

Point Beach-Kewaunee Environmental Radioactivity Survey

2018



WISCONSIN DEPARTMENT
of **HEALTH SERVICES**

**Division of Public Health
Bureau of Environmental and Occupational Health
Radiation Protection Section**

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Executive Summary

Wisconsin Stat. § 254.41 mandates the Wisconsin Department of Health Services (DHS) to conduct environmental radiation monitoring around the nuclear power facilities that affect Wisconsin. This environmental monitoring report is for the Point Beach and Kewaunee nuclear generating plants for the calendar year January - December 2018 and provides a description and results of this environmental monitoring program.

The DHS environmental monitoring program consists of the collection of various types of samples from the air, water, and terrestrial exposure pathways, sample analysis, and interpretation of the data. The sampling program included samples of air, precipitation, ambient gamma radiation, surface water, fish, shoreline sediment, soil, milk, well water, and vegetation that are collected from selected locations at planned sampling intervals.

Program Summary

For 2018, all sample results from the Point Beach-Kewaunee environmental monitoring area were less than state and federal standards or guidelines.

The DHS environmental monitoring programs provide an ongoing baseline of radioactivity measurements to assess any Wisconsin health concerns from the operation of nuclear power generating facilities in or near Wisconsin or other radiological incidents that may occur within Wisconsin or worldwide. These monitoring programs show the following:

Environmental radioactivity levels have been trending downward in the time period since the 1950s–1960s atmospheric nuclear testing and such radiological incidents as the Chernobyl nuclear reactor incident of 1986 and Fukushima Daiichi incident in 1986.

- There were no incidents during 2018 that required additional environmental monitoring.
- There is no radioactive problem with sampled types of food consumed in Wisconsin and no health problem related to radioactivity for Wisconsin citizens.

DHS's ongoing environmental monitoring programs will continue to provide assurances to the citizens of Wisconsin that the environment surrounding the Kewaunee Power Station and Point Beach nuclear power facilities will continue to be evaluated.

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Point Beach-Kewaunee

Environmental Radioactivity Survey, 2018

Introduction

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DHS Point Beach-Kewaunee Environmental Monitoring Sampling Program

DHS environmental monitoring program consists of the collection of various types of samples from the air, water, and terrestrial exposure pathways. The sampling program included samples of air, precipitation, ambient gamma radiation as measured by thermoluminescent dosimeters (TLD), surface water, fish, shoreline sediment, soil, milk, well water, and vegetation that are collected from selected locations at planned sampling intervals.

Table 1 provides a listing of types of samples collected, collection frequency, sites where samples are collected, number of samples collected, number of samples that were missed or had sample or analysis deviations, and a listing of the required analyses. Table 2 is a listing of sampling sites and includes a description, direction, and distance from the monitored power plants. Table 3 provides an explanation of missing samples or non-routine sample analyses. Figure 1 is a map showing the location of environmental sampling sites in relation to Kewaunee Power Station and Figure 2 is a map showing the location of environmental sampling sites in relation to the Point Beach power plant.

Program Modifications

There were no program modification implemented for calendar year 2018.

Laboratory Services and Quality Assurance

Analysis of the samples is performed under contract with the Wisconsin State Laboratory of Hygiene (WSLH). WSLH maintains a quality assurance program. Analytical procedures provide for routine replicate analyses to verify methods and instrument operation. Traceable sources are used daily to regularly calibrate instrumentation and conduct performance checks. Instrumentation quality control charts are maintained and available upon written request.

WSLH participates in the Environmental Resource Associates' Proficiency Testing program and has performed satisfactorily over the report period. In addition, WSLH participates in the Multi Analytical Performance Evaluation Program (MAPER) for environmental matrix analysis. Proficiency testing results are available from the Wisconsin State Laboratory of Hygiene.

Detection Limits

Detection limits, required by DHS, are expressed as a lower limit of detection (LLD). The required DHS LLD as indicated in Table 4 under the heading "LLD" is an "a priori" estimate of the capability for detecting an activity concentration by a given measurement system, procedure, and type of sample. Counting statistics of the appropriate instrument background are used to compute the LLD for each specific analysis. Using 4.66 times the standard deviation (s_b) of the instrument background, the LLD for each specific analysis is defined at the 95% Confidence Level.

The LLD for each radioisotope listed in Table 4 has been calculated from the following equation:

$$LLD = \frac{4.66 s_b}{E * V * 2.22 * Y * S * \exp(-dt)}$$

Where:

- LLD is the "a priori" lower limit of detection as defined above, as picocuries per unit mass or volume.
- s_b is the standard deviation of the background counting rate or of the counting rate of blank sample as appropriate, as counts per minute.
- E is the counting efficiency, as counts per disintegration.
- V is the sample size in units of mass or volume.
- 2.22 is the number of disintegrations per minute per picocurie.
- Y is the fractional radiochemical yield, when applicable.
- S is the self-absorption correction factor.
- d is the radioactive decay constant for the particular radionuclide.
- t is for environmental samples, the elapsed time between sample collection, or end of the sample collection period, and time of counting.

Typical values for E, V, Y and dt have been used to calculate the LLD.

Reporting of Sample Analysis Results

Results for specific analyses are reported as either a "less than" (<) value or an actual activity value. The reporting of results in Table 4 under the heading "Range" and in Tables 5 -16 is an "a posteriori" calculation based on the actual analysis performed using the actual sample values for E, V, Y, and dt. Typically the reported "less than" (<) results are lower than the required Wisconsin DHS LLD indicating that the required DHS LLD has been met.

An actual activity value will be accompanied by an uncertainty term for that analysis. The uncertainty term is a plus or minus counting uncertainty term at the 2 sigma (95%) confidence interval and is printed as (+- or \pm).

Examples and explanations of data reporting are:

Example	Nuclide	Activity reported
1	^{137}Cs	< 10 pCi/liter
2	^{137}Cs	15 ± 3 pCi/liter

In example 1 we can be 95% confident that the sample activity, if any, is less than the LLD of 10 pCi/liter. In example 2 we can be 95% confident that the actual sample activity is greater than the LLD for that analysis and is between 12 and 18 pCi/liter.

Table 1 Sample collection summary and required analyses for 2018.

Sample Type	Collection and Frequency	Site Locations	Number of Samples Collected	Number of Sample Deviations	Required Analyses
air particulate	C/W	1, 4, 7, 8, 17, 18	245	9	GA, GB, GI ^w
air iodine	C/W	4, 17, 18	125	3	GI
precipitation	C/BW	1, 4	12	0	GB ^{x,u} , H ^x
TLD	G/Q	T1–T18, T20, T28-T31, T51–T58	124	0	ambient gamma
surface water	G/M	9, 12a, 17	31	1	GA ^{u,v} , GB ^{u,v} , GI, Sr ^z , H ^z , I ^y
surface water	G/SA	5, 29	6	0	GA ^{u,v} , GB ^{u,v} , GI, Sr, H
fish	G/Q	10a	7	1	GI
shoreline sediment	G/A	5, 10a, 12a, 12b, 12c, 26, 29	7	0	GA, GB, GI
vegetation	G/SA	1, 2, 3, 4, 5, 7, 8, 14, 17	18	0	GA, GB, GI
soil	G/SA	1, 2, 3, 4, 5, 7, 8, 14, 17	18	0	GA, GB, GI
well water	G/SA	3, 10b, 11, 12d N, 12d S	8	2	GA, GB, H
milk	G/M	24, 27, 28	36	0	GI, I ^y , Sr

Collection type: C/ = continuous; G/ = grab

Frequency: /W = weekly; /M = monthly; /Q = quarterly; /A = annually; /BW = bi-weekly; /SA = semi-annually

Required analyses: GA = gross alpha; GB = gross beta; GI = gamma isotopic; Sr = strontium; I = iodine; H = tritium

^u = Soluble

^v = Insoluble

^w = A quarterly composite for each site

^x = One monthly composite from 2 sites

^y = The procedure is performed six (6) times per year for each sample site

^z = The procedure is performed for each site on a quarterly composite (3-month composite)

Table 2 Wisconsin DHS Point Beach-Kewaunee environmental monitoring sampling sites.

Sample site	Distance and direction (miles)		Location description
	Kewaunee	Point Beach	
PBK-1	5.7 WSW	5.7 WNW	Francar residence
PBK-2	4.9 S	0.7 SSW	Southwest corner property line - Point Beach
PBK-3	4.3 SSW	1.5 W	Two Creeks Town Hall
PBK-4	3.1 S	1.2 NNW	Residence north property line - Point Beach
PBK-5	2.6 S	1.7 NNW	Two Creeks Park; NW corner of property
PBK-7	7.3 SSW	3.3 SSW	WPSC substation, Cty V
PBK-8	0.8 WNW	4.9 N	P Ihlenfeldt farm
PBK-9	4.7 S	0.5 SSE	Point Beach, meteorological tower
PBK-10a	4.2 S	0.1 E	Point Beach, effluent channel
PBK-10b	4.2 S	0.1 E	Point Beach, entrance
PBK-11	3.1 SSW	2.0 NW	Two Creeks International Harvester
PBK-12a	0.1 E	4.2 N	Kewaunee, effluent channel
PBK-12b	0.1 E	4.2 N	Kewaunee, effluent channel, 500 feet N
PBK-12c	0.1 E	4.2 N	Kewaunee, effluent channel, 500 feet S
PBK-12d	0.1 W	4.2 N	Kewaunee, well sites (North and South)
PBK-14	0.8 W	4.3 N	Nuclear Road – field east of parking lot
PBK-17	11.4 NNE	15.6 N	Green Bay Pumping Station - Rostok
PBK-18	0.1 S	4.1 N	Kewaunee, meteorological tower
PBK-24	2.6 N	6.9 N	L. Struck farm
PBK-26	8.3 NNE	12.6 N	Kewaunee
PBK-27	3.5 SSW	1.7 NW	R. Barta farm
PBK-28	6.0 S	1.8 SSE	Strutz Farms Inc
PBK-29	6.1 SSE	2.1 SSE	Irish Road – at Lake Michigan
PBK-(T1-T8)	4.0 S	0.6 NW	Point Beach ISFSI on outside of perimeter fence
PBK-T9	3.2 S	1.2 NNW	Point Beach north property line, Lakeshore Road
PBK-T10	5.1 S	0.8 SSE	Nuclear Road, 0.6 mile E of Lakeshore Road
PBK-T11	5.1 S	0.9 SSW	Nuclear Road, 0.1 mile E of Lakeshore Road
PBK-T12	5.0 SSW	1.4 WSW	Highway 42, 0.6 mile N of Nuclear Road
PBK-T13	4.0 SSW	1.4 WNW	Highway 42, 0.3 mile N of Tapawingo Road
PBK-T14	3.1 SSW	1.9 NW	Two Creeks Road, 0.1 mile E of Highway 42
PBK-T15	7.6 S	3.3 S	Junction of Lakeshore Road and Ravine Drive
PBK-T16	7.3 SSW	3.3 SW	Cty V, 0.5 mile W of Hwy 42
PBK-T17	5.6 SW	3.8 W	Junction of Saxonbury Road and Tapawingo Road
PBK-T18	3.2 SW	3.3 NW	Zander Road, 0.1 mile W on Tannery Road
PBK-T28	7.2 NNE	11.4 N	Kewaunee, South on Hwy 42
PBK-T29	12.4 S	8.1 SSW	Two Rivers, Junction of Hwy 42 and 34th Avenue
PBK-T30	16.0 SSW	11.9 SSW	Manitowoc, Hwy 42, Two Rivers Chamber of Commerce
PBK-T31	8.6 SW	5.6 WSW	Mishicot, Cty V, in front of house #653
PBK-T51-T58	0.1 NNW	4.4 N	KPS ISFSI on the inside of the perimeter fence

Table 3 Missing sample or sample deviation report for 2018.

Sample type	Date	Site	Explanation
Air Particulate	11/14/18	PBK-1	Report not returned from lab - unavailable
Air Particulate	05/16/18	PBK-4	Report not returned from lab - unavailable
Air Particulate	05/23/18	PBK-4	Report not returned from lab - unavailable
Air Particulate	05/09/18	PBK-7	Report not returned from lab - unavailable
Air Particulate	05/16/18	PBK-7	Report not returned from lab - unavailable
Air Particulate	07/25/18	PBK-7	Report not returned from lab - unavailable
Air Particulate	08/01/18	PBK-7	Report not returned from lab - unavailable
Air Particulate	07/06/18	PBK-17	Report not returned from lab - unavailable
Air Particulate	03/26/18	PBK-18	Report not returned from lab - unavailable
Air Particulate	06/25/18	PBK-18	Report not returned from lab - unavailable
Air Particulate	July - Dec	PBK-8	Discontinued starting July 1 due to Kewaunee decommissioning
Air Particulate	July - Dec	PBK-18	Discontinued starting July 1 due to Kewaunee decommissioning
Air Particulate	04/23/18	PBK-4	Low air volume
Air Particulate	05/09/18	PBK-4	Low air volume
Air Particulate	05/31/18	PBK-4	Low air volume
Air Particulate	04/18/18	PBK-7	Low air volume
Air Particulate	07/03/18	PBK-7	Low air volume
Air Particulate	05/15/18	PBK-8	Low air volume
Air Particulate	05/22/18	PBK-8	Low air volume
Air Particulate	05/29/18	PBK-8	Low air volume
Air Particulate	06/28/18	PBK-17	Low air volume
Air Particulate	11/21/18	PBK-17	Low air volume
Air Particulate	02/26/18	PBK-18	Low air volume
Air Particulate	05/23/18	PBK-18	Low air volume
Surface Water	01/08/18	PBK-9	Sample not collected due to ice build-up along the shoreline
Surface Water	11/14/18	PBK-9	Isotope not reported by lab
Surface Water	12/11/18	PBK-9	Isotope not reported by lab
Surface Water	11/05/18	PBK-17	I-131 analyzed 180 days after holding time
Surface Water	12/04/18	PBK-17	I-131 analyzed 180 days after holding time
Surface Water	12/04/18	PBK-17	Suspended solids alpha and beta could not be analyzed due to lab accident
Surface Water	5/30/18	PBK-5	Analyte not reported by lab
Well Water	July	PBK-12s S	Kewaunee Power Station's South well was discontinued due to reduced need of water.
Fish 4th Quarter	Oct - Dec	PBK-10a	Insufficient sample size for analysis
Well Water	May	PBK-12d1	Kewaunee Power Station South well – Discontinued starting July 1 due to Kewaunee decommissioning
Well Water	May	PBK-12d1	Kewaunee Power Station South well – Discontinued starting July 1 due to Kewaunee decommissioning
Well Water	Sept	PBK-12d1	Kewaunee Power Station South well – Discontinued starting July 1 due to Kewaunee decommissioning
Milk	9/12/18	PBK-24	Iodine not reported by laboratory
Milk	2/14/18	PBK-27	Strontium 90 not reported by laboratory

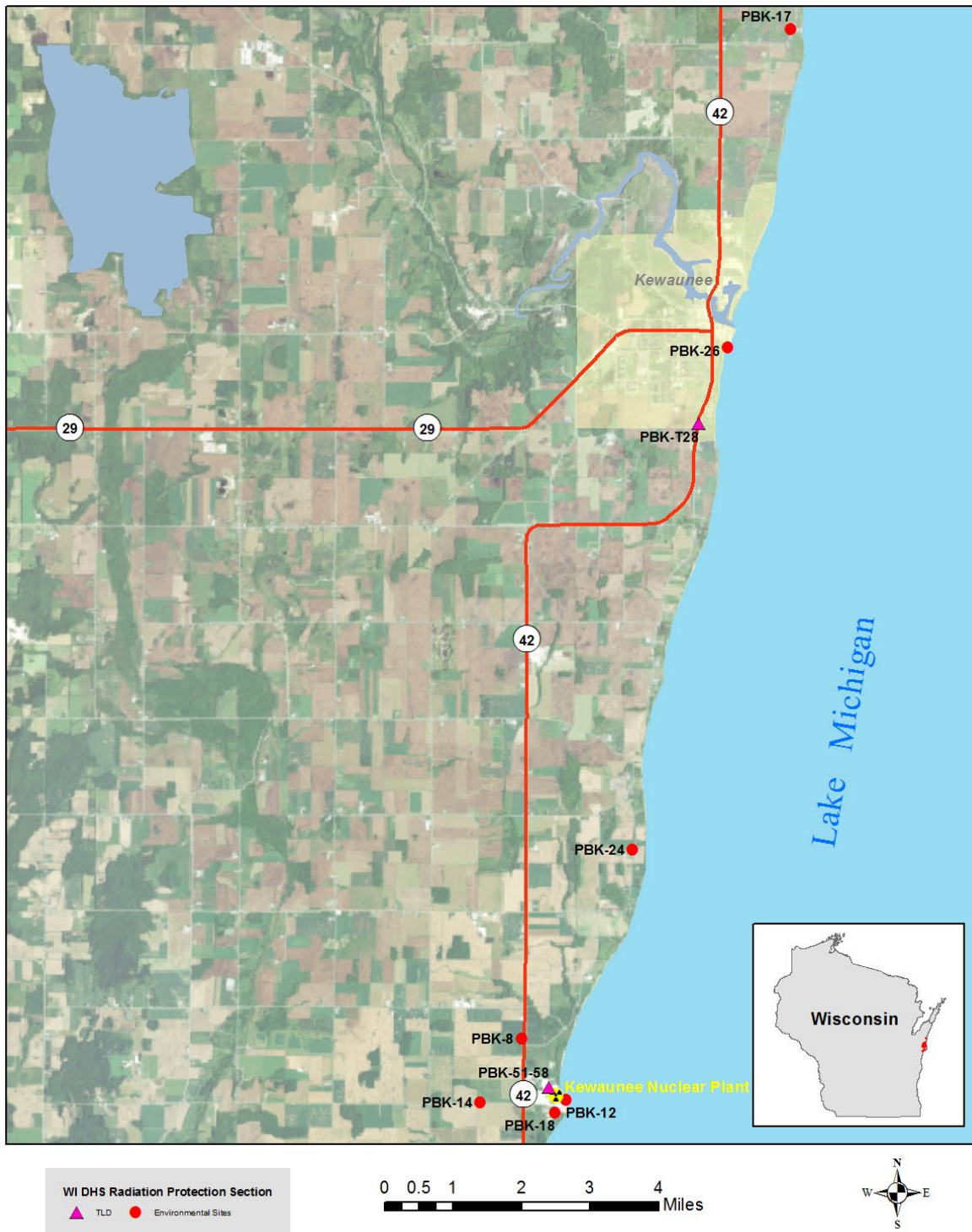


Figure 1 Point Beach-Kewaunee environmental monitoring sampling sites in relation to the Kewaunee plant.

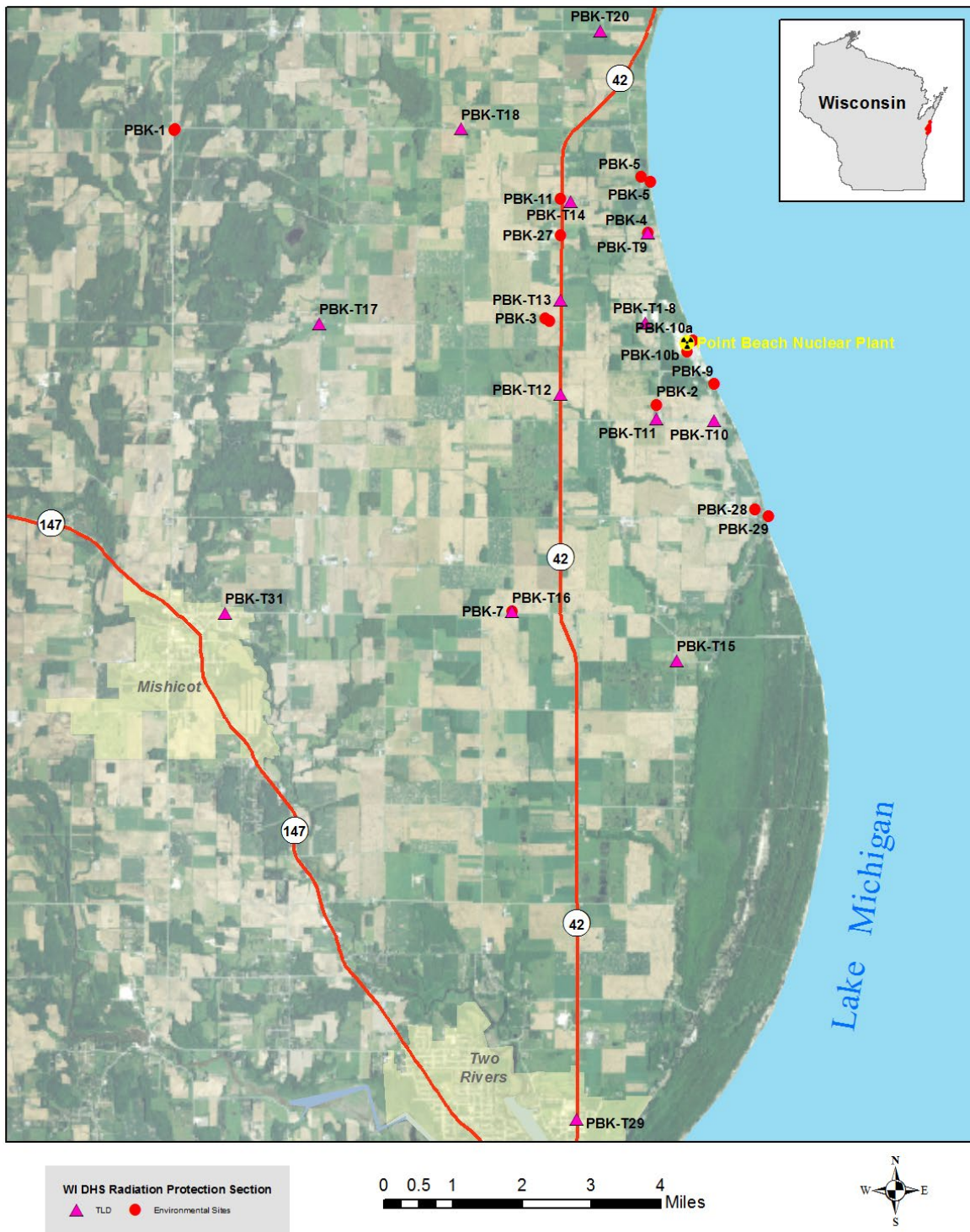


Figure 2 Point Beach-Kewaunee environmental monitoring sampling sites in relation to the Point Beach plant.

Results and Discussion for the Wisconsin DHS Point Beach-Kewaunee Environmental Monitoring program

Air Particulate

Table 4 provides a summary of reported activities by DHS for air particulate samples. Tables 5–6 provide results from the individual sample analyses.

From the gross beta activities listed in Table 4, it may be noted that there were no significant differences due to distance away from either the Kewaunee or the Point Beach facility. Although the gross beta activity was above the LLD, it was similar to previous years; and the increase in gross beta activity could not be attributed to Kewaunee Power Station or the Point Beach nuclear plant operation.

The gamma isotopic analysis of the quarterly air particulate filter composites detected only background levels of the radioisotopes listed in Table 6. All other radioisotopes were below their respective LLD. Beryllium-7 (^7Be), detected in all composites, is a naturally occurring radioisotope that is constantly produced through nuclear reactions between cosmic rays and nuclei in the atmosphere and was detected in air composites from other areas of the state.

Air Iodine

Table 4 provides a summary of reported activities by DHS for air iodine samples. Table 5 provides results from the individual sample analyses.

All air iodine measurements were below the LLD of 0.07 pCi/m^3 . Sample analysis suggests that neither the Kewaunee Power Station nor the Point Beach nuclear generating facilities influenced air iodine levels during the reporting period.

Ambient Gamma Radiation—Thermoluminescent Dosimeters (TLD)

Table 4 provides a summary of reported activities by DHS for ambient gamma radiation. Table 7 provides results from the individual sample analyses.

Analysis of samples taken at varying distances from either Kewaunee Power Station or Point Beach nuclear facilities did not yield significant differences in exposure for sites PBK-T9 through PBK-T31. Excluding the sites around the perimeter of the Point Beach ISFSI (PBK-T1 – PBK-T8) and Kewaunee Power Stations ISFSI (PBK-51 - PBK-58), the average quarterly exposure from the remaining 15 sites was 14.4 ± 1.7 milliroentgens. The average quarterly exposure at the Point Beach ISFSI for 2018 was at background levels and was comparable to other areas in Wisconsin. In 2018 there was a substantial increase in exposure readings for 4 TLD around the Kewaunee Power Station ISFSI. This increase corresponds to the placement of additional spent fuel on the ISFSI pad. Influence by the Kewaunee Station or the Point Beach nuclear generating facilities on air quality is not evident from ambient gamma radiation analysis.

Precipitation

Table 4 provides a summary of reported activities by DHS for precipitation. Table 8 provides results from the individual sample analyses. Sample analysis indicates that neither the Kewaunee Power Station nor the Point Beach nuclear generating facilities influenced precipitation activity levels.

The gross beta activity in precipitation was within the normal range of activity when compared to previous years' data.

Fish

Table 4 provides a summary of reported activities by DHS for fish samples. Table 9 provides results from the individual sample analyses. The fish samples showed no unusual activities. Forty quarter samples lacked sufficient volume to conduct gamma analysis.

Shoreline Sediment

Table 4 provides a summary of reported activities by DHS for shoreline sediment samples. Table 10 provides results from the individual sample analyses.

Analysis of the shoreline samples showed no unusual activities. All samples indicated naturally occurring potassium-40 (^{40}K). Previous years' reported activities also detected cesium-137 (^{137}Cs), which was likely attributable to residual fallout from previous atmospheric nuclear weapons testing. Samples commonly detect naturally occurring radioisotopes from the uranium-238 (^{238}U) and thorium-232 (^{232}Th) decay series, but they have not been quantified or reported. Sample analysis indicates that neither the Kewaunee Power Station nor the Point Beach nuclear generating facilities influenced shoreline sediment activity levels.

Surface Water

Table 4 provides a summary of reported activities by DHS for surface water samples. Table 11 provides results from individual sample analyses.

Gamma isotopic analysis found all radioisotopes were below their respective LLD. Nearly all activity for gross beta, gross beta suspended solids, and iodine were at background levels and were comparable to data from previous years. In May of 2018 an increased tritium concentration was observed at two surface water locations. The tritium increased to 2520 and 633 pCi/L from the average of ~90 pCi/L. Further analysis did not find elevated Sr-89, Sr-90 or gamma emitters in the tritium samples.

All isotopes show activities well below state or federal standards. Influence by Point Beach and Kewaunee Power Station nuclear generating facilities is not evident from surface water sample analysis.

Well Water

Table 4 provides a summary of reported activities by DHS for well water samples. Table 12 results from the individual sample analyses.

The well water samples showed no unusual gross alpha and gross beta activities and all activities for tritium (^3H) were less than its LLD. The measured activities were all below state and federal standards. Influence by the Kewaunee Power Station or Point Beach nuclear generating facilities is not evident from well water sample analysis.

Milk

Table 4 provides a summary of reported activities by DHS for milk samples. Table 13 results from the individual sample analyses.

The analysis of milk samples detected no unusual activities. Naturally occurring potassium-40 (^{40}K) was detected in all samples. The detection of strontium-90 (^{90}Sr), is attributable to residual fallout from previous atmospheric nuclear weapons testing. Strontium-90 has also been detected in previous years at similar activity levels. Influence by the Kewaunee Power Station or Point Beach nuclear generating facilities is not evident from milk sample analysis.

Vegetation

Table 4 provides a summary of reported activities by DHS for vegetation samples. Table 14 provides results from the individual sample analyses.

Analysis of the vegetation samples showed no unusual activities, even though gross beta was above the LLD the values were consistent with previous years. The gamma isotopic analysis detected naturally occurring potassium-40 (^{40}K) and beryllium-7 (^7Be) above the LLD, but the values were consistent with previous years samples. Influence by the Kewaunee or Point Beach nuclear generating facilities is not evident from vegetation sample analysis.

Soil

Table 4 provides a summary of reported activities by DHS for soil samples. Table 15 provides results from the individual sample analyses.

Analysis of the soil samples showed no unusual activities, even though all gross beta were above the LLD, the values were consistent with previous years. Naturally occurring potassium-40 (^{40}K) was detected in all samples. The reported activities for cesium-137 (^{137}Cs) were also detected in previous years and are attributable to residual fallout from previous atmospheric nuclear weapons testing. Naturally occurring radioisotopes from the uranium-238 (^{238}U) and thorium-232 (^{232}Th) decay series are commonly detected but have not been quantified or reported. Influence by the Kewaunee or Point Beach nuclear generating facilities is not evident from soil sample analysis.

Point Beach Independent Spent Fuel Storage Installation

Table 7 provides a summary of reported activities by DHS for ambient gamma radiation monitored in the vicinity of the Point Beach Independent and Kewaunee Power Station Spent Fuel Storage Installation (ISFSI).

Thermoluminescent dosimeter (TLD) measurements detected ambient gamma exposure levels greater than background at all sites (T1–T8) located on the Point Beach ISFSI perimeter fence closest to the ventilated storage casks. TLD measurements did not detect an increase in ambient gamma exposure levels at sites T9 - T14 (14.9 ± 1.5 milliroentgens; 0.8 – 1.9 miles from the Point Beach ISFSI) or at sites T15–T31 (13.9 ± 1.7 milliroentgens; greater than 2 miles from the Point Beach ISFSI). These readings are consistent with previous years' data. In 2018 average standard quarterly ambient gamma exposure for sites T9 –T31 was 14.4 ± 1.7 milliroentgens and for sites T1–T8 was 39.4 ± 15.6 milliroentgens per standard quarter depending on the distance from the storage casks.

Kewaunee Power Station Independent Spent Fuel Storage Installation

Table 7 provides a summary of reported activities by DHS for ambient gamma radiation monitored in the vicinity of the Kewaunee Power Station Independent Spent Fuel Storage Installation (ISFSI).

Thermoluminescent dosimeter (TLD) measurements did detect ambient gamma exposure above background at sites T51–T58, located on the Kewaunee Power Station ISFSI perimeter fence. TLD measurements did not detect an increase in ambient gamma exposure levels at sites T9, T18, and T20 (13.8 ± 1.4 milliroentgens; 1.4–3.1 miles from the Point Beach ISFSI). In 2018, average standard quarterly ambient gamma exposure for sites T9–T31 was 14.4 ± 1.7 milliroentgens, and for sites T51–T58 was 108.7 ± 100.1 milliroentgens per standard quarter, depending on the distance from the storage casks.

The increase in ambient gamma radiation coincides with the placement of spent nuclear fuel from the cooling pool to the ISFSI.

Dose to an Average Individual

Federal regulations 10 CFR 20, 10 CFR 50 Appendix I, and 40 CFR 190 restrict the annual exposure of the population from all parts of the nuclear fuel cycle, including nuclear power plants. Doses resulting from gaseous and liquid effluent releases from the Point Beach or Kewaunee nuclear generating facilities are less than the limits as stated in these federal regulations.

The DHS limit for permissible levels of radiation exposure from external sources in unrestricted areas is defined in the Wis. Admin. Code § DHS 157.23. Doses resulting from gaseous and liquid effluent releases from the Point Beach or Kewaunee nuclear generating facilities are less than the limits as stated in Wis. Admin. Code § DHS 157.23.

References

Wisconsin Admin. Code § DHS 157.23

State of Wisconsin, "FINAL ENVIRONMENTAL IMPACT STATEMENT, Point Beach Nuclear Power Plant Projects Proposed by Wisconsin Electric Power Company, Temporary Storage of Spent Nuclear Fuel in Dry Casks, PSC Docket 6630-CE-197, Unit 2 Steam Generator Replacement, PSC Docket 6630-CE-209, AUGUST 1994."

U.S. Environmental Protection Agency, Environmental Radiation Requirements for Normal Operations of Activities in the Uranium Fuel Cycle, EPA 520/4-76-016, 40 CFR Part 190, November 1976.

U.S. Nuclear Regulatory Commission, Title 10, Part 20.

U.S. Nuclear Regulatory Commission, Title 10, Part 50, Appendix I.

Sample Activity Summary

Table 4 Sample activity summary for the Wisconsin DHS Point Beach-Kewaunee environmental monitoring.

Sample type (units)	LLD	Number of samples ^a	Analysis	Range
Air particulate (pCi/m ³)	0.005	254 / 253	gross beta	< 0.002 - 0.056
			gamma isotopic	
	0.030	20 / 0	Barium 140	< 0.0036
	0.020	20 / 20	Beryllium 7	0.036 – 0.088
	0.002	20 / 0	Cerium 141	< 0.0013
	0.005	20 / 0	Cerium 144	< 0.0031
	0.002	20 / 0	Cesium 134	< 0.0005
	0.002	20 / 0	Cesium 137	< 0.0006
	0.002	20 / 0	Cobalt 58	< 0.0005
	0.002	20 / 0	Cobalt 60	< 0.0006
	0.020	20 / 0	Iodine 131	< 0.0018
	0.005	20 / 0	Iron 59	< 0.0018
	0.020	20 / 0	Lanthanum 140	< 0.0014
	0.002	20 / 0	Manganese 54	< 0.0032
	0.002	20 / 0	Niobium 95	< 0.0006
	0.002	20 / 0	Ruthenium 103	< 0.0006
	0.015	20 / 0	Ruthenium 106	< 0.0046
	0.005	20 / 0	Zinc 65	< 0.0021
0.005	20 / 0	Zirconium 95	< 0.0009	
Air iodine (pCi/m ³)	0.07	128 / 0	I-131	< 0.069
Surface water (pCi/liter)	3.0	37 / 0	Gross Alpha Sus Sol	< 0.915 - 0.978
	3.0	37 / 1	Gross Beta Sus Sol	< 1.26 – 7.60
	3.0	37 / 0	Gross Alpha	< 1.62 - 1.33
	3.0	37 / 5	Gross Beta	< 12.6 – 6.07
	0.5	16 / 3	Iodine 131	< 0.55
	300	16 / 2	Tritium	< 234 - 2520
	2.0	18 / 0	Strontium 89	< 2.08 - 1.67
	1.0	18 / 0	Strontium 90	< 0.238 - 0.475
			gamma isotopic	
	15	37 / 0	Barium 140	< 52.1
	15	37 / 0	Cesium 134	< 11.3
	30	37 / 0	Cesium 137	< 12.4
	15	37 / 0	Cobalt 58	< 10.7
	30	37 / 0	Cobalt 60	< 12.7
	15	37 / 0	Iodine 131	< 13.9
	30	37 / 0	Iron 59	< 18
	15	37 / 0	Lanthanum 140	< 13.9
	15	37 / 0	Manganese 54	< 9.71 – 0.64
15	37 / 0	Niobium 95	< 11.3	
60	37 / 0	Zinc 65	< 19.2	
15	37 / 0	Zirconium 95	< 17.3	

Table 4 (continued) Sample activity summary for the Wisconsin DHS Point Beach-Kewaunee environmental monitoring program.

Sample type (units)	LLD	Number of samples ^a	Analysis	Range
Fish (pCi/kg wet)			gamma isotopic	
	50	7 / 0	Cesium 134	< 19.5
	60	7 / 0	Cesium 137	9.7 - 25.2
	60	7 / 0	Cobalt 58	< 7.68
	70	7 / 0	Cobalt 60	< 5.08
	130	7 / 0	Iron 59	< 23
	50	7 / 0	Manganese 54	< 5.17
	50	7 / 0	Niobium 95	< 15
	800	7 / 7	Potassium 40	1650 - 3230
	130	7 / 0	Zinc 65	< 10.8
	100	7 / 0	Zirconium 95	< 14.7
Shoreline sediment (pCi/kg dry)	15000	7 / 0	gross alpha	< 5340
	6000	7 / 7	gross beta	6310 - 8440
			gamma isotopic	
	80	7 / 0	Cs-134	< 16
	80	7 / 0	Cs-137	< 20 - 28
	90	7 / 0	Co-58	< 15.4
	90	7 / 0	Co-60	< 19.7
	600	7 / 0	Fe-59	< 39
	60	7 / 0	Mn-54	< 15.9
	100	7 / 0	Nb-95	< 21.7
	800	7 / 7	K-40	4910 - 8120
	300	7 / 0	Zn-65	< 42
	200	7 / 0	Zr-95	< 30.3
Vegetation (pCi/kg wet)	5000	18 / 0	Gross Alpha	< 1980 - 2220
	4000	18 / 18	Gross Beta	4000 - 8850
			gamma isotopic	
	350	18 / 0	Barium 140	< 138
	600	18 / 11	Beryllium 7	< 138 - 7260
	80	18 / 0	Cesium 134	< 26
	90	18 / 0	Cesium 137	< 29.8
	600	18 / 0	Cobalt 58	< 27
	100	18 / 0	Cobalt 60	< 29.5
	80	18 / 0	Iodine 131	< 52
	200	18 / 0	Iron 59	< 56.5
	100	18 / 0	Lanthanum 140	< 36.5
	90	18 / 0	Manganese 54	< 25.1
	100	18 / 0	Niobium 95	< 27.7
	2000	18 / 18	Potassium 40	3970 - 7600
	250	18 / 0	Zinc 65	< 57.7
	200	18 / 0	Zirconium 95	< 47.8
	Precipitation (nCi/m ²)	1.5	12 / 0	gross beta
300		12 / 0	H-3	< 41.48

Table 4 (continued) Sample activity summary for the Wisconsin DHS Point Beach-Kewaunee environmental monitoring program.

Sample type (units)	LLD	Number of samples ^a	Analysis	Range
Soil (pCi/kg dry)	15000	18 / 0	Gross Alpha	< 6660 - 8810
	6000	18 / 18	Gross Beta	17600 - 23500
			gamma isotopic	
	80	18 / 0	Cesium 134	< 30.6
	80	18 / 10	Cesium 137	< 38.1 - 236
	90	18 / 0	Cobalt 58	< 45.3
	90	18 / 0	Cobalt 60	< 40.9
	600	18 / 0	Iron 59	< 154
	60	18 / 0	Manganese 54	< 42.6
	100	18 / 0	Niobium 95	< 99.7
	800	18 / 18	Potassium 40	12800 - 24700
	300	18 / 0	Zinc 65	< 93.8
	250	18 / 0	Zirconium 95	< 92.1
	Milk (pCi/liter)	0.5	19 / 0	Iodine 131
1.5		18 / 1	Strontium 90	< 5.62 - 3.23
			gamma isotopic	
60		36 / 0	Barium 140	< 45.1
15		36 / 0	Cesium 134	< 12.1
15		36 / 0	Cesium 137	< 12.9
15		36 / 0	Cobalt 58	< 12
15		36 / 0	Cobalt 60	< 13.4
15		36 / 0	Iodine 131	< 14.3
40		36 / 0	Iron 59	< 25.6
15		36 / 0	Lanthanum 140	< 14.8
15		36 / 0	Manganese 54	< 11.9
15		36 / 0	Niobium 95	< 11.9
500		36 / 36	Potassium 40	1040 - 1490
40		36 / 0	Zinc 65	< 28.9
40		36 / 0	Zirconium 95	< 20.1
Well water (pCi/liter)	5.0	10 / 0	gross alpha	< 2.6 – 2.7
	3.0	10 / 0	gross beta	< 2.6 – 1.8
	300	10 / 0	H-3	< 232
Ambient radiation (mR/Std Qtr)	1.0	124 / 124	exposure	11 – 347.6

a - Number of analyses / number of analyses detected above the WI DHS LLD.

b - LLD activities expressed in units of pCi/liter.

c - mR/TLD

d – Samples not analyzed due to laboratory error and delays, see result and discussion section.

Table 5 Wisconsin DHS air particulate gross beta and air iodine (I-131) analysis results from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m³

Site: PBK-1

1st Qtr			3rd Qtr		
Collection End Date	Volume m ³	Air Particulate	Collection date	Volume m ³	Air Particulate
01/03/18	444.9	0.0319 ± 0.0022	07/03/18	427.1	0.02010 ± 0.002
01/10/18	541	0.0245 ± 0.0018	07/11/18	580.2	0.0168 ± 0.0015
01/18/18	615.8	0.0158 ± 0.0014	07/18/18	544.6	0.0169 ± 0.0016
01/24/18	455.6	< 0.0021	07/25/18	558.8	0.0158 ± 0.0015
01/31/18	523.2	0.0194 ± 0.0017	08/01/18	551.7	0.0154 ± 0.0015
02/07/18	541	0.0183 ± 0.0016	08/08/18	569.5	0.0244 ± 0.0017
02/14/18	537.5	0.0258 ± 0.0018	08/15/18	541	0.0231 ± 0.0017
02/21/18	523.2	0.0260 ± 0.0018	08/22/18	541	0.0249 ± 0.0018
02/27/18	441.4	0.0194 ± 0.0019	08/29/18	541	0.0225 ± 0.0017
03/08/18	676.3	0.0199 ± 0.0014	09/05/18	544.6	0.0113 ± 0.0014
03/14/18	455.6	0.0200 ± 0.0019	09/11/18	484.1	0.0109 ± 0.0015
03/21/18	526.8	0.0178 ± 0.0016	09/19/18	619.3	0.0192 ± 0.0015
03/28/18	533.9	0.0154 ± 0.0016	09/26/18	551.7	0.0145 ± 0.0015
mean +- s.d.		0.0212 ± 0.0049	mean +- s.d.		0.0182 ± 0.0047

2nd Qtr			4th Qtr		
Collection End Date	Volume m ³	Air Particulate	Collection date	Volume m ³	Air Particulate
04/04/18	523.2	0.0187 ± 0.0017	10/02/18	480.5	0.0176 ± 0.0017
04/12/18	605.1	0.0220 ± 0.0016	10/10/18	640.7	0.0102 ± 0.0012
04/18/18	434.2	0.0141 ± 0.0018	10/17/18	590.9	0.0134 ± 0.0014
04/25/18	526.8	0.0162 ± 0.0016	10/24/18	569.5	0.0129 ± 0.0014
05/02/18	526.8	0.0142 ± 0.0015	10/31/18	548.2	0.0178 ± 0.0016
05/09/18	523.2	0.0143 ± 0.0015	11/07/18	555.3	0.0134 ± 0.0014
05/16/18	526.8	0.0136 ± 0.0015	11/14/18		*d
05/23/18	512.6	0.0127 ± 0.0015	11/21/18	565.9	0.0208 ± 0.0016
05/30/18	494.8	0.0243 ± 0.0019	11/28/18	548.2	0.0210 ± 0.0017
06/06/18	519.7	0.0089 ± 0.0014	12/05/18	548.2	0.0173 ± 0.0016
06/13/18	509	0.0141 ± 0.0016	12/12/18	551.7	0.0481 ± 0.0022
06/20/18	491.2	0.0142 ± 0.0016	12/19/18	555.3	0.03670 ± 0.002
06/27/18	505.4	0.0109 ± 0.0015	12/26/18	565.9	0.0239 ± 0.0017
mean ± s.d.		0.0153 ± 0.0043	mean ± s.d.		0.0211 ± 0.0110

*a – Laboratory error

*b – Error in recording data in the field

*c = The original data sheet was not returned

*d = Data sheet unavailable

Table 5 (continued) Wisconsin DHS air particulate gross beta and air iodine (I-131) analysis results from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m³

Site: PBK-4

1st Qtr				3rd Qtr			
Collection End Date	Volume m ³	Air particulate	Air iodine	Collection End Date	Volume m ³	Air particulate	Air iodine
01/03/18	378.9	0.0260 ± 0.0024	< 0.0512	07/03/18	545.2	0.0178 ± 0.0016	< 0.0200
01/10/18	424.9	0.0244 ± 0.0021	< 0.0366	07/11/18	537.6	0.0171 ± 0.0016	< 0.0354
01/17/18	432.6	0.0130 ± 0.0018	< 0.0197	07/17/18	445.4	0.0173 ± 0.0019	< 0.0183
01/24/18	450.5	0.0345 ± 0.0023	< 0.0141	07/23/18	476.1	0.0141 ± 0.0017	< 0.0174
01/30/18	389.1	0.0190 ± 0.0021	< 0.0151	07/30/18	540.1	0.0125 ± 0.0015	< 0.0162
02/07/18	478.7	0.0171 ± 0.0018	< 0.0293	08/08/18	665.6	0.0222 ± 0.0015	< 0.0474
02/14/18	432.6	0.0261 ± 0.0022	< 0.0191	08/13/18	376.3	0.0195 ± 0.0022	< 0.0206
02/21/18	455.7	0.0255 ± 0.0021	< 0.0540	08/20/18	537.6	0.0270 ± 0.0019	< 0.0172
02/26/18	325.1	0.0139 ± 0.0023	< 0.0327	08/29/18	688.6	0.0214 ± 0.0015	< 0.0150
03/07/18	581.1	0.0209 ± 0.0016	< 0.0119	09/06/18	614.4	0.0101 ± 0.0013	< 0.0167
03/14/18	458.2	0.0169 ± 0.0018	< 0.0364	09/12/18	468.5	0.0121 ± 0.0016	< 0.0199
03/20/18	389.1	0.0193 ± 0.0021	< 0.0209	09/17/18	396.8	0.0220 ± 0.0022	< 0.0235
03/26/18	386.5	0.0158 ± 0.0021	< 0.0251	09/27/18	768	0.0148 ± 0.0012	< 0.0154
mean ± s.d.		0.0210 ± 0.0061	< 0.0282	mean ± s.d.		0.0176 ± 0.0049	< 0.0218

2nd Qtr			
Collection End Date	Volume m ³	Air particulate	Air iodine
04/02/18	458.2	0.0175 ± 0.0019	< 0.0695
04/11/18	581.1	0.0218 ± 0.0017	< 0.0307
04/18/18	440.3	0.0162 ± 0.0019	< 0.0301
04/23/18	330.2	0.0165 ± 0.0023	< 0.0219
04/30/18	458.2	0.0125 ± 0.0017	< 0.0301
05/09/18	179.2	0.0186 ± 0.0018	< 0.0642
05/16/18		*d	*d
05/23/18		*d	*d
05/31/18	69.1	0.0232 ± 0.0042	< 0.059
06/04/18	296.9	0.0067 ± 0.0022	< 0.0639
06/13/18	650.2	0.0117 ± 0.0013	< 0.0144
06/21/18	555.5	0.0131 ± 0.0015	< 0.0103
06/25/18	289.3	0.0109 ± 0.0024	< 0.0326
mean ± s.d.		0.0154 ± 0.0050	< 0.0388

4th Qtr			
Collection End Date	Volume m ³	Air particulate	Air iodine
10/02/18	401.9	0.01520 ± 0.002	< 0.0237
10/09/18	563.2	0.0107 ± 0.0014	< 0.0135
10/17/18	665.6	0.0121 ± 0.0013	< 0.0152
10/23/18	481.2	0.0120 ± 0.0016	< 0.0135
10/31/18	652.8	0.0147 ± 0.0013	< 0.0099
11/07/18	583.6	0.0119 ± 0.0014	< 0.0430
11/14/18	591.3	0.0160 ± 0.0015	< 0.0298
11/20/18	504.3	0.0170 ± 0.0017	< 0.0231
11/27/18	596.4	0.0210 ± 0.0016	< 0.0225
12/05/18	688.6	0.0154 ± 0.0013	< 0.0289
12/12/18	606.7	0.0369 ± 0.0019	< 0.0166
12/19/18	593.9	0.0326 ± 0.0019	< 0.0071
12/27/18	688.6	0.0229 ± 0.0015	< 0.0237
mean ± s.d.		0.0184 ± 0.0082	< 0.0206

*a – Laboratory error

*b – Error in recording data in the field

*c = The original data sheet was not returned

*d = Data sheet unavailable

Table 5 (continued) Wisconsin DHS air particulate gross beta and air iodine (I-131) analysis results from the Point Beach-Kewaunee environmental monitoring program.
Measurements in units of pCi/m³



Site: PBK-7

1st Qtr

Collection End Date	Volume m ³	Air particulate
01/10/18	496.4	0.0253 ± 0.0019
01/17/18	487.9	0.0172 ± 0.0018
01/24/18	493.6	0.0370 ± 0.0022
01/31/18	482.3	0.0219 ± 0.0019
02/07/18	490.7	0.0190 ± 0.0018
02/14/18	493.6	0.0306 ± 0.0021
02/21/18	476.6	0.0301 ± 0.0021
02/27/18	400.5	0.0214 ± 0.0022
03/08/18	578.2	0.0240 ± 0.0017
03/14/18	425.9	0.0220 ± 0.0021
03/21/18	473.8	0.0186 ± 0.0018
03/28/18	490.7	0.0166 ± 0.0017
mean +- s.d.		0.0237 ± 0.0062

3rd Qtr

Collection End Date	Volume m ³	Air particulate
07/03/18	380.7	0.0221 ± 0.0022
07/11/18	510.5	0.0171 ± 0.0017
07/18/18	485.1	0.0188 ± 0.0018
07/25/18	*d	*d
08/01/18	*d	*d
08/08/18	527.4	0.0249 ± 0.0018
08/15/18	518.9	0.0236 ± 0.0018
08/22/18	507.7	0.0209 ± 0.0018
08/29/18	518.9	0.0238 ± 0.0018
09/05/18	499.2	0.0109 ± 0.0015
09/11/18	451.3	0.0117 ± 0.0017
09/19/18	583.8	0.0170 ± 0.0015
mean +- s.d.		0.0188 ± 0.0048

2nd Qtr

Collection End Date	Volume m ³	Air particulate
04/04/18	476.6	0.0200 ± 0.0019
04/12/18	547.1	0.0244 ± 0.0018
04/18/18	392.0	0.0170 ± 0.0021
04/25/18	479.5	0.0192 ± 0.0018
05/02/18	451.3	0.0158 ± 0.0018
05/09/18	*d	*d
05/16/18	*d	*d
05/23/18	437.2	0.0121 ± 0.0008
05/30/18	448.4	0.0258 ± 0.0021
06/06/18	442.8	0.0100 ± 0.0017
06/13/18	445.6	0.0147 ± 0.0018
06/20/18	425.9	0.0153 ± 0.0019
06/27/18	442.8	0.0121 ± 0.0017
mean +- s.d.		0.0170 ± 0.0051

4th Qtr

Collection End Date	Volume m ³	Air particulate
10/10/18	603.6	0.0136 ± 0.0014
10/10/18	544.3	0.0126 ± 0.0015
10/24/18	552.8	0.0138 ± 0.0015
10/31/18	552.8	0.0175 ± 0.0016
11/07/18	538.7	0.0119 ± 0.0015
11/14/18	578.2	0.0194 ± 0.0016
11/21/18	566.9	0.0240 ± 0.0017
11/28/18	547.1	0.0209 ± 0.0017
12/05/18	575.4	0.0177 ± 0.0016
12/12/18	581.0	0.0479 ± 0.0022
12/19/18	564.1	0.03840 ± 0.002
12/26/18	578.2	0.0245 ± 0.0017
mean +- s.d.		0.0214 ± 0.0099

- *a – Laboratory error
- *b – Error in recording data in the field
- *c = The original data sheet was not returned
- *d = Data sheet unavailable

Table 5 (continued) Wisconsin DHS air particulate gross beta and air iodine (I-131) analysis results from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m³

Site: PBK-17

1st Qtr				3rd Qtr			
Collection End Date	Volume m ³	Air particulate	Air iodine	Collection End Date	Volume m ³	Air particulate	Air iodine
01/05/18	740.1	0.0210 ± 0.0014	< 0.0438	07/06/18	558.2	*d	< 0.0122
01/12/18	606.2	0.0228 ± 0.0016	< 0.0270	07/13/18	500.1	0.0157 ± 0.0016	< 0.0343
01/19/18	621.4	0.0209 ± 0.0016	< 0.0137	07/20/18	520.3	0.013 ± 0.0015	< 0.0317
01/26/18	603.7	0.0275 ± 0.0017	< 0.0059	07/27/18	527.9	0.0133 ± 0.0015	< 0.012
02/02/18	601.2	0.0198 ± 0.0016	< 0.0235	08/03/18	525.4	0.0167 ± 0.0016	< 0.0147
02/08/18	543.1	0.0157 ± 0.0016	< 0.0154	08/10/18	527.9	0.0235 ± 0.0018	< 0.0094
02/16/18	692.1	0.0313 ± 0.0017	< 0.0234	08/16/18	452.1	0.0223 ± 0.0019	< 0.0345
02/22/18	517.8	0.0160 ± 0.0017	< 0.0245	08/24/18	598.6	0.0217 ± 0.0016	< 0.0254
03/02/18	674.4	0.0215 ± 0.0015	< 0.0044	08/31/18	179.3	0.0252 ± 0.0018	< 0.0414
03/09/18	596.1	0.0128 ± 0.0014	< 0.0271	09/13/18	1002.8	0.0117 ± 0.0009	< 0.0168
03/16/18	588.5	0.0217 ± 0.0016	< 0.0150	09/21/18	603.7	0.0165 ± 0.0014	< 0.0246
03/23/18	588.5	0.0156 ± 0.0015	< 0.0278	09/28/18	555.7	0.0177 ± 0.0016	< 0.0089
03/29/18	505.2	0.0152 ± 0.0016	< 0.0116				
mean +- s.d.		0.0202 ± 0.0053	< 0.0202	mean +- s.d.		0.0180 ± 0.0046	< 0.0222

2nd Qtr				4th Qtr			
Collection End Date	Volume m ³	Air particulate	Air iodine	Collection End Date	Volume m ³	Air particulate	Air iodine
04/06/18	676.9	0.0192 ± 0.0014	< 0.0171	10/05/18	550.6	0.0127 ± 0.0015	< 0.0302
04/12/18	515.3	0.0217 ± 0.0018	< 0.0253	10/12/18	550.6	0.0101 ± 0.0014	< 0.0537
04/27/18	482.4	0.0148 ± 0.0017	< 0.0479	10/19/18	568.3	0.0148 ± 0.0015	< 0.0183
05/03/18	573.4	0.0147 ± 0.0015	< 0.0183	10/26/18	558.2	0.0111 ± 0.0014	< 0.0263
05/11/18	636.5	0.0142 ± 0.0014	< 0.0163	11/02/18	553.2	0.0157 ± 0.0015	< 0.0296
05/18/18	568.3	0.0120 ± 0.0014	< 0.0278	11/08/18	492.5	0.0113 ± 0.0016	< 0.0696
04/20/18	669.4	0.0144 ± 0.0013	< 0.0194	11/16/18	651.7	0.0174 ± 0.0014	< 0.0231
05/24/18	492.5	0.0113 ± 0.0016	< 0.0372	11/21/18	409.2	0.01740 ± 0.002	< 0.0406
06/01/18	616.3	0.02230 ± 0.0016	< 0.0459	11/30/18	735	0.0189 ± 0.0013	< 0.0157
06/08/18	505.2	0.00650 ± 0.0014	< 0.0164	12/07/18	563.3	0.0163 ± 0.0016	< 0.0142
06/15/18	510.2	0.0140 ± 0.0016	< 0.0297	12/14/18	568.3	0.0560 ± 0.0024	< 0.0229
06/22/18	497.6	0.0130 ± 0.0016	< 0.0436	12/21/18	555.7	0.0245 ± 0.0018	< 0.0156
06/28/18	431.9	0.0104 ± 0.0017	< 0.0436	12/28/18	563.3	0.0216 ± 0.0016	< 0.0209
mean +- s.d.		0.0146 ± 0.0045	< 0.0287	mean +- s.d.		0.0191 ± 0.0119	< 0.0293

*a – Laboratory error

*b – Error in recording data in the field

*c = The original data sheet was not returned

*d = Data sheet unavailable

Table 5 (continued) Wisconsin DHS air particulate gross beta and air iodine (I-131) analysis results from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m³

Site: PBK-18

1st Qtr				3rd Qtr			
Collection End Date	Volume m ³	Air particulate	Air iodine	Collection End Date	Volume m ³	Air particulate	Air iodine
01/03/18	600.9	0.0251 ± 0.0017	< 0.053				
01/10/18	602.3	0.0232 ± 0.0017	< 0.0319				
01/17/18	603.2	0.0142 ± 0.0014	< 0.015				
01/24/18	597.2	0.034 ± 0.0019	< 0.0157				
01/30/18	513.1	0.0213 ± 0.0018	< 0.0131				
02/07/18	690.2	0.0192 ± 0.0014	< 0.0234				
02/14/18	600.2	0.0278 ± 0.0018	< 0.0291				
02/21/18	597.0	0.025 ± 0.0017	< 0.0160				
02/26/18	427.7	0.014 ± 0.0019	< 0.0145				
03/07/18	763.5	0.0266 ± 0.0015	< 0.0088				
03/14/18	528.7	0.0129 ± 0.0015	< 0.0381				
03/20/18	502.5	0.0164 ± 0.0017	< 0.0234				
03/26/18	*d	*d	< 0.0152				
mean +- s.d.		0.0217 ± 0.0065	< 0.0229				

PBK-18 Discontinued
July 1, 2018 due to
Kewaunee
decommissioning

2nd Qtr				4th Qtr			
Collection End Date	Volume m ³	Air particulate	Air iodine	Collection End Date	Volume m ³	Air particulate	Air iodine
04/02/18	727.6	0.017 ± 0.0013	< 0.0240				
04/11/18	945.7	0.0209 ± 0.0012	< 0.0137				
04/18/18	730.0	0.0158 ± 0.0013	< 0.026				
04/23/18	519.1	0.0187 ± 0.0017	< 0.0215				
04/30/18	711.0	0.0126 ± 0.0012	< 0.0297				
05/09/18	910.1	0.0158 ± 0.0011	< 0.0175				
05/16/18	708.7	0.0126 ± 0.0012	< 0.0094				
05/23/18	286.8	0.0114 ± 0.0011	< 0.0336				
05/31/18	789.2	0.0234 ± 0.0014	< 0.0487				
06/04/18	402.9	0.0066 ± 0.0017	< 0.0157				
06/13/18	888.8	0.0116 ± 0.001	< 0.0083				
06/21/18	789.2	0.0144 ± 0.0012	< 0.0189				
06/25/18	*d	*d	*d				
mean +- s.d.		0.0151 ± 0.0046	< 0.0222				

PBK-18 Discontinued
July 1, 2018 due to
Kewaunee
decommissioning

*a – Laboratory error
 *b – Error in recording data in the field
 *c = The original data sheet was not returned
 *d = Data sheet unavailable

Table 6 Wisconsin DHS gamma isotopic analysis results from the quarterly composites of air particulate filters collected from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m³

Site: PBK-1	1st quarter	2nd quarter	3rd quarter	4th quarter
Barium 140	< 0.0016	< 0.0025	< 0.0018	< 0.0028
Beryllium 7	0.0548 ± 0.0056	0.0816 ± 0.0075	0.0663 ± 0.0060	0.05 ± 0.0054
Cerium 141	< 0.0004	< 0.0005	< 0.0004	< 0.0005
Cerium 144	< 0.0013	< 0.0014	< 0.0012	< 0.0013
Cesium 134	< 0.0002	< 0.0003	< 0.0002	< 0.0004
Cesium 137	< 0.0002	< 0.0002	< 0.0002	< 0.0004
Cobalt 58	< 0.0002	< 0.0003	< 0.0003	< 0.0003
Cobalt 60	< 0.0003	< 0.0004	< 0.0003	< 0.0005
Iodine 131	< 0.0007	< 0.0018	< 0.0011	< 0.0014
Iron 59	< 0.0005	< 0.0008	< 0.0006	< 0.0010
Lanthanum 140	< 0.0007	< 0.0012	< 0.0005	< 0.0010
Manganese 54	< 0.0003	< 0.0003	< 0.0002	< 0.0032
Niobium 95	< 0.0003	< 0.0005	< 0.0003	< 0.0006
Ruthenium 103	< 0.0002	< 0.0003	< 0.0002	< 0.0005
Ruthenium 106	< 0.002	< 0.0025	< 0.0022	< 0.0032
Zinc 65	< 0.0006	< 0.0008	< 0.0005	< 0.0006
Zirconium 95	< 0.0005	< 0.0006	< 0.0004	< 0.0006

Site: PBK-4

Barium 140	< 0.0036	< 0.0021	< 0.0021	< 0.002
Beryllium 7	0.0732 ± 0.0071	0.0361 ± 0.0071	0.0777 ± 0.0073	0.0413 ± 0.0043
Cerium 141	< 0.0009	< 0.0007	< 0.0004	< 0.0003
Cerium 144	< 0.0031	< 0.0023	< 0.0014	< 0.0009
Cesium 134	< 0.0005	< 0.0003	< 0.0004	< 0.0002
Cesium 137	< 0.0006	< 0.0005	< 0.0002	< 0.0002
Cobalt 58	< 0.0005	< 0.0004	< 0.0003	< 0.0002
Cobalt 60	< 0.0005	< 0.0005	< 0.0003	< 0.0002
Iodine 131	< 0.0017	< 0.0009	< 0.0013	< 0.0008
Iron 59	< 0.0009	< 0.0009	< 0.0007	< 0.0005
Lanthanum 140	< 0.0012	< 0.0007	< 0.0013	< 0.0008
Manganese 54	< 0.0005	< 0.0004	< 0.0003	< 0.0001
Niobium 95	< 0.0006	< 0.0004	< 0.0005	< 0.0003
Ruthenium 103	< 0.0005	< 0.0004	< 0.0004	< 0.0002
Ruthenium 106	< 0.0045	< 0.0033	< 0.0023	< 0.0016
Zinc 65	< 0.0008	< 0.0008	< 0.0007	< 0.0005
Zirconium 95	< 0.0008	< 0.0007	< 0.0008	< 0.0004

Site: PBK-7

Barium 140	< 0.0035	< 0.0029	< 0.0016	< 0.0016
Beryllium 7	0.0773 ± 0.0073	0.0876 ± 0.0074	0.0442 ± 0.0046	0.0442 ± 0.0046
Cerium 141	< 0.0009	< 0.0005	< 0.0004	< 0.0003
Cerium 144	< 0.0009	< 0.0013	< 0.0011	< 0.001
Cesium 134	< 0.0005	< 0.0005	< 0.0003	< 0.0002
Cesium 137	< 0.0006	< 0.0013	< 0.0002	< 0.0002
Cobalt 58	< 0.0004	< 0.0003	< 0.0003	< 0.0003
Cobalt 60	< 0.0006	< 0.0003	< 0.0003	< 0.0002
Iodine 131	< 0.0015	< 0.0003	< 0.0003	< 0.0012
Iron 59	< 0.0009	< 0.0018	< 0.0012	< 0.0006
Lanthanum 140	< 0.0013	< 0.0006	< 0.0006	< 0.0008
Manganese 54	< 0.0005	< 0.0014	< 0.0009	< 0.0002
Niobium 95	< 0.0005	< 0.0003	< 0.0002	< 0.0003
Ruthenium 103	< 0.0006	< 0.0005	< 0.0003	< 0.0002
Ruthenium 106	< 0.0046	< 0.0003	< 0.0003	< 0.0021
Zinc 65	< 0.0009	< 0.0020	< 0.0021	< 0.0005
Zirconium 95	< 0.0009	< 0.0006	< 0.0006	< 0.0004

Radioisotopes other than those reported were not detected

Table 6 (continued) Wisconsin DHS gamma isotopic analysis results from the quarterly composites of air particulate filters collected from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m³

Site: PBK-8	1st quarter	2nd quarter	3rd quarter	4th quarter
Barium 140	< 0.0019	< 0.0021		
Beryllium 7	0.074 ± 0.007	0.0682 ± 0.0064		
Cerium 141	< 0.0004	< 0.0004		
Cerium 144	< 0.0015	< 0.0013		
Cesium 134	< 0.0003	< 0.0002		
Cesium 137	< 0.0002	< 0.0002		
Cobalt 58	< 0.0002	< 0.0002		
Cobalt 60	< 0.0003	< 0.0003		
Iodine 131	< 0.001	< 0.001		
Iron 59	< 0.0006	< 0.0006		
Lanthanum 140	< 0.0007	< 0.0006		
Manganese 54	< 0.0003	< 0.0002		
Niobium 95	< 0.0003	< 0.0004		
Ruthenium 103	< 0.0002	< 0.0002		
Ruthenium 106	< 0.0029	< 0.0026		
Zinc 65	< 0.0005	< 0.0006		
Zirconium 95	< 0.0006	< 0.0006		

Discontinued July 2018

Site: PBK-17

Barium 140	< 0.0014	< 0.0028	< 0.0028	< 0.0036
Beryllium 7	0.0583 ± 0.0055	0.0764 ± 0.007	0.0717 ± 0.0072	0.0444 ± 0.005
Cerium 141	< 0.0003	< 0.0005	< 0.0005	< 0.0005
Cerium 144	< 0.0011	< 0.0016	< 0.0016	< 0.0014
Cesium 134	< 0.0003	< 0.0004	< 0.0004	< 0.0004
Cesium 137	< 0.0002	< 0.0003	< 0.0003	< 0.0003
Cobalt 58	< 0.0002	< 0.0004	< 0.0004	< 0.0004
Cobalt 60	< 0.0003	< 0.0004	< 0.0003	< 0.0005
Iodine 131	< 0.0006	< 0.0013	< 0.0013	< 0.0014
Iron 59	< 0.0004	< 0.0009	< 0.0009	< 0.0006
Lanthanum 140	< 0.0007	< 0.0013	< 0.0013	< 0.0014
Manganese 54	< 0.0003	< 0.0004	< 0.0004	< 0.0003
Niobium 95	< 0.0003	< 0.0004	< 0.0004	< 0.0003
Ruthenium 103	< 0.0002	< 0.0004	< 0.0004	< 0.0004
Ruthenium 106	< 0.0018	< 0.0030	< 0.0035	< 0.0027
Zinc 65	< 0.0006	< 0.0006	< 0.0006	< 0.0007
Zirconium 95	< 0.0004	< 0.0006	< 0.0006	< 0.0006

Site: PBK-18

Barium 140	< 0.0015	< 0.0013		
Beryllium 7	0.0574 ± 0.0056	0.0719 ± 0.006		
Cerium 141	< 0.0003	< 0.0003		
Cerium 144	< 0.0012	< 0.001		
Cesium 134	< 0.0002	< 0.0001		
Cesium 137	< 0.0001	< 0.0001		
Cobalt 58	< 0.0003	< 0.0001		
Cobalt 60	< 0.0003	< 0.0001		
Iodine 131	< 0.0007	< 0.0006		
Iron 59	< 0.0004	< 0.0004		
Lanthanum 140	< 0.0006	< 0.0001		
Manganese 54	< 0.0002	< 0.0002		
Niobium 95	< 0.0003	< 0.0002		
Ruthenium 103	< 0.0002	< 0.0001		
Ruthenium 106	< 0.0019	< 0.0014		
Zinc 65	< 0.0005	< 0.0004		
Zirconium 95	< 0.0003	< 0.0002		

Discontinued July 2018

Radioisotopes other than those reported were not detected.

Table 7 Wisconsin DHS TLD network for the Point Beach-Kewaunee environmental monitoring program.



	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Placed:	1/16-17/18	4/17-18/18	7/11-12/18	10/16-17/18
Date Removed:	4/17-18/18	7/11-12/18	10/16-17/18	1/15-17/19
Average Days in the Field:	90-91	85-86	97-98	91-92

Location: Individual quarterly data is reported as: mR / Standard Quarter +/- 2 sigma counting error.

TLD sites located at the Point Beach ISFSI

1	27.8 ± 1.8	28.1 ± 1.5	27.2 ± 2.1	28.3 ± 2.7
2	51.1 ± 2	54.1 ± 3.4	51.4 ± 2.4	57.3 ± 3.9
3	45 ± 3.6	39.4 ± 2.3	72.5 ± 3.1	68.6 ± 1.9
4	20.9 ± 1.6	20.9 ± 1.2	24.2 ± 1.7	27.7 ± 1.4
5	19.4 ± 0.5	19 ± 1.2	20.9 ± 0.7	24.3 ± 0.9
6	40.2 ± 1.2	36.6 ± 2.4	46.8 ± 2.2	45.3 ± 2.9
7	56.5 ± 2.3	50.1 ± 3	56.4 ± 2.1	53.2 ± 3.4
8	25 ± 1.4	24.1 ± 1.1	25.1 ± 1.4	26.5 ± 1.4
Quarterly average ± s.d.	35.7 ± 14.3	26.7 ± 0.8	40.6 ± 18.9	41.4 ± 17.0

TLD sites, excluding sites 1- 8, that are located 0 - 2 miles from either the Point Beach or the Kewaunee facility.

9	12.9 ± 0.9	11.7 ± 1	13.1 ± 1.1	12.6 ± 1.1
10	15 ± 0.6	15.5 ± 1.1	14.7 ± 1	16.7 ± 1.3
11	13.9 ± 0.6	14.3 ± 1	14 ± 0.9	15.1 ± 1.1
12	14.3 ± 1	14.7 ± 1.2	14.2 ± 1.2	16.1 ± 1.1
13	13.6 ± 1	15.9 ± 0.8	14.6 ± 0.8	17 ± 0.8
14	16.8 ± 1.3	16.3 ± 1.1	16.4 ± 0.9	16.9 ± 1.2
20	14.2 ± 0.8	12.2 ± 0.8	14.6 ± 0.7	13.6 ± 1
Quarterly average ± s.d.	14.4 ± 1.5	14.4 ± 1.7	14.5 ± 0.5	15.4 ± 1.7

TLD sites that are located 2 - 5 miles from either the Point Beach or the Kewaunee facility.

15	15 ± 0.7	15.8 ± 1.1	15.7 ± 1	16.9 ± 1.1
16	11.6 ± 0.7	11.7 ± 0.9	14.1 ± 1.4	12.6 ± 0.9
17	17.4 ± 1	14.8 ± 1.1	17 ± 1.2	16 ± 1
18	15.6 ± 0.5	14.4 ± 0.6	16.2 ± 0.7	14.9 ± 1.1
Quarterly average ± s.d.	14.9 ± 2.43	14.2 ± 1.8	15.8 ± 1.2	15.1 ± 1.9

TLD sites that are located greater than 5 miles from either the Point Beach or the Kewaunee facility.

28	13.9 ± 0.7	12.6 ± 1.1	14.2 ± 0.8	13.3 ± 1.1
29	12.7 ± 0.6	11 ± 0.7	12.8 ± 0.5	11.1 ± 0.8
30	15 ± 1.8	13.5 ± 1.2	15.6 ± 1.3	14.2 ± 0.7
31	13.1 ± 1.1	11.5 ± 0.9	13.3 ± 0.8	12.7 ± 0.8
Quarterly average ± s.d.	13.7 ± 1.0	12.2 ± 1.1	14.0 ± 1.2	12.8 ± 1.3

TLD sites that are located at the Kewaunee Power Station's (KPS) Independent Spent Fuel Installation (ISFSI).

51	39.1 ± 2	31.7 ± 2.7	36.8 ± 1.7	29.6 ± 2.8
52	37.9 ± 2.1	82.3 ± 2.7	73.8 ± 3.8	29.6 ± 2.8
53	231.3 ± 10.6	196.7 ± 5.7	208 ± 7.8	182 ± 5.8
54	347.6 ± 13.5	286.9 ± 16	310.1 ± 14.6	250.6 ± 12.8
55	184 ± 10.2	161.6 ± 6.9	185.5 ± 11.1	158 ± 7.5
56	64.3 ± 1.2	63.2 ± 4	64.2 ± 2.7	57 ± 3.6
57	29.1 ± 1.5	23.6 ± 1.9	26.4 ± 1.4	20.3 ± 1.5
58	18.5 ± 1.2	15.2 ± 1.6	16.9 ± 0.6	15.5 ± 1.6
Quarterly average +/- s.d.	118.9 +/- 121.4	107.7 +/- 97.8	115.2 +/- 106.6	92.8 +/- 90.7

ND - No data; the TLD was lost in the field.



Table 8 Wisconsin DHS analysis results for precipitation samples collected for the Point Beach-Kewaunee environmental monitoring program.

Measurements in units of nCi/m²

monthly composite sample

Collection	Inches	Gross beta	Tritium
01/10/18	1.78	0.36 ± 0.04	< 9.81
02/08/18	1.17	0.14 ± 0.02	< 6.42
03/22/18	0.69	0.20 ± 0.01	< 3.77
4/5/2018	5.00	0.92 ± 0.20	< 29.72
05/10/18	1.98	< 0.11	< 11.72
06/07/18	4.24	< 0.23	< 24.99
7/3/2018	4.48	0.32 ± 0.19	< 26.29
08/06/18	7.10	0.65 ± 0.23	< 41.48
09/08/18	1.22	0.09 ± 0.05	< 7.13
10/02/18	3.82	0.22 ± 0.12	< 22.32
11/08/18	1.11	0.17 ± 0.05	< 6.48
12/06/18	1.25	< 0.08	< 7.27

Table 9 Wisconsin DHS analysis results for fish samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/kg (wet)

WI DHS data

Collection Type	1/06/2018 Whitefish & Lake Herring	1/17/18 Brown Trout	02/01/18 Brown Trout	4/04/18 Brown Trout	4/26/18 Burbot
gamma isotopic					
Cesium 134	< 2.15	< 3.13	< 3.55	< 19.4	< 3.08
Cesium 137	9.7 ± 1.17	25.2 ± 2.73	21.2 ± 3.42	20.3 ± 2.11	19.6 ± 2.22
Cobalt 58	< 5.03	< 5.67	< 6.83	< 5.36	< 5.75
Cobalt 60	< 2.27	< 2.79	< 3.81	< 2.14	< 2.97
Iron 59	< 21.3	< 23	< 20.6	< 20.1	< 19.1
Manganese 54	< 2.45	< 3.17	< 3.94	< 2.74	< 3.2
Niobium 95	< 15	< 14.4	< 14.6	< 14.9	< 12.6
Potassium 40	2710 ± 432	2580 ± 415	2720 ± 436	2860 ± 457	1650 ± 270
Zinc 65	< 6.07	< 8.64	< 8.91	< 6.35	< 7.67
Zirconium 95	< 10.2	< 11.4	< 12.7	< 10.1	< 10.6

Collection Type	7/08/18 Lake Herring	8/08/18 Lake Trout	4th Quarter
gamma isotopic			
Cesium 134	< 2.3	< 4.57	*a
Cesium 137	24.9 ± 3.06	14.4 ± 2.66	*a
Cobalt 58	< 4.82	< 7.68	*a
Cobalt 60	< 2.53	< 5.08	*a
Iron 59	< 17.4	< 22	*a
Manganese 54	< 2.42	< 5.17	*a
Niobium 95	< 12.8	< 14.2	*a
Potassium 40	3230 ± 514	2490 ± 410	*a
Zinc 65	< 6.06	< 10.8	*a
Zirconium 95	< 9.69	< 14.7	*a

*a – Insufficient sample size

Table 10 Wisconsin DHS analysis results for shoreline sediment samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/kg (dry)			
Location	PBK-5	PBK-10a	PBK-29
Collection date	05/30/18	0529/18	05/30/18
gross alpha	< 5340	< 3260	< 3840
gross beta	7100 ± 856	6310 ± 845	7370 ± 1100
gamma isotopic			
Cesium 134	< 8.29	< 14.5	< 8.38
Cesium 137	< 10.9	28 ± 8.1	< 11.7
Cobalt 58	< 12.2	< 13.9	< 9.9
Cobalt 60	< 11.9	< 15.3	< 8.76
Iron 59	< 35.4	< 34.3	< 23.6
Manganese 54	< 11	< 14.7	< 8.99
Niobium 95	< 14.9	< 16.3	< 14.5
Potassium 40	8120 ± 1340	4910 ± 868	5180 ± 870
Zinc 65	< 30.4	< 33.8	< 24.4
Zirconium 95	< 22.7	< 30.3	< 18.2

Location	PBK-12a	PBK-12b	PBK-12c	PBK-26
Collection date	05/29/18	05/29/18	05/29/18	05/29/18
gross alpha	< 3280	< 3120	< 3730	< 4840
gross beta	8340 ± 950	8440 ± 1010	6840 ± 997	6650 ± 1080
gamma isotopic				
Cesium 134	< 5.97	< 7.7	< 11	< 16
Cesium 137	13.8 ± 4.45	< 11.8	< 14.8	< 20
Cobalt 58	< 7.95	< 11.9	< 11.5	< 15.4
Cobalt 60	< 8.43	< 9.12	< 15.2	< 19.7
Iron 59	< 17.2	< 33.4	< 30.4	< 39
Manganese 54	< 7.21	< 9.85	< 13.3	< 15.9
Niobium 95	< 11.8	< 17.3	< 14.5	< 21.7
Potassium 40	5290 ± 870	5700 ± 957	6700 ± 1110	7990 ± 1360
Zinc 65	< 19	< 23.6	< 31.6	< 42
Zirconium 95	< 15.7	< 18.1	< 26.9	< 30.1

*a – not reported by lab

Table 11 Wisconsin DHS analysis results for surface water samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/liter

PBK-9; Point Beach meteorological tower

Collection date	01/8/18	02/14/18	03/14/18	04/11/18	05/09/18	06/13/18
Gross Alpha Sus Sol	*b	< 0.566	< 0.659	< 0.649	< 0.702	< 0.29
Gross Beta Sus Sol	*b	< 1.08	< 1.08	< 1.14	< 1.07	< 0.562
Gross Alpha	*b	0.662 ± 0.419	0.549 ± 0.373	1.33 ± 0.49	0.666 ± 0.396	0.666 ± 0.28
Gross Beta	*b	1.59 ± 0.505	3.01 ± 0.71	3.68 ± 0.8	2.87 ± 0.75	1.41 ± 0.5
Iodine 131	*b	< 0.344	< 0.241	< 0.191		
Tritium *a	*b		< 234			< 231
Strontium 89 *a	*b		< 1.21			< 0.338
Strontium 90 *a	*b		< 0.204			< 0.217
Gamma isotopic						
Barium 140	*b	< 16.9	< 19.9	< 26.9	< 31.6	< 17.3
Cesium 134	*b	< 5.69	< 6.4	< 8.81	< 7.91	< 5.6
Cesium 137	*b	< 5.45	< 5.58	< 7.52	< 10.8	< 5.32
Cobalt 58	*b	< 6.28	< 5.44	< 7.41	< 8.39	< 4.04
Cobalt 60	*b	< 5.65	< 4.52	< 8.82	< 11	< 5.18
Iodine 131	*b	< 6.05	< 5.87	< 8.81	< 11.2	< 5.8
Iron 59	*b	< 11.2	< 7.94	< 17.1	< 14.1	< 9.16
Lanthanum 140	*b	< 9.32	< 6.27	< 10.3	< 12	< 7.18
Manganese 54	*b	< 6.45	< 6.34	< 6.94	< 8.92	< 6.14
Niobium 95	*b	< 6.6	< 6.62	< 7.35	< 7.82	< 5.02
Zinc 65	*b	< 13.2	< 10.8	< 15.5	< 16.7	< 11.1
Zirconium 95	*b	< 10.3	< 11.4	< 12	< 13.8	< 8.08

Collection date	07/11/18	08/08/18	09/11/18	10/17/18	11/14/18	12/11/18
Gross Alpha Sus Sol	< 0.262	< 0.368	< 0.815	< 0.856	*c	*c
Gross Beta Sus Sol	< 0.558	< 0.501	< 1.11	< 0.728	*c	*c
Gross Alpha	0.649 ± 0.296	0.544 ± 0.268	< 1.6	< 1.48	0.822 ± 0.170	< 1.42
Gross Beta	1.64 ± 0.365	1.78 ± 0.369	3.32 ± 1.54	2.62 ± 1.36	2.40 ± 0.214	2.27 ± 1.33
Iodine 131	< 0.264	< 0.49				0.374
Tritium *a			< 233			< 230
Strontium 89 *a			< 2			< 0.549
Strontium 90 *a			0.48 ± 0.12			0.308 ± 0.108
Gamma isotopic						
Barium 140	< 36.6	< 39.8	< 38.1	< 52.1	39.9	16.7
Cesium 134	< 9.93	< 9.49	< 7.46	< 11.3	9.41	4.31
Cesium 137	< 7.99	< 12.4	< 8.73	< 9.36	12.0	4.24
Cobalt 58	< 8.68	< 9.38	< 7.25	< 10.7	8.10	4.44
Cobalt 60	< 9.56	< 11.9	< 8.24	< 12.7	11.8	4.62
Iodine 131	< 9.82	< 11.0	< 13.4	< 13.9	12.3	4.77
Iron 59	< 17	< 16.2	< 12.7	< 18	17.3	7.73
Lanthanum 140	< 13.9	< 12.8	< 13.1	< 10.3	10.7	6.14
Manganese 54	< 8.73	< 9.02	< 7.27	< 9.71	9.38	4.54
Niobium 95	< 8.71	< 9.5	< 7.66	< 10.1	8.82	5.18
Zinc 65	< 12	< 18.3	< 14.3	< 16.1	17.5	8.86
Zirconium 95	< 13.4	< 15.7	< 11.4	< 13.6	16.3	7.13

*a - The analysis is performed on a quarterly composite.

*b - Sample not collected due to safety concerns – ice build-up along the lake shoreline

*c – not reported by lab

radioisotopes other than those reported were not detected.

Table 11 (continued) Wisconsin DHS analysis results for surface water samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/liter

PBK-12a (K-001D); Kewaunee effluent channel

Collection date	01/02/18	02/05/18	03/01/18	04/02/18	05/01/18	06/04/18
Gross Alpha Sus Sol	< 0.68	< 0.71	< 0.602	*c	< 0.674	< 0.258
Gross Beta Sus Sol	< 1.26	< 1.07	< 1.22	*c	< 1.26	< 0.517
Gross Alpha	< 0.973	< 0.773	0.932 ± 0.511	*c	0.679 ± 0.413	0.536 ± 0.291
Gross Beta	1.47 ± 0.954	1.71 ± 0.503	1.48 ± 0.636	*c	2.9 ± 0.679	1.67 ± 0.468
Iodine 131		< 0.398	< 0.318	< 0.421		
Tritium *a			< 234			< 231
Strontium 89 *a		< 0.153	1.67 ± 0.724			< 0.294
Strontium 90 *a		0.17 ± 0.08	< 0.196			< 0.184
Gamma isotopic						
Barium 140	< 34	< 19.1	< 22.9	< 30.2	< 24.8	< 37.1
Cesium 134	< 6.81	< 5.09	< 6.08	< 5.63	< 6.44	< 9.73
Cesium 137	< 4.95	< 5.32	< 4.89	< 6.19	< 5.45	< 7.67
Cobalt 58	< 5.84	< 5.35	< 5.79	< 6.04	< 5.45	< 8.29
Cobalt 60	< 7	< 6.85	< 5.65	< 5.69	< 6.86	< 9.15
Iodine 131	< 13	< 6.96	< 8.85	< 9.94	< 10.7	< 11.5
Iron 59	< 14.7	< 8.05	< 8.19	< 11.6	< 9.23	< 14.6
Lanthanum 140	< 10.5	< 8.23	< 5.96	< 10	< 10.7	< 13.8
Manganese 54	< 6.47	< 6.24	< 6.4	< 4.91	< 6.77	< 8.46
Niobium 95	< 8.54	< 5.8	< 6.66	< 6.92	< 6.79	< 8.22
Zinc 65	< 11.1	< 10.4	< 10.9	< 15.2	< 13.8	< 13.8
Zirconium 95	< 11.6	< 11.3	< 9.85	< 11.5	< 11	< 15.8

Collection date:	07/02/18	08/01/18	09/01/18	10/01/18	11/01/18	12/01/18
Gross Alpha Sus Sol	< 0.289	< 0.317				
Gross Beta Sus Sol	< 0.488	< 0.644				
Gross Alpha	0.539 ± 0.305	< 0.51				
Gross Beta	< 0.91	2.38 ± 0.387				
Iodine 131		< 0.5				
Tritium *a						
Strontium 89 *a						
Strontium 90 *a						
Gamma isotopic			Discontinued due to decommissioning			
Barium 140	< 32.2	< 30.5				
Cesium 134	< 6.27	< 5.45				
Cesium 137	< 7.53	< 6.7				
Cobalt 58	< 5.67	< 6.73				
Cobalt 60	< 7.37	< 5.93				
Iodine 131	< 13.3	< 12.8				
Iron 59	< 12	< 12.9				
Lanthanum 140	< 10.4	< 13.5				
Manganese 54	< 5.43	< 7.85				
Niobium 95	< 6.07	< 7.49				
Zinc 65	< 11.7	< 14.3				
Zirconium 95	< 10.7	< 13.2				

*a - The analysis is performed on a quarterly composite.

*b - Sample not collected due to safety concerns

*c - not reported by lab

Radioisotopes other than those reported were not detected.

Table 11 (continued) Wisconsin DHS analysis results for surface water samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/liter

PBK-17; Green Bay Water Utility - Rostok

Collection date:	01/08/18	02/05/18	03/05/18	04/02/18	05/07/18	06/04/18
Gross Alpha Sus Sol	< 0.7	< 0.915	< 0.71	< 0.683	< 0.668	< 0.299
Gross Beta Sus Sol	< 1.08	< 1.1	< 1.1	< 0.869	< 1.12	< 0.495
Gross Alpha	< 1.1	0.73 ± 0.448	0.601 ± 0.381	< 1.45	< 0.582	0.679 ± 0.292
Gross Beta	< 1.51	1.3 ± 0.616	1.41 ± 0.692	< 2.53	1.67 ± 0.662	1.32 ± 0.443
Iodine 131			< 0.430	< 0.432		
Tritium *a			< 234			< 231
Strontium 89 *a		< 0.141	< 1.4			< 0.37
Strontium 90 *a		0.234 ± 0.0761	< 0.238			< 0.21
Gamma isotopic						
Barium 140	< 18.3	< 19	< 29.4	< 33.8	< 22.2	< 21.6
Cesium 134	< 5.11	< 5.59	< 8.63	< 8.92	< 6.15	< 5.1
Cesium 137	< 5.49	< 5.16	< 9.65	< 9.48	< 5.71	< 4.23
Cobalt 58	< 4.42	< 4.34	< 8.6	< 8.2	< 5.44	< 5.1
Cobalt 60	< 5.2	< 4.85	< 8.58	< 10.5	< 6.82	< 4.93
Iodine 131	< 6.56	< 5.97	< 9.5	< 11.1	< 6.45	< 6.81
Iron 59	< 9.51	< 8.34	< 15.8	< 16.4	< 12	< 12.1
Lanthanum 140	< 3.6	< 5.81	< 12.3	< 9.64	< 9.1	< 10.9
Manganese 54	< 4.6	< 4.7	< 8.89	< 8.2	< 5.72	< 5.18
Niobium 95	< 6.07	< 4.37	< 8.38	< 8.95	< 6.3	< 6.3
Zinc 65	< 11.2	< 10.3	< 19.2	< 17	< 10.4	< 10.9
Zirconium 95	< 11.1	< 6.68	< 13.9	< 14.6	< 10.2	< 9.65

Collection date:	07/09/18	08/06/18	09/04/18	10/02/18	11/05/18	12/04/18
Gross Alpha Sus Sol	< 0.292	< 0.264	< 0.527	< 0.634	< 0.617	*e
Gross Beta Sus Sol	< 0.509	< 0.491	< 0.906	< 0.735	0.933 ± 0.53	*e
Gross Alpha	< 0.508	< 0.384	< 1.32	< 1.39	< 1.48	< 0.925
Gross Beta	< 11.2	1.35 ± 0.364	2.17 ± 1.42	< 1.76	< 2.16	< 1.75
Iodine 131	< 0.276	< 0.452			< 0.521 *d	< 0.553 *d
Tritium *a			< 233			< 230
Strontium 89 *a			< 2.08			0.691 ± 0.42
Strontium 90 *a			0.204 ± 0.105			< 0.193
Gamma isotopic						
Barium 140	< 27.2	< 23.2	< 21.6	< 24.3	< 42.3	< 37.1
Cesium 134	< 5.72	< 5.98	< 5.07	< 6.63	< 8.88	< 10.6
Cesium 137	< 5.49	< 6.21	< 5.68	< 7	< 12.4	< 10.4
Cobalt 58	< 7.73	< 5.47	< 5.4	< 6.79	< 9.35	< 8.03
Cobalt 60	< 5.36	< 7.97	< 6.36	< 5.43	< 11.6	< 10.6
Iodine 131	< 7.35	< 7.92	< 7.16	< 8.35	< 13.2	< 12.1
Iron 59	< 7.54	< 13.4	< 10.1	< 13.5	< 17.9	< 1.75
Lanthanum 140	< 9.68	< 9.36	< 7.43	< 10.2	< 11.2	< 12.1
Manganese 54	< 6.21	< 6.02	< 7.02	< 6.92	< 8.25	0.635 ± 0.345
Niobium 95	< 8.22	< 7.43	< 6.65	< 7.06	< 9.91	< 11.3
Zinc 65	*c	< 13.6	< 10.5	< 13.7	< 18.3	< 12.7
Zirconium 95	< 13.7	< 11.8	< 10.4	< 9.81	< 17.3	< 8.86

*a - The analysis is performed on a quarterly composite.

*d - Analyzed Past 180 days holding time

*b - Sample not collected due to safety concerns

*e - Not analyzed due to lab accident

*c - not reported by lab

radioisotopes other than those reported were not detected.

Table 11 (continued) Wisconsin DHS analysis results for surface water samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/liter

	PBK-5	PBK-12a	PBK-29	PBK-5	PBK-12a	PBK-29
Collection date:	5/30/18	05/30/18	05/30/18	9/11/18	09/12/18	9/11/18
Gross Alpha Sus Sol	< 0.6	< 0.343	0.959 ± 0.342	< 0.746	0.978 ± 0.621 *d	< 0.7
Gross Beta Sus Sol	< 1.1	7.60 ± 0.506	0.688 ± 0.336	1.77 ± 0.785	< 0.991 *d	< 0.97
Gross Alpha	0.821 ± 0.483	0.769 ± 0.281	0.907 ± 0.314	< 1.62	< 0.982 *d	1.02 ± 0.745
Gross Beta	2.14 ± 0.68	6.07 ± 0.562	< 9.89	< 1.85	3.27 ± 0.944 *d	< 12.6
Tritium	< 230	2520 ± 179	633 ± 149	< 229	< 229 *d	< 229
Strontium 89	< 0.153	< 0.143	< 0.166	< 0.25	< 0.227 *d	< 0.201
Strontium 90	0.386 ± 0.087	0.317 ± 0.081	0.279 ± 0.095	< 0.205	< 0.178 *d	0.319 ± 0.0916
Gamma isotopic						
Barium 140	< 36.1	< 6.41	< 22.1	< 39.2	< 24.3 *d	< 38.2
Cesium 134	< 9.16	< 2.00	< 5.4	< 8.37	< 6.74 *d	< 8.22
Cesium 137	< 11.2	< 1.66	< 6.19	< 9.95	< 5.68 *d	< 10.6
Cobalt 58	< 7.81	< 1.54	< 4.99	< 7.24	< 5.78 *d	< 8.29
Cobalt 60	< 12.5	17.5 ± 2.24	< 7.33	< 9.62	< 7.17 *d	< 8.86
Iodine 131	< 10.5	< 2.01	< 5.39	< 13.7	< 8.33 *d	< 12.6
Iron 59	< 16.6	< 3.06	< 10.9	< 15.6	< 14.2 *d	< 13.9
Lanthanum 140	< 12.1	< 1.99	< 8.54	< 11.9	< 11 *d	< 13.2
Manganese 54	< 7.91	< 1.83	< 5.85	< 7.6	< 6.75 *d	< 7.82
Niobium 95	< 8.25	< 1.63	< 5.91	< 8.93	< 7.56 *d	< 9.3
Zinc 65	< 17.9	< 3.56	< 12.9	< 15.5	< 14.6 *d	< 15.4
Zirconium 95	< 13.4	< 2.74	< 9.89	< 14.5	< 11.4 *d	< 13.6

*a - The analysis is performed on a quarterly composite.

*d - Analyzed Past 180 days holding time

*b - Sample not collected due to safety concerns

*e - Not analyzed due to lab accident

*c - not reported by lab

radioisotopes other than those reported were not detected.

Table 12 Wisconsin DHS analysis results for well water samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/liter

Site:	PBK-3	PBK-10	PBK-11	PBK-12d N	PBK-12d S
Collection date:	05/30/18	4/11/18	05/30/18	05/29/18	Discontinued July 1, 2018
Gross Alpha	0.9 ± 0.592	2.73 ± 1.55	1.45 ± 0.954	< 2.56	*a
Gross Beta	0.877 ± 0.52	1.81 ± 0.707	1.3 ± 0.689	< 2.62	*a
Tritium	< 230	< 232	< 230	< 230	*a

Site:	PBK-3	PBK-10	PBK-11	PBK-12d N	PBK-12d S
Collection date:	09/11/18	10/17/18	09/11/18	09/12/18	Discontinued July 1, 2018
Gross Alpha	< 0.887	< 0.564	1.12 ± 0.666	< 2.49	*a
Gross Beta	< 1.32	< 0.711	1.81 ± 0.743	< 2.14	*a
Tritium	< 231	< 231	< 231	< 231	*a

*a - The well was shut down due to reduced water needs

NS - A sample was unable to be collected.



Table 13 Wisconsin DHS analysis results for milk samples collected for the Point Beach-Kewaunee environmental monitoring program.

PBK-28 (E-21); Strutz farm

Collection date:	01/10/18	02/14/18	03/14/18	04/11/18	05/09/18	06/13/18
Iodine 131 *b		< 0.229	< 0.146	< 0.161		
Strontium 90	0.211 ± 0.134	< 0.188	< 0.269	< 0.347	< 0.392	< 0.334
gamma isotopic						
Barium 140	< 36.6	< 20.2	< 30.6	< 39.1	< 20.8	< 39.3
Cesium 134	< 6.95	< 6.48	< 6.5	< 12.1	< 6.15	< 9.83
Cesium 137	< 8.06	< 5.49	< 7	< 11	< 4.42	< 12.8
Cobalt 58	< 6.66	< 6.36	< 7.68	< 9.53	< 5.13	< 9.6
Cobalt 60	< 9.6	< 5.92	< 6.37	< 13.4	< 5.78	< 11.9
Iodine 131	< 14	< 6.85	< 8.78	10.6	< 6.66	< 12.2
Iron 59	< 14.6	< 10.7	< 15.1	< 24.7	< 10.8	< 21.8
Lanthanum 140	< 9.88	< 9.4	< 8.79	< 12.9	< 6.86	< 9.47
Manganese 54	< 7.34	< 7.75	< 6.41	< 10.6	< 5.94	< 7.95
Niobium 95	< 7.59	< 6.69	< 7.08	< 10.2	< 5.49	< 8.26
Potassium 40	1410 ± 248	1380 ± 266	1180 ± 237	1390 ± 295	1410 ± 249	1230 ± 247
Zinc 65	< 14.3	< 15	< 18.4	< 28.1	< 13.3	< 23.8
Zirconium 95	< 12.8	< 11.9	< 14.8	< 18.8	< 8.78	< 16.1

Collection date:	07/11/18	08/08/18	09/12/18	10/17/18	11/14/18	12/12/18
Iodine 131 *b	< 0.237	< 0.446			< 0.264	
Strontium 90	0.316 ± 0.177	0.366 ± 0.22	0.365 ± 0.248	0.833 ± 0.195	0.387 ± 0.229	< 0.388
gamma isotopic						
Barium 140	< 29.6	< 23.7	< 29.6	< 22.1	< 42.8	< 23.2
Cesium 134	< 7.41	< 6.72	< 7.29	< 7.05	< 10.4	< 7.48
Cesium 137	< 6.33	< 5.86	< 5.68	< 6.54	< 8.99	< 6.54
Cobalt 58	< 6.68	< 5.8	< 6.54	< 7.1	< 9.98	< 7.68
Cobalt 60	< 6.65	< 7.52	< 7.97	< 7.12	< 11.4	< 8.49
Iodine 131	< 11.9	< 7.2	< 9.39	< 6.6	< 11.3	< 6.15
Iron 59	< 14.1	< 14.7	< 16.2	< 12.1	< 25.6	< 14.9
Lanthanum 140	< 11.9	< 8.14	< 8.81	< 8.35	< 12.2	< 8.94
Manganese 54	< 7.78	< 6.86	< 5.45	< 7.45	< 10.3	< 7.74
Niobium 95	< 7.6	< 6.51	< 7.08	< 6.99	< 11.3	< 7.42
Potassium 40	1330 ± 249	1200 ± 238	1320 ± 255	1300 ± 254	1290 ± 281	1440 ± 274
Zinc 65	< 16	< 17.9	< 16	< 12.9	< 21	< 18.6
Zirconium 95	< 12.7	< 13.8	< 15.3	< 11.8	< 19.1	< 13

Radioisotopes other than those reported were not detected.

*a – Not reported by laboratory

*b - The analysis is performed bi-monthly



Table 13 (continued) Wisconsin DHS analysis results for milk samples collected for the Point Beach-Kewaunee environmental monitoring program.

Measurements in units of pCi/liter

PBK-24; Struck farm

Collection date:	01/10/18	02/14/18	03/14/18	04/11/18	05/9/18	06/13/18
Iodine 131 *b		< 0.391	< 0.18	< 0.161		
Strontium 90	< 0.242	0.208 ± 0.0729	< 0.29	< 0.372	< 0.323	0.459 ± 0.222
gamma isotopic						
Barium 140	< 39.1	< 25.4	< 19.9	< 25.1	< 21.1	< 25
Cesium 134	< 7.07	< 6.23	< 6.95	< 7.27	< 5.79	< 6.72
Cesium 137	< 9.69	< 5.86	< 6.38	< 6.21	< 5.02	< 6.38
Cobalt 58	< 7.09	< 6.34	< 5.6	< 6.94	< 5.74	< 6.69
Cobalt 60	< 9.4	< 7.69	< 8.49	< 6.36	< 6.67	< 8.22
Iodine 131	< 14	< 6.11	< 6.12	< 6.67	< 6.35	< 6.45
Iron 59	< 15.2	< 13.9	< 14	< 14.5	< 8.81	< 15.8
Lanthanum 140	< 11.4	< 5.73	< 8.1	< 4.35	< 6.35	< 8.74
Manganese 54	< 6.6	< 8.28	< 7.75	< 5.8	< 5.73	< 7.17
Niobium 95	< 7.99	< 8.75	< 8.52	< 7.13	< 5.40	< 7.25
Potassium 40	1460 ± 262	1530 ± 289	1510 ± 287	1400 ± 271	1300 ± 231	1400 ± 267
Zinc 65	< 14.6	< 19.3	< 15	< 18.2	< 10.1	< 15.4
Zirconium 95	< 13.1	< 11.9	< 11.5	< 12.6	< 7.83	< 11

Collection date:	07/11/18	08/08/18	09/12/18	10/17/18	11/14/18	12/12/18
Iodine 131 *b	< 0.235	< 0.483				< 0.246
Strontium 90	< 0.398	< 0.346	0.47 ± 0.184	< 0.368	0.398 ± 0.223	< 0.42
gamma isotopic						
Barium 140	< 31.9	< 25.9	< 24.2	< 35.3	< 42.7	< 30.2
Cesium 134	< 7.51	< 7.68	< 6.48	< 10.2	< 8.51	< 10.1
Cesium 137	< 6.1	< 6.7	< 6.54	< 12.1	< 7.11	< 11
Cobalt 58	< 6.76	< 6.85	< 7.46	< 8.54	< 7.59	< 12
Cobalt 60	< 9.25	< 7.12	< 6.81	< 11.3	< 9.52	< 12.8
Iodine 131	< 10.4	< 6.45	< 6.86	< 10.5	< 12.7	< 10.2
Iron 59	< 15.7	< 16.2	< 14	< 19.1	< 13.5	< 19.6
Lanthanum 140	< 13	< 7.44	< 9.86	< 11.7	< 14.8	< 13.9
Manganese 54	< 7.03	< 7.02	< 7.89	< 9.93	< 8	< 11.9
Niobium 95	< 8.14	< 8.17	< 7.11	< 8.94	< 9.35	< 8.79
Potassium 40	1410 ± 259	1330 ± 259	1100 ± 220	1290 ± 254	1040 ± 215	1320 ± 290
Zinc 65	< 14.4	< 15.9	< 15.9	< 21	< 19.6	< 28.9
Zirconium 95	< 10.6	< 13.8	< 11.9	< 17.1	< 14.1	< 18.3

Radioisotopes other than those reported were not detected.

*a – Not reported by laboratory

*b - The analysis is performed bi-monthly



Table 13 (continued) Wisconsin DHS analysis results for milk samples collected for the Point Beach-Kewaunee environmental monitoring program.

Measurements in units of pCi/liter

PBK-27 (E-40); R. Barta farm

Collection date:	01/10/18	02/14/18	03/14/18	04/11/18	05/09/18	06/13/18
Iodine 131 *b		< 0.316	< 0.177	< 0.128		
Strontium 90	< 0.249	*a	0.453 ± 0.187	0.401 ± 0.201	0.458 ± 0.201	< 0.338
gamma isotopic						
Barium 140	< 35.8	< 39.9	< 45.1	< 27.2	< 25.6	< 38.4
Cesium 134	< 7.49	< 9.99	< 11.9	< 6.95	< 6.24	< 9.32
Cesium 137	< 9.6	< 12.9	< 11.3	< 5.86	< 5.68	< 11.9
Cobalt 58	< 6.68	< 8.89	< 8.41	< 7.31	< 7.16	< 10.1
Cobalt 60	< 9.76	< 10.8	< 12.7	< 7.52	< 6.78	< 11.1
Iodine 131	< 13.3	< 10.7	< 11.2	< 6.27	< 6.8	< 11.9
Iron 59	< 13.5	< 20.8	< 18	< 14.7	< 16.5	< 17.9
Lanthanum 140	< 9.24	< 11.5	< 12.1	< 9.32	< 7.49	< 10.6
Manganese 54	< 6.43	< 10.1	< 11	< 7.02	< 8.29	< 10.3
Niobium 95	< 7.4	< 8.79	< 11.9	< 6.66	< 7.54	< 9.6
Potassium 40	1400 ± 249	1440 ± 280	1460 ± 308	1140 ± 231	1490 ± 284	1490 ± 285
Zinc 65	< 14.9	< 20.4	< 26.6	< 14	< 17.1	< 20.1
Zirconium 95	< 13.2	< 17.5	< 20.1	< 11.3	< 13	< 15.7

Collection date:	07/11/18	08/08/18	09/12/18	10/17/18	11/14/18	12/12/18
Iodine 131 *b	< 0.246	< 0.441			< 0.264	< 0.267
Strontium 90	< 0.49	0.369 ± 0.186	< 0.541	0.325 ± 0.185	< 5.62	3.23 ± 0.305
gamma isotopic						
Barium 140	< 44.5	< 39.8	< 41.5	< 37.1	< 28.2	< 22.5
Cesium 134	< 8.56	< 10.8	< 10.1	< 11.3	< 5.98	< 5.7
Cesium 137	< 8	< 12.1	< 12.9	< 11.3	< 6.54	< 6.38
Cobalt 58	< 8.57	< 8.36	< 8.89	< 10.9	< 6.54	< 6.79
Cobalt 60	< 11	< 13	< 12.8	< 13.4	< 9.08	< 8.49
Iodine 131	< 14.3	< 13.5	< 12.3	< 10.3	< 7.38	< 6.06
Iron 59	< 22.5	< 20.5	< 20.6	< 17.7	< 14.8	< 15.6
Lanthanum 140	< 9.16	< 11	< 12.4	< 14	< 8.83	< 6.35
Manganese 54	< 10.1	< 9.38	< 9.62	< 11.9	< 6.54	< 7.59
Niobium 95	< 9.36	< 9.13	< 8.3	< 11.6	< 5.85	< 7.9
Potassium 40	1430 ± 280	1290 ± 258	1160 ± 238	1340 ± 291	1410 ± 270	1440 ± 275
Zinc 65	< 23.8	< 22.7	< 21.1	< 28.1	< 15.9	< 14.5
Zirconium 95	< 16.5	< 16.5	< 17.3	< 14.4	< 11.9	< 12

Radioisotopes other than those reported were not detected.

*a – Not reported by laboratory

*b - The analysis is performed bi-monthly



Table 14 Wisconsin DHS analysis results for vegetation samples collected for the Point Beach-Kewaunee environmental monitoring program.

Measurements in units of pCi/kilogram (wet)

Site:	PBK-1	PBK-2	PBK-3	PBK-4	PBK-5
Collection date:	05/29/18	05/30/18	05/29/18	05/30/18	05/30/18
Gross Alpha	1240 ± 883	796 ± 554	< 1230	< 1150	< 928
Gross Beta	8850 ± 488	6990 ± 331	4560 ± 350	5960 ± 364	6330 ± 351
gamma isotopic					
Barium 140	< 97.1	< 59.3	< 43	< 99.8	< 43.6
Beryllium 7	739 ± 129	315 ± 76.3	625 ± 89.3	270 ± 81.9	219 ± 61.2
Cesium 134	< 17	< 11.6	< 9.71	< 19.9	< 9.75
Cesium 137	< 18.2	< 11.5	< 9.17	< 24.5	< 10.3
Cobalt 58	< 17	< 12.8	< 9.63	< 19	< 10.9
Cobalt 60	< 22.9	< 12.7	< 9.9	< 25	< 11.8
Iodine 131	< 30.8	< 16.6	< 15.8	< 31.2	< 13.6
Iron 59	< 52.8	< 24.3	< 23.3	< 39.4	< 26.8
Lanthanum 140	< 29.3	< 17.8	< 14.3	< 30.4	< 16.8
Manganese 54	< 23.5	< 11.5	< 11.3	< 18.1	< 10.1
Niobium 95	< 17.4	< 14.9	< 11.6	< 22.4	< 13.9
Potassium 40	6070 ± 1070	6220 ± 1060	4540 ± 782	6560 ± 1120	5690 ± 961
Zinc 65	< 47.3	< 28.9	< 26	< 45.1	< 25.3
Zirconium 95	< 37.5	< 20.9	< 18.4	< 32.6	< 18.4

Site:	PBK-7	PBK-8	PBK-14	PBK-17
Collection date:	05/29/18	05/30/18	05/30/18	05/31/18
Gross Alpha	< 1380	< 961	< 1160	< 630
Gross Beta	6650 ± 422	8130 ± 349	5630 ± 308	4190 ± 265
gamma isotopic				
Barium 140	< 56.6	< 81.1	< 36.1	< 56.4
Beryllium 7	794 ± 112	231 ± 86.3	243 ± 49	< 138
Cesium 134	< 11.4	< 20.8	< 8.39	< 16.1
Cesium 137	< 13.2	< 22.1	< 8.59	< 13.9
Cobalt 58	< 14.2	< 21.4	< 9.82	< 17.3
Cobalt 60	< 17.8	< 23.6	< 12	< 23.2
Iodine 131	< 19.9	< 34.4	< 10.9	< 19.5
Iron 59	< 30.3	< 49.9	< 20.7	< 40.4
Lanthanum 140	< 17.2	< 34.6	< 12	< 22.4
Manganese 54	< 15	< 23	< 9.11	< 17.2
Niobium 95	< 13.2	< 24.7	< 8.93	< 18.2
Potassium 40	7180 ± 1220	6660 ± 1200	5890 ± 982	3970 ± 729
Zinc 65	< 34.6	< 50.6	< 23.1	< 41.5
Zirconium 95	< 24.1	< 38.3	< 15.2	< 26.1

Radioisotopes other than those reported were not detected.

Table 14 (continued) Wisconsin DHS analysis results for vegetation samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/kilogram (wet)

Site:	PBK-1	PBK-2	PBK-3	PBK-4	PBK-5
Collection date:	09/11/18	09/12/18	09/11/18	09/11/18	09/11/18
Gross Alpha	< 1950	< 1500	2220 ± 1190	1620 ± 991	1780 ± 1230
Gross Beta	5180 ± 506	4650 ± 423	4910 ± 454	4660 ± 484	4800 ± 524
gamma isotopic					
Barium 140	< 131	< 138	< 71.6	< 74.4	< 24.4
Beryllium 7	6130 ± 471	6760 ± 521	4160 ± 352	4700 ± 374	6550 ± 388
Cesium 134	< 22.9	< 26	< 14.4	< 19.5	< 5.4
Cesium 137	< 27.8	< 29.8	< 13.9	< 16.7	< 5.06
Cobalt 58	< 21.1	< 27	< 16.5	< 12.9	< 4.56
Cobalt 60	< 27	< 29.5	< 15.3	< 20.8	< 5.43
Iodine 131	< 51.3	< 52	< 32.2	< 35.1	< 10
Iron 59	< 41.8	< 56.5	< 34.2	< 33.4	< 11.3
Lanthanum 140	< 36.5	< 36.3	< 22.1	< 24.7	< 8.14
Manganese 54	< 21.4	< 25.1	< 15.4	< 17.3	< 5.21
Niobium 95	< 26.5	< 27.7	< 17.6	< 18.7	< 5.14
Potassium 40	5230 ± 927	4150 ± 773	4830 ± 869	5060 ± 881	4440 ± 713
Zinc 65	< 48.8	< 57.7	< 38.6	< 42.3	< 11.7
Zirconium 95	< 47.8	< 43.4	< 27.8	< 25	< 7.61

Site:	PBK-7	PBK-8	PBK-14	PBK-17
Collection date:	09/11/18	09/11/18	09/12/18	09/12/18
Gross Alpha	< 895	589 ± 304	< 1980	< 1760
Gross Beta	4870 ± 309	6590 ± 264	4220 ± 426	4000 ± 497
gamma isotopic				
Barium 140	< 59.4	< 57.6	< 114	< 85.6
Beryllium 7	2100 ± 189	392 ± 77.5	3480 ± 348	7260 ± 540
Cesium 134	< 12.7	< 10.5	< 20.7	< 15.2
Cesium 137	< 11.9	< 10.3	< 24.5	< 16.5
Cobalt 58	< 10.5	< 10.5	< 23.4	< 17.3
Cobalt 60	< 15.3	< 13.1	< 24.6	< 15.6
Iodine 131	< 19.8	< 18.6	< 36.6	< 27.4
Iron 59	< 27.5	< 29.9	< 49.5	< 33.7
Lanthanum 140	< 16.2	< 16.4	< 35.6	< 24.7
Manganese 54	< 12.9	< 11	< 24.1	< 17.7
Niobium 95	< 12.4	< 13.6	< 25.6	< 19.9
Potassium 40	5740 ± 959	7600 ± 1270	4150 ± 812	3970 ± 734
Zinc 65	< 24.5	< 28.5	< 40.9	< 38.7
Zirconium 95	< 19	< 24.7	< 39.9	< 31.9

Radioisotopes other than those reported were not detected.

Table 15 Wisconsin DHS analysis results for soil samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/kilogram (dry)

Site:	PBK-1	PBK-2	PBK-3	PBK-4	PBK-5
Collection date:	05/29/18	05/30/18	05/29/18	05/30/18	05/30/18
Gross Alpha	7620 ± 3280	5890 ± 2970	6140 ± 2760	6420 ± 2760	8250 ± 3390
Gross Beta	14600 ± 1220	17900 ± 1140	23500 ± 1330	19600 ± 1220	20500 ± 1320
gamma isotopic					
Cesium 134	< 12.1	< 23.4	< 23.8	< 21.2	< 24.9
Cesium 137	236 ± 24.8	62.4 ± 15.3	92.6 ± 16	116 ± 17.3	< 38.1
Cobalt 58	< 18.1	< 27.6	< 27.4	< 27.6	< 30.6
Cobalt 60	< 14.7	< 29.3	< 24.2	< 25.9	< 30.3
Iron 59	< 41.9	< 85.7	< 80.6	< 77.5	< 74.5
Manganese 54	< 15.9	< 26.2	< 27.7	< 26	< 26.2
Niobium 95	< 25.5	< 38.5	< 33.6	< 41.6	< 49
Potassium 40	13800 ± 2260	18000 ± 2930	22900 ± 3690	18800 ± 3050	19800 ± 3220
Zinc 65	< 40.8	< 59.8	< 57.7	< 57.1	< 63.6
Zirconium 95	*a	< 57.9	< 53.1	< 54.7	< 53.9

Site:	PBK-7	PBK-8	PBK-14	PBK-17
Collection date:	05/29/18	05/30/18	05/30/18	05/31/18
Gross Alpha	8700 ± 3970	6510 ± 2920	7660 ± 2970	6570 ± 3550
Gross Beta	23300 ± 1400	21200 ± 1350	22100 ± 1270	15200 ± 1080
gamma isotopic				
Cesium 134	< 30.6	< 22.9	< 26.7	< 21.2
Cesium 137	198 ± 30.3	59.3 ± 14.5	155 ± 22.5	106 ± 17.1
Cobalt 58	< 45.1	< 26.5	< 30.1	< 27.2
Cobalt 60	< 40.9	< 22.8	< 32.7	< 25.5
Iron 59	< 127	< 66.9	< 73.9	< 72.5
Manganese 54	< 42.6	< 24.3	< 30.7	< 21.1
Niobium 95	< 72.2	< 35.7	< 42.8	< 36.7
Potassium 40	23900 ± 3960	20100 ± 3260	22100 ± 3590	15100 ± 2470
Zinc 65	< 93.8	< 63.5	< 76.6	< 55.1
Zirconium 95	< 88.7	< 45.4	< 60.3	< 52.6

*a – Not reported by laboratory

Naturally occurring radioisotopes such as radium-226 (²²⁶Ra), bismuth-214 (²¹⁴Bi), lead-214 (²¹⁴Pb), actinium-228 (²²⁸Ac), bismuth-212 (²¹²Bi), lead-212 (²¹²Pb) from the naturally occurring uranium-238 (²³⁸U), and thorium-232 (²³²Th) decay series are commonly detected but have not been quantified or reported.

Radioisotopes other than those reported were not detected.

Table 15 (continued) Wisconsin DHS analysis results for soil samples collected for the Point Beach- Kewaunee environmental monitoring program.



Measurements in units of pCi/kilogram (dry)

Site:	PBK-1	PBK-2	PBK-3	PBK-4	PBK-5
Collection date:	09/11/18	09/12/18	09/11/18	09/11/18	09/11/18
Gross Alpha	< 4320	5740 ± 2770	6010 ± 2940	6860 ± 3580	8180 ± 3150
Gross Beta	13900 ± 1230	18400 ± 1290	22500 ± 1450	18600 ± 1300	17600 ± 1250
gamma isotopic					
Cesium 134	< 19.1	< 26.3	< 15.9	< 14.7	< 15.7
Cesium 137	70.5 ± 14.2	167 ± 23.5	78.5 ± 15.3	128 ± 16.3	30 ± 8.45
Cobalt 58	< 20.1	< 23.4	< 18.7	< 32	< 15.6
Cobalt 60	< 23.4	< 30.4	< 21.1	< 15.5	< 17.6
Iron 59	< 51.8	< 65.8	< 46.4	< 111	< 40.1
Manganese 54	< 22.1	< 29.9	< 23.7	< 19.9	< 16
Niobium 95	< 27.3	< 31.3	< 28.3	< 81.1	< 19.6
Potassium 40	16400 ± 2660	18400 ± 3010	24700 ± 3980	20100 ± 3240	23200 ± 3700
Zinc 65	< 51.4	< 64.7	< 47.8	< 48.2	< 42.1
Zirconium 95	< 40	< 52.9	< 38.3	< 65	< 31.3

Site:	PBK-7	PBK-8	PBK-14	PBK-17
Collection date:	09/11/18	09/11/18	09/12/18	09/12/18
Gross Alpha	8320 ± 3840	6160 ± 3230	8810 ± 3770	< 6660
Gross Beta	22600 ± 1550	18400 ± 1540	11500 ± 1190	12300 ± 1310
gamma isotopic				
Cesium 134	< 22.3	< 14	< 22.6	< 16.8
Cesium 137	207 ± 23.4	73.6 ± 12.8	154 ± 21.3	163 ± 17.8
Cobalt 58	< 45.3	< 28.3	< 39.4	< 33.8
Cobalt 60	< 26.9	< 15	< 26.3	< 18.3
Iron 59	< 146	< 99.4	< 154	< 92.9
Manganese 54	< 29.8	< 18.8	< 27.1	< 21.3
Niobium 95	< 99.1	< 58.7	< 99.7	< 64.7
Potassium 40	24100 ± 3900	18200 ± 2930	12800 ± 2120	13900 ± 2250
Zinc 65	< 76.1	< 45	< 58.2	< 48.0
Zirconium 95	< 88.8	< 60.7	< 92.1	< 58.0

Naturally occurring radioisotopes such as radium-226 (²²⁶Ra), bismuth-214 (²¹⁴Bi), lead-214 (²¹⁴Pb), actinium-228 (²²⁸Ac), bismuth-212 (²¹²Bi), lead-212 (²¹²Pb) from the naturally occurring uranium-238 (²³⁸U), and thorium-232 (²³²Th) decay series are commonly detected but have not been quantified or reported.

Radioisotopes other than those reported were not detected.

Appendices

Appendix A - Radionuclide Concentration Levels needing review by state radiological coordinator (SRC)

If radioactivity concentrations exceed SRC review levels for a given radionuclide, consult SRC or review and assessment.

Medium	Radionuclide	SRC Review Level ^a
Airborne Particulates or Gas (pCi/m ³)	Gross Beta	1
	I-131 (Charcoal)	0.1
	Cs-134	1
	Cs-137	1
Precipitation (pCi/l)	H-3	1,000
Water (pCi/l)	Gross Alpha	10
	Gross Beta	30
	H-3	10,000
	Mn-54	100
	Fe-59	40
	Co-58	100
	Co-60	30
	Zn-65	30
	Zr-Nb-95	40
	I-131	1
	Cs-134	10
	Cs-137	20
	Ba-La-140	100
	Sr-89	8
Sr-90	8 ^d	
Milk (pCi/l)	I-131	1
	Cs-134	20
	Cs-137	20
	Ba-La-140	100
	Sr-89	10
Grass (Vegetation), Cattle Feed, and Vegetables (pCi/kg wet)	Gross Beta	30,000
	I-131	100
	Cs-134	200
	Cs-137	200
	Sr-89	1,000
	Sr-90	1,000
	Sr-90	1,000

Appendix A (continued) - Radionuclide Concentration Levels needing review by state radiological coordinator (SRC)
 If radioactivity concentrations exceed SRC review levels for a given radionuclide, consult SRC or review and assessment.

Medium	Radionuclide	SRC Review Level ^a
Eggs (pCi/kg) wet	Gross Beta	30,000
	Cs-134	200
	Cs-137	200
	Sr-89	1,000
Soil, Bottom Sediment (pCi/kg)	Gross Beta	5,000
	Cs-134	5,000
	Cs-137	5,000
	Sr-89	5,000
	Sr-90	5,000
Meat (pCi/kg)	Gross Beta (Flesh, Bones)	10,000
	Cs-134 (Flesh)	1,000
	Cs-137 (Flesh)	2,000
	Sr-89 (Bones)	2,000
	Sr-90 (Bones)	2,000
Fish (pCi/kg wet)	Gross Beta (Flesh, Bones)	10,000
	Mn-54	--
	Fe-59	--
	Co-58	--
	Co-60	--
	Cs-134 (Flesh)	1,000
	Cs-137 (Flesh)	2,000
	Sr-89 (Bones)	2,000
	Sr-90 (Bones)	2,000
	Zn-65 (Bones)	--
Thermoluminescent Dosimeter (mR/Std Qtr)	Direct Exposure	

- Radionuclides will be monitored by Wisconsin Dept. of Health Services, Radiation Protection Sections, Environmental Monitoring program and concentrations above the listed levels will be reported to the Wisconsin State Radiological Coordinator (SRC) for further review and assessment.
- For drinking water (well water) samples, this is a 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used. (NUREG-1301. Supplement No. 1, page 64, table 3.12-2)
- If no drinking water pathway exists, a value of 20 pCi/l may be used. (NUREG-1301. Supplement No. 1, page 64, table 3.12-2)
- Drinking Water values from Prescribed Procedures for Measurement of Radioactivity in Drinking Water, EPA-600/4-80-032, August 1980.

Appendix B—Sample Point Locations

The sample point locations.

Sample Point	Location Description	Latitude or Y	Longitude or X
PBK-1	Francar residence	44.31286	-87.64382
PBK-1	Francar residence	44.31273	-87.64391
PBK-2	Southwest corner property line - Point Beach	44.27170	-87.54323
PBK-3	Two Creeks Town Hall	44.28455	-87.56638
PBK-3	Two Creeks Town Hall	44.28419	-87.56558
PBK-4	Residence north property line - Point Beach	44.29741	-87.54500
PBK-5	Two Creeks Park; NW corner of property	44.30497	-87.54435
PBK-5	Two Creeks Park; NW corner of property	44.30584	-87.54646
PBK-7	WPSC substation, Cty V	44.24071	-87.57332
PBK-8	P Ihlenfeldt farm	44.35174	-87.54321
PBK-9	Point Beach, meteorological tower	44.27477	-87.53120
PBK-10a	Point Beach, effluent channel	44.28133	-87.53549
PBK-10b	Point Beach, entrance	44.27964	-87.53686
PBK-11	Two Creeks International Harvester	44.30250	-87.56315
PBK-12a	Kewaunee, effluent channel	44.34245	-87.53385
PBK-12b	Kewaunee, effluent channel, 500 feet N	44.34345	-87.53421
PBK-12c	Kewaunee, effluent channel, 500 feet S	44.34152	-87.53314
PBK-12d(1)	Kewaunee , south well	44.34273	-87.53818
PBK-12d(2)	Kewaunee , north well	44.34419	-87.53834
PBK-14	Nuclear Road – field east of parking lot	44.34209	-87.55209
PBK-17	Green Bay Pumping Station - Rostok	44.50379	-87.48515
PBK-17	Green Bay Pumping Station – Rostok	44.50370	-87.48645
PBK-18	Kewaunee, meteorological tower	44.34047	-87.53631
PBK-24	L. Struck Farm	44.37997	-87.51994
PBK-26	Kewaunee	44.45584	-87.49985
PBK-27	Barta Farm	44.29703	-87.56319
PBK-28	Strutz Farm	44.255999	-87.522693
PBK-29	Irish Road – at Lake Michigan	44.25499	-87.51986
PBK-T1-8	Point Beach ISFSI on outside of perimeter fence	44.28533	-87.54587
PBK-T9	Point Beach north property line, Lakeshore Road	44.29741	-87.54495
PBK-T10	Nuclear Road, 0.6 mile E of Lakeshore Road	44.26935	-87.53113
PBK-T11	Nuclear Road, 0.1 mile E of Lakeshore Road	44.26961	-87.54318
PBK-T12	Highway 42, 0.6 mile N of Nuclear Road	44.27331	-87.56329
PBK-T13	Highway 42, 0.3 mile N of Tapawingo Road	44.28735	-87.56325
PBK-T14	Two Creeks Road, 0.1 mile E of Highway 42	44.30216	-87.56109

Appendix B (continued) - Sample Point Locations

The sample point locations.

Sample Point	Location Description	Latitude or Y	Longitude or X
PBK-T15	Junction of Lakeshore Road and Ravine Drive	44.23341	-87.53894
PBK-T16	Cty V, 0.5 mile W of Hwy 42	44.24072	-87.57332
PBK-T17	Junction of Saxonbury Road and Tapawingo Road	44.28387	-87.61360
PBK-T18	Zander Road, 0.1 mile W on Tannery Road	44.31300	-87.58396
PBK-T20	Junction of Cty BB and Ratajcsak Lane	44.32765	-87.55484
PBK-T28	Kewaunee, South on Hwy 42	44.44445	-87.50591
PBK-T29	Two Rivers, Junction of Hwy 42 and 34th Avenue	44.16469	-87.55987
PBK-T30	Manitowoc, Hwy 42, Two Rivers Chamber of Commerce	44.12039	-87.62514
PBK-T31	Mishicot, Cty V, in front of house #653	44.24052	-87.63330
PBK-51-58	KPS ISFSI on the inside of the perimeter fence	44.34421	-87.53651
PBK-T51	KPS ISFSI on the inside of the perimeter fence	44.34369	-87.53676
PBK-T52	KPS ISFSI on the inside of the perimeter fence	44.34389	-87.53570
PBK-T53	KPS ISFSI on the inside of the perimeter fence	44.34419	-87.53558
PBK-T54	KPS ISFSI on the inside of the perimeter fence	44.34450	-87.53592
PBK-T55	KPS ISFSI on the inside of the perimeter fence	44.34455	-87.53634
PBK-T56	KPS ISFSI on the inside of the perimeter fence	44.34442	-87.53704
PBK-T57	KPS ISFSI on the inside of the perimeter fence	44.34420	-87.53726
PBK-T58	KPS ISFSI on the inside of the perimeter fence	44.34377	-87.53726