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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
2020 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Dear Sir or Madam:

Vistra Operations Company LLC ("Vistra OpCo") hereby submits the Comanche Peak Nuclear Power Plant {CPNPP) 2020 Annual Radioactive Effluent Release Report. The enclosed report is provided pursuant to 10 CFR 50.36a and CPNPP Technical Specification 5.6.3. The report covers the period from January 1, 2020 to December 31, 2020.

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

If you have any questions regarding this submittal, please contact Garry Struble at (254) 897-6628 or

garry.struble@luminant.com.

Sincerely,

Jack C. Hicks

Jack C. Hicks

Enclosure: CPNPP 2020 Annual Radioactive Effluent Release Report

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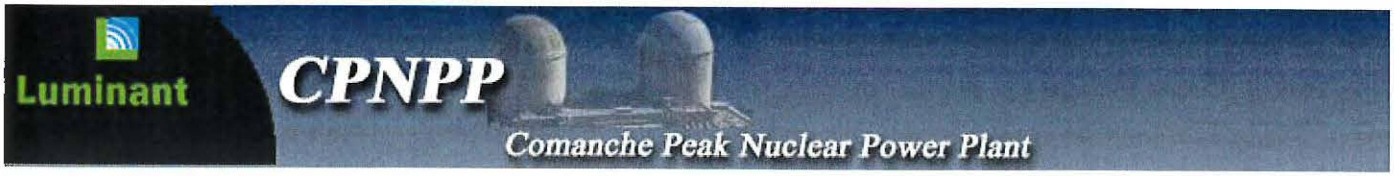

2020 ANNUAL RADIOLOGICAL EFFLUENTS RELEASE REPORT

January 1, 2020 - December 31, 2020

Preparer:	Donald E. Rebstock	Date:	3/25/2021
Reviewer:	Garrick Kinchen	Date:	3/29/2021
Approval:	Rob Daniels	Date:	3/29/2021
	Chemistry Manager		

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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, 2020 through December 31, 2020. Data in this report were calculated in accordance with the CPNPP ODCM using the Canberra OpenEMS software.

1.1 Executive Summary

The radioactive effluent monitoring program for 2020 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	2019	2020	Comments
Tritium (Ci)	24.9	22.3	1
C-14 (Ci)	25.3	25.2	2
Total Fission and Activation Products (Ci)	0.34	0.51	3
Total Particulate (Ci)	0	0	4
Gross Alpha (Ci)	0	0	4
Iodine (Ci)	0	0	4
Calculated Gamma Air Dose (mRad)	3.12E-04	4.51E-04	5
Calculated Beta Air Dose (mRad)	1.14E-04	1.65E-04	5
Total Body Dose (mRem)	0.08	0.08	

Comments:

1. The major contributor to gaseous tritium activity is evaporation from the spent fuel pools. Factors contributing 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.

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. 2020 radioactive noble gaseous activity released was higher than 2019 due to more Argon-41 (Ar-41) gas activity released. Ar-41 is the major constituent of the total radioactive gas released from the site. Non-radioactive argon gas is routinely added to the Reactor Coolant System (RCS) and then activated to radioactive Ar-41 to enhance detection of primary to secondary leakage. Leaks in each unit’s argon injection system were found and repaired late 2019. The repair resulted in higher Ar-41 activity released in 2020 compared to the 2019 activity released (CR-2019-007553).

4. No detectable particulate, gross alpha, or iodine activity was released during 2019 and 2020.

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

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	2019	2020	Comments
Total Activity Excluding Tritium (Ci)	1.36E-03	7.85E-04	
Tritium Activity (Ci)	1210	1370	1
Total Body Dose (mRem)	0.13	0.11	
Total Volume Released (Gallons)	998,679	1,178,336	2

Comments:

1. Tritium released values can vary significantly from year to year based on a couple of factors. 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 how many outages there were during a calendar year. More liquid waste is processed and released during unit outages.

2. Both units were refueled during 2020. More liquid waste is generated and released during refueling outages.

Meteorological Data

During 2020, the CPNPP meteorological system achieved a 99.8% mean recoverable data rate for the joint frequency parameters required by Regulatory Guide 1.23 for wind speed, wind direction and delta temperature. See Section 7.1 for the actual recovery percentages.

Monitors OOS > 30 Days

During 2020, there were no Technical Specification/ODCM effluent radiation monitors out of service (OOS) for >30 days.

ODCM Changes

There were no revisions to the ODCM during 2020.

1.1 Executive Summary (continued)

Solid Waste

Two-year summary of the solid waste production:

Total Waste	2019	2020	% Error
Shipped (m^3)	387	118	25%
Shipped (Ci)	172	394	25%
Buried (m^3)	135	118	25%
Buried (Ci)	172	394	25%

Comments:

In 2020, the decrease in shipped and buried waste volumes were due to making only two DAW shipments compared to five in 2019. Additionally, only three High Integrity Containers (HIC) of spent resins were shipped in 2020 as compared to five in 2019.

The shipped 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.

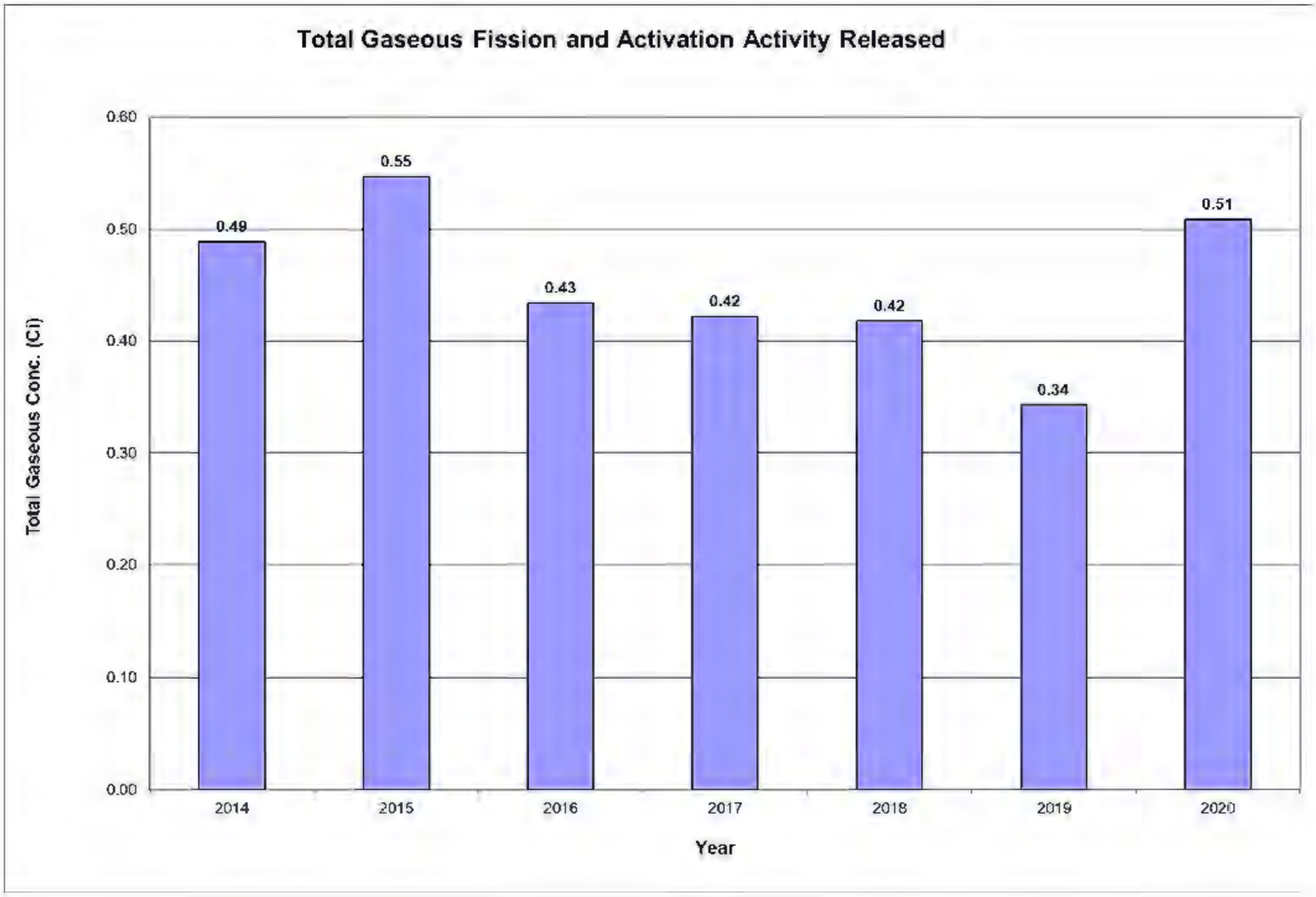
Groundwater Tritium

Water wells used to monitor CPNPP for tritium leaks into the groundwater all had results that were less than the minimum detectable activity (MDA), with the exception of Monitoring Well 11 (MW-11) during 2020. MW-11 indicated slightly positive results less than three times the MDA. The primary source of tritium intrusion to MW-11 is likely from the percolation of treated Squaw Creek Reservoir (SCR) water leaking at a rate of 0.3 to 5 gpm (documented by TR-2019-009165 and TR-2020-004573) from the Water Treatment Plant's Filter Water Storage Tank (FWST). Because SCR water always contains low background concentrations of tritium, SCR water used in the plant will contain similar concentrations. All of these sample results were less than the required lower limit of discrimination of 2,000 pCi/L and much less than the drinking water limit of 20,000 pCi/L. See Section 8.8 for details.

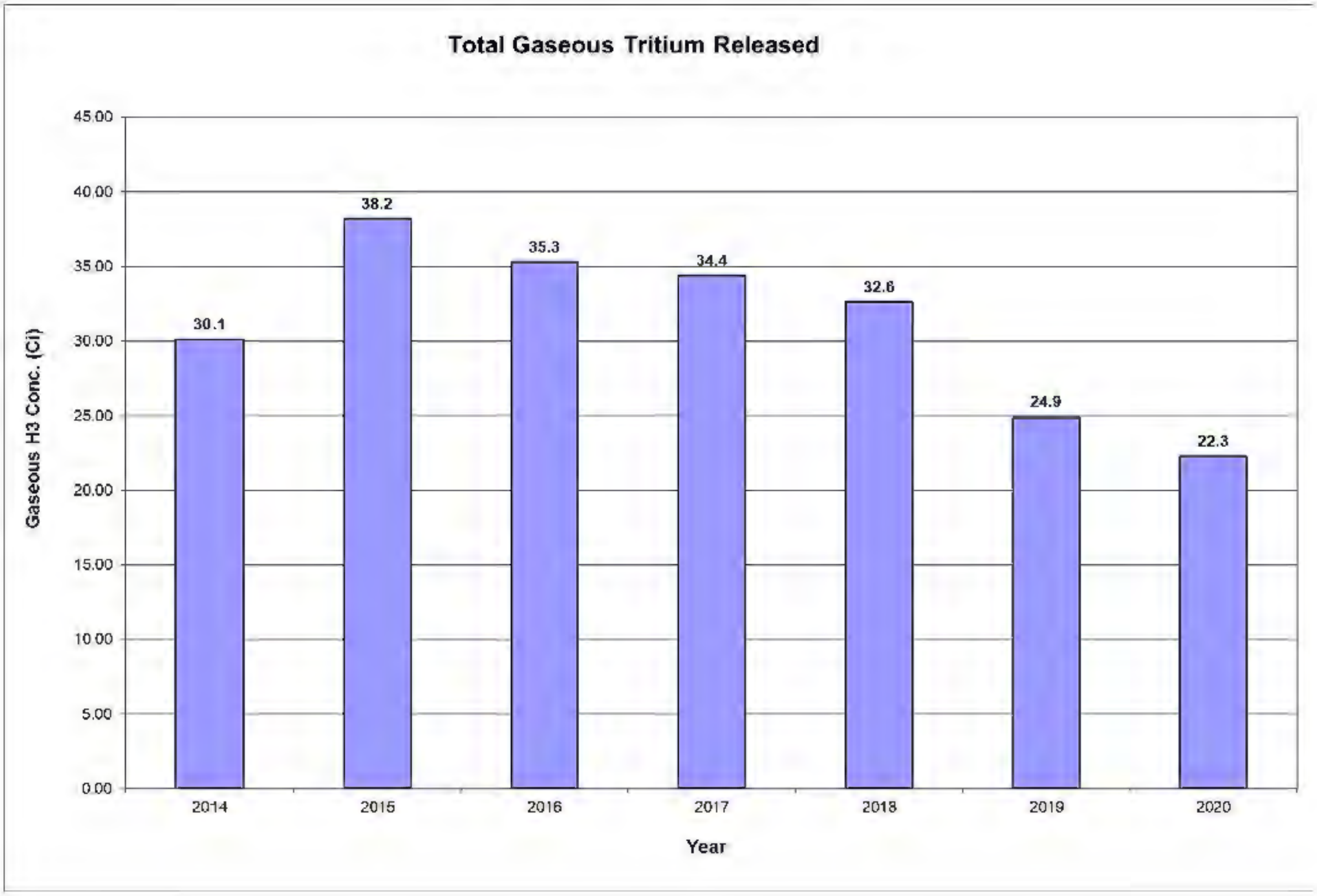
Conclusion

During 2020, 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).

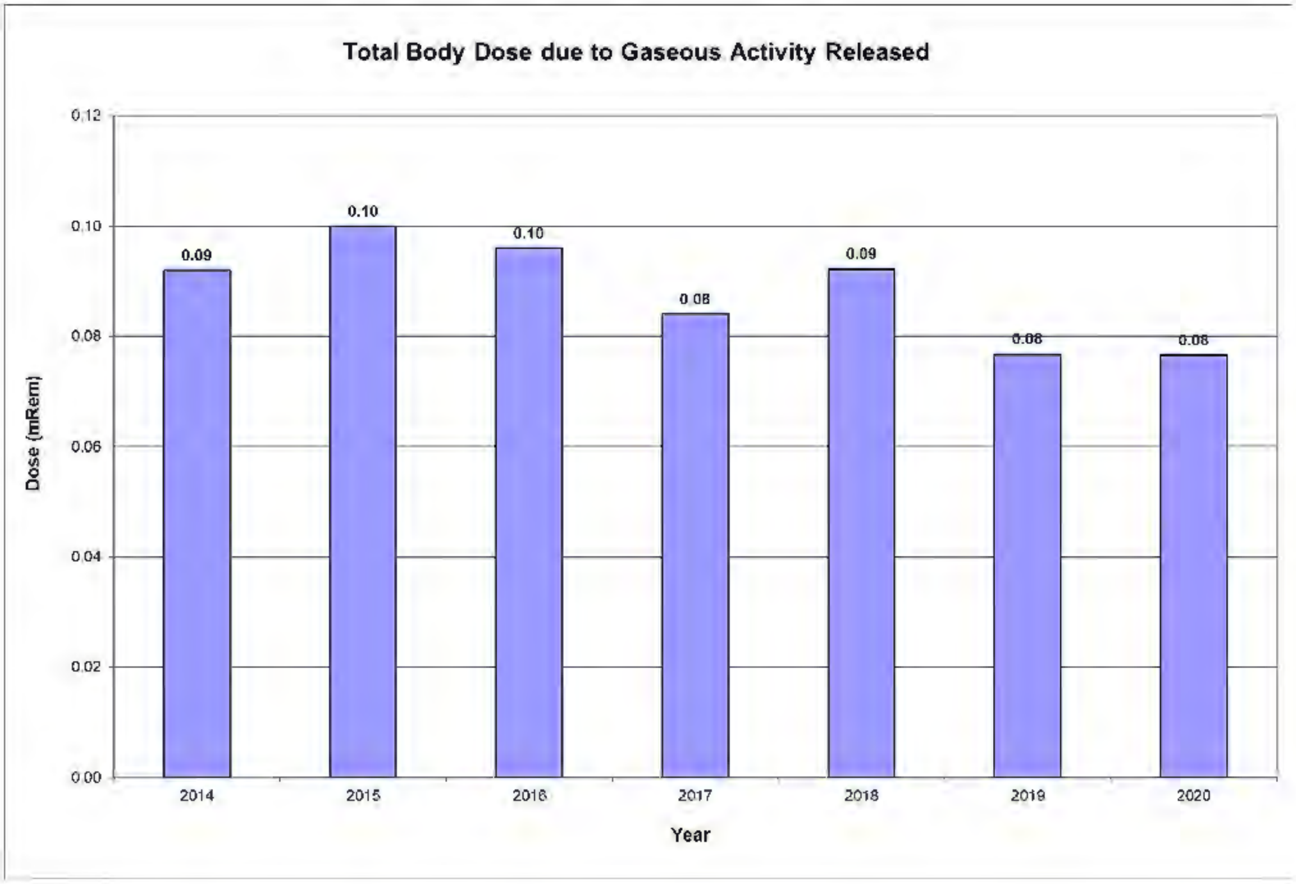
1.2 Historical Trend Graphs



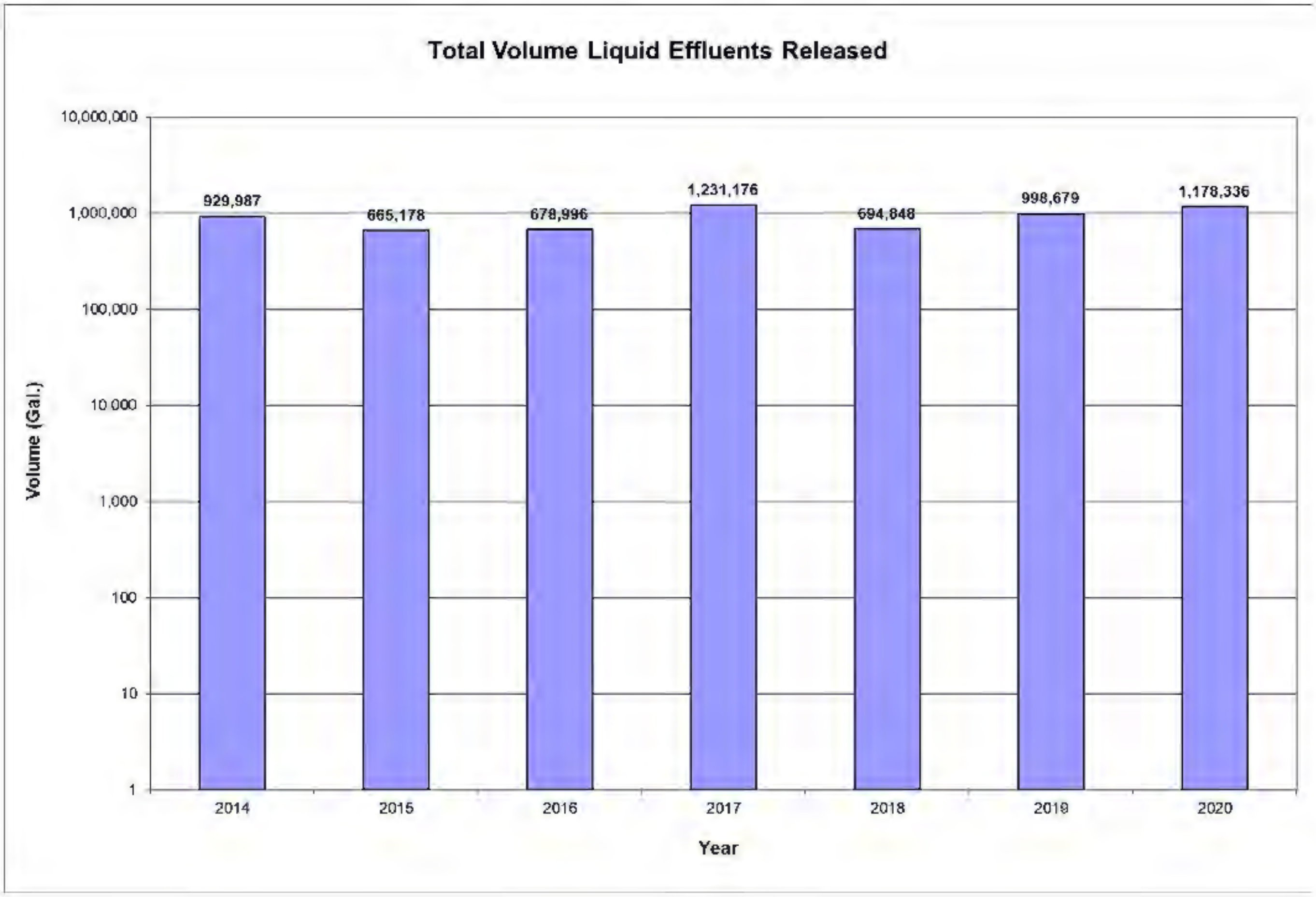
Year	Total Gaseous Fission and Activation Activity Released Comments
2020	2020 radioactive noble gaseous activity released was higher than 2019 due to more Argon-41 (Ar-41) gas activity released. Ar-41 is the major constituent of the total radioactive gas released from the site. Non-radioactive argon gas is routinely added to the Reactor Coolant System (RCS) and then activated to radioactive Ar-41 to enhance detection of primary to secondary leakage. Leaks in each unit's argon injection system were found and repaired late 2019. The repair resulted in higher Ar-41 activity released in 2020 compared to the 2019 activity released (CR-2019-007553).



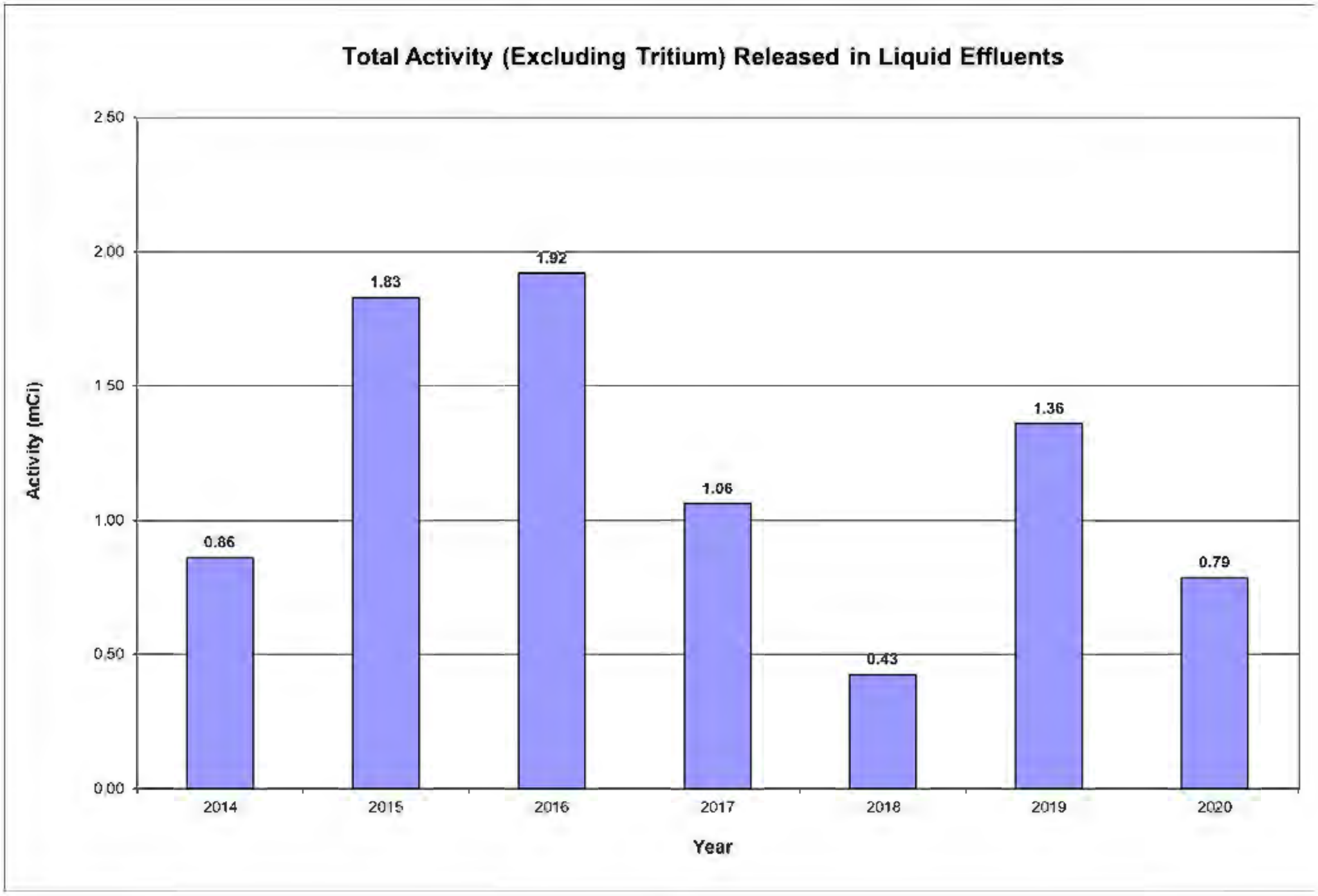
Year	Total Gaseous Tritium Released Comments
All	The major contributor to gaseous tritium activity is evaporation from the spent fuel pools. Factors contributing to the tritium activity in the pools is related to the type of fuel used (i.e., 18-month fuel) the core life, power output, and number of core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



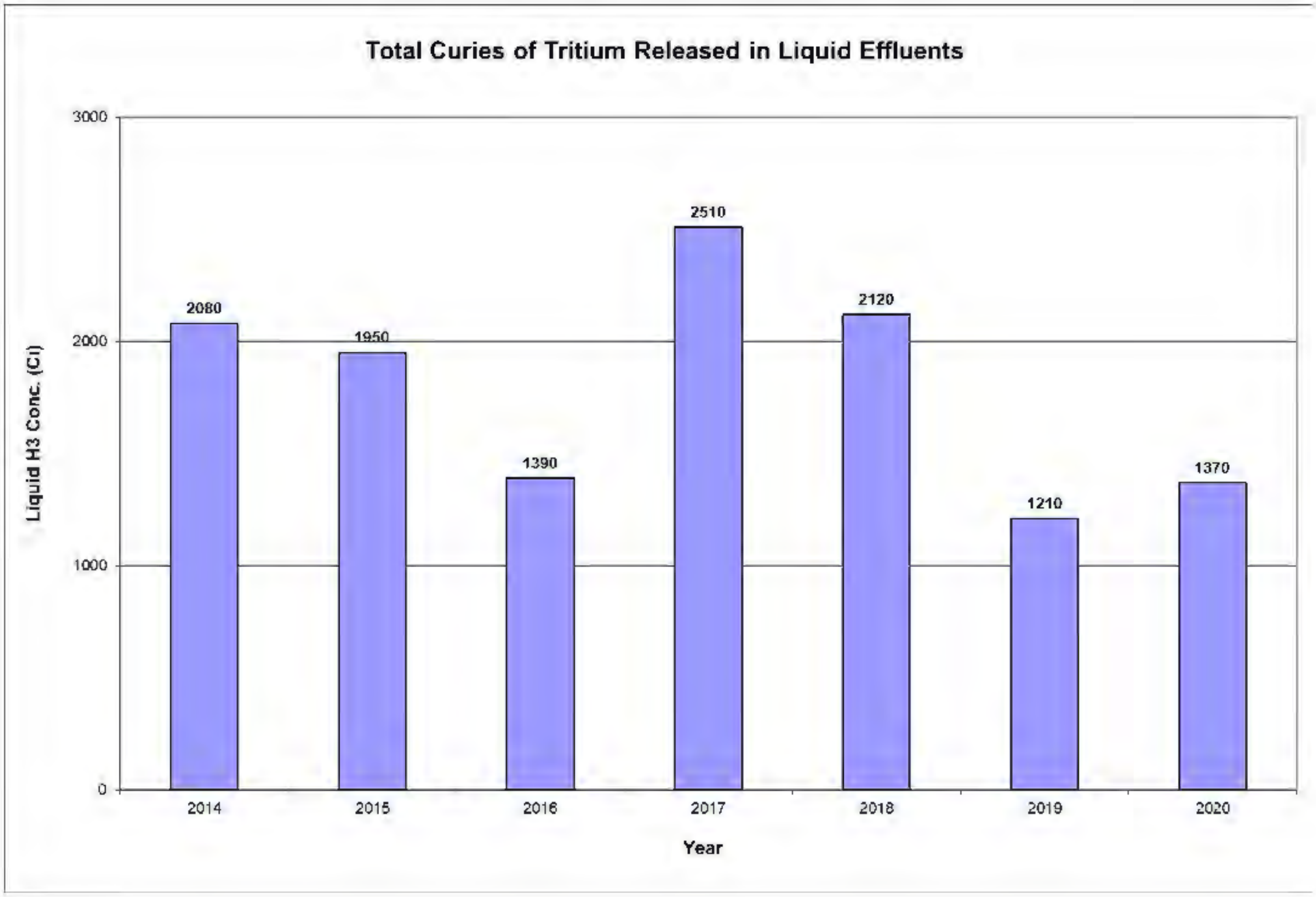
Year	Total Body Dose due to Gaseous Activity Released Comments
N/A	No comments.



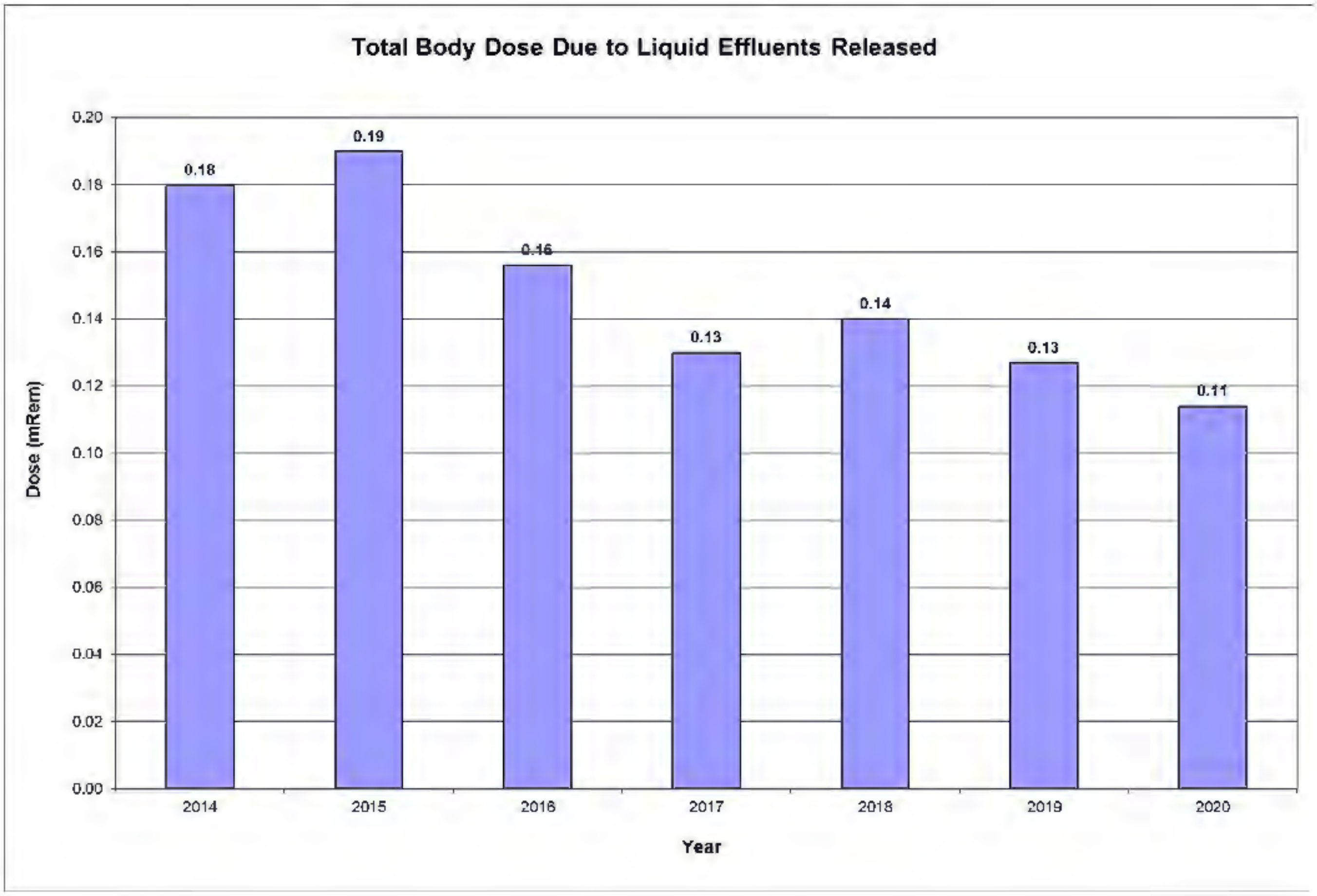
Year	Total Volume Liquid Effluents Released Comments
All	Total volume of liquid effluents released can vary significantly from year to year depending on the number of refueling and maintenance outages. More liquid waste is processed and released during these outages.



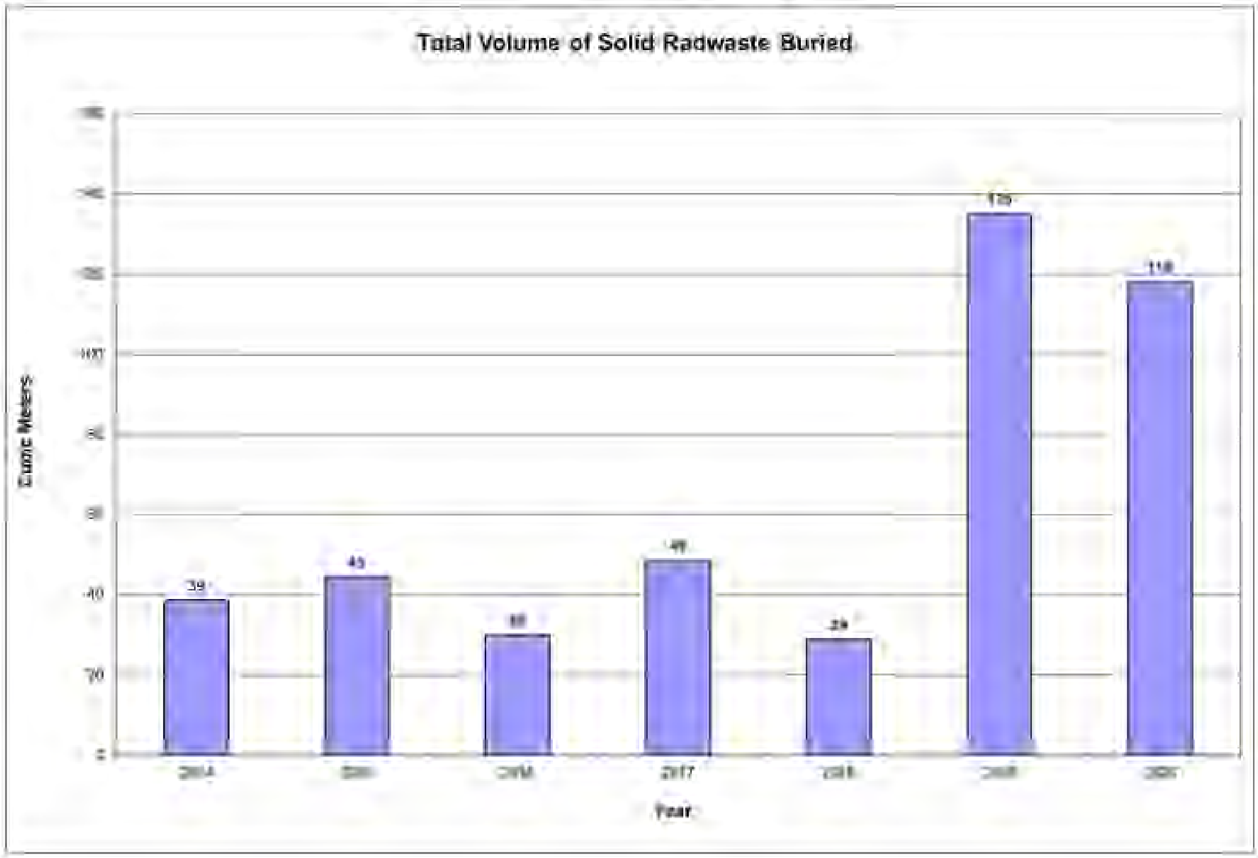
Year	Total Activity (Excluding Tritium) Released in Liquid Effluents Comments
All	Total activity released in liquid effluents can vary year to year depending on the number of refueling and maintenance outages, as well as other factors.



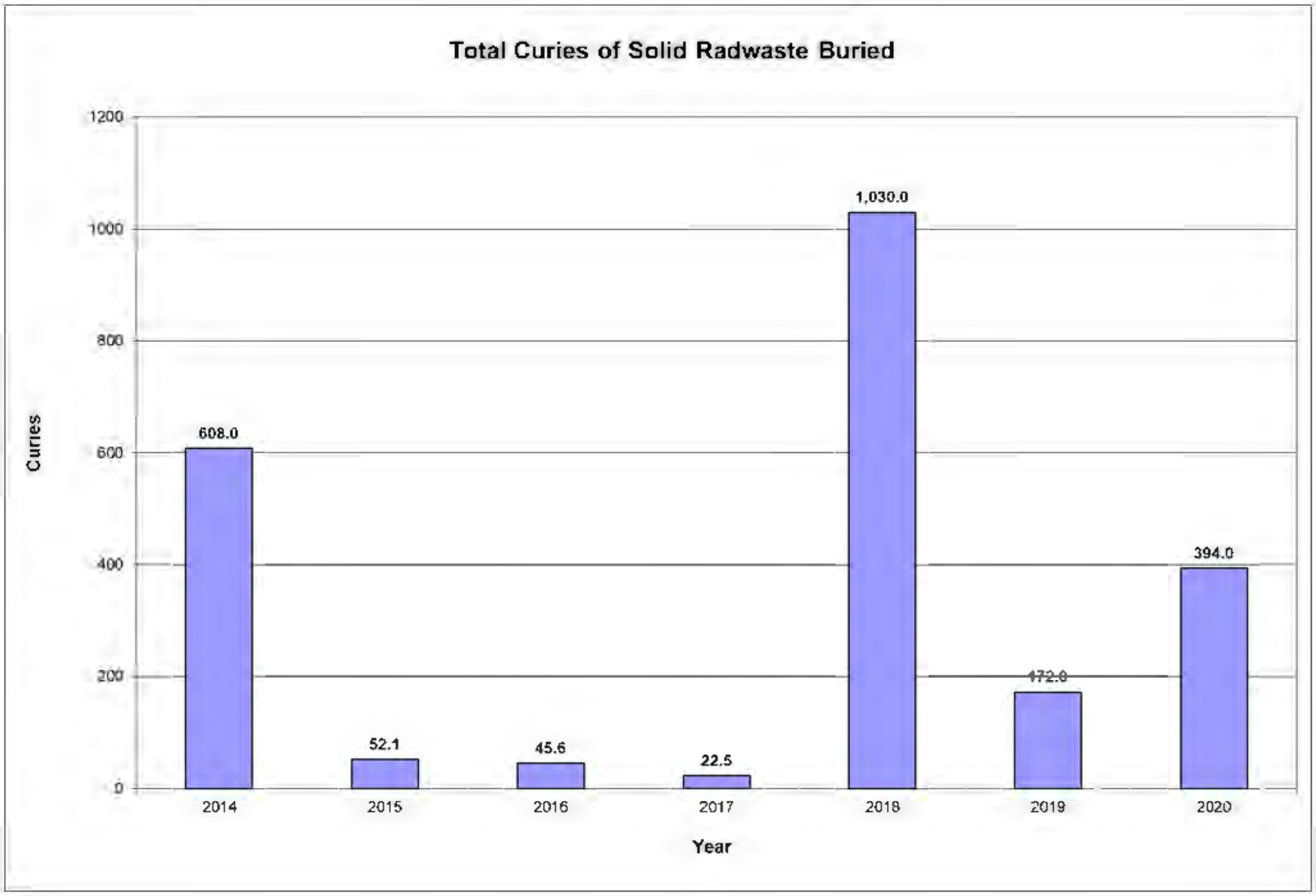
Year	Total Curies of Tritium Released in Liquid Effluents Comments
All	Tritium released values can vary significantly from year to year based on a couple of factors. First, reactor coolant tritium production changes based on fuel burnup characteristics. Tritium activity increases following reactor startup, 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.
2017	More tritium was released due to multiple outages during the year.



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



Year	Total Volume of Solid Radwaste Buried Comments
2017	2017 was a multi-outage year which led to a higher volume of solid waste shipped and buried.
2018	Shipments of waste during 2018 were based on a one outage year since the last Unit 2 outage carried over into 2019. Additionally, the efficiency methods in place have reduced the shipped/buried volume of waste during the last few years.
2019	The waste volume increase over the previous year was due to an effort to reduce onsite waste inventory. The spent resin inventory was near capacity and a resin shipping campaign was undertaken shipping 5 HICs offsite to make space to support interim resin storage for planned plant operational needs. Additionally, we had several Energy Solutions Sea Land containers stored onsite containing Dry Active Waste (DAW). To avoid continuing to pay rental costs on these containers and to reduce waste inventory, 10 Sea Lands were returned to Energy Solutions in a DAW shipping campaign.
2020	In 2020, the decrease in shipped and buried waste volume was due to making only two DAW shipments compared to five in 2019. Additionally, only three High Integrity Containers of spent resins were shipped in 2020 as compared to five in 2019.



Year	Total Curies of Solid Radwaste Buried Comments
2014	In 2014 CPNPP continued to ship and bury stored Class B and Class C wastes at the compact disposal facility in Andrews, Texas. In advance of the compliance date for 10 CFR 37, waste containers with the highest radioactivity, particularly those exceeding category two quantities, were chosen to be shipped. In 2013, CPNPP had just began shipments to the new Andrews, Texas disposal facility and the waste containers chosen for shipment represented lower total activity to allow the staff to become familiar with the new procedure processes required by the new facility. Buried volume in both years are similar since these values are normally associated with Class A Dry Active Waste that represents an order of magnitude more volume than Class B and Class C wastes packaged in 120 cubic feet, or about 3 cubic meter, containers.
2017	Lower total activity buried was due to solid waste having lower activity.
2018	During 2018, CPNPP shipped off 5 High Integrity Containers (HICs) containing high activity resin in order to make room for future resin transfers and filter changes. These shipments were necessary to ensure the expected volume of resin transferred from the plant during 2019 could be properly stored on site. These shipments led to higher values for Curies shipped and buried for 2018.
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.

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 (Unplanned) Releases

Abnormal releases are defined as unplanned or uncontrolled releases of radioactive material from the site boundary. There were no abnormal (unplanned) liquid or gaseous radioactive effluent releases during 2020.

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

The 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. The 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. The 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

The 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 2020 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 2.81E-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 2020 is retained onsite. These data are available for review by the NRC upon request. Joint Frequency Tables are included in Attachment 10.1. During the year of this report, the goal of > 90% joint data recovery was met. The individual percent recoveries are listed below:

Meteorological Data Recovery	
Channel	**% Recovery**
10 m Wind Speed	99.8
10 m Wind Direction	99.8
Delta Temperature A	99.8
Delta Temperature B	99.8

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 thirty days.

During 2020, there were no instances where these instruments were inoperable for more than thirty days.

8.2 Changes to the Offsite Dose Calculation Manual

No changes were made to the ODCM during 2020.

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 2020 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 2020 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 (Unplanned) Gaseous Effluent Release

No abnormal (unplanned) gaseous effluent releases occurred during 2020.

8.5.2 Abnormal (Unplanned) Liquid Effluent Releases

No abnormal (unplanned) liquid effluent releases occurred during 2020.

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

A total of 455 ft^3 of powdex resin was transferred to the LVW pond during 2020. The cumulative activity deposited in the LVW pond since operations began through the end of 2020 is 1.82E-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 2020, 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 12 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). Four other wells are situated on the periphery North, South and West of the Power Block. Three monitoring wells were placed along the wastewater management system underground piping. Each well is 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 the groundwater all had results that were less than the minimum detectable activity (MDA), with the exception of Monitoring Well 11 (MW-11) during 2020. MW-11 indicated slightly positive results less than three times the MDA. The primary source of tritium intrusion to MW-11 is likely from the percolation of treated Squaw Creek Reservoir (SCR) water leaking at a rate of 0.3 to 5 gpm (documented by TR-2019-009165 and TR-2020-004573) from the Water Treatment Plant's Filter Water Storage Tank (FWST). Because SCR water always contains low background concentrations of tritium, SCR water used in the plant will contain similar concentrations. All of these sample results were less than the required lower limit of discrimination of 2,000 pCi/L and much less than the drinking water limit of 20,000 pCi/L.

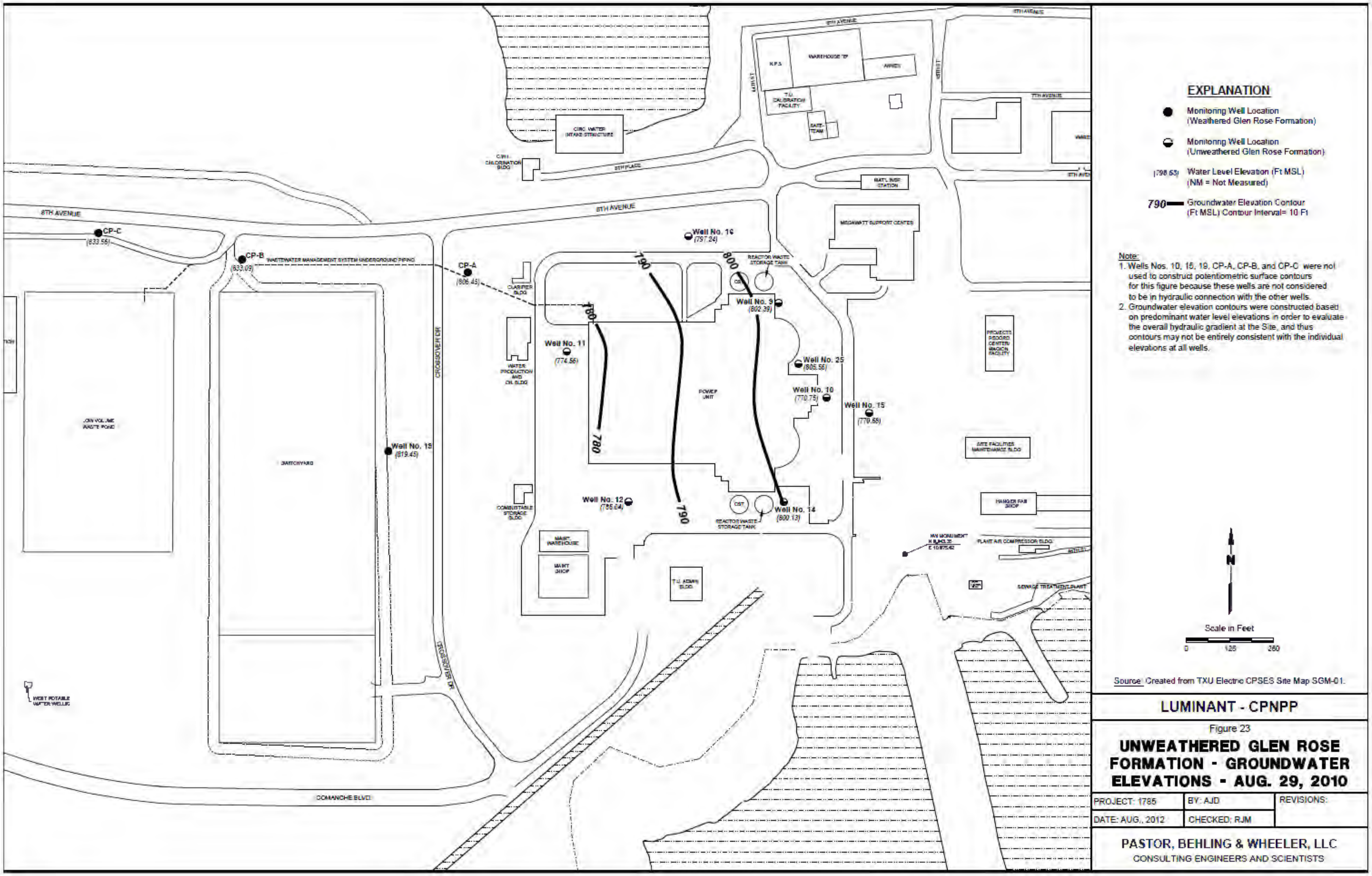
Other areas also monitored, but not considered part of the groundwater monitoring program included storm water catch basin, evaporation pond storm drain and the old steam generator mausoleum. These sample points are from surface water and not indicative of groundwater tritium. A Hydrogeology study performed 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.

As identified in the table below, there were no samples of well water above the MDA with the exception of MW-11 (as described above). Based on this information and the guidance in NEI 07-07, Rev. 1, no reports to the NRC or local officials were necessary or performed in 2020. Continued monitoring of perched water sample points will occur as part of the Groundwater Monitoring Program (STA-654) and any new sources of tritium or increase in the activity will be evaluated and remediated as necessary.

Groundwater Tritium Results (pCi/L)

MW Location	3/16/2020	6/29/2020	9/24/2020	12/17/2020
9	<755	<755	<674	<767
10	<755	<755	<674	<767
11	1040	1890	1290	1650
12	<755	<755	<674	<767
14	<755	<755	<674	<767
15	<755	<755	<674	<767
16	<755	<755	<674	<767
19	<755	<755	<674	<767
25	<755	<755	<674	<767
CP-A	<755	<755	<674	<767
CP-B	<755	<755	<674	<767
CP-C	<755	<755	<674	<767

Groundwater Tritium Monitoring Well Map



8.9 Independent Spent Fuel Storage Installation (ISFSI)

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	16	14	14	55
2. Total time period for Batch releases	Minutes	3.29E+03	4.77E+03	4.16E+03	3.96E+03	1.62E+04
3. Maximum time period for a batch release	Minutes	3.20E+02	4.05E+02	3.60E+02	3.47E+02	4.05E+02
4. Average time period for a batch release	Minutes	2.99E+02	2.98E+02	2.97E+02	2.83E+02	2.94E+02
5. Minimum time period for a batch release	Minutes	2.85E+02	2.65E+02	2.40E+02	2.20E+02	2.20E+02

B. Gaseous Releases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
1. Number of batch releases		26	33	31	35	125
2. Total time period for batch releases	Minutes	9.67E+03	1.29E+04	1.02E+04	1.68E+04	4.96E+04
3. Maximum time period for a batch release	Minutes	4.67E+02	1.54E+03	3.91E+02	4.97E+03	4.97E+03
4. Average time period for a batch release	Minutes	3.72E+02	3.91E+02	3.28E+02	4.81E+02	3.97E+02
5. Minimum time period for a batch release	Minutes	3.11E+02	1.47E+02	1.76E+02	2.36E+02	1.47E+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	9.39E-02	1.53E-01	1.05E-01	1.57E-01	5.09E-01
2. Average Release rate for period	µCi/sec	1.19E-02	1.95E-02	1.32E-02	1.97E-02	1.61E-02
3. Percent of Applicable Limit	%	*	*	*	*	*
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	%	*	*	*	*	*
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	%	*	*	*	*	*
D. Tritium						
1. H-3 Release	Curies	3.96E+00	6.70E+00	7.61E+00	4.03E+00	2.23E+01
2. Average Release rate for period	µCi/sec	5.03E-01	8.52E-01	9.58E-01	5.07E-01	7.05E-01
3. Percent of Applicable Limit	%	*	*	*	*	*
E. Carbon-14						
1. C-14 Release	Curies	6.70E+00	5.89E+00	6.87E+00	5.74E+00	2.52E+01
2. Average Release rate for period	µCi/sec	8.51E-01	7.49E-01	8.65E-01	7.22E-01	7.97E-01
3. Percent of Applicable Limit	%	*	*	*	*	*
F. Gross Alpha						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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

Estimated Total Error for All Values Reported Is < 1.0%

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	3.91E+00	6.66E+00	7.58E+00	3.97E+00	2.21E+01
Carbon-14						
C-14	Curies	2.01E+00	1.77E+00	2.06E+00	1.72E+00	7.56E+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	8.96E-02	1.31E-01	9.65E-02	1.43E-01	4.61E-01
Kr-85m	Curies	0.00E+00	4.94E-05	0.00E+00	0.00E+00	4.94E-05
Kr-85	Curies	0.00E+00	5.42E-04	8.16E-03	5.01E-05	8.75E-03
Xe-131m	Curies	0.00E+00	0.00E+00	0.00E+00	8.43E-06	8.43E-06
Xe-133m	Curies	0.00E+00	2.18E-04	0.00E+00	8.84E-05	3.07E-04
Xe-133	Curies	4.28E-03	1.71E-02	5.10E-04	9.32E-03	3.12E-02
Xe-135m	Curies	0.00E+00	2.59E-05	0.00E+00	1.13E-05	3.72E-05
Xe-135	Curies	0.00E+00	3.85E-03	0.00E+00	3.83E-03	7.68E-03
Total for Period	**Curies**	**9.39E-02**	**1.53E-01**	**1.05E-01**	**1.57E-01**	**5.09E-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	4.32E-02	3.90E-02	3.66E-02	5.86E-02	1.77E-01
Carbon-14						
C-14	Curies	4.69E+00	4.12E+00	4.81E+00	4.02E+00	1.76E+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	9.64E-05	7.01E-04	3.54E-04	4.19E-04	1.57E-03
2. Average diluted concentration during period	µCi/mL	1.04E-11	3.89E-11	2.25E-11	2.78E-11	2.70E-11
3. Percent of Applicable Limit	%	*	*	*	*	*
B. Tritium						
1. Total Release	Curies	9.44E+02	7.69E+02	5.93E+02	4.29E+02	2.74E+03
2. Average diluted concentration during period	µCi/mL	1.02E-04	4.27E-05	3.77E-05	2.85E-05	4.71E-05
3. Percent of Applicable Limit	%	*	*	*	*	*
C. Dissolved and Entrained Gases						
1. Total Release	Curies	1.06E-04	1.55E-04	9.45E-05	8.84E-05	4.43E-04
2. Average diluted concentration during period	µCi/mL	1.14E-11	8.60E-12	6.00E-12	5.86E-12	7.64E-12
3. Percent of Applicable Limit	%	*	*	*	*	*
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
E: Waste Vol Release (Pre-Dilution)	Liters	8.94E+05	1.30E+06	1.14E+06	1.13E+06	4.46E+06
F. Volume of Dilution Water Used	Liters	9.25E+09	1.80E+10	1.57E+10	1.51E+10	5.81E+10

*** Applicable limits are expressed in terms of dose.**
Estimated Total Error for All Values Reported is < 1.0%

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	0.00E+00	0.00E+00
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						
Cr-51	Curies	0.00E+00	2.35E-05	0.00E+00	0.00E+00	2.35E-05
Mn-54	Curies	0.00E+00	0.00E+00	7.29E-07	0.00E+00	7.29E-07
Co-58	Curies	1.43E-06	1.88E-04	1.09E-04	3.52E-05	3.34E-04
Co-60	Curies	4.68E-05	1.31E-04	6.28E-05	3.52E-05	2.76E-04
Ni-63	Curies	0.00E+00	0.00E+00	0.00E+00	1.39E-04	1.39E-04
Nb-95	Curies	0.00E+00	1.57E-06	3.21E-06	0.00E+00	4.78E-06
Ce-143	Curies	0.00E+00	6.40E-06	1.27E-06	0.00E+00	7.67E-06
Total for Period	**Curies**	**4.82E-05**	**3.50E-04**	**1.77E-04**	**2.09E-04**	**7.85E-04**
B. Tritium						
H-3	Curies	4.72E+02	3.84E+02	2.97E+02	2.15E+02	1.37E+03
C. Dissolved and Entrained Gases						
Xe-133	Curies	5.29E-05	7.74E-05	4.72E-05	4.42E-05	2.22E-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	0.00E+00	6.22E-09	1.27E-08	4.42E-05	4.42E-05
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0	0	0	0.001	0
Liver	mRem	2.20E-02	2.36E-02	3.44E-02	3.44E-02	1.14E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.44	0.471	0.689	0.687	1.144
Total Body	mRem	2.20E-02	2.36E-02	3.44E-02	3.44E-02	1.14E-01
Limit	mRem	1.5	1.5	1.5	1.5	3
Percent of Limit	%	1.468	1.571	2.296	2.291	3.813
Thyroid	mRem	2.20E-02	2.36E-02	3.44E-02	3.44E-02	1.14E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.44	0.471	0.689	0.687	1.144
Kidney	mRem	2.20E-02	2.36E-02	3.44E-02	3.44E-02	1.14E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.44	0.471	0.689	0.687	1.144
Lung	mRem	2.20E-02	2.36E-02	3.44E-02	3.44E-02	1.14E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.44	0.471	0.689	0.687	1.144
GI-Lli	mRem	2.20E-02	2.36E-02	3.45E-02	3.44E-02	1.14E-01
Limit	mRem	5	5	5	5	10
Percent of Limit	%	0.441	0.472	0.69	0.687	1.145

Table 9.8

Air Dose Due To Gaseous Releases

NG Dose	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Gamma Air	mRad	8.74E-05	1.29E-04	9.40E-05	1.41E-04	4.51E-04
Limit	mRad	5	5	5	5	10
Percent of Limit	%	0.002	0.003	0.002	0.003	0.005
Beta Air	mRad	3.12E-05	4.81E-05	3.49E-05	5.12E-05	1.65E-04
Limit	mRad	10	10	10	10	20
Percent of Limit	%	0	0	0	0.001	0.001
NG Total Body	mRem	8.30E-05	1.23E-04	8.93E-05	1.34E-04	4.29E-04
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.001	0.002	0.001	0.002	0.003
NG Skin	mRem	1.21E-04	1.81E-04	1.32E-04	1.96E-04	6.30E-04
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.002	0.002	0.002	0.003	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	1.60E-02	1.86E-02	2.37E-02	1.82E-02	7.66E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.213	0.249	0.316	0.243	0.511
Total Body	mRem	1.60E-02	1.86E-02	2.37E-02	1.82E-02	7.66E-02
Limit	mRem	7.5	7.5	7.5	7.5	145
Percent of Limit	%	0.213	0.249	0.316	0.243	0.511
Thyroid	mRem	1.60E-02	1.86E-02	2.37E-02	1.82E-02	7.66E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.213	0.249	0.316	0.243	0.511
Kidney	mRem	1.60E-02	1.86E-02	2.37E-02	1.82E-02	7.66E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.213	0.249	0.316	0.243	0.511
Lung	mRem	1.60E-02	1.86E-02	2.37E-02	1.82E-02	7.66E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.213	0.249	0.316	0.243	0.511
GI-Lli	mRem	1.60E-02	1.86E-02	2.37E-02	1.82E-02	7.66E-02
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.213	0.249	0.316	0.243	0.511
Bone	mRem	5.74E-02	5.05E-02	5.89E-02	4.92E-02	2.16E-01
Limit	mRem	7.5	7.5	7.5	7.5	15
Percent of Limit	%	0.766	0.673	0.785	0.656	1.440

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	1.02E+01	3.94E+02	1.02E+01	3.94E+02	± 25%
b. Dry active waste	1.08E+02	1.72E-01	1.08E+02	1.72E-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	1.18E+02	3.94E+02	1.18E+02	3.94E+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	86.54	3.41E+02
	Co-60	6.52	2.57E+01
	Fe-55	4.70	1.85E+01
	Cs-137d	0.80	3.13E+00
	Sb-125	0.20	8.00E-01
	Ni-59	0.63	2.48E+00
	Mn-54	0.29	1.15E+00
	C-14	0.19	7.53E-01
	H-3	0.01	2.66E-02
	Tc-99	<0.01	4.21E-03
	I-129	<0.01	6.73E-03
	Other (1)	0.12	4.80E-01
	Total	100.00	3.94E+02
b. Dry active waste	Fe-55	46.60	8.02E-02
	Co-60	27.21	4.68E-02
	Ni-63	21.03	3.62E-02
	C-14	1.64	2.82E-03
	Mn-54	1.63	2.80E-03
	Sb-125	0.90	1.54E-03
	Co-58	0.36	6.16E-04
	Nb-95	0.34	5.83E-04
	Zr-95	0.16	2.83E-04
	H-3	LLD	-0-
	Tc-99	LLD	-0-
	I-129	LLD	-0-
	Other (2)	0.14	2.34E-04
	Total	100.00	1.72E-01

(1) Nuclides representing <1% of total shipped activity: Co-57, Sr-90d, Cs-134, Co-58, Sb-124, and Nb-95.
(2) Nuclides representing <1% of total shipped activity: Cs-137d and Co-57.

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	B	Poly HIC*	2	Waste Control Specialists, Andrews, TX
	C	Poly HIC*	1	
b. Dry active waste	A	General Design	2	

*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

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2020 00:00 to 31-DEC-2020 23:59

STABILITY CLASS **A**

ELEVATION: 10 m

WIND DIRECTION	Wind Speed (mph)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	8	27	16	0	0	51
NNE	2	18	25	8	0	0	53
NE	4	28	14	0	0	0	46
ENE	5	33	9	0	0	0	47
E	3	23	6	0	0	0	32
ESE	1	41	22	1	0	0	65
SE	0	15	36	3	0	0	54
SSE	1	14	40	21	0	0	76
S	0	4	21	6	1	0	32
SSW	0	3	3	2	0	0	8
SW	0	2	3	0	0	0	5
WSW	0	1	1	0	0	0	2
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	2	0	0	0	2
NNW	0	3	24	13	5	0	45
VARIABLE	8	0	0	0	0	0	8
TOTAL	24	193	233	70	6	0	526
Periods of calm (hours):		0					
Hours of missing data:		1					

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2020 00:00 to 31-DEC-2020 23:59

STABILITY CLASS **B**

ELEVATION: 10 m

WIND DIRECTION	Wind Speed (mph)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	6	13	6	3	0	29
NNE	2	11	13	4	1	0	31
NE	5	9	6	1	1	0	22
ENE	5	10	4	0	0	0	19
E	1	18	3	0	0	0	22
ESE	3	23	12	0	0	0	38
SE	1	17	11	4	0	0	33
SSE	1	24	42	25	1	0	93
S	1	9	29	34	2	0	75
SSW	1	4	12	2	1	0	20
SW	0	1	3	1	0	0	5
WSW	0	1	5	1	0	0	7
W	0	1	0	1	0	0	2
WNW	0	0	0	0	0	0	0
NW	0	0	9	1	0	0	10
NNW	0	8	17	10	3	0	38
VARIABLE	7	0	1	0	0	0	8
TOTAL	28	142	180	90	12	0	452
Periods of calm (hours):		0					
Hours of missing data:		0					

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2020 00:00 to 31-DEC-2020 23:59

STABILITY CLASS **C**

ELEVATION: 10 m

WIND DIRECTION	Wind Speed (mph)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	3	11	12	9	0	0	35
NNE	4	10	10	2	1	0	27
NE	12	4	9	0	1	0	26
ENE	8	12	2	0	1	0	23
E	6	6	3	0	0	0	15
ESE	4	32	5	2	0	0	43
SE	1	25	21	2	0	0	49
SSE	4	32	39	31	3	0	109
S	0	13	40	63	7	0	123
SSW	0	8	16	7	1	0	32
SW	0	4	9	0	0	0	13
WSW	0	2	4	4	0	0	10
W	0	1	4	0	1	0	6
WNW	0	0	2	0	0	0	2
NW	0	12	15	6	1	0	34
NNW	2	16	16	28	7	3	72
VARIABLE	16	1	0	0	0	0	17
TOTAL	60	189	207	154	23	3	636
Periods of calm (hours):	0						
Hours of missing data:	1						

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2020 00:00 to 31-DEC-2020 23:59

STABILITY CLASS **D**

ELEVATION: 10 m

WIND DIRECTION	Wind Speed (mph)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	25	121	190	75	4	1	416
NNE	13	87	143	37	4	0	284
NE	9	52	86	9	1	0	157
ENE	11	38	35	3	1	0	88
E	25	77	37	2	0	0	141
ESE	43	145	38	0	0	0	226
SE	25	223	198	27	0	0	473
SSE	11	151	404	204	9	0	779
S	11	85	286	208	17	0	607
SSW	3	52	69	58	4	0	186
SW	7	36	30	25	0	0	98
WSW	10	22	5	6	2	0	45
W	4	9	10	2	0	0	25
WNW	3	27	74	30	1	0	135
NW	6	48	81	80	21	1	237
NNW	19	47	152	150	26	1	395
VARIABLE	75	25	3	2	0	0	105
TOTAL	300	1245	1841	918	90	3	4397
Periods of calm (hours):	6						
Hours of missing data:	7						

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2020 00:00 to 31-DEC-2020 23:59

STABILITY CLASS **E**

ELEVATION: 10 m

WIND DIRECTION	Wind Speed (mph)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	19	43	27	0	0	0	89
NNE	14	60	21	0	0	0	95
NE	6	12	6	1	0	0	25
ENE	2	14	2	0	0	0	18
E	19	32	1	0	0	0	52
ESE	44	106	2	0	0	0	152
SE	34	367	123	0	0	0	524
SSE	38	175	232	10	0	0	455
S	15	49	60	4	0	0	128
SSW	12	30	25	6	0	0	73
SW	11	13	24	2	0	0	50
WSW	13	11	8	0	0	0	32
W	6	15	3	0	0	0	24
WNW	4	30	15	1	0	0	50
NW	12	48	29	0	0	0	89
NNW	9	26	9	1	0	0	45
VARIABLE	83	12	1	1	0	0	97
TOTAL	341	1043	588	26	0	0	1998
Periods of calm (hours):	6						
Hours of missing data:	3						

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2020 00:00 to 31-DEC-2020 23:59

STABILITY CLASS **F**

ELEVATION: 10 m

WIND DIRECTION	Wind Speed (mph)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	1	1	0	0	0	4
NNE	1	9	1	0	0	0	11
NE	0	0	0	0	0	0	0
ENE	0	1	0	0	0	0	1
E	1	0	0	0	0	0	1
ESE	1	6	0	0	0	0	7
SE	12	76	3	0	0	0	91
SSE	12	26	12	0	0	0	50
S	19	19	3	0	0	0	41
SSW	23	10	2	0	0	0	35
SW	27	6	6	0	0	0	39
WSW	22	13	3	0	0	0	38
W	14	8	0	0	0	0	22
WNW	18	14	0	0	0	0	32
NW	16	48	5	0	0	0	69
NNW	1	7	0	0	0	0	8
VARIABLE	29	3	0	0	0	0	32
TOTAL	198	247	36	0	0	0	481
Periods of calm (hours):		5					
Hours of missing data:		0					

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 1-JAN-2020 00:00 to 31-DEC-2020 23:59

STABILITY CLASS **G**

ELEVATION: 10 m

WIND DIRECTION	Wind Speed (mph)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	0	0	0	0	0	1
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	2	3	0	0	0	0	5
SSE	8	2	0	0	0	0	10
S	10	2	0	0	0	0	12
SSW	21	15	2	0	0	0	38
SW	18	21	1	0	0	0	40
WSW	27	30	3	0	0	0	60
W	15	7	3	0	0	0	25
WNW	15	3	0	0	0	0	18
NW	19	14	3	0	0	0	36
NNW	2	0	0	0	0	0	2
VARIABLE	9	0	0	0	0	0	9
TOTAL	147	97	12	0	0	0	256
Periods of calm (hours):	1						
Hours of missing data:	0						

Reg. Guide 1.21 Joint Frequency Table

CPNPP

HOURS AT EACH WIND SPEED AND DIRECTION

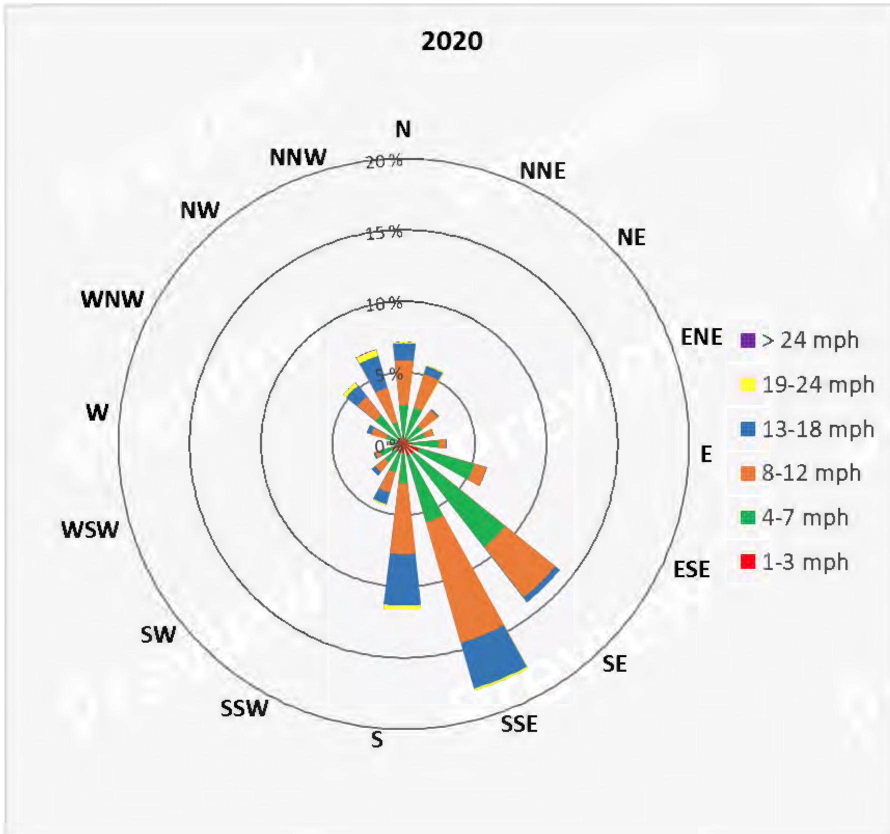
PERIOD OF RECORD: 1-JAN-2020 00:00 to 31-DEC-2020 23:59

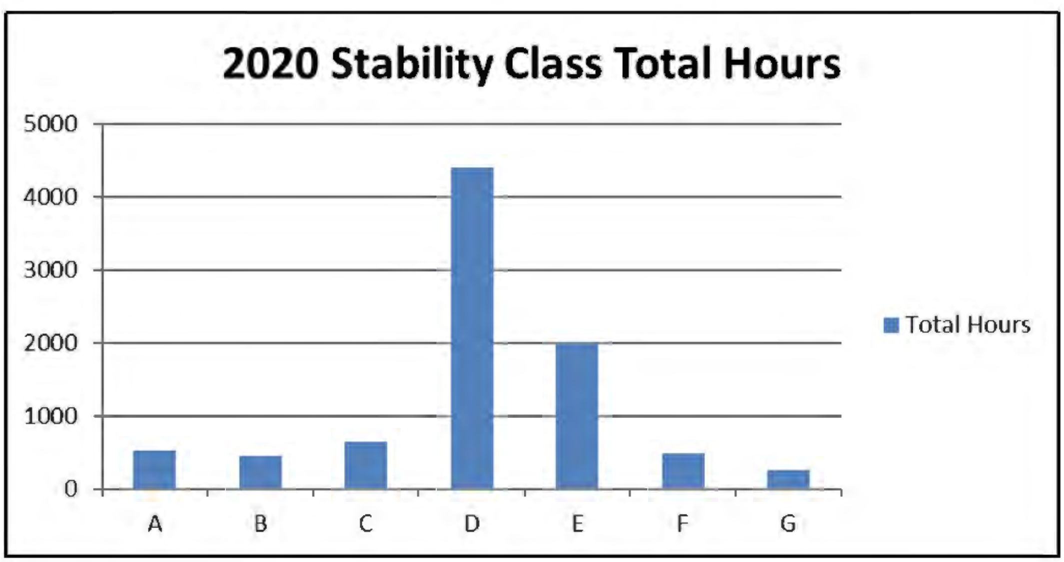
STABILITY CLASS **ALL**

ELEVATION: 10 m

WIND DIRECTION	Wind Speed (mph)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	51	190	270	106	7	1	625
NNE	36	195	213	51	6	0	501
NE	36	105	121	11	3	0	276
ENE	31	108	52	3	2	0	196
E	55	156	50	2	0	0	263
ESE	96	353	79	3	0	0	531
SE	75	726	392	36	0	0	1229
SSE	75	424	769	291	13	0	1572
S	56	181	439	315	27	0	1018
SSW	60	122	129	75	6	0	392
SW	63	83	76	28	0	0	250
WSW	72	80	29	11	2	0	194
W	39	41	20	3	1	0	104
WNW	40	74	91	31	1	0	237
NW	53	170	144	87	22	1	477
NNW	33	107	218	202	41	4	605
VARIABLE	227	41	5	3	0	0	276
TOTAL	1098	3156	3097	1258	131	6	8746
Periods of calm (hours):	18						
Hours of missing data:	20						

2020 Wind Rose and Stability Class Graphs





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.

TR-2021-000682 was initiated to document the evaluation of prevailing wind directions for all stability classes over the calendar year 2020. This evaluation is performed annually 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. The 2020 predominant wind direction (SSE) and stability class category (Pasquill Class D) did not change when compared with the five year rolling average which includes 2020. 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 5730 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 can help 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.