

**State of Wisconsin**  
**2015**  
**Prairie Island**  
**Environmental Radioactivity Survey**



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# State of Wisconsin, Department of Health Services

2015

## Prairie Island Environmental Monitoring Survey

### 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 2015. 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 2015 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 2015, 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 2015 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 will continue to provide assurances to the citizens of Wisconsin that the environment surrounding the Prairie Island nuclear power facility and other monitoring areas will continue to be evaluated.

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## State of Wisconsin DHS

2015

### Prairie Island Environmental Radioactivity Survey

## 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 2015. It provides a description and results of this environmental monitoring program.

## Wisconsin 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 that 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 that 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 2015:

- The Environmental Monitoring program suspended milk collection during the last quarter (Oct-Dec) of 2015 due to laboratory staffing and analysis issues.

## 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 ±). Examples and explanations of data reporting are:

Example	Nuclide	Activity reported
1	<sup>137</sup> Cs	< 10 pCi/liter
2	<sup>137</sup> 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. 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 NNF	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 (discontinued November 2015)
PRI-13	3.8 E	Christiansen farm
PRI-15	13.9 N	R. Peterson farm
PRI-T30	1.9 N	Diamond Bluff
PRI-T31	1.7 NNF	Diamond Bluff
PRI-T32	1.8 ENE	290th Avenue
PRI-T33	4.4 N	Hwy 35, Thomas Killian residence
PRI-T34	4.7 NF	Cty K and 840th Street
PRI-T35	5.2 E	Cty VV 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	78	0	GA, GB, GI
Air iodine	C/BW	1a, 6a, 9	75	3	GI
Precipitation	C/BW	1a, 9	12	0	GB, H
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, 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

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

Sample type	Date	Site	Explanation
Air Iodine	03/24/15	PRI-1	Sample data not reported by lab
Air Iodine	04/08/15	PRI-1	Sample not reported by lab
Air Iodine	04/08/15	PRI-9	There was a mechanical problem with the air collection unit.
TLD	3 <sup>rd</sup> QT	T30	The TLD was lost in the field
Surface Water	09/21/15	PRI-1	Sample data not reported by lab
Surface Water	09/21/15	PRI-2	Sample data not reported by lab
Surface Water	09/21/15	PRI-4a	Sample data not reported by lab
Milk	January 2015	PRI-10	Dairy not producing milk
Milk	05/13/15	PRI-10	Sr-90 sample data not reported by lab
Milk	06/10/15	PRI-10	Sr-90 sample data not reported by lab
Milk	Oct – Dec 2015	PRI-10	Milk sampling suspended due to WSLH staffing
Milk	05/13/15	PRI-15	Sr-90 sample data not reported by lab
Milk	06/10/15	PRI-15	Sr-90 sample data not reported by lab
Milk	Oct – Dec 2015	PRI-15	Milk sampling suspended due to WSLH staffing



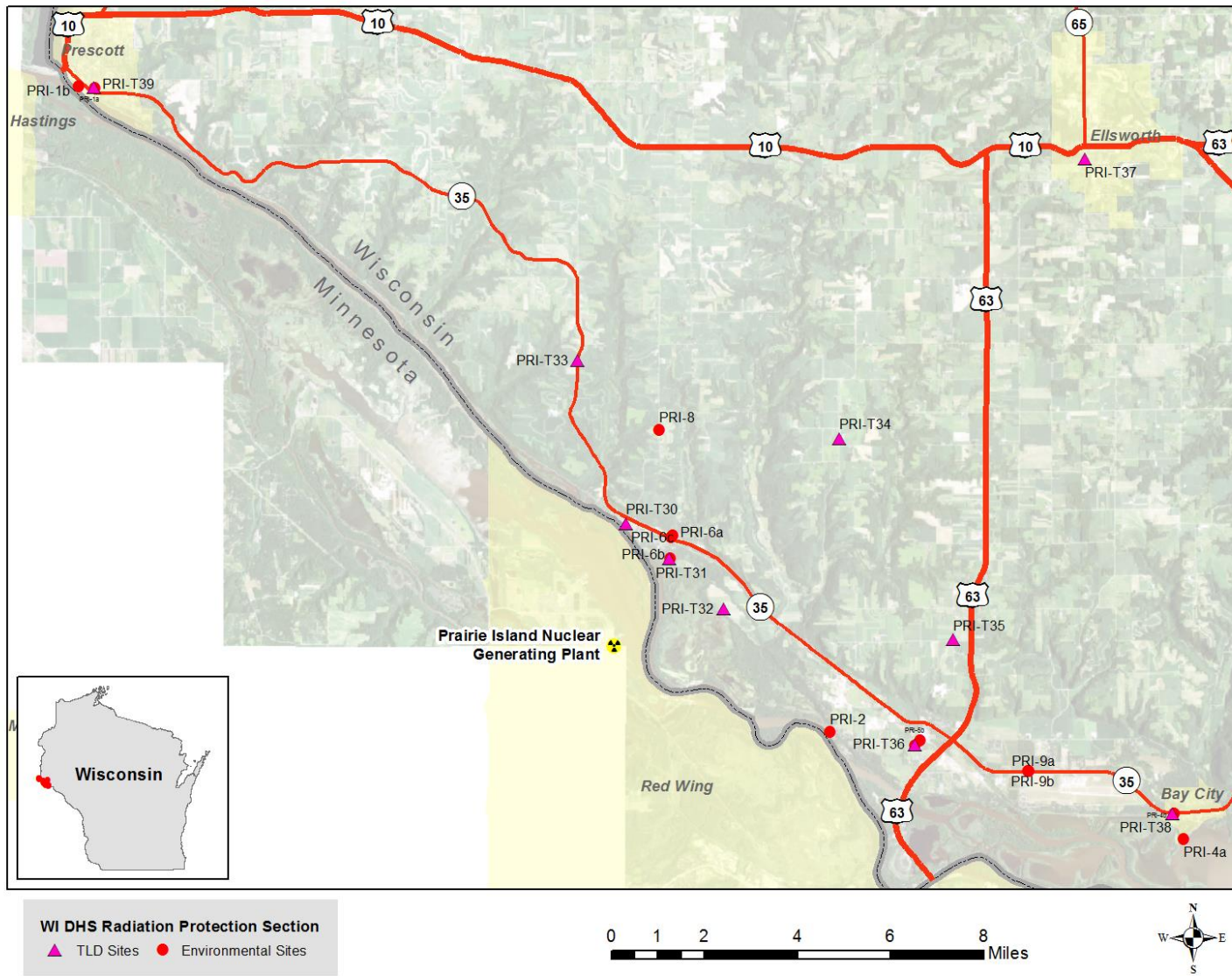


Figure 1. Location of Wisconsin DHS environmental monitoring sites for the Prairie Island monitoring program

# 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. Table 5-6 provide results from the individual sample analyses.

Table 5 shows gross beta activities listed in, 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 4 provides gamma isotopic analysis of the quarterly air particulate filter composites detected only small amounts of the radioisotopes. Beryllium-7 ( $^7\text{Be}$ ), detected in all composites, 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  $0.07 \text{ pCi/m}^3$ . 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 2015 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  $15.4 \pm 2.7$  milliroentgens. The average quarterly exposure for 2015 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 provide 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. During this reporting period, samples were sent to ATI Environmental Inc. Midwest Laboratory as a result of Wisconsin State Lab of Hygiene's inability to analyze strontium.

From the gamma isotopic analysis all radioisotopes were below their respective LLD. All reported activities for gross beta; gross alpha and tritium ( $^3\text{H}$ ) 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 ( $^{40}\text{K}$ ) 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 provide results from the individual sample analyses.

The well water samples showed no unusual gross alpha and gross beta activities and all activities for tritium ( $^3\text{H}$ ) 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. Table 12 provide results from the individual sample analyses. During this reporting period, samples were sent to ATI Environmental Inc. Midwest Laboratory as a result of Wisconsin State Lab of Hygiene's inability to analyze strontium and iodine.

Analysis of the milk samples showed no unusual activities. Naturally occurring potassium-40 ( $^{40}\text{K}$ ) was detected in all samples. The detected activities for strontium-90 ( $^{90}\text{Sr}$ ) 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 ( $^7\text{Be}$ ) and potassium-40 ( $^{40}\text{K}$ ) listed in Table 4. 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 provide results from the individual sample analyses.

Analysis of the soil samples showed no unusual activities. The gamma isotopic analysis detected only small amounts of the radionuclides listed in Table 4. Potassium-40 ( $^{40}\text{K}$ ) is a naturally occurring radioisotope. The reported activities for cesium-137 ( $^{137}\text{Cs}$ ) were also detected in previous years and are attributable to fallout from previous atmospheric nuclear tests. Naturally occurring radioisotopes

from the uranium-238 ( $^{238}\text{U}$ ) and thorium-232 ( $^{232}\text{Th}$ ) 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 <sup>a</sup>	Analysis	Range
Air particulate (pCi/m <sup>3</sup> )	0.005	77 / 77	gross beta gamma isotopic	0.008 - 0.042
	0.020	12 / 12	Be-7	0.052 - 0.071
	0.002	12 / 0	Mn-54	< 0.0003
	0.002	12 / 0	Co-58	< 0.0003
	0.005	12 / 0	Fe-59	< 0.0007
	0.002	12 / 0	Co-60	< 0.0004
	0.005	12 / 0	Zn-65	< 0.0006
	0.002	12 / 0	Nb-95	< 0.0004
	0.005	12 / 0	Zr-95	< 0.0005
	0.002	12 / 0	Ru-103	< 0.0003
	0.015	12 / 0	Ru-106	< 0.0024
	0.020	12 / 0	I-131	< 0.0036
	0.002	12 / 0	Cs-134	< 0.0003
	0.002	12 / 0	Cs-137	< 0.0003
	0.030	12 / 0	Ba-140	< 0.0028
	0.020	12 / 0	La-140	< 0.0011
	0.002	12 / 0	Ce-141	< 0.0005
	0.005	12 / 0	Ce-144	< 0.0014
Air iodine (pCi/m <sup>3</sup> )	0.07	74 / 0	I-131	< 0.034
Surface water (pCi/liter)	3.0	6 / 1	gross alpha (sol)	< 0.7 – 3.0
	3.0	6 / 1	gross beta (sol)	< 1.0 – 3.0
	3.0	6 / 0	gross alpha (insol)	< 0.7 – 1.1
	3.0	6 / 0	gross beta (insol)	< 1.2
	300	6 / 1	H-3	<207 - 646
	2.0	6 / 3	Sr-89	< 8.1
	1.0	6 / 0	Sr-90	< 0.7
			gamma isotopic	
	15	6 / 0	Mn-54	< 7
	15	6 / 0	Co-58	< 7
	30	6 / 0	Fe-59	< 16
	15	6 / 0	Co-60	< 9
	30	6 / 0	Zn-65	< 16
	15	6 / 0	Nb-95	< 8
	30	6 / 0	Zr-95	< 12
	15	6 / 0	I-131	< 8
	15	6 / 0	Cs-134	< 8
	15	6 / 0	Cs-137	< 9
60	6 / 0	Ba-140	< 28	
15	6 / 0	La-140	< 12	

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

Sample type (units)	LLD	Number of samples <sup>a</sup>	Analysis	Range
Fish (pCi/kg wet)	800	8 / 8	gamma isotopic K-40	2120 – 3570
	50	8 / 0	Mn-54	< 8
	60	8 / 0	Co-58	< 12
	130	8 / 0	Fe-59	< 35
	60	8 / 0	Co-60	< 8
	130	8 / 0	Zn-65	< 20
	50	8 / 0	Nb-95	< 15
	100	8 / 0	Zr-95	< 22
	50	8 / 0	Cs-134	< 8
	60	8 / 0	Cs-137	< 8
	Precipitation (nCi/m <sup>2</sup> )	1.5	12 / 1	gross beta
300		12 / 0	H-3	< 58
Well water (pCi/liter)	3.0	6 / 0	gross alpha	< 2.2
	3.0	6 / 5	gross beta	< 3.8 - 3.83
	300	6 / 0	H-3	< 207
Vegetation (pCi/kg wet)	5000	12 / 0	gross alpha	< 1840
	4000	12 / 9	gross beta	2710 – 6660
	600	12 / 9	gamma isotopic Be-7	< 273 – 8160
	2000	12 / 12	K-40	3790 – 6660
	90	12 / 0	Mn-54	< 45
	100	12 / 0	Co-58	< 41
	200	12 / 0	Fe-59	< 90
	100	12 / 0	Co-60	< 50
	250	12 / 0	Zn-65	< 106
	100	12 / 0	Nb-95	< 47
	200	12 / 0	Zr-95	< 77
	80	12 / 0	I-131	< 77
	80	12 / 0	Cs-134	< 37
	90	12 / 0	Cs-137	< 41
	350	12 / 0	Ba-140	< 225
	100	12 / 0	La-140	< 84

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

Sample type (units)	LLD	Number of samples <sup>a</sup>	Analysis	Range
Soil (pCi/kg dry)	15000	12 / 2	gross alpha	5150 – 18800
	6000	12 / 12	gross beta	10800 - 18100
			gamma isotopic	
	800	12 / 12	K-40	11100 – 14800
	60	12 / 0	Mn-54	< 39
	90	12 / 0	Co-58	< 32
	600	12 / 0	Fe-59	< 95
	90	12 / 0	Co-60	< 38
	300	12 / 0	Zn-65	< 86
	100	12 / 0	Nb-95	< 54
	250	12 / 0	Zr-95	< 70
	80	12 / 0	Cs-134	< 35
	80	12 / 10	Cs-137	<36 - 475
Milk (pCi/liter)	1.5	7 / 0	I-131	< 1.2 – 0.78
	1.0	13 / 1	Sr-90	< 0.4 – 1.52
			gamma isotopic	
	500	17 / 17	K-40	1090 - 1580
	15	17 / 0	Mn-54	< 11
	15	17 / 0	Co-58	< 12
	40	17 / 0	Fe-59	< 27
	15	17 / 0	Co-60	< 15
	40	17 / 0	Zn-65	< 33
	15	17 / 0	Nb-95	< 10
	40	17 / 0	Zr-95	< 17
	15	17 / 0	I-131	< 15
	15	17 / 0	Cs-134	< 11
	15	17 / 0	Cs-137	< 12
	60	17 / 0	Ba-140	< 43
15	17 / 0	La-140	< 15	
ambient radiation (TLD) (mR/Std Qtr)	1.0 <sup>c</sup>	39 / 39	direct exposure	9.2 – 20.3

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<sup>3</sup>

**PRI-1 (3100 series); Prescott**

**PRI-6 (3200 series); Diamond Bluff**

Collection date	Volume m <sup>3</sup>	Air particulate	Air iodine	Collection date	Volume m <sup>3</sup>	Air particulate	Air iodine
01/16/15	1107	0.030 ± 0.002	< 0.007	01/16/15	1125	0.009 ± 0.003	< 0.009
01/27/15	726	0.019 ± 0.002	< 0.006	01/27/15	728	0.027 ± 0.002	< 0.007
02/12/15	1092	0.027 ± 0.002	< 0.006	02/12/15	1095	0.027 ± 0.002	< 0.007
02/23/15	765	0.042 ± 0.002	< 0.013	02/23/15	771	0.040 ± 0.002	< 0.008
03/11/15	1082	0.024 ± 0.002	< 0.009	03/11/15	1088	0.021 ± 0.002	< 0.009
03/24/15	846	0.019 ± 0.002	< *d	03/24/15	840	0.019 ± 0.002	< 0.008
1st Qtr				1st Qtr			
mean +- s.d.		0.027 ± 0.009	< 0.008	mean +- s.d.		0.024 ± 0.010	< 0.008
04/08/15	997	0.014 ± 0.001	< *d	04/08/15	994	0.016 ± 0.001	< 0.010
04/22/15	890	0.014 ± 0.002	< 0.0127	04/22/15	896	0.013 ± 0.001	< 0.010
05/07/15	952	0.017 ± 0.002	< 0.0134	05/07/15	944	0.017 ± 0.002	< 0.006
05/21/15	886	0.008 ± 0.001	< 0.0067	05/21/15	885	0.008 ± 0.001	< 0.007
06/07/15	1018	0.015 ± 0.001	< 0.0235	06/07/15	1028	0.015 ± 0.001	< 0.026
06/18/15	663	0.013 ± 0.002	< 0.0072	06/18/15	675	0.013 ± 0.003	< 0.015
2nd Qtr				2nd Qtr			
mean +- s.d.		0.014 ± 0.003	< 0.013	mean +- s.d.		0.013 ± 0.003	< 0.012
07/01/15	761	0.016 ± 0.002	< 0.015	7/1/2015	780	0.013 ± 0.002	< 0.016
07/16/15	902	0.019 ± 0.002	< 0.007	07/16/15	889	0.016 ± 0.002	< 0.009
07/30/15	849	0.020 ± 0.002	< 0.011	07/30/15	832	0.019 ± 0.002	< 0.014
08/13/15	845	0.018 ± 0.002	< 0.014	08/13/15	829	0.018 ± 0.002	< 0.009
08/27/15	867	0.020 ± 0.002	< 0.014	08/27/15	852	0.020 ± 0.002	< 0.012
09/10/15	860	0.029 ± 0.002	< 0.013	09/10/15	833	0.029 ± 0.002	< 0.018
09/24/15	868	0.025 ± 0.002	< 0.009	09/24/15	850	0.024 ± 0.002	< 0.010
3rd Qtr				3rd Qtr			
mean +- s.d.		0.021 ± 0.005	< 0.012	mean +- s.d.		0.020 ± 0.005	< 0.012
10/08/15	854	0.022 ± 0.002	< 0.006	10/08/15	854	0.021 ± 0.002	< 0.004
10/22/15	874	0.023 ± 0.002	< 0.026	10/22/15	854	0.024 ± 0.002	< 0.034
11/05/15	909	0.022 ± 0.002	< 0.017	11/05/15	894	0.022 ± 0.002	< 0.021
11/17/15	778	0.027 ± 0.002	< 0.014	11/17/15	762	0.027 ± 0.002	< 0.013
11/29/15	790	0.023 ± 0.002	< 0.018	11/29/15	773	0.021 ± 0.002	< 0.024
12/17/15	1217	0.032 ± 0.002	< 0.013	12/17/15	1186	0.030 ± 0.002	< 0.014
4th Qtr				4th Qtr			
mean +- s.d.		0.025 ± 0.004	< 0.018	mean +- s.d.		0.024 ± 0.004	< 0.018

\*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<sup>3</sup>

**PRI-9 (3400 series); Bay City substation**

Collection date	Volume m3	Air particulate	Air iodine
01/16/15	1296	0.030 +- 0.002	< 0.008
01/27/15	867	0.020 +- 0.002	< 0.005
02/12/15	1283	0.025 +- 0.001	< 0.007
02/23/15	902	0.040 +- 0.002	< 0.008
03/11/15	1297	0.021 +- 0.001	< 0.009
1st Qtr			
mean +- s.d.		0.027 +- 0.008	< 0.007
03/24/15	1005	0.017 +- 0.002	< 0.009
04/08/15	1174	0.014 +- 0.001	< *a
04/22/15	1059	0.012 +- 0.001	< 0.007
05/07/15	1120	0.016 +- 0.001	< 0.009
05/21/15	1076	0.008 +- 0.001	< 0.010
06/07/15	1262	0.013 +- 0.001	< 0.021
06/18/15	838	0.013 +- 0.002	< 0.010
2nd Qtr			
mean +- s.d.		0.013 +- 0.003	< 0.011
7/1/2015	780	0.013 +- 0.002	< 0.016
07/16/15	889	0.016 +- 0.002	< 0.009
07/30/15	832	0.019 +- 0.002	< 0.014
08/13/15	829	0.018 +- 0.002	< 0.009
08/27/15	852	0.020 +- 0.002	< 0.012
09/10/15	833	0.029 +- 0.002	< 0.018
09/24/15	850	0.024 +- 0.002	< 0.010
3rd Qtr			
mean +- s.d.		0.018 +- 0.005	< 0.012
10/08/15	1077	0.020 +- 0.002	< 0.008
10/22/15	1108	0.021 +- 0.002	< 0.017
11/05/15	1142	0.020 +- 0.001	< 0.003
11/17/15	974	0.023 +- 0.002	< 0.015
11/29/15	979	0.021 +- 0.002	< 0.020
12/17/15	1499	0.028 +- 0.001	< 0.011
4th Qtr			
mean +- s.d.		0.022 +- 0.003	< 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.

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Measurements in units of pCi/m<sup>3</sup>

Site:	1st quarter	2nd quarter	3 <sup>rd</sup> quarter	4th quarter
Be-7	0.061 ± 0.0039	0.070 ± 0.0032	0.067 ± 0.0048	0.059 ± 0.0043
Mn-54	< 0.0001	< 0.0000	< 0.0003	< 0.0002
Co-58	< 0.0001	< 0.0000	< 0.0002	< 0.0002
Fe-59	< 0.0003	< 0.0001	< 0.0005	< 0.0005
Co-60	< 0.0002	< 0.0000	< 0.0004	< 0.0002
Zn-65	< 0.0002	< 0.0001	< 0.0006	< 0.0004
Nb-95	< 0.0002	< 0.0000	< 0.0003	< 0.0003
Zr-95	< 0.0003	< 0.0001	< 0.0005	< 0.0004
Ru-103	< 0.0002	< 0.0001	< 0.0002	< 0.0003
Ru-106	< 0.0011	< 0.0003	< 0.0021	< 0.0016
I-131	< 0.0017	< 0.0021	< 0.0008	< 0.0018
Cs-134	< 0.0001	< 0.0000	< 0.0003	< 0.0002
Cs-137	< 0.0002	< 0.0000	< 0.0003	< 0.0002
Ba-140	< 0.0022	< 0.0014	< 0.0015	< 0.0028
La-140	< 0.0008	< 0.0007	< 0.0008	< 0.0011
Ce-141	< 0.0004	< 0.0001	< 0.0004	< 0.0004
Ce-144	< 0.0009	< 0.0001	< 0.0012	< 0.0010
Site:				
Be-7	0.055 ± 0.0035	0.064 ± 0.0037	0.062 ± 0.0055	0.052 ± 0.0036
Mn-54	< 0.0001	< 0.0000	< 0.0003	< 0.0002
Co-58	< 0.0001	< 0.0000	< 0.0003	< 0.0002
Fe-59	< 0.0003	< 0.0001	< 0.0007	< 0.0005
Co-60	< 0.0001	< 0.0000	< 0.0004	< 0.0002
Zn-65	< 0.0002	< 0.0000	< 0.0005	< 0.0003
Nb-95	< 0.0002	< 0.0001	< 0.0004	< 0.0003
Zr-95	< 0.0002	< 0.0001	< 0.0005	< 0.0004
Ru-103	< 0.0001	< 0.0001	< 0.0003	< 0.0003
Ru-106	< 0.0008	< 0.0002	< 0.0024	< 0.0015
I-131	< 0.0012	< 0.0030	< 0.0008	< 0.0019
Cs-134	< 0.0001	< 0.0000	< 0.0003	< 0.0002
Cs-137	< 0.0001	< 0.0000	< 0.0003	< 0.0002
Ba-140	< 0.0015	< 0.0026	< 0.0017	< 0.0028
La-140	< 0.0006	< 0.0006	< 0.0007	< 0.0010
Ce-141	< 0.0002	< 0.0001	< 0.0005	< 0.0004
Ce-144	< 0.0005	< 0.0001	< 0.0014	< 0.0010
Site:				
Be-7	0.061 ± 0.0038	0.071 ± 0.0041	0.061 ± 0.0051	0.053 ± 0.0035
Mn-54	< 0.0001	< 0.0001	< 0.0002	< 0.0001
Co-58	< 0.0001	< 0.0000	< 0.0002	< 0.0001
Fe-59	< 0.0003	< 0.0001	< 0.0005	< 0.0003
Co-60	< 0.0001	< 0.0000	< 0.0003	< 0.0001
Zn-65	< 0.0002	< 0.0001	< 0.0006	< 0.0002
Nb-95	< 0.0002	< 0.0001	< 0.0003	< 0.0002
Zr-95	< 0.0002	< 0.0001	< 0.0004	< 0.0002
Ru-103	< 0.0002	< 0.0001	< 0.0002	< 0.0002
Ru-106	< 0.0009	< 0.0002	< 0.0019	< 0.0009
I-131	< 0.0019	< 0.0036	< 0.0007	< 0.0020
Cs-134	< 0.0001	< 0.0000	< 0.0002	< 0.0001
Cs-137	< 0.0001	< 0.0001	< 0.0002	< 0.0001
Ba-140	< 0.0022	< 0.0019	< 0.0013	< 0.0022
La-140	< 0.0007	< 0.0007	< 0.0006	< 0.0009
Ce-141	< 0.0003	< 0.0001	< 0.0004	< 0.0003
Ce-144	< 0.0007	< 0.0002	< 0.0012	< 0.0005

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



	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Placed:	01/13/15	04/02/15	07/07/15	10/06/15
Date Removed:	04/02/15	07/07/15	10/06/15	01/05/16
Days in the Field:	79	96	91	91
Individual quarterly date is reported as: mR / Standard Quarter + 2 sigma counting error.				
<b>TLD sites that are located 0 – 2 miles from the Prairie island facility.</b>				
T30	13.4 +- 1.0	12.9 +- 0.5	ND	15.4 +- 0.4
T31	9.2 +- 1.3	14.1 +- 0.7	11.3 +- 0.8	15.9 +- 0.7
T32	13.2 +- 1.1	13.8 +- 1.0	16.3 +- 0.9	16.1 +- 0.8
Quarterly average +- s.d.	11.9 +- 2.4	13.6 +- 0.7	13.8 +- 0.9	15.8 +- 0.6
<b>TLD sites that are located 2– 5 miles from the Prairie island facility</b>				
T33	13.4 +- 1.1	16.7 +- 0.6	15.0 +- 0.6	18.8 +- 0.5
T34	17.1 +- 1.0	17.3 +- 0.6	20.3 +- 1.3	20.1 +- 0.4
T35	17.4 +- 1.1	17.5 +- 1.0	19.7 +- 0.7	19.7 +- 1.2
T36	15.7 +- 1.4	14.4 +- 0.8	17.2 +- 0.7	16.5 +- 0.8
Quarterly average +- s.d.	15.9 +- 1.8	16.5 +- 0.8	18.1 +- 0.8	18.8 +- 0.7
<b>TLD sites that are located greater than 5 miles from the Prairie island facility</b>				
T37	15.4 +- 1.9	13.5 +- 0.5	17.4 +- 1.4	17.4 +- 0.4
T38	11.2 +- 0.9	13.4 +- 0.8	12.7 +- 0.5	15.8 +- 0.7
T39	10.7 +- 1.2	16.0 +- 0.6	12.2 +- 1.0	17.8 +- 0.6
Quarterly average +- s.d.	12.4 +- 2.6	14.3 +- 0.6	14.1 +- 1.0	17.0 +- 0.6
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
01/16/15	0.43	0.08 +- 0.01	< 2.3
02/12/15	0.42	0.09 +- 0.01	< 2.2
03/24/15	0.60	0.08 +- 0.02	< 3.2
04/08/15	2.66	0.15 +- 0.05	< 14.1
05/07/15	3.24	0.30 +- 0.07	< 17.1
06/07/15	4.00	0.14 +- 0.07	< 21.0
07/01/15	11.06	0.36 +- 0.21	< 58.2
08/13/15	5.00	0.18 +- 0.09	< 26.2
09/10/15	4.46	0.17 +- 0.09	< 23.2
10/08/15	0.34	0.02 +- 0.01	< 1.8
11/05/15	4.74	1.59 +- 0.16	< 25.2
12/17/15	2.52	0.07 +- 0.04	< 13.2

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-4a
Collection date:	05/27/15	05/26/15	05/26/15	09/21/15	09/21/15	09/21/15
gross alpha-sol	< 0.7	3.0 +- 1.3	1.5 +- 1.0	< 0.6	< 0.7	< 0.6
gross beta-sol	1.8 +- 0.9	3.0 +- 0.9	2.5 +- 0.9	< 1.0	1.6 +- 0.7	1.9 +- 0.9
gross alpha-insol	< 0.6	< 0.6	1.1 +- 0.6	< 0.6	< 0.7	< 0.7
gross beta-insol	< 1.2	< 1.0	< 1.2	< 1.0	< 1.2	< 1.1
H-3	< 207	< 207	< 207	< 206	646 +- 135	< 206
Sr-89	< 5.0	< 5.5	< 8.1	< 1.3	< 1.3	< 1.0
Sr-90	< 0.5	< 0.5	< 0.7	< 0.6	< 0.6	< 0.5
gamma isotopic						
Mn-54	< 5	< 7	< 7	< 1	< 2	< 1
Co-58	< 5	< 7	< 6	< 1	< 1	< 1
Fe-59	< 11	< 14	< 16	< 3	< 3	< 3
Co-60	< 7	< 9	< 8	< 1	< 1	< 1
Zn-65	< 13	< 15	< 16	< 2	< 2	< 2
Nb-95	< 6	< 8	< 7	< 2	< 3	< 2
Zr-95	< 11	< 12	< 11	< 2	< 2	< 2
I-131	< 6	< 7	< 8	*c	*c	*c
Cs-134	< 6	< 8	< 8	< 1	< 1	< 1
Cs-137	< 6	< 9	< 7	< 1	< 1	< 1
Ba-140	< 22	< 27	< 28	< 13	< 15	< 16
La-140	< 12	< 12	< 9	< 5	< 4	< 6

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:	05/26/15	05/26/15	05/27/15	09/21/15	09/21/15	09/22/15
gross alpha	< 1.84	< 2.1	< 1.7	< 2.1	< 1.9	< 2.2
gross beta	< 2.8	3.83 +- 2.4	< 3.4	< 3.1	< 3.8	< 3.2
H-3	< 207	< 207	< 207	< 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)

<b>Collection date:</b>	05/19/15	05/21/15	09/15/15	09/15/15
<b>Location:</b>	downstream	upstream	downstream	downstream
<b>Type:</b>	Combined	Combined	White Bass	Drum
gamma isotopic				
K-40	2400 +- 402	2120 +- 357	2960 +- 481	2940 +- 470
Mn-54	< 6.5	< 5.3	< 6.3	< 5.2
Co-58	< 7.8	< 7.3	< 8.9	< 7.8
Fe-59	< 31.6	< 20.1	< 27.5	< 24.6
Co-60	< 7.9	< 6.0	< 7.3	< 7.0
Zn-65	< 18.8	< 14.6	< 15.5	< 12.7
Nb-95	< 14.9	< 12.8	< 13.1	< 12.7
Zr-95	< 16.6	< 14.7	< 14.4	< 12.2
Cs-134	< 5.8	< 4.8	< 5.0	< 4.6
Cs-137	< 5.7	< 5.9	< 5.7	< 4.6
<b>Collection date:</b>	09/15/15	9/16/15	9/16/15	9/16/15
<b>Location:</b>	downstream	upstream	upstream	upstream
<b>Type:</b>	Carp	White Bass	Freshwater Drum	Carp
gamma isotopic				
K-40	2710 +- 439	3570 +- 584	2840 +- 472	3050 +- 513
Mn-54	< 5.5	< 5.0	< 6.3	< 8
Co-58	< 7.7	< 6.8	< 8.7	< 12
Fe-59	< 29.6	< 18.4	< 24.4	< 35
Co-60	< 7.3	< 7.0	< 8.3	< 8
Zn-65	< 15.3	< 12.3	< 15.1	< 20
Nb-95	< 14.9	< 12.2	< 14.5	< 15
Zr-95	< 14.5	< 13.6	< 16.8	< 22
Cs-134	< 4.9	< 4.9	< 5.9	< 8
Cs-137	< 4.8	< 6.5	< 7.5	< 7

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-13	PRI-10	PRI-10	PRI-10
Collection date:		02/11/15	03/04/15	04/21/15	05/13/15	06/10/15
I-131		< 0.4		< 0.1	< 0.65 *a	
Sr-90	*c	< 0.4	< 0.5	0.8 +- 0.26 *a	*c	*c
gamma isotopic						
K-40	*c	1500 +- 293	1560 +- 310	1280 +- 248	1430 +- 249	1400 +- 253
Mn-54	*c	< 8	< 8	< 7	< 5	< 8
Co-58	*c	< 9	< 8	< 8	< 4	< 7
Fe-59	*c	< 22	< 22	< 17	< 13	< 15
Co-60	*c	< 11	< 8	< 10	< 7	< 10
Zn-65	*c	< 21	< 16	< 19	< 13	< 17
Nb-95	*c	< 9	< 9	< 8	< 4	< 7
Zr-95	*c	< 14	< 13	< 13	< 8	< 12
I-131	*c	< 15	< 9	< 13	< 8	< 13
Cs-134	*c	< 10	< 8	< 8	< 5	< 8
Cs-137	*c	< 10	< 9	< 8	< 5	< 9
Ba-140	*c	< 39	< 31	< 39	< 23	< 39
La-140	*c	< 13	< 15	< 14	< 12	< 11
Location	PRI-10	PRI-10	PRI-10	PRI-10	PRI-10	PRI-10
Collection date:	07/14/15	08/11/15	09/16/15	Oct	Nov	Dec
I-131	*c		*c		*d	
Sr-90	< 0.6	0.8 +- 0.3	< 0.7	*d	*d	*d
gamma isotopic						
K-40	1500 +- 327	1500 +- 276	1320 +- 265	*d	*d	*d
Mn-54	< 11	< 7.7	< 8.37	*d	*d	*d
Co-58	< 12	< 8.11	< 7.71	*d	*d	*d
Fe-59	< 27	< 19.1	< 20	*d	*d	*d
Co-60	< 14	< 9.05	< 10.1	*d	*d	*d
Zn-65	< 33	< 18.4	< 19.5	*d	*d	*d
Nb-95	< 9	< 7.89	< 8.27	*d	*d	*d
Zr-95	< 16	< 10.6	< 13.1	*d	*d	*d
I-131	< 9	< 9.92	< 6.76	*d	*d	*d
Cs-134	< 11	< 6.08	< 8.82	*d	*d	*d
Cs-137	< 10	< 7.2	< 8.81	*d	*d	*d
Ba-140	< 36	< 29.3	< 29	*d	*d	*d
La-140	< 14	< 13.7	< 12.1	*d	*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 = sampling suspended

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**

<b>Collection date:</b>	01/13/15	02/11/15	03/04/15	04/21/15	05/13/15	06/10/15
I-131	< 1	< 0.4		< 0.1	< 0.5	
Sr-90	0.4 +- 0.3	< 0.4	< 0.5	1.5 +- 0.41 *b	*c	*c
gamma isotopic						
K-40	1370 +- 249	1500 +- 293	1560 +- 310	1450 +- 279	1350 +- 268	1520 +- 283
Mn-54	< 5	< 8	< 8	< 7	< 9	< 7
Co-58	< 6	< 9	< 8	< 8	< 9	< 6
Fe-59	< 11	< 22	< 22	< 19	< 20	< 14
Co-60	< 8	< 11	< 8	< 10	< 10	< 9
Zn-65	< 14	< 21	< 16	< 18	< 18	< 18
Nb-95	< 6	< 9	< 9	< 8	< 9	< 8
Zr-95	< 12	< 14	< 13	< 13	< 15	< 10
I-131	< 8	< 15	< 9	< 12	< 13	< 14
Cs-134	< 7	< 10	< 8	< 8	< 9	< 8
Cs-137	< 7	< 10	< 9	< 8	< 10	< 7
Ba-140	< 24	< 39	< 31	< 42	< 37	< 28
La-140	< 10	< 13	< 15	< 10	< 10	< 13
<b>Collection date:</b>	07/14/15	08/11/15	09/16/15			
I-131		*c			*d	
Sr-90	< 0.6	0.7 +- 0.3	0.8 +- 0.3	*d	*d	*d
gamma isotopic						
K-40	1300 +- 267	1580 +- 286	1540 +- 276	*d	*d	*d
Mn-54	< 8.13	< 8.22	< 7.74	*d	*d	*d
Co-58	< 8.1	< 6.87	< 6.28	*d	*d	*d
Fe-59	< 18.9	< 15.6	< 13.5	*d	*d	*d
Co-60	< 12	< 8.9	< 9.93	*d	*d	*d
Zn-65	< 24.1	< 15.6	< 13	*d	*d	*d
Nb-95	< 9.72	< 7.38	< 8.13	*d	*d	*d
Zr-95	< 16	< 13.1	< 11.5	*d	*d	*d
I-131	< 10.7	< 10.7	< 11.5	*d	*d	*d
Cs-134	< 9.88	< 7.25	< 7.51	*d	*d	*d
Cs-137	< 11.6	< 8.66	< 9.37	*d	*d	*d
Ba-140	< 26.8	< 34.2	< 35.2	*d	*d	*d
La-140	< 9.27	< 11.6	< 12.1	*d	*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 = sampling suspended



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:	PRI-1a	PRI-4b	PRI-5	PRI-6a	PRI-8	PRI-9
<b>Collection date:</b>	05/27/15	05/26/15	05/26/15	05/27/15	05/27/16	05/26/15
gross alpha	< 1060	< 436	< 1100	< 782	< 571	< 671
gross beta	4870 +- 394	2800 +- 200	4390 +- 338	4990 +- 338	4420 +- 239	2710 +- 218
gamma isotopic						
Be-7	630 +- 123	< 273	390 +- 111	649 +- 124	477 +- 91	4422 +- 117
K-40	4390 +- 830	3790 +- 794	4130 +- 785	6660 +- 1160	3850 +- 690	3840 +- 750
Mn-54	< 18	< 25	< 16	< 23	< 14	< 25
Co-58	< 20	< 25	< 20	< 19	< 13	< 23
Fe-59	< 43	< 54	< 52	< 47	< 27	< 52
Co-60	< 27	< 31	< 28	< 27	< 14	< 26
Zn-65	< 57	< 71	< 55	< 47	< 34	< 57
Nb-95	< 22	< 27	< 25	< 23	< 15	< 25
Zr-95	< 34	< 41	< 33	< 39	< 23	< 39
I-131	< 31	< 43	< 40	< 38	< 24	< 47
Cs-134	< 19	< 24	< 25	< 21	< 16	< 23
Cs-137	< 21	< 20	< 22	< 26	< 13	< 24
Ba-140	< 81	< 119	< 117	< 106	< 60	< 117
La-140	< 38	< 47	< 38	< 31	< 26	< 39
<b>Collection date:</b>	09/22/15	09/21/15	09/21/15	09/21/15	09/22/15	09/21/15
gross alpha	< 1840	< 758	< 1470	< 1040	< 687	< 1420
gross beta	4200 +- 505	3770 +- 275	6660 +- 555	5690 +- 400	4650 +- 270	4780 +- 415
gamma isotopic						
Be-7	3350 +- 223	3360 +- 366	7480 +- 612	4680 +- 462	8160 +- 674	4500 +- 408
K-40	5240 +- 870	5670 +- 1070	6360 +- 1180	6620 +- 1300	4440 +- 981	4400 +- 846
Mn-54	< 11	< 28	< 31	< 45	< 28	< 26
Co-58	< 11	< 28	< 31	< 40	< 41	< 26
Fe-59	< 23	< 73	< 63	< 86	< 90	< 63
Co-60	< 16	< 31	< 42	< 50	< 49	< 39
Zn-65	< 25	< 61	< 79	< 106	< 95	< 59
Nb-95	< 13	< 35	< 36	< 41	< 47	< 26
Zr-95	< 20	< 53	< 53	< 56	< 77	< 51
I-131	< 31	< 59	< 73	< 77	< 64	< 67
Cs-134	< 11	< 28	< 29	< 29	< 37	< 27
Cs-137	< 16	< 31	< 41	< 32	< 26	< 39
Ba-140	< 73	< 131	< 172	< 225	< 207	< 149
La-140	< 20	< 46	< 57	< 84	< 79	< 47

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-6a	PRI-8	PRI-9
<b>Collection date:</b>	05/27/15	05/26/15	05/26/15	05/27/15	05/27/15	05/26/15
gross alpha	11000 +- 3840	6970 +- 3710	5170 +- 3030	18700 +- 4630	18800 +- 4920	9580 +- 3740
gross beta	12600 +- 1340	11900 +- 1220	12600 +- 1270	18100 +- 1530	18000 +- 1460	11600 +- 1350
gamma isotopic						
K-40	11500 +- 1860	11100 +- 1880	11300 +- 1910	14100 +- 2250	14000 +- 2230	11900 +- 1830
Mn-54	< 17	< 29	< 27	< 14	< 14	< 12
Co-58	< 35	< 41	< 40	< 26	< 22	< 25
Fe-59	< 133	< 128	< 137	< 120	< 101	< 122
Co-60	< 20	< 25	< 27	< 12	< 10	< 12
Zn-65	< 43	< 71	< 56	< 30	< 26	< 31
Nb-95	< 97	< 89	< 92	< 98	< 88	< 83
Zr-95	< 70	< 85	< 84	< 58	< 51	< 51
Cs-134	< 15	< 24	< 21	< 10	< 9	< 9
Cs-137	475 +- 34	66 +- 17	97 +- 18	226 +- 16	129 +- 10	144 +- 11
<b>Collection date:</b>	09/23/15	09/21/15	09/21/15	09/21/15	09/22/15	09/21/16
gross alpha	5150 +- 3360	5370 +- 2890	10100 +- 3490	9070 +- 3400	9840 +- 3480	6190 +- 2860
gross beta	11500 +- 1220	11500 +- 1150	11300 +- 1220	15400 +- 1190	12200 +- 1340	10800 +- 1240
gamma isotopic						
K-40	11400 +- 1870	12100 +- 1990	12900 +- 2130	12300 +- 2070	14800 +- 2420	11600 +- 1880
Mn-54	< 19	< 20	< 31	< 33	< 24	< 18
Co-58	< 23	< 25	< 39	< 41	< 26	< 20
Fe-59	< 63	< 70	< 116	< 120	< 72	< 59
Co-60	< 21	< 19	< 34	< 37	< 29	< 18
Zn-65	< 50	< 48	< 65	< 83	< 52	< 42
Nb-95	< 31	< 47	< 60	< 56	< 44	< 41
Zr-95	< 43	< 53	< 78	< 79	< 55	< 41
Cs-134	< 20	< 17	< 21	< 28	< 23	< 14
Cs-137	< 36	87 +- 15	120 +- 22	175 +- 28	148 +- 20	232 +- 21

Naturally occurring radioisotopes such as radium-226 ( $^{226}\text{Ra}$ ), bismuth-214 ( $^{214}\text{Bi}$ ), lead-214 ( $^{214}\text{Pb}$ ), actinium-228 ( $^{228}\text{Ac}$ ), bismuth-212 ( $^{212}\text{Bi}$ ), lead-212 ( $^{212}\text{Pb}$ ) from the naturally occurring uranium-238 ( $^{238}\text{U}$ ) and thorium-232 ( $^{232}\text{Th}$ ) 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 <sup>a</sup>
Airborne Particulates or Gas (pCi/m <sup>3</sup> )	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 <sup>d</sup>	
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

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.

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Sample Point	Location Description
PRI-1a	Prescott; air site
PRI-1b	Prescott; harbor area
PRI-1vs	Prescott; air site - vegetation and soil
PRI-2	Trenton
PRI-4a	Bay City Park
PRI-4b	Bay City, Hwy 35
PRI-4sw	Bay City, Hwy 35 soil and surface water
PRI-5a	Hager City - Post Office
PRI-5b	Hager City - vegetation and soil
PRI-6a	Diamond Bluff; Pierce County highway shed
PRI-6b	Diamond Bluff cemetery - well water
PRI-6c	Diamond Bluff; Pierce County highway shed - vegetation and soil
PRI-8	Station 2 – farm
PRI-9a	Bay City substation
PRI-9b	Bay City substation - vegetation and soil
PRI-T30	Diamond Bluff - Naughty Hog
PRI-T31	Diamond Bluff cemetery
PRI-T32	290th Avenue
PRI-T33	Hwy 35, Thomas Killian residence
PRI-T34	Cty K and 840th Street
PRI-T35	Cty VV and 790th Street
PRI-T36	Hager City
PRI-T37	Ellsworth
PRI-T38	Bay City, Hwy 35
PRI-T39	Prescott; air site