

State of Wisconsin

2013

Prairie Island

Environmental Radioactivity Survey



**Wisconsin Department of Health Services
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P-00441 (Rev. 01/2015)**

State of Wisconsin, Department of Health Services

2013

Prairie Island Environmental Monitoring Survey

Executive Summary

Section 254.41 of the Wisconsin Statutes 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 2013. 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 2013, 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 1950's-1960's atmospheric nuclear testing and such radiological incidents as the Chernobyl nuclear reactor incident.
- There were no incidents during 2013, 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

Section 254.41 of the Wisconsin Statutes 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 2013. 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

There were no program modifications for 2013.

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 to regularly calibrate the counters and daily performance checks are made between calibrations. In addition, quality control charts are maintained on the counters.

WSLH participates in the Environmental Resource Associates' Proficiency Testing program and has performed satisfactorily over the report period. 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 ±). Examples and explanations of data reporting are:

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

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

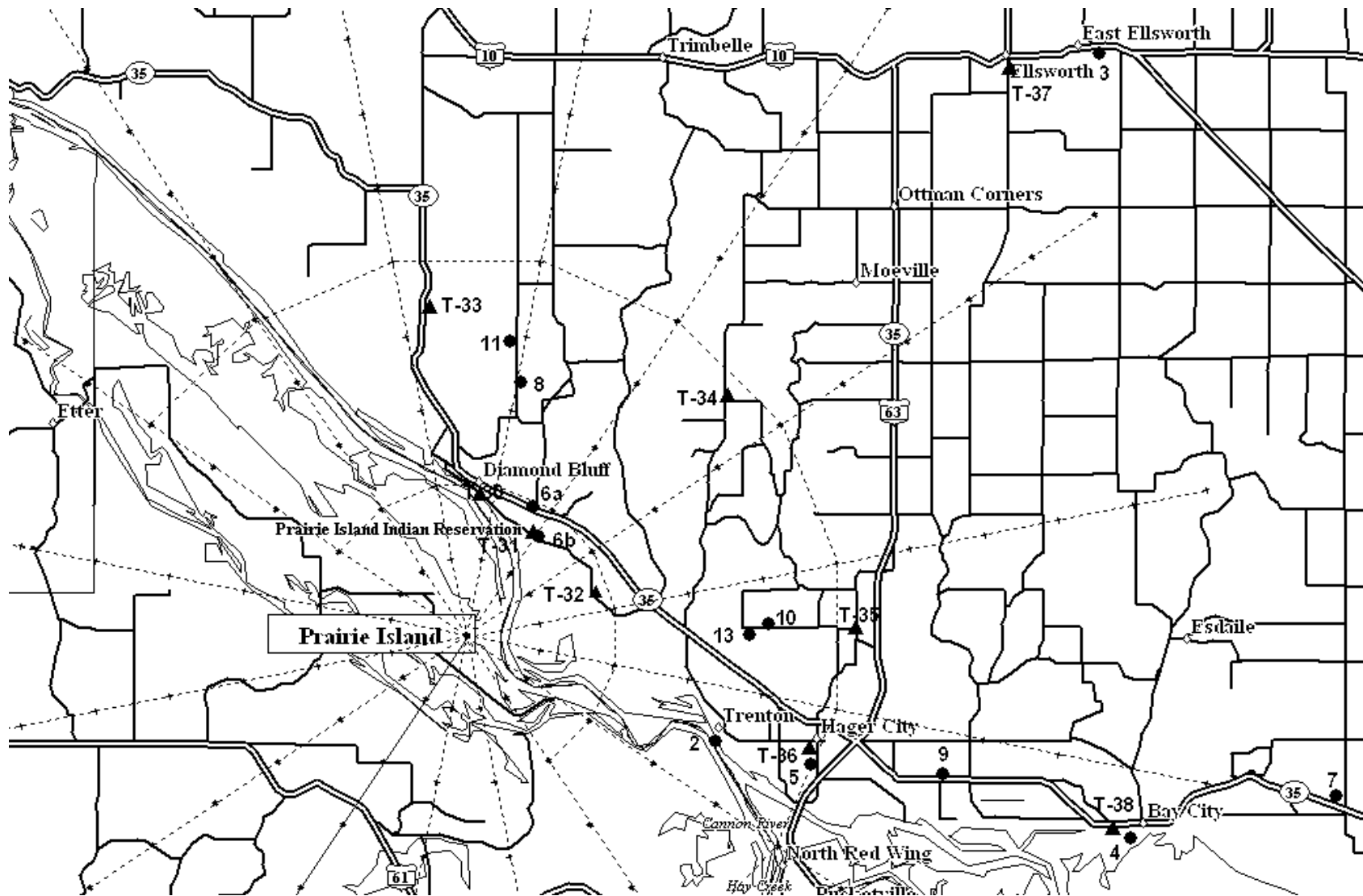


Figure 1. Location of Wisconsin DHS environmental monitoring sites for the Prairie Island monitoring program.

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	3	GA, GB, GI
Air iodine	C/BW	1a, 6a, 9	77	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	6	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, 13, 15	24	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	02/20/13	PRI-1	On 02/20/13, the air site was not accessible due to a lock problem.
air particulate	01/23/13	PRI-9	The air site was not operating for 8 days and 12 hours at the end of the sampling period.
air particulate	02/07/13	PRI-9	The air site was not operating from 01/23/13 12:40 until 02/04/13 14:11.
air iodine	02/20/13	PRI-1	On 02/20/13, the air site was not accessible due to a lock problem.
air iodine	01/23/13	PRI-9	The air site was not operating for 8 days and 12 hours at the end of the sampling period.
air iodine	02/07/13	PRI-9	The air site was not operating from 01/23/13 12:40 until 02/04/13 14:11.
TLD	1 st quarter	PRI-T32	The TLD was lost in the field.

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 (^7Be), detected in all composites, is a naturally occurring radioisotope that is constantly produced through nuclear reactions between cosmic rays and nuclei in the atmosphere. 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 - Thermoluminescent 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 2013 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 14.4 ± 2.0 milliroentgens. The average quarterly exposure for 2013 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 (^3H) 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 (^3H) 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. 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 (^7Be) 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

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.

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	77 / 77	gross beta gamma isotopic	0.010 - 0.050
	0.020	12 / 12	Be-7	0.038 - 0.074
	0.002	12 / 0	Mn-54	< 0.0006
	0.002	12 / 0	Co-58	< 0.0006
	0.005	12 / 0	Fe-59	< 0.0013
	0.002	12 / 0	Co-60	< 0.0008
	0.005	12 / 0	Zn-65	< 0.0011
	0.002	12 / 0	Nb-95	< 0.0006
	0.005	12 / 0	Zr-95	< 0.0009
	0.002	12 / 0	Ru-103	< 0.0006
	0.015	12 / 0	Ru-106	< 0.0049
	0.020	12 / 0	I-131	< 0.0020
	0.002	12 / 0	Cs-134	< 0.0006
	0.002	12 / 0	Cs-137	< 0.0007
	0.030	12 / 0	Ba-140	< 0.0036
	0.020	12 / 0	La-140	< 0.0020
	0.002	12 / 0	Ce-141	< 0.0010
	0.005	12 / 0	Ce-144	< 0.0032
Air iodine (pCi/m ³)	0.07	77 / 0	I-131	< 0.019
Surface water (pCi/liter)	3.0	6 / 6	gross beta (sol)	1.6 – 4.2
	3.0	6 / 0	gross beta (insol)	< 1.2
	3.0	6 / 4	gross alpha (sol)	< 1.3 – 4.0
	3.0	6 / 1	gross alpha (insol)	< 0.8 – 1.2
	300	6 / 0	H-3	< 210
	2.0	6 / 0	Sr-89	< 0.4
	1.0	6 / 0	Sr-90	< 0.3
			gamma isotopic	
	15	6 / 0	Mn-54	< 9
	15	6 / 0	Co-58	< 10
	30	6 / 0	Fe-59	< 18
	15	6 / 0	Co-60	< 12
	30	6 / 0	Zn-65	< 20
	15	6 / 0	Nb-95	< 9
	30	6 / 0	Zr-95	< 16
	15	6 / 0	I-131	< 11
	15	6 / 0	Cs-134	< 12
	15	6 / 0	Cs-137	< 11
60	6 / 0	Ba-140	< 45	
15	6 / 0	La-140	< 14	

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 (pCi/kg wet)	800	6 / 6	gamma isotopic K-40	2450 – 3080
	50	6 / 0	Mn-54	< 6
	60	6 / 0	Co-58	< 10
	130	6 / 0	Fe-59	< 29
	60	6 / 0	Co-60	< 7
	130	6 / 0	Zn-65	< 16
	50	6 / 0	Nb-95	< 16
	100	6 / 0	Zr-95	< 15
	50	6 / 0	Cs-134	< 6
	60	6 / 0	Cs-137	< 7
Precipitation (nCi/m ²)	1.5 ^b	12 / 11	gross beta	< 0.04 -0.69
	300 ^b	12 / 0	H-3	< 37
Well water (pCi/liter)	3.0	6 / 0	gross beta	< 4.2
	3.0	6 / 0	gross alpha	< 2.8
	300	6 / 0	H-3	< 210
Vegetation (pCi/kg wet)	5000	12 / 0	gross alpha	< 2080
	4000	12 / 12	gross beta	2210 – 5050
	600	12 / 12	gamma isotopic Be-7	460 – 3060
	2000	12 / 12	K-40	2910 – 5770
	90	12 / 0	Mn-54	< 37
	100	12 / 0	Co-58	< 28
	200	12 / 0	Fe-59	< 70
	100	12 / 0	Co-60	< 52
	250	12 / 0	Zn-65	< 57
	100	12 / 0	Nb-95	< 44
	200	12 / 0	Zr-95	< 74
	80	12 / 0	I-131	< 52
	80	12 / 0	Cs-134	< 38
	90	12 / 0	Cs-137	< 59
	350	12 / 0	Ba-140	< 160
	100	12 / 0	La-140	< 69

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 (pCi/kg dry)	6000	12 / 12	gross beta	8140 – 16400
	15000	12 / 12	gross alpha	3630 - 16900
			gamma isotopic	
	800	12 / 12	K-40	10300 – 13600
	60	12 / 0	Mn-54	< 23
	90	12 / 0	Co-58	< 25
	600	12 / 0	Fe-59	< 59
	90	12 / 0	Co-60	< 26
	300	12 / 0	Zn-65	< 55
	100	12 / 0	Nb-95	< 33
	250	12 / 0	Zr-95	< 51
	80	12 / 0	Cs-134	< 20
	80	12 / 12	Cs-137	41 - 222
Milk (pCi/liter)	1.0	24 / 21	Sr-90	< 0.5 - 1.1
	1.5	8 / 0	I-131	< 0.6
			gamma isotopic	
	500	24 / 24	K-40	1090 - 1580
	15	24 / 0	Mn-54	< 13
	15	24 / 0	Co-58	< 14
	40	24 / 0	Fe-59	< 32
	15	24 / 0	Co-60	< 15
	40	24 / 0	Zn-65	< 27
	15	24 / 0	Nb-95	< 12
	40	24 / 0	Zr-95	< 21
	15	24 / 0	I-131	< 15
	15	24 / 0	Cs-134	< 12
	15	24 / 0	Cs-137	< 13
	60	24 / 0	Ba-140	< 47
15	24 / 0	La-140	< 15	
Direct exposure (mR/Std Qtr)	1.0 ^c	39 / 39	direct exposure	10.5 – 19.5

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; Prescott				PRI-6; Diamond Bluff			
Collection date	Volume m ³	Air particulate	Air iodine	Collection date	Volume m ³	Air particulate	Air iodine
01/07/13	815	0.050 +- 0.002	< 0.008	01/07/13	831	0.048 +- 0.002	< 0.006
01/23/13	1093	0.029 +- 0.002	< 0.004	01/23/13	1119	0.028 +- 0.002	< 0.009
02/07/13	1030	0.034 +- 0.002	< 0.007	02/07/13	1051	0.035 +- 0.002	< 0.010
*a 02/20/13				02/20/13	903	0.021 +- 0.002	< 0.006
03/06/13	1829	0.021 +- 0.001	< 0.006	03/06/13	958	0.017 +- 0.001	< 0.006
03/20/13	940	0.022 +- 0.002	< 0.006	03/20/13	954	0.021 +- 0.002	< 0.007
04/03/13	944	0.018 +- 0.002	< 0.007	04/03/13	967	0.015 +- 0.001	< 0.007
1st Qtr				1st Qtr			
mean +- s.d.		0.029 +- 0.012	< 0.006	mean +- s.d.		0.026 +- 0.012	< 0.007
04/17/13	934	0.013 +- 0.001	< 0.006	04/17/13	942	0.014 +- 0.001	< 0.005
05/01/13	907	0.018 +- 0.002	< 0.015	05/01/13	918	0.020 +- 0.002	< 0.019
05/16/13	937	0.014 +- 0.001	< 0.006	05/16/13	971	0.012 +- 0.001	< 0.006
06/01/13	968	0.011 +- 0.001	< 0.006	06/01/13	980	0.012 +- 0.001	< 0.006
06/16/13	914	0.015 +- 0.002	< 0.007	06/16/13	941	0.017 +- 0.002	< 0.006
06/30/13	801	0.015 +- 0.002	< 0.015	06/30/13	846	0.014 +- 0.002	< 0.013
2nd Qtr				2nd Qtr			
mean +- s.d.		0.014 +- 0.002	< 0.009	mean +- s.d.		0.015 +- 0.003	< 0.009
07/13/13	731	0.021 +- 0.002	< 0.019	07/13/13	758	0.020 +- 0.002	< 0.014
07/23/13	572	0.019 +- 0.002	< 0.009	07/23/13	595	0.019 +- 0.002	< 0.014
08/11/13	3608	0.015 +- 0.001	< 0.011	08/11/13	1147	0.014 +- 0.001	< 0.010
08/24/13	745	0.026 +- 0.002	< 0.014	08/24/13	781	0.028 +- 0.002	< 0.017
09/05/13	686	0.024 +- 0.002	< 0.011	09/05/13	704	0.022 +- 0.002	< 0.012
09/19/13	815	0.026 +- 0.002	< 0.009	09/19/13	840	0.028 +- 0.002	< 0.009
10/02/13	770	0.021 +- 0.002	< 0.011	10/02/13	792	0.020 +- 0.002	< 0.009
3rd Qtr				3rd Qtr			
mean +- s.d.		0.022 +- 0.004	< 0.012	mean +- s.d.		0.022 +- 0.005	< 0.012
10/18/13	973	0.016 +- 0.002	< 0.008	10/18/13	1003	0.016 +- 0.001	< 0.006
10/30/13	763	0.012 +- 0.002	< 0.018	10/30/13	782	0.012 +- 0.002	< 0.020
11/13/13	906	0.024 +- 0.002	< 0.010	11/13/13	925	0.024 +- 0.002	< 0.012
12/02/13	1244	0.030 +- 0.002	< 0.009	12/02/13	1268	0.028 +- 0.002	< 0.011
12/17/13	1004	0.035 +- 0.002	< 0.006	12/17/13	1037	0.037 +- 0.002	< 0.008
12/30/13	873	0.031 +- 0.002	< 0.010	12/30/13	898	0.031 +- 0.002	< 0.011
4th Qtr				4th Qtr			
mean +- s.d.		0.025 +- 0.009	< 0.010	mean +- s.d.		0.025 +- 0.009	< 0.011

*a - On 02/20/13, the air site was not accessible due to a lock problem.

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/m³

PRI-9; Bay City substation

Collection date	Volume m ³	Air particulate	Air iodine
01/07/13	1041	0.049 +- 0.002	< 0.006
01/23/13 *a	651	0.029 +- 0.002	< 0.019
02/07/13 *b			
02/20/13	858	0.024 +- 0.002	< 0.006
03/06/13	915	0.020 +- 0.002	< 0.012
03/20/13	874	0.020 +- 0.002	< 0.013
04/03/13	917	0.016 +- 0.002	< 0.008
1st Qtr			
mean +- s.d.		0.029 +- 0.013	< 0.012
04/17/13	908	0.013 +- 0.001	< 0.007
05/01/13	857	0.019 +- 0.002	< 0.018
05/16/13	910	0.014 +- 0.001	< 0.007
06/01/13	957	0.012 +- 0.001	< 0.048
06/16/13	985	0.015 +- 0.001	< 0.005
06/30/13	986	0.013 +- 0.001	< 0.006
2nd Qtr			
mean +- s.d.		0.014 +- 0.003	< 0.015
07/13/13	909	0.021 +- 0.002	< 0.015
07/23/13	731	0.020 +- 0.002	< 0.012
08/11/13	1361	0.013 +- 0.001	< 0.007
08/24/13	942	0.028 +- 0.002	< 0.012
09/05/13	859	0.022 +- 0.002	< 0.007
09/19/13	1013	0.025 +- 0.002	< 0.008
10/02/13	923	0.019 +- 0.002	< 0.007
3rd Qtr			
mean +- s.d.		0.021 +- 0.005	< 0.010
10/18/13	1116	0.017 +- 0.001	< 0.006
10/30/13	878	0.010 +- 0.001	< 0.017
11/13/13	1053	0.025 +- 0.002	< 0.011
12/02/13	1432	0.028 +- 0.001	< 0.007
12/17/13	1162	0.036 +- 0.002	< 0.004
12/30/13	1014	0.030 +- 0.002	< 0.009
4th Qtr			
mean +- s.d.		0.024 +- 0.009	< 0.009

*a - The air site was not operating for 8 days and 12 hours at the end of the sampling period.

*b - The air site was not operating from 01/23/13 12:40 until 02/04/13 14:11.

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	3 rd quarter	4th quarter
Be-7	0.072 +- 0.006	0.073 +- 0.008	0.074 +- .0065	0.038 +- 0.006
Mn-54	< 0.0002	< 0.0006	< 0.0003	< 0.0004
Co-58	< 0.0002	< 0.0004	< 0.0003	< 0.0004
Fe-59	< 0.0005	< 0.0011	< 0.0005	< 0.0002
Co-60	< 0.0003	< 0.0008	< 0.0003	< 0.0003
Zn-65	< 0.0004	< 0.0009	< 0.0006	< 0.0007
Nb-95	< 0.0003	< 0.0006	< 0.0003	< 0.0005
Zr-95	< 0.0004	< 0.0008	< 0.0006	< 0.0008
Ru-103	< 0.0003	< 0.0005	< 0.0003	< 0.0003
Ru-106	< 0.0018	< 0.0045	< 0.0021	< 0.0039
I-131	< 0.0020	< 0.0012	< 0.0019	< 0.0011
Cs-134	< 0.0002	< 0.0004	< 0.0003	< 0.0005
Cs-137	< 0.0003	< 0.0006	< 0.0002	< 0.0005
Ba-140	< 0.0029	< 0.0028	< 0.0029	< 0.0027
La-140	< 0.0009	< 0.0011	< 0.0009	< 0.0009
Ce-141	< 0.0005	< 0.0010	< 0.0005	< 0.0005
Ce-144	< 0.0014	< 0.0030	< 0.0012	< 0.0018
Site: PRI-6				
Be-7	0.066 +- 0.005	0.070 +- 0.008	0.068 +- 0.006	0.043 +- 0.007
Mn-54	< 0.0002	< 0.0006	< 0.0002	< 0.0005
Co-58	< 0.0002	< 0.0005	< 0.0002	< 0.0006
Fe-59	< 0.0005	< 0.0013	< 0.0006	< 0.0013
Co-60	< 0.0003	< 0.0008	< 0.0003	< 0.0008
Zn-65	< 0.0004	< 0.0009	< 0.0006	< 0.0010
Nb-95	< 0.0003	< 0.0005	< 0.0003	< 0.0006
Zr-95	< 0.0004	< 0.0009	< 0.0004	< 0.0009
Ru-103	< 0.0003	< 0.0006	< 0.0003	< 0.0006
Ru-106	< 0.0016	< 0.0049	< 0.0018	< 0.0048
I-131	< 0.0020	< 0.0012	< 0.0018	< 0.0020
Cs-134	< 0.0002	< 0.0006	< 0.0002	< 0.0005
Cs-137	< 0.0002	< 0.0006	< 0.0002	< 0.0007
Ba-140	< 0.0025	< 0.0032	< 0.0022	< 0.0036
La-140	< 0.0010	< 0.0012	< 0.0013	< 0.0015
Ce-141	< 0.0005	< 0.0009	< 0.0004	< 0.0010
Ce-144	< 0.0013	< 0.0030	< 0.0011	< 0.0032
Site: PRI-9				
Be-7	0.063 +- 0.005	0.063 +- 0.008	0.074 +- 0.006	0.047 +- 0.007
Mn-54	< 0.0002	< 0.0004	< 0.0003	< 0.0005
Co-58	< 0.0002	< 0.0003	< 0.0003	< 0.0005
Fe-59	< 0.0005	< 0.0007	< 0.0007	< 0.0011
Co-60	< 0.0002	< 0.0004	< 0.0003	< 0.0007
Zn-65	< 0.0004	< 0.0007	< 0.0004	< 0.0011
Nb-95	< 0.0002	< 0.0005	< 0.0003	< 0.0005
Zr-95	< 0.0003	< 0.0006	< 0.0004	< 0.0009
Ru-103	< 0.0002	< 0.0003	< 0.0003	< 0.0005
Ru-106	< 0.0013	< 0.0028	< 0.0018	< 0.0034
I-131	< 0.0016	< 0.0008	< 0.0017	< 0.0019
Cs-134	< 0.0002	< 0.0004	< 0.0002	< 0.0005
Cs-137	< 0.0001	< 0.0004	< 0.0002	< 0.0006
Ba-140	< 0.0024	< 0.0017	< 0.0025	< 0.0034
La-140	< 0.0011	< 0.0008	< 0.0012	< 0.0020
Ce-141	< 0.0003	< 0.0005	< 0.0004	< 0.0009
Ce-144	< 0.0008	< 0.0015	< 0.0011	< 0.0029

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

Date Placed:	01/09/13	04/10/13	07/10/13	10/09/13
Date Removed:	04/10/13	07/10/13	10/09/13	01/23/14
Days in the Field:	91	91	91	106
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	12.1 +- 0.7	15.0 +- 0.7	12.9 +- 0.8	16.0 +- 0.1
T31	11.3 +- 1.4	10.5 +- 0.7	11.7 +- 1.0	11.2 +- 0.7
T32	ND	14.6 +- 1.2	12.8 +- 0.9	15.5 +- 1.1
Quarterly average +- s.d.	11.7 +- 0.6	13.4 +- 2.5	12.5 +- 0.7	14.2 +- 2.6
TLD sites that are located 2– 5 miles from the Prairie island facility				
T33	16.6 +- 0.8	14.5 +- 0.5	16.7 +- 1.6	15.9 +- 0.6
T34	14.7 +- 0.6	16.7 +- 0.6	17.1 +- 0.8	17.6 +- 0.5
T35	16.8 +- 0.7	13.0 +- 1.1	19.5 +- 0.7	13.6 +- 0.8
T36	13.8 +- 0.6	13.8 +- 0.8	15.6 +- 0.8	14.5 +- 0.9
Quarterly average +- s.d.	15.5 +- 1.5	14.5 +- 1.6	17.2 +- 1.6	15.4 +- 1.7
TLD sites that are located greater than 5 miles from the Prairie island facility				
T37	14.7 +- 1.3	12.7 +- 0.7	16.7 +- 1.9	13.2 +- 0.4
T38	12.9 +- 0.6	15.2 +- 0.9	13.5 +- 0.6	16.1 +- 1.3
T39	11.7 +- 0.8	13.2 +- 0.7	12.8 +- 0.8	14.1 +- 0.6
Quarterly average +- s.d.	13.1 +- 1.5	13.7 +- 1.3	14.3 +- 2.1	14.5 +- 1.5
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/m ²			
monthly composite sample			
Collection	inches	Gross beta	Tritium
01/26/13	0.26	0.06 +- 0.01	< 2
02/20/13	2.00	0.69 +- 0.07	< 13
03/20/13	2.07	0.17 +- 0.05	< 13
04/17/13	4.07	0.47 +- 0.10	< 22
05/16/13	4.82	0.22 +- 0.09	< 26
06/30/13	6.94	0.35 +- 0.14	< 37
07/23/13	1.64	0.09 +- 0.05	< 9
08/24/13	1.89	< 0.04	< 10
09/24/13	1.17	0.06 +- 0.02	< 6
10/30/13	3.11	0.11 +- 0.07	< 17
11/13/13	0.65	0.10 +- 0.02	< 4
12/30/13	1.39	0.24 +- 0.03	< 8

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-4	PRI-1	PRI-2	PRI-4
Collection date:	06/12/13	06/12/13	06/12/13	09/24/13	09/23/13	09/23/13
gross alpha-sol	1.5 +- 0.6	3.3 +- 1.1	4.0 +- 1.2	< 1.1	2.1 +- 1.2	< 1.3
gross beta-sol	2.4 +- 0.6	3.9 +- 0.7	4.2 +- 0.7	2.6 +- 0.7	1.6 +- 0.7	1.6 +- 0.8
gross alpha-insol	< 0.7	< 0.6	< 0.6	1.2 +- 0.7	< 0.7	< 0.8
gross beta-insol	< 1.2	< 1.1	< 1.2	< 1.2	< 1.0	< 1.2
H-3	< 208	< 208	< 208	< 210	< 210	< 210
Sr-89	< 0.3	< 0.4	< 0.3	< 0.3	< 0.3	< 0.4
Sr-90	< 0.3	< 0.3	< 0.2	< 0.3	< 0.3	< 0.3
gamma isotopic						
Mn-54	< 6	< 5	< 7	< 9	< 8	< 7
Co-58	< 5	< 5	< 6	< 10	< 6	< 9
Fe-59	< 10	< 11	< 13	< 18	< 12	< 9
Co-60	< 7	< 8	< 7	< 12	< 8	< 9
Zn-65	< 12	< 12	< 14	< 20	< 15	< 16
Nb-95	< 5	< 6	< 6	< 9	< 6	< 6
Zr-95	< 10	< 10	< 8	< 16	< 12	< 14
I-131	< 6	< 7	< 6	< 11	< 9	< 8
Cs-134	< 7	< 6	< 5	< 12	< 7	< 8
Cs-137	< 6	< 5	< 5	< 11	< 7	< 7
Ba-140	< 24	< 23	< 22	< 45	< 24	< 32
La-140	< 10	< 9	< 5	< 11	< 14	< 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:	06/12/13	06/12/13	06/12/13	09/23/13	09/23/13	09/24/13
gross alpha	< 2.7	< 2.0	< 2.6	< 1.7	< 2.8	< 2.0
gross beta	< 4.2	< 3.6	< 3.8	< 2.3	< 3.8	< 2.7
H-3	< 208	< 208	< 208	< 214	< 214	< 214

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:	05/20/13	05/20/13	05/23/13	05/23/13
Location:	downstream	downstream	upstream	upstream
Type:	white bass	carp	white bass	carp
gamma isotopic				
K-40	2530 +- 420	2450 +- 420	2630 +- 440	2660 +- 440
Mn-54	< 5	< 5	< 6	< 5
Co-58	< 8	< 9	< 10	< 8
Fe-59	< 21	< 28	< 26	< 23
Co-60	< 7	< 6	< 7	< 6
Zn-65	< 11	< 14	< 14	< 11
Nb-95	< 15	< 13	< 16	< 14
Zr-95	< 14	< 13	< 15	< 5
Cs-134	< 5	< 5	< 5	< 6
Cs-137	< 6	< 5	< 5	< 7

Collection date:	09/16/13	09/19/13
Location:	downstream	upstream
Type:	white bass	fresh water drum
gamma isotopic		
K-40	2630 +- 450	3080 +- 500
Mn-54	< 6	< 5
Co-58	< 8	< 7
Fe-59	< 29	< 20
Co-60	< 5	< 6
Zn-65	< 16	< 11
Nb-95	< 15	< 14
Zr-95	< 13	< 14
Cs-134	< 5	< 5
Cs-137	< 6	< 6

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-13	PRI-10
Collection date:	01/15/13	02/13/13	03/12/13	04/16/13	05/13/13	06/11/13
I-131			< 0.6		< 0.4	< 0.6
Sr-90	0.5 +- 0.2	< 0.3	0.8 +- 0.2	0.5 +- 0.3	0.9 +- 0.6	0.5 +- 0.2
gamma isotopic						
K-40	1290 +- 290	1200 +- 260	1390 +- 280	1400 +- 280	1260 +- 250	1180 +- 240
Mn-54	< 11	< 7	< 6	< 7	< 7	< 8
Co-58	< 10	< 6	< 6	< 6	< 6	< 10
Fe-59	< 18	< 14	< 13	< 11	< 13	< 19
Co-60	< 15	< 9	< 7	< 8	< 6	< 13
Zn-65	< 24	< 14	< 15	< 17	< 16	< 17
Nb-95	< 9	< 6	< 6	< 7	< 7	< 10
Zr-95	< 16	< 9	< 9	< 10	< 8	< 18
I-131	< 11	< 7	< 7	< 7	< 7	< 11
Cs-134	< 10	< 6	< 5	< 7	< 6	< 9
Cs-137	< 13	< 7	< 6	< 7	< 6	< 12
Ba-140	< 37	< 23	< 22	< 25	< 23	< 35
La-140	< 9	< 10	< 7	< 9	< 7	< 11

Location	PRI-13	PRI-10	PRI-13	PRI-10	PRI-13	PRI-10
Collection date:	07/16/13	08/13/13	09/10/13	10/14/13	11/12/13	12/10/13
I-131		< 0.3				
Sr-90	0.8 +- 0.2	0.7 +- 0.3	0.9 +- 0.2	0.8 +- 0.3	0.8 +- 0.3	0.8 +- 0.3
gamma isotopic						
K-40	1230 +- 310	1440 +- 280	1090 +- 280	1360 +- 300	1550 +- 340	1450 +- 260
Mn-54	< 9	< 9	< 9	< 10	< 11	< 7
Co-58	< 12	< 9	< 11	< 9	< 9	< 8
Fe-59	< 32	< 19	< 18	< 22	< 21	< 14
Co-60	< 12	< 14	< 10	< 13	< 13	< 10
Zn-65	< 27	< 18	< 24	< 13	< 26	< 16
Nb-95	< 10	< 9	< 10	< 9	< 6	< 7
Zr-95	< 18	< 15	< 19	< 14	< 15	< 13
I-131	< 11	< 13	< 10	< 11	< 10	< 14
Cs-134	< 12	< 10	< 10	< 10	< 11	< 7
Cs-137	< 11	< 11	< 11	< 8	< 9	< 10
Ba-140	< 39	< 34	< 37	< 33	< 32	< 32
La-140	< 12	< 13	< 11	< 15	< 11	< 9

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
Continued.

Measurements in units of pCi/liter

Location: PRI-15

Collection date:	01/15/13	02/13/13	03/12/13	04/16/13	05/13/13	06/11/13
I-131			< 0.5		< 0.3	< 0.6
Sr-90	0.6 +- 0.2	0.9 +- 0.2	0.6 +- 0.2	0.6 +- 0.3	< 0.2	0.5 +- 0.2
gamma isotopic						
K-40	1370 +- 240	1580 +- 320	1500 +- 310	1370 +- 270	1420 +- 280	1290 +- 260
Mn-54	< 4	< 9	< 8	< 6	< 9	< 9
Co-58	< 4	< 8	< 8	< 6	< 9	< 9
Fe-59	< 11	< 18	< 17	< 15	< 17	< 17
Co-60	< 5	< 12	< 14	< 8	< 13	< 13
Zn-65	< 10	< 21	< 20	< 15	< 17	< 22
Nb-95	< 5	< 9	< 9	< 6	< 9	< 9
Zr-95	< 6	< 16	< 16	< 11	< 17	< 15
I-131	< 15	< 12	< 13	< 7	< 12	< 12
Cs-134	< 4	< 9	< 9	< 7	< 9	< 9
Cs-137	< 4	< 13	< 13	< 6	< 13	< 12
Ba-140	< 27	< 33	< 33	< 21	< 40	< 36
La-140	< 8	< 12	< 9	< 8	< 10	< 10
Collection date:	07/16/13	08/13/13	09/10/13	10/14/13	11/12/13	12/10/13
I-131		< 0.4				
Sr-90	0.6 +- 0.3	0.5 +- 0.2	1.1 +- 0.2	0.6 +- 0.2	< 0.5	1.0 +- 0.3
gamma isotopic						
K-40	1260 +- 260	1350 +- 320	1370 +- 320	1390 +- 330	1500 +- 300	1470 +- 320
Mn-54	< 12	< 13	< 11	< 12	< 8	< 10
Co-58	< 8	< 14	< 8	< 10	< 8	< 10
Fe-59	< 20	< 26	< 21	< 20	< 13	< 20
Co-60	< 15	< 12	< 15	< 12	< 8	< 13
Zn-65	< 21	< 20	< 25	< 22	< 18	< 17
Nb-95	< 12	< 11	< 9	< 9	< 7	< 6
Zr-95	< 19	< 19	< 19	< 21	< 11	< 18
I-131	< 13	< 12	< 12	< 15	< 9	< 11
Cs-134	< 8	< 7	< 8	< 10	< 7	< 7
Cs-137	< 13	< 9	< 11	< 8	< 7	< 9
Ba-140	< 37	< 47	< 30	< 41	< 28	< 45
La-140	< 13	< 14	< 11	< 15	< 12	< 13

Radioisotopes other than those reported were not detected.

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-1	PRI-4	PRI-5	PRI-6	PRI-8	PRI-9
Collection date:	06/12/13	06/12/13	06/12/13	06/12/13	06/12/13	06/12/13
gross alpha	< 900	< 740	< 1090	< 850	< 1000	< 880
gross beta	4620 +- 350	2210 +- 260	5050 +- 400	4560 +- 310	4300 +- 340	3780 +- 300
gamma isotopic						
Be-7	460 +- 60	7920 +- 60	570 +- 50	800 +- 60	580 +- 50	930 +- 70
K-40	5080 +- 470	3040 +- 290	4710 +- 420	5150 +- 460	4760 +- 420	3910 +- 360
Mn-54	< 19	< 15	< 13	< 15	< 13	< 16
Co-58	< 19	< 13	< 15	< 16	< 13	< 16
Fe-59	< 34	< 30	< 26	< 33	< 27	< 34
Co-60	< 25	< 20	< 20	< 20	< 14	< 21
Zn-65	< 47	< 34	< 36	< 37	< 32	< 29
Nb-95	< 19	< 15	< 14	< 19	< 15	< 21
Zr-95	< 34	< 26	< 25	< 29	< 23	< 26
I-131	< 30	< 23	< 27	< 28	< 23	< 28
Cs-134	< 20	< 12	< 15	< 15	< 13	< 12
Cs-137	< 28	< 20	< 19	< 18	< 17	< 22
Ba-140	< 75	< 64	< 65	< 70	< 53	< 70
La-140	< 32	< 19	< 20	< 17	< 4	< 20
Collection date:	09/24/13	09/23/13	09/24/13	09/23/13	09/24/13	09/23/13
gross alpha	< 2080	< 1580	< 1950	< 1580	< 1480	< 1800
gross beta	3150 +- 550	4800 +- 470	3880 +- 510	2960 +- 1440	4570 +- 470	2680 +- 460
gamma isotopic						
Be-7	2920 +- 320	2530 +- 300	3060 +- 390	2220 +- 260	2840 +- 320	1280 +- 230
K-40	2910 +- 650	5190 +- 1000	3710 +- 850	4240 +- 810	5770 +- 1070	3630 +- 780
Mn-54	< 25	< 29	< 37	< 26	< 27	< 26
Co-58	< 25	< 24	< 28	< 24	< 28	< 21
Fe-59	< 43	< 55	< 70	< 49	< 62	< 52
Co-60	< 34	< 35	< 52	< 34	< 37	< 31
Zn-65	< 53	< 52	< 57	< 52	< 57	< 42
Nb-95	< 26	< 32	< 44	< 22	< 30	< 20
Zr-95	< 43	< 55	< 74	< 43	< 41	< 37
I-131	< 36	< 40	< 52	< 35	< 36	< 29
Cs-134	< 28	< 26	< 38	< 23	< 27	< 22
Cs-137	< 37	< 38	< 59	< 36	< 34	< 24
Ba-140	< 111	< 125	< 160	< 93	< 107	< 95
La-140	< 37	< 45	< 69	< 23	< 31	< 36

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-1	PRI-4	PRI-5	PRI-6	PRI-8	PRI-9
Collection date:	06/12/13	06/12/13	06/12/13	06/12/13	06/12/13	06/12/13
gross alpha	10400 +- 2800	4700 +- 2170	3630 +- 2400	11800 +- 2920	11900 +- 2930	5780 +- 2520
gross beta	12200 +- 1000	9330 +- 1000	8140 +- 980	13600 +- 1080	14200 +- 1120	8720 +- 1020
gamma isotopic						
K-40	11200 +- 1000	11800 +- 990	10300 +- 360	12900 +- 870	13500 +- 1190	11500 +- 1020
Mn-54	< 17	< 16	< 15	< 21	< 21	< 15
Co-58	< 16	< 16	< 16	< 19	< 16	< 16
Fe-59	< 36	< 40	< 39	< 42	< 50	< 40
Co-60	< 16	< 23	< 22	< 21	< 20	< 17
Zn-65	< 45	< 35	< 37	< 44	< 47	< 34
Nb-95	< 14	< 18	< 17	< 19	< 18	< 17
Zr-95	< 27	< 31	< 29	< 35	< 34	< 26
Cs-134	< 15	< 16	< 13	< 15	< 16	< 13
Cs-137	76 +- 8	119 +- 8	41 +- 5	222 +- 14	73 +- 8	147 +- 10
Collection date:	09/24/13	09/23/13	09/24/13	09/23/13	09/24/13	09/23/13
gross alpha	7400 +- 3400	9000 +- 3600	6700 +- 3600	16900 +- 4300	7600 +- 3300	8000 +- 3500
gross beta	10900 +- 1180	9600 +- 1200	11300 +- 1300	16400 +- 1500	13000 +- 1300	10500 +- 1300
gamma isotopic						
K-40	10800 +- 1900	10900 +- 1900	11000 +- 1800	12400 +- 2200	13600 +- 2300	11400 +- 1900
Mn-54	< 17	< 15	< 16	< 19	< 23	< 17
Co-58	< 18	< 14	< 16	< 18	< 25	< 17
Fe-59	< 37	< 33	< 46	< 41	< 59	< 41
Co-60	< 17	< 17	< 21	< 20	< 26	< 20
Zn-65	< 39	< 35	< 45	< 46	< 55	< 37
Nb-95	< 17	< 18	< 20	< 19	< 33	< 21
Zr-95	< 28	< 26	< 32	< 30	< 51	< 35
Cs-134	< 14	< 13	< 13	< 14	< 20	< 15
Cs-137	96 +- 16	120 +- 20	65 +- 13	120 +- 19	57 +- 14	110 +- 15

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

Radioisotopes other than those reported were not detected.