State of Wisconsin

2014

Prairie Island

Environmental Radioactivity Survey

Wisconsin Department of Health Services
Division of Public Health
Bureau of Environmental and Occupational Health
Radiation Protection Section
P.O. Box 2659
Madison, Wisconsin 53701
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State of Wisconsin, Department of Health Services

2014

Prairie Island Environmental Monitoring Survey

Executive Summary

Wisconsin Stat. 254.41 mandates the State of Wisconsin, Department of Health Services 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 2014. It provides a description and results of this environmental monitoring program.

The Wisconsin Department of Health Services' 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, milk, well water, soil and vegetation that are collected from selected locations at planned sampling intervals.

Program Summary

For 2014, all sample results from the Prairie Island environmental monitoring area were less than state and federal standards or guidelines.

The Wisconsin Department of Health Services' 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 2014, 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.

The Department'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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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 2014. It provides a description and results of this environmental monitoring program.

Wisconsin DHS Prairie Island Environmental Monitoring Sampling Program

The Wisconsin 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 description, direction and distance 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 Welch dairy farm (PRI-10) ceased milking in late November, so there was no December sample.

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 Wisconsin DHS, will be 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, and
t	for environmental samples is 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 will be 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” calculations 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-3	10.9 NE	Ellsworth (discontinued 07/01/96)
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-7	11.9 E	Junction of Hwy 35 & Cty D (discontinued 07/01/96)
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
PRI-11	4.0 NNE	D. Dosdall farm (discontinued in March, 1995)
PRI-12	11.1 NNW	S. Rohl farm (discontinued in October, 1999)
PRI-13	3.8 E	Christiansen farm
PRI-14	13.8 N	A. Huppert farm (discontinued in February 2004)
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 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 2013.

Sample Type	Collection and Frequency	Site Locations	Number of Samples Collected	Number of Sample Deviations	Required Analyses
Air particulate	C/BW	1a, 6a, 9	77	1	GA, GB, GI
Air iodine	C/BW	1a, 6a, 9	78	0	GI
Precipitation	C/BW	1a, 9	12	0	GB, H
TLD	C/Q	T30 – T39	40	0	direct exposure
Surface water	G/SA	1b, 2, 4a	6	3	GA, GB, GI, Sr, H
Fish	G/SA	upstream, downstream	4	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	23	0	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 particulate	12/02/14	PRI-9	No data due to lab instrument error
Air particulate	10/29/14	PRI-6	Power was off for an unknown time
Precipitation	5/28/14		Laboratory error resulted in no data
Milk	04/16/14	PRI-10	Laboratory error data not reported for I-131
Milk	06/13/14	PRI-10	Laboratory error data not reported for I-131
Milk	02/26/14	PRI-10	Detection limit not met due to laboratory error for I-131 in gamma spec
Milk	08/12/14	PRI-10	Laboratory error data not reported for I-131
Milk	08/12/14	PRI-10	Laboratory error data not reported for Sr-90

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

Sample type	Date	Site	Explanation
Milk	10/14/14	PRI-10	Laboratory error data not reported for Sr-90
Milk	11/12/14	PRI-10	Quality standard for lower lower limit of detection not met for I-131
Milk	11/12/14	PRI-10	Laboratory error data not reported for Sr-90
Milk	04/16/14	PRI-15	Laboratory error data not reported for I-131
Milk	05/13/14	PRI-15	Detection limit not met due to laboratory error for Co-60
Milk	06/12/14	PRI-15	Laboratory error data not reported for I-131
Milk	07/17/14	PRI-15	There was a unacceptable high background for Sr-90
Milk	09/09/14	PRI-15	Detection limit not met due to laboratory error
Milk	10/14/14	PRI-15	Laboratory error data not reported for Sr-90
Milk	10/14/14	PRI-15	Detection limit not met due to laboratory error for Co-60
Milk	10/14/14	PRI-15	Detection limit not met due to laboratory error for I-131 in gamma spec
Milk	11/12/14	PRI-15	Laboratory error data not reported for Sr-90
Milk	11/12/14	PRI-15	There was an unacceptable high background
Milk	12/16/14	PRI-15	laboratory error, data not reported for I-131
Milk	12/16/14	PRI-15	laboratory error, data not reported for Sr-90

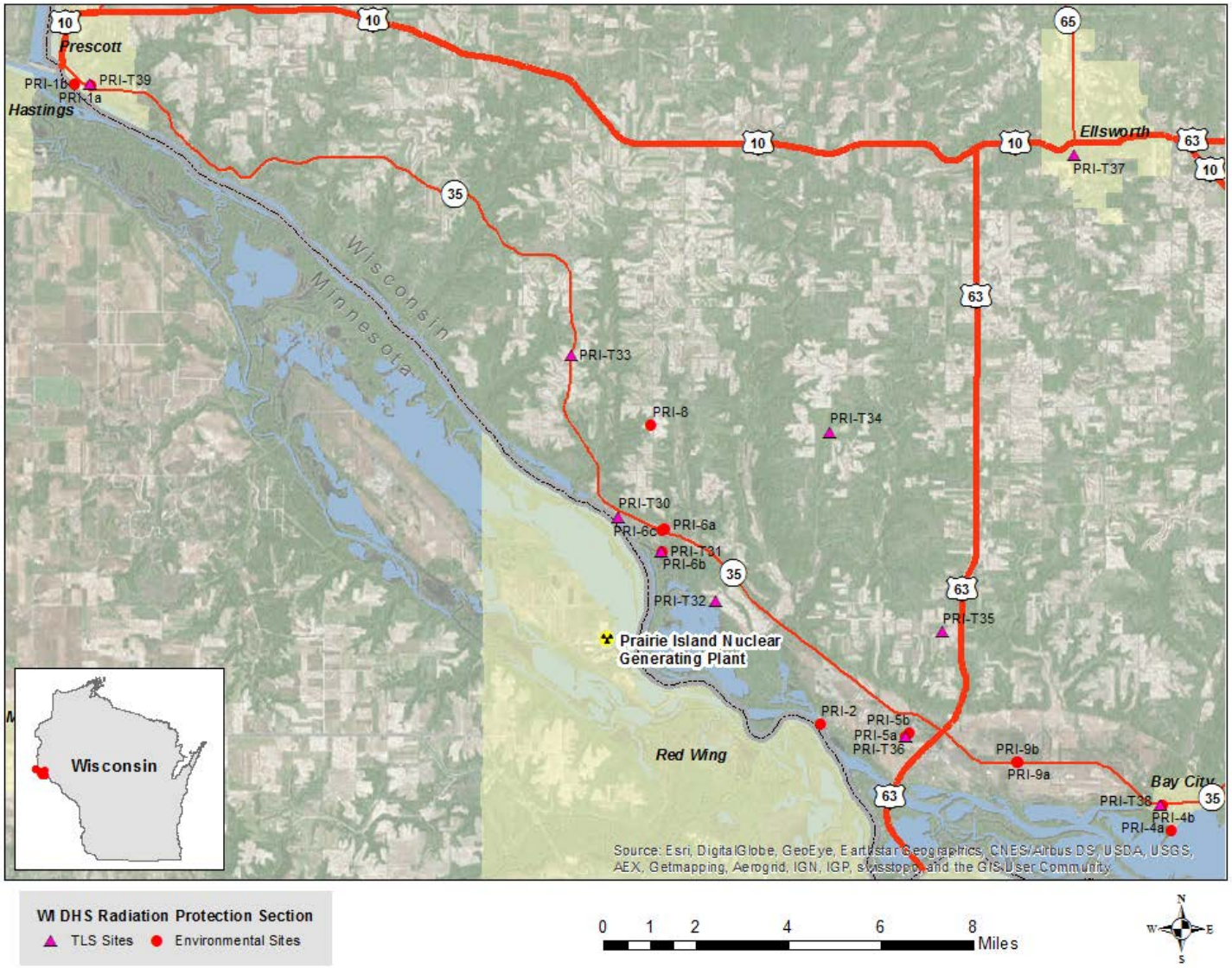

Figure 1. Location of Wisconsin DHS environmental monitoring sites for the Prairie Island monitoring program.

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

Air Particulate

A summary of reported activities by Wisconsin DHS for air particulate samples is included in Table 4. Results from the individual sample analyses are listed in Tables 5-6.

From the individual activities or quarterly averages for gross beta activities it may be noted that there are no significant differences between sites at different distances from the Prairie Island facility. With no significant difference with distance from the Prairie Island site, an increase in gross beta activity attributable to the Prairie Island plant operation is not evident.

The gamma isotopic analysis of the quarterly air particulate filter composites detected only small amounts of the radioisotopes listed in Table 4. Beryllium-7 (^{7}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 is 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

A summary of reported activities by Wisconsin DHS for air iodine samples is included in Table 4. Results from the individual sample analyses are listed in Table 5.

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 - Thermoluminecent Dosimeters (TLD)

A summary of reported activities by Wisconsin DHS for ambient gamma radiation is included in Table 4. Results from the individual sample analyses are listed in Table 7.

Direct radiation (TLD) data for 2014 from the Wisconsin DHS network was comparable for all sites. Significant differences in exposure were not noticed at different distances from the Prairie Island nuclear facility. The average quarterly exposure from the ten sites located within Wisconsin was 14.2 $\pm$ 2.5 milliroentgens. The average quarterly exposure for 2014 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

A summary of reported activities by Wisconsin DHS for precipitation is included in Table 4. Results from the individual sample analyses are listed in Table 8.

The gross beta activity in precipitation was all within the normal range of activity when compared to previous year's data. Influence by the Prairie Island nuclear facility is not evident from precipitation analysis.

Surface Water

A summary of reported activities by Wisconsin DHS for surface water samples is included in Table 4. Results from the individual sample analyses are listed in Table 9.

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

Fish

A summary of reported activities by Wisconsin DHS for fish samples is included in Table 4. Results from the individual sample analyses are listed in Table 11.

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

A summary of reported activities by Wisconsin DHS for well water samples is included in Table 4. Results from the individual sample analyses are listed in Table 10.

The well water samples showed no unusual gross alpha and gross beta activities and all activities for tritium (^{3}H) were less than its LLD. The measured activities are all below state and federal standards. Influence by the Prairie Island nuclear facility is not evident from well water sample analysis.

Milk

A summary of reported activities by Wisconsin DHS for milk samples is included in Table 4. Results from the individual sample analyses are listed in Table 12.

Analysis of the milk samples showed no unusual activities. However, there were 3 milk samples with levels of detection above 0.5 pCi/L due to laboratory error. In addition, there were 6 samples that were not analyzed for iodine-131 (^{131}I) due to laboratory delays and 6 samples of strontium-90 (^{90}Sr) were not analyzed due to laboratory delays. Laboratory error also resulted in 5 issues ranging from detection limits not being met to high background. 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

A summary of reported activities by Wisconsin DHS for vegetation samples is included in Table 4. Results from the individual sample analyses are listed in Tables 13.

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) 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

A summary of reported activities by Wisconsin DHS for soil samples is included in Table 4. Results from the individual sample analyses are listed in Table 14.

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}K) is a naturally occurring radioisotope. The reported activities for cesium-137 (^{137}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}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. Adm. Code section DHS 157.23. Doses resulting from gaseous and liquid effluent releases from the Prairie Island nuclear generating facility are less than the limits as stated in Wis. Adm. Code section DHS 157.23.

References

State of Wisconsin, Wisconsin Administrative Code, DHS 157.23

US 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 (pCi/m^3)	0.005	78 / 77	gross beta	0.009 - 0.043
			gamma isotopic	
	0.020	12 / 12	Be-7	0.015 - 0.072
	0.002	12 / 0	Mn-54	<0.0005
	0.002	12 / 0	Co-58	<0.0004
	0.005	12 / 0	Fe-59	<0.0010
	0.002	12 / 0	Co-60	<0.0006
	0.005	12 / 0	Zn-65	<0.0010
	0.002	12 / 0	Nb-95	<0.0006
	0.005	12 / 0	Zr-95	<0.0008
	0.002	12 / 0	Ru-103	<0.0006
	0.015	12 / 0	Ru-106	<0.0039
	0.020	12 / 0	I-131	<0.0021
	0.002	12 / 0	Cs-134	<0.0005
	0.002	12 / 0	Cs-137	<0.0005
	0.030	12 / 0	Ba-140	<0.0034
	0.020	12 / 0	La-140	<0.0014
	0.002	12 / 0	Ce-141	<0.0009
	0.005	12 / 0	Ce-144	<0.0028
Air iodine (pCi/m^3)	0.07	78 / 0	I-131	< 0.025
Surface water (pCi/liter)	3.0	6 / 0	gross alpha (sol)	< 0.7 – 2.4
	3.0	6 / 0	gross beta (sol)	< 1.1 – 2.9
	3.0	6 / 4	gross alpha (insol)	< 0.7
	3.0	6 / 1	gross beta (insol)	< 1.3
	300	6 / 0	H-3	< 220
	2.0	6 / 0	Sr-89	< 0.5
	1.0	6 / 0	Sr-90	< 0.3
			gamma isotopic	
	15	6 / 0	Mn-54	< 10
	15	6 / 0	Co-58	< 11
	30	6 / 0	Fe-59	< 20
	15	6 / 0	Co-60	< 12
	30	6 / 0	Zn-65	< 17
	15	6 / 0	Nb-95	< 9
	30	6 / 0	Zr-95	< 15
	15	6 / 0	I-131	< 14
	15	6 / 0	Cs-134	< 9
	15	6 / 0	Cs-137	< 12
	60	6 / 0	Ba-140	< 40
	15	6 / 0	La-140	< 15

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

Sample type (units)	LLD	Number of samples [a]	Analysis	Range
Fish			gamma isotopic	
(pCi/kg wet)	800	4 / 4	K-40	2630 – 2790
	50	4 / 0	Mn-54	< 5
	60	4 / 0	Co-58	< 7
	130	4 / 0	Fe-59	< 25
	60	4 / 0	Co-60	< 6
	130	4 / 0	Zn-65	< 12
	50	4 / 0	Nb-95	< 15
	100	4 / 0	Zr-95	< 14
	50	4 / 0	Cs-134	< 5
	60	4 / 0	Cs-137	< 6 – 7
Precipitation	1.5	12 / 0	gross beta	0.05 -0.34
(nCi/m^2)	300	12 / 0	H-3	< 53
Well water	3.0	6 / 0	gross alpha	< 1.6
(pCi/liter)	3.0	6 / 0	gross beta	< 1.2 -1.18
	300	6 / 0	H-3	< 220
Vegetation	5000	12 / 0	gross alpha	< 1920 - 3460
(pCi/kg wet)	4000	12 / 5	gross beta	< 415 – 10000
			gamma isotopic	
	600	12 / 10	Be-7	< 220 – 4150
	2000	12 / 11	K-40	1550 – 7210
	90	12 / 0	Mn-54	< 30
	100	12 / 0	Co-58	< 28
	200	12 / 0	Fe-59	< 66
	100	12 / 0	Co-60	< 44
	250	12 / 0	Zn-65	< 79
	100	12 / 0	Nb-95	< 32
	200	12 / 0	Zr-95	< 56
	80	12 / 0	I-131	< 60
	80	12 / 0	Cs-134	< 31
	90	12 / 0	Cs-137	< 42
	350	12 / 0	Ba-140	< 140
	100	12 / 0	La-140	< 53

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

Sample type (units)	LLD	Number of samples [a]	Analysis	Range
Soil	15000	12 / 0	gross alpha	< 3850 – 12500
(pCi/kg dry)	6000	12 / 12	gross beta	6700 - 23400
			gamma isotopic	
	800	12 / 12	K-40	10600 – 14200
	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 / 7	Cs-137	61 - 580
Milk	1.5	7 / 3	I-131	< 1.7 – 0.3
(pCi/liter)	1.0	17 / 0	Sr-90	< 0.7 – 0.8
			gamma isotopic	
	500	24 / 24	K-40	1090 - 1580
	15	24 / 0	Mn-54	< 13
	15	24 / 0	Co-58	< 13
	40	24 / 0	Fe-59	< 25
	15	24 / 1	Co-60	< 15
	40	24 / 0	Zn-65	< 30
	15	24 / 0	Nb-95	< 12
	40	24 / 0	Zr-95	< 21
	15	24 / 2	I-131	< 15.5
	15	24 / 0	Cs-134	< 12
	15	24 / 0	Cs-137	< 15
	60	24 / 0	Ba-140	< 50
	15	24 / 0	La-140	< 15
ambient radiation (TLD)	1.0 [c]	39 / 39	direct exposure	9.8 – 19.0
(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				**PRI-6 (3200 series); Diamond Bluff**			
Collection date	Volume m3	Air particulate	Air iodine	Collection date	Volume m3	Air particulate	Air iodine
01/08/14	630	0.032 ± 0.003	< 0.011	01/08/14	651	0.031± 0.002	< 0.006
01/21/14	876	0.026 ± 0.002	< 0.008	01/21/14	903	0.024 ± 0.002	< 0.007
02/03/14	897	0.017 ± 0.002	< 0.007	02/03/14	932	0.016 ± 0.002	< 0.021
02/19/14	1104	0.023 ± 0.002	< 0.005	02/19/14	1143	0.023 ± 0.002	< 0.006
03/05/14	956	0.030 ± 0.002	< 0.007	03/05/14	983	0.029 ± 0.002	< 0.006
03/18/14	863	0.021 ± 0.002	< 0.015	03/18/14	887	0.021 ± 0.002	< 0.009
04/02/14	990	0.021 ± 0.002	< 0.007	04/02/14	1017	0.019 ± 0.002	< 0.007
1st Qtr				1st Qtr			
mean +- s.d.		0.024 ± 0.005	< 0.009	mean +- s.d.		0.023 ± 0.005	< 0.009
04/16/14	918	0.018 ± 0.002	< 0.006	04/16/14	943	0.017 ± 0.002	< 0.007
04/29/14	836	0.016 ± 0.002	< 0.011	04/29/14	854	0.016 ± 0.002	< 0.010
05/13/14	886	0.009 ± 0.001	< 0.011	05/13/14	910	0.009 ± 0.001	< 0.013
05/28/14	924	0.015 ± 0.002	< 0.007	05/28/14	950	0.014 ± 0.001	< 0.006
06/11/14	819	0.015 ± 0.002	< 0.018	06/11/14	835	0.014 ± 0.002	< 0.017
06/27/14	939	0.013 ± 0.001	< 0.008	06/27/14	956	0.015 ± 0.001	< 0.012
2nd Qtr				2nd Qtr			
mean +- s.d.		0.014 ± 0.003	< 0.010	mean +- s.d.		0.014 ± 0.003	< 0.011
07/10/14	764	0.013 ± 0.002	< 0.018	07/10/14	783	0.014 ± 0.002	< 0.017
07/23/14	762	0.018 ± 0.002	< 0.019	07/23/14	773	0.020 ± 0.002	< 0.019
08/06/14	809	0.020 ± 0.002	< 0.017	08/06/14	825	0.020 ± 0.002	< 0.019
08/21/14	878	0.021 ± 0.002	< 0.018	08/21/14	887	0.020 ± 0.002	< 0.015
09/05/14	881	0.016 ± 0.002	< 0.014	09/05/14	886	0.017 ± 0.002	< 0.012
09/19/14	855	0.021 ± 0.002	< 0.015	09/19/14	866	0.020 ± 0.002	< 0.014
09/30/14	673	0.027 ± 0.002	< 0.024	09/30/14	676	0.026 ± 0.002	< 0.025
3rd Qtr				3rd Qtr			
mean +- s.d.		0.019 ± 0.004	< 0.018	mean +- s.d.		0.020 ± 0.004	< 0.017
10/16/14	1012	0.015 ± 0.001	< 0.006	10/16/14	1021	0.013 ± 0.001	< 0.010
10/29/14	825	0.017 ± 0.002	< 0.012	10/29/14	434 *a	0.017 ± 0.003	< 0.023
11/17/14	1254	0.017 ± 0.001	< 0.005	11/17/14	1261	0.018 ± 0.001	< 0.006
12/02/14	1001	0.026 ± 0.002	< 0.007	12/02/14	1010	0.026 ± 0.002	< 0.009
12/17/14	1003	0.043 ± 0.002	< 0.011	12/17/14	1002	0.043 ± 0.002	< 0.019
12/31/14	941	0.024 ± 0.002	< 0.007	12/31/14	940	0.025 ± 0.002	< 0.008
4th Qtr				4th Qtr			
mean +- s.d.		0.024 ± 0.010	< 0.008	mean +- s.d.		0.024 ± 0.011	< 0.024

*a = power was off for an unknown time

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

Measurements in units of pCi/m^3

PRI-9 (3400 series); Bay City substation

Collection date	Volume m3	Air particulate			Air iodine	
01/08/14	725	0.032	±	0.002	<	0.017
01/21/14	1020	0.024	±	0.002	<	0.006
02/03/14	1017	0.016	±	0.001	<	0.017
02/19/14	1257	0.023	±	0.001	<	0.004
03/05/14	1087	0.029	±	0.002	<	0.006
03/18/14	997	0.020	±	0.002	<	0.006
04/02/14	1156	0.020	±	0.001	<	0.005
1st Qtr						
mean +- s.d.		0.023	±	0.006	<	0.009
04/16/14	1038	0.016	±	0.001	<	0.005
04/29/14	959	0.017	±	0.002	<	0.009
05/13/14	1012	0.009	±	0.001	<	0.006
05/28/14	1083	0.015	±	0.001	<	0.006
06/11/14	1019	0.012	±	0.001	<	0.014
06/27/14	1189	0.013	±	0.001	<	0.005
2nd Qtr						
mean +- s.d.		0.014	±	0.003	<	0.014
07/10/14	982	0.012	±	0.001	<	0.010
07/23/14	982	0.018	±	0.002	<	0.015
08/06/14	1061	0.019	±	0.002	<	0.014
08/21/14	1149	0.020	±	0.001	<	0.012
09/05/14	1168	0.017	±	0.001	<	0.011
09/19/14	1109	0.020	±	0.002	<	0.011
09/30/14	866	0.025	±	0.002	<	0.016
3rd Qtr						
mean +- s.d.		0.019	±	0.004	<	0.019
10/16/14	1289	0.014	±	0.001	<	0.006
10/29/14	1023	0.015	±	0.001	<	0.006
11/17/14	1511	0.016	±	0.001	<	0.005
12/02/14	1210	*b	±	*b	<	0.007
12/17/14	1214	0.040	±	0.002	<	0.008
12/31/14	1135	0.023	±	0.002	<	0.006
4th Qtr						
mean +- s.d.		0.0216	±	0.011	<	0.006

*a = power was off for an unknown time

*b = no data due to instrument error

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	0.051 +- 0.007	0.067 +- 0.008	0.061 +- 0.005	0.041 +- 0.004
Mn-54	< 0.0002	< 0.0004	< 0.0002	< 0.0002
Co-58	< 0.0004	< 0.0003	< 0.0002	< 0.0003
Fe-59	< 0.0006	< 0.0010	< 0.0007	< 0.0007
Co-60	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Zn-65	< 0.0006	< 0.0008	< 0.0006	< 0.0006
Nb-95	< 0.0004	< 0.0006	< 0.0004	< 0.0004
Zr-95	< 0.0005	< 0.0007	< 0.0005	< 0.0005
Ru-103	< 0.0003	< 0.0004	< 0.0003	< 0.0003
Ru-106	< 0.0018	< 0.0037	< 0.0021	< 0.0020
I-131	< 0.0021	< 0.0009	< 0.0017	< 0.0020
Cs-134	< 0.0003	< 0.0004	< 0.0003	< 0.0003
Cs-137	< 0.0002	< 0.0004	< 0.0002	< 0.0002
Ba-140	< 0.0033	< 0.0018	< 0.0026	< 0.0034
La-140	< 0.001	< 0.0012	< 0.0012	< 0.0014
Ce-141	< 0.0005	< 0.0006	< 0.0004	< 0.0004
Ce-144	< 0.0011	< 0.0018	< 0.0011	< 0.0011
Site: PRI-6				
Be-7	0.052 +- 0.004	0.065 +- 0.007	0.072 +- 0.005	0.044 +- 0.004
Mn-54	< 0.0002	< 0.0005	< 0.0001	< 0.0003
Co-58	< 0.0002	< 0.0004	< 0.0002	< 0.0003
Fe-59	< 0.0004	< 0.0007	< 0.0004	< 0.0007
Co-60	< 0.0002	< 0.0006	< 0.0002	< 0.0003
Zn-65	< 0.0004	< 0.0010	< 0.0003	< 0.0005
Nb-95	< 0.0003	< 0.0004	< 0.0002	< 0.0004
Zr-95	< 0.0003	< 0.0008	< 0.0003	< 0.0005
Ru-103	< 0.0002	< 0.0006	< 0.0002	< 0.0003
Ru-106	< 0.0013	< 0.0039	< 0.0013	< 0.0023
I-131	< 0.0020	< 0.0014	< 0.0019	< 0.0018
Cs-134	< 0.0002	< 0.0005	< 0.0002	< 0.0003
Cs-137	< 0.0001	< 0.0005	< 0.0002	< 0.0002
Ba-140	< 0.0025	< 0.0030	< 0.0026	< 0.0030
La-140	< 0.0009	< 0.0011	< 0.0008	< 0.0014
Ce-141	< 0.0003	< 0.0009	< 0.0004	< 0.0005
Ce-144	< 0.0008	< 0.0028	< 0.0010	< 0.0012
Site: PRI-9				
Be-7	0.056 +- 0.004	0.066 +- 0.007	0.070 +- 0.005	0.039 +- 0.004
Mn-54	< 0.0001	< 0.0003	< 0.0002	< 0.0002
Co-58	< 0.0002	< 0.0004	< 0.0002	< 0.0002
Fe-59	< 0.0004	< 0.0005	< 0.0005	< 0.0005
Co-60	< 0.0002	< 0.0003	< 0.0003	< 0.0002
Zn-65	< 0.0003	< 0.0004	< 0.0004	< 0.0003
Nb-95	< 0.0002	< 0.0004	< 0.0003	< 0.0003
Zr-95	< 0.0003	< 0.0005	< 0.0004	< 0.0004
Ru-103	< 0.0002	< 0.0004	< 0.0003	< 0.0002
Ru-106	< 0.0011	< 0.0027	< 0.0018	< 0.0015
I-131	< 0.0018	< 0.0008	< 0.0020	< 0.0019
Cs-134	< 0.0001	< 0.0003	< 0.0002	< 0.0002
Cs-137	< 0.0003	< 0.0003	< 0.0003	< 0.0002
Ba-140	< 0.0022	< 0.0023	< 0.0028	< 0.0025
La-140	< 0.0008	< 0.0008	< 0.0010	< 0.0010
Ce-141	< 0.0004	< 0.0005	< 0.0005	< 0.0004
Ce-144	< 0.0009	< 0.0013	< 0.0013	< 0.0008

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

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Placed:	01/23/14	04/23/14	07/16/14	10/16/14
Date Removed:	04/23/14	07/16/14	10/16/14	01/13/15
Days in the Field:	90	84	92	89
	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	10.8 +- 1.0	14.9 +- 1.1	11.3 +- 0.5	17.6 +- 0.4
T31	10.0 +- 1.1	9.8 +- 1.2	10.3 +- 0.8	15.0 +- 0.6
T32	11.7 +- 1.0	14.6 +- 1.5	14.2 +- 0.6	17.3 +- 0.9
Quarterly average +- s.d.	10.8 +- 0.9	13.1 +- 2.9	11.9 +- 2.0	16.6 +- 1.4
TLD sites that are located 2– 5 miles from the Prairie island facility				
T33	13.3 +- 1.1	14.1 +- 1.2	13.7 +- 0.8	18.2 +- 0.4
T34	13.6 +- 1.0	16.9 +- 1.1	15.1 +- 0.4	19.0 +- 0.6
T35	16.1 +- 1.0	12.6 +- 1.6	17.9 +- 0.6	17.1 +- 1.0
T36	12.7 +- 1.0	13.3 +- 1.3	13.8 +- 0.5	16.2 +- 1.2
Quarterly average +- s.d.	13.9 +- 1.5	14.2 +- 1.9	15.1 +- 2.0	17.6 +- 1.2
TLD sites that are located greater than 5 miles from the Prairie island facility				
T37	14.7 +- 1.9	12.0 +- 1.1	16.0 +- 1.4	14.7 +- 0.4
T38	12.2 +- 1.0	15.3 +- 1.3	12.2 +- 0.4	17.9 +- 0.7
T39	11.3 +- 1.1	13.8 +- 1.6	10.9 +- 0.8	17.5 +- 0.6
Quarterly average +- s.d.	12.7 +- 1.8	13.7 +- 1.7	13.0 +- 2.7	16.7 +- 1.7

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**
01/21/14	0.48	0.05 +- 0.01	0.00 < 2.66
02/19/14	1.05	0.06 +- 0.02	0.00 < 5.79
03/18/14	1.28	0.09 +- 0.03	0.00 < 7.02
04/29/14	4.91	0.34 +- 0.11	0.00 < 27.44
05/28/14	5.02	*a +- 0.14	0.00 < 28.05
06/27/14	9.52	0.27 +- 0.15	0.00 < 53.20
07/23/14	2.17	0.07 +- 0.04	0.00 < 11.91
08/21/14	2.50	0.09 +- 0.05	0.00 < 13.53
09/30/14	5.82	0.17 +- 0.11	0.00 < 31.34
10/21/14	1.25	0.00 +- 0.04	0.00 < 6.67
11/17/14	0.48	0.25 +- 0.02	0.00 < 2.55
12/31/14	1.05	0.17 +- 0.03	0.00 < 5.57

*a = laboratory error, no data reported

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:	06/12/14	06/12/14	06/12/14	10/23/14	10/23/14	10/23/14
gross alpha-sol	1.3 +- 0.8	1.5 +- 1.0	2.4 +- 1.0	< 0.7	1.87 +- 1.1	< 1.2
gross beta-sol	1.8 +- 0.8	2.5 +- 0.9	2.9 +- 0.9	< 1.1	2.0 +- 0.9	1.4 +- 0.8
gross alpha-insol	< 0.6	< 0.6	< 0.6	< 0.5	< 0.7	< 0.6
gross beta-insol	< 1.3	< 1.1	< 1.2	< 1.1	< 1.3	< 1.2
H-3	< 220	< 220	< 217	< 210	< 210	< 210
Sr-89	< 0.4	< 0.4	< 0.5	b	b	b
Sr-90	0.5 +- 0.1	< 0.2	< 0.3	b	b	b
gamma isotopic						
Mn-54	< 6	< 9	< 8	< 5	< 7	< 10
Co-58	< 7	< 11	< 10	< 5	< 6	< 7
Fe-59	< 12	< 16	< 20	< 12	< 10	< 14
Co-60	< 8	< 8	< 7	< 6	< 6	< 12
Zn-65	< 13	< 11	< 17	< 11	< 12	< 17
Nb-95	< 8	< 9	< 9	< 6	< 7	< 9
Zr-95	< 10	< 14	< 15	< 10	< 11	< 14
I-131	< 11	< 14	< 14	< 8	< 9	< 13
Cs-134	< 7	< 8	< 8	< 8	< 5	< 9
Cs-137	< 6	< 7	< 9	< 6	< 6	< 12
Ba-140	< 26	< 40	< 34	< 28	< 28	< 35
La-140	< 15	< 3	< 15	< 11	< 10	< 14

Radioisotopes other than those reported were not detected.

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:						
gross alpha	< 1.1	< 1.6	< 1.1	< 0.9	< 1.6	< 1.1
gross beta	< 1.1	< 0.9	< 0.9	1.18 +- 0.6	< 1.2	< 1.1
H-3	< 220	< 220	< 220	< 210	< 210	< 210

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:	05/19/14	05/21/14
Location:	downstream	upstream
Type:	drum, crape, white bass *a	drum, crape, white bass *a
gamma isotopic		
K-40	2700 +- 446	2800 +- 455
Mn-54	< 4	< 5
Co-58	< 7	< 7
Fe-59	< 24	< 23
Co-60	< 5	< 6
Zn-65	< 11	< 11
Nb-95	< 13	< 14
Zr-95	< 12	< 14
Cs-134	< 4	< 5
Cs-137	6.99 +- 2	< 6

Collection date:	09/15/14	09/18/14
Location:	downstream	upstream
Type:	drum, crape, white bass *a	drum, crape, white bass *a
gamma isotopic		
K-40	2790 +- 452	2630 +- 424
Mn-54	< 5	< 4
Co-58	< 7	< 7
Fe-59	< 25	< 22
Co-60	< 6	< 5
Zn-65	< 12	< 10
Nb-95	< 15	< 15
Zr-95	< 14	< 14
Cs-134	< 5	< 4
Cs-137	< 5	< 5

Radioisotopes other than those reported were not detected

*a - three fish were combined into a single sample due to the lack of sample volume

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

Collection date:	01/15/14	02/26/14	03/20/14	04/16/14	05/13/14	06/13/14
I-131		< 0.2		*e		*e
Sr-90	0.8 +- 0.2	0.5 < 0.3	0.7 +- 0.3	0.4 +- 0.2	0.8 +- 0.2	0.3 +- 0.2
gamma isotopic						
K-40	1370 +- 330	1340 +- 252	1390 +- 290	1270 +- 280	1410 +- 280	1410 +- 310
Mn-54	< 13	< 8	< 8	< 8	< 7	< 11
Co-58	< 12	< 8	< 7	< 9	< 7	< 11
Fe-59	< 21	< 19	< 18	< 15	< 15	< 23
Co-60	< 15	< 11	< 10	< 7	< 9	< 9
Zn-65	< 30	< 17	< 20	< 22	< 21	< 20
Nb-95	< 12	< 10	< 9	< 8	< 10	< 11
Zr-95	< 18	< 16	< 15	< 15	< 13	< 17
I-131	< 12	< 15.5 *a	< 11	< 9	< 10	< 14
Cs-134	< 11	< 8	< 8	< 9	< 7	< 10
Cs-137	< 12	< 11	< 10	< 7	< 8	< 9
Ba-140	< 37	< 45	< 31	< 24	< 24	< 28
La-140	< 11	< 13	< 13	< 15	< 11	< 13

Collection date:	07/17/14	08/12/14	09/09/14	10/14/14	11/12/14	ceased operation
I-131		*e		< 0.4	< 1.5 ***c**	
Sr-90	< 0.28 *b	*e	0.5 +- 0.3	*e	*e	
gamma isotopic						
K-40	1530 +- 322	1440 +- 264	1430 +- 258	1480 +- 281	1450 +- 288	
Mn-54	< 10	< 8	< 6	< 8	< 8	
Co-58	< 8	< 7	< 5	< 8	< 9	
Fe-59	< 24	< 15	< 14	< 16	< 19	
Co-60	< 10	< 11	< 6	< 12	< 12	
Zn-65	< 22	< 19	< 11	< 17	< 18	
Nb-95	< 11	< 8	< 6	< 7	< 8	
Zr-95	< 15	< 13	< 12	< 14	< 12	
I-131	< 14	< 10	< 8	< 8	< 8	
Cs-134	< 9	< 9	< 7	< 7	< 9	
Cs-137	< 10	< 9	< 6	< 8	< 9	
Ba-140	< 27	< 31	< 25	< 28	< 27	
La-140	< 3	< 11	< 7	< 12	< 14	

Radioisotopes other than those reported were not detected.

*a – Detection limit not met due to laboratory error

*b - There was a quality issue with the sample

*c - The detection limit of 0.5 pCi/L was not met

*d – There was an unacceptable high background

*e – laboratory error, data not reported

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

Measurements in units of pCi/liter

Location: PRI-15

Collection date:	01/15/14	02/26/14	03/20/14	04/16/14	05/13/14	06/12/14
I-131	< 1.74 *d	< 0.3		*e		*e
Sr-90	0.8 +- 0.3	0.7 +- 0.2	0.8 +- 0.3	0.6 +- 0.2	0.5 +- 0.2	0.5 +- 0.3
gamma isotopic						
K-40	1560 +- 350	1340 +- 259	1260 +- 308	1390 +- 220	1480 +- 300	1260 +- 280
Mn-54	< 9	< 6	< 12	< 2	< 12	< 9
Co-58	< 9	< 6	< 10	< 2	< 11	< 13
Fe-59	< 22	< 12	< 23	< 5	< 22	< 25
Co-60	< 14	< 9	< 12	< 2	< 15 *e	< 11
Zn-65	< 26	< 17	< 22	< 4	< 24	< 26
Nb-95	< 9	< 8	< 11	< 4	< 11	< 10
Zr-95	< 15	< 12	< 17	< 4	< 18	< 17
I-131	< 9	< 11	< 10	< 28	< 14	< 15
Cs-134	< 8	< 6	< 11	< 2	< 12	< 8
Cs-137	< 10	< 7	< 12	< 2	< 15	< 7
Ba-140	< 43	< 30	< 42	< 30	< 50	< 34
La-140	< 4	< 14	< 14	< 10	< 12	< 10

Collection date:	07/17/14	08/12/14	09/09/14	10/14/14	11/12/14	12/16/14
I-131				0.34 +- 0.2	< 1.74 *d	*e
Sr-90	< 0.37 *d	< 0.3	< 0.69 *a	*e	*e	*e
gamma isotopic						
K-40	1378 +- 278	1510 +- 290	1480 +- 264	1310 +- 267	1400 +- 284	1350 +- 273
Mn-54	< 9	< 9	< 7	< 12	< 8	< 9
Co-58	< 6	< 9	< 6	< 10	< 6	< 9
Fe-59	< 18	< 17	< 12	< 22	< 18	< 18
Co-60	< 10	< 13	< 6	< 15.1 *a	< 12	< 11
Zn-65	< 20	< 20	< 13	< 25	< 22	< 22
Nb-95	< 10	< 9	< 7	< 10	< 8	< 9
Zr-95	< 14	< 14	< 11	< 21	< 11	< 13
I-131	< 10	< 12	< 7	< 15.3 *a	< 10.1	< 10
Cs-134	< 8	< 10	< 7	< 10	< 9	< 9
Cs-137	< 8	< 12	< 6	< 14	< 9	< 10
Ba-140	< 35	< 37	< 22	< 44	< 31	< 32
La-140	< 12	< 11	< 7	< 12	< 12	< 10

Radioisotopes other than those reported were not detected.

*a – Detection limit not met due to laboratory error

*b - There was a quality issue with the sample

*c - The detection limit of 0.5 pCi/L was not met

*d – There was an unacceptable high background

*e – laboratory error, data not reported

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
Collection date:	06/12/14	06/11/14	06/12/14	06/12/14	06/12/14	06/11/14
gross alpha	< 850	< 740	< 340	< 1000	< 796	< 906
gross beta	4260 +- 320	3730 +- 280	2130 +- 150	10000 +- 470	4370 +- 292	3200 +- 289
gamma isotopic						
Be-7	2010 +- 240	330 +- 90	< 220	1870 +- 250	1090 +- 171	1090 +- 171
K-40	5400 +- 1000	4800 +- 900	5400 +- 1000	6170 +- 1100	4680 +- 859	5550 +- 1000
Mn-54	< 24	< 19	< 19	< 30	< 21	< 23
Co-58	< 18	< 17	< 17	< 27	< 20	< 23
Fe-59	< 52	< 35	< 40	< 58	< 45	< 49
Co-60	< 27	< 23	< 24	< 30	< 29	< 30
Zn-65	< 53	< 43	< 46	< 64	< 48	< 41
Nb-95	< 24	< 21	< 20	< 25	< 21	< 24
Zr-95	< 34	< 33	< 31	< 41	< 38	< 39
I-131	< 40	< 34	< 27	< 60	< 51	< 50
Cs-134	< 18	< 16	< 20	< 24	< 21	< 20
Cs-137	< 28	< 23	< 23	< 34	< 23	< 25
Ba-140	< 100	< 77	< 97	< 140	< 128	< 124
La-140	< 27	< 19	< 26	< 26	< 31	< 34
Collection date:	10/24/14	10/23/14	10/22/14	10/23/14	10/23/14	10/22/14
gross alpha	< 1920	< 827	< 994	< 937	3460 +- 356	< 1590
gross beta	2320 +- 510	3770 +- 365	4530 +- 346	+- 415	3760 +- 749	5050 +- 487
gamma isotopic						
Be-7	4150 +- 403	1610 +- 192	3880 +- 361	2610 +- 270	3460 +- 356	2920 +- 333
K-40	1550 +- 461	3840 +- 740	7210 +- 1260	3830 +- 718	3760 +- 749	5400 +- 1020
Mn-54	< 28	< 19	< 28	< 17	< 29	< 28
Co-58	< 28	< 18	< 21	< 14	< 27	< 27
Fe-59	< 55	< 45	< 53	< 33	< 58	< 66
Co-60	< 28	< 22	< 32	< 20	< 34	< 44
Zn-65	< 59	< 48	< 47	< 41	< 57	< 79
Nb-95	< 27	< 22	< 22	< 20	< 32	< 29
Zr-95	< 56	< 27	< 43	< 29	< 56	< 56
I-131	< 34	< 26	< 45	< 28	< 48	< 57
Cs-134	< 26	< 15	< 24	< 16	< 28	< 31
Cs-137	< 23	< 18	< 32	< 16	< 35	< 42
Ba-140	< 126	< 59	< 108	< 82	< 135	< 137
La-140	< 49	< 26	< 30	< 26	< 42	< 53

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
Collection date:	06/12/14	06/11/14	06/12/14	06/12/14	06/12/14	06/11/15
gross alpha	6500 +- 2900	< 3700	7500 +- 3400	12500 +- 3800	11500 +- 3940	8140 +- 3380
gross beta	10900 +- 1400	6700 +- 1200	11000 +- 1300	14800 +- 1400	14100 +- 1410	10700 +- 1270
gamma isotopic						
K-40	11500 +- 1900	12100 +- 2000	11400 +- 1900	14200 +- 2400	12700 +- 2190	11100 +- 1900
Mn-54	< 21	< 18	< 32	< 27	< 36	< 23
Co-58	< 15	< 15	< 28	< 25	< 32	< 23
Fe-59	< 37	< 41	< 62	< 62	< 74	< 51
Co-60	< 22	< 20	< 33	< 29	< 36	< 23
Zn-65	< 42	< 46	< 64	< 62	< 71	< 42
Nb-95	< 23	< 20	< 38	< 30	< 38	< 28
Zr-95	< 38	< 34	< 44	< 55	< 65	< 37
Cs-134	< 20	< 15	< 25	< 22	< 35	< 20
Cs-137	580 +- 50	150 +- 20	70 +- 20	110 +- 20	61 +- 21	253 +- 33
Collection date:	10/23/14	10/23/14	10/23/14	10/23/14	10/23/14	10/22/14
gross alpha	6470 +- 3160	< 3850	6400 +- 2760	10300 +- 3500	12100 +- 4090	12300 +- 4030
gross beta	8830 +- 1610	9760 +- 1540	11800 +- 1380	18400 +- 1720	23400 +- 2120	14800 < 1590
gamma isotopic						
K-40	13100 +- 2230	11100 +- 1870	10600 +- 1800	12700 +- 2180	13300 +- 2270	10900 +- 1860
Mn-54	< 34	< 24	< 28	< 30	< 39	< 24
Co-58	< 32	< 19	< 27	< 28	< 30	< 26
Fe-59	< 80	< 60	< 73	< 72	< 95	< 70
Co-60	< 35	< 32	< 31	< 30	< 38	< 26
Zn-65	< 79	< 47	< 65	< 79	< 86	< 70
Nb-95	< 51	< 32	< 37	< 42	< 54	< 37
Zr-95	< 70	< 39	< 48	< 56	< 67	< 53
Cs-134	< 29	< 21	< 26	< 26	< 35	< 23
Cs-137	61 +- 19	130 +- 22	76 +- 20	160 +- 28	69 +- 22	106 +- 20

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.