POINT BEACH

April 26, 2024

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

Point Beach Nuclear Plant, Units 1 and 2
Dockets 50-266, 50-301 and 72-005
Renewed License Nos. DPR-24 and DPR-27

2023 Annual Monitoring Report

Enclosed is the Annual Monitoring Report for PBNP Units 1 and 2, for the period January 1 through December 31, 2023.

This letter contains no new regulatory commitments and no revisions to existing regulatory commitments.

Should you have any questions regarding this submission, please contact Mr. Kenneth Mack, Fleet Licensing Manager, at 561-904-3635.

Sincerely,

Paul Rasmus
General Manager, Regulatory Affairs

Enclosure: Annual Monitoring Report

cc: Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW
American Nuclear Insurers
WI Division of Public Health, Radiation Protection Section
Office of Nuclear Material Safety and Safeguards, USNRC

ENCLOSURE

ANNUAL MONITORING REPORT 2023

NEXTERA ENERGY POINT BEACH, LLC
POINT BEACH NUCLEAR PLANT

DOCKETS 50-266 (UNIT 1), 50-301 (UNIT 2), 72-005 (ISFSI)
RENEWED LICENSES DPR-24 and DPR-27

January 1, 2023 through December 31, 2023

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SUMMARY

The Annual Monitoring Report for the period from January 1, 2023, through December 31, 2023, is submitted in accordance with Point Beach Nuclear Plant (PBNP) Units 1 and 2, Technical Specification 5.6.2 and filed under Dockets 50-266 and 50-301 for Renewed Facility Operating Licenses DPR-24 and DPR-27, respectively. It also contains results of monitoring in support of the Independent Spent Fuel Storage Installation (ISFSI) Docket 72-005. The report presents the results of effluent and environmental monitoring programs, solid waste shipments, non-radioactive chemical releases, and circulating water system operation.

During 2023, the following Curies (Ci) of radioactive material were released via the liquid and atmospheric pathways:

	Liquid	Atmospheric
Tritium (Ci)	890	90.9
[1]Particulate (Ci)	0.0822	0.000056
Noble Gas (Ci)	0.165	14.600
C-14[2]	0.0135	11.08

[1]Atmospheric particulate includes radioiodine (I-131 - I-133).
[2]Liquid is measured, atmospheric is calculated.

For the purpose of compliance with the effluent design objectives of Appendix I to 10 CFR 50, doses from effluents are calculated for the hypothetical maximally exposed individual (MEI) for each age group and compared to the Appendix I objectives. Doses less than or equal to the Appendix I values are considered to be evidence that PBNP releases are as low as reasonably achievable (ALARA) and comply with the EPA's limits in 40CFR190. The maximum annual calculated doses in millirem (mrem) or millirad (mrad) are shown below and compared to the corresponding design objectives of 10 CFR 50, Appendix I.

LIQUID RELEASES

Dose Category	Calculated Dose	Appendix I Dose	% Appendix I
Whole body dose	0.00652 mrem	3 mrem	0.22
Organ dose	0.00764 mrem	10 mrem	0.0764

ATMOSPHERIC RELEASES

Dose Category	Calculated Dose	Appendix I Dose	% Appendix I
Particulate organ dose	0.0195 mrem	30 mrem	0.065
Noble gas gamma ray air dose	0.000383 mrad	20 mrad	0.00192
Noble gas beta air dose	0.000582 mrad	40 mrad	0.00146
Noble gas dose to the whole body	0.000344 mrem	10 mrem	0.00344
Noble gas dose to the skin	0.000631 mrem	30 mrem	0.00210

The results show that during 2023, the doses from PBNP effluents were ≤0.22% of the Appendix I design objectives. This is greater than the 2022 result of 0.17%. The increase is expected due to Point Beach having a two-outage year in 2023 and producing 1.41E5 more gallons of batch releases compared to 2022. However, operation of the PBNP radwaste treatment system continues to be ALARA.

A survey of land use with respect to the location of dairy cattle was made pursuant to Section 12.2.5 of the PBNP ODCM. As in previous years, no dairy cattle were found to be grazing at the site boundary. Therefore, the assumption that cattle graze at the site boundary used in the evaluation of doses from PBNP effluents remains conservative. Of the sixteen compass sectors around PBNP, six are over Lake Michigan. A land use census (LUC) of the remaining ten sectors over land identifies any changes in the closest garden, occupied dwelling, and dairy in each sector. The 2023 LUC results confirm the assumption that, for the purpose of calculating effluent doses, the maximally exposed person lives at the site boundary remains conservative.

The 2023 Radiological Environmental Monitoring Program (REMP) collected 721 individual samples for radiological analyses. Quarterly composites of weekly air particulate filters generated an additional 24 samples and quarterly composites of monthly lake water samples resulted in a further 12 samples. This yielded a total of 757 samples. The ambient radiation measurements in the vicinity of PBNP and the ISFSI were conducted using 148 sets of thermoluminescent dosimeters (TLDs).

Air monitoring from six different sites, 5 surrounding the plant and a control location, did not reveal any effect from Point Beach effluents. Terrestrial monitoring consisting of soil, vegetation, and milk found no influence from PBNP. Similarly, samples from the aquatic environment, consisting of lake and well water, and fish revealed no buildup of PBNP radionuclides released in liquid effluents. Therefore, the data shows no environmental effect from plant operation.

In 2023, there were no new storage casks added to the ISFSI. The total number of existing dry storage casks is 56: 16 ventilated, vertical storage casks (VSC-24) and 34 NUHOMS®, horizontally stacked storage modules, and 6 HOLTEC HI-STORM FW Storage Modules. The subset of the PBNP REMP samples used to evaluate the environmental impact of the PBNP ISFSI showed no environmental impact from its operation.

The environmental monitoring conducted during 2023 confirmed that the effluent control program at PBNP ensured a minimal impact on the environment.

One-hundred-eighty-six (186) samples were analyzed for tritium as part of the groundwater protection program (GWPP). These samples came from drinking water wells, monitoring wells, yard drain outfalls, yard manholes, surface water on site, the sump for the subsurface drainage system (SSD - located under the plant foundation), and four groundwater foundation integrity monitoring wells located in the facades. The results show no substantial change in tritium from previous years. No drinking water wells (depth >100 feet) have any detectable tritium that is statistically different than zero. Tritium continues to be confined to the upper soil layer where the flow is toward the lake. Groundwater samples from wells in the vicinity of the remediated, former earthen retention pond continue to show low levels of tritium. Gamma scans of groundwater samples originating within the power block found no plant related gamma emitters. The results of GWPP monitoring indicate no significant change from previous years.

Part A
EFFLUENT MONITORING

1.0 INTRODUCTION

The PBNP effluent monitoring program is designed to comply with federal regulations for ensuring the safe operation of PBNP with respect to releases of radioactive material to the environment and its subsequent impact on the public. Pursuant to 10 CFR 50.34a, operations should be conducted to keep the levels of radioactive material in effluents to unrestricted areas as low as reasonably achievable (ALARA). In 10 CFR 50, Appendix I, the Nuclear Regulatory Commission (NRC) provides the numerical values for what it considers to be the appropriate ALARA design objectives to which the licensee's calculated effluent doses may be compared. These doses are a small fraction of the dose limits specified by 10 CFR 20.1301 and lower than the Environmental Protection Agency (EPA) limits specified in 40 CFR 190.

10 CFR 20.1302 directs PBNP to make the appropriate surveys of radioactive materials in effluents released to unrestricted and controlled areas. Liquid wastes are monitored by inline radiation monitors as well as by isotopic analyses of samples of the waste stream prior to discharge from PBNP. Airborne releases of radioactive wastes are monitored in a similar manner. The appropriate portions of the radwaste treatment systems are used as required to keep both liquid and atmospheric releases ALARA. Prior to release, results of isotopic analyses are used to adjust the release rate of discrete volumes of liquid and atmospheric wastes (from liquid waste holdup tanks and from gas decay tanks) such that the concentrations of radioactive material in the air and water beyond PBNP are below the PBNP Technical Specification concentration limits for liquid effluents and release rate limits for gaseous effluents.

Solid wastes are shipped offsite for disposal at NRC licensed facilities. The amount of radioactivity in the solid waste is determined prior to shipment in order to determine the proper shipping configuration as regulated by the Department of Transportation and the NRC.

10 CFR 72.210 grants a general license for an Independent Spent Fuel Storage Installation (ISFSI) to all nuclear power reactor sites operating under 10 CFR 50. The ISFSI annual reporting requirement pursuant to 10 CFR 72.44(d)(3) is no longer applicable (Reference: 64 FR 50616). Any release of radioactive materials from the operation of the ISFSI must comply with the limits of Part 20 and Part 50 Appendix I design objectives. The dose criteria for effluents and direct radiation specified by 10 CFR 72.104 states that during normal operations and anticipated occurrences, the annual dose equivalent to any real individual beyond the controlled area must not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ. The dose from naturally occurring radon and its decay products is exempt. Because the loading of the storage casks occurs within the primary auxiliary building of PBNP, the doses from effluents due to the loading process will be assessed and quantified as part of the PBNP Radiological Effluent Control Program.

2.0 RADIOACTIVE LIQUID RELEASES

The radioactive liquid release path to the environment is via the circulating water discharge. A liquid waste treatment system in conjunction with administrative controls is used to minimize the impact on the environment and maintain doses to the public ALARA from the liquid releases.

2.1 Doses From Liquid Effluent

Doses from liquid effluent are calculated using the methodology of the Offsite Dose Calculation Manual (ODCM). These calculated doses use parameters such as the amount of radioactive material released, the total volume of liquid, the total volume of dilution water, and usage factors (e.g., water and fish consumption, shoreline and swimming factors). These calculations produce a conservative estimation of the dose. For compliance with 10 CFR 50, Appendix I design objectives, the annual dose is calculated to the hypothetical maximally exposed individual (MEI). The MEI is assumed to reside at the site boundary in the highest χ/Q sector and is maximized with respect to occupancy, food consumption, and other uses of this area. As such, the MEI represents an individual with reasonable deviations from the average for the general population in the vicinity of PBNP. A comparison of the calculated doses to the 10 CFR 50, Appendix I design objectives is presented in Table 2-1. The conservatively calculated dose to the MEI is a very small fraction of the Appendix I design objective.

Table 2-1
Comparison of 2023 Liquid Effluent Calculated Doses to 10 CFR 50 Appendix I Design Objectives

Annual Limit [mrem]	Highest Total Calculated Dose [mrem]	% of Design Objective
3 (whole body)	0.00652	0.22
10 (any organ)	0.00764	0.0764

2.2 2023 Circulating Water Radionuclide Release Summary

Radioactive liquid releases via the circulating water discharge are summarized by individual source and total curies released on a quarterly and annual basis (Table 2-2). These releases are composed of batch releases (processed waste and steam generators) and continuous releases (wastewater effluent, and blowdown from Units 1 and 2). The wastewater effluent consists of liquid from turbine hall sumps, plant well house backwashes, sewage treatment plant effluent, water treatment plant backwashes, the Unit 1 and 2 facade sumps and the subsurface drainage system sump.

2.3 2023 Isotopic Composition of Circulating Water Discharges

The isotopic composition of circulating water discharges during the current reporting period is presented in Table 2-3. The 2023 liquid batch release of 6.69E+05 gallons (Table 2-2) was an increase from 2022 processed waste released (5.28E+05 gallons), which is consistent with water processing requirements during a two-outage year. The total isotopic curie distribution of fission and activation products released in 2023 was 9.57E-2 Ci which was higher than the 2022 value of gamma emitters and hard-to-detects 7.69E-02 Ci. The total antimony (Sb) in 2023 increased to 4.60e-2 Ci in comparison to the 2022 value of 1.40E-03 Ci, while subsequently the Zr-Nb decreased slightly to 1.32E-03 Ci released when compared to the 2022 total of 1.92E-03 curies. Tin isotope (Sn-113/Sn-117m/Sn-125) totals decreased from the 3.35E-04 Ci identified in 2022 to 2.04E-04 Ci in 2023, though Sn-125 was only present in 2022 releases. Te-123m was documented at 9.10E-03 Ci in 2023, which is an increase from the 2.59E-03 Ci observed in 2022. The 2023 C-14 decreased to 1.35E-02 Ci in 2023 from the 2.46E-02 Ci observed in 2022. Sr-92, which was not detected in 2022, but was present in the 2023 effluent at 1.78E-6 Ci. Tritium increased to 890 Ci in 2023 in comparison to the 644 Ci documented in 2022 which can again be attributed to having a two-outage year in 2023.

2.4 Beach Drain System Releases Tritium Summary

Beach drain is the term used to describe the point at which the site yard drainage system empties onto the beach of Lake Michigan. These outfalls carry yard and roof drain runoff to the beach. The plant foundation has a subsurface drainage system (SSD) around the external base of the foundation. This SSD relieves hydrostatic pressure on the foundation by draining water away from the foundation. The drainage pipes empty out onto the beach. In 2014, the SSD outfalls, designated as S-12 and S-13, were added to the beach drain sampling program. Their quarterly results are presented with the other beach drains.

The quarterly results from the monthly beach drain and SSD samples are presented in Table 2-4. The total monthly flow is calculated assuming that the flow rate at the time of sampling persists for the whole month. In 2023, no tritium was observed at the effluent LLDs. Tritium found in the beach drains is not included in the effluent totals unless it can be shown to be the result of a spill or similar event. Because the source of beach drain tritium has been determined to be recapture, including beach drain tritium in the effluent totals would be double counting (NRC RIS 2008-03, Return/re-use of previously discharged radioactive effluents).

The principal source of water for the beach drains is the yard drain system. Yard drain water sources are rain and snow melt containing recaptured tritium. During the winter natural melting is the principal source. Additionally, various roof drains connect to the yard drain system. In addition to precipitation, the roof drains also carry condensate from various building AC units. A secondary source may be groundwater in leakage. This is evidenced by flow during periods of no precipitation. Because there are no external storage tanks or piping that carries radioactive liquids, the main source of radioactivity for this system is recapture/washout of airborne tritium discharges via the yard drain system. Because of these various recapture sources, the beach drains also are sampled as part of the groundwater monitoring program. These results and other groundwater monitoring results are presented in Part D of this Annual Monitoring Report.

Table 2-2
Summary of Circulating Water Discharge
January 1, 2023 through December 31, 2023

	1st QTR	2nd QTR	3rd QTR	4th QTR	Annual Totals
Total Activity Released (Ci)					
Fission & Activation Products[1]	1.70E-02	2.12E-02	9.75E-03	4.77E-02	9.57E-02
Gross Alpha	ND	ND	ND	ND	ND
Tritium	2.92E+02	1.83E+02	2.62E+02	1.53E+02	8.90E+02
Noble Gases	7.58E-03	6.36E-03	1.39E-02	1.37E-01	1.65E-01
Total Vol Released (gal)					
Liquid Batch Releases[2]	1.78E+05	1.59E+05	1.01E+05	2.31E+05	6.69E+05
Continuous Releases[3]	3.24E+07	2.71E+07	2.49E+07	2.58E+07	1.10E+08
Total Gallons	3.26E+07	2.73E+07	2.50E+07	2.60E+07	1.11E+08
Total cc	1.23E+11	1.03E+11	9.46E+10	9.85E+10	4.20E+11
Unit 1 Circ Water Dilution Volume (gal)	2.37E+10	4.42E+10	4.97E+10	4.05E+10	1.58E+11
Unit 2 Circ Water Dilution Volume (gal)	2.36E+10	4.43E+10	4.98E+10	4.82E+10	1.66E+11
Total of Both Units Circ Water Dilution Volume (gal)	4.72E+10	8.85E+10	9.95E+10	8.87E+10	3.24E+11
Dilution volume used (cc)[4]	8.93E+13	1.67E+14	1.88E+14	1.53E+14	5.98E+14
Avg diluted discharge conc (μCi/cc)					
Gamma Scan (+HTDs)[1]	1.90E-10	1.27E-10	5.19E-11	3.11E-10	6.80E-10
Gross Alpha	ND	ND	ND	ND	ND
Tritium	3.27E-06	1.09E-06	1.39E-06	9.99E-07	6.76E-06
Noble Gases	8.49E-11	3.80E-11	7.39E-11	8.94E-10	1.09E-09

1 HTDs include Fe-55, C-14, Ni-63, Sr-90, and Tc-99.
2 Liquid Batch Releases are the processed waste tanks and steam generator releases
3 Continuous Batch Releases include Steam Generator Blowdown Filter Outlet, Wastewater Effluent, and Subsurface Drainage
4 Circulating water discharge from the Unit that was overboard for the month or with the lowest dilution flow used for average estimated diluted discharge concentration.
ND: means that the radionuclide was not identified in any samples and all analyses were performed with instrumentation meeting the lower limit of detection as required by the PBNP Offsite Dose Calculation Manual.

Table 2-3
Isotopic Composition of Circulating Water Discharges (Ci)
January 1, 2023 through December 31, 2023

Nuclide	1st QTR (Ci)	2nd QTR (Ci)	3rd QTR (Ci)	4th QTR (Ci)	Annual Total (Ci)
H-3	2.92E+02	1.83E+02	2.62E+02	1.53E+02	8.90E+02
C-14	5.63E-03	2.59E-03	2.21E-03	3.08E-03	1.35E-02
Ag-110m	7.17E-05	5.61E-05	4.15E-05	2.68E-04	4.37E-04
As-76				1.36E-05	1.36E-05
Co-58	1.44E-04	7.63E-04	3.08E-05	2.69E-03	3.63E-03
Co-60	4.30E-04	9.99E-04	2.44E-04	1.78E-03	3.45E-03
Cr-51	1.06E-04	1.47E-03		1.07E-03	2.65E-03
Cs-137	3.04E-05	1.52E-05			4.56E-05
Cs-138				1.33E-05	1.33E-05
F-18	2.59E-03	2.39E-03	2.83E-03	2.61E-03	1.04E-02
Fe-55	1.73E-04	5.02E-04		6.27E-04	1.30E-03
Fe-59		1.67E-04		2.31E-03	2.48E-03
I-132	9.01E-06			4.15E-05	5.05E-05
La-140				1.41E-05	1.41E-05
Mn-54	1.04E-06	3.56E-05		7.54E-06	4.42E-05
Na-24				2.92E-06	2.92E-06
Nb-95	2.46E-05	4.92E-04		3.17E-04	8.34E-04
Nb-97	9.05E-06	2.17E-05	2.55E-06		3.33E-05
Ni-63	1.40E-04		7.02E-05	4.12E-04	6.22E-04
Sb-124	9.84E-05	1.29E-04	8.51E-04	6.15E-03	7.23E-03
Sb-125	6.12E-03	5.58E-03	3.28E-03	2.38E-02	3.88E-02
Sn-113		8.09E-05		1.23E-04	2.04E-04
Sn-125					ND
Sr-92		1.78E-06			1.78E-06
Tc-99	1.59E-04	6.08E-05	4.55E-05	7.42E-05	3.40E-04
Te-123m	1.27E-03	5.55E-03	1.48E-04	2.13E-03	9.10E-03
Zn-65		1.13E-05			1.13E-05
Zr-95		2.87E-04		1.71E-04	4.58E-04
Kr-85				1.45E-03	1.45E-03
Xe-131m			2.40E-04	4.78E-03	5.02E-03
Xe-133	7.47E-03	6.32E-03	1.37E-02	1.30E-01	1.57E-01
Xe-133m	2.84E-05		1.71E-05	3.65E-04	4.11E-04
Xe-135	7.82E-05	3.79E-05		4.00E-04	5.16E-04

ND: means that the radionuclide was not identified in any samples and all analyses were performed with instrumentation meeting the lower limit of detection as required by the PBNP Offsite Dose Calculation Manual.

Table 2-4
Beach and Subsoil System Drains - Tritium Summary
January 1, 2023 through December 31, 2023

	S-1	S-3	S-7	S-8	S-9	S-10	S-12	S-13
1st Qtr								
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flow (gal)	2.62E+06	1.10E+06	1.74E+05	0.00E+00	4.46E+04	1.79E+05	8.00E+03	0.00E+00
2nd Qtr								
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flow (gal)	1.49E+06	3.75E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.42E+05	0.00E+00
3rd Qtr								
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flow (gal)	1.02E+06	1.77E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.13E+04	0.00E+00
4th Qtr								
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flow (gal)	8.17E+05	6.74E+05	0.00E+00	0.00E+00	0.00E+00	4.32E+04	1.31E+05	0.00E+00

2.6 Land Application of Sewage Sludge and Wastewater

In 1988, pursuant to 10 CFR 20.302(a), Point Beach received NRC approval for the disposal of sewage sludge, which may contain trace amounts of radionuclides, by land application on acreage within the site. Land application of sewage sludge is regulated by the Wisconsin Department of Natural Resources. Point Beach has not land applied sewage sludge for over a decade. Therefore, Point Beach has not renewed its WI DNR permit to dispose of sewage sludge in this manner.

There were no sludge or equalization basin disposals by land application during 2023. All disposals from the PBNP sewage treatment plant (STP) were done at the Manitowoc Sewage Treatment Plant. A total of 99,000 gallons in 19 shipments were sent to Manitowoc. All sludge and equalization basin discharges were analyzed to environmental LLDs, except for 2 which were analyzed to effluent LLDs and less than detectable. Naturally occurring radionuclides such as Ra-226 and K-40 were present in all samples. For the shipments in 2023 the total Ra-226 and K-40 were 51.7 µCi and 79.6 µCi, respectively. Small concentrations of H-3 (64 – 660 pCi/L) were found in all of the shipments for a total of 107.2 µCi. Based on the daily flow at the Manitowoc plant, the H-3 discharge concentration would be on the order of 0.221 pCi/L or 90,500 times lower than the EPA drinking water limit of 20,000 pCi/L.

The STP H-3 is attributable to groundwater in-leakage at the STP lift station whose volume is known to increase after a heavy rain or snow melt event. The STP is in the groundwater flow path from the retention pond area and the lake. The STP H-3 concentrations are comparable to those found in the retention pond area monitoring wells.

2.7 Carbon-14

Carbon-14 (C-14) is a naturally occurring radionuclide. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Small amounts of C-14 also are produced by nuclear reactors, but the amounts produced are less than C-14 produced by weapons testing or that occurs naturally. Based on information from the NRC obtained at industry sponsored workshops, Point Beach began evaluating C-14 liquid discharges in 2009, prior to the issuance of Regulatory Guide 1.21 [RG 1.21], Rev 2 in June of 2009. Point Beach continues to analyze batch liquid waste discharges for C-14 and reporting the results in the Annual Monitoring Report.

The NRC requested that all nuclear plants report C-14 emissions beginning with the 2010 monitoring reports. Pursuant to NRC guidance in RG 1.21(Rev 2), evaluation of C-14 in liquid wastes is not required because the quantity released via this pathway is much less than that contributed by gaseous emissions. However, as stated above, Point Beach began C-14 analyses and reporting prior to the issuance of RG 1.21 (Rev 2). RG 1.21 states that a radionuclide is a principal effluent component if it contributes greater than 1% of the Appendix I design objective dose compared to the other radionuclides in the effluent type, or, if it is greater than 1% of the activity of all radionuclides in the effluent type. In this case, C-14 is compared to other (non-tritium or noble gases) radionuclides discharged in liquids.

For 2023, the annual total of C-14 (1.35E-02 Ci) in liquid discharges is documented in Table 2-3. The 2023 amount of C-14 released makes up about 14% of the non-tritium radionuclides released in liquids (1.35E-02/9.57E-02).

3.0 RADIOACTIVE AIRBORNE RELEASES

The release paths to the environment contributing to radioactive airborne release totals during this reporting period were the auxiliary building vent stack, the drumming area vent stack, the letdown gas stripper, the Unit 1 containment purge stack, and the Unit 2 containment purge stack. A gaseous radioactive effluent treatment system in conjunction with administrative controls is used to minimize the impact on the environment from the airborne releases and maintain doses to the public ALARA.

3.1 Doses from Airborne Effluent

Doses from airborne effluent are calculated for the maximum exposed individual (MEI) following the methodology contained in the PBNP ODCM. These calculated doses use parameters such as the amount of radioactive material released, the concentration at and beyond the site boundary, the average site weather conditions, and usage factors (e.g., breathing rates, food consumption). In addition to the MEI doses, the energy deposited in the air by noble gas beta particles and gamma rays is calculated and compared to the corresponding Appendix I design objectives. A comparison of the annual Appendix I design objectives for atmospheric effluents to the highest organ dose and the noble gas doses calculated using ODCM methodology is listed in Table 3-2. C-14 is not included in the Appendix I calculations because it is not an Appendix I radionuclide. The C-14 dose calculation has been required since 2010 (see Sections 3.4 through 3.6, below, for a more detailed description) and is treated separately. The comparison between airborne effluent doses with and without C-14 is shown in Table 3-5. The highest Appendix I dose is 1.95e-02 mrem for the child age group thyroid. Had C-14 been included, the child-bone dose would have been the highest at 1.56E-01 mrem. Even with the inclusion of C-14 the doses demonstrate that releases from PBNP to the atmosphere continue to be ALARA at 0.52% of the dose objective. This percentage is exactly the same as the 2022 result.

3.2 Radioactive Airborne Release Summary

Radioactivity released in airborne effluents for 2023 is summarized in Table 3-3. The particulate total decreased to 3.33E-05 Ci in 2023 from 1.74E-04 Ci in 2022. This decrease is attributed to a decrease in F-18 (3.06E-06 2023 compared to 1.62E-04 in 2022). Tritium increased in 2023 to 90.9 Ci from 79.7 in 2022. Noble gases increased to 14.6 Ci in 2023 from 1.30 Ci in 2022. This increase is directly due to the identification of failed fuel in the Unit 2 reactor which started trending in June of 2023.

3.3 Isotopic Airborne Releases

The monthly isotopic airborne releases for 2023, from which the airborne doses were calculated, are presented in Table 3-4. Carbon-14 is not included in Table 3-4 because it was calculated and not measured. C-14 is discussed in the following sections.

As in previous years the outage impact of the isotopic mixture is demonstrated in the comparison of the non-outage particulate releases. During the outage in March-April, ten different particulates were identified in the airborne effluent. In October-November eleven different particulates were identified. Most were released via the open hatches on the 26 and 66-foot elevation of containment. The convective flow through the open hatch during purge is unfiltered. Although the flow is into the façade, there are two circumferential gaps around the façade. It is assumed that the release into façade is transferred to the outside and therefore is treated as a release to the environment.

As was noted in Section 3.2, the total particulate curies observed decreased in 2023 when compared to 2022, the decline is attributed to the decrease in F-18 in 2023.

3.4 Carbon-14

C-14 is a naturally occurring radionuclide. Nuclear weapons testing of the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Small amounts of C-14 also are produced by nuclear reactors as neutrons interact with the dissolved oxygen and nitrogen in the primary coolant. However, the amount produced by nuclear reactors is much less than that produced by weapons testing or that occur naturally.

The NRC has requested that nuclear plants report C-14 emissions. C-14 is a hard-to-detect radionuclide. It is not a gamma emitter and must be chemically separated from the effluent stream before it can be measured. Because nuclear plants currently are not equipped to perform this type of sampling, RG 1.21 allows for calculating C-14 discharges based on fission rates.

The Electric Power Research Institute (EPRI) developed the methodology for calculating C-14 generation and releases for the nuclear industry. The results were published as Technical Report 1021106 (December 2010), "Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents." In addition to neutron flux, the percent oxygen and nitrogen in the VCTs is used in the C-14 calculation as both gases contribute to the generation of C-14. Pursuant to NRC guidance (Regulatory Guide 1.21, Rev 2, p. 16, June 2009), most of the C-14 emissions from nuclear plant occur in the gaseous phase.

The Point Beach C-14 generation for 2023 was calculated using the EPRI guidance and the current core parameters resulting from the power uprate. The calculated amounts were 5.55 Ci for Unit 1 and 5.53 Ci for Unit 2 yielding a total of 11.08 Ci which is statistically the same as 2016 through 2022. The 2023 calculated total 11.08 Ci is roughly 820 times higher than the 1.35E-02 Ci of C-14 determined by analyses of composites from liquid waste batch discharges, steam generator blowdown, and other waste streams.

3.5 C-14 Airborne Effluent Dose Calculation

The dose from the airborne C-14 is dependent on its chemical form. The C-14 released to the atmosphere consists of both organic and inorganic species. Both the inorganic and organic C-14 contribute to the inhalation dose. Only the inorganic $^{14}CO_2$ species contributes to the dose from the ingestion of photosynthetically incorporated C-14. The organic forms such as methane, CH_4, are not photosynthetically active. For PWRs such as PBNP most of the gaseous C-14 occurs as methane, $^{14}CH_4$, not as carbon dioxide, $^{14}CO_2$.

The amount of $^{14}CO_2$ present in the PBNP airborne effluent has not been measured. However, such measurements have been made at a comparable PWR site similar to the PBNP design. The Ginna nuclear generating station is of similar design to PBNP. It is a Westinghouse 2-loop PWR of the same vintage as PBNP and approximately the same power (prior to the PBNP power uprate). Measurements at Ginna for 18 months in 1980 - 1981 (Kunz, "Measurement of ^{14}C Production and Discharge From the Ginna Nuclear Power Reactor," 1982) found that ten percent of the C-14 was discharged as $^{14}CO_2$. Therefore, 10% of the 11.08 Ci of the calculated C-14 for PBNP will be used in the ingestion dose calculations.

C-14 dose calculations were made using the dose factors and the methodology of Regulatory Guide 1.109. In 2018 the inhalation dose factors were updated to reflect a change in the χ/Q value in the Point Beach ODCM. The inhalation dose was calculated using all forms of C-14. All forms of the C-14 are used because regardless of whether the C-14 is in the form of $^{14}CO_2$ or an organic form, such as CH_4, both would be inhaled and contribute to a lung dose.

For the other existing pathways, milk, meat, and produce, the dose depends upon the amount incorporated into biomass consumed by cattle and people: forage for cattle and produce for humans. Incorporation only occurs via photosynthesis. Photosynthesis only incorporates $^{14}CO_2$ and accounts for only 10% of the total C-14 release for these pathways.

The airborne effluent C-14 dose calculations were made as described above. They were made for the MEI as explained in Section 2.1. This approach utilizes all the pathways that are applicable to a hypothetical person residing at the site boundary. Because C-14 is present as a gas, the pathways are milk, meat, and produce (vegetables, fruit, and grain) and the Regulatory Guide 1.109, Table E-5 usage factors are applied to the calculation. As such, the resulting dose will be conservative in that the produce usage factor includes grain and fruit and these pathways do not exist in the vicinity of the point for which the C-14 doses are calculated. Furthermore, because leafy vegetables are included in the produce pathway, they are not used as a separate pathway because that would result in double accounting for leafy vegetable dose contribution.

In 2022 the C-14 dose calculation methodology was changed in the PBNP ODCM to reflect changes in a new software that was implemented. The new changes use the NUREG-0133 methodology for C-14 calculation of dose. The calculations used to determine the dose were updated for the annual C-14 dose contribution.

Carbon-14 is not an Appendix I radionuclide. Therefore, airborne C-14 is not summed with the other airborne radioactive effluents for comparison of airborne effluent dose to the Appendix I dose objectives. However, the C-14 doses are presented and compared to the other radionuclide doses in Table 3-5.

3.6 C-14 Measurements

No C-14 measurements were made of PBNP airborne effluents. In 2010, C-14 was measured in crops grown on fields in the owner controlled area located in the highest χ/Q sector at the site's south boundary. One field was leased for feed corn by a dairy south of the plant. That dairy is part of the REMP. In an adjacent field soybeans were grown by another farmer. These two crops were sampled in this sector and as well as in a background location about 17 miles SW of the plant. Based on the measurement error, there was no statistical difference between the results obtained on site in the highest χ/Q sector as compared to the background site some 17 miles away (2013 AMR, Table 10-3). These results demonstrated that the dose from C-14 in Point Beach airborne effluents should not measurably increase the C-14 dose compared to that received from naturally occurring C-14 in plants (1 mrem: NCRP Report 93, Ionizing Radiation Exposure of the Population of the United States, 1987, p.12).

3.7 Abnormal Release

An abnormal gaseous release occurred in July 2023. The abnormal release involved a gaseous leak on the Point Beach waste gas system, resulting in the loss of gaseous effluent from the C and D gas decay tanks. The release began on July 5 at 22:00 when the C-GDT was in service. On July 8 at 15:50, D-GDT was placed in service until July 10 at 18:46, when the leak was discovered due to a loss of volume. A sample of the in service C-GDT was taken on July 11 at 04:05 and contained Xe-131m, Xe-133, and Xe-133m. Permits were generated using the RADEAS software by inputting the isotopic results and the release durations which were calculated from the loss of gaseous effluent based on Operations logs. The total curie (Ci) of isotopes released and doses due to the abnormal release is presented in Table 3.1. Based on the sample results obtained, the volume discharged, and amount of time it took to perform the discharge, quantification of the release was possible, and no ODCM limits were exceeded or challenged.

Table 3-1
Curies Released and Dose Calculations from Abnormal Gaseous Release

		C-GDT 23-00081GB	D-GDT 23-00082GB	
	Sample Results (μCi/cc)	Ci Released	Ci Released	Total Ci Released
Xe-131m	1.53E-05	7.89E-04	1.11E-03	1.90E-03
Xe-133	7.27E-04	3.75E-02	5.26E-02	9.01E-02
Xe-133m	2.42E-06	1.25E-04	1.75E-04	3.00E-04
	Annual Limit	C-GDT 23-00081GB	D-GDT 23-00082GB	Total Dose
Gamma Air Dose (mrad)	10	4.63E-07	6.49E-07	1.11E-06
Beta Air Dose (mrad)	20	1.40E-06	1.96E-06	3.36E-06
Total Body Dose (mrem)	5	3.84E-07	5.39E-07	9.23E-07
Skin Dose (mrem)	15	9.23E-07	1.29E-06	2.21E-06

Table 3-2
Comparison of 2023 Airborne Effluent Calculated Doses to 10 CFR 50 Appendix I Design Objectives

Category	Annual Appendix I Design Objective	January-December Calculated Dose	Percent of Appendix I Design Objective
Particulate	30 mrem/organ	0.0195 mrem	0.065
Noble gas	20 mrad (gamma air)	0.000383 mrad	0.00192
Noble gas	40 mrad (beta air)	0.000582 mrad	0.00146
Noble gas	10 mrem (whole body)	0.000344 mrem	0.00344
Noble gas	30 mrem (skin)	0.000631 mrem	0.00210

Table 3-3
Radioactive Airborne Effluent Release Summary
January 1, 2023 through December 31, 2023

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual Total
Total Noble Gas (Ci)[1]	2.46E-01	1.73E-01	6.26E+00	7.97E+00	1.46E+01
Total Radioiodines (Ci)[2]	4.29E-08	0.00E+00	4.27E-06	1.83E-05	2.26E-05
Total Particulate (Ci)[3]	5.67E-06	7.52E-07	3.07E-06	2.38E-05	3.33E-05
Alpha (Ci)	ND	ND	ND	ND	ND
All other beta + gamma (Ci)	5.67E-06	7.52E-07	3.07E-06	2.38E-05	3.33E-05
Total Tritium (Ci)	2.34E+01	1.78E+01	1.83E+01	3.14E+01	9.09E+01
Avg. Rel. Rate (μCi/sec)[4]	5.86E-01	5.24E-01	6.34E-01	9.51E-01	

[1] Total noble gas (airborne releases) and activation gas Ar-41.

[2] Although for dose calculations iodines are grouped with particulates, for this reporting table they are separated from the particulate group.

[3] Total Particulate is the sum of alpha, strontium, and others. It does not include radioiodines or C-14. C-14 is calculated for the year and no monthly values are available.

[4] Average release rate is based off the average tritium release rates.

ND: means that the radionuclide was not identified in any samples and all analyses were performed with instrumentation meeting the lower limit of detection as required by the PBNP Offsite Dose Calculation Manual.

TABLE 3-4
Isotopic Composition of Airborne Releases
January 1, 2023 through December 31, 2023

	1st QTR	2nd QTR	3rd QTR	4th QTR	Annual
Nuclide	(Ci)	(Ci)	(Ci)	(Ci)	**Total**
H-3	2.34E+01	1.78E+01	1.83E+01	3.14E+01	9.09E+01
Ar-41	1.64E-01	1.67E-01	1.71E-01	1.61E-01	6.63E-01
Kr-85m	ND	ND	ND	1.50E-04	1.50E-04
Xe-131m	1.54E-04	ND	1.90E-03	6.44E-03	8.49E-03
Xe-133	8.23E-02	6.14E-03	6.08E+00	7.80E+00	1.40E+01
Xe-133m	1.53E-04	ND	3.00E-04	5.53E-04	1.01E-03
Xe-135	ND	ND	4.34E-04	1.71E-03	2.14E-03
I-131	4.29E-08	ND	4.65E-07	5.33E-06	5.84E-06
I-133	ND	ND	3.80E-06	1.29E-05	1.67E-05
Br-82	9.35E-09	ND	ND	ND	9.35E-09
Co-57	ND	ND	ND	1.48E-08	1.48E-08
Co-58	8.13E-07	ND	ND	6.76E-06	7.57E-06
Co-60	1.25E-06	ND	ND	4.34E-06	5.59E-06
Cr-51	1.22E-06	ND	ND	7.83E-07	2.00E-06
Cs-137	ND	ND	ND	1.36E-10	1.36E-10
F-18	1.10E-06	7.52E-07	1.21E-06	ND	3.06E-06
Fe-55	ND	ND	ND	ND	ND
Mn-54	1.22E-07	ND	ND	1.83E-07	3.05E-07
Nb-95	7.51E-07	ND	ND	2.06E-06	2.81E-06
Ni-63	ND	ND	1.86E-06	8.33E-06	1.02E-05
Sr-89	ND	ND	ND	ND	ND
Sr-90	ND	ND	ND	ND	ND
Tc-99	ND	ND	ND	ND	ND
Sb-125	6.05E-09	ND	ND	ND	6.05E-09
Zr-95	4.04E-07	ND	ND	1.37E-06	1.77E-06

ND: means that the radionuclide was not identified in any samples and all analyses were performed with instrumentation meeting the lower limit of detection, as required by the PBNP Offsite Dose Calculation Manual.

Table 3-5
Comparison of Airborne Effluent Doses (Appendix I and C-14)

2023 Appendix I (Airborne Particulate + Tritium) Dose (mrem)

	Bone	Liver	T-WB	Thyroid	Kidney	Lung	GI-LLI	Skin
Adult	5.45E-05	1.21E-02	1.21E-02	1.22E-02	1.21E-02	1.21E-02	1.21E-02	2.94E-05
Teen	7.16E-05	1.36E-02	1.36E-02	1.37E-02	1.36E-02	1.36E-02	1.36E-02	2.94E-05
Child	1.40E-04	1.93E-02	1.93E-02	1.95E-02	1.93E-02	1.93E-02	1.93E-02	2.94E-05
Infant	7.08E-05	8.50E-03	8.50E-03	8.79E-03	8.49E-03	8.49E-03	8.49E-03	2.94E-05

Ann.Limit	3.00E+01
% Ann Lim	6.50E-02

2023 Carbon-14 Dose (mrem)

	Bone	Liver	T. Body	Thyroid	Kidney	Lungs	GI-LLI	Skin
Adult	4.25E-02	8.41E-03	8.41E-03	8.41E-03	8.41E-03	8.41E-03	8.41E-03	0.00E+00
Teen	6.88E-02	1.36E-02	1.36E-02	1.36E-02	1.36E-02	1.36E-02	1.36E-02	0.00E+00
Child	1.56E-01	3.10E-02	3.10E-02	3.10E-02	3.10E-02	3.10E-02	3.10E-02	0.00E+00
Infant	1.30E-01	2.77E-02	2.77E-02	2.77E-02	2.77E-02	2.77E-02	2.77E-02	0.00E+00

2023 Total Airborne Non-Noble Gas Dose [Particulate + H-3 + C-14 (mrem)]

	Bone	Liver	T-WB	Thyroid	Kidney	Lung	GI-LLI	Skin
Adult	4.26E-02	2.05E-02	2.05E-02	2.06E-02	2.05E-02	2.05E-02	2.05E-02	2.94E-05
Teen	6.89E-02	2.72E-02	2.72E-02	2.73E-02	2.72E-02	2.72E-02	2.72E-02	2.94E-05
Child	1.56E-01	5.03E-02	5.03E-02	5.05E-02	5.03E-02	5.03E-02	5.03E-02	2.94E-05
Infant	1.30E-01	3.62E-02	3.62E-02	3.65E-02	3.62E-02	3.62E-02	3.62E-02	2.94E-05

Ann.Limit	3.00E+01
% Limit	5.21E-01

The percent of limit is calculated using the highest total dose, the Child Age Group.

4.0 RADIOACTIVE SOLID WASTE SHIPMENTS

4.1 Types, Volumes, and Activity of Shipped Solid Waste

The following types, volumes, and activity of solid waste were shipped from PBNP for offsite disposal or burial during 2023. No Types C or D wastes were shipped. No irradiated fuel was shipped offsite. The volume, activity and type of waste are listed in Table 4-1.

Table 4-1
Quantities and Types of Waste Shipped from PBNP in 2023

Type of Waste	Quantity	Activity
A. Spent resins, filter sludge, evaporator bottoms, etc.	7.93 m^3	122.5 Ci
	280.0 ft^3	
B. Dry compressible waste, contaminated equipment, etc	234.0 m^3	0.402 Ci
	8260.0 ft^3	
C. Irradiated components, control rods, etc.	0.00 m^3	N/A Ci
	ft^3	
D. Other	0.0 m^3	N/A Ci

4.2 Solid Waste Disposition

There were six solid waste shipments from PBNP during 2023. The dates and destinations are shown in Table 4-2.

Table 4-2
2023 PBNP Radioactive Waste Shipments

3/10/2023	Oak Ridge, TN
3/30/2023	Oak Ridge, TN
6/6/2023	Clive, UT
7/26/2023	Erwin, TN
9/25/2023	Oak Ridge, TN
11/17/2023	Oak Ridge, TN

4.3 Major Nuclide Composition (by Type of Waste)

The major radionuclide content of the 2023 solid waste was determined by gamma isotopic analysis and the application of scaling factors for certain indicator radionuclides based on the measured isotopic content of representative waste stream samples. The estimated isotopic content is presented in Table 4-3. Only those radionuclides with detectable activity are listed.

Table 4-3
2023 Estimated Solid Waste Major Radionuclide Composition

Type A			Type B		
Nuclide	Activity (mCi)	Percent Abundance	Nuclide	Activity (mCi)	Percent Abundance
Total Activity	4.91E+00	1.00E+00	Total Activity	1.18E+02	99.99%
H-3	4.08E-03	0.08%	H-3	1.34E-03	0.00%
C-14	2.26E-02	0.46%	C-14	3.52E-03	0.00%
Cr-51	1.78E-02	0.36%	Mn-54	2.19E+00	1.85%
Mn-54	1.53E-02	0.31%	Fe-55	4.14E+00	3.50%
Fe-55	9.50E-02	1.93%	Co-57	3.21E-01	0.27%
Fe-59	4.52E-03	0.09%	Co-58	1.47E+00	1.24%
Co-57	3.32E-03	0.07%	Co-60	5.61E+01	47.36%
Co-58	5.74E-02	1.17%	Ni-59	2.69E-01	0.23%
Co-60	2.07E+00	42.10%	Ni-63	5.11E+01	43.15%
Ni-59	3.01E-02	0.61%	Sr-89	2.21E-03	0.00%
Ni-63	2.36E+00	48.13%	Sr-90	1.61E-02	0.01%
Zn-65	8.40E-04	0.02%	Tc-99	2.48E-03	0.00%
Sr-90	5.32E-04	0.01%	Sb-125	1.78E+00	1.51%
Zr-95	3.25E-02	0.66%	Cs-137	8.38E-01	0.71%
Nb-95	6.23E-02	1.27%	Ce-144	9.46E-04	0.00%
Tc-99	1.23E-04	0.00%	Pu-238	2.33E-04	0.00%
Ag-110m	1.77E-02	0.36%	Pu-239	1.06E-04	0.00%
Sn-113	1.98E-03	0.04%	Pu-241	1.94E-01	0.16%
Sb-124	1.59E-03	0.03%	Am-241	2.21E-04	0.00%
Sb-125	7.32E-02	1.49%	Cm-242	1.18E-05	0.00%
I-129	2.51E-05	0.00%	Cm-243	1.00E-04	0.00%
Cs-137	3.44E-02	0.70%			
Ce-144	6.20E-04	0.01%			
Pu-238	4.90E-05	0.00%			
Pu-239	2.45E-05	0%			
Pu-241	3.38E-03	0.07%			
Am-241	1.54E-04	0%			
Cm-242	4.23E-06	0%			
Cm-243	5.38E-05	0%			

5.0 NONRADIOACTIVE CHEMICAL RELEASES

5.1 Scheduled Chemical Waste Releases

There were no scheduled chemical waste releases of neutralized wastewater to the circulating water system from January 1, 2023 through December 31, 2023.

Scheduled chemical waste releases are based on the analytical results obtained from sampling a representative number of neutralizing tanks.

5.2 Miscellaneous Chemical Waste Releases

Miscellaneous chemical waste releases from the wastewater effluent (based on effluent analyses) to the circulating water for January 1, 2023, to June 30, 2023, included 2.38E+07 gallons of clarified effluent. The wastewater contained 3.57E+03 lbs. of suspended solids.

Miscellaneous chemical waste releases from the wastewater effluent (based on effluent analyses) to the circulating water for July 1, 2023, to December 31, 2023, included 1.94E+07 gallons of clarified effluent. The wastewater contained 1.62E+03 lbs. of suspended solids.

Miscellaneous chemical waste released directly to the circulating water, based on amount of chemicals used from January 1, 2023, to June 30, 2023, included 4.23+05 lbs. of sodium bisulfite solution (1.61E+05 lbs. sodium bisulfite), 3.11E+05 lbs. of Sodium Hypochlorite Solution (3.89E+04 lbs. sodium hypochlorite), 1.54E+04 lbs. Acti-Brom 1338 (6.75E+03 lbs. sodium bromide). 3.01E+03 lbs. of biodetergent, and 3.91E+04 lbs. of silt dispersant.

Miscellaneous chemical waste released directly to the circulating water, based on amount of chemicals used from July 1, 2023, to December 31, 2023, included 6.58E+05 lbs. of sodium bisulfite solution (2.50E+05 lbs. sodium bisulfite), 4.57E+05 lbs. Sodium Hypochlorite Solution (5.71E+04 lbs. sodium hypochlorite), 1.83E+04 lbs. Acti-Brom 1338 (8.24E+03 lbs. sodium bromide), 4.32E+03 lbs. of biodetergent, and 2.03E+04 lbs. of silt dispersant.

6.0 CIRCULATING WATER SYSTEM OPERATION

The circulating water system operation during this reporting period is described in Table 6-1.

Table 6-1
Circulating Water System Operation for 2023

	UNIT	JAN	FEB	MAR***	APR	MAY	JUN
Average Volume Cooling Water Discharge [million gal/day]*	1	348.5	348.5	363.3	389.0	551.5	551.5
	2	348.5	348.5	123.7	387.3	552.9	552.9
Average Cooling Water Intake Temperature [°F]	1	37	36	36	44	48	60
	2	37	36	37	44	49	60
Average Cooling Water Discharge Temperature [°F]	1	69	69	65	55	67	67
	2	68	68	68	65	65	66
Average Ambient Lake Temperature [°F]		35	34	38	41	46	46

* For days with cooling water discharge flow.
*** U2 outage 3/12/23-3/31/23

Table 6-1(continued)
Circulating Water System Operation for 2023

	UNIT	JUL	AUG	SEP	OCT***	NOV	DEC
Average Volume Cooling* Water Discharge [million gal/day]	1	551.5	551.5	551.5	155.4	539.9	476.2
	2	552.9	552.9	552.9	574.2	552.0	476.8
Average Cooling Water Intake Temperature [°F]	1	61	64	62	55	46	40
	2	62	64	63	55	46	40
Average Cooling Water Discharge Temperature [°F]	1	74	84	83	72	64	65
	2	73	82	81	70	62	64
Average Ambient Lake Temperature [°F]		52	62	62	51	44	37

* For days with cooling water discharge flow.
*** U1 outage 10/8/23-10/28/23

Part B
Miscellaneous Reporting Requirements

7.0 ADDITIONAL REPORTING REQUIREMENTS

7.1 Revisions to the PBNP Effluent and Environmental Programs

Revision 24 of the Offsite Dose Calculation Manual (ODCM) was issued in February 2022. The site operated under the guidance of this revision for the entirety of 2023.

The ODCM was revised to align with the standard methodologies in NUREG-0133, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, as are implemented in the Radiological Effluent Administrative System (RADEAS) software design. Point Beach transitioned to RADEAS for generating all liquid and gaseous effluent releases in 2022.

Equations in the ODCM reflect some of the nomenclature from the RADEAS software design description and utilize NUREG-0133 methodology. Pre-calculated dose parameters (Aio and Rio) and pre-calculated dose conversion factors were replaced with the basis document dose factors for each applicable organ/age as can be found in NUREG-0172 (Age-Specific Radiation Dose Commitment Factors For A One-Year Chronic Intake), Reg. Guide 1.109 (Calculation of Annual Doses To Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I), and other regulatory guides as applicable.

Additional changes include updating the tritium (H-3) and strontium-90 (Sr-90) dose factors from the NRC LADTAP values to the NUREG-0172 values which are more conservative. As well, to align with effluent reporting performed by the RADEAS software changes to the Annual Monitoring Report section of the ODCM were updated.

7.2 Interlaboratory Comparison Program

ATI Environmental transitioned to Microbac Laboratories Inc. on June 1, 2023. Microbac Labs Inc., the analytical laboratory contracted to perform the radioanalyses of the PBNP environmental samples, participated in several interlaboratory comparison studies including those administered by Environmental Resources Associates (ERA) during 2023. The results of these comparisons can be found in Appendix A of the attached final report for 2023, January – December 2022 from Microbac Labs, which is located in Appendix 1 of this report.

7.3 Special Circumstances

No special circumstances to report regarding operation of the explosive gas monitor for the waste gas holdup system was needed during 2023.

Part C
RADIOLOGICAL ENVIRONMENTAL MONITORING

8.0 INTRODUCTION

The objective of the PBNP Radiological Environmental Monitoring Program (REMP) is to determine whether the operation of PBNP or the ISFSI has radiologically impacted the environment. To accomplish this, the REMP collects and analyzes air, water, milk, soil, vegetation (grasses and weeds), and fish samples for radionuclides and uses thermoluminescent dosimeters (TLDs) to determine the ambient radiation background. The analyses of the various environmental media provide data on measurable levels of radiation and radioactive materials in the principal pathways of environmental exposure. These measurements also serve as a check of the efficacy of PBNP effluent controls.

The REMP fulfills the requirements of 10 CFR 20.1302, PBNP General Design Criterion (GDC) 17, GDC 64 of Appendix A to 10 CFR 50, and Sections IV.B.2 and IV.B.3 of Appendix I to 10 CFR 50 for the operation of the plant. A subset of the PBNP REMP samples, consisting of air, soil and vegetation, as well as TLDs, provide the means to measure changes in the ambient environmental radiation levels at sites near the ISFSI and at the PBNP site boundary. This is to ensure that radiation levels from the ISFSI are maintained within the dose limits of 10 CFR 72.104. Because the ISFSI is within the PBNP site boundary, radiation doses from PBNP and the ISFSI combined, must be used to assess compliance with 10 CFR 72.122 and 40 CFR 190. Therefore, radiological environmental monitoring for the ISFSI is provided by selected sampling sites, which are part of the PBNP REMP.

For the aquatic environment, the samples include water as well as the biological integrators, such as fish. Because of their migratory behavior, fish are wide area integrators. Grab samples of lake water provide a snapshot of radionuclide concentrations at the time the sample is taken; whereas analysis of fish yield concentrations integrated over time.

The air-grass-cow-milk exposure pathway unites the terrestrial and atmospheric environments. This pathway is important because of the many dairy farms around PBNP. Therefore, the REMP includes samples of air, general grasses, and milk from the PBNP environs. An annual land use survey is made to determine whether the assumptions on the location of dairy cattle remain conservative with respect to dose calculations for PBNP effluents. The dose calculations assume that the dairy cattle are located at the south site boundary, the highest depositional sector. In addition, soil samples are collected and analyzed in order to monitor the potential for long-term buildup of radionuclides in the vicinity of PBNP.

For the measurement of ambient environmental radiation levels that may be affected by direct radiation from PBNP or by noble gas effluents, the REMP employs a series of TLDs situated around PBNP and the ISFSI.

9.0 PROGRAM DESCRIPTION

9.1 Results Reporting Convention

The vendor used by PBNP to analyze the environmental samples is directed to report analysis results as measured by a detector, which can meet the required lower limit of detection (LLD) as specified in Table 12-1 of the ODCM for each sample. The report provided by the vendor (see Appendix 1) contains values, which can be either negative, positive or zero plus/minus the two sigma counting uncertainty, which provides the 95% confidence level for the measured value.

The LLD is an *a priori* concentration value that specifies the performance capability of the counting system used in the analyses of the REMP samples. The parameters for the *a priori* LLD are chosen such that only a five percent chance exists of falsely concluding a specific radionuclide is present when it is not present at the specified LLD. Based on detector efficiency and average background activity, the time needed to count the sample in order to achieve the desired LLD depends upon the sample size. Hence, the desired LLD may be achieved by adjusting various parameters. When a suite of radionuclides are required to be quantified in an environmental sample such as lake water, the count time used is that required to achieve the LLD for the radionuclide with the longest counting time. Therefore, in fulfilling the requirement for the most difficult to achieve radionuclide LLD, the probability of detecting the other radionuclides is increased because the counting time used is longer than that required to achieve the remaining radionuclide LLDs.

The REMP results in this report are reported as averages of the measurements made throughout the calendar year plus/minus the associated standard deviation. If all net sample concentrations are equal to or less than zero, the result is reported as "Not Detectable" (ND), indicating no detectable level of activity present in the sample. If any of the net sample concentrations indicate a positive result statistically greater than zero, all of the data reported is used to generate the reported statistics. Because of the statistical nature of radioactive decay, when the radionuclide of interest is not present in the sample, negative and positive results centered about zero will be seen. Excluding validly measured concentrations, whether negative or as small positive values below the LLD, artificially inflates the calculated average value. Therefore, all generated data are used to calculate the statistical values (i.e., average, standard deviation) presented in this report. The calculated average may be a negative number.

As mentioned above, radioactive decay is a statistical process which has an inherent uncertainty in the analytical result. No two measurements will yield the exact same result. However, the results are considered equal if the results fall within a certain range based upon the statistical parameters involved in the process. The REMP analytical results are reported at the 95% confidence limit in which the true result may be two standard deviations above or below the reported result. This means that there is only a 5% chance of concluding that the identified radioactive atom is not there when it really is present in the sample. A false positive is an analytical result which statistically shows that the radionuclide is present in the sample when it really is not there. Typically, if the 95% confidence interval for a positive does not include zero, the radionuclide is considered to be present. For example, the result is reported as 100 ± 90. One hundred minus 90 yields a positive result and therefore may be considered to be present. However, this may be a false positive. If the radionuclide was not in the plant effluent, this result would fall into that category which 5% of the time it is falsely concluded that the radionuclide is present when in actuality it is not. This usually happens at low concentrations at or near the LLD where fluctuations in the background during the counting process skew the results to produce a positive result.

In interpreting the data, effects due to the plant must be distinguished from those due to other sources. A key interpretive aid in assessment of these effects is the design of the PBNP REMP, which is based upon the indicator-control concept. Most types of samples are collected at both indicator locations and at control locations. A plant effect would be indicated if the radiation level at an indicator location was significantly larger than that at the control location. The difference would have to be greater than could be accounted for by typical fluctuation in radiation levels arising from other sources.

9.2 Sampling Parameters

Samples are collected and analyzed at the frequency indicated in Table 9-1 from the locations described in Table 9-2 and shown in Figures 9-1, 9-2 and 9-3. (The latter two figures show sampling locations not shown in preceding figures due to space limitations. The location of the former retention pond, retired and remediated to NRC unrestricted access criteria, is indicated in Figure 9-3). The list of PBNP REMP sampling sites used to determine environmental impact around the ISFSI is found in Table 9-3. The minimum acceptable sample size is found in Table 9-4. In addition, Table 9-1 indicates the collection and analysis frequency of the ISFSI fence TLDs.

9.3 Deviations from Required Collection Frequency

Deviations from the collection frequency given in Table 9-1 are allowed because of hazardous conditions, automatic sampler malfunction, seasonal unavailability, and other legitimate reasons (Section 12.2.2.e of the ODCM). Table 9-5 lists the deviations from the scheduled sampling frequency that occurred during the reporting period.

9.4 Assistance to the State of Wisconsin

The Radiation Protection Unit of the Wisconsin Department of Health and Family Services maintains a radiological environmental monitoring program to confirm the results from the PBNP REMP. As a courtesy to the State of Wisconsin, PBNP personnel collect certain environmental samples (Table 9-6) for the State from sites that are near PBNP sampling sites, or are co-located.

9.5 Program Modifications

No procedural program modifications were made to the REMP in 2023.

Table 9-1
PBNP REMP Sample Analysis and Frequency

Sample Type	Sample Codes	Analyses	Frequency
Environmental Radiation Exposure	E-01, -02, -03, -04, -05 -06, -07, -08, -09, -12 -14, -15, -16B, -17, -18, 20, -22, -23, -24, -25, -26B, -27, -28 -29, -30, 31, -32, -38, -39,-41, -42,-43, -44 -TC	TLD	Quarterly
Vegetation	E-01, -02, -03, -04, -06, -20,	Gamma Isotopic Analysis	2x/yr as available
Fish	E-13	Gamma Isotopic Analysis (Analysis of edible portions only)	4x/yr as available
Well Water	E-10	Gross Beta, H-3 Sr-89, 90, I-131 Gamma Isotopic Analysis	Quarterly
Lake Water	E-01, -05, -06	Gross Beta, Sr-89/90, H-3 I-131 Gamma Isotopic Analysis	Monthly / Quarterly composite of monthly collections Monthly Monthly
Milk	E-11, -40, -21	Sr-89, 90 I-131 Gamma Isotopic Analysis	Monthly
Air Filters	E-01, -02, -03, -04, -08, -20	Gross Beta I-131 Gamma Isotopic Analysis	Weekly (particulate) Weekly (charcoal) Quarterly (on composite particulate filters)
Soil	E-01, -02, -03, -04, -06, -20	Gamma Isotopic Analysis	1x/yr
Shoreline Sediment	E-01, -05, -06	Gamma Isotopic Analysis	1x/yr
ISFSI Ambient Radiation Exposure	North, East, South, West Fence Sections	TLD	Quarterly

Table 9-2
PBNP REMP Sampling Locations

Location Code	Location Description
E-01	Primary Meteorological Tower South of the Plant
E-02	Site Boundary Control Center - East Side of Building
E-03	Tapawingo Road, about 0.4 Miles West of Lakeshore Road
E-04	North Boundary
E-05	Two Creeks Park
E-06	Point Beach State Park - Coast Guard Station; TLD located South of the Lighthouse on Telephone pole
E-07	WPSC Substation on County V, about 0.5 Miles West of Hwy 42
E-08	G.J. Francar Property at Southeast Corner of the Intersection of Cty. B and Zander Road
E-09	Nature Conservancy
E-10	PBNP Site Well
E-11	Dairy Farm about 3.75 Miles West of Site
E-12	Discharge Flume/Pier
E-13	Pumphouse
E-14	South Boundary, about 0.2 miles East of Site Boundary Control Center
E-15	Southwest Corner of Site
E-16B	WSW, Hwy 42, a residence about 0.25 miles North of Nuclear Road
E-17	North of Mishicot, Cty. B and Assman Road, Northeast Corner of Intersection
E-18	Northwest of Two Creeks at Zander and Tannery Roads
E-20	Reference Location, 17 miles Southwest, at Holy Family Convent Property
E-21	Local Dairy Farm just South of Site on Lakeshore and Irish Roads
E-22	West Side of Hwy 42, about 0.25 miles North of Johanek Road
E-23	Greenfield Lane, about 4.5 Miles South of Site, 0.5 Miles East of Hwy 42
E-24	North Side of County Rt. V, near intersection of Saxonburg Road
E-25	South Side of County Rt. BB, about 0.5 miles West of Norman Road
E-26B	804 Tapawingo Road, about 0.4 miles East of Cty. B, North Side of Road
E-27	Intersection of Saxonburg and Nuclear Roads, Southwest Corner, about 4 Miles WSW
E-28	TLD site on western most pole between the 2nd and 3rd parking lots.
E-29	Area of North Meteorological Tower.
E-30	NE corner at Intersection of Tapawingo and Lakeshore Roads.
E-31	On utility pole North side of Tapawingo Road closest to the gate at the West property line.
E-32	On a conduit/pole located near the junction of property lines, about 500 feet east of the west gate in line with first designated treeline on Tapawingo Road and about 1200 feet south of Tapawingo Road. The location is almost under the power lines between the blue and gray transmission towers. (The conduit/pole is about 6 feet high).
E-38	Tree located at the West end of the area previously containing the Retention Pond.
E-39	Tree located at the East end of the area previously containing the Retention Pond.
E-40	Local Dairy Farm, W side of Hwy 42, about 1.8 miles north of the Nuclear Rd intersection
E-41	NW corner of Woodside and Nuclear Rds (Kewaunee County)
E-42	NW corner of Church and Division, East of Mishicot
E-43	West side of Tannery Rd south of Elmwood (7th utility pole south of Elmwood)
E-44	Utility Pole N Side of Tapawingo Rd near house at 5011
E-TC	Transportation Control; Reserved for TLDs

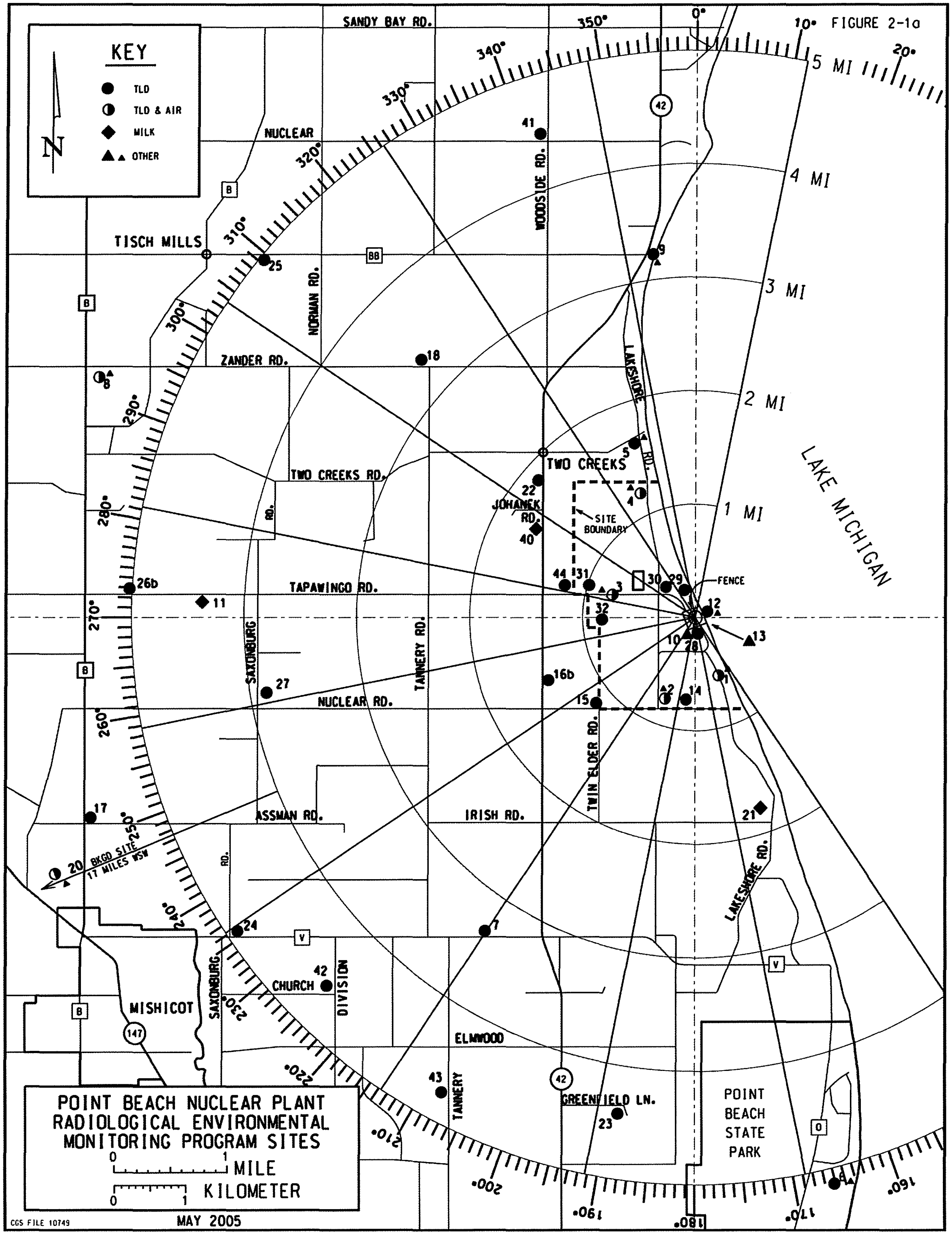


Figure 9-1
PBNP REMP Sampling Sites

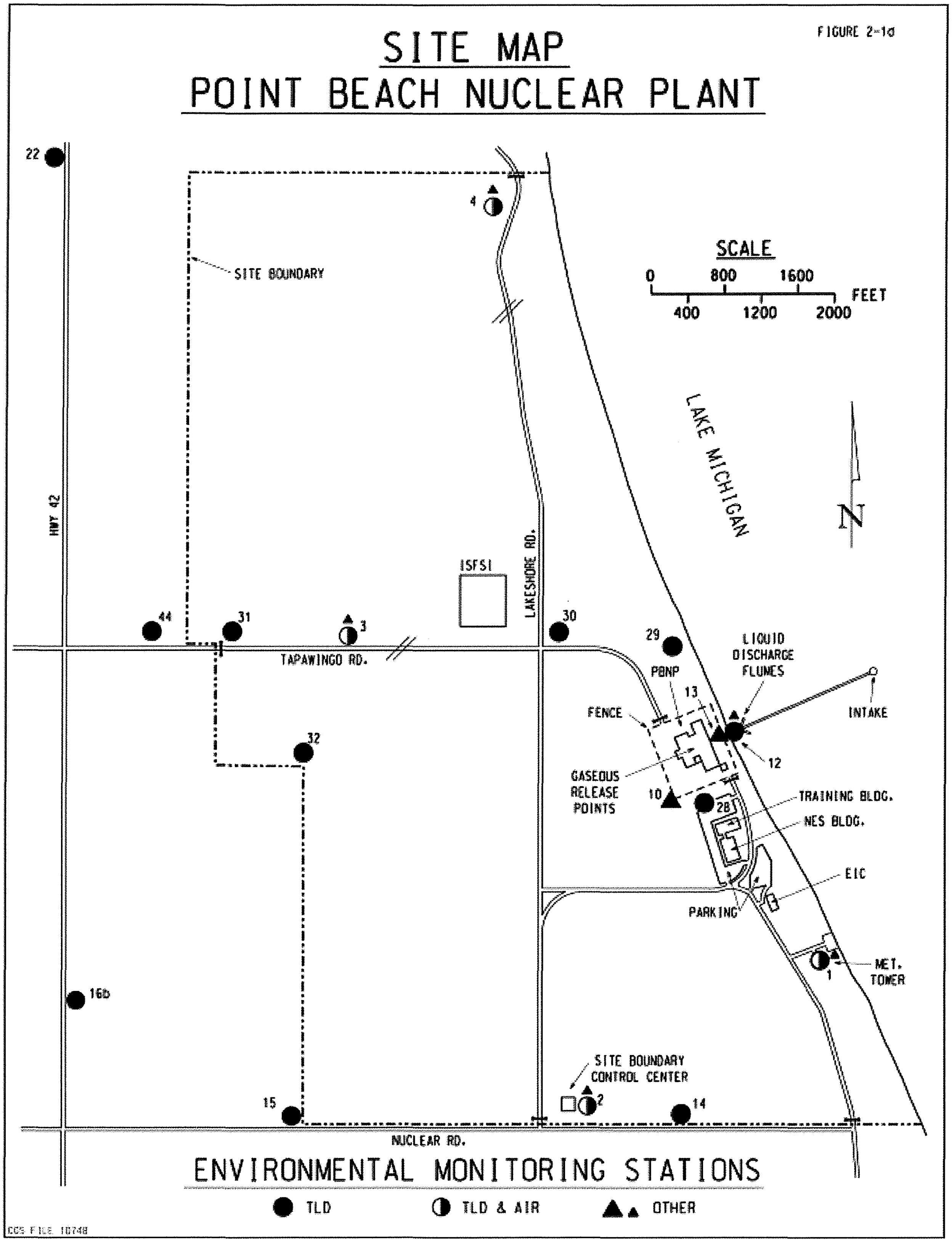


Figure 9-2
Map of REMP Sampling Sites Located Around PBNP

FIGURE 2-1C

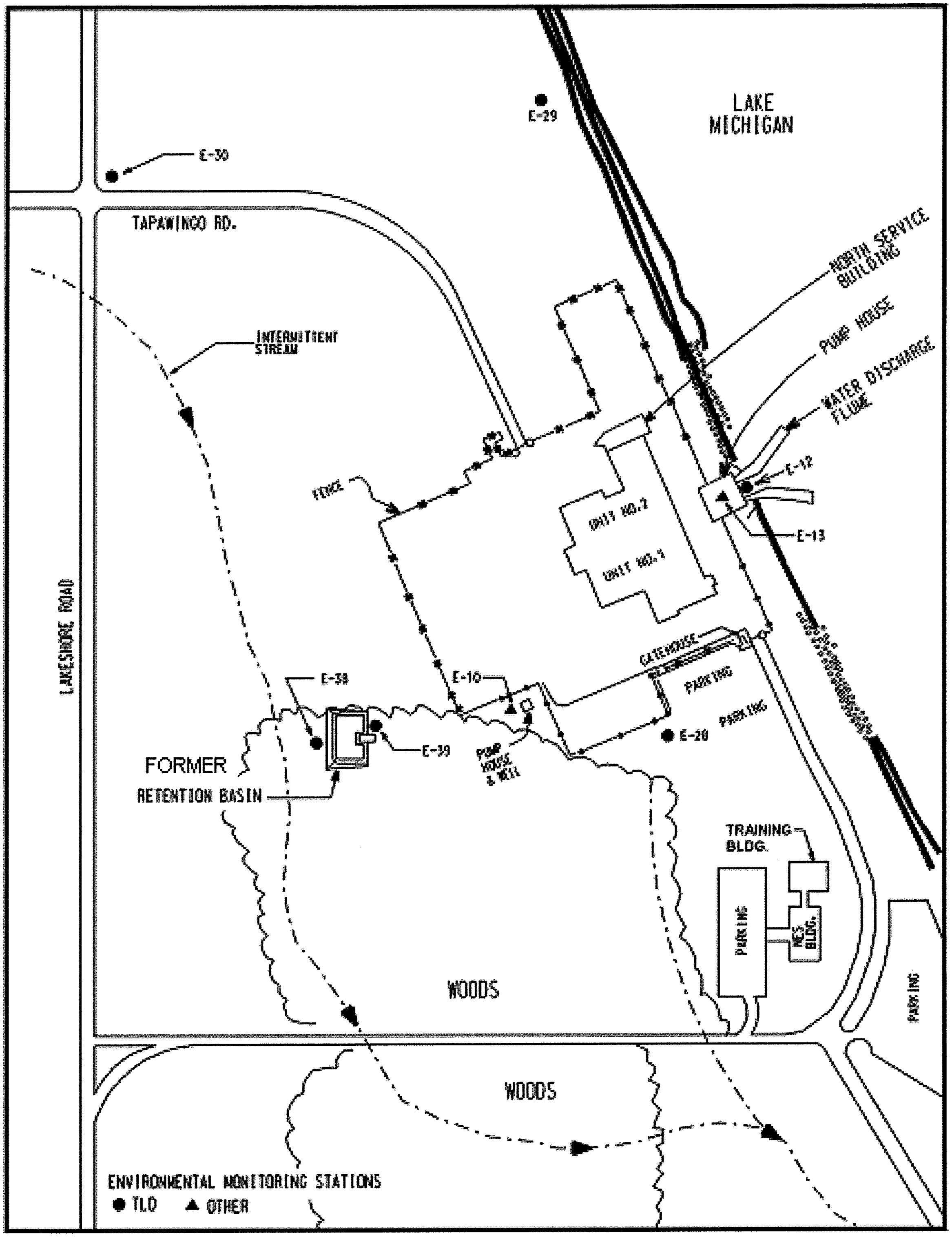


Figure 9-3
Enhanced Map Showing REMP Sampling Sites Closest to PBNP

Table 9-3
ISFSI Sampling Sites

Ambient Radiation Monitoring (TLD)	Soil, Vegetation and Airborne Monitoring
E-03	E-02
E-28	E-03
E-29	E-04
E-30	
E-31	
E-32	
E-44	

Table 9-4
Minimum Acceptable Sample Size

Sample Type	Size
Vegetation	100-1000 grams
Lake Water	8 liters
Air Filters	250 m^3 (volume of air)
Well Water	8 liters
Milk	8 liters
Fish (edible portions)	1000 grams
Soil	500-1000 grams
Shoreline Sediment	500-1000 grams

Table 9-5
Deviations from Scheduled Sampling and Frequency During 2023

Sample Type	Location	Scheduled Collection Date	Reason for not conducting REMP as required	Plans for Preventing Recurrence
AI	E-01 E-02 E-03 E-04 E-08 E-20	05-24-23	Samples were misplaced by the shipping company, arrived on 7/7/23. Unable to reach MDA.	Communicate with lab vendor to ensure samples arrive and are analyzed in timely manner
AP/AI	E-08	06-07-23	Sampler found not running due to a tripped fuse. Very low sample volume	Monitor equipment and work through maintenance work process to correct issue.
AP/AI	E-08	06-28-23	Sampler found not running due to a tripped fuse. Very low sample volume	
AP/AI	E-01	07-05-23	Sampler found not running due to a tripped fuse. Very low sample volume	Monitor equipment and work through maintenance work process to correct issue.
AP/AI	E-01	07-12-23	Sampler found not running due to a tripped fuse. Very low sample volume	
AP/AI	E-01	08-30-23	Sampler found not running due to a power outage.	Monitor equipment and work through maintenance work process to correct issue.
AP/AI	E-01	09-07-23	Sampler found not running due to a power outage.	

Table 9-6
Sample Collections for State of Wisconsin

Sample Type	Location	Frequency
Lake Water	E-01	Monthly
Fish	E-13	Quarterly, As Available
Precipitation	E-04 E-08	Twice a month, As Available
Milk	E-11 E-21	Monthly
Well Water	E-10	Twice per year

9.6 Analytical Parameters

The types of analyses and their frequencies are given in Table 9-1. The LLDs for the various analyses are found in Section 10 (Table 10-1) with the summary of the REMP results. All environmental LLDs listed in Table 12-1 of the ODCM (also in Table 10-1) were achieved during 2023.

9.7 Description of Analytical Parameters in Table 9-1

9.7.1 Gamma isotopic analysis

Gamma isotopic analysis consists of a computerized scan of the gamma ray spectrum from 80 keV to 2048 keV. Specifically included in the scan are Mn-54, Fe-59, Co-58, Co-60, Zr-95, Nb-95, Ru-103, Ru-106, I-131, Ba-La-140, Cs-134, Cs-137, Ce-141, and Ce-144. However, other detected nuclear power plant produced radionuclides also are noted. The above radionuclides detected by gamma isotopic analysis are decay corrected to the time of collection. Frequently detected, but not normally reported in the Annual Monitoring Report, are the naturally occurring radionuclides Ra-226, Bi-214, Pb-212, Tl-208, Ac-228, Be-7, and K-40.

9.7.2 Gross Beta Analysis

Gross beta analysis is a non-specific analysis that consists of measuring the total beta activity of the sample. No individual radionuclides are identifiable by this method. Gross beta analysis is a quick method of screening samples for the presence of elevated activity that may require additional, immediate analyses.

9.7.3 Water Samples

Water samples include both Lake Michigan and well water. The Lake Michigan samples are collected along the shoreline at two locations north and two locations south of PBNP. The well water is sampled from the on-site PBNP well. Gross beta measurements are made on the solids remaining after evaporation of the unfiltered sample to dryness. Gamma isotopic analyses are performed using 1-liter liquid samples. Strontium is determined by chemical separation and beta counting.

9.7.4 Air Samples

Particulate air filters are allowed to decay at least 72 hours before gross beta measurements are made in order for naturally occurring radionuclides to become a negligible part of the total activity. Gross beta measurements serve as a quick check for any unexpected activity that may require immediate investigation. Quarterly composites of the particulate air filters are analyzed for long-lived radionuclides such as Cs-134 and Cs-137. Charcoal cartridges for radioiodine are counted as soon as possible so the I-131 will undergo only minimal decay prior to analyses. The weekly charcoal cartridges are screened for I-131 by counting them all at the same time to achieve a lower LLD. If a positive result is obtained, each cartridge is counted individually.

In order to ensure that the air sampling pumps are operating satisfactorily, a gross leak check is performed weekly. The pumps are changed out annually for calibration and maintenance beyond what can be accomplished in the field.

9.7.5 Vegetation

Vegetation samples consist predominantly of green, growing plant material (grasses and weeds most likely to be eaten by cattle if they were present at the sampling site). Care is taken not to include dirt associated with roots by cutting the vegetation off above the soil line.

No special vegetation samples were obtained for C-14 analyses in 2023.

9.7.6 Environmental Radiation Exposure

The 2023 environmental radiation exposure measurements were made using TLD cards. The TLD card is a small passive detector, which integrates radiation exposure. Each TLD consists of a Teflon sheet coated with a crystalline, phosphorus material (calcium sulfate containing dysprosium) which absorbs the gamma ray energy deposited in them. Each TLD is read in four distinct areas to yield four exposure values which are averaged. Prior to the third quarter of 2001, exposure data was obtained using three lithium fluoride (LiF) TLD chips sealed in black plastic. The difference in material types can impact the amount of exposure measured. An evaluation of the response difference between the two types of TLD in 2001 demonstrated that the TLD cards produced a 14% higher response than the LiF chips (2011 AMR, Table 9-7, p. 36).

The reported field exposure is the arithmetic average of the measured exposure values at each location minus the exposure transportation control TLD (exposure received while the field TLD is in storage and transit). The gamma rays may originate from PBNP produced radionuclides or from naturally occurring radionuclides. The TLDs remain at the monitoring site for roughly three months prior to analyses and the results are reported as mrem per seven days. Because the TLDs are constantly bombarded by naturally occurring gamma radiation, even during shipment to and from PBNP, the amount of exposure during transportation is measured using transportation controls with each shipment of TLDs to and from the laboratory. The doses recorded on the transportation controls are subtracted from the monitoring TLDs in order to obtain the net *in situ* dose.

9.7.7 ISFSI Ambient Radiation Exposure

The ISFSI fence TLDs are part of the 10CFR72.44 monitoring and are not considered part of the REMP. However, their results can be used indirectly to determine whether the operation of the ISFSI is having an impact on the ambient environmental radiation beyond the site boundary. Impacts are determined by comparison of fence TLD results to the results of the monitoring at PBNP site boundary and other selected locations. These results are used as part of the 40CFR190 compliance demonstration.

10.0 RESULTS

10.1 Summary of 2023 REMP Results

Radiological environmental monitoring conducted at PBNP from January 1, 2023, through December 31, 2023, consisted of analysis of air filters, milk, lake water, well water, soil, fish, shoreline sediments, and vegetation as well as TLDs. The results are summarized, averages and high values, in Table 10-1 which contain the following information:

Sample:	Type of the sample medium
Description:	Type of measurement
N:	Number of samples analyzed
LLD:	*a priori* lower limit of detection
Average:	Average value ± the standard deviation of N samples
High:	Highest measured value ± it's associated 2 sigma counting error
Units:	Units of measurement

For certain analyses, an LLD, which is lower than that required by REMP, is used because the lower value derives from the counting time required to obtain the LLDs for radionuclides that are more difficult to detect. For these analyses, both LLDs are listed with the technical specification required REMP LLD given in parentheses. The results are discussed in the narrative portion of this report (Section 11). Blank values have not been subtracted from the results presented in Table 10-1. A listing of all the individual results obtained from the contracted analytical laboratory and the laboratory's radioanalytical quality assurance results and Interlaboratory Crosscheck Program results are presented in the Appendix.

In Table 10-1 no results are reported as less than LLD (<LLD). All results are reported to Point Beach by the contracted radioanalytical laboratory "as measured" whether positive or negative (see Section 9-1). Based on these results, a radionuclide is considered detected if it meets the criterion that the measured value minus its 2σ counting error is greater than zero ($x-2\sigma > 0$). A "ND" entry in Table 10-1 means that for this radionuclide the criterion was not satisfied for any of the measurements. If one analysis fulfilled the criterion, then all of the reported results, both positive and negative, were used in calculating the average shown in Table 10-1.

The method of determining averages based on "as measured" results follows the recommendations made in NUREG-0475 (1978), "Radiological Environmental Monitoring by NRC Licensees for Routine Operations of Nuclear Facilities Task Force Report," and in Health Physics Society Committee Report HPSR-1 (1980) "Upgrading Environmental Radiation Data" released as document EPA 520/1-80-012 and in more recent documents such as ANSI N42.23-1996, "Instrument Quality Assurance for Radioassay Laboratories;" ANSI N13.30-1996, "Performance Criteria for Radiobioassay;" DE91-013607, "Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance" and NUREG-1576, "Multi-Agency Radiological Laboratory Analytical Protocols Manual."

In addition to the required radionuclides for each medium analyzed, Table 10-1 also has an additional radionuclide listed known to originate with nuclear power plants. This radionuclide is either Co-60, Ru-103, or any other radionuclide which has the lowest LLD based on the analytical parameters needed to meet the LLDs required for radionuclides specified for the medium being analyzed. The radionuclide is identified by parentheses.

During the analyses for those radionuclides specifically required to be identified, naturally occurring radionuclides such as Ra-226, Be-7 and K-40 are detected in many samples. Their concentrations are presented in Table 10-1 for a comparison to those radionuclides for which specific analyses are required by the regulations. There are no regulatory required LLDs for naturally occurring radionuclides.

Finally, Point Beach reports the results for soil analyses. There is no regulatory requirement for soil analyses in standard RETS (NUREG-0472 and NUREG-1301). Point Beach includes soil analyses in the REMP to be able to compare current results to the historical record.

Table 10-2 contains the ISFSI fence TLD results.

Table 10-1
Summary of Radiological Environmental Monitoring Results for 2023

Sample	Description	N	LLD (a)	Average ± 1 Std. Deviation (b)	High ± 2 sigma	Units
TLD	Environmental Radiation	128	1 mrem	1.14 ± 0.21	1.64 ± 0.04	mR/7days
	Control (E-20)	4	1 mrem	1.11 ± 0.07	1.16 ± 0.09	mR/7days
Air	Gross Beta	254	0.01	0.026 ± 0.010	0.054 ± 0.005	pCi/m3
	Control (E-20) Gross beta	52	0.01	0.027 ± 0.010	0.053 ± 0.005	pCi/m3
	I-131	254	0.030 (0.07)	ND	-	pCi/m3
	Control (E-20) I-131	52	0.030 (0.07)	ND	-	pCi/m3
	Cs-134	20	0.01(0.05)	ND	-	pCi/m3
	Control (E-20) Cs-134	4	0.01(0.05)	ND	-	pCi/m3
	Cs-137	20	0.01(0.06)	ND	-	pCi/m3
	Control (E-20) Cs-137	4	0.01(0.06)	ND	-	pCi/m3
	Other γ emitters (Co-60)	20	0.1	ND	-	pCi/m3
	Control (E-20) Other (Co-60)	4	0.1	ND	-	pCi/m3
	Natural Be-7	20	-	0.065 ± 0.014	0.086 ± 0.017	pCi/m3
	Control (E-20) Natural Be-7	4	-	0.061 ± 0.016	0.072 ± 0.015	pCi/m3
Milk	Sr-89	36	5	ND	-	pCi/L
	Sr-90	36	1	0.4 ± 0.2	0.7 ± 0.3	pCi/L
	I-131	36	0.5	ND	-	pCi/L
	Cs-134	36	5 (15)	ND	-	pCi/L
	Cs-137	36	5 (18)	0.4 ± 1.3	2.6 ± 0.9	pCi/L
	Ba-La-140	36	5 (15)	ND	-	pCi/L
	Other gamma emitters(Co-60)	36	15	ND	-	pCi/L
	Natural K-40	36	-	1334 ± 67	1481 ± 73	pCi/L
Well Water	Gross beta	4	4	±	±	pCi/L
	H-3	4	500 (3000)	80 ± 99	137 ± 83	pCi/L
	Sr-89	4	5(10)	ND	-	pCi/L
	Sr-90	4	1 (2)	ND	-	pCi/L
	I-131	4	0.5 (2)	ND	-	pCi/L
	Mn-54	4	10 (15)	ND	-	pCi/L
	Fe-59	4	30	ND	-	pCi/L
	Co-58	4	10(15)	ND	-	pCi/L
	Co-60	4	10(15)	ND	-	pCi/L
	Zn-65	4	30	ND	-	pCi/L
	Zr-Nb-95	4	15	ND	-	pCi/L
	Cs-134	4	10(15)	ND	-	pCi/L
	Cs-137	4	10(18)	0.2 ± 2.2	3.1 ± 2.6	pCi/L
	Ba-La-140	4	15	ND	-	pCi/L
	Other gamma emitters(Ru-103)	4	30	ND	-	pCi/L

NS = No Sample obtained during the year

(a) When two LLD values are listed, the required LLD per the PBNP REMP is enclosed in the parentheses. Whenever possible, PBNP uses the lower value to obtain greater sensitivity.

(b) "ND" indicates that the sample result is Not Detectable, i.e., sample concentrations were statistically equal to zero or <MDA.

Table 10-1 (continued)
Summary of Radiological Environmental Monitoring Results for 2023

Sample	Description	N	LLD (a)	Average ± 1 Std. Deviation (b)	High ± 2 sigma	Units
Lake Water	Gross beta	36	4	1.2 ± 0.5	2.7 ± 0.7	pCi/L
	I-131	36	0.5 (2)	0.02 ± 0.22	1.21 ± 0.11	pCi/L
	Mn-54	36	10 (15)	0.3 ± 1.2	4.3 ± 3.1	pCi/L
	Fe-59	36	30	-0.8 ± 2.4	2.0 ± 1.3	pCi/L
	Co-58	36	10(15)	0.0 ± 1.3	2.7 ± 2.7	pCi/L
	Co-60	36	10(15)	0.3 ± 1.2	2.9 ± 2.8	pCi/L
	Zn-65	36	30	-1.9 ± 4.4	1.6 ± 1.1	pCi/L
	Zr-Nb-95	36	15	ND	-	pCi/L
	Cs-134	36	10 (15)	-0.3 ± 1.7	1.5 ± 1.3	pCi/L
	Cs-137	36	10 (18)	0.2 ± 1.0	2.5 ± 1.9	pCi/L
	Ba-La-140	36	15	ND	-	pCi/L
	Other gamma (Ru-103)	36	30	ND	-	pCi/L
	Sr-89	12	5(10)	0.05 ± 0.28	0.39 ± 0.38	pCi/L
	Sr-90	12	1 (2)	0.15 ± 0.17	0.38 ± 0.37	pCi/L
	H-3	12	200 (3000)	67 ± 83	187 ± 89	pCi/L
Fish	Mn-54	12	0.13	ND	-	pCi/g
	Fe-59	12	0.26	-0.005 ± 0.018	0.012 ± 0.011	pCi/g
	Co-58	12	0.13	ND	-	pCi/g
	Co-60	12	0.13	ND	-	pCi/g
	Zn-65	12	0.26	ND	-	pCi/g
	Cs-134	12	0.13	ND	-	pCi/g
	Cs-137	12	0.15	0.016 ± 0.007	0.030 ± 0.017	pCi/g
	Other gamma (Ru-103)	12	0.5	0.001 ± 0.023	0.058 ± 0.012	pCi/g
	Natural K-40	12	-	2.46 ± 0.47	3.20 ± 0.41	pCi/g
Shoreline Sediment	Cs-134	3	0.18	ND	-	pCi/g
	Cs-137	3	0.15	0.016 ± 0.007	0.020 ± 0.009	pCi/g
	Natural Be-7	3	-	0.052 ± 0.042	0.101 ± 0.038	pCi/g
	Natural K-40	3	-	6.21 ± 0.83	7.042 ± 0.295	pCi/g
	Natural Ra-226	3	-	0.36 ± 0.03	0.394 ± 0.15	pCi/g
Soil	Cs-134	6	0.15	ND	-	pCi/g
	Cs-137	6	0.15	0.20 ± 0.12	0.422 ± 0.04	pCi/g
	Natural Be-7	6	-	0.115 ± 0.18	0.457 ± 0.26	pCi/g
	Natural K-40	6	-	16.57 ± 2.93	20.60 ± 0.84	pCi/g
	Natural Ra-226	6	-	1.16 ± 0.42	1.658 ± 0.35	pCi/g
Vegetation	I-131	12	0.06	-0.002 ± 0.009	0.018 ± 0.011	pCi/g
	Cs-134	12	0.06	ND	-	pCi/g
	Cs-137	12	0.08	0.011 ± 0.018	0.063 ± 0.007	pCi/g
	Other gamma emitters (Co-60)	12	0.25	0.002 ± 0.005	0.006 ± 0.003	pCi/g
	Natural Be-7	12	-	0.80 ± 0.76	2.13 ± 0.33	pCi/g
	Natural K-40	12	-	5.26 ± 1.29	6.65 ± 0.42	pCi/g

(a) When two LLD values are listed, the required LLD per the PBNP REMP is enclosed in the parentheses. Whenever possible, PBNP uses the lower value to obtain greater sensitivity.
(b) "ND" indicates that the sample result is Not Detectable, i.e., sample concentrations were statistically equal to zero or <MDA.

Table 10-2
Average ISFSI Fence TLD Results for 2023

Fence Location	Average	±	Standard Deviation	Units
North	2.13	±	0.25	mR/7 days
East	3.34	±	0.18	mR/7 days
South	2.62	±	0,06	mR/7 days
West	6.49	±	0.21	mR/7 days

11.0 DISCUSSION

11.1 TLD Cards

The ambient radiation was measured in the general area of the site boundary, at an outer ring 4 to 5 miles from the plant, at special interest areas, and at one control location, roughly 17 miles southwest of the plant. The average indicator TLD is 1.14 ± 0.19 mR/7-days compared to 1.11 ± 0.07 mR/7-days at the background location. These two values are not significantly different from each other. Neither of the indicator TLD values are significantly different from those observed from 2001 through 2022 for the same type of TLD (tabulated below in Table 11-1). Prior to third quarter of 2001 TLD LiF chips were used versus the current TLD cards, see Section 9.7.6 for additional information. The response difference between the two types of TLDs is evident in Table 11-1. Prior to 2001 all of the annual averages are <1 mrem/7-days. Beginning in 2001, all are >1 mrem/7-days.

Table 11-1
Average Indicator TLD Results from 1993 – 2023

Year	Average mR/7-days	±	St. Dev*
1993	0.82	±	0.15
1994	0.90	±	0.12
1995	0.87	±	0.13
1996	0.85	±	0.12
1997	0.87	±	0.11
1998	0.79	±	0.13
1999	0.79	±	0.21
2000	0.91	±	0.15
2001	1.06	±	0.19
2002	1.17	±	0.21
2003	1.10	±	0.20
2004	1.10	±	0.22
2005	1.04	±	0.21
2006	1.14	±	0.21
2007	1.08	±	0.20
2008	1.05	±	0.17
2009	1.08	±	0.17
2010	1.11	±	0.15
2011	1.14	±	0.25
2012	1.17	±	0.17
2013	1.14	±	0.20
2014	1.07	±	0.19
2015	1.18	±	0.20
2016	1.19	±	0.21
2017	1.11	±	0.17
2018	1.11	±	0.17
2019	1.10	±	0.20
2020	1.16	±	0.20
2021	1.21	±	0.22
2022	1.23	±	0.21
2023	1.14	±	0.21

*St. Dev = Standard Deviation

Table 11-2
Average ISFSI Fence TLD Results (mR/7 days)

TLD FENCE LOCATION				
YEAR	North	East	South	West
1995	1.29	1.28	1.10	1.26
1996	2.12	1.39	1.10	1.68
1997	2.05	1.28	1.00	1.66
1998	2.08	1.37	1.02	1.86
1999	2.57	1.84	1.11	3.26
2000	2.72	2.28	1.25	5.05
2001	2.78	2.54	1.36	6.08
2002	2.79	2.74	1.42	6.46
2003	2.70	2.60	1.50	6.88
2004	2.61	2.12	1.41	6.50
2005	2.54	2.05	1.44	5.63
2006	2.73	2.35	1.38	5.80
2007	2.72	2.73	1.34	5.47
2008	2.64	2.37	1.36	5.36
2009	2.36	2.35	1.20	4.63
2010	2.64	3.02	1.41	5.05
2011	2.44	2.62	1.31	4.75
2012	2.59	3.27	1.40	4.92
2013	2.57	3.66	1.15	4.28
2014	2.45	3.35	1.14	4.24
2015	2.31	3.24	1.17	4.36
2016	2.30	3.34	1.33	4.35
2017	2.21	3.84	1.30	4.25
2018	2.24	4.21	1.49	4.32
2019	2.20	4.18	1.57	4.08
2020	2.46	4.19	1.71	4.2
2021	2.33	3.97	2.27	5.89
2022	2.33	3.95	3.07	7.43
2023	2.13	3.34	2.62	6.49

There is no significant change in the exposure in the TLD monitoring locations around the ISFSI (Table 11-3). The results at E-03 and E-31 (W of the ISFSI) and E-32 (SW of the ISFSI) are similar to previous years (1.31, 1.27, and 1.40 respectively) and continue to be higher than E-30 (1.04) on the east side and closest to the ISFSI. E-03, about equidistant between the ISFSI and the site boundary location E-31, continues to be slightly higher than the site boundary location, but the difference is not statistically different. (See Figs. 9-1 and 9-2 for locations).

Although the mR/7-day results for the three TLD locations nearest the site boundary

(E-03 1.31 ± 0.021; E-31, 1.27± 0.28; E-32, 1.40 ± 0.32) are higher than at the background site E-20 (1.11 ± 0.15), they are comparable at the 95% confidence level, indicating a small, but not significant, increase in ambient gamma radiation at the site boundary due to the operation of the ISFSI. In 2018, a TLD monitoring location was added at location E-44 TLD, directly west of E-03 and E-31, but prior to the nearest resident. The average reading at E-44 (1.22 ± 0.24) is similar to the observed readings at E-03, E-31, and background location E-20 (1.31, 1.27, and 1.11 respectively).

Further data supporting this conclusion is the comparison of the TLD results at selected locations around the ISFSI before and after the storage of spent fuel at the ISFSI (Figure 11-1). As stated in Section 9.7.6, the TLD values increased by about 14% in the second half of 2001 when the TLD monitoring devices were changed from LiF chips in the first half of 2001 to calcium sulfate impregnated TLD cards. After that initial change, the measured radiation exposure, as measured by the TLD cards, has remained fairly constant with a slight increase with the addition of stored fuel at the ISFSI. Each year the variations in the TLD results appear to move in concert with each other and with the background site, E-20, which is 17 miles south west of the ISFSI.

Comparing the ISFSI TLD results to results from surrounding REMP indicator and background TLDs reveals minimal impact of the ISFSI on the surrounding radiation levels (Figure 11-2). All ISFSI TLD levels slightly decreased in 2023. As reported last year, an increase in the 2022 West ISFSI TLD was expected based on the placement of the new casks on the ISFSI pad in 2021. As previously discussed, the small increase in 2001 is more related to the switch from the LiF chips to the calcium sulfate impregnated Teflon TLD cards as evidenced by the synchronicity with E-20, the background site.

LiF TLD chips were replaced with calcium sulfate impregnated Teflon TLD cards in the third quarter of 2001 resulting in a higher measured background values.

Figure 11-1 ISFSI AREA TLD RESULTS

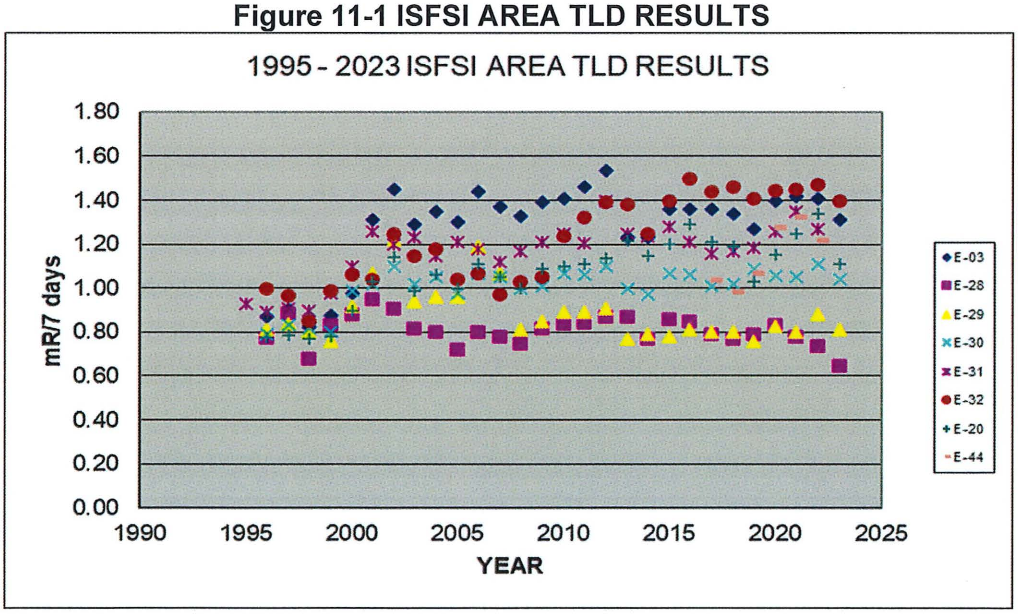
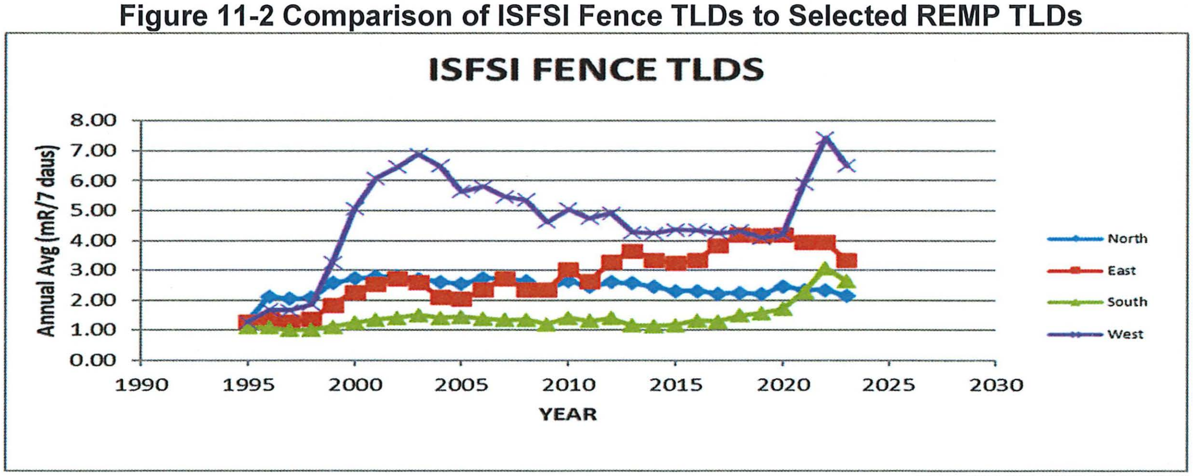


Table 11-3
Average TLD Results Surrounding the ISFSI (mR/7 days)

	Sampling Site							
	E-03	E-28	E-29	E-30	E-31**	E-32**	E-44****	E-20***
Pre-Operation*	0.93	0.87	0.87	0.81	0.93	0.98		0.88
1996	0.87	0.78	0.81	0.79	0.93	1.00		0.78
1997	0.91	0.89	0.84	0.84	0.89	0.97		0.79
1998	0.82	0.68	0.80	0.82	0.91	0.85		0.77
1999	0.88	0.83	0.76	0.80	0.90	0.99		0.78
2000	0.98	0.88	0.92	0.99	0.98	1.06		0.90
2001	1.31	0.95	1.07	1.02	1.10	1.04		1.03
2002	1.45	0.91	1.22	1.10	1.26	1.25		1.14
2003	1.29	0.82	0.94	1.02	1.20	1.15		0.99
2004	1.35	0.80	0.96	1.05	1.23	1.18		1.06
2005	1.30	0.72	0.96	0.98	1.15	1.04		1.00
2006	1.44	0.80	1.19	1.07	1.21	1.07		1.11
2007	1.37	0.78	1.07	1.05	1.18	0.97		1.05
2008	1.33	0.75	0.81	1.00	1.12	1.03		1.00
2009	1.39	0.82	0.85	1.01	1.17	1.05		1.09
2010	1.41	0.84	0.89	1.07	1.21	1.24		1.10
2011	1.46	0.85	0.90	1.06	1.25	1.32		1.11
2012	1.54	0.87	0.91	1.10	1.21	1.39		1.14
2013	1.23	0.87	0.77	1.00	1.40	1.38		1.22
2014	1.23	0.77	0.79	0.97	1.25	1.25		1.15
2015	1.36	0.86	0.78	1.07	1.24	1.40		1.20
2016	1.36	0.85	0.81	1.06	1.28	1.50		1.29
2017	1.36	0.79	0.80	1.01	1.21	1.44		1.21
2018	1.34	0.77	0.80	1.02	1.16	1.46	1.04	1.19
2019	1.27	0.79	0.76	1.09	1.17	1.41	0.99	1.03
2020	1.40	0.84	0.83	1.06	1.18	1.45	1.07	1.15
2021	1.42	0.78	0.80	1.05	1.26	1.45	1.28	1.25
2022	1.41	0.74	0.88	1.11	1.35	1.47	1.33	1.34
2023	1.31	0.65	0.81	1.04	1.27	1.40	1.22	1.11

*Pre-Operational data are the averages of the years 1992 through 3rd quarter of 1995.
**Sites E-31 and E-32 are located at the Site Boundary to the West and South-West of the ISFSI.
***E-20 is located approximately 17 miles WSW of the ISFSI.
****E-44 Added in 2018

Figure 11-2 Comparison of ISFSI Fence TLDs to Selected REMP TLDs



11.2 Milk

Naturally occurring K-40 (1334 ± 67 pCi/L) continues to be the most prevalent radionuclide measured in milk at concentrations roughly 3330 times higher than the only potential plant related radionuclide, Sr-90 (0.4 ± 0.2 pCi/L), detected in milk. The annual average Sr-90 concentrations in milk continue to be similar to previous years. Co-60 revealed four low positive results with all being <MDA. No positive results for I-131, Cs-134, Ba-La-140, or Sr-89 were obtained in 2023.

There was a total of six low positive Cs-137 results obtained in 2023. Five were below the MDC limit and therefore may be false positives. One sample showed slightly higher than the lab MDA (2.6 ± 0.9, MDA 2.3). In the last five years, Cs-137 was discharged from PBNP airborne effluents only in March 2016 and October 2017. In 2023, one release contained Cs-137 and occurred in November. This was after the samples had been collected and would not have accounted for the results.

The 2023 average Sr-90 concentrations have not changed much over the last few years (Figure 11-3). Over the past twenty-one years, the average has decreased from 1.2 ± 0.5 pCi/L in 1997 to 0.4 ± 0.2 pCi/L in 2023. The graph of the annual averages displays a logarithmic decrease over time (Figure 11-3).

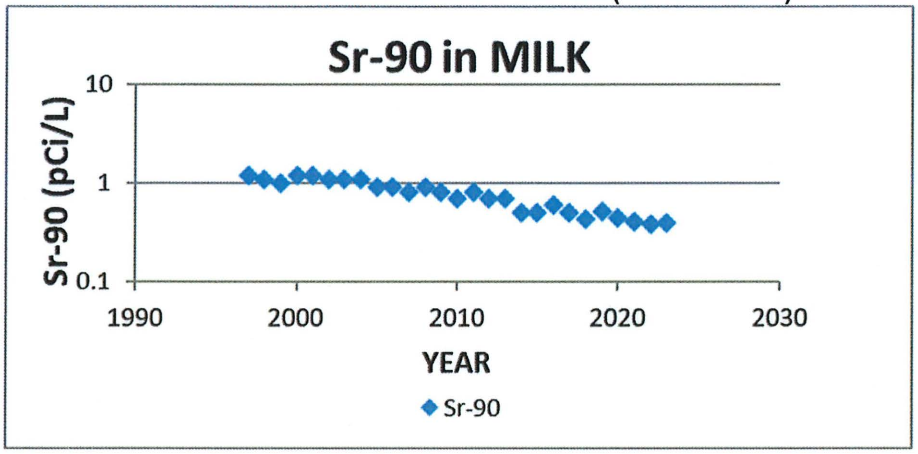
The annual averages are from the monthly Sr-90 measurements from three different dairies (Figure 9-1). The only dairy that has been in the monitoring program over the entire 1997 – 2023 timespan under consideration is located at site E-21. It is located south of the plant. The other two, E-40 and E-11, are replacements for dairies which had dropped out of the program at various times during this time interval. The replacements were chosen to maintain, to the extent possible, the former sampling sites west and north of Point Beach.

Point Beach discharged no airborne Sr-90 in 2023. Since 1997, PBNP has discharged airborne Sr-90 only in 3 years: 1999, 2.4E-08 Ci; 2004, 3.2E-08 Ci; and 2011, 1.6 E-08 Ci. It is interesting to note that nine of highest Sr-90 results occur at E-11 located about 4.4 miles west of PBNP (Fig. 9-1). If the observed Sr-90 activity were from Point Beach the highest Sr-90 concentrations would occur at E-21, the dairy south of the site boundary in the highest X/Q and D/Q meteorological sector. This dairy grows feed corn on site and in a field across the road from the site boundary in the highest D/Q sectors. Feed crops are the dominant source of food for dairy cattle. No cattle have been seen grazing near the site boundary for many years.

The major Sr-90 input to the environment is from fallout from atmospheric weapons testing during the early 1960s with minor inputs during the 50's, 70's and later contributions from the Chernobyl accident in the late 1980s and from Fukushima in 2011. The Sr-90 in milk persists due to its 28.6 year half-life and to cycling in the biosphere. With little or no atmospheric input to the environment, the mode of entry into cattle feed must be root uptake by forage crops and transfer into the milk. Over the time period of this graph (1997 – 2023), these low discharges do not appear to impact the decreasing concentrations as they continue to decrease over time.

It is concluded that the milk data for 2023 show no radiological effects of the plant operation.

Figure 11-3
Sr-90 Concentration in Milk (1997 – 2023)



11.3 Air

The average annual gross beta concentrations (plus/minus the 2σ uncertainty) in weekly airborne particulates at the indicator and control locations were 0.026 ± 0.021 pCi/m^3 and 0.027 ± 0.019 pCi/m^3, respectively, and are similar to levels observed from 1993 through 2022 (Figure 11-4).

The 2023 weekly gross beta concentrations reveal higher winter values and lower summer values (Figure 11-5). This is a repeat of the patterns seen in 2006 - 2022. The slight September-October peak is similar to what was observed in 2015 (Figure 11-6). The August-October peak is observed throughout the US and believed to result from weather patterns impacting with naturally occurring airborne radionuclides. This would explain why the control and indicators are moving in concert. Therefore, a plant effect can be ruled out.

Figure 11-4 Annual Average Air Gross β (1993 – 2023)

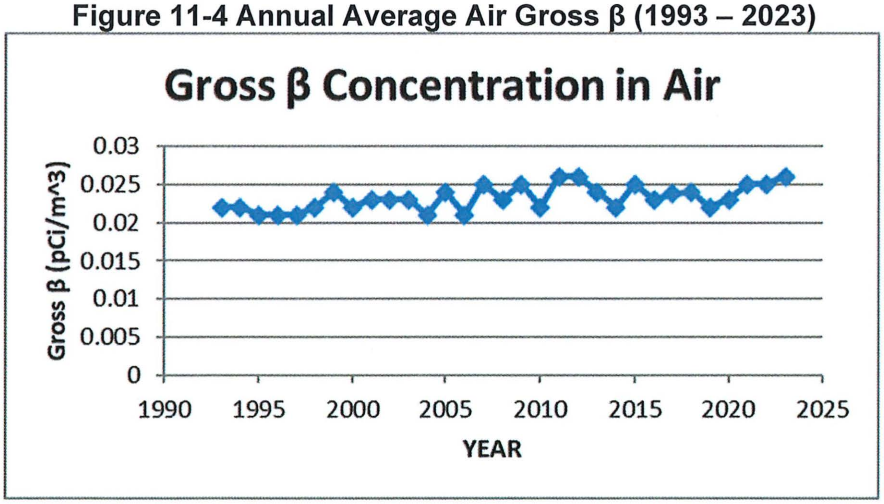


Figure 11-5 2023 Airborne Gross Beta

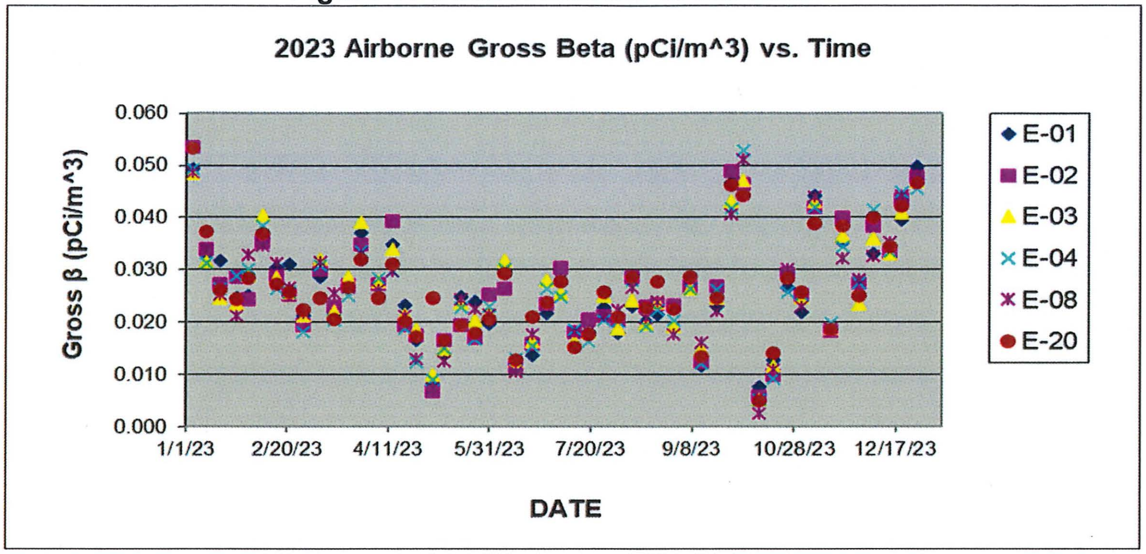
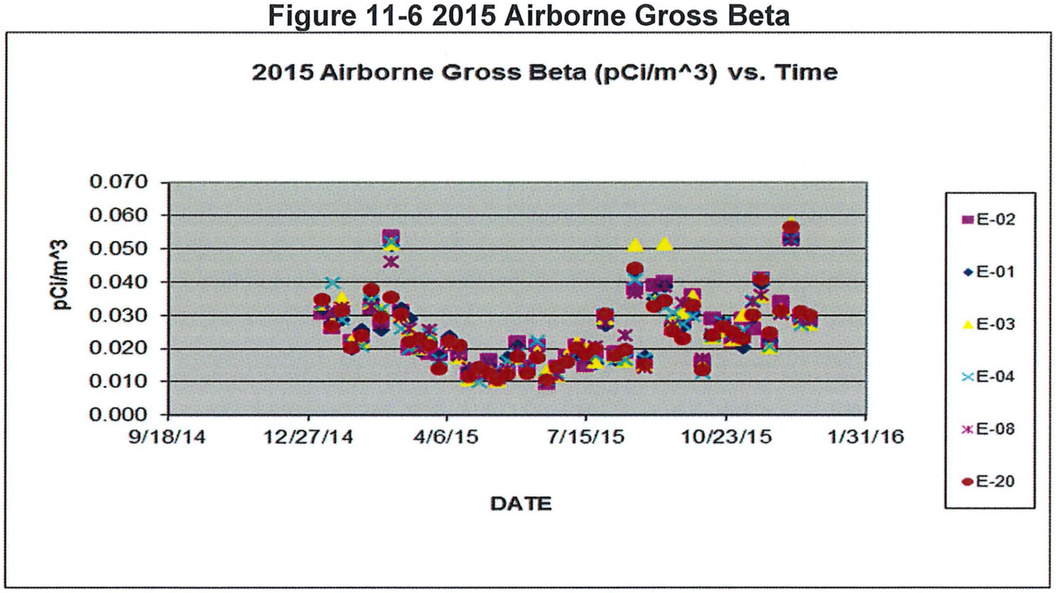


Figure 11-6 2015 Airborne Gross Beta



No I-131 was detected during 2023. In 2005, the new method of evaluating airborne I-131 was instituted. Instead of counting each charcoal cartridge separately, all six cartridges for the week are counted as one sample in a predetermined geometry to screen the samples for I-131. If any airborne radioiodine is detected, each sample cartridge is counted individually. With no detectable I-131, the reported analytical result is the minimum detectable activity (MDA) conservatively calculated using the smallest of the six sample volumes. The reported MDAs ranged from 0.006 to 0.027 pCi/m^3. Because the analysis LLD is based on counting only one cartridge, the use of six cartridges or roughly six times the sample volume with the same count time as would be needed to achieve the desired LLD for only one sample, the actual LLD is about six times lower than the programmatic value given in Table 10-1. Similarly, the actual MDA is about one-sixth of that reported, in the range of 0.001 to 0.004 pCi/m^3.

At each sampling location, the particulate filters are composited quarterly and analyzed for Cs-134, Cs-137 and any other (Co-60) detectable gamma emitters. As summarized in Table 10-1. There was one sample at E-03 in the 3rd quarter that had a positive result, 0.0005 + 0.0004 with an MDC of 0.0003 pCi/m^3.

By contrast, naturally occurring Beryllium-7 was found in all of the quarterly composites at concentrations ranging from 0.038 to 0.086 pCi/m^3. Be-7 ($T_{1/2}$ = 53.3 days) is produced in the atmosphere by the interaction of cosmic rays with oxygen and nitrogen nuclei. Its half-life is long enough to allow for it to be detected in the quarterly composited filters.

In summary, the 2023 air gamma data from quarterly composites do not indicate a measurable environmental impact from the operation of PBNP.

11.4 Lake Water

For the REMP-specified gamma emitting radionuclides listed in Table 10-1, the reported concentrations continue to occur as small, negative and positive values scattered around zero, indicating no radiological impact from the operation of PBNP. Only 10 of the results were positive, of which, three are from north of the plant, at site E-05 (see Figure 9-1). May samples at E-05 and E-06 were unable to achieve the LLD (15 pCi/L) due to a vendor error. The laboratory inadvertently placed the samples into storage without ever counting them. When the mistake was discovered, the lab counted the samples, but were unable to attain the LLD.

One of the ten positive results was greater than the minimum detectable concentration (MDC) in April at E-06 (I-131, 1.21 ± 0.11 pCi/L, MDC = 0.11 pCi/L). I-131 was not discharged in any of PBNP's liquid discharges in 2023.

The other few indications of positive concentrations were found for Mn-54, Co-58, Fe-59, Co-60, Zn-65, Cs-134 and Cs-137, but were all found to be less than the MDC. Cs-134 was not identified in the PBNP effluent this year and is therefore determined to be false positive.

Aliquots of the monthly samples are composited quarterly and analyzed for Sr-89/90 and for tritium. Small amounts of Sr-90 were detected in two of the twelve quarterly composites. One site located south of the plant, and one in a sample from north of the plant. Both results were below the statistically calculated MDC. No Sr-90 was discharged in 2023 or in 2012 – 2015 and 2017-2022. A small amount was discharged in March of 2016. Sr-90 has a 28.6 year half-life and, like Cs-137, it is a remnant of atmospheric weapons testing in the '50s and '60s. Therefore, positive Sr-90 concentrations could be indicative of fallout being recycled in Lake Michigan. However, because the concentrations are below their MDCs, they most likely are false positives and therefore unlikely to be the result of past PBNP discharges.

Tritium, in addition to being produced by water-cooled reactors such as PBNP, also is a naturally occurring radionuclide. It also was produced by atmospheric weapons testing. However, due to its mobility, any tritium now found in Lake Michigan at the concentrations typically found in monitoring programs cannot be from that time period. It is the result of power plant discharges. Point Beach discharges on the order of 600 - 1000 Ci of tritium per year.

Twelve quarterly lake water composites were generated from the monthly samples. Out of the twelve quarterly composites, six had positive tritium indications, and of those, two were greater than the MDC (1st quarter E-01; 181±89, MDC = 164, and 1st quarter E-05; 187+89, MDC=164) All results are in pCi/L.

In conclusion, the observed tritium concentrations were well below the limit set forth by the EPA for drinking water standards (20,000 pCi/L). As well, based on the results of the gamma scans of Lake Michigan water, there is no measurable impact on the lake from PBNP discharges.

11.5 Fish

Twelve (12) fish were analyzed in 2023 with nine exhibiting detectable amounts of plant related activity. Of these, seven were positive for Cs-137 with two Cs-137 results >MDC. The positive Cs-137 concentrations ranged from 0.012 ± 0.005 to 0.030 ± 0.017 pCi/g. Cs-137 was released in low levels during the first and second quarters. It is likely that the Cs-137 observed is the recycling of Cs-137 that entered Lake Michigan as fallout from atmospheric weapons testing in the '50s and '60s with lesser amounts from events at Chernobyl and Fukushima.

Positive results below their MDCs were found also for Fe-59 and Ru-103. All three positive hits were below the MDC. Fe-59 was discharged in the 2nd and 4th quarters during 2023. Ru-103 was not in any effluent release in 2023.

The highest radionuclide concentration in fish is naturally occurring K-40 with an average concentration of 3.20 ± 0.41\pCi/g.

Based on these results, it is concluded that there is little impact of PBNP discharges on Lake Michigan fish.

11.6 Well Water

All tritium results were less than the MDC for the 2023 well samples. One nuclide, Cs-137, was detected in the 1st quarter 2023 sample. The result was 3.1 ± 2.6 pCi/L and was less than the MDC of 6.6. There is no pathway for liquid effluents to have interaction with the aquifer that supplies the drinking well. The result was determined to be a false positive, based on no available pathway and no other nuclides being identified in that sample or any others throughout 2023. Therefore, there is no evidence of PBNP effluents getting into the aquifer supplying drinking water to PBNP.

11.7 Soil

Cs-137 is present in the soils throughout North America and the world resulting from the atmospheric nuclear weapons testing in the 1950s, 1960s, and 1970s and from the 1986 Chernobyl accident, and more recently, from the Fukushima event. Soil is an integrating sample media, in that it is a better indicator of long term buildup of Cs-137 as opposed to current deposition for local sources. In addition to erosion and radioactive decay, human activities can modify the soil Cs-137 concentrations.

In 2023, Cs-137 was detected in all six of the soil samples obtained in September. The concentrations ranged from 0.077 ± 0.03 to 0.422 ± 0.04 pCi/g and all were >MDC. The highest value for Cs-137 was found at E-02. There was one U2 containment forced vent airborne release from November 3 through November 6, 2023 which contained Cs-137. Activity from the release measured 1.36E-04 µCi at a concentration of 4.78E-08 pCi/cc. This release would have been after the soil samples were collected and would not have accounted for these soil results.

The values of Cs-137 observed are consistent with years past, therefore it seems unlikely that the observed soil Cs-137 is attributable to PBNP effluent. The most likely source is recycling of fallout from atmospheric weapons testing in the 50s and 60 as well as the Chernobyl and Fukushima events and subsequently being bound to the soil.

By comparison to naturally occurring radionuclides, Cs-137 continues to be present in soil samples at well below the levels of naturally occurring Be-7, K-40, and Ra-226 (see Table 10-1).

11.8 Shoreline Sediment

Shoreline sediment consists of sand and other sediments washed up on the Lake Michigan shore. As in soil samples, the only non-naturally occurring radionuclide found in these samples is Cs-137. All three samples obtained had Cs-137 concentrations statistically different from zero with one sample below the MDC, and two above. All three were well below the LLD of 0.15.

Shoreline sediment Cs-137 concentrations continue to be about one-tenth of that found in soils (Table 10-1). This is expected because Cs-137 in the geological media is bound to fine particles, such as clay, as opposed to the sand found on the beach. Lake Michigan sediments are a known reservoir of fallout Cs-137. Wave action suspends lake sediments depositing them on the beach. The fine particles deposited on the beach eventually are sorted from the beach leaving the heavier sand; hence the lower Cs-137 concentrations in beach samples. In contrast to Cs-137, K-40, which is actually part of the minerals making up the clay and sand, is at a concentration about several hundred times higher than the Cs-137 that is attached to particle surfaces. Therefore, it is not surprising that Cs-137 is present at concentrations 1% or less of the naturally occurring concentrations of K-40.

The most likely source of the observed Cs-137 is the cycling of fallout from atmospheric weapons tests and events such as Chernobyl and Fukushiima in the Lake Michigan environment and not current PBNP discharges. As with soil, the naturally occurring radionuclides such as K-40, and Ra-226 are found in the shoreline sediment samples. Therefore, the shoreline sediment data indicate no radiological effects from current plant operation.

11.9 Vegetation

The REMP collects general vegetation, non-cultivated plants which would be consumed by grazing cattle.

The naturally occurring radionuclides Be-7 and K-40 were found in all of the general vegetation samples (Table 10-1). The source of Be-7 is atmospheric deposition. It is continuously formed in the atmosphere by cosmic ray spallation of oxygen, carbon, and nitrogen atoms. Spallation is a process whereby a cosmic ray breaks up the target atom's nucleus producing a radionuclide of lower mass. Be-7 in the vegetation samples had an average of 0.80 ± 0.76 pCi/g. In general vegetation Be-7 concentrations were higher in the fall than in the spring and ranged from 0.08 ± 0.12 to 2.13 ± 0.33 pCi/g. The average Be-7 concentrations in the vegetation increased from May (0.17 ± 0.10 pCi/g) to September (1.43± 0.56). In contrast, K-40 is a primordial radionuclide which is incorporated into vegetation from the soil during the growing process. By not being dependent upon seasonal atmospheric variations and plant surface to capture deposition, the vegetation K-40 concentrations from root uptake are more uniform with a range of 2.66 ± 0.12 to 6.65 ± 0.42.

Cs-137 can be present in vegetation via both pathways. Fresh Cs-137 fallout is associated, like Be-7, with deposition on the plant surface. Old fallout from the ‘50s and ‘60s is now being incorporated into growing plants in the same manner as potassium because it is in the same chemical family as potassium. This fallout Cs-137 has been found in firewood ash at many locations in the United States that are far from any nuclear plants (S. Farber, "Cesium-137 in Wood Ash, Results of a Nationwide Survey," 5th Ann. Nat. Biofuels Conf., 10/21/1992).

In 2023, three of the twelve vegetation samples had a positive indication for Cs-137. These occurrences were attributed to the above described mechanism. The only 2016 airborne Cs-137 discharged by PBNP occurred in March when there was no fresh vegetation. In 2017 the airborne Cs-137 release occurred in October after the vegetation and crops were collected. From 2018-2022 there was no airborne Cs-137 released in plant effluents. 2023 had one Cs-137 that occurred in November. This was after the samples had been collected and would not have accounted for the results. Therefore, the Cs-137 has to be the result of uptake via roots. Therefore, it is unlikely that the Cs-137 results indicate an impact from PBNP releases.

There was no positive sample results for Cs-134 in vegetation samples. One positive Co-60 at E-06 was detected in the 2023 vegetation samples. One positive I-131 result was detected in the vegetation samples at E-04. All identified isotopes were less than the MDC.

Based on the 2023 vegetation sampling results, it is concluded that there is little or no effect from PBNP effluents.

11.10 Land Use Census (LUC)

In accordance with the requirements of Section 12.2.5 of the ODCM, a visual verification of animals grazing in the vicinity of the PBNP site boundary was completed in 2023. In 2020, changes to the land use surrounding the site due to the installation of solar panels at and around the site boundary were noted. These changes ensure that the use of pasturelands or grazing herds remain conservative, as there is less land near the site boundary for grazing animals and pasture use. Based on this the existing milk-sampling program continues to be acceptable. The nearest dairy (E-21) lies in the SSE sector and it is one of the Point Beach REMP milk sampling sites. Also, the highest χ/Q (1.09E-06) and D/Q (6.23E-09) values occur in these sectors. As demonstrated from the vegetation in the area, there is no measureable plant impact on the environment. Therefore, dose calculations to the maximum exposed hypothetical individual, assumed to reside at the site boundary in the S sector, continues to be conservative for the purpose of calculating doses via the grass-cow-milk and the other ingestion pathways.

The 2023 LUC revealed that one garden location within a 5-mile radius of the site in the N sector required replacement. This garden location was not previously identified in 2020 either. The 2023 LUC also revealed a milking animals location within a 5-mile radius of the site in the NNW sector required replacement. Again, this location was identified in 2020. Two new garden locations were identified in the 2023 LUC for the WNW and W sectors. None of the changes identified in the 2023 LUC necessitate changes to the current REMP, such as the addition of new sampling locations.

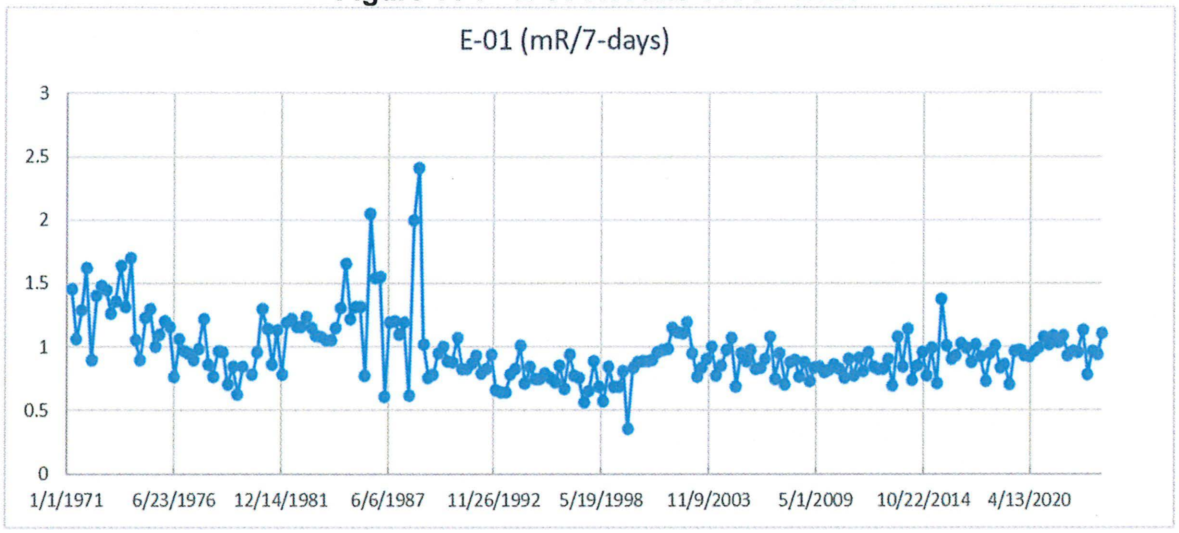
11.11 Long Term TLD Trending

To put the 2023 REMP TLD results in perspective, it is instructive to look at long term trends. The following examines the TLD results from 1971 to 2023. The ANSI standard (ANSI/HPS N13.37-2014 "Environmental Dosimetry) states that the data from early vintage dosimetry systems (c. 1970 – 1990) should not be considered comparable to current dosimetry systems in establishing a baseline for environmental TLD results. These problems are evident from the review of our early data as discussed below.

The pre-operational data, 1968 – 1970, are not included. The pre-operational ambient radiation monitoring sites were E-01 (the met tower area) through E-04 (the north boundary). They were monitored using TLDs and ionization chambers. E-04 was used as a background location until E-08 (see Figure 9-1) was added for the operational REMP in 1971. Prior to 1975, a control TLD stored in a lead pig was used for a comparison to those placed in the field. In the pre-operational data, the control TLD could be equal to or higher than the field results and both the field and control TLD results appear erratic compared to the ion-chamber results. Also, the reported TLD results do not have transportation exposures from New Mexico to Wisconsin subtracted. Therefore, only the TLD results beginning in 1971, with the transportation caveat, are used in this analysis of long-term trends.

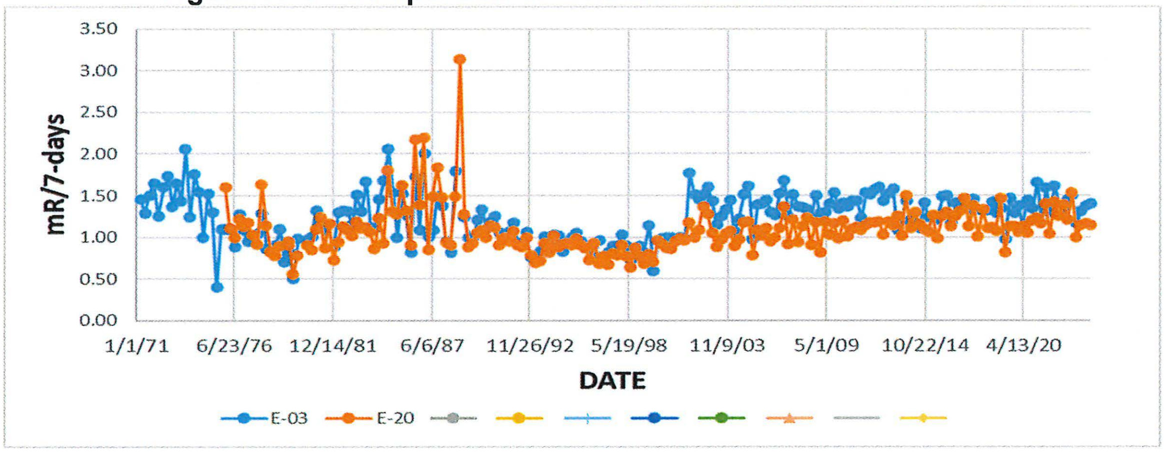
The trend at E-01(Figure 11-7) shows slowly decreasing *trend* from 1971 to 1979. This may be an artifact. The cause is not known. As previously mentioned, no transportation controls were used until the 4th quarter of 1975, so no transport dose corrections were made prior to that quarter. There is a small increase in 1980 when the current contracted REMP lab began. A slowly decreasing exposure rate occurs from 1980 – 1992 except for the 1984 - 1988 time segments. The erratic results from 1984 – 1988 were traced to a faulty connection in the TLD reader.

Figure 11-7 E-01 Results 1971 – 2023



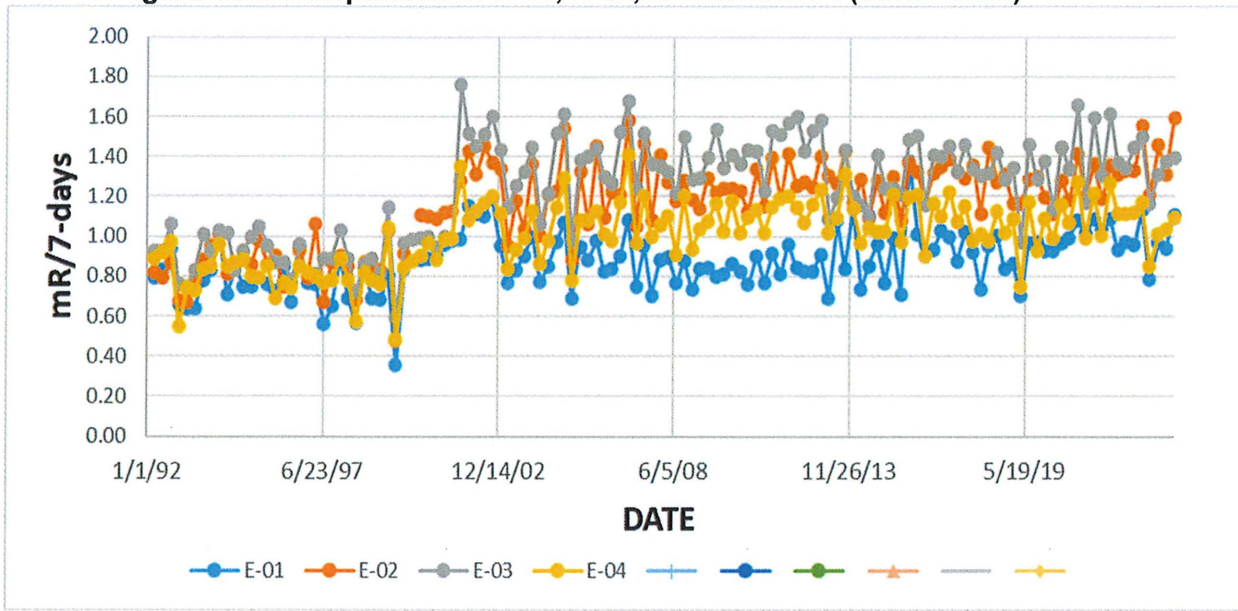
The TLD package from 1980 to 2001 consisted of three LiF chips sealed in a black plastic bag. The magnitude of the error bars indicates the degree of variability of the 1984 - 1988 results from the three chips due to a fault in the TLD reader. The results appear much the same for the E-03 and E-20 results (Figure 11-8). Note that E-20 did not begin until 1976. Again, there is an increase in both the E-20 (the background site) and E-03 (the location nearest the ISFSI) which coincides with the switch from the LiF chips to the Teflon TLD cards. Given that the first twelve casks were loaded December 1995 to September 2000 in which there were no increases in the TLD results, the increase in 2001 indicates that this change is the result of the different response of the new TLDs and not of any effluents or shine from the plant.

Figure 11-8 Comparison of E-03 and E-20 Results 1971 – 2023



Narrowing the time window for the TLD results from 1992 to the present allows for a comparison among the original four TLD locations since the introduction of the ISFSI (Figure 11-9) without the interference by the faulty TLD reader in the mid-1980s. Sites E-01 and E-02 are about 1 mile south of the ISFSI. E-03 is 1200 feet west and E-04 is 4300 feet north.

Figure 11-9 Comparison of E-01, E-02, E-03 and E-04 (1992 –2023)



The comparison shows a definite difference between E-01 and the other three locations. E-01, although approximately the same distance from the ISFSI as E-02 and further away than either E-03 or E-04, is lower than the other three sites. Therefore, distance is not the determining factor in the difference among the measured exposures. There are two factors which could cause the observed difference. The first difference is that E-02, E-03, are surrounded by ploughed fields with solar panels, and E-04 is surrounded by plowed fields whereas the area around E-01 is uncultivated. Second, E-01 is within 100 feet of the lake. Therefore, about 50% of the area contributing natural radiation to the location is a combination of sandy soil, beach sand, and lake water. Since E-01 has a combination of different natural radiation contributors (beach sand, lake water, and soil), that could explain the lower results that are observed at E-01.

The impact of the ISFSI on the ambient radiation levels at its nearest site boundary, the west boundary is shown in Figure 11-10. The ISFSI impact on ambient exposure levels was addressed briefly in Section 11.1 (see Figure 11-2).

Figure 11-10 E-03, E-31, E-44 and Background Site E-20 Results 1992 to 2023

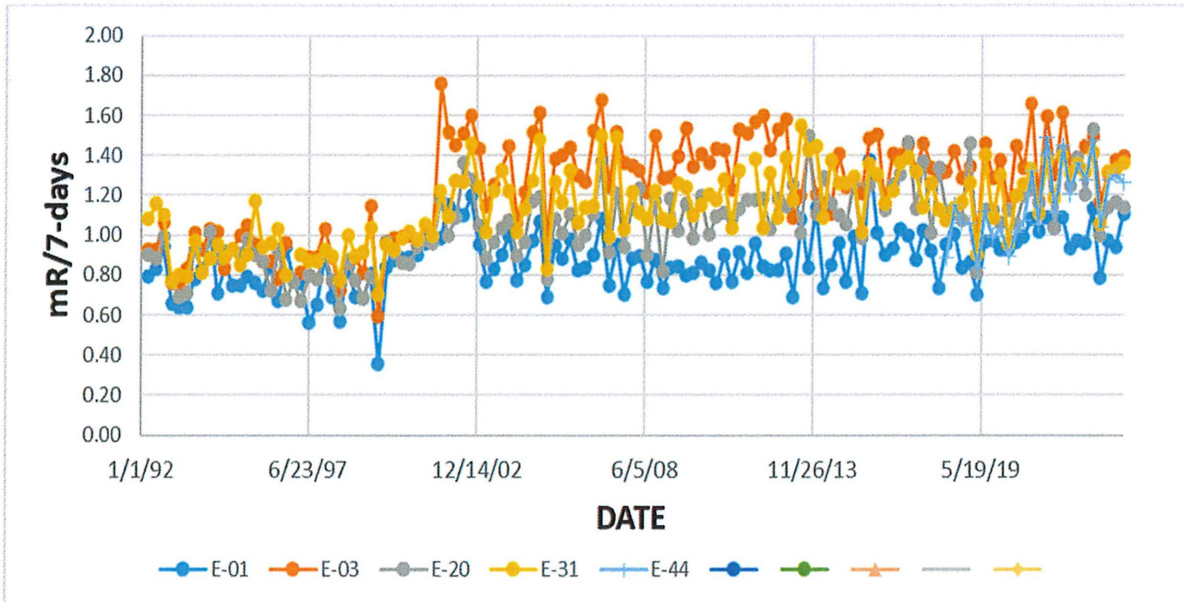


Figure 11-2 shows that beginning with the use of the Teflon TLD cards in the fourth quarter of 2000, the measured exposure levels at E-03 are 2 – 5 mR/7-days lower than the exposures at the west fence of the ISFSI. Figure 11-10 shows that although their individual 95% confidence levels overlap indicating no statistical difference, the quarterly exposures at E-03 (about 1200 feet from the ISFSI) are consistently higher than the exposure at E-31 (at the site boundary about 1400 feet west of E-03). Therefore, the lower values at E-31 compared to E-03 appear to be a real difference as the distance from the ISFSI increases at the west boundary. Because land usage and location are similar at E-03 and E-31, the cause of the previously identified response differences between E-03 and E-01 are not applicable. In 2018, a TLD monitoring location was added at location E-44, directly west of E-03 and E-31 over the site boundary. It can be seen that since 2018, E-44 shows a decreased reading when compared to E-03 and subsequently E-31. Therefore, the lower results at the site boundary location E-31 and E-44 show that the exposures from the ISFSI are dropping off and approaching the lower readings found at the background site E-20.

12.0 REMP CONCLUSION

Based on the analytical results from the 757 environmental samples (721 individual samples with an additional 24 quarterly air particulate composites and 12 quarterly lake water composites) together with 132 REMP + 16 ISFSI sets of TLDs that comprised the PBNP REMP for 2023, PBNP effluents had no discernable effect on the surrounding environs. The calculated effluent doses are below the 10 CFR 50, Appendix I dose objectives demonstrating that PBNP continues to have good controls on effluent releases. The control of effluents from PBNP continues to be acceptable pursuant to the ALARA criteria of 10 CFR 50.34a. Additionally, when the TLD results are factored into the overall exposure, the resulting doses are lower than the ISFSI (10 CFR 72.104) and EPA (40 CFR 190) limits of 25 mrem whole body, 75 mrem thyroid, and 25 mrem any other organ.

From the long-term analysis of TLD results, there is no evidence of elevated ambient radiation levels from the operation of Point Beach and the ISFSI except for the slightly higher exposures measured at the site boundary (E-31) compared to the background reference site (E-20) [see Figure 11-10].

Part D
GROUNDWATER MONITORING

13.0 PROGRAM DESCRIPTION

PBNP monitors groundwater for tritium as part of the Groundwater Protection Program (GWPP). The GWPP supports NEI 07-07, the nuclear industry's groundwater protection initiative. The GWPP also fulfills the requirement of 10 CFR 20.1501(a) to make surveys of areas, including to subsurface in order to comply with Part 20. During 2023 the sampling program consisted of beach drains, intermittent stream and bog locations, drinking water wells, façade wells, yard electrical manholes, ground water monitoring wells, and the subsurface drainage (SSD) system sump located in the U-2 façade.

In the late 1970s, the beach drains entering Lake Michigan were found to contain tritium. The beach drains are the discharge points for yard drainage system, which carries storm water runoff, and are known to be infiltrated by groundwater as observed by discharges even when no rain has occurred. In the 1980s, the source of tritium for this pathway was postulated to be spent fuel pool leakage into the groundwater under the plant. Based on this observation, modifications were made to the pool, and the tritium concentrations decreased below the effluent LLDs. Beach drain effluents continue to be monitored and are accounted for in the monthly effluent quantification process. Because the beach drains are susceptible to groundwater in-leakage from other sources such as the area around the former retention pond which is known to contain tritium, the beach drains are monitored as part of the groundwater monitoring program. In addition to tritium, groundwater beach drain samples also are gamma scanned for the same suite of radionuclides as lake water using the lake water LLDs.

Three intermittent stream locations and the Energy Information Center (EIC) well were added to the groundwater monitoring program in the late 1990s when it was discovered that tritium diffusion from the then operable, earthen retention pond was observable in the intermittent streams which transverse the site in a NW to SE direction. A fourth stream location closer to the plant was added in 2008. These streams pass on the east and west sides of the former retention pond and empty into Lake Michigan about half a mile south of the plant near the meteorological tower. The intermittent stream samples track tritium in the surface groundwater.

The groundwater monitoring program also includes two bogs / ponds on site. One is located about 400 feet SSE of the former retention pond; the other, about 1500 feet N between Warehouses 6 and 7.

In addition to the main plant well, four other drinking water wells are monitored. The Site Boundary Control Center well, located at the plant entrance, the Warehouse 6 well, on the north side of the plant, and the EIC well, located south of the plant. In 2012, a new building (Warehouse 7) was constructed for radwaste. The well for this building was added to the GWPP. These wells do not draw water from the top 20 - 30 feet of soil which is known to contain tritium. These wells monitor the deeper (200 - 600 feet), drinking water aquifer from which the main plant well draws its water. The two soil layers are separated by a gray, very dense till layer of low permeability identified by hydrological studies.

Manholes in the plant yard and for the subsurface drainage (SSD) system under the plant are available for obtaining ground water samples. The plant yard manholes for accessing electrical conduits are susceptible to ground water in-leakage. Therefore, a number of these were sampled. The SSD system was designed to lessen hydrostatic pressure on the foundation by controlling the flow of water under the plant and around the perimeter of the foundation walls. The SSD system flows to a sump in the Unit 2 facade. The sump was sampled twelve times during 2023.

Due to flooding concerns, man-holes and clean-outs for the SSD were sealed in 2014. Therefore, only the SSD sump is now used for sampling.

In the 1990s, two wells were sunk in each unit's façade to monitor the groundwater levels and look for evidence of concrete integrity as part of the ISI IWE Containment Inspection Program. These wells are stand pipes which are sampled periodically for chemical analyses. Façade well sampling has been part of the GWPP since 2007. These wells are sampled quarterly.

In November 2019 repairs to the beach drain access and additional wave run up rip-rap was placed around the shoreline to prevent additional high lake level impacts and beach erosion. These repairs and additions allowed for better access to beach drain sampling in 2020. S-1 and S-3 locations were sampled every month during the year when flow was available, and S-12 was also more accessible throughout the year for sampling. Other beach drain locations were noted as not having flow during the sampling periods.

The groundwater sampling sites (other than the beach drains, SSDs and manholes) are shown in Figure 13-1.

Figure 13-1 Groundwater Monitoring Locations

14.0 RESULTS AND DISCUSSION

14.1 Streams and Bogs

The results from the surface groundwater monitoring associated with the former retention pond are presented in Table 14-1. For the most part the creek results are near the MDC and lower than the results in the beach drain run-off samples. The highest averages are for the East Creek and STP which are in the groundwater flow path from the retention pond area to Lake Michigan. The West Creek is west of the former retention pond, an upstream location with respect to the groundwater flow. The tritium concentration at GW-08, close to the former retention pond, is about one-tenth of the tritium concentrations it had prior to the remediation of the retention pond.

Table 14-1 Intermittent Streams and Bogs
H-3 Concentration (pCi/l)

Month	GW-01(E-01)	GW-02	GW-03	GW-17	BOGS		MDC
	Creek Confluence	E. Creek	W. Creek	STP	GW-07	GW-08	
Jan	80 ± 84	218 ± 91	153 ± 88	319 ± 96			160
Feb	113 ± 79	327 ± 91	106 ± 79	475 ± 99			154
Mar	156 ± 88	306 ± 95	92 ± 84	370 ± 98			164
Apr	227 ± 88	235 ± 88	168 ± 85	388 ± 96			161
May	187 ± 91	214 ± 92	199 ± 91	332 ± 98	344 ± 99	501 ± 106	161
Jun	215 ± 88	288 ± 92	153 ± 85	246 ± 90			163
Jul	226 ± 89	226 ± 89	148 ± 85	260 ± 91			162
Aug	217 ± 92	207 ± 92	89 ± 85	270 ± 95			161
Sep	98 ± 82	82 ± 81	114 ± 83	239 ± 89			163
Oct	NS ± NS	NS ± NS	NS ± NS	NS ± NS			
Nov	85 ± 87	187 ± 93	43 ± 85	237 ± 95			172
Dec	68 ± 83	169 ± 89	143 ± 87	262 ± 93			171
Average	152 ± 65	224 ± 68	128 ± 44	309 ± 76			

A blank indicates no sample was scheduled. Streams are sampled monthly; bogs, annually.
Values are presented as the measured value and the 95% confidence level counting error.
ND = not statistically different from zero at the 95% confidence level. NS= No sample available

The analyses of these surface water samples show low concentrations of tritium, similar to those observed in the beach drains. The West Creek (GW-03) samples had tritium results right at the MDC in most cases. Small positive tritium concentrations occurred in the samples from the confluence of the two creeks (GW-01), which again are similar to the West Creek concentrations. In contrast, there are more positive results from GW-02 (south end of the East Creek) and GW-17 (located at the north end of the East Creek).

The bog (GW-08) SE of the former retention pond is higher than the bog at GW-07 north of the former retention pond. The GW-08 bog result is increased a little from 2022, but is down from the 3200 - 3800 pCi/l seen in 1999 before the retention pond was remediated. A gamma analysis of the GW-07 bog sample from May 2023 showed no positive isotopes. Previous years' gamma scans did not show any indications of isotopes either, and the increased tritium result at GW-07 may be attributed to washout/snowmelt during the spring from previous releases.

14.2 Beach Drains

The 2023 results for the beach drains that were sampled are presented in Table 14-2. S-1 collects yard drainage from the north part of the site yard; S-3, from the south. Drains S-8 and S-9 carry water from the lake side yard drains whereas drains S-7 and S-10 are from the turbine building roof. S-12 is a drain from the external SSD which run along the outside northern half of the foundation wall, and S-13 is the south external SSD drain. They are not connected to the internal SSD under the plant which drains to a sump in the U2 façade. Sample points S-8 and S-13 did not have analyzes due to no flow during sample collection. These points are excluded from Table 14-2.

Table 14-2
2023 Beach Drain H-3 Concentration (pCi/l)

Month	S-1	S-3	S-7	S-9	S-10	S-12	MDC
Jan	415 ± 95	178 ± 83	NF ±	NF ±	NF ±	294 ± 89	157
Feb	358 ± 98	1716 ± 153	1407 ± 139	NF ±	NF ±	287 ± 94	159
Mar	386 ± 97	436 ± 99	281 ± 92	283 ± 92	655 ± 92	290 ± 92	163
Apr	470 ± 100	381 ± 96	NF ±	NF ±	NF ±	276 ± 91	161
May	435 ± 100	171 ± 86	NF ±	NF ±	NF ±	500 ± 103	162
Jun	443 ± 98	281 ± 90	NF ±	NF ±	NF ±	NF ±	157
Jul	288 ± 90	317 ± 91	NF ±	NF ±	NF ±	NF ±	158
Aug	381 ± 97	245 ± 90	NF ±	NF ±	NF ±	338 ± 95	159
Sep	287 ± 92	80 ± 81	NF ±	NF ±	NF ±	237 ± 90	163
Oct	369 ± 97	211 ± 89	NF ±	NF ±	NF ±	NF ±	167
Nov	322 ± 96	985 ± 125	NF ±	NF ±	589 ± 109	244 ± 93	171
Dec	331 ± 98	111 ± 87	NF ±	NF ±	NF ±	134 ± 88	171
Avg =	374 ± 60	397 ± 214	844 ± 797	283 ± 92	622 ± 47	289 ± 43	

ND = not detected and ≤MDC NS = no sample
NF = no sample due to no flow *MDC=165 for S-3 in April

The tritium concentrations at S-1, S-3, and S-12 are consistent with results from previous years. Results are similar to those observed at intermittent streams and in manholes around the site, and like in years prior are attributed to tritium recapture.

Gamma scans were performed on the beach drain samples at the LLD used for lake water. A few indications of small, positive concentration values below their MDCs were found for Mn-54, Co-58, Co-60, Fe-59, Cs-134, Cs-137, and Ba/La-140. Co-58 was found in the S-9 March sample to be above the MDC (2.9 ± 1.5 MDC 2.7). Gaseous effluents would be the most likely cause of a positive hit. There were no gaseous releases with Co-58 in February (sample was from 3/1/23), therefore Co-58 was considered a false positive. Fe-59 was present in S-12 March sample (7.3 +5.4 MDC 4.0). There were no liquid or air releases of Fe-59 in February 2023, therefore it is considered a false positive in the S-12 March 1, 2023, sample. Recapture could have contributed to the observed positive values, though tritium can be concluded as only PBNP radionuclide positively found in the beach drains.

14.3 Electrical Vaults and Other Manholes

Manholes for access to below ground electrical facilities are susceptible to groundwater in-leakage. The manholes on the east side of the plant, between the Turbine building and Lake Michigan have low tritium concentrations (Table 14-3). Z-065A and Z-065B are located on the west side of the pump house. Manholes, Z-066A and Z-067A through Z-066D and Z-067D are between the pump house and the turbine building and run in parallel in the NE section of the yard beginning just north of the Unit 2 truck bay and run from the Unit 2 truck bay north to the EDG building. Z-068 is located just west of the EDG building and north of Z-066/067D. Each of the two A, B, C, and D vaults are side by side.

Table 14-3
2023 East Yard Area Manhole Tritium (pCi/l)

MH	Spring	Fall
Z-065A(M-1)	402 ± 98	320 ± 97
Z-065B(M-2)	506 ± 103	325 ± 97
Z-066A	377 ± 97	246 ± 93
Z-067A	334 ± 95	225 ± 92
Z-066B	382 ± 97	146 ± 88
Z-067B	448 ± 101	237 ± 93
Z-066C	453 ± 101	310 ± 96
Z-067C	421 ± 99	237 ± 94
Z-066D	358 ± 96	206 ± 91
Z-067D	256 ± 91	108 ± 86
Z-068	603 ± 108	189 ± 90
MDC	162	172

Elevated tritium could be attributed to washout from rain/snowmelt as the manholes are outside. Tritium results are similar to what is observed in the subsurface drainage system with no isotopes present.

14.4 Façade Wells and Subsurface Drainage System

There are two methods of sampling the groundwater under the plant foundation. The first is a set of four shallow wells, two in each façade. The other is a subsurface drainage system (SSD). The façade wells were installed to monitor for groundwater conditions which may affect the integrity of the concrete and rebar of each unit's foundation. The SSD was designed to relieve hydrostatic pressure on each unit's foundation as well as the Auxiliary and Turbine buildings.

The façade wells are not located symmetrically in the two units. The Unit 1 façade wells are east of the containment in the SE (1Z-361A) and NE (1Z-361B) corners of the façade. However, in Unit 2, there is one well in the NW corner (2Z-361A) and the other rotated approximately 180° in the SW corner (2Z-361B). In each, the well cap is level with the floor. The 2023 façade well tritium results are shown in Table 14-4. The Unit 1 wells consistently have higher tritium concentrations than the U2 wells with 1Z-361A, in the SE corner of the Unit 1 façade, on average having the highest tritium concentrations.

In addition to tritium analysis, the façade wells were analyzed for gamma isotopic activity. As in lake w\ater samples, small positive values below their calculated, minimum detectable concentrations were found for Mn-54, Co-58, Fe-59, Co-60, Cs-137, and Ba-La-140. The 15 pCi/L Lower Limit of Detection (LLD) for Ba-La-140 analysis at the offsite vendor lab was not achieved in 4[th] quarter for all samples. The LLD could not be achieved due to the age of sample when received by the laboratory. All other isotope LLDs were achieved for these sample.

Table 14-4
2023 Facade Well Water Tritium (pCi/l)

	UNIT 1		UNIT 2		
Month	**1Z-361A**	**1Z-361B**	**2Z-361A**	**2Z-361B**	**MDC**
March	288 ± 92	221 ± 89	ND	138 ± 84	163
May	229 ± 89	174 ± 86	91 ± 82	353 ± 96	162
July	261 ± 95	230 ± 93	ND	286 ± 96	162
October	310 ± 97	200 ± 91	88 ± 85	291 ± 96	173
ND = Not Detected and <MDC NS = No Sample					

To relieve hydrostatic pressure on the foundation, Point Beach has an external and an internal subsurface drainage system (SSD) to drain groundwater away from the foundation.

The internal SSD consist of perforated piping which drains groundwater by gravity to a sump located in the Unit 2 façade. A comparison of the 2018 through 2023 SSD results is presented in Table 14-5. In 2023, the tritium results were similar as to what was observed in 2019-2022.

The SSD samples are scanned for gamma emitters. A few slightly positive values were found for Mn-54, Co-58, Fe-59, Co-60, Zn-65, and Cs-137, Ba-La-140 and all results were below the MDC. The 15 pCi/L Lower Limit of Detection (LLD) for Ba-La-140 analysis at the offsite vendor lab was not achieved in the June, September, October, and November samples. The 15 pCi/L LLD was not achieved for Zr-Nb-95 in September. The LLDs were all missed due to untimely shipping of the collected samples.

Table 14-5
2018 - 2023 Unit 2 Facade SSD Sump H-3 (pCi/l)

	2019			2020			2021			2022			2023		
Date	**pCi/l**		**2σ**	**pCi/l**		**2σ**	**pCi/l**		**2σ**	**pCi/l**		**2σ**	**pCi/l**		**2σ**
Jan	808	±	110	3557	±	196	1185	±	127	2547	±	170	1697	±	146
Feb	923	±	114	3356	±	187	1409	±	135	2939	±	186	1805	±	149
Mar	924	±	116	1915	±	150	1605	±	148	1820	±	155	1072	±	132
Apr	1580	±	136	1468	±	134	1437	±	139	1112	±	129	1384	±	138
May	1470	±	131	1225	±	129	1174	±	131		NS		1392	±	136
Jun	1784	±	146	1217	±	130	806	±	114	962	±	128	2339	±	169
Jul	1681	±	144	2136	±	157	6496	±	257	1473	±	147	1120	±	131
Aug	1703	±	143	1900	±	150	2915	±	180	2642	±	174	1004	±	123
Sep	1412	±	132	1621	±	141	2714	±	175	1219	±	132	1391	±	140
Oct	8932	±	291	1419	±	135	2654	±	175	1611	±	149	462	±	104
Nov	10877	±	318	1170	±	130	2672	±	175	1197	±	128	792	±	117
Dec	5886	±	240	1241	±	131	2439	±	169	1110	±	129	870	±	120
Average	3165	±	3444	1852	±	814	2292	±	1514	1694	±	703	1277	±	507

The external SSD system runs along the external foundation walls for the Unit 1 and Unit 2 facades, the Auxiliary Building, the North Service Building, and the Turbine Hall. It is not connected to the internal SSD system. During 2014, work to mitigate the possibility of external flooding events uncovered the N (S-12) and S (S-13) external SSD outfalls. Both the north and south halves of the external SSD system drain toward the beach. Several samples from SSD S-12 were obtained in 2023 and the results averaged 289 pCi/L, which is lower yet still comparable to the concentrations found in various manholes (Table 14-3) on the east side of the plant during 2023.

14.5 Potable Water and Monitoring Wells

Outside of the protected area, ten wells, in addition to the main plant well (Section 11.7), are used for monitoring tritium in groundwater: the four potable water wells, GW-04 (Energy Information Center or EIC), GW-05 (Warehouse 6), GW-18 (Warehouse 7), GW-06 (Site Boundary Control Center), and six tritium groundwater monitoring wells, GW-11 through GW-16 (Figure 13-1).

The potable water wells monitor the deep, drinking water aquifer whereas the monitoring wells penetrate less than 30 feet to monitor the top soil layer. The potable water aquifer is separated from the shallow, surface water aquifer by a thick, clay layer with very low permeability. The potable water wells had no detectable tritium, except for three results at GW-04 in April, May, and June 2023. These results were almost statistically no different than zero, and all were <MDC. GW-18 had a detection in the 3rd quarter 2023 which was 124 ± 83 pCi/L and still less than MDC of 162 (Table 14-6).

GW-04 is analyzed monthly for gamma, and had two slightly positive results each for Co-58 and Cs-137. Both were less than the MDC. This was determined to be false positives as there were no known spills or effluent release pathways that would have interacted with this location.

GW-18 completed its second full year of monitoring and had 3 quarters with no detectable gamma scans and one that contained two slightly positive, but less than MDC results for Co-60 (3.8 ± 2.7 pCi/L, MDC 6.5 pCi/L) and Cs-137 (4.1 ± 2.4 pCi/L, MDC 5.6 pCi/L). There were no known spills or effluent release pathways that would have interacted with this location.

Table 14-6
2023 Potable Well Water Tritium Concentration (pCi/l)

Month	EIC WELL GW-04	EIC MDC	Warehouse 6 Well GW-05	SBCC Well GW-06	WH 7 GW-18	GW-05, 06, 18 MDC
Jan	ND	160	ND	ND	ND	160
Feb	ND	154				
Mar	ND	164				
Apr	108 ± 81	161	ND	ND	ND	161
May	88 ± 85	161				
Jun	93 ± 79	158				
Jul	ND	162	ND	ND	124 ± 83	162
Aug	ND	161				
Sep	ND	163				
Oct	ND	169			ND	170
Nov	ND	172				
Dec	ND	171	ND	ND		

ND= not detected

The monitoring well results are similar to those obtained in previous years. The two monitoring wells showing higher and consistently detectable tritium (GW-15, GW-16) are in the flow path from the retention pond area to the lake (Table 14-7), however are approaching similar levels as observed at the locations nearest the lake such as GW-11 and GW-14. GW-15 duplicate samples were analyzed for gamma and no additional nuclides were detected.

Table 14-7
2023 Quarterly Monitoring Well Tritium (pCi/l)

Q	MW-01 GW-11	MW-02 GW-12	MW-06 GW-13	MW-05 GW-14	MW-04 *GW-15	MW-03 GW-16	**MDC**
1	93 ± 84	ND	100 ± 85	219 ± 91	245 ± 92	245 ± 92	159
2	164 ± 86	ND	118 ± 83	273 ± 92	193 ± 87	285 ± 92	162
3	214 ± 88	ND	ND	155 ± 85	200 ± 88	314 ± 94	162
4	ND	ND	ND	106 ± 85	122 ± 86	134 ± 87	171

ND= not statistically different from zero and <MDC. NS = no sample available
*Duplicate samples taken, highest value reported.

In summary, the results from monitoring wells GW-15 and GW-16 as well as results from the nearby surface water sample locations (GW-03, the east creek; GW-08, the bog to the SE of the former pond; and GW-17, the surface water on the SE corner of the STP) show that the area around and in the groundwater flow path from the former retention pond remain impacted by the tritium that diffused from the pond into the soil while it was in use.

14.6 Air Conditioning Condensate Samples

The results from the airborne tritium recapture study presented in the 2011 AMR demonstrated that the tritium via precipitation was higher close to the plant than away from the plant. Additionally, it was shown that the condensate from AC units located on building roofs and within the plant contained high concentrations of H-3. Similar results for AC condensate were demonstrated in 2012, 2013, 2014, and 2016. Based on this information AC Condensate samples were moved to a three year periodicity and were obtained in 2022 showing similar results as were previously observed. A comparison of the results is shown in Table 14-8.

Table 14-8
2022 Air Conditioning Tritium Concentration (pCi/l)

Location	2012 H-3 (pCi/l)	2σ	2013 H-3 (pCi/l)	2σ	2014 H-3 (pCi/l)	2σ	2016 H-3 (pCi/l)	2σ	2019 H-3 (pCi/l)	2σ	2022 H-3 (pCi/l)	2σ
NSB (4th floor)	557	± 102	478	± 102	328	± 101	NS		NS		NS	±
Turbine Bldg 66'	998	± 118	757	± 112	527	± 108	6096	± 240	NS		2625	± 175
S Service Bldg Roof	5822	± 231	2606	± 166	2690	± 166	2911	± 174	920	± 114	900	± 120
South Gate Roof	473	± 99	217	± 91	173	± 95	171	± 85	ND		121	± 84
Turbine Bldg 8'	602	± 104	1055	± 123	874	± 119	NS		ND		1054	± 126
Training Bldg Roof	185	± 86	203	± 90	ND	±	ND		ND		138	± 86

NS = no sample ND = not detected, measured value - 2σ ≤ 0

These results show that the H-3 concentrations continue to be higher in the immediate vicinity of Units 1 and 2 (S. Service Building and Turbine Building) than at the Training Building, which is some 800 feet south. The higher concentrations occurring within the area of the yard drains feeding beach drains support the conclusion that precipitation scavenging and roof drains continue to be a source for the H-3 found in the beach drains. This was taken from 2022 AMR.

15.0 GROUNDWATER SUMMARY

Groundwater monitoring indicates that low levels of tritium continue to occur in the upper soil layer but not in the deep, drinking water aquifer. These results also indicate that the low levels of tritium are restricted to a small, well defined area close to the plant. Results from precipitation analyses (2011 AMR) show that airborne tritium concentrations are higher close to the plant as compared to results at the site boundaries. The observed tritium concentrations in the yard manholes can be explained by the higher tritium in precipitation close to the plant. In addition to tritium captured by precipitation, the beach drains also receive the tritium captured in the AC condensate because the condensate drainage is connected to the yard drain system.

Tritium continues in the soil below the plant foundation as evidenced by results from the subsurface drainage system and from the façade wells.

In conclusion, the groundwater tritium concentrations observed at Point Beach are below the EPA drinking water standards prior to emptying into Lake Michigan where they will undergo further dilution. All analyses to date indicate that the drinking water contains no tritium. None of the tritium in the upper soil layer is migrating off-site toward the surrounding population. This is based on the known west-to-east groundwater flow toward Lake Michigan and the results from the two monitoring wells west of the plant (GW-12 and GW-13, Figure 13-1). Additionally, because no tritium is detected at a value statistically different than zero in either of the four potable water wells closest to the power block or from the drinking water well at the site boundary, none of the tritium observed in the upper soil layer has penetrated into the drinking water aquifer to impact either on-site or off-site personnel.

APPENDIX 1

Microbac Laboratories Inc.
Final Report for the Point Beach Nuclear Plant
and
Other Analyses
Reporting Period: January – December 2023

87 pages follow

MICROBAC

MONTHLY
PROGRESS REPORT
NextEra Energy

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

THE POINT BEACH NUCLEAR PLANT
TWO RIVERS, WISCONSIN

PREPARED AND SUBMITTED
BY
Microbac Laboratories Inc.

Project Number: 8006

Reporting Period: January-December, 2023

Reviewed and
Approved by ______________________ Date 2/6/24

A. Banavali, PhD.
Laboratory Director

Distribution: R. Prucha, 1 email, 1 hardcopy

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1.0 INTRODUCTION

The following constitutes the current Monthly Progress Report for the Environmental Radiological Monitoring Program conducted at the Point Beach Nuclear Plant, Two Rivers, Wisconsin. Results of completed analyses are presented in the attached tables. Missing entries indicate analyses that are not completed. These results will appear in subsequent reports. Data tables reflect sample analysis results for both Technical Specification requirements and Special Interest locations and samples are randomly selected within the Program monitoring area to provide additional data for cross-comparisons.

For all gamma isotopic analyses, the spectrum is computer scanned from 80 to 2048 KeV. Specifically included are Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, Ru-103, Ru-106, I-131, Ba-La-140, Cs-134, Cs-137, Ce-141, and Ce-144. Naturally occurring gamma-emitters, such as K-40 and Ra daughters, are frequently detected in soil and sediment samples. Specific isotopes listed are K-40, Tl-208, Pb-212, Bi-214, Ra-226 and Ac-228. The results reported under "Other Gammas" may be Co-60, Ru-103 or any other radionuclide which is indicative of other gammas for the sample type. "Other Gammas" do not include naturally occuring radionuclides.

All concentrations, except gross beta, are decay corrected.

All samples were collected within the scheduled period unless noted otherwise in the Listing of Missed Samples.

POINT BEACH NUCLEAR PLANT

2.0 LISTING OF MISSED SAMPLES

Sample Type	Location	Expected Collection Date	Reason
AI	E-01, E-02, E-03, E-04, E-08, E-20	05-24-23	Samples were mispladed by the shipping company, arrived on 7/7/23. Unable to reach MDA.
AP/AI	E-08	06-07-23	Sampler found not running due to a tripped fuse. Very low sample volume.
AP/AI	E-08	06-28-23	Sampler found not running due to a tripped fuse. Very low sample volume.
AP/AI	E-01	07-05-23	Sampler found not running due to a tripped fuse. Very low sample volume.
AP/AI	E-01	07-12-23	Sampler found not running due to a tripped fuse. Very low sample volume.
AP/AI	E-01	08-30-23	Sampler found not running due to a power outage.
AP/AI	E-01	09-07-23	Sampler found not running due to a power outage.

3.0 Data Tables

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-01, Meteorological Tower
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
01-04-23	298	0.049 ± 0.005	< 0.019
01-11-23	313	0.033 ± 0.004	< 0.007
01-18-23	304	0.032 ± 0.004	< 0.011
01-26-23	346	0.025 ± 0.004	< 0.012
02-01-23	272	0.025 ± 0.004	< 0.016
02-08-23	294	0.036 ± 0.004	< 0.018
02-15-23	306	0.030 ± 0.004	< 0.016
02-21-23	271	0.031 ± 0.004	< 0.015
02-28-23	305	0.021 ± 0.004	< 0.010
03-08-23	348	0.029 ± 0.004	< 0.014
03-15-23	303	0.022 ± 0.004	< 0.012
03-22-23	309	0.027 ± 0.004	< 0.011
03-28-23	251	0.037 ± 0.005	< 0.008
1st Quarter Mean ± s.d.		0.031 ± 0.008	< 0.013
04-06-23	386	0.027 ± 0.003	< 0.007
04-13-23	300	0.035 ± 0.004	< 0.013
04-19-23	270	0.023 ± 0.004	< 0.013
04-25-23	255	0.017 ± 0.004	< 0.017
05-03-23	344	0.008 ± 0.003	< 0.012
05-09-23	257	0.014 ± 0.003	< 0.012
05-17-23	356	0.025 ± 0.003	< 0.010
05-24-23	298	0.024 ± 0.003	NS[a]
05-31-23	293	0.020 ± 0.003	< 0.019
06-07-23	311	0.030 ± 0.004	< 0.017
06-13-23	256	0.011 ± 0.003	< 0.011
06-21-23	341	0.014 ± 0.003	< 0.011
06-28-23	306	0.022 ± 0.003	< 0.009
2nd Quarter Mean ± s.d.		0.021 ± 0.008	< 0.013

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
07-05-23		NS[a]	
07-12-23		NS[a]	
07-19-23	263	0.018 ± 0.004	< 0.013
07-26-23	305	0.023 ± 0.003	< 0.027
08-02-23	309	0.018 ± 0.003	< 0.016
08-09-23	304	0.023 ± 0.004	< 0.017
08-16-23	307	0.020 ± 0.003	< 0.020
08-22-23	265	0.022 ± 0.004	< 0.015
08-30-23		NS[a]	
09-07-23		NS[a]	
09-13-23	252	0.012 ± 0.004	< 0.011
09-20-23	294	0.023 ± 0.003	< 0.022
09-27-23	307	0.047 ± 0.004	< 0.009
10-03-23	261	0.047 ± 0.005	< 0.008
3rd Quarter Mean ± s.d.		0.025 ± 0.012	< 0.016
10-11-23	351	0.008 ± 0.004	< 0.009
10-18-23	306	0.013 ± 0.003	< 0.013
10-25-23	312	0.027 ± 0.004	< 0.008
11-01-23	310	0.022 ± 0.003	< 0.009
11-07-23	293	0.044 ± 0.004	< 0.015
11-15-23	298	0.019 ± 0.003	< 0.008
11-21-23	263	0.035 ± 0.004	< 0.010
11-29-23	354	0.025 ± 0.003	< 0.009
12-06-23	298	0.033 ± 0.004	< 0.011
12-14-23	342	0.034 ± 0.004	< 0.010
12-20-23	253	0.040 ± 0.005	< 0.009
12-27-23	298	0.050 ± 0.005	< 0.014
01-03-24	302	0.021 ± 0.004	< 0.007
4th Quarter Mean ± s.d.		0.028 ± 0.012	< 0.010
Cumulative Average		0.026 ± 0.010	< 0.013

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-02, Site Boundary Control Center
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
01-04-23	305	0.054 ± 0.005	< 0.019
01-11-23	312	0.034 ± 0.004	< 0.007
01-18-23	308	0.027 ± 0.004	< 0.011
01-26-23	348	0.029 ± 0.004	< 0.012
02-01-23	265	0.024 ± 0.004	< 0.016
02-08-23	305	0.035 ± 0.004	< 0.018
02-15-23	305	0.029 ± 0.004	< 0.016
02-21-23	269	0.025 ± 0.004	< 0.015
02-28-23	310	0.019 ± 0.003	< 0.010
03-08-23	356	0.030 ± 0.004	< 0.014
03-15-23	304	0.023 ± 0.004	< 0.012
03-22-23	304	0.027 ± 0.004	< 0.011
03-28-23	257	0.035 ± 0.005	< 0.008
1st Quarter Mean ± s.d.		0.030 ± 0.008	< 0.013
04-06-23	390	0.027 ± 0.003	< 0.007
04-13-23	300	0.039 ± 0.004	< 0.013
04-19-23	270	0.020 ± 0.004	< 0.013
04-25-23	256	0.017 ± 0.004	< 0.017
05-03-23	339	0.007 ± 0.003	< 0.012
05-09-23	256	0.017 ± 0.004	< 0.012
05-17-23	355	0.019 ± 0.003	< 0.010
05-24-23	296	0.017 ± 0.003	NS[a]
05-31-23	291	0.025 ± 0.004	< 0.019
06-07-23	306	0.026 ± 0.004	< 0.018
06-13-23	255	0.012 ± 0.003	< 0.011
06-21-23	344	0.016 ± 0.003	< 0.011
06-28-23	304	0.024 ± 0.003	< 0.009
2nd Quarter Mean ± s.d.		0.020 ± 0.008	< 0.013
07-05-23	297	0.031 ± 0.004	< 0.006
07-12-23	313	0.018 ± 0.003	< 0.013
07-19-23	305	0.021 ± 0.003	< 0.011
07-26-23	302	0.021 ± 0.003	< 0.022
08-02-23	299	0.020 ± 0.003	< 0.017
08-09-23	302	0.029 ± 0.004	< 0.016
08-16-23	307	0.023 ± 0.004	< 0.022
08-22-23	265	0.024 ± 0.004	< 0.019
08-30-23	345	0.023 ± 0.003	< 0.012
09-07-23	341	0.027 ± 0.004	< 0.016
09-13-23	266	0.012 ± 0.003	< 0.011
09-20-23	297	0.027 ± 0.004	< 0.021
09-27-23	300	0.049 ± 0.005	< 0.009
10-03-23	259	0.047 ± 0.005	< 0.008
3rd Quarter Mean ± s.d.		0.026 ± 0.010	< 0.015
10-11-23	357	0.006 ± 0.004	< 0.009
10-18-23	311	0.010 ± 0.003	< 0.013
10-25-23	307	0.029 ± 0.004	< 0.008
11-01-23	308	0.025 ± 0.004	< 0.009
11-07-23	298	0.042 ± 0.004	< 0.014
11-15-23	302	0.018 ± 0.003	< 0.008
11-21-23	264	0.040 ± 0.005	< 0.010
11-29-23	343	0.028 ± 0.003	< 0.009
12-06-23	303	0.038 ± 0.004	< 0.011
12-14-23	340	0.033 ± 0.004	< 0.010
12-20-23	255	0.044 ± 0.005	< 0.009
12-27-23	297	0.048 ± 0.005	< 0.014
01-03-24	303	0.018 ± 0.004	< 0.007
4th Quarter Mean ± s.d.		0.029 ± 0.013	< 0.010
Cumulative Average		0.026 ± 0.010	< 0.013

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-03, West Boundary
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131	Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030	Required LLD		0.010	0.030
01-04-23	309	0.048 ± 0.005	< 0.018	07-05-23	310	0.025 ± 0.003	< 0.006
01-11-23	309	0.031 ± 0.004	< 0.008	07-12-23	310	0.016 ± 0.003	< 0.014
01-18-23	311	0.025 ± 0.004	< 0.011	07-19-23	309	0.018 ± 0.003	< 0.011
01-26-23	350	0.024 ± 0.003	< 0.012	07-26-23	305	0.025 ± 0.004	< 0.025
02-01-23	266	0.029 ± 0.004	< 0.016	08-02-23	305	0.019 ± 0.003	< 0.016
02-08-23	294	0.041 ± 0.004	< 0.018	08-09-23	298	0.024 ± 0.004	< 0.012
02-15-23	307	0.029 ± 0.004	< 0.016	08-16-23	306	0.020 ± 0.003	< 0.021
02-21-23	265	0.026 ± 0.004	< 0.015	08-22-23	259	0.024 ± 0.004	< 0.016
02-28-23	304	0.021 ± 0.004	< 0.010	08-30-23	348	0.019 ± 0.003	< 0.012
03-08-23	351	0.032 ± 0.004	< 0.014	09-07-23	340	0.026 ± 0.004	< 0.016
03-15-23	304	0.022 ± 0.004	< 0.012	09-13-23	267	0.015 ± 0.004	< 0.011
03-22-23	303	0.029 ± 0.004	< 0.011	09-20-23	302	0.025 ± 0.003	< 0.021
03-28-23	253	0.039 ± 0.005	< 0.008	09-27-23	307	0.043 ± 0.004	< 0.009
				10-03-23	259	0.047 ± 0.005	< 0.008
1st Quarter Mean ± s.d.		0.030 ± 0.008	< 0.013	3rd Quarter Mean ± s.d.		0.025 ± 0.009	< 0.014
04-06-23	389	0.028 ± 0.003	< 0.007	10-11-23	364	0.005 ± 0.004	< 0.009
04-13-23	296	0.034 ± 0.004	< 0.013	10-18-23	309	0.012 ± 0.003	< 0.013
04-19-23	267	0.022 ± 0.004	< 0.013	10-25-23	310	0.029 ± 0.004	< 0.008
04-25-23	253	0.019 ± 0.004	< 0.017	11-01-23	315	0.025 ± 0.003	< 0.008
05-03-23	341	0.010 ± 0.003	< 0.012				
				11-07-23	296	0.043 ± 0.004	< 0.015
05-09-23	257	0.015 ± 0.003	< 0.012	11-15-23	302	0.019 ± 0.003	< 0.008
05-17-23	354	0.024 ± 0.003	< 0.010	11-21-23	262	0.036 ± 0.005	< 0.010
05-24-23	298	0.020 ± 0.003	NS[a]	11-29-23	355	0.023 ± 0.003	< 0.009
05-31-23	298	0.022 ± 0.003	< 0.019				
				12-06-23	300	0.036 ± 0.004	< 0.011
06-07-23	314	0.032 ± 0.004	< 0.017	12-14-23	348	0.033 ± 0.004	< 0.010
06-13-23	253	0.013 ± 0.003	< 0.011	12-20-23	256	0.041 ± 0.005	< 0.009
06-21-23	343	0.016 ± 0.003	< 0.011	12-27-23	299	0.047 ± 0.005	< 0.014
06-28-23	290	0.028 ± 0.004	< 0.010	01-03-24	308	0.017 ± 0.004	< 0.007
2nd Quarter Mean ± s.d.		0.022 ± 0.007	< 0.013	4th Quarter Mean ± s.d.		0.028 ± 0.013	< 0.010
				Cumulative Average		0.026 ± 0.010	< 0.013

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-04, North Boundary
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131	Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030	Required LLD		0.010	0.030
01-04-23	307	0.049 ± 0.005	< 0.018	07-05-23	306	0.025 ± 0.003	< 0.006
01-11-23	308	0.031 ± 0.004	< 0.008	07-12-23	316	0.019 ± 0.003	< 0.017
01-18-23	304	0.026 ± 0.004	< 0.011	07-19-23	311	0.016 ± 0.003	< 0.011
01-26-23	348	0.029 ± 0.004	< 0.012	07-26-23	309	0.020 ± 0.003	< 0.022
02-01-23	267	0.030 ± 0.004	< 0.016	08-02-23	301	0.020 ± 0.003	< 0.014
02-08-23	300	0.038 ± 0.004	< 0.018	08-09-23	301	0.028 ± 0.004	< 0.016
02-15-23	307	0.026 ± 0.004	< 0.016	08-16-23	311	0.019 ± 0.003	< 0.024
02-21-23	261	0.026 ± 0.004	< 0.015	08-22-23	255	0.022 ± 0.004	< 0.015
02-28-23	306	0.018 ± 0.003	< 0.010	08-30-23	347	0.020 ± 0.003	< 0.012
03-08-23	345	0.031 ± 0.004	< 0.014	09-07-23	342	0.026 ± 0.004	< 0.016
03-15-23	298	0.020 ± 0.004	< 0.012	09-13-23	277	0.012 ± 0.003	< 0.010
03-22-23	311	0.025 ± 0.004	< 0.011	09-20-23	303	0.026 ± 0.004	< 0.021
03-28-23	259	0.034 ± 0.005	< 0.008	09-27-23	316	0.042 ± 0.004	< 0.008
				10-03-23	258	0.053 ± 0.005	< 0.008
1st Quarter Mean ± s.d.		0.030 ± 0.008	< 0.013	3rd Quarter Mean ± s.d.		0.025 ± 0.011	< 0.014
04-06-23	394	0.028 ± 0.003	< 0.007	10-11-23	372	0.005 ± 0.004	< 0.009
04-13-23	302	0.030 ± 0.004	< 0.013	10-18-23	307	0.009 ± 0.003	< 0.013
04-19-23	269	0.019 ± 0.004	< 0.013	10-25-23	314	0.026 ± 0.003	< 0.008
04-25-23	253	0.012 ± 0.004	< 0.017	11-01-23	319	0.025 ± 0.003	< 0.008
05-03-23	340	0.009 ± 0.003	< 0.012				
				11-07-23	297	0.042 ± 0.004	< 0.014
05-09-23	256	0.015 ± 0.004	< 0.012	11-15-23	302	0.020 ± 0.003	< 0.008
05-17-23	354	0.023 ± 0.003	< 0.010	11-21-23	267	0.034 ± 0.004	< 0.010
05-24-23	297	0.017 ± 0.003	NS[a]	11-29-23	357	0.027 ± 0.003	< 0.009
05-31-23	291	0.023 ± 0.004	< 0.019				
				12-06-23	298	0.042 ± 0.005	< 0.011
06-07-23	307	0.030 ± 0.004	< 0.017	12-14-23	346	0.034 ± 0.004	< 0.010
06-13-23	257	0.013 ± 0.003	< 0.011	12-20-23	260	0.045 ± 0.005	< 0.009
06-21-23	343	0.015 ± 0.003	< 0.011	12-27-23	299	0.046 ± 0.005	< 0.014
06-28-23	297	0.026 ± 0.004	< 0.010	01-03-24	308	0.019 ± 0.004	< 0.007
2nd Quarter Mean ± s.d.		0.020 ± 0.007	< 0.013	4th Quarter Mean ± s.d.		0.029 ± 0.013	< 0.010
				Cumulative Average		0.025 ± 0.010	< 0.013

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-08, G.J. Francar Residence
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
01-04-23	307	0.049 ± 0.005	< 0.018
01-11-23	308	0.034 ± 0.004	< 0.008
01-18-23	304	0.025 ± 0.004	< 0.011
01-26-23	350	0.021 ± 0.003	< 0.012
02-01-23	269	0.033 ± 0.004	< 0.016
02-08-23	299	0.035 ± 0.004	< 0.018
02-15-23	304	0.031 ± 0.004	< 0.016
02-21-23	261	0.027 ± 0.004	< 0.015
02-28-23	307	0.022 ± 0.004	< 0.010
03-08-23	340	0.032 ± 0.004	< 0.014
03-15-23	309	0.026 ± 0.004	< 0.011
03-22-23	300	0.027 ± 0.004	< 0.012
03-28-23	268	0.033 ± 0.005	< 0.008
1st Quarter Mean ± s.d.		0.030 ± 0.007	< 0.013
04-06-23	387	0.026 ± 0.003	< 0.007
04-13-23	295	0.030 ± 0.004	< 0.013
04-19-23	270	0.021 ± 0.004	< 0.013
04-25-23	252	0.013 ± 0.004	< 0.018
05-03-23	347	0.007 ± 0.003	< 0.012
05-09-23	254	0.013 ± 0.003	< 0.012
05-17-23	351	0.024 ± 0.003	< 0.010
05-24-23	302	0.023 ± 0.003	NS[a]
05-31-23	293	0.022 ± 0.003	< 0.019
06-07-23		NS[a]	
06-13-23	255	0.011 ± 0.003	< 0.011
06-21-23	344	0.018 ± 0.003	< 0.011
06-28-23		NS[a]	
2nd Quarter Mean ± s.d.		0.019 ± 0.007	< 0.013

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
[b] 07-03-23	227	0.028 ± 0.004	< 0.009
07-12-23	298	0.018 ± 0.003	< 0.019
07-19-23	306	0.018 ± 0.003	< 0.011
07-25-23	263	0.021 ± 0.004	< 0.020
08-02-23	341	0.022 ± 0.003	< 0.017
08-09-23	292	0.027 ± 0.004	< 0.016
08-16-23	310	0.021 ± 0.003	< 0.021
08-22-23	263	0.024 ± 0.004	< 0.017
08-30-23	349	0.018 ± 0.003	< 0.012
09-07-23	329	0.028 ± 0.004	< 0.017
09-13-23	271	0.016 ± 0.004	< 0.010
09-20-23	300	0.022 ± 0.003	< 0.021
09-27-23	289	0.041 ± 0.004	< 0.009
10-03-23	263	0.051 ± 0.005	< 0.008
3rd Quarter Mean ± s.d.		0.025 ± 0.010	< 0.015
10-11-23	348	0.003 ± 0.004	< 0.010
10-18-23	311	0.011 ± 0.003	< 0.013
10-25-23	311	0.030 ± 0.004	< 0.008
11-01-23	312	0.023 ± 0.003	< 0.009
11-07-23	287	0.044 ± 0.005	< 0.015
11-15-23	304	0.019 ± 0.003	< 0.008
11-21-23	259	0.032 ± 0.004	< 0.010
11-29-23	353	0.028 ± 0.003	< 0.009
12-06-23	300	0.033 ± 0.004	< 0.011
12-14-23	339	0.035 ± 0.004	< 0.011
12-20-23	256	0.044 ± 0.005	< 0.009
12-27-23	297	0.048 ± 0.005	< 0.014
01-03-24	304	0.019 ± 0.004	< 0.007
4th Quarter Mean ± s.d.		0.028 ± 0.013	< 0.010
Cumulative Average		0.025 ± 0.010	< 0.013
Indicator Locations Annual Mean ± s.d.		**0.026 ± 0.010**	**< 0.013**

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.
[b] Sampler found not running due to a tripped fuse.

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-20, Silver Lake
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131	Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030	Required LLD		0.010	0.030
01-04-23	316	0.053 ± 0.005	< 0.018	07-05-23	303	0.028 ± 0.004	< 0.006
01-11-23	319	0.037 ± 0.004	< 0.007	07-12-23	308	0.015 ± 0.003	< 0.017
01-18-23	307	0.026 ± 0.004	< 0.011	07-19-23	303	0.018 ± 0.003	< 0.011
01-26-23	349	0.024 ± 0.004	< 0.012	07-26-23	298	0.026 ± 0.004	< 0.018
02-01-23	272	0.028 ± 0.004	< 0.016	08-02-23	307	0.021 ± 0.003	< 0.015
02-08-23	303	0.037 ± 0.004	< 0.018	08-09-23	296	0.029 ± 0.004	< 0.015
02-15-23	317	0.027 ± 0.004	< 0.015	08-16-23	309	0.023 ± 0.004	< 0.023
02-21-23	268	0.026 ± 0.004	< 0.015	08-22-23	260	0.028 ± 0.004	< 0.016
02-28-23	304	0.022 ± 0.004	< 0.010	08-30-23	348	0.023 ± 0.003	< 0.012
03-08-23	362	0.025 ± 0.003	< 0.013	09-07-23	331	0.029 ± 0.004	< 0.017
03-15-23	313	0.021 ± 0.004	< 0.011	09-13-23	270	0.013 ± 0.003	< 0.010
03-22-23	312	0.027 ± 0.004	< 0.011	09-20-23	300	0.025 ± 0.003	< 0.021
03-28-23	267	0.032 ± 0.005	< 0.008	09-27-23	305	0.046 ± 0.004	< 0.009
				10-03-23	258	0.044 ± 0.005	< 0.008
1st Quarter Mean ± s.d.		0.030 ± 0.009	< 0.013	3rd Quarter Mean ± s.d.		0.026 ± 0.009	< 0.014
04-06-23	400	0.025 ± 0.003	< 0.007	10-11-23	362	0.005 ± 0.004	< 0.009
04-13-23	301	0.031 ± 0.004	< 0.013	10-18-23	302	0.014 ± 0.003	< 0.014
04-19-23	278	0.020 ± 0.004	< 0.013	10-25-23	307	0.028 ± 0.004	< 0.008
04-25-23	255	0.017 ± 0.004	< 0.017	11-01-23	319	0.026 ± 0.003	< 0.008
05-03-23	340	0.025 ± 0.004	< 0.012				
				11-07-23	303	0.039 ± 0.004	< 0.014
05-09-23	258	0.017 ± 0.004	< 0.012	11-15-23	307	0.018 ± 0.003	< 0.008
05-17-23	350	0.020 ± 0.003	< 0.010	11-21-23	263	0.038 ± 0.005	< 0.010
05-24-23	295	0.018 ± 0.003	NS[a]	11-29-23	345	0.025 ± 0.003	< 0.009
05-31-23	295	0.020 ± 0.003	< 0.019				
				12-06-23	301	0.040 ± 0.004	< 0.011
06-07-23	319	0.029 ± 0.004	< 0.017	12-14-23	341	0.034 ± 0.004	< 0.010
06-13-23	262	0.013 ± 0.003	< 0.011	12-20-23	260	0.042 ± 0.005	< 0.009
06-21-23	351	0.021 ± 0.003	< 0.011	12-27-23	299	0.047 ± 0.005	< 0.014
06-28-23	308	0.024 ± 0.003	< 0.009	01-03-24	309	0.017 ± 0.004	< 0.007
2nd Quarter Mean ± s.d.		0.021 ± 0.005	< 0.012	4th Quarter Mean ± s.d.		0.029 ± 0.013	< 0.010
				Cumulative Average		0.026 ± 0.009	< 0.012
				Control Annual Mean ± s.d.		0.027 ± 0.010	< 0.012

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

POINT BEACH NUCLEAR PLANT

Table 2. Gamma emitters in quarterly composites of air particulate filters

Units: pCi/m^3

Location	Lab Code	Be-7	Be-7	Cs-134	Cs-134	Cs-137	Cs-137	(Other) Co-60	(Other) (Co-60)	Volume
	Req. LLD	-	MDC	0.01	MDC	0.01	MDC	(0.10)	MDC	m^3
					1st Quarter					
E-01	EAP- 822	0.058 ± 0.013	-	-0.0003 ± 0.0005	< 0.0009	0.0000 ± 0.0006	< 0.0009	0.0004 ± 0.0006	< 0.0009	3919
E-02	- 823	0.059 ± 0.011	-	-0.0004 ± 0.0003	< 0.0006	0.0002 ± 0.0003	< 0.0006	0.0001 ± 0.0004	< 0.0006	3947
E-03	- 824	0.056 ± 0.009	-	-0.0030 ± 0.0005	< 0.0007	-0.0003 ± 0.0004	< 0.0006	0.0004 ± 0.0004	< 0.0007	3926
E-04	- 825	0.043 ± 0.008	-	0.0000 ± 0.0003	< 0.0006	0.0001 ± 0.0004	< 0.0008	-0.0004 ± 0.0004	< 0.0005	3920
E-08	- 826	0.077 ± 0.012	-	-0.0003 ± 0.0004	< 0.0007	-0.0001 ± 0.0005	< 0.0007	0.0002 ± 0.0005	< 0.0006	3925
E-20	- 827	0.063 ± 0.009	-	-0.0003 ± 0.0003	< 0.0006	0.0004 ± 0.0004	< 0.0005	-0.0001 ± 0.0004	< 0.0004	4008
					2nd Quarter					
E-01	EAP- 2066	0.081 ± 0.016	-	0.0001 ± 0.0005	< 0.0009	0.0001 ± 0.0005	< 0.0007	0.0000 ± 0.0006	< 0.0005	3971
E-02	- 2067	0.082 ± 0.017	-	0.0002 ± 0.0006	< 0.0008	0.0001 ± 0.0005	< 0.0007	-0.0001 ± 0.0006	< 0.0005	3961
E-03	- 2068	0.072 ± 0.016	-	0.0004 ± 0.0005	< 0.0011	-0.0002 ± 0.0005	< 0.0007	0.0005 ± 0.0006	< 0.0008	3951
E-04	- 2069	0.076 ± 0.017	-	0.0003 ± 0.0004	< 0.0007	-0.0002 ± 0.0005	< 0.0004	-0.0002 ± 0.0006	< 0.0008	3959
E-08	- 2070	0.073 ± 0.019	-	0.0003 ± 0.0006	< 0.0010	0.0002 ± 0.0006	< 0.0008	-0.0001 ± 0.0006	< 0.0008	3350
E-20	- 2071	0.072 ± 0.015	-	0.0000 ± 0.0006	< 0.0009	-0.0001 ± 0.0005	< 0.0006	0.0001 ± 0.0004	< 0.0005	4012
					3rd Quarter					
E-01	EAP- 3147	0.086 ± 0.017	-	-0.0002 ± 0.0004	< 0.0009	0.0003 ± 0.0005	< 0.0014	-0.0008 ± 0.0008	< 0.0019	2866
E-02	- 3148	0.071 ± 0.008	-	-0.0001 ± 0.0002	< 0.0005	0.0003 ± 0.0003	< 0.0008	0.0002 ± 0.0003	< 0.0010	4198
E-03	- 3149	0.075 ± 0.003	-	0.0001 ± 0.0001	< 0.0002	0.0005 ± 0.0004	< 0.0003	0.0003 ± 0.0005	< 0.0005	4225
E-04	- 3150	0.072 ± 0.014	-	0.0000 ± 0.0003	< 0.0007	0.0003 ± 0.0004	< 0.0011	0.0001 ± 0.0004	< 0.0015	4253
E-08	- 3151	0.077 ± 0.013	-	-0.0002 ± 0.0004	< 0.0006	-0.0008 ± 0.0006	< 0.0010	-0.0001 ± 0.0006	< 0.0013	4099
E-20	- 3152	0.072 ± 0.013	-	0.0000 ± 0.0003	< 0.0007	0.0001 ± 0.0004	< 0.0010	0.0003 ± 0.0004	< 0.0013	4195
					4th Quarter					
E-01	EAP- 4107	0.049 ± 0.013	-	-0.0002 ± 0.0005	< 0.0008	0.0001 ± 0.0006	< 0.0007	0.0006 ± 0.0006	< 0.0007	3980
E-02	- 4108	0.044 ± 0.011	-	0.0002 ± 0.0006	< 0.0012	0.0002 ± 0.0006	< 0.0010	0.0001 ± 0.0006	< 0.0008	3987
E-03	- 4109	0.046 ± 0.012	-	-0.0002 ± 0.0006	< 0.0010	0.0000 ± 0.0005	< 0.0006	-0.0001 ± 0.0005	< 0.0006	4023
E-04	- 4110	0.051 ± 0.012	-	0.0002 ± 0.0005	< 0.0010	-0.0002 ± 0.0005	< 0.0007	0.0002 ± 0.0004	< 0.0008	4045
E-08	- 4111	0.054 ± 0.013	-	-0.0006 ± 0.0005	< 0.0010	-0.0002 ± 0.0005	< 0.0007	0.0004 ± 0.0005	< 0.0009	3980
E-20	- 4112	0.038 ± 0.011	-	0.0000 ± 0.0005	< 0.0011	-0.0001 ± 0.0006	< 0.0007	0.0001 ± 0.0006	< 0.0007	4015
Annual Mean±s.d.		**0.064 ± 0.014**		**-0.0002 ± 0.0006**	**< 0.0008**	**0.0000 ± 0.0003**	**< 0.0007**	**0.0001 ± 0.0003**	**< 0.0008**	

POINT BEACH NUCLEAR PLANT

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-11 Lambert Dairy Farm

Collection Date	01-11-23	MDC	02-09-23	MDC	03-08-23	MDC	Required LLD
Lab Code	EMI- 43		EMI- 271		EMI- 505		
Sr-89	0.2 ± 0.7	< 0.7	-0.5 ± 0.5	< 0.5	0.0 ± 0.6	< 0.7	5.0
Sr-90	0.4 ± 0.3	< 0.5	0.7 ± 0.3	< 0.6	0.5 ± 0.3	< 0.5	1.0
I-131	0.06 ± 0.15	< 0.29	-0.13 ± 0.19	< 0.44	0.10 ± 0.17	< 0.29	0.5
K-40	1371 ± 110	-	1298 ± 49	-	1410 ± 45	-	
Cs-134	-0.5 ± 1.9	< 3.4	-0.3 ± 0.8	< 1.7	-0.4 ± 0.6	< 1.2	5.0
Cs-137	-1.0 ± 2.1	< 3.3	0.3 ± 1.0	< 1.8	1.6 ± 0.8	< 1.6	5.0
Ba-La-140	0.6 ± 1.7	< 2.0	0.0 ± 1.0	< 2.1	0.0 ± 0.7	< 1.4	5.0
Other (Co-60)	1.4 ± 2.4	< 3.2	0.4 ± 1.1	< 2.0	0.3 ± 0.9	< 1.5	15.0

Collection Date	04-12-23	MDC	05-10-23	MDC	06-15-23	MDC	Required LLD
Lab Code	EMI- 859		EMI- 1179		EMI- 1570		
Sr-89	0.5 ± 0.6	< 0.7	-0.1 ± 0.6	< 0.6	0.2 ± 0.7	< 0.7	5.0
Sr-90	0.3 ± 0.3	< 0.5	0.7 ± 0.3	< 0.5	0.5 ± 0.5	< 0.8	1.0
I-131	0.01 ± 0.11	< 0.19	0.01 ± 0.12	< 0.22	-0.02 ± 0.13	< 0.25	0.5
K-40	1420 ± 113	-	1424 ± 106	-	1321 ± 68	-	
Cs-134	-1.7 ± 1.8	< 3.4	-1.1 ± 1.5	< 2.8	-0.7 ± 1.3	< 2.5	5.0
Cs-137	-1.0 ± 2.4	< 3.6	2.5 ± 1.7	< 3.3	0.6 ± 1.5	< 2.3	5.0
Ba-La-140	-2.7 ± 2.0	< 2.5	-1.8 ± 1.4	< 0.9	-1.6 ± 1.6	< 2.5	5.0
Other (Co-60)	0.8 ± 2.9	< 3.6	-0.2 ± 2.1	< 2.7	-2.0 ± 1.6	< 1.9	15.0

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-11 Lambert Dairy Farm

Collection Date	07-12-23	MDC	08-09-23	MDC	09-13-23	MDC	Required LLD
Lab Code	EMI- 1933		EMI- 2379		EMI- 2686		
Sr-89	0.2 ± 0.7	< 0.7	0.3 ± 0.6	< 0.7	0.1 ± 0.9	< 1.2	5.0
Sr-90	0.5 ± 0.3	< 0.6	0.3 ± 0.3	< 0.5	-0.1 ± 0.3	< 0.8	1.0
I-131	0.04 ± 0.11	< 0.20	0.04 ± 0.17	< 0.31	0.05 ± 0.19	< 0.38	0.5
K-40	1302 ± 42	-	1358 ± 86	-	1277 ± 84	-	
Cs-134	-0.1 ± 0.7	< 1.5	0.0 ± 0.7	< 2.7	-1.4 ± 1.5	< 3.0	5.0
Cs-137	2.6 ± 0.9	< 2.3	2.1 ± 0.9	< 4.3	1.1 ± 1.9	< 4.7	5.0
Ba-La-140	0.5 ± 0.9	< 1.9	0.0 ± 0.7	< 1.9	0.4 ± 1.6	< 1.8	5.0
Other (Co-60)	2.3 ± 0.9	< 2.6	1.5 ± 1.0	< 5.2	1.9 ± 1.8	< 5.1	15.0

Collection Date	10-11-23	MDC	11-08-23	MDC	12-13-23	MDC	Required LLD
Lab Code	EMI- 3059		EMI- 3448		EMI- 3875		
Sr-89	-0.4 ± 0.7	< 0.7	0.1 ± 0.7	< 0.7	0.4 ± 0.8	< 0.7	5.0
Sr-90	0.7 ± 0.3	< 0.5	0.4 ± 0.3	< 0.6	0.5 ± 0.4	< 0.7	1.0
I-131	0.00 ± 0.22	< 0.41	-0.14 ± 0.13	< 0.25	0.04 ± 0.13	< 0.23	0.5
K-40	1247 ± 39	-	1278 ± 66	-	1277 ± 90	-	
Cs-134	0.4 ± 0.8	< 1.3	-0.7 ± 1.3	< 2.5	-0.7 ± 1.7	< 3.0	5.0
Cs-137	-3.8 ± 3.2	< 2.1	-0.3 ± 1.5	< 2.0	0.8 ± 2.0	< 3.5	5.0
Ba-La-140	0.2 ± 0.6	< 0.7	-1.0 ± 1.5	< 2.4	-1.6 ± 1.6	< 2.1	5.0
Other (Co-60)	-0.1 ± 3.3	< 2.3	0.6 ± 1.6	< 2.9	1.5 ± 1.8	< 2.3	15.0

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-21 Strutz Dairy Farm

Collection Date	01-11-23	MDC	02-08-23	MDC	03-08-23	MDC	Required LLD
Lab Code	EMI- 44		EMI- 241		EMI- 506		
Sr-89	-0.4 ± 0.6	< 0.7	0.1 ± 0.4	< 0.5	0.1 ± 0.5	< 0.7	5.0
Sr-90	0.6 ± 0.3	< 0.5	0.2 ± 0.3	< 0.5	0.2 ± 0.3	< 0.5	1.0
I-131	0.08 ± 0.18	< 0.33	-0.14 ± 0.11	< 0.21	0.02 ± 0.20	< 0.40	0.5
K-40	1351 ± 96	-	1169 ± 41	-	1350 ± 68	-	
Cs-134	-0.4 ± 1.4	< 2.5	0.2 ± 0.8	< 1.5	-1.7 ± 1.3	< 2.6	5.0
Cs-137	2.0 ± 1.8	< 3.2	0.5 ± 0.8	< 2.6	0.1 ± 1.5	< 3.0	5.0
Ba-La-140	0.4 ± 1.7	< 2.5	0.0 ± 0.7	< 1.4	-0.7 ± 4.7	< 2.8	5.0
Other (Co-60)	-1.6 ± 1.9	< 2.2	0.0 ± 1.0	< 3.0	-1.5 ± 1.6	< 1.9	15.0

Collection Date	04-12-23	MDC	05-10-23	MDC	06-14-23	MDC	Required LLD
Lab Code	EMI- 860		EMI- 1180		EMI- 1565		
Sr-89	0.3 ± 0.6	< 0.7	0.1 ± 0.6	< 0.6	-0.1 ± 0.5	< 0.5	5.0
Sr-90	0.3 ± 0.3	< 0.5	0.2 ± 0.3	< 0.6	0.5 ± 0.3	< 0.6	1.0
I-131	-0.01 ± 0.11	< 0.20	0.02 ± 0.13	< 0.23	0.04 ± 0.15	< 0.27	0.5
K-40	1481 ± 73	-	1301 ± 110	-	1357 ± 66	-	
Cs-134	0.0 ± 1.1	< 1.8	-0.5 ± 1.3	< 2.2	0.0 ± 1.3	< 2.4	5.0
Cs-137	0.9 ± 1.2	< 2.2	-1.0 ± 1.8	< 3.2	0.7 ± 1.5	< 2.7	5.0
Ba-La-140	-1.2 ± 1.2	< 1.6	-2.1 ± 1.9	< 1.5	-1.9 ± 1.5	< 2.1	5.0
Other (Co-60)	0.1 ± 1.5	< 2.2	1.7 ± 2.3	< 2.4	1.2 ± 1.6	< 2.9	15.0

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-21 Strutz Dairy Farm

Collection Date	07-12-23	MDC	08-09-23	MDC	09-13-23	MDC	Required LLD
Lab Code	EMI- 1934		EMI- 2380		EMI- 2687		
Sr-89	-0.1 ± 0.7	< 0.8	0.2 ± 0.6	< 0.8	-0.2 ± 0.8	< 1.0	5.0
Sr-90	0.4 ± 0.3	< 0.6	0.1 ± 0.3	< 0.5	0.2 ± 0.3	< 0.7	1.0
I-131	-0.02 ± 0.10	< 0.19	0.00 ± 0.13	< 0.24	0.01 ± 0.23	< 0.49	0.5
K-40	1346 ± 69	-	1249 ± 65	-	1234 ± 121	-	
Cs-134	-1.3 ± 1.3	< 2.5	0.2 ± 1.3	< 2.4	-3.6 ± 2.6	< 4.6	5.0
Cs-137	-0.8 ± 1.5	< 2.0	0.9 ± 1.6	< 3.0	-0.6 ± 2.9	< 4.1	5.0
Ba-La-140	-2.9 ± 1.4	< 2.8	-0.1 ± 1.5	< 3.0	1.3 ± 2.9	< 1.9	5.0
Other (Co-60)	0.7 ± 1.4	< 2.8	0.0 ± 1.6	< 2.6	-0.6 ± 3.2	< 3.4	15.0

Collection Date	10-11-23	MDC	11-08-23	MDC	12-13-23	MDC	Required LLD
Lab Code	EMI- 3060		EMI- 3449		EMI- 3876		
Sr-89	-0.4 ± 0.7	< 0.8	-0.4 ± 0.8	< 0.8	0.1 ± 0.7	< 0.8	5.0
Sr-90	0.6 ± 0.3	< 0.5	0.7 ± 0.4	< 0.6	0.1 ± 0.3	< 0.7	1.0
I-131	0.12 ± 0.19	< 0.36	-0.25 ± 0.13	< 0.25	-0.04 ± 0.17	< 0.35	0.5
K-40	1310 ± 76	-	1285 ± 69	-	1313 ± 42	-	
Cs-134	-0.4 ± 1.4	< 2.6	-1.9 ± 1.3	< 2.3	-0.7 ± 0.7	< 1.4	5.0
Cs-137	2.3 ± 1.6	< 4.2	0.1 ± 1.4	< 1.8	-0.2 ± 0.5	< 2.2	5.0
Ba-La-140	-1.4 ± 1.2	< 1.5	-0.2 ± 1.1	< 1.3	0.1 ± 0.7	< 1.0	5.0
Other (Co-60)	1.4 ± 1.7	< 4.3	-0.5 ± 1.4	< 1.2	0.2 ± 0.5	< 2.3	15.0

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-40 Barta

Collection Date	01-11-23	MDC	02-08-23	MDC	03-08-23	MDC	Required LLD
Lab Code	EMI- 46		EMI- 242		EMI- 507		
Sr-89	-0.1 ± 0.6	< 0.6	-0.2 ± 0.5	< 0.6	-0.4 ± 0.6	< 0.6	5.0
Sr-90	0.4 ± 0.3	< 0.4	0.2 ± 0.3	< 0.6	0.5 ± 0.3	< 0.5	1.0
I-131	-0.07 ± 0.10	< 0.18	-0.12 ± 0.11	< 0.21	-0.10 ± 0.22	< 0.41	0.5
K-40	1471 ± 91	-	1341 ± 69	-	1339 ± 46	-	
Cs-134	-1.6 ± 1.3	< 2.1	-0.6 ± 1.4	< 2.5	0.1 ± 0.8	< 1.7	5.0
Cs-137	0.8 ± 4.2	< 3.2	0.0 ± 1.6	< 1.8	0.6 ± 0.9	< 1.9	5.0
Ba-La-140	0.5 ± 1.6	< 2.0	-3.5 ± 1.7	< 1.6	-1.1 ± 0.9	< 1.6	5.0
Other (Co-60)	-0.4 ± 1.9	< 2.4	1.2 ± 1.6	< 3.2	0.2 ± 1.1	< 1.7	15.0

Collection Date	04-12-23	MDC	05-10-23	MDC	06-14-23	MDC	Required LLD
Lab Code	EMI- 861		EMI- 1181		EMI- 1566		
Sr-89	0.1 ± 0.5	< 0.6	0.2 ± 0.5	< 0.5	0.3 ± 0.6	< 0.6	5.0
Sr-90	0.3 ± 0.3	< 0.5	0.6 ± 0.3	< 0.4	0.3 ± 0.4	< 0.7	1.0
I-131	-0.04 ± 0.12	< 0.22	0.12 ± 0.21	< 0.40	-0.12 ± 0.14	< 0.28	0.5
K-40	1412 ± 79	-	1389 ± 78	-	1346 ± 69	-	
Cs-134	1.1 ± 1.3	< 2.7	-0.7 ± 1.1	< 2.0	0.1 ± 1.3	< 2.5	5.0
Cs-137	0.8 ± 1.7	< 3.5	-1.3 ± 1.5	< 2.6	-0.8 ± 1.5	< 2.3	5.0
Ba-La-140	0.4 ± 1.2	< 2.4	0.3 ± 1.2	< 1.8	-2.7 ± 1.4	< 2.8	5.0
Other (Co-60)	0.3 ± 1.8	< 2.8	-0.3 ± 1.5	< 2.9	-1.9 ± 1.7	< 2.9	15.0

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-40 Barta

Collection Date	07-12-23	MDC	08-09-23	MDC	09-13-23	MDC	Required LLD
Lab Code	EMI- 1935		EMI- 2381		EMI- 2688		
Sr-89	0.2 ± 0.6	< 0.6	0.0 ± 0.6	< 0.7	0.7 ± 1.1	< 1.3	5.0
Sr-90	0.1 ± 0.3	< 0.5	0.1 ± 0.3	< 0.5	-0.2 ± 0.4	< 0.9	1.0
I-131	-0.01 ± 0.13	< 0.27	-0.02 ± 0.13	< 0.23	0.19 ± 0.20	< 0.38	0.5
K-40	1344 ± 71	-	1358 ± 86	-	1232 ± 84	-	
Cs-134	-0.1 ± 1.3	< 2.5	-0.1 ± 1.4	< 2.7	-0.9 ± 1.3	< 2.4	5.0
Cs-137	0.6 ± 1.6	< 3.2	1.7 ± 1.9	< 4.3	1.1 ± 1.5	< 3.3	5.0
Ba-La-140	0.8 ± 4.9	< 4.2	-0.8 ± 1.4	< 1.9	-1.2 ± 1.4	< 1.6	5.0
Other (Co-60)	-0.5 ± 1.8	< 3.6	2.1 ± 1.7	< 5.2	0.1 ± 1.6	< 2.9	15.0

Collection Date	10-11-23	MDC	11-08-23	MDC	12-13-23	MDC	Required LLD
Lab Code	EMI- 3061		EMI- 3450		EMI- 3877		
Sr-89	0.3 ± 0.7	< 0.7	0.2 ± 0.8	< 0.9	-0.1 ± 0.6	< 0.6	5.0
Sr-90	0.3 ± 0.3	< 0.6	0.2 ± 0.4	< 0.8	0.5 ± 0.3	< 0.6	1.0
I-131	0.13 ± 0.22	< 0.41	-0.15 ± 0.13	< 0.26	-0.03 ± 0.17	< 0.35	0.5
K-40	1350 ± 115	-	1354 ± 79	-	1351 ± 36	-	
Cs-134	-2.3 ± 2.5	< 4.6	0.1 ± 1.1	< 2.0	-0.3 ± 0.6	< 1.1	5.0
Cs-137	0.4 ± 2.9	< 2.8	0.3 ± 1.4	< 2.3	0.6 ± 0.7	< 1.3	5.0
Ba-La-140	-0.8 ± 2.5	< 2.1	-0.3 ± 1.0	< 1.9	-0.6 ± 0.6	< 1.0	5.0
Other (Co-60)	-1.8 ± 2.8	< 2.8	0.4 ± 1.7	< 3.1	0.2 ± 0.7	< 1.1	15.0

Sr-89 Annual Mean + s.d.	**0.1 ± 0.3**
Sr-90 Annual Mean + s.d.	**0.4 ± 0.2**
I-131 Annual Mean + s.d.	**-0.01 ± 0.09**
K-40 Annual Mean + s.d.	**1334 ± 67**
Cs-134 Annual Mean + s.d.	**-0.6 ± 0.9**
Cs-137 Annual Mean + s.d.	**0.4 ± 1.3**
Ba-La Annual Mean + s.d.	**-0.7 ± 1.2**
Co-60 Annual Mean + s.d.	**0.3 ± 1.1**

Table 4. Radioactivity in Well Water Samples, E-10
Collection: Quarterly
Units: pCi/L

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Req. LLD
Collection Date	01-18-23	04-12-23	07-19-23	10-10-23	
Lab Code	EWW- 114	EWW- 880	EWW- 2085	EWW- 3071	
Gross Beta	1.4 ± 1.2	0.7 ± 1.0	1.8 ± 1.1	1.2 ± 0.7	4.0
H-3	120 ± 86[a]	137 ± 83	131 ± 84	-68 ± 74	500
Sr-89	0.3 ± 0.4	-0.1 ± 0.4	-0.4 ± 0.4	0.3 ± 0.4	5.0
Sr-90	-0.1 ± 0.2	0.0 ± 0.2	0.0 ± 0.2	-0.5 ± 0.2	1.0
I-131	0.04 ± 0.18	-0.02 ± 0.18	-0.06 ± 0.15	0.10 ± 0.20	0.5
Mn-54	-2.8 ± 3.2	0.9 ± 1.7	-3.7 ± 2.1	-0.5 ± 4.8	10
Fe-59	-6.3 ± 6.4	0.5 ± 3.7	-2.6 ± 5.2	7.8 ± 10.3	30
Co-58	-2.1 ± 3.6	-0.7 ± 1.5	0.7 ± 2.2	-2.8 ± 4.5	10
Co-60	0.9 ± 3.1	1.5 ± 1.9	1.4 ± 3.0	-1.4 ± 6.4	10
Zn-65	-18.5 ± 10.3	-2.2 ± 4.6	2.7 ± 5.0	-26.2 ± 18.2	30
Zr-Nb-95	-1.6 ± 4.2	-3.3 ± 1.9	-3.5 ± 2.9	1.7 ± 6.1	15
Cs-134	-5.9 ± 3.5	-0.5 ± 1.6	-1.2 ± 2.3	-22.0 ± 7.5	10
Cs-137	0.6 ± 3.7	-1.9 ± 2.0	3.1 ± 2.6	-1.1 ± 5.9	10
Ba-La-140	1.9 ± 3.2	0.4 ± 2.3	0.5 ± 2.5	-7.1 ± 16.0	15
Other (Ru-103)	0.5 ± 2.9	-0.3 ± 1.8	-0.4 ± 2.3	-2.5 ± 4.5	30

[a]Tritium recount = 86 ± 81 pCi/L. MDA < 164 pCi/L.

MDC Data

Collection Date	01-18-23	04-12-23	07-19-23	10-10-23	
Lab Code	EWW- 114	EWW- 880	EWW- 2085	EWW- 3071	
Gross Beta	< 2.1	< 1.8	< 2.0	< 1.1	4.0
H-3	< 160	< 161	< 162	< 170	500
Sr-89	< 0.5	< 0.5	< 0.5	< 0.6	5.0
Sr-90	< 0.5	< 0.5	< 0.4	< 0.6	1.0
I-131	< 0.36	< 0.37	< 0.28	< 0.36	0.5
Mn-54	< 4.9	< 2.3	< 1.8	< 7.2	10
Fe-59	< 4.7	< 5.3	< 5.5	< 11.9	30
Co-58	< 4.8	< 2.4	< 2.2	< 5.7	10
Co-60	< 4.1	< 3.2	< 8.3	< 9.4	10
Zn-65	< 12.5	< 5.6	< 7.9	< 16.7	30
Zr-Nb-95	< 6.8	< 2.6	< 4.2	< 8.9	15
Cs-134	< 6.2	< 3.2	< 4.6	< 9.4	10
Cs-137	< 6.6	< 2.6	< 6.6	< 7.1	10
Ba-La-140	< 2.9	< 3.3	< 3.8	< 4.4	15
Other (Ru-103)	< 5.0	< 3.1	< 3.1	< 3.9	30

Table 5. Lake water, analyses for gross beta, iodine-131 and gamma emitting isotopes.
Location: E-01 (Meteorological Tower)
Collection: Monthly composites
Units: pCi/L

		MDC		MDC		MDC		MDC	
Lab Code	ELW- 38		ELW- 269		ELW- 517		ELW- 862		
Date Collected	01-10-23		02-08-23		03-08-23		04-12-23		Req. LLD
Gross beta	1.7 ± 0.6	< 1.0	2.0 ± 0.6	< 0.8	1.9 ± 0.6	< 0.9	1.4 ± 0.6	< 0.9	4.0
I-131	-0.03 ± 0.11	< 0.20	-0.09 ± 0.21	< 0.47	0.00 ± 0.16	< 0.28	-0.05 ± 0.11	< 0.20	0.5
Be-7	-2.4 ± 10.4	< 18.3	4.8 ± 12.0	< 15.6	-5.2 ± 7.6	< 12.3	-0.7 ± 10.4	< 18.1	
Mn-54	1.8 ± 1.6	< 2.3	0.9 ± 1.5	< 3.1	-0.3 ± 1.1	< 1.8	-1.0 ± 1.7	< 2.1	10
Fe-59	-0.8 ± 2.6	< 4.0	-0.3 ± 2.8	< 4.4	-1.6 ± 2.2	< 2.8	-2.0 ± 3.2	< 5.7	30
Co-58	-1.7 ± 1.8	< 2.1	0.9 ± 1.5	< 2.4	-0.5 ± 1.0	< 1.5	0.7 ± 1.8	< 3.2	10
Co-60	1.3 ± 1.6	< 1.7	0.7 ± 1.2	< 2.1	0.5 ± 1.4	< 2.3	-1.4 ± 1.8	< 1.6	10
Zn-65	-1.6 ± 3.0	< 4.1	0.7 ± 3.3	< 4.1	0.5 ± 2.2	< 4.0	1.3 ± 3.3	< 4.5	30
Zr-Nb-95	-0.7 ± 1.8	< 2.6	-0.6 ± 1.5	< 2.9	-1.2 ± 1.2	< 1.8	-0.3 ± 1.8	< 2.8	15
Cs-134	-0.5 ± 1.6	< 2.5	0.1 ± 1.3	< 2.8	-0.3 ± 1.1	< 2.0	1.5 ± 1.3	< 1.8	10
Cs-137	0.8 ± 1.9	< 2.9	0.4 ± 1.7	< 2.9	1.1 ± 1.2	< 2.1	1.6 ± 1.7	< 2.8	10
Ba-La-140	0.9 ± 2.1	< 2.1	-1.9 ± 1.8	< 4.0	-0.8 ± 1.4	< 1.9	1.5 ± 1.7	< 2.0	15
Other (Ru-103)	-0.9 ± 1.1	< 2.0	-2.1 ± 1.5	< 1.9	-0.3 ± 0.9	< 1.6	0.5 ± 1.3	< 1.8	30
Lab Code	ELW- 1169		ELW- 1562		ELW- 1936		ELW- 2339		
Date Collected	05-09-23		06-13-23		07-12-23		08-08-23		Req. LLD
Gross beta	1.0 ± 0.5	< 0.9	1.3 ± 0.6	< 0.9	1.1 ± 0.5	< 0.9	0.6 ± 0.5	< 0.8	4.0
I-131	0.00 ± 0.11	< 0.20	-0.08 ± 0.13	< 0.24	-0.03 ± 0.12	< 0.22	0.06 ± 0.12	< 0.21	0.5
Be-7	-6.4 ± 9.9	< 19.8	4.9 ± 10.4	< 14.2	8.4 ± 18.6	< 25.0	-3.8 ± 23.2	< 35.5	
Mn-54	0.6 ± 1.6	< 2.6	0.9 ± 1.3	< 1.5	2.5 ± 2.0	< 2.7	2.5 ± 2.9	< 4.0	10
Fe-59	1.4 ± 2.8	< 7.5	-1.9 ± 2.4	< 5.0	-0.7 ± 4.4	< 7.9	-9.9 ± 6.5	< 5.0	30
Co-58	-1.0 ± 1.4	< 2.7	0.2 ± 1.0	< 1.4	-0.4 ± 2.1	< 2.9	-0.6 ± 2.6	< 3.0	10
Co-60	-0.4 ± 1.6	< 2.2	0.6 ± 1.2	< 1.5	-1.9 ± 2.6	< 2.8	-0.2 ± 3.3	< 8.6	10
Zn-65	-1.5 ± 3.5	< 4.9	0.4 ± 2.8	< 3.4	-0.2 ± 4.2	< 4.5	-4.2 ± 7.2	< 7.2	30
Zr-Nb-95	-2.3 ± 1.5	< 2.4	-1.4 ± 1.2	< 1.9	-3.4 ± 2.3	< 3.2	-4.6 ± 2.9	< 2.6	15
Cs-134	-0.1 ± 1.3	< 2.7	0.8 ± 1.3	< 2.4	-1.3 ± 2.3	< 2.4	1.8 ± 2.5	< 5.1	10
Cs-137	1.3 ± 1.8	< 3.1	-0.4 ± 1.3	< 1.5	-0.4 ± 2.4	< 2.8	0.0 ± 3.2	< 6.9	10
Ba-La-140	-1.7 ± 1.4	< 3.1	-0.5 ± 1.6	< 3.0	1.1 ± 2.9	< 4.6	0.7 ± 2.1	< 4.3	15
Other (Ru-103)	0.3 ± 1.1	< 2.9	-0.4 ± 1.1	< 2.2	0.4 ± 2.0	< 3.5	-1.2 ± 2.8	< 3.4	30
Lab Code	ELW- 2677		ELW- 3068		ELW- 3444		ELW- 3872		
Date Collected	09-12-23		10-10-23		11-07-23		12-13-23		Req. LLD
Gross beta	0.7 ± 0.5	< 0.9	1.1 ± 0.5	< 0.9	1.5 ± 0.6	< 0.9	0.7 ± 0.5	< 1.0	4.0
I-131	0.01 ± 0.15	< 0.26	0.24 ± 0.25	< 0.46	-0.26 ± 0.14	< 0.28	-0.02 ± 0.15	< 0.27	0.5
Be-7	-27.9 ± 38.2	< 3.8	-35.5 ± 25.3	< 22.3	-8.8 ± 24.9	< 27.4	14.5 ± 14.2	< 27.8	
Mn-54	0.3 ± 5.7	< 7.8	-2.4 ± 3.3	< 4.4	2.2 ± 3.5	< 6.6	-0.1 ± 1.4	< 2.1	10
Fe-59	-3.7 ± 1.3	< 11.3	-2.4 ± 5.5	< 3.2	4.8 ± 6.4	< 6.9	-1.4 ± 3.1	< 2.3	30
Co-58	-1.1 ± 5.0	< 5.2	1.0 ± 2.3	< 2.2	-2.4 ± 3.1	< 4.7	0.3 ± 1.9	< 3.5	10
Co-60	2.6 ± 5.0	< 4.9	1.1 ± 2.9	< 7.7	-0.6 ± 3.5	< 3.9	1.2 ± 2.1	< 5.4	10
Zn-65	-20.0 ± 12.5	< 6.5	-4.5 ± 6.3	< 3.5	-9.5 ± 8.5	< 8.3	1.1 ± 3.7	< 6.7	30
Zr-Nb-95	-0.9 ± 7.3	< 6.5	1.3 ± 3.1	< 3.8	-0.8 ± 3.1	< 3.5	-1.6 ± 1.7	< 2.9	15
Cs-134	-8.4 ± 4.5	< 8.1	2.1 ± 3.2	< 4.6	-3.9 ± 3.6	< 6.2	-0.2 ± 1.5	< 2.7	10
Cs-137	0.5 ± 5.5	< 6.1	1.9 ± 3.1	< 7.9	-2.7 ± 3.6	< 4.4	2.5 ± 1.9	< 4.7	10
Ba-La-140	-5.0 ± 6.5	< 7.1	-1.2 ± 2.0	< 2.7	1.5 ± 4.0	< 3.8	-0.6 ± 1.4	< 1.8	15
Other (Ru-103)	-4.8 ± 4.3	< 4.5	-0.7 ± 2.7	< 2.8	-0.2 ± 2.8	< 3.1	-0.9 ± 1.6	< 1.8	30

Table 5. Lake water, analyses for gross beta, iodine-131 and gamma emitting isotopes.
Location: E-05 (Two Creeks Park)
Collection: Monthly composites Units: pCi/L

		MDC		MDC		MDC		MDC	
Lab Code	ELW- 39		ELW- 228		ELW- 518		ELW- 863		
Date Collected	01-10-23		02-07-23		03-08-23		04-12-23		Req. LLD
Gross beta	1.2 ± 0.5	< 0.9	1.1 ± 0.6	< 0.9	1.4 ± 0.6	< 0.9	1.1 ± 0.5	< 0.9	4.0
I-131	-0.15 ± 0.12	< 0.23	-0.05 ± 0.12	< 0.21	0.16 ± 0.21	< 0.37	0.01 ± 0.10	< 0.18	0.5
Be-7	-6.3 ± 4.1	< 15.2	16.8 ± 7.4	< 15.9	-7.5 ± 1.8	< 19.2	-3.4 ± 12.6	< 25.0	
Mn-54	0.2 ± 0.6	< 1.1	0.7 ± 1.2	< 2.0	0.4 ± 2.3	< 3.7	-1.0 ± 2.0	< 3.6	10
Fe-59	-1.4 ± 1.1	< 3.7	1.0 ± 2.2	< 4.5	-0.4 ± 4.9	< 6.8	-2.5 ± 3.1	< 4.5	30
Co-58	0.2 ± 0.6	< 1.7	-0.7 ± 1.1	< 1.5	-1.2 ± 2.4	< 3.1	1.0 ± 1.7	< 2.5	10
Co-60	0.0 ± 0.7	< 1.2	0.7 ± 1.5	< 2.7	-1.8 ± 2.8	< 3.7	-0.4 ± 1.9	< 2.4	10
Zn-65	-0.9 ± 1.3	< 3.0	-0.3 ± 2.3	< 2.8	-2.1 ± 5.0	< 6.2	1.3 ± 3.6	< 5.4	30
Zr-Nb-95	-1.8 ± 0.6	< 3.5	-0.7 ± 1.3	< 1.7	-0.9 ± 4.0	< 3.9	0.1 ± 1.7	< 3.9	15
Cs-134	-0.1 ± 0.6	< 1.0	0.2 ± 1.1	< 2.0	-3.3 ± 2.3	< 4.2	-0.9 ± 1.4	< 2.2	10
Cs-137	0.7 ± 0.7	< 1.1	0.3 ± 1.4	< 2.4	1.9 ± 2.4	< 3.8	-0.3 ± 2.0	< 2.7	10
Ba-La-140	-3.1 ± 0.7	< 2.9	-2.5 ± 3.2	< 1.7	-1.6 ± 2.4	< 2.5	-0.4 ± 2.1	< 2.0	15
Other (Ru-103)	-1.3 ± 0.5	< 2.0	-0.3 ± 0.9	< 1.6	-2.5 ± 2.2	< 2.7	-0.9 ± 1.3	< 2.0	30
Lab Code	ELW- 1170		ELW- 1563		ELW- 1937		ELW- 2340		
Date Collected	05-09-23		06-13-23		07-12-23		08-08-23		Req. LLD
Gross beta	1.1 ± 0.5	< 0.9	1.1 ± 0.5	< 0.9	0.7 ± 0.5	< 0.9	0.9 ± 0.5	< 0.9	4.0
I-131	0.10 ± 0.12	< 0.21	-0.02 ± 0.15	< 0.28	-0.02 ± 0.13	< 0.23	-0.09 ± 0.12	< 0.22	0.5
Be-7	9.0 ± 4.9	< 23.4	-4.5 ± 9.7	< 12.5	-12.1 ± 24.3	< 28.3	10.3 ± 32.6	< 62.4	
Mn-54	-0.1 ± 0.5	< 0.9	0.9 ± 1.5	< 1.9	4.3 ± 3.1	< 5.5	0.2 ± 4.3	< 6.2	10
Fe-59	2.0 ± 1.3	< 4.1	1.6 ± 2.1	< 4.6	-1.2 ± 6.6	< 8.4	-3.0 ± 11.4	< 10.0	30
Co-58	-1.4 ± 0.5	< 1.2	0.8 ± 1.2	< 1.8	3.1 ± 3.2	< 5.7	3.0 ± 3.8	< 7.2	10
Co-60	-0.7 ± 1.3	< 2.0	1.4 ± 1.3	< 1.9	0.6 ± 3.0	< 4.4	2.9 ± 4.5	< 5.3	10
Zn-65	1.6 ± 1.1	< 2.6	1.9 ± 2.7	< 3.8	1.6 ± 5.0	< 4.0	-13.8 ± 10.7	< 5.6	30
Zr-Nb-95	-2.3 ± 0.6	< 4.5	-1.3 ± 1.3	< 2.0	-2.8 ± 3.5	< 3.5	1.0 ± 4.8	< 6.9	15
Cs-134	0.1 ± 0.5	< 1.1	0.7 ± 1.3	< 2.4	-0.7 ± 2.9	< 5.2	3.2 ± 4.8	< 7.7	10
Cs-137	-1.7 ± 1.4	< 1.7	-0.7 ± 1.4	< 1.4	1.2 ± 3.6	< 6.1	0.8 ± 5.2	< 7.6	10
Ba-La-140	-17.8 ± 0.6	[a] < 25.5	-1.5 ± 1.8	< 2.6	2.0 ± 3.6	< 4.4	3.5 ± 5.1	< 6.0	15
Other (Ru-103)	-1.2 ± 0.6	< 2.8	-2.3 ± 1.2	< 2.2	2.7 ± 2.8	< 4.0	-3.4 ± 4.7	< 5.4	30
Lab Code	ELW- 2678		ELW- 3069		ELW- 3445		ELW- 3873		
Date Collected	09-12-23		10-10-23		11-07-23		12-13-23		Req. LLD
Gross beta	0.7 ± 0.5	< 0.8	1.4 ± 0.6	< 0.8	1.4 ± 0.6	< 0.8	1.4 ± 0.6	< 0.8	4.0
I-131	-0.10 ± 0.20	< 0.41	0.10 ± 0.22	< 0.40	-0.04 ± 0.15	< 0.28	-0.16 ± 0.14	< 0.27	0.5
Be-7	-14.1 ± 19.0	< 21.6	3.0 ± 35.2	< 56.8	3.0 ± 10.7	< 22.8	0.3 ± 12.3	< 22.8	
Mn-54	1.8 ± 2.6	< 5.1	0.3 ± 5.5	< 9.5	1.0 ± 1.5	< 2.1	-1.2 ± 1.6	< 2.1	10
Fe-59	-1.5 ± 4.5	< 3.2	3.5 ± 9.7	< 8.2	0.0 ± 2.6	< 4.5	-0.7 ± 2.8	< 3.9	30
Co-58	0.7 ± 2.2	< 3.8	1.5 ± 3.9	< 6.0	-1.1 ± 1.5	< 1.6	0.2 ± 1.5	< 1.6	10
Co-60	-0.8 ± 3.3	< 8.5	1.3 ± 6.0	< 5.1	0.5 ± 1.9	< 2.5	-0.6 ± 1.3	< 1.1	10
Zn-65	-1.8 ± 6.1	< 7.7	-9.0 ± 11.8	< 7.0	-0.6 ± 2.9	< 4.1	-0.5 ± 3.0	< 5.4	30
Zr-Nb-95	0.2 ± 2.6	< 4.1	-3.2 ± 5.7	< 7.2	-1.8 ± 1.9	< 2.3	-0.6 ± 1.7	< 2.3	15
Cs-134	-1.5 ± 2.5	< 4.8	-0.2 ± 4.4	< 7.4	-1.8 ± 1.4	< 2.5	0.6 ± 1.6	< 2.7	10
Cs-137	1.2 ± 2.6	< 6.8	0.3 ± 5.7	< 8.2	-0.1 ± 1.9	< 3.2	1.3 ± 1.6	< 2.3	10
Ba-La-140	4.0 ± 7.9	< 4.6	-3.9 ± 5.9	< 5.2	0.1 ± 1.4	< 1.9	1.3 ± 1.4	< 2.4	15
Other (Ru-103)	2.0 ± 2.6	< 5.4	0.9 ± 3.8	< 6.0	-0.8 ± 1.4	< 2.6	0.3 ± 1.2	< 2.0	30

[a] MDA not met due to a delayed analysis.

Table 5. Lake water, analyses for gross beta, iodine-131 and gamma emitting isotopes.
Location: E-06 (Coast Guard Station)
Collection: Monthly composites Units: pCi/L

		MDC		MDC		MDC		MDC	
Lab Code	ELW- 40		ELW- 332		ELW- 520		ELW- 864		
Date Collected	01-10-23		02-15-23		03-08-23		04-12-23		Req. LLD
Gross beta	1.8 ± 0.6	< 1.0	0.8 ± 1.0	< 1.8	1.4 ± 0.6	< 1.1	2.7 ± 0.7	< 0.9	4.0
I-131	-0.05 ± 0.12	< 0.23	-0.19 ± 0.16	< 0.30	0.04 ± 0.20	< 0.36	1.21 ± 0.11 [a]	< 0.11	0.5
Be-7	2.5 ± 9.3	< 21.8	1.8 ± 6.3	< 10.9	-1.2 ± 11.2	< 18.4	-3.9 ± 21.3	< 24.7	
Mn-54	-0.3 ± 1.5	< 2.1	-0.2 ± 0.7	< 1.5	-0.4 ± 1.4	< 2.8	-0.8 ± 3.0	< 4.6	10
Fe-59	1.6 ± 2.9	< 5.8	0.3 ± 1.4	< 2.3	-0.8 ± 2.8	< 2.1	-7.1 ± 5.8	< 6.0	30
Co-58	-0.3 ± 1.4	< 2.3	-0.3 ± 0.7	< 1.1	1.5 ± 1.4	< 2.0	2.7 ± 2.7	< 4.2	10
Co-60	-0.3 ± 1.7	< 1.2	0.4 ± 1.5	< 2.7	0.3 ± 1.7	< 1.2	2.9 ± 2.8	< 3.7	10
Zn-65	-1.5 ± 2.9	< 4.0	-1.9 ± 1.6	< 2.2	-0.5 ± 3.2	< 4.9	-1.7 ± 6.7	< 7.8	30
Zr-Nb-95	-1.4 ± 1.6	< 3.0	-1.6 ± 0.8	< 1.7	-1.1 ± 1.5	< 2.3	2.0 ± 2.8	< 5.3	15
Cs-134	0.6 ± 1.5	< 2.5	0.2 ± 0.7	< 1.4	0.6 ± 1.4	< 2.7	-2.1 ± 2.7	< 5.2	10
Cs-137	-0.4 ± 1.7	< 2.7	-1.3 ± 1.5	< 2.3	-0.3 ± 1.5	< 2.8	0.5 ± 2.8	< 5.1	10
Ba-La-140	0.4 ± 1.3	< 2.0	0.4 ± 0.8	< 1.6	0.3 ± 1.5	< 2.6	-1.8 ± 2.8	< 2.4	15
Other (Ru-103)	0.2 ± 1.1	< 2.6	0.3 ± 0.7	< 1.4	-0.5 ± 1.3	< 1.9	0.4 ± 2.5	< 4.7	30
Lab Code	ELW- 1171		ELW- 1564		ELW- 1938		ELW- 2341		
Date Collected	05-09-23		06-13-23		07-12-23		08-08-23		Req. LLD
Gross beta	1.4 ± 0.6	< 0.9	1.1 ± 0.6	< 0.9	0.7 ± 0.5	< 0.9	0.9 ± 0.5	< 0.8	4.0
I-131	0.06 ± 0.12	< 0.21	-0.09 ± 0.13	< 0.24	0.00 ± 0.16	< 0.28	-0.01 ± 0.10	< 0.19	0.5
Be-7	3.0 ± 6.7	< 33.6	-4.7 ± 20.8	< 30.8	-4.8 ± 18.6	< 23.5	-2.8 ± 19.1	< 23.3	
Mn-54	0.2 ± 0.9	< 2.2	0.6 ± 2.7	< 3.3	-0.2 ± 2.1	< 2.8	0.3 ± 2.3	< 3.7	10
Fe-59	0.0 ± 1.8	< 7.8	-0.4 ± 5.1	< 11.3	-5.9 ± 4.3	< 7.5	-4.0 ± 4.6	< 4.6	30
Co-58	-1.1 ± 0.8	< 2.0	-0.6 ± 2.6	< 3.5	-2.8 ± 2.1	< 2.6	1.6 ± 2.2	< 4.0	10
Co-60	0.3 ± 0.9	< 1.9	-2.2 ± 3.0	< 2.9	1.6 ± 1.9	< 2.5	0.4 ± 1.2	< 7.8	10
Zn-65	-0.8 ± 2.0	< 3.7	4.3 ± 5.3	< 6.8	0.1 ± 4.6	< 5.0	-6.7 ± 5.2	< 2.6	30
Zr-Nb-95	-4.4 ± 0.9	< 5.8	-1.8 ± 2.8	< 4.9	1.3 ± 2.1	< 3.1	-0.4 ± 2.5	< 2.9	15
Cs-134	-0.1 ± 0.8	< 1.7	-1.7 ± 2.6	< 5.0	0.6 ± 2.2	< 4.1	-0.8 ± 1.9	< 4.4	10
Cs-137	-0.1 ± 0.9	< 1.6	0.3 ± 2.7	< 3.7	-0.4 ± 2.3	< 2.7	-2.2 ± 1.4	< 6.9	10
Ba-La-140	-68.9 ± 3.1	[b] < 68.6	-3.9 ± 3.0	< 8.0	-1.4 ± 3.1	< 5.7	0.3 ± 2.3	< 2.9	15
Other (Ru-103)	0.4 ± 0.8	< 2.7	0.9 ± 2.3	< 5.0	-0.2 ± 2.0	< 3.7	-0.2 ± 2.3	< 2.6	30
Lab Code	ELW- 2679		ELW- 3070		ELW- 3446		ELW- 3874		
Date Collected	09-12-23		10-10-23		11-07-23		12-13-23		Req. LLD
Gross beta	0.5 ± 0.5	< 0.9	0.3 ± 0.5	< 0.9	1.5 ± 0.6	< 0.9	1.3 ± 0.6	< 0.9	4.0
I-131	0.12 ± 0.22	< 0.42	0.09 ± 0.19	< 0.34	0.03 ± 0.15	< 0.27	-0.04 ± 0.14	< 0.26	0.5
Be-7	19.4 ± 31.5	< 29.7	1.6 ± 22.5	< 27.6	10.9 ± 9.9	< 21.0	9.8 ± 10.2	< 14.1	
Mn-54	-2.4 ± 4.8	< 6.1	1.3 ± 2.1	< 2.7	-0.8 ± 1.3	< 1.4	-0.4 ± 1.3	< 1.5	10
Fe-59	-0.4 ± 8.1	< 8.2	-1.4 ± 4.7	< 3.5	0.9 ± 2.9	< 3.3	-0.3 ± 2.2	< 3.1	30
Co-58	1.3 ± 4.5	< 6.6	-0.6 ± 2.6	< 1.9	-2.0 ± 1.3	< 0.8	-1.5 ± 1.7	< 1.6	10
Co-60	3.1 ± 5.3	< 6.9	2.0 ± 3.2	< 7.9	0.4 ± 1.9	< 3.0	-1.5 ± 1.7	< 2.5	10
Zn-65	-11.7 ± 11.6	< 5.7	-4.7 ± 4.5	< 2.9	-0.5 ± 2.9	< 2.0	-2.6 ± 3.0	< 2.1	30
Zr-Nb-95	-0.8 ± 4.4	< 8.3	0.2 ± 2.1	< 3.2	-2.6 ± 1.6	< 1.9	-0.9 ± 1.4	< 2.2	15
Cs-134	0.9 ± 4.1	< 7.1	-0.4 ± 2.5	< 4.6	-0.6 ± 1.5	< 2.6	0.8 ± 1.4	< 2.5	10
Cs-137	1.5 ± 4.3	< 5.8	2.2 ± 2.9	< 7.4	-0.7 ± 1.6	< 2.2	0.2 ± 1.7	< 2.7	10
Ba-La-140	0.8 ± 4.7	< 5.6	-0.5 ± 2.8	< 3.3	-1.0 ± 1.8	< 2.8	0.5 ± 1.6	< 3.0	15
Other (Ru-103)	-3.1 ± 4.5	< 6.6	-0.7 ± 2.7	< 4.1	0.7 ± 1.1	< 2.5	-1.0 ± 1.2	< 2.1	30

[a] Recount = 1.1 ± 0.14 pCi/L, MDA < 0.17 pCi/L, Reanalysis 1.3 ± 0.14 pCi/L, MDA < 0.15 pCi/L. For additional results see App. F
[b] MDA not met due to a delayed analysis.

Annual
Annual

All locations	**Mean ± s.d.**		**Mean ± s.d.**		**Mean ± s.d.**
Gross Beta	**1.2 ± 0.5**				
I-131	**0.02 ± 0.22**	**Co-58**	**0.0 ± 1.3**	**Cs-134**	**-0.3 ± 1.7**
Be-7	**-0.7 ± 9.5**	**Co-60**	**0.3 ± 1.2**	**Cs-137**	**0.2 ± 1.0**
Mn-54	**0.3 ± 1.2**	**Zn-65**	**-1.9 ± 4.4**	**Ba-La-140**	**-2.1 ± 10.4**
Fe-59	**-0.8 ± 2.4**	**Zr-Nb-95**	**-0.9 ± 1.4**	**Ru-103**	**-0.4 ± 1.3**

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Table 6. Lake water, analyses for tritium, strontium-89 and strontium-90.
Collection: Quarterly composites of weekly grab samples
Units: pCi/L

Location	E-01 (Meteorological Tower)							
Period	1st Qtr.	**MDC**	2nd Qtr.	**MDC**	3rd Qtr.	**MDC**	4th Qtr.	**MDC**
Lab Code	ELW- 557		ELW- 1650		ELW- 2783		ELW- 3925	
H-3	181 ± 89	< 164	141 ± 82	< 157	5 ± 77	< 163	-84 ± 75	< 171
Sr-89	0.07 ± 0.45	< 0.52	0.04 ± 0.74	< 0.95	0.28 ± 0.79	< 0.99	-0.09 ± 0.56	< 0.71
Sr-90	0.21 ± 0.27	< 0.54	0.12 ± 0.26	< 0.53	0.37 ± 0.35	< 0.68	0.12 ± 0.27	< 0.56

Location	E-05 (Two Creeks Park)							
Period	1st Qtr.		2nd Qtr.		3rd Qtr.		4th Qtr.	
Lab Code	ELW- 558		ELW- 1651		ELW- 2784		ELW- 3926	
H-3	187 ± 89	< 164	96 ± 80	< 157	35 ± 79	< 163	-28 ± 79	< 171
Sr-89	0.39 ± 0.38	< 0.50	-0.14 ± 0.78	< 1.00	-0.41 ± 0.76	< 0.97	-0.38 ± 0.59	< 0.76
Sr-90	-0.13 ± 0.22	< 0.51	0.18 ± 0.27	< 0.55	0.38 ± 0.37	< 0.72	0.22 ± 0.29	< 0.57

Location	E-06 (Coast Guard Station)							
Period	1st Qtr.		2nd Qtr.		3rd Qtr.		4th Qtr.	
Lab Code	ELW- 559		ELW- 1653		ELW- 2785		ELW- 3927	
H-3	121 ± 86	< 164	82 ± 79	< 157	19 ± 78	< 163	45 ± 83	< 171
Sr-89	0.21 ± 0.46	< 0.58	-0.06 ± 0.68	< 0.82	0.21 ± 0.73	< 0.87	0.47 ± 0.54	< 0.85
Sr-90	0.05 ± 0.27	< 0.57	0.21 ± 0.24	< 0.46	0.23 ± 0.35	< 0.71	-0.15 ± 0.21	< 0.50

Tritium Annual Mean ± s.d.	**67 ± 83**
Sr-89 Annual Mean ± s.d.	**0.05 ± 0.28**
Sr-90 Annual Mean ± s.d.	**0.15 ± 0.17**

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Table 7. Fish, analyses for gamma emitting isotopes.
Location: E-13
Collection: Quarterly   Units: pCi/g wet

	Sample Description and Concentration	MDC		MDC		MDC	Req. LLD
Collection Date	02-03-23		02-18-23		02-23-23		
Lab Code	EF- 399		EF- 400		EF- 401		
Type	Trout		Burbot		Burbot		
K-40	2.31 ± 0.36	-	2.33 ± 0.30	-	1.64 ± 0.24	-	
Mn-54	-0.003 ± 0.010	< 0.017	-0.004 ± 0.009	< 0.017	0.007 ± 0.007	< 0.016	0.13
Fe-59	0.003 ± 0.018	< 0.070	-0.015 ± 0.016	< 0.057	0.012 ± 0.011	< 0.046	0.26
Co-58	-0.013 ± 0.010	< 0.023	-0.005 ± 0.007	< 0.012	0.000 ± 0.006	< 0.017	0.13
Co-60	-0.004 ± 0.012	< 0.017	-0.005 ± 0.008	< 0.009	0.002 ± 0.006	< 0.013	0.13
Zn-65	-0.015 ± 0.024	< 0.020	0.008 ± 0.018	< 0.029	0.012 ± 0.012	< 0.023	0.26
Cs-134	-0.003 ± 0.010	< 0.017	0.003 ± 0.008	< 0.017	-0.005 ± 0.006	< 0.011	0.13
Cs-137	0.009 ± 0.011	< 0.019	0.030 ± 0.017	< 0.017	0.013 ± 0.008	< 0.014	0.15
Other (Ru-103)	-0.036 ± 0.008	< 0.030	-0.007 ± 0.008	< 0.032	-0.009 ± 0.005	< 0.017	0.5
Collection Date	04-25-23		05-03-23		05-24-23		
Lab Code	EF- 1507		EF- 1508		EF- 1509		
Type	Trout		Burbot		Burbot		
K-40	2.84 ± 0.29	-	2.72 ± 0.36	-	2.62 ± 0.33	-	
Mn-54	0.001 ± 0.008	< 0.010	-0.003 ± 0.011	< 0.015	0.003 ± 0.007	< 0.010	0.13
Fe-59	0.002 ± 0.010	< 0.066	0.004 ± 0.018	< 0.075	0.018 ± 0.018	< 0.047	0.26
Co-58	0.005 ± 0.010	< 0.018	-0.020 ± 0.010	< 0.017	-0.005 ± 0.007	< 0.012	0.13
Co-60	-0.007 ± 0.011	< 0.010	-0.004 ± 0.012	< 0.013	0.002 ± 0.006	< 0.009	0.13
Zn-65	-0.006 ± 0.015	< 0.019	0.010 ± 0.023	< 0.036	-0.002 ± 0.018	< 0.024	0.26
Cs-134	-0.003 ± 0.008	< 0.011	-0.021 ± 0.011	< 0.021	0.005 ± 0.008	< 0.010	0.13
Cs-137	0.017 ± 0.011	< 0.021	0.011 ± 0.012	< 0.015	0.027 ± 0.013	< 0.042	0.15
Other (Ru-103)	0.012 ± 0.006	< 0.032	-0.016 ± 0.009	< 0.036	0.000 ± 0.007	< 0.019	0.5

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Table 7. Fish, analyses for gamma emitting isotopes.
Location: E-13
Collection: Quarterly Units: pCi/g wet

	Sample Description and Concentration (pCi/g wet)	MDC		MDC		MDC	Req. LLD
Collection Date	09-11-23		07-03-23		08-13-23		
Lab Code	EF- 2723		EF- 2725		EF- 2726		
Type	Rainbow Trout		Salmon		Lake Trout		
K-40	3.20 ± 0.41	-	2.70 ± 0.53	-	2.49 ± 0.20		
Mn-54	0.000 ± 0.009	< 0.016	0.011 ± 0.014	< 0.024	0.000 ± 0.004	< 0.009	0.13
Fe-59	0.005 ± 0.017	< 0.046	-0.046 ± 0.029	< 0.181	-0.017 ± 0.008	< 0.027	0.26
Co-58	0.003 ± 0.009	< 0.024	-0.012 ± 0.012	< 0.041	0.000 ± 0.004	< 0.011	0.13
Co-60	0.009 ± 0.010	< 0.032	-0.008 ± 0.014	< 0.008	-0.001 ± 0.005	< 0.008	0.13
Zn-65	-0.033 ± 0.025	< 0.034	-0.016 ± 0.036	< 0.028	-0.021 ± 0.012	< 0.019	0.26
Cs-134	-0.010 ± 0.010	< 0.018	-0.025 ± 0.015	< 0.028	-0.009 ± 0.004	< 0.008	0.13
Cs-137	0.023 ± 0.012	< 0.028	0.013 ± 0.018	< 0.029	0.012 ± 0.005	< 0.010	0.15
Other (Ru-103)	0.001 ± 0.010	< 0.029	0.058 ± 0.012	< 0.109	-0.001 ± 0.004	< 0.028	0.5
Collection Date	08-17-23		10-14-23		10-31-23		
Lab Code	EF- 2727		EF- 3736		EF- 3737		
Type	Burbot		Burbot		Burbot		
K-40	1.80 ± 0.29	-	1.93 ± 0.41	-	2.88 ± 0.49	-	
Mn-54	-0.006 ± 0.007	< 0.013	-0.013 ± 0.016	< 0.014	-0.011 ± 0.014	< 0.017	0.13
Fe-59	0.003 ± 0.017	< 0.034	-0.025 ± 0.023	< 0.046	-0.009 ± 0.027	< 0.061	0.26
Co-58	-0.011 ± 0.008	< 0.012	-0.003 ± 0.011	< 0.025	-0.001 ± 0.012	< 0.024	0.13
Co-60	0.005 ± 0.010	< 0.030	-0.001 ± 0.014	< 0.018	-0.004 ± 0.016	< 0.011	0.13
Zn-65	-0.020 ± 0.021	< 0.029	0.004 ± 0.034	< 0.028	-0.053 ± 0.036	< 0.032	0.26
Cs-134	-0.015 ± 0.008	< 0.016	-0.003 ± 0.012	< 0.022	-0.015 ± 0.014	< 0.023	0.13
Cs-137	0.012 ± 0.011	< 0.026	0.010 ± 0.015	< 0.024	0.016 ± 0.016	< 0.025	0.15
Other (Ru-103)	0.008 ± 0.007	< 0.038	-0.012 ± 0.010	< 0.047	0.018 ± 0.011	< 0.041	0.5

Table 8. Radioactivity in shoreline sediment samples

Collection: Annual

Sample Description and Concentration (pCi/g dry)

		MDC		MDC		MDC	
Collection Date	10/17/2023		10/17/2023		10/17/2023		
Lab Code	ESS- 3320		ESS- 3321		ESS- 3232		LLD
Location	E-01		E-05		E-06		
Be-7	0.032 ± 0.054	< 0.149	0.025 ± 0.026	< 0.088	0.101 ± 0.038	< 0.082	
K-40	5.386 ± 0.406	-	6.210 ± 0.223	-	7.042 ± 0.295	-	-
Cs-134	-0.001 ± 0.007	< 0.009	0.000 ± 0.003	< 0.007	-0.003 ± 0.005	< 0.007	0.15
Cs-137	0.020 ± 0.009	< 0.017	0.007 ± 0.004	< 0.008	0.020 ± 0.009	< 0.010	0.15
Tl-208	0.077 ± 0.018	-	0.041 ± 0.010	-	0.093 ± 0.012	-	-
Pb-212	0.189 ± 0.021	-	0.108 ± 0.009	-	0.262 ± 0.014	-	-
Bi-214	0.190 ± 0.033	-	0.076 ± 0.016	-	0.318 ± 0.027	-	-
Ra-226	0.366 ± 0.192	-	0.326 ± 0.093	-	0.394 ± 0.150	-	-
Ac-228	0.234 ± 0.077	-	0.117 ± 0.025	-	0.343 ± 0.046	-	-

	Annual Mean ±s.d.
Be-7	**0.052 ± 0.042**
K-40	**6.21 ± 0.83**
Cs-134	**0.00 ± 0.00**
Cs-137	**0.016 ± 0.007**
Tl-208	**0.07 ± 0.03**
Pb-212	**0.19 ± 0.08**
Bi-214	**0.19 ± 0.12**
Ra-226	**0.36 ± 0.03**
Ac-228	**0.23 ± 0.11**

Table 9. Radioactivity in soil samples

Collection: Annual

Sample Description and Concentration (pCi/g dry)

		MDC		MDC		MDC	
Collection Date	9/28/2023		9/28/2023		9/28/2023		Req.
Lab Code	ESO- 2921		ESO- 2922		ESO- 2923		LLD
Location	E-01		E-02		E-03		
Be-7	0.457 ± 0.26	< 0.30	0.099 ± 0.11	< 0.18	0.121 ± 0.04	< 0.09	
K-40	20.60 ± 0.84	-	17.48 ± 0.81	-	17.88 ± 0.32	-	-
Cs-134	-0.013 ± 0.01	< 0.02	-0.006 ± 0.01	< 0.02	-0.003 ± 0.01	< 0.01	0.15
Cs-137	0.134 ± 0.02	< 0.03	0.422 ± 0.04	< 0.03	0.148 ± 0.01	< 0.01	0.15
Tl-208	0.268 ± 0.03	-	0.214 ± 0.03	-	0.171 ± 0.02	-	-
Pb-212	0.756 ± 0.05	-	0.675 ± 0.14	-	0.470 ± 0.02	-	-
Bi-214	0.534 ± 0.05	-	0.441 ± 0.07	-	0.477 ± 0.02	-	-
Ra-226	1.658 ± 0.35	-	1.224 ± 0.38	-	1.196 ± 0.12	-	-
Ac-228	0.785 ± 0.14	-	0.766 ± 0.12	-	0.534 ± 0.05	-	-
Collection Date	9/28/2023		9/28/2023		9/28/2023		
Lab Code	ESO- 2924		ESO- 2926		ESO- 2927		
Location	E-04		E-06		E-20		
Be-7	0.034 ± 0.08	< 0.16	-0.016 ± 0.06	< 0.17	-0.003 ± 0.11	< 0.28	
K-40	15.54 ± 0.71	-	11.79 ± 0.57	-	16.16 ± 0.77	-	-
Cs-134	-0.008 ± 0.01	< 0.02	-0.001 ± 0.01	< 0.02	-0.011 ± 0.01	< 0.02	0.15
Cs-137	0.077 ± 0.03	< 0.03	0.252 ± 0.03	< 0.02	0.155 ± 0.03	< 0.03	0.15
Tl-208	0.142 ± 0.03	-	0.086 ± 0.02	-	0.136 ± 0.03	-	-
Pb-212	0.361 ± 0.03	-	0.170 ± 0.02	-	0.388 ± 0.04	-	-
Bi-214	0.341 ± 0.04	-	0.229 ± 0.03	-	0.411 ± 0.05	-	-
Ra-226	1.307 ± 0.26	-	0.389 ± 0.22	-	1.176 ± 0.33	-	-
Ac-228	0.443 ± 0.08	-	0.247 ± 0.06	-	0.437 ± 0.08	-	-

	Annual Mean ± s.d.	
Be-7	**0.115 ± 0.18**	
K-40	**16.57 ± 2.93**	-
Cs-134	**-0.007 ± 0.00**	0.15
Cs-137	**0.20 ± 0.12**	0.15
Tl-208	**0.17 ± 0.06**	-
Pb-212	**0.47 ± 0.22**	-
Bi-214	**0.41 ± 0.11**	-
Ra-226	**1.16 ± 0.42**	-
Ac-228	**0.54 ± 0.21**	-

Table 10. Radioactivity in vegetation samples
Collection: Bi-annual

Sample Description and Concentration (pCi/g wet)

		MDC		MDC		MDC	
Location	E-01		E-02		E-03		
Collection Date	05-24-23		05-24-23		05-24-23		
Lab Code	EG- 1323		EG- 1324		EG- 1325		Req. LLD
Be-7	0.35 ± 0.15	-	0.17 ± 0.10	-	0.20 ± 0.09	-	-
K-40	5.69 ± 0.49	-	6.24 ± 0.38	-	5.91 ± 0.38	-	-
I-131	0.001 ± 0.007	< 0.016	0.000 ± 0.004	< 0.009	-0.005 ± 0.004	< 0.007	0.060
Cs-134	-0.003 ± 0.009	< 0.016	0.001 ± 0.006	< 0.010	0.000 ± 0.006	< 0.012	0.060
Cs-137	0.001 ± 0.010	< 0.017	0.002 ± 0.006	< 0.010	-0.002 ± 0.007	< 0.011	0.080
Other (Co-60)	-0.003 ± 0.011	< 0.013	0.000 ± 0.006	< 0.009	0.006 ± 0.008	< 0.012	0.060
Location	E-04		E-06		E-20		
Collection Date	05-24-23		05-24-23		05-24-23		
Lab Code	EG- 1326		EG- 1327		EG- 1328		Req. LLD
Be-7	0.08 ± 0.06	-	0.12 ± 0.06	-	0.08 ± 0.06	-	-
K-40	6.64 ± 0.42	-	4.18 ± 0.27	-	6.65 ± 0.42	-	-
I-131	0.000 ± 0.005	< 0.014	0.002 ± 0.003	< 0.011	0.000 ± 0.005	< 0.010	0.060
Cs-134	-0.002 ± 0.006	< 0.018	0.001 ± 0.004	< 0.008	-0.002 ± 0.006	< 0.013	0.060
Cs-137	-0.002 ± 0.008	< 0.017	0.024 ± 0.010	< 0.009	-0.002 ± 0.008	< 0.011	0.080
Other (Co-60)	-0.001 ± 0.009	< 0.017	-0.001 ± 0.006	< 0.009	-0.001 ± 0.009	< 0.014	0.060

Table 10. Radioactivity in vegetation samples
Collection: Bi-annual

Sample Description and Concentration (pCi/g wet)

		MDC		MDC		MDC	
Location	E-01		E-02		E-03		
Collection Date	09-28-23		09-28-23		09-28-23		
Lab Code	EG- 2915		EG- 2916		EG- 2917		Req. LLD
Be-7	0.65 ± 0.22	-	1.07 ± 0.39	-	2.13 ± 0.33	-	-
K-40	4.04 ± 0.59	-	5.30 ± 0.79	-	6.07 ± 0.64	-	-
I-131	-0.009 ± 0.014	< 0.034	-0.011 ± 0.014	< 0.031	-0.015 ± 0.012	< 0.029	0.060
Cs-134	-0.003 ± 0.012	< 0.024	-0.035 ± 0.020	< 0.036	0.003 ± 0.015	< 0.020	0.060
Cs-137	0.005 ± 0.015	< 0.037	0.002 ± 0.025	< 0.032	0.011 ± 0.015	< 0.032	0.080
Other (Co-60)	-0.009 ± 0.016	< 0.035	0.003 ± 0.027	< 0.030	0.008 ± 0.014	< 0.037	0.060
Location	E-04		E-06		E-20		
Collection Date	09-28-23		09-28-23		09-28-23		
Lab Code	EG- 2918		EG- 2919		EG- 2920		Req. LLD
Be-7	1.69 ± 0.32	-	1.89 ± 0.09	-	1.15 ± 0.22	-	-
K-40	5.97 ± 0.61	-	2.66 ± 0.12	-	3.72 ± 0.44	-	-
I-131	0.018 ± 0.011	< 0.056	0.003 ± 0.005	< 0.010	-0.008 ± 0.008	< 0.024	0.060
Cs-134	-0.005 ± 0.012	< 0.024	0.001 ± 0.003	< 0.005	-0.007 ± 0.008	< 0.015	0.060
Cs-137	0.010 ± 0.013	< 0.032	0.063 ± 0.007	< 0.009	0.015 ± 0.010	< 0.022	0.080
Other (Co-60)	0.001 ± 0.015	< 0.036	0.006 ± 0.003	< 0.009	0.009 ± 0.009	< 0.023	0.060

Be-7 Annual Mean ± s.d.	**0.80 ± 0.76**
K-40 Annual Mean ± s.d.	**5.26 ± 1.29**
I-131 Annual Mean ± s.d.	**-0.002 ± 0.009**
Cs-134 Annual Mean ± s.d.	**-0.004 ± 0.010**
Cs-137 Annual Mean ± s.d.	**0.011 ± 0.018**
Co-60 Annual Mean ± s.d.	**0.002 ± 0.005**

POINT BEACH NUCLEAR PLANT

Table 11. Ambient Gamma Radiation [a]
LLD/7days: < 1mR/TLD

1st. Quarter, 2023

Date Annealed:	12-06-22	Days in the field	88
Date Placed:	01-04-23 [b]	Days from Annealing	
Date Removed:	04-02-23	to Readout:	120
Date Read:	04-05-23		

Location	Days in Field	Total mR	Net mR	mR/Stnd Qtr (91 days)	Net mR per 7 days
Indicator					
E-1	88	15.6 ± 1.0	9.9 ± 1.0	10.2 ± 1.0	0.78 ± 0.08
E-2	88	20.9 ± 1.2	15.2 ± 1.2	15.7 ± 1.2	1.21 ± 0.09
E-3	88	20.4 ± 1.3	14.7 ± 1.3	15.2 ± 1.3	1.17 ± 0.10
E-4	88	16.4 ± 0.9	10.7 ± 0.9	11.0 ± 0.9	0.85 ± 0.07
E-5	88	17.4 ± 0.3	11.6 ± 0.3	12.0 ± 0.3	0.92 ± 0.02
E-6	88	18.0 ± 0.7	12.3 ± 0.7	12.7 ± 0.7	0.98 ± 0.05
E-7	87	17.9 ± 0.3	12.2 ± 0.3	12.7 ± 0.4	0.98 ± 0.03
E-8	88	15.5 ± 0.7	9.8 ± 0.7	10.1 ± 0.7	0.78 ± 0.06
E-9	87	17.1 ± 0.2	11.4 ± 0.3	11.9 ± 0.3	0.92 ± 0.02
E-12	88	13.5 ± 0.4	7.7 ± 0.5	8.0 ± 0.5	0.62 ± 0.04
E-14	87	19.2 ± 0.7	13.5 ± 0.7	14.1 ± 0.7	1.09 ± 0.05
E-15	88	20.2 ± 0.7	14.5 ± 0.7	15.0 ± 0.8	1.15 ± 0.06
E-16B	87	18.8 ± 0.7	13.0 ± 0.7	13.6 ± 0.7	1.05 ± 0.06
E-17	87	16.9 ± 0.4	11.2 ± 0.5	11.7 ± 0.5	0.90 ± 0.04
E-18	87	18.5 ± 0.7	12.8 ± 0.7	13.4 ± 0.8	1.03 ± 0.06
E-22	87	17.9 ± 0.6	12.2 ± 0.6	12.8 ± 0.6	0.98 ± 0.05
E-23	88	21.5 ± 0.4	15.8 ± 0.4	16.3 ± 0.4	1.26 ± 0.03
E-24	88	18.0 ± 0.6	12.3 ± 0.6	12.7 ± 0.6	0.98 ± 0.05
E-25	87	18.7 ± 0.1	13.0 ± 0.2	13.6 ± 0.2	1.05 ± 0.02
E-26B	87	16.9 ± 0.4	11.2 ± 0.4	11.7 ± 0.4	0.90 ± 0.03
E-27	87	18.5 ± 0.2	12.8 ± 0.3	13.4 ± 0.3	1.03 ± 0.02
E-28	88	13.2 ± 0.4	7.5 ± 0.4	7.8 ± 0.4	0.60 ± 0.03
E-29	88	15.2 ± 0.4	9.4 ± 0.5	9.8 ± 0.5	0.75 ± 0.04
E-30	87	17.5 ± 0.6	11.8 ± 0.7	12.3 ± 0.7	0.95 ± 0.05
E-31	88	19.0 ± 0.4	13.3 ± 0.4	13.7 ± 0.4	1.06 ± 0.03
E-32	88	22.3 ± 0.8	16.6 ± 0.8	17.2 ± 0.8	1.32 ± 0.06
E-38	88	19.7 ± 1.2	14.0 ± 1.2	14.5 ± 1.3	1.11 ± 0.10
E-39	88	19.3 ± 1.0	13.6 ± 1.0	14.0 ± 1.1	1.08 ± 0.08
E-41	87	18.5 ± 0.4	12.8 ± 0.5	13.4 ± 0.5	1.03 ± 0.04
E-42	88	19.2 ± 0.3	13.5 ± 0.3	13.9 ± 0.4	1.07 ± 0.03
E-43	88	19.3 ± 1.1	13.6 ± 1.1	14.1 ± 1.2	1.08 ± 0.09
E-44	88	18.8 ± 0.8	13.1 ± 0.8	13.5 ± 0.8	1.04 ± 0.06
Control					
E-20	88	18.3 ± 0.8	12.6 ± 0.9	13.0 ± 0.9	1.00 ± 0.07
Mean±s.d.		18.1 ± 2.0	12.4 ± 2.0	12.9 ± 2.1	0.99 ± 0.16

In-Transit Exposure	Date Annealed	Date Read	ITC-1	ITC-2
	12-06-22	01-11-23	6.1 ± 0.1	6.3 ± 0.2
	03-08-23	04-05-23	5.3 ± 0.2	5.1 ± 0.2

[a] The $CaSO_4$:Dy dosimeter cards provide four separate readout areas. Values listed represent the mean and standard deviation of the average of the four readings.

[b] Some TLDs placed on 1/5, as indicated.

POINT BEACH NUCLEAR PLANT

Table 11. Ambient Gamma Radiation [a]
LLD/7days: < 1mR/TLD

2nd Quarter, 2023

Date Annealed:	03-08-23	Days in the field	94
Date Placed:	04-02-23	Days from Annealing	
Date Removed:	07-05-23	to Readout:	121
Date Read:	07-07-23		

Location	Days in Field	Total mR	Net mR	mR/Stnd Qtr (91 days)	Net mR per 7 days
Indicator					
E-1	94	18.2 ± 0.2	13.0 ± 0.5	12.6 ± 0.5	0.97 ± 0.04
E-2	94	24.7 ± 1.4	19.6 ± 1.5	19.0 ± 1.4	1.46 ± 0.11
E-3	94	22.8 ± 1.9	17.6 ± 1.9	17.1 ± 1.9	1.31 ± 0.14
E-4	94	18.7 ± 0.5	13.5 ± 0.7	13.1 ± 0.7	1.01 ± 0.05
E-5	94	20.8 ± 0.8	15.6 ± 0.9	15.1 ± 0.9	1.16 ± 0.07
E-6	94	18.1 ± 0.6	12.9 ± 0.7	12.5 ± 0.7	0.96 ± 0.06
E-7	94	18.0 ± 0.2	12.8 ± 0.5	12.4 ± 0.5	0.95 ± 0.04
E-8	94	18.0 ± 0.8	12.9 ± 1.0	12.5 ± 0.9	0.96 ± 0.07
E-9	94	19.7 ± 0.3	14.5 ± 0.6	14.1 ± 0.6	1.08 ± 0.04
E-12	94	15.4 ± 0.9	10.2 ± 1.0	9.9 ± 1.0	0.76 ± 0.08
E-14	94	19.8 ± 1.9	14.6 ± 1.9	14.1 ± 1.9	1.09 ± 0.14
E-15	94	20.0 ± 0.8	14.8 ± 1.0	14.4 ± 0.9	1.10 ± 0.07
E-16B	94	22.5 ± 0.6	17.3 ± 0.8	16.7 ± 0.8	1.29 ± 0.06
E-17	94	21.1 ± 0.8	15.9 ± 0.9	15.4 ± 0.9	1.19 ± 0.07
E-18	94	22.6 ± 1.6	17.5 ± 1.7	16.9 ± 1.6	1.30 ± 0.12
E-22	94	21.8 ± 0.5	16.6 ± 0.7	16.1 ± 0.7	1.24 ± 0.05
E-23	94	24.1 ± 0.6	19.0 ± 0.8	18.3 ± 0.8	1.41 ± 0.06
E-24	94	21.1 ± 1.3	15.9 ± 1.4	15.4 ± 1.3	1.19 ± 0.10
E-25	94	22.7 ± 0.5	17.6 ± 0.7	17.0 ± 0.7	1.31 ± 0.05
E-26B	94	19.2 ± 0.3	14.1 ± 0.6	13.6 ± 0.5	1.05 ± 0.04
E-27	94	22.2 ± 0.5	17.1 ± 0.7	16.5 ± 0.7	1.27 ± 0.05
E-28	94	13.7 ± 0.2	8.5 ± 0.6	8.2 ± 0.5	0.63 ± 0.04
E-29	94	16.1 ± 0.8	10.9 ± 0.9	10.6 ± 0.9	0.81 ± 0.07
E-30	94	19.2 ± 0.6	14.1 ± 0.7	13.6 ± 0.7	1.05 ± 0.06
E-31	94	22.9 ± 1.4	17.7 ± 1.5	17.1 ± 1.4	1.32 ± 0.11
E-32	94	23.1 ± 0.5	17.9 ± 0.7	17.3 ± 0.7	1.33 ± 0.05
E-38	94	21.1 ± 0.6	15.9 ± 0.8	15.4 ± 0.7	1.19 ± 0.06
E-39	94	21.8 ± 0.6	16.7 ± 0.8	16.1 ± 0.7	1.24 ± 0.06
E-41	94	23.0 ± 0.2	17.8 ± 0.5	17.2 ± 0.5	1.33 ± 0.04
E-42	94	22.7 ± 0.6	17.6 ± 0.8	17.0 ± 0.8	1.31 ± 0.06
E-43	94	22.7 ± 0.7	17.6 ± 0.9	17.0 ± 0.8	1.31 ± 0.06
E-44	94	22.3 ± 0.2	17.1 ± 0.6	16.6 ± 0.5	1.28 ± 0.04
Control					
E-20	94	20.4 ± 0.7	15.3 ± 0.8	14.8 ± 0.8	1.14 ± 0.06
Mean±s.d.		20.6 ± 2.6	15.5 ± 2.6	15.0 ± 2.5	1.15 ± 0.19

In-Transit Exposure	Date Annealed	Date Read	ITC-1	ITC-2
	03-08-23	04-05-23	5.3 ± 0.2	5.1 ± 0.2
	06-12-23	07-07-23	5.0 ± 0.3	5.2 ± 0.3

[a] The $CaSO_4$:Dy dosimeter cards provide four separate readout areas. Values listed represent the mean and standard deviation of the average of the four readings.

POINT BEACH NUCLEAR PLANT

Table 11. Ambient Gamma Radiation [a]
LLD/7days: < 1mR/TLD

3rd Quarter, 2023

Date Annealed:	06-12-23	Days in the field	88
Date Placed:	07-05-23	Days from Annealing	
Date Removed:	10-01-23	to Readout:	115
Date Read:	10-05-23		

Location	Days in Field	Total mR	Net mR	mR/Stnd Qtr (91 days)	Net mR per 7 days
Indicator					
E-1	88	16.2 ± 0.9	11.8 ± 1.0	12.2 ± 1.0	0.94 ± 0.08
E-2	88	20.9 ± 0.5	16.5 ± 0.7	17.1 ± 0.7	1.31 ± 0.05
E-3	88	21.7 ± 1.0	17.3 ± 1.1	17.9 ± 1.2	1.38 ± 0.09
E-4	88	17.4 ± 0.7	13.0 ± 0.8	13.4 ± 0.9	1.03 ± 0.07
E-5	88	18.4 ± 0.5	14.0 ± 0.7	14.5 ± 0.7	1.11 ± 0.05
E-6	88	18.0 ± 0.4	13.6 ± 0.6	14.1 ± 0.6	1.08 ± 0.05
E-7	88	18.8 ± 0.5	14.4 ± 0.7	14.9 ± 0.7	1.15 ± 0.06
E-8	88	16.6 ± 1.0	12.2 ± 1.1	12.6 ± 1.1	0.97 ± 0.09
E-9	88	18.5 ± 0.2	14.1 ± 0.5	14.6 ± 0.5	1.13 ± 0.04
E-12	88	13.0 ± 0.1	8.6 ± 0.5	8.9 ± 0.5	0.69 ± 0.04
E-14	88	20.2 ± 0.3	15.8 ± 0.6	16.4 ± 0.6	1.26 ± 0.05
E-15	88	23.4 ± 0.5	19.0 ± 0.7	19.7 ± 0.7	1.51 ± 0.05
E-16B	88	19.6 ± 0.6	15.2 ± 0.8	15.7 ± 0.8	1.21 ± 0.06
E-17	88	17.6 ± 0.5	13.2 ± 0.7	13.7 ± 0.7	1.05 ± 0.05
E-18	88	20.8 ± 0.7	16.4 ± 0.8	17.0 ± 0.9	1.31 ± 0.07
E-22	88	19.7 ± 0.6	15.3 ± 0.8	15.8 ± 0.8	1.22 ± 0.06
E-23	88	23.4 ± 0.5	19.0 ± 0.7	19.6 ± 0.7	1.51 ± 0.05
E-24	88	18.7 ± 0.6	14.3 ± 0.7	14.8 ± 0.8	1.14 ± 0.06
E-25	88	20.8 ± 0.3	16.4 ± 0.5	17.0 ± 0.6	1.31 ± 0.04
E-26B	88	18.6 ± 0.4	14.2 ± 0.6	14.7 ± 0.6	1.13 ± 0.05
E-27	88	20.0 ± 0.3	15.6 ± 0.6	16.1 ± 0.6	1.24 ± 0.04
E-28	88	13.5 ± 0.3	9.1 ± 0.5	9.4 ± 0.5	0.72 ± 0.04
E-29	88	15.4 ± 0.4	11.0 ± 0.6	11.4 ± 0.6	0.87 ± 0.05
E-30	88	18.0 ± 0.5	13.6 ± 0.7	14.1 ± 0.7	1.08 ± 0.05
E-31	88	21.1 ± 0.6	16.7 ± 0.8	17.3 ± 0.8	1.33 ± 0.06
E-32	88	25.0 ± 0.2	20.6 ± 0.5	21.3 ± 0.5	1.64 ± 0.04
E-38	88	21.6 ± 1.4	17.2 ± 1.5	17.8 ± 1.6	1.37 ± 0.12
E-39	88	22.2 ± 1.1	17.8 ± 1.2	18.4 ± 1.3	1.42 ± 0.10
E-41	88	21.7 ± 0.4	17.4 ± 0.6	17.9 ± 0.6	1.38 ± 0.05
E-42	88	20.5 ± 0.4	16.1 ± 0.6	16.6 ± 0.6	1.28 ± 0.05
E-43	88	23.0 ± 0.8	18.7 ± 0.9	19.3 ± 1.0	1.48 ± 0.08
E-44	88	20.8 ± 0.7	16.4 ± 0.8	16.9 ± 0.9	1.30 ± 0.07
Control					
E-20	88	19.0 ± 1.0	14.6 ± 1.1	15.1 ± 1.1	1.16 ± 0.09
Mean±s.d.		19.5 ± 2.7	15.1 ± 2.7	15.6 ± 2.8	1.20 ± 0.22

In-Transit Exposure	Date Annealed	Date Read	ITC-1	ITC-2
	06-12-23	07-07-23	5.0 ± 0.3	5.2 ± 0.3
	09-12-23	10-05-23	3.8 ± 0.1	3.6 ± 0.2

[a] The $CaSO_4$:Dy dosimeter cards provide four separate readout areas. Values listed represent the mean and standard deviation of the average of the four readings.

Table 11. Ambient Gamma Radiation [a]
LLD/7days: < 1mR/TLD

4th Quarter, 2023

Date Annealed:	09-12-23	Days in the field	95
Date Placed:	10-01-23	Days from Annealing	
Date Removed:	01-04-24	to Readout:	121
Date Read:	01-11-24		

Location	Days in Field	Total mR	Net mR	mR/Stnd Qtr (91 days)	Net mR per 7 days
Indicator					
E-1	95	19.1 ± 0.2	15.0 ± 0.4	14.4 ± 0.4	1.11 ± 0.03
E-2	95	25.7 ± 1.1	21.6 ± 1.1	20.7 ± 1.1	1.59 ± 0.08
E-3	95	23.0 ± 1.5	19.0 ± 1.5	18.2 ± 1.5	1.40 ± 0.11
E-4	95	18.9 ± 0.5	14.8 ± 0.6	14.2 ± 0.6	1.09 ± 0.05
E-5	95	22.0 ± 0.7	17.9 ± 0.8	17.2 ± 0.7	1.32 ± 0.06
E-6	95	18.0 ± 0.4	13.9 ± 0.5	13.3 ± 0.5	1.02 ± 0.04
E-7	95	18.6 ± 0.5	14.6 ± 0.7	13.9 ± 0.6	1.07 ± 0.05
E-8	95	19.1 ± 0.7	15.1 ± 0.8	14.4 ± 0.8	1.11 ± 0.06
E-9	95	19.5 ± 0.4	15.4 ± 0.5	14.7 ± 0.5	1.13 ± 0.04
E-12	95	15.5 ± 0.9	11.4 ± 1.0	11.0 ± 0.9	0.84 ± 0.07
E-14	95	19.8 ± 1.4	15.7 ± 1.4	15.0 ± 1.4	1.16 ± 0.11
E-15	95	21.2 ± 1.6	17.1 ± 1.6	16.4 ± 1.6	1.26 ± 0.12
E-16B	95	22.5 ± 0.6	18.4 ± 0.7	17.7 ± 0.7	1.36 ± 0.05
E-17	95	19.4 ± 0.7	15.3 ± 0.8	14.7 ± 0.8	1.13 ± 0.06
E-18	95	22.3 ± 0.8	18.2 ± 0.9	17.4 ± 0.8	1.34 ± 0.06
E-22	95	21.9 ± 0.8	17.9 ± 0.8	17.1 ± 0.8	1.32 ± 0.06
E-23	95	24.6 ± 0.3	20.6 ± 0.5	19.7 ± 0.5	1.52 ± 0.04
E-24	95	19.9 ± 1.0	15.8 ± 1.1	15.2 ± 1.0	1.17 ± 0.08
E-25	95	21.5 ± 0.6	17.4 ± 0.7	16.7 ± 0.7	1.28 ± 0.05
E-26B	95	18.2 ± 0.3	14.2 ± 0.5	13.6 ± 0.4	1.05 ± 0.03
E-27	95	20.9 ± 0.4	16.9 ± 0.6	16.2 ± 0.5	1.24 ± 0.04
E-28	95	12.9 ± 0.4	8.9 ± 0.5	8.5 ± 0.5	0.65 ± 0.04
E-29	95	14.8 ± 0.3	10.7 ± 0.5	10.2 ± 0.5	0.79 ± 0.03
E-30	95	18.7 ± 0.6	14.6 ± 0.7	14.0 ± 0.7	1.08 ± 0.05
E-31	95	22.5 ± 1.2	18.5 ± 1.2	17.7 ± 1.2	1.36 ± 0.09
E-32	95	21.8 ± 0.6	17.7 ± 0.7	17.0 ± 0.7	1.31 ± 0.05
E-38	95	20.1 ± 0.5	16.1 ± 0.6	15.4 ± 0.6	1.19 ± 0.05
E-39	95	21.4 ± 0.6	17.4 ± 0.7	16.6 ± 0.7	1.28 ± 0.05
E-41	95	22.3 ± 0.3	18.2 ± 0.5	17.5 ± 0.5	1.34 ± 0.04
E-42	95	22.3 ± 0.9	18.3 ± 1.0	17.5 ± 1.0	1.35 ± 0.07
E-43	95	22.4 ± 0.7	18.4 ± 0.8	17.6 ± 0.7	1.35 ± 0.06
E-44	95	21.2 ± 0.5	17.2 ± 0.6	16.4 ± 0.6	1.26 ± 0.04
Control					
E-20	95	19.5 ± 0.8	15.4 ± 0.9	14.8 ± 0.9	1.14 ± 0.07
Mean±s.d.		20.4 ± 2.6	16.3 ± 2.6	15.6 ± 2.5	1.20 ± 0.19
In-Transit Exposure		Date Annealed	Date Read	ITC-1	ITC-2
		09-12-23	10-05-23	3.8 ± 0.1	3.6 ± 0.2
		12-12-23	01-11-24	4.5 ± 0.2	4.4 ± 0.2

[a] The $CaSO_4$:Dy dosimeter cards provide four separate readout areas. Values listed represent the mean and standard deviation of the average of the four readings.

	Total mR	Net mR	mR/Stnd Qtr (91 days)	Net mR per 7 days
Annual Indicator Mean±s.d.	19.7 ± 2.7	14.8 ± 2.9	14.8 ± 2.8	1.1 ± 0.2
Annual Control Mean±s.d.	19.3 ± 0.9	14.5 ± 1.3	14.4 ± 1.0	1.1 ± 0.1
Annual Indicator/Control Mean±s.d.	19.7 ± 2.7	14.8 ± 2.9	14.8 ± 2.7	1.1 ± 0.2

Table 12. Groundwater Tritium Monitoring Program
(Monthly Collections)
Units = pCi/L

Intermittent Streams

Sample ID	GW-01				GW-02		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-18-23	EWW- 105	80 ± 84	< 160	01-18-23	EWW- 106	218 ± 91	< 160
02-15-23	EWW- 343	113 ± 79	< 154	02-15-23	EWW- 344	327 ± 91	< 154
03-22-23	EWW- 603	156 ± 88	< 164	03-22-23	EWW- 604	306 ± 95	< 164
04-19-23	EWW- 955	227 ± 88	< 161	04-19-23	EWW- 956	235 ± 88	< 161
05-17-23	EWW- 1268	187 ± 91	< 161	05-17-23	EWW- 1269	214 ± 92	< 161
06-21-23	EWW- 1660	215 ± 88	< 163	06-21-23	EWW- 1661	288 ± 92	< 163
07-19-23	EWW- 2090	226 ± 89	< 162	07-19-23	EWW- 2091	226 ± 89	< 162
08-22-23	EWW- 2511	217 ± 92	< 161	08-22-23	EWW- 2512	207 ± 92	< 161
09-21-23	EWW- 2791	98 ± 82	< 163	09-21-23	EWW- 2792	82 ± 81	< 163
10-17-23		NF[a]		10-17-23		NF[a]	
11-14-23	EWW- 3540	85 ± 87	< 172	11-14-23	EWW- 3541	187 ± 93	< 172
12-20-23	EWW- 3943	68 ± 83	< 171	12-20-23	EWW- 3944	169 ± 89	< 171
Mean ± s.d.		152 ± 65		Mean ± s.d.		224 ± 68	

Sample ID	GW-03				GW-17		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-18-23	EWW- 107	153 ± 88	< 160	01-18-23	EWW- 110	319 ± 96	< 160
02-15-23	EWW- 345	106 ± 79	< 154	02-15-23	EWW- 347	475 ± 99	< 154
03-22-23	EWW- 605	92 ± 84	< 164	03-22-23	EWW- 607	370 ± 98	< 164
04-19-23	EWW- 957	168 ± 85	< 161	04-19-23	EWW- 958	388 ± 96	< 161
05-17-23	EWW- 1271	199 ± 91	< 161	05-17-23	EWW- 1273	332 ± 98	< 161
06-21-23	EWW- 1662	153 ± 85	< 163	06-21-23	EWW- 1663	246 ± 90	< 163
07-19-23	EWW- 2092	148 ± 85	< 162	07-19-23	EWW- 2093	260 ± 91	< 162
08-22-23	EWW- 2513	89 ± 85	< 161	08-22-23	EWW- 2516	270 ± 95	< 161
09-21-23	EWW- 2793	114 ± 83	< 163	09-21-23	EWW- 2795	239 ± 89	< 163
10-17-23		NF[a]		10-17-23		NF[a]	
11-14-23	EWW- 3542	43 ± 85	< 172	11-14-23	EWW- 3545	237 ± 95	< 172
12-20-23	EWW- 3945	143 ± 87	< 171	12-20-23	EWW- 3947	262 ± 93	< 171
Mean ± s.d.		128 ± 44		Mean ± s.d.		309 ± 76	

[a] "NF" = No flow.

Wells

Sample ID	GW-04 (EIC Well)		
Collection Date	Lab Code	Tritium	MDC
01-18-23	EWW- 109	59 ± 83	< 160
02-15-23	EWW- 346	62 ± 76	< 154
03-22-23	EWW- 606	73 ± 83	< 164
04-19-23	EWW- 953	108 ± 81	< 161
05-17-23	EWW- 1272	88 ± 85	< 161
06-21-23	EWW- 1664	93 ± 79	< 158
07-19-23	EWW- 2098	62 ± 80	< 162
08-22-23	EWW- 2515	29 ± 82	< 161
09-21-23	EWW- 2794	66 ± 80	< 163
10-17-23	EWW- 3229	-44 ± 76	< 169
11-14-23	EWW- 3544	-39 ± 80	< 172
12-20-23	EWW- 3946	56 ± 82	< 171
Mean ± s.d.		51 ± 48	

Table 12. Groundwater Tritium Monitoring Program
(Monthly Collections)
Units = pCi/L

Beach Drains

Sample ID	S-1				S-3		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-05-23	ESW- 34	415 ± 95	< 157	01-05-23	ESW- 35	178 ± 83	< 157
02-07-23	ESW- 243	358 ± 98	< 159	02-07-23 [a]	ESW- 245	1716 ± 153	< 162
03-01-23	ESW- 415	386 ± 97	< 163	03-01-23	ESW- 416	436 ± 99	< 163
04-06-23	ESW- 789	470 ± 100	< 161	04-06-23	ESW- 790	381 ± 96	< 161
05-03-23	ESW- 1093	435 ± 100	< 162	05-03-23	ESW- 1094	171 ± 86	< 162
06-08-23	ESW- 1482	443 ± 98	< 157	06-08-23	ESW- 1483	281 ± 90	< 157
07-06-23	ESW- 1797	288 ± 90	< 158	07-06-23	ESW- 1798	317 ± 91	< 158
08-02-23	EWW- 2302	381 ± 97	< 159	08-02-23	ESW- 2303	245 ± 90	< 159
09-12-23	EWW- 2680	287 ± 92	< 163	09-12-23	ESW- 2681	80 ± 81	< 163
10-03-23	EWW- 2995	369 ± 97	< 167	10-03-23	ESW- 2996	211 ± 89	< 167
11-01-23	EWW- 3402	322 ± 96	< 171	11-01-23	ESW- 3403	985 ± 125	< 171
12-05-23	EWW- 3773	331 ± 98	< 171	12-05-23	EWW- 3774	111 ± 87	< 171
Mean ± s.d.		374 ± 60		Mean ± s.d.		426 ± 471	

[a] Tritium > 1000 pCi/L. Water resampled on 2/9. Tritium result = 892 ± 121 pCi/L, MDC < 159 pCi/L.Additional analyses in app. F.

Sample ID	S-7				S-8		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-05-23		NF[a]		01-05-23		NF[a]	
02-07-23 [b]	ESW- 246	1407 ± 139	< 159	02-07-23		NF[a]	
03-01-23	ESW- 417	281 ± 92	< 163	03-01-23		NF[a]	
04-06-23		NF[a]		04-06-23		NF[a]	
05-03-23		NF[a]		05-03-23		NF[a]	
06-08-23		NF[a]		06-08-23		NF[a]	
07-06-23		NF[a]		07-06-23		NF[a]	
08-02-23		NF[a]		08-02-23		NF[a]	
09-12-23		NF[a]		09-12-23		NF[a]	
10-03-23		NF[a]		10-03-23		NF[a]	
11-01-23		NF[a]		11-01-23		NF[a]	
12-05-23		NF[a]		12-05-23		NF[a]	
Mean ± s.d.		844 ± 797		Mean ± s.d.			

[b] Tritium > 1000 pCi/L. Additional analyses in app. F.

Sample ID	S-9				S-10		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-05-23		NF[a]		01-05-23		NF[a]	
02-07-23		NF[a]		02-07-23		NF[a]	
03-01-23	ESW- 418	283 ± 92	< 163	03-01-23	ESW- 419	655 ± 92	< 163
04-06-23		NF[a]		04-06-23		NF[a]	
05-03-23		NF[a]		05-03-23		NF[a]	
06-08-23		NF[a]		06-08-23		NF[a]	
07-06-23		NF[a]		07-06-23		NF[a]	
08-02-23		NF[a]		08-02-23		NF[a]	
09-12-23		NF[a]		09-12-23		NF[a]	
10-03-23		NF[a]		10-03-23		NF[a]	
11-01-23		NF[a]		11-01-23	ESW- 3404	589 ± 109	
12-05-23		NF[a]		12-05-23		NF[a]	
Mean ± s.d.				Mean ± s.d.		622 ± 47	

[a] "NF" = No flow.

Table 12. Groundwater Tritium Monitoring Program
(Monthly Collections)
Units = pCi/L

Beach Drains (cont.)

Sample ID	S-12				S-13		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-05-23	EWW- 36	294 ± 89	< 157	01-05-23		NF[a]	
02-07-23	EWW- 247	287 ± 94	< 159	02-07-23		NF[a]	
03-01-23	EWW- 420	290 ± 92	< 163	03-01-23		NF[a]	
04-06-23	EWW- 791	276 ± 91	< 161	04-06-23		NF[a]	
05-03-23	EWW- 1095	500 ± 103	< 162	05-03-23		NF[a]	
06-08-23		NF[a]		06-08-23		NF[a]	
07-06-23		NF[a]		07-06-23		NF[a]	
08-02-23	EWW- 2304	338 ± 95	< 159	08-02-23		NF[a]	
09-12-23	EWW- 2683	237 ± 90	< 163	09-12-23		NF[a]	
10-03-23		NF[a]		10-03-23		NF[a]	
11-01-23	EWW- 3405	244 ± 93	< 171	11-01-23		NF[a]	
12-05-23	EWW- 3776	134 ± 88	< 171	12-05-23		NF[a]	
Mean ± s.d.		289 ± 97		Mean ± s.d.			

U2 Façade Subsurface Drain Sump

Collection Date	Lab Code	Tritium	MDC
01-31-23	EW- 225	1697 ± 146	< 155
02-28-23	EW- 342	1805 ± 149	< 154
03-31-23	EW- 894	1072 ± 132	< 158
04-30-23	EW- 1151	1384 ± 138	< 162
05-31-23	EW- 1481	1392 ± 136	< 157
06-30-23	EW- 2545	2339 ± 169	< 161
07-31-23	EW- 2342	1120 ± 131	< 162
08-31-23	EW- 2676	1004 ± 123	< 163
09-30-23	EW- 4057	1391 ± 140	< 171
10-31-23	EW- 4059	462 ± 104	< 170
11-30-23	EW- 4060	792 ± 117	< 169
12-31-23	EW- 4061	870 ± 120	< 169
Mean ± s.d.		1277 ± 507	

[a] "NF" = No flow.

POINT BEACH NUCLEAR PLANT

Beach Drains

Units: = pCi/L | Gamma isotopic analysis

Location	S-1		S-3		S-7		S-8	
Collection Date	01-05-23		01-05-23		01-05-23		01-05-23	
Lab Code	EW- 34	MDC	EW- 35	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	-8.0 ± 9.5	< 18.9	-3.5 ± 11.3	< 21.1	-		-	
Mn-54	0.8 ± 1.5	< 2.0	-0.2 ± 1.5	< 2.1	-		-	
Fe-59	0.4 ± 3.0	< 4.4	2.1 ± 2.7	< 5.5	-		-	
Co-58	0.7 ± 1.4	< 2.7	1.5 ± 1.4	< 2.3	-		-	
Co-60	1.7 ± 1.4	< 1.7	0.3 ± 1.7	< 1.0	-		-	
Zn-65	2.2 ± 3.4	< 4.8	1.8 ± 3.1	< 4.8	-		-	
Zr-Nb-95	-0.8 ± 1.4	< 2.2	-2.4 ± 1.4	< 2.0	-		-	
Cs-134	-0.4 ± 1.3	< 2.4	-0.8 ± 1.4	< 2.5	-		-	
Cs-137	0.2 ± 1.6	< 3.2	0.7 ± 2.0	< 3.6	-		-	
Ba-La-140	-0.9 ± 1.8	< 2.5	-1.3 ± 1.7	< 1.3	-		-	

Location	S-9		S-10		S-12		S-13	
Collection Date	01-05-23		01-05-23		01-05-23		01-05-23	
Lab Code	NF[a]	MDC	NF[a]	MDC	EW- 36	MDC	NF[a]	MDC
Be-7	-		-		-14.2 ± 14.2	< 22.4	-	
Mn-54	-		-		-0.3 ± 1.7	< 2.3	-	
Fe-59	-		-		1.3 ± 3.7	< 5.2	-	
Co-58	-		-		1.3 ± 3.0	< 2.5	-	
Co-60	-		-		-1.6 ± 3.3	< 6.2	-	
Zn-65	-		-		-2.8 ± 3.7	< 4.8	-	
Zr-Nb-95	-		-		0.1 ± 2.0	< 3.3	-	
Cs-134	-		-		-0.5 ± 1.6	< 3.3	-	
Cs-137	-		-		1.0 ± 3.2	< 5.3	-	
Ba-La-140	-		-		-1.3 ± 1.8	< 2.5	-	

Location	S-1		S-3		S-7		S-8	
Collection Date	02-07-23		02-07-23		02-07-23		02-07-23	
Lab Code	EW- 243	MDC	EW- 245	MDC	EW- 246	MDC	NF[a]	MDC
Be-7	14.7 ± 14.4	< 25.4	-1.5 ± 9.0	< 17.5	4.1 ± 15.4	< 28.7	-	
Mn-54	-1.2 ± 1.8	< 2.5	-1.3 ± 1.3	< 1.3	-1.2 ± 1.7	< 2.8	-	
Fe-59	4.0 ± 3.6	< 5.3	-1.2 ± 3.1	< 3.7	1.9 ± 2.7	< 3.5	-	
Co-58	-0.1 ± 1.7	< 1.6	-0.8 ± 1.3	< 2.2	0.5 ± 1.5	< 2.6	-	
Co-60	0.3 ± 1.9	< 1.8	0.1 ± 1.7	< 2.3	-0.5 ± 1.5	< 6.5	-	
Zn-65	-3.7 ± 4.1	< 3.3	-3.0 ± 3.0	< 5.0	-2.9 ± 3.8	< 4.8	-	
Zr-Nb-95	-1.6 ± 3.0	< 3.4	-1.4 ± 2.3	< 1.9	-3.1 ± 1.8	< 2.8	-	
Cs-134	-0.4 ± 1.7	< 3.2	0.0 ± 1.3	< 2.2	0.2 ± 1.5	< 2.9	-	
Cs-137	-0.8 ± 2.0	< 3.3	2.8 ± 1.6	< 3.0	1.9 ± 1.7	< 5.0	-	
Ba-La-140	-0.5 ± 2.1	< 3.0	-0.2 ± 1.5	< 1.3	0.7 ± 1.8	< 2.9	-	

[a] "NF" = No flow.

Beach Drains (cont.)

Units: = pCi\L | Gamma isotopic analysis

Location	S-9		S-10		S-12		S-13	
Collection Date	02-07-23		02-07-23		02-07-23		02-07-23	
Lab Code	NF[a]	MDC	NF[a]	MDC	EW- 247	MDC	NF[a]	MDC
Be-7	-		-		-7.1 ± 2.3	< 22.1	-	
Mn-54	-		-		0.3 ± 2.6	< 4.3	-	
Fe-59	-		-		-0.5 ± 5.3	< 6.0	-	
Co-58	-		-		-1.2 ± 2.9	< 4.7	-	
Co-60	-		-		2.4 ± 2.9	< 4.9	-	
Zn-65	-		-		-2.1 ± 6.7	< 7.7	-	
Zr-Nb-95	-		-		-2.2 ± 3.0	< 3.7	-	
Cs-134	-		-		-0.8 ± 2.9	< 5.0	-	
Cs-137	-		-		-1.0 ± 3.3	< 4.2	-	
Ba-La-140	-		-		-0.8 ± 8.7	< 2.8	-	

Location	S-1		S-3		S-7		S-8	
Collection Date	03-01-23		03-01-23		03-01-23		03-01-23	
Lab Code	EW- 415	MDC	EW- 416	MDC	EW- 417	MDC	NF[a]	MDC
Be-7	13.7 ± 8.9	< 18.0	21.8 ± 14.7	< 32.4	5.5 ± 23.4	< 20.1	-	
Mn-54	-0.9 ± 1.4	< 1.7	-0.8 ± 1.5	< 2.0	1.1 ± 2.4	< 4.1	-	
Fe-59	-2.0 ± 2.5	< 3.9	-1.8 ± 3.1	< 2.6	-2.8 ± 5.4	< 3.6	-	
Co-58	0.4 ± 1.4	< 2.0	0.6 ± 1.7	< 2.9	0.1 ± 2.4	< 3.2	-	
Co-60	-1.4 ± 1.5	< 1.3	-2.0 ± 0.6	< 6.3	-2.8 ± 3.1	< 3.9	-	
Zn-65	1.9 ± 2.6	< 5.0	-2.5 ± 3.6	< 4.8	-1.9 ± 7.0	< 6.4	-	
Zr-Nb-95	-2.4 ± 1.5	< 2.8	-1.7 ± 1.7	< 3.3	-1.1 ± 2.8	< 4.7	-	
Cs-134	-0.3 ± 1.1	< 1.8	1.0 ± 1.4	< 2.9	-3.4 ± 2.7	< 4.9	-	
Cs-137	-0.3 ± 1.5	< 3.0	0.6 ± 0.6	< 4.9	-1.4 ± 3.1	< 4.4	-	
Ba-La-140	-0.3 ± 1.5	< 2.4	-2.1 ± 1.4	< 1.8	1.7 ± 3.3	< 4.8	-	

Location	S-9		S-10		S-12		S-13	
Collection Date	03-01-23		03-01-23		03-01-23		03-01-23	
Lab Code	EW- 418	MDC	EW- 419	MDC	EW- 420	MDC	NF[a]	MDC
Be-7	15.2 ± 15.2	< 30.5	14.6 ± 8.7	< 18.4	-17.9 ± 20.0	< 24.4	-	
Mn-54	0.8 ± 1.8	< 3.3	-1.0 ± 1.2	< 1.6	2.4 ± 2.6	< 4.7	-	
Fe-59	2.4 ± 3.8	< 6.6	1.8 ± 2.3	< 3.9	7.3 ± 5.4	< 4.0	-	
Co-58	2.9 ± 1.5	< 2.7	0.4 ± 1.3	< 2.6	-6.0 ± 2.6	< 4.7	-	
Co-60	1.8 ± 2.2	< 2.5	0.6 ± 1.5	< 1.8	1.5 ± 2.8	< 3.6	-	
Zn-65	-1.1 ± 4.0	< 5.6	-2.6 ± 2.6	< 4.1	-4.4 ± 6.7	< 6.9	-	
Zr-Nb-95	0.8 ± 2.1	< 3.6	-1.1 ± 1.5	< 2.1	1.5 ± 2.6	< 5.8	-	
Cs-134	1.2 ± 1.8	< 3.4	0.5 ± 1.2	< 2.4	-0.6 ± 2.7	< 4.4	-	
Cs-137	0.7 ± 2.1	< 4.6	-0.2 ± 1.4	< 2.1	0.2 ± 2.5	< 3.8	-	
Ba-La-140	-1.0 ± 2.1	< 2.9	-0.2 ± 1.3	< 1.1	1.8 ± 2.9	< 2.8	-	

[a] "NF" = No flow.

Beach Drains (cont.)

Units: = pCi\L

Gamma isotopic analysis

Location	S-1		S-3		S-7		S-8	
Collection Date	04-06-23		04-06-23		04-06-23		04-06-23	
Lab Code	EW- 789	MDC	EW- 790	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	4.4 ± 10.4	< 23.8	-0.7 ± 1.0	< 25.9	-		-	
Mn-54	0.3 ± 1.5	< 2.2	-1.0 ± 1.7	< 1.6	-		-	
Fe-59	1.0 ± 3.5	< 5.4	-2.0 ± 3.2	< 4.4	-		-	
Co-58	-0.3 ± 1.7	< 1.4	0.7 ± 1.8	< 1.9	-		-	
Co-60	1.0 ± 1.7	< 1.8	-1.4 ± 1.8	< 2.0	-		-	
Zn-65	-0.9 ± 2.7	< 4.4	1.3 ± 3.3	< 5.9	-		-	
Zr-Nb-95	0.0 ± 2.0	< 3.6	-3.4 ± 1.8	< 2.6	-		-	
Cs-134	0.2 ± 1.6	< 3.0	1.5 ± 1.3	< 2.6	-		-	
Cs-137	1.3 ± 1.7	< 3.0	1.6 ± 1.7	< 2.4	-		-	
Ba-La-140	-0.3 ± 2.2	< 2.1	1.5 ± 1.6	< 2.1	-		-	

Location	S-9		S-10		S-12		S-13	
Collection Date	04-06-23		04-06-23		04-06-23		04-06-23	
Lab Code	NF[a]	MDC	NF[a]	MDC	EW- 791	MDC	NF[a]	MDC
Be-7	-		-		-8.1 ± 16.6	< 23.5	-	
Mn-54	-		-		-0.3 ± 2.0	< 2.8	-	
Fe-59	-		-		1.6 ± 3.7	< 5.3	-	
Co-58	-		-		0.6 ± 1.7	< 3.1	-	
Co-60	-		-		0.4 ± 2.8	< 2.2	-	
Zn-65	-		-		-4.8 ± 4.6	< 3.5	-	
Zr-Nb-95	-		-		-1.3 ± 2.1	< 3.0	-	
Cs-134	-		-		-0.8 ± 2.0	< 4.1	-	
Cs-137	-		-		-0.6 ± 2.3	< 2.9	-	
Ba-La-140	-		-		-2.8 ± 2.0	< 3.6	-	

Location	S-1		S-3		S-7		S-8	
Collection Date	05-03-23		05-03-23		05-03-23		05-03-23	
Lab Code	EW- 1093	MDC	EW- 1094	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	-4.3 ± 15.5	< 26.2	2.4 ± 8.9	< 14.9	-		-	
Mn-54	-1.9 ± 2.0	< 2.4	-1.3 ± 1.3	< 1.4	-		-	
Fe-59	-1.0 ± 3.9	< 6.6	-0.4 ± 2.3	< 4.1	-		-	
Co-58	-1.1 ± 2.0	< 3.3	0.3 ± 1.2	< 1.9	-		-	
Co-60	1.7 ± 2.3	< 2.1	0.1 ± 1.6	< 1.9	-		-	
Zn-65	-2.8 ± 4.2	< 4.6	-3.5 ± 2.7	< 4.6	-		-	
Zr-Nb-95	-2.5 ± 3.6	< 3.7	-1.1 ± 1.3	< 2.0	-		-	
Cs-134	-0.1 ± 1.8	< 3.3	-0.7 ± 1.3	< 2.3	-		-	
Cs-137	1.1 ± 2.2	< 3.3	0.5 ± 1.5	< 2.6	-		-	
Ba-La-140	2.0 ± 2.1	< 4.4	-1.8 ± 1.6	< 1.5	-		-	

[a] "NF" = No flow.

Beach Drains (cont.)

Units: = pCi\L

Gamma isotopic analysis

Location	S-9		S-10		S-12		S-13	
Collection Date	05-03-23		05-03-23		05-03-23		05-03-23	
Lab Code	NF[a]	MDC	NF[a]	MDC	EW- 1095	MDC	NF[a]	MDC
Be-7	-		-		-6.6 ± 8.2	< 13.8	-	
Mn-54	-		-		-0.3 ± 1.4	< 2.0	-	
Fe-59	-		-		-0.3 ± 2.3	< 3.3	-	
Co-58	-		-		0.2 ± 1.3	< 2.2	-	
Co-60	-		-		0.8 ± 1.5	< 1.8	-	
Zn-65	-		-		1.7 ± 2.5	< 3.6	-	
Zr-Nb-95	-		-		-1.0 ± 1.3	< 2.1	-	
Cs-134	-		-		0.2 ± 1.2	< 2.2	-	
Cs-137	-		-		1.0 ± 1.5	< 2.5	-	
Ba-La-140	-		-		0.9 ± 1.4	< 3.2	-	

Location	S-1		S-3		S-7		S-8	
Collection Date	06-08-23		06-08-23		06-08-23		06-08-23	
Lab Code	EW- 1482	MDC	EW- 1483	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	-7.2 ± 10.4	< 15.8	-4.1 ± 9.8	< 13.8	-		-	
Mn-54	0.3 ± 1.4	< 2.9	1.5 ± 1.2	< 2.9	-		-	
Fe-59	0.8 ± 2.7	< 5.5	2.1 ± 2.4	< 3.7	-		-	
Co-58	-0.1 ± 1.4	< 2.7	-1.3 ± 1.3	< 2.1	-		-	
Co-60	0.3 ± 1.4	< 2.5	-1.0 ± 2.6	< 2.3	-		-	
Zn-65	-4.1 ± 3.1	< 2.2	-1.3 ± 2.2	< 3.1	-		-	
Zr-Nb-95	0.5 ± 1.4	< 2.9	-0.3 ± 1.3	< 2.4	-		-	
Cs-134	0.3 ± 1.2	< 2.3	-0.8 ± 1.2	< 2.3	-		-	
Cs-137	-0.3 ± 1.4	< 2.7	-0.4 ± 1.5	< 2.8	-		-	
Ba-La-140	-0.9 ± 1.7	< 3.4	-1.4 ± 4.4	< 2.2	-		-	

Location	S-9		S-10		S-12		S-13	
Collection Date	06-08-23		06-08-23		06-08-23		06-08-23	
Lab Code	NF[a]	MDC	NF[a]	MDC		MDC	NF[a]	MDC
Be-7	-		-		-		-	
Mn-54	-		-		-		-	
Fe-59	-		-		-		-	
Co-58	-		-		-		-	
Co-60	-		-		-		-	
Zn-65	-		-		-		-	
Zr-Nb-95	-		-		-		-	
Cs-134	-		-		-		-	
Cs-137	-		-		-		-	
Ba-La-140	-		-		-		-	

[a] "NF" = No flow.

POINT BEACH NUCLEAR PLANT

Beach Drains (cont.)

Units: = pCi\L

Gamma isotopic analysis

Location	S-1		S-3		S-7		S-8	
Collection Date	07-06-23		07-06-23		07-06-23		07-06-23	
Lab Code	EW- 1797	MDC	EW- 1798	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	1.4 ± 12.5	< 15.0	-0.8 ± 1.3	< 15.5	-		-	
Mn-54	0.9 ± 1.4	< 1.6	1.2 ± 1.4	< 1.7	-		-	
Fe-59	-1.4 ± 3.0	< 5.2	1.2 ± 3.0	< 4.9	-		-	
Co-58	0.5 ± 1.3	< 1.6	0.3 ± 1.4	< 1.7	-		-	
Co-60	-1.1 ± 1.5	< 1.9	0.2 ± 1.5	< 1.9	-		-	
Zn-65	0.4 ± 3.0	< 3.8	2.0 ± 2.8	< 4.1	-		-	
Zr-Nb-95	-0.7 ± 1.5	< 2.0	1.0 ± 1.4	< 2.1	-		-	
Cs-134	0.6 ± 1.5	< 2.9	0.7 ± 1.5	< 2.8	-		-	
Cs-137	-0.2 ± 1.6	< 2.0	-0.2 ± 1.7	< 2.0	-		-	
Ba-La-140	-0.9 ± 1.8	< 2.2	-1.1 ± 1.9	< 2.5	-		-	

Location	S-9		S-10		S-12		S-13	
Collection Date	07-06-23		07-06-23		07-06-23		07-06-23	
Lab Code	NF[a]	MDC	NF[a]	MDC		MDC	NF[a]	MDC
Be-7	-		-		-		-	
Mn-54	-		-		-		-	
Fe-59	-		-		-		-	
Co-58	-		-		-		-	
Co-60	-		-		-		-	
Zn-65	-		-		-		-	
Zr-Nb-95	-		-		-		-	
Cs-134	-		-		-		-	
Cs-137	-		-		-		-	
Ba-La-140	-		-		-		-	

Location	S-1		S-3		S-7		S-8	
Collection Date	08-02-23	MDC	08-02-23	MDC	08-02-23	MDC	08-02-23	MDC
Lab Code	EW- 2302		EW- 2303		NF[a]		NF[a]	
Be-7	12.5 ± 20.4	< 37.2	5.8 ± 29.5	< 33.9	-		-	
Mn-54	-1.6 ± 2.2	< 3.8	4.9 ± 3.6	< 5.2	-		-	
Fe-59	-3.9 ± 5.3	< 5.2	3.1 ± 7.7	< 12.4	-		-	
Co-58	0.8 ± 2.3	< 2.6	-0.4 ± 3.9	< 6.0	-		-	
Co-60	0.8 ± 2.7	< 3.6	-2.3 ± 3.2	< 3.7	-		-	
Zn-65	0.5 ± 5.8	< 6.3	-6.1 ± 8.4	< 5.5	-		-	
Zr-Nb-95	-2.3 ± 3.0	< 6.6	-0.3 ± 4.5	< 8.1	-		-	
Cs-134	-2.5 ± 2.7	< 4.6	-0.5 ± 3.2	< 6.0	-		-	
Cs-137	0.3 ± 3.0	< 4.2	0.9 ± 3.6	< 7.0	-		-	
Ba-La-140	-2.8 ± 9.4	< 3.2	-12.6 ± 5.0	< 6.3	-		-	

[a] "NF" = No flow.

POINT BEACH NUCLEAR PLANT

Beach Drains (cont.)

Units: = pCi\L | Gamma isotopic analysis

Location	S-9		S-10		S-12		S-13	
Collection Date	08-02-23		08-02-23		08-02-23		08-02-23	
Lab Code	NF[a]	MDC	NF[a]	MDC	EW- 2304	MDC	NF[a]	MDC
Be-7	-		-		-16.0 ± 3.2	< 24.9	-	
Mn-54	-		-		-6.1 ± 4.2	< 5.2	-	
Fe-59	-		-		-0.8 ± 8.7	< 9.3	-	
Co-58	-		-		-1.0 ± 1.1	< 5.0	-	
Co-60	-		-		-1.6 ± 5.3	< 4.9	-	
Zn-65	-		-		-2.5 ± 10.1	< 15.4	-	
Zr-Nb-95	-		-		-5.4 ± 3.7	< 3.9	-	
Cs-134	-		-		1.8 ± 4.2	< 7.3	-	
Cs-137	-		-		-1.6 ± 4.5	< 4.7	-	
Ba-La-140	-		-		3.0 ± 3.6	< 3.8	-	

Location	S-1		S-3		S-7		S-8	
Collection Date	09-12-23		09-12-23		09-12-23		09-12-23	
Lab Code	EW- 2680	MDC	EW- 2681	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	19.7 ± 22.7	< 38.3	-8.2 ± 20.6	< 32.2	-		-	
Mn-54	-1.5 ± 2.6	< 2.6	0.2 ± 2.2	< 3.3	-		-	
Fe-59	1.6 ± 6.3	< 5.1	-2.5 ± 4.8	< 5.3	-		-	
Co-58	-0.8 ± 2.6	< 1.8	-0.4 ± 2.2	< 2.3	-		-	
Co-60	2.5 ± 2.7	< 9.1	-1.0 ± 2.7	< 8.2	-		-	
Zn-65	-2.8 ± 5.3	< 4.4	-2.5 ± 5.3	< 7.3	-		-	
Zr-Nb-95	0.2 ± 2.8	< 4.8	-0.6 ± 3.0	< 5.2	-		-	
Cs-134	-0.3 ± 2.6	< 4.8	-1.1 ± 2.2	< 4.2	-		-	
Cs-137	2.1 ± 3.0	< 8.1	3.5 ± 3.2	< 7.9	-		-	
Ba-La-140	-2.9 ± 2.5	< 3.9	-0.3 ± 2.4	< 4.4	-		-	

Location	S-9		S-10		S-12		S-13	
Collection Date	09-12-23		09-12-23		09-12-23		09-12-23	
Lab Code	NF[a]	MDC	NF[a]	MDC	EW- 2683	MDC	NF[a]	MDC
Be-7	-		-		10.2 ± 27.8	< 33.1	-	
Mn-54	-		-		0.8 ± 3.4	< 6.6	-	
Fe-59	-		-		8.3 ± 6.5	< 9.2	-	
Co-58	-		-		-2.0 ± 3.3	< 5.2	-	
Co-60	-		-		-3.5 ± 3.7	< 4.1	-	
Zn-65	-		-		6.6 ± 9.1	< 7.5	-	
Zr-Nb-95	-		-		-2.4 ± 3.9	< 5.5	-	
Cs-134	-		-		-1.9 ± 3.4	< 6.3	-	
Cs-137	-		-		-0.3 ± 4.4	< 4.0	-	
Ba-La-140	-		-		0.3 ± 4.3	< 4.2	-	

[a] "NF" = No flow.

Beach Drains (cont.)

Units: = pCi\L

Gamma isotopic analysis

Location	S-1		S-3		S-7		S-8	
Collection Date	10-03-23		10-03-23		10-03-23		10-03-23	
Lab Code	EW- 2995	MDC	EW- 2996	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	-10.3 ± 19.1	< 26.8	33.0 ± 28.6	< 41.8	-		-	
Mn-54	-1.2 ± 1.8	< 2.6	-0.6 ± 4.7	< 6.3	-		-	
Fe-59	-2.4 ± 3.9	< 2.9	5.5 ± 9.6	< 12.3	-		-	
Co-58	0.6 ± 2.0	< 1.7	2.1 ± 4.6	< 6.5	-		-	
Co-60	1.2 ± 2.7	< 7.1	-6.4 ± 4.6	< 4.7	-		-	
Zn-65	-1.7 ± 5.1	< 6.3	4.5 ± 8.4	< 11.3	-		-	
Zr-Nb-95	-2.5 ± 2.3	< 2.8	-1.7 ± 4.5	< 5.3	-		-	
Cs-134	-0.3 ± 2.2	< 3.9	0.1 ± 4.1	< 7.6	-		-	
Cs-137	4.0 ± 2.5	< 6.0	2.4 ± 4.2	< 5.9	-		-	
Ba-La-140	0.6 ± 2.1	< 2.8	1.9 ± 4.2	< 3.4	-		-	

Location	S-9		S-10		S-12		S-13	
Collection Date	10-03-23		10-03-23		10-03-23		10-03-23	
Lab Code	NF[a]	MDC	NF[a]	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	-		-		-		-	
Mn-54	-		-		-		-	
Fe-59	-		-		-		-	
Co-58	-		-		-		-	
Co-60	-		-		-		-	
Zn-65	-		-		-		-	
Zr-Nb-95	-		-		-		-	
Cs-134	-		-		-		-	
Cs-137	-		-		-		-	
Ba-La-140	-		-		-		-	

Location	S-1	MDC	S-3	MDC	S-7	MDC	S-8	MDC
Collection Date	11-01-23		11-01-23		11-01-23		11-01-23	
Lab Code	EW- 3402		EW- 3403		NF[a]		NF[a]	
Be-7	9.5 ± 27.1	< 28.0	-7.7 ± 11.3	< 19.8	-		-	
Mn-54	1.0 ± 3.5	< 5.6	-0.2 ± 1.6	< 2.7	-		-	
Fe-59	9.0 ± 7.2	< 10.5	0.3 ± 3.2	< 5.5	-		-	
Co-58	0.9 ± 3.0	< 5.4	0.7 ± 1.5	< 3.1	-		-	
Co-60	-2.3 ± 4.3	< 4.2	0.2 ± 1.3	< 1.0	-		-	
Zn-65	4.0 ± 6.9	< 8.3	-1.3 ± 2.4	< 2.9	-		-	
Zr-Nb-95	1.3 ± 3.4	< 5.4	-0.9 ± 1.8	< 2.5	-		-	
Cs-134	1.8 ± 2.8	< 5.1	-0.6 ± 1.7	< 2.7	-		-	
Cs-137	0.1 ± 3.6	< 5.4	-0.8 ± 1.8	< 1.8	-		-	
Ba-La-140	-4.8 ± 4.3	< 3.0	1.1 ± 1.6	< 3.1	-		-	

[a] "NF" = No flow.

POINT BEACH NUCLEAR PLANT

Beach Drains (cont.)

Units: = pCi\L | Gamma isotopic analysis

Location	S-9		S-10		S-12		S-13	
Collection Date	11-01-23		11-01-23		11-01-23		11-01-23	
Lab Code	NF[a]	MDC	EW- 3404	MDC	EW- 3405	MDC	NF[a]	MDC
Be-7	-		1.4 ± 13.4	< 23.7	2.2 ± 23.2	< 29.3	-	
Mn-54	-		-1.3 ± 1.6	< 2.4	2.1 ± 3.0	< 5.4	-	
Fe-59	-		-2.3 ± 3.1	< 3.4	-4.4 ± 6.4	< 5.5	-	
Co-58	-		1.0 ± 1.6	< 2.4	1.1 ± 2.8	< 4.3	-	
Co-60	-		1.9 ± 1.9	< 5.4	1.8 ± 3.2	< 3.6	-	
Zn-65	-		-0.8 ± 3.7	< 5.9	-9.6 ± 7.5	< 4.1	-	
Zr-Nb-95	-		-2.1 ± 1.5	< 1.8	-3.1 ± 2.8	< 3.2	-	
Cs-134	-		0.9 ± 1.5	< 2.9	-4.8 ± 3.2	< 5.5	-	
Cs-137	-		1.2 ± 1.9	< 4.6	-0.7 ± 3.6	< 5.4	-	
Ba-La-140	-		-3.8 ± 2.0	< 2.3	2.7 ± 2.6	< 2.2	-	

Location	S-1		S-3		S-7		S-8	
Collection Date	12-05-23		12-05-23		12-05-23		12-05-23	
Lab Code	EW- 3773	MDC	EW- 3774	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	2.7 ± 12.9	< 18.4	3.8 ± 11.8	< 24.9	-		-	
Mn-54	0.8 ± 1.5	< 1.9	0.9 ± 1.7	< 2.5	-		-	
Fe-59	2.1 ± 2.8	< 5.1	-1.2 ± 3.8	< 4.5	-		-	
Co-58	-0.8 ± 1.9	< 3.0	0.9 ± 1.8	< 2.7	-		-	
Co-60	0.4 ± 2.1	< 1.4	1.3 ± 2.2	< 3.3	-		-	
Zn-65	0.7 ± 2.9	< 2.7	-3.9 ± 5.0	< 8.3	-		-	
Zr-Nb-95	-1.1 ± 2.1	< 2.6	-1.4 ± 2.0	< 2.4	-		-	
Cs-134	-0.2 ± 1.7	< 3.2	-0.3 ± 1.7	< 3.3	-		-	
Cs-137	0.1 ± 1.7	< 1.9	0.1 ± 2.2	< 3.5	-		-	
Ba-La-140	-0.8 ± 1.9	< 2.0	1.4 ± 2.1	< 2.6	-		-	

Location	S-9		S-10		S-12		S-13	
Collection Date	12-05-23		12-05-23		12-05-23		12-05-23	
Lab Code	NF[a]	MDC	NF[a]	MDC	EW- 3776	MDC	NF[a]	MDC
Be-7	-		-		-8.0 ± 14.5	< 27.2	-	
Mn-54	-		-		0.8 ± 2.0	< 2.8	-	
Fe-59	-		-		2.5 ± 4.1	< 5.2	-	
Co-58	-		-		0.8 ± 1.9	< 2.5	-	
Co-60	-		-		0.6 ± 1.7	< 2.6	-	
Zn-65	-		-		1.7 ± 4.0	< 4.5	-	
Zr-Nb-95	-		-		-0.2 ± 2.1	< 4.3	-	
Cs-134	-		-		0.1 ± 1.7	< 3.0	-	
Cs-137	-		-		-1.1 ± 2.3	< 2.6	-	
Ba-La-140	-		-		-1.6 ± 5.3	< 4.9	-	

[a] "NF" = No flow.

Table 12. Groundwater Tritium Monitoring Program
(Quarterly Collections)
Units = pCi/L

Quarterly Wells

Sample ID	GW-05 (WH 6 Well)				GW-06 (SBCC Well)		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-18-23	EWW- 111	-6 ± 79	< 160	01-18-23	EWW- 112	38 ± 81	< 160
04-13-23	EWW- 881	46 ± 78	< 161	04-13-23	EWW- 882	-34 ± 72	< 161
07-19-23	EWW- 2094	52 ± 79	162	07-19-23	EWW- 2096	55 ± 79	< 162
10-10-23	EWW- 3072	-51 ± 75	< 170	10-10-23	EWW- 3073	33 ± 81	< 170
Mean ± s.d.		10 ± 49		Mean ± s.d.		23 ± 39	

Sample ID	GW-11 (MW-1)				GW-12 (MW-2)		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
02-08-23	EWW- 272	93 ± 84	< 159	02-08-23	EWW- 273	11 ± 79	< 159
04-27-23	EWW- 1108	164 ± 86	< 162	04-27-23	EWW- 1109	75 ± 81	< 162
07-19-23	EWW- 2186	214 ± 88	< 162	07-19-23	EWW- 2187	5 ± 76	< 162
12-07-23	EWW- 3892	42 ± 82	< 171	12-07-23	EWW- 3893	-15 ± 78	< 171
Mean ± s.d.		128 ± 76		Mean ± s.d.		19 ± 39	

Sample ID	GW-13 (MW-6)				GW-14A (MW-05A)		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
02-08-23	EWW- 274	100 ± 85	< 159	02-08-23	EWW- 275	219 ± 91	< 159
04-27-23	EWW- 1110	118 ± 83	< 162	04-27-23	EWW- 1111	273 ± 92	< 162
07-19-23	EWW- 2188	74 ± 80	< 162	07-19-23	EWW- 2189	155 ± 85	< 162
12-07-23	EWW- 3894	-10 ± 79	< 171	12-07-23	EWW- 3895	106 ± 85	< 171
Mean ± s.d.		70 ± 57		Mean ± s.d.		188 ± 73	

Sample ID	GW-15A (MW-4)				GW-15B (MW-4)		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
02-08-23	EWW- 276	135 ± 86	< 159	02-08-23	EWW- 277	245 ± 92	< 159
04-27-23	EWW- 1112	193 ± 87	< 162	04-27-23	EWW- 1113	150 ± 85	< 162
07-19-23	EWW- 2190	200 ± 88	< 162	07-19-23	EWW- 2191	186 ± 87	< 162
12-07-23	EWW- 3896	66 ± 83	< 171	12-07-23	EWW- 3897	122 ± 86	< 171
Mean ± s.d.		148 ± 63		Mean ± s.d.		176 ± 53	

Sample ID	GW-16A (MW-3)		
Collection Date	Lab Code	Tritium	MDC
02-08-23	EWW- 278	245 ± 92	< 159
04-27-23	EWW- 1114	285 ± 92	< 162
07-19-23	EWW- 2192	314 ± 94	< 162
12-07-23	EWW- 3898	134 ± 87	< 171
Mean ± s.d.		245 ± 79	

Table 12. Groundwater Tritium Monitoring Program
(Quarterly Collections)
Units = pCi/L

Quarterly Wells (cont.)

Sample ID: GW-18 (WH 7 Well)

Collection Date	Lab Code	Tritium	MDC
01-18-23	EWW- 113	59 ± 83	< 160
04-13-23	EWW- 883	50 ± 78	< 161
07-19-23	EWW- 2097	124 ± 83	< 162
10-10-23	EWW- 3075	-25 ± 77	< 170
Mean ± s.d.		52 ± 61	

Façade Wells

Sample ID: GW-09 1Z-361A / GW-09 1Z-361B

Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
02-28-23	EWW- 482	288 ± 92	< 163	02-28-23	EWW- 483	221 ± 89	< 163
05-02-23	EWW- 1123	229 ± 89	< 162	05-02-23	EWW- 1124	174 ± 86	< 162
07-25-23	EWW- 2343	261 ± 95	< 162	07-25-23	EWW- 2344	230 ± 93	< 162
10-02-23	EWW- 3999	310 ± 97	< 173	10-02-23	EWW- 4000	200 ± 91	< 173
Mean ± s.d.		272 ± 35		Mean ± s.d.		206 ± 25	

Sample ID: GW-10 2Z-361A / GW-10 2Z-361B

Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
02-28-23	EWW- 484	76 ± 80	< 163	02-28-23	EWW- 485	138 ± 84	< 163
05-02-23	EWW- 1125	91 ± 82	< 162	05-02-23	EWW- 1126	353 ± 96	< 162
07-25-23	EWW- 2345	46 ± 83	< 162	07-25-23	EWW- 2346	286 ± 96	< 162
10-02-23	EWW- 4001	88 ± 85	< 173	10-02-23	EWW- 4002	291 ± 96	< 173
Mean ± s.d.		75 ± 21		Mean ± s.d.		267 ± 91	

(Annual Collections)
Units = pCi/L

Bogs

Sample ID: GW-07 (North Bog) / GW-08 EIC Bog

Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
05-18-23	[a] EWW- 1278	344 ± 99	< 161	05-18-23	[b] EWW- 1279	501 ± 106	< 161

[a] Reanalysis = 245 ± 101 pCi/L, MDC < 168 pCi/L.

[b] Reanalysis = 493 ± 112 pCi/L, MDC < 168 pCi/L.

Table 12. Groundwater Tritium Monitoring Program

Units = pCi/L

Manholes

Sample ID	MH Z-065A				MH Z-065B		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-24-23	EW- 1096	402 ± 98	< 162	04-24-23	EW- 1097	506 ± 103	< 162
09-13-23	EW- 3462	320 ± 97	< 172	09-13-23	EW- 3463	325 ± 97	< 172
Mean ± s.d.		361 ± 58		Mean ± s.d.		415 ± 128	

Sample ID	MH Z-065C				MH Z-065D		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
Mean ± s.d.				Mean ± s.d.			

Sample ID	MH Z-066A				MH Z-066B		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-25-23	EW- 1098	377 ± 97	< 162	04-25-23	EW- 1099	382 ± 97	< 162
09-13-23	EW- 3424	246 ± 93	< 172	09-13-23	EW- 3465	146 ± 88	< 172
Mean ± s.d.		312 ± 93		Mean ± s.d.		264 ± 167	

Sample ID	MH Z-066C				MH Z-066D		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-25-23	EW- 1100	453 ± 101	< 162	04-25-23	EW- 1101	358 ± 96	< 162
09-13-23	EW- 3466	310 ± 96	< 172	09-13-23	EW- 3467	206 ± 91	< 172
Mean ± s.d.		381 ± 101		Mean ± s.d.		282 ± 107	

Sample ID	MH Z-067A				MH Z-067B		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-24-23	EW- 1103	334 ± 95	< 162	04-25-23	EW- 1104	448 ± 101	< 162
09-13-23	EW- 3468	225 ± 92	< 172	09-13-23	EW- 3469	237 ± 93	< 172
Mean ± s.d.		279 ± 77		Mean ± s.d.		342 ± 149	

Manholes (cont.)

Sample ID	MH Z-067C				MH Z-067D		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-25-23	EW- 1105	421 ± 99	< 162	04-25-23	EW- 1106	256 ± 91	< 162
09-13-23	EW- 3470	237 ± 93	< 172	09-13-23	EW- 3471	108 ± 86	< 172
Mean ± s.d.		329 ± 130		Mean ± s.d.		182 ± 105	

Sample ID	MH Z-068				MH-1		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-26-23	EW- 1107	603 ± 108	< 162				
09-13-23	EW- 3472	189 ± 90	< 172				
Mean ± s.d.		396 ± 292		Mean ± s.d.			

Sample ID	MH-4				MH-6		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
Mean ± s.d.				Mean ± s.d.			

Sample ID	MH-7				MH-8		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
Mean ± s.d.				Mean ± s.d.			

Sample ID	MH-16				MH-2		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
Mean ± s.d.				Mean ± s.d.			

Sample ID	MH-5A				MH-9		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
Mean ± s.d.				Mean ± s.d.			

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APPENDIX A

INTERLABORATORY AND INTRALABORATORY COMPARISON PROGRAM RESULTS

NOTE: Appendix A is updated four times a year. The complete appendix is included in March, June, September and December monthly progress reports only.

October, 2022 through September, 2023

Appendix A

Interlaboratory/ Intralaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of its quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the RAD PT Study Proficiency Testing Program administered by Environmental Resource Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via irradiation and evaluation by the University of Wisconsin-Madison Radiation Calibration Laboratory at the University of Wisconsin Medical Radiation Research Center.

Table A-3 lists results of the analyses on intralaboratory "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on intralaboratory "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 lists analytical results from the intralaboratory "duplicate" program for the past twelve months. Acceptance is based on each result being within 25% of the mean of the two results or the two sigma uncertainties of each result overlap.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

Results in Table A-7 were obtained through participation in the MRAD PT Study Proficiency Testing Program administered by Environmental Resource Associates, serving as a replacement for studies conducted previously by the Environmental Measurement Laboratory Quality Assessment Program (EML).

Attachment A lists the laboratory acceptance criteria for various analyses.

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR INTRALABORATORY "SPIKED" SAMPLES

Analysis	Ratio of lab result to known value.
Gamma Emitters	0.8 to 1.2
Strontium-89, Strontium-90	0.8 to 1.2
Potassium-40	0.8 to 1.2
Gross alpha	0.5 to 1.5
Gross beta	0.8 to 1.2
Tritium	0.8 to 1.2
Radium-226, Radium-228	0.7 to 1.3
Plutonium	0.8 to 1.2
Iodine-129, Iodine-131	0.8 to 1.2
Nickel-63, Technetium-99, Uranium-238	0.7 to 1.3
Iron-55	0.8 to 1.2
Other Analyses	0.8 to 1.2

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

RAD study

Lab Code	Date	Concentration (pCi/L) Analysis	Laboratory Result	ERA Value	Acceptance Limits	Acceptance
RAD-132 Study						
ERDW-162	2/23/2023	Ba-133	33.0 ± 3.5	30.5	24.2 - 34.6	Pass
ERDW-162	2/23/2023	Cs-134	30.7 ± 3.0	28.2	21.9 - 31.1	Pass
ERDW-162	2/23/2023	Cs-137	191 ± 7	190	171 - 211	Pass
ERDW-162	2/23/2023	Co-60	110 ± 4	110	99.0 - 123	Pass
ERDW-162	2/23/2023	Zn-65	109 ± 8	105	94.5 - 125	Pass
ERDW-162	2/23/2023	Gr. Alpha	25.3 ± 0.2	30.0	15.3 - 39.2	Pass
ERDW-162	2/23/2023	G. Beta	15.0 ± 0.1	16.5	9.25 - 24.8	Pass
ERDW-162	2/23/2023	Ra-226	7.58 ± 0.52	8.26	6.21 - 9.71	Pass
ERDW-162	2/23/2023	Ra-228	7.44 ± 1.53	7.17	4.51 - 9.20	Pass
ERDW-162	2/23/2023	H-3	22,600 ± 467	21,600	18,900 - 23,800	Pass
RAD-134 Study						
ERDW-1956	7/10/2023	Ba-133	64.1 ± 4.7	66.5	55.4 - 73.2	Pass
ERDW-1956	7/10/2023	Cs-134	97.0 ± 4.8	90.8	74.5 - 99.9	Pass
ERDW-1956	7/10/2023	Cs-137	179 ± 8	163	147 - 181	Pass
ERDW-1956	7/10/2023	Co-60	26.6 ± 2.9	20.7	17.5 - 25.6	Fail [b]
ERDW-1956	7/10/2023	Zn-65	318 ± 12	290	261 - 339	Pass
ERDW-50167	7/10/2023	Gr. Alpha	34.3 ± 1.9	47.9	24.9 - 60.3	Pass
ERDW-50167	7/10/2023	G. Beta	27.4 ± 1.2	28.6	18.2 - 36.4	Pass
ERDW-50171	7/10/2023	Ra-226	19.3 ± 0.9	17.4	12.9 - 19.9	Pass
ERDW-50171	7/10/2023	Ra-228	7.11 ± 1.59	7.16	4.50 - 9.18	Pass
ERDW-50173	7/10/2023	H-3	10,500 ± 326	9,860	8,570 - 10,800	Pass
ERDW-50169	7/10/2023	I-131	23.9 ± 1.2	24.4	20.2 - 28.9	Pass

[a] Results obtained by Microbac Laboratories Inc. - Northbrook as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resource Associates (ERA).

[b] The Cobalt-60 result did not meet ERA acceptance criteria. The sample was reanalyzed and passed for all analytes. (Co-60 reanalysis result was 21.2 ± 3.0 pCi/L). No cause for the earlier failure could be determined.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).[a]

			mrem			
Lab Code	Irradiation Date	Description	Delivered Dose	Reported[b] Dose	Performance[c] Quotient (P)	
Environmental, Inc.		Group 1				
2022-23-1	2/7/2023	Spike 1	134.0	134.5	0.00	
2022-23-1	2/7/2023	Spike 2	134.0	131.1	-0.02	
2022-23-1	2/7/2023	Spike 3	134.0	134.0	0.00	
2022-23-1	2/7/2023	Spike 4	134.0	130.7	-0.02	
2022-23-1	2/7/2023	Spike 5	134.0	131.5	-0.02	
2022-23-1	2/7/2023	Spike 6	134.0	139.3	0.04	
2022-23-1	2/7/2023	Spike 7	134.0	134.8	0.01	
2022-23-1	2/7/2023	Spike 8	134.0	130.7	-0.02	
2022-23-1	2/7/2023	Spike 9	134.0	133.1	-0.01	
2022-23-1	2/7/2023	Spike 10	134.0	129.9	-0.03	
2022-23-1	2/7/2023	Spike 11	134.0	125.6	-0.06	
2022-23-1	2/7/2023	Spike 12	134.0	139.5	0.04	
2022-23-1	2/7/2023	Spike 13	134.0	135.2	0.01	
2022-23-1	2/7/2023	Spike 14	134.0	135.8	0.01	
2022-23-1	2/7/2023	Spike 15	134.0	133.6	0.00	
2022-23-1	2/7/2023	Spike 16	134.0	132.7	-0.01	
2022-23-1	2/7/2023	Spike 17	134.0	125.1	-0.07	
2022-23-1	2/7/2023	Spike 18	134.0	131.9	-0.02	
2022-23-1	2/7/2023	Spike 19	134.0	125.3	-0.06	
2022-23-1	2/7/2023	Spike 20	134.0	128.2	-0.04	
Mean (Spike 1-20)				132.1	-0.01	Pass[d]
Standard Deviation (Spike 1-20)				4.1	0.03	Pass[d]

a TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.

b Reported dose was converted from exposure (R) to Air Kerma (cGy) using a conversion of 0.876. Conversion from air kerma to ambient dose equivalent for Cs-137 at the reference dose point $H^*(10)K_a = 1.20$. mrem/cGy = 1000.

c Performance Quotient (P) is calculated as ((reported dose - conventionally true value) ÷ conventionally true value) where the conventionally true value is the delivered dose.

d Acceptance is achieved when neither the absolute value of the mean of the P values, nor the standard deviation of the P values exceed 0.15.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).[a]

Lab Code	Irradiation Date	Description	Delivered Dose (mrem)	Reported[b] Dose (mrem)	Performance[c] Quotient (P)	
Environmental, Inc.		Group 2				
2022-23-2	2/7/2023	Spike 21	70.0	71.7	0.02	
2022-23-2	2/7/2023	Spike 22	70.0	72.1	0.03	
2022-23-2	2/7/2023	Spike 23	70.0	66.2	-0.05	
2022-23-2	2/7/2023	Spike 24	70.0	70.6	0.01	
2022-23-2	2/7/2023	Spike 25	70.0	71.0	0.01	
2022-23-2	2/7/2023	Spike 26	70.0	71.3	0.02	
2022-23-2	2/7/2023	Spike 27	70.0	68.4	-0.02	
2022-23-2	2/7/2023	Spike 28	70.0	70.2	0.00	
2022-23-2	2/7/2023	Spike 29	70.0	72.1	0.03	
2022-23-2	2/7/2023	Spike 30	70.0	71.2	0.02	
2022-23-2	2/7/2023	Spike 31	70.0	67.5	-0.04	
2022-23-2	2/7/2023	Spike 32	70.0	68.8	-0.02	
2022-23-2	2/7/2023	Spike 33	70.0	72.2	0.03	
2022-23-2	2/7/2023	Spike 34	70.0	69.6	-0.01	
2022-23-2	2/7/2023	Spike 35	70.0	69.7	0.00	
2022-23-2	2/7/2023	Spike 36	70.0	68.0	-0.03	
2022-23-2	2/7/2023	Spike 37	70.0	72.2	0.03	
2022-23-2	2/7/2023	Spike 38	70.0	70.6	0.01	
2022-23-2	2/7/2023	Spike 39	70.0	70.4	0.01	
2022-23-2	2/7/2023	Spike 40	70.0	66.5	-0.05	
Mean (Spike 21-40)				70.0	0.00	Pass[d]
Standard Deviation (Spike 21-40)				1.9	0.03	Pass[d]

a TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.

b Reported dose was converted from exposure (R) to Air Kerma (cGy) using a conversion of 0.876. Conversion from air kerma to ambient dose equivalent for Cs-137 at the reference dose point $H^*(10)K_a$ = 1.20 . mrem/cGy = 1000.

c Performance Quotient (P) is calculated as ((reported dose - conventionally true value) ÷ conventionally true value) where the conventionally true value is the delivered dose.

d Acceptance is achieved when neither the absolute value of the mean of the P values, nor the standard deviation of the P values exceed 0.15.

TABLE A-3. Intralaboratory "Spiked" Samples

Lab Code[b]	Date	Concentration[a]					
		Analysis	Laboratory results 2s, n=1[c]	Known Activity	Control Limits[d]	Acceptance	Ratio Lab/Known
SPDW-40361	10/12/2022	Ra-226	10.0 ± 0.3	12.3	8.6 - 16.0	Pass	0.81
SPDW-40344	11/3/2022	Ra-228	13.2 ± 1.8	13.4	9.4 - 17.4	Pass	0.99
SPDW-40346	11/8/2022	Gr. Alpha	42.0 ± 2.2	60.2	30.1 - 90.3	Pass	0.70
SPDW-40346	11/8/2022	Gr. Beta	16.6 ± 1.0	17.7	14.2 - 21.2	Pass	0.94
SPDW-40352	11/17/2022	Sr-90	18.8 ± 1.2	17.1	13.7 - 20.5	Pass	1.10
SPDW-40355	11/18/2022	H-3	10,143 ± 316	10,400	8,320 - 12,480	Pass	0.98
SPDW-40364	11/30/2022	Gr. Alpha	38.4 ± 1.5	49.1	24.6 - 73.7	Pass	0.78
SPDW-40364	11/30/2022	Gr. Beta	30.9 ± 1.2	31.5	25.2 - 37.8	Pass	0.98
LCS-W-110822	2/1/2022	Cs-137	222 ± 10	206	165 - 247	Pass	1.08
LCS-W-110822	2/1/2022	Co-57	1,060 ± 117	973	778 - 1,168	Pass	1.09
LCS-W-110822	2/1/2022	Co-60	250 ± 8	251	201 - 301	Pass	1.00
LCS-W-110822	2/1/2022	Mn-54	537 ± 18	511	409 - 613	Pass	1.05
LCS-W-110822	2/1/2022	Zn-65	673 ± 35	708	566 - 850	Pass	0.95
SPDW-40372	11/21/2022	Ra-226	11.3 ± 0.3	12.3	8.6 - 16.0	Pass	0.92
SPU-3883	12/1/2022	H-3	21,694 ± 1,387	23,900	19,120 - 28,680	Pass	0.91
SPW-3950	12/1/2022	Ni-63	1,937 ± 28	2,135	1,708 - 2,562	Pass	0.91
SPDW-40366	12/2/2022	H-3	22,466 ± 464	23,900	19,120 - 28,680	Pass	0.94
SPW-3969	12/2/2022	Ni-63	2,123 ± 29	2,135	1,708 - 2,562	Pass	0.99
SPW-3881	12/5/2022	Tc-99	85.0 ± 1.6	108	75 - 140	Pass	0.79
SPDW-40374	12/12/2022	H-3	22,554 ± 463	23,900	19,120 - 28,680	Pass	0.94
SPDW-40382	12/12/2022	Ra-226	12.7 ± 0.4	12.3	8.6 - 16.0	Pass	1.03
SPDW-40380	12/22/2022	H-3	22,200 ± 462	23,900	19,120 - 28,680	Pass	0.93
SPDW-26	1/5/2023	Ra-228	11.8 ± 1.9	13.4	9.4 - 17.4	Pass	0.88
SPDW-50002	1/11/2023	H-3	21,747 ± 452	22,100	17,680 - 26,520	Pass	0.98
SPDW-50004	1/20/2023	H-3	21,861 ± 458	22,100	17,680 - 26,520	Pass	0.99
SPDW-50006	1/5/2023	Ra-226	11.3 ± 0.3	12.3	8.6 - 16.0	Pass	0.92
SPDW-50034	1/27/2023	Ra-226	12.6 ± 0.4	12.3	8.6 - 16.0	Pass	1.02
LCS-SO-012723	8/1/2020	Cs-134	17.1 ± 0.2	19.2	15.4 - 23.0	Pass	0.89
LCS-SO-012723	8/1/2020	Zn-65	13.8 ± 1.7	14.1	11.3 - 16.9	Pass	0.98
LCS-SO-012723	8/1/2020	Co-60	26.4 ± 0.2	27.0	21.6 - 32.4	Pass	0.98
LCS-SO-012723	8/1/2020	Co-57	30.7 ± 0.1	30.9	24.7 - 37.1	Pass	0.99
LCS-SO-012723	8/1/2020	Mn-54	17.7 ± 0.8	16.5	13.2 - 19.8	Pass	1.07
LCS-SO-012723	8/1/2020	K-40	18.4 ± 0.7	16.8	13.4 - 20.2	Pass	1.10
SPDW-50010	1/31/2023	Ra-228	9.7 ± 1.3	13.4	9.4 - 17.4	Pass	0.72
SPDW-50008	2/3/2023	H-3	21,961 ± 459	22,100	17,680 - 26,520	Pass	0.99
SPDW-50016	2/10/2023	H-3	22,137 ± 462	22,100	17,680 - 26,520	Pass	1.00
SPDW-50012	2/24/2023	Sr-90	18.6 ± 1.2	17.1	13.7 - 20.5	Pass	1.09
SPDW-50032	2/16/2023	Ra-228	13.1 ± 1.9	13.4	9.4 - 17.4	Pass	0.98
SPDW-50018	2/16/2023	Gr. Alpha	19.1 ± 1.3	23.5	11.8 - 28.2	Pass	0.81
SPDW-50018	2/16/2023	Gr. Beta	133 ± 2	141	112 - 169	Pass	0.94
SPDW-50021	2/17/2023	H-3	21,843 ± 459	22,100	17,680 - 26,520	Pass	0.99
SPDW-50047	2/24/2023	Ra-226	12.8 ± 0.4	12.3	8.6 - 16.0	Pass	1.04

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).
[b] Laboratory codes : W & SPW (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).
[c] Results are based on single determinations.
[d] Acceptance criteria are listed in Attachment A of this report.

TABLE A-3. Intralaboratory "Spiked" Samples

Lab Code[b]	Date	Concentration[a] Analysis	Laboratory results 2s, n=1[c]	Known Activity	Control Limits[d]	Acceptance	Ratio Lab/Known
SPDW-50049	3/17/2023	H-3	22,120 ± 465	22,100	17,680 - 26,520	Pass	1.00
SPDW-50056	3/24/2023	H-3	21,911 ± 463	22,100	17,680 - 26,520	Pass	0.99
SPDW-50060	3/16/2023	Ra-226	12.9 ± 0.4	12.3	8.6 - 16.0	Pass	1.05
SPDW-50097	4/13/2023	Ra-226	11.7 ± 0.5	12.3	8.6 - 16.0	Pass	0.95
SPDW-50068	4/14/2023	H-3	22,656 ± 482	22,100	17,680 - 26,520	Pass	1.03
SPDW-50081	4/25/2023	H-3	21,594 ± 461	22,100	17,680 - 26,520	Pass	0.98
SPDW-50131	5/3/2023	Ra-226	11.4 ± 0.3	12.3	8.6 - 16.0	Pass	0.93
SPDW-50104	5/12/2023	H-3	21,513 462	22,100	17,680 - 26,520	Pass	0.97
SPDW-50117	5/26/2023	H-3	22,069 468	22,100	17,680 - 26,520	Pass	1.00
SPDW-50182	6/8/2023	Ra-226	10.4 ± 0.3	12.3	8.6 - 16.0	Pass	0.85
SPDW-50137	6/12/2023	H-3	21,898 ± 456	22,100	17,680 - 26,520	Pass	0.99
SPDW-50138	6/12/2023	H-3	21,898 ± 456	22,100	17,680 - 26,520	Pass	0.99
SPDW-50153	6/26/2023	H-3	21,672 ± 456	22,100	17,680 - 26,520	Pass	0.98
SPDW-50153	6/26/2023	H-3	21,672 ± 456	22,100	17,680 - 26,520	Pass	0.98
SPDW-50259	7/19/2023	Ra-226	10.5 ± 0.3	12.3	8.6 - 16.0	Pass	0.85
SPDW-50219	8/15/2023	Sr-90	17.5 ± 1.1	17.1	13.7 - 20.5	Pass	1.02
SPDW-50291	8/28/2023	Ra-226	11 ± 0	12.3	8.6 - 16.0	Pass	0.89
SPDW-50249	8/22/2023	Gr. Alpha	16.7 ± 1.4	23.5	11.8 - 28.2	Pass	0.71
SPDW-50249	8/22/2023	Gr. Beta	128 ± 2	141	112 - 169	Pass	0.91
SPDW-50252	8/18/2023	H-3	21,628 ± 459	22,100	17,680 - 26,520	Pass	0.98
SPDW-50257	8/25/2023	H-3	22,152 ± 469	22,100	17,680 - 26,520	Pass	1.00
LCS-09/12/23	8/1/2020	Cs-134	17,533 ± 346	19,170	15,336 - 23,004	Pass	0.91
LCS-09/12/23	8/1/2020	Co-60	27,480 ± 347	26,055	20,844 - 31,266	Pass	1.05
LCS-09/12/23	8/1/2020	K-40	20,183 1268	18,468	14,774 - 22,162	Pass	1.09
SPDW-50270	9/6/2023	H-3	22,287 ± 469	22,100	17,680 - 26,520	Pass	1.01
SPDW-50283	9/25/2023	H-3	21,062 ± 444	22,100	17,680 - 26,520	Pass	0.95

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).
[b] Laboratory codes : W & SPW (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).
[c] Results are based on single determinations.
[d] Acceptance criteria are listed in Attachment A of this report.

TABLE A-4. Intralaboratory "Blank" Samples

Lab Code[b]	Sample Type	Date	Analysis[c]	Concentration[a] Laboratory results (4.66σ) LLD	Activity[d]	Acceptance Criteria (4.66 σ)
SPDW-40345	Water	11/8/2022	Gr. Alpha	0.53	-0.17 ± 0.36	2
SPDW-40345	Water	11/8/2022	Gr. Beta	0.78	-0.05 ± 0.54	4
SPDW-40350	Water	11/11/2022	H-3	166	96 ± 84	200
SPDW-40352	Water	11/17/2022	Sr-89	0.66	-0.01 ± 0.53	5
SPDW-40352	Water	11/17/2022	Sr-90	0.61	0.11 ± 0.29	1
SPDW-40354	Water	11/18/2022	H-3	155	21 ± 76	200
SPDW-40354	Water	11/18/2022	I-131	0.18	-0.11 ± 0.09	1
SPW-3880	Water	12/1/2022	Tc-99	5.58	2.99 ± 3.44	200
SPU-3882	Urine	12/1/2022	H-3	1157	599 ± 642	2000
SPW-3949	Water	12/2/2022	Ni-63	16.3	9.0 ± 10.0	200
SPW-3968	Water	12/2/2022	Ni-63	15.9	0.0 ± 9.6	200
SPDW-40370	Water	12/7/2022	I-131	0.10	-0.04 ± 0.06	1
SPDW-40381	Water	12/12/2022	Ra-226	0.06	-0.04 ± 0.05	2
SPDW-40379	Water	12/22/2022	H-3	162	107 ± 84	200
SPW-25	Water	1/5/2023	Ra-228	0.98	0.74 ± 0.54	2
SPDW-50000	Water	1/6/2023	I-131	0.36	-0.10 ± 0.16	1
SPDW-50001	Water	1/11/2023	H-3	157	13 ± 74	200
SPDW-50003	Water	1/20/2023	H-3	161	98 ± 85	200
SPDW-50005	Water	1/5/2023	Ra-226	0.02	0.00 ± 0.03	2
SPDW-50033	Water	1/27/2023	Ra-226	0.03	-0.01 ± 0.03	2
SPDW-50009	Water	1/31/2023	Ra-228	1.40	0.69 ± 0.75	2
SPDW-50007	Water	2/3/2023	H-3	160	17 ± 80	200
SPDW-50015	Water	2/10/2023	H-3	159	91 ± 84	200
SPDW-50011	Water	2/9/2023	Sr-89	0.62	0.24 ± 0.49	5
SPDW-50011	Water	2/9/2023	Sr-90	0.66	-0.02 ± 0.30	1
SPDW-50018	Water	2/16/2023	Gr. Alpha	0.62	0.01 ± 0.44	2
SPDW-50018	Water	2/16/2023	Gr. Beta	0.78	-0.10 ± 0.54	4
SPDW-50020	Water	2/17/2023	H-3	154	122 ± 80	200
SPDW-50031	Water	2/16/2023	Ra-228	0.82	0.42 ± 0.43	2
SPDW-50046	Water	2/24/2023	Ra-226	0.03	0.05 ± 0.04	2
SPDW-50044	Water	3/13/2023	I-131	0.15	-0.06 ± 0.08	1
SPDW-50048	Water	3/17/2023	H-3	163	80 ± 80	200
SPDW-50055	Water	3/24/2023	H-3	169	63 ± 82	200
SPDW-50059	Water	3/16/2023	Ra-226	0.04	-0.02 ± 0.03	2
SPDW-50063	Water	3/28/2023	Ra-226	0.06	-0.01 ± 0.05	2
SPDW-50067	Water	4/14/2023	H-3	173	92 ± 87	200
SPDW-50069	Water	4/17/2023	I-131	0.11	-0.05 ± 0.08	1
SPDW-50102	Water	5/15/2023	I-131	0.15	-0.01 ± 0.08	1
SPDW-50103	Water	5/12/2023	H-3	161	67 ± 80	200
SPDW-50116	Water	5/26/2023	H-3	161	122 ± 87	200

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).

[b] Laboratory codes : W & SPW (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

[c] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[d] Activity reported is a net activity result.

TABLE A-4. Intralaboratory "Blank" Samples

Lab Code[b]	Sample Type	Date	Analysis[c]	Concentration[a] Laboratory results (4.66σ) LLD	Activity[d]	Acceptance Criteria (4.66 σ)
SPDW-50137	Water	6/12/2023	H-3	157	125 ± 80	200
SPDW-50154	Water	6/26/2023	H-3	157	105 ± 80	200
SPDW-50181	Water	6/8/2023	Ra-226	0.04	-0.07 ± 0.03	2
SPDW-50218	Water	8/15/2023	Sr-89	0.66	-0.07 ± 0.48	5
SPDW-50218	Water	8/15/2023	Sr-90	0.55	0.02 ± 0.26	1
SPDW-50248	Water	8/22/2024	Gr. Alpha	0.57	-0.03 ± 0.40	2
SPDW-50248	Water	8/22/2024	Gr. Beta	0.70	0.28 ± 0.50	4
SPDW-50256	Water	8/25/2023	H-3	161	75 ± 84	200
SPDW-50258	Water	7/19/2023	Ra-226	0.06	-0.25 ± 0.04	2
SPDW-50270	Water	9/6/2023	H-3	160	90 ± 81	200
SPDW-50282	Water	9/25/2023	H-3	163	53 ± 79	200
SPDW-50290	Water	8/28/2023	Ra-226	0.05	0.00 ± 0.04	2

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).

[b] Laboratory codes : W & SPW (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

[c] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[d] Activity reported is a net activity result.

TABLE A-5. Intralaboratory "Duplicate" Samples

			Concentration[a]			
Lab Code[b]	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
AP-100321A/B	10/3/2022	Gr. Beta	0.015 ± 0.003	0.011 ± 0.003	0.013 ± 0.002	Pass
SO-3140,3141	10/3/2022	Be-7	0.353 ± 0.180	0.304 ± 0.163	0.328 ± 0.121	Pass
SO-3140,3141	10/3/2022	K-40	11.2 ± 0.6	11.0 ± 0.6	11.1 ± 0.4	Pass
SO-3140,3141	10/3/2022	Cs-137	0.055 ± 0.016	0.069 ± 0.020	0.062 ± 0.013	Pass
SO-3140,3141	10/3/2022	Tl-208	0.132 ± 0.022	0.114 ± 0.024	0.123 ± 0.016	Pass
SO-3140,3141	10/3/2022	Bi-214	0.315 ± 0.041	0.390 ± 0.041	0.353 ± 0.029	Pass
SO-3140,3141	10/3/2022	Pb-212	0.344 ± 0.029	0.357 ± 0.029	0.351 ± 0.020	Pass
SO-3140,3141	10/3/2022	Pb-214	0.362 ± 0.043	0.446 ± 0.047	0.404 ± 0.032	Pass
SO-3140,3141	10/3/2022	Ra-226	0.602 ± 0.250	0.768 ± 0.248	0.685 ± 0.176	Pass
SO-3140,3141	10/3/2022	Ac-228	0.442 ± 0.101	0.405 ± 0.083	0.423 ± 0.066	Pass
SO-3140,3141	10/3/2022	Gr. Alpha	4.07 ± 1.77	4.43 ± 2.17	4.25 ± 1.40	Pass
SO-3140,3141	10/3/2022	Gr. Beta	15.6 ± 1.6	17.0 ± 1.5	16.3 ± 1.1	Pass
AP-101021A/B	10/10/2022	Gr. Beta	0.037 ± 0.005	0.040 ± 0.005	0.039 ± 0.004	Pass
S-3501,3502	10/18/2022	K-40	16.3 ± 1.2	16.3 ± 1.3	16.3 ± 0.9	Pass
AP-101821A/B	10/18/2022	Gr. Beta	0.026 ± 0.003	0.027 ± 0.003	0.026 ± 0.002	Pass
DW-40328,40329	10/25/2022	Ra-226	2.13 ± 0.18	2.17 ± 0.28	2.15 ± 0.17	Pass
AP-102621A/B	10/26/2022	Gr. Beta	0.051 ± 0.005	0.047 ± 0.005	0.049 ± 0.003	Pass
SG-3557,3558	11/1/2022	Gr. Alpha	24.5 ± 4.0	25.0 ± 4.0	24.8 ± 2.8	Pass
SG-3557,3558	11/1/2022	Gr. Beta	26.7 ± 2.2	29.3 ± 2.3	28.0 ± 1.6	Pass
SG-3557,3558	11/1/2022	Pb-214	9.23 ± 0.15	9.23 ± 0.32	9.23 ± 0.18	Pass
SG-3557,3558	11/1/2022	Ac-228	7.35 ± 0.31	8.26 ± 0.63	7.81 ± 0.35	Pass
AP-110221A/B	11/2/2022	Gr. Beta	0.020 ± 0.003	0.020 ± 0.003	0.020 ± 0.002	Pass
DW-40341,40342	11/7/2022	Ra-226	1.18 ± 0.15	0.89 ± 0.14	1.04 ± 0.10	Pass
DW-40341,40342	11/7/2022	Ra-228	1.98 ± 0.95	3.32 ± 1.12	2.65 ± 0.73	Pass
AP-110921A/B	11/9/2022	Gr. Beta	0.025 ± 0.003	0.025 ± 0.003	0.025 ± 0.002	Pass
AP-111621A/B	11/16/2022	Gr. Beta	0.013 ± 0.002	0.015 ± 0.002	0.014 ± 0.002	Pass
AP-112321A/B	11/23/2022	Gr. Beta	0.034 ± 0.004	0.031 ± 0.004	0.032 ± 0.003	Pass
AP-113021A/B	11/30/2022	Gr. Beta	0.056 ± 0.005	0.058 ± 0.005	0.057 ± 0.003	Pass
SG-4016,4017	12/5/2022	Gr. Alpha	24.5 ± 4.0	25.0 ± 4.0	24.7 ± 2.9	Pass
SG-4016,4017	12/5/2022	Gr. Beta	26.7 ± 2.2	29.3 ± 2.3	28.0 ± 1.6	Pass
SG-4016,4017	12/5/2022	Pb-214	8.64 ± 0.30	9.28 ± 0.30	8.96 ± 0.21	Pass
SG-4016,4017	12/5/2022	Ac-228	10.8 ± 0.8	10.0 ± 0.8	10.4 ± 0.6	Pass
AP-120721A/B	12/7/2022	Gr. Beta	0.034 ± 0.003	0.030 ± 0.003	0.032 ± 0.002	Pass
DW-40375,40376	12/14/2022	Ra-228	5.05 ± 0.96	7.15 ± 1.09	6.10 ± 0.73	Pass
DW-40375,40376	12/14/2022	Ra-226	3.33 ± 0.27	4.28 ± 0.29	3.81 ± 0.20	Pass
AP-121621A/B	12/16/2022	Gr. Beta	0.039 ± 0.004	0.033 ± 0.004	0.036 ± 0.003	Pass
AP-122721A/B	12/27/2022	Gr. Beta	0.018 ± 0.002	0.016 ± 0.002	0.017 ± 0.001	Pass
W-21,22	12/27/2022	Ra-226	0.99 ± 0.29	1.52 ± 0.34	1.26 ± 0.22	Pass
AP-122821A/B	12/28/2022	Gr. Beta	0.042 ± 0.003	0.039 ± 0.003	0.041 ± 0.002	Pass

TABLE A-5. Intralaboratory "Duplicate" Samples

			Concentration[a]			
Lab Code[b]	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
WW-65,66	1/10/2023	Gr. Beta	15.4 ± 2.0	17.2 ± 2.1	16.3 ± 1.5	Pass
WW-107,108	1/18/2023	H-3	153 ± 88	132 ± 87	143 ± 62	Pass
SG-187,188	1/30/2023	Gr. Alpha	28.1 ± 3.9	22.0 ± 3.5	25.1 ± 2.6	Pass
SG-187,188	1/30/2023	Gr. Beta	22.3 ± 1.8	22.2 ± 1.8	22.3 ± 1.3	Pass
SG-187,188	1/30/2023	Pb-214	4.08 ± 0.16	3.38 ± 0.09	3.73 ± 0.09	Pass
SG-187,188	1/30/2023	Ac-228	3.88 ± 0.28	3.98 ± 0.14	3.93 ± 0.16	Pass
SWU-201,202	1/31/2023	H-3	171 ± 89	234 ± 92	203 ± 64	Pass
SW-243,244	2/7/2023	H-3	358 ± 98	262 ± 93	310 ± 68	Pass
PW-266,267	2/6/2023	Ra-226	0.61 ± 0.18	0.37 ± 0.20	0.49 ± 0.13	Pass
DW-50028.50029	2/27/2023	Ra-226	0.68 ± 0.13	0.76 ± 0.13	0.72 ± 0.09	Pass
DW-50028.50029	2/27/2023	Ra-228	2.26 ± 0.65	1.20 ± 0.65	1.73 ± 0.46	Pass
DW-50052,50053	2/27/2023	Ra-228	0.48 ± 0.57	1.19 ± 0.65	0.84 ± 0.43	Pass
DW-50035,50036	2/28/2023	Gr. Alpha	3.68 ± 1.42	4.00 ± 1.29	3.84 ± 0.96	Pass
DW-50035,50036	2/28/2023	Gr. Beta	2.50 ± 0.64	1.99 ± 0.64	2.25 ± 0.45	Pass
LW-518,519	3/8/2023	Gr. Beta	1.71 ± 0.64	1.38 ± 0.64	1.55 ± 0.45	Pass
SG-571,572	3/8/2023	Pb-214	7.80 ± 0.46	8.20 ± 0.35	8.00 ± 0.29	Pass
SG-571,572	3/8/2023	Ac-228	11.9 ± 0.8	11.4 ± 0.6	11.7 ± 0.5	Pass
SG-571.572	3/8/2023	Gr. Alpha	86.5 ± 10.6	89.6 ± 11.0	88.1 ± 7.6	Pass
DW-50052,50053	3/17/2023	Gr. Alpha	9.16 ± 1.02	14.7 ± 1.2	11.9 ± 0.8	Pass
DW-50052,50053	3/17/2023	Gr. Beta	6.03 ± 0.71	7.58 ± 0.75	6.81 ± 0.52	Pass
CF-700,701	3/22/2023	K-40	2.91 ± 0.32	3.30 ± 0.36	3.11 ± 0.24	Pass
SW-679,680	3/27/2023	H-3	14,480 ± 389	14,487 ± 389	14,484 ± 275	Pass
SG-974,975	4/4/2023	Gr. Alpha	12.0 ± 2.1	12.1 ± 2.1	12.1 ± 1.5	Pass
DW-50074,50075	4/21/2023	Ra-226	1.63 ± 0.22	1.56 ± 0.28	1.60 ± 0.18	Pass
DW-50074,50075	4/21/2023	Ra-228	3.41 ± 0.98	2.14 ± 0.80	2.78 ± 0.63	Pass
U-1038,1039	4/20/2023	Gr. Beta	6.14 ± 1.71	6.46 ± 2.19	6.30 ± 1.39	Pass
WW-1101,1102	4/25/2023	H-3	358 ± 96	334 ± 95	346 ± 68	Pass
DW-50092,50093	5/1/2023	Ra-226	1.00 ± 0.22	1.46 ± 0.19	1.23 ± 0.15	Pass
DW-50092,50093	5/1/2023	Ra-228	1.11 ± 0.73	1.57 ± 0.82	1.34 ± 0.55	Pass
WW-1122,1123	5/2/2023	H-3	307 ± 93	229 ± 89	268 ± 64	Pass
WW-1269,1270	5/17/2023	H-3	366 ± 100	214 ± 92	290 ± 68	Pass
DW-50110,50111	5/29/2023	Ra-226	6.27 ± 0.40	4.77 ± 0.26	5.52 ± 0.24	Pass
DW-50110,50111	5/29/2023	Ra-228	2.81 ± 0.97	3.53 ± 0.98	3.17 ± 0.69	Pass
SW-1356,1357	5/30/2023	H-3	380 ± 94	257 ± 88	319 ± 64	Pass
WW-1398,1399	5/24/2023	H-3	571 ± 103	613 ± 105	592 ± 74	Pass
SG-1377,1378	5/30/2023	Pb-214	1.07 ± 0.14	1.19 ± 0.15	1.13 ± 0.10	Pass
SG-1377,1378	5/30/2023	Ac-228	1.23 ± 0.28	1.11 ± 0.23	1.17 ± 0.18	Pass

TABLE A-5. Intralaboratory "Duplicate" Samples

			Concentration[a]			
Lab Code[b]	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
DW-50124,50125	6/5/2023	Ra-226	0.25 ± 0.08	0.24 ± 0.09	0.25 ± 0.06	Pass
DW-50126,50127	6/5/2023	Gr. Alpha	2.50 ± 1.17	3.87 ± 1.39	3.19 ± 0.91	Pass
WW-1441,1442	6/6/2023	Gr. Beta	2.55 ± 0.64	1.91 ± 0.67	2.23 ± 0.46	Pass
SW-1483,1484	6/8/2023	H-3	281 ± 90	281 ± 90	281 ± 64	Pass
CF-1546,1547	6/12/2023	K-40	7.77 ± 0.34	7.48 ± 0.48	7.63 ± 0.29	Pass
S-1567,1568	6/14/2023	K-40	9.75 ± 0.71	9.80 ± 0.77	9.78 ± 0.52	Pass
WW-1630,1631	6/6/2023	H-3	319 ± 93	236 ± 89	278 ± 64	Pass
F-1945,1946	6/26/2023	K-40	3.81 ± 0.34	3.22 ± 0.54	3.52 ± 0.32	Pass
DW-50157,50158	6/26/2023	Gr. Beta	0.93 ± 0.59	1.09 ± 0.06	1.01 ± 0.30	Pass
DW-50160,50161	7/5/2023	Ra-226	2.63 ± 0.32	2.77 ± 0.27	2.70 ± 0.21	Pass
DW-50160,50161	7/5/2023	Ra-228	2.46 ± 0.78	2.51 ± 0.81	2.49 ± 0.56	Pass
DW-50188,50189	7/21/2023	Ra-226	3.07 ± 0.30	2.63 ± 0.20	2.85 ± 0.18	Pass
DW-50188,50189	7/21/2023	Ra-228	5.28 ± 0.92	5.08 ± 0.90	5.18 ± 0.64	Pass
DW-50197,50198	7/24/2023	Gr. Alpha	5.82 ± 1.50	5.78 ± 1.30	5.80 ± 0.99	Pass
DW-50200,50201	7/24/2023	Ra-226	2.51 ± 0.24	4.07 ± 0.29	3.29 ± 0.19	Pass
DW-50200,50201	7/24/2023	Ra-228	7.04 ± 1.13	6.55 ± 1.09	6.80 ± 0.79	Pass
SG-2199,2200	7/25/2023	Pb-214	1.18 ± 0.22	1.03 ± 0.19	1.11 ± 0.15	Pass
SG-2199,2200	7/25/2023	Ac-228	1.74 ± 0.32	1.86 ± 0.42	1.80 ± 0.26	Pass
SG-2315,2316	8/3/2023	Gr. Alpha	59.5 ± 6.7	48.2 ± 6.1	53.9 ± 4.5	Pass
SG-2315,2316	8/3/2023	Gr. Beta	39.8 ± 2.9	34.4 ± 2.6	37.1 ± 1.9	Pass
DW-50200,50201	8/9/2023	Ra-228	1.88 ± 0.71	1.29 ± 0.70	1.59 ± 0.50	Pass
DW-50262,50263	8/24/2023	Ra-228	2.62 ± 0.87	1.46 ± 0.52	2.04 ± 0.51	Pass
DW-50262,50263	8/24/2023	Ra-228	2.62 ± 0.87	2.8 ± 0.67	2.71 ± 0.55	Pass
DW-50262,50263	8/24/2023	Ra-228	2.62 ± 0.87	1.73 ± 0.67	2.18 ± 0.55	Pass
DW-50268,50269	8/29/2023	Gr. Alpha	0.87 ± 0.69	0.97 ± 0.81	0.92 ± 0.53	Pass
SG-2660,2661	9/4/2023	Gr. Alpha	68.5 ± 7.1	51.0 ± 6.3	59.8 ± 4.7	Pass
SG-2660,2661	9/4/2023	Pb-214	13.7 ± 0.5	14.2 ± 0.5	14.0 ± 0.4	Pass
SG-2660,2661	9/4/2023	Ac-228	14.4 ± 0.8	14.3 ± 0.9	14.4 ± 0.6	Pass
W-2776,2777	9/18/2023	Gr. Alpha	1.86 ± 1.73	0.99 ± 1.64	1.43 ± 1.19	Pass
W-2776,2777	9/18/2023	Ra-226	0.43 ± 0.10	0.55 ± 0.27	0.49 ± 0.14	Pass
W-2776,2777	9/18/2023	Ra-228	1.71 ± 1.07	3.33 ± 1.12	2.52 ± 0.77	Pass
DW-50296,50297	9/27/2023	Ra-226	0.51 ± 0.09	0.54 ± 0.20	0.53 ± 0.11	Pass

Note: Duplicate analyses are performed on every twentieth sample received. Results are not listed for those analyses with activities that measure below the LLD.

[a] Results are reported in units of pCi/L, except for air filters (pCi/Filter or pCi/m3), food products, vegetation, soil and sediment (pCi/g).

[b] AP (Air Particulate), AV (Aquatic Vegetation), BS (Bottom Sediment), CF (Cattle Feed), CH (Charcoal Canister), DW (Drinking Water), E (Egg), F (Fish), G (Grass), LW (Lake Water), MI (Milk), P (Precipitation), PM (Powdered Milk), S (Solid), SG (Sludge), SO (Soil), SS (Shoreline Sediment), SW (Surface Water), SWT (Surface Water Treated), SWU (Surface Water Untreated), U (Urine), VE (Vegetation), W (Water), WW (Well Water).

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

				Concentration[a]		
Lab Code [b]	Reference Date	Analysis	Laboratory result	Known Activity	Acceptance Range [c]	Acceptance
MADW-2613	8/1/2022	Gross Alpha	1.39 ± 0.10	0.90	0.27 - 1.53	Pass
MADW-2613	8/1/2022	Gross Beta	1.69 ± 0.04	1.31	0.66 - 1.97	Pass
MASO-2737	8/1/2022	Cs-134	523 ± 5	627	439 - 815	Pass
MASO-2737	8/1/2022	Cs-137	1.18 ± 2.21	0	NA [c]	Pass
MASO-2737	8/1/2022	Co-57	715 ± 6	786	550 - 1022	Pass
MASO-2737	8/1/2022	Co-60	-0.04 ± 1.07	0	NA [c]	Pass
MASO-2737	8/1/2022	Mn-54	903 ± 11	841	589 - 1093	Pass
MASO-2737	8/1/2022	Zn-65	1227 ± 19	1140	798 - 1482	Pass
MASO-2737	8/1/2022	K-40	595 ± 37	537	376 - 698	Pass
MADW-2733	8/1/2022	Cs-134	13.6 ± 0.3	17.1	12.0 - 22.2	Pass
MADW-2733	8/1/2022	Cs-137	16.0 ± 0.4	16.8	11.8 - 21.8	Pass
MADW-2733	8/1/2022	Co-57	27.5 ± 0.4	30.0	21.0 - 39.0	Pass
MADW-2733	8/1/2022	Co-60	14.4 ± 0.3	17.0	11.9 - 22.1	Pass
MADW-2733	8/1/2022	Mn-54	-0.03 ± 0.10	0	NA [c]	Pass
MADW-2733	8/1/2022	Zn-65	11.5 ± 0.6	11.3	7.9 - 14.7	Pass
MADW-2733	8/1/2022	K-40	3.88 ± 1.51	0	NA [c]	Pass
MADW-2733	8/1/2022	Sr-90	6.79 ± 0.32	7.73	5.41 - 10.05	Pass
MAAP-2735	8/1/2022	Cs-134	-0.001 ± 0.029	0	NA [c]	Pass
MAAP-2735	8/1/2022	Cs-137	1.76 ± 0.11	1.53	1.07 - 1.99	Pass
MAAP-2735	8/1/2022	Co-57	3.50 ± 0.07	3.32	2.32 - 4.32	Pass
MAAP-2735	8/1/2022	Co-60	2.11 ± 0.08	1.99	1.39 - 2.59	Pass
MAAP-2735	8/1/2022	Mn-54	2.18 ± 0.13	1.88	1.32 - 2.44	Pass
MAAP-2735	8/1/2022	Zn-65	1.83 ± 0.22	1.58	1.11 - 2.05	Pass
MAVE-2740	8/1/2022	Cs-134	0.01 ± 0.06	0	NA [c]	Pass
MAVE-2740	8/1/2022	Cs-137	1.15 ± 0.12	1.083	0.758 - 1.408	Pass
MAVE-2740	8/1/2022	Co-57	-0.003 ± 0.035	0	NA [c]	Pass
MAVE-2740	8/1/2022	Co-60	4.71 ± 0.14	4.62	3.23 - 6.01	Pass
MAVE-2740	8/1/2022	Mn-54	2.67 ± 0.19	2.43	1.70 - 3.16	Pass
MAVE-2740	8/1/2022	Zn-65	7.73 ± 0.39	7.49	5.24 - 9.74	Pass
MAAP-544	2/1/2023	Gross Alpha	1.23 ± 0.10	0.97	0.29 - 1.65	Pass
MAAP-544	2/1/2023	Gross Beta	1.67 ± 0.06	1.49	0.75 - 2.24	Pass
MADW-543	2/1/2023	Gross Alpha	0.843 ± 0.074	1.19	0.36 - 2.02	Pass
MADW-543	2/1/2023	Gross Beta	0.578 ± 0.093	5.94	2.97 - 8.91	Fail [d]

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration[a]			
Lab Code [b]	Reference Date	Analysis	Laboratory result	Known Activity	Acceptance Range [c]	Acceptance
MASO-540	2/1/2023	Cs-134	2.33 ± 2.77	0	NA [c]	Pass
MASO-540	2/1/2023	Cs-137	1.22 ± 2.41	0	NA [c]	Pass
MASO-540	2/1/2023	Co-57	585 ± 4	698	489 - 907	Pass
MASO-540	2/1/2023	Co-60	727 ± 8	795	557 - 1034	Pass
MASO-540	2/1/2023	Mn-54	1180 ± 10	1230	861 - 1599	Pass
MASO-540	2/1/2023	Zn-65	846 ± 11	990	693 - 1287	Pass
MASO-540	2/1/2023	K-40	526 ± 23	574	402 - 746	Pass
MADW-545	2/1/2023	Cs-134	9.17 ± 0.17	9.6	6.7 - 12.5	Pass
MADW-545	2/1/2023	Cs-137	9.38 ± 0.29	8.7	6.1 - 11.3	Pass
MADW-545	2/1/2023	Co-57	-0.01 ± 0.08	0.0	NA [c]	Pass
MADW-545	2/1/2023	Co-60	7.47 ± 0.18	7.24	5.07 - 9.41	Pass
MADW-545	2/1/2023	Mn-54	12.3 ± 0.3	11.3	7.9 - 14.7	Pass
MADW-545	2/1/2023	Zn-65	15.7 ± 0.5	15.3	10.7 - 19.9	Pass
MADW-545	2/1/2023	K-40	1.23 ± 1.52	0	NA [c]	Pass
MADW-545	2/1/2023	Sr-90	-0.0035 ± 0.0172	0	NA [c]	Pass
MAAP-538	2/1/2023	Cs-134	1.12 ± 0.04	1.52	1.06 - 1.98	Pass
MAAP-538	2/1/2023	Cs-137	0.56 ± 0.07	0.630	0.441 - 0.819	Pass
MAAP-538	2/1/2023	Co-57	0.62 ± 0.30	0.661	0.463 - 0.859	Pass
MAAP-538	2/1/2023	Co-60	0.89 ± 0.07	1.05	0.74 - 1.37	Pass
MAAP-538	2/1/2023	Mn-54	2.02 ± 0.09	2.14	1.50 - 2.78	Pass
MAAP-538	2/1/2023	Zn-65	2.13 ± 0.14	2.25	1.58 - 2.93	Pass
MAAP-538	2/1/2023	Sr-90	0.004 ± 0.061	0	NA [c]	Pass
MAVE-545	2/1/2023	Cs-134	7.45 ± 0.39	7.60	5.32 - 9.88	Pass
MAVE-545	2/1/2023	Cs-137	0.010 ± 0.084	0	NA [c]	Pass
MAVE-545	2/1/2023	Co-57	6.83 ± 0.17	6.93	4.85 - 9.01	Pass
MAVE-545	2/1/2023	Co-60	6.89 ± 0.17	6.51	4.56 - 8.46	Pass
MAVE-545	2/1/2023	Mn-54	9.08 ± 0.28	8.03	5.62 - 10.44	Pass
MAVE-545	2/1/2023	Zn-65	7.83 ± 0.39	7.43	5.20 - 9.66	Pass

[a] Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

[b] Laboratory codes as follows: MAW (water), MADW (water), MAAP (air filter), MASO (soil) and MAVE (vegetation).

[c] MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide an acceptance range.

[d] A decimal point was misplaced in a unit conversion. If the conversion was was done properly the result: 5.78 ± 0.93 Bq/L woud have been within MAPEP's acceptance range.

TABLE A-7. Interlaboratory Comparison Crosscheck Program, Environmental Resource Associates (ERA)[a].

MRAD-38 Study

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory Result	ERA Value [c]	Acceptance Limits [d]	Acceptance
ERAP-599	3/20/2023	Cs-134	139	153	99 - 188	Pass
ERAP-599	3/20/2023	Cs-137	970	892	733 - 1170	Pass
ERAP-599	3/20/2023	Co-60	474	467	397 - 593	Pass
ERAP-599	3/20/2023	Mn-54	< 3.3	< 35.0	0.00 - 35.0	Pass
ERAP-599	3/20/2023	Zn-65	1280	1110	910 - 1700	Pass
ERAP-599	3/20/2023	Sr-90	143	137	87 - 187	Pass
ERAP-598	3/20/2023	Gross Alpha	72.7	76.8	40.1 - 127	Pass
ERAP-598	3/20/2023	Gross Beta	35.0	32.8	19.9 - 49.6	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory (EIML) as a participant in the crosscheck program for proficiency testing administered by Environmental Resource Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

[b] Laboratory code ERAP (air filter). Results are reported in units of (pCi/Filter).

[c] The ERA Assigned values for the air filter standards are equal to 100% of the parameter present in the standard as determined by the gravimetric and/or volumetric measurements made during standard preparation as applicable.

[d] The acceptance limits are established per the guidelines contained in the Department of Energy (DOE) report EML-564, Analysis of Environmental Measurements Laboratory (EML) Quality Assessment Program (QAP) Data Determination of Operational Criteria and Control Limits for Performance Evaluation Purposes or ERA's SOP for the generation of Performance Acceptance Limits.

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Appendix B

Data Reporting Conventions

APPENDIX B. DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$

where: x = value of the measurement;

s = 2σ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L, it is reported as: < L, where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

If duplicate analyses are reported, the convention is as follows. :

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $< L_1$, $< L_2$ Reported result: < L, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$, < L Reported result: $x \pm s$ if $x \geq L$; < L otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation "s" of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n}\sum x \qquad s = \sqrt{\frac{\sum (x-\bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained numbers are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Sampling Program and Locations

Sample Type	Locations No.	Locations Codes (and Type)[a]	Collection Type (and Frequency)[b]	Analysis (and Frequency)[b]
Airborne Filters	6	E-1-4, 8, 20	Weekly	GB, GS, on QC for each location
Airborne Iodine	6	E-1-4, 8, 20	Weekly	I-131
Ambient Radiation (TLD's)	22	E-1-9, 12, 14-18, 20, 22-32, 34-36, 38,39	Quarterly	Ambient Gamma
Lake Water	5	E-1, 5, 6, 33	Monthly	GB, GS, I-131 on MC H-3, Sr-89-90 on QC
Well Water	1	E-10	Quarterly	GB, GS, H-3, Sr-89-90, I-131
Vegetation	8	E-1-4, 6, 20	2x / year as available	GS
Shoreline Silt	5	E-1, 5, 6	Annual	GS
Soil	8	E-1-4, 6, 20	Annual	GS
Milk	3	E-11, 40, 21	Monthly	GS, I-131, Sr-89-90
Fish	1	E-13	2x / year as available	GS (in edible portions)

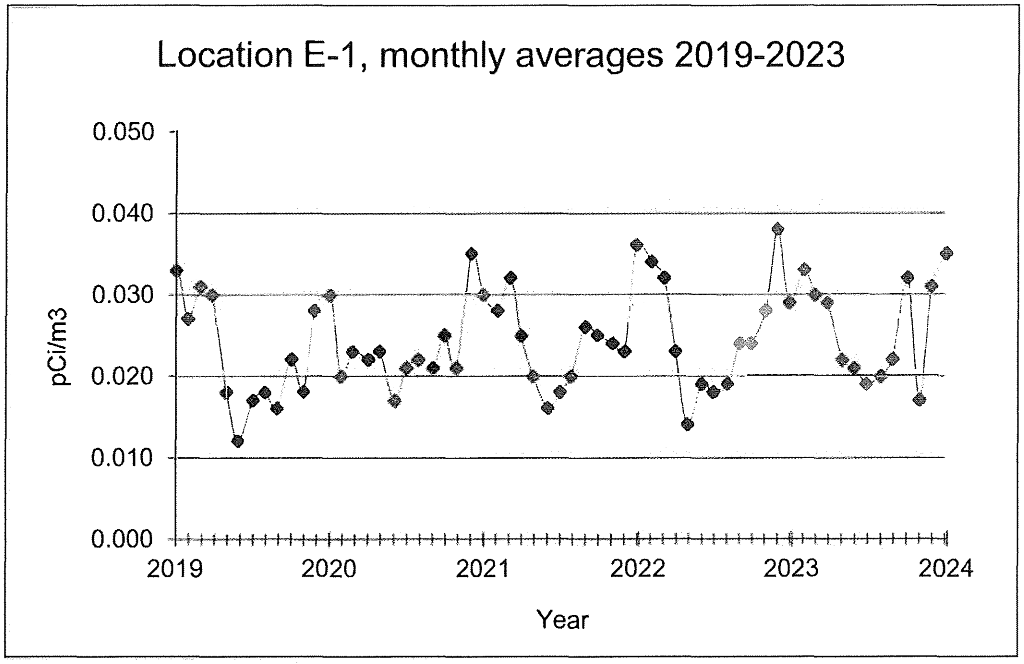
[a] Locations codes are defined in Table 2. Control Stations are indicated by (C). All other stations are indicators.

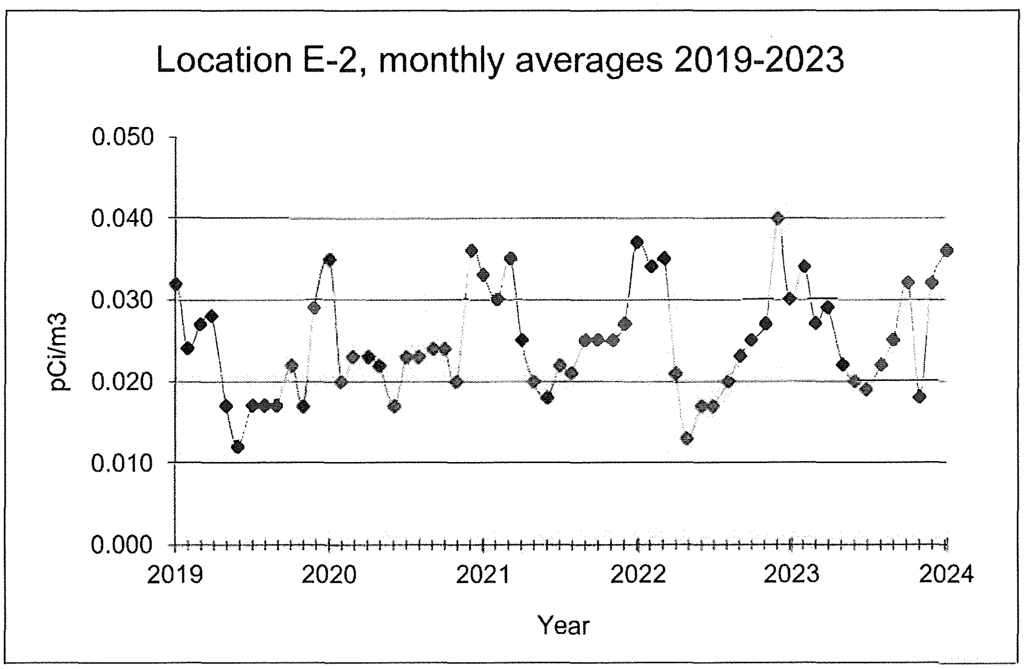
[b] Analysis type is coded as follows: GB = gross beta, GA = gross alpha, GS = gamma spectroscopy, H-3 = tritium, Sr-89 = strontium-89, Sr-90 = strontium-90, I-131 = iodine-131. Analysis frequency is coded as follows: MC = monthly composite, QC = quarterly composite.

APPENDIX D

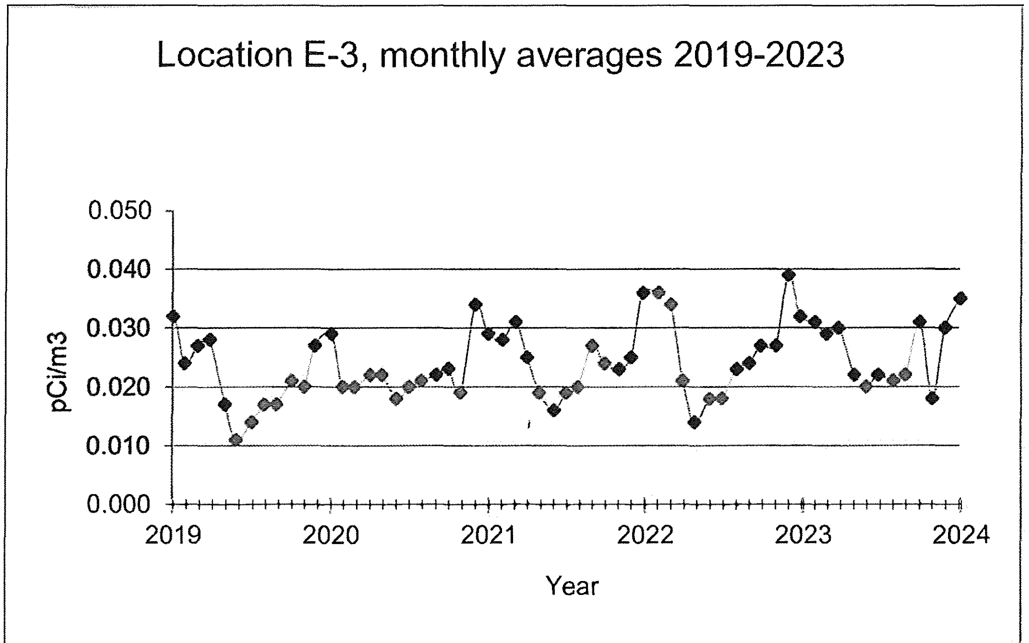
Graphs of Data Trends

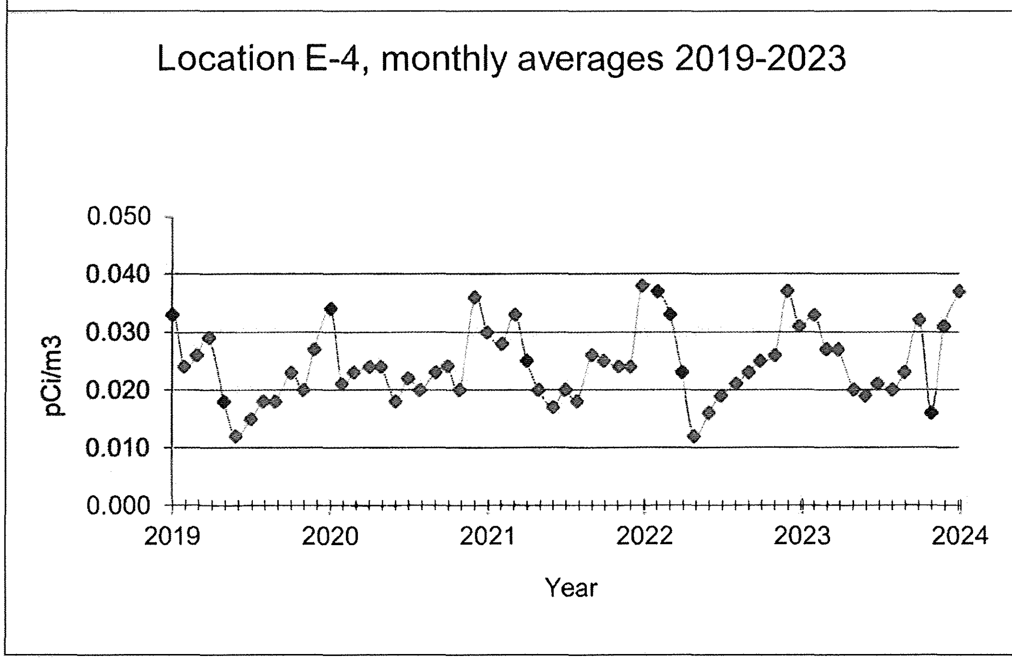
Air Particulates - Gross Beta



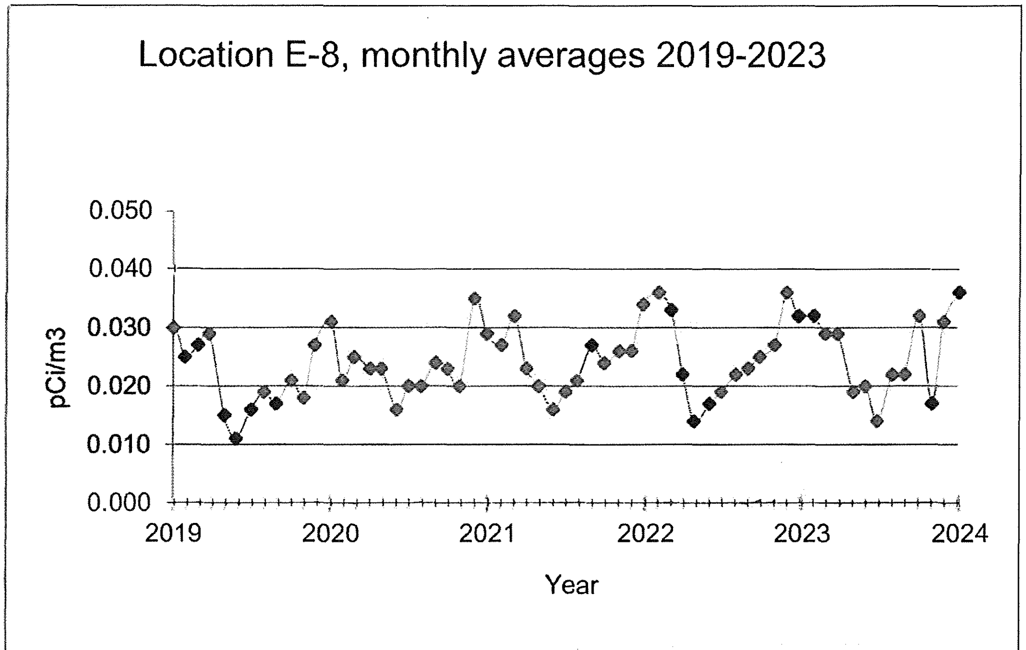


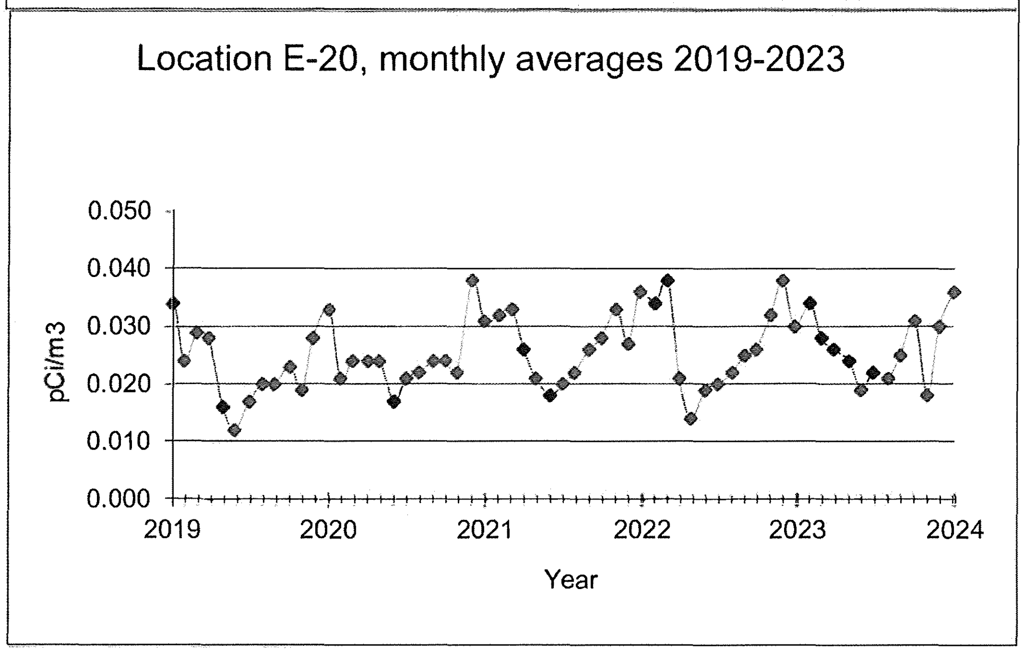
Air Particulates - Gross Beta





Air Particulates - Gross Beta





APPENDIX E

Supplemental Analyses

POINT BEACH NUCLEAR PLANT

Facade Wells

Units: = pCi\L — Gamma isotopic analysis

Location	GW-09 1Z-361A		GW-09 1Z-361B		GW-10 2Z-361A		GW-10 2Z-361B	
Collection Date	02-28-23		02-28-23		02-28-23		02-28-23	
Lab Code	EWW- 482	MDC	EWW- 483	MDC	EWW- 484	MDC	EWW- 485	MDC
Be-7	-15.1 ± 13.1	< 27.9	2.0 ± 11.1	< 15.1	-8.8 ± 19.7	< 34.6	3.0 ± 16.8	< 28.6
Mn-54	-0.3 ± 1.5	< 1.9	-0.4 ± 1.4	< 1.6	-0.5 ± 2.0	< 3.7	0.5 ± 1.9	< 3.7
Fe-59	-6.0 ± 3.0	< 5.3	-1.7 ± 2.6	< 5.0	1.6 ± 3.7	< 8.3	2.8 ± 3.6	< 7.4
Co-58	-0.5 ± 1.4	< 1.9	0.2 ± 1.3	< 1.6	-0.8 ± 2.0	< 3.6	-0.8 ± 1.7	< 3.9
Co-60	0.6 ± 1.6	< 2.1	0.5 ± 1.4	< 1.7	0.4 ± 2.5	< 4.5	1.0 ± 2.0	< 4.0
Zn-65	-1.5 ± 3.3	< 5.5	-2.6 ± 2.5	< 3.0	2.8 ± 3.3	< 4.1	-3.9 ± 3.8	< 6.1
Zr-Nb-95	-3.5 ± 1.6	< 2.3	-0.9 ± 1.4	< 2.1	-3.5 ± 2.7	< 5.6	-3.3 ± 1.7	< 3.5
Cs-134	-0.5 ± 1.6	< 3.0	0.6 ± 1.4	< 2.5	-1.0 ± 2.2	< 3.7	-1.9 ± 1.7	< 3.5
Cs-137	-0.3 ± 1.7	< 2.0	2.0 ± 1.4	< 1.7	0.9 ± 2.7	< 4.7	1.3 ± 1.9	< 3.7
Ba-La-140	1.8 ± 1.8	< 1.3	1.3 ± 1.6	< 3.6	-4.3 ± 2.5	< 6.3	-0.1 ± 2.1	< 4.9
Location	GW-09 1Z-361A		GW-09 1Z-361B		GW-10 2Z-361A		GW-10 2Z-361B	
Collection Date	05-02-23		05-02-23		05-02-23		05-02-23	
Lab Code	EWW- 1122	MDC	EWW- 1124	MDC	EWW- 1125	MDC	EWW- 1126	MDC
Be-7	-5.7 ± 16.4	< 29.7	-10.0 ± 13.3	< 17.3	-8.2 ± 16.3	< 24.0	-1.8 ± 7.3	< 14.4
Mn-54	1.2 ± 1.9	< 3.8	0.8 ± 1.6	< 2.1	1.0 ± 1.9	< 3.2	0.4 ± 0.9	< 1.5
Fe-59	0.1 ± 3.5	< 6.2	1.3 ± 3.1	< 5.7	2.8 ± 3.4	< 8.5	-0.9 ± 1.6	< 3.4
Co-58	1.9 ± 1.7	< 3.4	-0.5 ± 1.5	< 1.8	-0.1 ± 1.6	< 2.6	-0.9 ± 0.8	< 1.4
Co-60	-0.8 ± 2.1	< 3.3	1.7 ± 1.7	< 2.1	0.6 ± 2.2	< 3.3	1.2 ± 0.9	< 2.1
Zn-65	1.6 ± 3.8	< 6.9	2.0 ± 3.0	< 4.4	2.8 ± 3.9	< 7.5	-0.4 ± 1.7	< 2.6
Zr-Nb-95	0.6 ± 1.8	< 2.9	-1.2 ± 1.6	< 2.1	-3.0 ± 1.8	< 2.5	-0.2 ± 1.0	< 2.1
Cs-134	-0.6 ± 1.8	< 3.6	0.1 ± 1.7	< 3.0	-0.4 ± 1.8	< 3.7	-0.5 ± 0.9	< 1.6
Cs-137	-1.1 ± 2.0	< 2.7	0.2 ± 1.8	< 2.2	-0.2 ± 2.0	< 3.2	1.2 ± 1.1	< 1.9
Ba-La-140	-2.6 ± 2.2	< 4.1	-4.0 ± 2.1	< 2.7	-4.4 ± 2.5	< 5.3	-0.1 ± 1.0	< 2.0

	GW-09 1Z-361A		GW-09 1Z-361B		GW-10 2Z-361A		GW-10 2Z-361B	
Collection Date	07-25-23		07-25-23		07-25-23		07-25-23	
Lab Code	EWW- 2343	MDC	EWW- 2344	MDC	EWW- 2345	MDC	EWW- 2346	MDC
Be-7	-4.7 ± 13.0	< 21.7	18.1 ± 12.3	< 41.5	3.1 ± 11.0	< 32.4	4.3 ± 11.2	< 19.5
Mn-54	-0.3 ± 1.5	< 1.8	0.1 ± 1.6	< 3.2	0.2 ± 1.2	< 2.6	0.7 ± 1.3	< 1.6
Fe-59	-4.0 ± 3.2	< 7.8	-3.1 ± 3.3	< 7.7	-2.0 ± 2.3	< 3.3	0.4 ± 2.6	< 7.0
Co-58	-1.6 ± 1.5	< 2.3	1.2 ± 1.5	< 3.0	-0.2 ± 1.1	< 2.8	-1.1 ± 1.3	< 1.9
Co-60	2.5 ± 1.6	< 2.1	-1.2 ± 1.7	< 2.1	4.6 ± 1.4	< 5.0	-0.6 ± 1.6	< 1.9
Zn-65	-1.2 ± 3.0	< 3.6	-4.7 ± 3.6	< 5.8	-1.4 ± 2.5	< 4.4	-5.5 ± 3.0	< 3.3
Zr-Nb-95	-2.6 ± 1.6	< 3.3	0.2 ± 1.6	< 4.1	-0.4 ± 1.2	< 4.3	-0.8 ± 2.3	< 3.3
Cs-134	-0.5 ± 1.5	< 2.9	-1.2 ± 1.5	< 2.8	-0.2 ± 1.2	< 2.4	-1.0 ± 1.5	< 2.8
Cs-137	-2.9 ± 1.8	< 1.9	-1.0 ± 1.7	< 2.4	4.1 ± 1.4	< 4.0	-0.4 ± 1.5	< 1.7
Ba-La-140	-8.9 ± 2.1	< 10.2	-2.3 ± 2.0	< 14.6	-3.8 ± 1.4	< 13.0	-4.8 ± 1.7	< 10.1

POINT BEACH NUCLEAR PLANT

Location	GW-09 1Z-361A		GW-09 1Z-361B		GW-10 2Z-361A		GW-10 2Z-361B	
Collection Date	10-02-23		10-02-23		10-02-23		10-02-23	
Lab Code	EWW- 3999	MDC	EWW- 4000	MDC	EWW- 4001	MDC	EWW- 4002	MDC
Be-7	-21.5 ± 10.5	< 43.2	6.4 ± 7.3	< 44.5	8.2 ± 8.8	< 62.3	13.8 ± 5.9	< 41.9
Mn-54	2.3 ± 1.2	< 2.7	0.3 ± 0.9	< 2.5	-0.3 ± 1.1	< 2.9	0.1 ± 0.7	< 1.9
Fe-59	1.5 ± 2.3	< 20.0	2.7 ± 1.5	< 15.4	-0.2 ± 2.0	< 14.2	0.3 ± 1.2	< 11.4
Co-58	1.0 ± 1.2	< 6.4	-0.4 ± 0.8	< 2.2	-1.4 ± 1.1	< 4.6	1.1 ± 0.7	< 3.0
Co-60	1.1 ± 1.3	< 2.2	1.6 ± 0.9	< 2.2	0.6 ± 1.1	< 2.5	0.1 ± 0.9	< 1.9
Zn-65	-2.2 ± 2.5	< 6.8	1.5 ± 1.7	< 4.3	-1.2 ± 2.2	< 4.6	0.0 ± 1.5	< 4.0
Zr-Nb-95	-16.5 ± 1.5	< 13.5	-4.5 ± 1.0	< 12.9	-11.4 ± 1.3	< 17.1	-5.6 ± 0.8	< 10.9
Cs-134	0.4 ± 1.4	< 3.2	-0.6 ± 0.9	< 1.8	-1.4 ± 1.1	< 2.2	0.0 ± 0.8	< 1.4
Cs-137	0.0 ± 1.5	< 2.5	1.4 ± 1.0	< 2.0	-1.1 ± 1.3	< 2.1	1.7 ± 0.9	< 1.7
Ba-La-140	-320.1 ± 1.5	< 314.1 [a]	8.1 ± 1.0	< 333.0 [a]	-7.9 ± 1.4	< 283.7 [a]	-170.4 ± 0.9	< 340.5 [a]

[a] LLD not reached due to late arrival and small sample size. Samples received on 1/4/24

POINT BEACH NUCLEAR PLANT

Supplemental Analyses

Units: = pCi/L

Gamma isotopic analysis

Location	GW-04		GW-18		U2FSSDS	
Collection Date	01-18-23		01-18-23		01-31-23	
Lab Code	EW- 109	MDC	EW- 113	MDC	EW- 225	MDC
Be-7	5.8 ± 19.9	< 26.5	7.0 ± 14.1	< 26.3	-3.7 ± 7.7	< 14.1
Mn-54	-1.6 ± 3.1	< 5.1	1.4 ± 1.5	< 3.0	1.0 ± 1.0	< 1.8
Fe-59	-6.8 ± 6.6	< 4.1	-1.5 ± 3.1	< 4.1	-0.7 ± 1.7	< 3.4
Co-58	-2.5 ± 2.6	< 4.4	-0.6 ± 1.5	< 2.5	-0.9 ± 0.9	< 1.6
Co-60	-1.9 ± 3.2	< 4.5	-0.5 ± 2.2	< 6.2	0.4 ± 1.0	< 1.9
Zn-65	4.8 ± 6.1	< 7.7	-2.5 ± 3.9	< 6.6	-1.4 ± 1.8	< 3.2
Zr-Nb-95	-3.3 ± 2.9	< 2.9	-2.4 ± 1.8	< 2.3	-1.9 ± 1.0	< 2.5
Cs-134	-1.0 ± 3.1	< 5.2	1.1 ± 1.6	< 3.1	-0.3 ± 1.0	< 1.6
Cs-137	-0.1 ± 3.5	< 3.7	-1.1 ± 2.3	< 5.6	0.4 ± 1.1	< 1.9
Ba-La-140	-1.7 ± 3.4	< 1.8	-0.8 ± 1.7	< 2.1	-0.7 ± 1.1	< 2.8

Location	S-3		GW-04		GW-15A,B	
Collection Date	02-09-23		02-15-23		02-10-23	
Lab Code	EW- 268	MDC	EW- 346	MDC	EW- 279	MDC
Be-7	-9.3 ± 17.9	< 21.8	8.3 ± 9.8	< 20.1	-5.1 ± 7.5	< 18.4
Mn-54	-0.5 ± 1.5	< 2.7	1.1 ± 1.3	< 2.9	0.1 ± 0.9	< 1.6
Fe-59	0.3 ± 3.5	< 4.5	1.9 ± 2.5	< 4.1	-1.2 ± 1.6	< 2.9
Co-58	-0.6 ± 2.0	< 3.0	1.1 ± 1.3	< 2.5	0.4 ± 0.9	< 1.4
Co-60	-0.3 ± 1.0	< 1.4	-0.6 ± 1.3	< 2.1	1.3 ± 1.0	< 2.2
Zn-65	-1.2 ± 3.4	< 2.2	-2.7 ± 3.0	< 4.7	-0.6 ± 1.9	< 3.8
Zr-Nb-95	-1.9 ± 1.9	< 4.5	0.5 ± 1.3	< 2.4	-2.2 ± 1.1	< 2.5
Cs-134	0.8 ± 1.8	< 3.5	-2.5 ± 1.3	< 2.3	-0.4 ± 0.9	< 1.7
Cs-137	0.0 ± 1.0	< 2.0	-1.2 ± 1.4	< 1.7	1.4 ± 1.1	< 2.0
Ba-La-140	-1.0 ± 1.7	< 1.9	-0.2 ± 1.3	< 2.4	-1.0 ± 1.1	< 2.7

Location	U2FSSDS		GW-04		U2FSSDS	
Collection Date	02-28-23	MDC	03-22-23	MDC	03-31-23	MDC
Lab Code	EW- 342		EWW- 606		EWW- 894	
Be-7	-1.9 ± 12.8	< 23.9	3.8 ± 15.6	< 29.1	4.5 ± 12.3	< 19.3
Mn-54	2.1 ± 1.5	< 2.2	0.2 ± 1.8	< 3.1	1.0 ± 1.6	< 2.0
Fe-59	3.3 ± 2.7	< 7.8	0.7 ± 1.1	< 3.3	2.5 ± 2.7	< 6.6
Co-58	-1.3 ± 1.5	< 2.6	-1.0 ± 2.0	< 2.1	-1.2 ± 1.4	< 1.9
Co-60	0.7 ± 1.6	< 2.0	0.4 ± 0.7	< 1.3	-0.4 ± 1.8	< 2.2
Zn-65	-3.4 ± 3.4	< 5.8	-2.0 ± 5.0	< 8.3	-2.1 ± 3.3	< 3.7
Zr-Nb-95	-3.0 ± 1.6	< 3.9	-4.3 ± 2.4	< 4.6	0.3 ± 1.5	< 2.8
Cs-134	0.6 ± 1.5	< 3.0	-2.4 ± 1.9	< 4.0	-1.3 ± 1.6	< 3.0
Cs-137	-0.1 ± 1.8	< 2.2	1.3 ± 0.6	< 1.3	1.1 ± 1.8	< 2.2
Ba-La-140	0.4 ± 1.8	< 13.9	-1.0 ± 1.9	< 2.4	-8.1 ± 2.1	< 6.1

POINT BEACH NUCLEAR PLANT

Supplemental Analyses

Units: = pCi\L

Gamma isotopic analysis

Location	GW-18		GW-04		GW-15A,B	
Collection Date	04-13-23		04-19-23		04-27-23	
Lab Code	EW- 883	MDC	EW- 953	MDC	EW- 1115	MDC
Be-7	-1.3 ± 23.9	< 41.3	-1.1 ± 4.0	< 8.8	-12.0 ± 15.4	< 28.2
Mn-54	-1.3 ± 3.3	< 5.4	0.6 ± 6.2	< 1.3	1.4 ± 1.8	< 4.1
Fe-59	-1.0 ± 7.7	< 10.5	-0.8 ± 1.2	< 1.8	-1.9 ± 3.4	< 8.2
Co-58	-0.2 ± 3.6	< 5.3	0.4 ± 0.6	< 1.2	0.7 ± 1.7	< 3.4
Co-60	-1.8 ± 4.1	< 4.3	0.5 ± 0.7	< 1.1	0.6 ± 2.0	< 2.5
Zn-65	-3.6 ± 7.8	< 7.8	0.7 ± 1.2	< 2.6	-2.1 ± 3.9	< 6.1
Zr-Nb-95	-0.2 ± 3.3	< 5.5	-0.2 ± 0.6	< 1.1	-3.4 ± 1.8	< 2.6
Cs-134	0.2 ± 3.2	< 5.1	-0.1 ± 0.6	< 1.0	-0.6 ± 1.7	< 3.6
Cs-137	0.2 ± 3.9	< 3.5	0.6 ± 0.6	< 1.3	1.3 ± 2.0	< 4.0
Ba-La-140	-3.2 ± 4.5	< 4.9	0.5 ± 0.7	< 1.5	-1.2 ± 2.0	< 2.7

Location	U2FSSDS		GW-04		U2FSSDS	
Collection Date	04-30-23		05-17-23		05-31-23	
Lab Code	EW- 1151	MDC	EW- 1272	MDC	EW- 1481	MDC
Be-7	-11.5 ± 12.7	< 17.5	5.8 ± 7.3	< 18.7	16.2 ± 18.0	< 38.6
Mn-54	0.9 ± 1.5	< 2.1	-0.4 ± 1.1	< 1.3	0.9 ± 2.1	< 4.6
Fe-59	-2.6 ± 2.8	< 5.4	-1.6 ± 1.8	< 3.3	-1.0 ± 3.8	< 9.4
Co-58	-0.6 ± 1.4	< 1.6	0.4 ± 1.0	< 1.3	0.7 ± 1.7	< 3.5
Co-60	-0.7 ± 1.5	< 1.7	1.1 ± 1.4	< 1.7	0.7 ± 2.2	< 4.6
Zn-65	-2.3 ± 3.1	< 3.4	-1.4 ± 2.3	< 2.5	2.7 ± 4.2	< 8.3
Zr-Nb-95	-0.1 ± 2.6	< 2.0	0.7 ± 1.2	< 2.8	-0.8 ± 1.9	< 3.7
Cs-134	-0.8 ± 1.6	< 3.0	-1.0 ± 1.1	< 2.1	-1.0 ± 1.9	< 3.9
Cs-137	0.3 ± 1.7	< 1.9	1.0 ± 1.3	< 2.6	-0.7 ± 2.2	< 3.8
Ba-La-140	2.7 ± 1.7	< 3.4	-1.6 ± 1.3	< 2.3	1.4 ± 2.3	< 8.3

Location	GW-07		GW-04		U2FSSDS	
Collection Date	05-18-23		06-21-23		06-30-23	
Lab Code	EW- 1278	MDC	EW- 1644	MDC	EW- 2545 [a]	MDC
Be-7	-6.2 ± 16.3	< 31.0	-8.5 ± 15.2	< 21.9	-1.7 ± 13.1	< 33.2
Mn-54	-2.4 ± 2.1	< 2.6	-2.8 ± 3.7	< 2.8	1.2 ± 1.5	< 2.0
Fe-59	-0.4 ± 3.1	< 2.8	-0.5 ± 3.9	< 8.0	-9.1 ± 3.1	< 11.9
Co-58	1.2 ± 2.2	< 4.6	1.8 ± 1.7	< 2.7	-0.3 ± 1.5	< 3.4
Co-60	0.7 ± 2.2	< 3.9	1.4 ± 2.0	< 2.5	1.0 ± 1.6	< 2.1
Zn-65	0.2 ± 4.7	< 4.3	0.3 ± 3.5	< 4.5	-2.0 ± 3.2	< 3.9
Zr-Nb-95	-3.2 ± 2.2	< 3.1	0.3 ± 1.8	< 3.1	-3.0 ± 2.8	< 6.8
Cs-134	-0.7 ± 1.9	< 3.7	0.0 ± 1.9	< 3.9	-0.2 ± 1.5	< 3.0
Cs-137	0.2 ± 1.9	< 3.4	-0.9 ± 2.1	< 2.2	-0.6 ± 1.8	< 2.3
Ba-La-140	-3.7 ± 2.5	< 5.8	3.8 ± 4.0	< 4.8	-15.4 ± 2.0	< 64.1

[a] Unable to reach LLD due to late sample arrival.

POINT BEACH NUCLEAR PLANT

Supplemental Analyses

Units: = pCi\L

Gamma isotopic analysis

Location	GW-18		GW-04		GW-15A,B	
Collection Date	07-19-23		07-19-23		07-19-23	
Lab Code	EW- 2097	MDC	EW- 2098	MDC	EW- 2193	MDC
Be-7	5.9 ± 21.9	< 21.9	-13.7 ± 29.8	< 51.8	26.7 ± 12.3	< 21.2
Mn-54	-1.5 ± 3.2	< 5.6	-0.2 ± 3.5	< 5.5	1.0 ± 1.5	< 1.9
Fe-59	1.4 ± 5.7	< 9.9	5.2 ± 6.1	< 8.1	-4.7 ± 3.1	< 6.3
Co-58	-1.3 ± 2.9	< 4.8	-2.3 ± 4.8	< 8.5	-2.0 ± 1.4	< 1.9
Co-60	-0.2 ± 2.6	< 4.0	0.3 ± 3.8	< 4.1	0.4 ± 1.6	< 2.1
Zn-65	-5.8 ± 7.0	< 5.0	-0.8 ± 9.7	< 10.4	3.3 ± 3.1	< 3.6
Zr-Nb-95	1.3 ± 2.7	< 5.0	-3.5 ± 4.6	< 9.6	-0.6 ± 2.5	< 2.8
Cs-134	-1.9 ± 2.8	< 4.6	-6.0 ± 4.2	< 6.7	-1.5 ± 1.6	< 2.9
Cs-137	1.3 ± 2.7	< 5.0	0.9 ± 4.2	< 4.5	0.4 ± 1.7	< 2.1
Ba-La-140	1.0 ± 3.4	< 5.8	3.6 ± 4.4	< 4.5	-3.8 ± 1.7	< 5.3

Location	U2FSSDS		GW-04		U2FSSDS	
Collection Date	07-31-23		08-22-23		08-31-23	
Lab Code	EW- 2342	MDC	EW- 2515	MDC	EW- 2676	MDC
Be-7	-2.2 ± 23.9	< 51.2	-18.0 ± 15.7	< 18.8	0.4 ± 1.3	< 18.1
Mn-54	1.1 ± 2.4	< 4.2	0.7 ± 1.8	< 3.0	1.4 ± 1.5	< 2.0
Fe-59	0.7 ± 4.5	< 4.5	-3.2 ± 4.0	< 2.7	-3.6 ± 2.9	< 5.9
Co-58	-1.7 ± 2.4	< 4.5	-0.1 ± 1.7	< 2.2	1.4 ± 1.4	< 2.0
Co-60	4.0 ± 3.0	< 9.7	0.7 ± 1.9	< 6.3	-0.3 ± 1.8	< 2.0
Zn-65	-0.8 ± 5.8	< 10.0	-1.2 ± 4.0	< 4.4	-2.4 ± 3.5	< 3.9
Zr-Nb-95	-0.8 ± 2.6	< 7.3	-0.2 ± 1.7	< 1.5	-1.9 ± 1.6	< 2.5
Cs-134	-1.4 ± 2.4	< 4.8	-0.3 ± 1.5	< 3.3	-2.4 ± 1.6	< 2.7
Cs-137	5.1 ± 3.0	< 8.0	1.8 ± 2.1	< 5.0	1.1 ± 1.6	< 1.9
Ba-La-140	-7.0 ± 2.8	< 10.8	1.5 ± 2.2	< 3.1	0.0 ± 1.8	< 3.9

Location	GW-04		U2FSSDS		GW-18	
Collection Date	09-21-23		09-30-23		10-10-23	
Lab Code	EW- 2794	MDC	EW- 4057 [a]	MDC	EW- 3075	MDC
Be-7	14.3 ± 38.1	< 51.0	-4.0 ± 14.2	< 102.8	-16.4 ± 17.7	< 21.7
Mn-54	-1.7 ± 5.9	< 6.2	-1.7 ± 1.5	< 2.7	0.3 ± 1.7	< 2.9
Fe-59	3.7 ± 11.7	< 8.9	6.4 ± 2.9	< 27.0	-3.1 ± 3.3	< 1.6
Co-58	0.9 ± 4.5	< 5.1	2.0 ± 1.4	< 6.7	-0.8 ± 1.5	< 1.8
Co-60	1.8 ± 3.9	< 5.0	2.8 ± 1.7	< 5.8	3.8 ± 2.7	< 6.5
Zn-65	-8.9 ± 9.9	< 6.7	-7.3 ± 3.6	< 7.0	1.7 ± 4.1	< 4.4
Zr-Nb-95	1.4 ± 5.0	< 5.9	-35.7 ± 1.6	< 17.2	-0.2 ± 2.1	< 3.3
Cs-134	-3.3 ± 4.3	< 7.1	-3.7 ± 1.6	< 3.3	-1.2 ± 2.0	< 3.7
Cs-137	-0.8 ± 5.8	< 5.3	3.5 ± 1.8	< 5.1	4.1 ± 2.4	< 5.6
Ba-La-140	-4.8 ± 6.6	< 4.8	-199.4 ± 1.7	< 1070.1	-1.7 ± 2.3	< 2.4

[a] Unable to reach LLD due to small sample size and late arrival to the lab. Sample counted between 60K and 80K seconds.

POINT BEACH NUCLEAR PLANT

Supplemental Analyses

Units: = pCi\L

Gamma isotopic analysis

Location	GW-04		U2FSSDS		GW-04	
Collection Date	10-18-24		10-31-23		11-14-23	
Lab Code	EW- 3229	MDC	EW- 4059 [a]	MDC	EW- 3544	MDC
Be-7	-9.6 ± 21.0	< 20.7	28.6 ± 10.9	< 64.9	6.4 ± 9.6	< 20.7
Mn-54	1.7 ± 2.5	< 4.3	0.8 ± 1.3	< 3.3	0.3 ± 1.3	< 2.3
Fe-59	2.4 ± 4.4	< 3.4	0.3 ± 2.5	< 17.8	2.4 ± 2.6	< 6.2
Co-58	0.5 ± 2.0	< 1.9	0.7 ± 1.4	< 4.7	-1.8 ± 1.4	< 2.0
Co-60	1.8 ± 2.3	< 7.3	0.3 ± 1.4	< 2.8	-0.3 ± 1.5	< 2.3
Zn-65	-5.3 ± 6.1	< 4.6	-4.8 ± 2.6	< 5.0	0.7 ± 2.6	< 4.6
Zr-Nb-95	-1.6 ± 2.3	< 2.0	-21.7 ± 1.6	< 13.3	-0.1 ± 1.5	< 2.8
Cs-134	0.9 ± 2.1	< 4.3	-1.2 ± 1.4	< 2.8	-1.0 ± 1.2	< 2.2
Cs-137	4.6 ± 2.8	< 7.0	-203.3 ± 4.6	< 3.0	0.4 ± 1.4	< 2.5
Ba-La-140	1.4 ± 2.9	< 3.0	40.8 ± 1.5	< 137.8	-0.2 ± 3.8	< 6.8

Location	U2FSSDS		GW-15A,B		GW-04	
Collection Date	11-30-23		12-07-23		12-20-23	
Lab Code	EW- 4060 [a]	MDC	EW- 3899	MDC	EW- 3946	MDC
Be-7	-2.8 ± 7.2	< 26.6	0.4 ± 6.2	< 20.1	-3.0 ± 6.8	< 9.4
Mn-54	0.6 ± 0.9	< 1.8	0.2 ± 0.8	< 1.6	0.3 ± 1.0	< 1.5
Fe-59	-1.9 ± 1.6	< 6.6	0.5 ± 1.4	< 3.1	-1.3 ± 2.1	< 2.9
Co-58	-0.5 ± 0.8	< 1.4	-0.4 ± 0.8	< 1.9	0.2 ± 1.2	< 1.8
Co-60	0.7 ± 1.0	< 2.1	0.3 ± 0.8	< 1.8	2.1 ± 1.2	< 2.2
Zn-65	0.4 ± 1.8	< 3.3	-0.8 ± 1.5	< 3.4	-1.4 ± 2.4	< 3.2
Zr-Nb-95	-2.6 ± 1.0	< 5.1	-3.5 ± 0.9	< 2.4	-0.4 ± 1.2	< 2.0
Cs-134	0.2 ± 0.9	< 1.7	-0.4 ± 0.8	< 1.5	-0.1 ± 1.1	< 1.9
Cs-137	0.8 ± 1.1	< 2.1	0.0 ± 0.9	< 1.7	2.1 ± 1.3	< 2.4
Ba-La-140	9.6 ± 1.0	< 25.6	-3.2 ± 0.9	< 4.7	-1.0 ± 1.3	< 2.4

Location	U2FSSDS	
Collection Date	12-31-23	
Lab Code	EW- 4061	MDC
Be-7	1.9 ± 12.7	< 18.2
Mn-54	0.9 ± 1.5	< 2.0
Fe-59	1.1 ± 2.8	< 6.1
Co-58	-0.3 ± 1.5	< 2.1
Co-60	-0.7 ± 1.7	< 2.0
Zn-65	0.1 ± 3.1	< 3.9
Zr-Nb-95	-2.1 ± 1.5	< 3.8
Cs-134	1.4 ± 1.6	< 2.8
Cs-137	0.1 ± 1.6	< 1.7
Ba-La-140	-0.6 ± 1.7	< 5.1

[a] Unable to reach LLD due to small sample size and late arrival to the lab. Sample counted between 60K and 80K seconds.

APPENDIX F

Special Analyses

Additional Analyses

Units pCi/L Location	S-3	**MDC**	S-7	**MDC**
Collection Date	02-07-23		02-07-23	
Lab Code	EW- 245		EW- 246	
Fe-55	-230.6 ± 276.7	< 476.6	-50.9 ± 270.2	< 449.6
Ni-63	-7.70 ± 44.5	< 73.5	4.20 ± 41.4	< 68
Sr-89	0.20 ± 0.4	< 0.50	-0.04 ± 0.5	< 0.70
Sr-90	-0.05 ± 0.2	< 0.50	-0.05 ± 0.2	< 0.50
Tc-99	6.1 ± 7.0	< 11.42	-3.1 ± 3.4	< 5.70

Location	E-006	**MDC**	E-006	**MDC**
Collection Date	04-12-23		04-20-23	
Lab Code	ELW- 864		ELW- 968	
Fe-55	154.3 ± 277.7	< 443.9		
Ni-63	1.22 ± 45.2	< 74.4		
Sr-89	-0.09 ± 0.4	< 0.52		
Sr-90	0.11 ± 0.3	< 0.55		
Tc-99	0.0 ± 6.8	< 11.2		

Location	E-006	**MDC**
Collection Date	04-20-23	
Lab Code	ELW- 968[a]	
Gross beta	1.3 ± 0.3	< 0.9
I-131	-0.01 ± 0.22	< 0.49
Be-7	2.1 ± 6.4	< 11.4
Mn-54	-0.5 ± 0.8	< 1.9
Fe-59	-1.9 ± 1.6	< 1.4
Co-58	-0.5 ± 0.8	< 1.7
Co-60	-0.5 ± 0.9	< 1.2
Zn-65	-0.7 ± 1.7	< 3.2
Zr-Nb-95	-0.2 ± 0.8	< 1.6
Cs-134	-0.2 ± 0.8	< 1.5
Cs-137	0.1 ± 0.9	< 1.5
Ba-La-140	-1.0 ± 1.0	< 2.1
Other (Ru-103)	0.0 ± 0.8	< 1.5

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LABORATORY REPORT NO.: 8006-100-1506
SAMPLES RECEIVED: 04-04-23
PURCHASE ORDER NO.:

Below are the results of the readout of supplemental TLDs deployed during the first quarter, 2023.

Period:	1st Quarter, 2023
Date Annealed:	12/06/22
Date Placed:	01/04/23
Date Removed:	04/02/23
Date Read:	04/05/23
Days in the Field:	88
Days from Annealing to Readout:	120
In-transit exposure:	5.59 ± 0.38

Location	Total mR	Net mR	Net mR Std Qtr	Net mR per 7 days
SGSF-North	17.0 ± 0.6	11.4 ± 0.7	11.8 ± 0.7	0.91 ± 0.06
SGSF-East	16.4 ± 0.7	10.8 ± 0.8	11.2 ± 0.8	0.86 ± 0.06
SGSF-South	17.2 ± 0.4	11.6 ± 0.5	12.0 ± 0.5	0.92 ± 0.04
SGSF-West	16.9 ± 0.3	11.3 ± 0.5	11.7 ± 0.5	0.90 ± 0.04
ISFSI-North	29.9 ± 0.9	24.3 ± 1.0	25.1 ± 1.0	1.93 ± 0.08
ISFSI-East	44.8 ± 1.5	39.2 ± 1.5	40.5 ± 1.6	3.12 ± 0.12
ISFSI-South	38.1 ± 1.3	32.5 ± 1.4	33.6 ± 1.4	2.58 ± 0.11
ISFSI-West	88.2 ± 2.7	82.6 ± 2.7	85.4 ± 2.8	6.57 ± 0.22
Control	19.8 ± 0.8	14.3 ± 0.9	14.7 ± 0.9	1.13 ± 0.07

5/2/23
Forrest G. Shaw III
Quality Assurance

APPROVED 5/3/23
Ashok Banavali, Ph.D.
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LABORATORY REPORT NO.: 8006-100-1514
SAMPLES RECEIVED: 07-07-23
PURCHASE ORDER NO.:

Below are the results of the readout of supplemental TLDs deployed during the second quarter, 2023.

Period:	2nd Quarter, 2023
Date Annealed:	03/08/23
Date Placed:	04/02/23
Date Removed:	07/06/23
Date Read:	07/07/23
Days in the Field:	95
Days from Annealing to Readout:	121
In-transit exposure:	4.83 ± 0.34

Location	Total mR	Net mR	Net mR Std Qtr	Net mR per 7 days
SGSF-North	17.8 ± 0.8	12.9 ± 0.8	12.4 ± 0.8	0.95 ± 0.06
SGSF-East	17.8 ± 0.3	13.0 ± 0.5	12.4 ± 0.4	0.96 ± 0.03
SGSF-South	17.3 ± 0.4	12.5 ± 0.5	11.9 ± 0.5	0.92 ± 0.04
SGSF-West	19.2 ± 0.5	14.4 ± 0.6	13.8 ± 0.6	1.06 ± 0.05
ISFSI-North	34.6 ± 1.8	29.8 ± 1.8	28.5 ± 1.7	2.19 ± 0.13
ISFSI-East	50.5 ± 2.0	45.7 ± 2.1	43.8 ± 2.0	3.37 ± 0.15
ISFSI-South	41.2 ± 1.3	36.3 ± 1.4	34.8 ± 1.3	2.68 ± 0.10
ISFSI-West	88.9 ± 5.3	84.1 ± 5.3	80.5 ± 5.1	6.20 ± 0.39
Control	23.3 ± 1.1	18.4 ± 1.1	17.7 ± 1.1	1.36 ± 0.08

7/28/23
Forrest G. Shaw III
Quality Assurance

APPROVED 7/28/23
Ashok Banavali, Ph.D.
Laboratory Manager

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LABORATORY REPORT NO.: 8006-100-1526
SAMPLES RECEIVED: 10-03-23
PURCHASE ORDER NO.:

Below are the results of the readout of supplemental TLDs deployed during the third quarter, 2023.

Period:	3rd Quarter, 2023
Date Annealed:	06/12/23
Date Placed:	07/06/23
Date Removed:	10/01/23
Date Read:	10/04/23
Days in the Field:	87
Days from Annealing to Readout:	114
In-transit exposure:	4.73 ± 0.33

Location	Total mR	Net mR	Net mR Std Qtr	Net mR per 7 days
SGSF-North	16.8 ± 0.6	12.0 ± 0.7	12.6 ± 0.7	0.97 ± 0.05
SGSF-East	16.0 ± 0.7	11.3 ± 0.8	11.8 ± 0.8	0.91 ± 0.06
SGSF-South	16.6 ± 0.4	11.9 ± 0.5	12.4 ± 0.5	0.96 ± 0.04
SGSF-West	16.7 ± 0.4	12.0 ± 0.5	12.6 ± 0.5	0.97 ± 0.04
ISFSI-North	29.0 ± 0.8	24.2 ± 0.8	25.4 ± 0.9	1.95 ± 0.07
ISFSI-East	46.2 ± 0.9	41.4 ± 1.0	43.3 ± 1.0	3.33 ± 0.08
ISFSI-South	36.6 ± 1.2	31.8 ± 1.2	33.3 ± 1.3	2.56 ± 0.10
ISFSI-West	85.5 ± 2.6	80.7 ± 2.6	84.5 ± 2.8	6.50 ± 0.21
Control	19.8 ± 0.8	15.1 ± 0.8	15.8 ± 0.9	1.21 ± 0.07

Forrest G. Shaw III 10/10/23
Forrest G. Shaw III
Quality Assurance Specialist

APPROVED A. Banavali 10/10/23
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LABORATORY REPORT NO.: 8006-100-1542
SAMPLES RECEIVED: 01-08-24
PURCHASE ORDER NO.:

Below are the results of the readout of supplemental TLDs deployed during the fourth quarter, 2023.

Period:	4th Quarter, 2023
Date Annealed:	09/12/23
Date Placed:	10/01/23
Date Removed:	01/04/24
Date Read:	01/11/24
Days in the Field:	95
Days from Annealing to Readout:	121
In-transit exposure:	2.08 ± 0.26

Location	Total mR	Net mR	Net mR Std Qtr	Net mR per 7 days
SGSF-North	17.3 ± 0.7	15.3 ± 0.7	14.6 ± 0.7	1.12 ± 0.05
SGSF-East	19.1 ± 0.3	17.0 ± 0.4	16.3 ± 0.4	1.25 ± 0.03
SGSF-South	17.5 ± 0.4	15.4 ± 0.4	14.8 ± 0.4	1.14 ± 0.03
SGSF-West	19.7 ± 0.6	17.6 ± 0.6	16.8 ± 0.6	1.30 ± 0.05
ISFSI-North	35.5 ± 1.5	33.4 ± 1.5	32.0 ± 1.4	2.46 ± 0.11
ISFSI-East	50.3 ± 1.6	48.2 ± 1.6	46.2 ± 1.5	3.55 ± 0.12
ISFSI-South	38.2 ± 2.4	36.1 ± 2.4	34.6 ± 2.3	2.66 ± 0.18
ISFSI-West	93.1 ± 3.8	91.0 ± 3.8	87.1 ± 3.6	6.70 ± 0.28
Control	23.3 ± 1.0	21.2 ± 1.0	20.3 ± 1.0	1.56 ± 0.07

Forrest G. Shaw III 2/22/24
Quality Assurance

APPROVED Ashok Banavali 2/22/24
Ashok Banavali, Ph.D.
Laboratory Director