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Pleasant Prairie Power Plant Sulfate in Groundwater
Pleasant Prairie Power Plant, Pleasant Prairie, WI
BRRTS#: 02-30-527479

Dear Ms. Laube-Anderson:

February 14, 2020

On behalf of We Energies, O'Brien & Gere Engineers, Inc., a Ramboll Company (Ramboll), has prepared this letter report discussing the presence of sulfate in groundwater at the Pleasant Prairie Power Plant (P4), BRRTS#: 012-30-527479. This letter report was prepared with the intent of obtaining a No Action Required or No Further Action determination from the Wisconsin Department of Natural Resources (WDNR). On August 1, 2019, We Energies submitted a technical memorandum, *Pleasant Prairie Power Plant (P4) Sulfate in Groundwater BRRTS#:02-30-527479*, and technical assistance form (Form 4400-237) and associated fee. In email correspondence on October 1, 2019, WDNR provided comments on the technical memorandum; the comments were further discussed on a conference call on October 18, 2019. This letter report was prepared to address comments received from WDNR.

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We Energies initially submitted a technical memorandum, *Pleasant Prairie Power Plant (P4) Groundwater Monitoring Program Review*, dated June 29, 2018, on July 2, 2018 for WDNR review and comment. In an email dated October 17, 2018 the WDNR provided references that indicated the presence of naturally occurring sulfate concentrations in groundwater. The October 17, 2018 response from WDNR suggested that an argument could be made that the concentrations of sulfate were naturally occurring, and if substantiated, a No Action Required or No Further Action determination may be appropriate.

Ramboll has incorporated previous comments and evaluated the references provided by the WDNR and has gathered additional information as lines of evidence to support a No Further Action determination. This letter includes a brief discussion of the references provided by the WDNR and documentation which supports that concentrations of sulfate reported in groundwater near P4 may be naturally occurring. The lines of evidence that suggest sulfate concentrations are naturally occurring include:

- Regionally elevated concentrations of naturally occurring sulfate in groundwater and increased sulfate in precipitation

- Geochemical conditions including;
 - Variability in groundwater elevations to release sulfate from oxidation of sulfide minerals within the clay till
 - Surficial activities that potentially mobilize sulfate from shallow clay till and/or road base materials
- Soil sample results from below the coal pile runoff basin liner

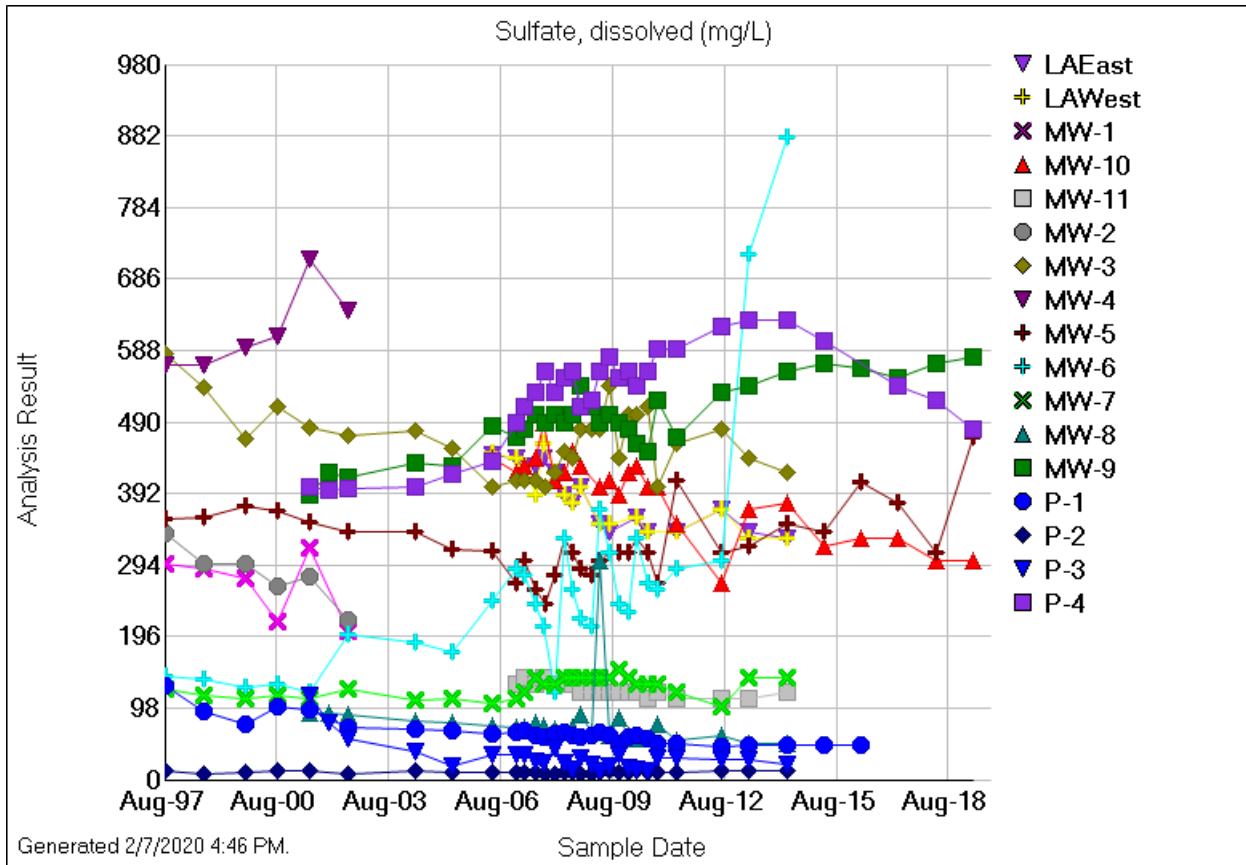
Furthermore, the power plant infrastructure including the coal pile and other potential sources (basins and runoff ditches) have been removed eliminating those facilities as potential sources that may have contributed to the sulfate concentrations in groundwater. The power plant was fueled with low sulfur coal during the life of the plant's operations.

SUMMARY OF SULFATE IMPACTS IN GROUNDWATER

The sulfate concentrations detected in groundwater from monitoring wells onsite (Figure 1) and trends were discussed in detail in the June 29, 2018 memorandum, additional evaluation including the 2019 results are included in the Figure below, Table 1, and are summarized as follows:

- An upward trend reported in MW-9 concentrations may have peaked and are stabilizing based on the last five rounds of data.
- Upward trends which were reported in piezometer P-4 are no longer observed and no statistically significant trends are observed. Recent data from the last five rounds suggest a downward trend.
- A downward trend reported in MW-10 is no longer present and concentrations indicate a stable trend. However, the median concentration detected over the eight most recent sampling events (330.5 mg/L) is less than the median concentration (420 mg/L) detected previously (1997-2011) indicating overall improvement in groundwater quality.
- Concentrations of sulfate in MW-5 have been variable following completion of basin lining activities and following their recent removal; recent data from the last three events indicates sulfate continues to be variable with concentrations ranging 160 mg/L (from 470 to 310 mg/L).

The groundwater flow direction is to the southwest as shown in Attachment A. Based on flow directions the sulfate concentrations and trends detected in groundwater may be the result of several contributing factors which include natural sources and the former plant infrastructure (as historically attributed). The relative contribution from each of these potential sources was not evaluated, but the potential sources from the former plant operations that are associated with this BRRTS case have been removed and as a result will not impact groundwater.



Sulfate concentrations in groundwater monitoring wells.

POTENTIAL SOURCES OF SULFATE IMPACTS IN GROUNDWATER

In addition to the information in the references provided by the WDNR, a literature search and review was conducted to identify potential sources of sulfate in shallow clay soils and within the sand and gravel aquifer in which the P4 monitoring wells are screened. Literature review indicated that the following conditions in addition to the plant operations may contribute to elevated sulfate concentrations detected in groundwater:

- Elevated naturally occurring sulfate concentrations in the Silurian dolomite and glacial sand and gravel aquifer
- Local evidence for elevated sulfate in shallow monitoring wells as demonstrated by a nearby BRRTS case with similar/higher sulfate concentrations unrelated to P4 operations
- Increased sulfur (as sulfate) present in southeast Wisconsin precipitation
- Low pH is measured in precipitation in southeast Wisconsin (which can influence geochemical conditions)

Each of these potential sources is discussed below.

Sulfate Concentrations in the Silurian Dolomite and Overlying Sand and Gravel

The monitoring wells at the site are screened within the unconsolidated glacial deposits which include clay till, silt, and sand. In general, the deeper wells (labeled with "P") are screened within the sand and gravel aquifer, while shallower wells are screened at least partially in the clay till. Based on the literature review, "the sand and gravel aquifer is connected hydrologically with the Silurian dolomite aquifer. Water moves freely between the aquifers, which generally are considered to be a single hydrologic unit referred to as the shallow aquifer" (SEWRPC, 2002).

A summary of groundwater data from this aquifer compiled by Kemmerer (1984) indicates that the regional concentrations of sulfate in the sand and gravel aquifer range from 0.4 to 893 mg/L, and in the Silurian dolomite the range is 0.4 to 1,400 mg/L. Furthermore, "log transformed sulfate concentration values are distributed normally or closely approximate normal distributions in all units. As a result, it is assumed that these data represent valid statistical samples of likely concentrations in areas of these units where data are available" (Kemmerer, 1984). Concentrations of sulfate detected in the site monitoring wells are within the range of concentrations detected in the same aquifer throughout the state prior to when plant operations began in 1984, and summarized in this study, and therefore concentrations detected near P4 may be a result of natural variability within these aquifers.

Evidence for Elevated Sulfate at Nearby BRRTS Sites

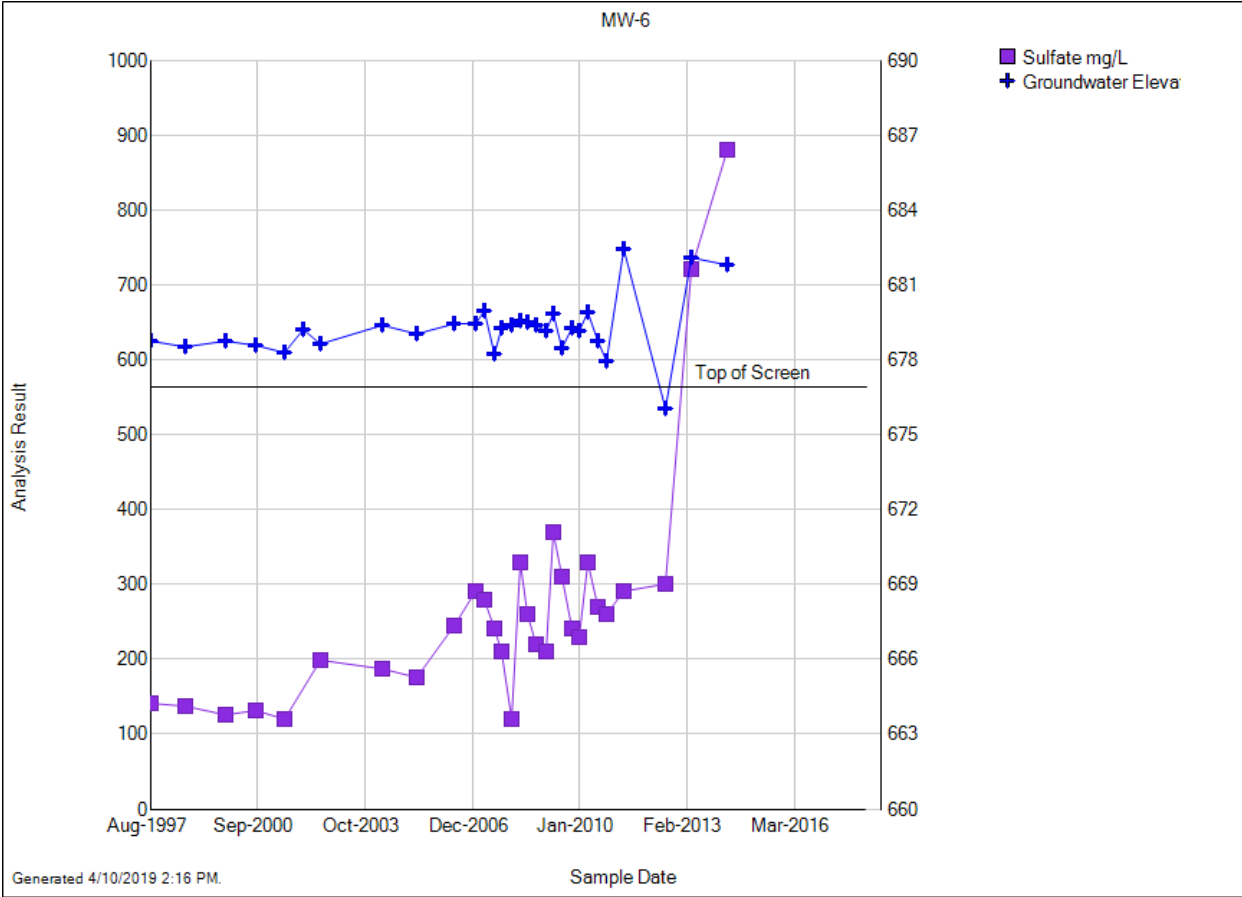
A survey of BRRTS cases located in the vicinity of P4 was completed using the WDNR Remediation and Redevelopment Sites Map (RR Sites Map), to identify sites that may have analyzed groundwater for sulfate concentrations. Sulfate concentrations are sometimes measured to evaluate whether natural attenuation is occurring at petroleum or chlorinated volatile organic compound (PVOCs or CVOCs) sites. Showing sulfate concentrations that decrease through time or along a flow path can be used as a line of evidence to support selection of monitored natural attenuation as a remedy.

One site, BRRTS Case #02-30-107682, was identified with accessible information that included concentrations of sulfate in shallow groundwater wells. The site is located about 1.5 miles northeast of the P4 property (Figure 2). The concentrations of sulfate in shallow groundwater monitoring wells and remediation sumps ranged from non-detect in sump locations to 870 mg/L in an upgradient background well (MW-1, Table B-1 Attachment B). This upgradient background well is screened within clay till and the measured water elevations were variable but were within the screened elevation of the well, (potentially resulting in oxidation of sulfide minerals in clay). The measured concentrations are similar to those associated with the P4 groundwater and, as discussed previously, within the range of regional concentrations reported in the summary report (Kemmerer, 1984). The BRRTS activity for this identified site was closed on September 25, 2002, with a groundwater use restriction because of residual petroleum impacts with no further requirements related to sulfate concentrations.

GEOCHEMICAL CONDITIONS

The natural sources of sulfate at the P4 site, as described in the Sulfate Concentrations in the Silurian Dolomite and Overlying Sand and Gravel section above, can be mobilized or migrate due to changes in the geochemical conditions at the site. In the November 13, 2014 technical memorandum *Groundwater Monitoring Program Review, We Energies Pleasant Prairie Power Plant* (NRT, 2014), increasing concentrations of sulfate and arsenic in groundwater at upgradient well MW-6 were attributed to oxidation of sulfide minerals at shallow depths in the soil column. High sulfate concentrations were a result of changes in groundwater elevation, which increased the potential for oxidation of pyrite minerals. In particular, the

increase in sulfate during 2013, followed a significant decline and subsequent rebound in groundwater elevation (see below). When the water elevation is compared to the top of the screen elevation in MW-6, it is apparent that air (oxygen) was in contact with the aquifer materials which can explain the sharp increase in sulfate observed in MW-6 during 2013.

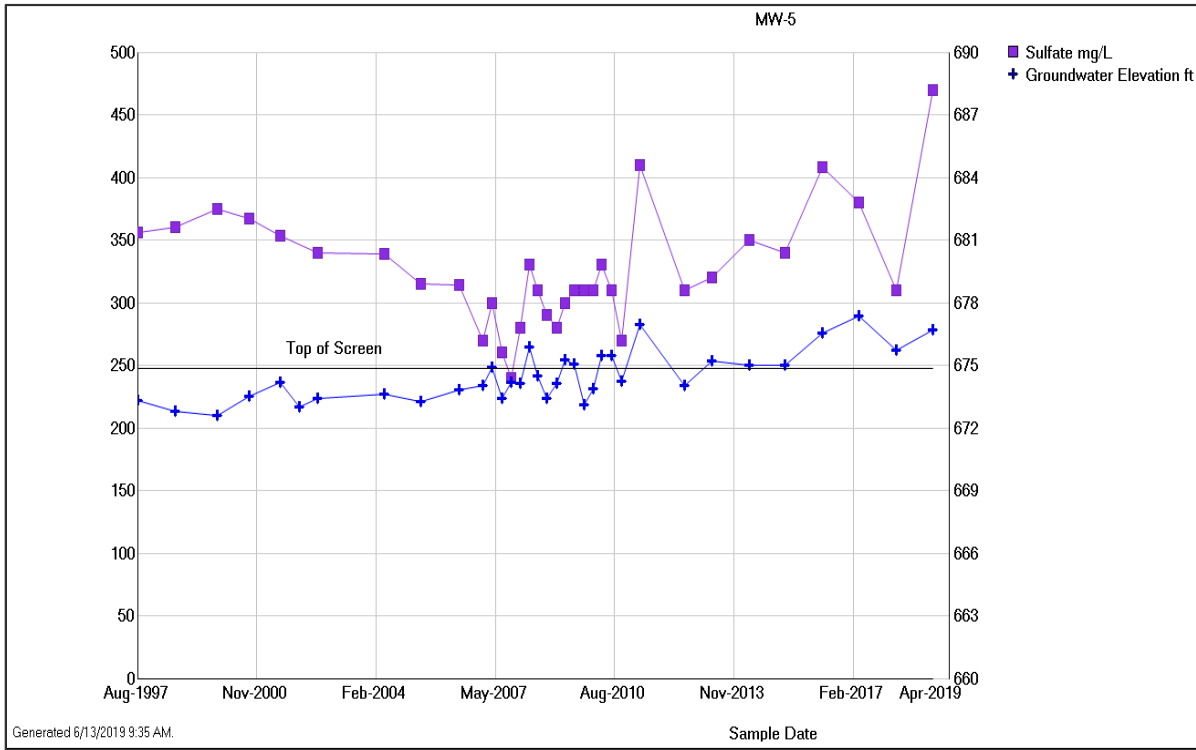


Groundwater concentrations and elevations in MW-6.

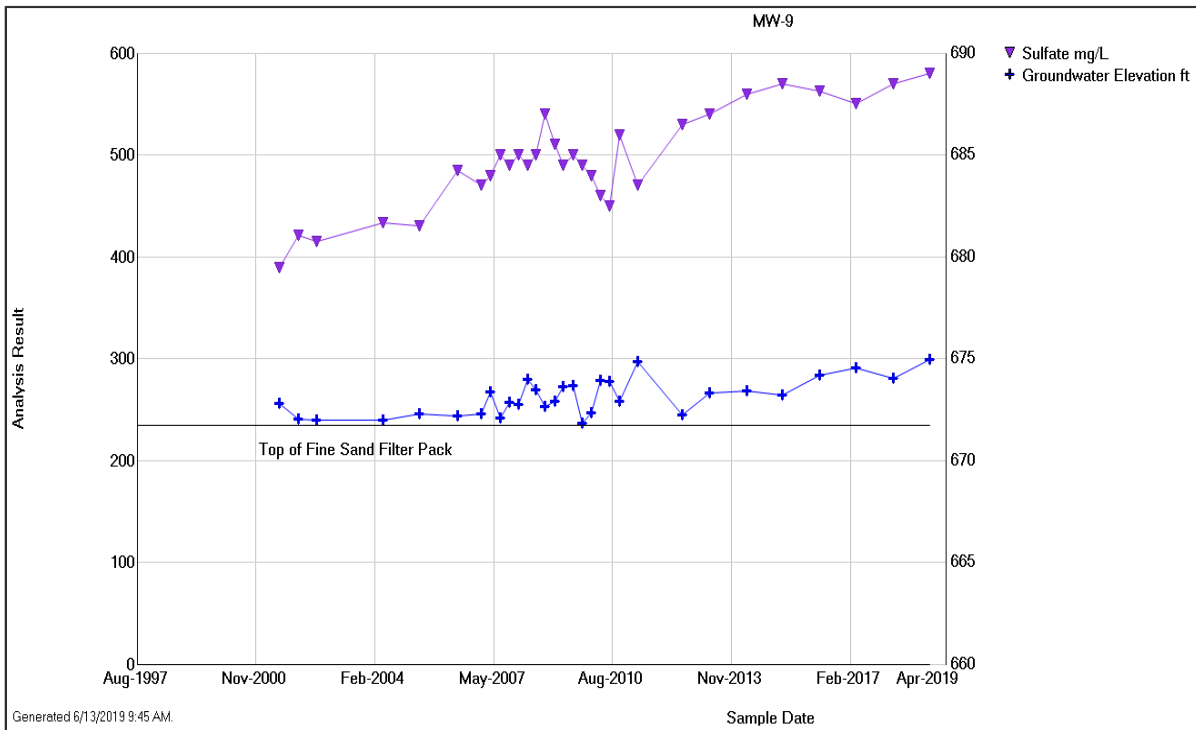
In addition to changes in water elevations, leaching of sulfate from surface deposition and/or oxidation of sulfide minerals contained in materials placed at the surface (i.e. road base, railroad ballast, and laydown lots from historical construction), has the potential to release sulfate to the aquifers over long term exposure to precipitation. Both mechanisms that have the potential to release sulfate to the aquifer are evaluated below.

Variability in Groundwater Elevation

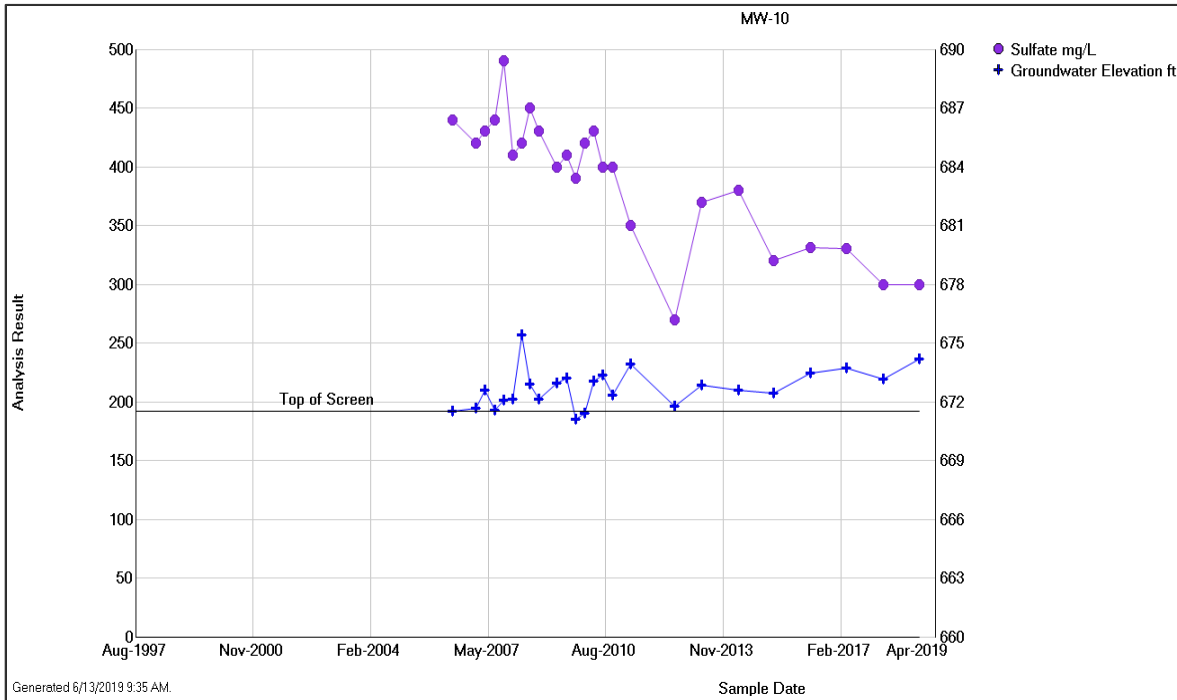
Groundwater elevations and sulfate concentrations are plotted for monitoring wells MW-5, MW-9, and MW-10. As shown in the plots, sulfate concentrations appear elevated when water elevations are at or near the screened interval. Significant increases also occur following periods when the water elevation declines to be within the screened interval (i.e. MW-5 and MW-9 in fall 2010, or MW-10 in fall 2012) which allows oxygen to contact the aquifer materials. P-4 is a piezometer, therefore changes in water elevation are not expected to result in variability in groundwater concentrations, however concentrations exhibit similar trends which indicates groundwater concentrations may be responding to variable water levels in upgradient recharge areas.



Groundwater concentrations and elevations in MW-5.

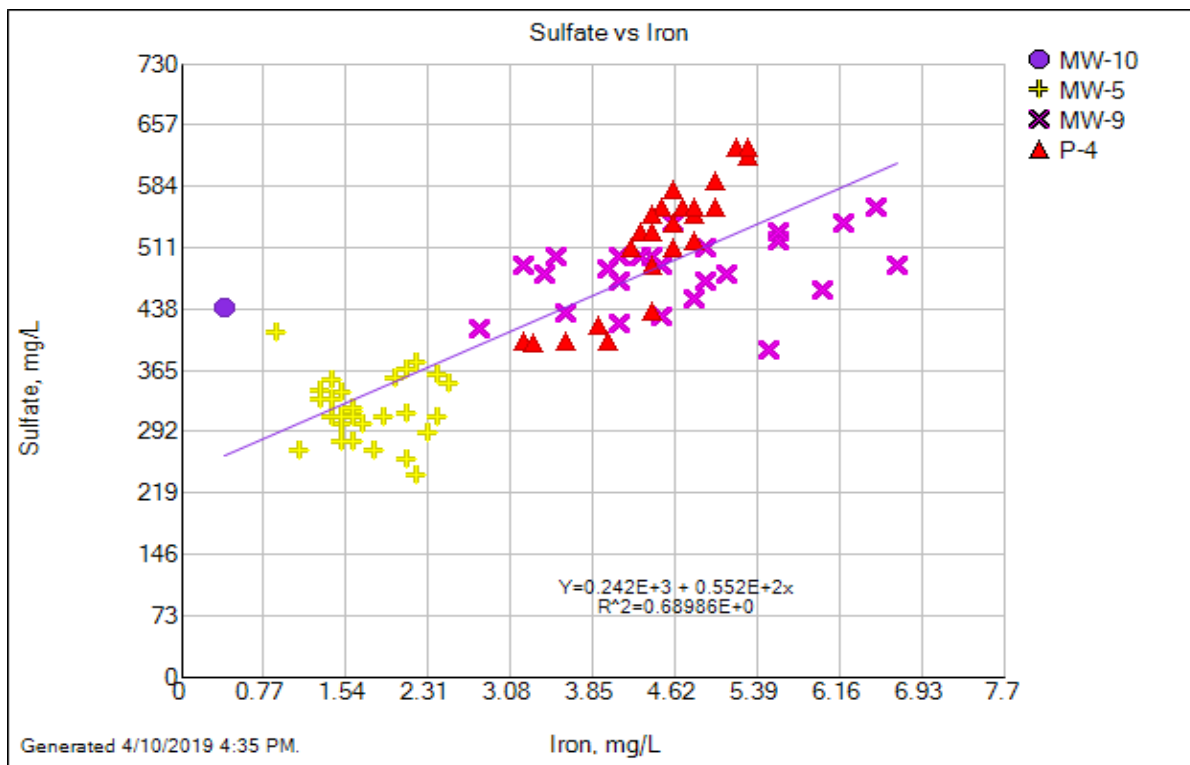


Groundwater concentrations and elevations in MW-9.



Groundwater concentrations and elevations in MW-10.

A scatter plot of iron and sulfate concentrations in these wells (below) provides support that pyrite oxidation is occurring because the resulting iron and sulfate concentrations show a relatively high correlation.



Sulfate and iron concentrations in downgradient wells.

Surficial Activity and Potential Mobilization of Sulfate from Shallow Soils

Sulfate concentrations can also be mobilized from surficial deposition or shallow materials that contain sulfide minerals. During construction of P4 and the necessary support structures, (i.e. substations, transmission lines, parking lots, roads, etc.) clay soils at the surface were disturbed over a large area (Figures 3 and 4). Limestone and gravel road base that is quarried in the area and utilized for construction often contains minor inclusions of sulfide minerals (arsenopyrite, pyrite, marcasite, sphalerite) and it is likely that these were displaced and exposed to air and/or precipitation which changes the geochemical conditions and increases the potential for oxidation and sulfate migration. Long term leaching of sulfate may occur from these sources:

- Pyrite and other sulfide minerals within formerly anaerobic clay till or road base materials (see historic aerials Figures 3 and 4)
- Lake Andrea was a former quarry as shown in historic aerials from 1974 to the 1990's (Figures 3-5), it is unclear what was mined from the quarry, but minerals were exposed to oxidation during the quarrying activities and could result in long term elevated sulfate within the lake

Soil Sample Results – Coal Pile Runoff Basin

Following removal of the Coal Pile Runoff Basin, soil samples were collected from the soils underlying the basin. The samples were analyzed for metals and indicators of potential impacts, and the results are provided in Table 2a and 2b and locations are shown in Figure 1 in Attachment D. The results indicate that only arsenic in two samples was detected above the industrial direct contact residual contaminant level (RCL). Arsenopyrite (Fe, As-S) and pyrite often are found in similar settings and as expected, concentrations of arsenic and sulfate were reported coincidentally within the clay till and road base materials. Sulfate was detected at concentrations ranging from 97.9 to 376 mg/kg. The presence of these compounds and their concentrations are representative of the clay till and gravel fill below the liner and because they are not significantly elevated are not indicative of a release from the basins.

Removal of the lined basin also expose the underlying materials (clay and gravel) to precipitation and potential oxidation since they are no longer isolated by the liner. The ground disturbance that occurred during removal and the remaining soils that are exposed at the surface could continue to be a source of sulfate to the aquifer until all available sulfate is leached. The recent concentration increases in MW-5, which is located nearest to these basins, may be a result of these activities.

Sulfate in Precipitation

Sulfate in precipitation is elevated in the southeast portion of the state, including Milwaukee, Racine, and Kenosha Counties (see Figure 12-6 below.) Sulfate deposition occurs when sulfur dioxide reacts with water in the air to form sulfate and sulfuric acid. The sulfate and sulfuric acid are deposited or transferred to surface or groundwater when it rains. Through evaporation and evapotranspiration water is removed and sulfate may become concentrated in soils, surface water, and groundwater. Due to the distribution of industry and heavy transportation traffic in southern Wisconsin and northern Illinois, the southeast portion of Wisconsin is susceptible to higher concentrations and more sulfate deposition with acidic precipitation as shown in the figure below.

CONCLUSIONS

Based on the information provided in this memorandum, sulfate in groundwater near P4 is likely a result of natural sources; however, plant operations, including construction activities and the low sulfur coal pile and ditches and basins, cannot be ruled out as a former contributing source. However, these sources have been removed, and although elevated sulfate concentrations may persist due to removal activities, We Energies operations no longer contributes to sulfate concentrations in groundwater, and no further action for We Energies is appropriate.

Please contact the undersigned or Tim Muehlfeld at We Energies, 414-221-2206, to discuss any questions or comments.

Sincerely,



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Figures

Figure 1	Monitoring Locations
Figure 2	Aerial Photograph 1981
Figure 3	Aerial Photograph 1987
Figure 4	Aerial Photograph 1974

Tables

Table 1	Groundwater Analytical Results
Table 2A	Summary of Post-Liner Removal Soil Sample Field Observations
Table 2B	Summary of Post-Liner Soil Sample Laboratory Analytical Results
Table 3	Surface Water Analytical Results

Attachments

Attachment A	Groundwater Flow Direction
Attachment B	Ocean Spray Summary, Figure, and Table
Attachment C1	Sulfate in Precipitation 1985-2017
Attachment C2	pH in Precipitation 1985-2017
Attachment D	Soil Sample Locations

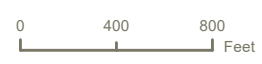
cc: Tim Muehlfeld, WEC Business Services, LLC

FIGURES



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- CURRENT MONITORING LOCATION
- PAST MONITORING LOCATION



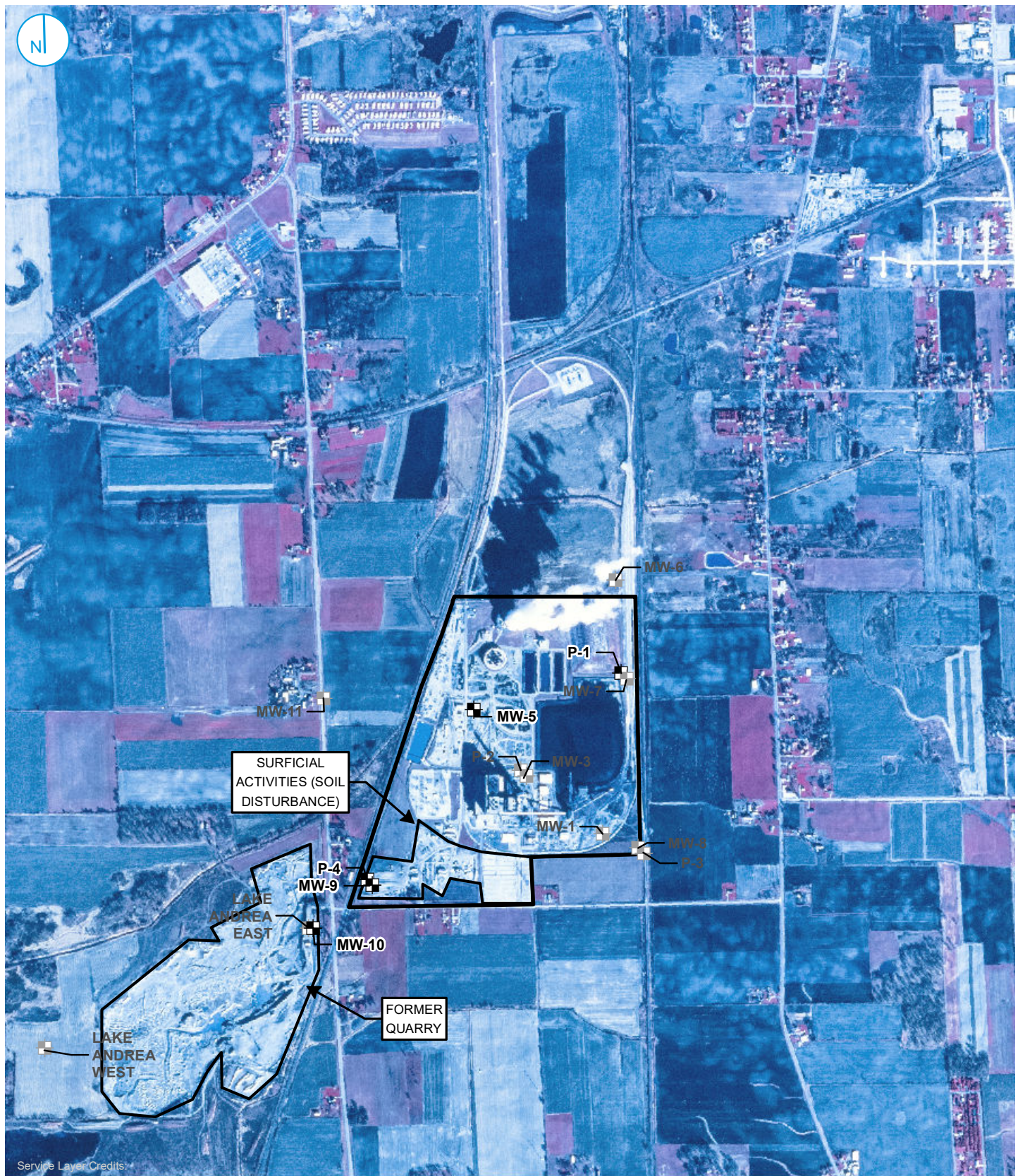
MONITORING LOCATIONS

FIGURE 1

WE ENERGIES GROUNDWATER/SURFACE WATER MONITORING
PLEASANT PRAIRIE POWER PLANT
 PLEASANT PRAIRIE, WISCONSIN

RAMBOLL US CORPORATION
 A RAMBOLL COMPANY





- CURRENT MONITORING LOCATION
- PAST MONITORING LOCATION
- PLEASANT PRAIRIE POWER PLANT PROPERTY

1981 IMAGERY

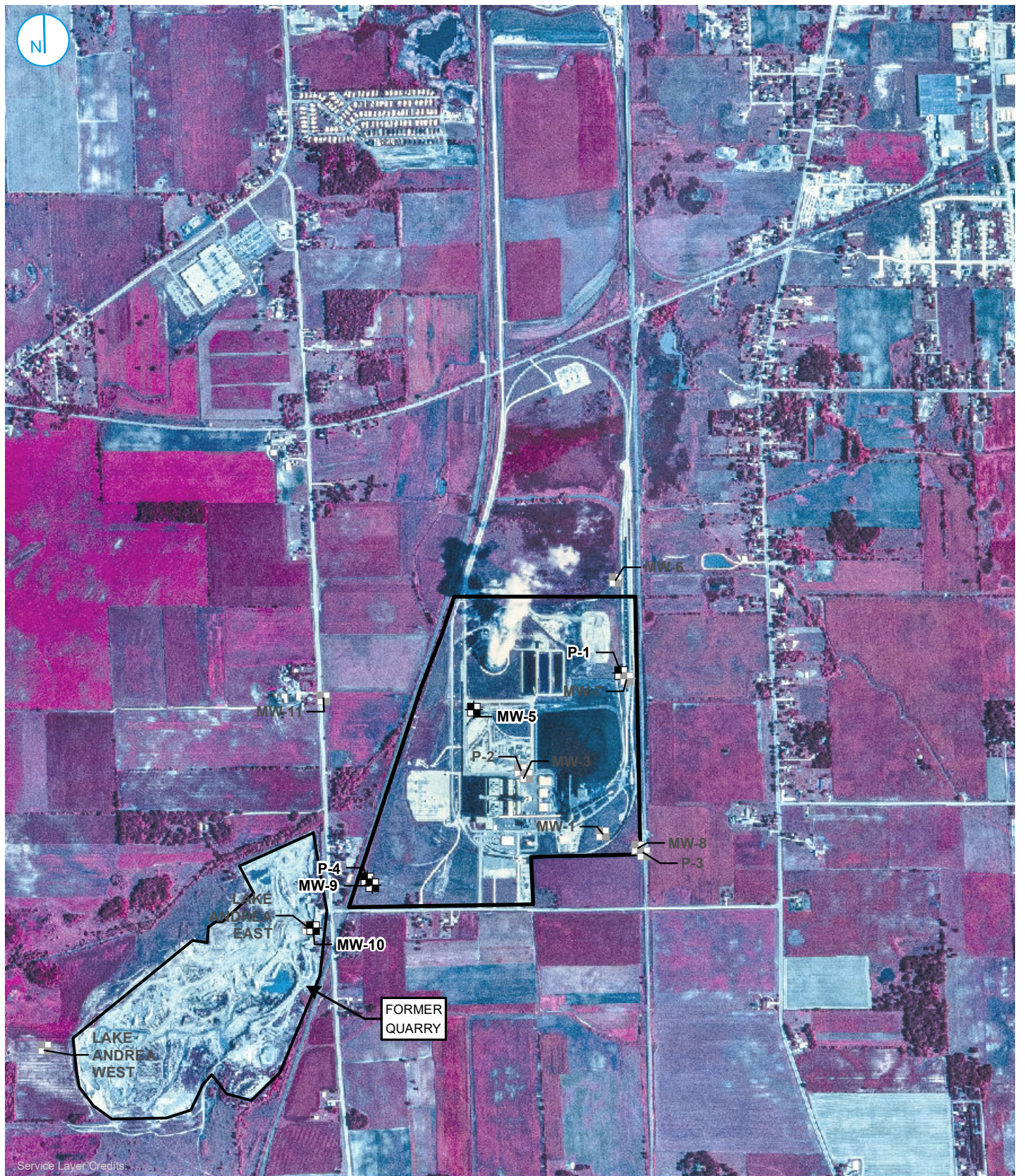
FIGURE 03

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



**WE ENERGIES GROUNDWATER/SURFACE WATER MONITORING
PLEASANT PRAIRIE POWER PLANT
PLEASANT PRAIRIE, WISCONSIN**





- CURRENT MONITORING LOCATION
- PAST MONITORING LOCATION
- PLEASANT PRAIRIE POWER PLANT PROPERTY

1987 IMAGERY

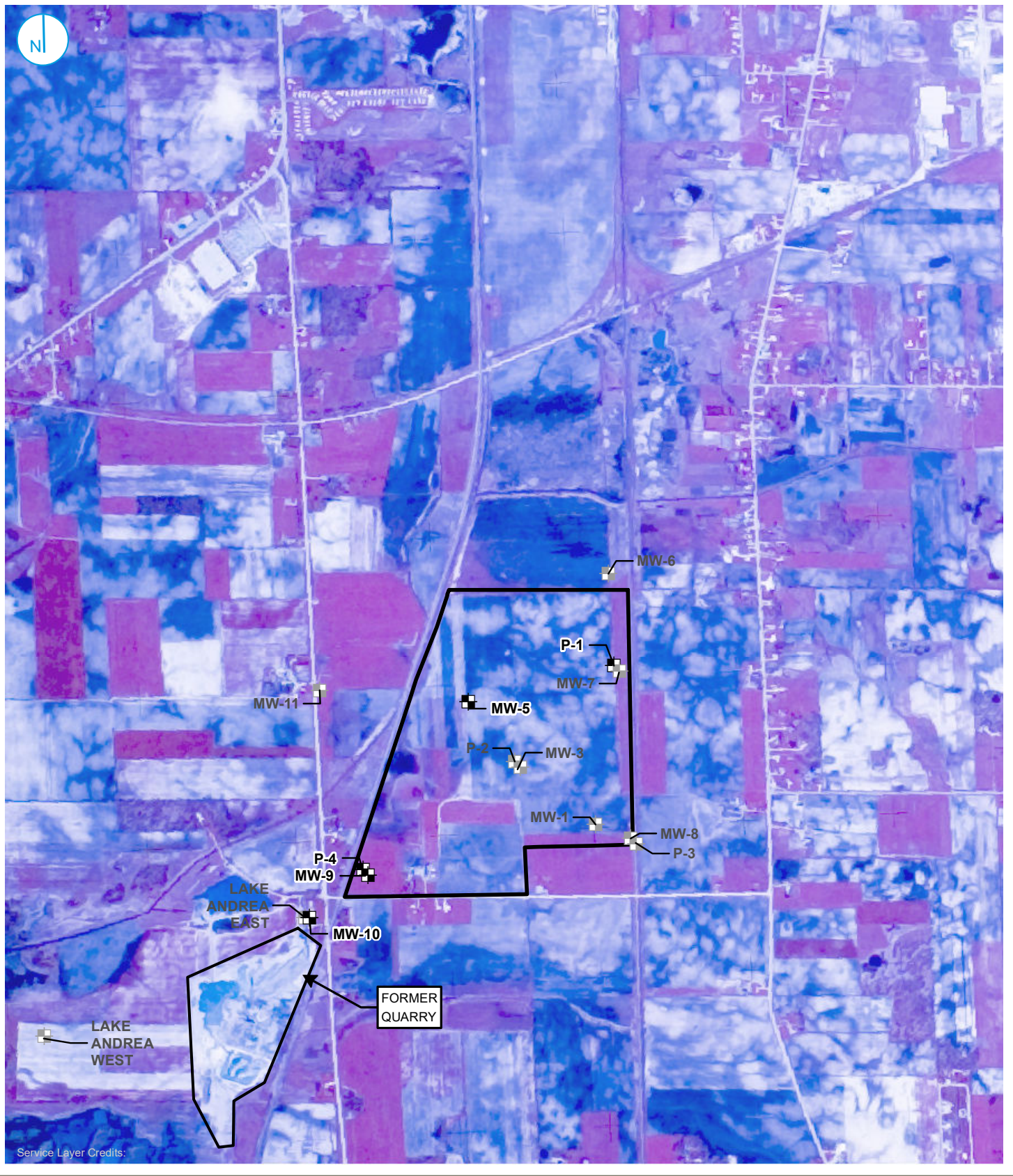
FIGURE 04




RAMBOLL US CORPORATION
A RAMBOLL COMPANY



**WE ENERGIES GROUNDWATER/SURFACE WATER MONITORING
PLEASANT PRAIRIE POWER PLANT
PLEASANT PRAIRIE, WISCONSIN**





-  CURRENT MONITORING LOCATION
-  PAST MONITORING LOCATION
-  PLEASANT PRAIRIE POWER PLANT PROPERTY

1974 IMAGERY

FIGURE 05

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WE ENERGIES GROUNDWATER/SURFACE WATER MONITORING
PLEASANT PRAIRIE POWER PLANT
PLEASANT PRAIRIE, WISCONSIN



TABLES

TABLE 2A
SUMMARY OF POST-LINER REMOVAL SOIL SAMPLE FIELD OBSERVATION
 COAL PILE RUNOFF BASIN ABANDONMENT
 Pleasant Prairie Power Plant
 Pleasant Prairie, Wisconsin

Sample ID	Sample Collection Date	Sample Depth (feet, bgs)	PID (ppm)	Soil Classification
SS-01	1/16/2019	0-0.5	4.0	gray/black CLAY (FILL), moist
SS-02	1/16/2019	0-0.5	< 1	brown/dark gray CLAY (FILL), moist, trace gravel
SS-03	1/16/2019	0-0.5	1.4	brown/dark gray CLAY (FILL), moist, trace gravel
SS-04	1/16/2019	0-0.5	< 1	brown/dark gray CLAY (FILL), moist, trace gravel
SS-05	1/16/2019	0-0.5	< 1	brown/dark gray CLAY (FILL), moist, trace gravel
SS-06	1/16/2019	0-0.5	< 1	brown/grayish brown CLAY (FILL), moist, trace to few gravel
SS-07	1/16/2019	0-0.5	< 1	gray/black CLAY (FILL), moist, trace gravel
SS-08	1/16/2019	0-0.5	1.1	gray/brown CLAY (FILL), moist, few sand, trace gravel
SS-09	1/16/2019	0-0.5	< 1	gray CLAY, moist, few sand, trace gravel
SS-10	1/16/2019	0-0.5	< 1	gray/grayish brown CLAY, moist, few sand, trace gravel
SS-11	1/16/2019	0-0.5	< 1	brown/grayish brown CLAY (FILL), moist, few sand, trace gravel
SS-12	1/16/2019	0-0.5	< 1	brown/grayish brown CLAY, moist, few sand, trace gravel
SS-13	1/16/2019	0-0.5	< 1	grayish brown CLAY (FILL), moist, few sand, trace gravel
SS-14	1/16/2019	0-0.5	< 1	grayish brown CLAY, moist, few sand, trace gravel
SS-15	1/16/2019	0-0.5	< 1	dark gray CLAY with GRAVEL (FILL), moist, few sand
SS-16	1/16/2019	0-0.5	< 1	black/brown/gray CLAY (FILL), moist, few sand, trace to few gravel

Notes:

bgs - below ground surface

PID - photoionization detector VOC field screening instrument

ppm - parts per million

VOC - volatile organic compound

TABLE 2B
SUMMARY OF POST-LINER REMOVAL SOIL SAMPLE LABORATORY ANALYTICAL RESULTS
 COAL PILE RUNOFF BASIN ABANDONMENT

Pleasant Prairie Power Plant
 Pleasant Prairie, Wisconsin

Sample ID	SS-01	SS-02	SS-03	SS-04	SS-05	SS-06	SS-06 DUP	SS-07	SS-08	WDNR Soil RCL			WDNR BTV
										Direct Contact		Groundwater Protection (DF=2)	
Sample Collection Date	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	Non-Industrial	Industrial	
Sample Depth (feet, bgs)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5			
Metals (mg/kg)													
Arsenic	6.9	7.5	8.5	8.0	10.2	8.0	8.4	8.6	7.1	0.677	3	0.584	8
Cadmium	0.17 J	< 0.12	< 0.11	< 0.11	< 0.12	< 0.11	< 0.11	< 0.12	< 0.12	71.1	985	0.752	1
Chromium, trivalent	22.2 J	22.5 J	27.5 J	22.1 J	23.2 J	22.5 J	19.6 J	19.7 J	23.0 J	100000	100000	--	44
Chromium, hexavalent	< 2.56	< 2.57	< 2.59	< 2.53	< 2.57	< 2.58	< 2.52	< 2.63	< 2.52	0.301	6.36	--	
Copper	20.4	20.4	23.0	23.2	23.8	31.3	22.3	21.6	17.7	3130	46700	91.6	35
Iron	20500	20400	24400	20200	21900	19700	19100	19800	23200	54800	100000	--	34314
Lead	10.3	10.6	14.0	11.8	14.9	11.6	10.9	11.9	12.4	400	800	27	52
Manganese	575	551	578	498	559	527	578	505	365	1830	25900	39.1244	2937
Sulfate	252	296	272	155	142	139	209	253	186	--	--	--	--
Zinc	60.9	61.0	66.7	59.7	64.2	438	46.7	61.6	64.3	23500	100000	--	150
VOCs (ug/kg)	ND	--	ND	--	--	--	--	--	ND	--	--	--	--

Sample ID	SS-09	SS-10	SS-11	SS-12	SS-13	SS-14	SS-15	SS-16	WDNR Soil RCL			WDNR BTV
									Direct Contact		Groundwater Protection (DF=2)	
Sample Collection Date	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019				
Sample Depth (feet, bgs)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5				
Metals (mg/kg)												
Arsenic	6.7	7.5	10.6	7.2	8.8	8.9	9.7	8.5	0.677	3	0.584	8
Cadmium	< 0.11	< 0.11	< 0.12	< 0.11	0.24 J	< 0.12	0.12 J	0.17 J	71.1	985	0.752	1
Chromium, trivalent	19.4 J	20.6 J	26.1 J	20.2 J	20.2 J	11.8 J	19.7 J	16.8 J	100000	100000	--	44
Chromium, hexavalent	< 2.50	< 2.54	< 2.61	< 2.53	< 2.57	6.56 J	< 2.52	< 2.61	0.301	6.36	--	
Copper	18.9	18.7	27.0	19.0	29.6	21.0	29.9	20.7	3130	46700	91.6	35
Iron	18800	21900	24600	18100	21300	19800	22000	18300	54800	100000	--	34314
Lead	9.6	14.2	14.1	10.7	13.3	11.0	16.2	11.7	400	800	27	52
Manganese	494	387	618	523	544	579	446	498	1830	25900	39.1244	2937
Sulfate	235	97.9	234	137	160	129	376	313	--	--	--	--
Zinc	42.7	59.1	64.8	54.5	70.0	58.1	74.8	62.8	23500	100000	--	150
VOCs (ug/kg)	--	--	--	--	--	--	--	--	--	--	--	--

WDNR Soil RCL			WDNR BTV
Direct Contact		Groundwater Protection (DF=2)	
Non-Industrial	Industrial		
0.677	3	0.584	8
71.1	985	0.752	1
100000	100000	--	44
0.301	6.36	--	
3130	46700	91.6	35
54800	100000	--	34314
400	800	27	52
1830	25900	39.1244	2937
--	--	--	--
23500	100000	--	150
--	--	--	--

Notes:

- not analyzed, not established or not applicable
- bgs - below ground surface
- BTV - background threshold value
- DF - dilution factor
- DUP - duplicate
- J - estimated concentration at or above the limit of detection and below the limit of quantitation
- mg/kg - milligrams per kilogram
- ND - not detected (refer to laboratory report for detection limits)
- RCL - residual contaminant level (June 2018)
- ug/kg - micrograms per kilogram
- VOCs - volatile organic compounds
- WDNR - Wisconsin Department of Natural Resources

Table 3 - Surface Water Analytical Results

Pleasant Prairie Power Plant
 We Energies
 Pleasant Prairie, Wisconsin

9-Digit Code	Sample Location	Sample Date	Inorganic		RNA	RNA	RNA	RNA
			Sulfate, Dissolved	Groundwater, depth to	pH, Field	Specific Conductance, Field	Temperature, Water	
								mg/L
Reporting Units:			Result	Flag	Result	Result	Result	Result
LAEast-38860	LAEast	5/23/2006	446	--	--	--	--	--
LAEast-39092	LAEast	1/10/2007	440	0	7.9	1,173	1.5	1.5
LAEast-39184	LAEast	4/12/2007	430	--	7.3	1,109	5.5	5.5
LAEast-39287	LAEast	7/24/2007	430	--	7.8	1,130	24.5	24.5
LAEast-39372	LAEast	10/17/2007	440	0	7.5	1,108	16.5	16.5
LAEast-39470	LAEast	1/23/2008	420	0	7.4	1,152	0	0
LAEast-39562	LAEast	4/24/2008	390	--	7.9	1,143	13.5	13.5
LAEast-39644	LAEast	7/15/2008	380	--	8	1,132	24	24
LAEast-39729	LAEast	10/8/2008	400	--	7.9	1,124	15	15
LAEast-39912	LAEast	4/9/2009	350	--	8.2	1,098	9	9
LAEast-40008	LAEast	7/14/2009	340	--	8.4	1,080	22	22
LAEast-40281	LAEast	4/13/2010	360	--	8.3	1,266	10.5	10.5
LAEast-40379	LAEast	7/20/2010	340	--	8.4	1,244	25.5	25.5
LAEast-40660	LAEast	4/27/2011	340	--	8.1	1,119	10	10
LAEast-41101	LAEast	7/11/2012	370	--	8.2	1,142	26.5	26.5
LAEast-41374	LAEast	4/10/2013	340	--	8.1	1,224	6.5	6.5
LAEast-41745	LAEast	4/16/2014	330	--	8.2	1,218	8	8
LakeAndreaB-39184	LakeAndreaB	4/12/2007	420	--	7.7	1,108	6	6
LAWest-38860	LAWest	5/23/2006	447	--	--	--	--	--
LAWest-39092	LAWest	1/10/2007	440	0	7.6	1,168	1.5	1.5
LAWest-39184	LAWest	4/12/2007	430	--	7.6	1,116	5.5	5.5
LAWest-39287	LAWest	7/24/2007	390	--	7.9	1,173	24.5	24.5
LAWest-39372	LAWest	10/17/2007	460	0	7.9	1,124	16.5	16.5
LAWest-39470	LAWest	1/23/2008	420	0	7.8	1,162	0	0
LAWest-39562	LAWest	4/24/2008	390	--	7.1	1,146	13.5	13.5
LAWest-39644	LAWest	7/15/2008	380	--	7.4	1,135	23	23
LAWest-39729	LAWest	10/8/2008	400	--	7.1	1,124	16	16
LAWest-39912	LAWest	4/9/2009	350	--	7.6	1,102	7	7
LAWest-40008	LAWest	7/14/2009	350	--	8.3	1,079	22.5	22.5
LAWest-40281	LAWest	4/13/2010	360	--	8	1,259	10.5	10.5
LAWest-40379	LAWest	7/20/2010	340	--	8.3	1,241	26.5	26.5
LAWest-40660	LAWest	4/27/2011	340	--	8	1,173	9.5	9.5
LAWest-41101	LAWest	7/11/2012	370	--	8.2	1,147	21.5	21.5
LAWest-41374	LAWest	4/10/2013	330	--	7.9	1,416	6.5	6.5
LAWest-41745	LAWest	4/16/2014	330	--	8.2	1,227	8	8
SG-1A-39286	SG-1A	7/23/2007	--	27.8	--	--	--	--
SG-1A-39561	SG-1A	4/23/2008	--	16.85	--	--	--	--
SG-1A-39643	SG-1A	7/14/2008	--	18.1	--	--	--	--
SG-1A-39729	SG-1A	10/8/2008	--	22.41	--	--	--	--
SG-1A-40007	SG-1A	7/13/2009	--	6.52	--	--	--	--
SG-2-39286	SG-2	7/23/2007	--	9.85	--	--	--	--
SG-2-39561	SG-2	4/23/2008	--	10.25	--	--	--	--
SG-2-39643	SG-2	7/14/2008	--	9.91	--	--	--	--
SG-2-39729	SG-2	10/8/2008	--	8.05	--	--	--	--
SG-2-39911	SG-2	4/8/2009	--	7.8	--	--	--	--
SG-2-40007	SG-2	7/13/2009	--	9.4	--	--	--	--
SG-3-39286	SG-3	7/23/2007	--	7.2	--	--	--	--
SG-3-39561	SG-3	4/23/2008	--	7.2	--	--	--	--
SG-3-39643	SG-3	7/14/2008	--	7.37	--	--	--	--
SG-3-39729	SG-3	10/8/2008	--	5.51	--	--	--	--
SG-3-39911	SG-3	4/8/2009	--	18.25	--	--	--	--
SG-31-39911	SG-31	4/8/2009	--	5.29	--	--	--	--

[O:CMD 2/6/20, C:CMD 2/6/20]

Underlined concentration that attains or exceeds WDNR PAL
Bold concentration that attains or exceeds WDNR ES
 PAL and ES from WI Administrative Code NR 140 groundwater quality standard revised effective February 2017.
 -- = Analysis not performed
 WDNR = Wisconsin Department of Natural Resources
 U = Concentration was not detected above the reported limit
 s.u. = standard units
 RNA = Remediation by Natural Attenuation (lab and field)
 PAL = Preventive Action Limit
 PAH = Polycyclic Aromatic Hydrocarbon
 mg/L = milligrams per liter
 NS = A groundwater quality standard has not been established.
 NO2 + NO3 = nitrite plus nitrate
 J = Estimated Concentration
 GEO = Geotechnical Property
 ES = Enforcement Standard
 Dup = Quality Control Field Duplicate Sample
 Deg C = degrees Celsius
 µS/cm = microsiemens per centimeter (aka micromhos per centimeter)
 µg/L = micrograms per liter (equivalent to parts per billion - ppb)
 < = Concentration is less than reported limit

Lab comments, additional data qualifiers and definitions can be found in associated laboratory reports.

ATTACHMENT A

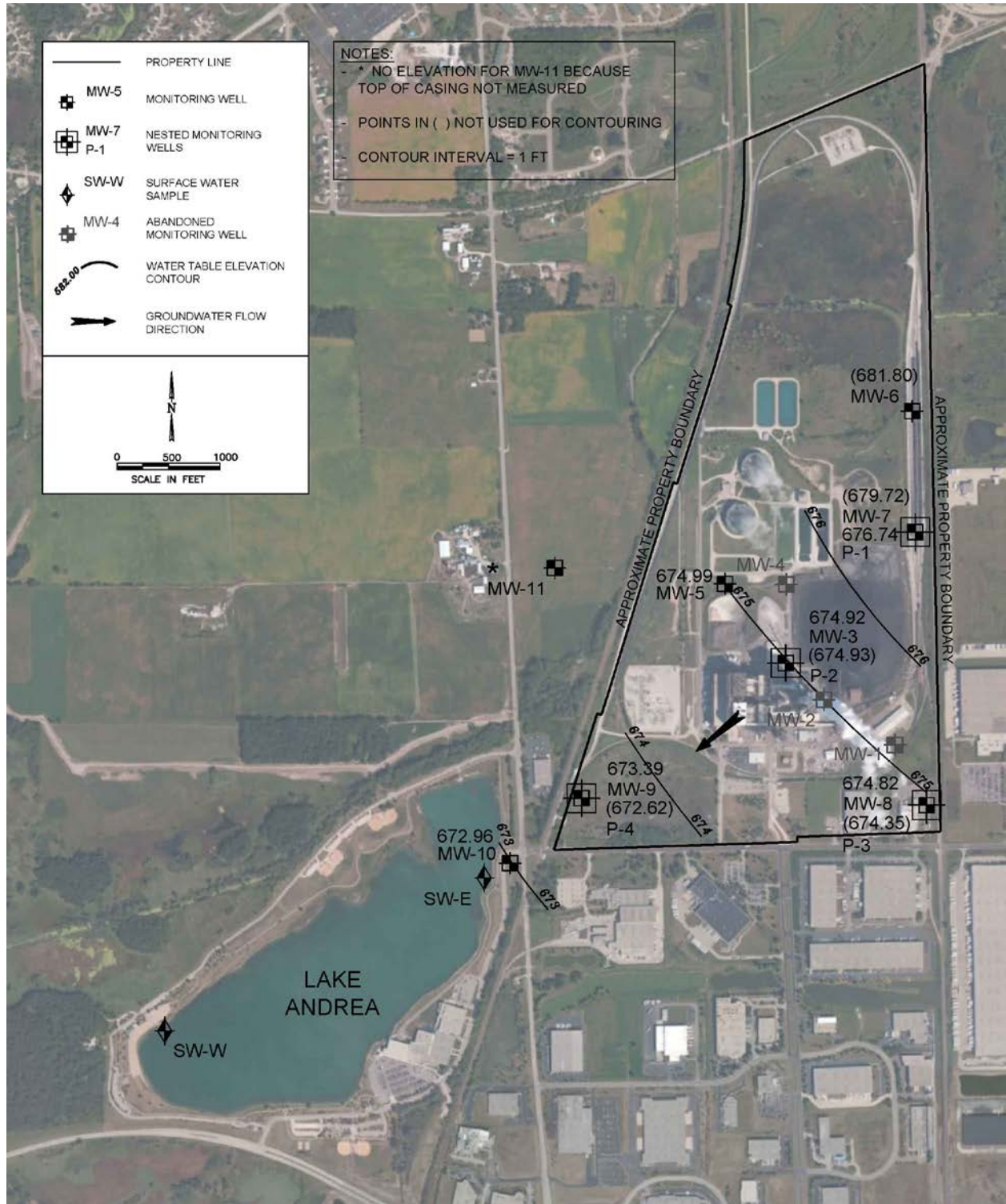


Figure 1. Site map showing current monitoring locations and groundwater elevations in April 2014. MW6, MW7, P3, and P4 were not used for contouring because they are screened in clay; MW3 was used instead of P2 for contouring because MW3 is closer to the water table; and MW11 was not used for contouring because the top of casing elevation was not surveyed.

ATTACHMENT B

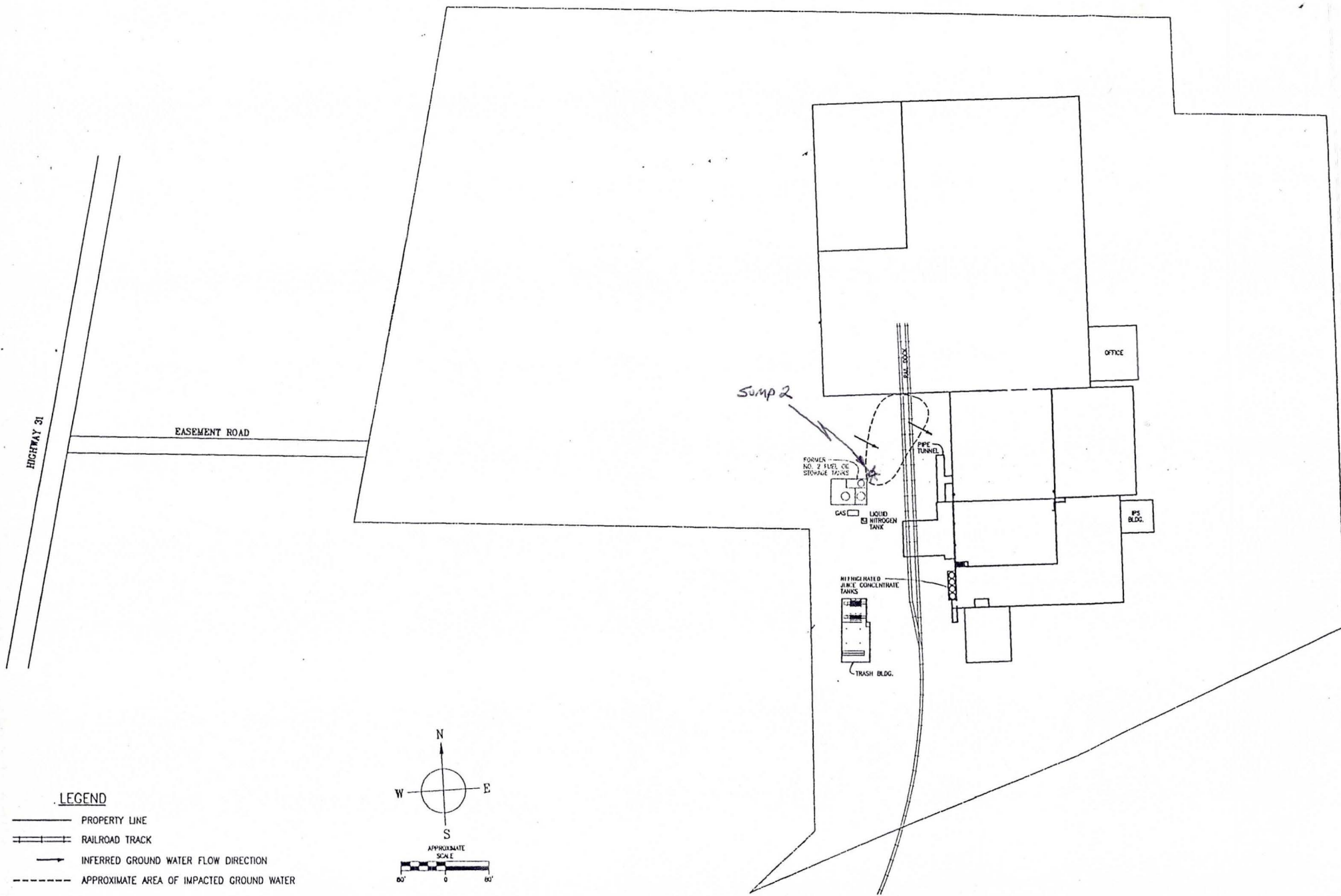
Table B-1 - Groundwater Analytical Results

BRRTS#: 02-30-107682

Ocean Spray

Pleasant Prairie, Wisconsin

Well ID	Date	Iron (ug/L)	Sulfate (mg/L)
MW-1	3/14/1997	458	648
MW-1	6/17/1997	235	870
MW-1	9/3/1997	<50.0	734
MW-1	12/3/1997	298	730
MW-2	3/14/1997	425	264
MW-2	6/17/1997	243	318
MW-2	9/3/1997	<50.0	289
MW-2	12/3/1997	359	252



LEGEND

- PROPERTY LINE
- RAILROAD TRACK
- INFERRED GROUND WATER FLOW DIRECTION
- - - - - APPROXIMATE AREA OF IMPACTED GROUND WATER

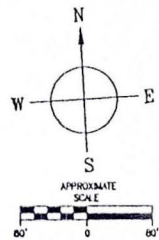


TABLE 3
 REMEDIATION BY NATURAL ATTENUATION INDICATOR MEASUREMENTS
 OCEAN SPRAY CRANBERRIES, INC.
 7800 60TH AVENUE
 KENOSHA, WISCONSIN

Monitoring Location Date Sampled Lab		MW-1				MW-2			
		3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI	3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI
Lab ID:	Units	97-A020067	97-A049203	97-AO74110	97-A109499	97-A020068	97-A049204	97-AO74111	97-A109500
Temperature	°C	7.2	9.85	13.69	10.83	6.83	9.66	14.32	11.57
DO	mg/L	3	4.82	5.03	2.16	3.87	3.68	2.79	1.15
Specific Conductance	µmhos/cm	1902	2225	1672	1486	1183	1557	1162	1023
pH		6.82	7.00	7.08	7.12	6.94	7.09	7.16	7.12
TDS	g/L	1.218	1.427	1.071	0.951	0.757	0.995	0.744	0.654
ORP	mv	383	458	419	409	370	455	219	400
CO ₂	mg/L	NA	152.8	162	NA	NA	98.6	114	NA
Iron (dissolved)	µg/L	458	235	<50.0	298	425	243	<50.0	359
Manganese (dissolved)	µg/L	41	<15.0	<15.0	<15.0	21	<15.0	<15.0	<15.0
Nitrate-N	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sulfate (total)	mg/L	648	870	734	730	264	318	289	252
Alkalinity	mg/L	340	300	339	343	402	351	424	463
Methane	µg/L	NA	<26.0	<26.0	<26	NA	<26.0	<26.0	<26

Notes:

- °C - Degrees celsius
- DO - Dissolved oxygen
- TDS - Total dissolved solids
- ORP - Oxygen-reduction potential
- mg/L - Milligrams per liter
- µg/mL - Micrograms per milliliter
- µmhos/cm - Micromhos per centimeter
- g/L - Grams per liter
- mv - Millivolts
- NM - Not measured; Parameters were not measured due to the presence of free product.
- * - A CO₂ measurement could not be determined due to the color and turbidity of the sample.
- NA - Not analyzed
- SAI - Specialized Assays, Incorporated.
 2960 Foster Creighton Drive
 Nashville, Tennessee 37204-0566
 WDNR Certification No. 998020430

TABLE 3
 REMEDIATION BY NATURAL ATTENUATION INDICATOR MEASUREMENTS
 OCEAN SPRAY CRANBERRIES, INC.
 7800 60TH AVENUE
 KENOSHA, WISCONSIN

Monitoring Location Date Sampled Lab		MW-3				MW-4			
		3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI	3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI
Lab ID:	Units	97-A020069	97049205	97-A074112	97-A109501	97-A020070	97-A049206	97-A074113	97-A109502
Temperature	°C	6.78	12.02	15.92	13.22	5.6	14.98	16.19	12.55
DO	mg/L	4.13	3.57	1.25	0.38	NM	4.39	2.51	0.5
Specific Conductance	µmhos/cm	1080	1389	1054	984	1080	41	1192	1024
pH		6.83	7.06	7.00	7.01	6.8	6.67	6.96	7.14
TDS	g/L	6.92	0.884	0.674	0.631	NM	0.026	0.763	0.656
ORP	mv	370	461	417	408	NM	410	167	153
CO ₂	mg/L	NA	93.4	*	NA	*	114.4	133	NA
Iron (dissolved)	µg/L	463	708	76	347	501	665	125	2,500
Manganese (dissolved)	µg/L	471	396	192	136	2,290	3,280	4,560	3,510
Nitrate-N	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sulfate (total)	mg/L	142	178	189	195	48.5	79.8	14.1	<5.0
Alkalinity	mg/L	443	364	461	478	470	424	572	598
Methane	µg/L	NA	<26.0	41	<26	NA	4,000	8,600	6,450

Notes:

- °C - Degrees celsius
- DO - Dissolved oxygen
- TDS - Total dissolved solids
- ORP - Oxygen-reduction potential
- mg/L - Milligrams per liter
- µg/mL - Micrograms per milliliter
- µmhos/cm - Micromhos per centimeter
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 2960 Foster Creighton Drive
 Nashville, Tennessee 37204-0566
 WDNR Certification No. 998020430

TABLE 3
 REMEDIATION BY NATURAL ATTENUATION INDICATOR MEASUREMENTS
 OCEAN SPRAY CRANBERRIES, INC.
 7800 60TH AVENUE
 KENOSHA, WISCONSIN

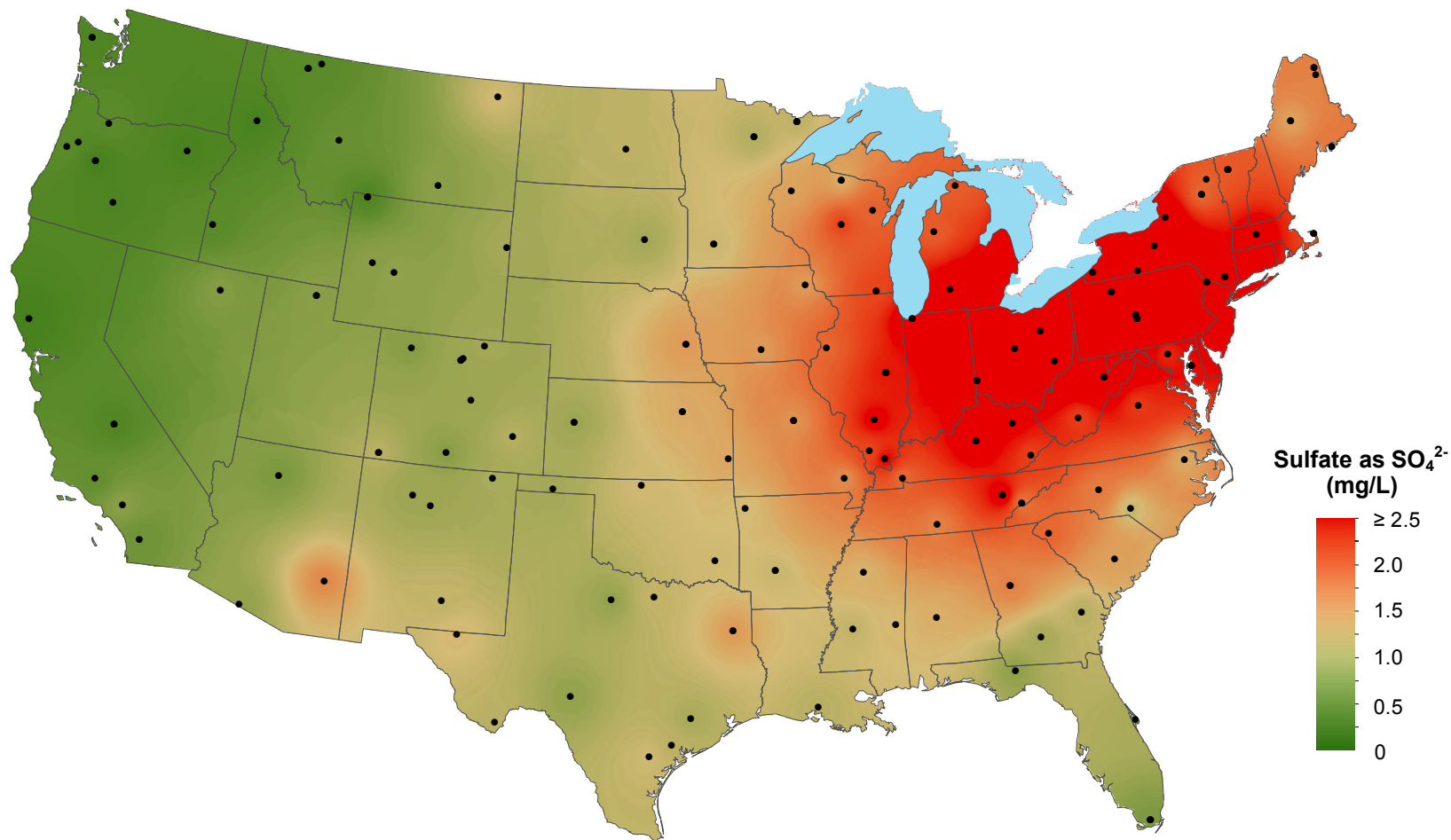
Monitoring Location Date Sampled Lab		Sump 1 (RS-1)				Sump 2 (RS-2)			
		3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI	3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI
Lab ID:	Units	97-A020071	97-A049207	97-AO74114	97-A109503	97-A020072	97-A049207	97-AO74115	97-A109504
Temperature	°C	6.3	15.93	17.11	8.38	5.2	15.95	19.12	12.37
DO	mg/L	NM	0.52	1.72	1.46	NM	0.30	1.28	0.53
Specific Conductance	µmhos/cm	1710	1194	19539	16317	620	7,470	7,881	6380
pH		7.8	7.15	6.76	6.69	8.1	6.8	6.94	6.82
TDS	g/L	NM	0.857	12.47	10.68	NM	4.827	5.052	4.109
ORP	mv	NM	385	149	212	NM	155	137	154
CO ₂	mg/L	NA	24.4	51	NA	NA	*	47	NA
Iron (dissolved)	µg/L	782	202	19,400	131	244	5,260	4,360	10,900
Manganese (dissolved)	µg/L	155	24	795	81.0	<15	223.0	230.0	188.0
Nitrate-N	mg/L	<0.10	0.25	<0.10	0.21	<0.10	<0.10	<0.10	<0.10
Sulfate (total)	mg/L	29.8	18.0	<5.0	28.0	11.5	<5.0	<5.0	<5.0
Alkalinity	mg/L	81	45.4	355	88.4	59.4	261	323	442
Methane	µg/L	NA	1,000	22,600	96	NA	13,000	38,800	20,800

Notes:

- °C - Degrees celsius
- DO - Dissolved oxygen
- TDS - Total dissolved solids
- ORP - Oxygen-reduction potential
- mg/L - Milligrams per liter
- µg/mL - Micrograms per milliliter
- µmhos/cm - Micromhos per centimeter
- g/L - Grams per liter
- mv - Millivolts
- NM - Not measured; Parameters were not measured due to the presence of free product.
- * - A CO₂ measurement could not be determined due to the color and turbidity of the sample.
- NA - Not analyzed
- SAI - Specialized Assays, Incorporated.
 2960 Foster Creighton Drive
 Nashville, Tennessee 37204-0566
 WDNR Certification No. 998020430

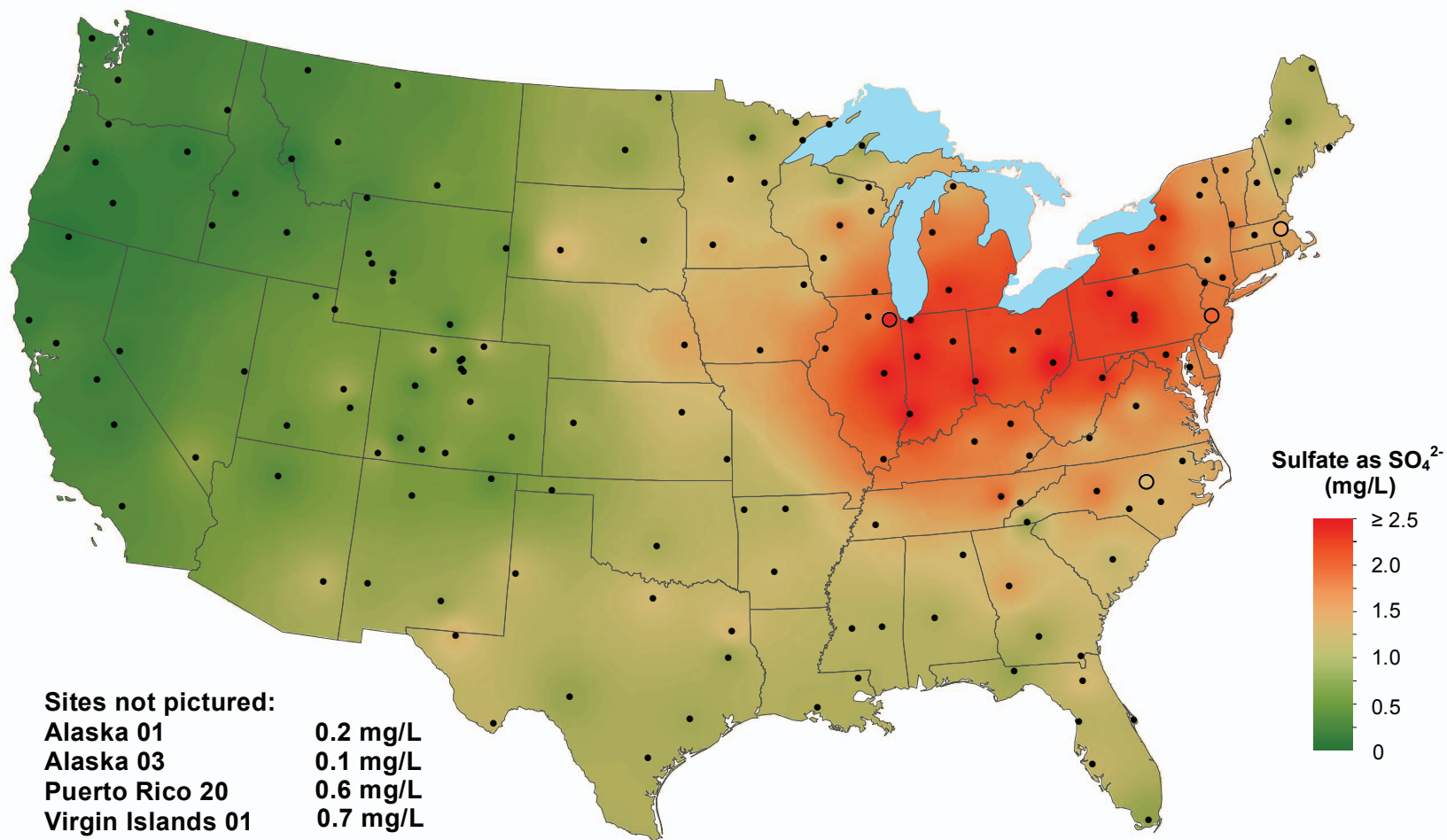
ATTACHMENT C1

Sulfate ion concentration, 1985

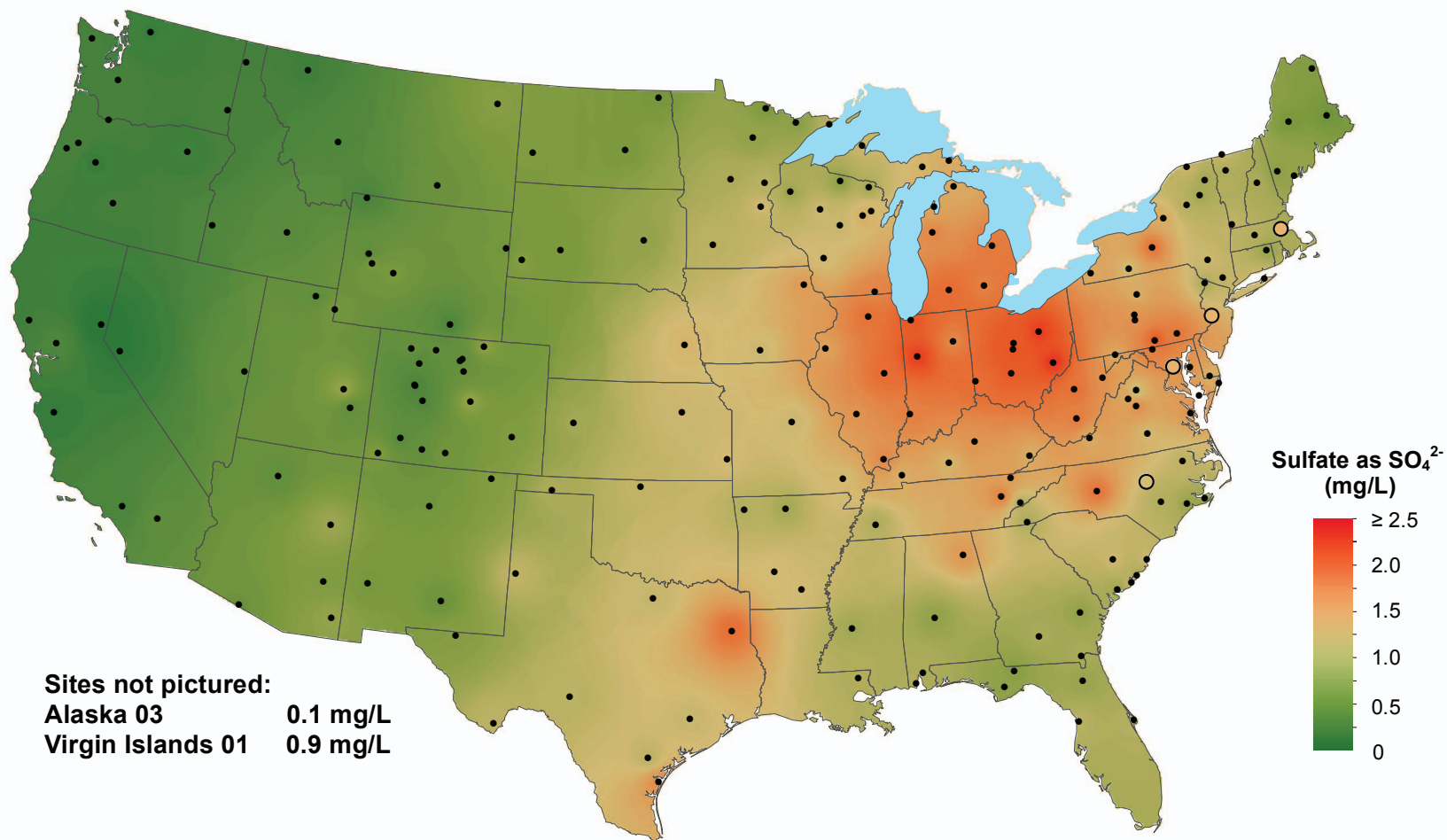


National Atmospheric Deposition Program/National Trends Network
<http://nadp.isws.illinois.edu>

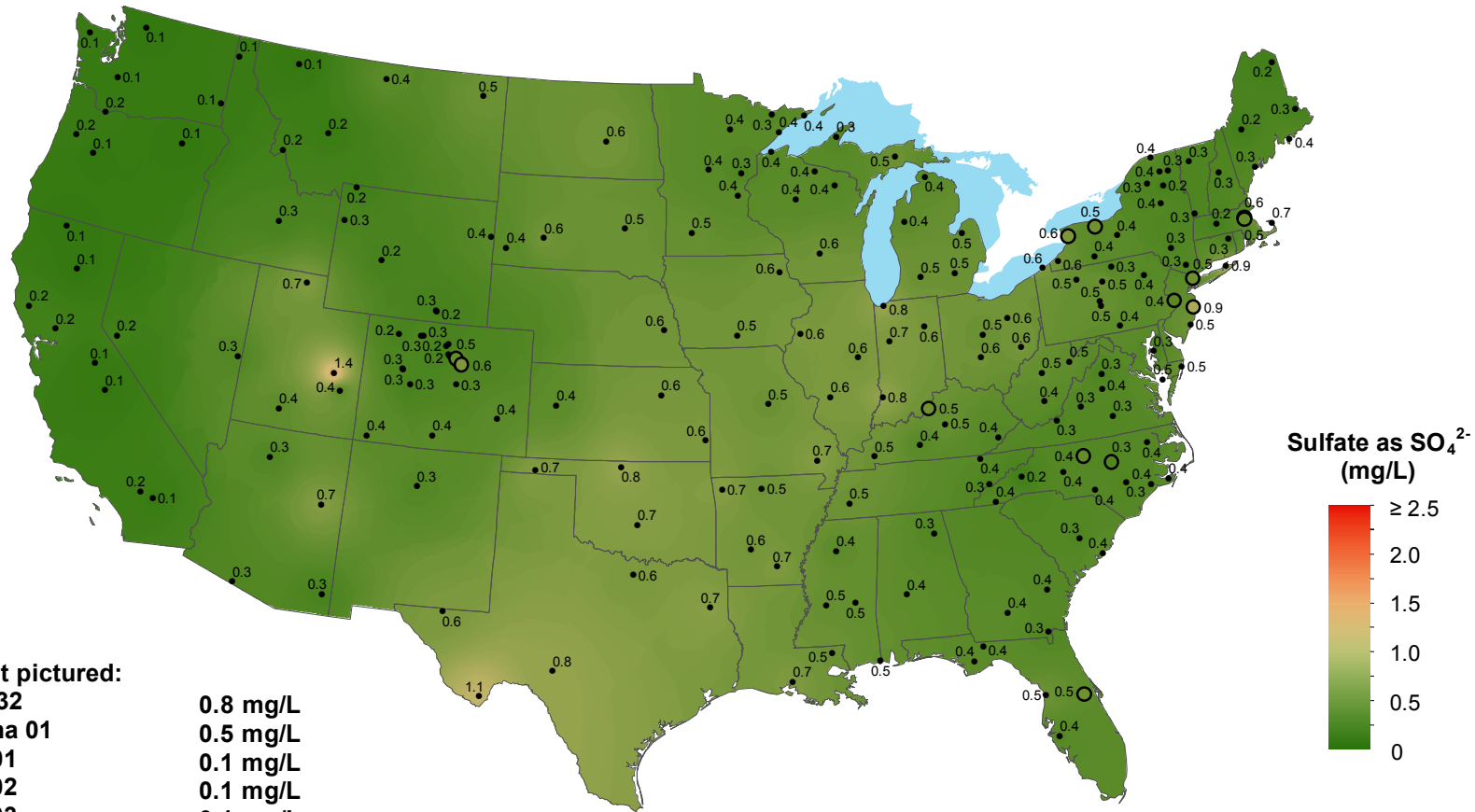
Sulfate ion concentration, 1998



Sulfate ion concentration, 2005



Sulfate ion concentration, 2017



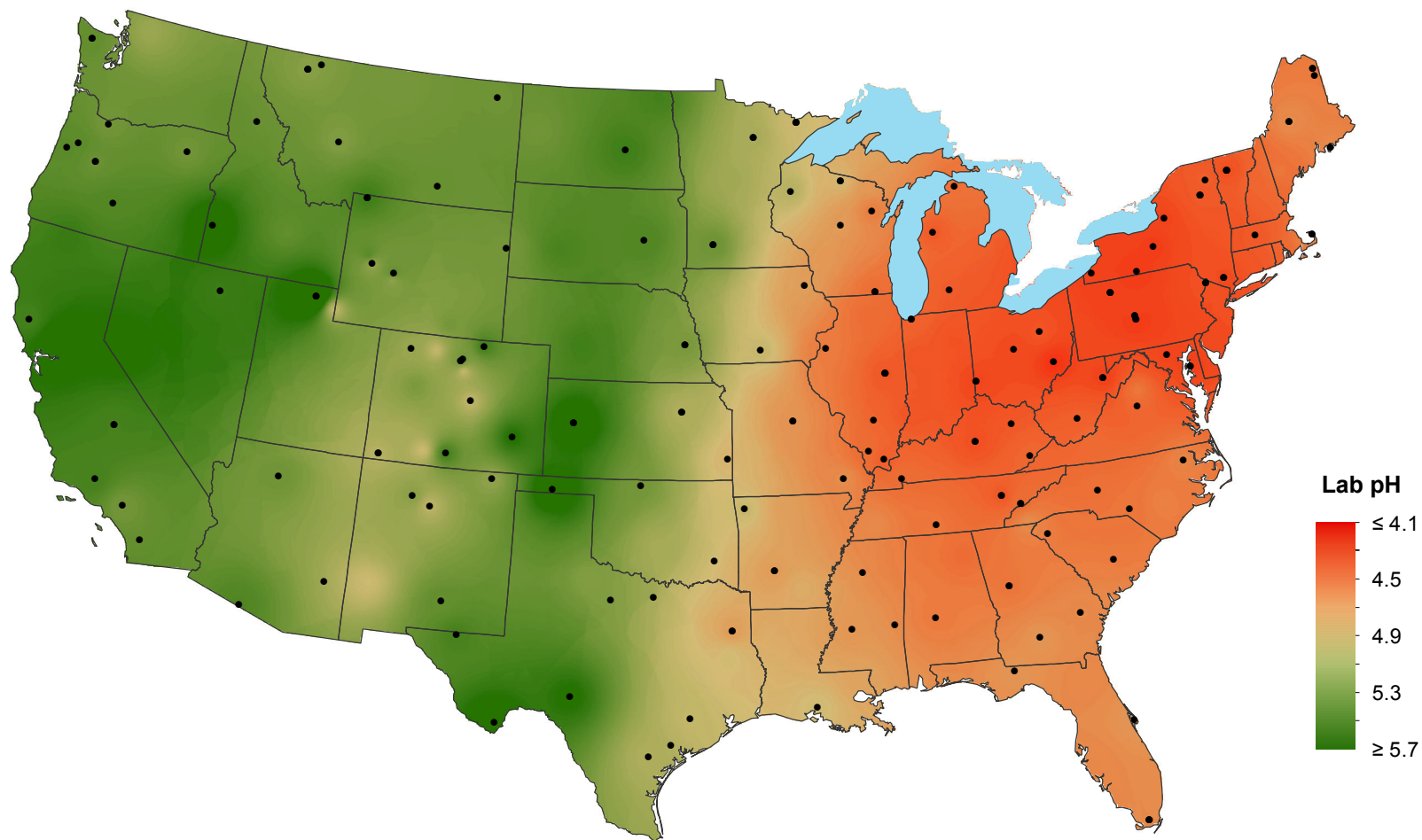
Sites not pictured:

Alberta 32	0.8 mg/L
Argentina 01	0.5 mg/L
Alaska 01	0.1 mg/L
Alaska 02	0.1 mg/L
Alaska 03	0.1 mg/L
Alaska 97	0.3 mg/L
British Columbia 22	1.5 mg/L
British Columbia 23	0.3 mg/L
British Columbia 24	0.2 mg/L
Saskatchewan 21	0.3 mg/L
Saskatchewan 31	0.4 mg/L

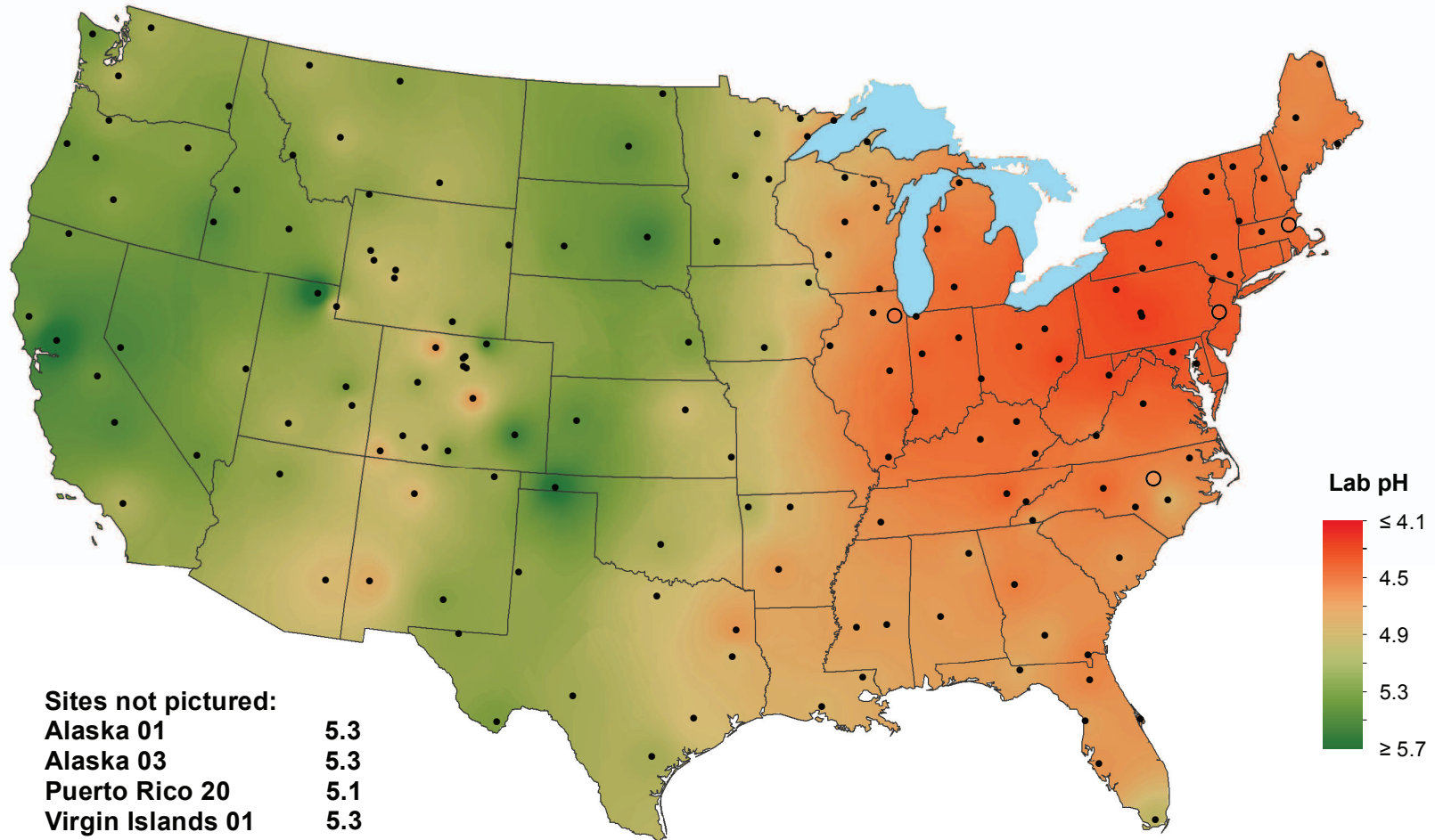
National Atmospheric Deposition Program/National Trends Network
<http://nadp.slh.wisc.edu>

ATTACHMENT C2

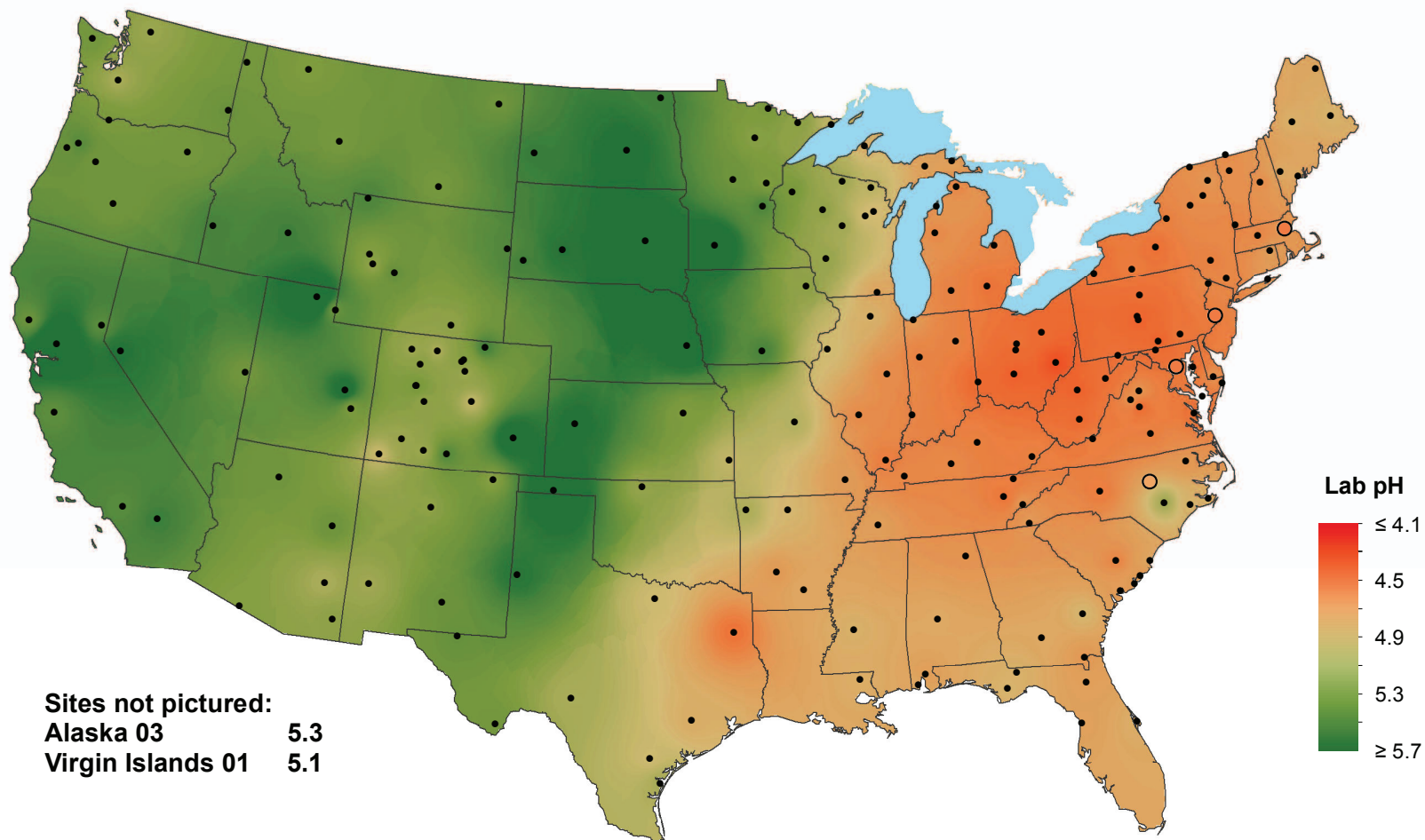
Hydrogen ion concentration as pH from measurements made at the Central Analytical Laboratory, 1985



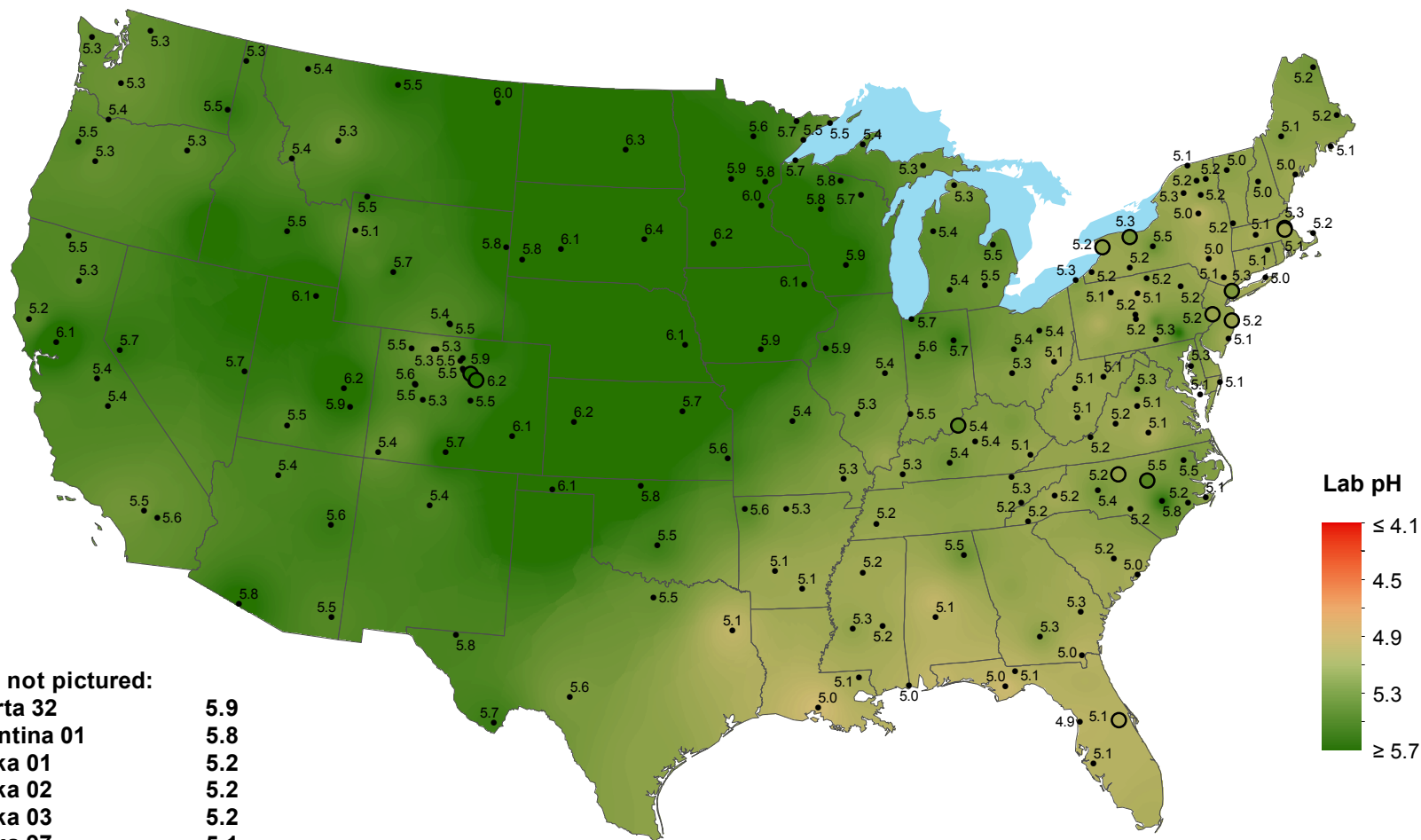
Hydrogen ion concentration as pH from measurements made at the Central Analytical Laboratory, 1998



Hydrogen ion concentration as pH from measurements made at the Central Analytical Laboratory, 2005



Hydrogen ion concentration as pH from measurements made at the Central Analytical Laboratory, 2017



Sites not pictured:

Alberta 32	5.9
Argentina 01	5.8
Alaska 01	5.2
Alaska 02	5.2
Alaska 03	5.2
Alaska 97	5.1
British Columbia 22	4.4
British Columbia 23	5.0
British Columbia 24	5.2
Saskatchewan 21	5.7
Saskatchewan 31	5.8

National Atmospheric Deposition Program/National Trends Network
<http://nadp.slh.wisc.edu>

ATTACHMENT D

FIGURE 1 - SOIL SAMPLE LOCATION MAP

● APPROXIMATE POST-LINER REMOVAL
SOIL SAMPLE LOCATION



1 inch = 75 feet
Date Printed: 5/30/2018



DISCLAIMER This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, data and information located in various state, county and municipal offices and other sources affecting the area shown and is to be used for reference purposes only. Kenosha County is not responsible for any inaccuracies herein contained. If discrepancies are found, please contact Kenosha County.