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PNP 2012-047

May 14, 2012

10 CFR 50, Appendix I
Technical Specification 5.6.2

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: 2011 Radiological Environmental Operating Report

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

Dear Sir or Madam:

Entergy Nuclear Operations, Inc. is submitting the enclosed Radiological Environmental Operating Report for the Palisades Nuclear Plant. This report was prepared in accordance with the requirements of 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, IV.C, and Technical Specification 5.6.2. The period covered by the enclosed report is January 1, 2011, through December 31, 2011.

This letter contains no new commitments and no revision to existing commitments.

Sincerely,

A handwritten signature in black ink, appearing to read "OWG", with a long horizontal line extending to the right.

OWG/bed

Enclosure: Radiological Environmental Operating Report, January 1 2011, Through
December 31, 2011

CC Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC

ENCLOSURE

RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT JANUARY 1, 2011, THROUGH DECEMBER 31, 2011

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ENCLOSURE

RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT JANUARY 1, 2011, THROUGH DECEMBER 31, 2011

I. INTRODUCTION

The Radiological Environmental Operating Report provides a summary and data interpretation of the Palisades Nuclear Plant (PNP) Radiological Environmental Monitoring Program (REMP) as conducted during the 2011 reporting period. This report was prepared in accordance with the requirements of 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, IV.C, and Technical Specification 5.6.2.

II. NON-ROUTINE REPORTS

No reportable events occurred during this reporting period.

III. DISCUSSION AND INTERPRETATION OF RESULTS

A. Air Samples

There were 260 air samples collected and analyzed for gross beta and I-131. Air iodine/particulate samples are collected weekly from five air-sampling locations. Air is metered into the sampling unit at an approximate one cubic foot per minute flow rate through a 47-mm air filter (air particulate) and an air iodine cartridge. Both filters are in-line with each other and housed within the same filter holder. Weekly samples were sent to GEL Laboratories for analysis.

Analysis of the airborne particulate sample data, between the four near-site indicator locations and the control location, demonstrated no statistical difference. The average concentration of gross beta for both indicator and control locations were 0.050 pCi/m^3 and 0.046 pCi/m^3 , respectively. The indicator location 5PR had the highest average concentration of 0.061 pCi/m^3 .

There were 11 positive indications of I-131 during the report period. These occurred between 3/19/11 and 4/8/11 on various air stations, including the control. The average concentration of I-131 for both indicator and control locations were 0.066 pCi/m^3 and 0.122 pCi/m^3 , respectively. The indicator location 4JS had the highest average concentration of 0.095 pCi/m^3 . The reporting level for I-131 is 0.9 pCi/m^3 . These were attributed to the Fukushima Daiichi event that occurred in Japan on March 11, 2011. This is supported by the fact that the control values were higher than the four indicator station results. This is further supported by the fact that the DC Cook REMF air stations and milk sampling program also detected I-131 during this time frame. All other

I-131 activity results were below the minimum detectable concentration (MDC) levels.

During 2011, effluent samples obtained from PNP REMP air stations, including control, identified detectable concentrations of I-131 that could be related to Fukushima Daiichi event from March 11, 2011, through approximately March 20, 2011. The concentrations detected were above levels historically observed for the plant's operational status during that period. Concentrations returned to those historically observed levels after April 9, 2011. Given the events of March 2011 at the Fukushima Daiichi plant in Japan, and the subsequent trans-Pacific transportation, it is reasonably concluded that the slightly elevated concentrations detected at the PNP REMP air stations are attributed to the Fukushima Daiichi plant releases.

B. Lake Water (Surface Water)

Palisades' Lake In (Indicator) and Ludington (Control) lake water samples were collected daily and combined into monthly composite samples. One gallon each of Palisades Lake-In and Ludington Lake-in composites were sent to GEL Laboratories for monthly analysis for gross beta and tritium. No treatment of the water samples with preservative is required.

No statistical difference was found between the indicator and control location samples and no PNP Offsite Dose Calculation Manual (ODCM) Appendix A, reporting limits were exceeded. The gross beta mean values for the indicator and control locations were 5.42 pCi/L and 4.43 pCi/L, respectively. Tritium was not detected in any indicator or control samples. There is no ODCM reporting criterion for gross beta; if gross beta activity is >10 pCi/L, then a gamma analysis is performed. Sample results remain slightly higher since 2008 due to a change in vendor performing analyses and how positive results are determined when each activity is compared to its listed minimum detectable concentration.

C. Drinking Water

Palisades' Domestic Water and South Haven Municipal Raw Water (Indicators) and Ludington (Control) water samples were collected daily and combined into monthly composite samples. One gallon each of these composites were sent to GEL Laboratories for analysis and analyzed for gross beta and tritium. No treatment of the water samples with preservative is required.

One South Haven Raw Water sample and two Ludington Control samples had gross beta concentration greater than MDC. The average gross beta concentrations for Ludington Control sample was 4.43 pCi/L and the

South Haven Raw Water concentration was 3.75 pCi/L. Tritium was not detected in any indicator or control sample. There is no ODCM reporting level for gross beta; if gross beta activity is >10 pCi/L, then a gamma analysis is performed. Sample results remain slightly higher since 2008 due to a change in vendor performing analyses and how positive results are determined when each activity is compared to its listed minimum detectable concentration.

South Haven Raw Water sample from October experienced sample container breach during transit and the entire sample was lost. CR-PLP-2012-2964 documents this loss of sample.

D. Milk

There are no dairy farms meeting the sampling criteria of being within eight kilometers (km) of PNP. Because of a lack of dairy farms, PNP analyzes broad leaf vegetation samples as a substitute for milk sampling.

E. Thermoluminescent Dosimeters (TLD) - Gamma Dose

Environmental gamma doses are measured quarterly by placement of TLDs at designated locations. Sensitivity for the TLDs is 3 millirem, with a linear response of 1 millirem to 50 rem.

The PNP direct radiation monitoring program consists of TLDs placed at 23 locations. There are ten inner ring TLDs, one on-site TLD, nine outer ring TLDs and three control TLDs located in Grand Rapids, Kalamazoo and Dowagiac.

Ninety-two TLDs were collected and analyzed during 2011. The on-site TLD is included with the inner ring (site boundary) TLDs for evaluating any dose effect that could be attributed to PNP.

The TLD data evaluations were performed by comparing the inner ring TLDs and the outer ring TLDs against the control TLDs.

The quarterly average gamma readings in mrem were:

Inner Ring	9.7
Outer Ring	11.4
Control	11.5

The highest average reading was observed at outer ring location number 2 with a value of 14.5 mrem and a maximum reading of 16.41 mrem. The average control dose, 11.5 mrem, plus 2 standard deviations was 13.9 mrem. No Inner Ring reading exceeded this amount. This

demonstrates that there was no direct radiation effect due to PNP operations.

Note: TLD readings are lower in 2011 than in the previous two years. This is due to the TLDs being analyzed by a different vendor who subtracts transit dose. However, it should be noted that the critical aspect of environmental TLD monitoring is the comparison between indicator and control TLD dose in the same monitoring period – more so than the comparison from one year to the next.

F. Crops

Two principal area crops, apples and blueberries, were collected. Approximately 1 kg of sample is placed in a plastic bag for shipment to the vendor for analysis. No special treatment of the samples with a preservative is necessary.

Blueberries and apples were collected at indicator station 4-JS (3.5 miles SE). There was no activity detected in the crop samples except for naturally occurring K-40 in both berry and apple samples.

G. Sediment

Sediment samples are collected semi-annually from a location ½ mile north of the plant along the waterline. No treatment of the samples with a preservative is necessary prior to shipment to the vendor for analysis.

There was no activity detected in the sediment samples except for naturally occurring K-40, Bi-214, Pb-212, and Pb-214. Note: Historical pre-operational environmental data for sediment samples could not be located.

H. Fish

Fish samples are collected semi-annually. Samples consist of species of commercially and/or recreational important species near the plant discharge area. Control samples are obtained in an area not influenced by plant discharge. Each one-liter quantity of fish sample is frozen for preservation for shipment to GEL Laboratories for analysis.

Four fish samples were collected in the vicinity of PNP and one control sample was collected from Ludington Pumped Storage Facility. Cs-137 was detected in four PNP samples with an average concentration of 13.9 pCi/kg, and in three Ludington samples with an average concentration of 23.0 pCi/kg. The reporting level for Cs-137 in fish is 2000 pCi/kg. The control sample that was obtained in 2011 was not

shipped to the vendor for analysis in a timely manner. This allowed for the sample to spoil and it was not shipped or analyzed. 2010 control data was used in lieu of current control data. This is documented in CR-PLP-2012-2785.

I. Broad Leaf Vegetation

Various different kinds of broad leaf vegetation in the South and SSE sectors along the site boundary were sampled monthly during the growing season. Similar broad leaf vegetation samples were obtained in the NE sector approximately 9 to 18 miles distant from the plant. Sample sizes are 1 kg per sample – nine samples total per month. Samples were sent to GEL Laboratories for gamma isotopic and Iodine-131 analyses. No treatment of the samples with a preservative is necessary.

This sampling was completed for the months of June through September. Thirty samples were obtained. Cs-137 was detected in 9 of the 20 indicator samples. The average Cs-137 concentration was 52.2 pCi/kg. The reporting level for Cs-137 is 2000 pCi/kg. Cs-137 was detected in 1 of the 10 control samples. The average Cs-137 concentration was 13.6 pCi/kg. The reporting level for Cs-137 is 2000 pCi/kg.

The following documentation is provided from Condition Report CR-PLP-2011-2205, corrective action 24, evaluating Cs-137 concentration in the environment

Twenty samples were obtained, 10 of broadleaf, and 10 of sediment/soil. Sediment samples were obtained from the same location as the leaves. These samples were obtained approximately 10 to 40 miles from PNP in several different sectors. The leaves of oak and/or maples were targeted in areas where the trees looked to be in the 40 to 50 year old range. The sediment samples were obtained from the topsoil (top 0.5 to 1 inch of soil). GPS coordinates were obtained at the sample locations. The following provides this information:

- 1 10/31/11 at 1335 predominantly fallen and attached maple leaves, GPS coordinates are 42.41662N and 86.16771W.
- 2 10/31/11 at 1400 predominantly fallen and attached oak and maple leaves, GPS coordinates are 42.39303N and 86.01734W.
- 3 10/31/11 at 1430 predominantly fallen maple and oak leaves, GPS coordinates are 42.36990N and 85.70859W.
- 4 10/31/11 at 1600 predominately fallen and attached maple leaves, GPS coordinates are 42.14949N and 86.26147W.
- 5 10/31/11 at 1630 predominately fallen maple and oak leaves, GPS coordinates are 42.00874N and 86.20403W.

- 6 10/31/11 at 1700 predominately fallen maple and oak leaves, GPS coordinates are 42.06865N and 86.15239W.
- 7 10/31/11 at 1745 predominantly fallen oak and maple leaves, GPS coordinates are 42.01193N and 85.96369W.
- 8 10/31/11 at 1700 predominantly fallen oak and maple leaves, GPS coordinates are 42.48382N and 86.04583W.
- 9 10/31/11 at 1805 predominantly fallen oak and maple leaves, GPS coordinates are 42.62994N and 85.89885W.
- 10 10/31/11 at 1825 predominantly fallen oak and maple leaves, GPS coordinates are 42.58925N and 85.99632W.

These samples were submitted to GEL Laboratories for gamma spectroscopy analysis. Natural radionuclides Be-7, K-40, Tl-208, Pb-210, Pb-212, Pb-214, Bi-214, and Ac-228 were identified in various samples. Natural radionuclide results are not evaluated for this action.

The positively identified radionuclides and concentration follow:

1. Sediment, Cs-137, 568 pCi/kg. Broadleaf, none detected.
2. Sediment, Cs-137, 216 pCi/kg. Broadleaf, Cs-137 23.8 pCi/kg.
3. Sediment, Cs-137, 65.5 pCi/kg. Broadleaf, none detected.
4. Sediment, Cs-137, 124 pCi/kg. Broadleaf, none detected.
5. Sediment, Cs-137, 123 pCi/kg. Broadleaf, none detected.
6. Sediment, none detected. Broadleaf, none detected.
7. Sediment, Cs-137, 174 pCi/kg. Broadleaf, none detected.
8. Sediment, Cs-137, 492 pCi/kg. Broadleaf, Cs-137, 13.9 pCi/kg.
9. Sediment, Cs-137, 394 pCi/kg. Broadleaf, Cs-137, 296 pCi/kg.
10. Sediment, Cs-137, 506 pCi/kg. Broadleaf, Cs-137, 107 pCi/kg.

In accordance with National Council on Radiation Protection and Measurements (NCRP) Releases Report No. 154, "Cs-137 in the Environment: Radioecology and Approaches to Assessment and Management," the primary source of Cs-137 in the biosphere is atmospheric nuclear weapons testing by the United States and the former Soviet Union from the 1940s to the 1960s. Of the roughly $2.73\text{E}7$ Curies of Cs-137 released to the biosphere, ~90% ($2.45\text{E}7$ Curies) was produced by atmospheric testing. Approximately 6% ($1.64\text{E}6$ Curies) was produced by the Chernobyl accident and roughly 4% ($1.09\text{E}6$ Curies) by nuclear fuel reprocessing facilities. Because of the chemical properties of cesium, it is readily transported through the environment and food chain. When in solution it can be efficiently taken up by plants and assimilated by animals because of its chemical similarity to the essential nutrient, potassium.

DC Cook Nuclear Plant, which is located approximately 25 miles to the south of PNP, conducted a Cs-137 soil study and determined that an

“average” background for Cs-137 was 171 pCi/kg in soil. Due to the fact that the Lower Limit of Detection (LLD) for sediment (180 pCi/kg) is larger than the LLD for food (80 pCi/kg) it is conceivable that broadleaf could be positive even while not having any indication from sediment. Positive indication of Cs-137 in broadleaf samples has occurred at DC Cook Nuclear Plant also. It has been attributed to uptake by the plant and deposition on the leaf surface.

Table 5.12 to NCRP Releases Report No. 154 provides a list of crops, soil types, and concentration ratios. This table indicates that there can be substantial differences in these ratios due to soil types. Since local soils typically have a combination of these, the uptake can vary, as is evidenced by the sample results provided here. The ratios of the sample data supplied here vary from 0.03 to 0.75. This could result from a variety of items ranging from topsoil movement through meteorological conditions, or man interfacing from as far back as 30 years ago, which could be unidentifiable today (e.g. fill dirt disposal).

In conclusion, there is ample documented evidence that Cs-137 exists in the environment from activities 25 to 50 plus years ago. Cs-137 has a 30.17 year half life so there is still plenty of the originally estimated $2.45E7$ Curies left in the biosphere. Cesium is readily transported through the environment due to its chemical properties. When in solution (during rainfall events) it can be efficiently taken up by plants. The evidence presented here documents the fact that there is a fairly wide ranging span of Cs-137 concentration in the environment that is far enough away from the site to not have been deposited there from plant effluents.

J. Non-Routine Samples

Six monthly samples were taken from the closest commercial well water at the seasonal Palisades Park housing subdivision south of PNP. Another six samples were taken from the community well, of which there are two cross-tied sources, at the seasonal Palisades Park facility also. Tritium and beta results were less than minimum detectable activity for all samples obtained.

K. Gaseous and Liquid Radwaste Effluent Composite Samples

Gaseous and liquid radwaste effluent composite samples are collected and analyzed on site and by GEL Laboratories. No special sample treatment with a preservative is required prior to laboratory analysis. The monthly liquid effluent composite sample is produced from samples collected from each batch release. The gaseous radwaste effluent weekly composite sample results are based on analyzing weekly stack gas filters.

Although not a direct reporting component in the PNP Annual Radiological Environmental Operating Report, results of the gaseous and liquid monthly radwaste effluent composite samples are evaluated against overall environmental trending data. This evaluation is the basis for determining isotopic dispersion and deposition patterns within the surrounding environs of PNP. All gaseous and liquid effluent results are compared to the PNP Offsite Dose Calculation Manual (ODCM), Appendix A, reporting levels.

IV. ASSESSMENT OF PALISADES OPERATION ENVIRONMENTAL IMPACT

In reviewing the 2011 PNP radiological environmental monitoring data, and comparing it to previous operational and pre-operational data, all trending parameters continue to indicate that the operation of PNP has minimal environmental impact. Most isotopic activity is at environmental background levels. Evidence of an overall environmental isotopic buildup (attributable to plant effluents) remains negligible as well. The positive Cs-137 results detected in sediment, broadleaf, and fish samples are attributed to atmospheric weapons testing and Chernobyl accident source term.

Palisades Nuclear Plant, Van Buren County, MI Docket 50-255

Annual Radiological Environmental Operating Report

January 1, 2011 to December 31, 2011

Sampling and Analysis Summary

Table 10.4-1

Medium	Collection Description	Location	Number of Samples Collected	Type of Analysis	Frequency of Analysis
Air	Continuous at appx 1 cfm	Stations 4, 5, 8, 9 and 10	260	Gross Beta, I-131	Weekly
Lake Water	1 gallon composite	Lake Intake	12	Gross Beta, Tritium	Monthly
Lake Water - Control	1 gallon composite	Ludington Lake In	12	Gross Beta, Tritium	Monthly
Drinking Water	1 gallon composite	South Haven Municipal (treated) and South Haven Raw	23	Gross Beta, Tritium	Monthly
TLD	Continuous	Inner Ring, Outer Ring, Controls	92	Gamma dose	Quarterly
Food Products	1 kg grab	4-JS, 3.5 miles SE	2	Gamma isotopic and I-131	At time of harvest
Sediment	1 L grab	Discharge 1/2 mile north of Palisades	2	Gamma isotopic	Semiannually
Fish	1 L grab	Discharge and Control	4	Gamma isotopic	Semiannually
Broad leaf Vegetation	1 kg grab	Plant boundary – S and SSE sectors, Control 9 to 18 miles NNE of plant	30	Gamma isotopic and I-131	Monthly during growing season

Environmental Radiological Monitoring Program Summary

Sample Data Summary
Table 10.4-2

Name of Facility	Palisades Nuclear Plant	Docket No	50-255
Location of Facility (County, State)	Van Buren, Michigan	Reporting Period	Jan 1, 2011 to Dec 31, 2011

Medium or Pathway Sampled (Unit of Measure)	Type/Total Number of Analyses Performed	Lower Limit of Detection* (MDC)	All Indicator Locations Mean (f) ^b Range ^b	Greatest Mean Name Distance & Direction	Greatest Mean (f) ^b Range ^b	Control Locations Mean (f) ^b Range ^b	Number of Reportable Occurrences
Air (pCi/m ³)	I-131 / 260	0.07	0.0659 (9/208) 0.0464 - 0.112	4JS 3.9 mi SE	0.0949 (2/52) 0.0778 - 0.112	0.122 (2/52) 0.121 - 0.123	0
	Gross beta / 260	0.01	0.050 (208/208) 0.023 - 0.125	5PR 5.8 mi ESE	0.061 (52/52) 0.031 - 0.125	0.046 (52/52) 0.025 - 0.100	0
Lake Water (pCi/L)	Gross beta / 24	4.0	5.42 (4/12) 3.51 - 8.30	Lake In Palisades	5.42 (4/12) 3.51 - 8.30	4.43 (2/12) 3.78 - 5.07	0
	Tritium / 24	2000	< MDC (0/12)	NA	< MDC (0/24)	< MDC (0/12)	0
Drinking Water (pCi/L)	Gross beta / 35	4.0	3.75 (1/23) 3.75	South Haven raw water 5.5 mi NNE	3.75 (1/11) 3.75	4.43 (2/12) 3.78 - 5.07	0
	Tritium / 35	2000	< MDC (0/23)	NA	< MDC (0/35)	< MDC (0/12)	0

Environmental Radiological Monitoring Program Summary

Sample Data Summary
Table 10.4-2

Medium or Pathway Sampled (Unit of Measure)	Type/Total Number of Analyses Performed	Lower Limit of Detection ^a (MDC)	All Indicator Locations Mean (f) ^b Range ^b	Greatest Mean Name Distance & Direction	Greatest Mean (f) ^b Range ^b	Control Locations Mean (f) ^b Range ^b	Number of Reportable Occurrences
Inner Ring TLD (Gamma mR)	Gamma Dose / 56	Sensitivity of 3 per vendor	9.7 (44/44) 7.31 - 12.4	Station # 1 Palisades	10.7 (4/4) 9.4 - 12.4	11.5 (12/12) 10.1 - 13.7	0
Outer Ring (Gamma mR)	Gamma Dose / 48	Sensitivity of 3 per vendor	11.4 (36/36) 8.6 - 16.4	Station # 2 5.6 miles S	14.5 (4/4) 12.6 - 16.4	11.5 (12/12) 10.1 - 13.7	0
Food Crops (pCi/kg wet)	I-131 / 2	60	< MDC (0/2)	NA	< MDC (0/2)	Control sample not required	0
	Cs-134 / 2	60	< MDC (0/2)	NA	< MDC (0/2)	Control sample not required	0
	Cs-137 / 2	80	< MDC (0/2)	NA	< MDC (0/2)	Control sample not required	0

Environmental Radiological Monitoring Program Summary

Greatest Mean Sampling Location

Table 10.4-3

Medium or Pathway Sampled (Unit of Measure)	Type/Total Number of Analyses Performed	Lower Limit of Detection ^a (MDC)	All Indicator Locations Mean (f) ^b Range ^b	Greatest Mean Name Distance & Direction	Greatest Mean (f) ^b Range ^b	Control Locations Mean (f) ^b Range ^b	Number of Reportable Occurrences
Sediment (pCi/kg dry)	Cs-134 / 2	150	< MDC (0/2)	NA	< MDC (0/2)	Control sample not required	0
	Cs-137 / 2	180	< MDC (0/2)	NA	< MDC (0/2)	Control sample not required	0
Fish (pCi/kg wet)	Mn-54 / 4	130	< MDC (0/4)	NA	< MDC (0/9)	< MDC * (0/4)	0
	Fe-59 / 4	260	< MDC (0/4)	NA	< MDC (0/9)	< MDC * (0/4)	0
	Co-58 / 4	130	< MDC (0/4)	NA	< MDC (0/9)	< MDC * (0/4)	0
	Co-60 / 4	130	< MDC (0/4)	NA	< MDC (0/9)	< MDC * (0/4)	0
	Zn-65 / 4	260	< MDC (0/4)	NA	< MDC (0/9)	< MDC * (0/4)	0
	Cs-134 / 4	130	< MDC (0/4)	NA	< MDC (0/9)	< MDC * (0/4)	0
	Cs-137 / 4	150	13.2 (4/4) 5.6 – 20.2	Palisades	20.2 (4/4) 20.2	23.0 * (3/4) 6.9 – 33.8	0
Broad Leaf Vegetation (pCi/kg wet)	I-131 / 30	60	< MDC (0/20)	NA	< MDC (0/20)	< MDC (0/10)	0
	Cs-134 / 30	60	< MDC (0/20)	NA	< MDC (0/20)	< MDC (0/10)	0
	Cs-137 / 30	80	52.2 (9/20) 7.8 – 467.0	BV23 0.43 miles S	115 (2/3) 71.9 – 223	13.6 (1/10) 13.6	0

^a Nominal Lower Limit of Detection (LLD) as defined in table notation c of ODCM Appendix A Table E-3

^b Mean and range based on detectable measurements only.

^f Fraction of detectable measurements at specific locations is indicated in parenthesis

* 2010 data used for control, see CR-PLP-2012-2785

Greatest Mean Sampling Location
January 1, 2011 to December 31, 2011

Medium or Pathway Sampled (unit of measurement)	Type of Analysis	Location	High	Low	Mean
Air (pCi/m3)	I-131	4JS	0.112	0.0778	0.0949
	Gross Beta	5PR	0.125	0.031	0.061
Lake Water (pCi/L)	Gross Beta	Lake In - Palisades	8.30	3.51	5.42
	Tritium	NA	< MDC	< MDC	< MDC
Drinking Water (pCi/L)	Gross Beta	South Haven Raw	3.75	3.75	3.75
	Tritium	NA	< MDC	< MDC	< MDC
Inner Ring TLD (gamma mR)	Quarterly	#1 (Palisades)	12.4	9.4	10.7
Outer Ring TLD (gamma mR)	Quarterly	# 2 5.6 miles S	16.4	12.6	14.5
Crops (pCi/kg wet)	I-131	NA	< MDC	< MDC	< MDC
	Other Gamma	NA	< MDC	< MDC	< MDC
Sediment (pCi/kg dry)	Gamma Emitters	NA	< MDC	< MDC	< MDC
Fish (pCi/gm wet)	Gamma Emitters	Palisades	20.2	20.2	20.2
Broad leaf vegetation (pCi/kg wet)	Gamma Emitters	Site Boundary South	223	71.9	115

**ATTACHMENT 1
SAMPLE COLLECTION ANOMOLIES**

Sample Affected	Location	Date	Problem	Evaluation
Air Sample	Station 9TP	8/8/11	Power outage	Power restored after storm (CR-PLP-2011-3893)
Air Sample	Station 4JS	12/20/11	Pump found not running	Filters were analyzed. Volume of air was 48.14 m ³ . Required LLD were not met. Pump replaced. (CR-PLP-2011-6977)
Drinking Water sample	South Haven Raw Water	Oct 11	Sample lost during transit	Oct 11 monthly composite sample from South Haven had sample container breached during transit, sample lost. (CR-PLP-2012-2964)
Fish samples	Control	2011	Sample was not analyzed	One control sample obtained, but not shipped to vendor in timely manner and subsequently spoiled and was discarded. (CR-PLP-2012-2785)
Land Use Census	Palisades	19 Oct 11	Untimely documentation	LUC performed during Oct 11, but not documented until 4/23/12. (CR-PLP-2012-3197)

ATTACHMENT 2 2011 LAND USE CENSUS REPORT

The attached tables are the results of the Palisades Land Use Census conducted on October 19, 2011. The first table references the distance from Palisades Nuclear Plant (PNP) to the nearest residence, garden (greater than 500 square feet), beef cattle, dairy cattle and goat, per meteorological sector. The next table identifies the locations of the nearest residence, garden, beef/dairy cattle and goats within a five mile radius of PNP, per meteorological sector. The last table lists the critical receptor locations used to calculate offsite doses by the GASPAR computer program.

Closest Receptor by Sector

Sector	Residence	Garden	Beef Cattle	Dairy Cow	Goat
NNE	1.68	1.75	> 5	> 5	> 5
NE	1.14	1.67	> 5	> 5	> 5
ENE	1.19	>5	> 5	> 5	> 5
E	1.67	2.80	> 5	> 5	2.62
ESE	0.99	1.78	> 5	> 5	> 5
SE	0.90	1.01	> 5	> 5	> 5
SSE	0.80	2.28	> 5	> 5	> 5
S	0.72	1.39	> 5	> 5	> 5
SSW	0.49	4.82	> 5	> 5	> 5

(Distance is in miles)

Locations

Sector	Location Description	Item	Distance from Plant (miles)
NNE	22514 Oak St	Residence	1.68
	SW corner of 20 th and O fire lane	Garden	1.75
NE	Ruggles Road, State Park Manager	Residence	1.14
	21175 Blue Star Hwy	Garden	1.67
ENE	77198 24 th Avenue	Residence	1.19
E	25112 76 th Street	Residence.	1.67
	73689 28 th Avenue	Garden	2.8
	Corner of M-140 and 24 th Ave	Goat	2.62
ESE	77555 28 th Ave	Residence	0.99
	28594 76 th Street	Garden	1.78
SE	28563 29 th Ave	Residence	0.9
	30423 77 ½ Street	Garden	1.01
SSE	78983 Ravine Way	Residence	0.8
	76890 34 th Avenue	Garden	2.28
S	Ravine Way, Palisades Park	Residence	0.72
	31881 Blue Star Hwy	Garden	1.39
SSW	Shorewood Walk, Palisades Park	Residence	0.49
	Corner of 82 nd and Blue Star Hwy	Garden	4.82

Critical Receptors

Sector	Item	Distance (miles)	X/Q (sec/m ³)	D/Q (1/m ²)
SSE	Site Boundary	0.48	2.41E-6	2.07E-8
SSE	Residence	0.80	1.11E-6	8.93E-9
SE	Garden	1.01	6.86E-7	5.91E-9
E	Goat	2.62	1.15E-7	6.73E-10

ATTACHMENT 3

**CHEMISTRY PROCEDURE CH 6.10
"RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM"**

Procedure No CH 6.10
Revision 4
Effective Date 2/2/10

PALISADES NUCLEAR PLANT
HEALTH PHYSICS PROCEDURE

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Approved: JBBurnett / 2/1/10
Procedure Sponsor Date

Process Applicability Exclusion ☒

New Procedure/Revision Summary:

Specific Changes

Revision 4 - DRN-10-00168

Added an additional map showing Control sample locations.

Added requirement that air sample pumps should be changed out every three years.

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

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TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

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- Attachment 1, "Environmental Sample Collection Schedule"
 - Attachment 2, "REMP Sample Locations"
 - Attachment 3, "Sample Shipment Identification"
 - Attachment 4, "Sample Packaging and Shipment"
 - Attachment 5, "Environmental Air Sample Data Sheet"
 - Attachment 6, "REMP Sample Collection Checklist"
 - Attachment 7, "REMP Analytical Requirements"
 - Attachment 8, "Environmental Monitoring Locations"
-

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

REFERENCE USE
<ul style="list-style-type: none">• Procedure and Procedure Precautions and Limitations are at the work location for reference.• Review and understand segments before performing any steps.• Signoff steps are completed, when included, before starting the next step.• Place keep in accordance with EN-HU-102, "Human Performance Tools."• Review the Procedure to verify segments have been completed.

1.0 PURPOSE

This procedure provides instructions for collection of environmental samples in support of the Radiological Environmental Monitoring Program (REMP) as required by the Offsite Dose Calculation Manual (ODCM). In addition to the ODCM required samples, additional required sampling is listed.

2.0 REFERENCES

2.1 SOURCE DOCUMENTS

- 2.1.1 Reg Guide 4.15(7)
- 2.1.2 10CFR50, Appendix I
- 2.1.3 Offsite Dose Calculation Manual (ODCM)
- 2.1.4 Branch Technical Position (Revision 4, 1979), "Radiological Portion of the Environmental Monitoring Program"
- 2.1.5 NRC IE Bulletin 80-10, "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity to Environment"

2.2 REFERENCE DOCUMENTS

- 2.2.1 Palisades ODCM, Appendix A, Sections III.J, IV.C, and Tables E-1 and E-2
- 2.2.2 Entergy Procedure EN-AD-103, "Document Control and Records Management Programs"
- 2.2.3 Entergy Procedure EN-HU-102, "Human Performance Tools"

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

2.3 COMMITMENTS

2.3.1 CMT 022011097, IE Bulletin 80-10 Response - "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity to Environment"

2.3.2 CMT 032011144, IE Bulletin 80-10 Response - "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity to Environment"

3.0 PREREQUISITES

None

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Any revisions to this procedure shall be reviewed against Palisades ODCM Specifications to verify compliance to all requirements.

4.2 Deviations from the required sampling schedule shall be documented in the Annual Radiological Environmental Operating Report.

4.3 Every effort shall be made to complete corrective action on malfunctioning sampling equipment prior to the end of the next sampling period.

4.4 If it is not possible to obtain the required samples, suitable alternative media and locations shall be substituted within 30 days.

4.5 Samples shall be collected, prepared, and shipped for analysis in a timely manner to ensure detection requirements are met. Other specific handling precautions for sample media are indicated in Section 5.0 as required.

4.6 Any deviation in the Radiological Environmental Monitoring Program including missing samples, unusual analytical results, elevated LLDs, etc, shall be investigated, evaluated, corrected, and documented.

4.7 If an air sampling unit is discovered not operating, attempt to find the cause and repair. If this cannot be done, replace applicable component and document on air sample collection data sheet.

4.8 Calibrate airflow meters annually.

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

- 4.9 Change out airflow meters prior to the expiration of calibration dates.
- 4.10 Change out air sample pumps every three years.
- 4.11 Ensure trees and bushes in the vicinity of air sampler locations are removed, along with any branches extending over the top of the sampler. The goal is to keep every station away from the drip line (with the exception of station 9, which has an existing canopy 50 feet above the station).
- 4.12 In the event that the Radiological Environmental Monitoring Programs sampling are not substantially conducted as described in Palisades ODCM Appendix A, Specification III.J, or an unusual or important event occurs from Plant operation that causes a significant environmental impact or affects a potential environmental impact, a report shall be submitted to the NRC within 30 days.

5.0 PROCEDURE

REFERENCE USE
<ul style="list-style-type: none">• Procedure and Procedure Precautions and Limitations are at the work location for reference.• Review and understand segments before performing any steps.• Signoff steps are completed, when included, before starting the next step.• Place keep in accordance with EN-HU-102, "Human Performance Tools."• Review the Procedure to verify segments have been completed.

5.1 LAKE-IN WATER SAMPLE COLLECTION – DAILY
CMT 032011144

- 5.1.1 Fill a 500 ml sample bottle from water downstream of "bio-box" located in the screen house.
- 5.1.2 Add the sample to the composite container (carboy).
- 5.1.3 At end of the month obtain a 1-gallon sample from carboy.
- 5.1.4 Package and ship sample per Attachment 4.
-

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

5.2 DRINKING WATER SAMPLE COLLECTION – DAILY

- 5.2.1 Obtain a 500 ml sample from any potable water sink.
- 5.2.2 Add the sample to the monthly sample container (carboy).
- 5.2.3 At end of the month obtain a 1-gallon sample from carboy.
- 5.2.4 Package and ship sample per Attachment 4.

5.3 ENVIRONMENTAL AIR SAMPLE COLLECTION – WEEKLY

- 5.3.1 Open cover at air sample station.
 - 5.3.2 Determine "As Found Leakage" by blocking air flow and checking air flow meter for movement.
 - a. If no leakage, then mark N in As Found Leakage column on Air Sample Data Sheet.
 - b. If leakage is indicated, then mark Y in As Found Leakage column, determine cause and repair.
 - 5.3.3 Remove old sampler assembly.
 - 5.3.4 Remove protective cover from new sampler assembly and place on old sampler assembly.
 - 5.3.5 Install new sampler assembly.
 - 5.3.6 Determine "As Left Leakage" by blocking air flow and checking air flow meter for movement.
 - a. If no leakage, then mark N in As Left Leakage column.
 - b. If leakage is indicated, then determine cause and repair.
 - 5.3.7 Record the Flow Meter Cal Due Date, Removed Date, Removed Time, Removed Meter Reading (ft³) and Pump Replacement Date.
-
- 5.3.8 Close and latch the air sample station cover.
 - 5.3.9 Proceed to the next station and continue process.

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

- 5.3.10 After completing air sample change out, complete the following for each sampler assembly:
- a. Remove particulate filter and place in glassine envelope.
 - b. Place filter envelope and charcoal cartridge in labeled zip-lock bag
 - c. Clean out any residue or moisture buildup in sampler head.
 - d. Check condition of O-rings, replace if necessary.
- 5.3.11 Place new particulate filter (fuzzy side out) and charcoal cartridge in sampler assembly and screw on cap.
- 5.3.12 Place protective cover on sampler assembly.
- 5.3.13 Prepare new air sample packages for following week.
- 5.3.14 Transfer data to vendor Chain of Custody sample data sheet.
- a. If volume is less than 150 m³, then notify REMP/RETS analyst.
- 5.3.15 When control air sample is obtained, then package and ship samples per Attachment 4.

5.4 SOUTH HAVEN RAW WATER SAMPLE COLLECTION – MONTHLY

NOTE:	Water treatment plant personnel add approximately 125 ml of raw water per day to sample containers.
--------------	---

- 5.4.1 Prepare a 1-gallon container labeled "SHRAW," "PAL," month and year.
- 5.4.2 Drop off container at the South Haven Municipal Water Treatment Plant.
- 5.4.3 Pick up previous month's container.
- 5.4.4 Package and ship samples per Attachment 4.
-

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

5.5 BROADLEAF VEGETATION SAMPLE COLLECTION – MONTHLY

- 5.5.1 Obtain 1 kg (2.2 lbs) samples of three different kinds of broadleaf vegetation in both the South and SSE sectors.
- 5.5.2 Obtain 1 kg (2.2 lbs) samples of the similar broadleaf vegetation 15 – 30 km (9.3 to 18.6 miles) distant in the NNE sector.
- 5.5.3 Obtain samples monthly during growing season.
- 5.5.4 Package and ship samples per Attachment 4.

5.6 ENVIRONMENTAL TLD COLLECTION – QUARTERLY

- 5.6.1 Upon receipt of TLDs from the laboratory contractor, inventory all TLDs and place in lead cave.

NOTE:	Remove field TLDs from the lead cave only for delivery to their proper locations. All control TLDs remain in the lead cave throughout the entire exposure period.
--------------	---

- 5.6.2 Change-out TLDs at each sample location.
- 5.6.3 For any missing TLDs, then:
 - a. Search immediate area.
 - b. If lost TLD is found, collect it and perform standard change out procedure.
 - c. If lost TLD is not found, post the new TLD in proper location.
- 5.6.4 Store collected field TLDs in lead cave along with control TLDs until ready for mailing to laboratory contractor.
- 5.6.5 Package and ship samples per Attachment 4.

5.7 PLANT AIR SAMPLE COLLECTION – QUARTERLY

- 5.7.1 Obtain 1-liter air samples from Air Receiver Tanks T-8A, 8B and 8C.
CMT 0220011097

-
- 5.7.2 Count samples for 2000 seconds on MCA.

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

5.8 SEPTIC SYSTEM SAMPLE COLLECTION – QUARTERLY

- 5.8.1 Obtain a 1 liter liquid sample from sanitary system septic tank.
- 5.8.2 Count sample for 2000 seconds on MCA.
- 5.8.3 Package and ship samples per Attachment 4.

5.9 FISH SAMPLE COLLECTION – IN SEASON

- 5.9.1 Precautions
 - a. At least one individual in the collection party is required to have Michigan Department of Environmental Quality (MDEQ) Cultural and Scientific Fish Collectors Permit if gill net is used.
 - b. If logistical problems prevent use of a boat to set gill nets from the lake side of Palisades, then the nets can be set offshore from the site boundary (by wading). Notify Security prior to using offshore wading method for beach access.
 - 5.9.2 Notify district MDEQ Fisheries biologist prior to sample collection
 - 5.9.3 Collect samples twice during the season of greatest abundance (typically May through October) as follows:
 - a. Collect at least two species of commercially and/or recreationally important fish in the vicinity of the Plant discharge area and the same species in an area not influenced by the Plant discharge (eg, Ludington Pump Storage Plant). One liter of flesh should be collected for each species caught for analysis accuracy.
 - b. Normally fish will be collected first from the vicinity of the discharge, then the same species at Ludington control station.
 - 5.9.4 Label all containers with sample type, location, and date.
 - 5.9.5 Package and ship samples per Attachment 4.
-

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

5.10 SEDIMENT SAMPLE COLLECTION - SEMIANNUALLY

- 5.10.1 Collect a 1-liter sediment sample semiannually 1/2 mile north of discharge.
- 5.10.2 Label containers with sample type, location, and date.
- 5.10.3 Package and ship samples per Attachment 4.

5.11 FOOD PRODUCT SAMPLE COLLECTION – YEARLY

- 5.11.1 Obtain one sample each of approximately 1 kg each of blueberries and apples from the Arrellanos' store.
- 5.11.2 Label containers with sample type, location, and date.
- 5.11.3 Package and ship samples per Attachment 4.

5.12 MISCELLANEOUS SAMPLES

- 5.12.1 Ludington - Control Lake-In daily composite samples are collected daily and shipped to Palisades monthly.
- 5.12.2 Package and ship samples per Attachment 4.

5.13 MONTHLY SAMPLE COLLECTION VERIFICATION

- 5.13.1 Attachment 6, "REMP Sample Collection Checklist," may be used to track collection and shipment of Environmental Samples.
 - 5.13.2 Verify that the indicated number and type of samples required by the ODCM were collected.
 - a. Document any unusual collection conditions or missing samples.
 - 5.13.3 Verify that a minimum of 150 m³ of air sample volume was obtained to ensure that analytical Lower Limit of Detection (LLD) requirements are met.
 - a. Evaluate, correct and document any significant deviations.
-

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

- 5.13.4 Identify new locations for obtaining replacement samples and add them to the Radiological Environmental Monitoring Program (REMP) within thirty (30) days if milk or fresh leafy vegetable samples become unavailable from one or more of the sample locations. The specific locations from which samples were unavailable may then be deleted from the monitoring program. Identify the cause(s) of sample unavailability and list the new location(s) for obtaining replacement samples in the next Annual Radiological Environmental Operating Report.

5.14 REVIEW OF SAMPLE ANALYSIS RESULTS

- 5.14.1 The sample analysis results should be reviewed by the REMF/RETS Analyst upon receipt of the analyses from the laboratory contractor.
- 5.14.2 Compare the monthly analytical results to the appropriate ODCM requirements (Attachment 7) to verify the following:
- a. The required analyses were performed.
 - b. Any results exceeding the action level shall be checked against ODCM Specification reporting requirements.
 - c. LLD sensitivity levels were reached. If sample LLDs are not reached, evaluate and document contributing factors.
 - d. The action taken if either isotopic action levels and/or NRC reporting levels are exceeded.
 - e. Any specific types of evaluation required.
 - f. Any action related to unusual or missing sample results.
-

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

5.15 SPECIAL REPORT

5.15.1 Prepare and submit to the NRC (within 30 days) a special report identifying the following, if the level of radioactivity as a result of Plant effluents in an environmental sampling medium at a specified location exceeds Palisades ODCM, Appendix A, Table E-2, reporting levels when averaged over any calendar quarter.

- a. The cause(s) for exceeding the limit(s).
- b. Corrective action(s) taken to reduce radioactive effluents.

5.15.2 The NRC Special Report shall be submitted if more than one (1) of the radionuclides listed in the specifications (Palisades ODCM, Appendix A, Table E-2) are detected in an environmental sample medium and:

$$\frac{\text{Concentration (1)}}{\text{Reporting Level (1)}} + \frac{\text{Concentration (2)}}{\text{Reporting Level (2)}} + \dots \geq 1.0$$

The quarterly sum of fractions calculation shall be completed within 90 days of end of quarter.

5.15.3 If radionuclides other than those listed in the specifications (Palisades ODCM, Appendix A, Table E-2) are detected and are the result of Plant effluents, the NRC Special Report shall be submitted if the potential annual dose to a member of the public is equal to or greater than the calendar year limits specifications (Palisades ODCM, Appendix A, III.H, III.C, and III.D). An NRC Special Report is not required if the measured level of radioactivity is not the result of Plant effluents. The condition shall be described in the Annual Radiological Environmental Operating Report.

Under all conditions, any radiological environmental surveillance sample possessing sufficient isotopic activity above the action level where an action level is listed in Attachment 2 but still below ODCM reporting requirements shall be evaluated. If no action level is listed in Attachment 2, any isotopic activity trending up shall be evaluated.

TITLE: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

6.0 ATTACHMENTS AND RECORDS

6.1 ATTACHMENTS

6.1.1 Attachment 1, "Environmental Sample Collection Schedule"

6.1.2 Attachment 2, "REMP Sample Locations"

6.1.3 Attachment 3, "Sample Shipment Identification"

6.1.4 Attachment 4, "Sample Packaging and Shipment"

6.1.5 Attachment 5, "Environmental Air Sample Data Sheet"

6.1.6 Attachment 6, "REMP Sample Collection Checklist"

6.1.7 Attachment 7, "REMP Analytical Requirements"

6.1.8 Attachment 8, "Environmental Monitoring Locations"

6.2 RECORDS

6.2.1 Records generated by this procedure shall be filed in accordance with Entergy Procedure EN-AD-103, "Document Control and Records Management Programs."

7.0 SPECIAL REVIEWS

None

ENVIRONMENTAL SAMPLE COLLECTION SCHEDULE

Proc No CH 6.10

Attachment 1

Revision 4

Page 1 of 2

Sample	Number of Samples and Locations	Sample Type	Collection/Analysis Frequency
Airborne Particulates and Iodines	4 within a 10 km radius 1 at 25 – 89 km distant	Continuous at approximately 1 cfm	Weekly
Drinking Water	1 – South Haven Municipal – Raw	Daily 125 sample collection to obtain a one-gallon composite	Monthly
Drinking Water	1 – Plant drinking water	Daily 500 sample collection to obtain a one-gallon composite	Monthly
Lake Surface	1 – Lake In, Screen-house downstream of "bio-box"	Daily 500 sample collection to obtain a one-gallon composite	Monthly
Lake Surface	1 – Control at Ludington	Daily composite to obtain one-gallon sample	Monthly
Sediment	Sediment – ½ mile north of plant	One-liter grab	Semi-annually
Food Products	1 sample each of blueberries and apples	1 kg grab sample	At time of harvest
Food Products	1 sample each of three different kinds of broadleaf vegetation in two sectors near plant boundary 1 – sample of each of similar broadleaf vegetation 15 – 30 km distant (9 to 18 miles)	1 kg grab samples	Monthly during growing season
Fish	2 – location in vicinity of plant discharge 2 – Ludington Control	One-liter of fish flesh from two different species. Obtain same species from control location (if available)	Sample in season or semiannually if they are not seasonal

ENVIRONMENTAL SAMPLE COLLECTION SCHEDULE

Proc No CH 6.10

Attachment 1

Revision 4

Page 2 of 2

Sample	Number of Samples and Locations	Sample Type	Collection/Analysis Frequency
TLD	9 – General vicinity of Site Boundary 9 – Within 12 km radius 3 – Control Stations	Continuous	Quarterly
Waste Water	1 – septic system	1 liter grab	Quarterly
Plant Air	3 – T-8A, B & C	1 liter grab	Quarterly

REMP SAMPLE LOCATIONS

Station		Code	Location	Air Part. and Iodine	Lake Water	Milk	Food Products	Sediment	TLD	Fish
1	ST	Palisades Nuclear Plant	Onsite, on tree near nw corner of bag crew bldg.		X				X	
1	ST	Palisades Nuclear Plant	Plant discharge area							X
2	TH	RR 3 Coloma, MI 5.6 miles S	TLD located on Becht Road, west side on post, 50 yards south of 48 th Ave.						X	
3	HS	76182 48th Ave Covert, MI 5.8 miles SSE	Along 48th Ave, 1/4 mile west of 76th St. In barnyard 50 yds off north side of road.						X	
4	JS	36197 M-140 Hwy Covert, MI 3-1/2 miles SE	Just north of Arellannos fruit stand, in grape arbor.				X		X	
4	JS	36 th Avenue, 1/2 miles east of M-140	South side of road	X						
5	PR	72723 CR 378 Covert, MI 3-1/2 miles ESE	Along CR 378, 3/4 mile east of M-140, 30 ft off north side of road. TLD located at Paul Rood residence; on tree in back yard just past driveway.	X					X	
6	RB	RR 3 South Haven, MI 4-1/2 miles NE	Along 12th Ave (CR 384), turn nw past maple grove, go 1/4 mile located in orchard on north side of road.						X	
7a	SN21	Emergency Siren 21 4.1 miles NNE	On Monroe Blvd, at corner of 76 th and 11th Street.						X	
8	SP	State Park 1 mile N	Onsite along the dump road, north of Plant. One mile from main gate. Near State Park boundary, on side of road as road turns west.	X					X	
9	TP	Covert Township Park 1.5 miles SSW	Along 32nd Ave, 1/4 mile west of Blue Star Hwy. 5 ft off south side of road. TLD located at end of road, at entrance to residence on beach, attached to emergency siren SN38.	X					X	
10	GR	Grand Rapids, MI 55 miles NNE	Grand Rapids Service Center, in storage area. Air sample on west side near shed. Control TLD 100 feet north of air sample station.	X					X	

REMP SAMPLE LOCATIONS

Station		Code	Location	Air Part. and Iodine	Lake Water	Milk	Food Products	Sediment	TLD	Fish
11	KZ	Kalamazoo, MI 35 miles E	Kalamazoo Service Center, in parking area on post in SE corner Control TLD.						X	
12	DG	58399 Wilbur Road, Dowagiac, MI 30 miles SSE	TLD located on pole approx 20 yards from road, NE of house.						X	
13	ST	Perimeter of Palisades NNE	Past #8 along dirt road. Proceed west up dune path at right of containment test structure. At first crest, turn north and proceed up adjacent hill to #13 at top (approx 50 yds from crest). Near State Park fence line.						X	
14	ST	Perimeter of Palisades NE	25 yards east of Station #34 between State Park and DFS Building.						X	
15	ST	Perimeter of Palisades E	North along Blue Star Hwy, 0.75 miles from access road, 10 ft off west side of road.						X	
16	ST	Perimeter of Palisades E	North along Blue Star Hwy, 0.4 miles from access road, 50 ft off west side of road.						X	
17	ST	Perimeter of Palisades ESE	Along access road, 25 yds south of southern power line, 15 yds off east side of road.						X	
18	ST	Perimeter of Palisades SE	20 yds from access road along south road. 40 yds off south road.						X	
19	ST	Perimeter of Palisades SSE	0.2 miles along south road from access road, 30 ft off north side of road.						X	
20	ST	Perimeter of Palisades S	0.4 miles along south road from access road, 20 ft off south side of road.						X	
21	ST	Perimeter of Palisades SSW	0.7 miles along south road from access road, just past top of hill. Near Lake Michigan Bluff.						X	
22	PW	Palisades Warehouse	Control TLD in lead cave.						X	
23	SN19	Emergency Siren 19 3 miles ENE	On CR 380.						X	

REMP SAMPLE LOCATIONS

Station		Code	Location	Air Part. and Iodine	Lake Water	Milk	Food Products	Sediment	TLD	Fish
24	SN26	Emergency Siren 26 6 miles E	On 67th Street.						X	
25	SH	South Haven, MI 5-1/2 miles NNE	South Haven Water Treatment Plant.		X					
30	STN	1/2 mile N of discharge						X		
32	LP	Ludington Pumped Storage 125 Miles N			X					X
45	CV	Alternate Control Air Sample Station	10 miles NNE of Plant	X						

[illegible]

SAMPLE PACKAGING AND SHIPMENT

1. Label samples clearly as to their contents.
 2. Seal liquid sample containers with tape to prevent leakage.
 3. Use sufficient packing material to avoid sample container damage during shipment.
 4. Package air filters in glassine or plastic envelopes.
 5. For TLD shipments, ensure that vendor's shipment instructions are followed.
 6. Ship samples to vendor laboratory with minimal delay after collection so as to avoid elevated analytical levels of detection.
 7. Record sample information on Attachment 3, "Sample Shipment Identification," or Attachment 5, "Environmental Air Sample Data Sheet," or per vendor's instructions as applicable. Include applicable form with shipment.
-

ENVIRONMENTAL AIR SAMPLE DATA SHEET

**Proc No CH 6.10
Attachment 5
Revision 4
Page 1 of 1**

PALISADES

A/S Station	As Found Leakage (Y / N)	As Left Leakage (Y / N)	Removed Date	Removed Time	Flow Meter Reading (ft ³)	Flow Meter Cal Due Date	Pump Replacement Date
8SP							
9TP							
4JS							
5PR							

Comments _____

Completed By _____ Date _____

Reviewed By _____ Date _____

REMP SAMPLE COLLECTION CHECKLIST

Month _____ Year _____

	Collected	Shipped
WEEKLY		
Air Samples		
Week 1	_____	_____
Week 2	_____	_____
Week 3	_____	_____
Week 4	_____	_____
Week 5	_____	_____
MONTHLY		
Broadleaf Veg	_____	_____
Lake In	_____	_____
Drinking Water	_____	_____
SHRAW	_____	_____
Ludington Ctrl	_____	_____

REMP SAMPLE COLLECTION CHECKLIST

Year _____

	Collected	Shipped
QUARTERLY		
TLDs		
1Q	_____	_____
2Q	_____	_____
3Q	_____	_____
4Q	_____	_____
Sanitary Wastewater		
1Q	_____	_____
2Q	_____	_____
3Q	_____	_____
4Q	_____	_____
Plant Air		
1Q	_____	
2Q	_____	
3Q	_____	
4Q	_____	
SEMI-ANNUAL		
Sediment		
1	_____	_____
2	_____	_____
Fish – Indicator		
1	_____	_____
2	_____	_____
Fish – Control		
1	_____	_____
2	_____	_____
ANNUAL		
Blueberries	_____	_____
Apples	_____	_____

This form is not required to be retained as a quality record.

REMP ANALYTICAL REQUIREMENTS

Proc No CH 6.10
Attachment 7
Revision 4
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<u>Media</u>	<u>Sampling Interval</u>	<u>Required Analysis</u>	<u>LLD</u>	<u>NRC^f Reporting Levels</u>	<u>Unusual Results^h</u>	
					<u>Action Level</u>	<u>Action Required</u>
Direct by TLD	Quarterly	Gamma Dose	10 mR			
Air Gaseous	Weekly	I-131	0.07 pCi/m ³	0.9 pCi/m ³	0.2 pCi/m ³	Notify
Air Particulate	Weekly	Gross Beta	0.01 pCi/m ³		See note g	Notify and perform gamma isotopic.
		Gamma ^{a,j}				
		Cs-134 Cs-137	0.05 pCi/m ³ 0.06 pCi/m ³	10 pCi/m ³ 20 pCi/m ³	5 pCi/m ³ 5 pCi/m ³	
Water Surface Drinking	Monthly	H-3 ⁱ	2000 pCi/L	20,000 pCi/L	1000 pCi/L	Notify Notify within 24 h if beta ≥10 pCi/L. Perform gamma analysis.
		Gross Beta	4 pCi/L		10 pCi/L	
		Gamma ^{a,j}		1000 pCi/L		
		Mn-54	15 pCi/L	400 pCi/L		
		Fe-59	30 pCi/L	1000 pCi/L		
		Co-58	15 pCi/L	300 pCi/L		
		Co-60	15 pCi/L	300 pCi/L		
		Zn-65	30 pCi/L	400 pCi/L		
		Zr-95	15 pCi/L	400 pCi/L		
		Nb-95	15 pCi/L	30 pCi/L		
		Cs-134	15 pCi/L	50 pCi/L		
		Cs-137	18 pCi/L	200 pCi/L		
		BaLa-140	15 pCi/L	2 pCi/L		
		I-131	1 pCi/L			
					Any gamma ≥30 pCi/L	Notify
					2 pCi/L	Notify
Sediment	Semiannual	Gamma ^j Cs-134 Cs-137	150 pCi/g 180 pCi/g		Any gamma ≥1 pCi/g	Notify

REMP ANALYTICAL REQUIREMENTS

<u>Media</u>	<u>Sampling Interval</u>	<u>Required Analysis</u>	<u>LLD</u>	<u>NRC^f Reporting Levels</u>	<u>Unusual Results^h</u>	
					<u>Action Level</u>	<u>Action Required</u>
Fish	Semiannual	Gamma ^j Mn-54 Fe-59 Co-58 Co-60 Zn-65 Cs-134 Cs-137	0.13 pCi/g 0.26 pCi/g 0.13 pCi/g 0.13 pCi/g 0.26 pCi/g 0.13 pCi/g 0.15 pCi/g	30 pCi/g 10 pCi/g 30 pCi/g 10 pCi/g 20 pCi/g 1 pCi/g 2 pCi/g	Any gamma ≥1 pCi/g	Notify
Broad Leaf Vegetation	Monthly when available	I-131 Gamma ^j Cs-134 Cs-137	0.06 pCi/g 0.08 pCi/g 0.08 pCi/g	0.1 pCi/g 1 pCi/g 2 pCi/g	0.1 pCi/g Any gamma ≥1 pCi/g	Notify Notify
Food Products	At time of harvest	Gamma ^j Cs-134 Cs-137	0.08 pCi/g 0.08 pCi/g	1 pCi/g 2 pCi/g	Any gamma ≥1 pCi/g	Notify

^aSupplementary analysis only.

^dRadioactivity levels may cause LLD levels to be exceeded.

^eMonthly composite of weekly filters.

^fReporting levels per ODCM, Appendix A, Section III.J and Table E-2.

^gIf gross beta activity is greater than or equal to 1 pCi/m³ or greater than or equal to ten times last years mean of control samples, perform gamma analysis on the individual samples.

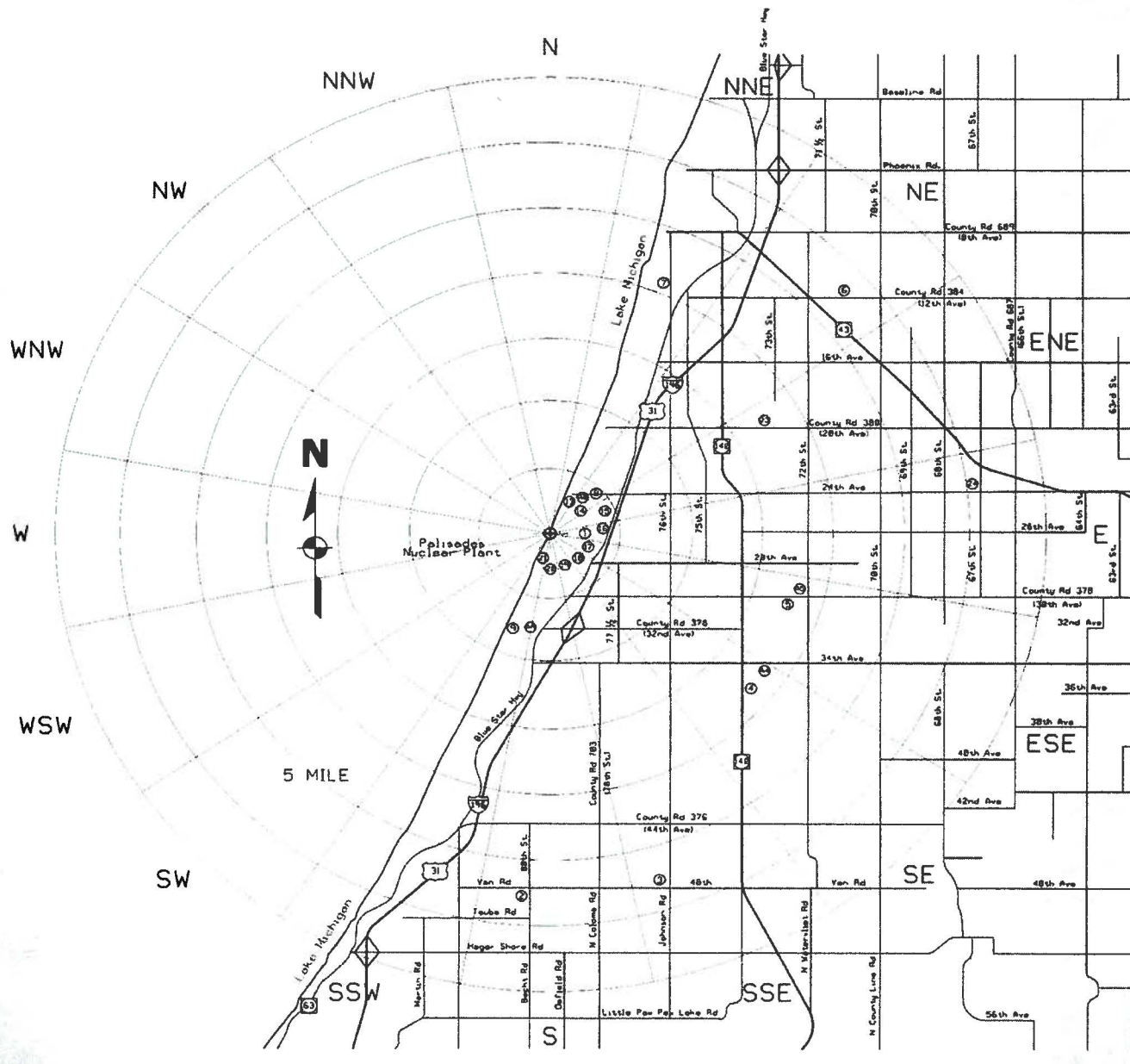
^hWhenever the Unusual Results Action Level is reached or exceeded, the word "Notify" under the Action Required column signifies that the Contract Laboratory performing the analysis is required to notify Palisades.

ⁱNot required for South Haven raw water sample.

^jGamma isotopic analysis means the identification and quantification of gamma emitting radionuclides that may be attributable to the effluents from the facility.

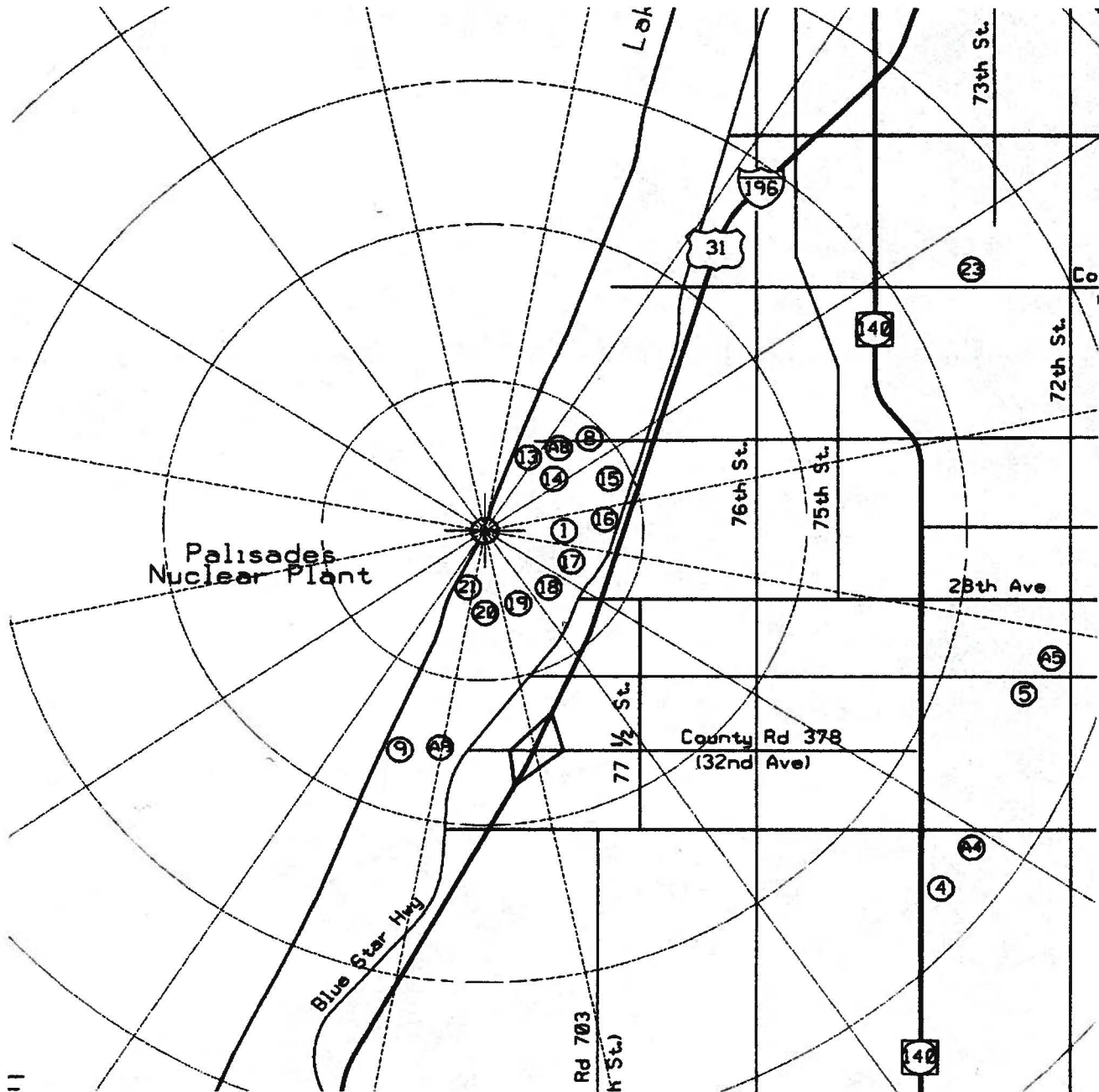
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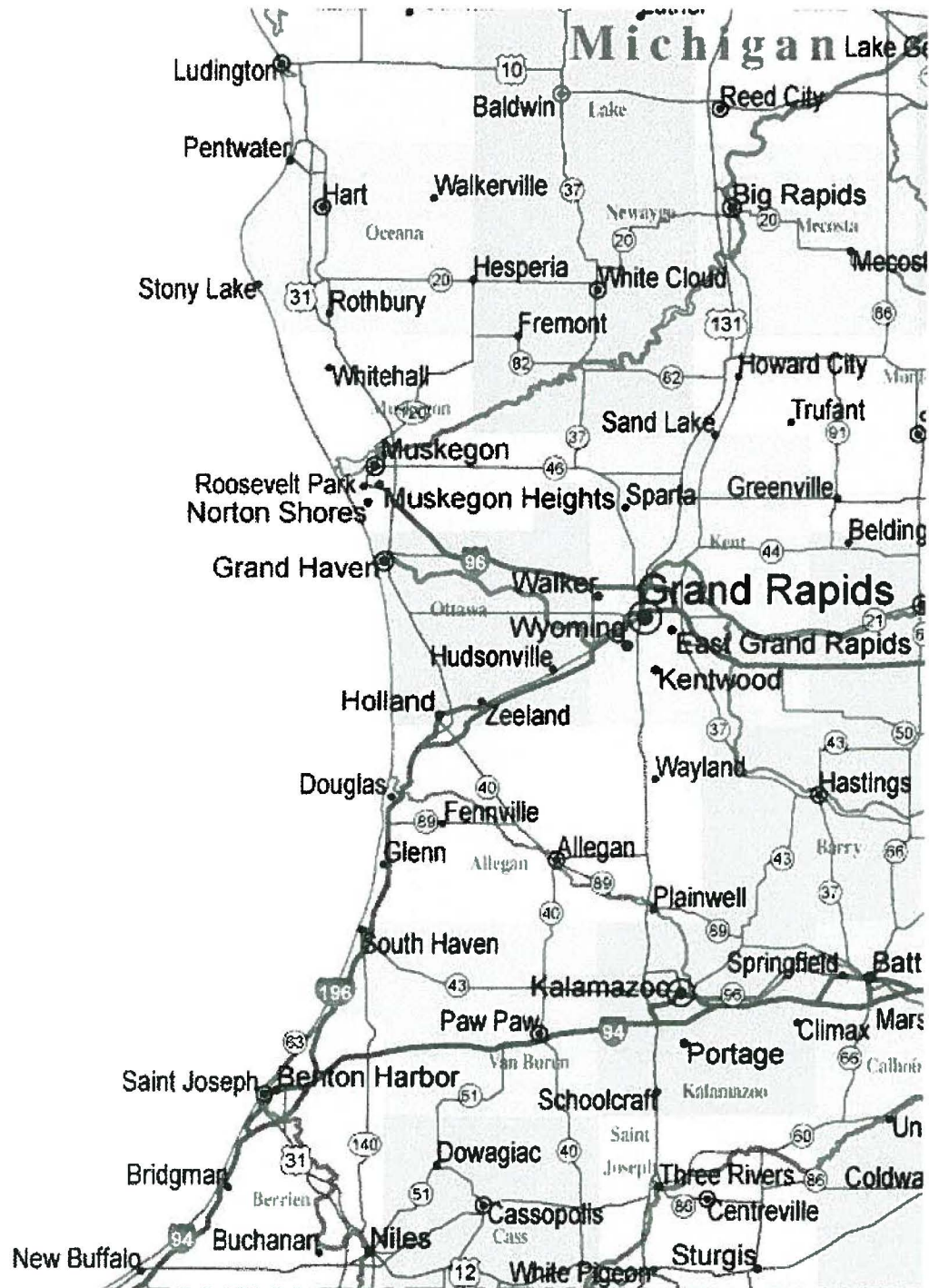
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ENVIRONMENTAL MONITORING LOCATIONS

TLDs

Location	Coordinates	Distance (mi)	Degrees	Sector
Stack	N 42 19 23.5 W 86 18 51.6			
1	N 42 19 20.7 W 86 18 36.1	0.507	96.09	E
Inner Ring				
13	N 42 19 47.2 W 86 18 34.1	0.518	28.62	NNE
8	N 42 19 46.8 W 86 18 24.0	0.594	41.21	NE
14	N 42 19 41.1 W 86 18 21.2	0.548	51.93	NE
15	N 42 19 42.3 W 86 17 58.1	0.838	64.94	ENE
16	N 42 19 28.0 W 86 17 54.6	0.814	83.9	E
17	N 42 19 10.5 W 86 18 13.9	0.590	114.98	ESE
18	N 42 19 4.2 W 86 18 28.9	0.491	138.96	SE
19	N 42 19 0.9 W 86 18 39.7	0.465	158.69	SSE
20	N 42 19 1.1 W 86 18 48.8	0.432	174.42	S
21	N 42 19 3.4 W 86 18 58.4	0.397	194.02	SSW
Outer Ring				
7	N 42 22 40.8 W 86 17 0.4	4.102	22.6	NNE
6	N 42 22 30.6 W 86 14 15.9	5.309	47.42	NE
23	N 42 20 44.7 W 86 15 35.3	3.191	60.75	ENE
24	N 42 19 59.4 W 86 11 49.4	6.029	83.4	E
5	N 42 18 27.6 W 86 14 57.5	3.491	107.87	ESE
4	N 42 17 10.8 W 86 15 43.5	3.690	133.63	SE
3	N 42 14 38.0 W 86 16 59.7	5.704	163.82	SSE
2	N 42 14 33.4 W 86 19 16.4	5.578	183.62	S

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9	N 42 18 1.6 W 86 19 34.6	1.686	201.22	SSW
Control TLDs				
10	N 42 53 16.5 W 85 40 36.1	50.727	39.51	NE
11	N 42 15 24.4 W 85 32 49.4	39.749	96.42	E
12	N 41 56 54.3 W 86 6 24.5	27.989	157.61	SSE

TLD # 10 is located within the Consumers Energy Grand Rapids service facility attached to a pole located adjacent to the south fence.

TLD # 11 is located within the Consumers Energy Kalamazoo service facility attached to a pole in the far NE corner of the facility – past the employee parking lot.

TLD # 12 is located approximately 30 yards from the road, NE and next to a private residence located at 58399 Wilbur Road, Dowagiac, MI.

Air Sample Stations

Location	Coordinates	Distance (mi)	Degrees	Sector
A8 (State Park)	N 42 19 46.8 W 86 18 24.8	0.587	40.38	NE
A9 (Township Park)	N 42 18 4.6 W 86 19 11.2	1.539	190.40	S
A4 (Covert)	N 42 17 12.1 W 86 15 21.7	3.903	130.22	SE
A5 (Rood)	N 42 18 30.5 W 86 14 47.8	5.804	106.36	ESE
A10 (Grand Rapids)	N 42 53 16.5 W 85 40 36.1	50.727	39.51	NE

Air Sample Station # 10 is located within the Consumers Energy Grand Rapids service facility, south side, next to a small service building and due East of TLD # 10.

Control fish and water samples are obtained from the Consumers Energy Pump Storage Facility located in Ludington, MI