2018 Annual Groundwater Monitoring and Corrective Action Report

Presque Isle Power Plant Ash Landfill No. 3

Marquette, Michigan

We Energies

January 31, 2019

OBG
Part of Ramboll

JANUARY 31, 2019 | PROJECT #71202

2018 Annual Groundwater Monitoring and Corrective Action Report

Presque Isle Power Plant Ash Landfill No. 3

Marquette, Michigan

Prepared for:

WEC Business Services, LLC
333 W. Everett Street
Milwaukee, WI

NATHANIEL R. KELLER
Senior Hydrogeologist

GLENN R. LUKE, PE
Managing Engineer

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

ASD	Alternate Source Demonstration
Ca	Calcium
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
mg/L	milligrams per liter
OBG	O'Brien & Gere Engineers, Inc., part of Ramboll
PIPP	Presque Isle Power Plant
SO_4	Sulfate
SSI	Statistically Significant Increase
TBD	To be Determined
TDS	Total Dissolved Solids

1 INTRODUCTION

This report has been prepared on behalf of We Energies by O'Brien & Gere Engineers, Inc., part of Ramboll (OBG), to provide the information required by Title 40 of the Code of Federal Regulations (40 CFR) 257.90(e) for the Presque Isle Power Plant (PIPP) Ash Landfill No. 3 located near Marquette, Michigan.

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.[1]

This report provides the required information for the PIPP Ash Landfill No. 3 for calendar year 2018.

[1] For calendar year 2018, corrective action and other information required to be included in the annual report as specified in 40 CFR 257.95 through 257.98 is not applicable.

2 MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

The PIPP Ash Landfill No. 3 remained in Detection Monitoring (40 CFR 257.94) during 2018. 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 2018 are included in Table 2.

In accordance with 40 CFR 257.93(h)(2), the *Statistical Analysis Plan, Presque Isle Power Plant Ash Landfill No. 3* (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 at monitoring wells at the PIPP Ash Landfill No. 3. 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). Alternate source demonstrations (ASD) were completed for the PIPP Ash Landfill No. 3 on the dates provided in Table 1. ASD documents are provided in Appendix A.

Table 1. Detection Monitoring Program Summary

Detection Monitoring Round	Sampling Date	Parameters Collected	Data Received	SSI Determination Date	SSI Parameters	Resample Date	ASD Date
1	11/8/2017	Appendix III	12/6/2017	1/15/2018	Ca, SO_4, TDS, pH	2/6/2018-2/7/2018	4/15/2018
2	5/22/2018-5/23/2018	Appendix III	6/7/2018	9/5/2018	Ca, SO_4, TDS, pH	8/28/2018	12/4/2018
3	11/8/2018	Appendix III	11/29/2018	TBD (before 2/27/2019)	TBD	TBD	TBD

Ca – Calcium
SO_4 - Sulfate
TBD – To Be Determined
TDS – Total Dissolved Solids

The PIPP Ash Landfill No. 3 remains in the Detection Monitoring Program in accordance with 40 CFR 257.94.

3 KEY ACTIONS COMPLETED IN 2018

Two groundwater sampling events were completed in 2018 as part of the Detection Monitoring Program, Rounds 2 and 3. One groundwater sample was collected from each background and downgradient well in the monitoring system during each event. Two resampling events were completed in accordance with the *Statistical Analysis Plan, Presque Isle Power Plant Ash Landfill No. 3* (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 Presque Isle Power Plant Ash Landfill No. 3. All monitoring data obtained under 40 CFR 257.90 through 257.98 (as applicable) in 2018 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 PIPP Ash Landfill No. 3 is presented on Figure 1. There were no changes to the monitoring system in 2018.

Statistical evaluation, including SSI determinations, of analytical data from the Detection Monitoring Program for November 8, 2017 (Detection Monitoring Round 1) and May 22-23, 2018 (Detection Monitoring Round 2) were completed within 90 days of receipt of the analytical data. Statistical evaluation of analytical data is being performed in accordance with the *Statistical Analysis Plan, Presque Isle Power Plant Ash Landfill No. 3* (Natural Resource Technology, an OBG Company, 2017).

Alternate Source Demonstrations for Detection Monitoring Rounds 1 and 2 dated April 15 and December 4, 2018, respectively, were prepared for PIPP Ash Landfill No. 3 in 2018 and are provided in Appendix A. ASDs were prepared in accordance with 40 CFR 257.94(e)(2) and provide a description, data, and pertinent information supporting an alternate source applicable to the wells and parameters with SSIs at PIPP Ash Landfill No. 3. The ASDs support the position that the SSIs observed during the Detection Monitoring Program were not due to a release from the CCR unit but were either from an error in sampling or analysis, from naturally occurring conditions (e.g. natural variation in groundwater quality), or anthropogenic affects related to landfill construction.

4 PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE PROBLEMS

No problems were encountered during implementation of the Detection Monitoring Program during 2018. Groundwater samples were collected and analyzed in accordance with the *Sampling and Analysis Plan* (Natural Resource Technology, Inc., 2015) prepared for Presque Isle Power Plant Ash Landfill No. 3, and all data was accepted.

5 KEY ACTIVITIES PLANNED FOR 2019

The following key activities are planned for 2019:

- Continuation of the Detection Monitoring Program with semi-annual sampling scheduled for the 2nd and 4th quarters of 2019.
- Complete statistical evaluation of analytical data from the downgradient wells, using background data to determine whether a SSI of Appendix III parameters over background concentrations has occurred.
- 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 SSI determination and included in the annual groundwater monitoring and corrective action report for 2019.
  - 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 2019, including associated recordkeeping/notifications required by 40 CFR 257.105 through 257.108.

REFERENCES

Natural Resource Technology, Inc., 2015, Sampling and Analysis Plan - Revision 1, Presque Isle Power Plant Ash Landfill No. 3, Marquette, Michigan, December 8, 2015.

Natural Resource Technology, an OBG Company, 2017, Statistical Analysis Plan, Presque Isle Power Plant Ash Landfill No. 3, Marquette, Michigan, October 17, 2017.

Tables

Presque Isle
Table 2. Presque Isle Power Plant Ash Landfill No. 3: Appendix III Analytical Results

Date Range: 10/01/2017 to 11/08/2018

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
MW70	11/08/2017	40160512001	0.0166	21.7000	0.93	<0.10	6.41	6.6
	02/07/2018	40164451008		40.4000			7.30	
	05/23/2018	AE27756	0.0180	45.0000	0.55	<0.05	7.50	4.8
	08/28/2018	AE30009					7.40	
	11/08/2018	AE31689	0.0120	33.0000	0.50	0.06	7.50	5.0
MW79	11/08/2017	40160512007	0.0420	14.9000	0.85	<0.10	5.54	35.9
	02/06/2018	40164451003					5.68	41.2
	05/23/2018	AE27757	0.0390	18.0000	0.64	<0.05	5.10	38.0
	08/28/2018	AE30008		18.0000			5.60	
	11/08/2018	AE31687	0.0380	10.0000	1.20	<0.04	5.17	15.0
MW80PR	11/08/2017	40160512008	0.0140	49.9000	4.80	<0.10	7.87	5.5
	02/06/2018	40164451001		52.0000			7.89	
	05/22/2018	AE27751	0.0190	53.0000	6.00	<0.10	7.90	5.5
	11/08/2018	AE31688	0.0110	52.0000	6.00	<0.04	7.57	5.4
MW85	11/08/2017	40160512004	0.0249	6.5200	0.55	<0.10	6.41	3.9
	02/07/2018	40164451004		6.4800			6.14	3.7
	05/23/2018	AE27753	0.0240	6.4000	0.38	<0.10	6.00	3.8
	11/08/2018	AE31693	0.0280	10.0000	0.44	<0.04	6.59	4.0
MW86	11/08/2017	40160512003	0.0147	4.1600	2.50	<0.50	5.84	<5.0
	02/07/2018	40164451006		3.3400			6.04	<1.0
	05/23/2018	AE27754	0.0210	2.4000	1.30	<0.05	5.60	0.7
	11/08/2018	AE31692	0.0091	2.0000	1.00	<0.04	6.32	0.5
MW87	11/08/2017	40160512002	0.0474	15.1000	0.96	<0.10	6.20	8.6
	02/07/2018	40164451007		17.6000			6.83	13.3
	05/23/2018	AE27755	0.0380	11.0000	0.78	<0.05	6.70	7.2
	11/08/2018	AE31691	0.0390	10.0000	0.50	0.07	6.91	5.8
MW95	11/08/2017	40160512006	0.0332	21.3000	0.66	<0.10	6.76	7.9
	02/06/2018	40164451002		23.0000			6.90	
	05/22/2018	AE27750	0.0330	29.0000	0.48	<0.10	6.80	8.7
	11/08/2018	AE31686	0.0290	5.0000	0.41	0.05	5.10	7.5

Presque Isle
Table 2. Presque Isle Power Plant Ash Landfill No. 3: Appendix III Analytical Results

Date Range: 10/01/2017 to 11/08/2018

Well Id	Date Sampled	Lab Id	TDS, mg/L
MW70	11/08/2017	40160512001	108.0
	05/23/2018	AE27756	230.0
	08/28/2018	AE30009	140.0
	11/08/2018	AE31689	120.0
MW79	11/08/2017	40160512007	74.0
	05/23/2018	AE27757	130.0
	11/08/2018	AE31687	62.0
MW80PR	11/08/2017	40160512008	148.0
	02/06/2018	40164451001	178.0
	05/22/2018	AE27751	180.0
	11/08/2018	AE31688	160.0
MW85	11/08/2017	40160512004	58.0
	02/07/2018	40164451004	44.0
	05/23/2018	AE27753	30.0
	11/08/2018	AE31693	46.0
MW86	11/08/2017	40160512003	154.0
	02/07/2018	40164451006	148.0
	05/23/2018	AE27754	140.0
	11/08/2018	AE31692	58.0
MW87	11/08/2017	40160512002	106.0
	02/07/2018	40164451007	126.0
	05/23/2018	AE27755	120.0
	11/08/2018	AE31691	36.0
MW95	11/08/2017	40160512006	122.0
	05/22/2018	AE27750	120.0
	11/08/2018	AE31686	34.0

Figures

DRAWN BY/DATE:
MPG 1/10/19
REVIEWED BY/DATE:
GRL 1/10/19
APPROVED BY DATE:
GRL 1/23/19

GROUNDWATER SAMPLING WELL LOCATION MAP

2018 ANNUAL GROUNDWATER MONITORING
AND CORRECTIVE ACTION REPORT
PRESQUE ISLE POWER PLANT LANDFILL NO. 3
MARQUETTE COUNTY, MICHIGAN

PROJECT NO: 71202

FIGURE NO: 1

OBG
Part of Ramboll

Appendix A

40 CFR 257.94(e)(2) Alternate Source Demonstrations (ASDs)

Appendix A1

April 15, 2018

OBG

Alternate Source Demonstration

Presque Isle Power Plant Ash Landfill No. 3

Marquette, MI

We Energies

April 15, 2018

OBG

APRIL 15, 2018 | PROJECT #67985

Alternate Source Demonstration

Presque Isle Power Plant Ash Landfill No. 3
Marquette, MI

Prepared for:

WEC Business Services, LLC
333 W. Everett Street
Milwaukee, WI

ERIC J. TLACHAC, PE
Managing Engineer

NATHANIEL R. KELLER, PG
Senior Hydrogeologist

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

ASD	alternate source demonstration
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
GCL	geosynthetic clay liner
HDPE	high density polyethylene
mg/L	milligrams per liter
NRT	Natural Resource Technology, Inc.
OBG	O'Brien & Gere Engineers, Inc.
PIPP	Presque Isle Power Plant
SSI	statistically significant increase
STD	standard units
TDS	total dissolved solids

1 INTRODUCTION

1.1 OVERVIEW

This document has been prepared on behalf of We Energies by O'Brien & Gere Engineers, Inc. (OBG) to provide pertinent information for an alternate source demonstration (ASD) as allowed by 40 CFR § 257.94(e)(2) for the Presque Isle Power Plant Ash Landfill No. 3 (PIPP Ash Landfill No. 3), located in Marquette, Michigan (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. The first semi-annual detection monitoring sample was collected on November 8, 2017 for which analytical data was received on December 4, 2017. Statistical analysis of the first detection monitoring sample for statistically significant increases (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 the sample results (January 15, 2018). The statistical determination identified the following SSIs at uppermost aquifer downgradient monitoring wells:

- Calcium above the background prediction interval at MW70 and MW95
- Sulfate above the background prediction interval at MW79
- Calcium, total dissolved solids (TDS), and pH above the background prediction interval at MW80PR

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 PIPP Ash Landfill No. 3 were the cause of the SSIs listed above. This ASD was completed within 90 days of determination of the SSIs (April 15, 2018) as required by 40 CFR § 257.94(e)(2).

1.2 BACKGROUND

PIPP Ash Landfill No. 3 consists of two landfill cells; Cell 1 was constructed in 2004 and filling began in 2005; Cell 2 was constructed in 2007 with filling beginning in 2008. Both landfill cells are constructed with a double liner system with a leak detection system and leachate collection. The bottom liner consists of a composite geosynthetic clay liner (GCL) and 60-mil high density polyethylene (HDPE) geomembrane, the leak detection layer consists of geocomposite, and top liner consists of 60-mil HDPE. Prior to the construction of PIPP Ash Landfill No. 3, CCR materials were placed in PIPP Ash Landfill No. 1 and PIPP Ash Landfill No. 2, both of which are located north of PIPP Ash Landfill No. 3.

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 on August 8, 2017. Groundwater is also sampled quarterly from additional monitoring wells to meet the requirements of the State of Michigan permit. Groundwater samples for PIPP Ash Landfill No. 3 have been collected since the late 1990's. The CCR monitoring program includes background wells MW85, MW86, and MW87, and downgradient wells MW70, MW79, MW80PR, and MW95. A map showing the groundwater monitoring system, including the state program and CCR Rule monitoring wells, is presented on Figure 1. Groundwater generally flows to the north/northeast (Figure 2) during periods of high groundwater elevation, and generally east during lower groundwater elevations (Figure A1 in Attachment A).

Samples were collected and analyzed in accordance with the Sampling and Analysis Plan (NRT, 2015) prepared for the 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

PIPP Ash Landfill No. 3 overlies unlithified glacial deposits that are 0 to greater than 88-ft thick, nearby glacial deposits are up to 100-ft thick. The glacial deposits are underlain by fresh to slightly weathered gneiss identified as Compeau Creek Gneiss. The unlithified glacial deposits, which represent the uppermost aquifer, are mostly highly permeable silty sands with some lenses of gravel and thin, discontinuous lenses of less permeable silts and clays.

Laboratory tests of coarse-grained unlithified glacial deposits indicated hydraulic conductivities ranging from 8 x 10^{-2} cm/s in sandy gravel to 6 x 10^{-5} cm/s in silty gravel. Similarly, field conducted hydraulic tests indicated hydraulic conductivities ranging from 5 x 10^{-1} cm/s in sand with gravel to 3 x 10^{-4} cm/s in sandy gravel. A partially continuous silt with clay layer exists in the northern portion of PIPP Ash Landfill No. 3; it extends into the southern portion of PIPP Ash Landfill No. 2 from the bedrock outcrop in the central portion of the PIPP Ash Landfill No. 3 footprint. The fine-grained layer is up to 8-ft thick and denotes a limited zone of decreased permeability within the unconsolidated glacial deposits. Laboratory tests of the fine-grained layer indicated hydraulic conductivities ranging from 1 x 10^{-4} cm/s in sandy silt to 6 x 10^{-6} in clay. Similarly, field conducted hydraulic tests indicated hydraulic conductivities ranging from 7 x 10^{-3} cm/s in sandy clay to 7 x 10^{-6} cm/s in sandy silt.

The lower boundary of the uppermost aquifer is relatively impermeable bedrock; field hydraulic tests indicated a hydraulic conductivity of approximately 5 x 10^{-8} cm/s, which occurs at a variable depth across the site. Bedrock ridges are found to the immediate east central, southeast, southwest and west central boundaries of the PIPP Ash Landfill No. 3 footprint. A bedrock outcrop also existed in the central portion of the landfill footprint prior to construction, where unlithified glacial deposits were not present (Figure A2 in Attachment A). Details of geology near PIPP Ash Landfill No. 3 are found on the cross-sections provided in Attachment A (Figures A3-A10) from the *Hydrogeologic Investigation Report: Presque Isle Power Plant Ash Landfill #3,* prepared by STS Consultants Ltd. and dated *August 17, 2001*.

2 ALTERNATE SOURCE DEMONSTRATION

2.1 SUMMARY

As allowed by 40 CFR § 257.94(e)(2), this ASD demonstrates that sources other than the PIPP Ash Landfill No. 3 caused the SSIs or that the apparent SSI was a result of natural variation in groundwater quality. Lines of evidence supporting this ASD include the following:

- Landfill Construction: PIPP Ash Landfill No. 3 is constructed with a double liner system with a leak detection system and leachate collection. The bottom liner consists of a composite 60-mil HDPE geomembrane and GCL , the leak detection layer consists of geocomposite, and top liner consists of 60-mil HDPE.
- Lack of CCR Indicators: Boron is a conservative and non-reactive tracer of CCR impacts, but has not been detected above background in any of the downgradient wells with reported SSIs. If groundwater has been impacted by PIPP Ash Landfill No. 3, then boron should be present at elevated concentrations in downgradient wells.
- Aquifer Composition, Recharge, and Geochemistry: The uppermost aquifer consists predominantly of unlithified sands and gravels with intermittent and discontinuous lenses of silt and clay, specifically in the northern portion of PIPP Ash Landfill No. 3. Monitoring wells screened within or below these lower conductivity units (silts and clays) may have different geochemical conditions than wells screened in sands and gravels.

  The groundwater flow directions and flow paths in the uppermost aquifer vary seasonally. In addition, following landfill construction there was lower recharge to the aquifer as the landfill liner inhibits infiltration below the footprint of the landfill. Without local recharge near the downgradient wells, groundwater from recharge zones located further away migrates to downgradient wells, which increases residence time and interaction with aquifer minerals. The distribution of naturally occurring inorganic constituents and geochemical conditions in the uppermost aquifer are variable, resulting in concentrations which may be elevated with respect to background but unrelated to PIPP Ash Landfill No. 3.

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

2.2 ASD SUPPORTING INFORMATION

2.2.1 Landfill Construction

This ASD is supported by the fact that PIPP Ash Landfill No. 3 was constructed relatively recently and incorporates a double liner system with a leak detection system and leachate collection. 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 in the landfill and with 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. Landfill monitoring and reporting indicate that the leachate collection system is functioning as designed, and indicated there is not significant leachate migration into underlying materials.

2.2.2 Lack of CCR Indicators

Boron is present in the PIPP Ash Landfill No.3 leachate at elevated concentrations (10.7 - 14.6 mg/L); however, in downgradient wells it is less than 0.055 mg/L (Figure 3). In wells with elevated concentrations of calcium (MW70, MW80PR, and MW95) there is no similar increase in boron concentration. Figure 4 below shows an overall negative correlation between calcium and boron, with higher calcium concentrations generally corresponding to lower boron, indicating the elevated calcium in groundwater is not related to PIPP Ash Landfill No. 3.

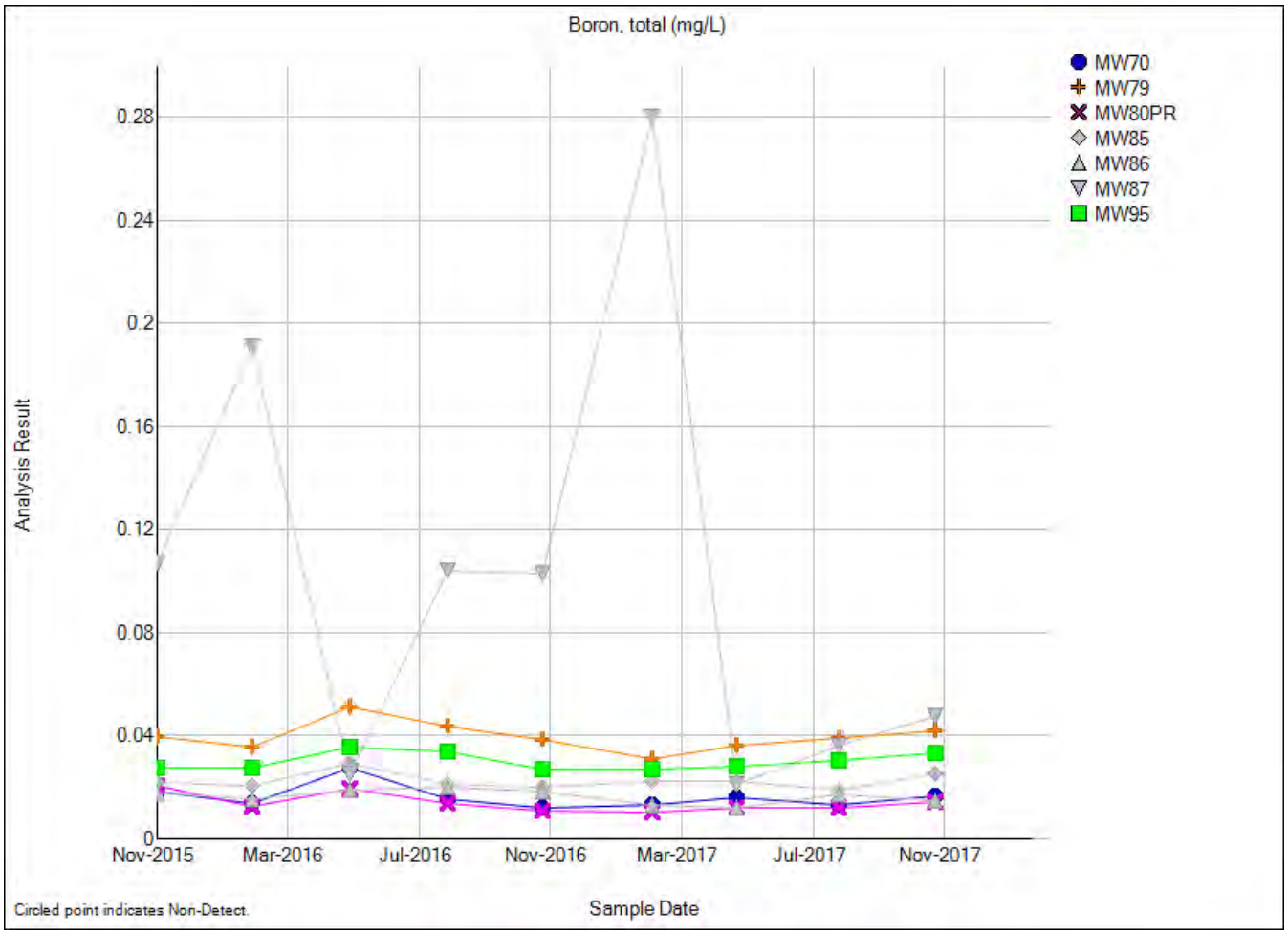


Figure 3. Time Series Plot of Boron Concentrations

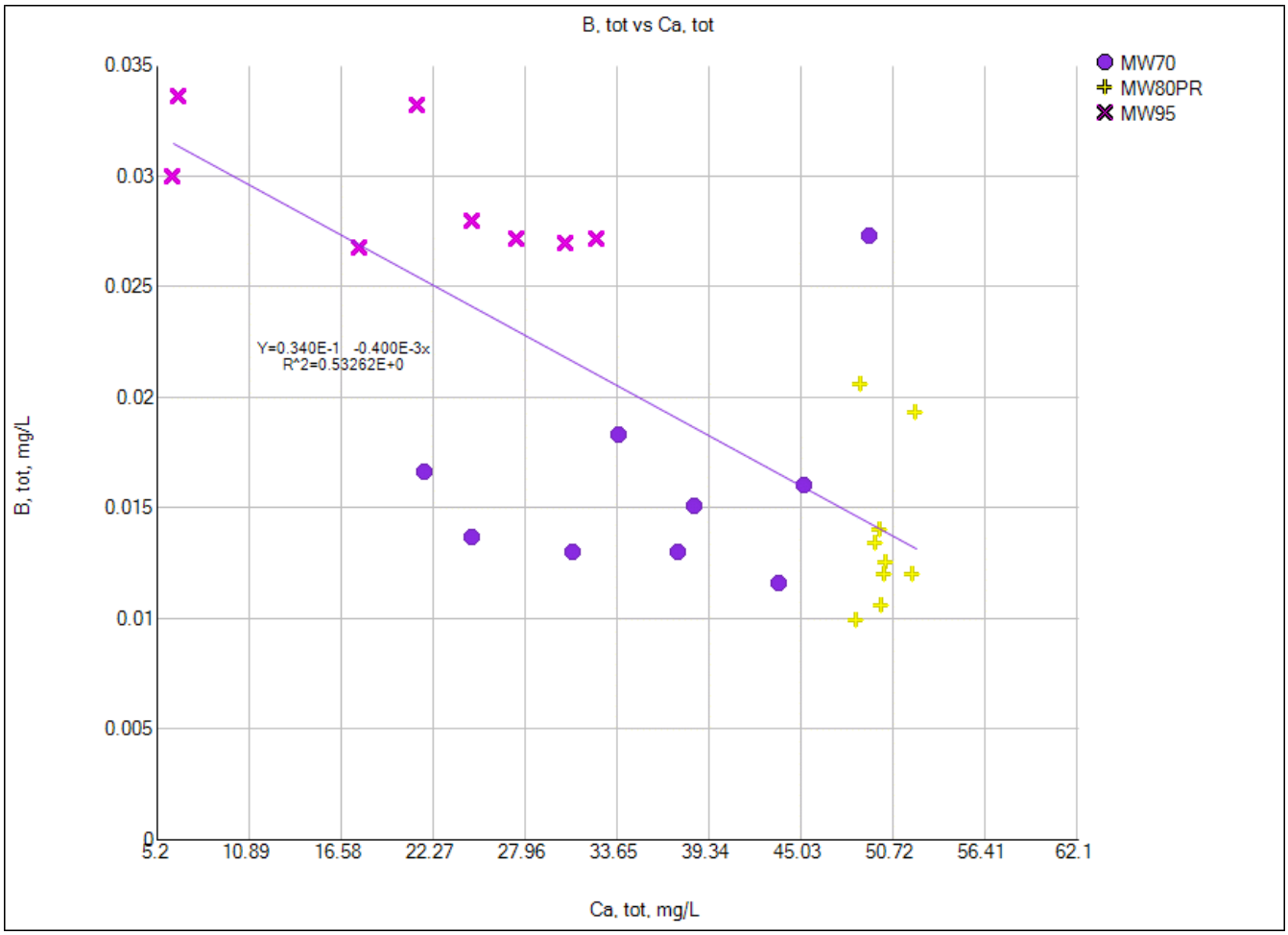


Figure 4. Scatter Plot of Boron vs. Calcium in MW70, MW80PR, and MW95

Sulfate concentrations in MW79 are also above the background prediction interval, but those concentrations do not correlate with increases in boron (Figure 5). This indicates that PIPP Ash Landfill No. 3 is not the source of elevated sulfate because the boron is not elevated in this same well. The sulfate detected in MW79 is strongly correlated with calcium (Figure 6).

A summary of the average ion ratios for calcium and sulfate is included in Table 3 to further support that groundwater is not being impacted by the landfill. The ion ratios show that background wells generally are closer to the leachate ratios which indicates that PIPP Ash Landfill No. 3 is not the source of elevated concentrations downgradient.

Table 3. Summary of Average Ion Ratios, Presque Isle Power Plant Landfill No. 3

Location ID	Ca/Cl	Ca/SO4	Ca/B	SO4/Ca	SO4/Cl	SO4/B
Leachate	0.7	0.05	14.0	22	15.3	314
MW70	28.0	6.23	2348.3	0.18	4.5	398
MW79	9.8	0.52	436.7	2.1	21.8	938
MW80PR	10.9	8.49	3827.9	0.12	1.3	451
MW85	7.5	1.90	384.9	0.58	3.9	202
MW86	0.9	1.11	253.2	1.1	0.9	248
MW87	5.7	1.30	157.8	0.93	4.3	161
MW95	15.9	2.51	683.3	0.59	6.9	266

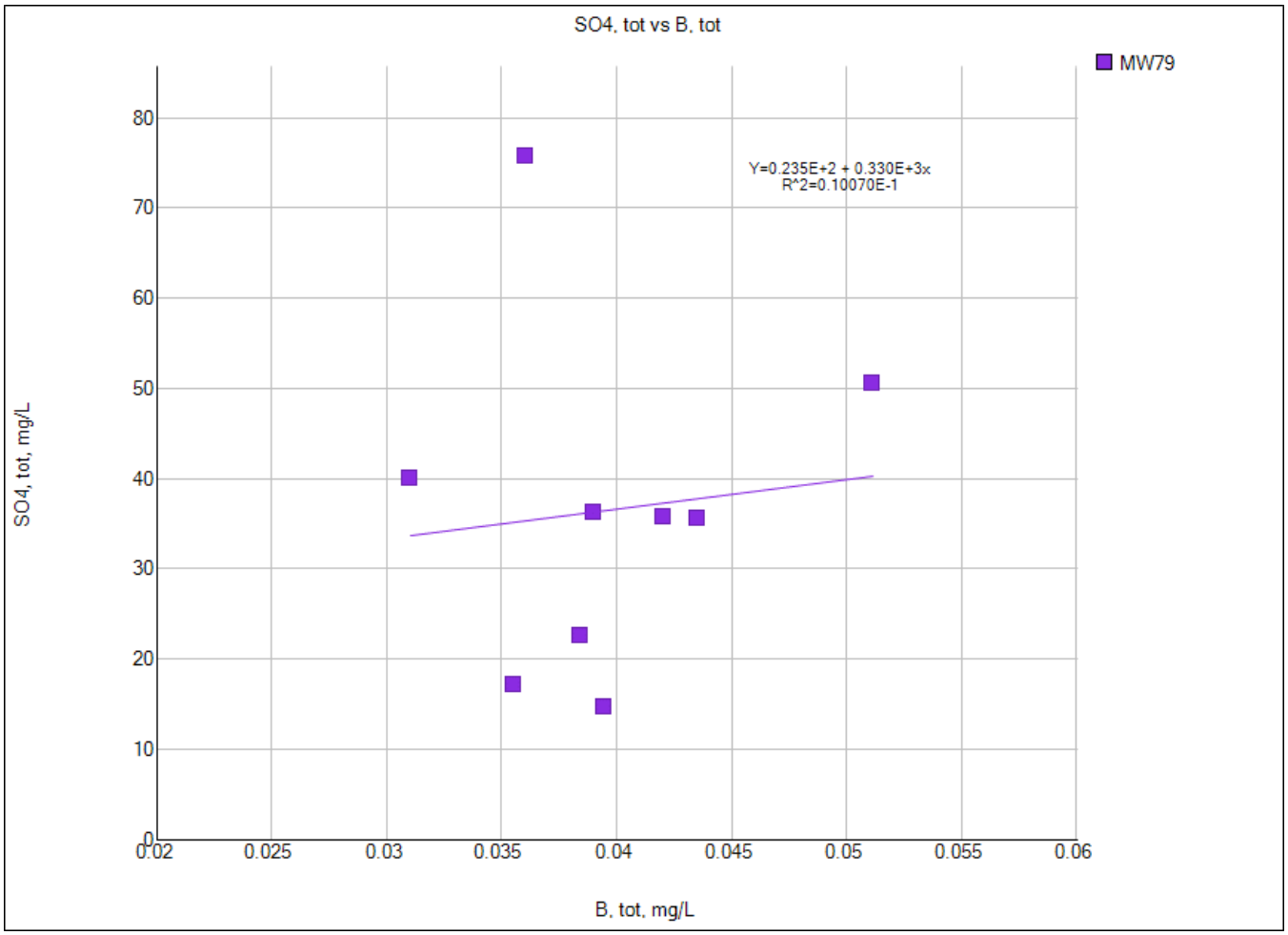


Figure 5. Scatter Plot of Sulfate vs. Boron in MW79

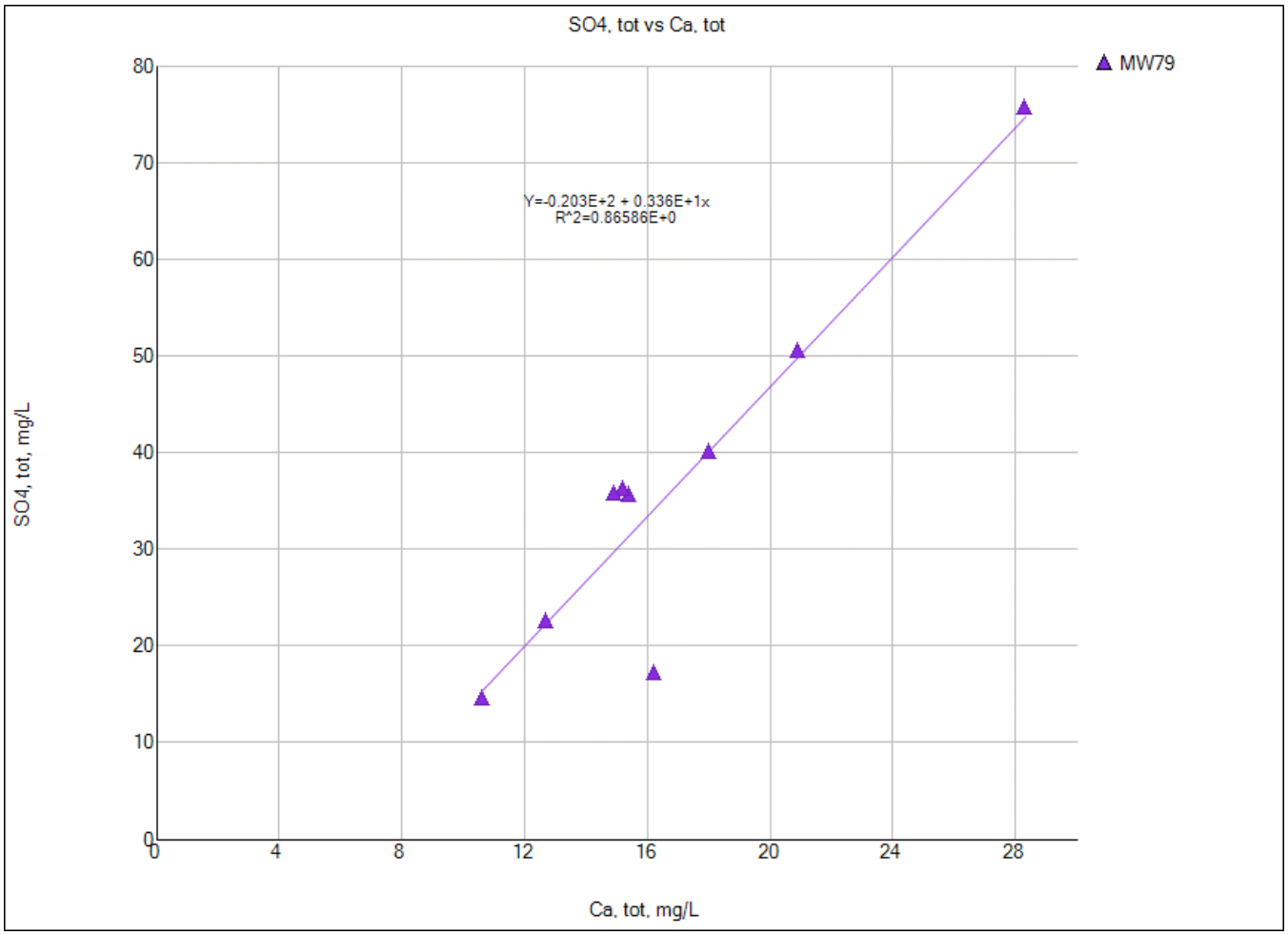


Figure 6. Scatter Plot of Sulfate vs. Calcium in MW79

2.2.3 Aquifer Composition, Recharge, and Geochemistry

The general water chemistry is displayed in the Piper diagram below (Figure 7). Background and downgradient groundwater samples, with the exception of MW79, plot within the same region of calcium/ magnesium dominated cations, and carbonate/bicarbonate anions. MW79 plots within the calcium/magnesium portion, but the dominant anion is sulfate. Leachate samples collected from the unit indicate sodium/potassium dominated cations and sulfate dominated anions. The background wells plot between the downgradient wells and leachate, indicating that the downgradient groundwater is not being influenced by the leachate. Based on the Piper diagram, downgradient wells MW70, MW80PR, and MW95 are enriched in calcium relative to the background wells. This is likely associated with the aquifer materials in which the wells are screened. Table 2 summarizes the USCS Classifications for the materials in which these wells are screened. Wells MW79, MW80PR, and MW95 are either screened within, or below fine grained materials (silt-ML, clay-CL, and sandy clay- SC). Clay and silt minerals commonly contain leachable calcium, sodium, potassium, etc., which may become more mobile at lower pH. MW79 and background wells MW85, MW86 and MW87 are screened in sands and gravels with low fines content and do not have elevated calcium concentrations (Figure 8).

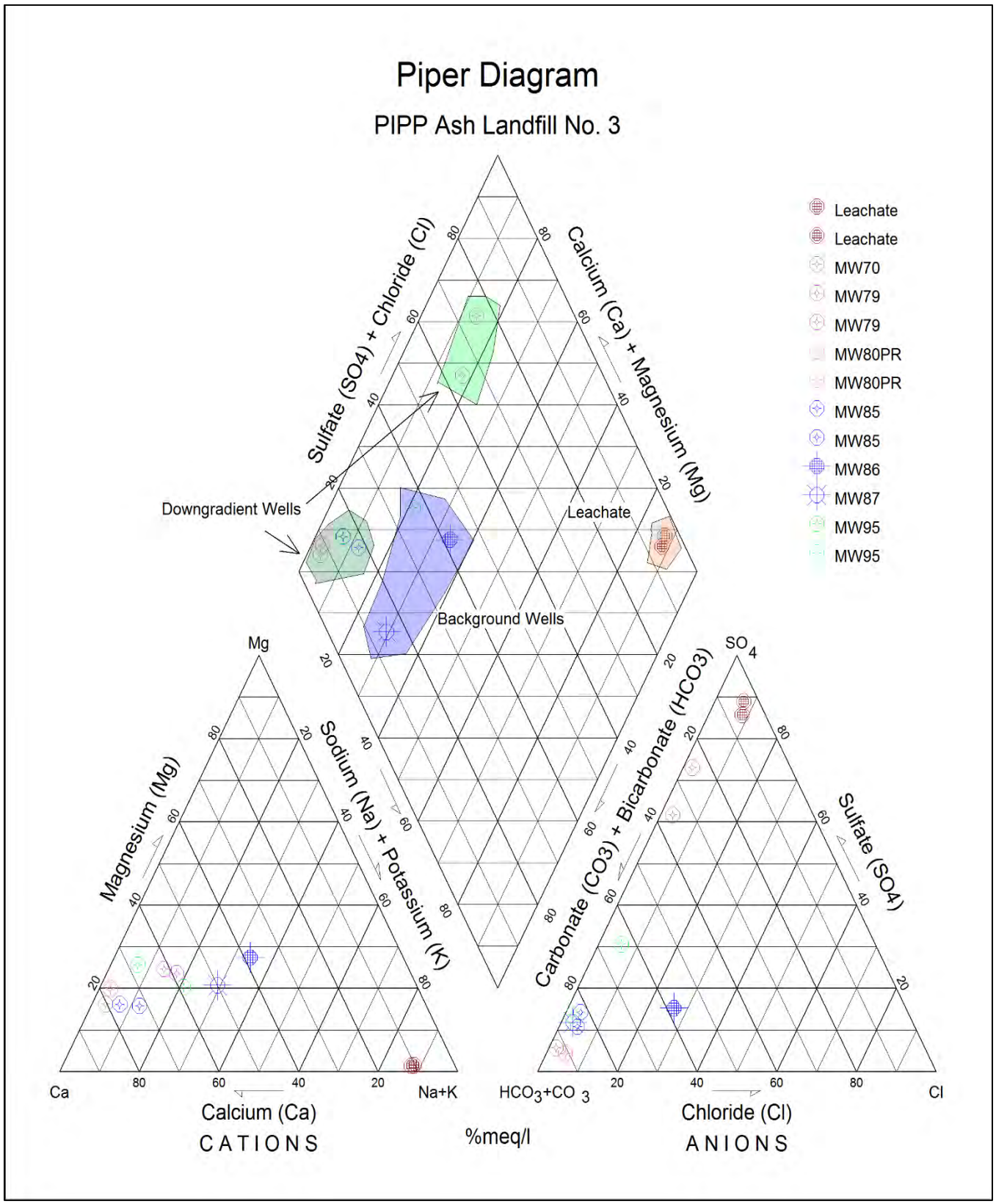


Figure 7. Piper Diagram of Groundwater Concentrations from May and August, 2017

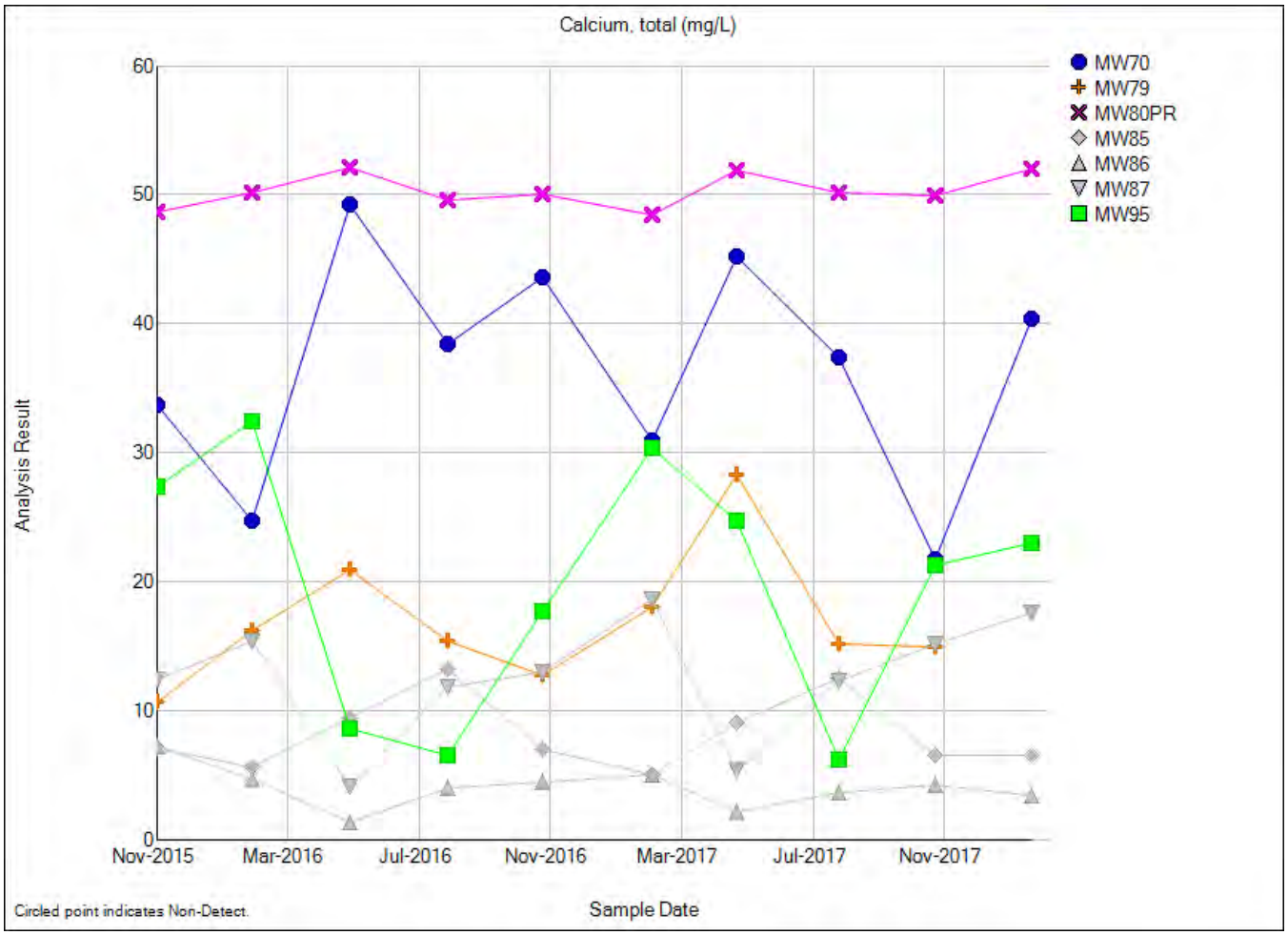


Figure 8. Calcium concentrations in CCR monitoring wells

Groundwater from MW80PR had the highest concentrations of calcium; SSIs were also reported in groundwater from this location for TDS and pH. The pH values plotted in Figure 9 show seasonal trends with lower pH in the spring when more rain water (low pH) is infiltrating and recharging the aquifer. pH is also the highest in well MW80PR relative to the other background and downgradient wells; however, it is also located furthest from the groundwater recharge area following construction of PIPP Ash Landfill No. 3 (Figure 10). The additional travel time of groundwater moving through the uppermost aquifer allows for increased interaction with the aquifer materials and dissolution of minerals into groundwater. The result of these reactions is elevated pH and TDS. pH measurements from MW70 and MW95 are also somewhat elevated, although more variable due to their location near potential recharge areas to the west for MW95, and to the west, south, and east for MW70.

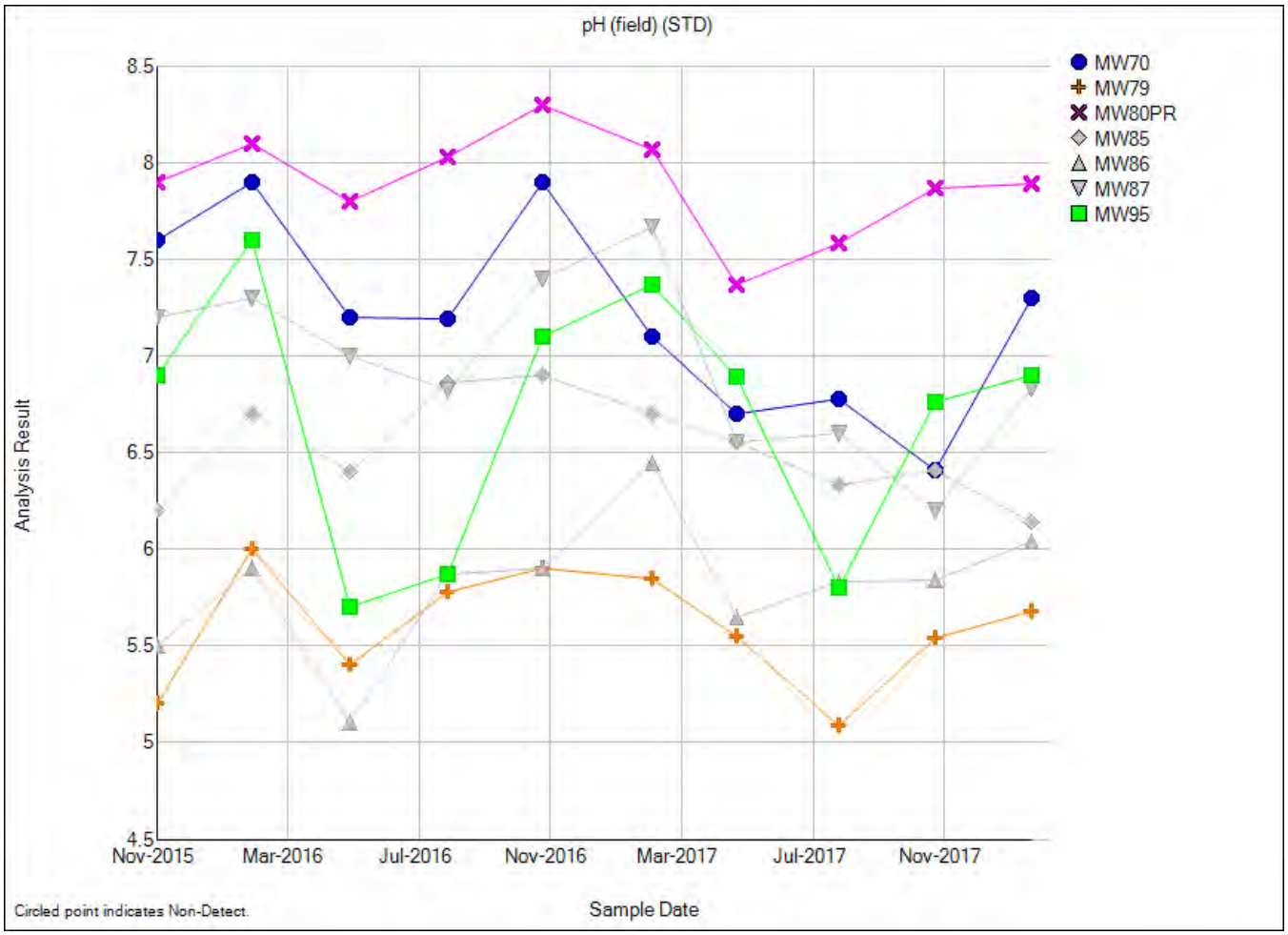


Figure 9. pH measurements in CCR monitoring wells at PIPP Ash Landfill No. 3

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 PIPP Ash Landfill No. 3 located in Marquette, MI.

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. The first semi-annual detection monitoring sample was collected on November 8, 2017 for which analytical data was received on December 4, 2017. Statistical analysis of the first 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 (January 15, 2018). The determination identified the following SSIs (concentrations greater than background prediction intervals) at downgradient monitoring wells:

- Calcium at wells MW70, MW80PR, and MW95
- Sulfate at well MW79
- TDS at well MW79

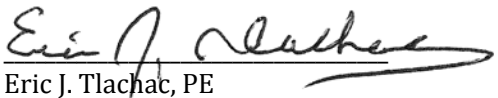
40 CFR § 257.94(e)(2) allows the owner or operator 90 days from the date of determination to demonstrate that a source other than the CCR unit caused the SSI, or that the apparent SSI was from a source other than the CCR unit, or that the SSI resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Pursuant to 40 CFR § 257.94(e)(2), this document demonstrates that sources other than the PIPP Ash Landfill No. 3 were the cause of the SSIs listed above. This ASD was completed within 90 days of determination of the SSIs (April 15, 2018) 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:

- Landfill Construction
- Lack of CCR Indicators
- Aquifer Composition, Recharge, and Geochemistry

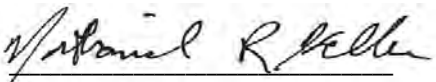
The preceding information serves as the ASD prepared in accordance with 40 CFR § 257.94(e)(2) and supports the position that the SSIs observed during the first semi-annual detection monitoring event are not due to a release from the CCR unit but are from both naturally occurring conditions in the uppermost aquifer and from anthropogenic effects related to landfill construction. Therefore, no further action (i.e. assessment monitoring) is warranted and PIPP #3 will remain in detection monitoring.

I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Michigan, 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.



Eric J. Tlachac, PE
Professional Engineer No. 6201053683
State of Michigan
O'Brien & Gere Engineers, Inc.
Date: April 15, 2018

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
Qualified Professional Geologist
O'Brien & Gere Engineers, Inc.
Date: April 15, 2018

REFERENCES

Natural Resource Technology, Inc., 2008 Letter to Mr. Carl Smith, Michigan Department of Environmental Quality. Re: Evaluation of Monitorability of Presque Isle Power Plant Landfill No. 3. January 31, 2008.

Natural Resource Technology, Inc., Sampling and Analysis Plan, Presque Isle Power Plant Ash Landfill No. 3. Marquette, Michigan, December 8, 2015.

Natural Resource Technology, an OBG Company, 2017, Statistical Analysis Plan, Presque Isle Power Plant Ash Landfill No. 3. Marquette, Michigan, October 17, 2017

STS Consultants, LTD. 2001. Hydrogeologic Investigation Report, Presque Isle Power Plant, Ash Landfill #3. August 17, 2001.

Tables

Presque Isle
Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 02/07/2018

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
MW70	11/04/2015	40124163003	0.0183	33.700	2.400	<0.200	7.600	6.200
	02/02/2016	40127847001	0.0137	24.700	3.000	<0.200	7.900	7.200
	05/05/2016	40131961001	0.0273	49.200	2.600	<0.200	7.200	5.800
	08/04/2016	40136329001	0.0151	38.400	<2.000	<0.200	7.190	5.500
	11/02/2016	40141308001	0.0116	43.600	0.970	<0.100	7.900	5.700
	02/14/2017	40145701001	0.0130	30.900	1.500	<0.100	7.100	7.000
	05/04/2017	40149461001	0.0160	45.200	0.860	<0.100	6.700	4.700
	08/08/2017	40154700001	0.0130	37.400	1.200	<0.100	6.780	5.500
	11/08/2017	40160512001	0.0166	21.700	0.930	<0.100	6.410	6.600
	02/07/2018	40164451008		40.400			7.300	
MW79	11/04/2015	40124163008	0.0394	10.600	2.500	<0.200	5.200	14.700
	02/02/2016	40127847007	0.0355	16.200	3.500	<0.200	6.000	17.200
	05/05/2016	40131961002	0.0511	20.900	3.000	<0.200	5.400	50.600
	08/04/2016	40136329007	0.0435	15.400	2.400	<0.200	5.780	35.700
	11/02/2016	40141308007	0.0384	12.700	1.100	<0.100	5.900	22.700
	02/14/2017	40145703001	0.0310	18.000	2.200	<0.100	5.850	40.100
	05/04/2017	40149461002	0.0360	28.300	1.700	<0.100	5.550	75.800
	08/08/2017	40154700008	0.0390	15.200	1.300	<0.100	5.090	36.300
	11/08/2017	40160512007	0.0420	14.900	0.850	<0.100	5.540	35.900
	02/06/2018	40164451003					5.680	41.200
MW80PR	11/04/2015	40124163001	0.0206	48.700	4.800	<0.200	7.900	5.900
	02/02/2016	40127847003	0.0125	50.200	5.800	<0.200	8.100	6.300
	05/05/2016	40131961003	0.0193	52.100	4.800	<0.200	7.800	6.300
	08/04/2016	40136329006	0.0134	49.600	4.200	<0.200	8.030	5.800
	11/02/2016	40141308006	0.0106	50.000	3.800	<0.100	8.300	5.600
	02/14/2017	40145701005	0.0099	48.400	4.400	<0.100	8.070	6.100
	05/04/2017	40149461003	0.0120	51.900	4.600	<0.100	7.370	6.000
	08/08/2017	40154700009	0.0120	50.100	4.600	<0.100	7.580	5.700
	11/08/2017	40160512008	0.0140	49.900	4.800	<0.100	7.870	5.500
	02/06/2018	40164451001		52.000			7.890	
MW85	11/04/2015	40124163007	0.0216	7.080	2.300	<0.200	6.200	4.700
	02/02/2016	40127847006	0.0205	5.550	2.900	<0.200	6.700	5.000
	05/05/2016	40131961004	0.0293	9.380	2.500	<0.200	6.400	4.600
	08/04/2016	40136329005	0.0208	13.200	<2.000	<0.200	6.860	4.700
	11/02/2016	40141308005	0.0196	6.950	0.770	<0.100	6.900	4.100
	02/14/2017	40145701004	0.0220	5.000	1.200	<0.100	6.700	4.200

Presque Isle
Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 02/07/2018

			B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
MW85	05/04/2017	40149461004	0.0220	9.000	0.800	<0.100	6.550	4.300
	08/08/2017	40154700005	0.0190	12.500	1.300	<0.100	6.330	4.200
	11/08/2017	40160512004	0.0249	6.520	0.550	<0.100	6.410	3.900
	02/07/2018	40164451004		6.480			6.140	3.700
MW86	11/04/2015	40124163006	0.0178	7.190	11.400	<1.000	5.500	<10.000
	02/02/2016	40127847005	0.0152	4.670	3.400	<0.200	5.900	6.300
	05/05/2016	40131961006	0.0186	1.280	3.200	<0.200	5.100	3.900
	08/04/2016	40136329003	0.0201	4.000	<10.000	<1.000	5.870	<10.000
	11/02/2016	40141308003	0.0181	4.450	3.300	<0.500	5.900	<5.000
	02/14/2017	40145701002	0.0130	5.000	5.700	<0.500	6.450	5.400
	05/04/2017	40149461007	0.0120	2.100	3.200	<0.500	5.650	<5.000
	08/08/2017	40154700003	0.0170	3.600	4.700	<0.500	5.830	<5.000
	11/08/2017	40160512003	0.0147	4.160	2.500	<0.500	5.840	<5.000
	02/07/2018	40164451006		3.340			6.040	<1.000
MW87	11/04/2015	40124163004	0.1070	12.400	2.500	<0.200	7.200	6.800
	02/02/2016	40127847004	0.1910	15.400	3.100	<0.200	7.300	9.600
	05/05/2016	40131961007	0.0252	4.080	2.800	<0.200	7.000	10.500
	08/04/2016	40136329002	0.1040	11.800	2.100	<0.200	6.820	9.600
	11/02/2016	40141308002	0.1030	12.900			7.400	
	11/10/2016	40141831001			1.100	0.120		7.900
	02/14/2017	40145703003	0.2800	18.600	5.600	<0.500	7.670	16.100
	05/04/2017	40149461008	0.0210	5.400	1.500	<0.100	6.550	7.300
	08/08/2017	40154700002	0.0360	12.300	1.200	<0.100	6.600	6.600
	11/08/2017	40160512002	0.0474	15.100	0.960	<0.100	6.200	8.600
	02/07/2018	40164451007		17.600			6.830	13.300
MW95	11/04/2015	40124163009	0.0272	27.400	2.400	<0.200	6.900	6.600
	02/02/2016	40127847008	0.0272	32.400	2.900	<0.200	7.600	7.000
	05/05/2016	40131961008	0.0357	8.550	2.500	<0.200	5.700	8.000
	08/04/2016	40136329008	0.0336	6.560	<2.000	<0.200	5.870	7.200
	11/02/2016	40141308008	0.0268	17.700	0.820	<0.100	7.100	7.700
	02/14/2017	40145703002	0.0270	30.400	1.300	0.100	7.370	8.700
	05/04/2017	40149461009	0.0280	24.700	0.890	<0.100	6.890	9.500
	08/08/2017	40154700006	0.0300	6.200	1.100	<0.100	5.800	8.100
	11/08/2017	40160512006	0.0332	21.300	0.660	<0.100	6.760	7.900
	02/06/2018	40164451002		23.000			6.900	

Presque Isle
Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 02/07/2018

Well Id	Date Sampled	Lab Id	TDS, mg/L
MW70	11/04/2015	40124163003	120.000
	02/02/2016	40127847001	96.000
	05/05/2016	40131961001	144.000
	08/04/2016	40136329001	122.000
	11/02/2016	40141308001	152.000
	02/14/2017	40145701001	110.000
	05/04/2017	40149461001	134.000
	08/08/2017	40154700001	122.000
	11/08/2017	40160512001	108.000
MW79	11/04/2015	40124163008	74.000
	02/02/2016	40127847007	78.000
	05/05/2016	40131961002	122.000
	08/04/2016	40136329007	90.000
	11/02/2016	40141308007	90.000
	02/14/2017	40145703001	108.000
	05/04/2017	40149461002	156.000
	08/08/2017	40154700008	88.000
	11/08/2017	40160512007	74.000
MW80PR	11/04/2015	40124163001	164.000
	02/02/2016	40127847003	156.000
	05/05/2016	40131961003	170.000
	08/04/2016	40136329006	166.000
	11/02/2016	40141308006	176.000
	02/14/2017	40145701005	164.000
	05/04/2017	40149461003	170.000
	08/08/2017	40154700009	166.000
	11/08/2017	40160512008	148.000
	02/06/2018	40164451001	178.000
MW85	11/04/2015	40124163007	42.000
	02/02/2016	40127847006	38.000
	05/05/2016	40131961004	44.000
	08/04/2016	40136329005	50.000
	11/02/2016	40141308005	50.000
	02/14/2017	40145701004	20.000
	05/04/2017	40149461004	38.000
	08/08/2017	40154700005	50.000

Presque Isle

Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 02/07/2018

			TDS, mg/L
MW85	11/08/2017	40160512004	58.000
	02/07/2018	40164451004	44.000
MW86	11/04/2015	40124163006	110.000
	02/02/2016	40127847005	52.000
	05/05/2016	40131961006	44.000
	08/04/2016	40136329003	114.000
	11/02/2016	40141308003	114.000
	02/14/2017	40145701002	94.000
	05/04/2017	40149461007	72.000
	08/08/2017	40154700003	148.000
	11/08/2017	40160512003	154.000
	02/07/2018	40164451006	148.000
MW87	11/04/2015	40124163004	86.000
	02/02/2016	40127847004	112.000
	05/05/2016	40131961007	82.000
	08/04/2016	40136329002	82.000
	11/10/2016	40141831001	106.000
	02/14/2017	40145703003	156.000
	05/04/2017	40149461008	58.000
	08/08/2017	40154700002	82.000
	11/08/2017	40160512002	106.000
	02/07/2018	40164451007	126.000
MW95	11/04/2015	40124163009	120.000
	02/02/2016	40127847008	124.000
	05/05/2016	40131961008	46.000
	08/04/2016	40136329008	38.000
	11/02/2016	40141308008	82.000
	02/14/2017	40145703002	110.000
	05/04/2017	40149461009	92.000
	08/08/2017	40154700006	40.000
	11/08/2017	40160512006	122.000

Table 2. CCR Rule Groundwater Monitoring Well Information
Presque Isle Power Plant Landfill No. 3
We Energies
Marquette, Michigan

Well Designation	Date Well Installed	Drilling Subcontractor	Drilling Method	Gradient Position	State Plane Northing[4]	State Plane Easting[4]	Latitude	Longitude	Ground Surface Elevation[3] (ft NAVD88)	Top of Protective Cover Pipe Elevation[3] (ft NAVD88)	Top of Well Riser Elevation[3] (ft NAVD88)	Borehole Drilled Depth[1,2] (ft bgs)	Borehole Bottom Elevation[1,2] (ft NAVD88)	Depth to Top of Well Screen[1,2] (ft bgs)	Depth to Well Bottom[1,2] (ft bgs)	Top of Screen Elevation[1,2] (ft NAVD88)	Well Bottom Elevation[1,2] (ft NAVD88)	Composition of Screened Interval
MW70	10/3/1996	STS Consultants	HSA	downgradient	656864.5910	26128210.6630	46.5837300	-87.4713260	844.40	846.53	846.76	29.0	817.94	18.5	28.5	828.44	818.44	SC,SM
MW79	6/16/1998	STS Consultants	HSA	downgradient	657654.4760	26127976.8410	46.5858920	-87.4722750	839.90	842.11	842.21	28.0	812.86	17.5	27.5	823.36	813.36	SP,SM
MW80PR	11/22/2011	SES	HSA	downgradient	657511.1140	26128268.8110	46.5855040	-87.4711100	831.80	834.58	834.35	39.0	793.23	35.0	38.0	797.23	794.23	SM (below CL)
MW85	6/14/1998	STS Consultants	HSA	upgradient	656719.1580	26127123.0380	46.5833130	-87.4756480	861.90	863.89	863.76	46.0	816.53	35.5	45.5	827.03	817.03	SW,SP
MW86	6/16/1998	STS Consultants	HSA	upgradient	656362.9700	26127244.4150	46.5823380	-87.4751570	862.00	863.85	863.76	16.3	846.03	4.5	14.5	857.83	847.83	SM,SP,SW
MW87[6]	6/16/1998	STS Consultants	Rotary	upgradient	656422.9610	26127549.4210	46.5825080	-87.4739450	853.60	855.38	855.40	38.0	815.85	27.5	37.5	826.35	816.35	Gneiss, SP
MW95[5]	10/10/2000	Boart Longyear	--	downgradient	657635.8430	26127421.8320	46.5858320	-87.4744820	851.30	853.02	853.16	35.0	816.52	24.0	34.0	827.72	817.72	ML, SM, SP

[OB: JJW, CB: ANS 9/22/15, U: GRL 10/30/15, CB: BGH 10/30/15]

Notes:

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

bgs = below ground surface

HSA = Hollow Stem Auger

1. The data source for well construction depths and elevations is STS Consultants Ltd. Hydrogeologic Investigation Report: Presque Isle Power Plant Ash Landfill #3. August 17, 2001.

2. Vertical datum for well construction elevations and depths was assumed to be NGVD29 based on other elevation data provided in STS Consultants Ltd. Hydrogeologic Investigation Report: Presque Isle Power Plant Ash Landfill #3. August 17, 2001. Elevation data in NGVD29 was converted to NAVD88 using North American Vertical Datum Conversion (VERTCON) for datum consistency with updated survey data from October 2015. Conversion is NGVD29 Elevation + 0.141 Feet = NAVD88 Elevation.

3. Ground surface elevation, top of protective cover pipe, and top of well riser were resurveyed by GEI Consultants, Inc. in October 2015. Vertical datum is NAVD88.

4. Horizontal datum is NAD 1983 (2011) State Plane Michigan North, FIPS 2111, International Feet, provided by GEI Consultants, Inc. October 2015.

5. All wells, except MW95, were constructed with 2-inch nominal size schedule 40 PVC with 10-slot screens. MW95 is constructed with 2-inch nominal size stainless steel and a 6-slot screen.

6. All wells are screened in unlithified glacial deposits, except MW87. MW87 is screened across both bedrock and unlithified glacial deposits.

Figures

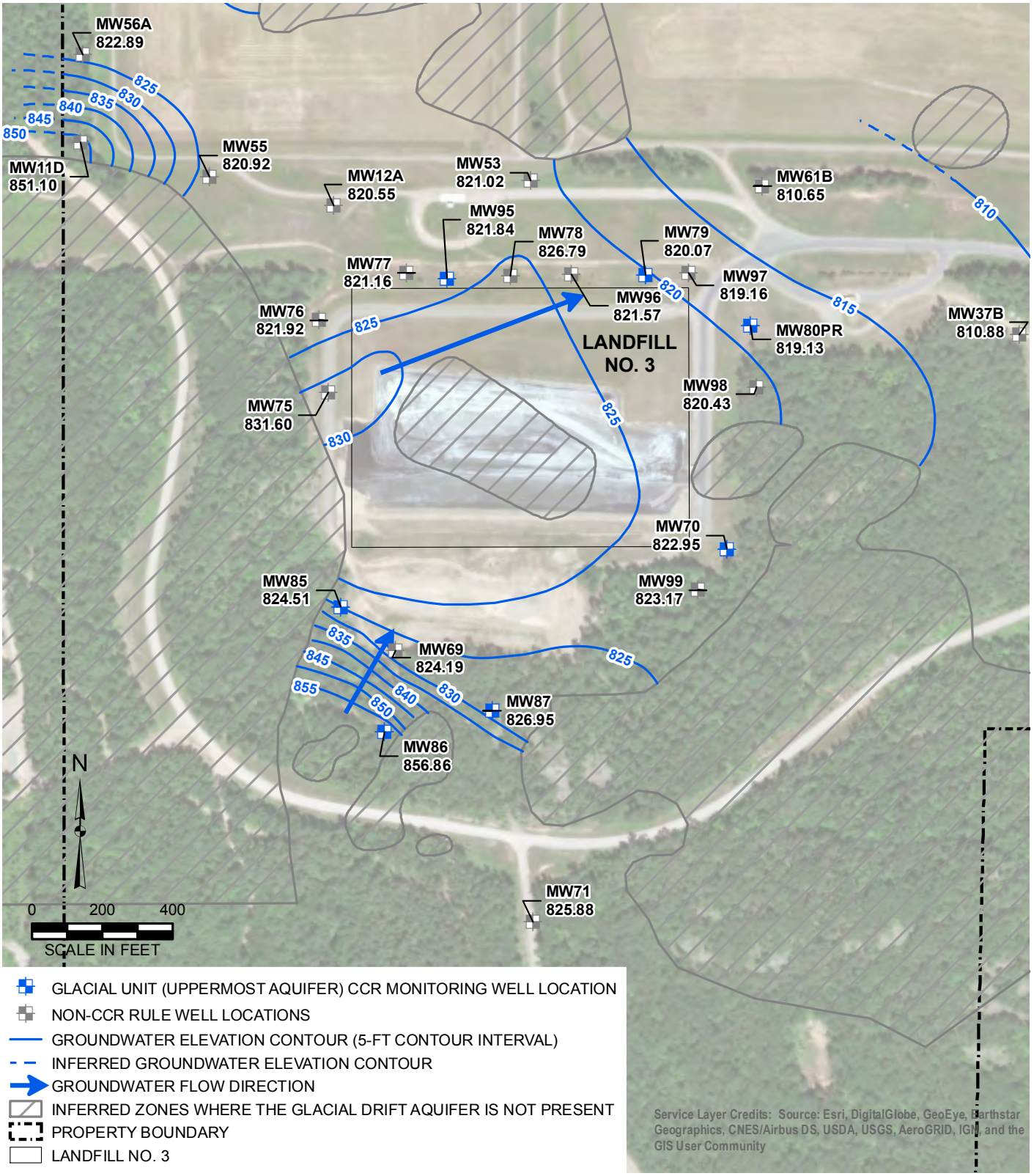
DRAWN BY/DATE:
MDM 9/21/15
REVIEWED BY/DATE:
NRK 4/12/18
APPROVED BY/DATE:
NRK 4/12/18

MONITORING WELL LOCATIONS

WE ENERGIES CCR RULE GROUNDWATER MONITORING
ALTERNATE SOURCE DEMONSTRATION
PRESQUE ISLE POWER PLANT LANDFILL NO. 3
MARQUETTE COUNTY, MICHIGAN

PROJECT NO: 67985

FIGURE NO: 1



Y:\GIS\Projects\1616\MXD\2018\R7_Pipp CCR GWE Contours May2017ABB.mxd Author: stolzsd; Date/Time: 4/13/2018, 11:11:11 AM

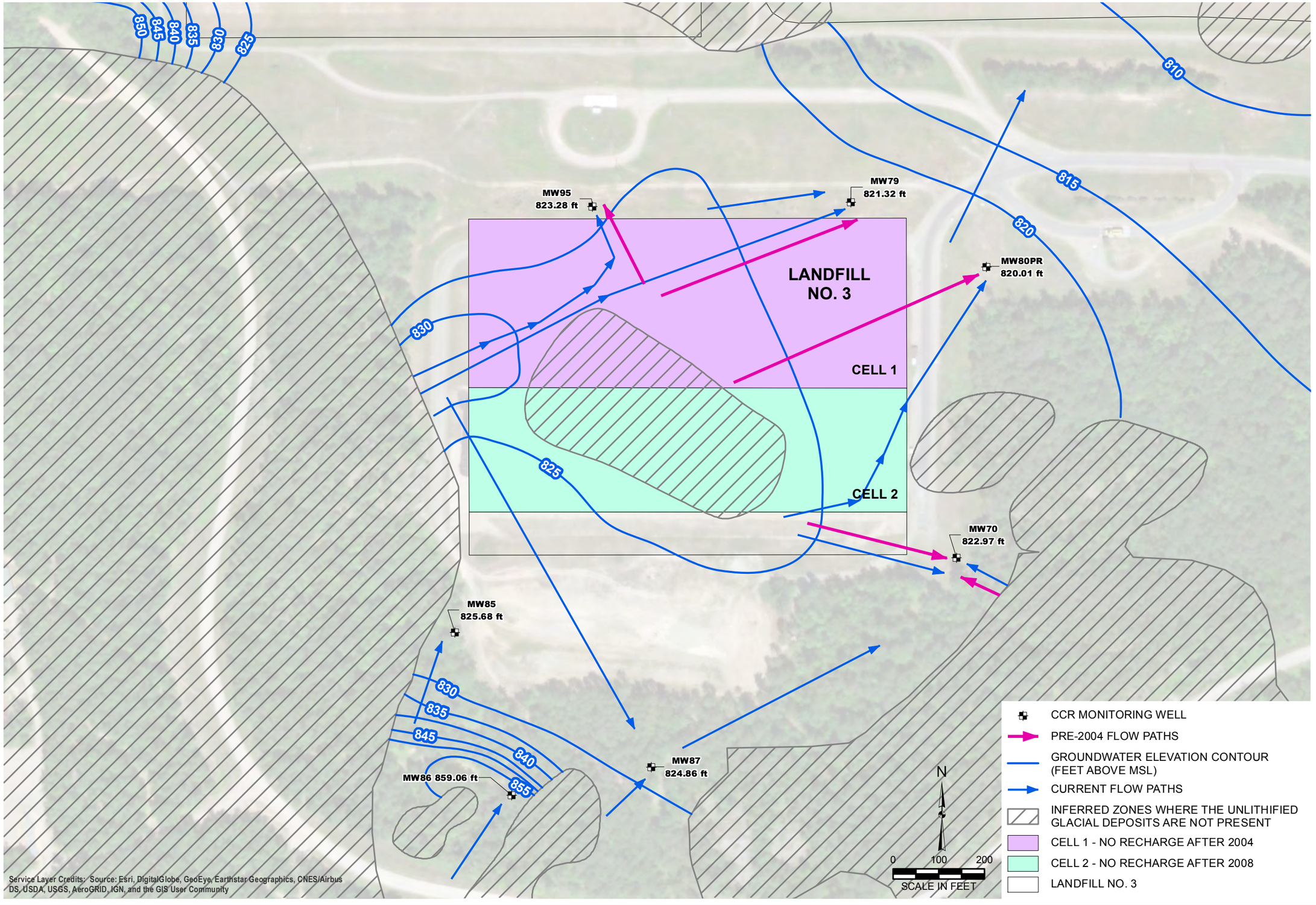
DRAWN BY/DATE:
SDS 9/12/17
REVIEWED BY/DATE:
NRK 4/12/18
APPROVED BY/DATE:
NRK 4/12/18

PRESQUE ISLE POWER PLANT LANDFILL NO.3
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
MAY 2-4, 2017

WE ENERGIES CCR RULE GROUNDWATER MONITORING
ALTERNATE SOURCE DEMONSTRATION
PRESQUE ISLE POWER PLANT LANDFILL NO. 3
MARQUETTE COUNTY, MICHIGAN

PROJECT NO: 67985

FIGURE NO: 2



DRAWN BY/DATE:
ABB 4/12/18
REVIEWED BY/DATE:
NRK 4/12/18
APPROVED BY/DATE:
NRK 4/12/18

CONCEPTUAL FLOW PATHS IN THE UPPERMOST AQUIFER PRE- AND POST- CONSTRUCTION

WE ENERGIES CCR RULE GROUNDWATER MONITORING
ALTERNATE SOURCE DEMONSTRATION
PRESQUE ISLE POWER PLANT LANDFILL NO. 3
MARQUETTE COUNTY, MICHIGAN

PROJECT NO. 67985

FIGURE NO. 10

Attachment A

Hydrogeologic Investigation Report Figures

Figure A1

GROUNDWATER TABLE CONTOUR MAP
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

LEGEND

- SITE GRID
- PROPERTY LINE
- EXTENT OF EXISTING LANDFILLS
- PROPOSED LANDFILL
- 900 — EXISTING SURFACE CONTOUR
- W27 — EXISTING MONITORING WELL LOCATION
- B-73 — NEW BORING LOCATION
- MW-81 — NEW BORING/MONITORING WELL LOCATION
- (815.00) — TABLE SURFACE ELEVATION, MSL (MEASURED ON NOVEMBER 7, 2000)
- INFERRED ZONES WHERE THE GLACIAL DRIFT AQUIFER IS NOT PRESENT
- GROUNDWATER FLOW DIRECTION
- Vgw = 51 ft/yr — CALCULATED GROUNDWATER FLOW VELOCITY

NOTES:

1. BASE MAP PREPARED BY AERO-METRIC ENGINEERING, INC. PROJECT NO. 1980328, DATE OF PHOTOGRAPHY: 4-3-98.
2. ELEVATIONS ON THIS MAP ARE BASED ON MEAN SEA LEVEL DATUM, NGVD29.
3. GRID SHOWN IS WISCONSIN ELECTRIC SITE GRID.
4. EXISTING SURFACE CONTOUR INTERVAL IS TWO FOOT.
5. PROPERTY BOUNDARY BASED ON DESCRIPTION ONLY (NOT FIELD VERIFIED).
6. W-84 WAS VANDALIZED AND SUBSEQUENTLY ABANDONED.
7. PRELIMINARY INVESTIGATION BORINGS AND MONITORING WELLS (B/W-69 THROUGH B-74) WERE ADVANCED/INSTALLED IN OCTOBER 1996. HYDROGEOLOGIC STUDY BORINGS AND MONITORING WELLS (B/W-75 THROUGH B-94) WERE ADVANCED/INSTALLED IN JUNE 1998 WITH THE EXCEPTION OF B/W-84R WHICH WAS ADVANCED/INSTALLED IN SEPTEMBER 1998. ADDITIONAL MONITORING WELLS MW-95 THROUGH MW-99 WERE ADVANCED/INSTALLED IN OCTOBER 2000.
8. STS SURVEYED THE BORING AND WELL LOCATIONS IN OCTOBER 1996, OCTOBER 1998, AND OCTOBER 2000.

SCALE IN FEET
200' 0 200'

REVISION NO.	DESCRIPTION	DATE	BY
1	REVISE CONTOURS W/RECENT DATA/ADD NEW WELLS	1/29/01	LLA

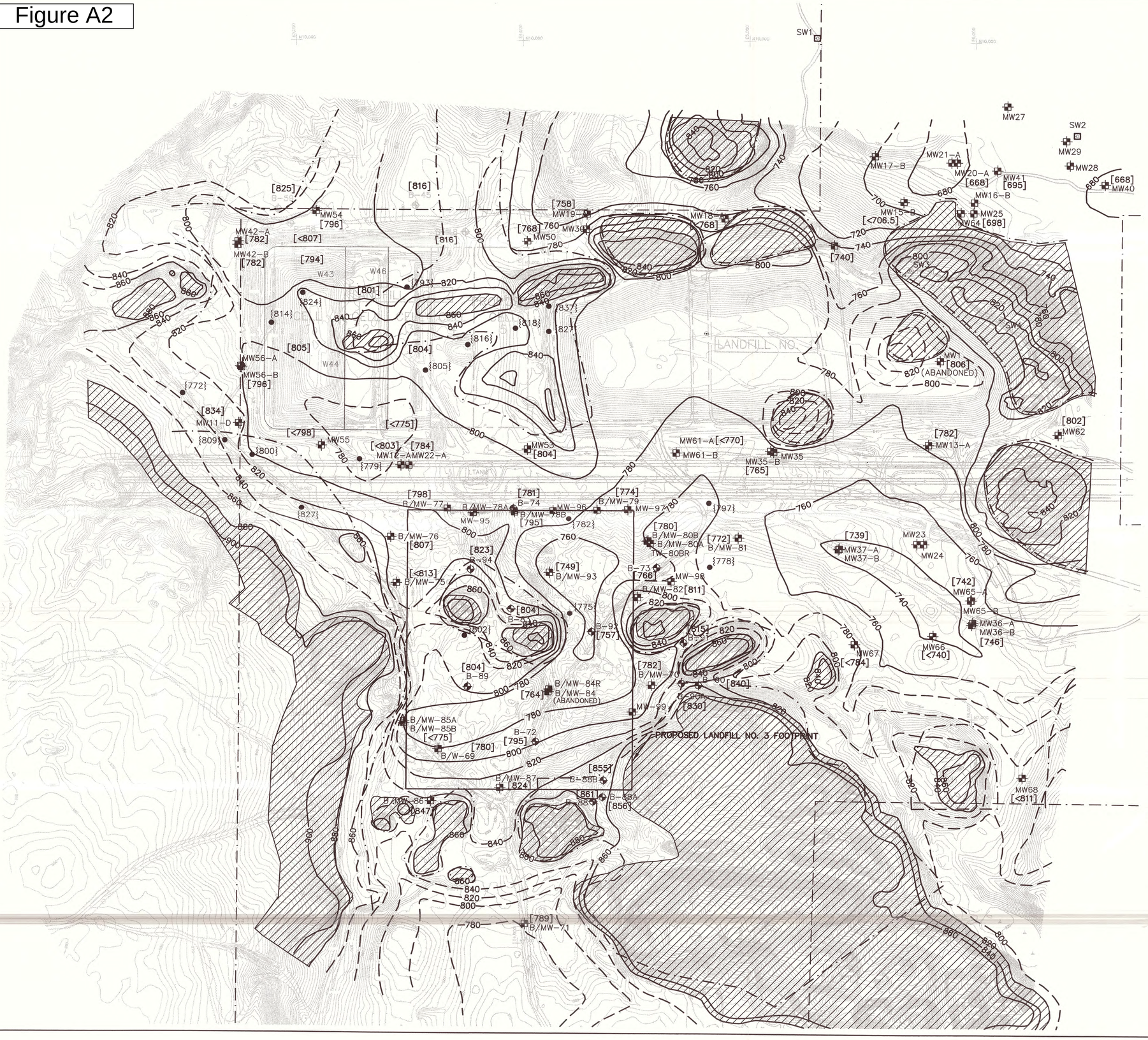
DRAWN BY LMD/SJW DATE 12-27-00
CHECKED BY COB/LKJ/BJB DATE 12-27-00
APPROVED BY JMT DATE 12-27-00
CADFILE \PROJECTS\PIPP\84955\LC\G5955LC09
XREF REVSBASE NEWBASE

STS Consultants Ltd.
Consulting Engineers
11425 W. Lake Park Dr.
Milwaukee, WI 53224
414.359.3030

STS PROJECT NUMBER 84955LC
STS PROJECT FILE G5955LC01
SCALE 1"=200'
SHEET NUMBER 5

W:\84955LC\dwg\G5849955LC001.dwg, 5, 08/17/2001 03:56:10 PM, STERR, STS Consultants, Ltd Milwaukee, WI 53224

Figure A2



LEGEND

- SITE GRID
- B–93 SOIL BORING LOCATION
- W–87 MONITORING WELL LOCATION
- PROPERTY LINE
- 900 EXISTING SURFACE CONTOUR
- 820 INTERPOLATED BEDROCK SURFACE CONTOUR
- 820 INFERRED BEDROCK SURFACE CONTOUR
- [771] BEDROCK ELEVATION (SEE NOTE 6)
- BEDROCK OUTCROP AREAS
- {778} BEDROCK SPOT ELEVATION TAKEN FROM SEISMIC SURVEY PERFORMED IN OCTOBER 1989, ELEVATIONS ±10 FEET

NOTES:

1. BASE MAP PREPARED BY AERO–METRIC ENGINEERING, INC. PROJECT NO. 1980328, DATE OF PHOTOGRAPHY: 4–3–98.
2. ELEVATIONS ON THIS MAP ARE BASED ON MEAN SEA LEVEL DATUM, NGVD29.
3. GRID SHOWN IS WISCONSIN ELECTRIC SITE GRID.
4. EXISTING SURFACE CONTOUR INTERVAL IS TWO FOOT. BEDROCK SURFACE CONTOUR IS 20 FEET.
5. PROPERTY BOUNDARY BASED ON DESCRIPTION ONLY (NOT FIELD VERIFIED).
6. BEDROCK ELEVATIONS BASED ON AUGER REFUSAL ELEVATIONS FROM BORING LOGS (EXCEPTIONS: W64 AND TW–80BR WHICH WERE DRILLED INTO BEDROCK).

SCALE IN FEET
200' 0 200'

BY	DATE	DESCRIPTION	REVISION NO.

DRAWN BY SNL — DATE 12-2-99
CHECKED BY COB/LKJ — DATE 12-2-99
APPROVED BY JMT — DATE 12-2-99
CADFILE: \PROJECTS\84955\LC\G5955LC10.DWG
XREF=\BASE

BEDROCK TOPOGRAPHIC MAP
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NUMBER	84955LC
STS PROJECT FILE	G5955LC10
SCALE	AS SHOWN
SHEET NUMBER	4

W:\84955lc\dwg\G5955LC10.dwg, 4, 08/17/2001 01:14:14 PM, STERR, STS Consultants, Ltd Milwaukee, WI 53224

Figure A3

LEGEND

- SITE GRID
- PROPERTY LINE
- EXTENT OF EXISTING LANDFILLS
- PROPOSED LANDFILL
- EXISTING SURFACE CONTOUR
- EXISTING MONITORING WELL LOCATION
- B-73 NEW BORING LOCATION
- B/MW-81 NEW BORING/MONITORING WELL LOCATION

UNIFIED SOIL CLASSIFICATION SYSTEM

GROUP SYMBOLS	TYPICAL NAMES
GW	WELL GRADED GRAVELS, GRAVEL–SAND MIXTURES, LITTLE OR NO FINES
GP	POORLY GRADED GRAVELS, GRAVEL–SAND MIXTURES, LITTLE OR NO FINES
GM	SILTY GRAVELS, GRAVEL–SAND–CLAY MIXTURES
GC	CLAYEY GRAVELS, GRAVEL–SAND–CLAY MIXTURES
SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SP	POORLY GRADED SANDS, GRAVELLY SANDS, TRACES OR NO FINES
SM	SILTY SANDS, SAND AND SILT MIXTURES
SC	CLAYEY SANDS, SAND AND CLAY MIXTURES
ML	INORGANIC SILTS, ROCK FLOUR, SILTY OR CLAYEY SILTS WITH SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAY, SILTY CLAYS, LEAN CLAYS

NOTES:

1. BASE MAP PREPARED BY AERO–METRIC ENGINEERING, INC. PROJECT NO. 1980328, DATE OF PHOTOGRAPHY: 4–3–98.
2. ELEVATIONS ON THIS MAP ARE BASED ON MEAN SEA LEVEL DATUM, NGVD29.
3. GRID SHOWN IS WISCONSIN ELECTRIC SITE GRID.
4. EXISTING SURFACE CONTOUR INTERVAL IS TWO FOOT.
5. PROPERTY BOUNDARY BASED ON DESCRIPTION ONLY (NOT FIELD VERIFIED).
6. MW–84 WAS VANDALIZED AND SUBSEQUENTLY ABANDONED.
7. PRELIMINARY INVESTIGATION BORINGS AND MONITORING WELLS (B/W–69 THROUGH B–74) WERE ADVANCED/INSTALLED IN OCTOBER 1996. HYDROGEOLOGIC STUDY BORINGS AND MONITORING WELLS (B/W–75 THROUGH B–94) WERE ADVANCED/INSTALLED IN JUNE 1998 WITH THE EXCEPTION OF B/W–84R WAS ADVANCED/INSTALLED IN SEPTEMBER 1998.
8. STS SURVEYED THE BORING AND WELL LOCATION IN OCTOBER, 1996 AND OCTOBER, 1998.

SCALE IN FEET
200' 0 200'

BY	DATE	DESCRIPTION	REVISION NO.

DRAWN BY PDS/SNL DATE 12-2-99
CHECKED BY COB/LKJ DATE 12-2-99
APPROVED BY JMT DATE 12-2-99
CADFILE \PROJECTS\PPP\84955\LC\G5955LC12.dwg
XREF REVSBASE NEWBASE

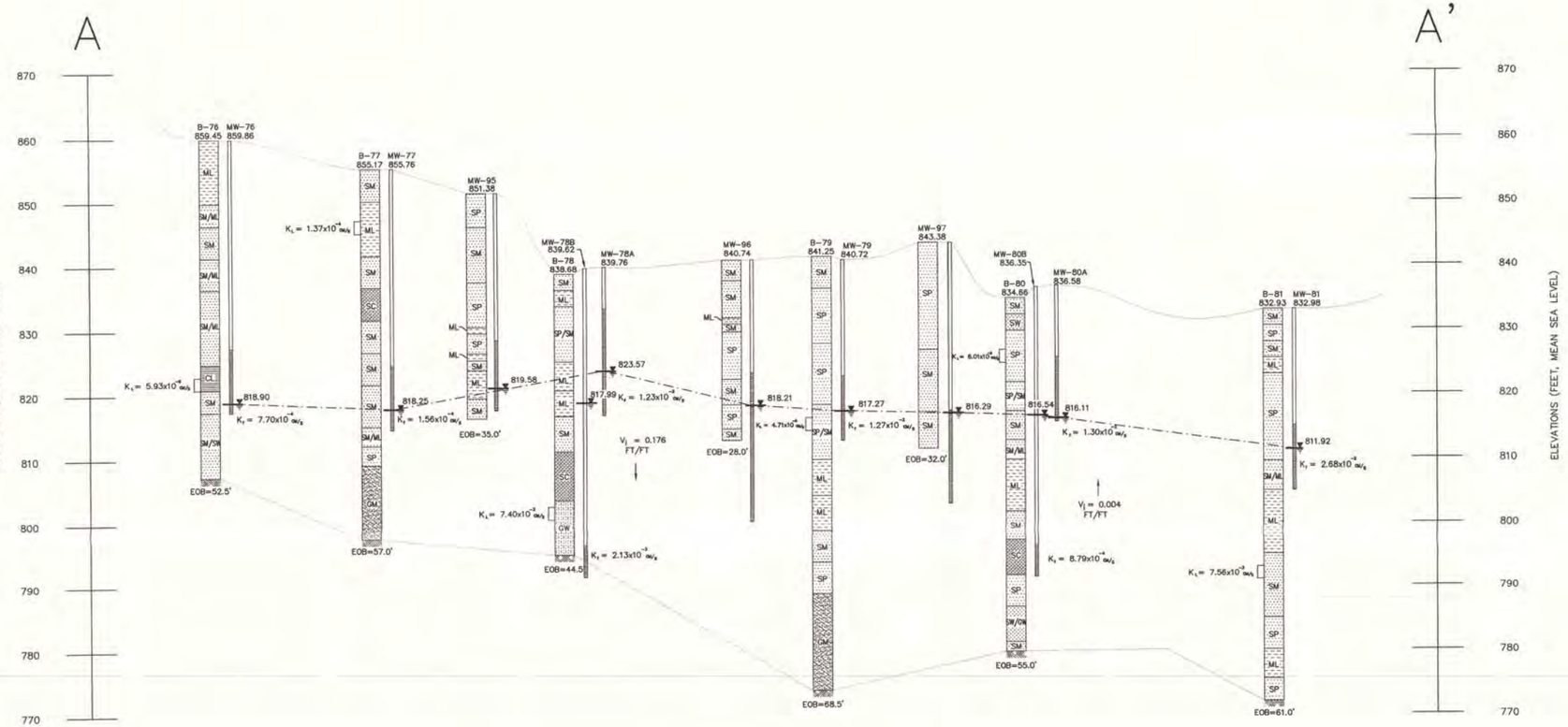
CROSS SECTION INDEX
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

STS Consultants Ltd.
Consulting Engineers
11425 W. Lake Park Dr.
Milwaukee, WI 53224
414.359.3030

STS PROJECT NUMBER 84955LG
STS PROJECT FILE G5955LC12
SCALE 1"=200'
SHEET NUMBER 7

W:\84955\LC\dwg\G5955LC12.dwg, 7, 08/17/2001 02:06:33 PM, STEER, STS Consultants, Ltd Milwaukee, WI 53224

Figure A4

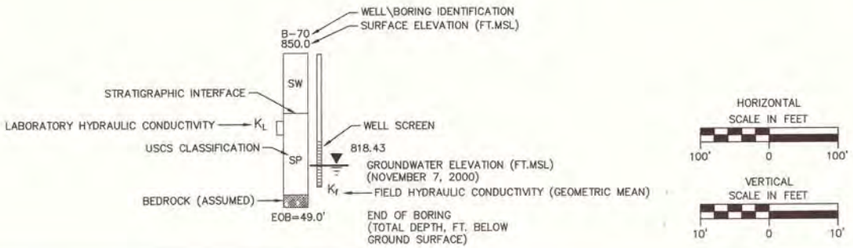


LEGEND

- GROUNDWATER TABLE SURFACE
- TOPOGRAPHIC SURFACE
- INTERPOLATED BEDROCK SURFACE
- INFERRED BEDROCK SURFACE
- VERTICAL GROUNDWATER GRADIENT ARROW INDICATES DIRECTION

A / 8 CROSS SECTION A–A'
HORIZONTAL SCALE: 1"= 100'
VERTICAL SCALE: 1" = 10'

NOTE:
CROSS SECTION A–A' DOES NOT INTERSECT PROPOSED LAND FILL



2	ADD BASE AND FINAL GRADES	2/15/01	LLA
1	ADD NEW WELL AND UPDATE GROUNDWATER ELEVATION	1/15/01	LLA
REVISION		DATE	BY

DRAWN BY: SNL/PDS — DATE: 12-2-99
CHECKED BY: COB/LKJ — DATE: 12-2-99
APPROVED BY: JMT — DATE: 12-2-99
CADFILE: ...\PROJECTS\PPP\84955\LC\G5955LC02.dwg

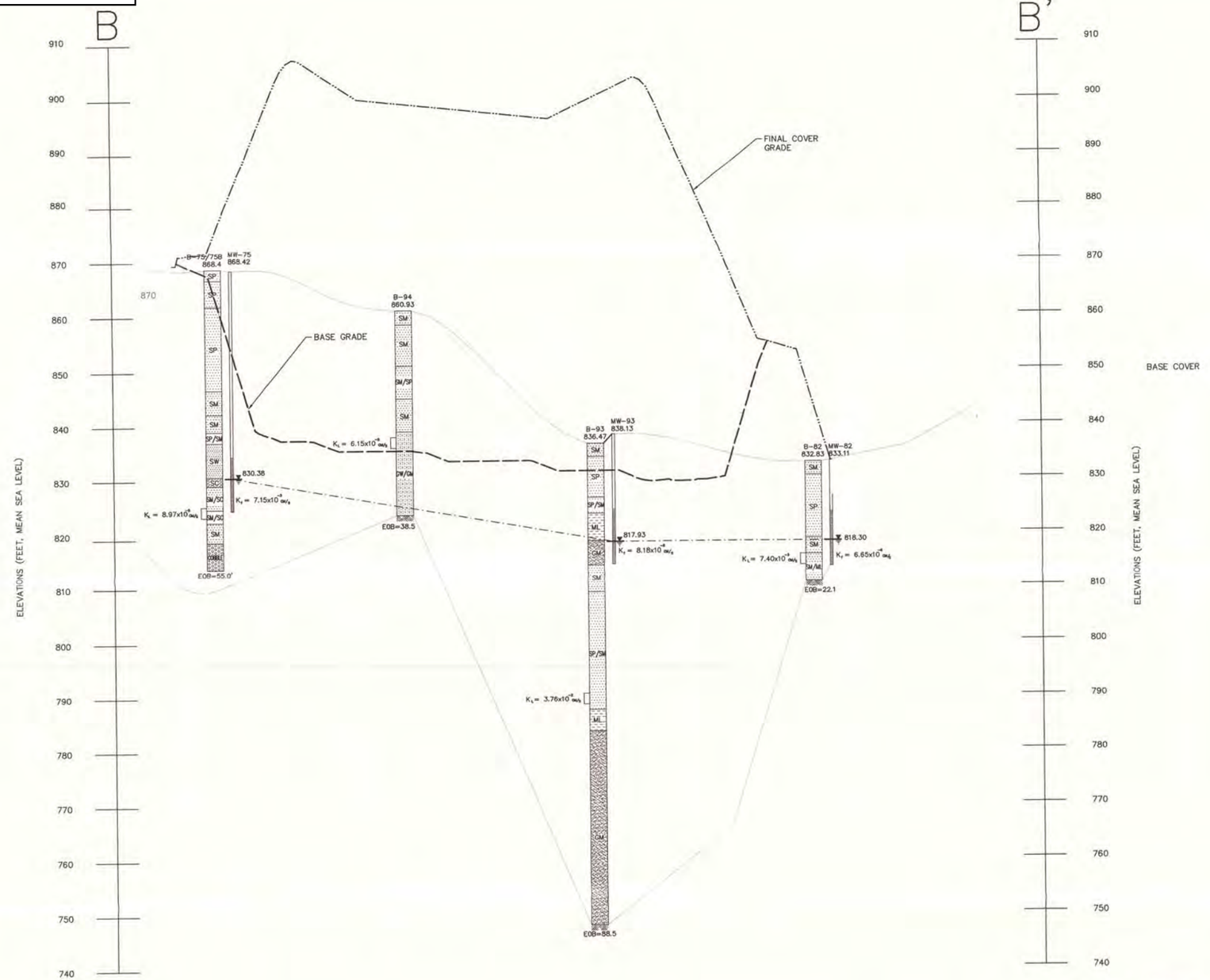
CROSS SECTION A–A'
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NUMBER: 84955LC
STS PROJECT FILE: G5955LC02
SCALE: 1"=100'
SHEET NUMBER: 8

W:\84955\cadwg\G5955LC02.dwg, 1 layout, 08/17/2000 03:32:52 PM, CTERP, STS Consultants, Ltd. Milwaukee, WI 53214

Figure A5



LEGEND

- GROUNDWATER TABLE SURFACE
- TOPOGRAPHIC SURFACE
- INTERPOLATED BEDROCK SURFACE
- INFERRED BEDROCK SURFACE
- FINAL COVER GRADE
- BASE GRADE

B/9 CROSS SECTION B-B'
HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1"= 10'

HORIZONTAL SCALE IN FEET
100' 0 100'

VERTICAL SCALE IN FEET
10' 0 10'

REVISION NO.	DESCRIPTION	DATE	
2	ADD BASE AND FINAL COVER GRADES	2/15/01	LJA
1	UPDATE GROUNDWATER ELEVATIONS	1/15/01	LJA

DRAWN BY POS/SNL DATE 12-2-99
CHECKED BY COB/LKJ DATE 12-2-99
APPROVED BY JMT DATE 12-2-99
CADFILE ...\PROJECTS\PPP\84955\LC\G5955LC03.dwg

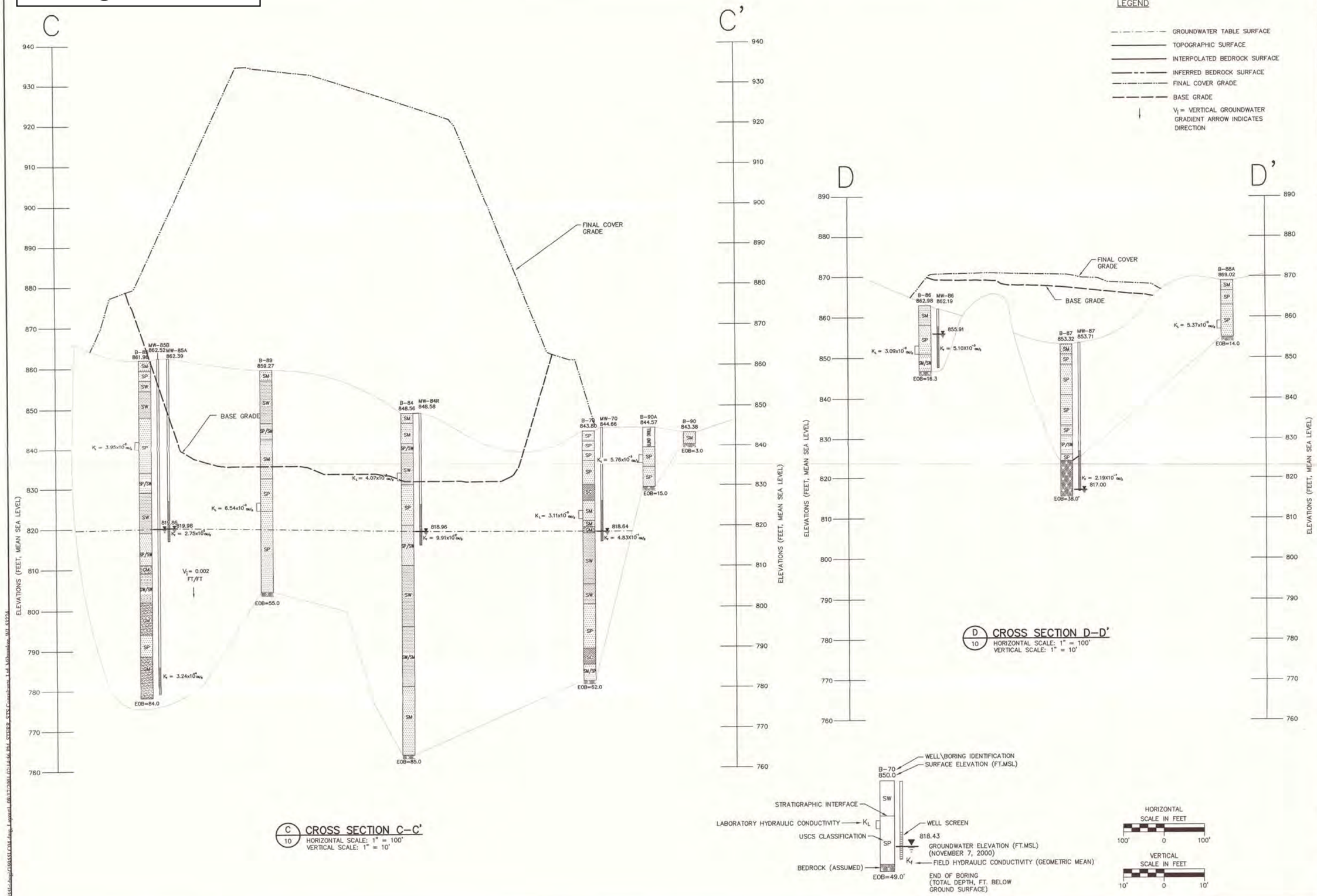
CROSS SECTION B-B'
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NUMBER 84955LC
STS PROJECT FILE G5955LC03
SCALE 1"=100'
SHEET NUMBER 9

W:\84955lc\dwg\G5955LC03.dwg, Layout1, 08/17/2001 02:12:43 PM, STERR, STS Consultants, Ltd Milwaukee, WI 53224

Figure A6



C 10 CROSS SECTION C–C'
HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

D 10 CROSS SECTION D–D'
HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

NO.	DESCRIPTION	DATE	BY
1	UPDATE GROUNDWATER ELEVATIONS	1/15/01	LA
2	ADD BASE AND FINAL COVER GRADES	2/15/01	LA

DRAWN BY PDS/SNL DATE 12-2-99
CHECKED BY COB/LKJ DATE 12-2-99
APPROVED BY JMT DATE 12-2-99
CADFILE \PROJECTS\PRPI\84955\LC\G5955LC04.dwg
DATE

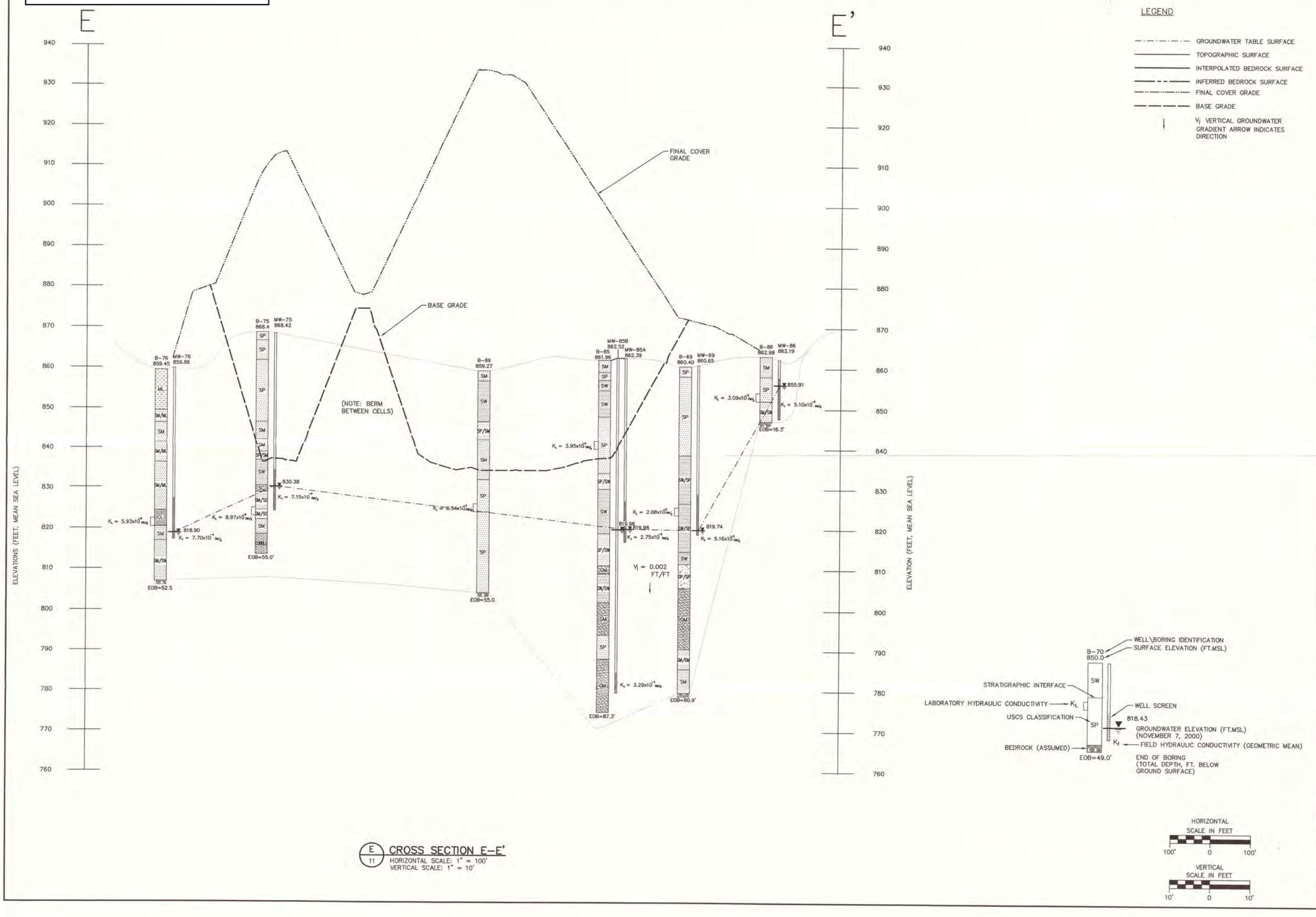
CROSS SECTION C–C' & D–D'
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NUMBER 84955LC
STS PROJECT FILE G5955LC04
SCALE 1"=100'
SHEET NUMBER 10

W:\84955\dwg\G5955LC04.dwg, Layout1, 08/17/2001 07:14:56 PM, STEVEP, STS Consultants Ltd Milwaukee, WI 53224

Figure A7



E 11 CROSS SECTION E-E'
HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

CROSS SECTION E-E'
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

REVISION NO.	DESCRIPTION	DATE	BY
2	ADD BASE AND FINAL COVER GRADES	2/15/01	LLA
1	UPDATE GROUNDWATER ELEVATIONS	1/15/01	LLA

DRAWN BY: SNL/PDS DATE: 12-2-99
CHECKED BY: COB/LKJ DATE: 12-2-99
APPROVED BY: JMT DATE: 12-2-99
CADFILE: \PROJECTS\84955\LC\G5955LC05.DWG
XREF

STS Consultants Ltd.
Consulting Engineers
11425 W. Lake Park Dr.
Milwaukee, WI 53224
414.359.3030

STS PROJECT NUMBER: 84955LC
STS PROJECT FILE: G5955LC05
SCALE: AS SHOWN
SHEET NUMBER: 11

W:\84955lc\dwg\G5955LC05.dwg, Layout1, 08/17/2001 02:16:57 PM, STERR, STS Consultants, Ltd Milwaukee, WI 53224

Figure A8

F

F'

ELEVATIONS (FEET, MEAN SEA LEVEL)

930 920 910 900 890 880 870 860 850 840 830 820 810 800 790 780 770 760

FINAL COVER GRADE

BASE GRADE

B-77 855.55 MW-77 855.76
$K_s = 1.37 \times 10^{-4}$ cm/s
$K_f = 1.56 \times 10^{-4}$ cm/s
818.25
EOB=57.0'

B-94 860.93
$K_s = 6.15 \times 10^{-4}$ cm/s
EOB=38.5'

B-83 852.79
$K_s = 7.79 \times 10^{-4}$ cm/s
EOB=49.0'

B-84 848.56 MW-84R 848.58
$K_s = 4.07 \times 10^{-3}$ cm/s
818.96
$K_f = 9.91 \times 10^{-4}$ cm/s
EOB=85.0'

B-88B 868.58
EOB=14.0'

B-88A 869.02
EOB=14.0'
$K_s = 5.37 \times 10^{-4}$ cm/s

B-88 865.11
EOB=4.7'

LEGEND

- GROUNDWATER TABLE SURFACE
- TOPOGRAPHIC SURFACE
- INTERPOLATED BEDROCK SURFACE
- INFERRED BEDROCK SURFACE
- FINAL COVER GRADE
- BASE GRADE

F / 12 CROSS SECTION F-F'
HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

B-70 850.0 — WELL\BORING IDENTIFICATION; SURFACE ELEVATION (FT.MSL)
STRATIGRAPHIC INTERFACE
LABORATORY HYDRAULIC CONDUCTIVITY — K_L
USCS CLASSIFICATION
WELL SCREEN
818.43 — GROUNDWATER ELEVATION (FT.MSL) (NOVEMBER 7, 2000)
K_f — FIELD HYDRAULIC CONDUCTIVITY (GEOMETRIC MEAN)
BEDROCK (ASSUMED)
EOB=49.0' — END OF BORING (TOTAL DEPTH, FT. BELOW GROUND SURFACE)

HORIZONTAL SCALE IN FEET
100' 0 100'

VERTICAL SCALE IN FEET
10' 0 10'

DRAWN BY	SNL/PDS	DATE 12-2-99
CHECKED BY	COB/LKJ	DATE 12-2-99
APPROVED BY	JMT	DATE 12-2-99
CADFILE	\PROJECTS\84955\LC\G5955LC06.DWG	
XREF		

REVISION NO.	DESCRIPTION	DATE	BY
1	UPDATE GROUNDWATER ELEVATIONS	1/29/01	LLA

CROSS SECTION F-F'
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

STS Consultants Ltd.
Consulting Engineers
11425 W. Lake Park Dr.
Milwaukee, WI 53224
414.359.3030

STS PROJECT NUMBER	84955LC
STS PROJECT FILE	G5955LC06
SCALE	AS SHOWN
SHEET NUMBER	12

W:\84955\dwg\G5955LC06.dwg, Layout1, 08/17/2001 02:33:51 PM, STERR, STS Consultants, Ltd Milwaukee, WI 53224

Figure A9

G

G'

LEGEND

- GROUNDWATER TABLE SURFACE
- TOPOGRAPHIC SURFACE
- INTERPOLATED BEDROCK SURFACE
- INFERRED BEDROCK SURFACE, BASED ON BEDROCK TOPOGRAPHIC MAP (SEE SHEET 4)
- FINAL COVER GRADE
- BASE GRADE
- V_I VERTICAL GROUNDWATER GRADIENT ARROW INDICATES DIRECTION

ELEVATIONS (FEET, MEAN SEA LEVEL)

930, 920, 910, 900, 890, 880, 870, 860, 850, 840, 830, 820, 810, 800, 790, 780, 770, 760, 750, 740

FINAL COVER GRADE

BASE GRADE

B-74 839.10 — EOB=58.0' — $K_s = 7.40x10^{-4}$ cm/s

B-78 838.68 — EOB=44.5'

W-78B 839.62 — 823.57 — 817.99 — $K_f = 1.23x10^{-4}$ cm/s — $K_s = 3.78x10^{-4}$ cm/s

W-78A 839.76 — $K_f = 2.13x10^{-5}$ cm/s

B-93 836.47 — $V_I = 0.176$ FT/FT

W-93 838.13 — 817.93 — $K_f = 8.18x10^{-4}$ cm/s — EOB=88.5'

B-92 837.69 — $K_s = 5.80x10^{-5}$ cm/s — EOB=80.5'

B-84 848.56 — $K_s = 4.07x10^{-4}$ cm/s

W-84R 848.58 — 818.96 — $K_f = 9.91x10^{-5}$ cm/s — EOB=85.0'

B-72 849.5 — EOB=54.1'

B-87 853.32 — $K_f = 2.19x10^{-5}$ cm/s — 817.00 — EOB=38.0'

W-87 853.71

B-71 856.0 — $K_s = 1.88x10^{-4}$ cm/s — EOB=67.0'

W-71 856.78 — 821.57 — $K_f = 6.08x10^{-4}$ cm/s

G / 13 CROSS SECTION G-G'
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1" = 10'

WELL\BORING IDENTIFICATION
SURFACE ELEVATION (FT.MSL)
STRATIGRAPHIC INTERFACE
LABORATORY HYDRAULIC CONDUCTIVITY — K_L
USCS CLASSIFICATION
BEDROCK (ASSUMED)
WELL SCREEN
818.43 GROUNDWATER ELEVATION (FT.MSL) (NOVEMBER 7, 2000)
K_f FIELD HYDRAULIC CONDUCTIVITY (GEOMETRIC MEAN)
END OF BORING (TOTAL DEPTH, FT. BELOW GROUND SURFACE)

HORIZONTAL SCALE IN FEET: 100' 0 100'
VERTICAL SCALE IN FEET: 10' 0 10'

REVISION NO.	DESCRIPTION	DATE	BY
1	UPDATE GROUNDWATER ELEVATIONS	1/15/01	LLA
2	ADD BASE AND FINAL COVER GRADES	2/15/01	LLA

DRAWN BY: SNL/PDS — DATE: 12-2-99
CHECKED BY: COR/LKJ — DATE: 12-2-99
APPROVED BY: JMT — DATE: 12-2-99
CADFILE: \PROJECTS\84955\LC\G5955LC07.DWG
XREF:

CROSS SECTION G-G'
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

STS Consultants Ltd.
Consulting Engineers
11425 W. Lake Park Dr.
Milwaukee, WI 53224
414.359.3030

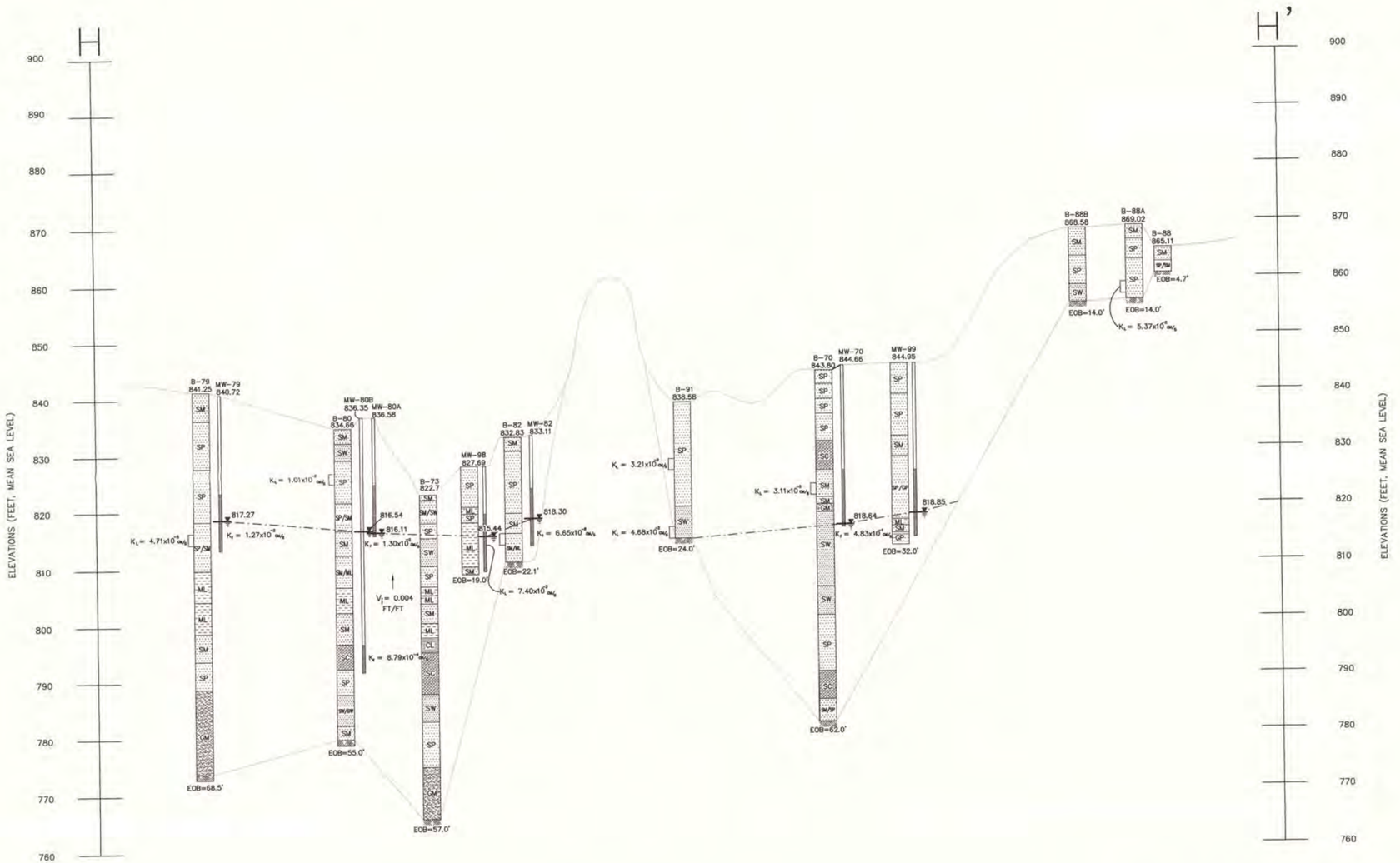
STS PROJECT NUMBER: 84955LC
STS PROJECT FILE: G5955LC07
SCALE: AS SHOWN
SHEET NUMBER: 13

Figure A10

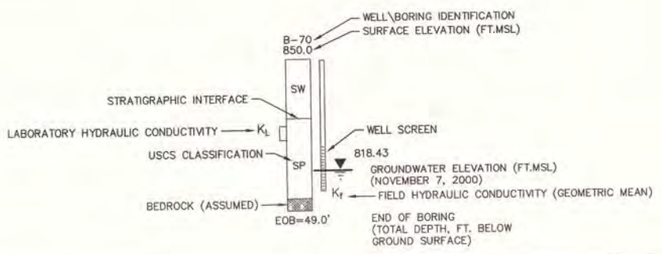
LEGEND

- GROUNDWATER TABLE SURFACE
- TOPOGRAPHIC SURFACE
- INTERPOLATED BEDROCK SURFACE
- INFERRED BEDROCK SURFACE
- V_J = VERTICAL GROUNDWATER GRADIENT ARROW INDICATE DIRECTION

NOTE: CROSS SECTION H–H" ONLY INTERSECTS THE BERM OF THE FAR SOUTHEAST CORNER (B–88A & B–88B) OF THE PROPOSED LANDFILL, SO DEPICTION OF SITE GRADES ON THIS DRAWING WAS NOT INCLUDED.



H/14 CROSS SECTION H–H'
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1" = 10'



HORIZONTAL SCALE IN FEET
100' 0 100'

VERTICAL SCALE IN FEET
10' 0 10'

REVISION NO.	DESCRIPTION	DATE	BY
1	ADD NEW WELLS AND UPGRADE GROUNDWATER ELEVATIONS	1/15/01	LLA
2	ADD BASE AND FINAL COVER GRADES GROUNDWATER ELEVATIONS	1/15/01	LLA

DRAWN BY SNL/PDS DATE 12-2-99
CHECKED BY COB/LKJ DATE 12-2-99
APPROVED BY JMT DATE 12-2-99
CADFILE \PROJECTS\84955\LC\G5955LC08.DWG
XREF

CROSS SECTION H–H'
HYDROGEOLOGIC INVESTIGATION
PROPOSED LANDFILL NO. 3
WISCONSIN ELECTRIC PRESQUE ISLE POWER PLANT
MARQUETTE, MICHIGAN

STS Consultants Ltd.
Consulting Engineers
11425 W. Lake Park Dr.
Milwaukee, WI 53224
414.359.3030

STS PROJECT NUMBER 84955LC
STS PROJECT FILE G5955LC08
SCALE AS SHOWN
SHEET NUMBER 14

OBG

THERE'S A WAY

Appendix A2

December 4, 2018

December 4, 2018

Mr. Tim Muehlfeld, PE
WEC Business Services, LLC
333 W. Everett Street – A231
Milwaukee, WI 53226

RE: 40 CFR Section 257.94(e)(2) Alternate Source Demonstration (ASD)
Detection Monitoring Round 2, We Energies Presque Isle Power Plant Ash Landfill No. 3

Dear **Mr. Muehlfeld:**

This letter has been prepared by O'Brien & Gere Engineers, Inc. (OBG) to provide pertinent information for an alternate source demonstration (ASD) as allowed by Title 40 Code of Federal Regulations (40 CFR) Part 257, Subpart D, Section 257.94(e)(2) for the Presque Isle Power Plant (PIPP) Ash Landfill No. 3 located in Marquette, Michigan.

The second semi-annual detection monitoring samples (Detection Monitoring Round 2) were collected on May 22 and 23, 2018 for which analytical data was received on June 7, 2018. Analytical data is presented in the attached Table 1. In accordance with 40 CFR Section 257.93(h)(2), statistical analysis of the data from Detection Monitoring Round 2 to identify statistically significant increases (SSIs) of 40 CFR Part 257 Subpart D Appendix III parameters over background concentrations was completed within 90 days of receipt of the analytical data (September 5, 2018). The statistical determination identified the following SSIs at downgradient monitoring wells:

- Calcium above the background prediction limit at wells MW70, MW79, MW80PR, and MW95
- Sulfate above the background prediction limit at well MW79
- Total dissolved solids (TDS) above the background prediction limit at wells MW70 and MW80PR
- pH above (or below) the background prediction limit at wells MW79 and MW80PR

The SSIs above background identified during Detection Monitoring Round 2 are consistent with Detection Monitoring Round 1, except for the calcium concentration and pH reported at MW79, and TDS concentration at MW70. These parameters were not detected at a concentrations indicative of a SSI above background at these locations during Detection Monitoring Round 1.

For the wells and parameters listed above that were detected in both Detection Monitoring Round 1 and Round 2, an Alternate Source Demonstration (ASD), *Alternate Source Demonstration, Presque Isle Power Plant Ash Landfill No. 3, Marquette, Michigan*; dated April 15, 2018 (OBG, 2018), prepared in accordance with 40 CFR Section 257.94(e)(2) provides a description, data, and pertinent information supporting an alternate source which applies to the wells and parameters with SSIs in Detection Monitoring Round 2 (and 1). The ASD supports the position that the SSIs observed during the Detection Monitoring Rounds 1 and 2, except for calcium and pH at MW79 and TDS at MW70, were not due to a release from the CCR unit but were from naturally occurring conditions in the uppermost aquifer and potentially unrelated anthropogenic effects in the area of the PIPP Ash Landfill No. 3.

40 CFR Section 257.94(e)(2) allows 90 days to demonstrate that an SSI was caused by a source other than the CCR unit or resulted from an error in sampling, analysis, statistical evaluation, or natural variation in

groundwater quality. Accordingly, an alternate source demonstration for calcium and pH at MW79 and TDS at MW70 was evaluated and completed within 90 days of the SSI determination, by December 4, 2018.

RESAMPLING OF WELLS WITH SSIs

To verify the SSIs, wells MW79 and MW70 were resampled on August 28, 2018 and analyzed for only the SSI parameters, in accordance the Statistical Analysis Plan[1]. Analytical results were received on September 21, 2018 and are included in Table 1. Statistical analysis of the resample data for those parameters with SSIs over background concentrations was completed on October 12, 2018. The statistical analysis determined that the resample concentration of TDS at MW70 and pH at MW79 did not exceed background; and the SSIs detected for these two parameters during the May 22 and 23, 2018 sampling event were not confirmed.

EVALUATION OF CALCIUM AT MW79

Based on the October 12, 2018 statistical analysis, the concentration of calcium from the resample event at MW79 exceeded background. The *Alternate Source Demonstration, Presque Isle Power Plant Ash Landfill No. 3, Marquette, Michigan*; dated April 15, 2018 (OBG, 2018), prepared in accordance with 40 CFR Section 257.94(e)(2) provides a description, data, and pertinent information supporting an alternate source of calcium at wells MW70, MW80PR, and MW95. The primary lines of evidence that support the ASD included the following:

- Landfill Construction
- Lack of CCR Indicators
- Aquifer Composition, Recharge, and Geochemistry

Data and information, including reference to the April 2018 document, supporting these ASD lines of evidence for calcium and MW79 are discussed in more detail below.

Landfill Construction

PIPP Ash Landfill No. 3 is constructed with a double liner system with a leak detection system and leachate collection. The bottom liner consists of a composite 60-mil high density polyethylene (HDPE) geomembrane and geosynthetic clay liner (GCL), the leak detection layer consists of geocomposite, and top liner consists of 60-mil HDPE. Leachate levels are monitored in the landfill and with 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. Landfill monitoring and reporting indicate that the leachate collection system is functioning as designed, and indicated there is not significant leachate migration into underlying materials.

Lack of CCR Indicator Parameters

Boron is a conservative and non-reactive tracer of CCR impacts, but has not been detected above background in downgradient wells with reported SSIs, including MW79. Boron is present in the PIPP Ash Landfill No.3 leachate at elevated concentrations (10 - 15 mg/L); however, in MW79 concentrations are less than 0.051 mg/L, as shown on Figure 1.

[1] Natural Resource Technology, an OBG Company, 2017, Statistical Analysis Plan, Presque Isle Power Plant Ash Landfill No. 3, Marquette, Michigan, October 17, 2017.

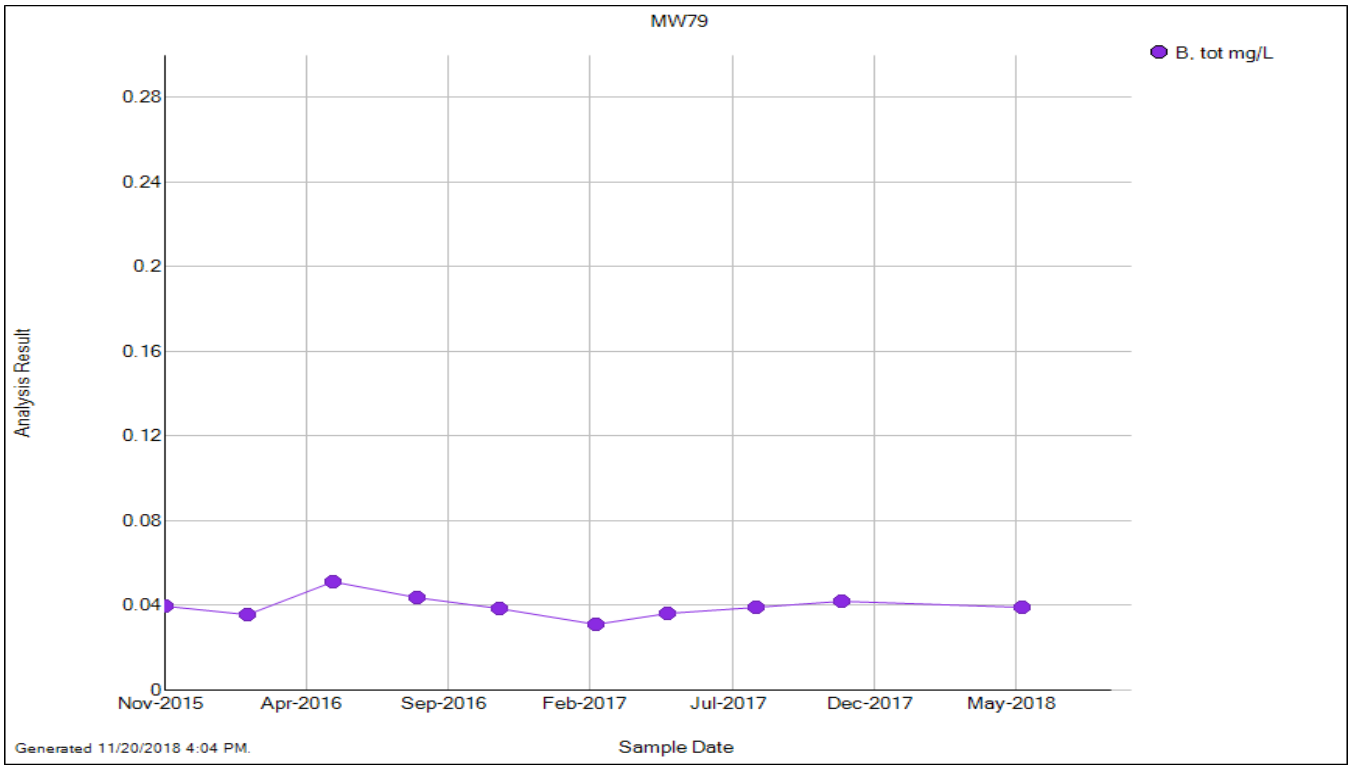


Figure 1. Time Series Plot of Boron Concentrations at MW79

Sulfate concentrations in MW79 are also above the background prediction interval, similar to calcium those concentrations do not correlate with boron. The calcium detected in MW79 is strongly correlated with sulfate (Figure 2-3). If groundwater at MW79 has been impacted by PIPP Ash Landfill No. 3, boron should be present at elevated concentrations in downgradient well MW79.

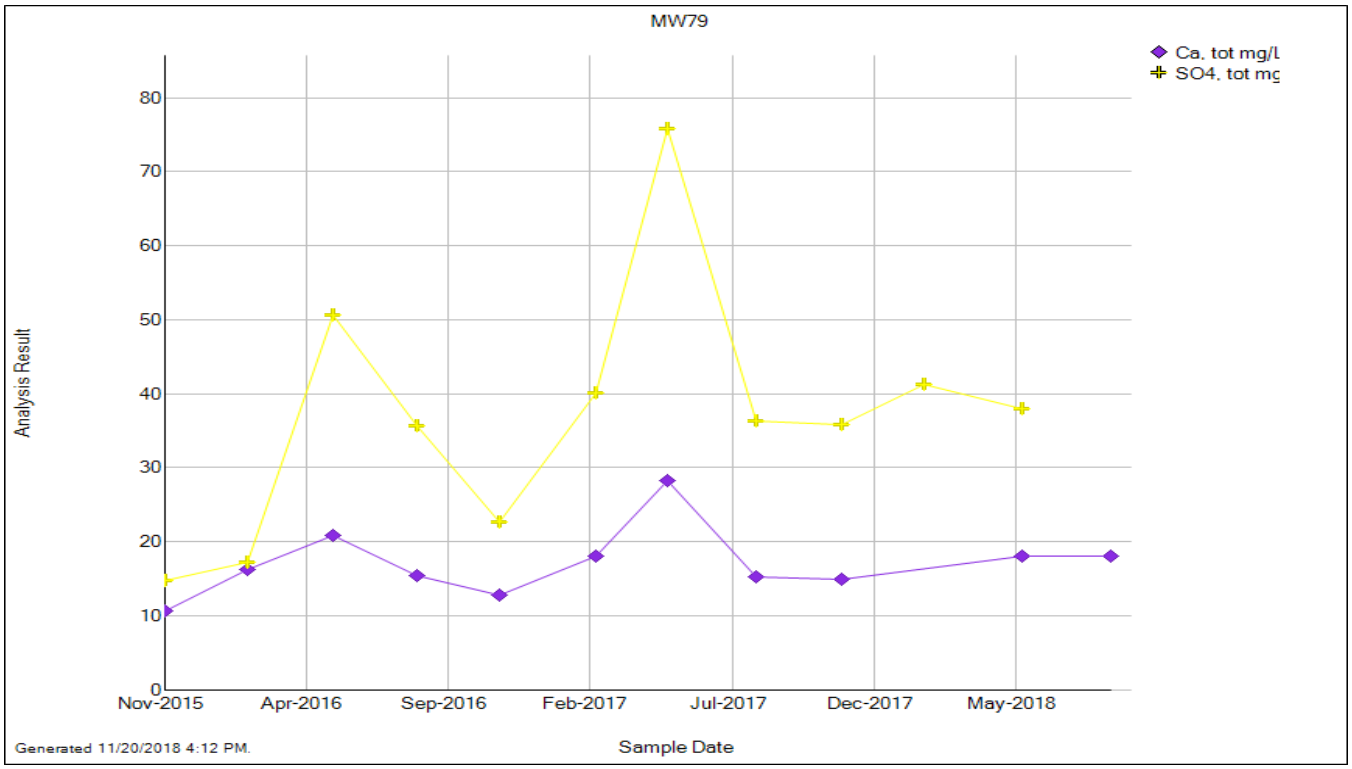


Figure 2. Time Series Plot of Calcium and Sulfate at MW79

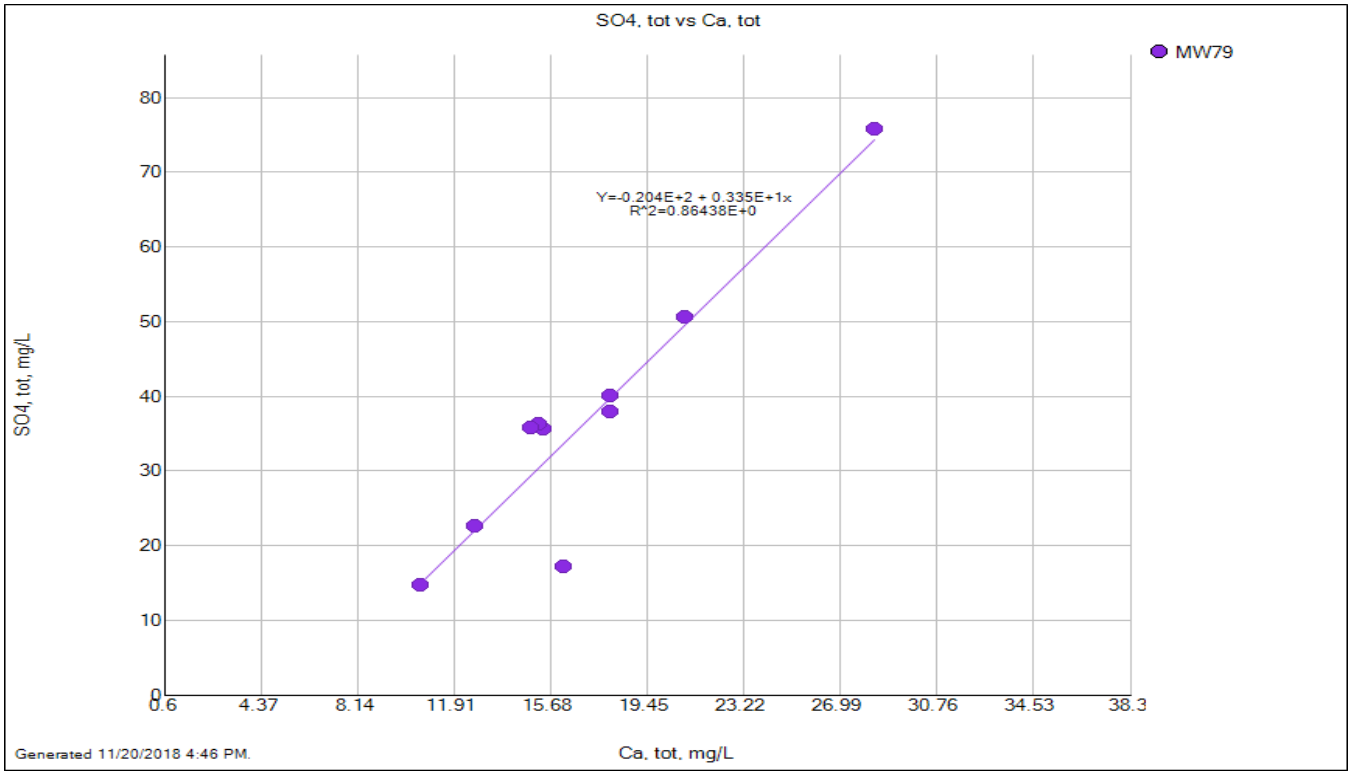


Figure 3. Scatter Plot of Sulfate vs. Calcium in MW79

Leachate from PIPP Ash Landfill No. 3 is alkaline as demonstrated by the measured pH since 2005, shown in Figure 4. The leachate pH generally ranges from 9-12. Measured pH at MW79 is presented on Figure 5, pH measurements during CCR Rule sample have ranged from 5-6. If groundwater at MW79 has been impacted by PIPP Ash Landfill No. 3 leachate, elevated or rising pH measurements would be expected in downgradient well MW79. Additionally, low pH can increase the solubility of minerals including limestone and dolomite which may be present at the surface or in the aquifer materials. These minerals, if present, may dissolve resulting in an increase in calcium concentrations and providing an additional alternate source for calcium in the groundwater at this well.

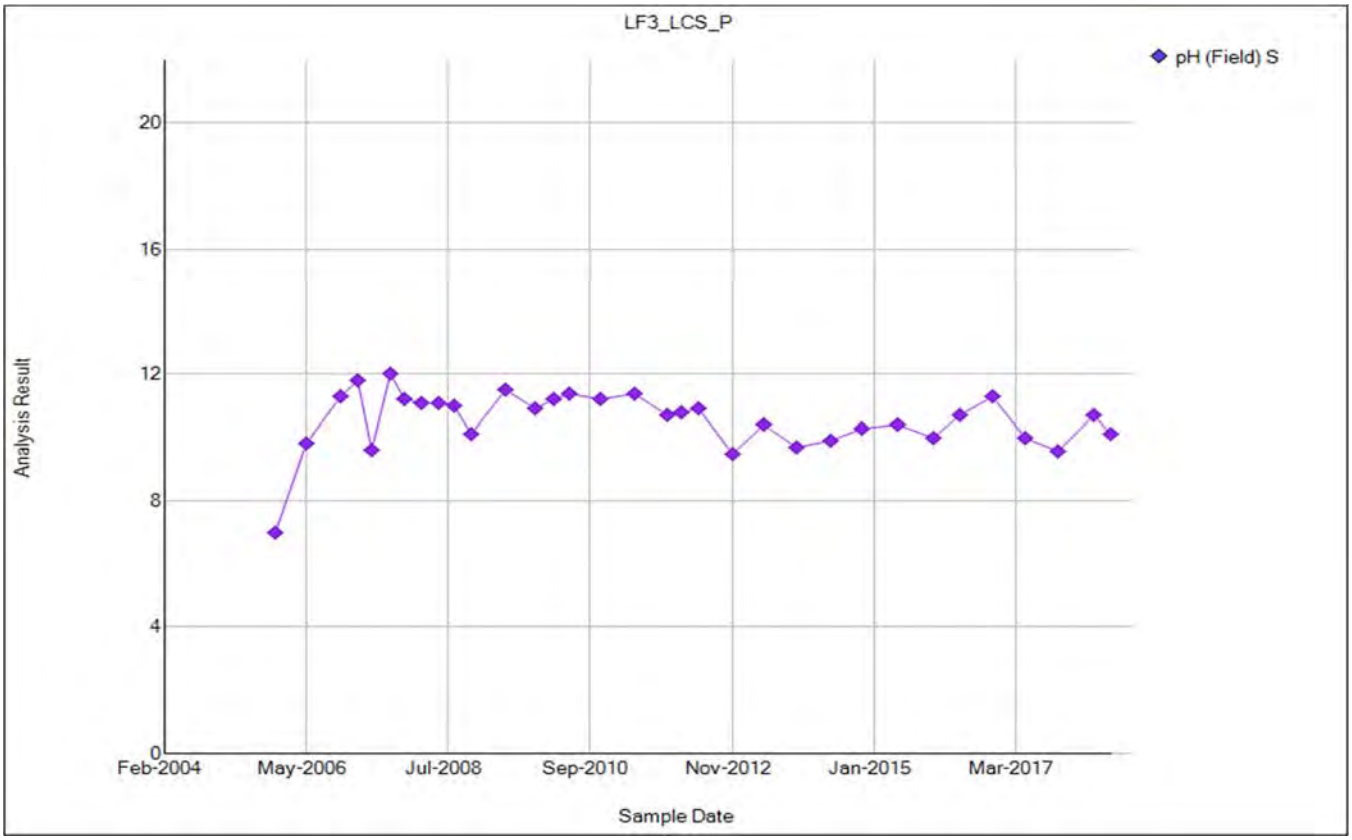


Figure 4. Time Series Plot of PIPP Ash Landfill No. 3 Leachate pH

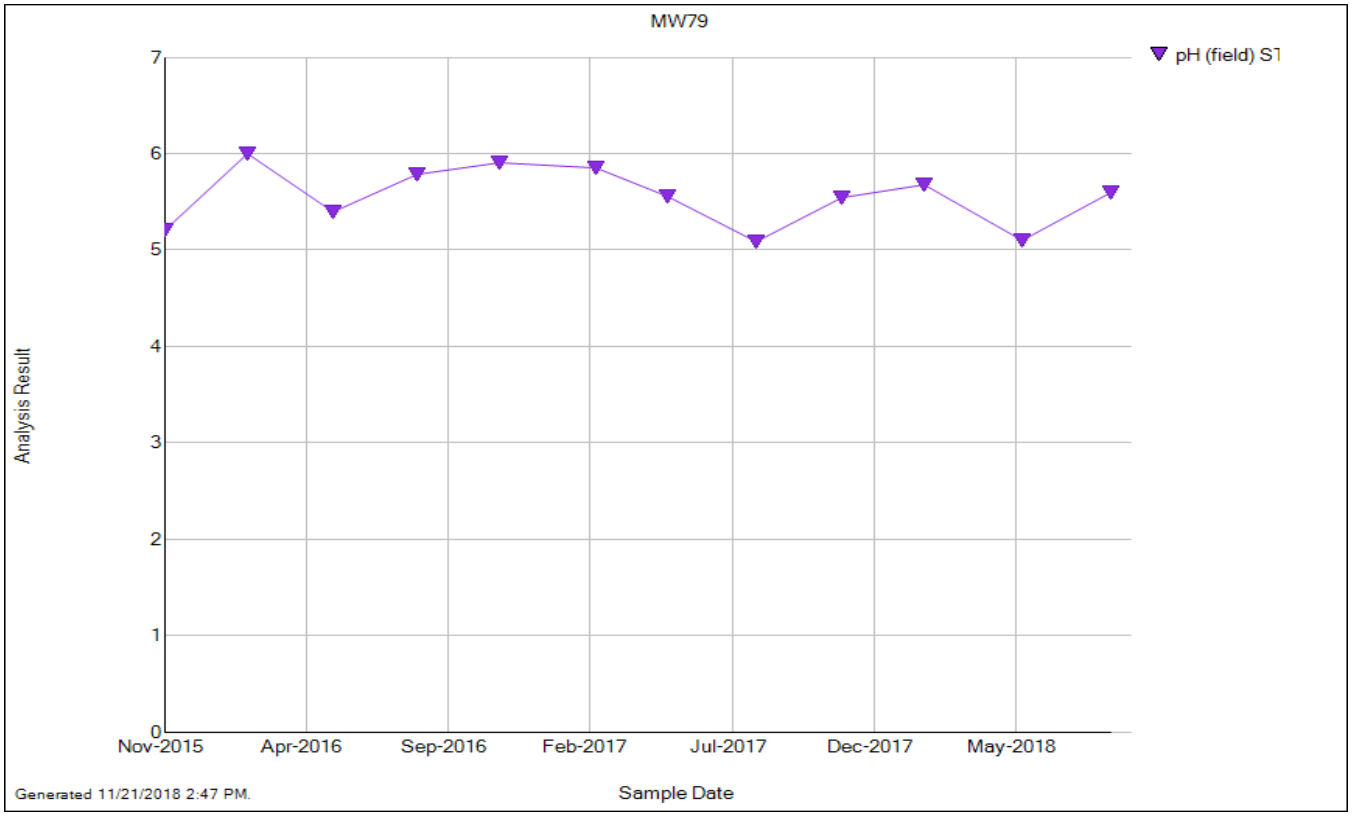


Figure 5. Time Series Plot of pH at MW79

Aquifer Composition, Recharge, and Geochemistry

The uppermost aquifer consists predominantly of unlithified sands and gravels with intermittent and discontinuous lenses of silt and clay, specifically located in the northern portion of PIPP Ash Landfill No. 3. Monitoring wells screened within or below these lower conductivity units (silts and clays) may have different geochemical conditions than wells screened in sands and gravels.

The groundwater flow directions and flow paths in the uppermost aquifer vary seasonally. In addition, following landfill construction there is lower recharge to the aquifer as the landfill liner inhibits infiltration below the footprint of the landfill. Without local recharge near the downgradient wells, groundwater from recharge zones located further away migrates to downgradient wells, which increases residence time and interaction with aquifer minerals. The distribution of naturally occurring inorganic constituents and geochemical conditions in the uppermost aquifer are variable, resulting in concentrations which may be elevated with respect to background but unrelated to PIPP Ash Landfill No. 3.

The general water chemistry at PIPP Ash Landfill No. 3 is displayed in the Piper diagram below (Figure 6), originally presented in the April 2018 ASD. Background and downgradient groundwater samples, except for MW79, plot within the same region of calcium/ magnesium dominated cations, and carbonate/bicarbonate anions. MW79 plots within the calcium/magnesium portion, but the dominant anion is sulfate. Leachate samples collected from the unit indicate sodium/potassium dominated cations and sulfate dominated anions. The background wells plot between the downgradient wells and leachate, indicating that the downgradient groundwater is not being influenced by the leachate.

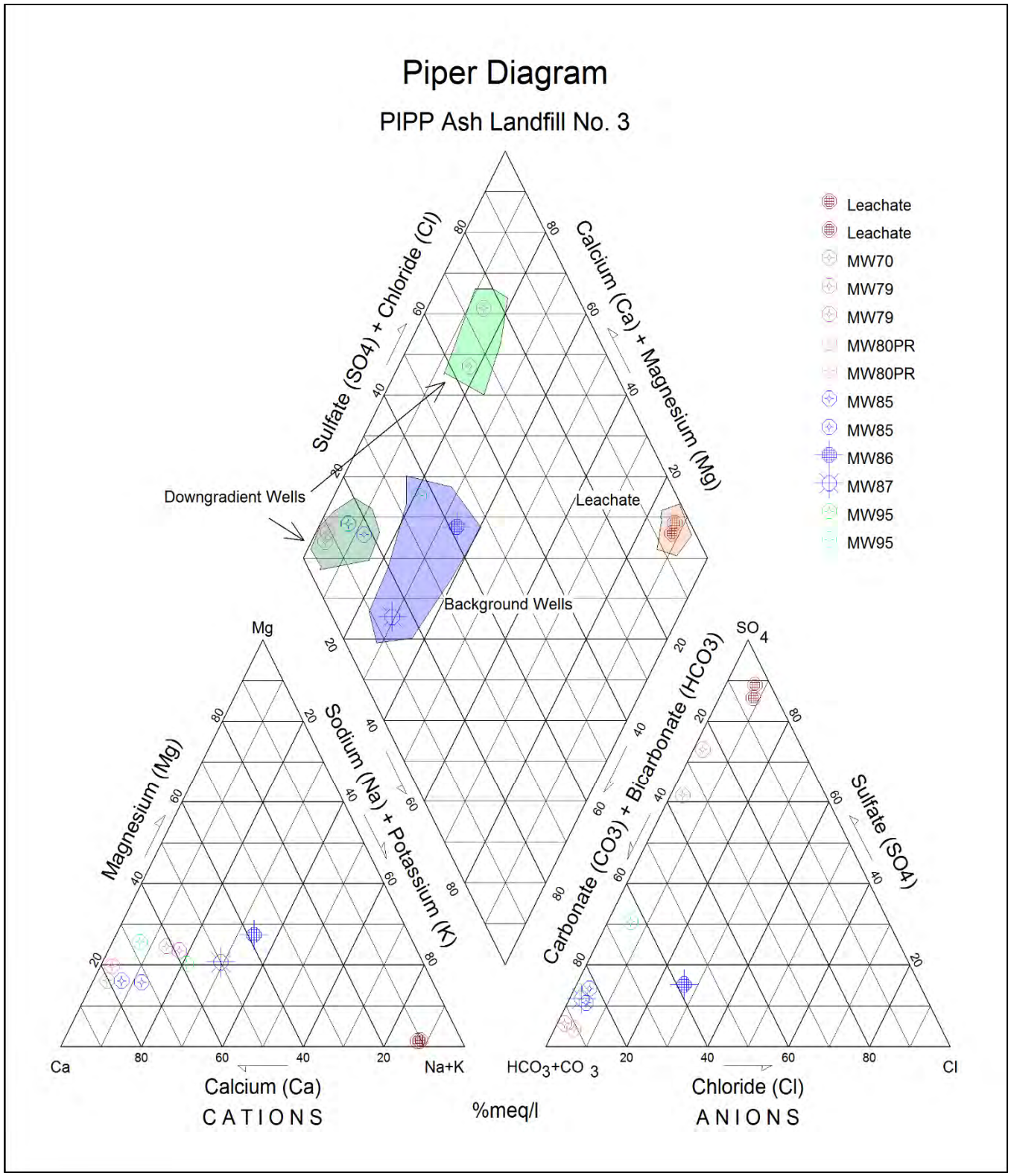


Figure 7. Piper Diagram of Groundwater Concentrations from May and August 2017

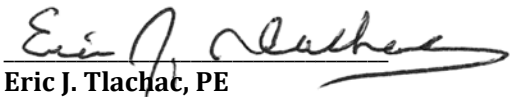
CONCLUSIONS AND CERTIFICATION

Each of the presented lines of evidence are applicable as a potential source of calcium concentrations detected at MW79 and provide an ASD for calcium in MW79.

The preceding information serves as the ASD prepared in accordance with 40 CFR Section 257.94(e)(2) and supports the position that the SSI reported during Detection Monitoring Round 2 was not due to a release from the CCR unit but was from either an error in sampling or analysis or naturally occurring conditions (e.g. natural variation in groundwater quality). Therefore, no further action (i.e. assessment monitoring) is warranted and the PIPP Landfill No. 3 will remain in detection monitoring.

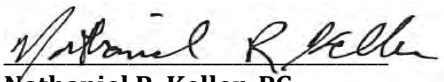
If you have any questions regarding this document, please do not hesitate to contact us.

Sincerely,
O'BRIEN & GERE ENGINEERS, INC.



Eric J. Tlachac, PE
Professional Engineer No. 6201053683
State of Michigan
O'Brien & Gere Engineers, Inc.
Date: December 4, 2018

I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Michigan, 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.



Nathaniel R. Keller, PG
Qualified Professional Geologist
O'Brien & Gere Engineers, Inc.
Date: December 4, 2018

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.

Attachments: Table 1. PIPP Ash Landfill No. 3: Appendix III Analytical Results

Presque Isle
Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 08/28/2018

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
MW70	11/04/2015	40124163003	0.0183	33.7000	2.40	<0.20	7.60	6.2
	02/02/2016	40127847001	0.0137	24.7000	3.00	<0.20	7.90	7.2
	05/05/2016	40131961001	0.0273	49.2000	2.60	<0.20	7.20	5.8
	08/04/2016	40136329001	0.0151	38.4000	<2.00	<0.20	7.19	5.5
	11/02/2016	40141308001	0.0116	43.6000	0.97	<0.10	7.90	5.7
	02/14/2017	40145701001	0.0130	30.9000	1.50	<0.10	7.10	7.0
	05/04/2017	40149461001	0.0160	45.2000	0.86	<0.10	6.70	4.7
	08/08/2017	40154700001	0.0130	37.4000	1.20	<0.10	6.78	5.5
	11/08/2017	40160512001	0.0166	21.7000	0.93	<0.10	6.41	6.6
	02/07/2018	40164451008		40.4000			7.30	
	05/23/2018	AE27756	0.0180	45.0000	0.55	<0.05	7.50	4.8
	08/28/2018	AE30009					7.40	
MW79	11/04/2015	40124163008	0.0394	10.6000	2.50	<0.20	5.20	14.7
	02/02/2016	40127847007	0.0355	16.2000	3.50	<0.20	6.00	17.2
	05/05/2016	40131961002	0.0511	20.9000	3.00	<0.20	5.40	50.6
	08/04/2016	40136329007	0.0435	15.4000	2.40	<0.20	5.78	35.7
	11/02/2016	40141308007	0.0384	12.7000	1.10	<0.10	5.90	22.7
	02/14/2017	40145703001	0.0310	18.0000	2.20	<0.10	5.85	40.1
	05/04/2017	40149461002	0.0360	28.3000	1.70	<0.10	5.55	75.8
	08/08/2017	40154700008	0.0390	15.2000	1.30	<0.10	5.09	36.3
	11/08/2017	40160512007	0.0420	14.9000	0.85	<0.10	5.54	35.9
	02/06/2018	40164451003					5.68	41.2
	05/23/2018	AE27757	0.0390	18.0000	0.64	<0.05	5.10	38.0
	08/28/2018	AE30008		18.0000			5.60	
MW80PR	11/04/2015	40124163001	0.0206	48.7000	4.80	<0.20	7.90	5.9
	02/02/2016	40127847003	0.0125	50.2000	5.80	<0.20	8.10	6.3
	05/05/2016	40131961003	0.0193	52.1000	4.80	<0.20	7.80	6.3
	08/04/2016	40136329006	0.0134	49.6000	4.20	<0.20	8.03	5.8
	11/02/2016	40141308006	0.0106	50.0000	3.80	<0.10	8.30	5.6
	02/14/2017	40145701005	0.0099	48.4000	4.40	<0.10	8.07	6.1
	05/04/2017	40149461003	0.0120	51.9000	4.60	<0.10	7.37	6.0
	08/08/2017	40154700009	0.0120	50.1000	4.60	<0.10	7.58	5.7
	11/08/2017	40160512008	0.0140	49.9000	4.80	<0.10	7.87	5.5
	02/06/2018	40164451001		52.0000			7.89	
	05/22/2018	AE27751	0.0190	53.0000	6.00	<0.10	7.90	5.5
MW85	11/04/2015	40124163007	0.0216	7.0800	2.30	<0.20	6.20	4.7

Presque Isle
Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 08/28/2018

			B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
MW85	02/02/2016	40127847006	0.0205	5.5500	2.90	<0.20	6.70	5.0
	05/05/2016	40131961004	0.0293	9.3800	2.50	<0.20	6.40	4.6
	08/04/2016	40136329005	0.0208	13.2000	<2.00	<0.20	6.86	4.7
	11/02/2016	40141308005	0.0196	6.9500	0.77	<0.10	6.90	4.1
	02/14/2017	40145701004	0.0220	5.0000	1.20	<0.10	6.70	4.2
	05/04/2017	40149461004	0.0220	9.0000	0.80	<0.10	6.55	4.3
	08/08/2017	40154700005	0.0190	12.5000	1.30	<0.10	6.33	4.2
	11/08/2017	40160512004	0.0249	6.5200	0.55	<0.10	6.41	3.9
	02/07/2018	40164451004		6.4800			6.14	3.7
	05/23/2018	AE27753	0.0240	6.4000	0.38	<0.10	6.00	3.8
MW86	11/04/2015	40124163006	0.0178	7.1900	11.40	<1.00	5.50	<10.0
	02/02/2016	40127847005	0.0152	4.6700	3.40	<0.20	5.90	6.3
	05/05/2016	40131961006	0.0186	1.2800	3.20	<0.20	5.10	3.9
	08/04/2016	40136329003	0.0201	4.0000	<10.00	<1.00	5.87	<10.0
	11/02/2016	40141308003	0.0181	4.4500	3.30	<0.50	5.90	<5.0
	02/14/2017	40145701002	0.0130	5.0000	5.70	<0.50	6.45	5.4
	05/04/2017	40149461007	0.0120	2.1000	3.20	<0.50	5.65	<5.0
	08/08/2017	40154700003	0.0170	3.6000	4.70	<0.50	5.83	<5.0
	11/08/2017	40160512003	0.0147	4.1600	2.50	<0.50	5.84	<5.0
	02/07/2018	40164451006		3.3400			6.04	<1.0
	05/23/2018	AE27754	0.0210	2.4000	1.30	<0.05	5.60	0.7
MW87	11/04/2015	40124163004	0.1070	12.4000	2.50	<0.20	7.20	6.8
	02/02/2016	40127847004	0.1910	15.4000	3.10	<0.20	7.30	9.6
	05/05/2016	40131961007	0.0252	4.0800	2.80	<0.20	7.00	10.5
	08/04/2016	40136329002	0.1040	11.8000	2.10	<0.20	6.82	9.6
	11/02/2016	40141308002	0.1030	12.9000			7.40	
	11/10/2016	40141831001			1.10	0.12		7.9
	02/14/2017	40145703003	0.2800	18.6000	5.60	<0.50	7.67	16.1
	05/04/2017	40149461008	0.0210	5.4000	1.50	<0.10	6.55	7.3
	08/08/2017	40154700002	0.0360	12.3000	1.20	<0.10	6.60	6.6
	11/08/2017	40160512002	0.0474	15.1000	0.96	<0.10	6.20	8.6
	02/07/2018	40164451007		17.6000			6.83	13.3
	05/23/2018	AE27755	0.0380	11.0000	0.78	<0.05	6.70	7.2
MW95	11/04/2015	40124163009	0.0272	27.4000	2.40	<0.20	6.90	6.6
	02/02/2016	40127847008	0.0272	32.4000	2.90	<0.20	7.60	7.0
	05/05/2016	40131961008	0.0357	8.5500	2.50	<0.20	5.70	8.0

Presque Isle
Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 08/28/2018

			B, tot, mg/L	Ca, tot, mg/L	Cl, tot, mg/L	F, tot, mg/L	pH (field), STD	SO4, tot, mg/L
MW95	08/04/2016	40136329008	0.0336	6.5600	<2.00	<0.20	5.87	7.2
	11/02/2016	40141308008	0.0268	17.7000	0.82	<0.10	7.10	7.7
	02/14/2017	40145703002	0.0270	30.4000	1.30	0.10	7.37	8.7
	05/04/2017	40149461009	0.0280	24.7000	0.89	<0.10	6.89	9.5
	08/08/2017	40154700006	0.0300	6.2000	1.10	<0.10	5.80	8.1
	11/08/2017	40160512006	0.0332	21.3000	0.66	<0.10	6.76	7.9
	02/06/2018	40164451002		23.0000			6.90	
	05/22/2018	AE27750	0.0330	29.0000	0.48	<0.10	6.80	8.7

Presque Isle
Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 08/28/2018

Well Id	Date Sampled	Lab Id	TDS, mg/L
MW70	11/04/2015	40124163003	120.0
	02/02/2016	40127847001	96.0
	05/05/2016	40131961001	144.0
	08/04/2016	40136329001	122.0
	11/02/2016	40141308001	152.0
	02/14/2017	40145701001	110.0
	05/04/2017	40149461001	134.0
	08/08/2017	40154700001	122.0
	11/08/2017	40160512001	108.0
	05/23/2018	AE27756	230.0
	08/28/2018	AE30009	140.0
MW79	11/04/2015	40124163008	74.0
	02/02/2016	40127847007	78.0
	05/05/2016	40131961002	122.0
	08/04/2016	40136329007	90.0
	11/02/2016	40141308007	90.0
	02/14/2017	40145703001	108.0
	05/04/2017	40149461002	156.0
	08/08/2017	40154700008	88.0
	11/08/2017	40160512007	74.0
	05/23/2018	AE27757	130.0
MW80PR	11/04/2015	40124163001	164.0
	02/02/2016	40127847003	156.0
	05/05/2016	40131961003	170.0
	08/04/2016	40136329006	166.0
	11/02/2016	40141308006	176.0
	02/14/2017	40145701005	164.0
	05/04/2017	40149461003	170.0
	08/08/2017	40154700009	166.0
	11/08/2017	40160512008	148.0
	02/06/2018	40164451001	178.0
	05/22/2018	AE27751	180.0
MW85	11/04/2015	40124163007	42.0
	02/02/2016	40127847006	38.0
	05/05/2016	40131961004	44.0
	08/04/2016	40136329005	50.0

Presque Isle
Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 08/28/2018

			TDS, mg/L
MW85	11/02/2016	40141308005	50.0
	02/14/2017	40145701004	20.0
	05/04/2017	40149461004	38.0
	08/08/2017	40154700005	50.0
	11/08/2017	40160512004	58.0
	02/07/2018	40164451004	44.0
	05/23/2018	AE27753	30.0
MW86	11/04/2015	40124163006	110.0
	02/02/2016	40127847005	52.0
	05/05/2016	40131961006	44.0
	08/04/2016	40136329003	114.0
	11/02/2016	40141308003	114.0
	02/14/2017	40145701002	94.0
	05/04/2017	40149461007	72.0
	08/08/2017	40154700003	148.0
	11/08/2017	40160512003	154.0
	02/07/2018	40164451006	148.0
	05/23/2018	AE27754	140.0
MW87	11/04/2015	40124163004	86.0
	02/02/2016	40127847004	112.0
	05/05/2016	40131961007	82.0
	08/04/2016	40136329002	82.0
	11/10/2016	40141831001	106.0
	02/14/2017	40145703003	156.0
	05/04/2017	40149461008	58.0
	08/08/2017	40154700002	82.0
	11/08/2017	40160512002	106.0
	02/07/2018	40164451007	126.0
	05/23/2018	AE27755	120.0
MW95	11/04/2015	40124163009	120.0
	02/02/2016	40127847008	124.0
	05/05/2016	40131961008	46.0
	08/04/2016	40136329008	38.0
	11/02/2016	40141308008	82.0
	02/14/2017	40145703002	110.0
	05/04/2017	40149461009	92.0

Presque Isle
Table 1. Presque Isle Power Plant Landfill No. 3: Appendix III Analytical Results

Date Range: 11/01/2015 to 08/28/2018

			TDS, mg/L
MW95	08/08/2017	40154700006	40.0
	11/08/2017	40160512006	122.0
	05/22/2018	AE27750	120.0

OBG
Part of Ramboll