Prairie Island
Environmental Radioactivity Survey

2016

WISCONSIN DEPARTMENT
of HEALTH SERVICES

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

P-00441-16 (07/2018)

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 Prairie Island Nuclear Generating Plant, located near Red Wing, Minnesota, for the calendar year January–December 2016. It provides a description and results of this environmental monitoring program.

The DHS environmental monitoring program consists of the collection, analysis, and interpretation of various types of sampled data from the air, water, and terrestrial exposure pathways. The 2016 radioactivity-sampling program included samples of air, precipitation, ambient gamma radiation, surface water, fish, milk, well water, soil, and vegetation that were collected from selected locations at planned sampling intervals.

Program Summary

For 2016, all sample results from the Prairie Island 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.
- There were no incidents during 2016, such as the 2011 Japan Fukushima Daiichi incident, that required additional environmental monitoring.
- There is no radioactive problem in types of food consumed in Wisconsin and no health problem related to radioactivity for Wisconsin citizens.

DHS's ongoing environmental monitoring programs provide assurances to the citizens of Wisconsin that we will continue to evaluate the Prairie Island nuclear power facility and other monitoring areas, for radioactivity levels.

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Introduction

Wisconsin Stat. § 254.41 mandates the Wisconsin Department of Health Services (DHS) to conduct environmental radiation monitoring around the nuclear power facilities that impact Wisconsin. This environmental monitoring report is for the Prairie Island Nuclear Generating Plant, located near Red Wing, Minnesota, for the calendar year January–December 2016. It provides a description and results of this environmental monitoring program.

DHS Prairie Island Environmental Monitoring Sampling Program

The 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, soil, milk, well water, and vegetation are collected from selected locations at planned sampling intervals.

Table 1 is a listing of sampling sites and includes a site description and the direction and distance of each site from the monitored power plant. Table 2 provides a listing of types of samples collected, sites where samples are collected, number of samples collected, number of samples were missed or had a non-routine sample analysis, and a listing of the required analyses. Table 3 provides an explanation of missing samples or non-routine sample analyses. Figure 1 is a map showing the location of each environmental sampling site.

Program Modifications

The following program modifications were implemented for 2016:

- Milk samples were suspended in the last quarter of 2015 due staffing and analysis issues at the Wisconsin State Laboratory of Hygiene. Milk sample collection was restarted in January of 2016 and shipped to ATI for analysis.
- Milk sampling ended in November of 2016 due to the retirement of the dairy farmer.

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.

In late 2014, the State Laboratory of Hygiene experienced some staffing issues that impacted their capacity. Starting in 2015, monthly surface water and milk samples were sent to ATI Environmental Inc. for analysis.

ATI Environmental Inc. Midwest Laboratory participates in the National Environmental Laboratory Accreditation Conference Standards (2003) for a variety of radiological analyses during the reporting period.

Detection Limits

Detection limits, required by Wisconsin 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 5-14 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 $\pm$ 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. Wisconsin DHS Prairie Island environmental monitoring sampling sites.

Sample site	Distance and direction (miles)	Location description
PRI-1a	11.6 NW	Prescott; air site
PRI-1b	11.6 NW	Prescott; harbor area
PRI-2	3.6 ESE	Trenton
PRI-4a	8.7 ESE	Bay City park
PRI-4b	8.7 ESE	Bay City, Hwy 35
PRI-5	4.8 ESE	Hager City
PRI-6a	1.9 NNE	Diamond Bluff; Pierce County highway shed
PRI-6b	1.8 NNE	Diamond Bluff cemetery
PRI-8	3.4 N	Station 2 – farm
PRI-9	6.6 ESE	Bay City substation on Hwy 35
PRI-10	2.6 NE	Welch farm (restarted January 2016 discontinued November of 2016)
PRI-13	3.8 E	Christiansen farm (Discontinued 2014)
PRI-15	13.9 N	R. Peterson farm
PRI-T30	1.9 N	Diamond Bluff
PRI-T31	1.7 NNE	Diamond Bluff
PRI-T32	1.8 ENE	290th Avenue
PRI-T33	4.4 N	Hwy 35, Thomas Killian residence
PRI-T34	4.7 NE	Cty K and 840th Street
PRI-T35	5.2 E	Cty W and 790th Street
PRI-T36	4.8 ESE	Hager City
PRI-T37	10.3 NE	Ellsworth
PRI-T38	8.9 ESE	Bay City, Hwy 35
PRI-T39	11.6 NW	Prescott

Table 2 Sample collection summary and required analyses for 2015.

Sample Type	Collection and Frequency	Site Locations	Number of Samples Collected	Number of Sample Deviations	Required Analyses
Air particulate	C/BW	1a, 6a, 9	76	2	GA, GB, GI[w]
Air iodine	C/BW	1a, 6a, 9	78	0	GI
Precipitation	C/BW	1a, 9	12	0	GB[x], H[x]
TLD	C/Q	T30 – T39	39	1	direct exposure
Surface water	G/SA	1b, 2, 4a	6	0	GA, GB, GI, Sr, H
Fish	G/SA	upstream, downstream	8	0	GI
Vegetation	G/SA	1a, 4b, 5, 6a, 8, 9	12	0	GA, GB, GI
Soil	G/SA	1a, 4b, 5, 6a, 8, 9	12	0	GA, GB, GI
Well water	G/SA	4a, 5, 6b	6	0	GA, GB, H
Milk	G/M	10,15	17	7	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

[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 3. Wisconsin DHS missing sample report or non-routine analyses.

Sample type	Date	Site	Explanation
Air Particulate	11/16/16	PRI-1	Data sheet unavailable – not returned from the state lab prior data compilation
Air Particulate	6/29/16	PRI-1	Low air volume – possible power outage
Air Particulate	12/22/16	PRI-6	Data sheet unavailable – not returned from the state lab prior data compilation
Air Particulate	4/21/16	PRI-6	Data sheet unavailable – not returned from the state lab prior data compilation
Air Particulate	6/29/16	PRI-6	Low air volume – possible power outage
Air Particulate	12/22/16	PRI-6	Data sheet unavailable – not returned from the state lab prior data compilation
Air Particulate	6/29/16	PRI-9	Low air volume – possible power outage
Milk	Nov 2016	PRI-10	No sample taken due to retirement
Milk	Dec 2016	PRI-10	No sample take due to retirement
Milk	Nov 2016	PRI-15	No sample taken due to retirement
Milk	Dec 2016	PRI-15	No sample take due to retirement
TLD	3rd quarter	PRIT-30	The TLD and Cage were removed

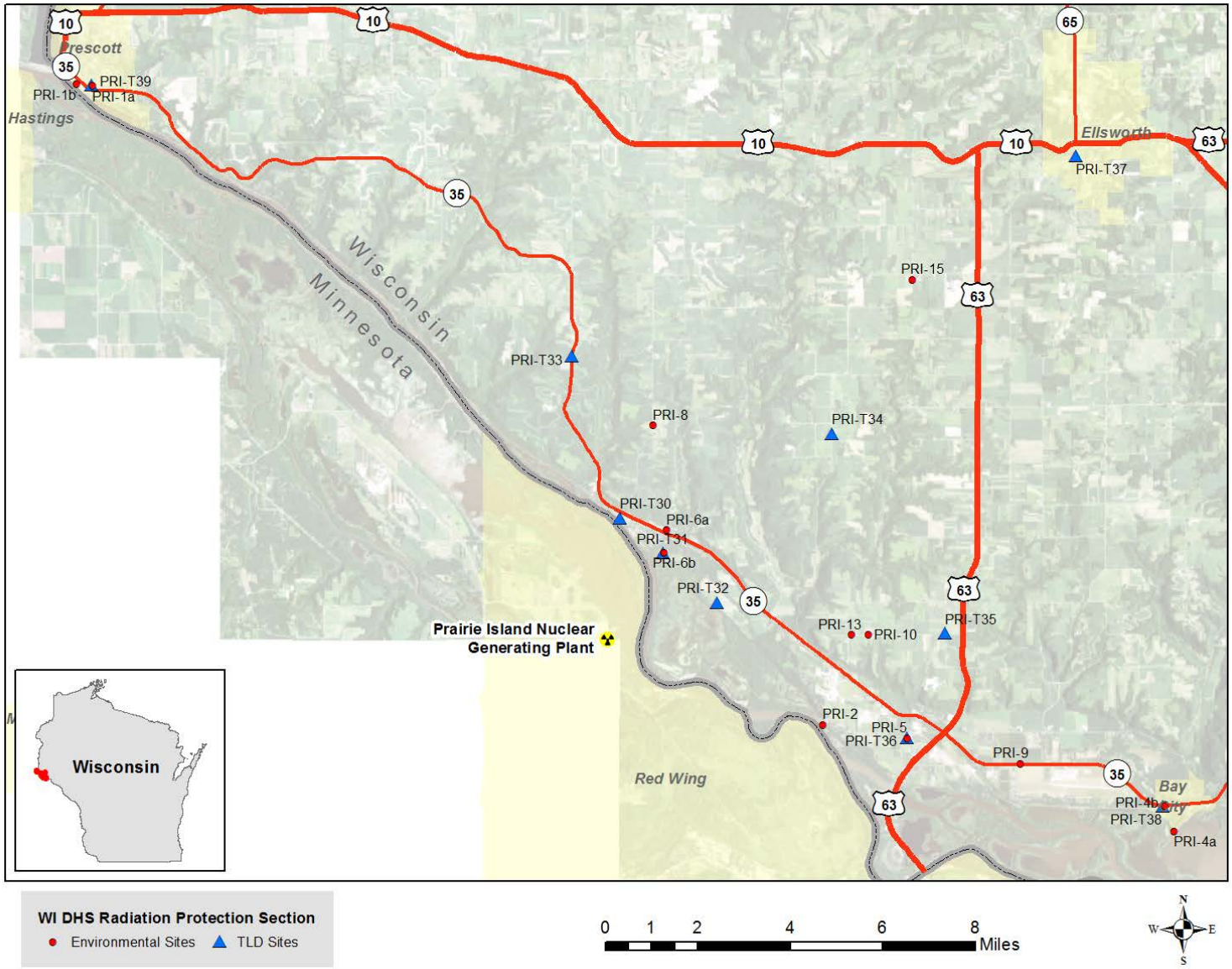

Figure 1. Location of Wisconsin DHS environmental monitoring sites for the Prairie Island monitoring program

Results and Discussion for the Wisconsin DHS Prairie Island Environmental Monitoring program

Air Particulate

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

Table 5 shows gross beta activities; it may be noted that there were no significant differences due to distance away from the Prairie Island facility. Although the gross beta activity was above the LLD, it was similar to previous years; and the elevated activity could not be attributed to the Prairie Island plant operation.

Table 6 provides gamma isotopic analysis of the quarterly air particulate filter composites. Only a small amount of the radioactive Beryllium-7 (^{7}Be), was detected in all composites. Beryllium-7 is a naturally occurring radioisotope that is constantly produced through nuclear reactions between cosmic rays and nuclei in the atmosphere. It was detected in air composites from other areas of the state on a routine basis. Influence by the Prairie Island nuclear generating facility on air quality is not evident from air particulate analysis.

Air Iodine

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

All air iodine measurements were below the LLD of 0.07 pCi/m^{3}. Influence by the Prairie Island nuclear generating facility on air quality is not evident from air iodine analysis.

Ambient Gamma Radiation—Thermoluminescent Dosimeters (TLD)

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

Direct radiation (TLD) data for 2016 from the Wisconsin DHS network was comparable for all sites. Samples taken at varying distances from the Prairie Island nuclear facility did not result in significant differences in exposure. The average quarterly exposure from the ten sites located within Wisconsin was 16.3 ± 0.7 milliroentgens. The average quarterly exposure for 2016 is at background levels and is comparable to other areas within Wisconsin. Influence by the Prairie Island nuclear facility is not evident from air ambient gamma radiation analysis.

Precipitation

Table 4 provides a summary of reported activities by Wisconsin DHS for precipitation. Table 8 provides results from the individual sample analyses.

The results for gross beta activity in precipitation fell within the normal range of activity when compared to previous years' data. Influence by the Prairie Island nuclear facility is not evident from precipitation analysis.

Surface Water

Table 4 provides a summary of reported activities by Wisconsin DHS for surface water samples. Tables 9 provide results from the individual sample analyses.

Gamma isotopic analysis for all radioisotopes were below their respective LLD. All reported activities for gross beta; gross alpha and tritium (^{3}H) were at background levels and were comparable to data from previous years. The surface water samples uniformly showed activities well below state or federal standards. Influence by the Prairie Island nuclear facility is not evident from surface water sample analysis.

Fish

Table 4 provides a summary of reported activities by Wisconsin DHS for fish samples. Table 11 provide results from the individual sample analyses.

The fish samples showed no unusual activities. Naturally occurring potassium-40 (^{40}K) was detected in all samples. All other radioisotopes were below their respective LLD. Influence by the Prairie Island nuclear facility is not evident from fish sample analysis.

Well Water

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

The well water samples did not show unusual gross alpha and gross beta activities and all activities for tritium (^{3}H) were less than its LLD. The measured activities were all below state and federal standards. Influence by the Prairie Island nuclear facility is not evident from well water sample analysis.

Milk

Table 4 provides a summary of reported activities by Wisconsin DHS for milk samples. Tables 12 provide results from the individual sample analyses.

Milk collection at PRI-10 was resumed in January of 2016 and suspended in November 2016 after being notified that the dairy was closing.

Analysis of the milk samples showed no unusual activities. Naturally occurring potassium-40 (^{40}K) was detected in all samples. The detected activities for strontium-90 (^{90}Sr) are attributable to residual fallout from previous atmospheric nuclear weapons testing and were also detected in previous years at similar activity levels. Influence by the Prairie Island nuclear facility is not evident from milk sample analysis.

Vegetation

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

Analysis of the vegetation samples showed no unusual activities. The gamma isotopic analysis detected only small amounts of the naturally occurring radioisotopes beryllium-7 (^{7}Be) and potassium-40 (^{40}K). All other radioisotopes were below their respective LLD. Influence by the Prairie Island nuclear facility is not evident from vegetation sample analysis.

Soil

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

Analysis of the soil samples showed no unusual activities. The gamma isotopic analysis detected only small amounts of radioactive Potassium-40 (^{40}K), which is a naturally occurring radioisotope. Radioactive cesium-137 (^{137}Cs) was also detected in current and previous years samples. The cesium-137 radioisotopes are attributable to fallout from previous atmospheric nuclear tests. 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 Prairie Island facility is not evident from soil sample analysis.

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 Prairie Island nuclear generating facility are less than the limits as stated in these Federal regulations.

The Wisconsin 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 Prairie Island nuclear generating facility are less than the limits stated in Wis. Admin. Code § DHS 157.23.

References

State of Wisconsin, Wis. Admin. Code § DHS 157.23

U.S. Environmental Protection Agency (EPA), Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion, Federal Guidance Report No. 11, EPA-520/1-88-020, (Office of Radiation Programs Washington, DC), September 1988.

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 Prairie Island environmental monitoring program.

Sample type (units)	LLD	Number of samples [a]	Analysis	Range
Air particulate	0.005	78 / 76	gross beta	0.01 - 0.04
(pCi/m^3)			gamma isotopic	
	0.020	12 / 12	Be-7	0.05 - 0.098
	0.002	12 / 0	Mn-54	< 0.0005
	0.002	12 / 0	Co-58	< 0.0005
	0.005	12 / 0	Fe-59	< 0.0009
	0.002	12 / 0	Co-60	< 0.0006
	0.005	12 / 0	Zn-65	< 0.0008
	0.002	12 / 0	Nb-95	< 0.0007
	0.005	12 / 0	Zr-95	< 0.0007
	0.002	12 / 0	Ru-103	< 0.0005
	0.015	12 / 0	Ru-106	< 0.0041
	0.020	12 / 0	I-131	< 0.0018
	0.002	12 / 0	Cs-134	< 0.0005
	0.002	12 / 0	Cs-137	< 0.0005
	0.030	12 / 0	Ba-140	< 0.0037
	0.020	12 / 0	La-140	< 0.0018
	0.002	12 / 0	Ce-141	< 0.0007
	0.005	12 / 0	Ce-144	< 0.0022
Air iodine	0.07	78 / 0	I-131	< 0.054
(pCi/m^3)				
Surface water	3.0	7 / 0	gross alpha (sol)	< 0.3 - 2.6
(pCi/liter)	3.0	7 / 0	gross beta (sol)	< 3.8 - 2.1
	3.0	7 / 0	gross alpha (insol)	< 0.5 - 1.2
	3.0	7 / 0	gross beta (insol)	< 1.9 - 1.1
	300	7 / 0	H-3	< 206
	2.0	4 / 0	Sr-89	< 1.1
	1.0	4 / 0	Sr-90	< 0.6
			gamma isotopic	
	15	7 / 0	Mn-54	< 7.7
	15	7 / 0	Co-58	< 9.3
	30	7 / 0	Fe-59	< 12.5
	15	7 / 0	Co-60	< 8.7
	30	7 / 0	Zn-65	< 15.8
	15	7 / 0	Nb-95	< 9.5
	30	7 / 0	Zr-95	< 12.2
	15	7 / 0	I-131	< 15
	15	7 / 0	Cs-134	< 8.7
	15	7 / 0	Cs-137	< 8.6
	60	7 / 0	Ba-140	< 36.9
	15	7 / 0	La-140	< 13.6

Table 4 (continued) Sample activity summary for the Wisconsin DHS Prairie Island environmental monitoring program.

Sample type (units)	LLD	Number of samples [a]	Analysis	Range
Fish			gamma isotopic	
(pCi/kg wet)	800	10 / 10	K-40	2520 - 3050
	50	10 / 0	Mn-54	< 11
	60	10 / 0	Co-58	< 12
	130	10 / 0	Fe-59	< 35
	60	10 / 0	Co-60	< 15
	130	10 / 0	Zn-65	< 29
	50	10 / 0	Nb-95	< 16
	100	10 / 0	Zr-95	< 20
	50	10 / 0	Cs-134	< 11
	60	10 / 0	Cs-137	< 14
Precipitation	1.5	12 / 0	gross beta	< 0.47 - 0.49
(nCi/m^2)	300	12 / 0	H-3	4.5 - 45.7
Well water	3.0	6 / 0	gross alpha	< 1.6
(pCi/liter)	3.0	6 / 5	gross beta	< 2.6 – 2.5
	300	6 / 0	H-3	< 210
Vegetation	5000	12 / 0	gross alpha	< 1620 - 1350
(pCi/kg wet)	4000	12 / 9	gross beta	3330 - 7180
			gamma isotopic	
	600	12 / 11	Be-7	< 20 - 3530
	2000	12 / 12	K-40	< 5910 - 6410
	90	12 / 0	Mn-54	< 32
	100	12 / 0	Co-58	< 29
	200	12 / 0	Fe-59	< 70
	100	12 / 0	Co-60	< 41
	250	12 / 0	Zn-65	< 75
	100	12 / 0	Nb-95	< 42
	200	12 / 0	Zr-95	< 59
	80	12 / 0	I-131	< 89
	80	12 / 0	Cs-134	< 32
	90	12 / 0	Cs-137	< 37
	350	12 / 0	Ba-140	< 189
	100	12 / 0	La-140	< 71

Table 4 (continued) Sample activity summary for the Wisconsin DHS Prairie Island environmental monitoring program.

Sample type (units)	LLD	Number of samples [a]	Analysis	Range
Soil	15000	12 / 0	gross alpha	6890 - 14800
(pCi/kg dry)	6000	12 / 12	gross beta	8430 - 17700
			gamma isotopic	
	80	12 / 0	Cs-134	< 32
	80	12 / 9	Cs-137	25.7 - 429
	90	12 / 0	Co-58	< 42
	90	12 / 0	Co-60	< 37
	600	12 / 0	Fe-59	< 114
	60	12 / 0	Mn-54	< 39
	100	12 / 0	Nb-95	< 78
	800	12 / 12	K-40	10800 - 18000
	300	12 / 0	Zn-65	< 87
	250	12 / 0	Zr-95	< 81
Milk	1.5	10 / 0	I-131	< 0.5
(pCi/liter)	1.0	20 / 1	Sr-90	< 0.7 - 1
	500	22 / 20	K-40	1213 - 1562
	15	22 / 0	Mn-54	< 3.6
	15	22 / 0	Co-58	< 4.5
	40	22 / 0	Fe-59	< 9.4
	15	22 / 0	Co-60	< 3.8
	40	22 / 0	Zn-65	< 7.5
	15	22 / 0	Nb-95	< 4.6
	40	22 / 0	Zr-95	< 6.8
	15	22 / 0	I-131	< 7.6
	15	22 / 0	Cs-134	< 4.2
	15	22 / 0	Cs-137	< 4.7
	60	22 / 0	Ba-140	< 20.4
	15	22 / 0	La-140	< 3.8
ambient radiation (TLD)	1.0 [c]	39 / 39	direct exposure	9.2 – 20.3
(mR/Std Qtr)				

a - Number of analyses / number of analyses detected above the Wisconsin DHS LLD.
b – LLD (minimum detectable concentration) activities expressed in units of pCi/liter.
c – 1.0 mR / TLD

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

Measurements in units of pCi/m^3

PRI-1 (3100 series); Prescott

Collection date	Volume m^3	Air particulate	Air iodine
01/01/16	1018	0.039 ± 0.002	< 0.012
01/14/16	915	0.026 ± 0.002	< 0.021
01/28/16	976	0.029 ± 0.002	< 0.018
02/10/16	901	0.021 ± 0.002	< 0.016
02/25/16	1038	0.017 ± 0.001	< 0.016
03/09/16	881	0.018 ± 0.001	< 0.020
03/22/16	866	0.015 ± 0.001	< 0.016
1st Qtr			
mean +- s.d.		0.024 ± 0.008	< 0.017
04/07/16	1074	0.015 ± 0.001	< 0.014
04/21/16	733	0.016 ± 0.001	< 0.011
05/03/16	773	0.010 ± 0.001	< 0.014
05/18/16	950	0.010 ± 0.001	< 0.014
06/05/16	1055	0.015 ± 0.001	< 0.007
06/18/16	776	0.013 ± 0.001	< 0.022
06/29/16	648	0.014 ± 0.002	< 0.017
2nd Qtr			
mean +- s.d.		0.013 ± 0.002	< 0.014
07/17/16	889	0.014 ± 0.001	< 0.023
07/30/16	750	0.017 ± 0.001	< 0.012
08/14/16	880	0.018 ± 0.001	< 0.014
08/27/16	786	0.019 ± 0.001	< 0.030
09/11/16	883	0.015 ± 0.001	< 0.030
09/22/16	674	0.017 ± 0.001	< 0.017
3rd Qtr			
mean +- s.d.		0.017 ± 0.001	< 0.021
10/06/16	855	0.015 ± 0.001	< 0.015
10/19/16	817	0.018 ± 0.001	< 0.023
11/04/16	1013	0.020 ± 0.001	< 0.024
*d	*d	*d ± *d	< 0.017
12/05/16	1121	0.028 ± 0.001	< 0.015
12/22/16	1263	0.022 ± 0.001	< 0.011
4th Qtr			
mean +- s.d.		0.021 ± 0.005	< 0.017

PRI-6 (3200 series); Diamond Bluff

Collection date	Volume m^3	Air particulate	Air iodine
01/01/16	992	0.036 ± 0.002	< 0.001
01/14/16	888	0.026 ± 0.002	< 0.002
01/28/16	956	0.028 ± 0.002	< 0.001
02/10/16	877	0.020 ± 0.002	< 0.002
02/25/16	1006	0.018 ± 0.002	< 0.001
03/09/16	856	0.017 ± 0.001	< 0.001
03/22/16	841	0.016 ± 0.001	< 0.001
1st Qtr			
mean +- s.d.		0.023 ± 0.007	< 0.014
04/07/16	1043	0.015 ± 0.001	< 0.013
04/21/16	*c	0.016 ± 0.001	< 0.010
05/03/16	769	0.011 ± 0.001	< 0.009
05/18/16	931	0.010 ± 0.001	< 0.016
06/05/16	1050	0.015 ± 0.001	< 0.008
06/18/16	770	0.013 ± 0.001	< 0.014
06/29/16	641	0.016 ± 0.002	< 0.017
2nd Qtr			
mean +- s.d.		0.014 ± 0.002	< 0.012
07/17/16	1042	0.015 ± 0.001	< 0.019
07/30/16	749	0.017 ± 0.001	< 0.013
08/14/16	861	0.018 ± 0.001	< 0.018
08/27/16	765	0.018 ± 0.001	< 0.026
09/11/16	865	0.016 ± 0.001	< 0.024
09/22/16	658	0.016 ± 0.001	< 0.020
3rd Qtr			
mean +- s.d.		0.017 ± 0.001	< 0.020
10/06/16	842	0.016 ± 0.001	< 0.018
10/19/16	802	0.019 ± 0.001	< 0.019
11/04/16	1002	0.020 ± 0.001	< 0.020
11/16/16	757	0.029 ± 0.002	< 0.019
12/05/16	1240	0.025 ± 0.001	< 0.010
*d	*d	*d ± *d	< 0.012
4th Qtr			
mean +- s.d.		0.022 ± 0.005	< 0.016

*a = There was a mechanical problem with the air collection unit, no samples were taken.

*b = There was a numbering issue with the filter numbers; this did not affect data collection.

*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 Prairie Island environmental monitoring program.

Measurements in units of pCi/m^3

PRI-9 (3400 series); Bay City substation

Collection date	Volume m3	Air particulate			Air iodine	
01/01/16	1250	0.040	+-	0.002	<	0.008
01/14/16	1106	0.025	+-	0.002	<	0.016
01/28/16	1195	0.026	+-	0.002	<	0.015
02/10/16	1096	0.021	+-	0.002	<	0.012
02/25/16	1254	0.018	+-	0.001	<	0.010
03/09/16	1073	0.017	+-	0.001	<	0.054
03/22/16	1056	0.013	+-	0.001	<	0.013
1st Qtr						
mean +- s.d.		0.023	+-	0.009	<	0.018
04/07/16	1311	0.014	+-	0.001	<	0.012
04/21/16	1111	0.016	+-	0.001	<	0.008
05/03/16	969	0.012	+-	0.001	<	0.006
05/18/16	1184	0.011	+-	0.001	<	0.012
06/05/16	1368	0.015	+-	0.001	<	0.005
06/18/16	1000	0.012	+-	0.001	<	0.015
06/29/16	856	0.013	+-	0.001	<	0.015
2nd Qtr						
mean +- s.d.		0.013	+-	0.002	<	0.010
07/17/16	1387	0.014	+-	0.001	<	0.013
07/30/16	981	0.016	+-	0.001	<	0.008
08/14/16	1120	0.018	+-	0.001	<	0.014
08/27/16	961	0.017	+-	0.001	<	0.015
09/11/16	1102	0.015	+-	0.001	<	0.019
09/22/16	856	0.017	+-	0.001	<	0.018
07/17/16	1387	0.014	+-	0.001	<	0.013
3rd Qtr						
mean +- s.d.		0.016	+-	0.001	<	0.015
10/06/16	1091	0.015	+-	0.001	<	0.012
10/19/16	1032	0.019	+-	0.001	<	0.011
11/04/16	1281	0.020	+-	0.001	<	0.019
11/16/16	952	0.030	+-	0.001	<	0.015
12/05/16	1540	0.025	+-	0.001	<	0.006
12/22/16	1419	0.024	+-	0.001	<	0.010
4th Qtr						
mean +- s.d.		0.022	+-	0.005	<	0.012

*a = There was a mechanical problem with the air collection unit, no samples were taken.

*b = There was a numbering issue with the filter numbers; this did not affect data collection.

*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 Prairie Island environmental monitoring program.

Measurements in units of pCi/m^3

Site: PRI-1	1st quarter	2nd quarter	3rd quarter	4th quarter
Be-7	0.0890 +- 0.0072	0.0902 +- 0.0082	0.0902 +- 0.0082	0.050 +- 0.005
Mn-54	< 0.0004	< 0.0005	< 0.0005	< 0.0003
Co-58	< 0.0004	< 0.0005	< 0.0005	< 0.0003
Fe-59	< 0.0009	< 0.0009	< 0.0009	< 0.0007
Co-60	< 0.0006	< 0.0005	< 0.0005	< 0.0003
Zn-65	< 0.0008	< 0.0008	< 0.0008	< 0.0006
Nb-95	< 0.0003	< 0.0007	< 0.0007	< 0.0004
Zr-95	< 0.0006	< 0.0007	< 0.0007	< 0.0007
Ru-103	< 0.0004	< 0.0005	< 0.0005	< 0.0004
Ru-106	< 0.0031	< 0.0041	< 0.0041	< 0.0027
I-131	< 0.0008	< 0.0018	< 0.0018	< 0.0017
Cs-134	< 0.0005	< 0.0005	< 0.0005	< 0.0003
Cs-137	< 0.0005	< 0.0004	< 0.0004	< 0.0003
Ba-140	< 0.0021	< 0.0037	< 0.0037	< 0.0032
La-140	< 0.0008	< 0.0018	< 0.0018	< 0.0010
Ce-141	< 0.0006	< 0.0007	< 0.0007	< 0.0005
Ce-144	< 0.0022	< 0.0021	< 0.0021	< 0.0015
Site: PRI-6				
Be-7	0.0977 +- 0.0081	0.0713 +- 0.0055	0.0713 +- 0.0055	0.050 +- 0.004
Mn-54	< 0.0003	< 0.0003	< 0.0003	< 0.0002
Co-58	< 0.0004	< 0.0003	< 0.0003	< 0.0002
Fe-59	< 0.0007	< 0.0008	< 0.0008	< 0.0004
Co-60	< 0.0003	< 0.0004	< 0.0004	< 0.0002
Zn-65	< 0.0008	< 0.0008	< 0.0008	< 0.0004
Nb-95	< 0.0005	< 0.0004	< 0.0004	< 0.0003
Zr-95	< 0.0006	< 0.0005	< 0.0005	< 0.0004
Ru-103	< 0.0003	< 0.0003	< 0.0003	< 0.0002
Ru-106	< 0.0032	< 0.0026	< 0.0026	< 0.0018
I-131	< 0.0007	< 0.0015	< 0.0015	< 0.0017
Cs-134	< 0.0004	< 0.0004	< 0.0004	< 0.0002
Cs-137	< 0.0004	< 0.0003	< 0.0003	< 0.0002
Ba-140	< 0.0017	< 0.0026	< 0.0026	< 0.0026
La-140	< 0.0006	< 0.0014	< 0.0014	< 0.0008
Ce-141	< 0.0006	< 0.0005	< 0.0005	< 0.0004
Ce-144	< 0.0019	< 0.0014	< 0.0014	< 0.0010
Site: PRI-9				
Be-7	0.0978 +- 0.0077	0.0667 +- 0.0048	0.0667 +- 0.0048	0.050 +- 0.004
Mn-54	< 0.0003	< 0.0003	< 0.0003	< 0.0002
Co-58	< 0.0003	< 0.0002	< 0.0002	< 0.0002
Fe-59	< 0.0006	< 0.0005	< 0.0005	< 0.0005
Co-60	< 0.0003	< 0.0003	< 0.0003	< 0.0002
Zn-65	< 0.0007	< 0.0005	< 0.0005	< 0.0004
Nb-95	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Zr-95	< 0.0005	< 0.0004	< 0.0004	< 0.0004
Ru-103	< 0.0003	< 0.0002	< 0.0002	< 0.0002
Ru-106	< 0.0028	< 0.0023	< 0.0023	< 0.0017
I-131	< 0.0008	< 0.0011	< 0.0011	< 0.0017
Cs-134	< 0.0004	< 0.0003	< 0.0003	< 0.0002
Cs-137	< 0.0003	< 0.0002	< 0.0002	< 0.0003
Ba-140	< 0.0017	< 0.0018	< 0.0018	< 0.0028
La-140	< 0.0008	< 0.0010	< 0.0018	< 0.0008
Ce-141	< 0.0005	< 0.0004	< 0.0004	< 0.0004
Ce-144	< 0.0015	< 0.0011	< 0.0011	< 0.0009

Table 7 Wisconsin DHS TLD network for the Prairie Island environmental monitoring program.

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Placed:	01/05/16	04/13/16	07/07/16	10/06/16
Date Removed:	04/13/16	07/07/16	10/06/16	01/18/17
Days in the Field:	99	85	91	104
	Individual quarterly date is reported as: mR / Standard Quarter + 2 sigma counting error.			
TLD sites that are located 0 – 2 miles from the Prairie island facility.				
T30	13.1 +- 0.5	14.0 +- 0.6	16.2 +- 0.5	15.4 +- 0.3
T31	11.2 +- 0.8	14.7 +- 0.6	13.0 +- 0.7	14.6 +- 0.6
T32	16.3 +- 0.8	15.4 +- 0.8	18.8 +- 1.0	15.8 +- 0.9
Quarterly average +- s.d.	13.5 +- 2.6	14.7 +- 0.7	16.0 +- 2.9	15.3 +- 0.3
TLD sites that are located 2– 5 miles from the Prairie island facility				
T33	14.9 +- 0.7	17.5 +- 0.6	16.2 +- 0.6	18.2 +- 0.3
T34	19.7 +- 1.2	18.6 +- 0.9	22.1 +- 1.4	19.0 +- 0.5
T35	18.2 +- 0.4	18.3 +- 1.1	21.4 +- 0.9	18.6 +- 1.2
T36	16.4 +- 0.6	15.3 +- 0.6	18.5 +- 0.8	15.7 +- 0.6
Quarterly average +- s.d.	17.3 +- 2.1	17.4 +- 1.5	19.6 +- 2.7	17.9 +- 0.4
TLD sites that are located greater than 5 miles from the Prairie island facility				
T37	16.8 +- 0.8	16.1 +- 0.4	19.1 +- 1.5	16.4 +- 0.4
T38	12.4 +- 0.5	14.2 +- 0.7	14.0 +- 0.5	14.4 +- 0.6
T39	11.7 +- 0.6	16.5 +- 0.8	13.9 +- 0.6	17.6 +- 0.7
Quarterly average +- s.d.	13.6 +- 2.8	15.6 +- 1.2	15.7 +- 3.0	16.1 +- 0.2

ND – The TLD was lost in the field.

Table 8 Wisconsin DHS analysis results for precipitation samples collected for the Prairie Island environmental monitoring program.

Measurements in units of nCi/m2

monthly composite sample

Collection	inches	Gross beta	Tritium
1/1/2016	1.24	0.13 +- 0.03	< 6.7
2/10/2016	0.84	0.14 +- 0.02	< 4.5
3/23/2016	1.17	0.04 +- 0.02	< 6.3
4/7/2016	1.35	0.10 +- 0.04	< 7.2
5/3/2016	2.24	0.11 +- 0.04	< 11.8
6/5/2016	4.18	< 0.16	< 22.0
7/17/2016	8.57	0.49 +- 0.32	< 45.7
8/14/2016	5.54	< 0.19	< 29.4
9/11/2016	5.54	< 0.47	< 29.3
10/6/2016	3.86	< 0.16	< 20.5
11/4/2016	2.69	0.17 +- 0.10	< 14.2
12/5/2016	1.02	0.07 +- 0.02	< 5.4

Table 9. Wisconsin DHS analysis results for surface water samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/liter

Site:	PRI-1	PRI-2	PRI-4a	PRI-1	PRI-2	PRI-4
Collection date:	06/08/16	06/08/16	06/07/16	08/09/16	08/10/16	08/10/16
gross alpha-sol (DS)	< 0.3	2.6 +- 0.5	2.0 +- 0.5	1.9 +- 1.3	2.5 +- 1.3	2.5 +- 1.3
gross beta-sol (DS)	0.7 +- 0.3	2.1 +- 0.3	2.0 +- 0.3	< 0.5	< 3.8	< 3.4
gross alpha-insol (SS)	< 0.2	< 0.2	< 0.3	< 0.5	1.2 +- 0.6	0.7 +- 0.6
gross beta-insol (SS)	< 0.8	< 0.8	< 0.8	< 1.5	< 1.9	1.1 +- 0.6
H-3	< 146	< 146	< 146	< 206	< 206	< 206
Sr-89	< 0.68	< 0.74	< 0.64	*c	*c	*c
Sr-90	< 0.55	< 0.58	< 0.52	*c	*c	*c
gamma isotopic						
Mn-54	< 2.0	< 2.5	< 2.1	< 7.7	< 7	< 6
Co-58	< 2.4	< 1.3	< 2.6	< 7.6	< 9	< 7
Fe-59	< 3.3	< 4.9	< 4.4	< 12.5	< 12	< 12
Co-60	< 2.4	< 2.2	< 1.0	< 7.7	< 7	< 9
Zn-65	< 3.2	< 4.1	< 4.7	< 15.8	< 15	< 15
Nb-95	< 2.8	< 2.8	< 2.7	< 7.9	< 9	< 8
Zr-95	< 4.1	< 5.2	< 3.4	< 12.0	< 12	< 12
I-131	< 6.3	< 6.0	< 6.0	< 14.9	< 15	< 15
Cs-134	< 3.0	< 2.7	< 3.0	< 8.5	< 8	< 9
Cs-137	< 2.3	< 2.9	< 1.9	< 8.3	< 7	< 9
Ba-140	< 11.3	< 12.5	< 14.5	< 36.9	< 36	< 33
La-140	< 1.6	< 3.9	< 1.9	< 13.6	< 12	< 13

Radioisotopes other than those reported were not detected.

*a - The analysis is performed on a quarterly composite. *b - did not meet lower limit of detection.

*c - analysis not performed.

Table 10. Wisconsin DHS analysis results for well water samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/liter

	PRI-4	**PRI-5**	**PRI-6**	**PRI-4**	**PRI-5**	**PRI-6**
Collection date:	06/07/16	06/07/16	06/08/16	08/10/16	08/10/16	08/09/16
gross alpha	< 1.6	< 1.5	< 1.3	< 1.3	< 1.5	< 1.3
gross beta	1.9 +- 1.2	2.5 +- 0.9	< 1.9	< 1.6	< 2.6	< 2.5
H-3	< 210	< 210	< 210	< 206	< 206	< 206

Table 11. Wisconsin DHS analysis results for fish samples collected for the Prairie island environmental monitoring program.

Measurements in units of pCi/kilogram (wet)

Collection date:	05/09/16	05/10/16	05/09/16	06/15/16	05/09/16
Location:	downstream	upstream	downstream	upstream	downstream
Type:	Carp	Carp	White Bass	White Bass	Freashwater Drum
gamma isotopic					
K-40	2940 +- 529	2830 +- 505	2690 +- 481	3050 +- 544	2990 +- 521
Mn-54	< 10	< 10	< 10	< 11	< 8
Co-58	< 11	< 10	< 11	< 12	< 11
Fe-59	< 27	< 24	< 25	< 35	< 31
Co-60	< 10	< 15	< 13	< 10	< 10
Zn-65	< 26	< 25	< 23	< 29	< 20
Nb-95	< 14	< 12	< 14	< 15	< 16
Zr-95	< 19	< 19	< 17	< 20	< 19
Cs-134	< 9	< 9	< 11	< 10	< 8
Cs-137	< 10	< 12	< 14	< 11	< 10

Collection date:	05/10/16	10/13/2016	10/12/2016	10/13/2016	10/12/2016
Location:	upstream	downstream	upstream	downstream	upstream
Type:	Carp	Carp	Carp	Carp	Carp
gamma isotopic					
K-40	2830 +- 505	2660 +- 459	2520 +- 436	2660 +- 459	2520 +- 436
Mn-54	< 10	< 3	< 3	< 3	< 3
Co-58	< 10	< 5	< 6	< 5	< 6
Fe-59	< 24	< 22	< 23	< 22	< 23
Co-60	< 15	< 3	< 3	< 3	< 3
Zn-65	< 25	< 7	< 7	< 7	< 7
Nb-95	< 12	< 15	< 15	< 15	< 15
Zr-95	< 19	< 11	< 11	< 11	< 11
Cs-134	< 9	< 3	< 3	< 3	< 3
Cs-137	< 12	< 2	< 2	< 2	< 2

Radioisotopes other than those reported were not detected

Table 12. Wisconsin DHS analysis results for milk samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/liter

Location	PRI-10	PRI-10	PRI-10	PRI-10	PRI-10	PRI-10
Collection date:	01/12/16	02/10/16	03/24/16	04/13/16	05/11/16	06/13/16
I-131		< 0.3		< 0.4		< 0.3
Sr-90	< 0.6	< 0.6	0.6	< 0.6	0.7 +- 0.4	1.0 +- 0.4
gamma isotopic						
K-40	1433 +- 115.7	1213 +- 106	1357 106	1319 +- 96	1411 +- 93.4	1357 +- 111
Mn-54	< 2.4	< 3.5	3.2	< 1.7	< 1.6	< 2.1
Co-58	< 3.3	< 2.0	1.9	< 2.5	< 3.5	< 1.6
Fe-59	< 9.4	< 4.9	4.7	< 6.1	< 4.0	< 3.4
Co-60	< 2.5	< 3.8	2.4	< 2.8	< 3.0	< 2.7
Zn-65	< 4.7	< 5.7	5.9	< 5.6	< 3.6	< 5.2
Nb-95	< 2.4	< 3.8	3.6	< 2.3	< 3.7	< 2.6
Zr-95	< 4.2	< 4.1	5.4	< 6.0	< 3.7	< 5.6
I-131	< 5.5	< 4.4	4.8	< 5.0	< 4.5	< 4.8
Cs-134	< 4.2	< 3.8	3.4	< 2.9	< 3.0	< 3.4
Cs-137	< 4.7	< 3.0	3.0	< 3.1	< 2.4	< 2.9
Ba-140	< 16.4	< 12.3	9.5	< 13.5	< 9.6	< 8.3
La-140	< 1.6	< 2.3	1.4	< 3.1	< 3.4	< 2.3

Location	PRI-10	PRI-10	PRI-10	PRI-10	PRI-10	PRI-10
Collection date:	07/11/16	08/10/16	09/14/16	10/11/16	Nov	Dec
I-131		< 0.4		< 0.3	*d	*d
Sr-90	< 0.7	< 0.6	0.7 +- 0.3	0.78 < 0.4	*d	*d
gamma isotopic						
K-40	1413 +- 123.5	1419 +- 120.9	1488 +- 113	1418 +- 113	*d	*d
Mn-54	< 3.1	< 3.3	< 2.2	< 2.6	*d	*d
Co-58	< 3.8	< 3.7	< 3.5	< 4.5	*d	*d
Fe-59	< 4.6	< 5.4	< 7.4	< 5.0	*d	*d
Co-60	< 2.5	< 2.4	< 2.4	< 2.7	*d	*d
Zn-65	< 4.3	< 5.8	< 5.8	< 6.9	*d	*d
Nb-95	< 3.7	< 3.6	< 4.6	< 2.8	*d	*d
Zr-95	< 6.0	< 4.0	< 6.8	< 3.8	*d	*d
I-131	< 3.9	< 5.1	< 7.2	< 4.0	*d	*d
Cs-134	< 4.0	< 3.3	< 4.0	< 3.6	*d	*d
Cs-137	< 3.4	< 2.6	< 3.6	< 3.4	*d	*d
Ba-140	< 10.2	< 11.0	< 12.2	< 13.0	*d	*d
La-140	< 2.8	< 3.7	< 3.8	< 3.5	*d	*d

Radioisotopes other than those reported were not detected.

*a = Lower Limit of Detection not met

*b = Did not meet matrix recovery

*c = not reported

*d = Farm has gone out of business, as a result the control will not be collected as well

Table 12 (continued). Wisconsin DHS analysis results for milk samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/liter

Location: PRI-15

Collection date:	01/12/16	02/09/16	03/24/16	04/13/16	05/11/16	06/13/16
I-131		< 0.3		< 0.3		< 0.4
Sr-90	< 0.5	< 0.7	< 0.7	< 0.3	0.9 +- 0.4	0.6 +- 0.3
gamma isotopic						
K-40	1405 +- 110	1308 +- 110	1371 +- 100	1406 +- 102	1500 +- 103	1400 +- 112
Mn-54	< 3.6	< 3.3	< 3.0	< 2.7	< 2.5	< 2.0
Co-58	< 2.5	< 2.7	< 2.7	< 2.6	< 2.8	< 2.1
Fe-59	< 4.3	< 6.1	< 7.0	< 7.6	< 7.2	< 4.3
Co-60	< 2.4	< 2.3	< 2.5	< 2.7	< 3.4	< 2.4
Zn-65	< 5.9	< 4.1	< 4.2	< 4.7	< 4.3	< 3.9
Nb-95	< 2.2	< 2.9	< 2.7	< 3.0	< 3.8	< 3.8
Zr-95	< 4.9	< 2.5	< 6.3	< 5.1	< 5.4	< 5.1
I-131	< 4.4	< 2.4	< 4.9	< 3.4	< 6.0	< 5.0
Cs-134	< 3.5	< 3.0	< 3.0	< 2.8	< 3.0	< 3.9
Cs-137	< 2.8	< 4.4	< 3.7	< 3.5	< 2.9	< 2.3
Ba-140	< 9.7	< 10.8	< 14.7	< 11.5	< 14.0	< 12.5
La-140	< 1.3	< 2.8	< 2.2	< 1.5	< 2.9	< 1.5

Collection date:	July	08/10/16	09/14/19	Oct	Nov	Dec
I-131		< 0.5		< 0.4	a	a
Sr-90	< 0.6	0.9 +- 0.4	0.7 +- 0.3	0.7 +- 0.4	a	a
gamma isotopic						
K-40	1404.1 +- 120	1562 +- 115.5	1561 +- 102	1459 +- 112	a	a
Mn-54	< 3.1	< 3.2	< 3.0	< 3.3	a	a
Co-58	< 3.3	< 4.2	< 3.8	< 3.5	a	a
Fe-59	< 5.8	< 7.3	< 5.1	< 5.8	a	a
Co-60	< 2.3	< 3.5	< 3.2	< 3.3	a	a
Zn-65	< 6.8	< 7.5	< 5.9	< 4.7	a	a
Nb-95	< 3.9	< 3.1	< 4.1	< 3.4	a	a
Zr-95	< 3.3	< 5.4	< 6.6	< 6.5	a	a
I-131	< 6.9	< 7.6	< 4.0	< 3.5	a	a
Cs-134	< 3.3	< 3.9	< 2.8	< 3.2	a	a
Cs-137	< 3.2	< 4.5	< 3.9	< 3.9	a	a
Ba-140	< 11.3	< 20.4	< 14.8	< 7.1	a	a
La-140	< 1.6	< 3.3	< 2.8	< 2.5	a	a

Radioisotopes other than those reported were not detected.

*a = Lower Limit of Detection not met

*b = Did not meet matrix recovery

*c = not reported

*d = Farm has gone out of business, as a result the control will not be collected as well

Table 13. Wisconsin DHS analysis results for vegetation samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/kilogram (wet)

Site:	06/08/16	06/07/16	06/07/16	06/07/16	06/09/16	06/07/16
Collection date:	PRI-1a	PRI-4b	PRI-5	PRI-6	PRI-8	PRI-9
gross alpha	< 1090	< 1170	< 725	< 1530	< 1280	1350 +- 895
gross beta	5110 +- 375	3850 +- 394	4900 +- 349	6290 +- 472	5740 +- 536	5280 +- 550
gamma isotopic						
Be-7	1050 +- 207	1280 +- 192	1440 +- 235	1150 +- 188	1450 +- 205	1880 +- 259
K-40	5470 +- 1040	4300 +- 805	5640 +- 1060	6410 +- 1150	5910 +- 5910	4900 +- 921
Mn-54	< 32	< 20	< 30	< 27	< 32	< 27
Co-58	< 29	< 26	< 29	< 28	< 22	< 29
Fe-59	< 60	< 48	< 68	< 64	< 53	< 70
Co-60	< 37	< 24	< 32	< 41	< 36	< 31
Zn-65	< 65	< 47	< 75	< 61	< 69	< 60
Nb-95	< 42	< 25	< 35	< 27	< 26	< 28
Zr-95	< 59	< 41	< 56	< 45	< 47	< 43
I-131	< 82	< 64	< 89	< 61	< 70	< 78
Cs-134	< 32	< 21	< 31	< 27	< 25	< 25
Cs-137	< 30	< 24	< 29	< 37	< 25	< 27
Ba-140	< 178	< 145	< 189	< 140	< 184	< 185
La-140	< 69	< 45	< 71	< 40	< 61	< 60
Collection date:	08/09/16	08/10/16	08/10/16	08/10/16	08/10/16	08/10/16
gross alpha	< 1160	< 889	< 536	< 1620	< 1230	< 1270
gross beta	4060 +- 461	4810 +- 404	6810 +- 273	7180 +- 471	3330 +- 384	3680 +- 373
gamma isotopic						
Be-7	< 20	626 +- 119	845 +- 142	2300 +- 257	3530 +- 302	1480 +- 198
K-40	5380 +- 953	5330 +- 958	5620 +- 1010	6400 +- 1140	3250 +- 616	4090 +- 815
Mn-54	< 17	< 22	< 22	< 21	< 20	< 24
Co-58	< 17	< 22	< 18	< 23	< 18	< 26
Fe-59	< 43	< 40	< 46	< 49	< 41	< 56
Co-60	< 22	< 21	< 26	< 28	< 29	< 33
Zn-65	< 42	< 44	< 48	< 48	< 41	< 67
Nb-95	< 19	< 21	< 22	< 28	< 18	< 25
Zr-95	< 31	< 36	< 41	< 40	< 32	< 43
I-131	< 31	< 34	< 41	< 44	< 42	< 37
Cs-134	< 20	< 22	< 22	< 25	< 18	< 22
Cs-137	< 18	< 22	< 26	< 21	< 24	< 25
Ba-140	< 85	< 92	< 108	< 108	< 99	< 118
La-140	< 22	< 29	< 32	< 25	< 34	< 49

Radioisotopes other than those reported were not detected.

Table 14. Wisconsin DHS analysis results for soil samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/kilogram (dry)

Site:	PRI-1a	PRI-4b	PRI-5	PRI-6	PRI-8	PRI-9
Collection date:	06/07/16	06/07/16	06/07/16	06/07/16	06/07/16	06/07/16
gross alpha	10600 +- 4200	8080 +- 3270	6890 +- 3060	8630 +- 3500	12400 +- 4200	14800 +- 3990
gross beta	8670 +- 1170	8480 +- 1300	12800 +- 1260	11900 +- 1360	17700 +- 1460	12000 +- 1390
gamma isotopic						
Cs-134	< 19	< 19	< 20	< 21	< 28	< 15
Cs-137	< 37	< 27	< 30	< 31	< 47	< 31
Co-58	< 21	< 21	< 25	< 25	< 32	< 18
Co-60	< 24	< 19	< 21	< 20	< 28	< 21
Fe-59	< 59	< 60	< 68	< 58	< 85	< 51
Mn-54	< 21	< 21	< 20	< 22	< 27	< 17
Nb-95	< 36	< 35	< 36	< 39	< 52	< 26
K-40	10800 +- 1910	12000 +- 2110	11700 +- 2060	13100 +- 2300	15200 +- 2680	11600 +- 1910
Zn-65	< 48	< 47	< 55	< 51	< 70	< 39
Zr-95	< 44	< 41	< 51	< 50	< 67	< 38
Collection date:	08/09/16	08/10/16	08/10/16	08/09/16	08/10/16	08/10/16
gross alpha	8520 +- 3500	9960 +- 3750	11300 +- 3940	12700 +- 3620	14500 +- 3870	8500 +- 3160
gross beta	9510 +- 1200	8430 +- 1330	15300 +- 1450	17500 +- 1430	14700 +- 1470	9200 +- 1200
gamma isotopic						
Cs-134	< 20	< 21	< 22	< 25	< 32	< 21
Cs-137	344 +- 32	< 29	72.7 +- 15	112 +- 19	152 +- 26	429 +- 39
Co-58	< 27	< 26	< 30	< 36	< 42	< 29
Co-60	< 20	< 32	< 24	< 28	< 37	< 23
Fe-59	< 73	< 86	< 77	< 96	< 114	< 75
Mn-54	< 23	< 23	< 25	< 28	< 39	< 24
Nb-95	< 41	< 43	< 49	< 68	< 78	< 49
K-40	11800 +- 2090	11200 +- 1920	13200 +- 2340	18000 +- 3160	16600 +- 2950	12800 +- 2260
Zn-65	< 51	< 56	< 64	< 70	< 87	< 59
Zr-95	< 52	< 59	< 62	< 66	< 81	< 58

Naturally occurring radioisotopes such as radium-226 (^{226}Ra), bismuth-214 (^{214}Bi), lead-214 (^{214}Pb), actinium-228 (^{228}Ac), bismuth-212 (^{212}Bi), lead-212 (^{212}Pb) from the naturally occurring uranium-238 (^{238}U) and thorium-232 (^{232}Th) 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)

Should radioactivity concentrations exceed SRC review levels for a given radionuclide, the SRC will be consulted for 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

Medium	Radionuclide	SRC Review Level [a]
Eggs (pCi/kg) wet)	Gross Beta	30,000
	Cs-134	200
	Cs-137	200
	Sr-89	1,000
	Sr-90	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
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 Doseimeter (mR/Std Qtr)	Direct Exposure	

a. Radionuclides will be monitored by Wisconsin DHS, 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.

b. 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)

c. 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)

d. 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
PRI-1a	Prescott; air site	44.74481	-92.79400
PRI-1b	Prescott; harbor area	44.74521	-92.79915
PRI-1vs	Prescott; air site - vegetation and soil	44.74363	-92.79210
PRI-2	Trenton	44.60299	-92.56593
PRI-4a	Bay City Park	44.57934	-92.45615
PRI-4b	Bay City, Hwy 35	44.58487	-92.45910
PRI-4sw	Bay City, Hwy 35 soil and surface water	44.57916	-92.45664
PRI-5a	Hager City - Post Office	44.60002	-92.53955
PRI-5b	Hager City - vegetation and soil	44.60099	-92.53809
PRI-6a	Diamond Bluff; Pierce County highway shed	44.64623	-92.61479
PRI-6b	Diamond Bluff cemetery - well water	44.64128	-92.61552
PRI-6c	Diamond Bluff; Pierce County highway shed - vegetation and soil	44.64600	-92.61524
PRI-8	Station 2 – farm	44.66949	-92.61880
PRI-9a	Bay City substation	44.59433	-92.50426
PRI-9b	Bay City substation - vegetation and soil	44.59435	-92.50451
PRI-T30	Diamond Bluff - Naughy Hog	44.64892	-92.62931
PRI-T31	Diamond Bluff cemetery	44.64116	-92.61579
PRI-T32	290th Avenue	44.63014	-92.59893
PRI-T33	Hwy 35, Thomas Killian residence	44.68485	-92.64411
PRI-T34	Cty K and 840th Street	44.66767	-92.56297
PRI-T35	Cty VV and 790th Street	44.62336	-92.52780
PRI-T36	Hager City	44.60021	-92.53953
PRI-T37	Ellsworth	44.72943	-92.48681
PRI-T38	Bay City, Hwy 35	44.58494	-92.45959
PRI-T39	Prescott; air site	44.74500	-92.79431