KEWAUNEE SOLUTIONS

May 15, 2025 KS-2025-008

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

Kewaunee Solutions, Inc.
Facility Operating License No. DPR-43
NRC Docket No. 50-305

Subject: Kewaunee Power Station 2024 Annual Radiological Environmental Operating Report

Enclosed is the Kewaunee Power Station (KPS) 2024 Annual Radiological Environmental Operating Report for January through December 2024. This report was prepared by Microbac Laboratories-Northbrook and is submitted to meet the requirements of KPS Technical Requirements Manual (TRM) Section 10.3.

The results of the 2024 Land Use Census, submitted in accordance with the KPS Radiological Environmental Monitoring Manual, Section 2.2.2/2.3.2, are also included in this report.

If you have any questions or require additional information, please feel free to contact myself at 508-728-1421.

Respectfully,

Joseph R. Lynch Digitally signed by Joseph R. Lynch
Date: 2025.05.14 13:24:03 -04'00'

Joseph R. Lynch
Licensing Manager
Kewaunee Solutions, Inc.

Commitments made in this letter: None

Attachment:

1. Kewaunee Power Station 2024 Annual Radiological Environmental Operating Report

cc:
Regional Administrator, Region III U.S. Nuclear Regulatory Commission
Ms. Amy Snyder, Project Manager U.S. Nuclear Regulatory Commission
Mr. Robert Busch, Wisconsin Department of Health Services Radiation Protection Section Radioactive Materials Program
Mr. Justin Folkwein, American Nuclear Insurers

ATTACHMENT 1

Kewaunee Power Station 2024 Annual Radiological Environmental Operating Report.

(109 Pages Follow)

KEWAUNEE SOLUTIONS

2024 Annual Radiological Environmental Operating Report

Kewaunee Power Station

KEWAUNEE SOLUTIONS

2024 Annual Radiological Environmental Operating Report

Kewaunee Power Station

Part I

Summary and Interpretation

MICROBAC®

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ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

TO

KEWAUNEE SOLUTIONS

RADIOLOGICAL MONITORING PROGRAM FOR
THE KEWAUNEE POWER STATION
KEWAUNEE, WISCONSIN

PART I - SUMMARY AND INTERPRETATION

January 1 to December 31, 2024

Prepared and submitted by:

Microbac Laboratories – Northbrook

Project No. 8002

Approved :

for Ashok D. Banavali, Ph.D.
Laboratory Director
Microbac Laboratories – Northbrook

Daniel Shannon
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Daniel J. Shannon
Radiation Protection Technical Manager
Kewaunee Power Station

PREFACE

The staff of Microbac Laboratories - Northbrook were responsible for the presentation of data in this report. Assistance in sample collection was provided by Kewaunee Power Station personnel. The report was prepared by staff members of Microbac Laboratories - Northbrook. Teledyne Brown Engineering, Inc. is responsible for the radiochemical analyses. Mirion Dosimetry Services is responsible for the Thermolumnescent Dosimetry.

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1.0 INTRODUCTION

The Kewaunee Power Station was a 598 megawatt pressurized water reactor located on the Wisconsin shore of Lake Michigan in Kewaunee County. The Plant became critical on March 7, 1974. Initial power generation was achieved on April 8, 1974, and the Plant was declared commercial on June 16, 1974.

Power operations of the Kewaunee Power Station ceased on May 7, 2013. The fuel was permanently removed from the reactor and placed in the spent fuel pool for storage on May 14, 2013. On June 15, 2017, the transfer of all spent fuel from the KPS Spent Fuel Pool (SFP) to the Independent Spent Fuel Storage Installation (ISFSI) was completed. All remaining irradiated materials were removed from the SFP in October of 2017.

On June 28, 2022, Dominion Energy Kewaunee (DEK) was sold to Energy Solutions and assumed the new company name of Kewaunee Solutions. The sale included the Kewaunee Power Station and ISFSI, and the transfer of the operating license DPR-43. Kewaunee Solutions transitioned from the SAFSTOR to the DECON method of decommissioning of the power station on May 22, 2023.

This report summarizes the environmental operation data collected during the period January – December 2024.

Energy Solutions, operator, and owner of the Kewaunee Power Station, assumes responsibility for the environmental program at the Plant. Any questions should be directed to Mr. Daniel J. Shannon, Radiological Protection Technical Manager, at (920) 304-1129.

2.0 SUMMARY

Results of sample analyses during the period January - December 2024 are summarized in Table 4.5. Radionuclide concentrations measured at indicator locations are compared with levels measured at control locations and in preoperational studies. In no instance were REMP threshold reporting levels exceeded.

3.0 RADIOLOGICAL SURVEILLANCE PROGRAM

Following is a description of the Radiological Surveillance Program and its execution.

3.1 METHODOLOGY

The sampling locations are shown in Figure 4-1. Table 4.1 describes the locations, lists for each direction and distance from the reactor stack, and defines which are the indicator and control locations.

The sampling program monitors the air, terrestrial, and aquatic environments. The types of samples collected at each location and the frequency of collections are presented in Table 4.2, using sample codes defined in Table 4.3. The collections and analyses that comprise the program are described below. Finally, the execution of the program in the current reporting year is discussed.

3.1.1 The Air Program

Ambient Gamma Radiation – TLDs

Ambient gamma radiation is monitored at the one control location (K-2), at four inner ring locations (K1f, K-25, K-27 and K-30), and at six outer ring locations (K-3, K-5, K-8, K-17, K-39 and K-43) by thermoluminescent dosimeters (TLDs). Two TLDs are placed at each location; one TLD is exchanged and read quarterly; the other TLD is exchanged annually and only read on an emergency basis.

Dosimeters have also been placed at four additional locations (K-1m, K-1o, K-1q and K-1r), to monitor the Independent Spent Fuel Storage Installation (ISFSI) as part of the inner ring locations. They are exchanged and read quarterly.

Airborne Particulates

Airborne particulates are collected on 47 mm diameter filters, at a volumetric rate of approx. one cubic foot per minute. The filters are collected weekly from four locations (K-1f, K-2(control), K-8 and K-43), and dispatched by mail to the vendor lab for radiometric analysis. The particulate filters are counted for gross beta activity, a minimum of three days after collection, to allow for the decay of naturally-occurring short-lived radionuclides.

Quarterly composites from each sampling location are analyzed for gamma-emitting isotopes by gamma spectroscopy.

Airborne Iodine

Airborne iodine analysis was discontinued beginning in 2018 due to the cessation of power operations (see Introduction on page 1).

Precipitation

The collection and analysis of precipitation samples was discontinued beginning in 2018 due to the cessation of power operations (see Introduction on page 1).

3.1.2 The Terrestrial Program

Milk

The collection and analysis of milk samples was discontinued beginning in 2018 due to the cessation of power operations (see Introduction on page 1).

Well Water

Well water is collected quarterly from one off-site well location K-13 and from three on-site wells located at K-1h, K-1u and K-1v. Samples are only collected at locations K-1u and K-1v when these sources are tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

Gamma spectroscopic analysis, tritium and gross beta on the total residue are performed for each water sample. Samples of water from the three on-site wells (K-1h, K-1u and K-1v) are analyzed for gross alpha. The water sample from K-1h is also tested for strontium-90.

Monitoring wells and results associated with the Ground Water Protection Program (GWPP) are reported in the KPS Annual Radioactive Effluent Release Report (ARERR). The groundwater monitoring well locations associated with the GWPP are included in Figure 4-2 along with the onsite well water sampling locations associated with the REMP.

Domestic Meat

The collection and analysis of domestic meat was discontinued in 2018 due to the cessation of power operations (see Introduction on page 1).

Eggs

The collection and analysis of eggs was discontinued in 2018 due to the cessation of power operations (see Introduction on page 1).

Broad leaf Vegetation

Annually, during the third quarter, samples of broad leaf vegetation are collected from location K-26. Samples may also be obtained from other local sources to supplement the program. In addition, two samples of broad leaf vegetation are collected annually from farmland owned by Kewaunee Solutions (K-23a and K-23b) and rented to a private individual for growing crops. The samples are analyzed for gamma emitting isotopes.

Cattle Feed

Cattle feed (e.g., hay and silage) is collected during the first quarter from dairy farm locations (K-3, K-34, K-35, K-38 and K-45). The samples are analyzed for gross beta, strontium-90 and gamma emitting isotopes.

Grass

Grass is collected during the second, third and fourth quarters from two on-site locations (K-1b and K-1f) and from the dairy farm locations (K-3, K-5, K-34, K-35, K-38 and K-39). The samples are analyzed for gross beta, strontium-90 and gamma emitting isotopes.

Soil

Soil samples are collected twice a year on-site at K-1f and from the dairy farm locations (K-3, K-34, K-35 and K-38). The samples are analyzed for gross alpha, gross beta, strontium-90 and gamma emitting isotopes.

3.1.3 The Aquatic Program

Surface Water

Surface water samples are taken quarterly from two locations on Lake Michigan: 1) at the point where plant effluent water is discharged into Lake Michigan (K-1d); and 2) at the main pumping station located approximately equidistant from Kewaunee and Green Bay, which pumps water from the Rostok water intake (K-9) located 11.5 miles NNE of the reactor site. Both raw and tap water are collected at K-9. One-gallon water samples are taken quarterly from two creeks that pass through the site (K-1b and K-1e). Samples from the Middle Creek (K-1b) are collected near the mouth of the creek. Samples from the South Creek (K-1e) are collected about ten feet downstream from the point where the outflow from the two drain pipes meets.

The water is analyzed for gamma emitting isotopes, gross beta activity in total residue, dissolved and suspended solids, tritium and strontium-90.

Fish

Fish samples are collected during the third quarter near location K-1d. The flesh is separated from the bones, gamma scanned and analyzed for gross beta activity. Bone samples are analyzed for gross beta, and strontium-90. A local fish market, (e.g.,Lafond's in Kewaunee), may be used for backup fish samples, if needed.

Aquatic Slime

The collection and analysis of aquatic slime was discontinued in 2018 due to the cessation of power operations (see Introduction on page 1).

Shoreline Sediment

Shoreline sediments are collected in May and November from three locations (K-1c, K-1j and K-9) in areas with potential for recreational value. The samples are analyzed for gross beta, strontium-90 and gamma emitting isotopes.

3.1.4 Program Execution

Program execution is summarized in Table 4.4. The program was executed for the year 2024 as described in the preceding sections, with the following exceptions:

Air Particulates

Air sampler was found off at location K-43 due to open power supply breaker. Sampler run time was 146 hours vs. expected 147 hours for the period ending 1/30/24 (CR#2700).

Air sampler was found with reduced run time at location K-8 due to temporary loss of power caused by severe weather. Sampler run time was 39 hours less than expected for the period ending 4/9/24 (CR#2024-0304).

Air sampler was found off at location K-8 due to loss of power caused by tripped open GFCI. Sampler run time was 8.29 hours for the period ending 5/14/24 (CR#2024-0406).

Air sampler was found off at location K-2 due to temporary loss of power caused by severe weather. Sampler run time was approximately 2 hours less than expected for the period ending 8/27/24 (CR#2024-0782).

The weekly air samples collected at all four locations (K-1 f, K-43, K-8, K-2) for the period ending 10/1/24 were lost in transit by US Mail to the offsite analysis lab (CR#2024-1138).

3.1.5 Program Modifications

None.

3.2 RESULTS AND DISCUSSION

Results for the reporting period January to December, 2024 are presented in summary form in Table 4.5. For each type of analysis, of each sampled medium, the table shows the annual mean and range for all indicator and control locations. The location with the highest annual mean and the results for this location are also given.

The discussion of the results has been divided into three broad categories: the air, terrestrial, and aquatic environments. Within each category, samples will be discussed in the order listed in Table 4.4.

Results of all measurements made in 2024 are not included in this section, although references to these results will be made in the discussion. A complete tabulation of results is provided in Part II of the 2024 annual report on the Radiological Monitoring Program for the Kewaunee Power Station.

3.2.1 Atmospheric Nuclear Detonations and Nuclear Accidents

There were no atmospheric nuclear tests or accidents reported in 2024. The Chernobyl and Fukushima Daiichi nuclear accidents occurred on April 26, 1986 and March 11, 2011, respectively. The last reported atmospheric nuclear test was conducted by the People's Republic of China on October 16, 1980. Contributions from these events have resulted in the presence of long-lived radioisotopes of cesium and strontium still detectable in the environment.

3.2.2 The Air Environment

Ambient Gamma Radiation – TLDs

Ambient gamma radiation was monitored by TLDs at eleven locations, ten indicators (K-1f, K-3, K-5, K-8, K-17, K-25, K-27, K-30, K-39 and K-43) and one control (K-2). TLDs at the indicator locations measured a mean dose equivalent of 13.7 mR/91 days, in close agreement with the control location 13.9 mR/91 days. The readings are slightly lower than the averages obtained from 2002 (and prior to) through 2022 due to the change to a new Environmental TLD vendor and

the accounting for transit and control dose.

These results support the conclusion that no plant effect on ambient gamma radiation was indicated. These values are comparable to the United States average value of 19.5 mR/91 days due to natural background radiation (National Council on Radiation Protection and Measurements, 1975). The highest annual mean was 15.2 mR/91 days, measured at indicator location K-39.

Year	Average (Indicators)	Average (Controls)
	Dose rate (mR/91 days)	
2008	15.6	14.2
2009	15.2	13.9
2010	15.2	14.3
2011	15.0	14.5
2012	16.1	15.3
2013	16.2	16.5
2014	15.0	14.8
2015	16.2	16.11
2016	16.1	15.9
2017	16.1	15.4
2018	16.4	17.1
2019	15.8	16.6
2020	16.4	16.7
2021	16.4	16.5
2022	17.1	16.6
2023	14.9	14.8
2024	13.7	13.9

Using ANSI/HPS N13.37-2014 as guidance, a determination of facility related dose was performed using quarterly TLD data from control and indicator locations from 2014 through 2023. A Quarterly Baseline Background Dose (B_Q) was computed for each TLD location. Then a Quarterly Minimum Differential Dose (MDD_Q) was calculated as 3 times the 90th percentile of the standard deviations of the historical quarterly results. The result of this calculation was 5.2 mrem. Due to changing TLD vendors starting in January 2023, transit and storage doses needed to be considered and the quarterly results reported by the vendor were corrected for the extraneous dose.

2024 results at all locations, both indicator and control, were lower than the sum of the Baseline Background Dose (B_Q) and the Quarterly Minimum Differential Dose (MDD_Q) which according to ANSI/HPS 13.37-2014 indicates no detection (ND) and which supports the conclusion that there is no plant effect.

Monitoring Location	Quarterly Baseline B_Q(mrem)	Normalized Quarterly Monitoring Data M_Q (mrem per standard quarter)				Quarterly Facility Dose $F_Q = M_Q - [B_Q+MDD_Q]$(mrem)			
		1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Indicators									
K-1f	14.5	12.9	14.0	10.8	8.9	ND	ND	ND	ND
K-3	16.7	13.2	14.7	15.1	10.1	ND	ND	ND	ND
K-5	15.6	14.0	13.7	18.1	10.1	ND	ND	ND	ND
K-8	16.0	14.2	13.7	14.5	10.4	ND	ND	ND	ND
K-17	17.0	15.8	16.0	16.1	10.4	ND	ND	ND	ND
K-25	17.9	15.3	16.0	17.8	11.0	ND	ND	ND	ND
K-27	16.4	16.0	16.7	15.1	9.8	ND	ND	ND	ND
K-30	15.7	13.4	13.3	15.1	9.8	ND	ND	ND	ND
K-39	16.9	15.2	15.0	17.8	12.8	ND	ND	ND	ND
K-43	14.6	13.5	13.3	15.1	9.2	ND	ND	ND	ND
Control									
K-2	16.6	14.5	15.0	15.8	10.4	ND	ND	ND	ND

Table assumes 1 roentgen = 1 rem.

Airborne Particulates

The annual gross beta concentration in air particulates averaged 0.019 pCi/m^3 at the indicator locations and 0.020 pCi/m^3 at the control location, similar to the means observed from 2002 (and prior to) through 2023. There is no indication of a plant effect, the average readings were evenly distributed between indicator and control locations. Results are tabulated below.

Year	Average (Indicators)	Average (Controls)
	Concentration (pCi/m^3)	
2002	0.023	0.023
2003	0.022	0.022
2004	0.019	0.020
2005	0.023	0.023
2006	0.021	0.021
2007	0.022	0.021
2008	0.022	0.022
2009	0.023	0.023
2010	0.023	0.022
2011	0.029	0.029
2012	0.029	0.030
2013	0.024	0.025
2014	0.019	0.019
2015	0.022	0.022
2016	0.021	0.020
2017	0.021	0.021
2018	0.023	0.024
2019	0.021	0.019
2020	0.023	0.023
2021	0.025	0.023
2022	0.025	0.023
2023	0.020	0.020
2024	0.019	0.020

Average annual gross beta concentrations in airborne particulates.

Variation in the gross beta activity throughout the year is not unusual. Typically, higher beta averages occur during the months of January and December, and the first and fourth quarters, as noted in data from 2002 through 2023.

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, produced continuously in the upper atmosphere by cosmic radiation, was detected in all samples, with an average activity of 0.172 pCi/m^3 at the indicator locations and an average of 0.155 pCi/m^3 at the control location. All other gamma-emitting isotopes were below their respective MDC levels.

3.2.3 The Terrestrial Environment

Well Water

One of twelve indicator samples tested positive for gross alpha at a reading of 2.5 pCi/L. Detectable gross beta activity was measured in eight of twelve indicator samples at average level of 3.7 pCi/L. None of the four control samples tested were positive for gross beta. Potassium-40, as measured by gamma spectroscopy, was not detected in any of the 16 samples tested. The positive gross beta is likely due to the presence of potassium-40 at a level below what gamma spectroscopy is able to detect. Past analysis for potassium by mass spectrometry has confirmed the presence of potassium in water samples obtained from these wells and potassium-40 is present in all naturally occurring potassium in the environment. Therefore, positive results can be attributed to agricultural runoff. The gross alpha activities are most likely contributions from naturally-occurring daughters of radium and thorium when detected in the well water.

No strontium-90 was detected in any of the four samples tested. All concentrations measured below an MDC value 3.4 pCi/L.

Sixteen well water samples were tested for tritium and gamma emitting isotopes. All tritium concentrations measured below a detection level of 199 pCi/L. Gamma-emitting isotopes measured below respective MDC levels.

Broad Leaf Vegetation

Three samples of broad leaf vegetation were analyzed for gamma emitters. Only naturally occurring potassium-40 and beryllium-7 were detected.

Cattle Feed

In the ten cattle feed samples analyzed in 2024 the gross beta average concentrations of 7.87 pCi/g wet indicator and 7.74 pCi/g wet control were detected which agrees well with the potassium-40 average concentration results of 7.55 pCi/g wet indicator and 6.77 pCi/g wet control. Strontium-90 was detected in two of the six indicator samples at an average level of 0.014 pCi/g wet and at all four of the control samples at an average level 0.015 pCi/g wet. Trace levels of strontium-90 in the environment can be attributed to nuclear testing and accidents. These results are also comparable to historical results for analysis of cattle feed. No plant effect is indicated.

Grass

Eighteen grass samples were collected in June, August and October at six indicator locations and two control locations for a total of twenty-four samples for the year. The samples were analyzed for gross beta, strontium-90 and gamma emitting isotopes. Analysis results show very good agreement between the gross beta results and the potassium-40 results. Naturally occurring beryllium-7 was also detected in a majority of the samples. Strontium-90 was detected in three of the eighteen samples tested in 2024 at an average level of 0.009 pCi/g wet. Trace levels of strontium-90 in the environment can be attributed to nuclear testing and accidents.

With the exception of the naturally-occurring beryllium and potassium, all gamma-emitting isotopes were below MDC levels. These results are comparable to historical results for analysis of grass. No plant effect is indicated.

Soil

Gross alpha was detected in three indicator samples collected in May of 2024 at an average concentration of 3.74 pCi/g dry and was also detected in two control samples collected in May of 2024 at an average concentration of 5.29 pCi/g dry. Mean gross beta levels measured at indicator and control locations averaged 29.7 and 28.7 pCi/g dry, respectively, primarily due to potassium-40 activity. Strontium-90 was not detected in any of the soil samples tested in 2024.

Cesium-137 was detected in one of the indicator location samples tested at a concentration of 0.07 pCi/g dry and one of the control location samples at a concentration of 0.11 pCi/g dry. Trace levels of Cs-137 in the environment can be attributed to nuclear testing and accidents. Potassium-40 was detected in all samples and averaged 18.7 and 16.0 pCi/g dry for indicator and control locations, respectively. All other gamma-emitting isotopes were below respective MDC levels. The levels of detected activities are comparable to those observed from 1990 through 2023. The data suggests no evidence of a plant effect.

3.2.4 The Aquatic Environment

Surface Water

Average gross beta activity in surface water measured slightly higher at the indicator locations (5.4 pCi/L) than at the control locations (2.7 pCi/L). A similar pattern of activity has been observed since 1978. The highest gross beta activity measured in 2024 was sampled from location K-1b at 9.1 pCi/L which is most likely due potassium-40 present in agricultural runoff.

Year	Average (Indicators)	Average (Controls)
	Gross Beta (pCi/L)	
2002	5.7	2.2
2003	7.3	2.4
2004	6.2	2.3
2005	5.2	1.7
2006	5.5	1.8
2007	5.7	1.8
2008	4.7	1.5
2009	4.7	1.5
2010	4.7	1.4
2011	5.0	1.5
2012	6.1	1.4
2013	5.7	1.5
2014	4.4	1.9
2015	4.2	1.4
2016	5.2	1.6
2017	4.2	1.4
2018	2.8	1.1
2019	3.1	1.2
2020	3.3	0.9
2021	2.2	1.1
2022	5.0	1.6
2023	5.3	2.9
2024	5.4	2.7

Average annual gross beta concentrations in surface water.

These results are comparable with what has been observed in the past.

Tritium was below an MDC of 196 pCi/L in all twenty samples tested in 2024. No Sr-90 was detected above an MDC of 5.5 pCi/L in any of the twenty samples tested in 2024.

Gamma-emitting isotopes measured below their respective MDC levels in all samples tested.

Fish

In the fish sample, the gross beta concentration was 5.65 pCi/g wet in flesh and 3.58 pCi/g wet in bone fractions. In flesh, the gross beta concentration was primarily due to the potassium-40 concentration of 4.47 pCi/g wet. Sr-90 was not detected in the bone fraction above an MDC of 0.03 pCi/g wet.

Excluding potassium-40, gamma-emitting isotopes measured below their respective MDC levels.

Shoreline Sediments

In shoreline sediment samples, the mean gross beta concentrations measured an average 9.59 pCi/g dry at the indicator locations versus an average of 9.95 pCi/g dry at the control location. These results are consistent with the average levels of potassium-40 measured in these samples (6.15 pCi/g dry and 8.14 pCi/g dry respectively).

Other gamma-emitting isotopes, with the exception of naturally-occurring potassium-40, were below their respective MDC levels.

Strontium-90 was measured below an MDC of 0.066 pCi/g dry for all locations.

These results support the conclusion that there is no plant effect.

3.3 LAND USE CENSUS

The Land Use Census satisfies the requirements of the KPS Radiological Environmental Monitoring Manual. Section 2.2.2 states:

"A land use census shall be conducted and shall identify within a distance of 8 km (5 mi.) the location, in each of the 10 meteorological sectors, of the nearest residence and the nearest garden of greater than $50 m^2$ ($500 ft^2$) producing broad leaf vegetation." (Figure 4-1)

The 2024 Land Use Census was completed late on January 28 and 29, 2025 due to the unexpected/unplanned retirement of the individual assigned to complete the census in 2024. The census is typically performed annually during the growing season per Radiation Protection Procedure RP-KW-001-014 (CR# 2025-0184).

No discernable changes were observed during the course of the Land Use Census. A summary of the Land Use Census is shown in table 4.6.

3.4 LABORATORY PROCEDURES

Analytical procedures and the quality assurance manual used by Teledyne Brown Engineering Environmental Service (TBE-ES) Laboratory are available for inspection, and the QA Program includes participation in Interlaboratory Comparison Programs. Results obtained for the TBE-ES Laboratory are presented in Appendix A.

4.0 FIGURES AND TABLES

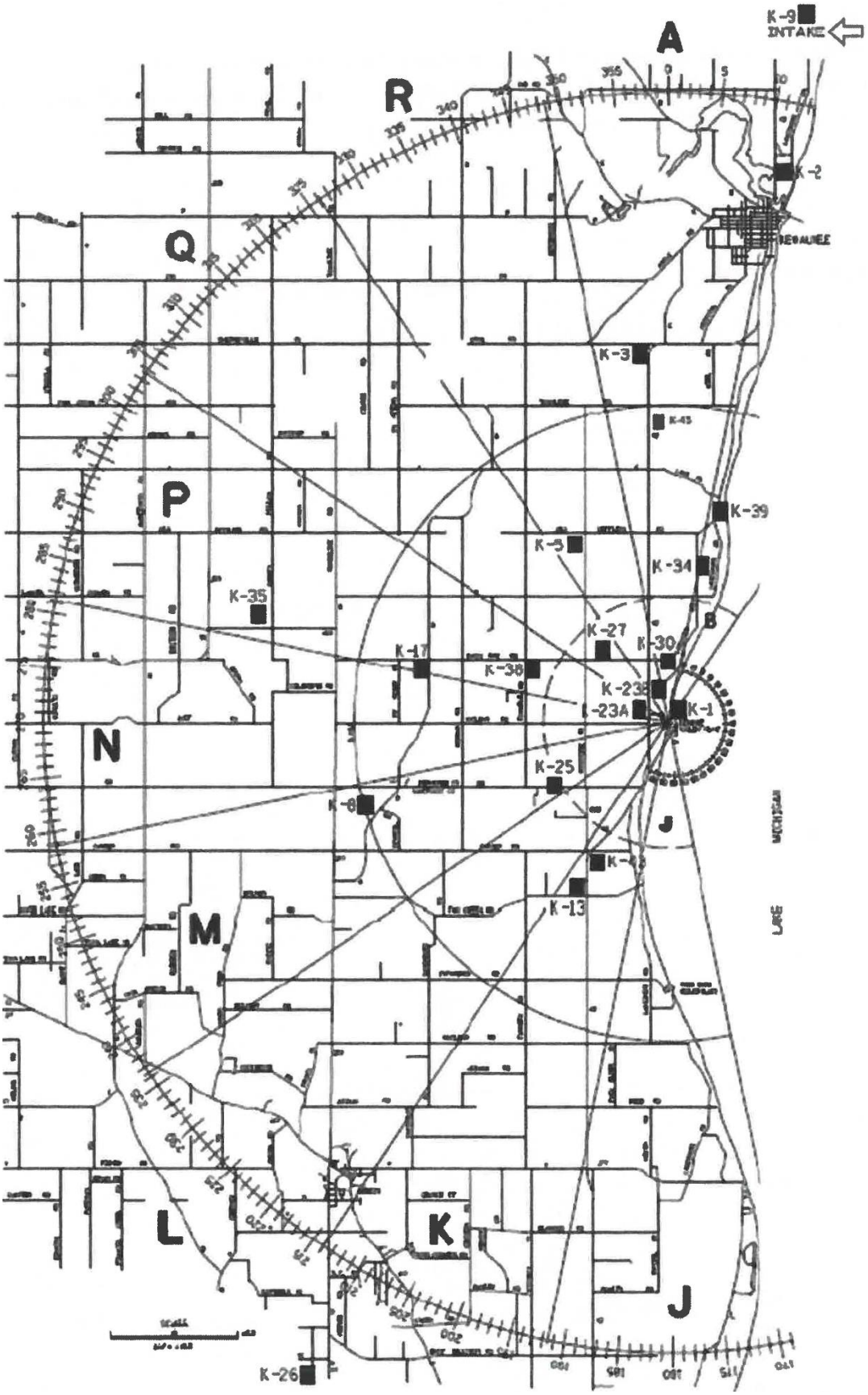

Figure 4-1. Sampling locations, Kewaunee Power Station.

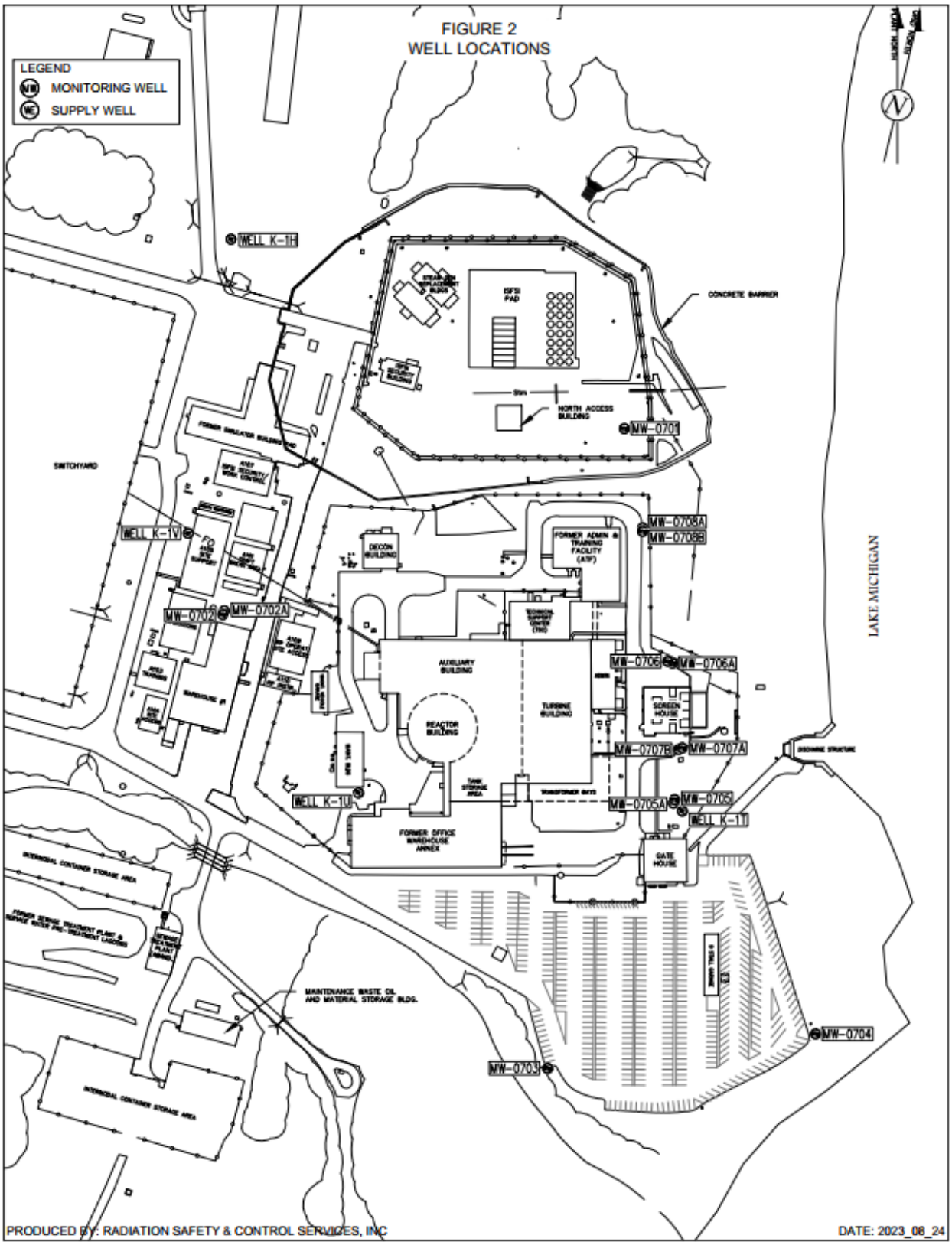

Figure 4-2. Groundwater Monitoring Wells, Kewaunee Power Station.

Table 4.1. Sampling locations, Kewaunee Power Station.

Code	Type [a]	Distance (miles)[b] and Sector	Location
K-1	I		Onsite
K-1b	I	0.12 N	Middle Creek
K-1c	I	0.10 N	500' north of condenser discharge
K-1d	I	0.10 E	Condenser discharge
K-1e	I	0.12 S	South Creek
K-1f	I	0.12 S	Maintenance Waste Oil and Material Storage Building
K-1h	I	0.12 NW	North Well
K-1j	I	0.10 S	500' south of condenser discharge
K-1m	I	0.15 N	ISFSI East
K-1o	I	0.16 N	ISFSI North
K-1q	I	0.16 N	ISFSI West
K-1r	I	0.13 N	ISFSI West
K-1u	I	0.05 SSW	Maintenance Building
K-1v	I	0.06 W	South Well
K-2	C	8.91 NNE	WPS Operations Building in Kewaunee
K-3[c]	I/C	5.9 N	Lyle and John Siegmund Farm, N2815 Hwy 42, Kewaunee
K-5	I	3.2 NNW	Ed Paplham Farm, E4160 Old Settlers Rd, Kewaunee
K-8	I	4.85 WSW	St. Isadore the Farmer Church, 18424 Tisch Mills Rd, Tisch Mills
K-9	C	11.5 NNE	Green Bay Municipal Pumping Station, six miles east of Green Bay (sample source is Lake Michigan from Rostok Intake two miles north of Kewaunee.
K-13	C	3.0 SSW	Rand's General Store, Two Creeks
K-17	I	4.0 W	Klimesh's' Farm, N885 Tk B, Kewaunee
K-23a	I	0.5 W	0.5 miles west of plant, Kewaunee site
K-23b	I	0.6 N	0.6 miles north of plant, Kewaunee site
K-25	I	1.9 SW	Wotachek Farm, 3968 E. Cty Tk BB, Two Rivers
K-26	C	9.1 SSW	Wilfert Farms Vegetable Stand (9.1 miles south of "BB")
K-27	I	1.53 NW	Schleis Farm, E4298 Sandy Bay Rd, Kewaunee
K-30	I	0.8 N	End of site boundary
K-34	I	2.7 N	Leon and Vicky Struck, N1549 Lakeshore Dr., Kewaunee
K-35	C	6.71 WNW	Duane Ducat, N1215 Sleepy Hollow Rd., Kewaunee
K-38	I	2.45 WNW	Dave Sinkula Farm, N890 Town Hall Road, Kewaunee
K-39	I	3.46 N	Francis Wojta, N1859 Lakeshore Dr., Kewaunee
K-43	I	2.71 SSW	Gary Maigatter Property, 17333 Hwy 42, Two Rivers
K-45	I	5.1 N	Wakker's Dairy, N2348 Highway 42, Kewaunee

[a] I = indicator; C = control

[b] Distances are measured from reactor stack.

[c] Location K-3 is an indicator for ambient radiation and a control for soil, cattle feed, and grass.

Table 4.2. Type and frequency of collection.

Location	Weekly	Quarterly	Semiannually	Annually
K-1b		SW GR [a]		
K-1c			SS [b]	
K-1d		SW		FI[c]
K-1e		SW		
K-1f	AP [g]	GR [a] TLD	SO	
K-1h		WW		
K-1j			SS [b]	
K-1m		TLD		
K-1o		TLD		
K-1q		TLD		
K-1r		TLD		
K-1u		WW[h]		
K-1v		WW[h]		
K-2	AP [g]	TLD		
K-3		GR [a] TLD	SO	CF [d]
K-5		GR [a] TLD		
K-8	AP [g]	TLD		
K-9		SW [f]	SS [b]	
K-13		WW		
K-17		TLD		
K-23a				BLV [e]
K-23b				BLV [e]
K-25		TLD		
K-26				BLV [e]
K-27		TLD		
K-30		TLD		
K-34		GR [a]	SO	CF [d]
K-35		GR [a]	SO	CF [d]
K-38		GR [a]	SO	CF [d]
K-39		GR [a] TLD		
K-43	AP [g]	TLD		
K-45				CF [d]

[a] Three times a year, second, third, and fourth quarters.
[b] Collected in May and November.
[c] Collected in the third quarter.
[d] First quarter (January, February or March) only.
[e] Alternate, since milk sampling is no longer performed.
[f] Two samples, raw and treated.
[g] Frequency may be increased dependent on the dust loading.
[h] Well water shall be taken when this source is tapped for drinking purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination..

Table 4.3. Sample Codes:

Code	Description
AP	Airborne particulates
BLV	Broad leaf vegetation
CF	Cattle feed
FI	Fish
GR	Grass
SO	Soil
SW	Surface water
SS	Shoreline sediment
TLD	Thermoluminescent dosimeter
WW	Well water

Table 4.4. Sampling Summary, January – December, 2024.

Sample Type	Collection Type and Frequency [a]	Number of Locations	Number of Samples Collected	Number of Samples Missed
Air Environment				
TLD's	C/Q	15	60	0
Airborne particulates	C/W	4	203	5
Terrestrial Environment				
Well water	G/Q	4	16	0
Broad Leaf Vegetation	G/A	3	3	0
Cattle Feed	G/A	5	10	0
Grass	G/TA	8	24	0
Soil	G/SA	5	10	0
Aquatic Environment				
Surface water	G/Q	4	20	0
Fish	G/A	1	1	0
Shoreline sediments	G/SA	3	6	0

[a] Type of collection is coded as follows: C = continuous; G = grab.
Frequency is coded as follows: W = weekly; BW = bi-weekly; SM = semimonthly; M = monthly; Q = quarterly; SA = semiannually; TA = three times per year; A = annually.

Table 4.5 Environmental Radiation Monitoring Program Summary.

Name of Facility: Kewaunee Power Station — Docket No.: 50-305
Location of Facility: Kewaunee County, Wisconsin (County, State) — Reporting Period: January-December, 2024

Sample Type (Units)	Type and Number of Analyses[a]	MDC[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
TLDs (Quarterly) (mR/91days)	Gamma 44	5.2[f]	13.7 (40/40) (8.9-18.1)	K-39,Wojta Property 3.46 N	15.2 (4/4) (12.8-17.8)	13.9 (4/4) (10.4-15.8)	0
TLDs, Quarterly (Protected Area) (mR/91days)	Gamma 16	5.2[f]	49.8 (16/16) (9.5-92.4)	K-1m, ISFSI E 0.15 N	86.8 (4/4) (84.6 -92.4)	None	0
Airborne Particulates (pCi/m^3)	GB 203	0.010	0.019 (153/153) (0.006-0.050)	K-1f, Maintenance Storage Building, 0.12 S	0.019 (51/51) (0.006-0.051)	0.020 (50/50) (0.006-0.051)	0
	GS 16						
	Be-7	0.020	0.172 (12/12) (0.089-0.301)	K-8,St. Isadore the Farmer Church 4.85 WSW	0.183 (4/4) (0.122-0.301)	0.155 (4/4) (0.122-0.193)	0
	Nb-95	0.0144	< MDC	-	-	< MDC	0
	Zr-95	0.0192	< MDC	-	-	< MDC	0
	Ru-103	0.0312	< MDC	-	-	< MDC	0
	Ru-106	0.0340	< MDC	-	-	< MDC	0
	Cs-134	0.0039	< MDC	-	-	< MDC	0
	Cs-137	0.0033	< MDC	-	-	< MDC	0
	Ce-141	0.0582	< MDC	-	-	< MDC	0
	Ce-144	0.0160	< MDC	-	-	< MDC	0

Table 4.5 Environmental Radiation Monitoring Program Summary.

Name of Facility: Kewaunee Power Station — Docket No. 50-305
Location of Facility: Kewaunee County, Wisconsin (County, State) — Reporting Period January-December, 2024

Sample Type (Units)	Type and Number of Analyses[a]	MDC[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Well Water (pCi/L)	GA 12	3.9	2.5 (1/12)	K-1u, Maint. Bldg., 0.05 mi, SSW	2.5 (1/4)	None	0
	GB 16	3.8	3.7 (8/12) (2.8-5.0)	K-1h, North Well, 0.12 mi, NW	4.3 (4/4) (3.6-5.0)	< MDC	0
	H-3 16	199	< MDC	-	-	< MDC	0
	K-40 16	143	< MDC	-	-	-	0
	Sr-90 4	3.4	< MDC	-	-	None	0
	GS 16						
	Mn-54	9.6	< MDC	-	-	< MDC	0
	Fe-59	20.9	< MDC	-	-	< MDC	0
	Co-58	15.5	< MDC	-	-	< MDC	0
	Co-60	9.8	< MDC	-	-	< MDC	0
	Zn-65	18.1	< MDC	-	-	< MDC	0
	Zr-Nb-95	13.8	< MDC	-	-	< MDC	0
	Cs-134	9.1	< MDC	-	-	< MDC	0
	Cs-137	8.8	< MDC	-	-	< MDC	0
	Ba-La-140	24.1	< MDC	-	-	< MDC	0
Broad leaf Vegetation (pCi/gwet)	GS 3						
	Be-7	0.35	1.34 (1/2)	K-23a 0.5 mi W. of Plant	2.50 (1/1)	< MDC	0
	K-40	0.50	3.82 (2/2) (3.03-4.60)	K-23b 0.6 mi N. of Plant	4.60 (1/1)	1.35 (1/1)	0
	Nb-95	0.047	< MDC	-	-	< MDC	0
	Zr-95	0.073	< MDC	-	-	< MDC	0
	Ru-103	0.044	< MDC	-	-	< MDC	0
	Ru-106	0.368	< MDC	-	-	< MDC	0
	Cs-134	0.047	< MDC	-	-	< MDC	0
	Cs-137	0.045	< MDC	-	-	< MDC	0
	Ce-141	0.055	< MDC	-	-	< MDC	0
	Ce-144	0.213	< MDC	-	-	< MDC	0
Cattle feed (pCi/gwet)	GB 10	0.008	7.87(6/6) (2.35-21.30)	K-38, Sinkula Farm 2.45mi. WNW	11.38 (2/2) (2.35-21.30)	7.74 (4/4) (3.18-11.80)	0
	Sr-90 10	0.006	0.014 (2/6) (0.009-0.010)	K-38, Sinkula Farm 2.45 mi. .WNW	0.021 (1/2)	0.015 (4/4) (0.003-0.017)	0
	GS 10						
	Be-7	0.480	0.73 (2/6) (0.44-1.02)	K-45, Wakker's Dairy 5.1 mi. N	1.02 (1/2)	2.04 (1/2)	0
	K-40	0.50	7.55 (6/6) (2.27-13.10)	K-38, Sinkula Farm 2.45 mi. WNW	9.21 (2/2) (3.31-15.10)	6.77 (4/4) (2.27-7.63)	0
	Nb-95	0.089	< MDC	-	-	< MDC	0
	Zr-95	0.078	< MDC	-	-	< MDC	0
	Ru-103	0.048	< MDC	-	-	< MDC	0
	Ru-106	0.476	< MDC	-	-	< MDC	0
	Cs-134	0.052	< MDC	-	-	< MDC	0
	Cs-137	0.048	< MDC	-	-	< MDC	0
	Ce-141	0.681	< MDC	-	-	< MDC	0
	Ce-144	0.281	< MDC	-	-	< MDC	0

Table 4.5 Environmental Radiation Monitoring Program Summary.

Name of Facility: Kewaunee Power Station — Docket No. 50-305
Location of Facility: Kewaunee County, Wisconsin (County, State) — Reporting Period: January-December, 2024

Sample Type (Units)	Type and Number of Analyses[a]	MDC[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Grass (pCi/gwet)	GB 24	0.10	9.05 (18/18) (6.69-14.20)	K-38, Sinkula Farm 2.4 mi WNW	10.1 (3/3) (6.7-12.5)	10.2 (6/6) (7.12 -15.7)	0
	Sr-90 24	0.005	0.009 (3/18)	K-34, Struck Farm, 2.7 mi. N	(0.013) (1/3)	< MDC	0
	GS 24						
	Be-7	0.47	4.44 (16/18) (1.93-4.15)	K-1b, Middle Creek 0.12 mi N	3.59 (2/3) (3.02-4.15)	0.63 (6/6) (1.01-1.80)	0
	K-40	0.50	6.06 (18/18) (4.44-10.4)	K-38, Sinkula Farm 2.45 mi. WNW	7.33 (3/3) (5.02-10.4)	6.96 (6/6) (5.47-11.4)	0
	Mn-54	0.061	< MDC	-	-	< MDC	0
	Co-58	0.047	< MDC	-	-	< MDC	0
	Co-60	0.059	< MDC	-	-	< MDC	0
	Nb-95	0.053	< MDC	-	-	< MDC	0
	Zr-95	0.091	< MDC	-	-	< MDC	0
	Ru-103	0.058	< MDC	-	-	< MDC	0
	Ru-106	0.478	< MDC	-	-	< MDC	0
	Cs-134	0.078	< MDC	-	-	< MDC	0
	Cs-137	0.054	< MDC	-	-	< MDC	0
	Ce-141	0.078	< MDC	-	-	< MDC	0
	Ce-144	0.335	< MDC	-	-	< MDC	0
Soil (pCi/gdry)	GA 10	3.8	3.74 (3/6) (3.06-4.57)	K-3, Sigmund Farm 5.9 mi N	5.68 (1/2)	5.29 (2/4) (4.89-5.68)	0
	GB 10	2.0	29.67 (6/6) (24.40-33.70)	K-3, Sigmund Farm 5.9 mi. N	33.2 (2/2) (31.8-34.5)	28.7 (4/4) (21.5-34.5)	0
	Sr-90 10	0.066	< MDC	-	-	< MDC	0
	GS 10						
	Be-7	0.85	< MDC	-	-	< MDC	0
	K-40	1.4	18.7 (6/6) (17.1-20.6)	K-34, Struck Farm 2.7 mi N	19.2 (2/2) (17.9-20.4)	16.0 (4/4) (8.8-21.6)	0
	Nb-95	0.126	< MDC	-	-	< MDC	0
	Zr-95	0.182	< MDC	-	-	< MDC	0
	Ru-103	0.085	< MDC	-	-	< MDC	0
	Ru-106	0.869	< MDC	-	-	< MDC	0
	Cs-134	0.115	< MDC	-	-	< MDC	0
	Cs-137	0.136	0.07 (1/6)	K-35,Ducat Residence 6.71 mi WNW	0.11 (1/2)	0.11 (1/4)	0
	Ce-141	0.137	< MDC	-	-	< MDC	0
	Ce-144	0.546	< MDC	-	-	< MDC	0

Table 4.5 Environmental Radiation Monitoring Program Summary.

Name of Facility: Kewaunee Power Station — Docket No.: 50-305
Location of Facility: Kewaunee County, Wisconsin (County, State) — Reporting Period: January-December, 2024

Sample Type (Units)	Type and Number of Analyses[a]	MDC[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Surface Water	GB (TR) 20	3.5	5.4 (11/12) (2.7 - 9.1)	K-1b, Middle Creek 0.12 mi. N	6.8 (4/4) (3.8-9.1)	2.7 (2/8) (2.4-2.9)	0
(pCi/L)	GS 20						
	K-40 20	144	< MDC	-	-	< MDC	0
	Mn-54	8.9	< MDC	-	-	< MDC	0
	Fe-59	18.5	< MDC	-	-	< MDC	0
	Co-58	7.7	< MDC	-	-	< MDC	0
	Co-60	9.8	< MDC	-	-	< MDC	0
	Zn-65	16.5	< MDC	-	-	< MDC	0
	Zr-Nb-95	8.8	< MDC	-	-	< MDC	0
	Cs-134	9.8	< MDC	-	-	< MDC	0
	Cs-137	8.2	< MDC	-	-	< MDC	0
	Ba-La-140	18.2	< MDC	-	-	< MDC	0
	H-3 20	196	< MDC	-	-	< MDC	0
	Sr-90 20	5.5	< MDC	-	-	< MDC	0
Fish (Flesh) (pCi/gwet)	GB 1	0.5	5.65 (1/1)	K-1d, Cond. Discharge 0.10 mi. E	5.65 (1/1)	None	0
	GS 1						
	K-40	0.5	4.47 (1/1)	K-1d, Cond. Discharge 0.10 mi. E	4.47 (1/1)	None	0
	Mn-54	0.057	< MDC	-	-	None	0
	Fe-59	0.157	< MDC	-	-	None	0
	Co-58	0.121	< MDC	-	-	None	0
	Co-60	0.067	< MDC	-	-	None	0
	Cs-134	0.049	< MDC	-	-	None	0
	Cs-137	0.046	< MDC	-	-	None	0
Fish (Bones) (pCi/gwet)	GB 1	0.5	3.58 (1/1)	K-1d, Cond. Discharge 0.10 mi. E	3.58 (1/1)	None	0
	Sr-90 1	0.03	< MDC	-	-	None	0

Table 4.5 Environmental Radiation Monitoring Program Summary.

Name of Facility: Kewaunee Power Station — Docket No. 50-305
Location of Facility: Kewaunee County, Wisconsin (County, State) — Reporting Period: January-December, 2024

Sample Type (Units)	Type and Number of Analyses[a]	MDC[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Shoreline Sediments (pCi/g)	GB 6	1.0	9.59(4/4) (8.07-12.8)	K-9, Rostok Intake 11.5 mi. NNE	9.95 (2/2) (9.80-10.1)	9.95 (2/2) (9.80-10.1)	0
	Sr-90 6	0.066	< MDC	-	-	< MDC	0
	GS 6						
	K-40	0.5	6.15 (4/4) (4.70–7.35)	K-9, Rostok Intake 11.5 mi. NNE	8.14 (2/2) (7.91–8.37)	8.14 (2/2) (7.91–8.37)	0
	Co-58	0.069	< MDC	-	-	< MDC	0
	Co-60	0.107	< MDC	-	-	< MDC	0
	Cs-134	0.067	< MDC	-	-	< MDC	0
	Cs-137	0.067	< MDC	-	-	< MDC	0

[a] GA = gross alpha, GB = gross beta, GS = gamma spectroscopy, TR = total residue.

[b] MDC = Minimum Detectable Concentration based on a 4.66 sigma counting error for background sample.

[c] Mean and range are based on detectable measurements only (i.e., >MDC) Fraction of detectable measurements at specified locations is indicated in parentheses (F).

[d] Locations are specified by station code (Table 4.1) and distance (miles) and direction relative to reactor site.

[e] Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

[f] For TLD's this value is the Quarterly Minimum Differential Dose(MDD_Q). See page 8 of this report for the details of how it is computed.

Table 4.6 Land Use Census

The following table lists an inventory of residence gardens ≥ 500 ft^2 found nearest the plant in each of the 10 meteorological sectors within a five mile radius of the Kewaunee Power Station. (Figure 4-1)

Sector	Township No.	Residence	Garden	Distance From Plant (miles)	Location ID
A	24	X		1.12	
A	12		X	3.71	
B	24	X	(Note 1)	1.01	
R	26	X		0.96	
R	23		X	2.16	
Q	23	X		1.27	
Q	23		X	1.53	K-27
P	26	X		1.35	
P	26		X	1.41	
N	35	X		0.94	
N	28		X	2.37	
M	35	X	(Note 2)	1.38	
L	35	X		1.00	
L	2		X	2.04	
K	36	X	(Note 3)	0.91	
J	11	X	(Note 4)	2.72	

Note 1. There were no gardens located in Sector B within five miles of the Kewaunee Power Station.
Note 2. There were no gardens located in Sector M within five miles of the Kewaunee Power Station.
Note 3. There were no gardens located in Sector K within five miles of the Kewaunee Power Station.
Note 4. There were no gardens located in Sector J within five miles of the Kewaunee Power Station.

5.0 REFERENCES

Arnold. J. R. and H. A. Al-Salih. 1955. Beryllium-7 Produced by Cosmic Rays. Science 121: 451-453.

Eisenbud, M. 1963. Environmental Radioactivity, McGraw-Hill, New York, New York, pp. 213, 275, and 276.

Gold, S., H. W. Barkhau, B. Shlein, and B. Kahn, 1964 Measurement of Naturally Occurring Radionuclides in Air, in the Natural Radiation Environment, University of Chicago Press, Chicago, Illinois, 369-382.

Microbac Laboratories, Northbrook

_____2023 Annual Report. Radiological Monitoring Program for the Kewaunee Power Station, Kewaunee, Wisconsin, Final Report, Part II, Data Tabulations and Analysis, January - December 2023.

ATI Environmental, Inc., Midwest Laboratory.

_____2001 to 2022. Annual Report. Radiological Monitoring Program for the Kewaunee Power Station, Kewaunee, Wisconsin, Final Report, Part II, Data Tabulations and Analysis, January - December 2000 – 2022.

_____1984 to 2000. (formerly Teledyne Brown Engineering Environmental Services, Midwest Laboratory) Annual Reports. Radiological Monitoring Program for the Kewaunee Power Station, Kewaunee, Wisconsin, Final Report, Part II, Data Tabulations and Analysis, January - December 1983 through January - December 1999.

_____1979 to 1983. (formerly Hazleton Environmental Sciences Corporation) Annual Reports. Radiological Monitoring for the Kewaunee Power Station, Kewaunee, Wisconsin, Final Report - Part II, Data Tabulations and Analysis, January - December, 1978 through 1982.

_____1977 to 1978. (formerly NALCO Environmental Sciences Corporation) Annual Reports. Radiological Monitoring for the Kewaunee Power Station, Kewaunee, Wisconsin, Final Report - Part II, Data Tabulations and Analysis, January - December, 1976 to 1977.

Industrial BIO-TEST Laboratories, Inc. 1974. Annual Report. Pre-operational Radiological Monitoring Program for the Kewaunee Power Station. Kewaunee, Wisconsin. January - December 1973.

Industrial BIO-TEST Laboratories, Inc. 1975. Semi-annual Report. Radiological Monitoring Program for the Kewaunee Power Station, Kewaunee, Wisconsin. Jan. - June, 1975.

Kewaunee Power Station. 2023. Radiological Environmental Monitoring Manual (REMM). Revision 25, 12 October 2023

National Center for Radiological Health. 1968. Section 1. Milk Surveillance. Radiological Health Data Rep., December 9: 730-746.

National Council on Radiation Protection and Measurements. 1975. Natural Radiation Background in the United States. NCRP Report No. 45.

Solon, L. R., W. M. Lowder, A. Shambron, and H. Blatz. 1960. Investigations of Natural Environmental Radiation. Science. 131: 903-906.

U.S. Environmental Protection Agency, 2007. RadNet, formerly Environmental Radiation Ambient Monitoring System, Gross Beta in Air (WI) 1981 – 2000.

Wilson, D.W., G. M. Ward, and J. E. Johnson, 1969. Environmental Contamination by Radioactive Materials. International Atomic Energy Agency, p. 125.

American National Standards Institute/Health Physics Society (ANSI/HPS) N13.37 - 2014, Environmental Dosimetry – Criteria for System Design and Implementation.

Teledyne Brown Engineering Environmental Services, Quality Assurance Manual, Rev. 37, 31 May 2024.

Appendix A

TBE-ES Interlaboratory Comparison Program Results

Summary of Results – Inter-laboratory Comparison Program (ICP)

The Teledyne Brown Engineering Environmental Services (TBE-ES) laboratory analyzed Performance Evaluation (PE) samples of air particulate (AP), milk, soil, vegetation, and water matrices that represent test and matrix combinations available for REMP programs. The PE samples supplied by Eckert & Ziegler (E&Z) Analytics Inc., Environmental Resource Associates (ERA), and Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

A. E&Z Analytics Evaluation Criteria

Analytics' evaluation report provides a ratio of TBE's result and E&Z Analytics' known value. Since flag values are not assigned by E&Z Analytics, TBE evaluates the reported ratios based on internal QC requirements based on the DOE MAPEP criteria.

1. A = Acceptable - reported result falls within ratio limits of 0.80-1.20
2. W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30
3. N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

B. ERA Evaluation Criteria

ERA's evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the US EPA, National Environmental Laboratory Accreditation Conference (NELAC), state-specific Performance Testing (PT) program requirements or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

1. A = Acceptable - Reported value falls within the Acceptance Limits
2. N = Not Acceptable - Reported value falls outside of the Acceptance Limits

C. DOE Evaluation Criteria

MAPEP's evaluation report provides an acceptance range with associated flag values. MAPEP defines three levels of performance:

1. Acceptable (flag = "A") - result within ± 20% of the reference value
2. Acceptable with Warning (flag = "W") - result falls in the ± 20% to ± 30% of the reference value
3. Not Acceptable (flag = "N") - bias is greater than 30% of the reference value

Note: The Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) samples are created to mimic conditions found at DOE sites which do not always resemble typical environmental samples obtained at commercial nuclear power facilities.

The Inter-Laboratory Comparison Program provides evidence of "in control" counting systems and methods, and that the laboratories are producing accurate and reliable data. For the TBE laboratory, 152 out of 167 analyses performed met the specified acceptance criteria. Fifteen analyses did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. A summary is found below:

A. NCR 24-02: ERA March MRAD-40 study with Air Particulate AM-241 evaluated as “Not Acceptable.” TBE reported 38.8 pCi/filter and the known value returned at 55.0 pCi/filter (range 39.3-73.3). The root cause investigation determined that the sample was not logged into the system correctly and therefore not prepared with the required tracer. To correct and prevent recurrence, personnel involved are to utilize a template to ensure all analyses are logged as required and the QA Manager will perform sample log review as a back up to ensure accuracy. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

B. NCR 24-03: ERA March MRAD-40 air particulate study GR-B evaluated as “Not Acceptable.” TBE reported 42.1 pCi/filter and the known value returned at 22.2 pCi/filter (range 13.5-33.5). The root cause investigation determined that alpha-to-beta crosstalk was more significant than normal which caused the beta activity to report falsely high data. To correct and prevent recurrence, personnel involved are to adjust the alpha-to-beta crosstalk via correction calculation measures when high alpha activities are observed. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

C. NCR 24-05: ERA April RAD-137 water study GR-A evaluated as “Not Acceptable.” TBE reported 35.2 pCi/L and the known value returned at 52.6 pCi/L (range 39.6-65.6). The root cause investigation determined that the provided samples contained a solids content that was significantly higher than the typical client samples tested by the laboratory. A set aliquot volume for prior ERA samples was used and not adjusted to account for the sudden increase in solid content. To correct and prevent recurrence, new sample types were ordered from ERA that used Am-241 to better reflect client sample testing and acceptable results were achieved. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

D. NCR 24-06: E&Z Analytics March E14092 air particulate study Co-60 evaluated as “Not Acceptable.” TBE reported 168 pCi and the known value returned at 126 pCi. Additionally, March E14093 soil Ce-141 evaluated as “Not Acceptable.” TBE reported 0.106pCi/g and the known value returned at 0.071pCi/g. The root cause investigation was unable to determine any anomaly thus no proposed corrective action. No recurrence has occurred.

E. CAR 24-02 (CAR 23-31): MAPEP February 24-MaS50 soil study Fe-55 evaluated as “Not Acceptable.” TBE reported 297 Bq/Kg and the known value returned at 650 Bq/Kg (range 455-845). The root cause investigation suspects that the current analytical procedure is not sufficient to add the interferences added to the sample by MAPEP. This investigation is still ongoing (See NCR 24-16) as the suggested corrective action did not provide desired results.

F. NCR 24-08: MAPEP February 24-MaS50 soil study Ni-63 evaluated as “Not Acceptable.” TBE reported 1070 Bq/Kg and the known value returned at 1530 Bq/Kg (range 1071-1989). The root cause investigation suspected that the sample contained added interferences that are not typically seen in client samples. All QC efforts associated with the sample were acceptable and no anomalies found, even after reanalysis. To correct and prevent recurrence, samples suspected of additional interferences will include the addition of Ni-59 tracer to determine yield results when calculating results. TBE analytical procedure TBE-2013 was updated to include this change.

G. NCR 24-09: MAPEP February 24-MaSU50 urine study Zn-65 evaluated as “Not Acceptable.” The root cause investigation determined that the sample was spiked lower than TBE’s typical detection limit and client requirements. The report was revised by MAPEP indicating “Not Evaluated,” resulting in this nuclide to not be considered a failure.

H. NCR 24-10: MAPEP February 24-MaW50 water study Tc-99 evaluated as “Not Acceptable.” TBE reported 9.95Bq/L and the known value returned 7.47Bq/L (range 5.23-9.71). The root cause investigation suspects Thorium interference that was not removed during the column separation process of the analytical procedure; however, it cannot be confirmed as all QC efforts associated with the sample were acceptable and with no anomalies found. To potentially correct and prevent recurrence, an additional rinse step was added to the procedure. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

I. NCR 24-11: MAPEP February 24-RdV50 vegetation study Sr-90 evaluated as “Not Acceptable.” TBE reported 0.276Bq/sample and the known value returned 0.529Bq/sample (range 0.370-0.688). The root cause investigation determined a laboratory accident resulting in a spilled (loss) of sample. No corrective action was performed as the cause was an unintentional sample spill.

J. NCR 24-14: ERA September MRAD-41 air particulate study U-234/238 evaluated as “Not Acceptable.” TBE reported 14.0/14.2 pCi/filter and the known value returned at 31.1/30.9 pCi/filter (range 23.1-36.9). The root cause investigation determined that the laboratory technician placed double the amount of tracer in the sample by error. To correct and prevent recurrence, samples that have been digested/leached with carrier/tracer added will have a label placed over the cap indicating it has already been added. Additionally, the beaker that aliquot is put in should have markings to indicate carrier/tracer has already been added to the sample.

K. NCR 24-15: ERA September MRAD-41 water study Fe-55 evaluated as “Not Acceptable.” TBE reported 615 pCi/L and the known value returned at 1230 pCi/L (range 723-1790). The root cause is still under investigation.

L. NCR 24-16: MAPEP August 24-MaS51 soil study Fe-55 evaluated as “Not Acceptable.” TBE did not report a value and the known value returned 780Bq/Kg (range 546-1014). The root cause is still under investigation.

M. NCR 24-17: MAPEP August 24-RdV51 vegetation study Sr-90 evaluated as “Not Acceptable.” TBE reported 0.95Bq/sample and the known value returned 2.39Bq/sample (range 1.67-3.11). The root cause is still under investigation.

A.1 Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
March 2024	E14089	Milk	Sr-89	pCi/L	79.6	78.2	1.02	A
			Sr-90	pCi/L	12.6	11.9	1.06	A
	E14090	Milk	Ce-141	pCi/L	75.6	85.0	0.89	A
			Co-58	pCi/L	-0.069	Not Measured		
			Co-60	pCi/L	139	158	0.88	A
			Cr-51	pCi/L	212	230	0.92	A
			Cs-134	pCi/L	167	198	0.84	A
			Cs-137	pCi/L	158	171	0.93	A
			Fe-59	pCi/L	81.1	86.5	0.94	A
			I-131	pCi/L	80.9	90.8	0.89	A
			Mn-54	pCi/L	173	183	0.95	A
			Zn-65	pCi/L	165	176	0.93	A
	E14091	Charcoal	I-131	pCi	90.1	90.3	1.00	A
	E14092	AP	Ce-141	pCi	68.1	67.5	1.01	A
			Co-58	pCi	1.73	Not Measured		
			Co-60	pCi	168	126	1.34	N(1)
			Cr-51	pCi	182	183	0.99	A
			Cs-134	pCi	157	157	1.00	A
			Cs-137	pCi	132	136.0	0.97	A
			Fe-59	pCi	70.3	68.6	1.02	A
			Mn-54	pCi	144	145	0.99	A
			Zn-65	pCi	125	140	0.89	A
	E14093	Soil	Ce-141	pCi/g	0.106	0.071	1.48	N(1)
			Co-58	pCi/g	-0.005	Not Measured		
			Co-60	pCi/g	0.121	0.133	0.91	A
			Cr-51	pCi/g	0.198	0.194	1.02	A
			Cs-134	pCi/g	0.206	0.166	1.24	W
			Cs-137	pCi/g	0.207	0.209	0.99	A
			Fe-59	pCi/g	0.063	0.073	0.87	A
			Mn-54	pCi/g	0.140	0.153	0.91	A
			Zn-65	pCi/g	0.149	0.148	1.01	A
	E14094	AP	Sr-89	pCi	83.9	90.6	0.93	A
			Sr-90	pCi	11.7	13.8	0.85	A
September 2024	E14095	Milk	Sr-89	pCi/L	88.0	92.3	0.95	A
			Sr-90	pCi/L	12.4	15.2	0.82	A
	E14096	Milk	Ce-141	pCi/L	124	124	1.00	A
			Co-58	pCi/L	154	150	1.03	A
			Co-60	pCi/L	232	236	0.98	A

A.1 Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
			Cr-51	pCi/L	284	274	1.04	A
			Cs-134	pCi/L	180.0	187	0.96	A
			Cs-137	pCi/L	126	127	0.99	A
			Fe-59	pCi/L	127.0	113	1.12	A
			I-131	pCi/L	85.3	89.0	0.96	A
			Mn-54	pCi/L	162	162	1.00	A
			Zn-65	pCi/L	294	275	1.07	A
	E14097	Charcoal	I-131	pCi	98.8	92.6	1.07	A
	E14098	AP	Ce-141	pCi	82.0	76.7	1.07	A
			Co-58	pCi	91.0	92.6	0.98	A
			Co-60	pCi	180	146	1.23	W
			Cr-51	pCi	208	170	1.22	W
			Cs-134	pCi	116	116	1.00	A
			Cs-137	pCi	83.1	78.9	1.05	A
			Fe-59	pCi	75.6	70.2	1.08	A
			Mn-54	pCi	101	100	1.01	A
			Zn-65	pCi	167	170	0.98	A
	E14099	Soil	Ce-141	pCi/g	0.224	0.222	1.01	A
			Co-58	pCi/g	0.249	0.268	0.93	A
			Co-60	pCi/g	0.420	0.423	0.99	A
			Cr-51	pCi/g	0.492	0.492	1.00	A
			Cs-134	pCi/g	0.278	0.336	0.83	A
			Cs-137	pCi/g	0.276	0.295	0.94	A
			Fe-59	pCi/g	0.233	0.204	1.14	A
			Mn-54	pCi/g	0.279	0.290	0.96	A
			Zn-65	pCi/g	0.538	0.494	1.09	A
	E14100	AP	Sr-89	pCi	79.8	82.7	0.96	A
			Sr-90	pCi	12.0	13.6	0.88	A
	E14197	Liquid	Gr-A (Am241)	pCi/L	47.6	50.1	0.95	A
			Gr-B (Cs137)	pCi/L	248	270	0.92	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

A.2 DOE's Mixed Analyte Performance Evaluation Program (MAPEP)
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
February 2024	24-MaS50	Soil	Fe-55	Bq/kg	297	650	455 - 845	N[3]
			Ni-63	Bq/kg	1070	1530	1071 - 1989	N[4]
			Tc-99	Bq/kg	325	336	235 - 437	A
			Th-228	Bq/kg	34.6	48.8	34.2 - 63.4	W
			Th-230	Bq/kg	49.7	54.0	38.0 - 70.0	A
			Th-232	Bq/kg	36.4	45.1	31.6 - 58.6	A
	24-MaSU50	Urine	Cs-134	Bq/L	1.12	1.36	0.95-1.77	A
			Cs-137	Bq/L	2.00	2.23	1.56-2.90	A
			Co-57	Bq/L	1.06	1.26	0.88 - 1.64	A
			Co-60	Bq/L	2.26	2.38	1.67 - 3.09	A
			K-40	Bq/L	-1.80	NR	-	
			Mn-54	Bq/L	1.44	1.51	1.06 - 1.96	A
			U-234	Bq/L	0.00101		*(1)*	A
			U-238	Bq/L	0.00228		*(1)*	A
			Zn-65	Bq/L	-0.42	0.84	0.59-1.09	NE[5]
	24-MaW50	Water	Ni-63	Bq/L	0.338	0.80	*(2)*	A
			Tc-99	Bq/L	9.95	7.47	5.23 - 9.71	N[6]
	24-RdV50	Vegetation	Cs-134	Bq/sample	2.80	3.67	2.57 - 4.77	W
			Cs-137	Bq/sample	2.21	2.57	1.80 - 3.34	A
			Co-57	Bq/sample	2.23	2.53	1.77 - 3.29	A
			Co-60	Bq/sample	2.42	2.96	2.07 - 3.85	A
			Mn-54	Bq/sample	0.033		*(1)*	A
			Sr-90	Bq/sample	0.276	0.529	0.370 - 0.688	N[7]
			Zn-65	Bq/sample	6.83	8.02	5.61 - 10.43	A
August 2024	24-MaS51	Soil	Fe-55	Bq/kg	*(8)*	780	546-1014	N[9]
			Ni-63	Bq/kg	1140.00	1450.00	1015 - 1885	W
			Tc-99	Bq/kg	155.00	171.00	120 - 222	A
			Th-228	Bq/kg	38.00	43.30	30.3 - 56.3	A
			Th-230	Bq/kg	46.10	44.00	30.8 - 57.2	A
			Th-232	Bq/kg	38.90	42.60	29.8 - 55.4	A
	24-MaW51	Water	Ni-63	Bq/L	0.60	-	*(1)*	A
			Tc-99	Bq/L	11.90	11.20	7.8 - 14.6	A
	24-RdV51	Vegetation	Cs-134	Bq/sample	3.12	2.89	2.02 - 3.76	A
			Cs-137	Bq/sample	2.18	1.91	1.34 - 2.48	A
			Co-57	Bq/sample	0.00	-	*(1)*	A
			Co-60	Bq/sample	2.24	2.01	1.41 - 2.61	A
			Mn-54	Bq/sample	3.76	3.53	2.47 - 4.59	A
			Sr-90	Bq/sample	0.95	2.39	1.67 - 3.11	N[10]
			Zn-65	Bq/sample	10.30	9.13	6.39 - 11.87	A

(a) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurement made during standard preparation

(b) DOE/MAPEP evaluation:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

(1) False positive test

(2) Sensitivity evaluation

(3) See **CAR 23-31**

(4) See **NCR 24-08**

(5) Not Evaluated, re-reported as Falst Pos by MAPEP

(6) See **NCR 24-10**

(7) See **NCR 24-11**

A.3 ERA Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
March 2024	MRAD-40	Water	Am-241	pCi/L	101	139	95.4 - 178	A
			Fe-55	pCi/L	2185	2480	1460- 3610	A
			Pu-238	pCi/L	62.0	70.4	42.3 - 91.2	A
			Pu-239	pCi/L	61.2	76.5	47.3 - 94.3	A
		Soil	Am-241	pCi/kg	NR	1880	1020 - 2660	
			Pu-238	pCi/kg	667	512	255 - 778	A
			Pu-239	pCi/kg	562	545	297 - 784	A
			Sr-90	pCi/kg	4050	3630	1130 - 5650	A
			U-234	pCi/kg	3040	4360	2040 - 5710	A
			U-238	pCi/kg	3270	4320	2370 - 5800	A
		AP	Am-241	pCi/filter	38.8	55.0	39.3 - 73.3	N(1)
			Fe-55	pCi/filter	387	386	141 - 616	A
			Pu-238	pCi/filter	45.9	41.1	31.0 - 50.5	A
			Pu-239	pCi/filter	54.9	56.1	41.9 - 67.7	A
			U-234	pCi/filter	11.1	11.6	8.60 - 13.6	A
			U-238	pCi/filter	12.8	11.5	8.68 - 13.7	A
			GR-A	pCi/filter	116	95.9	50.1 - 158	A
			GR-B	pCi/filter	42.1	22.2	13.5 - 33.5	N(2)
April 2024	RAD-137	Water	Ba-133	pCi/L	62.8	65.9	50.1 - 81.7	A
			Cs-134	pCi/L	51.0	57.8	42.8 - 72.8	A
			Cs-137	pCi/L	153	186	149 - 223	A
			Co-60	pCi/L	92.1	98.8	79.7 - 118	A
			Zn-65	pCi/L	208	240	188 - 292	A
			GR-A	pCi/L	35.2	52.6	39.6 - 65.6	N(3)
			GR-B	pCi/L	49	46.5	33.9 - 59.1	A
			U-Nat	pCi/L	56.0	59.3	52.8-65.8	A
			H-3	pCi/L	19,000	21,300	18,200 - 24,400	A
			Sr-89	pCi/L	48.9	52.2	37.8 - 66.6	A
			Sr-90	pCi/L	32.6	37.6	32.0 - 43.2	A
			I-131	pCi/L	21.8	25.1	21.7 - 28.5	A
September 2024	MRAD-41	Water	Am-241	pCi/L	108.0	117.0	80.3-150	A
			Fe-55	pCi/L	615	1230	723-1790	N(4)
			Pu-238	pCi/L	99	103	61.9-133	A
			Pu-239	pCi/L	123	133	82.3-164	A
		Soil	Am-241	pCi/kg	1320	1110	599-1570	A
			Pu-238	pCi/kg	1380	1860	928-2830	A
			Pu-239	pCi/kg	796	1030	561-1480	A
			Sr-90	pCi/kg	3240	4730	1470-7370	A

			U-234	pCi/kg	2540	2860	1340-3750	A
			U-238	pCi/kg	2390	2840	1560-3810	A
		AP	Am-241	pCi/filter	27.0	29.1	20.8-38.8	A
			Fe-55	pCi/filter	644	800	292-1280	A
			Pu-238	pCi/filter	22.3	21.5	16.2-26.4	A
			Pu-239	pCi/filter	30.6	32.4	24.2-39.1	A
			U-234	pCi/filter	14.0	31.1	23.1-36.4	N(5)
			U-238	pCi/filter	14.2	30.9	23.3-36.9	N(5)
			GR-A	pCi/filter	80.0	72.4	37.8-119	A
			GR-B	pCi/filter	57.5	47.9	29.0-72.4	A
October 2024	RAD-139	Water	Ba-133	pCi/L	30.3	27.4	15.5-39.3	A
			Cs-134	pCi/L	73.3	80.2	63.0-97.4	A
			Cs-137	pCi/L	46.6	46.3	23.3-69.3	A
			Co-60	pCi/L	44.2	45.3	31.6-59.0	A
			Zn-65	pCi/L	104	114.0	75.0-153	A
			GR-A	pCi/L	47.6	51.7	38.9-64.5	A
			GR-B	pCi/L	44.2	48.1	35.2-61.0	A
			U-Nat	pCi/L	28.3	26.90	23.6-30.2	A
			H-3	pCi/L	4,690	5,320	3870-6770	A
			Sr-89	pCi/L	57.5	44.2	30.6-57.8	A
			Sr-90	pCi/L	37.3	35.6	30.2-41.0	A
			I-131	pCi/L	28.3	26.3	22.7-29.9	A

(a) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) ERA evaluation:

A = Acceptable - Reported value falls within the Acceptance Limits

N = Not Acceptable - Reported value falls outside of the Acceptance Limits

*(1) See **NCR 24-02***

*(2) See **NCR 24-03***

*(3) See **NCR 24-05***

*(4) See **NCR 24-15***

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

Effluent Concentrations

APPENDIX C

Table C-1. Maximum permissible concentrations of radioactivity in air and water above natural background in unrestricted areas[a].

	Air (pCi/m^3)		Water (pCi/L)
Gross alpha	1×10^{-3}	Strontium-89	8,000
Gross beta	1	Strontium-90	500
Iodine-131[b]	2.8×10^{-1}	Cesium-137	1,000
		Barium-140	8,000
		Iodine-131	1,000
		Potassium-40 [c]	4,000
		Gross alpha	2
		Gross beta	10
		Tritium	1×10^6

[a] Taken from Table 2 of Appendix B to Code of Federal Regulations Title 10, Part 20, and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

[b] Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

[c] A natural radionuclide.

KEWAUNEE SOLUTIONS

2024 Annual Radiological Environmental Operating Report

Kewaunee Power Station

Part II, Data Tabulations, Graphs and Analyses

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ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

TO

KEWAUNEE SOLUTIONS

RADIOLOGICAL MONITORING PROGRAM FOR
THE KEWAUNEE POWER STATION
KEWAUNEE, WISCONSIN

ANNUAL REPORT - PART II
DATA TABULATIONS AND ANALYSES

January 1 to December 31, 2024

Prepared and submitted by

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PREFACE

The staff of Microbac Laboratories - Northbrook were responsible for the presentation of data in this report. Assistance in sample collection was provided by Kewaunee Power Station personnel. The report was prepared by staff members of Microbac Laboratories - Northbrook. Teledyne Brown Engineering, Inc. is responsible for the radiochemical analyses. Mirion Dosimetry Services is responsible for the Thermolumnescent Dosimetry.

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1.0 INTRODUCTION

The following constitutes Part II of the final report for the 2024 Radiological Monitoring Program conducted at the Kewaunee Power Station (KPS), Kewaunee, Wisconsin.

Included are tabulations of data for all samples collected in 2024 along with graphs of data trends. A summary and interpretation of the data presented here are published in Part I of the 2024 Annual Report on the Radiological Monitoring Program for the Kewaunee Power Station.

FIGURE 1
ENVIRONMENTAL SAMPLING LOCATION

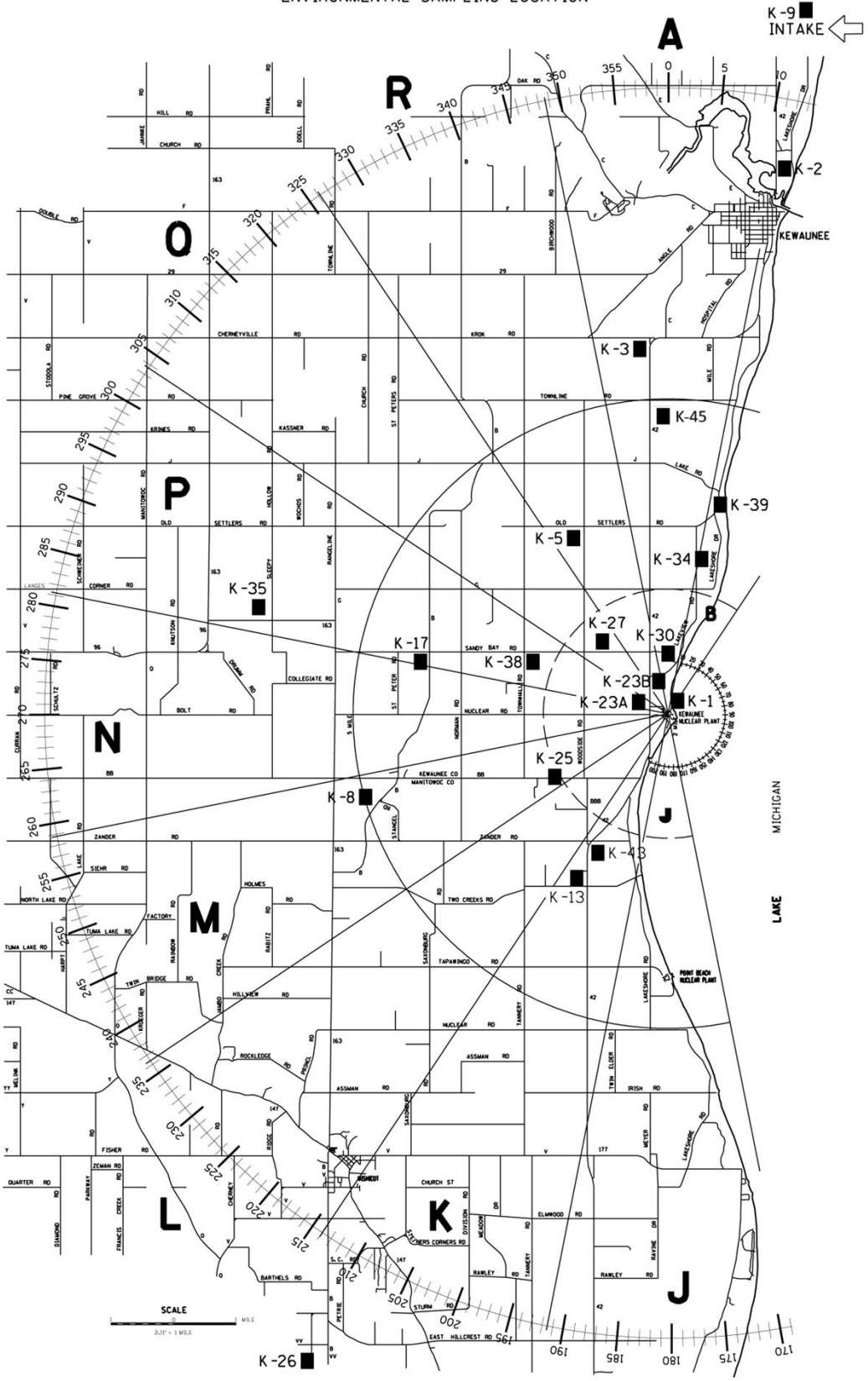

Table 1. Sampling locations, Kewaunee Power Station.

Code	Type[a]	Distance (miles)[b] and Sector	Location
K-1	I		Onsite
K-1b	I	0.12 N	Middle Creek
K-1c	I	0.10 N	500' north of condenser discharge
K-1d	I	0.10 E	Condenser discharge
K-1e	I	0.12 S	South Creek
K-1f	I	0.12 S	Maintenance Waste Oil and Material Storage Building
K-1h	I	0.12 NW	North Well
K-1j	I	0.10 S	500' south of Condenser Discharge
K-1m	I	0.15 N	ISFSI East
K-1o	I	0.16 N	ISFSI North
K-1q	I	0.16 N	ISFSI West
K-1r	I	0.13 N	ISFSI West
K-1u	I	0.05 SSW	Maintenance Building
K-1v	I	0.06 W	South Well
K-2	C	8.91 NNE	WPS Operations Building in Kewaunee
K-3[c]	I/C	5.9 N	Lyle and John Siegmund Farm, N2815 Hy 42, Kewaunee
K-5	I	3.2 NNW	Ed Paplham Farm, E4160 Old Settlers Rd, Kewaunee
K-8	I	4.85 WSW	St. Isadore the Farmer Church, 18424 Tisch Mills Rd, Tisch Mills
K-9	C	11.5 NNE	Green Bay Municipal Pumping Station, six miles east of Green Bay (sample source is Lake Michigan water from Rostok Intake, two miles north of Kewaunee).
K-13	C	3.0 SSW	Rand's General Store, Two Creeks
K-17	I	4.0 W	Klimesh's Farm, N855, Tk B, Kewaunee
K-23a	I	0.5 W	0.5 miles west of plant, Kewaunee site
K-23b	I	0.6 N	0.6 miles north of plant, Kewaunee site
K-25	I	1.9 SW	Wotachek Farm, E3968 Cty Tk BB, Two Rivers
K-26	C	9.1 SSW	Wilfert Farms Vegetable Stand (9.1 miles south of "BB")
K-27	I	1.53 NW	Schleis Farm, E4298 Sandy Bay Rd, Kewaunee
K-30	I	0.8 N	End of site boundary
K-34	I	2.7 N	Leon and Vicki Struck Farm, N1549 Lakeshore Dr., Kewaunee
K-35	C	6.71 WNW	Duane Ducat, N1215 Sleepy Hollow Rd., Kewaunee
K-38	I	2.45 WNW	Dave Sinkula Farm, N890 Town Hall Road, Kewaunee
K-39	I	3.46 N	Francis Wojta, N1859 Lakeshore Road, Kewaunee
K-43	I	2.71 SSW	Gary Maigatter Property, 17333 Hwy 42, Two Rivers
K-45	I	5.1 N	Wakker's Dairy, N2348 Highway 42, Kewaunee

[a] I = indicator; C = control.

[b] Distances are measured from reactor stack.

[c] Location K-3 is an indicator for ambient radiation and a control for soil, cattlefeed and grass.

Table 2. Type and frequency of collection.

Location	Weekly	Quarterly	Semiannually	Annually
K-1b		SW GR [a]		
K-1c			SS [b]	
K-1d		SW		FI [c]
K-1e		SW		
K-1f	AP [g]	GR [a] TLD	SO	
K-1h		WW		
K-1j			SS [b]	
K-1m		TLD		
K-1o		TLD		
K-1q		TLD		
K-1r		TLD		
K-1u		WW [h]		
K-1v		WW [h]		
K-2	AP [g]	TLD		
K-3		GR [a] TLD	SO	CF [d]
K-5		GR [a] TLD		
K-8	AP [g]	TLD		
K-9		SW [f]	SS [b]	
K-13		WW		
K-17		TLD		
K-23a				BLV [e]
K-23b				BLV [e]
K-25		TLD		
K-26				BLV [e]
K-27		TLD		
K-30		TLD		
K-34		GR [a]	SO	CF [d]
K-35		GR [a]	SO	CF [d]
K-38		GR [a]	SO	CF [d]
K-39		GR [a] TLD		
K-43	AP [g]	TLD		
K-45				CF [d]

[a] Three times a year, second, third and fourth quarters.

[b] Collected in May and November.

[c] Collected in the third quarter.

[d] First quarter (January, February, March) only.

[e] Alternate since milk sampling is no longer performed.

[f] Two samples, raw and treated.

[g] Frequency may be increased dependent on dust loading.

[h] Well water shall be taken when this source is tapped for drinking purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

Table 3. Sample Codes:

Code	Description
AP	Airborne particulates
BLV	Broad leaf vegetation
CF	Cattle feed
FI	Fish
GR	Grass
SO	Soil
SW	Surface water
SS	Shoreline Sediment
TLD	Thermoluminescent dosimeter
WW	Well water

2.0 GRAPHS OF DATA TRENDS

Note: Conventions used in trending data.

The following conventions should be used in the interpretation of the graphs of data trends:

1. Both solid and open data points may be used in the graphs. A solid point indicates an activity, an open point, a lower limit of detection (LLD) value.
2. Data points are connected by a solid line. A break in the plot indicates missing data.

Air Particulates – Gross Beta

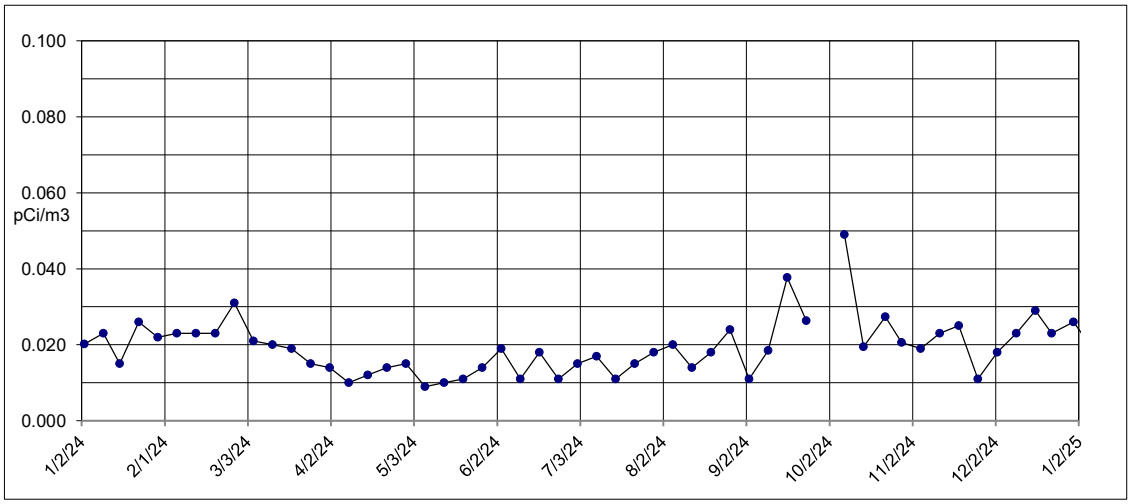

Figure 2. Location K-1f (weekly samples, 2024).
Sample for the week ending 10/01/24 was lost in transit to the lab (CR# 2024-1138).

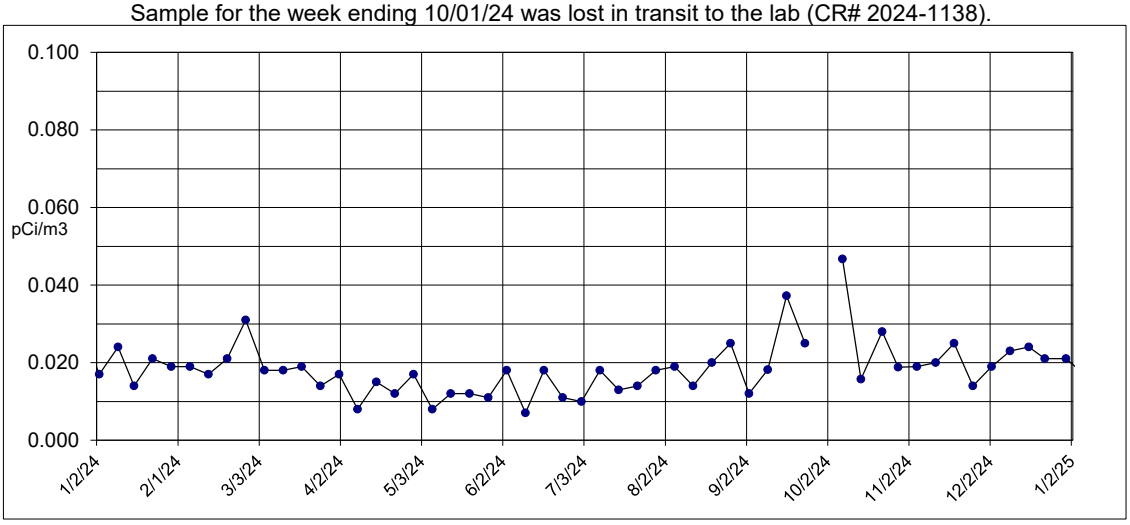

Figure 3. Location K-2 (weekly samples, 2024).
Sample for the week ending 10/01/24 was lost in transit to the lab (CR# 2024-1138).

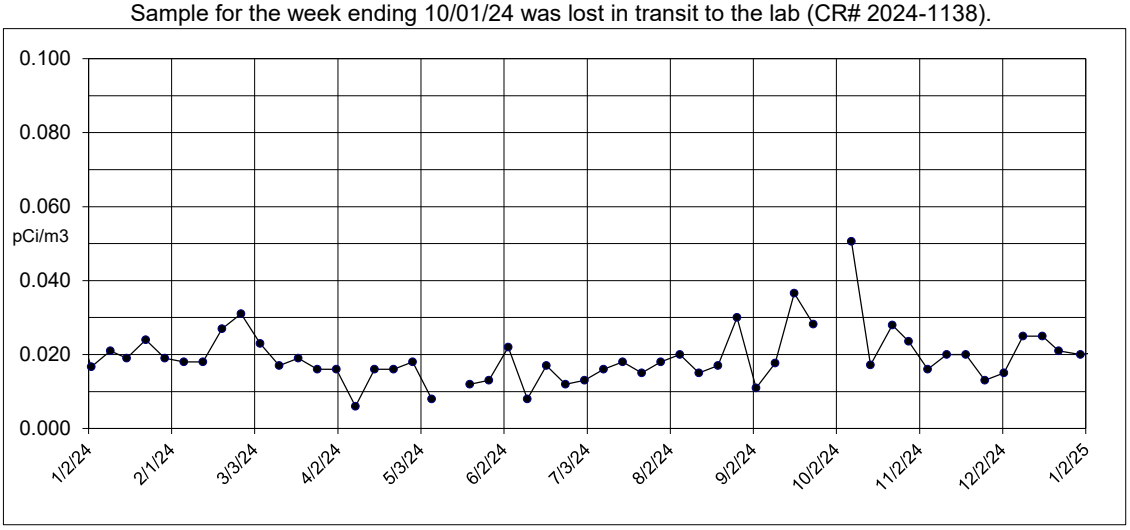

Figure 4. Location K-8 (weekly samples, 2024).
No Sample for week ending 5/14/24 @ location K-8. GFI circuit tripped. (CR# 2024-0406)
Sample for the week ending 10/01/24 was lost in transit to the lab (CR# 2024-1138).

Air Particulates – Gross Beta

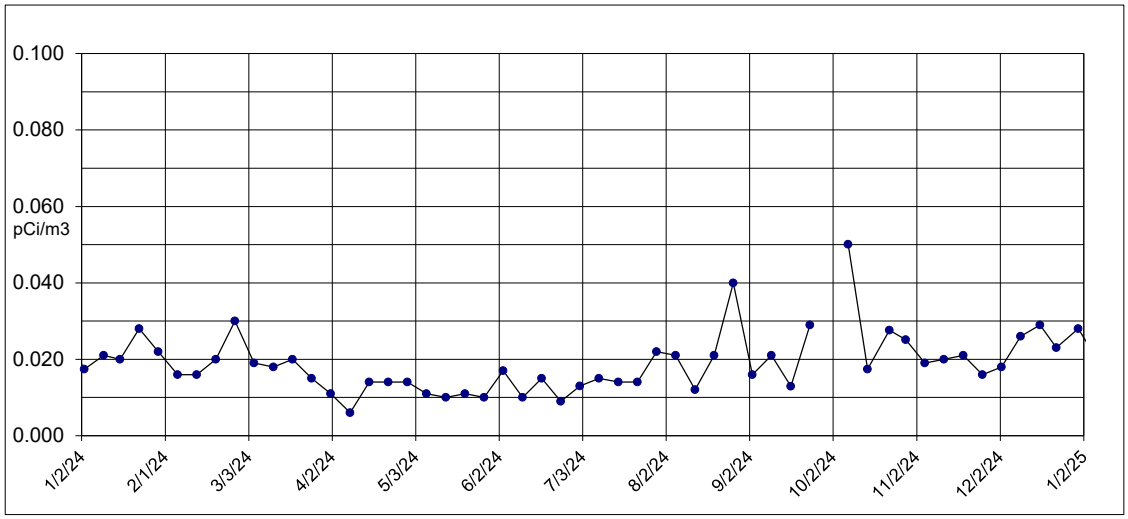

Figure 5. Location K-43 (weekly samples, 2024).
Sample for the week ending 10/01/24 was lost in transit to the lab (CR# 2024-1138).

Air Particulates – Gross Beta

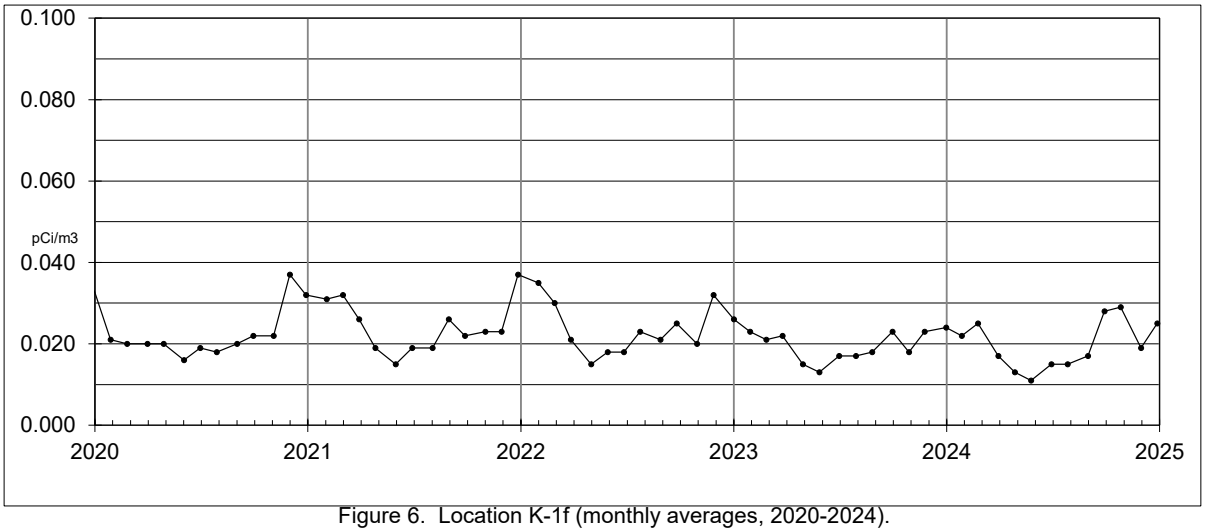

Figure 6. Location K-1f (monthly averages, 2020-2024).

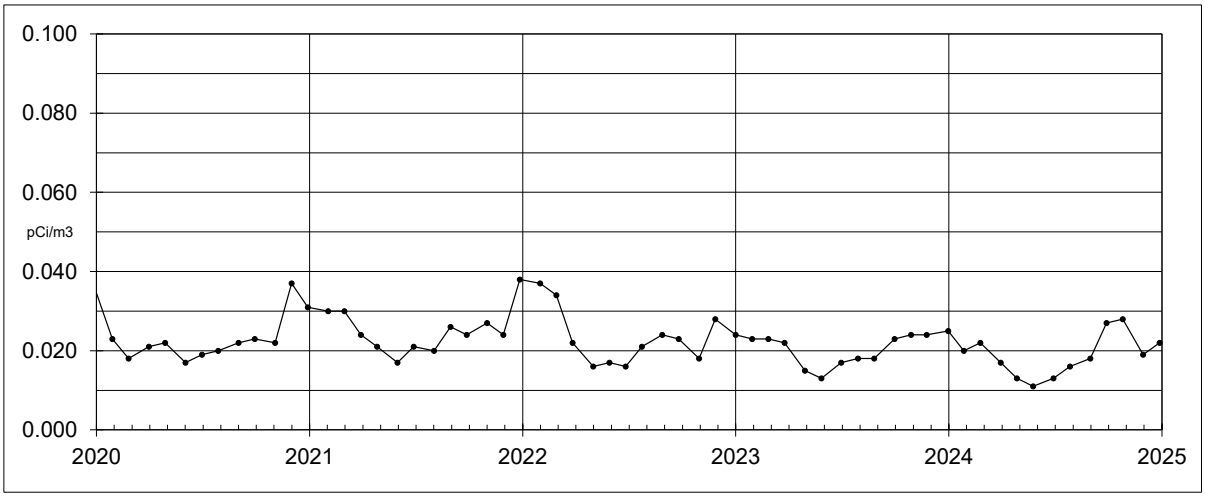

Figure 7. Location K-2 (monthly averages, 2020-2024).

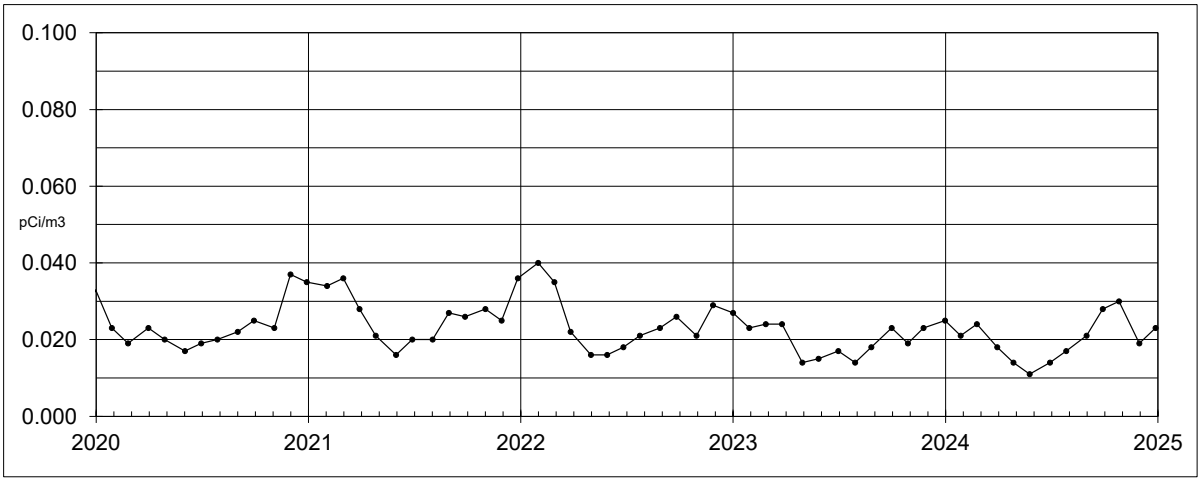

Figure 8. Location K-8 (monthly averages, 2020-2024).

Air Particulates – Gross Beta

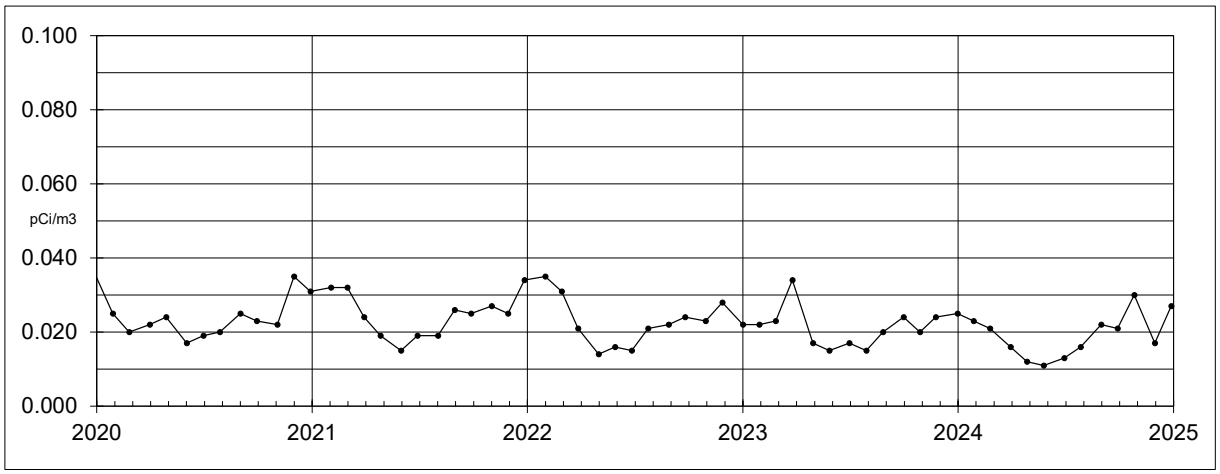

Figure 9. Location K-43 (monthly averages, 2020-2024).

Well Water – Gross Alpha

Note: An open data point indicates activity less than the lower limit of detection (LLD).

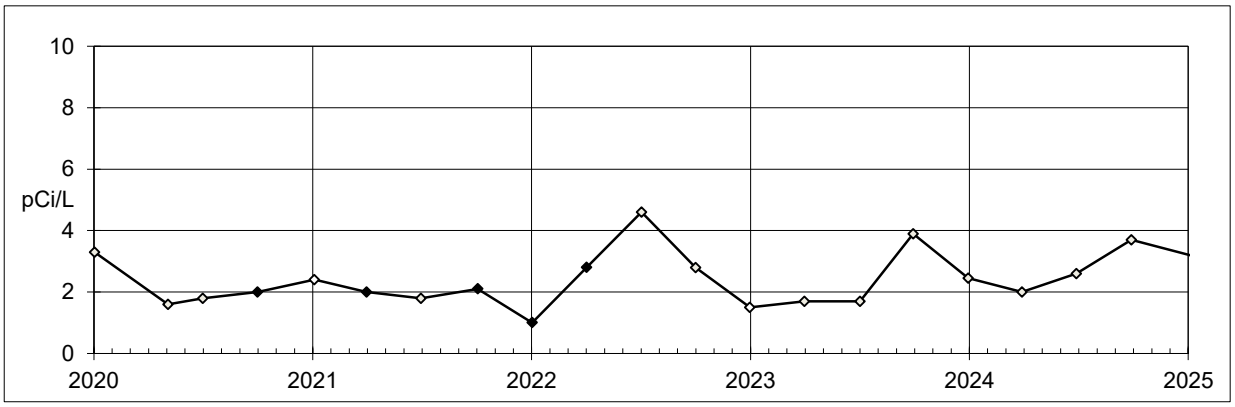

Figure 10. Location K-1h. Total Residue. Quarterly collection.

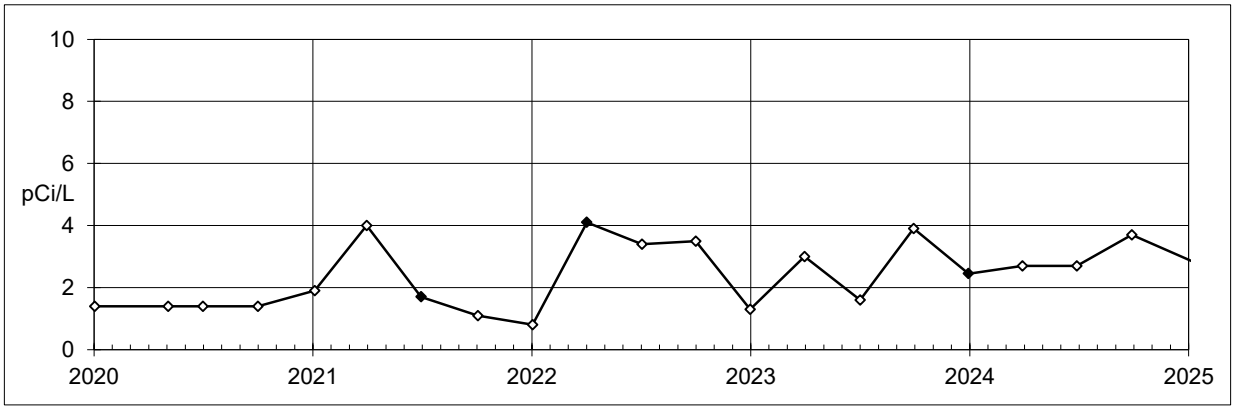

Figure 11. Location K-1u. Total Residue. Quarterly collection. Sample taken only when source has been tapped for drinking or irrigation purposes.

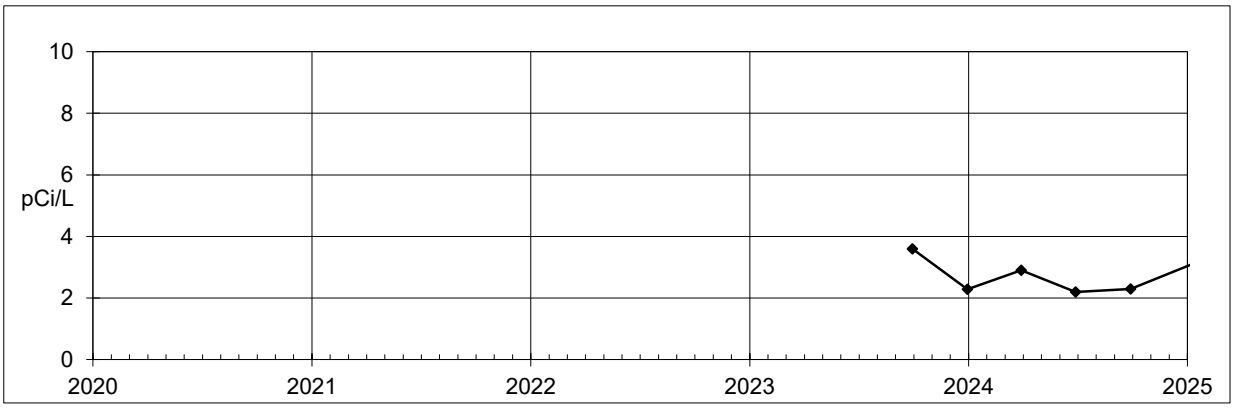

Figure 12. Location K-1v. Total Residue. Quarterly collection. Sample taken only when source has been tapped for drinking or irrigation purposes. Sampling initiated 10/02/23.

Well Water – Gross Beta

Note: An open data point indicates activity less than the lower limit of detection (LLD).

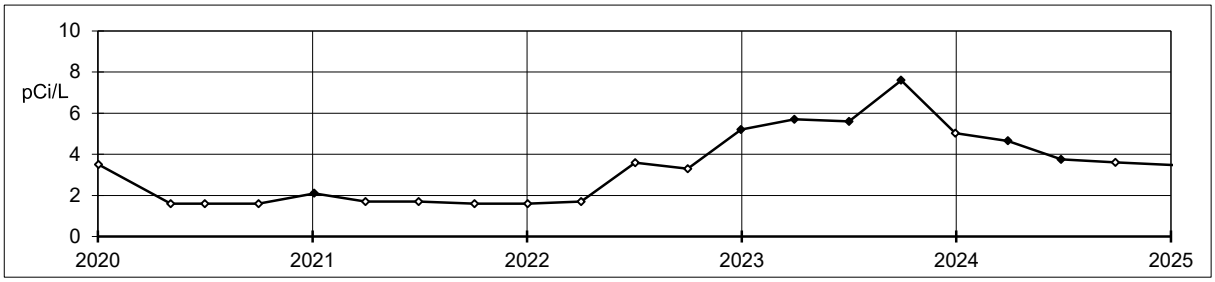

Figure 13. Location K-1h. Total Residue. Quarterly collection.

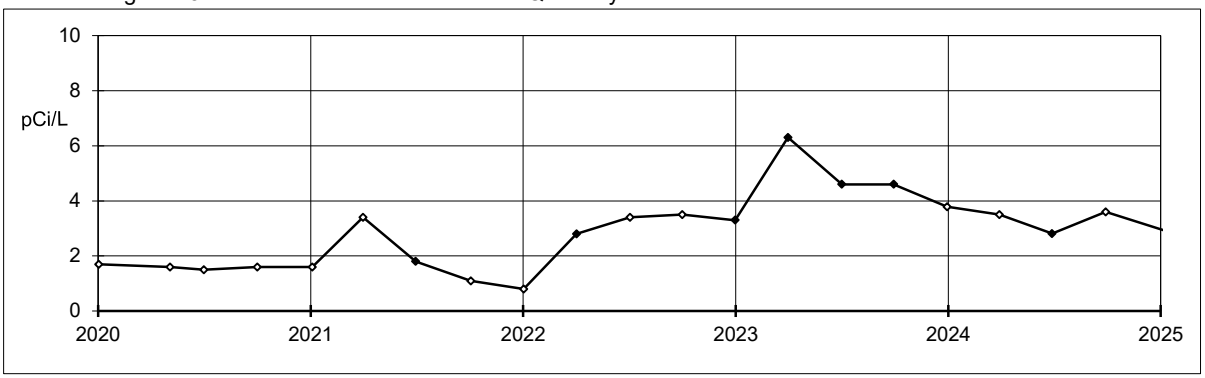

Figure 14. Location K-1u. Total Residue. Quarterly collection.

Sample taken only when source has been tapped for drinking or irrigation purposes.

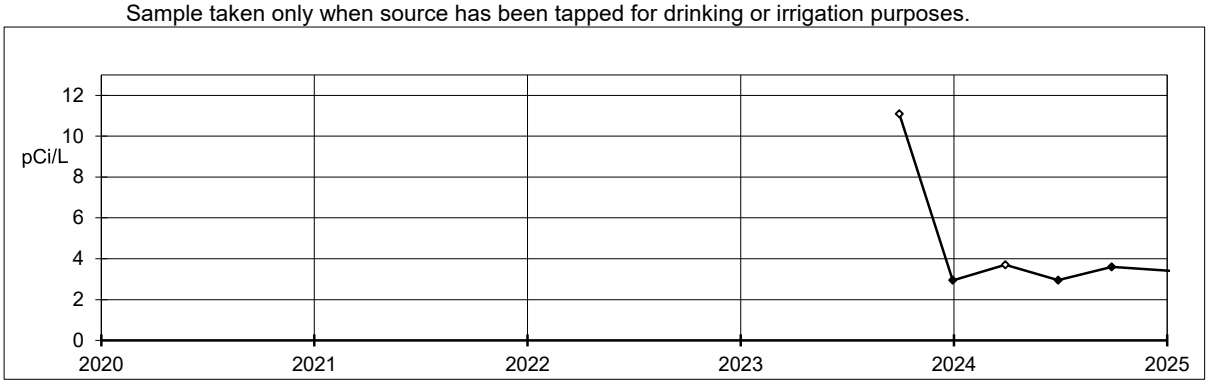

Figure 15. Location K-1v. Total Residue. Quarterly collection.

Sample taken only when source has been tapped for drinking or irrigation purposes.

Sampling initiated 10/03/23.

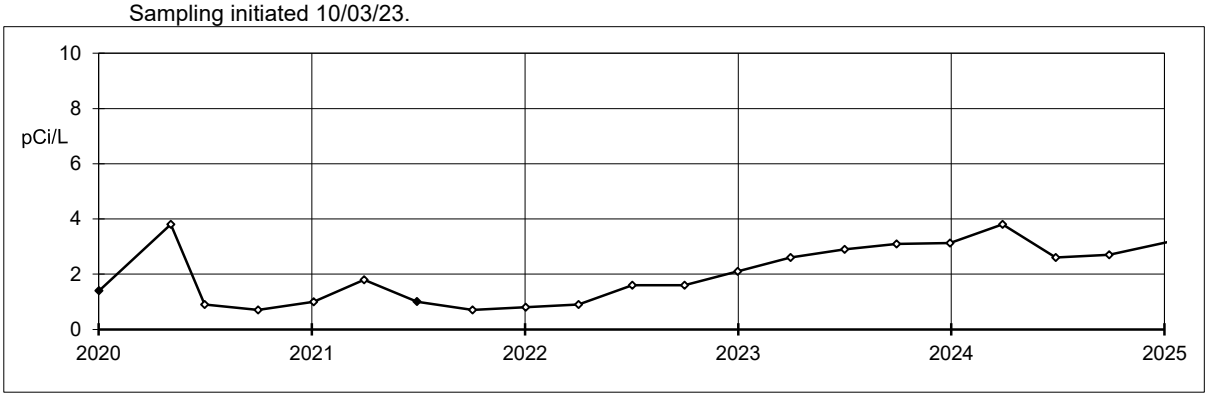

Figure 16. Location K-13. Total Residue. Quarterly collection.

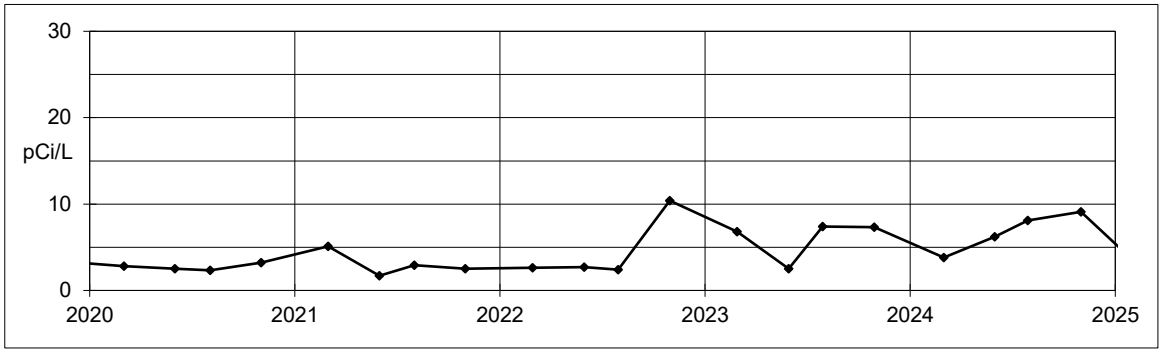

Figure 17. Surface water . Middle Creek, Onsite (K-1b).

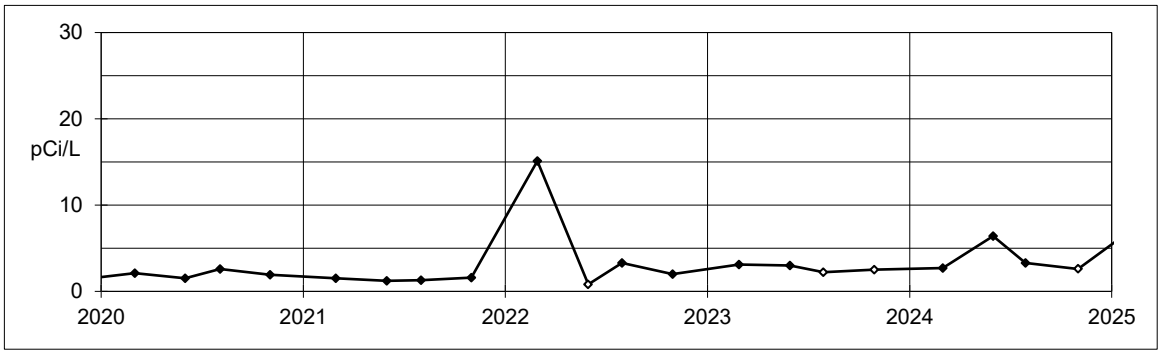

Figure 18. Surface water. Lake Michigan, condenser discharge, Onsite (K-1d).

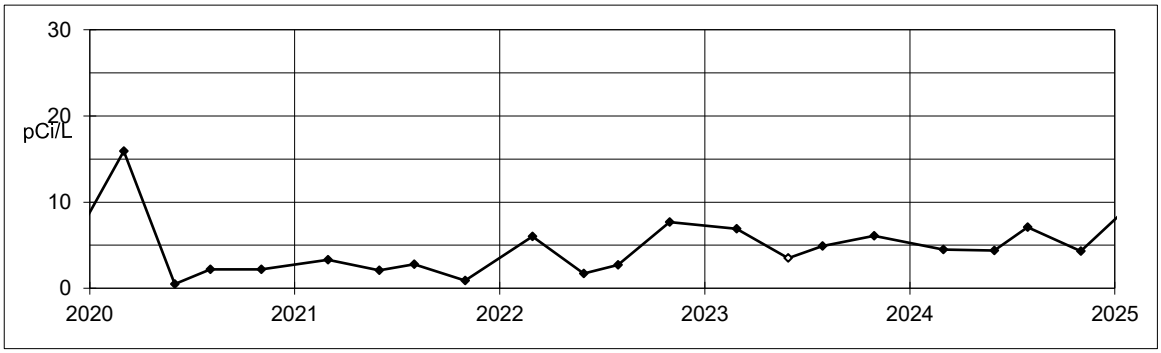

Figure 19. Surface water. South Creek, Onsite (K-1e).

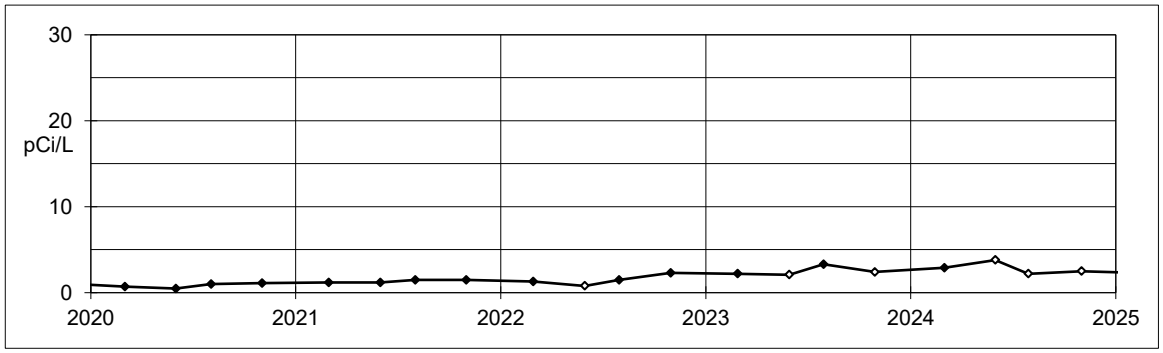

Figure 20. Surface water (raw). Lake Michigan, Rostok Intake (K-9)

Surface Water - H-3

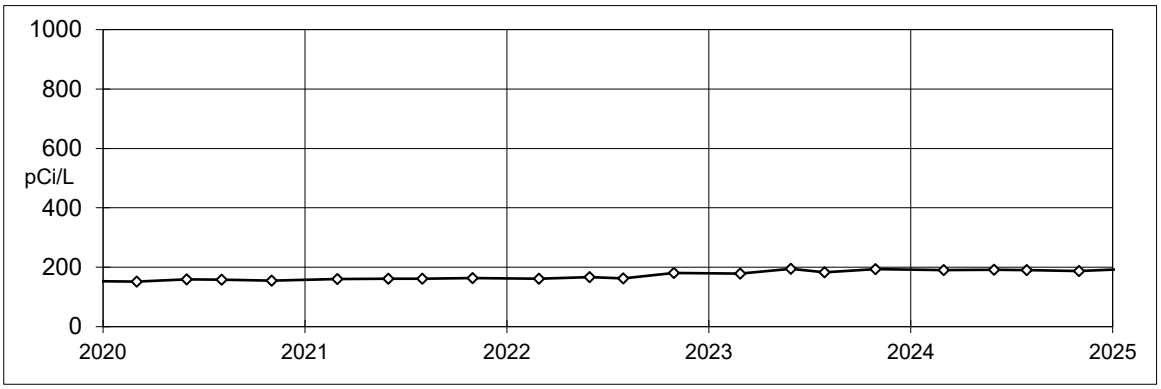

Figure 21. Surface water. Lake Michigan, condenser discharge, K-1d. Quarterly collection.

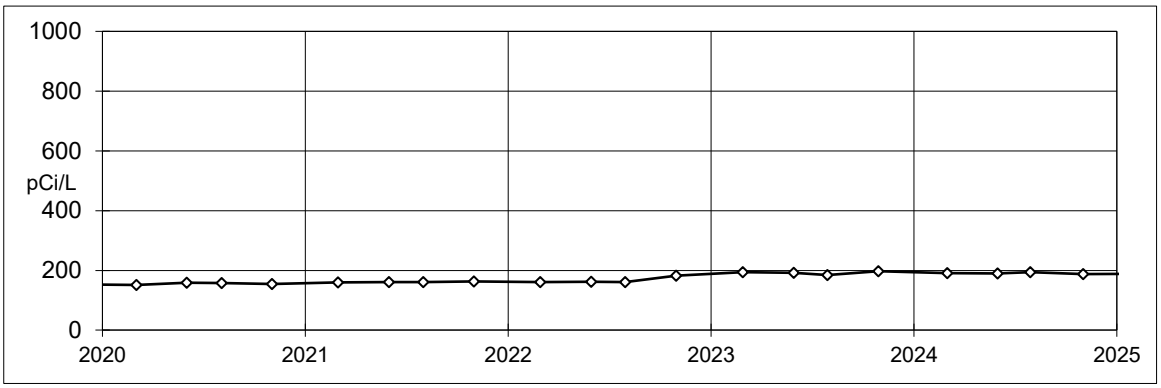

Figure 22. Surface water. Lake Michigan, Rostok Intake, K-9. Quarterly collection.

3.0 DATA TABULATIONS

Table 4. Airborne particulates, analyses for gross beta.
Location: K-1f
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-10-24	311	0.023 ± 0.011	07-09-24	302	0.017 ± 0.009
01-16-24	259	0.015 ± 0.008	07-16-24	302	0.011 ± 0.006
01-23-24	302	0.026 ± 0.013	07-23-24	304	0.015 ± 0.008
01-30-24	301	0.022 ± 0.011	07-30-24	301	0.018 ± 0.009
02-06-24	300	0.023 ± 0.011	08-06-24	304	0.020 ± 0.010
02-13-24	306	0.023 ± 0.011	08-13-24	301	0.014 ± 0.007
02-20-24	300	0.023 ± 0.011	08-20-24	300	0.018 ± 0.009
02-27-24	303	0.031 ± 0.015	08-27-24	309	0.024 ± 0.012
			09-03-24	304	0.011 ± 0.006
03-05-24	299	0.021 ± 0.010			
03-12-24	303	0.020 ± 0.010	09-10-24	298	0.019 ± 0.009
03-19-24	301	0.019 ± 0.009	09-17-24	301	0.038 ± 0.018
03-26-24	304	0.015 ± 0.008	09-24-24	303	0.026 ± 0.013
04-02-24	397	0.014 ± 0.007	10-01-24		[a]
04-09-24	311	0.010 ± 0.005	10-08-24	305	0.049 ± 0.023
04-16-24	302	0.012 ± 0.006	10-15-24	303	0.020 ± 0.010
04-23-24	301	0.014 ± 0.007	10-23-24	344	0.027 ± 0.013
04-30-24	302	0.015 ± 0.007	10-29-24	260	0.021 ± 0.010
05-07-24	297	0.009 ± 0.005	11-05-24	306	0.019 ± 0.010
05-14-24	311	0.010 ± 0.005	11-12-24	297	0.023 ± 0.011
05-21-24	299	0.011 ± 0.006	11-19-24	305	0.025 ± 0.012
05-28-24	301	0.014 ± 0.007	11-26-24	308	0.011 ± 0.006
			12-03-24	299	0.018 ± 0.009
06-04-24	303	0.019 ± 0.009			
06-11-24	300	0.011 ± 0.006	12-10-24	303	0.023 ± 0.011
06-18-24	303	0.018 ± 0.009	12-17-24	303	0.029 ± 0.014
06-25-24	301	0.011 ± 0.006	12-23-24	259	0.023 ± 0.011
07-02-24	304	0.015 ± 0.007	12-31-24	343	0.026 ± 0.012
2nd Quarter Mean ± s.d.		0.013 ± 0.003	4th Quarter Mean ± s.d.		0.024 ± 0.009
			Cumulative Average		0.019

[a] No Sample. Weekly samples lost in transit to the lab. (CR# 2024-1138)

Table 5. Airborne particulates, analyses for gross beta.

Location: K-2

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta		Date Collected	Volume (m^3)	Gross Beta	
Required LLD		0.010		Required LLD		0.010	
01-10-24	311	0.024 ± 0.011		07-09-24	303	0.018 ± 0.009	
01-16-24	259	0.014 ± 0.008		07-16-24	301	0.013 ± 0.007	
01-23-24	302	0.021 ± 0.010		07-23-24	305	0.014 ± 0.007	
01-30-24	301	0.019 ± 0.009		07-30-24	301	0.018 ± 0.009	
02-06-24	300	0.019 ± 0.009		08-06-24	305	0.019 ± 0.009	
02-13-24	306	0.017 ± 0.008		08-13-24	301	0.014 ± 0.007	
02-20-24	300	0.021 ± 0.010		08-20-24	300	0.020 ± 0.010	
02-27-24	303	0.031 ± 0.015		08-27-24	305	0.025 ± 0.012	[a]
				09-03-24	297	0.012 ± 0.007	
03-05-24	299	0.018 ± 0.009					
03-12-24	304	0.018 ± 0.009		09-10-24	298	0.018 ± 0.009	
03-19-24	301	0.019 ± 0.009		09-17-24	300	0.037 ± 0.018	
03-26-24	305	0.014 ± 0.007		09-24-24	303	0.025 ± 0.012	
04-02-24	296	0.017 ± 0.009		10-01-24			[b]
04-09-24	310	0.008 ± 0.005		10-08-24	304	0.047 ± 0.022	
04-16-24	302	0.015 ± 0.008		10-15-24	303	0.016 ± 0.008	
04-23-24	302	0.012 ± 0.006		10-23-24	344	0.028 ± 0.013	
04-30-24	301	0.017 ± 0.008		10-29-24	260	0.019 ± 0.010	
05-07-24	297	0.008 ± 0.005		11-05-24	306	0.019 ± 0.009	
05-14-24	311	0.012 ± 0.006		11-12-24	297	0.020 ± 0.010	
05-21-24	299	0.012 ± 0.006		11-19-24	305	0.025 ± 0.012	
05-28-24	302	0.011 ± 0.006		11-26-24	308	0.014 ± 0.007	
				12-03-24	299	0.019 ± 0.009	
06-04-24	302	0.018 ± 0.009					
06-11-24	300	0.007 ± 0.005		12-10-24	303	0.023 ± 0.011	
06-18-24	305	0.018 ± 0.009		12-17-24	302	0.024 ± 0.012	
06-25-24	302	0.011 ± 0.006		12-23-24	259	0.021 ± 0.011	
07-02-24	303	0.010 ± 0.005		12-31-24	343	0.021 ± 0.010	
2nd Quarter Mean ± s.d.		0.012 ± 0.004		4th Quarter Mean ± s.d.		0.023 ± 0.008	
				Cumulative Average		0.018	

[a] K2 air sampler temporarily lost power due to severe weather. (CR# 2024-0782)

[b] No Sample. Weekly samples lost in transit to the lab. (CR# 2024-1138)

Table 6. Airborne particulates, analyses for gross beta.

Location: K-8
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-10-24	311	0.021 ± 0.010	07-09-24	302	0.016 ± 0.008
01-16-24	259	0.019 ± 0.010	07-16-24	302	0.018 ± 0.009
01-23-24	302	0.024 ± 0.011	07-23-24	303	0.015 ± 0.007
01-30-24	301	0.019 ± 0.010	07-30-24	302	0.018 ± 0.009
02-06-24	300	0.018 ± 0.009	08-06-24	303	0.020 ± 0.010
02-13-24	306	0.018 ± 0.009	08-13-24	301	0.015 ± 0.008
02-20-24	299	0.027 ± 0.013	08-20-24	300	0.017 ± 0.009
02-27-24	303	0.031 ± 0.015	08-27-24	310	0.030 ± 0.014
			09-03-24	304	0.011 ± 0.006
03-05-24	299	0.023 ± 0.011			
03-12-24	303	0.017 ± 0.008	09-10-24	298	0.018 ± 0.009
03-19-24	301	0.019 ± 0.010	09-17-24	301	0.037 ± 0.017
03-26-24	304	0.016 ± 0.008	09-24-24	303	0.028 ± 0.014
04-02-24	297	0.016 ± 0.008	10-01-24		[c]
04-09-24	234	0.006 ± 0.004 [a]	10-08-24	305	0.051 ± 0.024
04-16-24	302	0.016 ± 0.008	10-15-24	303	0.017 ± 0.009
04-23-24	301	0.016 ± 0.008	10-23-24	344	0.028 ± 0.013
04-30-24	303	0.018 ± 0.009	10-29-24	260	0.024 ± 0.012
05-07-24	298	0.008 ± 0.004	11-05-24	306	0.016 ± 0.008
05-14-24		[b]	11-12-24	297	0.020 ± 0.010
05-21-24	299	0.012 ± 0.006	11-19-24	305	0.020 ± 0.010
05-28-24	301	0.013 ± 0.007	11-26-24	308	0.013 ± 0.007
			12-03-24	299	0.015 ± 0.008
06-04-24	304	0.022 ± 0.011			
06-11-24	300	0.008 ± 0.005	12-10-24	303	0.025 ± 0.012
06-18-24	303	0.017 ± 0.008	12-17-24	302	0.025 ± 0.012
06-25-24	301	0.012 ± 0.006	12-23-24	259	0.021 ± 0.011
07-02-24	305	0.013 ± 0.007	12-31-24	343	0.020 ± 0.010
2nd Quarter Mean ± s.d.		0.013 ± 0.005	4th Quarter Mean ± s.d.		0.023 ± 0.010
			Cumulative Average		0.019

[a] Reduced run-time due to power outages in area. (CR# 2024-0304)

[b] No Sample. GFI circuit tripped. (CR# 2024-0406)

[c] No Sample. Weekly samples lost in transit to the lab. (CR# 2024-1138)

Table 7. Airborne particulates, analyses for gross beta.

Location: K-43

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-10-24	311	0.021 ± 0.010	07-09-24	301	0.015 ± 0.008
01-16-24	259	0.020 ± 0.010	07-16-24	303	0.014 ± 0.007
01-23-24	302	0.028 ± 0.014	07-23-24	303	0.014 ± 0.007
01-30-24	263	0.022 ± 0.011 [a]	07-30-24	303	0.022 ± 0.011
02-06-24	300	0.016 ± 0.008	08-06-24	303	0.021 ± 0.010
02-13-24	306	0.016 ± 0.008	08-13-24	301	0.012 ± 0.006
02-20-24	300	0.020 ± 0.010	08-20-24	300	0.021 ± 0.010
02-27-24	303	0.030 ± 0.014	08-27-24	310	0.040 ± 0.019
			09-03-24	303	0.016 ± 0.008
03-05-24	299	0.019 ± 0.009			
03-12-24	303	0.018 ± 0.009	09-10-24	298	0.021 ± 0.010
03-19-24	301	0.020 ± 0.010	09-17-24	301	0.013 ± 0.007
03-26-24	304	0.015 ± 0.008	09-24-24	303	0.029 ± 0.014
04-02-24	297	0.011 ± 0.006	10-01-24		[b]
04-09-24	311	0.006 ± 0.004	10-08-24	305	0.050 ± 0.023
04-16-24	302	0.014 ± 0.007	10-15-24	303	0.017 ± 0.009
04-23-24	301	0.014 ± 0.007	10-23-24	344	0.028 ± 0.013
04-30-24	304	0.014 ± 0.007	10-29-24	260	0.025 ± 0.012
05-07-24	298	0.011 ± 0.006	11-05-24	306	0.019 ± 0.009
05-14-24	308	0.010 ± 0.005	11-12-24	297	0.020 ± 0.010
05-21-24	299	0.011 ± 0.006	11-19-24	305	0.021 ± 0.010
05-28-24	301	0.010 ± 0.006	11-26-24	308	0.016 ± 0.008
			12-03-24	299	0.018 ± 0.009
06-04-24	304	0.017 ± 0.008			
06-11-24	301	0.010 ± 0.005	12-10-24	303	0.026 ± 0.013
06-18-24	302	0.015 ± 0.008	12-17-24	303	0.029 ± 0.014
06-25-24	302	0.009 ± 0.005	12-23-24	259	0.023 ± 0.011
07-02-24	306	0.013 ± 0.007	12-31-24	343	0.028 ± 0.014
2nd Quarter Mean ± s.d.		0.012 ± 0.003	4th Quarter Mean ± s.d.		0.025 ± 0.009
			Cumulative Average		0.019

[a] Reduced run time (1 hr) due to open power supply breaker. (CR# 2700)

[b] No Sample. Weekly samples lost in transit to the lab. (CR# 2024-1138)

Table 8. Airborne particulate data, gross beta analyses, monthly averages, minima and maxima.

January

Location	Average	Minima	Maxima
Indicators	0.022	0.015	0.028
K-1f	0.022	0.015	0.026
K-8	0.021	0.019	0.024
K-43	0.023	0.020	0.028
Controls	0.020	0.014	0.024
K-2	0.020	0.014	0.024

February

Location	Average	Minima	Maxima
Indicators	0.023	0.016	0.031
K-1f	0.025	0.023	0.031
K-8	0.024	0.018	0.031
K-43	0.021	0.016	0.030
Controls	0.022	0.017	0.031
K-2	0.022	0.017	0.031

March

Location	Average	Minima	Maxima
Indicators	0.017	0.011	0.023
K-1f	0.017	0.014	0.020
K-8	0.018	0.016	0.023
K-43	0.016	0.011	0.020
Controls	0.017	0.014	0.019
K-2	0.017	0.014	0.019

April

Location	Average	Minima	Maxima
Indicators	0.013	0.006	0.015
K-1f	0.013	0.010	0.015
K-8	0.014	0.010	0.015
K-43	0.012	0.006	0.014
Controls	0.013	0.008	0.017
K-2	0.013	0.008	0.017

May

Location	Average	Minima	Maxima
Indicators	0.011	0.008	0.014
K-1f	0.011	0.009	0.014
K-8	0.011	0.008	0.013
K-43	0.011	0.010	0.011
Controls	0.011	0.008	0.012
K-2	0.011	0.008	0.012

June

Location	Average	Minima	Maxima
Indicators	0.014	0.008	0.022
K-1f	0.015	0.011	0.019
K-8	0.014	0.008	0.022
K-43	0.013	0.009	0.017
Controls	0.013	0.007	0.018
K-2	0.013	0.007	0.018

Note: Samples collected on the first, second or third day of the month are grouped with data of the previous month.

Table 8. Airborne particulate data, gross beta analyses, monthly averages, minima and maxima, (continued)

July

Location	Average	Minima	Maxima
Indicators	0.016	0.011	0.022
K-1f	0.015	0.011	0.018
K-8	0.017	0.015	0.018
K-43	0.016	0.014	0.022
Controls	0.016	0.013	0.018
K-2	0.016	0.013	0.018

August

Location	Average	Minima	Maxima
Indicators	0.020	0.011	0.040
K-1f	0.017	0.011	0.024
K-8	0.021	0.015	0.030
K-43	0.022	0.012	0.040
Controls	0.018	0.012	0.025
K-2	0.018	0.012	0.025

September

Location	Average	Minima	Maxima
Indicators	0.026	0.013	0.038
K-1f	0.028	0.019	0.038
K-8	0.028	0.018	0.037
K-43	0.021	0.013	0.029
Controls	0.027	0.018	0.037
K-2	0.027	0.018	0.037

October

Location	Average	Minima	Maxima
Indicators	0.030	0.017	0.051
K-1f	0.029	0.020	0.049
K-8	0.030	0.017	0.051
K-43	0.030	0.017	0.050
Controls	0.028	0.016	0.047
K-2	0.028	0.016	0.047

November

Location	Average	Minima	Maxima
Indicators	0.018	0.011	0.025
K-1f	0.019	0.011	0.025
K-8	0.017	0.013	0.020
K-43	0.019	0.016	0.021
Controls	0.019	0.014	0.025
K-2	0.019	0.014	0.025

December

Location	Average	Minima	Maxima
Indicators	0.025	0.020	0.029
K-1f	0.025	0.023	0.029
K-8	0.023	0.020	0.025
K-43	0.027	0.023	0.029
Controls	0.022	0.021	0.024
K-2	0.022	0.021	0.024

Note: Samples collected on the first, second or third day of the month are grouped with data of the previous month.

Table 9. Airborne particulate samples, quarterly composites of weekly samples, analysis for gamma-emitting isotopes.

	Sample Description and Concentration (pCi/m^3)			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Indicator				
K-1f				
Lab Code	L105047-1	L106520-1	L108076-1 [a]	L-108594-1
Volume (m^3)	3885	3963	3629	3934
Be-7	0.135 ± 0.044	0.194 ± 0.059	0.180 ± 0.054	0.138 ± 0.058
Nb-95	< 0.0052	< 0.0061	< 0.0089	< 0.0082
Zr-95	< 0.0089	< 0.0118	< 0.0164	< 0.0182
Ru-103	< 0.0088	< 0.0199	< 0.0251	< 0.0182
Ru-106	< 0.0196	< 0.0199	< 0.0200	< 0.0319
Cs-134	< 0.0022	< 0.0028	< 0.0026	< 0.0038
Cs-137	< 0.0013	< 0.0015	< 0.0017	< 0.0030
Ce-141	< 0.0134	< 0.0217	< 0.0476	< 0.0242
Ce-144	< 0.0073	< 0.0088	< 0.0112	< 0.0117
K-8				
Lab Code	L105047-3	L106520-3	L108076-3 [a]	L108594-3
Volume (m^3)	3884	3552	3628	3934
Be-7	0.180 ± 0.052	0.129 ± 0.082	0.301 ± 0.063	0.122 ± 0.056
Nb-95	< 0.0063	< 0.0099	< 0.0076	< 0.0071
Zr-95	< 0.0090	< 0.0162	< 0.0129	< 0.0143
Ru-103	< 0.0141	< 0.0202	< 0.0218	< 0.0121
Ru-106	< 0.0304	< 0.0197	< 0.0191	< 0.0204
Cs-134	< 0.0023	< 0.0023	< 0.0023	< 0.0024
Cs-137	< 0.0023	< 0.0025	< 0.0019	< 0.0020
Ce-141	< 0.0254	< 0.0309	< 0.0387	< 0.0223
Ce-144	< 0.0159	< 0.0119	< 0.0087	< 0.0128

[a] Composite samples do not include the weekly samples 09/24/24-10/01/24 which were lost in transit to the lab. (CR# 2024-1138)

Table 9. Airborne particulate samples, quarterly composites of weekly samples, analysis for gamma-emitting isotopes, (continued).

	Sample Description and Concentration (pCi/m^3)			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Indicator				
K-43				
Lab Code	L105047-2	L106520-2	L108076-2 [a]	L108594-2
Volume (m^3)	3843	3938	3627	3934
Be-7	0.179 ± 0.054	0.149 ± 0.060	0.273 ± 0.102	0.089 ± 0.050
Nb-95	< 0.0074	< 0.0120	< 0.0144	< 0.0062
Zr-95	< 0.0137	< 0.0158	< 0.0192	< 0.0101
Ru-103	< 0.0128	< 0.0230	< 0.0312	< 0.0112
Ru-106	< 0.0192	< 0.0340	< 0.0304	< 0.0213
Cs-134	< 0.0026	< 0.0039	< 0.0035	< 0.0016
Cs-137	< 0.0017	< 0.0033	< 0.0027	< 0.0018
Ce-141	< 0.0189	< 0.0377	< 0.0582	< 0.0169
Ce-144	< 0.0097	< 0.0145	< 0.0126	< 0.0086
Control				
K-2				
Lab Code	L105047-4	L106520-4	L108076-4 [a]	L108594-4
Volume (m^3)	3885	3935	3619	3934
Be-7	0.141 ± 0.037	0.164 ± 0.077	0.193 ± 0.078	0.122 ± 0.043
Nb-95	< 0.0062	< 0.0066	< 0.0063	< 0.0067
Zr-95	< 0.0066	< 0.0125	< 0.0112	< 0.0151
Ru-103	< 0.0067	< 0.0139	< 0.0142	< 0.0149
Ru-106	< 0.0164	< 0.0203	< 0.0153	< 0.0225
Cs-134	< 0.0021	< 0.0028	< 0.0018	< 0.0029
Cs-137	< 0.0012	< 0.0020	< 0.0013	< 0.0021
Ce-141	< 0.0121	< 0.0251	< 0.0276	< 0.0284
Ce-144	< 0.0083	< 0.0102	< 0.0072	< 0.0160

[a] Composite samples do not include the weekly samples 09/24/24-10/01/24 which were lost in transit to the lab. (CR# 2024-1138)

Table 10. Ambient gamma radiation (TLD), quarterly exposure.

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	
	01-02-24	04-01-24	07-01-24	10-01-24	
	04-01-24	07-01-24	10-01-24	01-09-25	
	mR/Qtr				
Indicator					Mean ± s.d.
K-1f	12.9	14.0	10.8	8.9	11.7 ± 2.3
K-3	13.2	14.7	15.1	10.1	13.3 ± 2.3
K-5	14.0	13.7	18.1	10.1	14.0 ± 3.3
K-8	14.2	13.7	14.5	10.4	13.2 ± 1.9
K-17	15.8	16.0	16.1	10.4	14.6 ± 2.8
K-25	15.3	16.0	17.8	11.0	15.0 ± 2.9
K-27	16.0	16.7	15.1	9.8	14.4 ± 3.1
K-30	13.4	13.3	15.1	9.8	12.9 ± 2.2
K-39	15.2	15.0	17.8	12.8	15.2 ± 2.0
K-43	13.5	13.3	15.1	9.2	12.8 ± 2.5
Mean ± s.d.	14.4 ± 1.1	14.6 ± 1.2	15.6 ± 2.1	10.3 ± 1.1	13.7 ± 2.3
Control					
K-2	14.5	15.0	15.8	10.4	13.9 ± 2.4
Inside the Protected Area [a]					
					Mean ± s.d.
K-1m	84.6	84.7	85.4	92.4	86.8 ± 3.8
K-1o	81.3	83.3	77.1	87.2	82.2 ± 4.2
K-1q	17.1	17.7	18.4	13.0	16.6 ± 2.4
K-1r	14.8	14.3	15.1	9.5	13.4 ± 2.6
Mean ± s.d.	49.5 ± 38.7	50.0 ± 39.3	49.0 ± 37.4	50.5 ± 45.4	49.8 ± 0.6

[a] 4th Quarter TLD's Inside the Protected Area (ISFSI) were changed out on 01-02-25.

Table 11. Well water, analyses for gross alpha, gross beta, tritium, strontium-90 and gamma-emitting isotopes.

Collection: Quarterly.

Sample Description and Concentration (pCi/L)				
Indicator				
K-1h				
Date Collected	01-02-24	04-01-24	07-01-24	10-01-24
Lab Code	L103803-1	L104875-3	L106075-1	L107287-16
Gross alpha	< 2.5	< 2.0	< 2.6	< 3.7
Gross beta	5.03 ± 3.24	4.65 ± 3.23	3.75 ± 2.20	3.61 ± 3.05
H-3	< 184	< 183	< 199	< 187
Sr-90	< 2.2	< 1.9	< 1.3	< 3.4
K-40	< 109	< 130	< 125	< 49
Mn-54	< 9.6	< 5.3	< 9.2	< 2.7
Fe-59	< 8.6	< 11.2	< 10.8	< 6.3
Co-58	< 15.5	< 7.7	< 8.1	< 2.5
Co-60	< 5.7	< 6.8	< 8.2	< 3.2
Zn-65	< 18.1	< 16.0	< 15.1	< 7.1
Zr-Nb-95	< 13.8	< 8.7	< 7.5	< 3.1
Cs-134	< 8.2	< 9.1	< 8.4	< 2.6
Cs-137	< 7.3	< 7.8	< 6.6	< 2.8
Ba-La-140	< 14.3	< 12.7	< 5.5	< 5.3
K-1u				
Date Collected	01-02-24	04-01-24	07-01-24	10-01-24
Lab Code	L103803-2	L104875-2	L106075-2	L107287-15
Gross alpha	2.45 ± 2.40	< 2.7	< 2.7	< 3.7
Gross beta	< 3.8	< 3.5	2.81 ± 1.79	< 3.6
H-3	< 193	< 183	< 194	< 188
K-40	< 115	< 131	< 106	< 32
Mn-54	< 4.6	< 6.5	< 6.7	< 1.8
Fe-59	< 15.4	< 20.9	< 10.9	< 3.8
Co-58	< 6.6	< 6.1	< 7.8	< 1.7
Co-60	< 3.9	< 9.8	< 7.6	< 2.0
Zn-65	< 14.7	< 12.6	< 14.1	< 4.0
Zr-Nb-95	< 7.0	< 10.0	< 6.3	< 1.9
Cs-134	< 6.7	< 7.7	< 6.5	< 2.0
Cs-137	< 6.9	< 6.3	< 6.2	< 1.9
Ba-La-140	< 11.3	< 24.1	< 11.8	< 3.0

Table 11. Well water, analyses for gross alpha, gross beta, tritium, strontium-90 and gamma-emitting isotopes (

Collection: Quarterly.

Sample Description and Concentration (pCi/L)				
Indicator				
K-1v				
Date Collected	01-02-24	04-01-24	07-01-24	10-01-24
Lab Code	L103803-3	L104875-1	L106075-3	L107287-4
Gross alpha	< 2.3	< 2.9	< 2.2	< 3.7
Gross beta	2.94 ± 2.29	< 3.7	2.95 ± 1.87	3.60 ± 3.03
H-3	< 184	< 184	< 194	< 184
K-40	< 143	< 121	< 127	< 30
Mn-54	< 6.8	< 6.3	< 5.8	< 1.8
Fe-59	< 14.7	< 12.9	< 15.5	< 3.9
Co-58	< 6.1	< 7.8	< 5.8	< 1.8
Co-60	< 5.8	< 7.2	< 6.7	< 2.2
Zn-65	< 14.6	< 16.2	< 11.5	< 4.0
Zr-Nb-95	< 8.7	< 9.3	< 6.6	< 2.0
Cs-134	< 7.5	< 8.5	< 6.3	< 2.1
Cs-137	< 6.8	< 8.1	< 6.5	< 2.0
Ba-La-140	< 9.3	< 11.6	< 10.7	< 3.3
Control				
K-13				
Date Collected	01-02-24	04-01-24	07-01-24	10-01-24
Lab Code	L103803-4	L104875-4	L106075-4	L107287-17
Gross beta	< 3.1	< 3.8	< 2.6	< 2.7
H-3	< 194	< 181	< 194	< 184
K-40	< 106	< 115	< 129	< 52
Mn-54	< 7.6	< 5.3	< 7.5	< 3.0
Fe-59	< 14.3	< 12.1	< 15.2	< 6.3
Co-58	< 8.0	< 4.1	< 6.6	< 2.9
Co-60	< 5.6	< 5.6	< 6.8	< 3.7
Zn-65	< 16.8	< 13.3	< 13.3	< 5.8
Zr-Nb-95	< 7.8	< 5.5	< 9.0	< 3.5
Cs-134	< 7.9	< 7.0	< 8.4	< 3.5
Cs-137	< 6.4	< 8.8	< 5.4	< 3.0
Ba-La-140	< 11.2	< 10.7	< 13.5	< 5.2

Table 12. Broadleaf vegetation samples, analyses for gamma-emitting isotopes. Annual collection.

Sample Description and Concentration (pCi/g wet)		
	Indicator	
Location	K-23a	K-23b
Date Collected	08-01-24	08-01-24
Lab Code	L106548-1	L106548-2
Type	Broad leaf veg.	Broad leaf veg.
Be-7	1.34 ± 0.43	< 0.351
K-40	3.03 ± 0.72	4.60 ± 0.73
Nb-95	< 0.047	< 0.036
Zr-95	< 0.073	< 0.050
Ru-103	< 0.044	< 0.033
Ru-106	< 0.368	< 0.366
Cs-134	< 0.044	< 0.047
Cs-137	< 0.045	< 0.030
Ce-141	< 0.055	< 0.047
Ce-144	< 0.213	< 0.165

	Control
Location	K-26
Date Collected	09-04-24
Lab Code	L106959-1
Type	Broad leaf veg.
Be-7	< 0.097
K-40	1.35 ± 0.20
Nb-95	< 0.012
Zr-95	< 0.021
Ru-103	< 0.010
Ru-106	< 0.085
Cs-134	< 0.010
Cs-137	< 0.012
Ce-141	< 0.019
Ce-144	< 0.074

Table 13. Cattlefeed, analyses for gross beta, strontium-90, and gamma-emitting isotopes.
Collection: First Quarter

	Sample Description and Concentration (pCi/g wet)			
	Control			
Location	K-3	K-3	K-35	K-35
Date Collected	01-02-24	01-02-24	01-02-24	01-02-24
Lab Code	L103801-1	L103801-2	L103801-7	L103801-8
Type	Hay / Haylage	Silage	Hay / Haylage	Silage
Gross beta	8.96 ± 4.06	11.80 ± 5.34	7.03 ± 3.21	3.18 ± 1.44
Sr-90	0.022 ± 0.016	0.008 ± 0.006	0.011 ± 0.008	0.018 ± 0.013
Be-7	2.04 ± 0.431	< 0.165	< 0.413	< 0.20
K-40	6.47 ± 0.93	4.04 ± 0.48	6.35 ± 0.91	10.20 ± 0.83
Nb-95	< 0.089	< 0.014	< 0.040	< 0.023
Zr-95	< 0.069	< 0.032	< 0.075	< 0.026
Ru-103	< 0.025	< 0.017	< 0.042	< 0.026
Ru-106	< 0.378	< 0.165	< 0.381	< 0.223
Cs-134	< 0.036	< 0.018	< 0.050	< 0.030
Cs-137	< 0.040	< 0.017	< 0.039	< 0.023
Ce-141	< 0.058	< 0.022	< 0.071	< 0.035
Ce-144	< 0.226	< 0.097	< 0.281	< 0.122
	Indicator			
Location	K-45	K-45	K-34	K-34
Date Collected	01-02-24	01-02-24	01-08-24	01-02-24
Lab Code	L103801-3	L103801-4	L103801-5	L103801-6
Type	Silage	Hay / Haylage	Hay / Haylage	Silage
Gross beta	5.34 ± 2.41	12.50 ± 5.67	2.49 ± 1.13	3.22 ± 1.46
Sr-90	< 0.004	< 0.004	< 0.005	0.006 ± 0.005
Be-7	< 0.004	1.02 ± 0.34	0.44 ± 0.21	< 0.15
K-40	3.60 ± 0.39	11.00 ± 1.06	4.25 ± 0.45	8.02 ± 0.63
Nb-95	< 0.016	< 0.043	< 0.020	< 0.019
Zr-95	< 0.031	< 0.078	< 0.020	< 0.032
Ru-103	< 0.016	< 0.048	< 0.018	< 0.019
Ru-106	< 0.137	< 0.335	< 0.185	< 0.175
Cs-134	< 0.015	< 0.048	< 0.024	< 0.024
Cs-137	< 0.019	< 0.046	< 0.023	< 0.021
Ce-141	< 0.023	< 0.070	< 0.033	< 0.027
Ce-144	< 0.082	< 0.255	< 0.130	< 0.102

Table 13. Cattlefeed, analyses for gross beta, strontium-90, and gamma-emitting isotopes (continued).
Collection: First Quarter

	Sample Description and Concentration (pCi/g wet)	
	Indicator	
Location	K-38	K-38
Date Collected	01-02-24	01-02-24
Lab Code	L103801-9	L103801-10
Type	Hay / Haylage	Silage
Gross beta	21.30 ± 9.62	2.35 ± 1.07
Sr-90	0.021 ± 0.015	< 0.004
Be-7	< 0.48	< 0.19
K-40	15.10 ± 1.33	3.31 ± 0.40
Nb-95	< 0.047	< 0.035
Zr-95	< 0.075	< 0.026
Ru-103	< 0.041	< 0.017
Ru-106	< 0.476	< 0.155
Cs-134	< 0.052	< 0.034
Cs-137	< 0.048	< 0.018
Ce-141	< 0.681	< 0.029
Ce-144	< 0.237	< 0.125

Table 14. Grass, analyses for gross beta, strontium-90, and gamma-emitting isotopes.
Collection: Quarterly, April through December
Units: pCi/g wet

Sample Description and Concentration (pCi/g wet)

	Indicator			
Location	K-1b	K-1f	K-5	K-34
Date Collected	06-03-24	06-03-24	06-03-24	06-03-24
Lab Code	L105732-1	L105732-2	L105732-5	L105732-7
Gross beta	8.40 ± 3.80	7.31 ± 3.31	7.49 ± 3.40	8.02 ± 3.63
Sr-90	< 0.004	< 0.005	< 0.004	< 0.004
Be-7	< 0.47	0.51 ± 0.21	0.64 ± 0.23	0.83 ± 0.28
K-40	5.17 ± 0.97	5.23 ± 0.66	4.91 ± 0.70	5.89 ± 0.64
Mn-54	< 0.046	< 0.027	< 0.034	< 0.033
Co-58	< 0.036	< 0.033	< 0.023	< 0.022
Co-60	< 0.054	< 0.034	< 0.056	< 0.032
Nb-95	< 0.041	< 0.028	< 0.028	< 0.025
Zr-95	< 0.078	< 0.054	< 0.050	< 0.051
Ru-103	< 0.043	< 0.028	< 0.025	< 0.030
Ru-106	< 0.307	< 0.256	< 0.308	< 0.248
Cs-134	< 0.051	< 0.028	< 0.036	< 0.037
Cs-137	< 0.048	< 0.029	< 0.029	< 0.024
Ce-141	< 0.061	< 0.037	< 0.035	< 0.044
Ce-144	< 0.277	< 0.151	< 0.154	< 0.168

	Indicator		Control	
Location	K-38	K-39	K-3	K-35
Date Collected	06-03-24	06-03-24	06-03-24	06-03-24
Lab Code	L105732-8	L105732-6	L105732-3	L105732-4
Gross beta	6.69 ± 3.03	7.67 ± 3.47	7.12 ± 3.23	7.84 ± 3.55
Sr-90	< 0.004	< 0.004	< 0.004	< 0.004
Be-7	0.44 ± 0.20	0.78 ± 0.20	0.63 ± 0.30	0.83 ± 0.36
K-40	5.02 ± 0.64	5.87 ± 0.74	5.53 ± 0.69	5.47 ± 0.89
Mn-54	< 0.023	< 0.034	< 0.034	< 0.037
Co-58	< 0.022	< 0.031	< 0.031	< 0.030
Co-60	< 0.031	< 0.040	< 0.041	< 0.038
Nb-95	< 0.032	< 0.025	< 0.033	< 0.037
Zr-95	< 0.045	< 0.057	< 0.055	< 0.076
Ru-103	< 0.029	< 0.030	< 0.029	< 0.046
Ru-106	< 0.262	< 0.309	< 0.339	< 0.391
Cs-134	< 0.037	< 0.029	< 0.037	< 0.045
Cs-137	< 0.030	< 0.035	< 0.027	< 0.036
Ce-141	< 0.040	< 0.041	< 0.049	< 0.061
Ce-144	< 0.182	< 0.161	< 0.195	< 0.231

Table 14. Grass, analyses for gross beta, strontium-90, and gamma-emitting isotopes (continued).
Collection: Quarterly, April through December
Units: pCi/g wet

Sample Description and Concentration (pCi/g wet)

	Indicator			
Location	K-1b	K-1f	K-5	K-34
Date Collected	08-01-24	08-01-24	08-01-24	08-01-24
Lab Code	L106549-1	L106549-2	L106549-4	L106549-5
Gross beta	6.97 ± 3.18	7.30 ± 3.33	11.70 ± 5.31	8.57 ± 3.90
Sr-90	< 0.004	< 0.004	< 0.005	< 0.004
Be-7	3.02 ± 0.60	1.78 ± 0.43	< 0.36	0.93 ± 0.47
K-40	4.96 ± 0.94	5.06 ± 0.99	4.99 ± 0.87	5.31 ± 0.85
Mn-54	< 0.041	< 0.054	< 0.037	< 0.037
Co-58	< 0.047	< 0.040	< 0.029	< 0.038
Co-60	< 0.059	< 0.058	< 0.038	< 0.042
Nb-95	< 0.046	< 0.050	< 0.051	< 0.046
Zr-95	< 0.091	< 0.089	< 0.077	< 0.075
Ru-103	< 0.049	< 0.046	< 0.045	< 0.044
Ru-106	< 0.439	< 0.478	< 0.460	< 0.396
Cs-134	< 0.053	< 0.045	< 0.053	< 0.045
Cs-137	< 0.047	< 0.044	< 0.049	< 0.039
Ce-141	< 0.068	< 0.060	< 0.063	< 0.074
Ce-144	< 0.288	< 0.278	< 0.258	< 0.269

	Indicator		Control	
Location	K-38	K-39	K-3	K-35
Date Collected	08-01-24	08-01-24	08-01-24	08-01-24
Lab Code			L106549-3	
Gross beta	11.10 ± 5.07	7.07 ± 3.22	10.10 ± 4.57	11.10 ± 5.00
Sr-90	< 0.004	< 0.004	< 0.005	< 0.004
Be-7	1.33 ± 0.50	1.64 ± 0.42	0.85 ± 0.44	0.85 ± 0.37
K-40	6.56 ± 1.21	4.44 ± 0.79	6.55 ± 1.00	5.77 ± 0.77
Mn-54	< 0.061	< 0.048	< 0.039	< 0.034
Co-58	< 0.045	< 0.038	< 0.031	< 0.033
Co-60	< 0.058	< 0.054	< 0.036	< 0.024
Nb-95	< 0.053	< 0.049	< 0.053	< 0.034
Zr-95	< 0.087	< 0.081	< 0.076	< 0.061
Ru-103	< 0.058	< 0.045	< 0.038	< 0.029
Ru-106	< 0.373	< 0.383	< 0.367	< 0.258
Cs-134	< 0.059	< 0.045	< 0.055	< 0.031
Cs-137	< 0.054	< 0.048	< 0.037	< 0.028
Ce-141	< 0.078	< 0.075	< 0.053	< 0.037
Ce-144	< 0.305	< 0.335	< 0.202	< 0.158

Table 14. Grass, analyses for gross beta, strontium-90, and gamma-emitting isotopes (continued).
Collection: Quarterly, April through December
Units: pCi/g wet

Sample Description and Concentration (pCi/g wet)

	Indicator			
Location	K-1b	K-1f	K-5	K-34
Date Collected	10-01-24	10-01-24	10-01-24	10-01-24
Lab Code	L107287-1	L107287-2		
Gross beta	7.54 ± 3.44	14.20 ± 6.45	9.51 ± 4.32	10.60 ± 4.81
Sr-90	< 0.004	< 0.004	< 0.004	0.013 ± 0.009
Be-7	4.15 ± 0.46	2.21 ± 0.40	3.92 ± 0.50	2.30 ± 0.34
K-40	5.69 ± 0.70	6.63 ± 0.82	6.56 ± 0.88	8.31 ± 0.70
Mn-54	< 0.034	< 0.035	< 0.048	< 0.034
Co-58	< 0.034	< 0.037	< 0.039	< 0.030
Co-60	< 0.040	< 0.043	< 0.055	< 0.033
Nb-95	< 0.036	< 0.042	< 0.053	< 0.034
Zr-95	< 0.064	< 0.042	< 0.077	< 0.059
Ru-103	< 0.039	< 0.034	< 0.047	< 0.031
Ru-106	< 0.303	< 0.320	< 0.373	< 0.299
Cs-134	< 0.038	< 0.039	< 0.078	< 0.033
Cs-137	< 0.038	< 0.035	< 0.048	< 0.036
Ce-141	< 0.056	< 0.052	< 0.067	< 0.058
Ce-144	< 0.201	< 0.206	< 0.277	< 0.058

	Indicator		Control	
Location	K-38	K-39	K-3	K-35
Date Collected	10-01-24	10-01-24	10-01-24	10-01-24
Lab Code				
Gross beta	12.50 ± 5.68	10.30 ± 4.70	15.70 ± 7.11	9.34 ± 4.23
Sr-90	0.005 ± 0.004	0.009 ± 0.006	< 0.005	< 0.004
Be-7	3.82 ± 0.48	2.59 ± 0.45	1.80 ± 0.32	1.11 ± 0.27
K-40	10.40 ± 0.83	8.12 ± 0.92	11.40 ± 0.90	7.05 ± 0.69
Mn-54	< 0.041	< 0.045	< 0.033	< 0.032
Co-58	< 0.040	< 0.042	< 0.034	< 0.033
Co-60	< 0.053	< 0.038	< 0.043	< 0.037
Nb-95	< 0.042	< 0.048	< 0.037	< 0.033
Zr-95	< 0.075	< 0.083	< 0.064	< 0.051
Ru-103	< 0.039	< 0.042	< 0.038	< 0.034
Ru-106	< 0.371	< 0.371	< 0.336	< 0.277
Cs-134	< 0.040	< 0.045	< 0.038	< 0.039
Cs-137	< 0.043	< 0.043	< 0.037	< 0.032
Ce-141	< 0.061	< 0.055	< 0.058	< 0.046
Ce-144	< 0.224	< 0.209	< 0.243	< 0.173

Table 15. Soil samples, analyses for gross alpha, gross beta, strontium-90, and gamma-emitting isotopes.
Collection: Semiannually

Sample Description and Concentration (pCi/g dry)

	Indicator		
Location	K-1f	K-34	K-38
Date Collected	05-02-24	05-02-24	05-02-24
Lab Code	L105348-1	L105348-3	L105348-5
Gross alpha	4.57 ± 3.39	3.06 ± 2.76	3.58 ± 2.98
Gross beta	32.4 ± 14.9	28.5 ± 13.1	33.7 ± 15.5
Sr-90	< 0.046	< 0.015	< 0.051
Be-7	< 0.84	< 0.73	< 0.66
K-40	17.2 ± 2.3	20.4 ± 2.1	17.1 ± 2.0
Nb-95	< 0.126	< 0.089	< 0.081
Zr-95	< 0.155	< 0.138	< 0.120
Ru-103	< 0.085	< 0.080	< 0.064
Ru-106	< 0.768	< 0.696	< 0.493
Cs-134	< 0.109	< 0.098	< 0.092
Cs-137	< 0.124	< 0.107	< 0.083
Ce-141	< 0.105	< 0.110	< 0.077
Ce-144	< 0.426	< 0.457	< 0.311
Location	K-1f	K-34	K-38
Date Collected	10-01-24	10-01-24	10-01-24
Lab Code	L107287-9	L107287-12	L107287-13
Gross alpha	< 3.67	< 3.73	< 3.80
Gross beta	24.4 ± 11.2	28.0 ± 12.9	31.0 ± 14.3
Sr-90	< 0.057	< 0.063	< 0.066
Be-7	< 0.31	< 0.85	< 0.63
K-40	19.1 ± 1.2	17.9 ± 2.0	20.6 ± 1.7
Nb-95	< 0.046	< 0.114	< 0.087
Zr-95	< 0.077	< 0.182	< 0.138
Ru-103	< 0.042	< 0.084	< 0.079
Ru-106	< 0.369	< 0.869	< 0.636
Cs-134	< 0.051	< 0.115	< 0.082
Cs-137	0.07 ± 0.03	< 0.136	< 0.08
Ce-141	< 0.055	< 0.137	< 0.109
Ce-144	< 0.193	< 0.546	< 0.370

Table 15. Soil samples, analyses for gross alpha, gross beta, strontium-90, and gamma-emitting isotopes (continued).
Collection: Semiannually

Sample Description and Concentration (pCi/g dry)

	Control	
Location	K-3	K-35
Date Collected	05-02-24	05-02-24
Lab Code	L105348-2	L105348-4
Gross alpha	5.68 ± 3.88	4.89 ± 3.55
Gross beta	31.8 ± 14.6	21.5 ± 10.0
Sr-90	< 0.063	< 0.047
Be-7	< 0.62	< 0.51
K-40	21.6 ± 2.0	8.8 ± 1.2
Nb-95	< 0.088	< 0.055
Zr-95	< 0.113	< 0.106
Ru-103	< 0.069	< 0.049
Ru-106	< 0.698	< 0.472
Cs-134	< 0.090	< 0.067
Cs-137	< 0.109	< 0.072
Ce-141	< 0.094	< 0.073
Ce-144	< 0.363	< 0.278
Location	K-3	K-35
Date Collected	10-01-24	10-01-24
Lab Code	L107287-10	L107287-11
Gross alpha	< 2.07	< 1.29
Gross beta	34.5 ± 15.8	26.9 ± 12.4
Sr-90	< 0.065	< 0.065
Be-7	< 0.77	< 0.47
K-40	18.5 ± 2.2	14.9 ± 1.4
Nb-95	< 0.112	< 0.064
Zr-95	< 0.161	< 0.111
Ru-103	< 0.084	< 0.062
Ru-106	< 0.745	< 0.506
Cs-134	< 0.108	< 0.067
Cs-137	< 0.12	0.11 ± 0.05
Ce-141	< 0.126	< 0.078
Ce-144	< 0.443	< 0.272

Table 16. Surface water samples, analyses for gross beta and gamma-emitting isotopes.

Collection: Quarterly

Sample Description and Concentration (pCi/L)			
Indicator			
K-1b			
Date Collected	03-04-24	06-03-24	08-01-24
Lab Code	L104538-1	L105732-9	L106550-1
Gross beta			
Suspended Solids	< 1.5	< 1.5	< 1.7
Dissolved Solids	2.8 ± 1.7	6.4 ± 3.5	3.2 ± 2.1
Total Residue	3.8 ± 2.5	6.2 ± 3.9	8.1 ± 4.8
K-40	< 119	< 118	< 144.0
Mn-54	< 5.9	< 6.7	< 6.9
Fe-59	< 12.6	< 8.5	< 14.3
Co-58	< 5.8	< 7.5	< 6.2
Co-60	< 5.5	< 8.7	< 6.9
Zn-65	< 10.0	< 15.6	< 9.4
Zr-Nb-95	< 6.4	< 6.5	< 6.4
Cs-134	< 6.0	< 7.6	< 7.6
Cs-137	< 5.7	< 4.9	< 7.3
Ba-La-140	< 7.6	< 8.9	< 11.1
K-1d			
Date Collected	03-04-24	06-03-24	08-01-24
Lab Code	L104538-2	L105732-10	L106550-2
Gross beta			
Suspended Solids	< 1.5	< 2.9	< 1.6
Dissolved Solids	1.3 ± 1.0	1.3 ± 1.0	1.7 ± 1.3
Total Residue	2.7 ± 2.1	6.4 ± 3.8	3.3 ± 2.3
K-40	< 108	< 131	< 98.6
Mn-54	< 5.7	< 7.0	< 5.7
Fe-59	< 17.8	< 14.0	< 12.6
Co-58	< 6.0	< 7.1	< 6.2
Co-60	< 7.1	< 7.9	< 6.7
Zn-65	< 13.1	< 13.9	< 11.5
Zr-Nb-95	< 6.2	< 8.8	< 6.4
Cs-134	< 7.6	< 6.4	< 7.1
Cs-137	< 7.2	< 8.2	< 6.3
Ba-La-140	< 7.6	< 8.1	< 9.7

Table 16. Surface water samples, analyses for gross beta and gamma-emitting isotopes (continued).

Collection: Quarterly

Sample Description and Concentration (pCi/L)	
Indicator	
K-1b	
Date Collected	11-04-24
Lab Code	L107809-1
Gross beta	
Suspended Solids	< 1.6
Dissolved Solids	6.6 ± 3.7
Total Residue	9.1 ± 5.3
K-40	< 137
Mn-54	< 6.2
Fe-59	< 7.0
Co-58	< 4.6
Co-60	< 6.5
Zn-65	< 12.8
Zr-Nb-95	< 5.8
Cs-134	< 7.0
Cs-137	< 5.2
Ba-La-140	< 8.5
K-1d	
Date Collected	11-04-24
Lab Code	L107809-2
Gross beta	
Suspended Solids	< 1.7
Dissolved Solids	2.1 ± 1.5
Total Residue	< 2.6
K-40	< 122
Mn-54	< 6.5
Fe-59	< 14.3
Co-58	< 6.8
Co-60	< 4.6
Zn-65	< 16.0
Zr-Nb-95	< 5.7
Cs-134	< 7.5
Cs-137	< 6.9
Ba-La-140	< 7.2

Table 16. Surface water samples, analyses for gross beta and gamma-emitting isotopes (continued).

Collection: Quarterly

Sample Description and Concentration (pCi/L)			
Indicator			
K-1e			
Date Collected	03-04-24	06-03-24	08-01-24
Lab Code	L104538-3	L105732-11	L106550-3
Gross beta			
Suspended Solids	< 1.5	< 2.4	< 1.6
Dissolved Solids	3.2 ± 2.1	3.0 ± 1.9	4.0 ± 2.5
Total Residue	4.5 ± 3.2	4.4 ± 2.8	7.1 ± 4.4
K-40	< 75.3	< 126	< 114.0
Mn-54	< 3.8	< 7.9	< 6.7
Fe-59	< 14.0	< 18.5	< 11.3
Co-58	< 4.2	< 7.0	< 6.4
Co-60	< 5.8	< 6.0	< 6.5
Zn-65	< 12.6	< 11.1	< 9.8
Zr-Nb-95	< 4.9	< 8.4	< 7.6
Cs-134	< 7.9	< 9.8	< 6.7
Cs-137	< 5.3	< 7.8	< 8.1
Ba-La-140	< 6.2	< 9.7	< 11.3

Date Collected	11-04-24
Lab Code	L107809-3
Gross beta	
Suspended Solids	< 1.7
Dissolved Solids	3.4 ± 2.1
Total Residue	4.3 ± 3.2
K-40	< 85.6
Mn-54	< 5.2
Fe-59	< 11.7
Co-58	< 5.7
Co-60	< 7.9
Zn-65	< 11.3
Zr-Nb-95	< 6.1
Cs-134	< 7.0
Cs-137	< 5.7
Ba-La-140	< 9.5

Table 16. Surface water samples, analyses for gross beta and gamma-emitting isotopes (continued).

Collection: Quarterly

Sample Description and Concentration (pCi/L)			
Control			
K-9 (Raw)			
Date Collected	03-04-24	06-03-24	08-01-24
Lab Code	L104538-4	L105732-13	L106550-4
Gross beta			
Suspended Solids	< 1.5	< 2.3	< 1.6
Dissolved Solids	2.0 ± 1.3	2.1 ± 1.3	< 1.6
Total Residue	2.9 ± 2.0	< 3.8	< 2.2
K-40	< 49.9	< 76.4	< 100.0
Mn-54	< 7.2	< 4.8	< 4.2
Fe-59	< 12.9	< 9.8	< 9.4
Co-58	< 6.9	< 4.8	< 4.0
Co-60	< 7.5	< 5.3	< 6.4
Zn-65	< 16.5	< 8.6	< 11.8
Zr-Nb-95	< 6.7	< 4.4	< 5.8
Cs-134	< 8.1	< 5.3	< 5.5
Cs-137	< 8.1	< 4.8	< 5.6
Ba-La-140	< 9.0	< 8.3	< 10.0
K-9 (Tap)			
Date Collected	03-04-24	06-03-24	08-01-24
Lab Code	L104538-5	L105732-12	L106550-5
Gross beta			
Suspended Solids	< 1.5	< 2.3	< 1.6
Dissolved Solids	< 1.3	1.8 ± 1.2	< 1.5
Total Residue	2.4 ± 1.9	< 3.9	< 2.2
K-40	< 114	< 102	< 100.0
Mn-54	< 4.1	< 8.9	< 6.2
Fe-59	< 11.4	< 17.8	< 12.7
Co-58	< 7.1	< 7.7	< 5.6
Co-60	< 9.8	< 8.5	< 4.8
Zn-65	< 10.5	< 12.2	< 10.5
Zr-Nb-95	< 7.6	< 7.1	< 5.8
Cs-134	< 6.8	< 8.3	< 7.1
Cs-137	< 7.7	< 7.9	< 7.4
Ba-La-140	< 9.9	< 12.3	< 11.4

Table 16. Surface water samples, analyses for gross beta, potassium-40, and gamma-emitting isotopes (continued).
Collection: Quarterly

Sample Description and Concentration (pCi/L)	
Control	
K-9 (Raw)	
Date Collected	11-04-24
Lab Code	L107809-4
Gross beta	
Suspended Solids	< 1.6
Dissolved Solids	2.1 ± 1.5
Total Residue	< 2.5
K-40	< 62.4
Mn-54	< 5.0
Fe-59	< 7.0
Co-58	< 5.0
Co-60	< 4.9
Zn-65	< 10.6
Zr-Nb-95	< 5.3
Cs-134	< 5.3
Cs-137	< 5.0
Ba-La-140	< 5.8
K-9 (Tap)	
Date Collected	11-04-24
Lab Code	L107809-5
Gross beta	
Suspended Solids	< 1.6
Dissolved Solids	3.4 ± 2.0
Total Residue	< 2.5
K-40	< 99.3
Mn-54	< 7.0
Fe-59	< 12.8
Co-58	< 6.3
Co-60	< 6.0
Zn-65	< 12.1
Zr-Nb-95	< 5.3
Cs-134	< 6.8
Cs-137	< 5.4
Ba-La-140	< 11.3

Table 17. Surface water, analyses for tritium and strontium-90.

Location and Collection Date	Lab Code	Concentration pCi/L H-3	Concentration pCi/L Sr-90
Indicator			
K-1b			
3/4/2024	L104538-1	< 196	< 2.2
6/3/2024	L105732-9	< 189	< 5.5
8/1/2024	L106550-1	< 188	< 1.5
11/4/2024	L107809-1	< 188	< 3.6
K-1d			
3/4/2024	L104538-2	< 190	< 2.1
6/3/2024	L105732-10	< 191	< 2.4
8/1/2024	L106550-2	< 190	< 1.8
11/4/2024	L107809-2	< 187	< 4.1
K-1e			
3/4/2024	L104538-3	< 194	< 1.6
6/3/2024	L105732-11	< 196	< 2.5
8/1/2024	L106550-3	< 188	< 1.6
11/4/2024	L107809-3	< 190	< 2.8
Control			
K-9			
3/4/2024 (Raw)	L104538-4	< 191	< 1.8
3/4/2024 (Tap)	L104538-5	< 194	< 2.4
6/3/2024 (Raw)	L105732-13	< 190	< 3.2
6/3/2024 (Tap)	L105732-12	< 189	< 2.8
8/1/2024 (Raw)	L106550-4	< 194	< 1.9
8/1/2024 (Tap)	L106550-5	< 191	< 3.4
11/4/24 (Raw)	L107809-4	< 188	< 3.0
11/4/24 (Tap)	L107809-5	< 189	< 3.2

Table 18. Fish, collected at K-1d, analyses for gross beta, and strontium-90 and gamma-emitting isotopes.
Collection: Annually

	Sample Description and Concentration (pCi/g wet)	
Collected	08-24-24	
Lab Code	L106957-1	L106957-2
Type		
Portion	Flesh	Bones
Gross beta	5.65 ± 2.56	3.58 ± 1.64
Sr-90	NA[a]	< 0.03
K-40	4.47 ± 0.91	NA[a]
Mn-54	< 0.057	NA[a]
Fe-59	< 0.157	NA[a]
Co-58	< 0.049	NA[a]
Co-60	< 0.067	NA[a]
Cs-134	< 0.049	NA[a]
Cs-137	< 0.046	NA[a]

[a] NA = Not analyzed; analyses not required.

Table 19. Shoreline sediment samples, analyses for gross beta and strontium-90, and gamma-emitting isotopes.
Collection: May and November

	Sample Description and Concentration (pCi/g dry)		
	Indicator		Control
Location	K-1C	K-1J	K-9
Collection Date	05-02-24	05-02-24	05-02-24
Lab Code	L105349-1	L105349-2	L105349-3
Gross beta	8.07 ± 4.00	8.24 ± 4.08	9.80 ± 4.75
Sr-90	< 0.053	< 0.064	< 0.057
K-40	5..03 ± 0.93	6.41 ± 0.84	8.37 ± 1.25
Co-58	< 0.051	< 0.039	< 0.052
Co-60	< 0.063	< 0.107	< 0.052
Cs-134	< 0.066	< 0.039	< 0.064
Cs-137	< 0.062	< 0.049	< 0.060
Location	K-1C	K-1J	K-9
Collection Date	11-04-24	11-04-24	11-04-24
Lab Code	L107810-1	L107810-2	L107810-3
Gross beta	9.23 ± 4.79	12.8 ± 6.25	10.1 ± 5.1
Sr-90	< 0.065	< 0.058	< 0.066
K-40	4.70 ± 0.90	7.35 ± 1.20	7.91 ± 1.21
Co-58	< 0.052	< 0.069	< 0.052
Co-60	< 0.061	< 0.074	< 0.063
Cs-134	< 0.067	< 0.064	< 0.058
Cs-137	< 0.065	< 0.067	< 0.060

KEWAUNEE SOLUTIONS

2024 Annual Radiological Environmental Operating Report

Kewaunee Power Station

Part III, Condition Reports

Print

CR_ID	2700
Short description	K-43 Environmental air sampler found off due to a tripped breaker.
Site	Kewaunee
Discovery Date/Time	1/30/2024 11:30 AM
Submitter	☐ Mark Peroutka-ext
Submitters Dept	14. Chemistry
Supervisor	☐ Daniel J. Shannon-ext
Unit 1 Mode	DEF
Unit ISFSI?	Yes
Revision #	
Long Description	K-43 Environmental air sampler found off due to an open breaker. The breaker opened due to an issue with the airsample pump. The sample was run time was 146 hours and the expected run time should have been 147 hours.
Initial Actions	Contacted landowner where K-43 is located to reset breaker and replaced pump with a new unit. The filter collected was sent to the vendor laboratory for analysis with a reduced run time (i.e., reduced sample volume).
Recom Actions:	Create CA for RP to include this CR in the annual radiological environmental operating report
additional Contacts	
Tag #:	
Equipment Location	
Equipment Description	
Plant System	
OP-AA-102 Review Reqd?	No
Operability Assesment	N/A
Operability Comments	

Functionality Assessment	N/A
Reportable Condition	No
Reportability Comments	
Is Equipment Important to Emergency Response WM-KW-100 values	No
O/R Comments	
Significance (screening)	3
Potential Repeat (screening)	Yes
Previous Issue	CR2081 Environmental Air Sampler Totalizer Indication Blank at K-43 and K-8 CR2314 Environmental air sampler found not running at location K-43 CR2438 K-43 Environmental Air Sampler run hours was short by about 97 hours.
CRT Comments	CA1130 (Shannon/Peterson) to include CR2700 (K-43 Environmental air sampler found off due to a tripped breaker) in the annual radiological environmental operating report (AREOR)
Work Order #	
Comments	
Status	Pending

Content Type: Item
Version: 5.0
Created at 1/30/2024 3:30 PM by ☐ Mark Peroutka-ext
Last modified at 1/31/2024 10:10 AM by ☐ Timothy P Olson (Dom Nuclear Projects, Inc - 4)

Close

Print

Title	K-43 Environmental air sampler found off due to a tripped breaker.
CA_ID	1130
CR#	2700
Short Description	
DCAC	☐ Timothy Olson-ext
Assignment type	CA
Priority	Per Schedule
Due Date	5/1/2025
Evaluator	☐ Daniel J. Shannon-ext
Assigned Dept	17. Facility Programs & Processes (Various)
Supervisor	☐ Darren J. Peterson
Manager Review Required?	
Manager	
Additional Reviewer	
Detailed Assignment	Include CR2700 (K-43 Environmental air sampler found off due to a tripped breaker) in the annual radiological environmental operating report (AREOR)
Response	
Num Appr Ext	
Site	Kewaunee
is this CA Req'd to resore full qualification or functionality	No
Is this an a(1) corrective action ?	No
Review comments	
Comments	
Email Notification 1	
Email Notification 2	
Due date -6	4/25/2025
Status	Perform Action
CR#:Description (location)	
Location	

CR Short description	K-43 Environmental air sampler found off due to a tripped breaker.

Content Type: Item
Version: 1.0
Created at 1/31/2024 6:58 AM by ☐ Timothy P Olson (Dom Nuclear Projects, Inc - 4)
Last modified at 1/31/2024 6:58 AM by ☐ Timothy P Olson (Dom Nuclear Projects, Inc - 4)

Close

ENERGYSOLUTIONS

CR-2024-0304

Environmental Air Sampler K-8 found with reduced sample run time

Source: Routine

Owning Organization: D&D **Project/Site:** Kewaunee **Functional Area:** Radiation Protection

Description:
Environmental Air Sampler K-8 found with reduced sample run time. The sampler timer had approximately 39 hours less run time than the calculated run time based on when the sample was changed out the previous week. The cause of the reduced sample run time was a temporary loss of power to the sampler due to severe weather the previous week.
Collected sample, completed Environmental sample collection data sheet and included this CR on the form.

Initiate

Completed By: Peroutka, Mark on 04/10/2024

Originator: Mark Peroutka **Date Identified:** 4/9/2024 **Initiated On:** 4/10/2024

Originators Questions	Answer	Notes
Were there any immediate actions taken?	No	N/A
Is there anyone else that might be able to provide additional information?	No	N/A
Externally Identified?	No	N/A

Ops Review

Completed By: Vorpahl, Dwight on 04/10/2024

OPS Review Questions	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Does condition impact operability of plant SSCs?	No	N/A	N/A	
10 CFR 21 Potentially Reportable?	No	N/A	N/A	
10 CFR 71 or 10 CFR 72 Potentially Reportable?	No	N/A	N/A	
10 CFR 50.75g Applicable?	No	N/A	N/A	
Is FFD assessment warranted?	No	N/A	N/A	
Other Actions/Notifications or information as necessary	No	N/A	N/A	
Is Work Process Request (WPR) warranted?	No	N/A	N/A	
Has a WPR already been initiated?	N/A	N/A	N/A	
Is CR result of human performance, or process error related to a quality related SSC?	N/A	N/A	N/A	

Screen

Completed By: Olson, Timothy on 04/15/2024

Completion Due Date: 9/7/2024

Significance Level: SL 3

Designation: CAQ

Responsible Manager: Timothy Olson

Screening Question	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Does Issue meet criteria for CR?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Require Causal Analysis	No	N/A	N/A	
Require an Action Plan	No	Close to actions taken. Event will be captured in the 2024 AREOR in accordance with RP-KW-HSP-HPE-280	N/A	
Require Extent of Condition Review	No	N/A	N/A	

RM Review	Task Skipped
Detailed Evaluation	Task Skipped
RM Concurrence	Task Skipped
QA Review	Task Skipped
CARB Approval	Task Skipped
RM Completion Review	Task Skipped
QA Completion Review	Task Skipped
Final Closure Review	Completed By: Olson, Timothy on 04/15/2024

ENERGYSOLUTIONS

CR-2024-0406

Environmental Air Sampler power loss

Source: Routine

Owning Organization: D&D **Project/Site:** Kewaunee **Functional Area:** Radiation Protection

Description:
While performing the weekly environmental air sample filter exchange, location K-8, environmental air sample pump was found to be without power. Run time on the sample was 8.29hrs. The GFCI was reset and power restored.

Initiate

Completed By: Kruse, James on 05/14/2024

Originator: James D Kruse **Date Identified:** 5/14/2024 **Initiated On:** 5/14/2024

Originators Questions	Answer	Notes
Were there any immediate actions taken?	Yes	GFCI breaker was reset.
Is there anyone else that might be able to provide additional information?	No	N/A
Externally Identified?	No	N/A

Ops Review

Completed By: Smythe, Richard on 05/14/2024

OPS Review Questions	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Does condition impact operability of plant SSCs?	No	N/A	N/A	
10 CFR 21 Potentially Reportable?	No	N/A	N/A	
10 CFR 71 or 10 CFR 72 Potentially Reportable?	No	N/A	N/A	
10 CFR 50.75g Applicable?	No	N/A	N/A	
Is FFD assessment warranted?	No	N/A	N/A	
Other Actions/Notifications or information as necessary	No	N/A	N/A	
Is Work Process Request (WPR) warranted?	No	N/A	N/A	
Has a WPR already been initiated?	N/A	N/A	N/A	
Is CR result of human performance, or process error related to a quality related SSC?	N/A	N/A	N/A	

Screen

Completed By: Olson, Timothy on 05/15/2024

Completion Due Date: 10/11/2024

Significance Level: SL 3

Designation: CAQ

Responsible Manager: Timothy Olson

ENERGYSOLUTIONS

CR-2024-0406

Screening Question	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Does Issue meet criteria for CR?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Require Causal Analysis	No	N/A	N/A	
Require an Action Plan	No	Power was restored to the air sampler upon identification. CR to be included in the 2024 AREOR in accordance with RP-KW-HSP-HPE-280. Close to actions taken. Previous K-8 CRs: CR1904 K-8 environmental air sample pump found in degraded condition (7/9/19) CR1927 K-8 location environmental air sample pump found not running due to blown fuse (8/13/19) CR1940 Environmental air sample pump found off at location K-8 (9/17/19) CR1974 K-8 Location environmental air sample pump found not running due to breaker being open (11/19/19) CR2025K-8 Environmental air sampler found off with blown fuse (3/10/20) CR2081 Environmental Air Sampler Totalizer Indication Blank at K-43 and K-8 (8/4/20) CR2217 K-8 Environmental air sampler found off due to an open breaker. Most likely the breaker opened due to recent lighting storms (8/10/21) CR2474 Environmental Air Sampler at Location K-8 Found Not Running (5/30/23) CR-2024-0304 Environmental Air Sampler K-8 found with reduced sample run time (4/10/24)	N/A	
Require Extent of Condition Review	No	N/A	N/A	

RM Review	Task Skipped
Detailed Evaluation	Task Skipped
RM Concurrence	Task Skipped
QA Review	Task Skipped
CARB Approval	Task Skipped
RM Completion Review	Task Skipped
QA Completion Review	Task Skipped
Final Closure Review	Completed By: Olson, Timothy on 05/15/2024

ENERGYSOLUTIONS

CR-2024-0782

Environmental Air Sampler K-2 power loss

Source: Routine

Owning Organization: D&D **Project/Site:** Kewaunee **Functional Area:** Radiation Protection

Description:
While performing the weekly environmental air sample filter exchange, location K-2, environmental air sample pump was found to be without power. Run time on the sample was 2 hours shorter than expected for the week ending 8/27
Power loss caused by weather event that occurred approximately2 hours prior to sample collection

Initiate

Completed By: Peroutka, Mark on 08/27/2024

Originator: Mark Peroutka **Date Identified:** 8/27/2024 **Initiated On:** 8/27/2024

Originators Questions	Answer	Notes
Were there any immediate actions taken?	No	N/A
Is there anyone else that might be able to provide additional information?	No	N/A
Externally Identified?	No	N/A

Ops Review

Completed By: Smythe, Richard on 08/27/2024

OPS Review Questions	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Does condition impact operability of plant SSCs?	No	N/A	N/A	
10 CFR 21 Potentially Reportable?	No	N/A	N/A	
10 CFR 71 or 10 CFR 72 Potentially Reportable?	No	N/A	N/A	
10 CFR 50.75g Applicable?	No	N/A	N/A	
Is FFD assessment warranted?	No	N/A	N/A	
Other Actions/Notifications or information as necessary	No	N/A	N/A	
Is Work Process Request (WPR) warranted?	No	N/A	N/A	
Has a WPR already been initiated?	N/A	N/A	N/A	
Is CR result of human performance, or process error related to a quality related SSC?	N/A	N/A	N/A	

Screen

Completed By: Olson, Timothy on 09/03/2024

Completion Due Date: 1/24/2025

Significance Level: SL 3

Designation: CAQ

Responsible Manager: Timothy Olson

ENERGYSOLUTIONS

CR-2024-0782

Screening Question	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Does Issue meet criteria for CR?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Require Causal Analysis	No	N/A	N/A	
Require an Action Plan	No	Sampler was confirmed running upon restoration of power to area. CR to be included in the 2024 AREOR in accordance with RP-KW-HSP-HPE-280. Close to actions taken. Previous CRs associated with K-2 air sampler: CR2034 (4/28/20) Environmental Air Particulate Sample at K-2 Not Collected CR2612 (10/17/23) Environmental Air Sampler at Location K-2 Found Not Running	N/A	
Require Extent of Condition Review	No	N/A	N/A	

RM Review	Task Skipped
Detailed Evaluation	Task Skipped
RM Concurrence	Task Skipped
QA Review	Task Skipped
CARB Approval	Task Skipped
RM Completion Review	Task Skipped
QA Completion Review	Task Skipped
Final Closure Review	Completed By: Olson, Timothy on 09/03/2024

Additional Details

Comments

By	Date	Time	Task	Comment
Mark Peroutka	8/27/2024	14:19	Initiate	Ensure sampler is running upon restoration of power to area. CR to be included in the 2024 AREOR in accordance with RP-KW-HSP-HPE-280.

ENERGYSOLUTIONS

CR-2024-1138

Environmental Air Samples Lost in Transit to TBE Lab

Source: Routine

Owning Organization: D&D **Project/Site:** Kewaunee **Functional Area:** Radiation Protection

Description:
On 10/1/24, the weekly environmental air particulate samples were collected from locations K-1f, K-43, K-8 and K-2 as required by RP-KW-HSP-HPE-164 and the Kewaunee Radiological Environmental Monitoring Manual (REMM). The samples were then packaged and sent via US Mail to the Teledyne Brown Environmental (TBE) Laboratory in Knoxville, TN for analysis. As of 12/3/24, the samples have not been received at the TBE Lab and it is assumed they have been lost in transit since they should have been received by now. The environmental sample collection data sheet for the week ending 10/1/24 is attached.

Initiate

Completed By: Shannon, Daniel on 12/03/2024

Originator: Daniel J Shannon **Date Identified:** 12/3/2024 **Initiated On:** 12/3/2024

Originators Questions	Answer	Notes
Were there any immediate actions taken?	No	N/A
Is there anyone else that might be able to provide additional information?	No	N/A
Externally Identified?	No	N/A

Ops Review

Completed By: Smythe, Richard on 12/03/2024

OPS Review Questions	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Does condition impact operability of plant SSCs?	No	N/A	N/A	
10 CFR 21 Potentially Reportable?	No	N/A	N/A	
10 CFR 71 or 10 CFR 72 Potentially Reportable?	No	N/A	N/A	
10 CFR 50.75g Applicable?	No	N/A	N/A	
Is FFD assessment warranted?	No	N/A	N/A	
Other Actions/Notifications or information as necessary	No	N/A	N/A	
Is Work Process Request (WPR) warranted?	No	N/A	N/A	
Has a WPR already been initiated?	N/A	N/A	N/A	
Is CR result of human performance, or process error related to a quality related SSC?	N/A	N/A	N/A	

Screen

Completed By: Olson, Timothy on 12/04/2024

10 CFR 71 Applicable:

Completion Due Date: 5/2/2025

Significance Level: SL 3

Designation: CAQ

Responsible Manager: Timothy Olson

Screening Question	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Does Issue meet criteria for CR?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Require Causal Analysis	No	N/A	N/A	
Require an Action Plan	No	Close to actions take/trend - This is the first incidence in over 10 years that these air samples have been lost in transit. This event will be included in the 2024 AREOR in accordance with RP-KW-HSP-HPE-280.	N/A	
Require Extent of Condition Review	No	N/A	N/A	

RM Review Task Skipped

Detailed Evaluation Task Skipped

RM Concurrence Task Skipped

QA Review Task Skipped

CARB Approval Task Skipped

RM Completion Review Task Skipped

QA Completion Review Task Skipped

Final Closure Review Completed By: Olson, Timothy on 12/04/2024

Additional Details

Attachments

10-1-24 Environmental Sample Collection Data Sheet.pdf

Comments

By	Date	Time	Task	Comment
Daniel J Shannon	12/3/2024	13:47	Initiate	There are no corrective actions recommended. This is the first incidence in over 10 years that these air samples have been lost in transit. This event will be included in the 2024 AREOR in accordance with RP-KW-HSP-HPE-280.

ATTACHMENT B
Environmental Sample Collection Data Sheet
(Page 1 of 1)

Environmental Air Sampler Filter Changes

Particulate air filters **SHALL** be changed weekly.

☐ Check if **NOT** sampled and leave this section blank

Location	Pre-Filter Change Op Check	Filter Service Date/Time	Roto-meter Flow Rate (LPM)	Indicated Total Run Time (hour-min.)	Post-Filter Change Op Check
K-1f	☒ SAT ☐ UNSAT	ON: 09/24/24 1030 OFF: 10-1-24/ 0935	ON: 30 OFF: 30	167.07	☒ SAT ☐ UNSAT
K-43	☒ SAT ☐ UNSAT	ON: 09/24/24 / 1037 OFF: 10-1-24/ 0944	ON: 30 OFF: 30	167.08	☒ SAT ☐ UNSAT
K-8	☒ SAT ☐ UNSAT	ON: 09/24/24/ 1046 OFF: 10-1-24/ 0953	ON: 30 OFF: 30	167.08	☒ SAT ☐ UNSAT
K-2	☒ SAT ☐ UNSAT	ON: 09/24/24 / 1243 OFF: 10-1-24/ 1021	ON: 30 OFF: 30	165.39	☒ SAT ☐ UNSAT

Fish Sample

☒ Check if **NOT** sampled and leave this section blank

Date/Time: _____ Species or Type: _____

Comments: _____

Problems encountered? ☐ YES ☒ NO

Condition Report submitted? ☐ YES ☒ NO CR Number: N/A

Performed By: Mark Perovich (Print/Sign) Date: 10-1-24

Reviewed By: Daniel J. Shannon (Print/Sign) Date: 10-1-24

INFORMATION USE

ENERGYSOLUTIONS

CR-2025-0184

2024 Land Use Census Delayed

Source: Routine

Owning Organization: D&D **Project/Site:** Kewaunee **Functional Area:** Radiation Protection

Description:
An annual Land Use Census is required to be performed in accordance with the KPS Radiological Environmental Monitoring Manual (REMM) Section 2.2.2. The Land Use Census is required to be performed during the growing season once per 12 months in accordance with REMM Surveillance Requirement 2.3.2, and the results are reported in the Annual Radiological Environmental Operating Report (AREOR) in accordance with REMM 2.4.1.a. KPS uses a vendor (Microbac) to perform and report the results of the annual Land Use Census in accordance with RP-KW-001-004, Land Use Census Program. The census is normally completed in September by the vendor, the results are reported to KPS in the first quarter of the following year, and then the census results are included in the AREOR that is due to be sent to the NRC by May 15th.

The 2024 Land Use Census report provided to KPS on February 18, 2025, stated that the 2024 Land Use Census was completed on January 28-29, 2025. Completion of the census was delayed due to the unanticipated retirement of the individual who was assigned to complete it in September of 2024. Attempts to contact the individual to obtain the results of the census were unsuccessful. The delayed 2024 Land Use Census report indicated that there were no discernable changes observed in the census.

Initiate

Completed By: Shannon, Daniel on 02/19/2025

Originator: Daniel J Shannon **Date Identified:** 2/19/2025 **Initiated On:** 2/19/2025

Originators Questions	Answer	Notes
Were there any immediate actions taken?	Yes	Notified RP Manager; reviewed REMM for any required immediate actions or reportability (none); initiated CR.
Is there anyone else that might be able to provide additional information?	No	N/A
Externally Identified?	No	N/A

Ops Review

Completed By: Jeanquart, Darin on 02/19/2025

OPS Review Questions	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Does condition impact operability of plant SSCs?	No	N/A	N/A	
10 CFR 21 Potentially Reportable?	No	N/A	N/A	
10 CFR 71 or 10 CFR 72 Potentially Reportable?	No	N/A	N/A	
10 CFR 50.75g Applicable?	No	N/A	N/A	
Is FFD assessment warranted?	No	N/A	N/A	
Other Actions/Notifications or information as necessary	No	N/A	N/A	
Is Work Process Request (WPR) warranted?	No	N/A	N/A	
Has a WPR already been initiated?	N/A	N/A	N/A	
Is CR result of human performance, or process error related to a quality related SSC?	N/A	N/A	N/A	

Screen

Completed By: Olson, Timothy on 02/20/2025

10 CFR 71 Applicable: No

ENERGYSOLUTIONS

CR-2025-0184

Completion Due Date: 7/19/2025

Significance Level: SL 3

Designation: CAQ

Responsible Manager: Timothy Olson

Screening Question	Answer	Notes	Person Notified	Date Notified
Is information in CR adequate?	Yes	N/A	N/A	
Does Issue meet criteria for CR?	Yes	N/A	N/A	
Are any Interim Actions needed?	No	N/A	N/A	
Require Causal Analysis	No	N/A	N/A	
Require an Action Plan	No	Close to actions taken - A tracking action item to verify completion of the land use census by the vendor was added to the RP Technical Group monthly duties checklist for the months of August and September each year. This issue will be included in the 2024 AREOR in accordance with RP-KW-HSP-HPE-280.	N/A	
Require Extent of Condition Review	No	N/A	N/A	

RM Review

Task Skipped

Detailed Evaluation

Task Skipped

RM Concurrence

Task Skipped

QA Review

Task Skipped

CARB Approval

Task Skipped

RM Completion Review

Task Skipped

QA Completion Review

Task Skipped

Final Closure Review

Completed By: Olson, Timothy on 02/20/2025

Additional Details

Comments

By	Date	Time	Task	Comment
Daniel J Shannon	2/19/2025	13:33	Initiate	A tracking action item to verify completion of the land use census by the vendor was added to the RP Technical Group monthly duties checklist for the months of August and September each year. This CR will be included in the 2024 AREOR in accordance with RP-KW-HSP-HPE-280. Recommend closing this CR to the actions taken.