

**Prairie Island
Environmental Radioactivity Survey
2019**



**WISCONSIN DEPARTMENT
of HEALTH SERVICES**

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

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Executive Summary

Wisconsin Stat. § 254.41 mandates the Wisconsin Department of Health Services (DHS) to conduct environmental radiation monitoring around the nuclear power facilities that affect Wisconsin. This environmental monitoring report is for the Prairie Island Nuclear Generating Plant, located near Red Wing, Minnesota, for the calendar year January–December 2019. 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 2019 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 2019, 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 2019 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' ongoing environmental monitoring programs provide assurances to the citizens of Wisconsin that we will continue to evaluate the Prairie Island nuclear power facility and other monitoring areas, for radioactivity levels.

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Prairie Island Environmental Radioactivity Survey, 2019

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 2019. 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 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 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 implemented for calendar year 2019.

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 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 (MAPEP) for environmental matrix analysis. Proficiency testing results are available from the Wisconsin State Laboratory of Hygiene.

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, requested by Wisconsin DHS, are expressed as a lower limit of detection (LLD). The 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 | ¹³⁷ Cs | < 10 pCi/liter |
| 2 | ¹³⁷ Cs | 15 ± 3 pCi/liter |

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

Table 1. Wisconsin DHS Prairie Island environmental monitoring sampling sites.

| Sample site | Distance and direction (miles) | Location description |
|--------------------|---------------------------------------|---|
| PRI-1a | 11.6 NW | Prescott; air site |
| PRI-1b | 11.6 NW | Prescott; harbor area |
| PRI-2 | 3.6 ESE | Trenton |
| PRI-4a | 8.7 ESE | Bay City park |
| PRI-4b | 8.7 ESE | Bay City, Hwy 35 |
| PRI-5 | 4.8 ESE | Hager City |
| PRI-6a | 1.9 NNE | Diamond Bluff; Pierce County highway shed |
| PRI-6b | 1.8 NNE | Diamond Bluff cemetery |
| PRI-8 | 3.4 N | Station 2 – farm |
| PRI-9 | 6.6 ESE | Bay City substation on Hwy 35 |
| PRI-16 | 18.4 NNE | Dairy Farm 356-283 Ellsworth (Started Aug 2018) - Control |
| PRI-17 | 7.5 NE | Dairy Farm 356-690 Ellsworth (Started September 2017) |
| PRI-18 | 7.3 NE | Dairy Farm 356-323 Ellsworth (Started Oct 2017) |
| PRI-T30 | 1.9 N | Diamond Bluff |
| PRI-T31 | 1.7 NNE | Diamond Bluff |
| PRI-T32 | 1.8 ENE | 290th Avenue |
| PRI-T33 | 4.4 N | Hwy 35, Thomas Killian residence |
| PRI-T34 | 4.7 NE | Cty K and 840th Street |
| PRI-T35 | 5.2 E | Cty W and 790th Street |
| PRI-T36 | 4.8 ESE | Hager City |
| PRI-T37 | 10.3 NE | Ellsworth |
| PRI-T38 | 8.9 ESE | Bay City, Hwy 35 |
| PRI-T39 | 11.6 NW | Prescott |

Table 2. Sample collection summary and required analyses for 2019.

| 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 ^w |
| Air iodine | C/BW | 1a, 6a, 9 | 78 | 0 | GI |
| Precipitation | C/BW | 1a, 9 | 12 | 1 | GB ^x , H ^x |
| TLD | C/Q | T30 – T39 | 40 | 0 | direct exposure |
| Surface water | G/SA | 1b, 2, 4a | 6 | 0 | GA, GB, GI, Sr, H |
| Fish | G/SA | upstream, downstream | 9 | 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 | 16, 17, 18 | 24 | 0 | GI, I ^y , Sr |

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

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

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

^w = A quarterly composite for each site

^x = One monthly composite from 2 sites

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

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

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

| Sample type | Date | Site | Explanation |
|-----------------|----------|----------------------|--|
| Air Particulate | 02/11/19 | PRI-1 | Low air volume |
| Air Particulate | 06/18/19 | PRI-1 | Low air volume |
| Air Particulate | 07/31/19 | PRI-1 | Low air volume |
| Air Particulate | 10/21/19 | PRI-1 | Low air volume |
| Air Particulate | 10/21/19 | PRI-6 | Low air volume |
| Air Particulate | 10/21/19 | PRI-9 | Low air volume |
| Precipitation | 09/11/19 | 1a, 9 (composite) | Analysis not reported by lab |
| Surface Water | 06/19/19 | PRI-1B | SR-89 matrix spike QC fell out of acceptable range |
| Surface Water | 06/19/19 | PRI-2 | SR-89 matrix spike QC fell out of acceptable range |
| Surface Water | 06/18/19 | PRI-4A | SR-89 matrix spike QC fell out of acceptable range |
| Surface Water | 09/11/19 | PRI-1B | SR-90 accuracy and matrix spike QC failures |
| Surface Water | 09/11/19 | PRI-1B | Minimum detectable activity for Sr-89 not met |
| Surface Water | 09/11/19 | PRI-1B | Gross alpha and beta matrix spike did not meet acceptance criteria |
| Surface Water | 09/11/19 | PRI-2 | SR-90 accuracy and matrix spike QC failures |

Table 4 (continued). Wisconsin DHS missing sample report or non-routine analyses.

| Sample type | Date | Site | Explanation |
|---------------|----------|--------|--|
| Surface Water | 09/11/19 | PRI-2 | Minimum detectable activity for Sr-89 not met |
| Surface Water | 09/11/19 | PRI-2 | Gross alpha and beta matrix spike did not meet acceptance criteria |
| Surface Water | 09/10/19 | PRI-4A | Sr-90 accuracy and matrix spike QC failures |
| Surface Water | 09/10/19 | PRI-4A | Minimum detectable activity for Sr-89 not met |
| Surface Water | 09/10/19 | PRI-4A | Gross alpha and beta matrix spike did not meet acceptance criteria |
| Milk | 03/18/19 | PRI-16 | QC accuracy and precision fell outside of upper control limits |
| Milk | 04/09/19 | PRI-16 | I-131 low recovery of iodine carrier |
| Milk | 05/14/19 | PRI-16 | Sr-90 analyzed 180 day past hold time |
| Milk | 05/14/19 | PRI-16 | I-131 analyzed 180 day past hold time |
| Milk | 06/10/19 | PRI-16 | I-131 analyzed 180 day past hold time |
| Milk | 05/14/19 | PRI-16 | I-131 analyzed 180 day past hold time |
| Milk | 07/15/19 | PRI-16 | I-131 analyzed 180 day past hold time |
| Milk | 07/15/19 | PRI-16 | Iodine carrier was below lower limit of 40% |
| Milk | 08/15/19 | PRI-16 | Iodine carrier was below lower limit of 40% |
| Milk | 08/15/19 | PRI-16 | Sr-90 analyzed 180 day past hold time |
| Milk | 09/10/19 | PRI-16 | Sr-90 analyzed 180 day past hold time |
| Milk | 11/12/19 | PRI-16 | Sr-90 analyzed 180 day past hold time |
| Milk | 12/10/19 | PRI-16 | Sr-90 analyzed 180 day past hold time |
| Milk | 06/10/19 | PRI-18 | Sr-90 analyzed 180 day past hold time |
| Milk | 08/15/19 | PRI-18 | Sr-90 analyzed 180 day past hold time |
| Milk | 08/15/19 | PRI-18 | Iodine carrier was below lower limit of 40% |
| Milk | 10/14/19 | PRI-18 | Sr-90 analyzed 180 day past hold time |
| Milk | 12/10/19 | PRI-18 | Sr-90 analyzed 180 day past hold time |
| Milk | 05/14/19 | PRI-17 | Sr-90 analyzed 180 day past hold time |
| Milk | 05/14/19 | PRI-17 | I-131 analyzed 180 days past hold time |
| Milk | 07/15/19 | PRI-17 | Iodine carrier was below lower limit of 40% |
| Milk | 07/15/19 | PRI-17 | Sr-90 analyzed 180 day past hold time |
| Milk | 09/10/19 | PRI-17 | Sr-90 analyzed 180 day past hold time |
| Milk | 11/12/19 | PRI-17 | Sr-90 analyzed 180 day past hold time |

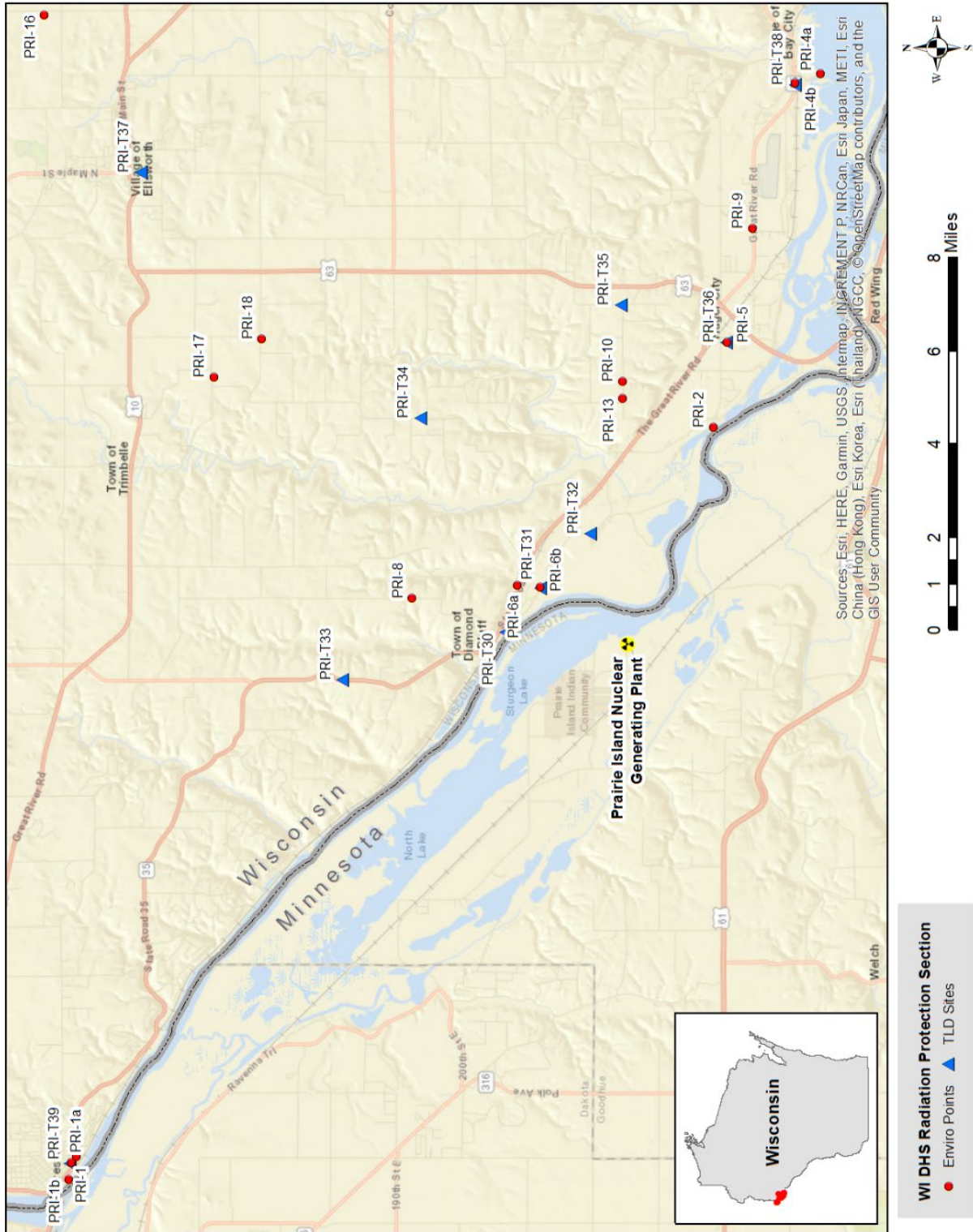


Figure 1 . Location of Wisconsin DHS environmental monitoring sites for the Prairie Island monitoring program

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

Air Particulate

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

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

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

Air Iodine

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

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

Ambient Gamma Radiation—Thermoluminescent Dosimeters (TLD)

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

Direct radiation (TLD) data for 2019 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 14.5 ± 1.27 milliroentgens. The average quarterly exposure for 2019 is at background levels and is comparable to other areas within Wisconsin. Influence by the Prairie Island nuclear facility is not evident from air ambient gamma radiation analysis.

Precipitation

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

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

Surface Water

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

Gamma isotopic analysis for radioisotopes were below their respective LLD. Reported activities for gross beta; and strontium 89 and 90 were at or near background levels and were comparable to data from previous years. Gross Alpha and Beta suspended solids analysis results for all fall samples were not returned by the laboratory. 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 provides results from the individual sample analyses.

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

Well Water

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

The well water samples showed no unusual gross alpha and gross beta activities and one tritium (^3H) sample exceeded 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 provides results from the individual sample analyses.

Two Sr-90 samples had activity above the LLD, all other samples had activity below the LLD. Naturally occurring potassium-40 (^{40}K) was detected in all samples at activity levels similar to previous years. The detected activities for strontium-90 (^{90}Sr) are attributable to residual fallout from previous atmospheric nuclear weapons testing and were also detected in previous years at similar activity levels. Influence by the Prairie Island nuclear facility is not evident from milk sample analysis.

Vegetation

Table 4 provides a summary of reported activities by Wisconsin DHS for vegetation samples. Table 13 provides 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 (^7Be) and potassium-40 (^{40}K). All other radioisotopes were below their respective LLD except for Gross Beta, which were at background levels similar to previous years. Influence by the Prairie Island nuclear facility is not evident from vegetation sample analysis.

Soil

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

Analysis of the soil samples showed no unusual activities. The gamma isotopic analysis detected only small amounts of radioactive Potassium-40 (^{40}K), which is a naturally occurring radioisotope. Cesium-137 (^{137}Cs) was also detected in current and previous years samples. The cesium-137 radioisotopes are attributable to fallout from previous atmospheric nuclear tests. Naturally occurring radioisotopes from the uranium-238 (^{238}U) and thorium-232 (^{232}Th) decay series are commonly detected but have not been quantified or reported. Gross Beta was at background and consistent with previous years. 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 5 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 / 78 | gross beta | 0.0085 ± 0.2950 |
| | | | gamma isotopic | |
| | 0.030 | 12 / 0 | Barium 140 | < 0.0026 |
| | 0.020 | 12 / 12 | Beryllium 7 | 0.0448 - 0.0572 |
| | 0.002 | 12 / 0 | Cerium 141 | < 0.0004 |
| | 0.005 | 12 / 0 | Cerium 144 | < 0.0009 |
| | 0.002 | 12 / 0 | Cesium 134 | < 0.0002 |
| | 0.002 | 12 / 0 | Cesium 137 | < 0.0005 - 0.0009 |
| | 0.002 | 12 / 0 | Cobalt 58 | < 0.0002 |
| | 0.002 | 12 / 0 | Cobalt 60 | < 0.0003 |
| | 0.020 | 12 / 0 | Iodine 131 | < 0.0018 |
| | 0.005 | 12 / 0 | Iron 59 | < 0.0005 |
| | 0.020 | 12 / 0 | Lanthanum 140 | < 0.0011 |
| | 0.002 | 12 / 0 | Manganese 54 | < 0.0002 |
| | 0.002 | 12 / 0 | Niobium 95 | < 0.0003 |
| | 0.002 | 12 / 0 | Ruthenium 103 | < 0.0003 |
| | 0.015 | 12 / 0 | Ruthenium 106 | < 0.0015 |
| | 0.005 | 12 / 0 | Zinc 65 | < 0.0004 |
| | 0.005 | 12 / 0 | Zirconium 95 | < 0.0004 |
| Air iodine (pCi/m ³) | 0.07 | 78 / 0 | I-131 | < 0.0645 |
| Surface Water (pCi/liter) | 3.0 | 3 / 0 | Gross Alpha Sus Sol | < 0.99 - 1.19 |
| | 3.0 | 3 / 0 | Gross Beta Sus Sol | < 1.59 - 1.54 |
| | 3.0 | 6 / 0 | Gross Alpha | < 1.05 - 1.99 |
| | 3.0 | 6 / 2 | Gross Beta | 0.79 - 4.42 |
| | 300 | 6 / 0 | Tritium | < 224 |
| | 2.0 | 6 / 2 | Strontium 89 | < 3.01 - 3.55 |
| | 1.0 | 6 / 0 | Strontium 90 | < 0.60 - 0.21 |
| | | | gamma isotopic | |
| | 60 | 6 / 0 | Barium 140 | < 39.3 |
| | 15 | 6 / 0 | Cesium 134 | < 11.3 |
| | 15 | 6 / 0 | Cesium 137 | < 9.36 |
| | 15 | 6 / 0 | Cobalt 58 | < 9.98 |
| | 15 | 6 / 0 | Cobalt 60 | < 10.3 |
| | 15 | 6 / 0 | Iodine 131 | < 9.28 |
| | 30 | 6 / 0 | Iron 59 | < 19 |
| | 15 | 6 / 0 | Lanthanum 140 | < 12.2 |
| | 15 | 6 / 0 | Manganese 54 | < 8.42 |
| | 15 | 6 / 0 | Niobium 95 | < 10.4 |
| | 30 | 6 / 0 | Zinc 65 | < 22.1 |
| | 30 | 6 / 0 | Zirconium 95 | < 17.3 |

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

| Sample type (units) | LLD | Number of samples ^a | Analysis | Range |
|---|--------|--------------------------------|----------------|---------------|
| Fish (pCi/kg wet) | | | gamma isotopic | |
| | 50 | 9 / 0 | Cesium 134 | < 5.91 |
| | 60 | 9 / 0 | Cesium 137 | < 7.17 |
| | 60 | 9 / 0 | Cobalt 58 | < 8.53 |
| | 60 | 9 / 0 | Cobalt 60 | < 7.07 |
| | 130 | 9 / 0 | Iron 59 | < 26.2 |
| | 50 | 9 / 0 | Manganese 54 | < 6.52 |
| | 50 | 9 / 0 | Niobium 95 | < 14.7 |
| | 800 | 9 / 9 | Potassium 40 | 2620 - 3250 |
| | 130 | 9 / 0 | Zinc 65 | < 14.7 |
| 100 | 9 / 0 | Zirconium 95 | < 17.2 | |
| Precipitation (nCi/m ²) | 1.5 | 11 / 0 | gross beta | < 0.2 - 1.07 |
| | 300 | 11 / 0 | H-3 | < 45.18 |
| Well water (pCi/liter) | 3.0 | 6 / 0 | gross alpha | < 1.7 - 1.15 |
| | 3.0 | 6 / 0 | gross beta | < 1.75 - 1.55 |
| | 300 | 6 / 1 | H-3 | < 868 |
| Vegetation (pCi/kg wet) | 5000 | 12 / 0 | Gross Alpha | < 3870 |
| | 4000 | 12 / 7 | Gross Beta | 1870 - 8590 |
| | | | gamma isotopic | |
| | 350 | 12 / 0 | Barium 140 | < 130 |
| | 600 | 12 / 12 | Beryllium 7 | 699 - 5220 |
| | 80 | 12 / 0 | Cesium 134 | < 31.3 |
| | 90 | 12 / 0 | Cesium 137 | < 32.6 |
| | 100 | 12 / 0 | Cobalt 58 | < 31.8 |
| | 100 | 12 / 0 | Cobalt 60 | < 32.7 |
| | 80 | 12 / 0 | Iodine 131 | < 50.5 |
| | 200 | 12 / 0 | Iron 59 | < 63.2 |
| | 100 | 12 / 0 | Lanthanum 140 | < 55.2 |
| | 90 | 12 / 0 | Manganese 54 | < 31.1 |
| | 100 | 12 / 0 | Niobium 95 | < 30.7 |
| | 2000 | 12 / 11 | Potassium 40 | < 384 - 5730 |
| 250 | 12 / 0 | Zinc 65 | < 69.6 | |
| 200 | 12 / 0 | Zirconium 95 | < 60.4 | |

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

| Sample type (units) | LLD | Number of samples ^a | Analysis | Range |
|--|----------------------------|--------------------------------|-----------------|----------------|
| Soil (pCi/kg dry) | 15000 | 12 / 1 | Gross Alpha | < 7270 – 17000 |
| | 6000 | 12 / 12 | Gross Beta | 8170 – 18500 |
| | | | gamma isotopic | |
| | 80 | 12 / 0 | Cesium 134 | < 20.9 |
| | 80 | 12 / 9 | Cesium 137 | 58.9 – 352 |
| | 90 | 12 / 0 | Cobalt 58 | < 29.1 |
| | 90 | 12 / 0 | Cobalt 60 | < 25.9 |
| | 600 | 12 / 0 | Iron 59 | < 129 |
| | 60 | 12 / 0 | Manganese 54 | < 27.9 |
| | 100 | 12 / 0 | Niobium 95 | < 159 |
| | 800 | 12 / 12 | Potassium 40 | 11400 – 16300 |
| | 300 | 12 / 0 | Zinc 65 | < 56.2 |
| | 250 | 12 / 0 | Zirconium 95 | < 76.2 |
| | Milk (pCi/liter) | 0.5 | 12 / 0 | Iodine 131 |
| 1.5 | | 24 / 2 | Strontium 90 | < 0.85 – 4.46 |
| | | | gamma isotopic | |
| 350 | | 24 / 0 | Barium 140 | < 45.6 |
| 80 | | 24 / 0 | Cesium 134 | < 14.1 |
| 90 | | 24 / 0 | Cesium 137 | < 13.8 |
| 600 | | 24 / 0 | Cobalt 58 | < 11.7 |
| 100 | | 24 / 0 | Cobalt 60 | < 14.2 |
| 80 | | 24 / 0 | Iodine 131 | < 14.9 |
| 200 | | 24 / 0 | Iron 59 | < 33.4 |
| 100 | | 24 / 0 | Lanthanum 140 | < 14.8 |
| 90 | | 24 / 0 | Manganese 54 | < 13.8 |
| 100 | | 24 / 0 | Niobium 95 | < 94.6 |
| 2000 | | 24 / 0 | Potassium 40 | 1190 – 1480 |
| 250 | | 24 / 0 | Zinc 65 | < 30.1 |
| 200 | | 24 / 0 | Zirconium 95 | < 21.9 |
| Ambient radiation (TLD) (mR/Std Qtr) | 1.0 ^c | 40 / 40 | direct exposure | 10.3 – 19.0 |

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

d - not reported by laboratory



Table 6. 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/m³

PRI-1 (3100 series); Prescott

| 1st Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 01/02/19 | 800.3 | 0.0268 ± 0.0014 | < 0.0101 |
| 01/16/19 | 735.4 | 0.0291 ± 0.0015 | < 0.0175 |
| 01/31/19 | 812.1 | 0.0238 ± 0.0013 | < 0.0086 |
| 02/11/19 | 580 | 0.0251 ± 0.0017 | < 0.0126 |
| 02/27/19 | 846.8 | 0.0279 ± 0.0014 | < 0.0251 |
| 03/12/19 | *a | 0.295 ± 0.0016 | < 0.015 |
| 03/23/19 | 723.1 | 0.0192 ± 0.0013 | < 0.0263 |
| mean +- s.d. | | 0.0639 ± 0.102 | < 0.0165 |

| 2nd Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 04/09/19 | 706.2 | 0.0168 ± 0.0013 | < 0.0377 |
| 04/24/19 | 749.1 | 0.0106 ± 0.0011 | < 0.0097 |
| 05/07/19 | 644.9 | 0.0132 ± 0.0013 | < 0.0368 |
| 05/22/19 | 729.8 | 0.0117 ± 0.0011 | < 0.0431 |
| 06/07/19 | 772.3 | 0.0136 ± 0.0011 | < 0.0102 |
| 06/18/19 | 520.4 | 0.0152 ± 0.0016 | < 0.0626 |
| mean +- s.d. | | 0.0136 ± 0.0023 | < 0.0334 |

| 3rd Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 07/06/19 | 836.2 | 0.0142 ± 0.0011 | < 0.0198 |
| 07/19/19 | 597.6 | 0.0176 ± 0.0015 | < 0.0119 |
| 07/31/19 | 565 | 0.018 ± 0.0015 | < 0.0238 |
| 08/16/19 | 749.6 | 0.023 ± 0.0014 | < 0.0369 |
| 08/29/19 | 614 | 0.0154 ± 0.0014 | < 0.0132 |
| 09/11/19 | 615.5 | 0.0178 ± 0.0014 | < 0.016 |
| 09/25/19 | 658.6 | 0.0236 ± 0.0015 | < 0.0291 |
| mean +- s.d. | | 0.0186 ± 0.0036 | < 0.0216 |

| 4th Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 10/11/19 | 774.2 | 0.0128 ± 0.0011 | < 0.0088 |
| 10/21/19 | 496.3 | 0.0147 ± 0.0016 | < 0.055 |
| 11/04/19 | 707.4 | 0.0151 ± 0.0012 | < 0.0597 |
| 11/19/19 | 776.1 | 0.0255 ± 0.0014 | < 0.0176 |
| 12/03/19 | 716.3 | 0.0125 ± 0.0012 | < 0.0164 |
| 12/18/19 | 777.6 | 0.0317 ± 0.0015 | < 0.0242 |
| mean +- s.d. | | 0.0188 ± 0.008 | < 0.0303 |

PRI-6 (3200 series); Diamond Bluff

| 1st Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 01/02/19 | 906.1 | 0.0264 ± 0.0013 | < 0.0118 |
| 01/16/19 | 867.9 | 0.0264 ± 0.0013 | < 0.0155 |
| 01/31/19 | 958.6 | 0.0224 ± 0.0012 | < 0.0064 |
| 02/11/19 | 689.6 | 0.021 ± 0.0014 | < 0.0164 |
| 02/27/19 | 1013 | 0.026 ± 0.0012 | < 0.0121 |
| 03/12/19 | 821.2 | 0.0268 ± 0.0014 | < 0.0107 |
| 03/23/19 | 860 | 0.0168 ± 0.0011 | < 0.0152 |
| mean +- s.d. | | 0.0237 ± 0.0002 | < 0.0126 |

| 2nd Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 04/09/19 | 842.1 | 0.0158 ± 0.0011 | < 0.0237 |
| 04/24/19 | 886.6 | 0.0104 ± 0.0009 | < 0.0097 |
| 05/07/19 | 769.3 | 0.0111 ± 0.0011 | < 0.0309 |
| 05/22/19 | 871.5 | 0.0104 ± 0.0009 | < 0.0347 |
| 06/07/19 | 923.3 | 0.0107 ± 0.0009 | < 0.0071 |
| 06/18/19 | 621.2 | 0.013 ± 0.0013 | < 0.0547 |
| mean +- s.d. | | 0.0119 ± 0.0022 | < 0.0269 |

| 3rd Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 07/19/19 | 698.1 | 0.0148 ± 0.0012 | < 0.0178 |
| 07/31/19 | 663.8 | 0.0179 ± 0.0014 | < 0.0094 |
| 08/16/19 | 884.8 | 0.0213 ± 0.0012 | < 0.0125 |
| 08/29/19 | 725.9 | 0.0139 ± 0.0012 | < 0.0216 |
| 09/11/19 | 729 | 0.0163 ± 0.0012 | < 0.0142 |
| 09/25/19 | 776.7 | 0.0213 ± 0.0013 | < 0.0077 |
| 07/19/19 | 698.1 | 0.0148 ± 0.0012 | < 0.0178 |
| mean +- s.d. | | 0.0201 ± 0.0049 | < 0.0139 |

| 4th Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 10/11/19 | 912.9 | 0.0112 ± 0.0009 | < 0.0645 |
| 10/21/19 | 584.9 | 0.015 ± 0.0014 | < 0.0321 |
| 11/04/19 | 834.2 | 0.0145 ± 0.0011 | < 0.0571 |
| 11/19/19 | 903.9 | 0.0245 ± 0.0012 | < 0.0173 |
| 12/18/19 | 915.9 | 0.0281 ± 0.0013 | < 0.0069 |
| 10/11/19 | 912.9 | 0.0112 ± 0.0009 | < 0.0334 |
| mean +- s.d. | | 0.0187 ± 0.0073 | < 0.0353 |

*a = Data 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/m³

PRI-9 (3400 series); Bay City substation

| 1st Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 01/02/19 | *a | 0.0269 ± 0.0014 | < 0.0154 |
| 01/16/19 | *a | 0.0242 ± 0.0013 | < 0.0234 |
| 01/31/19 | 949.7 | 0.0207 ± 0.0011 | < 0.0071 |
| 02/11/19 | 675.3 | 0.0195 ± 0.0014 | < 0.0126 |
| 02/27/19 | 734.6 | 0.0323 ± 0.0016 | < 0.0207 |
| 03/12/19 | *a | 0.0174 ± 0.001 | < 0.0143 |
| 03/23/19 | 842.1 | 0.0159 ± 0.0011 | < 0.024 |
| mean +- s.d. | | 0.0225 ± 0.0058 | < 0.0168 |

| 2nd Qtr | | | |
|-----------------|-----------------------|------------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 04/09/19 | 833.3 | 0.0135 ± 0.0011 | < 0.0215 |
| 04/24/19 | 873.9 | 0.00843 ± 0.0009 | < 0.0051 |
| 05/07/19 | 745.4 | 0.0109 ± 0.0011 | < 0.0175 |
| 05/22/19 | 847.5 | 0.00871 ± 0.0009 | < 0.0144 |
| 06/07/19 | 898.9 | 0.01 ± 0.0009 | < 0.006 |
| 06/18/19 | 602.7 | 0.0124 ± 0.0013 | < 0.056 |
| mean +- s.d. | | 0.0107 ± 0.0021 | < 0.0201 |

| 3rd Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 07/06/19 | 971.2 | 0.012 ± 0.0009 | < 0.0196 |
| 07/19/19 | 689.8 | 0.0153 ± 0.0013 | < 0.0125 |
| 07/31/19 | 653.7 | 0.0147 ± 0.0013 | < 0.0141 |
| 08/15/19 | 870.8 | *a | < 0.0166 |
| 08/29/19 | *a | 0.0119 ± 0.0012 | < 0.0108 |
| 09/11/19 | 707.9 | 0.015 ± 0.0012 | < 0.0167 |
| 09/25/19 | *a | 0.0182 ± 0.0012 | < 0.0102 |
| mean +- s.d. | | 0.0146 ± 0.0024 | < 0.0144 |

| 4th Qtr | | | |
|-----------------|-----------------------|-----------------|------------|
| Collection date | Volume m ³ | Air particulate | Air iodine |
| 10/11/19 | 895.2 | 0.0103 ± 0.0009 | < 0.0112 |
| 10/21/19 | 576 | 0.0124 ± 0.0014 | < 0.0509 |
| 11/04/19 | 814.6 | 0.0131 ± 0.0011 | < 0.0614 |
| 11/19/19 | 886.4 | 0.0212 ± 0.0012 | < 0.0142 |
| 12/18/19 | 894 | 0.0268 ± 0.0013 | < 0.0242 |
| 01/01/20 | 828.2 | 0.0317 ± 0.0015 | < 0.046 |
| mean +- s.d. | | 0.0193 ± 0.0088 | < 0.0347 |

*a = Data unavailable

Table 7. 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/m³

| Site: PRI-1 | 1st quarter | 2nd quarter | 3 rd quarter | 4th quarter |
|--------------------|------------------------------|-----------------------|------------------------------|-----------------|
| Barium 140 | < 0.0026 | < 0.0028 | < 0.0031 | < 0.0025 |
| Beryllium 7 | 0.0541 ± 0.0053 | 0.0861±0.0077 | 0.0777 ± 0.0067 | 0.0572 ± 0.0042 |
| Cerium 141 | < 0.0004 | < 0.0006 | < 0.0004 | < 0.0003 |
| Cerium 144 | < 0.0012 | < 0.0015 | < 0.0013 | < 0.0007 |
| Cesium 134 | < 0.0003 | < 0.0004 | < 0.0003 | < 0.0002 |
| Cesium 137 | < 0.0002 | < 0.0003 | 0.0009 ± 0.0002 ¹ | < 0.0002 |
| Cobalt 58 | < 0.0002 | < 0.0004 | < 0.0002 | < 0.0002 |
| Cobalt 60 | < 0.0003 | < 0.0003 | < 0.0005 | < 0.0002 |
| Iodine 131 | < 0.0014 | < 0.0016 | < 0.0018 | < 0.0018 |
| Iron 59 | < 0.0007 | < 0.0009 | < 0.0007 | < 0.0004 |
| Lanthanum 140 | < 0.0014 | < 0.0011 | < 0.0014 | < 0.0010 |
| Manganese 54 | < 0.0002 | < 0.0004 | < 0.0003 | < 0.0001 |
| Niobium 95 | < 0.0003 | < 0.0005 | < 0.0003 | < 0.0002 |
| Ruthenium 103 | < 0.0003 | < 0.0004 | < 0.0003 | < 0.0002 |
| Ruthenium 106 | < 0.0022 | < 0.0029 | < 0.0029 | < 0.0015 |
| Zinc 65 | < 0.0006 | < 0.0007 | < 0.0006 | < 0.0003 |
| Zirconium 95 | < 0.0004 | < 0.0007 | < 0.0006 | < 0.0003 |
| Site: PRI-6 | | | | |
| Barium 140 | < 0.0024 | < 0.0030 | < 0.0024 | < 0.0025 |
| Beryllium 7 | 0.0691 ± 0.0049 | 0.0900 ± 0.0065 | 0.0612 ± 0.0060 | 0.0462 ± 0.0039 |
| Cerium 141 | < 0.0003 | < 0.0007 | < 0.0005 | < 0.0004 |
| Cerium 144 | < 0.0007 | < 0.0020 | < 0.0012 | < 0.0008 |
| Cesium 134 | < 0.0001 | < 0.0004 | < 0.0003 | < 0.0002 |
| Cesium 137 | 0.0005 ± 0.0001 ¹ | < 0.0003 | < 0.0003 | < 0.0005 |
| Cobalt 58 | < 0.0001 | < 0.0004 | < 0.0003 | < 0.0002 |
| Cobalt 60 | < 0.0002 | < 0.0004 | < 0.0002 | < 0.0003 |
| Iodine 131 | < 0.0018 | < 0.0018 | < 0.0010 | < 0.0018 |
| Iron 59 | < 0.0004 | < 0.0006 | < 0.0006 | < 0.0005 |
| Lanthanum 140 | < 0.0008 | < 0.0011 | < 0.0010 | < 0.0011 |
| Manganese 54 | < 0.0001 | < 0.0003 | < 0.0003 | < 0.0002 |
| Niobium 95 | < 0.0002 | < 0.0004 | < 0.0003 | < 0.0003 |
| Ruthenium 103 | < 0.0002 | < 0.0004 | < 0.0003 | < 0.0002 |
| Ruthenium 106 | < 0.0014 | < 0.0027 | < 0.0022 | < 0.0014 |
| Zinc 65 | < 0.0002 | < 0.0006 | < 0.0006 | < 0.0003 |
| Zirconium 95 | < 0.0003 | < 0.0006 | < 0.0005 | < 0.0004 |
| Site: PRI-9 | | | | |
| Barium 140 | < 0.0023 | < 0.0032 | < 0.0040 | < 0.0022 |
| Beryllium 7 | 0.0723 ± 0.0047 | 0.0800 ± 0.0071 | 0.0608 ± 0.0062 | 0.0448 ± 0.0035 |
| Cerium 141 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0003 |
| Cerium 144 | < 0.0005 | < 0.0016 | < 0.0015 | < 0.0007 |
| Cesium 134 | < 0.0001 | < 0.0004 | < 0.0004 | < 0.0002 |
| Cesium 137 | < 0.0001 | < 0.0002 ² | < 0.0003 ² | < 0.0002 |
| Cobalt 58 | < 0.0001 | < 0.0004 | < 0.0004 | < 0.0002 |
| Cobalt 60 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0002 |
| Iodine 131 | < 0.0016 | < 0.0018 | < 0.0018 | < 0.0017 |
| Iron 59 | < 0.0003 | < 0.0006 | < 0.0007 | < 0.0004 |
| Lanthanum 140 | < 0.0008 | < 0.0015 | < 0.0012 | < 0.0011 |
| Manganese 54 | < 0.0001 | < 0.0003 | < 0.0004 | < 0.0002 |
| Niobium 95 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0003 |
| Ruthenium 103 | < 0.0001 | < 0.0004 | < 0.0004 | < 0.0002 |
| Ruthenium 106 | < 0.001 | < 0.0029 | < 0.0028 | < 0.0015 |
| Zinc 65 | < 0.0002 | < 0.0007 | < 0.0008 | < 0.0004 |
| Zirconium 95 | < 0.0003 | < 0.0007 | < 0.0007 | < 0.0004 |

¹ – After receiving results >MDA sample was reanalyzed and gave results which remained >MDA.

² – After receiving results >MDA sample was reanalyzed and gave results <MDA.

Radioisotopes other than those reported were not detected

Table 8. Wisconsin DHS TLD network for the Prairie Island environmental monitoring program.



| | 1st Quarter | 2nd Quarter | 3rd Quarter | 4th Quarter |
|--------------------|---|-------------|-------------|-------------|
| Date Placed: | 01/08-09/19 | 04/09-10/19 | 07/10-11/19 | 10/9-10/19 |
| Date Removed: | 04/09-10/19 | 07/10-11/19 | 10/09-10/19 | 01/22-23/20 |
| Days in the Field: | 90-91 | 92-93 | 90-91 | 105-106 |
| Location: | Individual quarterly date is reported as: mR / Standard Quarter + 2 sigma counting error. | | | |

TLD sites that are located 0 – 2 miles from the Prairie island facility.

| | | | | |
|---------------------------|------------|------------|------------|------------|
| T30 | 13.5 ± 0.7 | 14.7 ± 0.5 | 15.1 ± 0.6 | 14.9 ± 0.4 |
| T31 | 10.3 ± 0.8 | 11.5 ± 0.6 | 12.4 ± 0.7 | 12.7 ± 0.7 |
| T32 | 13.1 ± 1.2 | 14.9 ± 1.0 | 15.3 ± 1.0 | 14.7 ± 1.0 |
| Quarterly average +- s.d. | 12.3 ± 1.7 | 13.7 ± 1.9 | 14.3 ± 1.6 | 14.1 ± 1.2 |

TLD sites that are located 2– 5 miles from the Prairie island facility

| | | | | |
|---------------------------|------------|------------|------------|------------|
| T33 | 13.8 ± 1.0 | 15.8 ± 0.5 | 15.0 ± 0.7 | 16.9 ± 0.5 |
| T34 | 17.9 ± 0.8 | 17.5 ± 0.6 | 19.0 ± 0.7 | 17.9 ± 0.5 |
| T35 | 13.8 ± 0.9 | 14.0 ± 0.6 | 16.0 ± 0.9 | 13.2 ± 0.7 |
| T36 | 15.9 ± 1.0 | 14.7 ± 0.6 | 17.6 ± 0.7 | 14.3 ± 0.7 |
| Quarterly average +- s.d. | 15.4 ± 2 | 15.5 ± 1.5 | 16.7 ± 2.1 | 16 ± 2.5 |

TLD sites that are located greater than 5 miles from the Prairie island facility

| | | | | |
|---------------------------|------------|------------|------------|------------|
| T37 | 11.2 ± 1.1 | 14.6 ± 0.8 | 13.5 ± 1.0 | 14.0 ± 0.7 |
| T38 | 13.7 ± 0.9 | 13.5 ± 0.8 | 15.2 ± 0.7 | 13.8 ± 0.9 |
| T39 | 13.1 ± 1.0 | 14.8 ± 0.6 | 14.1 ± 0.9 | 15.2 ± 0.5 |
| Quarterly average +- s.d. | 12.7 ± 1.3 | 14.3 ± 0.7 | 14.3 ± 0.9 | 14.3 ± 0.8 |

ND – The TLD was lost in the field.

Table 9. 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 |
|------------|--------|-------------|---------|
| 01/02/19 | 1.33 | 0.26 ± 0.03 | < 7.74 |
| 02/11/19 | 2.02 | 0.30 ± 0.04 | < 11.70 |
| 03/12/19 | 1.25 | 0.08 ± 0.02 | < 7.21 |
| 04/09/19 | 3.17 | 0.39 ± 0.06 | < 18.36 |
| 05/07/19 | 7.32 | 1.07 ± 0.24 | < 42.02 |
| 06/07/19 | 5.65 | 0.49 ± 0.18 | < 32.15 |
| 07/06/19 | 7.94 | < 0.12 | < 45.18 |
| 08/29/19 | 0.55 | < 0.02 | < 3.13 |
| 09/11/19 | 6.64 | < 0.22 | < 37.78 |
| 10/08/19 | 1.93 | < 0.03 | *a |
| 11/04/19 | 2.15 | 0.32 ± 0.07 | < 5.30 |
| 12/03/19 | 1.55 | 0.33 ± 0.06 | < 9.57 |

*a = not reported by lab

*b = analyzed past 180 days holding time

Table 10. 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: | 06/19/19 | 06/19/19 | 06/18/19 | 09/11/19 | 09/11/19 | 09/10/19 |
| Gross Alpha Sus Sol | 0.12 ± 0.48 | 1.19 ± 0.71 | < 0.99 | *a | *a | *a |
| Gross Beta Sus Sol | < 1.07 | 1.54 ± 0.77 | < 1.59 | *a | *a | *a |
| Gross Alpha | 1.09 ± 0.47 | 1.99 ± 0.71 | < 0.88 | < 1.05 | 1.11 ± 0.39 | < 0.858 |
| Gross Beta | 0.79 ± 0.56 | 2.65 ± 0.64 | 4.42 ± 0.95 | 0.90 ± 0.88 | 2.70 ± 0.57 | 2.57 ± 0.99 |
| Strontium 89 | 0.52 ± 0.24 | < 0.355 | 0.77 ± 0.23 | < 3.01 | 3.55 ± 1.97 | < 2.46 |
| Strontium 90 | 0.21 ± 0.98 | 0.16 ± 0.10 | < 0.169 | < 0.484 | < 0.601 | < 0.443 |
| Tritium | < 224 | < 224 | < 224 | < 223 | < 224 | < 224 |
| gamma isotopic | | | | | | |
| Barium 140 | < 39.3 | < 22.8 | < 26.3 | < 27.3 | < 24.9 | < 22.4 |
| Cesium 134 | < 11.3 | < 5.27 | < 6.97 | < 5.66 | < 6.38 | < 4.62 |
| Cesium 137 | < 9.36 | < 6.85 | < 4.86 | < 6.63 | < 6.21 | < 5.93 |
| Cobalt 58 | < 9.98 | < 6.52 | < 7.87 | < 5.36 | < 6.36 | < 4.37 |
| Cobalt 60 | < 10.3 | < 6.36 | < 7.17 | < 6.64 | < 7.53 | < 5.19 |
| Iodine 131 | < 9.28 | < 6.78 | < 8.54 | < 9.11 | < 8.5 | < 7.92 |
| Iron 59 | < 19.0 | < 7.33 | < 15.6 | < 11.8 | < 11.2 | < 8.64 |
| Lanthanum 140 | < 12.2 | < 6.70 | < 9.06 | < 11.2 | < 10.3 | < 7.33 |
| Manganese 54 | < 8.42 | < 4.21 | < 7.67 | < 5.25 | < 6.91 | < 4.38 |
| Niobium 95 | < 10.4 | < 6.97 | < 7.32 | < 7.28 | < 6.19 | < 4.85 |
| Zinc 65 | < 22.1 | < 15.4 | < 9.87 | < 12 | < 14.1 | < 8.2 |
| Zirconium 95 | < 17.3 | < 12.4 | < 12.4 | < 10.5 | < 9.31 | < 7.9 |

Radioisotopes other than those reported were not detected.

*a – not reported by laboratory

Table 11. Wisconsin DHS analysis results for well water samples collected for the Prairie Island environmental monitoring program.



Measurements in units of pCi/liter

| | PRI-4a | PRI-5 | PRI-6b | PRI-4a | PRI-5 | PRI-6b |
|-------------------------|----------|--------------|--------------|----------|----------|----------|
| Collection date: | 06/18/19 | 06/19/19 | 06/19/19 | 09/10/19 | 09/10/19 | 09/11/19 |
| Gross Alpha | < 1.22 | < 1.63 | 1.15 ± 0.833 | < 1.7 | < 1.51 | < 1.69 |
| Gross Beta | < 1.14 | 1.55 ± 0.681 | < 1.05 | < 1.75 | < 1.2 | < 1.52 |
| Tritium | < 224 | < 224 | < 224 | < 224 | < 868 | < 224 |



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

Measurements in units of pCi/kilogram (wet)

| | 06/17/19 | 06/17/19 | 09/16/19 | 09/16/19 | 06/16/19 |
|------------------|-------------------|---------------------------------|-------------------|-------------------|-------------------|
| Collection date: | 06/17/19 | 06/17/19 | 09/16/19 | 09/16/19 | 06/16/19 |
| Location: | Downstream (P-13) | Downstream (P-13) | Downstream (P-13) | Downstream (P-13) | Downstream (P-13) |
| Type: | Carp | White Bass & Freshwater Drum *b | Freshwater Drum | White Bass | Carp |
| gamma isotopic | | | | | |
| Cesium 134 | < 3.21 | < 2.72 | < 2.42 | < 1.68 | < 2.14 |
| Cesium 137 | < 2.97 | < 3.3 | < 4.23 | < 1.93 | < 2.01 |
| Cobalt 58 | < 5.98 | < 4.93 | < 5.37 | < 3.50 | < 5.11 |
| Cobalt 60 | < 3.46 | < 2.97 | < 2.63 | < 1.83 | < 2.47 |
| Iron 59 | < 20.4 | < 16.8 | < 18.6 | < 13.3 | < 18.9 |
| Manganese 54 | < 4.04 | < 2.86 | < 2.96 | < 1.78 | < 2.66 |
| Niobium 95 | < 13.5 | < 11.6 | < 13.7 | < 9.55 | < 14.3 |
| Potassium 40 | 2620 ± 423 | 2850 ± 456 | 2830 ± 453 | 3170 ± 503 | 2850 ± 456 |
| Zinc 65 | < 8.57 | < 6.76 | < 7.22 | < 4.42 | < 6.68 |
| Zirconium 95 | < 11.1 | < 10 | < 10.4 | < 6.94 | < 10.4 |

| | 06/18/19 | 06/18/19 | 06/17/19 | 06/17/19 |
|------------------|-----------------|---------------------------------|-----------------|-----------------|
| Collection date: | 06/18/19 | 06/18/19 | 06/17/19 | 06/17/19 |
| Location: | Upstream (P-19) | Upstream (P-19) | Upstream (P-19) | Upstream (P-19) |
| Type: | Carp | White Bass & Freshwater Drum *b | Freshwater Drum | Carp |
| gamma isotopic | | | | |
| Cesium 134 | < 5.91 | < 5.83 | < 2.56 | < 2.71 |
| Cesium 137 | < 7.17 | < 5.65 | < 3.08 | < 3.10 |
| Cobalt 58 | < 8.53 | < 7.72 | < 5.39 | < 5.36 |
| Cobalt 60 | < 7.07 | < 5.47 | < 2.78 | < 2.91 |
| Iron 59 | < 25.5 | < 26.2 | < 18.6 | < 19.8 |
| Manganese 54 | < 6.32 | < 6.52 | < 2.81 | < 2.87 |
| Niobium 95 | < 14.7 | < 14.3 | < 13.8 | < 13.5 |
| Potassium 40 | 3250 ± 531 | 2990 ± 493 | 3200 ± 510 | 2970 ± 474 |
| Zinc 65 | < 13.7 | < 14.7 | < 6.92 | < 6.99 |
| Zirconium 95 | < 17.2 | < 16.2 | < 10.7 | < 10.7 |

Radioisotopes other than those reported were not detected

*a = Sample was too small for analysis

*b = Sample was combined due to insufficient sample size



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

Measurements in units of pCi/liter

| Location | PRI-16 | PRI-16 | PRI-16 | PRI-16 | PRI-16 | PRI-16 |
|------------------|---------------|--------------|---------------|--------------|---------------|------------|
| Collection date: | 01/07/19 | 02/18/19 | 03/18/19 | 04/09/19 | 05/14/19 | 06/10/19 |
| Iodine 131 | *b | *b | *b | 0.41 ± 0.177 | *b | *b |
| Strontium 90 | 0.619 ± 0.257 | 1.11 ± 0.202 | 0.673 ± 0.271 | 4.46 ± 0.661 | 0.517 ± 0.289 | < 0.624 |
| gamma isotopic | | | | | | |
| Barium 140 | < 30.6 | < 45.2 | < 25.6 | < 23.7 | < 43.6 | < 41.1 |
| Cesium 134 | < 6.75 | < 9.61 | < 6.95 | < 7.17 | < 9.59 | < 13.8 |
| Cesium 137 | < 7.78 | < 11 | < 6.21 | < 6.21 | < 12.9 | < 13.8 |
| Cobalt 58 | < 6.31 | < 10.4 | < 7.01 | < 7.69 | < 11.1 | < 11.7 |
| Cobalt 60 | < 7.86 | < 13.4 | < 7.52 | < 7.42 | < 13.6 | < 14.2 |
| Iodine 131 | < 11.5 | < 11.2 | < 5.78 | < 7.42 | < 13.7 | < 13.3 |
| Iron 59 | < 13.9 | < 24.5 | < 13.6 | < 15.8 | < 20.3 | < 33.4 |
| Lanthanum 140 | < 14.8 | < 14.3 | < 11.6 | < 8.71 | < 11.1 | < 4.06 |
| Manganese 54 | < 6.3 | < 11.6 | < 8.66 | < 6.72 | < 11 | < 9.98 |
| Niobium 95 | < 7.77 | < 11.2 | < 8.19 | < 6.83 | < 94.6 | < 9.91 |
| Potassium 40 | 1380 ± 257 | 1280 ± 282 | 1280 ± 248 | 1330 ± 256 | 1310 ± 267 | 1290 ± 302 |
| Zinc 65 | < 14.3 | < 24.1 | < 15 | < 14.1 | < 24 | < 30.1 |
| Zirconium 95 | < 12.9 | < 18.1 | < 11.6 | < 12.1 | < 20.9 | < 21.1 |

| Location | PRI-16 | PRI-16 | PRI-16 | PRI-16 | PRI-16 | PRI-16 |
|------------------|------------|------------|---------------|------------|---------------|------------|
| Collection date: | 07/15/19 | 08/15/19 | 09/10/19 | 10/14/19 | 11/12/19 | 12/10/19 |
| Iodine 131 | < 0.373 | < 0.327 | < 0.398 | < 0.33 | < 0.474 | *b |
| Strontium 90 | < 0.496 | < 0.372 | 0.639 ± 0.323 | < 0.539 | 0.818 ± 0.301 | < 0.75 |
| gamma isotopic | | | | | | |
| Barium 140 | < 44.4 | < 36.8 | < 27.2 | < 27.6 | < 22.1 | < 45.6 |
| Cesium 134 | < 9.56 | < 8.16 | < 7.8 | < 5.58 | < 6.96 | < 9.53 |
| Cesium 137 | < 11.1 | < 10.7 | < 7.1 | < 6.08 | < 7.55 | < 9.74 |
| Cobalt 58 | < 9.07 | < 8.2 | < 8.45 | < 5.57 | < 6.77 | < 8.9 |
| Cobalt 60 | < 11 | < 10.5 | < 9.4 | < 6.79 | < 8.47 | < 8.24 |
| Iodine 131 | < 14.9 | < 13.7 | < 6.7 | < 8.02 | < 6.87 | < 13.6 |
| Iron 59 | < 20.9 | < 17.9 | < 15.5 | < 15.4 | < 12.7 | < 14.7 |
| Lanthanum 140 | < 11.6 | < 12.6 | < 8.85 | < 7.84 | < 7.29 | < 10.9 |
| Manganese 54 | < 9.51 | < 8.67 | < 6.23 | < 7.76 | < 7.03 | < 9.12 |
| Niobium 95 | < 10.6 | < 8.78 | < 9.44 | < 5.94 | < 7.32 | < 9.12 |
| Potassium 40 | 1310 ± 256 | 1390 ± 259 | 1410 ± 281 | 1240 ± 233 | 1480 ± 289 | 1400 ± 280 |
| Zinc 65 | < 16.7 | < 17.6 | < 18.8 | < 16.2 | < 19.3 | < 18.4 |
| Zirconium 95 | < 16.6 | < 15 | < 11.9 | < 10.2 | < 13.8 | < 18.3 |

Radioisotopes other than those reported were not detected.

*a = Lower Limit of Detection not met

*b = The analysis is performed bi-monthly

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-17 | PRI-18 | PRI-17 | PRI-18 | PRI-17 | PRI-18 |
|------------------|---------------|---------------|------------|----------------|------------|---------------|
| Collection date: | 01/07/19 | 02/18/19 | 03/18/19 | 04/09/19 | 05/14/19 | 06/10/19 |
| I-131 | < 0.259 | *b | *b | 0.287 ± 0.119 | *b | < 0.409 |
| Sr-90 | 0.722 ± 0.236 | 0.893 ± 0.467 | < 0.852 | < 3.94 ± 0.646 | < 0.452 | 0.483 ± 0.246 |
| gamma isotopic | | | | | | |
| Barium 140 | < 29.9 | < 28.9 | < 22 | < 38.8 | < 39.5 | < 36.4 |
| Cesium 134 | < 5.59 | < 7.88 | < 5.84 | < 6.46 | < 10.6 | < 8.95 |
| Cesium 137 | < 5.86 | < 7.08 | < 8.09 | < 5.98 | < 12.4 | < 8.34 |
| Cobalt 58 | < 6.67 | < 8.59 | < 6.87 | < 6.64 | < 8.58 | < 9.89 |
| Cobalt 60 | < 7.88 | < 8.77 | < 7.86 | < 8.63 | < 12.2 | < 10.5 |
| Iodine 131 | < 11.2 | < 7.36 | < 7.49 | < 11.5 | < 12 | < 10.5 |
| Iron 59 | < 14.2 | < 16.5 | < 15.9 | < 14.5 | < 15.9 | < 15.7 |
| Lanthanum 140 | < 8.81 | < 13.1 | < 8.91 | < 10.5 | < 13.3 | < 14 |
| Manganese 54 | < 7.55 | < 7.88 | < 7.62 | < 7.31 | < 9.23 | < 10 |
| Niobium 95 | < 8.76 | < 7.26 | < 7.97 | < 10.2 | < 9.4 | < 8.94 |
| Potassium 40 | 1360 ± 261 | 1290 ± 249 | 1250 ± 244 | 1460 ± 280 | 1440 ± 281 | 1250 ± 258 |
| Zinc 65 | < 17.4 | < 12.3 | < 16.3 | < 17 | < 21.9 | < 15.5 |
| Zirconium 95 | < 12.6 | < 11.9 | < 10.8 | < 10.9 | < 16.7 | < 18.2 |

| Location | PRI-17 | PRI-18 | PRI-17 | PRI-18 | PRI-17 | PRI-18 |
|------------------|------------|---------------|------------|---------------|------------|--------------|
| Collection date: | 07/15/19 | 08/15/19 | 09/10/19 | 10/14/19 | 11/12/19 | 12/10/19 |
| I-131 | < 0.349 | < 0.301 | < 0.486 | *b | *b | *b |
| Sr-90 | < 0.541 | 0.674 ± 0.257 | < 0.578 | 0.701 ± 0.283 | < 0.571 | 1.07 ± 0.405 |
| gamma isotopic | | | | | | |
| Barium 140 | < 43.2 | < 23.0 | < 43.9 | < 27.8 | < 33.7 | < 6.62 |
| Cesium 134 | < 9.37 | < 6.93 | < 14.1 | < 8.39 | < 10.6 | < 6.94 |
| Cesium 137 | < 11.5 | < 5.90 | < 10.2 | < 9.44 | < 10.9 | < 6.48 |
| Cobalt 58 | < 8.96 | < 6.19 | < 11.1 | < 8.18 | < 11.2 | < 7.56 |
| Cobalt 60 | < 10.9 | < 8.22 | < 13.2 | < 10.3 | < 9.26 | < 10.3 |
| Iodine 131 | < 14.5 | < 7.93 | < 14.4 | < 9.68 | < 9.61 | < 14.2 |
| Iron 59 | < 20.9 | < 13.8 | < 26.5 | < 15.9 | < 19.8 | < 9.49 |
| Lanthanum 140 | < 11.8 | < 10.8 | < 4.03 | < 13.3 | < 14 | < 6.3 |
| Manganese 54 | < 8.82 | < 6.36 | < 13.8 | < 10.2 | < 8.1 | < 6.51 |
| Niobium 95 | < 9.74 | < 6.85 | < 11.5 | < 9.96 | < 9.39 | 1410 ± 255 |
| Potassium 40 | 1200 ± 238 | 1430 ± 261 | 1190 ± 286 | 1370 ± 275 | 1320 ± 280 | < 13.5 |
| Zinc 65 | < 19.7 | < 13.8 | < 27.6 | < 21.9 | < 21.1 | < 12.1 |
| Zirconium 95 | < 14.7 | < 12.9 | < 21.9 | < 14.9 | < 18.6 | < 6.62 |

Radioisotopes other than those reported were not detected.

*a = Lower Limit of Detection not met

*b = The analysis is performed bi-monthly



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

Measurements in units of pCi/kilogram (wet)

| Sample Location | PRI-1a | PRI-4b | PRI-5 | PRI-6a | PRI-8 | PRI-9 |
|------------------|-------------|-------------|-------------|------------|------------|------------|
| Collection Start | 06/19/19 | 06/18/19 | 06/19/19 | 06/19/19 | 06/19/19 | 06/19/19 |
| Gross Alpha | < 2130 | < 2750 | < 3870 | < 3000 | < 3210 | < 2700 |
| Gross Beta | 1870 ± 480 | 2400 ± 725 | 7420 ± 1050 | 4720 ± 814 | 5900 ± 924 | 4190 ± 771 |
| gamma isotopic | | | | | | |
| Barium 140 | < 119 | < 100 | < 56.3 | < 54.7 | < 84.6 | < 65.6 |
| Beryllium 7 | 935 ± 177 | 1160 ± 169 | 699 ± 103 | 1330 ± 163 | 827 ± 124 | 766 ± 117 |
| Cesium 134 | < 26.8 | < 21.2 | < 13.4 | < 12.6 | < 19.1 | < 16.9 |
| Cesium 137 | < 28.2 | < 20.3 | < 13 | < 12 | < 23.4 | < 15 |
| Cobalt 58 | < 31.8 | < 19.1 | < 10.8 | < 15.3 | < 19.7 | < 12.7 |
| Cobalt 60 | < 32.7 | < 17.9 | < 13.6 | < 19.3 | < 27.2 | < 15.1 |
| Iodine 131 | < 36.4 | < 41 | < 22.2 | < 20.1 | < 30.2 | < 23.1 |
| Iron 59 | < 56.1 | < 47 | < 28.8 | < 31.5 | < 36.7 | < 31.7 |
| Lanthanum 140 | < 44.3 | < 36.9 | < 12.9 | < 16.3 | < 28.9 | < 25.5 |
| Manganese 54 | < 31.1 | < 19.6 | < 13.8 | < 16 | < 17.7 | < 15 |
| Niobium 95 | < 29.9 | < 20.1 | < 14.8 | < 15.7 | < 20.1 | < 14.8 |
| Potassium 40 | 5140 ± 1010 | 5730 ± 1000 | 5300 ± 896 | 4980 ± 872 | 5510 ± 950 | 3810 ± 672 |
| Zinc 65 | < 69.4 | < 51.9 | < 28.5 | < 27.4 | < 41.3 | < 34.1 |
| Zirconium 95 | < 54.2 | < 36.7 | < 21.6 | < 25.5 | < 31.5 | < 23.5 |

| Sample Location | PRI-1a | PRI-4b | PRI-5 | PRI-6a | PRI-8 | PRI-9 |
|------------------|------------|------------|------------|------------|------------|------------|
| Collection Start | 09/10/19 | 09/10/19 | 09/10/19 | 09/11/19 | 09/10/19 | 09/10/19 |
| Gross Alpha | < 1850 | < 1760 | < 1550 | < 1420 | < 1720 | < 3040 |
| Gross Beta | 3650 ± 464 | 3370 ± 387 | 8590 ± 537 | 5080 ± 328 | 4910 ± 436 | 2720 ± 462 |
| gamma isotopic | | | | | | |
| Barium 140 | < 130 | < 112 | < 122 | < 80.9 | < 98.1 | < 97.6 |
| Beryllium 7 | 5220 ± 509 | 1300 ± 184 | 2920 ± 277 | 1300 ± 165 | 1900 ± 229 | 2970 ± 286 |
| Cesium 134 | < 31.3 | < 19.4 | < 24.6 | < 17.5 | < 19.7 | < 15.1 |
| Cesium 137 | < 32.6 | < 24.5 | < 28.7 | < 17.1 | < 19.8 | < 17 |
| Cobalt 58 | < 28 | < 22.1 | < 22.1 | < 19.4 | < 19.4 | < 18 |
| Cobalt 60 | < 29.3 | < 24.8 | < 30.5 | < 19.7 | < 24.5 | < 19.1 |
| Iodine 131 | < 50.5 | < 38.1 | < 45.6 | < 27.3 | < 29.8 | < 29.8 |
| Iron 59 | < 63.2 | < 46.2 | < 51.4 | < 36.8 | < 37.6 | < 36.2 |
| Lanthanum 140 | < 55.2 | < 38.5 | < 41 | < 28.9 | < 26.9 | < 34.3 |
| Manganese 54 | < 29.4 | < 21 | < 22.7 | < 19.3 | < 19.4 | < 18.7 |
| Niobium 95 | < 30.7 | < 26.4 | < 25.8 | < 18.9 | < 20.9 | < 19.7 |
| Potassium 40 | 4420 ± 906 | 3400 ± 674 | 5540 ± 979 | 3910 ± 730 | 4880 ± 893 | 3250 ± 614 |
| Zinc 65 | < 69.6 | < 44.5 | < 48.7 | < 37.1 | < 45.6 | < 38.3 |
| Zirconium 95 | < 60.4 | < 37.8 | < 43.7 | < 33.3 | < 37.5 | < 33.5 |

Radioisotopes other than those reported were not detected.



Table 15. Wisconsin DHS analysis results for soil samples collected for the Prairie Island environmental monitoring program.

| Sample Location | PRI-1a | PRI-4b | PRI-5 | PRI-6a | PRI-8 | PRI-9 |
|------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Collection Start | 06/19/19 | 06/18/19 | 06/19/19 | 06/19/19 | 06/19/19 | 06/19/19 |
| Gross Alpha | 13100 ± 4190 | 4730 ± 3070 | 14100 ± 7330 | 10800 ± 4120 | 13900 ± 4200 | 12400 ± 3510 |
| Gross Beta | 10900 ± 1290 | 12900 ± 1400 | 18000 ± 2660 | 14900 ± 1640 | 14800 ± 1380 | 14700 ± 1240 |
| gamma isotopic | | | | | | |
| Cesium 134 | < 19.6 | < 16.2 | < 10.9 | < 13.2 | < 20.9 | < 11.2 |
| Cesium 137 | 352 ± 33 | 168 ± 17.5 | 58.9 ± 9.56 | 93.8 ± 14 | 75.2 ± 14.3 | 293 ± 24.6 |
| Cobalt 58 | < 25.8 | < 18.8 | < 15.1 | < 19.5 | < 29.1 | < 19 |
| Cobalt 60 | < 22.2 | < 17.4 | < 11.6 | < 16.7 | < 25.9 | < 12.6 |
| Iron 59 | < 71 | < 49.2 | < 38.4 | < 56.8 | < 82.3 | < 50.8 |
| Manganese 54 | < 21.6 | < 16.3 | < 13.7 | < 18.5 | < 27.9 | < 15.6 |
| Niobium 95 | < 43.6 | < 27.9 | < 28.7 | < 37.4 | < 50.8 | < 32.3 |
| Potassium 40 | 11400 ± 1890 | 13700 ± 2210 | 12000 ± 1930 | 16300 ± 2640 | 15900 ± 2580 | 12400 ± 2010 |
| Zinc 65 | < 49.2 | < 36.3 | < 31 | < 42.4 | < 56.2 | < 34.8 |
| Zirconium 95 | < 55.3 | < 39.6 | < 33.8 | < 38.8 | < 60.7 | < 38.9 |
| Sample Location | PRI-1a | PRI-4b | PRI-5 | PRI-6a | PRI-8 | PRI-9 |
| Collection Start | 09/10/19 | 09/10/19 | 09/10/19 | 09/10/19 | 09/10/19 | 09/10/19 |
| Gross Alpha | 5160 ± 2980 | 9120 ± 3760 | 17000 ± 4000 | 14300 ± 4540 | 13100 ± 3580 | < 7270 |
| Gross Beta | 8170 ± 1240 | 13700 ± 1160 | 14000 ± 1210 | 14900 ± 1500 | 18500 ± 1370 | 11600 ± 1570 |
| gamma isotopic | | | | | | |
| Cesium 134 | < 12 | < 8.45 | < 10.5 | < 9.9 | < 7.2 | < 7.61 |
| Cesium 137 | 311 ± 21.7 | 152 ± 13.6 | 70.4 ± 7.97 | 95.3 ± 8.72 | 106 ± 8.73 | 159 ± 12.9 |
| Cobalt 58 | < 28.4 | < 24.6 | < 25.5 | < 27.5 | < 21 | < 23.5 |
| Cobalt 60 | < 11.7 | < 8.81 | < 10.3 | < 10.6 | < 7.36 | < 8.1 |
| Iron 59 | < 122 | < 119 | < 114 | < 129 | < 94.9 | < 108 |
| Manganese 54 | < 14.8 | < 12.6 | < 11.9 | < 12.5 | < 15.2 | < 10.9 |
| Niobium 95 | < 93.2 | < 159 | < 133 | < 97.4 | < 94.3 | < 141 |
| Potassium 40 | 12800 ± 2050 | 12500 ± 2010 | 12600 ± 2010 | 15500 ± 2470 | 15500 ± 2460 | 12300 ± 1960 |
| Zinc 65 | < 34.5 | < 28.8 | < 31.2 | < 31.9 | < 23.4 | < 28.2 |
| Zirconium 95 | < 76.2 | < 56.5 | < 57.7 | < 57.8 | < 50.1 | < 54.1 |

*a - not reported by lab

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

Radioisotopes other than those reported were not detected.

Appendices

Appendix A – Radionuclide Concentration Levels needing review by State Radiological Coordinator (SRC)

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

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

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

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

Appendix B – Sample Point Locations

The sample point locations.

| Sample Point | Location Description | Latitude or Y | Longitude or X |
|--------------|---|---------------|----------------|
| PRI-1a | Prescott; air site | 44.74481 | -92.79400 |
| PRI-1b | Prescott; harbor area | 44.74521 | -92.79915 |
| PRI-1vs | Prescott; air site - vegetation and soil | 44.74363 | -92.79210 |
| PRI-2 | Trenton | 44.60299 | -92.56593 |
| PRI-4a | Bay City Park | 44.57934 | -92.45615 |
| PRI-4b | Bay City, Hwy 35 | 44.58487 | -92.45910 |
| PRI-4sw | Bay City, Hwy 35 soil and surface water | 44.57916 | -92.45664 |
| PRI-5a | Hager City - Post Office | 44.60002 | -92.53955 |
| PRI-5b | Hager City - vegetation and soil | 44.60099 | -92.53809 |
| PRI-6a | Diamond Bluff; Pierce County highway shed | 44.64623 | -92.61479 |
| PRI-6b | Diamond Bluff cemetery - well water | 44.64128 | -92.61552 |
| PRI-6c | Diamond Bluff; Pierce County highway shed - vegetation and soil | 44.64600 | -92.61524 |
| PRI-8 | Station 2 – farm | 44.66949 | -92.61880 |
| PRI-9a | Bay City substation | 44.59433 | -92.50426 |
| PRI-9b | Bay City substation - vegetation and soil | 44.59435 | -92.50451 |
| PRI-16 | Dairy Farm 356-283 replaced Dairy Farm 356-177 starting August 2018 | 44.750660 | -92.437912 |
| PRI-17 | Dairy Farm 356-690 Ellsworth | 44.71331 | -92.55019 |
| PRI-18 | Dairy Farm 356-323 Ellsworth | 44.70270 | -92.53849 |
| PRI-T30 | Diamond Bluff - Naughty Hog | 44.64892 | -92.62931 |
| PRI-T31 | Diamond Bluff cemetery | 44.64116 | -92.61579 |
| PRI-T32 | 290th Avenue | 44.63014 | -92.59893 |
| PRI-T33 | Hwy 35, Thomas Killian residence | 44.68485 | -92.64411 |
| PRI-T34 | Cty K and 840th Street | 44.66767 | -92.56297 |
| PRI-T35 | Cty VV and 790th Street | 44.62336 | -92.52780 |
| PRI-T36 | Hager City | 44.60021 | -92.53953 |
| PRI-T37 | Ellsworth | 44.72943 | -92.48681 |
| PRI-T38 | Bay City, Hwy 35 | 44.58494 | -92.45959 |
| PRI-T39 | Prescott; air site | 44.74500 | -92.79431 |