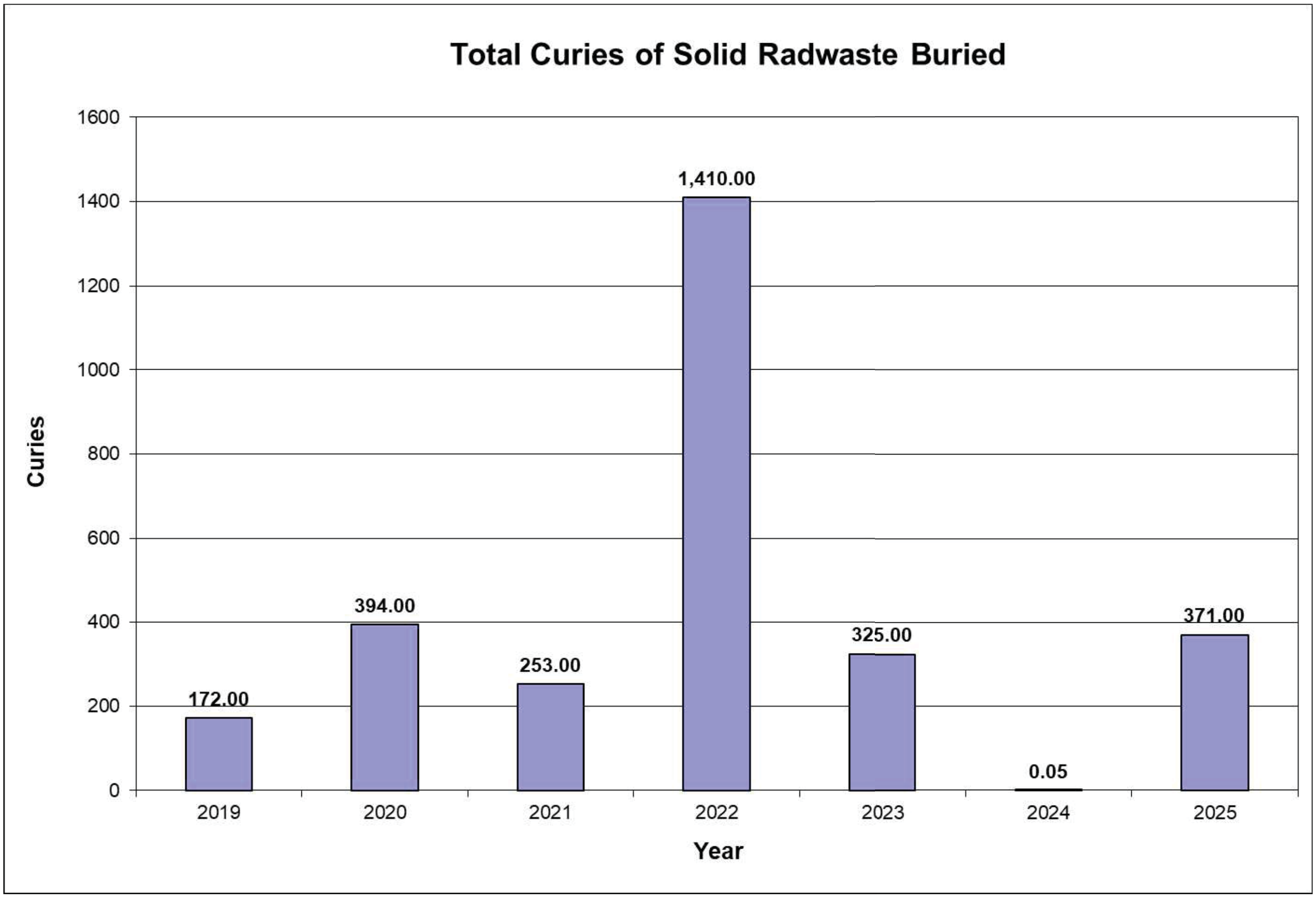


Year	Total Body Dose Due to Liquid Effluents Released Comments
N/A	No comments.



Year	Comments
2021/2022	The increase in waste volume buried during these years is due to an effort to reduce our backlog of radwaste stored on site. A significant radwaste backlog has accumulated over the past few years and the station has implemented a multi-year plan to reduce and ultimately eliminate this backlog.
2023	Solid radwaste backlog volume reduction continued through 2023.
2024	Radwaste volume buried decreased from 2023 due to no resins or filters shipped during the year. Additionally, the Dry Active Waste volume generation was significantly lower due to one refueling outage in 2024 versus two refueling outages during 2023.
2025	During 2025 the waste volume increase over the previous year was due to an effort to reduce onsite waste inventory and to free up storage vault availability. In 2024 there were no resins / filters shipped offsite for disposal and during 2025 there were eight shipments of resins for disposal. Additionally, during 2024 there were only four shipments of Dry Active Waste shipped offsite and in 2025 there were seven shipments of Dry Active Waste for disposal.



Year	Comments
2019	The majority of waste shipped offsite was Dry Active Waste (DAW) with low activity. While the total volume buried increased significantly over the previous years (refer to Total Volume of Solid Radwaste Buried histogram on next page), the Curies buried was much lower.
2020	The shipped and buried total activity was more than double the activity shipped in 2019. One of the High Integrity Containers shipped in 2020 was a Waste Class C shipment which by itself had an activity level 30% greater than the total sum of all activity shipped in 2019.
2022	The spent resin inventory was near the capacity of the shielded vaults and a resin shipping campaign was undertaken. 15 High Integrity Containers were shipped offsite to make space to support resin and filter storage capacity for planned plant operational needs. Seven of the 15 High Integrity Containers shipped were waste Class B and C which have much higher activity than waste Class A containers. This significantly added to the total shipped activity from previous years.
2024	Curies buried was much less due to no spent resins buried during 2024.
2025	During 2025 the activity shipped offsite was over 8,000 times greater than activity shipped offsite during 2024 primarily due to the eight resin shipments made in 2025 which are exponentially higher in activity as compared to Dry Active Waste shipment activity.

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

The ODCM Radiological Effluent Control limits applicable to the release of radioactive material in liquid and gaseous effluents are described in the following sections.

2.1.1 Fission and Activation Gases (Noble Gases)

The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to less than or equal to 500 mRem/yr to the whole body and less than or equal to 3000 mRem/yr to the skin.

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

a. During any calendar quarter: Less than or equal to 5 mRad for gamma radiation and less than or equal to 10 mRad for beta radiation, and

b. During any calendar year: Less than or equal to 10 mRad for gamma radiation and less than or equal to 20 mRad for beta radiation.

2.1.2 Iodine-131, Iodine-133, Tritium and Radioactive Material in Particulate Form

The dose rate due to iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days, released in gaseous effluents from the site to areas at and beyond the site boundary, shall be limited to less than or equal to 1500 mRem/yr to any organ.

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

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

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

2.1.3 Liquid Effluents

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to 10 times the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-4 μCi/mL total activity.

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

a. During any calendar quarter to less than or equal to 1.5 mRem to the whole body and to less than or equal to 5 mRem to any organ, and

b. During any calendar year to less than or equal to 3 mRem to the whole body and to less than or equal to 10 mRem to any organ.

2.1.4 LVW Pond Resin Inventory

The quantity of radioactive material contained in resins transferred to the LVW pond shall be limited by the following expression:

$$(264/V) \bullet \Sigma_j A_j/C_j < 1.0$$

excluding tritium, dissolved or entrained noble gases and radionuclides with less than an 8-day half-life, where:

A_j = pond inventory limit for a single radionuclide j (Curies),

C_j = 10CFR20, Appendix B, Table 2 Column 2, concentration for a single radionuclide j (μCi/mL),

V = volume of resins in the pond (gallons), and

264 = conversion factor (μCi/Ci per mL/gal)

This expression limits the total quantity of radioactive materials in resins discharged to the LVW Pond to a value such that the average concentration in the resins, calculated over the total volume of resins in the pond, will not exceed one times the Effluent Concentration Limits specified in 10 CFR 20, Appendix B, Table 2, Column 2.

2.1.5 Total Dose

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

2.2 Effluent Concentration Limits

2.2.1 Gaseous Effluents

For gaseous effluents, effluent concentration limits (ECL) values are not directly used in release rate calculations since the applicable limits are expressed in terms of dose rate at the site boundary.

2.2.2 Liquid Effluents

The values specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 are used as the ECL for liquid radioactive effluents released to unrestricted areas. A value of 2.0E-04 µCi/mL is used as the ECL for dissolved and entrained noble gases in liquid effluents.

2.3 Measurements and Approximations of Total Radioactivity

Measurements of total radioactivity in liquid and gaseous radioactive effluents were accomplished in accordance with the sampling and analysis requirements of Tables 4.11-1 and 4.11-2, respectively, of the CPNPP ODCM.

2.3.1 Liquid Radioactive Effluents

Each batch release was sampled and analyzed for gamma emitting radionuclides using gamma spectroscopy. Composite samples were analyzed monthly and quarterly for the Primary Effluent Tanks (PET), Waste Monitor Tanks (WMT), Laundry Holdup and Monitor Tanks (LHMT), and Waste Water Holdup Tanks (WWHT). Composite samples were analyzed monthly for tritium and gross alpha radioactivity in the onsite laboratory using liquid scintillation and gas flow proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90, Fe-55, and Ni-63 by a contract laboratory. The results of the composite analyses from the previous month or quarter were used to estimate the quantities of these radionuclides in liquid effluents during the current month or quarter. The total radioactivity in liquid effluent releases was determined from the measured and estimated concentrations of each radionuclide present and the total volume of the effluent released during periods of discharge.

For batch releases of powdex resin to the LVW pond, samples were analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques. Composite samples were analyzed quarterly for Sr-89 and Sr-90 by a contract laboratory.

For continuous releases to the Circulating Water Discharge from the LVW pond, daily grab samples were obtained over the period of pond discharge. These samples were composited and analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques. Composite samples were also analyzed for tritium and gross alpha radioactivity using liquid scintillation and gas flow proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90, Fe-55, and Ni-63 by a contract laboratory.

2.3.2 Gaseous Radioactive Effluents

Each gaseous batch release was sampled and analyzed for radioactivity prior to release. Waste Gas Decay Tank samples were analyzed for gamma emitting radionuclides. Containment Building charcoal (iodine), particulate, noble gas, and tritium grab samples were also analyzed for radioactivity prior to each release. The results of the analyses and the total volume of effluent released were used to determine the total amount of radioactivity released in the batch mode.

For continuous effluent release pathways, noble gas and tritium grab samples were collected and analyzed weekly. Samples were analyzed for gamma emitting radionuclides by gamma spectroscopy and liquid scintillation counting techniques. Continuous release pathways were continuously sampled using radioiodine adsorbers and particulate filters. The radioiodine adsorbers and particulate filters were analyzed weekly for I-131 and gamma emitting radionuclides using gamma spectroscopy. Results of the noble gas and tritium grab samples, radioiodine adsorber and particulate filter analyses from the current week, and the average effluent flow rate for the previous week were used to determine the total amount of radioactivity released in the continuous mode. Monthly composites of particulate filters were analyzed for gross alpha activity, in the onsite laboratory using the gas flow proportional counting technique. Quarterly composites of particulate filters were analyzed for Sr-89 and Sr-90 by a contract laboratory.

C-14 was estimated in accordance with the methodology in the EPRI report *Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents.* EPRI, Palo Alto, CA: 2010, 1021106. See Attachment 10.3 for more information on C-14.

2.4 Batch Releases

A summary of information for liquid and gaseous batch releases is included in Table 9.1.

2.5 Abnormal Releases

An abnormal release is defined as the unplanned or uncontrolled release of radioactive material from the site boundary. No abnormal releases occurred during the year of this report.

3.0 GASEOUS EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables 9.3 and 9.4. All releases of radioactive material in gaseous form are considered to be ground level releases.

4.0 LIQUID EFFLUENTS

The quantities of radioactive material released in liquid effluents are summarized in Tables 9.5 and 9.6.

5.0 SOLID WASTES

The quantities of radioactive material released as solid wastes are summarized in Table 9.10.

6.0 RADIOLOGICAL IMPACT ON MAN

6.1 Dose Due to Liquid Effluents

Dose to an adult from the fish and cow-meat consumption pathways from Squaw Creek Reservoir was calculated in accordance with the methodology and parameters in the ODCM. Results of the calculations are summarized on a quarterly and annual basis in Table 9.7.

6.2 Dose Due to Gaseous Effluents

Air doses due to gaseous effluent gamma and beta emissions were calculated using the highest annual average atmospheric dispersion factor at the Site Boundary location, in accordance with the methodology and parameters in the ODCM. Results of the calculations are summarized on a quarterly and annual basis in Table 9.8.

6.3 Dose Due to Radioiodines, Tritium, and Particulates in Gaseous Releases

Dose to an adult, teen, child, and infant from radioiodines and particulates, for the pathways listed in Part II, Table 2.4 of the ODCM, were calculated using the highest dispersion and deposition factors, as appropriate, in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in Table 9.9. Because of pathway similarity, C-14 dose is included in this table.

6.4 40CFR190 Dose Evaluation

ODCM Radiological Effluent Control 3.11.4 requires dose evaluations to demonstrate compliance with 40 CFR Part 190 only if the calculated quarterly or yearly dose exceed two times the applicable quarterly or annual dose limits. At no time during 2025 were any of these limits exceeded; therefore, no evaluations are required.

6.5 Dose to a Member of the Public from Activities Inside the Site Boundary

Dose to a Member of the Public from activities inside the site boundary was evaluated. The highest dose resulted from recreational fishing on Squaw Creek Reservoir. A dose of 3.45E-03 mRem/yr was calculated based on an individual fishing twice a week, five hours each day, six months per year. Pathways included in the calculation were gaseous inhalation and submersion. Liquid pathways are not considered since all doses are calculated at the point of circulation water discharge into the reservoir.

7.0 METEROLOGICAL DATA

7.1 Meteorological Monitoring Program

In accordance with ODCM Administrative Control 6.9.1.4, a summary of hourly meteorological data, collected during the year of the report is normally retained onsite. Joint Frequency Tables are typically published in Attachment 10.1. However, during 2025, wind speed and direction data from the CPNPP met tower were unavailable due to modifications and upgrades to the meteorological monitoring system (references: TR-2020-001904 and FDA-2025-000010-01). Therefore, the goal of >90% joint data recovery was not met.

8.0 RELATED INFORMATION

8.1 Operability of Liquid and Gaseous Monitoring Instrumentation

ODCM Radiological Effluent Controls 3.3.3.4 and 3.3.3.5 require an explanation of why designated inoperable liquid and gaseous monitoring instrumentation was not restored to operable status within 30 days.

During 2025, there were no Technical Specification/ODCM effluent radiation monitor out of service (OOS) for greater than 30 days.

8.2 Changes to the Offsite Dose Calculation Manual

There were no changes to the ODCM during 2025.

8.3 New Locations for Dose Calculations or Environmental Monitoring

ODCM Administrative Control 6.9.1.4 requires any new locations for dose calculations and/or environmental monitoring, identified by the Land Use Census, to be included in the Radioactive Effluent Release Report. Based on the 2025 Land Use Census, no new receptor locations were identified which resulted in changes requiring a revision in current environmental sample locations. Values for the current nearest resident, milk animal, garden, X/Q and D/Q values in all sectors surrounding CPNPP were included in the 2025 Land Use Census.

8.4 Liquid Holdup and Gas Storage Tanks

ODCM Administrative Control 6.9.1.4 requires a description of the events leading to liquid holdup or gas storage tanks exceeding the limits required to be established by Technical Specification 5.5.12. Technical Requirements Manual 13.10.33 limits the quantity of radioactive material contained in each unprotected outdoor tank to less than or equal to 10 Curies, excluding tritium and dissolved or entrained noble gases. Technical Requirements Manual 13.10.32 limits the quantity of radioactive material contained in each gas storage tank to less than or equal to 200,000 Curies of noble gases (considered as Xe-133 equivalent). These limits were not exceeded during the period covered by this report.

8.5 Noncompliance with Radiological Effluent Control Requirements

This section provides a listing and description of Abnormal Releases, issues that did not comply with the applicable requirements of the Radiological Effluents Controls given in Part I of the CPNPP ODCM and/or issues that did not comply with associated Administrative Controls and that failed to meet CPNPP expectations regarding Station Radioactive Effluent Controls. Detailed documentation concerning evaluations of these events and corrective actions is maintained onsite.

8.5.1 Abnormal Gaseous Effluent Release

No abnormal (unplanned) gaseous effluent releases occurred during 2025.

8.5.2 Abnormal Liquid Effluent Releases

No abnormal (unplanned) liquid effluent releases occurred during 2025.

8.6 Resin Releases to the Low Volume Waste (LVW) Pond

A total of 76 ft^3 of powdex resin was transferred to the LVW pond during 2025. The cumulative activity deposited in the LVW pond since operations began through the end of 2025 is 1.73E-03 Curies, consisting of Co-58, Co-60, Cs-134, Cs-137, I-131, Sr-90, and Sb-125.

8.7 Changes to the Liquid, Gaseous, and Solid Waste Treatment Systems

In accordance with the CPNPP Process Control Program, Section 6.2.6.2, changes to the Radwaste Treatment Systems (liquid, gaseous, and solid) should be summarized and reported to the Commission in the Radioactive Effluent Release Report if the changes implemented required a 10CFR50.59 safety evaluation.

During 2025, no changes to the Radwaste Treatment Systems occurred meeting the reporting criteria of the Process Control Program.

8.8 Groundwater Tritium Monitoring Program

The monitoring well network at CPNPP includes 15 wells completed in the un-weathered and weathered portions of the Glen Rose Formation. Two monitoring wells are located near the Refueling Water Storage Tank (one at each RWST). Three wells are near or down-gradient of the fuel building (East Side). Seven other wells are situated on the periphery North, Northwest, South, Southeast and West of the Power Block. Three monitoring wells were placed along the wastewater management system underground piping. Each of the wells are sampled on a quarterly frequency to test for contamination via gamma spectroscopy and Liquid Scintillation.

Water wells used to monitor CPNPP for tritium leaks into groundwater all had results that were less than the minimum detectable activity (MDA), with the exception of Monitoring Wells 11 and 24 during 2025 as indicated in Table 1. MW-11 rendered positive results for first three quarters of 2025. Tracking Report TR-2024-002038 documented a historical data review that concluded that the likely source of tritium is lake water leakage from the Unit 1 Circulating Water Tunnel that is in proximity to MW-11 screening position. During the last Unit 1 Circulating Water Tunnel inspection it was observed that it experiences groundwater ingress. Since the tunnel experiences in-leakage it could also leak water out. Reservoir water pumped through the tunnel is consistently above 12,000 pCi/L. MW-24 had a positive tritium sample result which was not above a threshold to initiate follow-up action. All of these sample results were much less than the drinking water limit of 20,000 pCi/L.

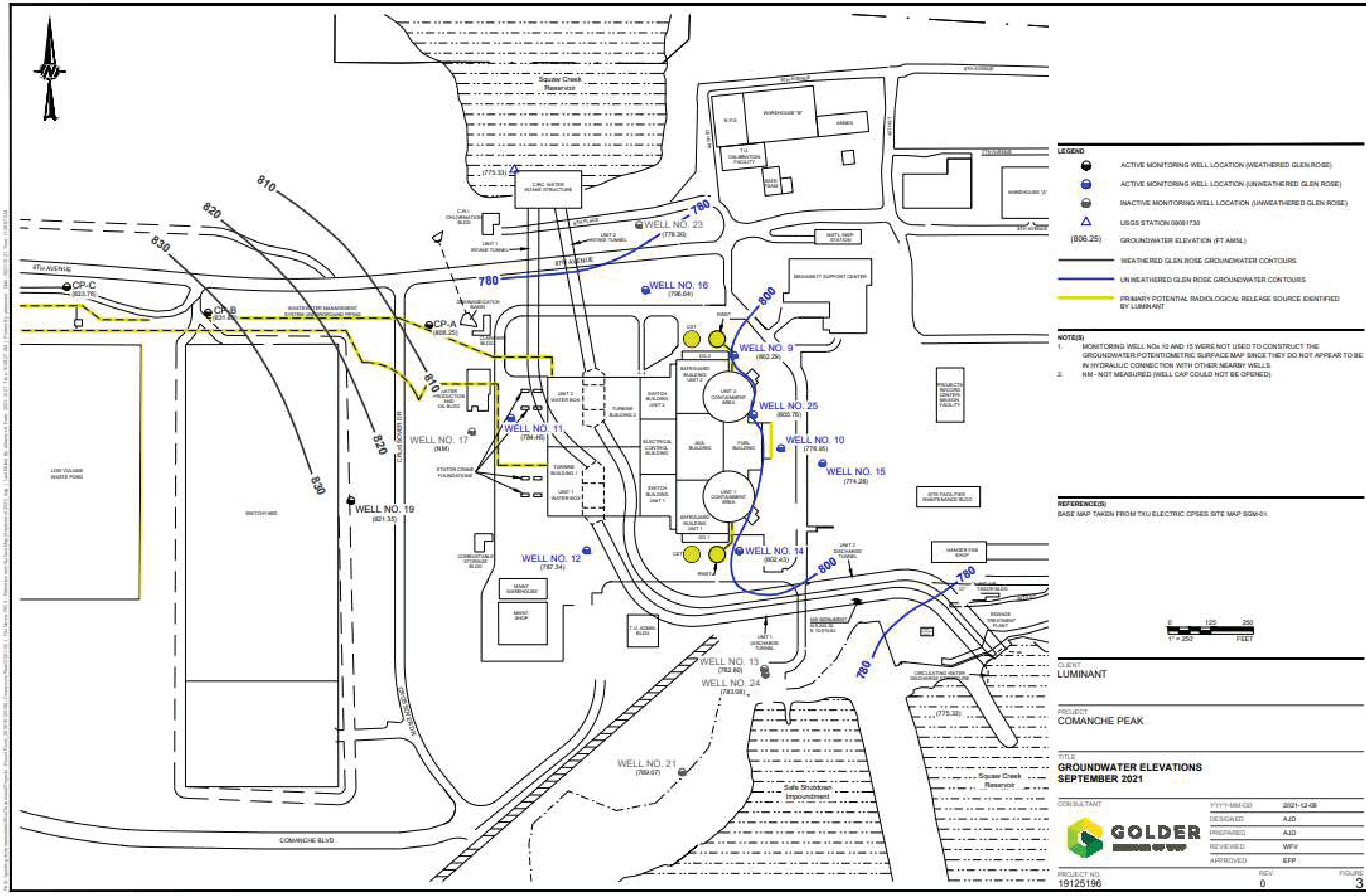
A Hydrogeology study performed by Golder Associates, Inc., described that CPNPP has perched water above an impermeable layer of bedrock. The 160 to 270 foot thick Glen Rose Formation (the top layer) is not considered a source of useful groundwater in the vicinity of CPNPP as it carries very little water and is unreliable in times of drought. The thickness and mostly impermeable nature of the Glen Rose Formation prevents migration of potentially contaminated groundwater to the underlying Twin Mountains Formation.

Continued monitoring of perched water sample points will occur as part of the Groundwater Monitoring Program (STA-654). Any new sources of tritium or increase in the activity will be evaluated and remediated as necessary.

Table 1
2025 Perched Groundwater Tritium Samples in PicoCuries Per Liter

MW Location	3/24/2025	6/20/2025	9/29/2025	12/18/2025
9	<1040	<984	<961	<1940
10	<1040	<984	<961	<1940
11	2440	1980	1830	<1940
12	<1040	<984	<961	<1940
14	<1040	<984	<961	<1940
15	<1040	<984	<961	<1940
16	<1040	<984	<961	<1940
19	<1040	<984	<961	<1940
21	<1040	<984	<961	<1940
23	<1040	<984	<961	<1940
24	1940	<984	<961	<1940
25	<1040	<984	<961	<1940
CP-A	<1040	<984	<961	<1940
CP-B	<1040	<984	<961	<1940
CP-C	<1040	<984	<961	<1940

Groundwater Tritium Monitoring Well Map



8.9 <u>Independent Spent Fuel Storage Installation (ISFSI)</u>

There are no radiological effluents released from the ISFSI. Direct dose from this installation is monitored using the normal environmental direct dose program and reported in the Annual Radiological Environmental Operating Report (AREOR).

SECTION 9.0
EFFLUENT TABLES

Table 9.1
Liquid and Gaseous Batch Release Summary

A. Liquid Releases	**Units**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**	**Annual**
1. Number of batch releases		11	13	7	7	38
2. Total time period for Batch releases	Minutes	3.28E+03	4.15E+03	2.10E+03	1.99E+03	1.15E+04
3. Maximum time period for a batch release	Minutes	3.45E+02	3.34E+02	3.45E+02	3.40E+02	3.45E+02
4. Average time period for a batch release	Minutes	2.98E+02	3.19E+02	3.01E+02	2.84E+02	3.03E+02
5. Minimum time period for a batch release	Minutes	1.00E+00	3.08E+02	1.20E+02	1.00E+00	1.00E+00

B. Gaseous Releases	**Units**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**	**Annual**
1. Number of batch releases		39	37	32	34	142
2. Total time period for batch releases	Minutes	3.93E+04	1.50E+04	1.09E+04	1.36E+04	7.88E+04
3. Maximum time period for a batch release	Minutes	9.62E+03	1.87E+03	3.81E+02	1.83E+03	9.62E+03
4. Average time period for a batch release	Minutes	1.01E+03	4.05E+02	3.41E+02	4.00E+02	5.55E+02
5. Minimum time period for a batch release	Minutes	1.89E+02	2.00E+02	2.76E+02	1.65E+02	1.65E+02

Table 9.2
Abnormal Liquid and Gaseous Batch Release Summary

A. Liquid Abnormal Release Totals	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Totals
1. Number of abnormal releases		0	0	0	0	0
2. Total activity of abnormal releases	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

B. Gas Abnormal Release Totals	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Totals
1. Number of abnormal releases		0	0	0	0	0
2. Total activity of abnormal releases	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 9.3
Gaseous Effluents - Summation of All Releases

Type of Effluent	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
A. Fission and Activation Gases						
1. Total Release	Curies	1.26E-01	1.61E-01	1.03E-01	1.15E-01	5.05E-01
2. Average Release rate for period	µCi/sec	1.61E-02	2.05E-02	1.29E-02	1.45E-02	1.60E-02
3. Percent of Applicable Limit	%	*	*	*	*	*
4. Estimated Total Error	%					23.5
B. Radioiodines						
1. Total Iodine-131	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Release rate for period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Percent of Applicable Limit	%	*	*	*	*	*
4. Estimated Total Error	%					14.3
C. Particulates						
1. Particulates (Half-Lives > 8 Days)	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Release rate for period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Percent of Applicable Limit	%	*	*	*	*	*
4. Estimated Total Error	%					31.3
D. Tritium						
1. H-3 Release	Curies	5.96E+00	1.10E+01	1.65E+01	1.10E+01	4.45E+01
2. Average Release rate for period	µCi/sec	7.66E-01	1.40E+00	2.07E+00	1.39E+00	1.41E+00
3. Percent of Applicable Limit	%	*	*	*	*	*
4. Estimated Total Error	%					23.8
E. Carbon-14						
1. C-14 Release	Curies	6.42E+00	5.59E+00	6.32E+00	6.56E+00	2.49E+01
2. Average Release rate for period	µCi/sec	8.25E-01	7.12E-01	7.93E-01	8.29E-01	7.90E-01
3. Percent of Applicable Limit	%	*	*	*	*	*
4. Estimated Total Error	%					None
F. Gross Alpha						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Estimated Total Error	%					31.3

*** Applicable limits are expressed in terms of dose.**

Table 9.4
Gaseous Effluents - Ground Level Releases

Continuous Mode

Nuclides Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
Fission Gases						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium						
H-3	Curies	5.75E+00	1.10E+01	1.64E+01	1.10E+01	4.41E+01
Carbon-14						
C-14	Curies	1.93E+00	1.68E+00	1.90E+00	1.97E+00	7.47E+00
Gross Alpha						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not reported.
Zeros in this table indicate that no radioactivity was present at detectable levels.

Table 9.4 (continued)
Gaseous Effluents - Ground Level Releases

Batch Mode

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
Fission Gases						
Ar-41	Curies	1.24E-01	1.47E-01	1.02E-01	1.13E-01	4.86E-01
Kr-85m	Curies	0.00E+00	0.00E+00	0.00E+00	6.70E-06	6.70E-06
Kr-85	Curies	2.40E-04	1.43E-03	0.00E+00	0.00E+00	1.67E-03
Xe-133m	Curies	9.41E-07	4.99E-04	0.00E+00	4.58E-05	5.46E-04
Xe-133	Curies	1.40E-03	8.75E-03	8.28E-04	1.85E-03	1.28E-02
Xe-135m	Curies	0.00E+00	2.24E-05	0.00E+00	0.00E+00	2.24E-05
Xe-135	Curies	8.27E-07	2.95E-03	0.00E+00	3.26E-04	3.28E-03
Total for Period	**Curies**	**1.26E-01**	**1.61E-01**	**1.03E-01**	**1.15E-01**	**5.05E-01**
Iodines						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium						
H-3	Curies	2.06E-01	7.63E-02	4.26E-02	3.89E-02	3.64E-01
Carbon-14						
C-14	Curies	4.49E+00	3.92E+00	4.43E+00	4.59E+00	1.74E+01
Gross Alpha						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not reported.
Zeros in this table indicate that no radioactivity was present at detectable levels.

Table 9.5
Liquid Effluents - Summation Of All Releases

	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
A. Fission and Activation Products						
1. Total Release (excludes tritium, gases, alpha)	Curies	1.13E-04	8.56E-05	2.67E-06	0.00E+00	2.02E-04
2. Average diluted concentration during period	µCi/mL	9.25E-12	6.09E-12	3.43E-13	0.00E+00	1.61E-12
3. Percent of Applicable Limit	%	*	*	*	*	*
4. Estimated Total Error	%					30.3
B. Tritium						
1. Total Release	Curies	3.24E+02	4.13E+02	1.16E+02	4.39E+02	1.29E+03
2. Average diluted concentration during period	µCi/mL	2.64E-05	2.94E-05	1.50E-05	4.81E-06	1.03E-05
3. Percent of Applicable Limit	%	*	*	*	*	*
4. Estimated Total Error	%					13.4
C. Dissolved and Entrained Gases						
1. Total Release	Curies	1.73E-04	3.23E-04	7.32E-06	8.05E-06	5.11E-04
2. Average diluted concentration during period	µCi/mL	1.41E-11	2.30E-11	9.41E-13	8.83E-14	4.08E-12
3. Percent of Applicable Limit	%	*	*	*	*	*
4. Estimated Total Error	%					11.6
D: Gross Alpha Radioactivity						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average diluted concentration during period	µCi/mL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4. Estimated Total Error	%					0.0
E: Waste Vol Release (Pre-Dilution)	Liters	7.44E+05	8.54E+05	5.29E+05	4.97E+07	5.18E+07
1. Estimated Total Error	%					2.2
F. Volume of Dilution Water Used	Liters	1.23E+10	1.41E+10	7.78E+09	9.12E+10	1.25E+11
4. Estimated Total Error	%					10.0

*** Applicable limits are expressed in terms of dose.**

Table 9.6
Liquid Effluents

Continuous Mode

Nuclides Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Fission and Activation Products						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium						
H-3	Curies	0.00E+00	0.00E+00	0.00E+00	4.66E-01	4.66E-01
Dissolved and Entrained Gases						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha Radioactivity	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Batch Mode

Nuclides Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
A. Fission and Activation Products						
Co-58	Curies	1.04E-04	8.26E-05	2.67E-06	0.00E+00	1.89E-04
Co-60	Curies	9.28E-06	3.04E-06	0.00E+00	0.00E+00	1.23E-05
Nb-95	Curies	9.81E-10	0.00E+00	0.00E+00	0.00E+00	9.81E-10
Total for Period	**Curies**	**1.13E-04**	**8.56E-05**	**2.67E-06**	**0.00E+00**	**2.02E-04**
B. Tritium						
H-3	Curies	3.24E+02	4.13E+02	1.16E+02	4.38E+02	1.29E+03
C. Dissolved and Entrained Gases						
Xe-133	Curies	1.73E-04	3.23E-04	7.32E-06	8.05E-06	5.11E-04
D. Gross Alpha Activity						
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not reported.
Zeros in this table indicate that no radioactivity was present at detectable levels.

Table 9.7
Dose Due to Liquid Releases

Organ Dose	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Bone	mRem	1.95E-12	0.00E+00	0.00E+00	0.00E+00	1.95E-12
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0	0	0	0	0
Liver	mRem	3.33E-02	3.32E-02	3.48E-02	3.30E-02	1.34E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.666	0.664	0.695	0.661	1.343
Total Body	mRem	3.33E-02	3.32E-02	3.48E-02	3.30E-02	1.34E-01
Limit	mRem	1.5	1.5	1.5	1.5	3
Percent of Limit	%	2.221	2.212	2.317	2.202	4.476
Thyroid	mRem	3.33E-02	3.32E-02	3.48E-02	3.30E-02	1.34E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.666	0.664	0.695	0.661	1.343
Kidney	mRem	3.33E-02	3.32E-02	3.48E-02	3.30E-02	1.34E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.666	0.664	0.695	0.661	1.343
Lung	mRem	3.33E-02	3.32E-02	3.48E-02	3.30E-02	1.34E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.666	0.664	0.695	0.661	1.343
GI-Lli	mRem	3.33E-02	3.32E-02	3.48E-02	3.30E-02	1.34E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.666	0.664	0.695	0.661	1.343

Table 9.8
Air Dose Due To Gaseous Releases

NG Dose	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Gamma Air	mRad	1.21E-04	1.44E-04	9.93E-05	1.10E-04	4.74E-04
Limit	mRad	5	5	5	5	10
Percent of Limit	%	0.002	0.003	0.002	0.00	0.003
Beta Air	mRad	4.27E-05	5.27E-05	3.51E-05	3.91E-05	1.70E-04
Limit	mRad	10	10	10	10	20
Percent of Limit	%	0	0.001	0	0	0.001
NG Total Body	mRem	1.15E-04	1.37E-04	9.43E-05	1.05E-04	4.51E-04
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.002	0.002	0.001	0.001	0.003
NG Skin	mRem	1.68E-04	2.01E-04	1.38E-04	1.53E-04	6.60E-04
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.002	0.003	0.002	0.002	0.004

Table 9.9
Dose Due to Radioiodines, Particulates, Tritium, and Carbon-14 in Gaseous Releases

Organ Dose	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Liver	mRem	1.84E-02	2.42E-02	3.30E-02	2.57E-02	1.01E-01
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.245	0.323	0.439	0.343	0.675
Total Body	mRem	1.84E-02	2.42E-02	3.30E-02	2.57E-02	1.01E-01
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.245	0.323	0.439	0.343	0.675
Thyroid	mRem	1.84E-02	2.42E-02	3.30E-02	2.57E-02	1.01E-01
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.245	0.323	0.439	0.343	0.675
Kidney	mRem	1.84E-02	2.42E-02	3.30E-02	2.57E-02	1.01E-01
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.245	0.323	0.439	0.343	0.675
Lung	mRem	1.84E-02	2.42E-02	3.30E-02	2.57E-02	1.01E-01
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.245	0.323	0.439	0.343	0.675
GI-Lli	mRem	1.84E-02	2.42E-02	3.30E-02	2.57E-02	1.01E-01
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.245	0.323	0.439	0.343	0.675
Bone	mRem	5.21E-03	4.54E-03	5.13E-03	5.32E-03	2.02E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.069	0.060	0.068	0.071	0.135

Table 9.10
Solid Radwaste and Irradiated Fuel Shipments

A. Solid Waste Shipped Offsite for Burial or Disposal (Not Irradiated Fuel)

1. Type of Waste	Shipped m^3	Shipped Ci	Buried m^3	Buried Ci	Percent Error
a. Spent resins/filters	3.92E+01	3.71E+02	3.92E+01	3.71E+02	± 25%
b. Dry active waste	3.48E+02	1.63E-01	2.92E+02	1.24E-01	± 25%
c. Irradiated components	0	0	0	0	N/A
d. Other (oil/miscellaneous liquids sent to processor for volume reduction)	0	0	0	0	N/A
TOTAL	3.88E+02	3.71E+02	3.31E+02	3.71E+02	± 25%

NOTE: Shipped volumes and Curies are not always equal to the buried volumes and Curies as a result of volume reducing processing, and some disposal occurs outside the twelve-month time period in which shipments occurred.

Dry active waste also includes some low-level radioactive resins, tank sediments, and filters that are handled and processed in a manner that is consistent with this waste stream.

2. Estimate of Major Nuclide Composition (by type of waste)	Nuclide	% Abundance	Activity Ci
a. Spent resins/filters	Ni-63	49.57	1.84E+02
	Fe-55	25.74	9.53E+01
	H-3	8.33	3.08E+01
	Co-60	6.80	2.52E+01
	Co-58	5.16	1.91E+01
	Mn-54	1.30	4.83E+00
	C-14	1.11	4.11E+00
	Sb-125	0.96	3.56E+00
	Cs-137d	0.46	1.69E+00
	Ni-59	0.30	1.11E+00
	Co-57	0.19	7.09E-01
	Tc-99	0.03	1.12E-01
	Co-58	0.02	5.91E-02
	Ce-144d	0.02	5.61E-02
	Other (1)	0.01	3.60E-02
	Total	100.00	3.71E-02
b. Dry active waste	Fe-55	36.97	6.01E-02
	Co-60	23.25	3.78E-02
	Ni-63	17.59	2.86E-02
	Sb-125	15.86	2.58E-02
	Mn-54	1.54	2.51E-03
	C-14	1.46	2.37E-03
	Co-58	1.07	2.37E-03
	Nb-95	0.89	1.44E-03
	Sn-113	0.39	6.32E-04
	Zr-95	0.36	2.37E-03
	Cs-137d	0.25	3.98E-04
	Nb-94	0.22	3.62E-04
	Other (2)	0.15	2.20E-04
	Total	100.00%	4.59E-02

(1) Nuclides representing <1% of total shipped activity: Ni-59, Co-57, Tc-99, Nb-94, Pu-241, Cs-134, Nb-95, Zn-65, Zr-95, Sn-113, Ba-133, Cm-243/44, Am-241, Cm-242, Pu-238 and Pu-239/40.

(2) Nuclides representing <1% of total shipped activity: Tc-99, Co-57, Sr-90d, Ni-59, Cm-144d, and Cr-51.

Table 9.10 (continued)
Solid Radwaste and Irradiated Fuel Shipments

3. Solid Waste Disposition (Mode of Transportation: Truck)

Waste Type	Waste Class	Container Type	Number of Shipments	Destination
a. Resin/filters	A	Poly HIC*	4	Waste Control Specialists, Andrews, TX
	A	Steel Liner	1	
	B	Poly HIC*	2	
	B	Steel Liner	1	
	C	Poly HIC*	0	
b. Dry active waste	A	General Design	7	

*High Integrity Container

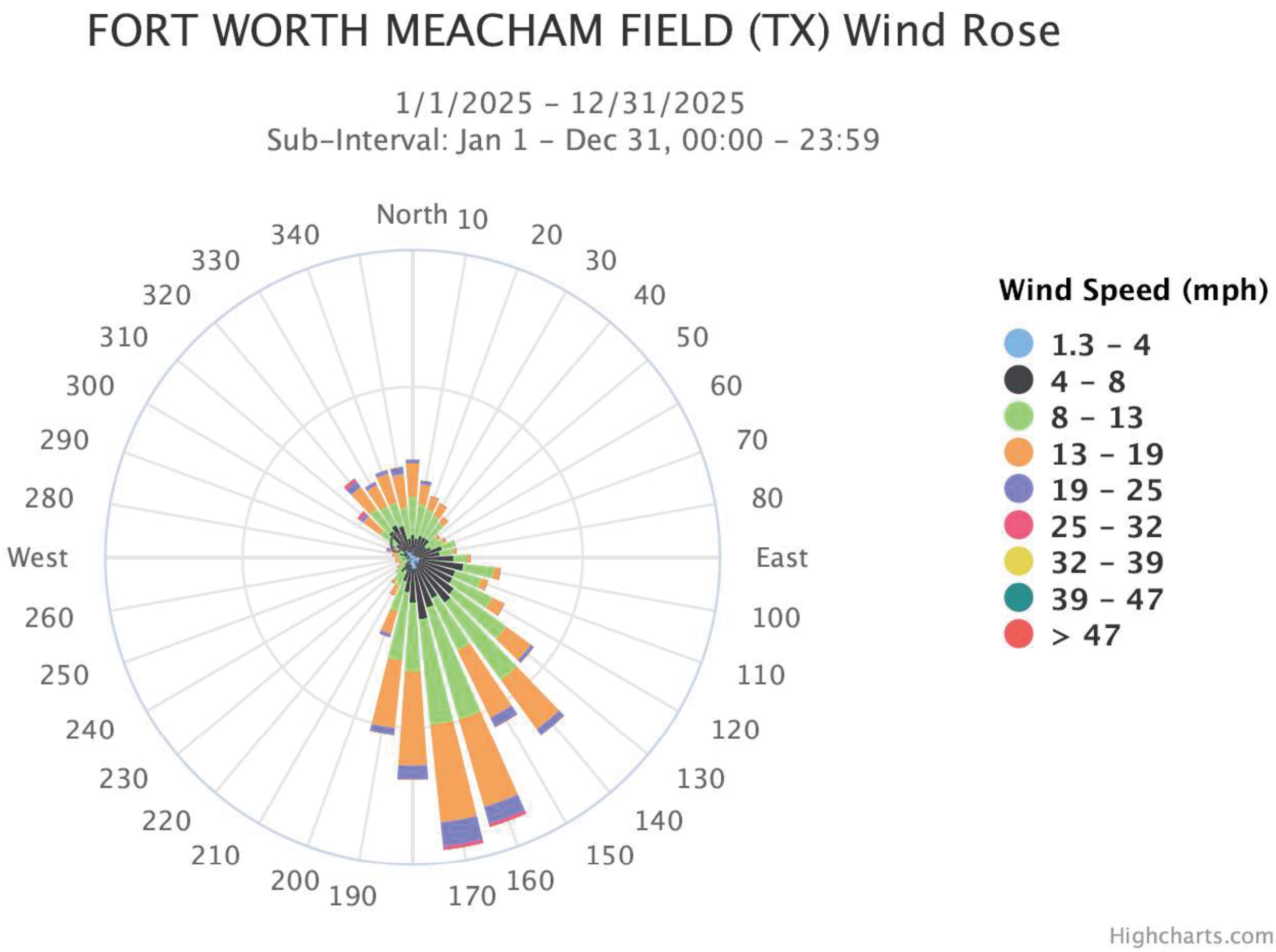
B. **Irradiated Fuel Shipments (Disposition)**

Number of Shipments	Mode of Transportation	Destination
0	N/A	N/A

Attachment 10.1
Meteorological Joint Frequency Distribution Tables*

*** NOTE:** Wind speed and direction data from the CPNPP met towers, normally included in the Joint Frequency Tables (JFTs), were unavailable for 2025 due to modifications and upgrades to the meteorological monitoring system. (references: TR-2020-001904 and FDA-2025-000010-01). Therefore, the JFTs are not included in this report (references: TR-2020-001904 and FDA-2025-000010-01).

Wind Rose and Stability Class Graphs



Predominant wind direction for 2025 continued to be from the SSE.

2025 Pasquill Stability Class is assumed to be "D" based on CPNPP met tower historical data (references: TR-2020-001904, CR-2024-001535, CR-2025-001148, and FDA-2025-000010-01, and LIST-2026-0100).

Attachment 10.2
Atmospheric Dispersion (X/Q) and Deposition (D/Q)
Calculation Methodology Discussion

Introduction

CR-2014-001059 evaluated the atmospheric dispersion (X/Q) and deposition (D/Q) calculation methodology and frequency as they relate to the meteorological data to ensure they are up to date. The CPNPP ODCM does not require a re-evaluation on any frequency or specific criteria for comparison. The NRC guidance documents cited in the ODCM also do not provide any requirements for re-evaluation. Revision 2 of Regulatory Guide 1.21, to which we are not committed, recommends that 5 years of meteorological data be used to evaluate the dispersion factors and that variation in the factors be within 10% in the non-conservative direction. The evaluation of our meteorological data included 6 years of data and meets the criteria.

Discussion

Meteorological data collected for the original FSAR, the NuBuild FSAR and historical Radiological Effluent Reports were reviewed. The data list the predominant wind direction, as a percentage, averaged for all speeds and stability classes within the period. For periods not summarized and when the plant was operable (1990-2000) only 1990, 1995 and 1996 show the predominant wind direction to be from the SSE. This information was not included, however, since the data should include a summary of at least 5 years of data. The original dispersion and deposition factors were calculated based on meteorological data collected and summarized from 1972 through 1976 at Comanche Peak. Data show the predominant wind direction to be from the South but only slightly more than winds originating from the SSE. The historical data from 1957-1976 was included in the original FSAR for comparison and show more bias toward the southerly direction but was collected from the Dallas-Fort Worth Airport location. Wind patterns for the DFW Airport were reviewed on the National Weather Service website for 1981-2010 and show that the prevailing wind direction remains from the South. This accounts for the slight variation in prevailing winds between historical and current data collected on site. During the New Build project for Units 3&4 and from OE 25286 the meteorological data were again summarized from 1997-2006, for Comanche Peak, and showed that the predominant wind direction shifted to the SSE. Using this data, new dispersion and deposition factors were calculated. The new factors were less conservative when compared to the original dispersion and deposition factors at the Exclusion Area Boundary (See Reference 3). The conclusion was to continue reporting offsite exposures based on the original values. The last column of data in Table 1 is summarized for the purposes of this evaluation and includes meteorological data since the New Build evaluation through 2012. This data, like the NuBuild data, show the predominant wind direction to be from the SSE.

Conclusion

Although the predominant wind direction frequency changes slightly from SSE to S when comparing the NuBuild Data to the original FSAR and Historical Data, the NuBuild calculations show that dispersion and deposition factors do not increase. Following the NuBuild evaluation, the wind direction remains the same and does not impact the calculation of the dispersion and deposition. Using the original factors would be conservative when calculating dose to the public.

LIST-2026-0100 was initiated to document the evaluation of prevailing wind directions for all stability classes over the calendar year 2025. This evaluation is not required, but is performed annually as a courtesy in accordance with Chemistry Guideline 25 to ensure the predominant wind direction has not changed based on the last 5 years of meteorological data including the current year. Because the CPNPP meteorological tower wind speed and direction data were unavailable due to modifications and upgrades to the meteorological monitoring system in 2025 (refer to TR-2020-001904 and FDA-2025-000010-01), a wind rose graph from Fort Worth Texas Meacham Field airport (geographically close location) was used to determine the predominant wind direction. Based on this wind, the 2025 predominant wind direction (SSE) did not change when compared with a five year rolling average from CPNPP's met tower data.

Regarding the atmospheric stability class, the National Weather Service (NWS) does not routinely derive or maintain stability class data from year to year. This information may be derived from radiosonde balloon soundings which are obtained twice a day. However, determining predominant stability class data for the entire year would be a tedious and resource intensive process. As a result of the data being unavailable in 2025, stability class "D" will be assumed as the predominant class based on historical data. Therefore, no recalculations of X/Q or D/Q values are required at this time.

Attachment 10.3
Carbon-14 Supplemental Information

Carbon-14 (C-14) is a naturally occurring isotope of carbon produced by interactions with cosmic radiation in the atmosphere with a half-life of 5,730 years. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. C-14 is also produced in commercial nuclear reactors, but the amounts are much less than the amounts produced from natural formation or from weapons testing.

In June 2009, the NRC provided revised guidance in Regulatory Guide 1.21, *Measuring, Evaluating and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste, Revision 2*, establishing an updated approach for identifying principal radionuclides. Because the overall quantity of radioactive releases has steadily decreased due to improvements in power plant operations, C-14 now qualifies as a “principal radionuclide” (anything greater than one percent of overall radioactivity in effluents) under federal regulations at many plants. In other words, C-14 has not increased and C-14 is not a new nuclear plant emission. Rather, the improvements in the mitigation of other isotopes have made C-14 more prominent.

The dose contribution of C-14 from liquid radioactive waste is essentially insignificant compared to that contributed by gaseous radioactive waste. Therefore, the evaluation of C-14 in liquid radioactive waste is not required by the new Reg. Guide 1.21, Rev. 2. The Reg. Guide 1.21, Rev. 2 also states that the quantity of gaseous C-14 released to the environment can be estimated by use of a C-14 source term production model.

A recent study produced by EPRI (*Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents,* EPRI, Palo Alto, CA: 2010, 1021106) developed a model for estimation of C-14 source production. This model was used by CPNPP for the 2010 Radioactive Effluent Release Report. Also in the CPNPP report, the assumption that 70% of the C-14 gaseous effluent is estimated to be from batch releases (e.g. WGDTs), and 30% of C-14 gaseous effluent is estimated to be from continuous releases through the unit vents (Ref. IAEA Technical Reports Series no. 421, "Management of Waste Containing Tritium and Carbon-14", 2004).

The C-14 released from PWR’s is primarily a mix of organic carbon and carbon dioxide released from the waste gas system. The C-14 species initially produced are primarily in the organic form, such as methane. The C-14 in the primary coolant can be converted to an inorganic chemical form of primarily carbon dioxide through a chemical transformation. Studies documented by the EPRI Report *Characterization of Carbon-14 Generated by the Nuclear Power Industry,* EPRI Palo Alto, CA: 1995, TR-105715, measured C-14 releases from PWRs indicating a range of 70% to 95% organic. The average value was indicated to be 80% organic with the remainder being carbon dioxide. As a result, a value of 80% organic C-14 is assumed by the CPNPP Radioactive Effluent Release Report methodology.

The public dose estimates from airborne C-14 in the CPNPP Effluent report are performed using dose models from NUREG-0133 and Regulatory Guide 1.109. The dose models and assumptions used for the dose estimates of C-14 are documented in the 2011 ODCM changes. The estimated C-14 dose impact on the maximum organ dose from airborne effluents released during 2011 is well below the 10CFR50, Appendix I, ALARA design objective of 15 mRem/yr per unit.

Attachment 10.4
Putting Radiation Dose in Context

Humans are exposed to radiation every day. The majority comes from natural sources including the earth, food and water consumption, the air, the sun and outer space. A smaller fraction radiation comes from man-made source such as X-rays, nuclear medical treatments, building materials, nuclear power plants, smoke detectors and televisions.

Radiation is measured in units called millirem (mRem). One mRem is a very small amount of exposure. On average, Americans receive 620 mRem of radiation dose every year. Approximately one-half of the dose comes from natural sources and the other half comes from medical procedures such as CAT scans.

The table below helps to give some perspective to dose from various sources:

Source	Average Annual Dose
Smoke detector in the home	0.008 mRem
Live within 50 miles of a nuclear power plant	0.009 mRem
Live within 50 miles of a coal-fired power plant*	0.03 mRem
NRC guideline for keeping radiation dose from nuclear power plants as low as reasonably achievable (ALARA)	5 mRem
Round trip flight from New York City to Los Angeles	5 mRem
Medical X-ray	10 mRem
EPA limit for dose to the public from the commercial nuclear fuel cycle	25 mRem
Food and water consumed throughout the course of one year	30 mRem
NRC limit for dose to the public from nuclear power plants	100 mRem
Mammogram	100 mRem
Average annual exposure for a nuclear power plant worker	120 mRem
Average annual exposure from background radiation	300 mRem
CT scan	1,000 mRem
NRC's annual limit for occupational exposure	5,000 mRem
Cardiac catheterization or coronary angiogram	5,000 mRem

*Coal is naturally radioactive.

Sources: U.S. Environmental Protection Agency, Health Physics Society.

Attachment 10.5
Errata from Previous Annual Radioactive Effluent Release Reports

1. The 2015 ARERR has a typographical error in Table 9.4 on page 30. The total tritium for the year was shown as 1.64e+01. It should have read 1.64E-01 Tritium value for the dose calculations was the correct value. AI-TR-2017-009339

2. The 2016 ARERR has an incorrect title on page 13 in the comments section. The title reads: "Total Body Dose due to Gaseous Activity Released Comments" and should read "Total Volume Liquid Effluents Released Comments" Comments in the box regarding the graph on page 13 were correct. IR-2018-001484

3. 2017 ARERR: p. 9- CPNPP should be added to "Water Plant" to clarify that it is the Comanche Peak water plant and not a public facility; p. 18- Comments Table should read "Total Volume of Solid Radwaste Buried" rather than "Total Body Dose due to Liquid Effluents Released"; p. 26- Third paragraph needs to be reworded for clarification. The 2018 ARERR was updated with these comments from TR-2019-000972.

4. 2020 ARERR: Liquid Effluents Table 9.6 on page 38 contains liquid effluent data per Unit vice per Site (exactly one-half of the Site values). However, Table 9.5, Liquid Effluents, Summation of All Releases data on page 37 is correct. Since dose contributions from liquid effluents is calculated using the summation values, dose values for liquid effluents are correct. The reporting error was limited to Table 9.6 and the Executive Summary for liquid effluents on page 8.

5. 2020 and 2021 ARERRs: Several post-release gaseous effluent permits used estimated vs. actual plant vent stack flow rates during 2020 and 2021. Plant vent stack (PVS) flow rates were estimated using the number of fans in service and summing their corresponding flow rates. This is an acceptable practice. Normally, actual PVS flow rates are derived from plant computer data. However, during these times, the actual values were unavailable when a part of the plant computer system was out of service. The impact to offsite calculated dose rates was insignificant since the only radioisotope released is usually tritium, and its activity is normally very low. This issue was documented in Comanche Peak's corrective action program (CR-2021-003323).

6. 2021 ARERR: During late 2022, plant vent stack flow rate typographical errors were found in two radiological gaseous effluent release permits generated and closed in 2021. These permits were reprocessed with the correct values and the affected tables were regenerated following the permit reprocessing. The corrections were evaluated to determine the impacts they had on gaseous tritium released and dose. Based on the evaluation, the corrections had only a minor impact on the amount of gaseous tritium released from the site during 2021 and revealed that total gaseous tritium released during 2021 was underreported by approximately 0.9%. However, the errors were not significant enough to change the dose contribution from tritium as reported in the 2021 ARERR. Therefore, the 2021 ARERR gaseous release dose values are correct (CR-2022-007381).

7. 2022 ARERR: At this time, no errata have been found in this report.

8. 2023 ARERR: At this time, no errata have been found in this report.

9. 2024 ARERR: Review and approval dates (2024 vs. 2025) incorrect on the cover page (CR-2026-0544).