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2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

PLEASANT PRAIRIE POWER PLANT ASH LANDFILL

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2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
PLEASANT PRAIRIE POWER PLANT ASH LANDFILL

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ACRONYMS AND ABBREVIATIONS

ASD	Alternate Source Demonstration
B	Boron
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
F	Fluoride
mg/L	milligrams per liter
NRT	Natural Resource Technology, an OBG Company
OBG	O'Brien & Gere Engineers, Inc.
P4	Pleasant Prairie Power Plant
Ramboll	O'Brien & Gere Engineers, Inc., a Ramboll Company
SSI	Statistically Significant Increase
TBD	To be Determined

1. INTRODUCTION

This report has been prepared on behalf of We Energies by O'Brien & Gere Engineers, Inc., a Ramboll Company (Ramboll) to provide the information required by Title 40 of the Code of Federal Regulations (40 CFR) 257.90(e) for the Pleasant Prairie Power Plant (P4) Ash Landfill located in Pleasant Prairie, Wisconsin.

In accordance with 40 CFR 257.90(e), the owner or operator of an existing coal combustion residual (CCR) unit must prepare an annual groundwater monitoring and corrective action report (Annual Report) for the preceding calendar year. The Annual Report must document the status of the groundwater monitoring and corrective action program for the CCR unit and summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. At a minimum, the Annual Report must contain the following information, to the extent available:

1. A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;
2. Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;
3. In addition to all the monitoring data obtained under 40 CFR 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;
4. A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and
5. Other information required to be included in the annual report as specified in 40 CFR 257.90 through 257.98.

This report provides the required information for the P4 Ash Landfill for calendar year 2019.

2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

The P4 Ash Landfill remained in Detection Monitoring (40 CFR 257.94) during 2019. Detection Monitoring Program sampling dates and parameters collected are provided in Table 1. Analytical results from the two sampling rounds collected and those statistically analyzed in 2019 are included in Table 2.

In accordance with 40 CFR 257.93(h)(2), the *Statistical Analysis Plan, Pleasant Prairie Power Plant Ash Landfill* (Natural Resource Technology, an OBG Company, 2017), and within 90 days of completing sampling and analysis (receipt of data); analytical data was evaluated for statistically significant increases (SSIs) over background concentrations for Appendix III constituents in groundwater monitoring wells at the P4 Ash Landfill. SSIs and the SSI determination dates are provided in Table 1.

40 CFR 257.94(e)(2) allows 90 days to demonstrate that a SSI was caused by a source other than the CCR unit or resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (i.e., an alternate source demonstration). An alternate source demonstration (ASD) was completed for the P4 Ash Landfill on the date provided in Table 1. The ASD document for 2019 is provided in Appendix A.

Table 1. Detection Monitoring Program Summary

Detection Round	Sampling Date	Parameters Collected	Data Received	SSI Determination Date	SSI Parameters	Resample Date	ASD Date
3	10/22/18-10/23/18	Appendix III	11/6/18	2/4/19	B	2/14/19	5/5/19
4	4/15/19	Appendix III	6/4/19	9/2/19	None	NA	NA
5	10/29/19-10/30/19	Appendix III	12/2/19	TBD (before 3/1/20)	TBD	TBD	TBD

B – Boron
NA – Not applicable
TBD – To Be Determined

The P4 Ash Landfill remains in the Detection Monitoring Program in accordance with 40 CFR 257.94.

3. KEY ACTIONS COMPLETED IN 2019

Two groundwater sampling events were completed in 2019 as part of the Detection Monitoring Program, Rounds 4 and 5. One groundwater sample was collected from each background and downgradient well in the monitoring system during each event. One resampling event was completed in accordance with the *Statistical Analysis Plan, Pleasant Prairie Power Plant Ash Landfill* (Natural Resource Technology, an OBG Company, 2017). Sampling dates are summarized in Table 1. All samples were collected and analyzed in accordance with the *Sampling and Analysis Plan* (Natural Resource Technology, Inc., 2015) prepared for the P4 Ash Landfill. All monitoring data obtained under 40 CFR 257.90 through 257.98 (as applicable) in 2019 are presented in Table 2.

A map showing the groundwater monitoring system, including the CCR unit and all background (upgradient) and downgradient monitoring wells with well identification numbers, for the P4 Ash Landfill is presented on Figure 1. There were no changes to the monitoring system in 2019.

Statistical evaluation, including SSI determinations, of analytical data from the Detection Monitoring Program for October 22-23, 2018 (Detection Monitoring Round 3) and April 15, 2019 (Detection Monitoring Round 4) were completed in 2019 and within 90 days of receipt of the analytical data. Statistical evaluation of analytical data was performed in accordance with the *Statistical Analysis Plan, Pleasant Prairie Power Plant Ash Landfill* (Natural Resource Technology, an OBG Company, 2017).

An Alternate Source Demonstration for Detection Monitoring Round 3 was prepared for the P4 Ash Landfill in 2019 and is provided in Appendix A. The ASD was prepared in accordance with 40 CFR 257.94(e)(2) and provides a description, data, and pertinent information to support an alternate source for wells and parameters with SSIs at the P4 Ash Landfill. The ASD provides justification that the SSIs observed during the Detection Monitoring Program were not due to a release from the CCR unit but were from naturally occurring conditions (e.g. natural variation in groundwater quality).

4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE PROBLEMS

No problems were encountered during implementation of the Detection Monitoring Program during 2019. Groundwater samples were collected and analyzed in accordance with the *Sampling and Analysis Plan* (Natural Resource Technology, Inc., 2015) prepared for the P4 Ash Landfill, and all data was accepted.

5. KEY ACTIVITIES FOR 2020

The following key activities are planned for 2020:

- Continuation of the Detection Monitoring Program with semi-annual sampling scheduled for the 2nd and 4th quarters of 2020.
- Complete statistical evaluation of analytical data from the downgradient wells, using background data to determine whether a SSI over background concentrations has occurred for Appendix III parameters.
- If an SSI is identified, potential alternate sources (i.e., a source other than the CCR unit caused the SSI or that that SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated. If an alternate source is demonstrated to be the cause of the SSI, a written demonstration will be completed within 90 days of the SSI determination and will included in the annual groundwater monitoring and corrective action report for 2020.
  - If an alternate source(s) is not identified to be the cause of the SSI, the applicable requirements of 40 CFR 257.94 through 257.98 (e.g., assessment monitoring) will apply in 2020, including associated recordkeeping/notifications required by 40 CFR 257.105 through 257.108.

6. REFERENCES

Natural Resource Technology, Inc., 2015, *Sampling and Analysis Plan-Revision 1, Pleasant Prairie Power Plant Ash Landfill, Pleasant Prairie, Wisconsin, December 8, 2015.*

Natural Resource Technology, an OBG Company, 2017, *Statistical Analysis Plan, Pleasant Prairie Power Plant Ash Landfill, Pleasant Prairie, Wisconsin, October 17, 2017.*

TABLES

Pleasant Prairie CCR
Table 1. Pleasant Prairie Power Plant Ash Landfill: Appendix III Analytical Results

Date Range: 10/01/2018 to 12/31/2019

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
W17BR	10/23/2018	AE31327	0.6600	13.0000	11.0	1.40	8.40	23.0
	04/15/2019	AE35074	0.6400	12.0000	11.0	1.40	8.80	25.0
	10/30/2019	AE41676	0.6400	12.0000	9.2	1.40	8.30	21.0
W20B	10/22/2018	AE31322	0.3200	64.0000	17.0	0.83	7.40	110.0
	04/15/2019	AE35078	0.3100	57.0000	16.0	0.76	8.00	110.0
	10/29/2019	AE41671	0.3100	51.0000	13.0	0.84	7.50	92.0
W20D	10/22/2018	AE31321	0.4600	27.0000	12.0	1.00	7.80	180.0
	04/15/2019	AE35079	0.4300	26.0000	11.0	1.00	8.10	180.0
	10/29/2019	AE41670	0.4400	25.0000	10.0	1.00	7.50	150.0
W31B	10/22/2018	AE31323	0.0950	98.0000	47.0	0.39	7.40	130.0
	04/15/2019	AE35081	0.0890	93.0000	43.0	0.47	7.70	130.0
	10/29/2019	AE41672	0.0890	89.0000	40.0	0.36	7.50	120.0
W73	10/23/2018	AE31326	0.4500	19.0000	11.0	1.00	8.20	130.0
	04/15/2019	AE35080	0.4300	19.0000	11.0	1.10	8.40	140.0
	10/30/2019	AE41678	0.4400	18.0000	11.0	1.00	7.60	120.0
W74	10/23/2018	AE31330	0.4100	21.0000	14.0	1.00	8.00	160.0
	04/15/2019	AE35077	0.4100	20.0000	14.0	1.00	8.50	160.0
	10/30/2019	AE41679	0.4100	21.0000	12.0	1.10	7.30	150.0
W75	10/23/2018	AE31329	0.4400	21.0000	9.9	0.98	8.20	140.0
	04/15/2019	AE35075	0.4200	20.0000	9.4	1.00	8.60	140.0
	10/30/2019	AE41677	0.4300	20.0000	8.5	1.00	8.00	120.0
W76	10/23/2018	AE31328	0.4600	20.0000	11.0	1.00	7.80	140.0
	02/14/2019	AE33639	0.5100				8.30	
	04/15/2019	AE35073	0.4400	19.0000	11.0	1.00	8.50	140.0
	10/30/2019	AE41674	0.4400	19.0000	10.0	1.00	6.90	100.0
W77	10/22/2018	AE31324	0.4400	26.0000	10.0	1.10	7.50	140.0
	04/15/2019	AE35072	0.4200	27.0000	9.4	1.10	8.00	140.0
	10/29/2019	AE41673	0.4200	25.0000	9.1	1.10	7.30	110.0

Pleasant Prairie CCR
Table 1. Pleasant Prairie Power Plant Ash Landfill: Appendix III Analytical Results

Date Range: 10/01/2018 to 12/31/2019

Well Id	Date Sampled	Lab Id	TDS, mg/L
W17BR	10/23/2018	AE31327	140.0
	04/15/2019	AE35074	160.0
	10/30/2019	AE41676	140.0
W20B	10/22/2018	AE31322	470.0
	04/15/2019	AE35078	420.0
	10/29/2019	AE41671	360.0
W20D	10/22/2018	AE31321	390.0
	04/15/2019	AE35079	360.0
	10/29/2019	AE41670	340.0
W31B	10/22/2018	AE31323	560.0
	04/15/2019	AE35081	530.0
	10/29/2019	AE41672	490.0
W73	10/23/2018	AE31326	300.0
	04/15/2019	AE35080	310.0
	10/30/2019	AE41678	310.0
W74	10/23/2018	AE31330	340.0
	04/15/2019	AE35077	330.0
	10/30/2019	AE41679	350.0
W75	10/23/2018	AE31329	310.0
	04/15/2019	AE35075	330.0
	10/30/2019	AE41677	290.0
W76	10/23/2018	AE31328	300.0
	04/15/2019	AE35073	320.0
	10/30/2019	AE41674	290.0
W77	10/22/2018	AE31324	370.0
	04/15/2019	AE35072	360.0
	10/29/2019	AE41673	360.0

FIGURES

Y:\GIS\Projects\161\11660\MXD\2019Annual_GWM_CAR\Figure 1_GW Samp Well Loc_P4.mxd

PROJECT: 71202 | DATED: 1/15/2020 | DESIGNER: GALARNMC

CCR RULE DOWNGRADIENT MONITORING WELL LOCATION

CCR RULE UPGRADIENT MONITORING WELL LOCATION

CCR RULE POTENTIAL CONTAMINANT PATHWAY MONITORING WELL

0 150 300 Feet

GROUNDWATER SAMPLING WELL LOCATION MAP

2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
WE ENERGIES P4 ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN

FIGURE 1

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

APPENDIX A
ALTERNATE SOURCE DEMONSTRATIONS (ASD)

APPENDIX A1
ALTERNATE SOURCE DEMONSTRATION, PLEASANT PRAIRIE POWER PLANT ASH LANDFILL, PLEASANT PRAIRIE, WI – MAY 5, 2019

OBG

Alternate Source Demonstration

Pleasant Prairie Power Plant Ash Landfill

Pleasant Prairie, WI

We Energies

May 5, 2019

OBG
Part of Ramboll

MAY 5, 2019 | PROJECT #71202

Alternate Source Demonstration

Pleasant Prairie Power Plant Ash Landfill
Pleasant Prairie, Wisconsin

Prepared for:

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ACRONYMS AND ABBREVIATIONS

ASD	Alternate source demonstration
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
HDPE	High density polyethylene
mg/L	milligrams per liter
NRT	Natural Resource Technology, an OBG Company
OBG	O'Brien & Gere Engineers, Inc., Part of Ramboll
Pleasant Prairie Power Plant Ash Landfill	P4 Ash Landfill
SSI	statistically significant increase
STD	standard units
TDS	Total dissolved solids
WAC	Wisconsin Administrative Code
WDNR	Wisconsin Department of Natural Resources

1 INTRODUCTION

1.1 OVERVIEW

This document has been prepared on behalf of We Energies by OBG, part of Ramboll (OBG) to provide pertinent information for an alternate source demonstration (ASD) as allowed by 40 CFR § 257.94(e)(2) for the Pleasant Prairie Power Plant (P4) Ash Landfill, located in Pleasant Prairie, Wisconsin (Figure 1).

Initial background groundwater monitoring consisting of a minimum of eight samples as required under 40 CFR § 257.94(b) was initiated in November 2015 and completed prior to October 17, 2017. Detection monitoring began in October 2017, and statistically significant increases (SSIs) were reported for boron in W73, and fluoride in W74 during the first semi-annual detection monitoring event. An ASD dated April 15, 2018 attributed concentrations of boron and fluoride to sources other than the P4 Ash Landfill (OBG, 2018). Results from the second detection monitoring event completed in April 2018 did not result in any SSIs.

The third semi-annual detection monitoring sample was collected on October 22, 2018, and analytical data was received on November 6, 2018. Statistical analysis of the results for SSIs of 40 CFR Part 257 Subpart D (CCR Rule) Appendix III parameters over background concentrations was completed within 90 days of collection and receipt of sample results (February 4, 2019). That statistical determination identified an SSI in the uppermost aquifer (i.e. bedrock groundwater unit) as follows:

- Boron above the background prediction interval at well W76

To verify this SSI, well W76 was resampled on February 14, 2019 and analyzed for boron, both total and dissolved, in accordance the Statistical Analysis Plan[1]. Following evaluation of analytical data from the resample, the SSI for boron was confirmed.

40 CFR § 257.94(e)(2) allows the owner or operator 90 days from the date of determination to demonstrate that a source other than the coal combustion residual (CCR) unit caused the SSI, or that the SSI resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Pursuant to 40 CFR § 257.94(e)(2), the following demonstrates that sources other than the P4 Ash Landfill were the cause of the SSI for boron at well W76 listed above. This ASD was completed within 90 days of determination of the SSIs (May 5, 2019) as required by 40 CFR § 257.94(e)(2).

1.2 BACKGROUND

The P4 Ash Landfill was constructed in 1980 and began filling in 1981. Initially construction was completed on top of the existing clay (Cell 1). Cells 2-4 were constructed with a base of 5 feet of compacted clay. By 2014, all CCR was removed from previous Cells 1-4 and a new landfill cell was constructed over the footprint of the previous cells. The new landfill cell (Cell 1) was constructed with a composite liner and a leachate collection system in 2013 – 2014. The composite liner consists of a 60-mil high density polyethylene (HDPE) geomembrane and geosynthetic clay liner. The new Cell 1 was placed in service in 2014.

1.3 GROUNDWATER MONITORING

Background groundwater sampling in compliance with the CCR Rule was initiated in November 2015, with the final round of background groundwater samples collected in August 2017. Groundwater is also sampled to meet the requirements of a Wisconsin Department of Natural Resources (WDNR) program and groundwater samples have been collected since the early 1990's. The CCR Rule monitoring program includes background wells W20D and W77, and downgradient wells W73 through W76. A map showing the groundwater monitoring system, including the WDNR program and CCR Rule monitoring wells, is presented on Figure 1. Groundwater generally flows to the northwest/ north, representative groundwater contours are shown on Figure 2.

[1] Natural Resource Technology, an OBG Company, 2017, Statistical Analysis Plan, Pleasant Prairie Power Plant Ash Landfill, Pleasant Prairie, Wisconsin, October 17, 2017.

Samples were collected and analyzed in accordance with the Sampling and Analysis Plan (Natural Resource Technology, Inc. 2015) prepared for the P4 Ash Landfill. All monitoring data obtained under 40 CFR § 257.90 through 257.98 (as applicable) are presented in Tables 1. Statistical evaluation of analytical data was performed in accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company, 2017) prepared for the landfill.

1.4 GEOLOGY

The P4 landfill overlies more than 100 feet of unlithified glacial deposits. The glacial unit is underlain by Silurian dolomite (bedrock groundwater unit), which is the uppermost aquifer beneath and in the vicinity of the P4 Ash Landfill (Figure 3). The groundwater flows toward the north-northeast in the Silurian dolomite in the landfill area. The glacial deposits consist largely of clay-rich till of the Oak Creek Formation and have low hydraulic conductivity. Silt, sand and gravel lenses also exist in the unlithified material beneath the current landfill area. Cross-sections (Figures 4 through 7) indicate most of the silt, sand, and gravel lenses are not laterally continuous beneath the current landfill area. However, southwest to northeast trending silt, sand, and gravel lenses occurring between elevations 625 and 660 feet may be laterally continuous beneath the current landfill area (Figures 4 and 5) and represent units for monitoring a potential contaminant pathway in accordance with 40 CFR § Part 257. Based on available data, groundwater flow in the potentially continuous silt, sand, and gravel lenses appears to be east-northeast.

In addition, a sandy unit exists just above bedrock beneath most of the landfill area. The sand unit is laterally continuous in some areas and is hydraulically connected to the underlying bedrock unit. Where present, the sand unit mantling the bedrock is monitored with the CCR Rule groundwater monitoring network.

2 ALTERNATE SOURCE DEMONSTRATION

2.1 SUMMARY

As allowed by 40 CFR § 257.94(e)(2), this ASD demonstrates that sources other than the P4 Landfill caused the SSI or that the apparent SSI was a result of natural variation in groundwater quality. Lines of evidence supporting this ASD include the following:

- Resample Event and Turbidity/ Suspended Solids: Downgradient well W76 was resampled to confirm the concentrations were representative. Results of the resample confirmed the SSI for boron at W76. Based on observations during preparation of the ASD (April 15, 2018) for W73, a filtered groundwater sample was collected from W76 during the resample. The results indicate that the concentration declined significantly, below the background prediction interval. The effect of turbidity or suspended solids on the sample result is consistent with adjacent well W73 which has previously reported boron concentrations above the background prediction interval in unfiltered samples.
- Landfill Construction: The existing P4 Ash Landfill Cell 1 was constructed in 2013-2014 with a composite liner (consisting of a geosynthetic clay liner and 60-mil HDPE geomembrane) and a leachate collection system. The P4 Ash Landfill also overlies a significant thickness of the Oak Creek Formation which has very low hydraulic conductivity.
- Aquifer Geochemistry: The distribution of naturally occurring inorganic constituents in the dolomite aquifer is variable and geochemical conditions which control the equilibrium concentrations change both laterally and vertically within the aquifer, resulting in concentrations that are variable, but unrelated to the P4 Ash Landfill.

Data and information supporting these ASD lines of evidence are discussed in more detail below.

2.2 ASD SUPPORTING INFORMATION

2.2.1 Resample Event and Turbidity/ Suspended Solids

Turbidity is a measurement of solids (in Nephelometric Turbidity Unit (NTU)) in a water sample. In most field instruments turbidity is measured using light that is directed through a water sample. The solids in the sample reflect the light and a detector measures the light, the more light reflected the higher the turbidity. The amount of light reflected (turbidity measurement) is a function of particle size, the number of particles, and the composition of particles. In some cases, organic matter will absorb light and bias the turbidity measurements low (Fondriest, 2014). Turbidity, although a measure of the light reflectance, is usually related to the total suspended solids (TSS) which is a measure of mass. In an unfiltered sample container, TSS may be dissolved into the groundwater because samples are preserved with nitric acid (low pH increases dissolution). The dissolution of solids may bias the result higher and not truly represent concentrations in the groundwater. The relationship between TSS and turbidity is site specific, but in general 1 mg/L of TSS is roughly equal to 1-2 NTU. (Omar and MatJafri, 2009).

Monitoring well W76 was resampled for total and dissolved boron. The concentration of total boron measured in the resample of W76 (0.51 mg/L) indicated the SSI was confirmed, however, the dissolved boron sample had a concentration of 0.44 mg/L, which is below the calculated prediction interval for background (0.455 mg/L). The turbidity measured in the sample was 0.62 NTU, and measurements of turbidity at W76 have been consistently below 10 NTU, except for one sample which reported 11 NTU. Turbidity at these levels in unfiltered samples is not expected to result in significant increases in concentration when samples are acidified (turbidity is dissolved into the sample), however, the small difference in boron concentration that was measured (0.07 mg/L) in the samples could be a result of the dissolution of solids even with the low turbidity measurements.

As discussed above, low turbidity could indicate that organic matter in the sample is not measured and the turbidity is biased low. Acidification of the water during sample preservation could result in the release of boron adsorbed onto the organic matter. Also, a measurement of 0.62 NTU indicates that TSS concentrations could be

between 0.6 and 1.2 mg/L, upon preservation the solids may dissolve and result in concentrations of boron that are elevated, a small contribution could result in the observed concentration increase of 0.07 mg/L.

Turbidity in background is below 38 NTU, with most turbidity measurements below 10 NTU. Generally, when the concentration of total boron is higher, the concentration declines more significantly after filtering. A summary of the boron concentrations and percent reduction for both W76 and W73 is included in Table 2 below. This indicates that turbidity and suspended solids is likely affecting the concentrations of total boron in groundwater samples collected from downgradient well W76, and these concentrations are not indicative of impacts from the P4 Ash landfill.

Table 2. Summary of Boron Concentrations and Comparison of Total and Dissolved Concentrations

Well	Date	Boron, dissolved.	Boron, total	Turbidity, NTU	Percent Reduction
W76	12/2/2015	0.407	0.424	11	4.01%
W76	1/25/2016		0.431	6.2	
W76	4/14/2016		0.463		
W76	7/13/2016		0.436	1.3	
W76	10/12/2016		0.443	4	
W76	1/11/2017		0.395	1	
W76	4/11/2017		0.42	3.92	
W76	8/31/2017		0.45	3.87	
W76	10/24/2017		0.446	2.11	
W76	4/16/2018		0.43	0.71	
W76	10/23/2018		0.46	0	
W76	2/14/2019	0.44	0.51	0.62	13.7%
W73	12/2/2015		0.418	9.8	
W73	1/25/2016	0.42	0.422	116	0.47%
W73	4/14/2016	0.461	0.464	28	0.65%
W73	7/13/2016	0.433	0.437	17	0.92%
W73	10/12/2016	0.438	0.447	149	2.01%
W73	1/11/2017	0.395	0.401	12.5	1.50%
W73	4/11/2017		0.43	6.49	
W73	8/31/2017	0.45	0.46	90.74	2.17%
W73	10/24/2017	0.45	0.463	98.19	2.81%
W73	1/18/2018	0.431	0.466	10.37	7.51%

2.2.2 Landfill Construction

This ASD is also supported by the fact that the P4 Ash Landfill was constructed with a composite liner including 60-mil HDPE geomembrane and geosynthetic clay liner, and a leachate collection system. Precipitation and/or leachate that collects on top of the liner is removed by a leachate collection system and managed in accordance with the landfill operating permit. Leachate levels are monitored with leachate head wells in the landfill and collection sump level monitoring; the system includes high level alarms to notify the landfill operators if leachate levels exceed predetermined levels. The system is flushed annually as part of regular operation and maintenance. System monitoring and reporting indicate that the leachate collection system is functioning as designed and indicate there is not significant leachate migration into underlying materials.

In the unlikely event that leachate is not captured by the collection system, the landfill overlies 50-100 feet of silty clay and the potential for downward migration of leachate into the uppermost aquifer is limited by the low

hydraulic conductivity of the Oak Creek Formation. Simpkins and Bradbury (1992) calculated downward velocities of 0.3 to 0.5 cm/yr in the Oak Creek Formation. At the highest velocities, it would require over 3,000 years for leachate to migrate through 50 feet of Oak Creek Formation, but the P4 Ash Landfill has only been active for 30 years indicating the SSIs are attributable to another source.

2.2.3 Aquifer Geochemistry

General Groundwater Chemistry of the Silurian Dolomite

The general water chemistry is displayed in the Piper diagram below (Figure 8). Background and downgradient groundwater samples all plot within the same region of sodium-potassium-magnesium dominated cations and sulfate anions. Leachate samples collected from the CCR Unit indicate sodium-potassium-calcium dominated cations and chloride-sulfate dominated anions. The downgradient wells within the anion plot are bracketed by upgradient wells W20D and W77, indicating that the groundwater is not being influenced by the leachate. This conclusion is also supported by the Stiff diagrams (Figure 9) which show that all the groundwater, upgradient and downgradient, is very similar and unlike the leachate.

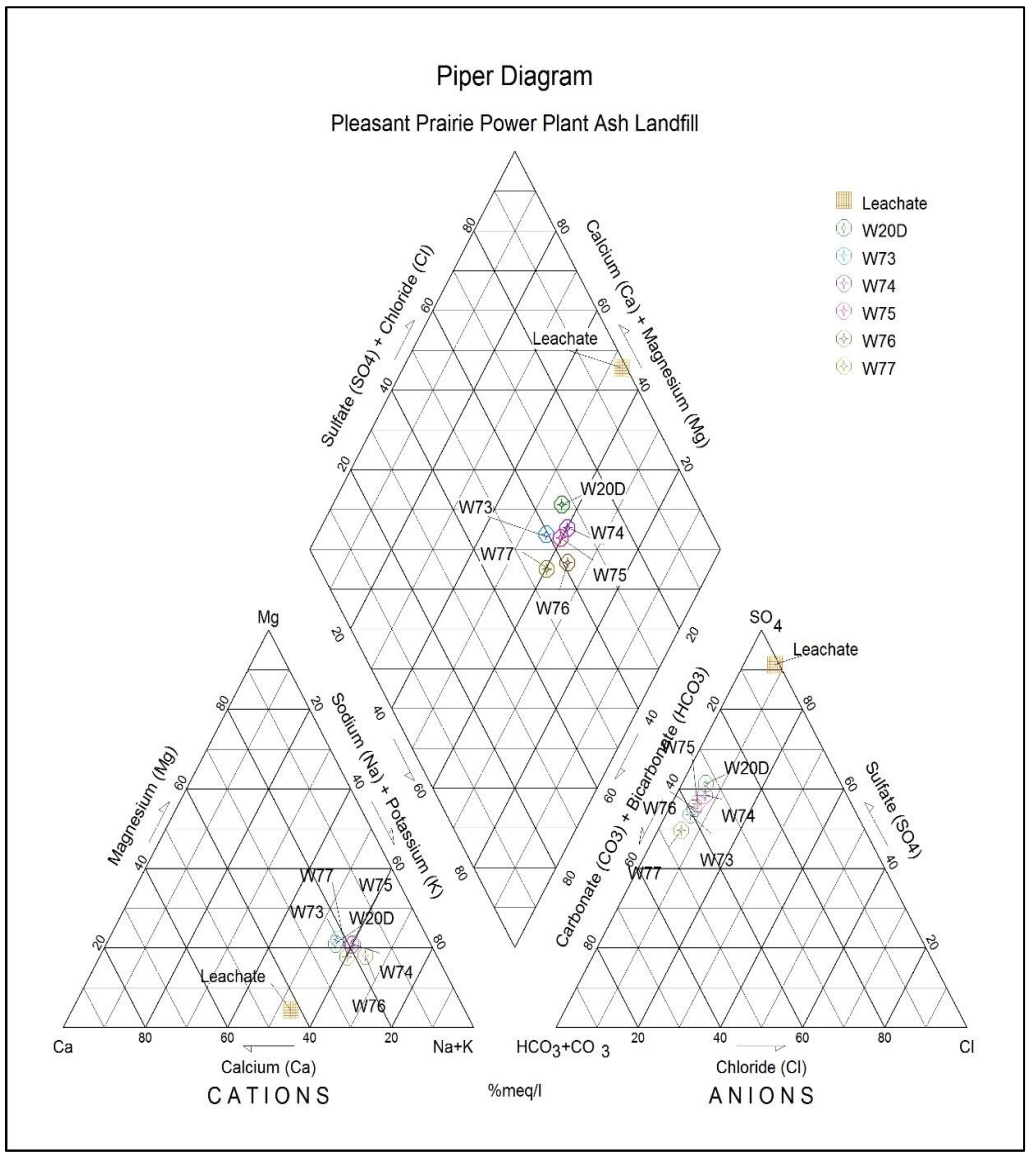


Figure 8. Piper Diagram for P4 Ash Landfill CCR Rule Monitoring Wells

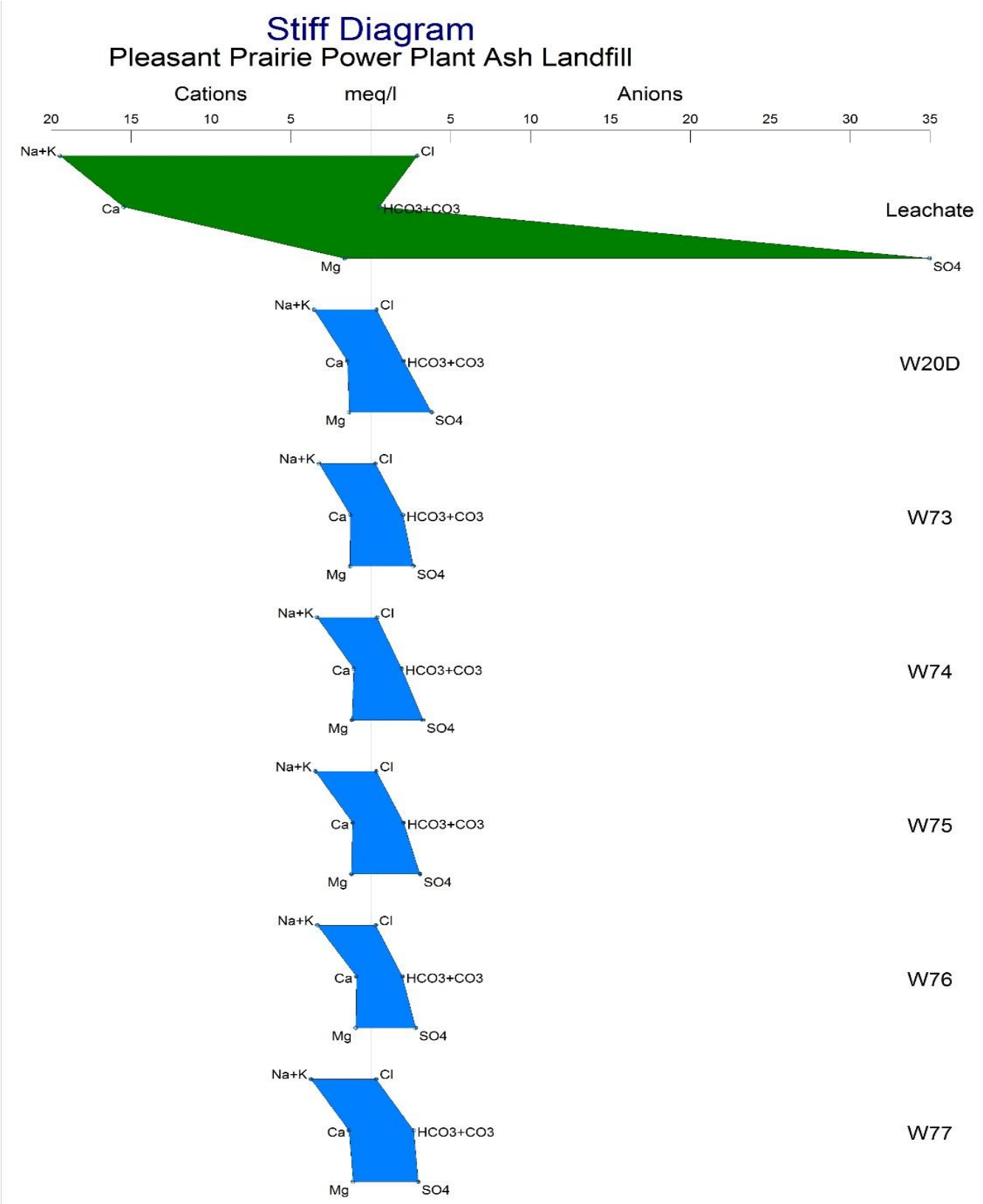


Figure 9. Stiff Diagram for P4 Ash Landfill CCR Rule Monitoring Wells

Geochemical Variations within the Silurian Dolomite

Natural variations in the composition (i.e. minerology) of the Silurian dolomite bedrock, which affect the presence of minerals and associated trace elements in groundwater, are observed at the P4 Ash Landfill. This natural variability of the dolomite bedrock, both vertically and laterally across the site, has resulted in variations in concentrations of boron in groundwater, amongst other naturally occurring inorganic constituents. Slightly elevated concentrations of boron at well W76 (and previously W73) can be evaluated by looking at the screened intervals of monitoring wells at the P4 Ash Landfill in conjunction with the seasonal variability in flow directions within the aquifer.

In general, groundwater flow in the upper portion of the Silurian dolomite is to the north; however, there are small variations resulting from seasonal variability which shift the flow to the northwest. Groundwater elevations for the background wells and wells W76 and W73 are plotted below (Figure 10). When elevations in W20D and W77 are similar groundwater flows generally north (Figure 3), while when the difference in elevation between W73 and W76 is high, groundwater flows more to the northwest (Figure 12) in this portion of the site.

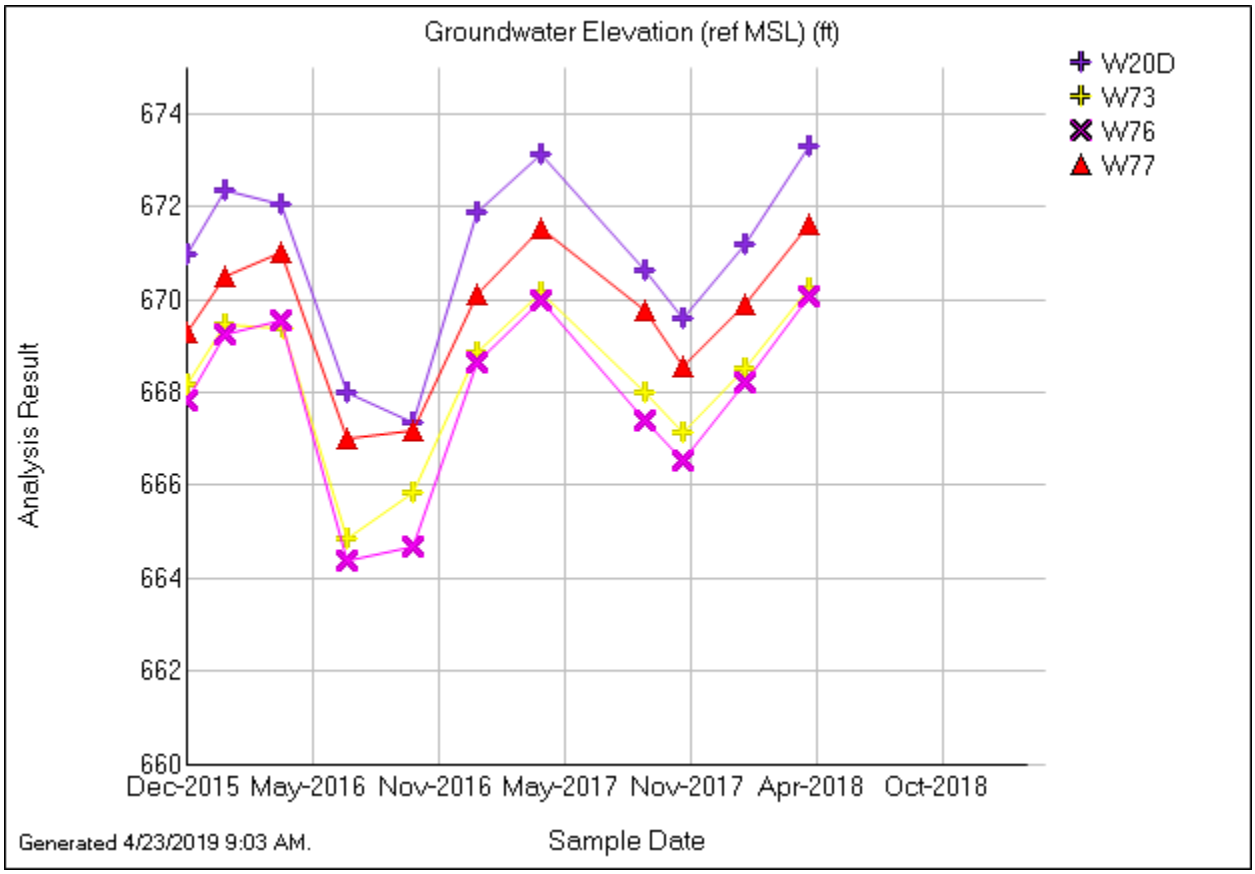


Figure 10. Plot of Groundwater Elevations for W76, W73, W20D, and W77

The plot shows that lower groundwater elevations typically occur in the summer and higher elevations in the winter. Based on locations of private wells within the uppermost aquifer (Attachment A), it is likely that summer groundwater pumping from the Silurian dolomite induces more northerly and potentially northwesterly flow directions, which may influence water quality as a result of changes in groundwater flow paths.

Concentrations of boron in W73 were attributed to the higher elevation of the screened interval, the geologic description of the dolomite bedrock on the boring log, and the potential for upgradient water residing in unconsolidated materials (OBG, 2018). Based on the topography of the bedrock surface (see bedrock surface contour map on Figure 3), monitoring well W73 is sampling a different (higher elevation) part of the

groundwater flow path than upgradient well W20D and the other downgradient wells. As displayed in Figure 12, when groundwater flow is to the northwest, W76 and W73 are likely influenced by the same upgradient source. In background wells, samples from W20D are higher than W77, and in W76, concentrations are similar to those in W20D, specifically in the most recent rounds of sampling.

The temporal variability in concentrations of boron, calcium, chloride and sulfate at wells W76 and W73 versus background locations W20D and W77 are shown on the time series plots (Figure 11, 13-15) below. Although the concentrations vary between wells for each of the parameters, the trends are generally the same in magnitude and direction except for calcium and chloride. In background wells W20D and W77, the calcium and chloride concentrations have been declining since the wells were installed. This potentially indicates that the drilling process disturbed the aquifer materials and concentrations have now stabilized. Parallel trends in boron and sulfate, the primary indicator parameters of CCR leachate impacts on groundwater, would not be expected in background wells and downgradient well W76 if the P4 Ash landfill was impacting groundwater.

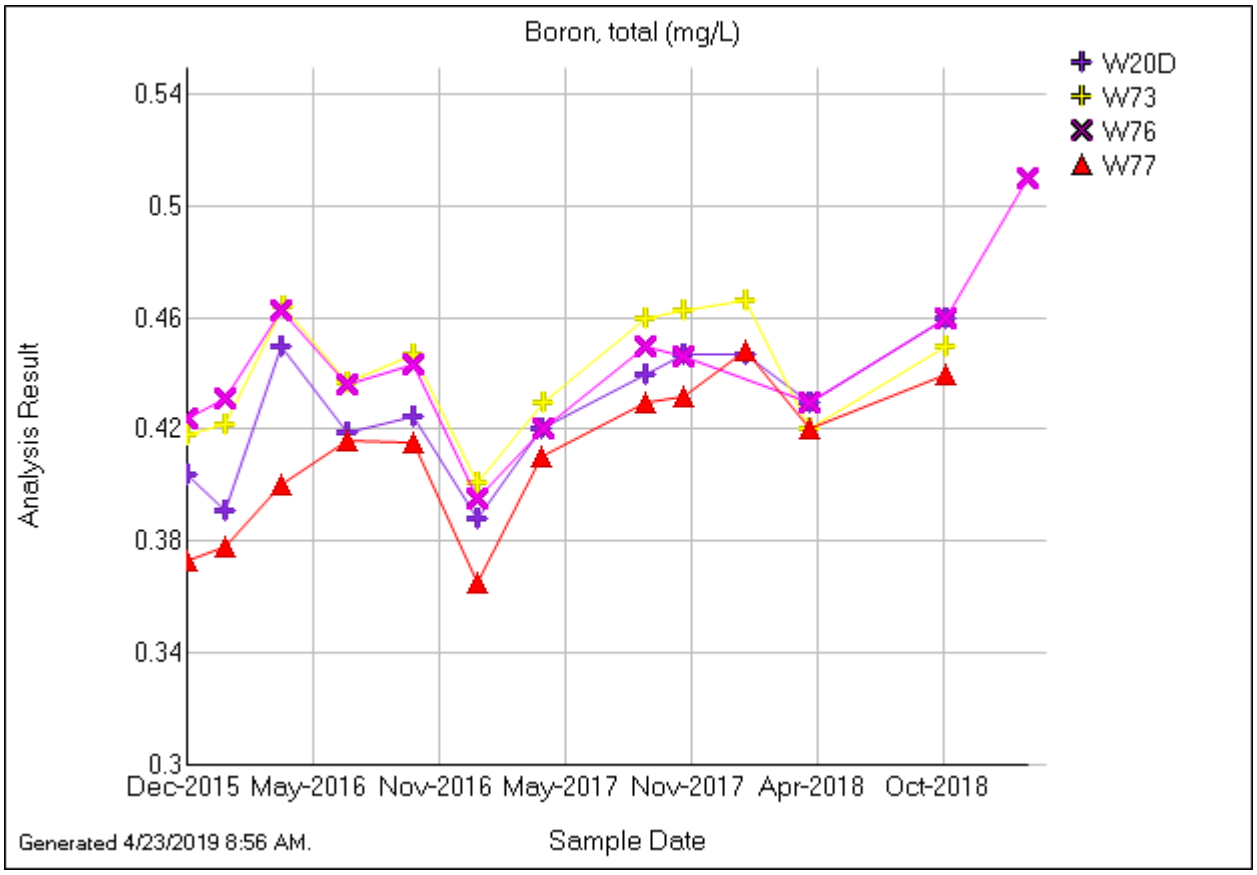


Figure 11. Time Series Plot of Boron Concentrations

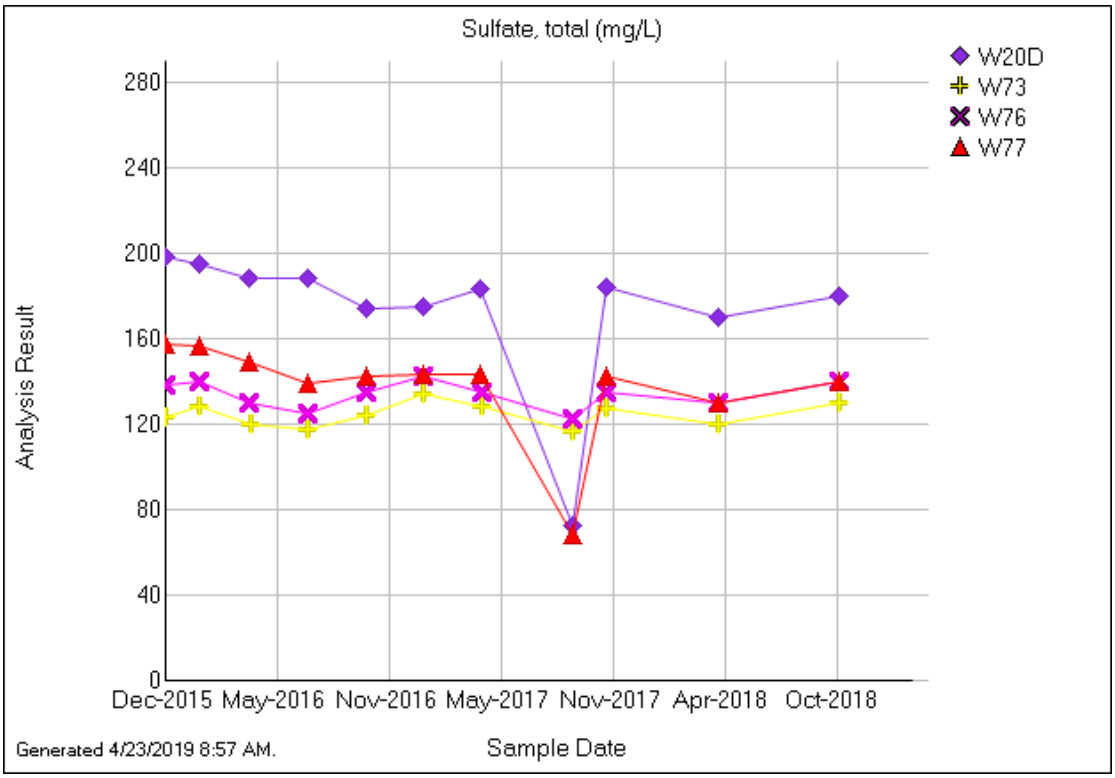


Figure 13. Time Series Plot of Sulfate Concentrations

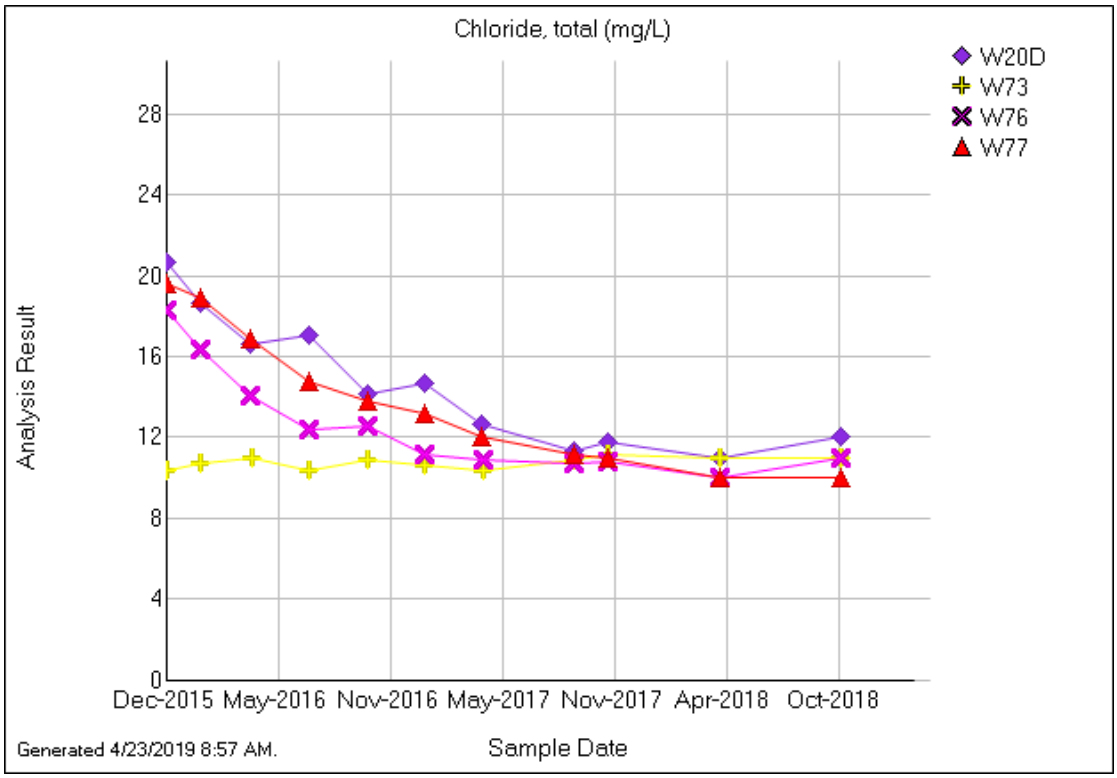


Figure 14. Time Series Plot of Chloride Concentrations

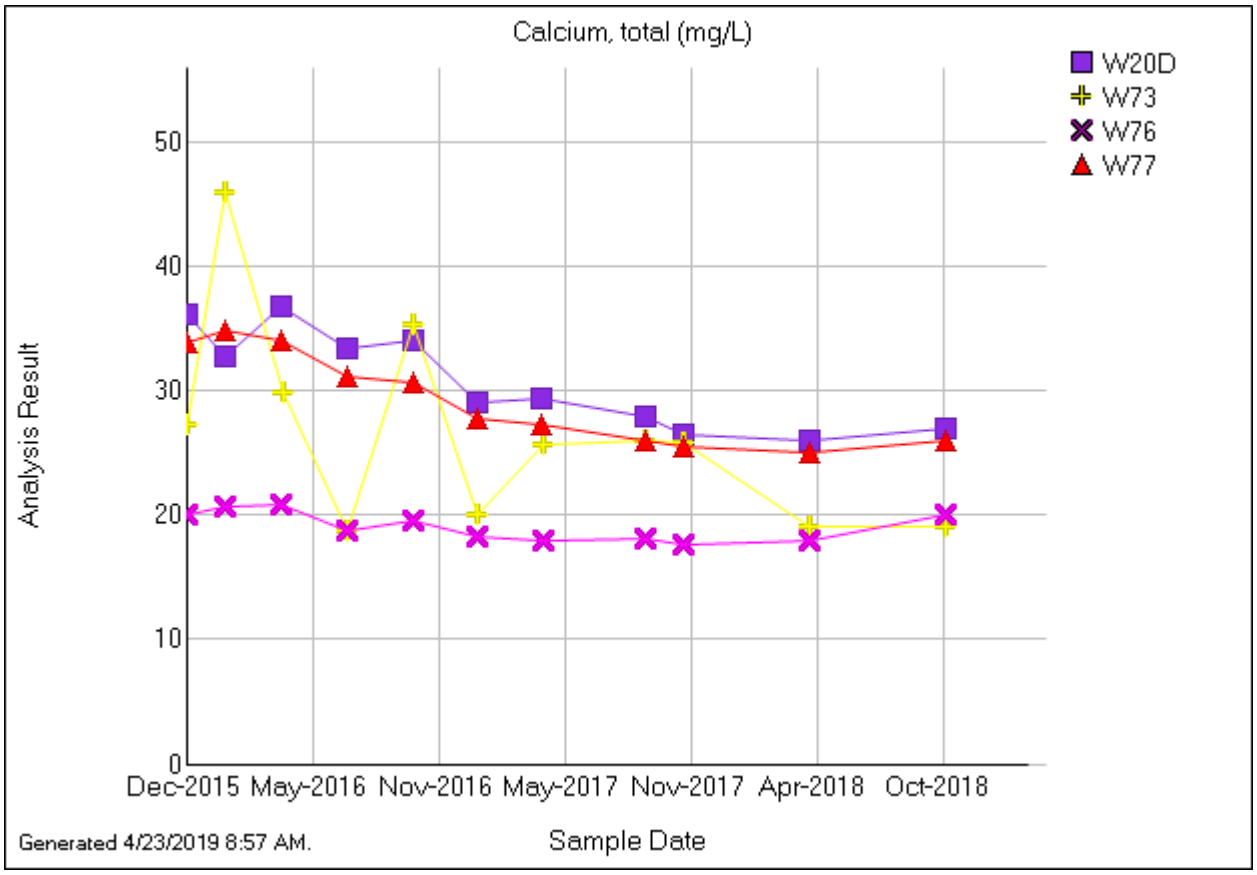


Figure 15. Time Series Plot of Calcium Concentrations

Ion Ratios

The final line of evidence for this ASD, which is supported by previous analysis, is ion ratios for boron compared to other primary indicators of CCR impacts - calcium, chloride, and sulfate. A summary of the ion ratios in groundwater at background wells W20D and W77, downgradient wells W76 and W73, and leachate is presented in Table 4 below. The results show that both of the background wells have ratios that are closer to leachate than W76. Background wells W20D and W77 have calcium/boron ion ratios of 73 and 72 versus 110 for Leachate; well W76 had a ratio of 44, lower than the background wells and further from leachate. Background wells W20D and W77 have a chloride/boron ion ratio of 35 and 34 which is lower than leachate (37), versus a lower ratio of 29 for well W76. Finally, background wells W20D and W77 have sulfate/boron ratios of 410 and 340 versus 544 for leachate; the ratio at well W76 (308) is lower than the background. All three ratios demonstrate that groundwater quality at the background wells in the Silurian dolomite is more like the leachate than groundwater at well W76, which is less like the leachate. Based on the ion ratios of four primary indicator parameters of CCRs, groundwater quality at well W76 has not been impacted by leachate from the P4 Ash Landfill.

Table 4. Summary of Average Ion Ratios

Sample ID	Ca/B	Cl/B	SO4/B
Leachate	110	37	544
W73	61	25	285
W76	44	29	308
W20D	73	35	410
W77	72	34	340

3 CONCLUSIONS AND CERTIFICATION

This document has been prepared on behalf of We Energies by OBG to provide pertinent information for an ASD as allowed by 40 CFR §257.94(e)(2) for the Pleasant Prairie Power Plant Ash Landfill located in Pleasant Prairie, Wisconsin.

Statistical analysis of the third detection monitoring sample for SSIs of 40 CFR Part 257 Appendix III parameters over background concentrations was completed within 90 days of collection of the sample (February 4, 2019). Following resampling, the determination identified that an SSI (concentrations greater than background prediction intervals) was present as follows:

- Boron at well W76

40 CFR §257.94(e)(2) allows the owner or operator 90 days from the date of determination to demonstrate that a source other than the CCR unit caused the SSI, or that the apparent SSI was from a source other than the CCR unit, or that the SSI resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Pursuant to 40 CFR §257.94(e)(2), this document demonstrates that sources other than the P4 Ash Landfill were the cause of the SSI listed above. This ASD was completed within 90 days of determination of the SSIs (May 5, 2019) as required by 40 CFR §257.94(e)(2).

Pursuant to 40 CFR §257.94(e)(2), the following lines of evidence were presented in this report to demonstrate that the listed SSIs are due to alternate sources as follows:

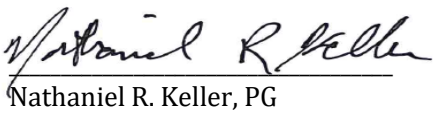
- Resample Event and Turbidity/ Suspended Solids
- Landfill Construction/ Underlying Geology
- Aquifer Geochemistry

The preceding information serves as the ASD prepared in accordance with 40 CFR §257.94(e)(2) and supports the position that the SSI observed during the third semi-annual detection monitoring event is not due to a release from the CCR unit but was from naturally occurring conditions. Therefore, no further action (i.e. assessment monitoring) is warranted and the P4 Ash Landfill will remain in detection monitoring.

I, Glenn R. Luke, a qualified professional engineer in good standing in the State of Wisconsin, certify that enclosed information is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Glenn R. Luke, PE
Professional Engineer No. 42834-6
State of Wisconsin
O'Brien & Gere Engineers, Inc.
Date: May 3, 2019

I, Nathaniel R. Keller, a qualified professional geologist, certify that the enclosed information is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.



Nathaniel R. Keller, PG
Professional Geologist No. 1283-013
State of Wisconsin
O'Brien & Gere Engineers, Inc.
Date: May 3, 2019

REFERENCES

Fondriest Environmental, Inc. 2014. "Turbidity, Total Suspended Solids and Water Clarity." Fundamentals of Environmental Measurements. 13 Jun. 2014. Web. https://www.fondriest.com/environmental-measurements/parameters/water-quality/turbidity-total-suspended-solids-water-clarity/

Natural Resource Technology, Inc., 2015, Sampling and Analysis Plan Revision 1, Pleasant Prairie Power Plant Ash Landfill, Pleasant Prairie, Wisconsin, December 8, 2015.

Natural Resource Technology, an OBG Company, 2017, Statistical Analysis Plan, Pleasant Prairie Power Plant Ash Landfill, Pleasant Prairie, Wisconsin, October 17, 2017.

OBG, 2018. Alternate Source Demonstration. Pleasant Prairie Power Plant Ash Landfill, Pleasant Prairie, WI, April 15, 2018.

Omar, Ahmad Fairuz Bin and Mohd Zubir Bin MatJafri, 2009. Turbidimeter Design and Analysis: A Review on Optical Fiber Sensors for the measurement of Water Turbidity. Sensors, 2009, 9, pp. 8311-8335

Peters, Roger M. 2004. Preliminary Bedrock Topography Map of Kenosha County, Wisconsin. Wisconsin Geological and Natural History Survey. Open File Report 2004-13B

Simpkins, W.W and K.R. Bradbury. 1992. Groundwater flow, velocity, and age in a thick, fine-grained till unit in southeastern Wisconsin. Journal of Hydrology. 132 (283-319).

Tables

Pleasant Prairie CCR
Table 1. Pleasant Prairie Power Plant Ash Landfill: Appendix III Analytical Results

Date Range: 10/15/2017 to 02/14/2019

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
W17BR	10/23/2017	40159525007	0.6530	12.0000	11.5	1.50	8.29	25.0
	04/16/2018	AE26941	0.6200	12.0000	12.0	1.40	7.29	24.0
	10/23/2018	AE31327	0.6600	13.0000	11.0	1.40	8.40	23.0
W20B	10/23/2017	40159525002	0.3390	85.7000	28.7	0.77	7.20	161.0
	04/16/2018	AE26935	0.3100	90.0000	35.0	0.71	7.13	180.0
	10/22/2018	AE31322	0.3200	64.0000	17.0	0.83	7.40	110.0
W20D	10/23/2017	40159525001	0.4470	26.5000	11.8	1.10	7.65	184.0
	01/18/2018	40163747005	0.4470			1.10	7.60	
	04/16/2018	AE26934	0.4300	26.0000	11.0	1.10	7.43	170.0
	10/22/2018	AE31321	0.4600	27.0000	12.0	1.00	7.80	180.0
W31B	10/24/2017	40159525009	0.0932	91.2000	38.9	<0.50	7.07	127.0
	04/16/2018	AE26936	0.0860	90.0000	42.0	0.38	6.68	120.0
	10/22/2018	AE31323	0.0950	98.0000	47.0	0.39	7.40	130.0
W73	10/24/2017	40159525011	0.4630	25.8000	11.2	0.95	8.36	127.0
	01/18/2018	40163747001	0.4660				8.02	
	04/16/2018	AE26943	0.4200	19.0000	11.0	1.00	7.40	120.0
	10/23/2018	AE31326	0.4500	19.0000	11.0	1.00	8.20	130.0
W74	10/23/2017	40159525003	0.4070	19.5000	13.8	1.20	7.75	162.0
	01/18/2018	40163747004				1.10	8.02	
	04/16/2018	AE26937	0.4000	20.0000	13.0	1.00	7.74	150.0
	10/23/2018	AE31330	0.4100	21.0000	14.0	1.00	8.00	160.0
W75	10/23/2017	40159525004	0.4430	19.9000	10.8	1.00	8.06	145.0
	04/16/2018	AE26938	0.4100	19.0000	9.8	1.00	7.71	130.0
	10/23/2018	AE31329	0.4400	21.0000	9.9	0.98	8.20	140.0
W76	10/23/2017	40159525006	0.4460	17.6000	10.8	1.10	7.76	135.0
	04/16/2018	AE26940	0.4300	18.0000	10.0	1.00	7.68	130.0
	10/23/2018	AE31328	0.4600	20.0000	11.0	1.00	7.80	140.0
	02/14/2019	AE33639	0.5100				8.30	
W77	10/24/2017	40159525010	0.4320	25.5000	11.0	1.10	7.71	142.0
	01/18/2018	40163747002	0.4480			1.10	7.51	
	04/16/2018	AE26942	0.4200	25.0000	10.0	1.10	7.47	130.0
	10/22/2018	AE31324	0.4400	26.0000	10.0	1.10	7.50	140.0

Pleasant Prairie CCR
Table 1. Pleasant Prairie Power Plant Ash Landfill: Appendix III Analytical Results

Date Range: 10/15/2017 to 02/14/2019

Well Id	Date Sampled	Lab Id	TDS, mg/L
W17BR	10/23/2017	40159525007	172.0
	04/16/2018	AE26941	190.0
	10/23/2018	AE31327	140.0
W20B	10/23/2017	40159525002	510.0
	04/16/2018	AE26935	630.0
	10/22/2018	AE31322	470.0
W20D	10/23/2017	40159525001	382.0
	04/16/2018	AE26934	390.0
	10/22/2018	AE31321	390.0
W31B	10/24/2017	40159525009	530.0
	04/16/2018	AE26936	520.0
	10/22/2018	AE31323	560.0
W73	10/24/2017	40159525011	308.0
	04/16/2018	AE26943	340.0
	10/23/2018	AE31326	300.0
W74	10/23/2017	40159525003	348.0
	04/16/2018	AE26937	370.0
	10/23/2018	AE31330	340.0
W75	10/23/2017	40159525004	330.0
	04/16/2018	AE26938	350.0
	10/23/2018	AE31329	310.0
W76	10/23/2017	40159525006	318.0
	04/16/2018	AE26940	350.0
	10/23/2018	AE31328	300.0
W77	10/24/2017	40159525010	372.0
	04/16/2018	AE26942	370.0
	10/22/2018	AE31324	370.0

Table 3. CCR Rule Groundwater Monitoring Well Information
Pleasant Prairie Power Plant Ash Landfill
Pleasant Prairie, Wisconsin

Well Designation	Wisconsin Unique Well Number	Date Well Installed	Drilling Subcontractor	Drilling Method	Gradient Position	State Plane Northing	State Plane Easting	Latitude	Longitude	Ground Surface Elevation (ft NAVD88)	Top of Protective Cover Pipe Elevation (ft NAVD88)	Top of Well Riser Elevation (ft NAVD88)	Borehole Drilled Depth (ft bgs)	Borehole Bottom Elevation (ft NAVD88)	Depth to Top of Well Screen (ft bgs)	Depth to Well Bottom (ft bgs)	Top of Screen Elevation (ft NAVD88)	Well Bottom Elevation (ft NAVD88)	Depth to Top of Bedrock (ft bgs)	Top of Bedrock Elevation (ft NAVD88)
W17BR	VN431	10/1/2013	Boart Longyear Company	Sonic	downgradient	213,385.17	2,534,203.49	42°33'57.3084"	-87°53'59.9346"	688.31	690.55	690.35	42.0	646.3	37.0	42.0	651.3	646.3	--	--
W20B[1]	--	3/17/1993	STS Consultants	Rotary	upgradient	212,752.70	2,533,099.53	42°33'51.3396"	-87°54'14.8968"	684.3	--	687.0	35.0	649.3	29.0	34.0	655.3	650.3	--	--
W20D	VQ580	3/4/2015	Cascade Drilling	Sonic	upgradient	212,757.97	2,533,085.40	42°33'51.3592"	-87°54'15.0776"	686.45	689.03	688.41	140.0	546.4	135.0	140.0	551.4	546.4	125.0	561.4
W31B[1]	--	2/26/1993	STS Consultants	Rotary	upgradient	211,923.81	2,533,157.23	42°33'43.1382"	-87°54'14.403"	681.0	--	683.8	38.5	642.5	33.0	38.0	648.0	643.0	--	--
W73	VN433	10/2/2013	Boart Longyear Company	Sonic	downgradient	213,367.88	2,534,399.36	42°33'57.0560"	-87°53'57.3214"	688.66	691.07	690.58	130.0	558.7	125.0	130.0	563.7	558.7	114.0	574.7
W74	VQ578	3/3/2015	Cascade Drilling	Sonic	downgradient	213,321.15	2,533,126.93	42°33'56.9099"	-87°54'14.3343"	685.02	687.49	686.83	140.0	545.0	135.0	140.0	550.0	545.0	124.5	560.5
W75	VQ577	3/23/2015	Cascade Drilling	Sonic	downgradient	213,321.56	2,533,540.32	42°33'56.8116"	-87°54'08.8120"	687.42	690.31	689.91	141.0	546.4	136.0	141.0	551.4	546.4	125.0	562.4
W76	VQ576	3/24/2015	Cascade Drilling	Sonic	downgradient	213,300.53	2,534,065.51	42°33'56.4738"	-87°54'01.8036"	689.00	692.11	691.63	141.0	548.0	136.0	141.0	553.0	548.0	125.0	564.0
W77	VQ575	3/19/2015	Cascade Drilling	Sonic	upgradient	212,178.92	2,534,660.05	42°33'45.2513"	-87°53'54.2383	684.89	687.63	687.23	126.0	558.9	121.0	126.0	563.9	558.9	110.0	574.9

Notes:

"--" indicates data is not available or does not apply.

bgs = below ground surface

HSA = Hollow Stem Auger

Sonic = vibratory (i.e. roto-Sonic®)

1. The data source for ground surface and top of well riser elevations is STS Consultants Ltd. Final Hydrogeologic Investigation Report: Wisconsin Electric Power Company , Pleasant Prairie Power Plant Ash Landfill, Pleasant Prairie, Wisconsin. April 4, 1997.

2. Ground surface, top of protective cover pipe and top of well riser elevations for wells were surveyed by A.W. Oakes & Son, Inc. on March 16, 2015 and March 27, 2015. Vertical datum assumed to be NAVD88 .

3. Horizontal datum is Wisconsin State Plane Coordinates South Zone, NAD 83.

4. All wells constructed with 2-inch nominal size schedule 80 PVC with 5-foot long 10-slot screens. All wells are screened in dolomite bedrock.

Figures

DRAWN BY/DATE:
SDS 4/29/19
REVIEWED BY/DATE:
JJW 4/29/19
APPROVED BY/DATE:
NRK 4/29/19

GROUNDWATER SAMPLING WELL LOCATION MAP

WE ENERGIES CCR RULE GROUNDWATER MONITORING
ALTERNATE SOURCE DEMONSTRATION
WE ENERGIES P4 ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN

PROJECT NO: 67985

FIGURE NO: 1

OBG
Part of Ramboll

Y:\GIS\Projects\1\1660\P4\MXD\ASD\Figure 1_GW Sampling Well Locs.mxd Author: GalarnMC; Date/Time: 4/29/2019, 11:15:53 AM

DRAWN BY/DATE:
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REVIEWED BY/DATE:
JJW 4/29/19
APPROVED BY/DATE:
NRK 4/29/19

PLEASANT PRAIRIE POWER PLANT ASH LANDFILL
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
OCTOBER 12, 2016
WE ENERGIES CCR RULE GROUNDWATER MONITORING
ALTERNATE SOURCE DEMONSTRATION
PLEASANT PRAIRIE POWER PLANT ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN

PROJECT NO: 67985

FIGURE NO: 2

OBG
Part of Ramboll

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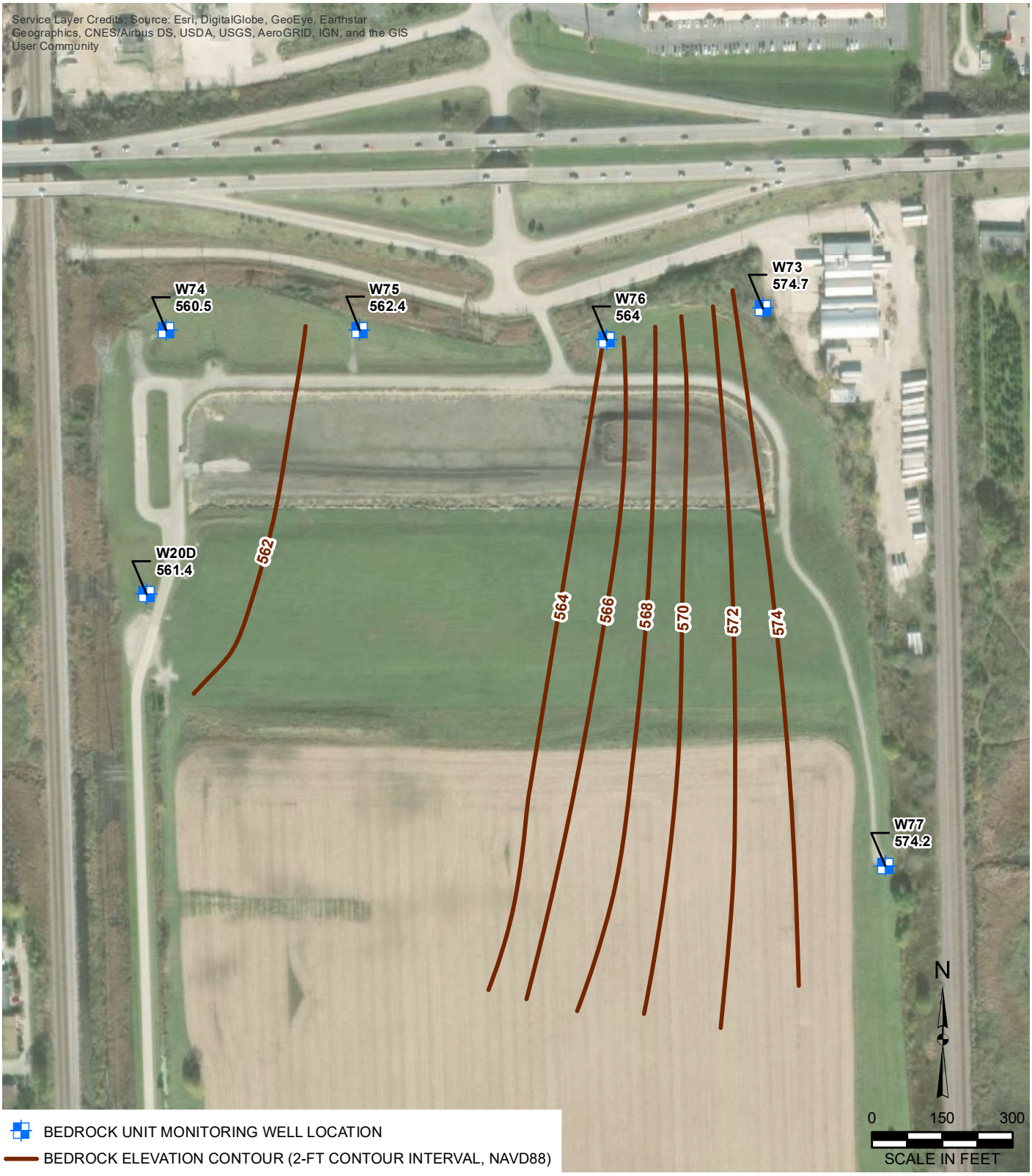


DRAWN BY/DATE:
SDS 4/29/19
REVIEWED BY/DATE:
JJW 4/29/19
APPROVED BY/DATE:
NRK 4/29/19

TOP OF BEDROCK CONTOUR MAP

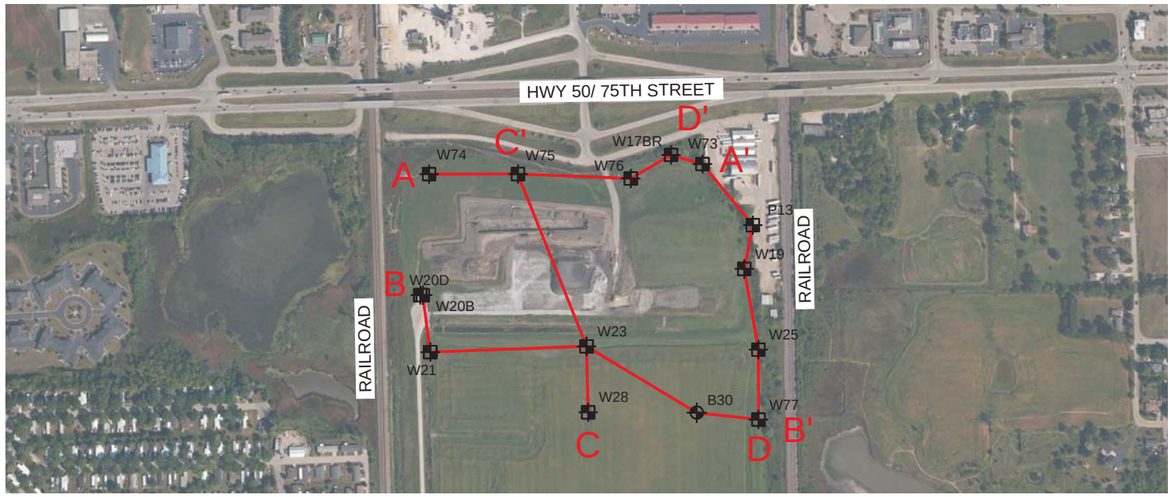
WE ENERGIES CCR RULE GROUNDWATER MONITORING
ALTERNATE SOURCE DEMONSTRATION
PLEASANT PRAIRIE POWER PLANT ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN

PROJECT NO: 67985

FIGURE NO: 3

OBG
Part of Ramboll

Y:\GIS\Projects\1\6\1660\P4\MXD\ASD\Figure 3_P4 Top of Bedrock Contours.mxd Author: GalamMC; Date/Time: 4/29/2019, 11:15:15 AM



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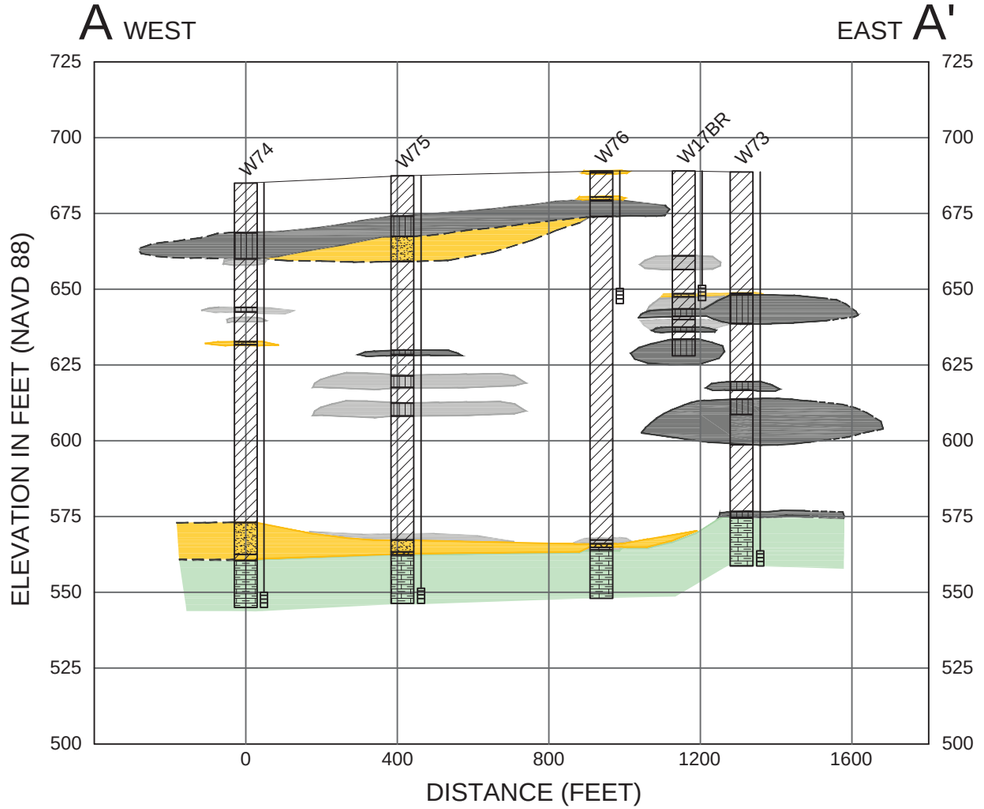
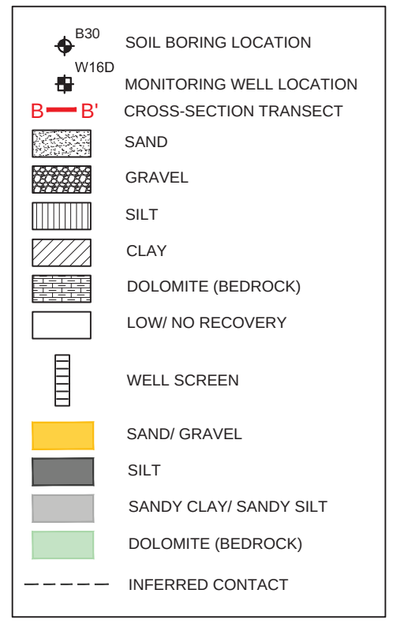
0 200 400 800

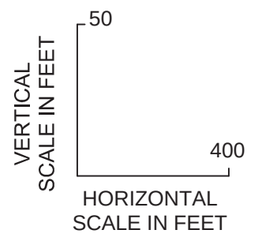
SCALE IN FEET

SOURCE NOTES:

1. DIGITAL ORTHOPHOTO FROM BING MAPS © 2012.
2. COORDINATE SYSTEM IS NAD27 WISCONSIN STATE PLANE, SOUTH ZONE, U.S. FOOT.







VERTICAL EXAGGERATION = 8

DRAWN BY: DMD DATE: 04/15/15
CHECKED BY: JJW DATE: 05/15/15
APPROVED BY: JJW DATE: 05/15/15
DRAWING NO: 1660-171-B02
REFERENCE: .

GEOLOGIC CROSS-SECTION A-A'

WE ENERGIES CCR RULE GROUNDWATER
ALTERNATE SOURCE DEMONSTRATION
WE ENERGIES P4 ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN

PROJECT NO.
67985

FIGURE NO.
4

May 27, 2015 11:48am PLOTTED BY: dduda SAVED BY: dduda
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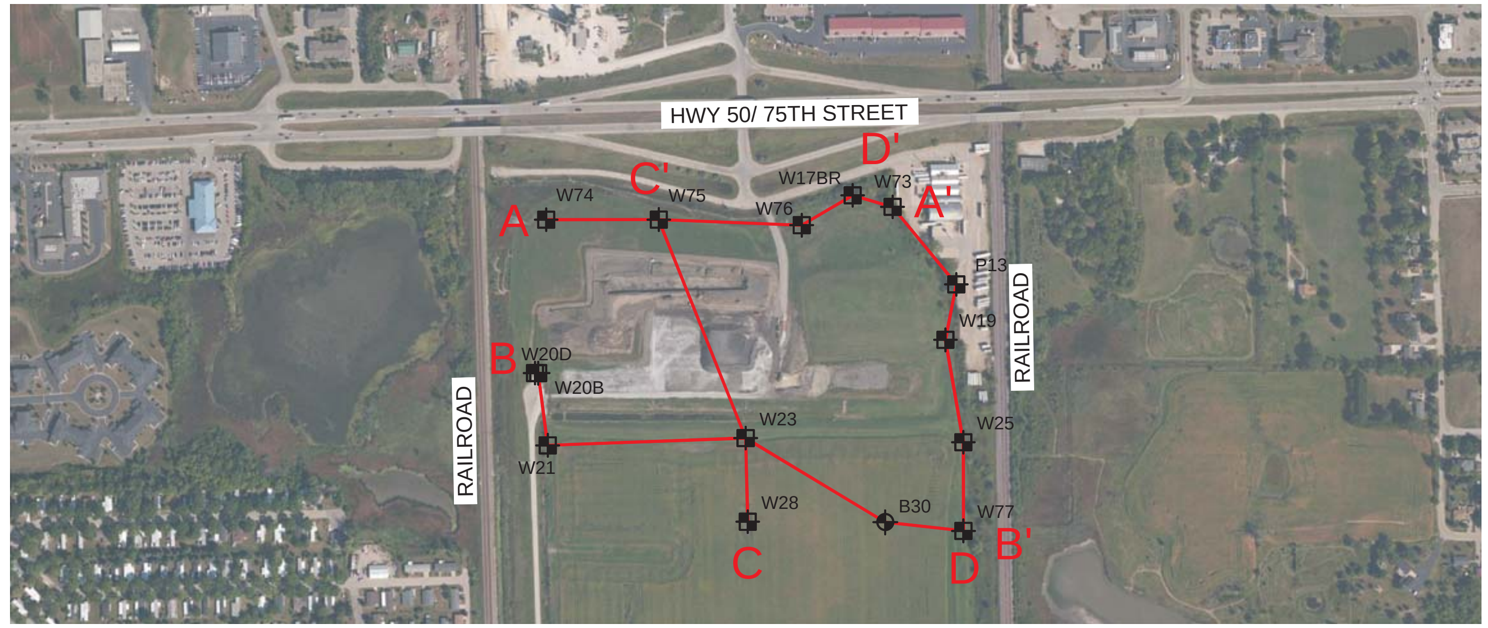
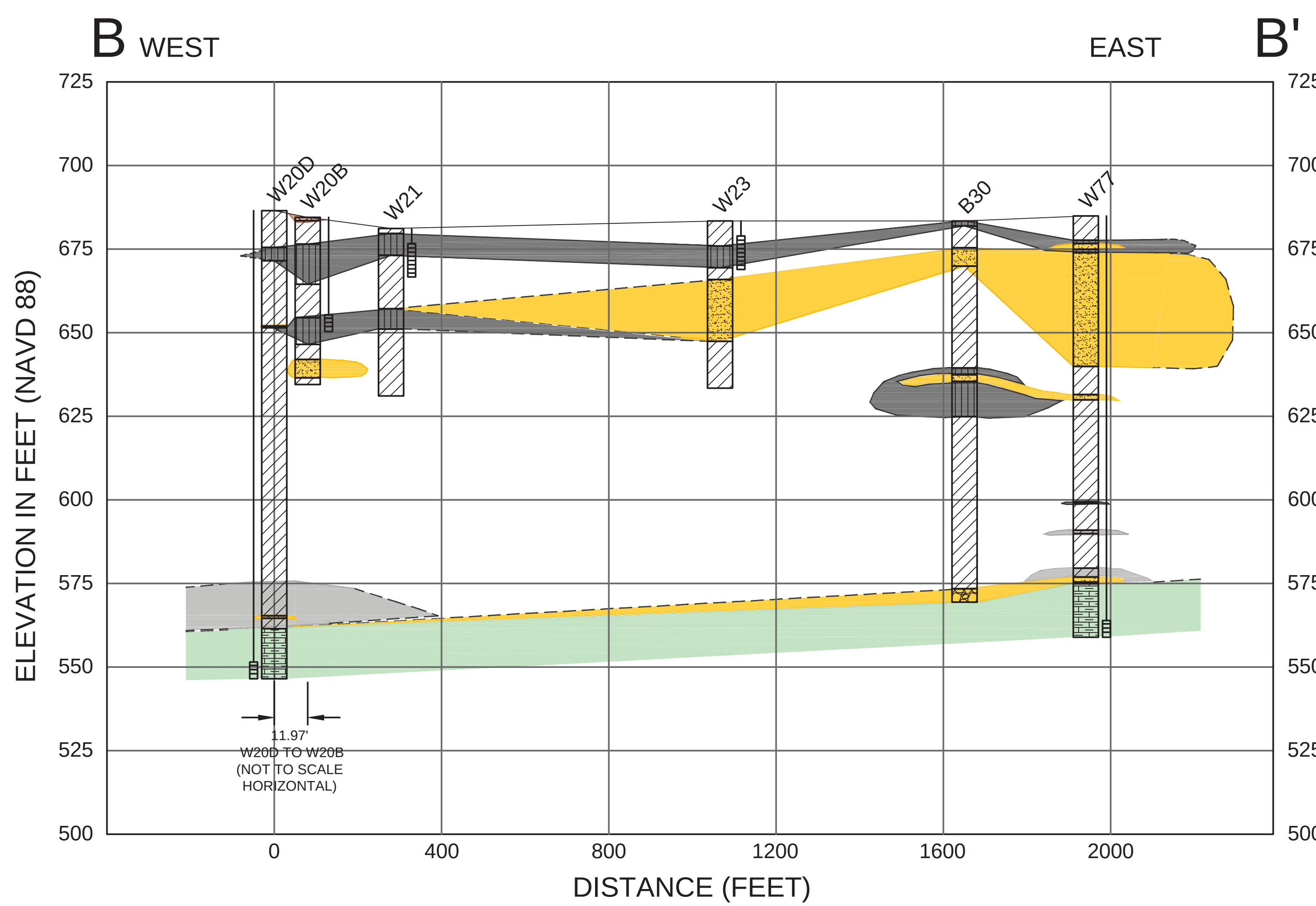


N

0 200 400 800
SCALE IN FEET

SOURCE NOTES:

1. DIGITAL ORTHOPHOTO FROM BING MAPS © 2012.
2. COORDINATE SYSTEM IS NAD27 WISCONSIN STATE PLANE, SOUTH ZONE, U.S. FOOT.



Symbol	Description
B30	SOIL BORING LOCATION
W16D	MONITORING WELL LOCATION
B — B'	CROSS-SECTION TRANSECT
	ASH
	SAND
	GRAVEL
	SILT
	CLAY
	DOLOMITE (BEDROCK)
	LOW/ NO RECOVERY
	WELL SCREEN
	ASH
	SAND
	SILT
	SANDY CLAY/ SANDY SILT
	DOLOMITE (BEDROCK)
– – – – –	INFERRED CONTACT

VERTICAL SCALE IN FEET 50

HORIZONTAL SCALE IN FEET 400

VERTICAL EXAGGERATION = 8

DRAWN BY: DMD DATE: 05/06/15
CHECKED BY: JJW DATE: 05/15/15
APPROVED BY: JJW DATE: 05/15/15
DRAWING NO: 1660-171-B03
REFERENCE: .

GEOLOGIC CROSS-SECTION B-B'

WE ENERGIES CCR RULE GROUNDWATER
ALTERNATE SOURCE DEMONSTRATION
WE ENERGIES P4 ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN

PROJECT NO.
67985

FIGURE NO.
5

May 27, 2015 11:55am PLOTTED BY: ddudo SAVED BY: ddudo
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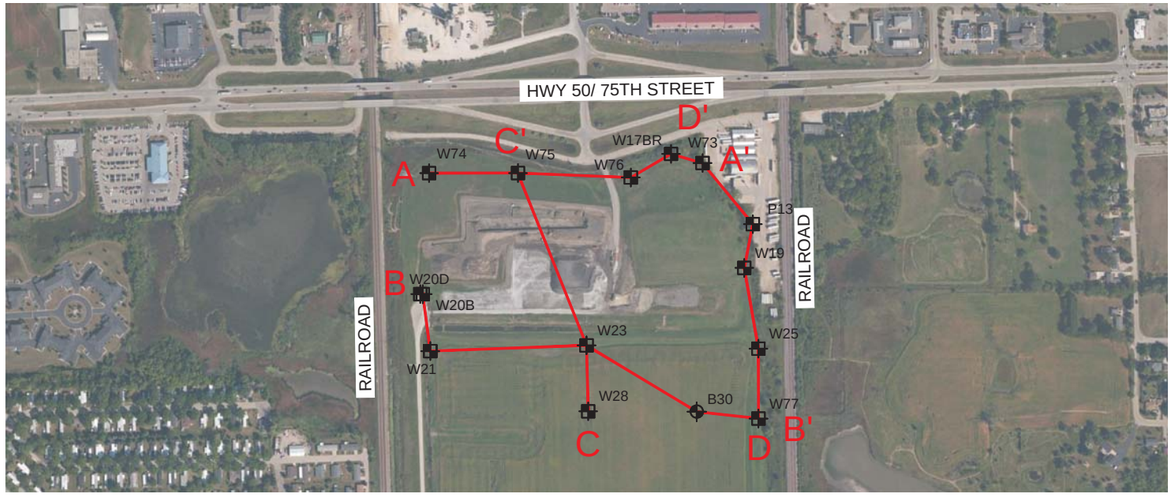
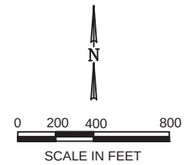
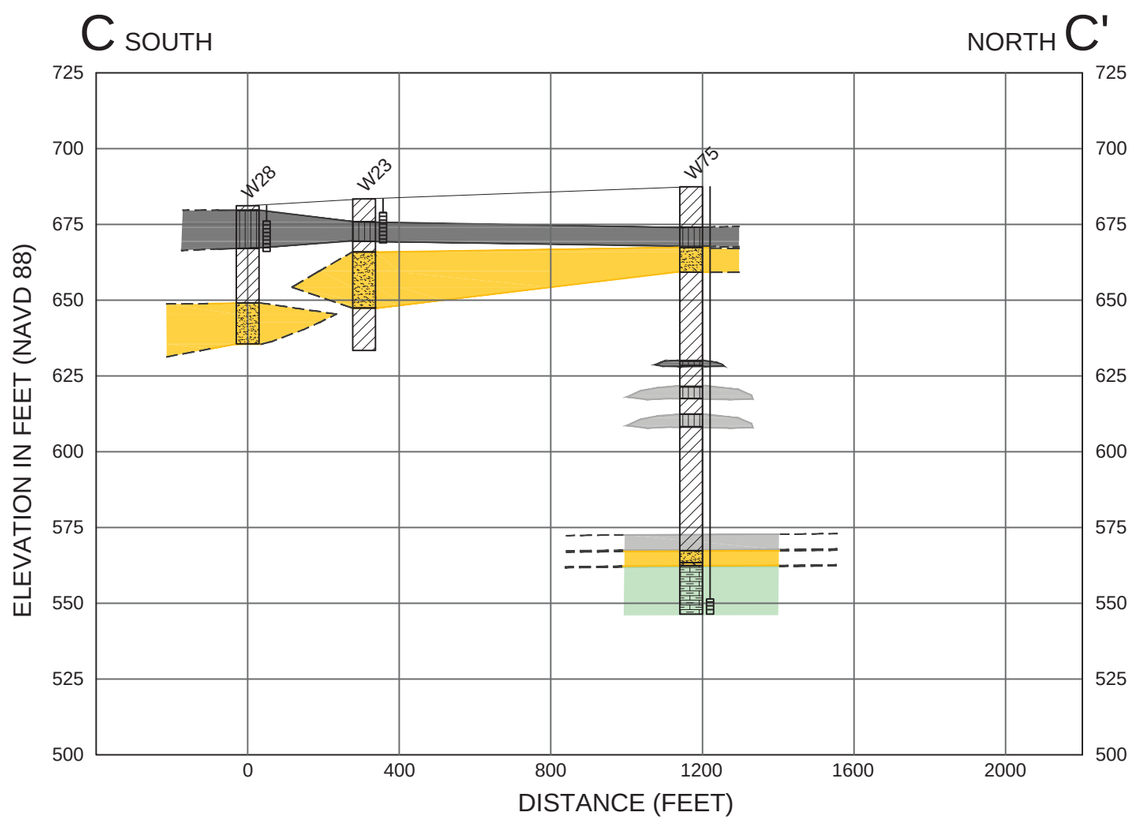
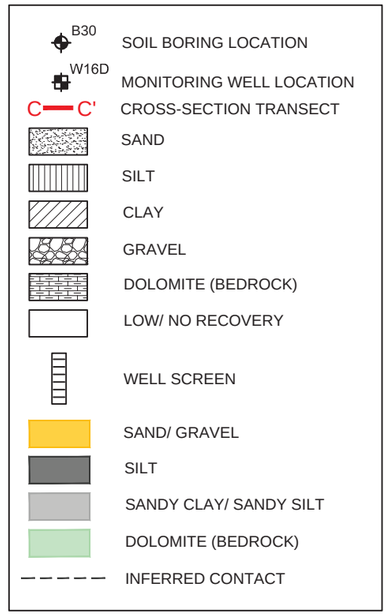


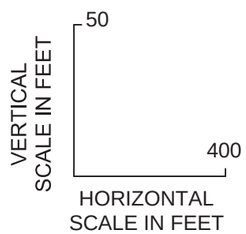


SOURCE NOTES:

1. DIGITAL ORTHOPHOTO FROM BING MAPS © 2012.
2. COORDINATE SYSTEM IS NAD27 WISCONSIN STATE PLANE, SOUTH ZONE, U.S. FOOT.







VERTICAL EXAGGERATION = 8

DRAWN BY: DMD DATE: 05/06/15
CHECKED BY: JJW DATE: 05/15/15
APPROVED BY: JJW DATE: 05/15/15
DRAWING NO: 1660-171-B04
REFERENCE: .

GEOLOGIC CROSS-SECTION C-C'

WE ENERGIES CCR RULE GROUNDWATER
ALTERNATE SOURCE DEMONSTRATION
WE ENERGIES P4 ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN

PROJECT NO.
67985

FIGURE NO.
6

May 27, 2015 11:51am PLOTTED BY: dduda SAVED BY: dduda
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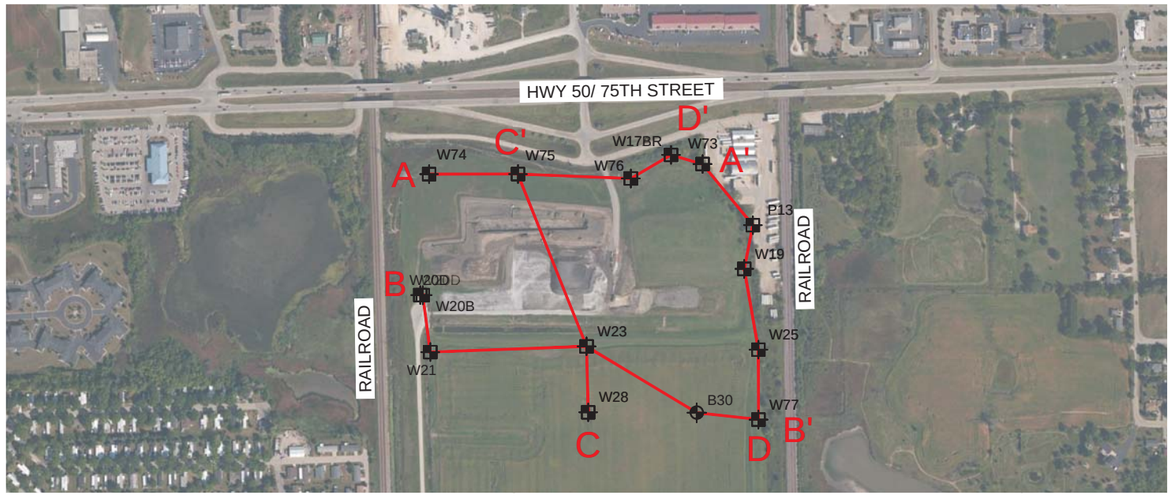
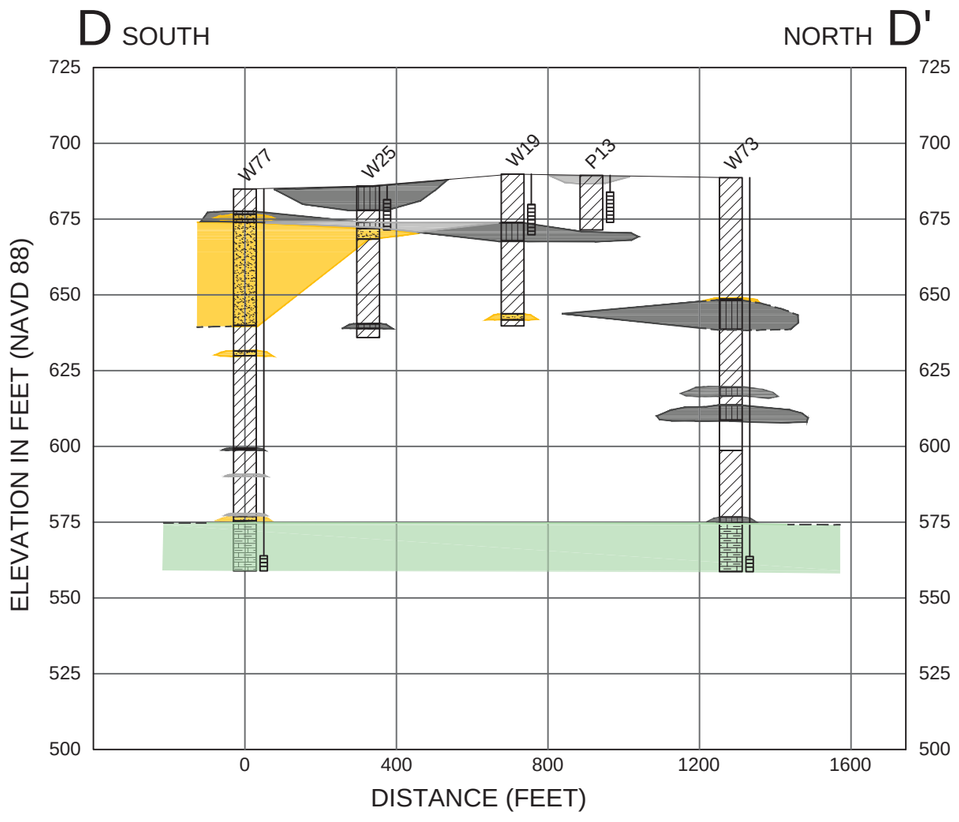
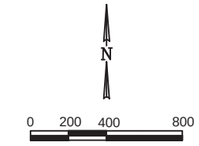
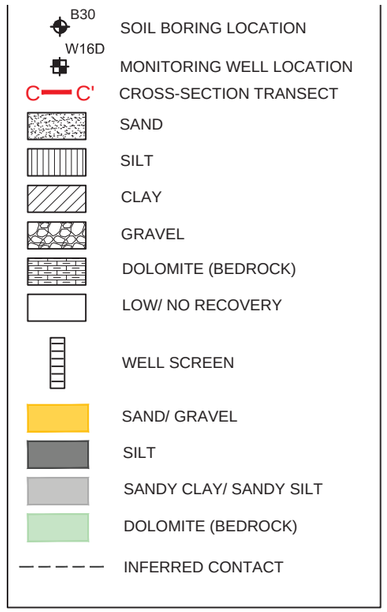


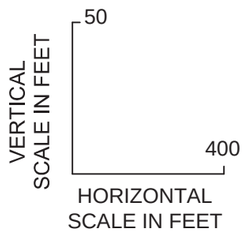




SOURCE NOTES:

1. DIGITAL ORTHOPHOTO FROM BING MAPS © 2012.
2. COORDINATE SYSTEM IS NAD27 WISCONSIN STATE PLANE, SOUTH ZONE, U.S. FOOT.





VERTICAL EXAGGERATION = 8

DRAWN BY: DMD DATE: 05/07/15
CHECKED BY: JJW DATE: 05/15/15
APPROVED BY: JJW DATE: 05/15/15
DRAWING NO: 1660-171-B05
REFERENCE: .

GEOLOGIC CROSS-SECTION D-D'

WE ENERGIES CCR RULE GROUNDWATER
ALTERNATE SOURCE DEMONSTRATION
WE ENERGIES P4 ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN

PROJECT NO.
67985

FIGURE NO.
7

May 27, 2015 11:53am PLOTTED BY: dduda SAVED BY: dduda
XYs: C:\Data\Projects\1660\1-71\1660-171-B05.dwg Layout1
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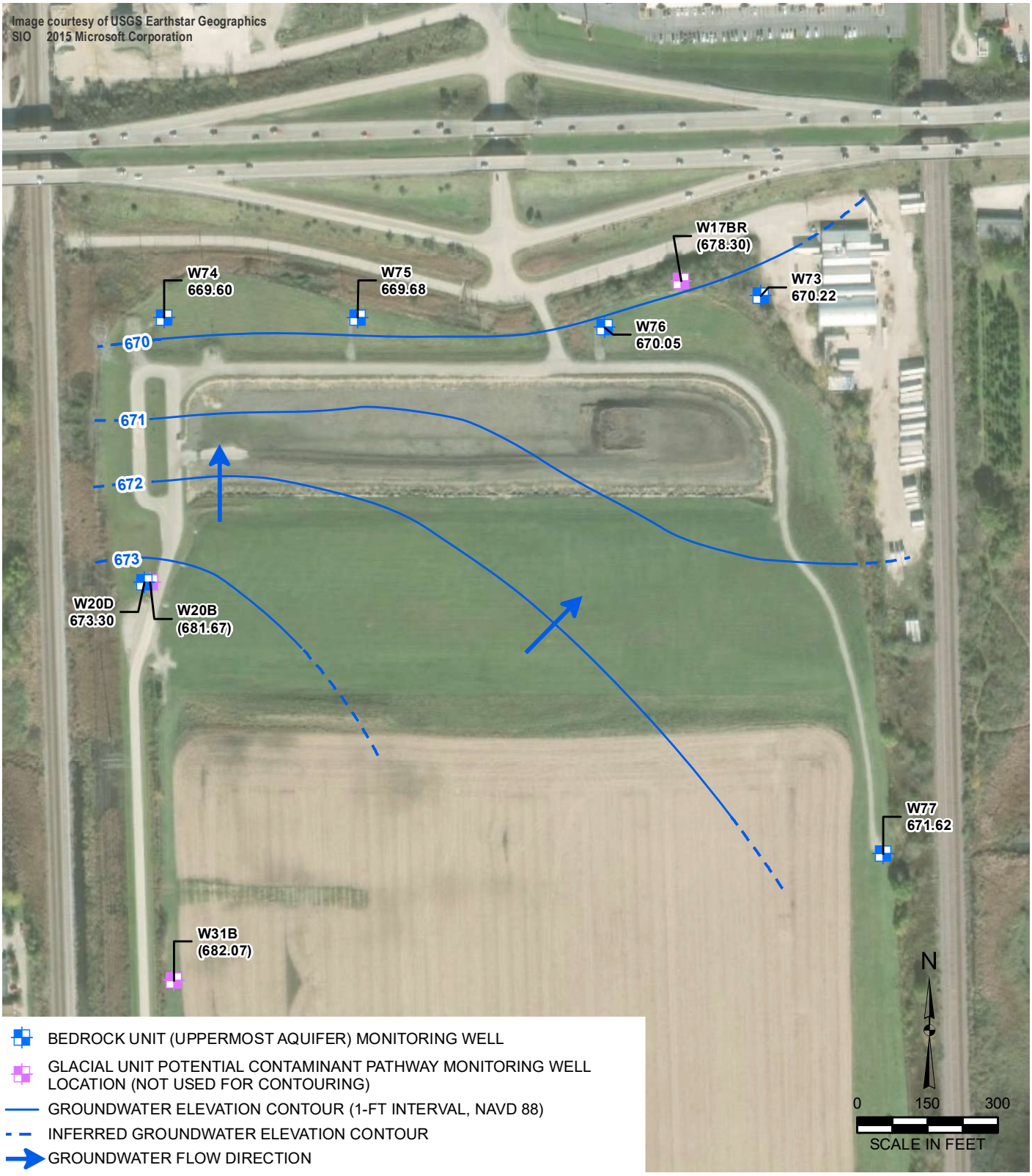


DRAWN BY/DATE:
MPG 4/29/19
REVIEWED BY/DATE:
GRL 4/29/19
APPROVED BY/DATE:
GRL 4/29/19

UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
2ND QUARTER 2018: APRIL 16, 2018

WE ENERGIES CCR RULE GROUNDWATER MONITORING
ALTERNATE SOURCE DEMONSTRATION
PLEASANT PRAIRIE POWER PLANT ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN

PROJECT NO: 67985

FIGURE NO: 12

OBG
Part of Ramboll

Y:\GIS\Projects\1\6\1660\P4\MXD\ASD\Figure 12_April2018 GW Contours.mxd Author: GalarnMC; Date/Time: 4/29/2019, 11:20:26 AM

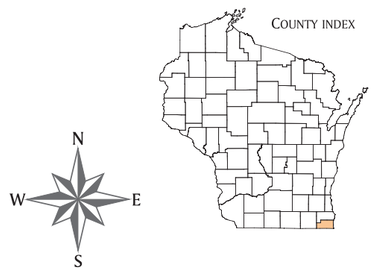
Attachment A

Preliminary Bedrock Topography Map of Kenosha, County

Preliminary bedrock topography map of Kenosha County, Wisconsin

R.M. Peters

2004



ESTIMATED ELEVATION IN FEET
(ABOVE MEAN SEA LEVEL)

> 850	700 - 750	550 - 600
800 - 850	650 - 700	500 - 550
750 - 800	600 - 650	< 500

• data point

1 0 1 2 3 4 5 6 7 8
KILOMETERS
1 0 1 2 3 4 5
MILES

Wisconsin Transverse Mercator Projection
1991 adjustment to the North American Datum of 1983 (NAD 83/91)

This map represents work performed by the Wisconsin Geological and Natural History Survey and is released to the open files in the interest of making the information readily available. This map has not been edited or reviewed for conformity with Wisconsin Geological and Natural History Survey standards and nomenclature.

This map is part of an ongoing project funded by STATEMAP, the state component of the National Cooperative Geologic Mapping Program of the U.S. Geological Survey.

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James M. Robertson, *Director and State Geologist*

Data entry and processing by K.K. Zeiler. Cartography by D.L. Patterson.

Wisconsin Geological and Natural History Survey
Open-File Report 2004-13B

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