2018 Annual Groundwater Monitoring and Corrective Action Report

SCL4A - Utility Waste Landfill Cell 4A, Sioux Energy Center St. Charles County, Missouri, USA

Submitted to:

Ameren Missouri
1901 Chouteau Avenue
St. Louis, Missouri 63103

Submitted by:

Golder Associates Inc.
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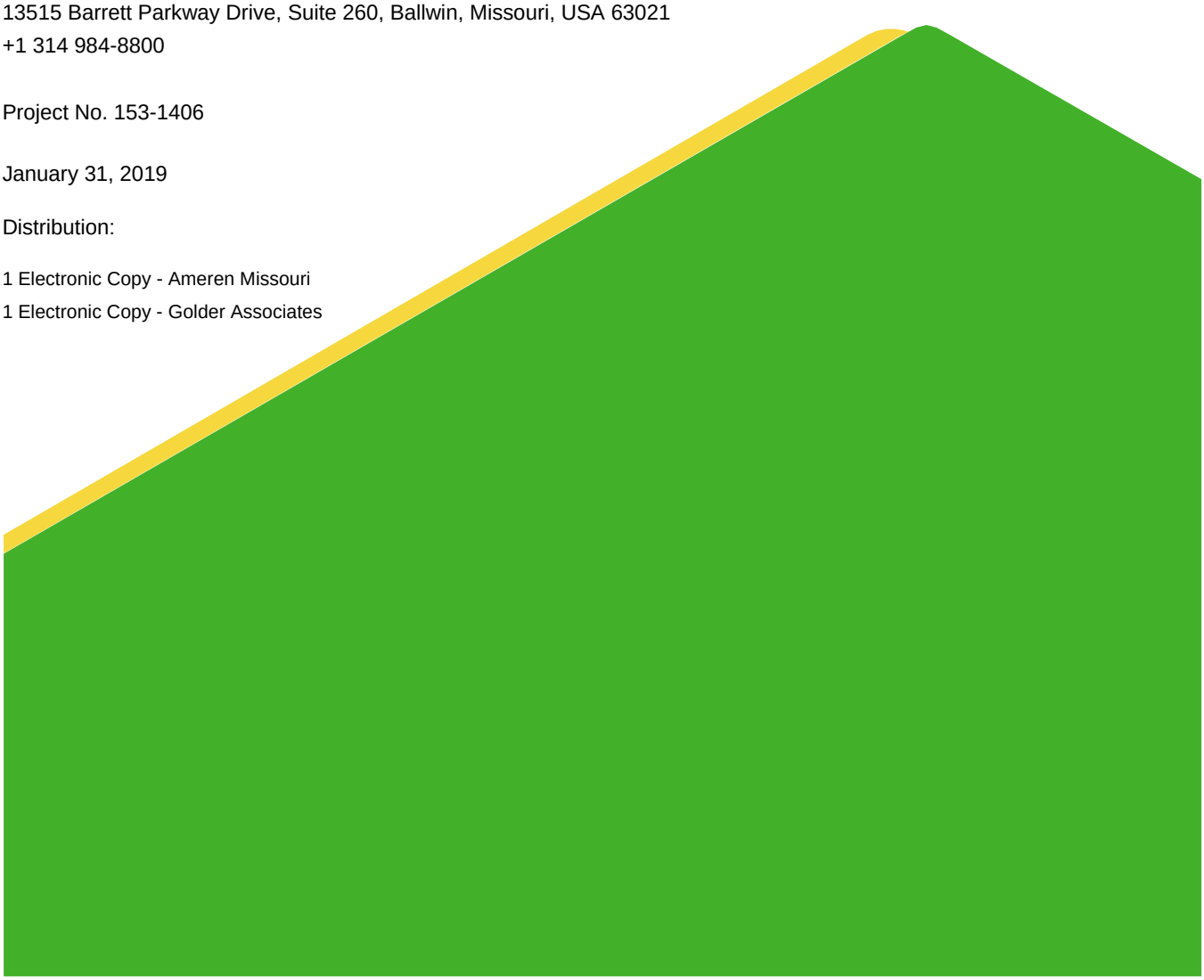
Project No. 153-1406

January 31, 2019

Distribution:

1 Electronic Copy - Ameren Missouri
1 Electronic Copy - Golder Associates



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1.0 INTRODUCTION

This annual report was developed to meet the requirements of United States Environmental Protection Agency (USEPA) 40 CFR Part 257 “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule” (the CCR Rule). The CCR Rule requires owners or operators of existing CCR units to produce an Annual Groundwater Monitoring and Corrective Action Report (Annual Report) each year (§§ 257.90(e)). Ameren Missouri (Ameren) has determined that the Utility Waste Landfill (UWL) Cell 4A (SCL4A) at the Sioux Energy Center (SEC) is subject to the requirements of the CCR Rule. This Annual Report for the SCL4A describes CCR Rule groundwater monitoring activities from January 1, 2018 through December 31, 2018.

2.0 INSTALLATION OR DECOMMISSIONING OF MONITORING WELLS

In accordance with the CCR Rule, a groundwater monitoring system has been installed to monitor the SCL4A. The groundwater monitoring system consists of six (6) monitoring wells screened in the uppermost aquifer and is displayed in **Figure 1**. No new monitoring wells were installed or decommissioned in 2018 as a part of the CCR Rule monitoring program for the SCL4A. For more information on the groundwater monitoring network, see the 2017 Annual Groundwater Monitoring Report for the SCL4A.

3.0 GROUNDWATER SAMPLING RESULTS AND DISCUSSION

The following sections review the sampling events completed for the SCL4A CCR Unit in 2018. **Table 1** below provides a summary of the samples collected in 2018 including the number of groundwater samples that were collected, the date of sample collection, and the monitoring program.

Table 1 – Summary of Groundwater Sampling Dates

Sampling Event	Groundwater Monitoring Wells						Monitoring Program
	BMW-1D	BMW-3D	UG-3	TMW-1	TMW-2	TMW-3	
	Date of Sample Collection						
January 2018 Verification Sampling	-	-	-	-	-	1/9/2018	Detection
May 2018 Detection Monitoring Sampling	5/14/2018	5/14/2018	5/15/2018	5/15/2018	5/15/2018	5/15/2018	Detection
July 2018 Verification Sampling	-	-	7/6/2018	-	7/5/2018	-	Detection
November 2018 Detection Monitoring Sampling	11/12/2018	11/12/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	Detection
Total Number of Samples Collected	2	2	3	2	3	3	NA

Notes:
1.) Verification Sampling Events tested for Appendix III Parameters with initial exceedances.
2.) Detection Monitoring Events tested for Appendix III Parameters.
3.) "-" No sample collected.

4.) NA - Not applicable.

3.1 Detection Monitoring Program

A Detection Monitoring event was completed November 13-15, 2017. Statistical Analyses to evaluate for Statistically Significant Increases (SSI) for the November 2017 event were completed in January 2018 and are included in this report. No SSIs were determined for the November 2017 event. A table summarizing the results of the statistical analysis of the November 2017 Detection Monitoring event is provided in **Table 2**.

A Detection Monitoring event was completed May 14-15, 2018, and testing was completed for all Appendix III analytes. Detections of Appendix III analytes triggered a verification sampling event, which was completed on July 5-6, 2018. Statistical analyses of these data determined that there were verified SSIs. A table summarizing the results of the statistical analysis of the May 2018 Detection Monitoring event is provided in **Table 3** and laboratory analytical data are provided in **Appendix A**.

As outlined in section 257.94(e)(2) of the CCR Rule, the owner or operator may demonstrate that a source other than the CCR Unit has caused an SSI and that the apparent SSI was the result of an alternative source or resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. An Alternative Source Demonstration (ASD) was completed for these SSIs and is provided in **Appendix B**. This ASD demonstrates that SSIs at the monitoring wells around the SCL4A, Utility Waster Landfill Cell 4A, are not caused by the SCL4A CCR Unit and the SCL4A remains in Detection Monitoring.

A Detection Monitoring event was completed November 12-14, 2018, and testing was performed for all Appendix III analytes. Statistical analyses to evaluate for SSIs in the November 2018 data were not completed in 2018. Results of the statistical evaluation will be included in the 2019 annual report. A table summarizing the results of the November 2018 Detection Monitoring event is provided in **Table 4** and laboratory analytical data are provided in **Appendix A**.

3.2 Groundwater Elevation, Flow Rate and Direction

To meet the requirements of §257.93(c), water level measurements were taken at all monitoring wells prior to the start of groundwater purging and sampling. Static water levels were measured within a 24-hour period in each monitoring well using an electronic water level indicator.

Groundwater elevations were used to generate potentiometric surface maps on **Figure 2** and **Figure 3**. As shown on the potentiometric surface maps, groundwater flow direction within the uppermost aquifer is dynamic and influenced by seasonal changes in the water level in the adjacent Mississippi and Missouri Rivers, since the alluvial aquifer is hydraulically connected to these water bodies. Groundwater in the alluvial aquifer will generally flow from the higher of the two rivers toward the lower elevation river. The SCPA Surface Impoundment and Poeling Lake also locally affect water levels and flow directions. Water flows into and out of the alluvial aquifer as a result of fluctuating river water levels that produce “bank recharge” and “bank discharge” conditions. At this facility, groundwater can flow north and south toward the Mississippi and Missouri Rivers, depending on river levels.

Groundwater flow direction and gradient were estimated for the downgradient CCR monitoring wells using the USEPA’s On-line Tool for Site Assessment Calculation for Hydraulic Gradient (Magnitude and Direction) (USEPA, 2016). Results from this assessment indicate that while groundwater flow direction is variable, the overall net groundwater flow at the SCL4A was toward the south, flowing toward the Missouri River. Horizontal gradients

calculated by the program range from 0.0001 to 0.0013 feet/foot with an estimated net annual groundwater velocity of approximately 33 feet per year.

4.0 STATUS OF THE GROUNDWATER MONITORING PROGRAM

The SCL4A remains in Detection Monitoring. Section 5.0 provides a discussion of the activities planned for 2018.

4.1 Sampling Issues

No notable sampling issues were encountered at the SCL4A during 2018.

5.0 ACTIVITIES PLANNED FOR 2019

Detection Monitoring is scheduled to continue on a semi-annual basis in the second and fourth quarters of 2019. Statistical analysis of the November 2018 Detection Monitoring data will be completed in 2019 and included in the 2019 Annual Report.

Tables

Table 2
November 2017 Detection Monitoring Results
SCL4A Surface Impoundment
Sioux Energy Center, St. Charles County, MO

ANALYTE	UNITS	BACKGROUND		GROUNDWATER MONITORING WELLS							
		BMW-1S	BMW-3S	Prediction Limit UG-3	UG-3	Prediction Limit TMW-1	TMW-1	Prediction Limit TMW-2	TMW-2	Prediction Limit TMW-3	TMW-3
November 2017 Detection Monitoring Event											
DATE	NA	11/13/2017	11/13/2017	NA	11/15/2017	NA	11/15/2017	NA	11/15/2017	NA	11/15/2017
pH	SU	6.95	7.08	5.901- 7.849	7.20	5.536-7.999	7.13	5.884-7.958	7.21	5.889-7.889	7.28
BORON, TOTAL	µg/L	118	104	896.5	293	DQR	71.1 J	DQR	87.8 J	133	89.9 J
CALCIUM, TOTAL	µg/L	156,000	128,000	154,345	126,000	118,318	92,200	135,076	117,000	153,227	137,000
CHLORIDE, TOTAL	mg/L	7.7	10.5	78.76	70.0	5.179	2.9	4.151	3.3	3.1	1.7
FLUORIDE, TOTAL	mg/L	0.30	0.34	0.3771	0.36	0.4047	0.37	0.4053	0.38	0.3588	0.30
SULFATE, TOTAL	mg/L	41.4	28.2	172.4	45.6	46.3	39.8	37.9	31.4	63.54	59.0
TOTAL DISSOLVED SOLIDS	mg/L	526	446	658.7	521	506.2	323	476.5	411	514.3	472

NOTES:

1. Unit Abbreviations: µg/L - micrograms per liter, mg/L - milligrams per liter, SU - standard units.
2. J - Result is an estimated value.
3. NA - Not applicable.
4. Prediction Limits calculated using Sanitas Software.
5. If all background values are less than the Practical Quantitation Limit (PQL) then the Double Quantification Rule (DQR) is used.
6. Values highlighted in yellow indicate a Statistically Significant Increase (SSI).
7. Values highlighted in green indicate an initial exceedance above the prediction limit that was not confirmed by Verification Sampling (not an SSI).
8. Only analytes/wells that were detected above the prediction limit were tested during Verification Sampling.

Prepared By: JSI
Checked By: LMS
Reviewed By: MNH

Table 3
May 2018 Detection Monitoring Results
SCL4A Surface Impoundment
Sioux Energy Center, St. Charles County, MO

ANALYTE	UNITS	BACKGROUND		GROUNDWATER MONITORING WELLS							
		BMW-1S	BMW-3S	Prediction Limit UG-3	UG-3	Prediction Limit TMW-1	TMW-1	Prediction Limit TMW-2	TMW-2	Prediction Limit TMW-3	TMW-3
May 2018 Detection Monitoring Event											
DATE	NA	5/14/2018	5/14/2018	NA	5/15/2018	NA	5/15/2018	NA	5/15/2018	NA	5/15/2018
pH	SU	7.84	7.17	5.901- 7.849	7.07	5.536-7.999	6.99	5.884-7.958	6.86	5.889-7.889	6.93
BORON, TOTAL	µg/L	74.0 J	65.6 J	896.5	693	DQR	62.2 J	DQR	79.1 J	133	87.3 J
CALCIUM, TOTAL	µg/L	147,000	126,000	154,345	130,000	118,318	91,700	135,076	120,000	153,227	128,000
CHLORIDE, TOTAL	mg/L	6.3	10.0	78.76	84.8	5.179	2.4	4.151	2.2	3.1	2.2
FLUORIDE, TOTAL	mg/L	0.30	0.36	0.3771	0.33	0.4047	0.33	0.4053	0.37	0.3588	0.32
SULFATE, TOTAL	mg/L	23.6	28.5	172.4	45.3	46.3	40.7	37.9	44.2	63.54	54.0
TOTAL DISSOLVED SOLIDS	mg/L	1,170	565	658.7	481 J	506.2	ND	476.5	721 J	514.3	485 J
July 2018 Verification Sampling Event											
DATE	NA				07/06/2018				07/05/2018		
pH	SU				7.20				6.74		
BORON, TOTAL	µg/L										
CALCIUM, TOTAL	µg/L										
CHLORIDE, TOTAL	mg/L				81.0						
FLUORIDE, TOTAL	mg/L										
SULFATE, TOTAL	mg/L								51.7		
TOTAL DISSOLVED SOLIDS	mg/L								484		

NOTES:

1. Unit Abbreviations: µg/L - micrograms per liter, mg/L - milligrams per liter, SU - standard units.
2. J - Result is an estimated value.
3. NA - Not applicable.
4. Prediction Limits calculated using Sanitas Software.
5. If all background values are less than the Practical Quantitation Limit (PQL) then the Double Quantification Rule (DQR) is used.
6. Values highlighted in yellow indicate a Statistically Significant Increase (SSI).
7. Values highlighted in green indicate an initial exceedance above the prediction limit that was not confirmed by Verification Sampling (not an SSI).
8. Only analytes/wells that were detected above the prediction limit were tested during Verification Sampling.

Prepared By: JSI
Checked By: LMS
Reviewed By: MNH

Table 4
November 2018 Detection Monitoring Results
SCL4A Surface Impoundment
Sioux Energy Center, St. Charles County, MO

ANALYTE	UNITS	BACKGROUND		GROUNDWATER MONITORING WELLS			
		BMW-1S	BMW-3S	UG-3	TMW-1	TMW-2	TMW-3
November 2018 Detection Monitoring Event							
DATE	NA	11/12/2018	11/12/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018
pH	SU	7.46	7.49	7.10	6.51	6.97	7.03
BORON, TOTAL	µg/L	72.9 J	61.5 J	425	69.5 J	81.4 J	87.4 J
CALCIUM, TOTAL	µg/L	157,000	124,000	129,000	96,400	131,000	137,000
CHLORIDE, TOTAL	mg/L	6.7	10.1	67.0	2.9	2.9	2.4
FLUORIDE, TOTAL	mg/L	0.34	0.36	0.21	0.40 J	0.36	ND
SULFATE, TOTAL	mg/L	28.8	25.6	63.9	46.1	49.8	51.3
TOTAL DISSOLVED SOLIDS	mg/L	556	436	575	334	414	457

NOTES:
1. Unit Abbreviations: µg/L - micrograms per liter, mg/L - milligrams per liter, SU - standard units.
2. J - Result is an estimated value.
3. ND - Constituent was analyzed for, but was not detected above the Method Detection Limit (MDL) and is considered a non-detect. Values displayed as ND.
4. NA - Not applicable.

Prepared By: JSI
Checked By: JAP
Reviewed By: MNH

Figures

N

LEGEND

Sioux Energy Center Property Boundary

Utility Waste Landfill (UWL)

SCL4A - Landfill Cell 4A

Water Recycle Pond

UWL Final Perimeter Fence

Sample/Measurement Locations

SCL4A Monitoring Well

Background Monitoring Well

Groundwater Elevation Piezometer

KEY MAP

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GOLDER GROUNDWATER MONITORING WELLS (BMW-1S, BMW-2S, BMW-3S, TMW-1, TMW-2 AND TMW-3) SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) UWL BOUNDARIES, DESIGNATIONS AND STATE MONITORING WELL LOCATIONS (UG-3) BASED ON DRAWINGS IN THE UWL PROPOSED LANDFILL PERMIT (#0918301).

REFERENCES

1.) AMEREN MISSOURI SIOUX ENERGY CENTER, SIOUX PROPERTY CONTROL MAP, FEBRUARY 2011.
2.) COORDINATE SYSTEM: NAD 1983 STATE PLANE MISSOURI EAST FIPS 2401 FEET.
3.) AMEREN MISSOURI DRAWING SX-8420-X-182001.

0 500 1,000 2,000 3,000 4,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
GROUNDWATER MONITORING PROGRAM

TITLE
SITE LOCATION AERIAL MAP AND MONITORING WELL LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2018-01-10
PREPARED	RJF
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153-1406
PHASE 0003
FIGURE 1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
1in
0

Path: G:\Projects\1150 Projects\153-1406 - Ameren GW Monitoring Program - MO\Phase 0003 - Sioux Energy\800 - FIGURES-DRAWINGS\PRODUCTION\2018 Annual Report\Figure 1 - SC4LA - Site Location Map.mxd

Path: G:\Projects\150 Projects\1531406 - Ameren GW Monitoring Program - MO\Phase 0003 - Sioux Energy\800 - FIGURES-DRAWINGS\PRODUCTION\GMP\2018 potmaps\Figure 2_SCPB-SCPC-SCL4A-May_18.mxd

LEGEND

- Sioux Energy Center Property Boundary
- SCPB - Fly Ash Surface Impoundment

Ground/Surface Water Measurement Locations

- SCL4A - UWL Cell 4A Monitoring Well
- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPB - Fly Ash Surface Impoundment Monitoring Well
- SCPC - WFGD Surface Impoundment Monitoring Well
- SCPA Pond Gauge
- River Elevation

Utility Waste Landfill (UWL)

- SCL4A - UWL Cell 4A
- SCPC - WFGD Surface Impoundment
- Water Recycle Pond
- UWL Future Perimeter Fence

Groundwater Elevation Contours

- Groundwater Elevation Contour (FT MSL)
- Inferred Groundwater Elevation Contour (FT MSL)
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GOLDER GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14, APRIL 29, AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FT MSL (FEET ABOVE MEAN SEA LEVEL).
4.) GROUNDWATER MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY USGS (UNITED STATES GEOLOGICAL SURVEY) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.
8.) UWL BOUNDARIES, DESIGNATIONS AND STATE MONITORING WELL LOCATIONS BASED ON DRAWINGS IN THE UWL PROPOSED LANDFILL PERMIT (#0918301).
9.) WFGD - WET FLUE GAS DESULFURIZATION..

REFERENCE

1.) AMEREN MISSOURI SIOUX ENERGY CENTER, SIOUX PROPERTY CONTROL MAP, FEBRUARY 2011.
2.) COORDINATE SYSTEM: NAD 1983 STATE PLANE MISSOURI EAST FIPS 2,401 FEET.
3.) USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES), 07010000 (ST. LOUIS), 05587498 (ALTON), GRAFTON (05587450).
4.) AMEREN MISSOURI SIOUX POWER PLANT UTILITY WASTE LANDFILL PROPOSED CONSTRUCTION PERMIT MODIFICATION (#0918301), AUGUST 2014.

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCL4A POTENTIOMETRIC SURFACE MAP - MAY 14, 2018

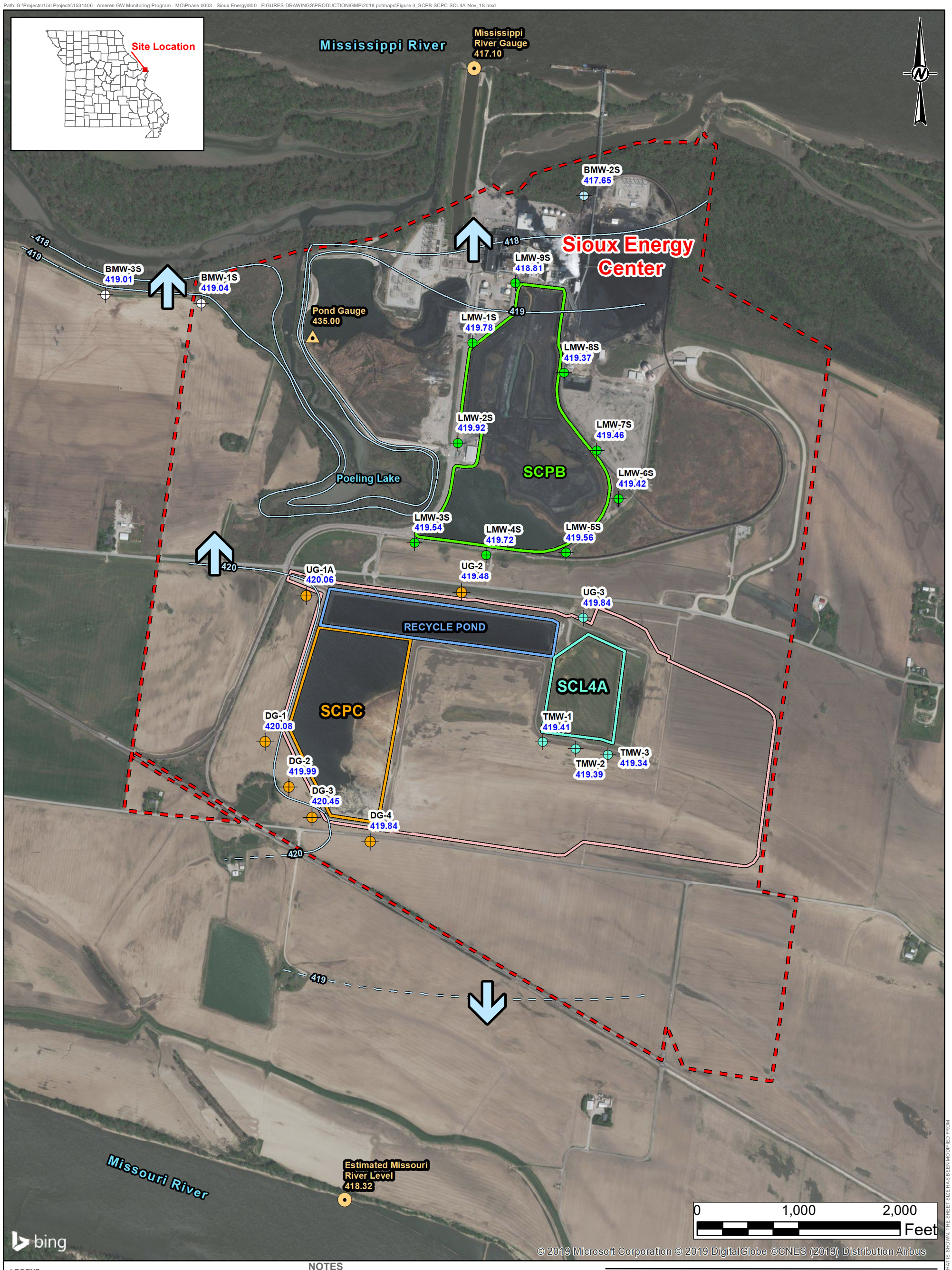
CONSULTANT
GOLDER

YYYY-MM-DD	2018-12-20
PREPARED	EFT
DESIGN	JSI
REVIEW	JAP
APPROVED	MNH

PROJECT No. 153-1406
PHASE 0003
FIGURE 2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
1 in
0

Path: G:\Projects\150 Projects\1531406 - Ameren GW Monitoring Program - MO\Phase 0003 - Sioux Energy\800 - FIGURES-DRAWINGS\PRODUCTION\GMP\2018 potmaps\Figure 3_SCPB-SCPC-SCL4A-Nov_18.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPB - Fly Ash Surface Impoundment

Ground/Surface Water Measurement Locations

- SCL4A - UWL Cell 4A Monitoring Well
- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPB - Fly Ash Surface Impoundment Monitoring Well
- SCPC - WFGD Surface Impoundment Monitoring Well
- SCPA Pond Gauge
- River Elevation

Utility Waste Landfill (UWL)

- SCL4A - UWL Cell 4A
- SCPC - WFGD Surface Impoundment
- Water Recycle Pond
- UWL Future Perimeter Fence

Groundwater Elevation Contours

- Groundwater Elevation Contour (FT MSL)
- Inferred Groundwater Elevation Contour (FT MSL)
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
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6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.
8.) UWL BOUNDARIES, DESIGNATIONS AND STATE MONITORING WELL LOCATIONS BASED ON DRAWINGS IN THE UWL PROPOSED LANDFILL PERMIT (#0918301).
9.) WFGD - WET FLUE GAS DESULFURIZATION.

REFERENCE

1.) AMEREN MISSOURI SIOUX ENERGY CENTER, SIOUX PROPERTY CONTROL MAP, FEBRUARY 2011.
2.) COORDINATE SYSTEM: NAD 1983 STATE PLANE MISSOURI EAST FIPS 2,401 FEET.
3.) USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES), 07010000 (ST. LOUIS), 05587498 (ALTON), GRAFTON (05587450).
4.) AMEREN MISSOURI SIOUX POWER PLANT UTILITY WASTE LANDFILL PROPOSED CONSTRUCTION PERMIT MODIFICATION (#0918301), AUGUST 2014.

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCL4A POTENTIOMETRIC SURFACE MAP - NOVEMBER 12, 2018

CONSULTANT
GOLDER

YYYY-MM-DD	2018-12-20
PREPARED	EFT
DESIGN	JSI
REVIEW	JAP
APPROVED	MNH

PROJECT No. 153-1406
PHASE 0003
FIGURE 3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 1 in 0

Appendices

APPENDIX A

Laboratory Analytical Data

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

January 11, 2018

Mark Haddock
Golder Associates
820 S. Main St
Suite 100
Saint Charles, MO 63301

RE: Project: AMEREN SIOUX ENERGY CTR-SCL4A
Pace Project No.: 60261742

Dear Mark Haddock:
Enclosed are the analytical results for sample(s) received by the laboratory on January 10, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jamie Church
jamie.church@pacelabs.com
314-838-7223
Project Manager

Enclosures

cc: Ryan Feldmann, Golder
Jeffrey Ingram, Golder Associates
John Suozzi, Golder Associates

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project: AMEREN SIOUX ENERGY CTR-SCL4A
Pace Project No.: 60261742

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
WY STR Certification #: 2456.01
Arkansas Certification #: 17-016-0
Illinois Certification #: 200030
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407
Utah Certification #: KS00021
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: AMEREN SIOUX ENERGY CTR-SCL4A
Pace Project No.: 60261742

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60261742001	**S-SCL4A-TMW-3**	Water	01/09/18 11:30	01/10/18 03:50

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: AMEREN SIOUX ENERGY CTR-SCL4A
Pace Project No.: 60261742

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60261742001	**S-SCL4A-TMW-3**	EPA 200.7	SMW	1	PASI-K

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: AMEREN SIOUX ENERGY CTR-SCL4A
Pace Project No.: 60261742

Sample: S-SCL4A-TMW-3 **Lab ID: 60261742001** Collected: 01/09/18 11:30 Received: 01/10/18 03:50 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Calcium	**140000**	ug/L	100	36.0	1	01/10/18 15:30	01/11/18 13:36	7440-70-2	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: AMEREN SIOUX ENERGY CTR-SCL4A
Pace Project No.: 60261742

QC Batch: 510171 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 Metals, Total
Associated Lab Samples: 60261742001

METHOD BLANK: 2089193 Matrix: Water
Associated Lab Samples: 60261742001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Calcium	ug/L	<36.0	100	36.0	01/11/18 12:53	

LABORATORY CONTROL SAMPLE: 2089194

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Calcium	ug/L	10000	10400	104	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2089195 2089196

Parameter	Units	60261738002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Calcium	ug/L	234000	10000	10000	236000	242000	22	86	70-130	3	20	M1

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2089197 2089198

Parameter	Units	60261746008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Calcium	ug/L	175000	10000	10000	188000	187000	130	124	70-130	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: AMEREN SIOUX ENERGY CTR-SCL4A
Pace Project No.: 60261742

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

ANALYTE QUALIFIERS

M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: AMEREN SIOUX ENERGY CTR-SCL4A
Pace Project No.: 60261742

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60261742001	**S-SCL4A-TMW-3**	EPA 200.7	510171	EPA 200.7	510212

Pace Analytical
www.pacelabs.com

Sample Condition Upon Receipt

WO# : 60261742

60261742

Client Name: Golder

Courier: FedEx ☐ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☑ Client ☐ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☑

Custody Seal on Cooler/Box Present: Yes ☑ No ☐ Seals intact: Yes ☑ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☑ Other ☐

Thermometer Used: T-266 / T-239 (CF 0.0 / CF +0.2) **Type of Ice:** Wet Blue None

Cooler Temperature (°C): As-read 1-9/13/20 **Corr. Factor** (CF 0.0 / CF +0.2) **Corrected** 1-9/13/2-0

Date and initials of person examining contents: 01/10/18

Temperature should be above freezing to 6°C

Chain of Custody present:	☑Yes ☐No ☐N/A	
Chain of Custody relinquished:	☑Yes ☐No ☐N/A	
Samples arrived within holding time:	☑Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☐Yes ☑No ☐N/A	
Rush Turn Around Time requested:	☑Yes ☐No ☐N/A	2Day
Sufficient volume:	☑Yes ☐No ☐N/A	
Correct containers used:	☑Yes ☐No ☐N/A	
Pace containers used:	☑Yes ☐No ☐N/A	
Containers intact:	☑Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☑N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☑N/A	
Sample labels match COC: Date / time / ID / analyses	☑Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☐Yes ☑No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	☑Yes ☐No ☐N/A	
Cyanide water sample checks: ☑ N/A Lead acetate strip turns dark? (Record only) Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No ☐Yes ☐No	
Trip Blank present:	☐Yes ☐No ☑N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☑N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☑N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☑N/A	JLS

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Jann Check 1/10/18

Project Manager Review: _____ Date: _____

Pace Analytical
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Golder Associates
Address:	820 South Main Street, Suite 100
	St Charles, MO 63301
Email To:	maddock@golder.com
Phone: 636-724-9191	Fax: 636-724-9323
Requested Due Date/TAT: Jan 12 2018	Standard

Section B Required Project Information:

Report To:	Mark Haddock (mhaddock@golder.com)
Copy To:	Jeffrey Ingram
	Ryan_Feldmann@golder.com
Purchase Order No.:	
Project Name:	Ameren Sioux Energy Ctr - SCL4A
Project Number:	153-1406.0003

Section C Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Jamie Church
Pace Profile #:	9285

REGULATORY AGENCY

☐ NPDES ☒ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: MO

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
	WP
	AR
	OT
	TS

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Boron	Calcium	Chloride	Fluoride	Sulfate	TDS	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
																		Y/N	N	N	N	N	N	N		60261742
1	S-SCL4A-TMW-3	WT	G			1-9-18	1130		2	1		1								1						BP3P20 BP2U 001
2		WT	G																							
3		WT	G																							
4		WT	G																							
5		WT	G																							
6		WT	G																							
7		WT	G																							
8		WT	G																							
9		WT	G																							
10		WT	G																							
11		WT	G																							
12		WT	G																							

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
See Jeff Ingram to confirm analysis	Golder	1-9-18	1400	PACE	1/9/18	1400	
	PACE	1/9/18	1700		1/10/18	0350	1.9
							1-3
							2-0

SAMPLER NAME AND SIGNATURE			Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER:	Ryan Feldmann					
SIGNATURE of SAMPLER:		DATE Signed (MM/DD/YY): 01/09/18				

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

MEMORANDUM

DATE January 15, 2018 **Project No.** 1531406

TO Project File
Golder Associates

CC Amanda Derhake, Jeff Ingram

FROM Tommy Goodwin **EMAIL Tommy_Goodwin@golder.com**

DATA VALIDATION SUMMARY, SIOUX ENERGY CENTER – SCL4A – AMEREN GROUNDWATER – DATA PACKAGE 60261742

The following is a summary of instances where quality control criteria in the functional guidelines were not met and data qualification was required:

- Calcium was outside the recovery criteria range for MS. Data was not qualified on MS/MSD data alone.

Golder Associates Inc.
13515 Barrett Parkway Drive, Suite 260,
Ballwin, Missouri, USA 63021

T: +1 314 984-8800 F: +1 314 984-8770

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Company Name: Golder Associates
Project Name: Ameren-Sioux-SCL4A-VS 2018 Jan
Reviewer: T Goodwin

Project Manager: J Ingram
Project Number: 1531406.0003 .
Validation Date: 4/15/18

Laboratory: Pace Analytical
Analytical Method (type and no.): Metals (Tot) 200.7
Matrix: ☐ Air ☐ Soil/Sed. ☒ Water ☐ Waste ☐

SDG #: 60261742

Sample Names: ~~S-TMW-1, S-TMS-2~~, S-TMW-3, ~~S-UG-3, S-SCL4A-DUP-1, S-SCL4A-FB-1, S-BMW-1S, S-BMW-3S~~
(8) (12)

NOTE: Please provide calculation in Comment areas or on the back (if on the back please indicate in comment areas).

Field Information	YES	NO	NA	COMMENTS
a) Sampling dates noted?	☒	☐	☐	
b) Sampling team indicated?	☒	☐	☐	
c) Sample location noted?	☒	☐	☐	
d) Sample depth indicated (Soils)?	☐	☐	☒	
e) Sample type indicated (grab/composite)?	☒	☐	☐	Grab
f) Field QC noted?	☒	☐	☐	
g) Field parameters collected (note types)?	☒	☐	☐	pH, Cond, Turb, Temp, DO, ORP, Flow, DTW
h) Field Calibration within control limits?	☒	☐	☐	
i) Notations of unacceptable field conditions/performances from field logs or field notes?	☐	☒	☐	
j) Does the laboratory narrative indicate deficiencies?	☐	☐	☒	

Note Deficiencies:

Chain-of-Custody (COC)	YES	NO	NA	COMMENTS
a) Was the COC properly completed?	☒	☐	☐	
b) Was the COC signed by both field and laboratory personnel?	☒	☐	☐	
c) Were samples received in good condition?	☑	☐	☐	

General (reference QAPP or Method)	YES	NO	NA	COMMENTS
a) Were hold times met for sample pretreatment?	☐	☐	☒	
b) Were hold times met for sample analysis?	☑	☐	☐	
c) Were the correct preservatives used?	☒	☐	☐	
d) Was the correct method used?	☒	☐	☐	
e) Were appropriate reporting limits achieved?	☒	☐	☐	
f) Were any sample dilutions noted?	☐	☑	☐	
g) Were any matrix problems noted?	☑	☑ Th	☐	Calcium

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Blanks	YES	NO	NA	COMMENTS
a) Were analytes detected in the method blank(s)?	☐	☑	☐	
b) Were analytes detected in the field blank(s)?	☐	☐	☑	
c) Were analytes detected in the equipment blank(s)?	☐	☐	☒	
d) Were analytes detected in the trip blank(s)?	☐	☐	☒	

Laboratory Control Sample (LCS)	YES	NO	NA	COMMENTS
a) Was a LCS analyzed once per SDG?	☑	☐	☐	
b) Were the proper analytes included in the LCS?	☑	☐	☐	
c) Was the LCS accuracy criteria met?	☑	☐	☐	

Duplicates	YES	NO	NA	COMMENTS
a) Were field duplicates collected (note original and duplicate sample names)?	☐	☑	☐	
b) Were field dup. precision criteria met (note RPD)?	☐	☐	☑	
c) Were lab duplicates analyzed (note original and duplicate samples)?	☐	☑	☐	
d) Were lab dup. precision criteria met (note RPD)?	☐	☐	☑	

Blind Standards	YES	NO	NA	COMMENTS
a) Was a blind standard used (indicate name, analytes included and concentrations)?	☐	☐	☒	
b) Was the %D within control limits?	☐	☐	☒	

Matrix Spike/Matrix Spike Duplicate (MS/MSD)	YES	NO	NA	COMMENTS
a) Was MS accuracy criteria met?	☐	☑	☐	(a (22/70-130)
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☑	
b) Was MSD accuracy criteria met?	☑	☐	☐	
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☑	
c) Were MS/MSD precision criteria met?	☑	☐	☐	

Comments/Notes:

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Data Qualification:

Sample Name	Constituent(s)	Result	Qualifier	Reason
None				

Signature: Tommy J. Woodward Date: 1/15/2018

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

December 28, 2018

Mark Haddock
Golder Associates
820 S. Main St
Suite 100
Saint Charles, MO 63301

RE: Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Dear Mark Haddock:
Enclosed are the analytical results for sample(s) received by the laboratory on May 16, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

REV-1, 12/28/18: Samples S-BMW-1S and S-BMW-3S added to report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jamie Church
jamie.church@pacelabs.com
314-838-7223
Project Manager

Enclosures

cc: Ryan Feldmann, Golder
Jeffrey Ingram, Golder Associates
Eric Schneider, Golder Associates

Pace Analytical Services, LLC
9608 Loiret Blvd.
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(913)599-5665

CERTIFICATIONS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Certification Number: 10090
Arkansas Drinking Water
WY STR Certification #: 2456.01
Arkansas Certification #: 18-016-0
Arkansas Drinking Water
Illinois Certification #: 004455
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116 / E10426
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407-18-11
Utah Certification #: KS000212018-8
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070
Missouri Certification Number: 10090

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60270508001	**S-TMW-1**	Water	05/15/18 13:40	05/16/18 03:20
60270508002	**S-TMW-2**	Water	05/15/18 15:00	05/16/18 03:20
60270508003	**S-TMW-3**	Water	05/15/18 16:25	05/16/18 03:20
60270508004	**S-UG-3**	Water	05/15/18 15:00	05/16/18 03:20
60270508005	**S-SCL4A-DUP-1**	Water	05/15/18 13:40	05/16/18 03:20
60270508006	**S-SCL4A-FB-1**	Water	05/15/18 16:05	05/16/18 03:20
60270510002	**S-BMW-1S**	Water	05/14/18 12:15	05/16/18 03:20
60270510003	**S-BMW-3S**	Water	05/14/18 10:25	05/16/18 03:20

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60270508001	**S-TMW-1**	EPA 200.7	TDS	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDB	1	PASI-K
		EPA 300.0	OL	3	PASI-K
60270508002	**S-TMW-2**	EPA 200.7	TDS	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDB	1	PASI-K
		EPA 300.0	OL	3	PASI-K
60270508003	**S-TMW-3**	EPA 200.7	TDS	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDB	1	PASI-K
		EPA 300.0	OL	3	PASI-K
60270508004	**S-UG-3**	EPA 200.7	TDS	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDB	1	PASI-K
		EPA 300.0	OL	3	PASI-K
60270508005	**S-SCL4A-DUP-1**	EPA 200.7	TDS	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDB	1	PASI-K
		EPA 300.0	OL	3	PASI-K
60270508006	**S-SCL4A-FB-1**	EPA 200.7	TDS	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDB	1	PASI-K
		EPA 300.0	OL	3	PASI-K
60270510002	**S-BMW-1S**	EPA 200.7	TDS	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDB	1	PASI-K
		EPA 300.0	OL	3	PASI-K
60270510003	**S-BMW-3S**	EPA 200.7	TDS	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDB	1	PASI-K
		EPA 300.0	OL	3	PASI-K

Pace Analytical Services, LLC
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ANALYTICAL RESULTS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Sample: S-TMW-1 **Lab ID: 60270508001** Collected: 05/15/18 13:40 Received: 05/16/18 03:20 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**62.2J**	ug/L	100	12.5	1	05/17/18 13:15	05/18/18 17:40	7440-42-8	
Calcium	**91700**	ug/L	200	53.5	1	05/17/18 13:15	05/18/18 17:40	7440-70-2	
Iron	**33.0J**	ug/L	50.0	6.1	1	05/17/18 13:15	05/18/18 17:40	7439-89-6	
Magnesium	**16300**	ug/L	50.0	14.0	1	05/17/18 13:15	05/18/18 17:40	7439-95-4	
Manganese	**172**	ug/L	5.0	0.73	1	05/17/18 13:15	05/18/18 17:40	7439-96-5	
Potassium	**5060**	ug/L	500	79.3	1	05/17/18 13:15	05/18/18 17:40	7440-09-7	
Sodium	**2790**	ug/L	500	157	1	05/17/18 13:15	05/18/18 17:40	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**273**	mg/L	20.0	4.9	1		05/25/18 11:05		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**<5.0**	mg/L	5.0	5.0	1		05/19/18 12:29		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**2.4**	mg/L	1.0	0.46	1		05/26/18 20:17	16887-00-6	
Fluoride	**0.33**	mg/L	0.20	0.063	1		05/26/18 20:17	16984-48-8	
Sulfate	**40.7**	mg/L	5.0	1.2	5		05/30/18 17:52	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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(913)599-5665

ANALYTICAL RESULTS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Sample: S-TMW-2 **Lab ID: 60270508002** Collected: 05/15/18 15:00 Received: 05/16/18 03:20 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**79.1J**	ug/L	100	12.5	1	05/17/18 13:15	05/18/18 17:43	7440-42-8	
Calcium	**120000**	ug/L	200	53.5	1	05/17/18 13:15	05/18/18 17:43	7440-70-2	
Iron	**400**	ug/L	50.0	6.1	1	05/17/18 13:15	05/18/18 17:43	7439-89-6	
Magnesium	**22800**	ug/L	50.0	14.0	1	05/17/18 13:15	05/18/18 17:43	7439-95-4	
Manganese	**195**	ug/L	5.0	0.73	1	05/17/18 13:15	05/18/18 17:43	7439-96-5	
Potassium	**5400**	ug/L	500	79.3	1	05/17/18 13:15	05/18/18 17:43	7440-09-7	
Sodium	**3360**	ug/L	500	157	1	05/17/18 13:15	05/18/18 17:43	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**374**	mg/L	20.0	4.9	1		05/25/18 11:19		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**721**	mg/L	5.0	5.0	1		05/19/18 12:29		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**2.2**	mg/L	1.0	0.46	1		05/26/18 20:32	16887-00-6	
Fluoride	**0.37**	mg/L	0.20	0.063	1		05/26/18 20:32	16984-48-8	
Sulfate	**44.2**	mg/L	5.0	1.2	5		05/30/18 18:07	14808-79-8	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Sample: S-TMW-3 **Lab ID: 60270508003** Collected: 05/15/18 16:25 Received: 05/16/18 03:20 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**87.3J**	ug/L	100	12.5	1	05/17/18 13:15	05/18/18 17:49	7440-42-8	
Calcium	**128000**	ug/L	200	53.5	1	05/17/18 13:15	05/18/18 17:49	7440-70-2	
Iron	**1370**	ug/L	50.0	6.1	1	05/17/18 13:15	05/18/18 17:49	7439-89-6	
Magnesium	**24000**	ug/L	50.0	14.0	1	05/17/18 13:15	05/18/18 17:49	7439-95-4	
Manganese	**336**	ug/L	5.0	0.73	1	05/17/18 13:15	05/18/18 17:49	7439-96-5	
Potassium	**6020**	ug/L	500	79.3	1	05/17/18 13:15	05/18/18 17:49	7440-09-7	
Sodium	**5350**	ug/L	500	157	1	05/17/18 13:15	05/18/18 17:49	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**409**	mg/L	20.0	4.9	1		05/25/18 11:25		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**485**	mg/L	5.0	5.0	1		05/19/18 12:29		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**2.2**	mg/L	1.0	0.46	1		05/26/18 20:47	16887-00-6	
Fluoride	**0.32**	mg/L	0.20	0.063	1		05/26/18 20:47	16984-48-8	
Sulfate	**54.0**	mg/L	5.0	1.2	5		05/30/18 23:33	14808-79-8	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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(913)599-5665

ANALYTICAL RESULTS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Sample: S-UG-3 **Lab ID: 60270508004** Collected: 05/15/18 15:00 Received: 05/16/18 03:20 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**693**	ug/L	100	12.5	1	05/17/18 13:15	05/18/18 17:52	7440-42-8	
Calcium	**130000**	ug/L	200	53.5	1	05/17/18 13:15	05/18/18 17:52	7440-70-2	M1
Iron	**10J**	ug/L	50.0	6.1	1	05/17/18 13:15	05/18/18 17:52	7439-89-6	
Magnesium	**24500**	ug/L	50.0	14.0	1	05/17/18 13:15	05/18/18 17:52	7439-95-4	
Manganese	**745**	ug/L	5.0	0.73	1	05/17/18 13:15	05/18/18 17:52	7439-96-5	
Potassium	**5750**	ug/L	500	79.3	1	05/17/18 13:15	05/18/18 17:52	7440-09-7	
Sodium	**36000**	ug/L	500	157	1	05/17/18 13:15	05/18/18 17:52	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**354**	mg/L	20.0	4.9	1		05/25/18 11:30		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**481**	mg/L	5.0	5.0	1		05/19/18 12:29		D6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**84.8**	mg/L	5.0	2.3	5		05/30/18 23:48	16887-00-6	
Fluoride	**0.33**	mg/L	0.20	0.063	1		05/26/18 21:32	16984-48-8	
Sulfate	**45.3**	mg/L	5.0	1.2	5		05/30/18 23:48	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Sample: S-SCL4A-DUP-1 **Lab ID: 60270508005** Collected: 05/15/18 13:40 Received: 05/16/18 03:20 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**85.2J**	ug/L	100	12.5	1	05/17/18 13:15	05/18/18 17:58	7440-42-8	
Calcium	**120000**	ug/L	200	53.5	1	05/17/18 13:15	05/18/18 17:58	7440-70-2	
Iron	**445**	ug/L	50.0	6.1	1	05/17/18 13:15	05/18/18 17:58	7439-89-6	
Magnesium	**22700**	ug/L	50.0	14.0	1	05/17/18 13:15	05/18/18 17:58	7439-95-4	
Manganese	**195**	ug/L	5.0	0.73	1	05/17/18 13:15	05/18/18 17:58	7439-96-5	
Potassium	**5440**	ug/L	500	79.3	1	05/17/18 13:15	05/18/18 17:58	7440-09-7	
Sodium	**3380**	ug/L	500	157	1	05/17/18 13:15	05/18/18 17:58	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**372**	mg/L	20.0	4.9	1		05/25/18 11:42		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**567**	mg/L	5.0	5.0	1		05/19/18 12:29		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**2.2**	mg/L	1.0	0.46	1		05/26/18 22:46	16887-00-6	
Fluoride	**0.36**	mg/L	0.20	0.063	1		05/26/18 22:46	16984-48-8	
Sulfate	**43.7**	mg/L	5.0	1.2	5		05/31/18 01:47	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Sample: S-SCL4A-FB-1 **Lab ID: 60270508006** Collected: 05/15/18 16:05 Received: 05/16/18 03:20 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**<12.5**	ug/L	100	12.5	1	05/17/18 13:15	05/18/18 18:00	7440-42-8	
Calcium	**<53.5**	ug/L	200	53.5	1	05/17/18 13:15	05/18/18 18:00	7440-70-2	
Iron	**<6.1**	ug/L	50.0	6.1	1	05/17/18 13:15	05/18/18 18:00	7439-89-6	
Magnesium	**<14.0**	ug/L	50.0	14.0	1	05/17/18 13:15	05/18/18 18:00	7439-95-4	
Manganese	**<0.73**	ug/L	5.0	0.73	1	05/17/18 13:15	05/18/18 18:00	7439-96-5	
Potassium	**<79.3**	ug/L	500	79.3	1	05/17/18 13:15	05/18/18 18:00	7440-09-7	
Sodium	**<157**	ug/L	500	157	1	05/17/18 13:15	05/18/18 18:00	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**<4.9**	mg/L	20.0	4.9	1		05/25/18 11:45		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**222**	mg/L	5.0	5.0	1		05/19/18 12:29		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**<0.46**	mg/L	1.0	0.46	1		05/26/18 23:01	16887-00-6	
Fluoride	**<0.063**	mg/L	0.20	0.063	1		05/26/18 23:01	16984-48-8	
Sulfate	**<0.24**	mg/L	1.0	0.24	1		05/26/18 23:01	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Sample: S-BMW-1S **Lab ID: 60270510002** Collected: 05/14/18 12:15 Received: 05/16/18 03:20 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**74.0J**	ug/L	100	12.5	1	05/17/18 13:15	05/18/18 18:05	7440-42-8	
Calcium	**147000**	ug/L	200	53.5	1	05/17/18 13:15	05/18/18 18:05	7440-70-2	
Iron	**20.8J**	ug/L	50.0	6.1	1	05/17/18 13:15	05/18/18 18:05	7439-89-6	
Magnesium	**28600**	ug/L	50.0	14.0	1	05/17/18 13:15	05/18/18 18:05	7439-95-4	
Manganese	**402**	ug/L	5.0	0.73	1	05/17/18 13:15	05/18/18 18:05	7439-96-5	
Potassium	**313J**	ug/L	500	79.3	1	05/17/18 13:15	05/18/18 18:05	7440-09-7	
Sodium	**4580**	ug/L	500	157	1	05/17/18 13:15	05/18/18 18:05	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**459**	mg/L	20.0	4.9	1		05/23/18 19:12		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**1170**	mg/L	5.0	5.0	1		05/19/18 12:28		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**6.3**	mg/L	1.0	0.46	1		05/26/18 23:31	16887-00-6	
Fluoride	**0.30**	mg/L	0.20	0.063	1		05/26/18 23:31	16984-48-8	
Sulfate	**23.6**	mg/L	2.0	0.47	2		05/31/18 02:32	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Sample: S-BMW-3S **Lab ID: 60270510003** Collected: 05/14/18 10:25 Received: 05/16/18 03:20 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**65.6J**	ug/L	100	12.5	1	05/17/18 13:15	05/18/18 18:07	7440-42-8	
Calcium	**126000**	ug/L	200	53.5	1	05/17/18 13:15	05/18/18 18:07	7440-70-2	
Iron	**140**	ug/L	50.0	6.1	1	05/17/18 13:15	05/18/18 18:07	7439-89-6	
Magnesium	**23200**	ug/L	50.0	14.0	1	05/17/18 13:15	05/18/18 18:07	7439-95-4	
Manganese	**344**	ug/L	5.0	0.73	1	05/17/18 13:15	05/18/18 18:07	7439-96-5	
Potassium	**552**	ug/L	500	79.3	1	05/17/18 13:15	05/18/18 18:07	7440-09-7	
Sodium	**4690**	ug/L	500	157	1	05/17/18 13:15	05/18/18 18:07	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**409**	mg/L	20.0	4.9	1		05/23/18 19:18		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**565**	mg/L	5.0	5.0	1		05/19/18 12:28		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**10.0**	mg/L	1.0	0.46	1		05/26/18 23:46	16887-00-6	
Fluoride	**0.36**	mg/L	0.20	0.063	1		05/26/18 23:46	16984-48-8	
Sulfate	**28.5**	mg/L	2.0	0.47	2		05/31/18 02:47	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

QC Batch: 526189 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 Metals, Total
Associated Lab Samples: 60270508001, 60270508002, 60270508003, 60270508004, 60270508005, 60270508006, 60270510002, 60270510003

METHOD BLANK: 2154807 Matrix: Water
Associated Lab Samples: 60270508001, 60270508002, 60270508003, 60270508004, 60270508005, 60270508006, 60270510002, 60270510003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Boron	ug/L	<12.5	100	12.5	05/18/18 17:34	
Calcium	ug/L	<53.5	200	53.5	05/18/18 17:34	
Iron	ug/L	<6.1	50.0	6.1	05/18/18 17:34	
Magnesium	ug/L	<14.0	50.0	14.0	05/18/18 17:34	
Manganese	ug/L	<0.73	5.0	0.73	05/18/18 17:34	
Potassium	ug/L	<79.3	500	79.3	05/18/18 17:34	
Sodium	ug/L	<157	500	157	05/18/18 17:34	

LABORATORY CONTROL SAMPLE: 2154808

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	1000	941	94	85-115	
Calcium	ug/L	10000	9740	97	85-115	
Iron	ug/L	10000	9940	99	85-115	
Magnesium	ug/L	10000	9600	96	85-115	
Manganese	ug/L	1000	975	98	85-115	
Potassium	ug/L	10000	9860	99	85-115	
Sodium	ug/L	10000	9730	97	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2154809 2154810

Parameter	Units	60270508004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L	693	1000	1000	1620	1650	92	95	70-130	2	20	
Calcium	ug/L	130000	10000	10000	134000	136000	37	62	70-130	2	20	M1
Iron	ug/L	10J	10000	10000	9770	9840	98	98	70-130	1	20	
Magnesium	ug/L	24500	10000	10000	32300	32800	78	84	70-130	2	20	
Manganese	ug/L	745	1000	1000	1670	1720	93	98	70-130	3	20	
Potassium	ug/L	5750	10000	10000	15500	15600	97	98	70-130	1	20	
Sodium	ug/L	36000	10000	10000	44200	45100	82	91	70-130	2	20	

MATRIX SPIKE SAMPLE: 2154811

Parameter	Units	60270510003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	65.6J	1000	1020	96	70-130	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

MATRIX SPIKE SAMPLE: 2154811

Parameter	Units	60270510003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Calcium	ug/L	126000	10000	135000	83	70-130	
Iron	ug/L	140	10000	9860	97	70-130	
Magnesium	ug/L	23200	10000	31800	86	70-130	
Manganese	ug/L	344	1000	1280	94	70-130	
Potassium	ug/L	552	10000	10500	99	70-130	
Sodium	ug/L	4690	10000	14500	98	70-130	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

QC Batch: 526735 Analysis Method: SM 2320B
QC Batch Method: SM 2320B Analysis Description: 2320B Alkalinity
Associated Lab Samples: 60270510002, 60270510003

METHOD BLANK: 2157540 Matrix: Water
Associated Lab Samples: 60270510002, 60270510003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Alkalinity, Total as CaCO3	mg/L	<4.9	20.0	4.9	05/23/18 17:53	

LABORATORY CONTROL SAMPLE: 2157541

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	mg/L	500	514	103	90-110	

SAMPLE DUPLICATE: 2157542

Parameter	Units	60270506001 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	mg/L	80.8	79.7	1	10	

SAMPLE DUPLICATE: 2157543

Parameter	Units	60270506005 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	mg/L	287	297	3	10	

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QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

QC Batch: 527256 Analysis Method: SM 2320B
QC Batch Method: SM 2320B Analysis Description: 2320B Alkalinity
Associated Lab Samples: 60270508001, 60270508002, 60270508003, 60270508004, 60270508005, 60270508006

METHOD BLANK: 2159906 Matrix: Water
Associated Lab Samples: 60270508001, 60270508002, 60270508003, 60270508004, 60270508005, 60270508006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Alkalinity, Total as CaCO3	mg/L	<4.9	20.0	4.9	05/25/18 10:30	

LABORATORY CONTROL SAMPLE: 2159907

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	mg/L	500	505	101	90-110	

SAMPLE DUPLICATE: 2159908

Parameter	Units	60270508004 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	mg/L	354	358	1	10	

SAMPLE DUPLICATE: 2159909

Parameter	Units	60270797004 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	mg/L	101	98.8	2	10	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

QC Batch: 526312 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60270510002, 60270510003

METHOD BLANK: 2155406 Matrix: Water
Associated Lab Samples: 60270510002, 60270510003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<5.0	5.0	5.0	05/19/18 12:28	

LABORATORY CONTROL SAMPLE: 2155407

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	1000	100	80-120	

SAMPLE DUPLICATE: 2155408

Parameter	Units	60270506001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	800	897	11	10	D6

SAMPLE DUPLICATE: 2155409

Parameter	Units	60270510004 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	277	<5.0		10	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

QC Batch: 526317 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60270508001, 60270508002, 60270508003, 60270508004, 60270508005, 60270508006

METHOD BLANK: 2155429 Matrix: Water
Associated Lab Samples: 60270508001, 60270508002, 60270508003, 60270508004, 60270508005, 60270508006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<5.0	5.0	5.0	05/19/18 12:29	

LABORATORY CONTROL SAMPLE: 2155430

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	943	94	80-120	

SAMPLE DUPLICATE: 2155431

Parameter	Units	60270507006 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	530	554	4	10	

SAMPLE DUPLICATE: 2155432

Parameter	Units	60270508004 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	481	579	18	10	D6

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

QC Batch: 527490 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60270508001, 60270508002, 60270508003

METHOD BLANK: 2160723 Matrix: Water
Associated Lab Samples: 60270508001, 60270508002, 60270508003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Chloride	mg/L	<0.29	1.0	0.29	05/26/18 10:21	
Fluoride	mg/L	<0.19	0.20	0.19	05/26/18 10:21	

LABORATORY CONTROL SAMPLE: 2160724

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.9	98	90-110	
Fluoride	mg/L	2.5	2.6	104	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2160725 2160726

Parameter	Units	60270506001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Fluoride	mg/L	0.63	2.5	2.5	3.2	3.2	103	104	90-110	1	15	

MATRIX SPIKE SAMPLE: 2160727

Parameter	Units	60270507006 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Fluoride	mg/L	0.37	2.5	3.1	108	90-110	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

QC Batch: 527491 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60270508004, 60270508005, 60270508006, 60270510002, 60270510003

METHOD BLANK: 2160728 Matrix: Water
Associated Lab Samples: 60270508004, 60270508005, 60270508006, 60270510002, 60270510003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Chloride	mg/L	<0.29	1.0	0.29	05/26/18 21:02	
Fluoride	mg/L	<0.19	0.20	0.19	05/26/18 21:02	
Sulfate	mg/L	<0.24	1.0	0.24	05/26/18 21:02	

LABORATORY CONTROL SAMPLE: 2160729

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.9	97	90-110	
Fluoride	mg/L	2.5	2.5	101	90-110	
Sulfate	mg/L	5	5.0	101	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2160730 2160731

Parameter	Units	60270508004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Fluoride	mg/L	0.33	2.5	2.5	3.0	3.0	106	105	90-110	1	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

QC Batch: 527546 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60270508001, 60270508002

METHOD BLANK: 2161064 Matrix: Water
Associated Lab Samples: 60270508001, 60270508002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Sulfate	mg/L	<0.24	1.0	0.24	05/30/18 08:44	

LABORATORY CONTROL SAMPLE: 2161065

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	4.9	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2161066 2161067

Parameter	Units	60270506001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	495	250	250	709	727	85	93	90-110	2	15	M1

MATRIX SPIKE SAMPLE: 2161068

Parameter	Units	60270507006 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	55.8	25	78.3	90	90-110	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

QC Batch: 527547 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60270508003, 60270508004, 60270508005, 60270510002, 60270510003

METHOD BLANK: 2161069 Matrix: Water
Associated Lab Samples: 60270508003, 60270508004, 60270508005, 60270510002, 60270510003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Chloride	mg/L	<0.29	1.0	0.29	05/30/18 23:03	
Sulfate	mg/L	<0.24	1.0	0.24	05/30/18 23:03	

LABORATORY CONTROL SAMPLE: 2161070

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.6	93	90-110	
Sulfate	mg/L	5	4.9	98	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2161071 2161072

Parameter	Units	60270508004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	84.8	25	25	109	110	96	99	90-110	1	15	E
Sulfate	mg/L	45.3	25	25	68.9	69.6	94	97	90-110	1	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

ANALYTE QUALIFIERS

D6	The precision between the sample and sample duplicate exceeded laboratory control limits.
E	Analyte concentration exceeded the calibration range. The reported result is estimated.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: AMEREN SEC SCL4A
Pace Project No.: 60270508

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60270508001	S-TMW-1	EPA 200.7	526189	EPA 200.7	526234
60270508002	S-TMW-2	EPA 200.7	526189	EPA 200.7	526234
60270508003	S-TMW-3	EPA 200.7	526189	EPA 200.7	526234
60270508004	S-UG-3	EPA 200.7	526189	EPA 200.7	526234
60270508005	S-SCL4A-DUP-1	EPA 200.7	526189	EPA 200.7	526234
60270508006	S-SCL4A-FB-1	EPA 200.7	526189	EPA 200.7	526234
60270510002	S-BMW-1S	EPA 200.7	526189	EPA 200.7	526234
60270510003	S-BMW-3S	EPA 200.7	526189	EPA 200.7	526234
60270508001	S-TMW-1	SM 2320B	527256		
60270508002	S-TMW-2	SM 2320B	527256		
60270508003	S-TMW-3	SM 2320B	527256		
60270508004	S-UG-3	SM 2320B	527256		
60270508005	S-SCL4A-DUP-1	SM 2320B	527256		
60270508006	S-SCL4A-FB-1	SM 2320B	527256		
60270510002	S-BMW-1S	SM 2320B	526735		
60270510003	S-BMW-3S	SM 2320B	526735		
60270508001	S-TMW-1	SM 2540C	526317		
60270508002	S-TMW-2	SM 2540C	526317		
60270508003	S-TMW-3	SM 2540C	526317		
60270508004	S-UG-3	SM 2540C	526317		
60270508005	S-SCL4A-DUP-1	SM 2540C	526317		
60270508006	S-SCL4A-FB-1	SM 2540C	526317		
60270510002	S-BMW-1S	SM 2540C	526312		
60270510003	S-BMW-3S	SM 2540C	526312		
60270508001	S-TMW-1	EPA 300.0	527490		
60270508001	S-TMW-1	EPA 300.0	527546		
60270508002	S-TMW-2	EPA 300.0	527490		
60270508002	S-TMW-2	EPA 300.0	527546		
60270508003	S-TMW-3	EPA 300.0	527490		
60270508003	S-TMW-3	EPA 300.0	527547		
60270508004	S-UG-3	EPA 300.0	527491		
60270508004	S-UG-3	EPA 300.0	527547		
60270508005	S-SCL4A-DUP-1	EPA 300.0	527491		
60270508005	S-SCL4A-DUP-1	EPA 300.0	527547		
60270508006	S-SCL4A-FB-1	EPA 300.0	527491		
60270510002	S-BMW-1S	EPA 300.0	527491		
60270510002	S-BMW-1S	EPA 300.0	527547		
60270510003	S-BMW-3S	EPA 300.0	527491		
60270510003	S-BMW-3S	EPA 300.0	527547		

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Sample Condition Upon Receipt

WO# : 60270508

60270508

Client Name: Golder

Courier: FedEx ☐ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☒ Client ☐ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☐

Custody Seal on Cooler/Box Present: Yes ☒ No ☐ Seals intact: Yes ☒ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☒ Other ☐

Thermometer Used: 301 **Type of Ice:** (Wet) Blue None

Cooler Temperature (°C): **As-read** 1.0 **Corr. Factor** +1.0 **Corrected** 2.0

Date and initials of person examining contents: JB 5/16

Temperature should be above freezing to 6°C

Chain of Custody present:	☒Yes ☐No ☐N/A	
Chain of Custody relinquished:	☒Yes ☐No ☐N/A	
Samples arrived within holding time:	☒Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☐Yes ☒No ☐N/A	
Rush Turn Around Time requested:	☐Yes ☒No ☐N/A	
Sufficient volume:	☒Yes ☐No ☐N/A	
Correct containers used:	☒Yes ☐No ☐N/A	
Pace containers used:	☒Yes ☐No ☐N/A	
Containers intact:	☒Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☒N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☒N/A	
Sample labels match COC: Date / time / ID / analyses	☒Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☐Yes ☒No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	☒Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☐No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No	
Trip Blank present:	☐Yes ☐No ☒N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☒N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☒N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☒N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Jann Check 5/17/18

Project Manager Review: _____ Date: _____

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Golder Associates	Report To:	Mark Haddock (mhaddock@golder.com)	Attention:	
Address:	820 South Main Street, Suite 100	Copy To:	Jeffrey Ingram	Company Name:	
	St Charles, MO 63301		Ryan Feldmann	Address:	
Email To:	mhaddock@golder.com	Purchase Order No.:		Pace Quote Reference:	
Phone:	636-724-9191 Fax: 636-724-9323	Project Name:	Ameren SEC SCL4A	Pace Project Manager:	Jamie Church
Requested Due Date/TAT:	Standard	Project Number:	153-1406.0003H	Pace Profile #:	9285, line 3

REGULATORY AGENCY

NPDES | GROUND WATER | DRINKING WATER

UST | RCRA | OTHER ____

Site Location STATE: MO

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information — SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	Valid Matrix Codes MATRIX / CODE: DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WP; AR; OT; TS	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Metals*	Chloride/Fluoride/Sulfate	TDS	Alkalinity	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	S-TMW-1		WT	G			5/15/18	1340		2	1		1						✓	✓	✓	✓		6027 0508 BP2U 001
2	S-TMW-2							1500		1	1		1											BP3N 002
3	S-TMW-3							1625		1	1		1											003
4	S-UG-3							1500		6	3		3											(3)BP2U (3)BP3N 004
5	S-SCL4A-DUP-1							—		2	1		1											005
6	S-SCL4A-FB-1							1605		4	1		1											BP2U BP3N 006
7																									
8																									
9																									
10																									
11																									
12																									

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
*EPA 200.7: B, Ca, Mg, K, Na, Fe, Mn	Golder	5/15/18	1740		5/16	1320	2.0	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Ryan Feldmann

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY): 5/15/18

Pace Analytical
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Sample Condition Upon Receipt

WO# : 60270510

60270510

Client Name: Golder Associates

Courier: FedEx ☐ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☒ Client ☐ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☐

Custody Seal on Cooler/Box Present: Yes ☒ No ☐ Seals intact: Yes ☒ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☒ Other ☐

Thermometer Used: 301 **Type of Ice:** (Wet) Blue None

JLS

Cooler Temperature (°C): **As-read** 3.2 **Corr. Factor** +0.0 **Corrected** 4.2

Date and initials of person examining contents: JB 5/16

Temperature should be above freezing to 6°C

Chain of Custody present:	☒Yes ☐No ☐N/A	
Chain of Custody relinquished:	☒Yes ☐No ☐N/A	
Samples arrived within holding time:	☒Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☐Yes ☒No ☐N/A	
Rush Turn Around Time requested:	☐Yes ☒No ☐N/A	
Sufficient volume:	☒Yes ☐No ☐N/A	
Correct containers used:	☒Yes ☐No ☐N/A	
Pace containers used:	☒Yes ☐No ☐N/A	
Containers intact:	☒Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☒N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☒N/A	
Sample labels match COC: Date / time / ID / analyses	☒Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☐Yes ☒No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	☒Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☐No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No	
Trip Blank present:	☐Yes ☐No ☒N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☒N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☒N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☒N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Jann Chuck 5/17/18

Project Manager Review: _____ Date: _____

Pace Analytical
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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 2

Section A — Required Client Information:

Company:	Golder Associates
Address:	820 South Main Street, Suite 100
	St Charles, MO 63301
Email To:	maddock@golder.com
Phone: 636-724-9191	Fax: 636-724-9323
Requested Due Date/TAT:	Standard

Section B — Required Project Information:

Report To:	Mark Haddock (mhaddock@golder.com)
Copy To:	Jeffrey Ingram, Ryan Feldmann
Purchase Order No.:	
Project Name:	Ameren SEC SCPB
Project Number:	153-1406.0003F

Section C — Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Jamie Church
Pace Profile #:	9285, line 3

REGULATORY AGENCY

NPDES | GROUND WATER | DRINKING WATER

UST | RCRA | OTHER

Site Location — STATE: MO

Section D — Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
	WP
	AR
	OT
	TS

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Metals*	Chloride/Fluoride/Sulfate	TDS	Alkalinity	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	~~S-LMW-1S~~																							
2	S-LMW-2S	WT	G			5/15/18	1150		2	1		1							✓	✓		✓		60270510 001
3	~~S-LMW-3S~~																							
4	~~S-LMW-4S~~																							
5	~~S-LMW-5S~~																							
6	~~S-LMW-6S~~																							
7	~~S-LMW-7S~~																							
8	~~S-LMW-8S~~																							
9	~~S-LMW-9S~~																							
10	S-BMW-1S	WT	G			5/14/18	1215		2	1		1							✓	✓		✓		002
11	S-BMW-3S	WT	G			5/14/18	1025		2	1		1							✓	✓		✓		003
12	~~S-LMW-DUP-1~~																							

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
*EPA 200.7: B, Ca, Mg, Mn, K, Na, Fe	Golder	5/15/18	1740		5/16	0320	4.2	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Ryan Feldmann

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY): 5/15/18

CHAIN-OF-CUSTODY / Analytical Request Document

Pace Analytical www.pacelabs.com

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 2 of 2

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Golder Associates	Report To:	Mark Haddock (mhaddock@golder.com)	Attention:	
Address:	820 South Main Street, Suite 100	Copy To:	Jeffrey Ingram	Company Name:	
	St Charles, MO 63301		Ryan Feldmann	Address:	
Email To:	mhaddock@golder.com	Purchase Order No.:		Pace Quote Reference:	
Phone:	636-724-9191 Fax: 636-724-9323	Project Name:	Ameren SEC SCPB	Pace Project Manager:	Jamie Church
Requested Due Date/TAT:	Standard	Project Number:	153-1406.0003F	Pace Profile #:	9285, line 3

REGULATORY AGENCY

NPDES (GROUND WATER) DRINKING WATER

UST RCRA OTHER _____

Site Location STATE: MO

Valid Matrix Codes: DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS

ITEM #	Section D Required Client Information: SAMPLE ID (A-Z, 0-9 / , -) Sample IDs MUST BE UNIQUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Requested Analysis Filtered (Y/N): Y/N	Analysis Test: Metals*	Chloride/Fluoride/Sulfate	TDS	Alkalinity	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	~~S-LMW-DUP-2~~ SCPB						1145																	
2	S-~~LMW~~-FB-1	WT	G			5/15/16	~~1150~~ RF		2	1								✓	✓	✓	✓			60270510 BP2N BP3N2 004
3	S-LMW-FB-2																							
4																								
5																								
6																								
7																								
8																								
9																								
10																								
11																								
12																								

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
*EPA 200.7, B, Ca, Mg, Mn, K, Na, Fe	Golder	5/15/16	1740		5/16	0320	4.2	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Ryan Feldmann

SIGNATURE of SAMPLER: _____ DATE Signed (MM/DD/YY): 5/15/16

MEMORANDUM

DATE January 15, 2019 **Project No.** 1531406

TO Project File
Golder Associates

CC

FROM Tommy Goodwin **EMAIL tgoodwin@golder.com**

DATA VALIDATION SUMMARY: AMEREN – SIOUX ENERGY CENTER – GROUNDWATER MONITORING – DATA PACKAGE 60270508

The following is a summary of instances where quality control criteria in the functional guidelines were not met and data qualification was required:

- When analytes exceeded the recovery criteria for MS/MSD of a sample, the sample result was not qualified on MS/MSD data alone.
- When a compound was detected in a sample result between the MDL and the PQL the results were recorded at the detection value and qualified as estimates (J).
- When a compound was detected in a blank (i.e. method, field, rinsate), and the sample results were greater than the MDL and less than the PQL the results were recorded at the PQL value and qualified as non-detects (U). When a compound was detected in a blank (i.e. method, field, rinsate), and the sample results were greater than the PQL and less than ten times the blank results the results were recorded at the result value and qualified as estimates (J).
- When a sample or field duplicate RPD was not met, associated samples were qualified as estimates (J). If the results were less than the MDL (MDC for radionuclide analysis) or detected in a blank below the PQL the results were qualified as non-detects and estimates (UJ).

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13515 Barrett Parkway Drive, Suite 260,
Ballwin, Missouri, USA 63021

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QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Company Name: Golder Associates
Project Name: Ameren - SEC- SCL4A- May 2018
Reviewer: T Goodwin

Project Manager: J Ingram
Project Number: 1531406
Validation Date: 1/15/19

Laboratory: Pace Analytical (T2)
SDG #: 60270508 (T2)
Analytical Method (type and no.): Metals (200.7~~&200.8~~), ~~Hg (245.1)~~, Alk (SM 2320B), TDS (SM 2540C), ~~Fe (SM 3500-Fe B)~~, Anions (300.0), ~~P (365.4)~~, ~~Ra (903.1&904.0)~~ (T2)
Matrix: ☐ Air ☐ Soil/Sed. ☒ Water ☐ Waste ☐
Sample Names S-TMW-1, S-TMW-2, S-TMW-3, S-UG-3, S-BMW-1S, S-BMW-3S, S-SCL4A-DUP-1, S-SCL4A-FB-1

NOTE: Please provide calculation in Comment areas or on the back (if on the back please indicate in comment areas).

Field Information	YES	NO	NA	COMMENTS
a) Sampling dates noted?	☒	☐	☐	5/14-15/18
b) Sampling team indicated?	☒	☐	☐	
c) Sample location noted?	☒	☐	☐	
d) Sample depth indicated (Soils)?	☐	☐	☒	
e) Sample type indicated (grab/composite)?	☒	☐	☐	Grab
f) Field QC noted?	☒	☐	☐	
g) Field parameters collected (note types)?	☒	☐	☐	pH, Cond, Turb, Temp, DO, ORP, Q, DTW
h) Field Calibration within control limits?	☒	☐	☐	
i) Notations of unacceptable field conditions/performances from field logs or field notes?	☐	☒	☐	
j) Does the laboratory narrative indicate deficiencies?	☐	☐	☒	

Note Deficiencies:

Chain-of-Custody (COC)	YES	NO	NA	COMMENTS
a) Was the COC properly completed?	☒	☐	☐	
b) Was the COC signed by both field and laboratory personnel?	☒	☐	☐	
c) Were samples received in good condition?	☒	☐	☐	

General (reference QAPP or Method)	YES	NO	NA	COMMENTS
a) Were hold times met for sample pretreatment?	☐	☐	☒	
b) Were hold times met for sample analysis?	☑	☐	☐	
c) Were the correct preservatives used?	☒	☐	☐	
d) Was the correct method used?	☒	☐	☐	
e) Were appropriate reporting limits achieved?	☒	☐	☐	
f) Were any sample dilutions noted?	☑	☐	☐	
g) Were any matrix problems noted?	☑	☐	☐	

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Blanks	YES	NO	NA	COMMENTS
a) Were analytes detected in the method blank(s)?	☐	☑	☐	
b) Were analytes detected in the field blank(s)?	☑	☐	☐	FB-1: TDS(22)
c) Were analytes detected in the equipment blank(s)?	☐	☐	☒	
d) Were analytes detected in the trip blank(s)?	☐	☐	☒	

Laboratory Control Sample (LCS)	YES	NO	NA	COMMENTS
a) Was a LCS analyzed once per SDG?	☒	☐	☐	
b) Were the proper analytes included in the LCS?	☒	☐	☐	
c) Was the LCS accuracy criteria met?	☑	☐	☐	

Duplicates	YES	NO	NA	COMMENTS
a) Were field duplicates collected (note original and duplicate sample names)?				Dup-1@ TMW-2
	☑	☐	☐	FB-1@ TMW-3
b) Were field dup. precision criteria met (note RPD)?	☐	☑	☐	DUP-1: TDS(24)
c) Were lab duplicates analyzed (note original and duplicate samples)?				
	☒	☐	☐	
d) Were lab dup. precision criteria met (note RPD)?	☐	☑	☐	[800's] TDS(18)

Blind Standards	YES	NO	NA	COMMENTS
a) Was a blind standard used (indicate name, analytes included and concentrations)?	☐	☐	☒	
b) Was the %D within control limits?	☐	☐	☒	

Matrix Spike/Matrix Spike Duplicate (MS/MSD)	YES	NO	NA	COMMENTS
a) Was MS accuracy criteria met?	☐	☑	☐	Ca, Cl
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☒	
b) Was MSD accuracy criteria met?	☐	☑	☐	Ca, SO_4^{2-}, Cl^-
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☒	
c) Were MS/MSD precision criteria met?	☑	☐	☐	

Comments/Notes:

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Data Qualification:

Sample Name	Constituent(s)	Result	Qualifier	Reason
S-TMW-2	Total Dissolved Solids (TDS)	721	J	RPD exceeded limits; Result > MDL
S-SCL4A-DUP-1	〃	567	J	〃 〃
S-TMW-3	〃	485	J	Detected in Field Blank (FB); 10x FB > Result > PQL

Signature: Tommy J. Good Jr. Date: 1/15/19

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

July 16, 2018

Mark Haddock
Golder Associates
820 S. Main St
Suite 100
Saint Charles, MO 63301

RE: Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

Dear Mark Haddock:
Enclosed are the analytical results for sample(s) received by the laboratory on July 07, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jamie Church
jamie.church@pacelabs.com
314-838-7223
Project Manager

Enclosures

cc: Ryan Feldmann, Golder
Jeffrey Ingram, Golder Associates
John Suozzi, Golder Associates

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CERTIFICATIONS

Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Certification Number: 10090
WY STR Certification #: 2456.01
Arkansas Certification #: 17-016-0
Illinois Certification #: 200030
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407
Utah Certification #: KS00021
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070
Missouri Certification Number: 10090

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SAMPLE SUMMARY

Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60274322001	**S-TMW-2**	Water	07/05/18 13:15	07/07/18 03:10
60274322002	**S-UG-3**	Water	07/06/18 10:35	07/07/18 03:10

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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(913)599-5665

SAMPLE ANALYTE COUNT

Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60274322001	**S-TMW-2**	SM 2540C	JDA	1	PASI-K
		EPA 300.0	OL	1	PASI-K
60274322002	**S-UG-3**	EPA 300.0	OL	1	PASI-K

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ANALYTICAL RESULTS

Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

Sample: S-TMW-2 **Lab ID: 60274322001** Collected: 07/05/18 13:15 Received: 07/07/18 03:10 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**484**	mg/L	5.0	5.0	1		07/10/18 13:07		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**51.7**	mg/L	5.0	1.2	5		07/15/18 18:18	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

Sample: S-UG-3 **Lab ID: 60274322002** Collected: 07/06/18 10:35 Received: 07/07/18 03:10 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**81.0**	mg/L	10.0	4.6	10		07/15/18 18:31	16887-00-6	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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QUALITY CONTROL DATA

Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

QC Batch: 533628 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60274322001

METHOD BLANK: 2185372 Matrix: Water
Associated Lab Samples: 60274322001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<5.0	5.0	5.0	07/10/18 13:07	

LABORATORY CONTROL SAMPLE: 2185373

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	992	99	80-120	

SAMPLE DUPLICATE: 2185374

Parameter	Units	60274226005 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	578	567	2	10	

SAMPLE DUPLICATE: 2185375

Parameter	Units	60274277002 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	2120	2200	3	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

QC Batch: 534438 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60274322001, 60274322002

METHOD BLANK: 2189085 Matrix: Water
Associated Lab Samples: 60274322001, 60274322002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Chloride	mg/L	<0.46	1.0	0.46	07/15/18 12:33	
Sulfate	mg/L	<0.24	1.0	0.24	07/15/18 12:33	

LABORATORY CONTROL SAMPLE: 2189086

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.8	96	90-110	
Sulfate	mg/L	5	5.0	100	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2189087 2189088

Parameter	Units	60274099003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	18.9	5	5	24.7	24.7	114	115	90-110	0	15	E,M1
Sulfate	mg/L	321	100	100	418	422	97	101	90-110	1	15	E

MATRIX SPIKE SAMPLE: 2189089

Parameter	Units	60274126003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	14.8	5	20.5	113	90-110	E,M1
Sulfate	mg/L	83.7	50	133	99	90-110	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

ANALYTE QUALIFIERS

E	Analyte concentration exceeded the calibration range. The reported result is estimated.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: SCL4A AMEREN MO CCR MONITORING
Pace Project No.: 60274322

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60274322001	**S-TMW-2**	SM 2540C	533628		
60274322001	**S-TMW-2**	EPA 300.0	534438		
60274322002	**S-UG-3**	EPA 300.0	534438		

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Sample Condition Upon Receipt

WO# : 60274322

60274322

Client Name: Golder Associates

Courier: FedEx ☐ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☑ Client ☐ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☑

Custody Seal on Cooler/Box Present: Yes ☑ No ☐ Seals intact: Yes ☑ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☑ Other ☐

Thermometer Used: T-297 **Type of Ice:** (Wet) Blue None

Cooler Temperature (°C): **As-read** -0.5 **Corr. Factor** +0.9 **Corrected** 0.4

Date and initials of person examining contents: HE 7/7

Temperature should be above freezing to 6°C

Chain of Custody present:	☑Yes ☐No ☐N/A	
Chain of Custody relinquished:	☑Yes ☐No ☐N/A	
Samples arrived within holding time:	☑Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☐Yes ☑No ☐N/A	
Rush Turn Around Time requested:	☐Yes ☑No ☐N/A	
Sufficient volume:	☑Yes ☐No ☐N/A	
Correct containers used:	☑Yes ☐No ☐N/A	
Pace containers used:	☑Yes ☐No ☐N/A	
Containers intact:	☑Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☑N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☑N/A	
Sample labels match COC: Date / time / ID / analyses	☑Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☐Yes ☑No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	☑Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☑No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☑No	
Trip Blank present:	☐Yes ☐No ☑N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☑N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☑N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☑N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: Jami Check 7/9/18 Date: _____

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www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

Section A Required Client Information:

Company:	Golder Associates
Address:	820 South Main Street, Suite 100
	St Charles, MO 63301
Email To:	maddock@golder.com
Phone: 636-724-9191	Fax: 636-724-9323
Requested Due Date/TAT:	Standard

Section B Required Project Information:

Report To:	Mark Haddock (mhaddock@golder.com)
Copy To:	Jeffrey Ingram, Ryan Feldman
Purchase Order No.:	
Project Name:	SCL4A Ameren MSCR Monitoring
Project Number	1531406.0003

Section C Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Jamie Church
Pace Profile #:	9285

REGULATORY AGENCY

☐ NPDES ☑ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: MO

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
	WP
	AR
	OT
	TS

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Boron	Calcium	Chloride	Fluoride	Sulfate	TDS			Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
																		Y/N	N	N	N	N	N	N				
1	S-TMW-2	WT	G			07/5/18	1315		2	1		1											✓	✓		BP2U	BP3N	60274322 w1
2	S-U6-3	WT	G			07/6/18	1035		1	1		1									✓					↓	↓	60273 w2
3		WT	G																									
4		WT	G																									
5		WT	G																									
6		WT	G																									
7		WT	G																									
8		WT	G																									
9		WT	G																									
10		WT	G																									
11		WT	G																									
12		WT	G																									

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	[signature] Golder	07/6/18	1615	[signature] PACE	7/6/18	1615				
	[signature] PACE	7/6/18	1700	[signature] Golder pos1	7/7/18	03:10	0.4	Y	Y	Y

SAMPLER NAME AND SIGNATURE		Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER:	Eric Schneider				
SIGNATURE of SAMPLER:	[signature]				
DATE Signed (MM/DD/YY):	07/06/18				

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.08, 12-Oct-2007

MEMORANDUM

DATE August 20, 2018 **Project No.** 1531406

TO Project File
Golder Associates

CC Amanda Derhake, Jeff Ingram

FROM Tommy Goodwin **EMAIL Tommy_Goodwin@golder.com**

DATA VALIDATION SUMMARY, SIOUX ENERGY CENTER – SCL4A – AMEREN GROUNDWATER – DATA PACKAGE 60274322

The following is a summary of instances where quality control criteria in the functional guidelines were not met and data qualification was required:

- Chloride and Sulfate were outside the recovery criteria range for MS/MSD. Data was not qualified on MS/MSD data alone.
- Reported results with high levels of non-target analytes or other matrix interference were analyzed at dilution and qualified as dilution (D).

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Ballwin, Missouri, USA 63021

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QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Company Name: Golder Associates
Project Name: Ameren – SCYLA-VS2
Reviewer: T Goodwin

Project Manager: J Ingram
Project Number: 1531406
Validation Date: 8/20/18

Laboratory: Pace Analytical
SDG #: 60274322
Analytical Method (type and no.): SM 2540C (TDS), EPA 300.0 (Anions)
Matrix: ☐ Air ☐ Soil/Sed. ☒ Water ☐ Waste ☐
Sample Names S-TMW-2, S-UG-3

NOTE: Please provide calculation in Comment areas or on the back (if on the back please indicate in comment areas).

Field Information	YES	NO	NA	COMMENTS
a) Sampling dates noted?	☒	☐	☐	
b) Sampling team indicated?	☒	☐	☐	
c) Sample location noted?	☒	☐	☐	
d) Sample depth indicated (Soils)?	☐	☐	☒	
e) Sample type indicated (grab/composite)?	☒	☐	☐	Grab
f) Field QC noted?	☒	☐	☐	
g) Field parameters collected (note types)?	☒	☐	☐	pH, Cond, Turb, Temp, DO, ORP, Flow, DTW
h) Field Calibration within control limits?	☒	☐	☐	
i) Notations of unacceptable field conditions/performances from field logs or field notes?	☐	☒	☐	
j) Does the laboratory narrative indicate deficiencies?	☐	☐	☒	

Note Deficiencies:

Chain-of-Custody (COC)	YES	NO	NA	COMMENTS
a) Was the COC properly completed?	☒	☐	☐	
b) Was the COC signed by both field and laboratory personnel?	☒	☐	☐	
c) Were samples received in good condition?	☒	☐	☐	

General (reference QAPP or Method)	YES	NO	NA	COMMENTS
a) Were hold times met for sample pretreatment?	☐	☐	☒	
b) Were hold times met for sample analysis?	☑	☐	☐	
c) Were the correct preservatives used?	☒	☐	☐	
d) Was the correct method used?	☒	☐	☐	
e) Were appropriate reporting limits achieved?	☒	☐	☐	
f) Were any sample dilutions noted?	☑	☐	☐	Sulfate, Chloride
g) Were any matrix problems noted?	☐	☐	☐	Cl^-, SO_4^{2-}

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Blanks	YES	NO	NA	COMMENTS
a) Were analytes detected in the method blank(s)?	☐	☑	☐	
b) Were analytes detected in the field blank(s)?	☐	☐	☑	
c) Were analytes detected in the equipment blank(s)?	☐	☐	☒	
d) Were analytes detected in the trip blank(s)?	☐	☐	☒	

Laboratory Control Sample (LCS)	YES	NO	NA	COMMENTS
a) Was a LCS analyzed once per SDG?	☒	☐	☐	
b) Were the proper analytes included in the LCS?	☒	☐	☐	
c) Was the LCS accuracy criteria met?	☑	☐	☐	

Duplicates	YES	NO	NA	COMMENTS
a) Were field duplicates collected (note original and duplicate sample names)?				Dup-1@ NA
	☒ TR	☑	☐	FB-1@ NA
b) Were field dup. precision criteria met (note RPD)?	☐	☐	☑	
c) Were lab duplicates analyzed (note original and duplicate samples)?				
	☒	☐	☐	
d) Were lab dup. precision criteria met (note RPD)?	☑	☐	☐	

Blind Standards	YES	NO	NA	COMMENTS
a) Was a blind standard used (indicate name, analytes included and concentrations)?	☐	☐	☒	
b) Was the %D within control limits?	☐	☐	☒	

Matrix Spike/Matrix Spike Duplicate (MS/MSD)	YES	NO	NA	COMMENTS
a) Was MS accuracy criteria met?	☐	☑	☐	Cl^-, ~~SO4~~ TR
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☒	
b) Was MSD accuracy criteria met?	☐	☑	☐	Cl^-, ~~SO4~~ TR
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☒	
c) Were MS/MSD precision criteria met?	☑	☐	☐	

Comments/Notes:

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Data Qualification:

Sample Name	Constituent(s)	Result	Qualifier	Reason
S-TMW-2	Sulfate	51.7	D	Analyzed @ dilution
S-UG-3	Chloride	81.0	J	J

Signature: Tommy J. Hood Jr. Date: 8/20/2018

Pace Analytical Services, LLC
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January 24, 2019

Mark Haddock
Golder Associates
820 S. Main St
Suite 100
Saint Charles, MO 63301

RE: Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Dear Mark Haddock:
Enclosed are the analytical results for sample(s) received by the laboratory between November 13, 2018 and November 15, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

REV-2, 1/14/19: Metals list trimmed.

REV-2A, 1/24/19: Project name revised.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jamie Church
jamie.church@pacelabs.com
314-838-7223
Project Manager

Enclosures

cc: Ryan Feldmann, Golder
Jeffrey Ingram, Golder Associates
Eric Schneider, Golder Associates

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CERTIFICATIONS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
Arkansas Drinking Water
Missouri Certification Number: 10090
WY STR Certification #: 2456.01
Arkansas Certification #: 18-016-0
Arkansas Drinking Water
Illinois Certification #: 004455
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116 / E10426
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407-18-11
Utah Certification #: KS000212018-8
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070
Missouri Certification Number: 10090

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SAMPLE SUMMARY

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60287003001	**S-TMW-1**	Water	11/14/18 09:40	11/15/18 10:00
60287003002	**S-TMW-2**	Water	11/14/18 10:50	11/15/18 10:00
60287003003	**S-TMW-3**	Water	11/14/18 11:50	11/15/18 10:00
60287003004	**S-UG-3**	Water	11/14/18 12:50	11/15/18 10:00
60287003005	**S-SCL4A-DUP-1**	Water	11/14/18 09:40	11/15/18 10:00
60287003006	**S-SCL4A-FB-1**	Water	11/14/18 10:45	11/15/18 10:00
60286568001	**S-BMW-1S**	Water	11/12/18 13:45	11/13/18 03:47
60286568002	**S-BMW-3S**	Water	11/12/18 11:05	11/13/18 03:47

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SAMPLE ANALYTE COUNT

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60287003001	**S-TMW-1**	EPA 200.7	EMR	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDF	1	PASI-K
		SM 3500-Fe B#4	ZMH	1	PASI-K
		SM 3500-Fe B#4	RMT	1	PASI-K
		EPA 300.0	WNM	3	PASI-K
		EPA 365.4	LDB	1	PASI-K
60287003002	**S-TMW-2**	EPA 200.7	EMR	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDF	1	PASI-K
		SM 3500-Fe B#4	ZMH	1	PASI-K
		SM 3500-Fe B#4	RMT	1	PASI-K
		EPA 300.0	WNM	3	PASI-K
		EPA 365.4	LDB	1	PASI-K
60287003003	**S-TMW-3**	EPA 200.7	EMR	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDF	1	PASI-K
		SM 3500-Fe B#4	ZMH	1	PASI-K
		SM 3500-Fe B#4	RMT	1	PASI-K
		EPA 300.0	WNM	3	PASI-K
		EPA 365.4	LDB	1	PASI-K
60287003004	**S-UG-3**	EPA 200.7	EMR	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDF	1	PASI-K
		SM 3500-Fe B#4	ZMH	1	PASI-K
		SM 3500-Fe B#4	RMT	1	PASI-K
		EPA 300.0	WNM	3	PASI-K
		EPA 365.4	LDB	1	PASI-K
60287003005	**S-SCL4A-DUP-1**	EPA 200.7	EMR	7	PASI-K
		SM 2320B	LDB	1	PASI-K
		SM 2540C	LDF	1	PASI-K
		SM 3500-Fe B#4	ZMH	1	PASI-K
		SM 3500-Fe B#4	RMT	1	PASI-K
		EPA 300.0	WNM	3	PASI-K
		EPA 365.4	LDB	1	PASI-K
60287003006	**S-SCL4A-FB-1**	EPA 200.7	EMR	7	PASI-K
		SM 2320B	LDB	1	PASI-K

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SAMPLE ANALYTE COUNT

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		SM 2540C	LDF	1	PASI-K
		SM 3500-Fe B#4	ZMH	1	PASI-K
		SM 3500-Fe B#4	RMT	1	PASI-K
		EPA 300.0	WNM	3	PASI-K
		EPA 365.4	LDB	1	PASI-K
60286568001	**S-BMW-1S**	EPA 200.7	EMR	7	PASI-K
		SM 2320B	ZMH	1	PASI-K
		SM 2540C	RLG	1	PASI-K
		SM 3500-Fe B#4	LDB	1	PASI-K
		SM 3500-Fe B#4	RMT	1	PASI-K
		EPA 300.0	WNM	3	PASI-K
		EPA 365.4	BLA	1	PASI-K
60286568002	**S-BMW-3S**	EPA 200.7	EMR	7	PASI-K
		SM 2320B	ZMH	1	PASI-K
		SM 2540C	RLG	1	PASI-K
		SM 3500-Fe B#4	LDB	1	PASI-K
		SM 3500-Fe B#4	RMT	1	PASI-K
		EPA 300.0	WNM	3	PASI-K
		EPA 365.4	BLA	1	PASI-K

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ANALYTICAL RESULTS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Sample: S-TMW-1 **Lab ID: 60287003001** Collected: 11/14/18 09:40 Received: 11/15/18 10:00 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**69.5J**	ug/L	100	12.5	1	11/30/18 10:47	11/30/18 21:57	7440-42-8	
Calcium	**96400**	ug/L	200	53.5	1	11/30/18 10:47	11/30/18 21:57	7440-70-2	
Iron	**86.9**	ug/L	50.0	6.1	1	11/30/18 10:47	11/30/18 21:57	7439-89-6	B
Magnesium	**17000**	ug/L	50.0	14.0	1	11/30/18 10:47	11/30/18 21:57	7439-95-4	
Manganese	**373**	ug/L	5.0	0.73	1	11/30/18 10:47	11/30/18 21:57	7439-96-5	
Potassium	**4960**	ug/L	500	79.3	1	11/30/18 10:47	11/30/18 21:57	7440-09-7	
Sodium	**3330**	ug/L	500	157	1	11/30/18 10:47	11/30/18 21:57	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**275**	mg/L	20.0	4.9	1		11/28/18 12:55		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**334**	mg/L	5.0	5.0	1		11/19/18 10:30		
Iron, Ferric (Calculation)	Analytical Method: SM 3500-Fe B#4								
Iron, Ferric	**0.086**	mg/L	0.050	0.012	1		12/03/18 14:25	7439-89-6	
Iron, Ferrous	Analytical Method: SM 3500-Fe B#4								
Iron, Ferrous	**<0.012**	mg/L	0.20	0.012	1		11/17/18 11:02		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**2.9**	mg/L	1.0	0.29	1		12/06/18 16:59	16887-00-6	
Fluoride	**0.40**	mg/L	0.20	0.19	1		12/06/18 16:59	16984-48-8	
Sulfate	**46.1**	mg/L	5.0	1.2	5		12/08/18 00:57	14808-79-8	
365.4 Total Phosphorus	Analytical Method: EPA 365.4								
Phosphorus	**0.050J**	mg/L	0.10	0.050	1		11/24/18 12:33	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Sample: S-TMW-2 **Lab ID: 60287003002** Collected: 11/14/18 10:50 Received: 11/15/18 10:00 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**81.4J**	ug/L	100	12.5	1	11/30/18 10:47	11/30/18 22:00	7440-42-8	
Calcium	**131000**	ug/L	200	53.5	1	11/30/18 10:47	11/30/18 22:00	7440-70-2	
Iron	**889**	ug/L	50.0	6.1	1	11/30/18 10:47	11/30/18 22:00	7439-89-6	
Magnesium	**23200**	ug/L	50.0	14.0	1	11/30/18 10:47	11/30/18 22:00	7439-95-4	
Manganese	**470**	ug/L	5.0	0.73	1	11/30/18 10:47	11/30/18 22:00	7439-96-5	
Potassium	**5980**	ug/L	500	79.3	1	11/30/18 10:47	11/30/18 22:00	7440-09-7	
Sodium	**3800**	ug/L	500	157	1	11/30/18 10:47	11/30/18 22:00	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**370**	mg/L	20.0	4.9	1		11/28/18 13:00		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**414**	mg/L	5.0	5.0	1		11/19/18 10:30		
Iron, Ferric (Calculation)	Analytical Method: SM 3500-Fe B#4								
Iron, Ferric	**0.86**	mg/L	0.050	0.012	1		12/03/18 14:26	7439-89-6	
Iron, Ferrous	Analytical Method: SM 3500-Fe B#4								
Iron, Ferrous	**0.028J**	mg/L	0.20	0.012	1		11/17/18 11:02		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**2.9**	mg/L	1.0	0.29	1		12/06/18 17:28	16887-00-6	
Fluoride	**0.36**	mg/L	0.20	0.19	1		12/06/18 17:28	16984-48-8	
Sulfate	**49.8**	mg/L	5.0	1.2	5		12/08/18 01:40	14808-79-8	
365.4 Total Phosphorus	Analytical Method: EPA 365.4								
Phosphorus	**0.11**	mg/L	0.10	0.050	1		11/24/18 12:35	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Sample: S-TMW-3 **Lab ID: 60287003003** Collected: 11/14/18 11:50 Received: 11/15/18 10:00 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**87.4J**	ug/L	100	12.5	1	11/30/18 10:47	11/30/18 22:02	7440-42-8	
Calcium	**137000**	ug/L	200	53.5	1	11/30/18 10:47	11/30/18 22:02	7440-70-2	
Iron	**2280**	ug/L	50.0	6.1	1	11/30/18 10:47	11/30/18 22:02	7439-89-6	
Magnesium	**24500**	ug/L	50.0	14.0	1	11/30/18 10:47	11/30/18 22:02	7439-95-4	
Manganese	**695**	ug/L	5.0	0.73	1	11/30/18 10:47	11/30/18 22:02	7439-96-5	
Potassium	**6420**	ug/L	500	79.3	1	11/30/18 10:47	11/30/18 22:02	7440-09-7	
Sodium	**5670**	ug/L	500	157	1	11/30/18 10:47	11/30/18 22:02	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**390**	mg/L	20.0	4.9	1		11/28/18 13:06		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**457**	mg/L	5.0	5.0	1		11/19/18 10:30		
Iron, Ferric (Calculation)	Analytical Method: SM 3500-Fe B#4								
Iron, Ferric	**2.2**	mg/L	0.050	0.012	1		12/03/18 14:27	7439-89-6	
Iron, Ferrous	Analytical Method: SM 3500-Fe B#4								
Iron, Ferrous	**0.10J**	mg/L	0.20	0.012	1		11/17/18 11:03		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**2.4**	mg/L	1.0	0.29	1		12/06/18 17:56	16887-00-6	
Fluoride	**<0.19**	mg/L	0.20	0.19	1		12/01/18 11:11	16984-48-8	
Sulfate	**51.3**	mg/L	5.0	1.2	5		12/01/18 11:59	14808-79-8	
365.4 Total Phosphorus	Analytical Method: EPA 365.4								
Phosphorus	**0.15**	mg/L	0.10	0.050	1		11/24/18 12:36	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Sample: S-UG-3 **Lab ID: 60287003004** Collected: 11/14/18 12:50 Received: 11/15/18 10:00 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**425**	ug/L	100	12.5	1	11/30/18 10:47	11/30/18 22:04	7440-42-8	
Calcium	**129000**	ug/L	200	53.5	1	11/30/18 10:47	11/30/18 22:04	7440-70-2	M1
Iron	**7.3J**	ug/L	50.0	6.1	1	11/30/18 10:47	11/30/18 22:04	7439-89-6	B
Magnesium	**23300**	ug/L	50.0	14.0	1	11/30/18 10:47	11/30/18 22:04	7439-95-4	
Manganese	**545**	ug/L	5.0	0.73	1	11/30/18 10:47	11/30/18 22:04	7439-96-5	
Potassium	**6300**	ug/L	500	79.3	1	11/30/18 10:47	11/30/18 22:04	7440-09-7	
Sodium	**40800**	ug/L	500	157	1	11/30/18 10:47	11/30/18 22:04	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**365**	mg/L	20.0	4.9	1		11/28/18 13:10		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**575**	mg/L	5.0	5.0	1		11/19/18 10:30		
Iron, Ferric (Calculation)	Analytical Method: SM 3500-Fe B#4								
Iron, Ferric	**<0.012**	mg/L	0.050	0.012	1		12/03/18 14:32	7439-89-6	
Iron, Ferrous	Analytical Method: SM 3500-Fe B#4								
Iron, Ferrous	**<0.012**	mg/L	0.20	0.012	1		11/17/18 11:03		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**67.0**	mg/L	5.0	1.4	5		12/01/18 13:03	16887-00-6	M1
Fluoride	**0.21**	mg/L	0.20	0.19	1		12/01/18 12:15	16984-48-8	
Sulfate	**63.9**	mg/L	5.0	1.2	5		12/01/18 13:03	14808-79-8	
365.4 Total Phosphorus	Analytical Method: EPA 365.4								
Phosphorus	**<0.050**	mg/L	0.10	0.050	1		11/24/18 12:37	7723-14-0	M1

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Sample: S-SCL4A-DUP-1 **Lab ID: 60287003005** Collected: 11/14/18 09:40 Received: 11/15/18 10:00 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**74.5J**	ug/L	100	12.5	1	11/30/18 10:47	11/30/18 22:10	7440-42-8	
Calcium	**97900**	ug/L	200	53.5	1	11/30/18 10:47	11/30/18 22:10	7440-70-2	
Iron	**80.2**	ug/L	50.0	6.1	1	11/30/18 10:47	11/30/18 22:10	7439-89-6	B
Magnesium	**17300**	ug/L	50.0	14.0	1	11/30/18 10:47	11/30/18 22:10	7439-95-4	
Manganese	**365**	ug/L	5.0	0.73	1	11/30/18 10:47	11/30/18 22:10	7439-96-5	
Potassium	**5100**	ug/L	500	79.3	1	11/30/18 10:47	11/30/18 22:10	7440-09-7	
Sodium	**3450**	ug/L	500	157	1	11/30/18 10:47	11/30/18 22:10	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**265**	mg/L	20.0	4.9	1		11/28/18 13:20		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**341**	mg/L	5.0	5.0	1		11/19/18 10:30		
Iron, Ferric (Calculation)	Analytical Method: SM 3500-Fe B#4								
Iron, Ferric	**0.080**	mg/L	0.050	0.012	1		12/03/18 14:32	7439-89-6	
Iron, Ferrous	Analytical Method: SM 3500-Fe B#4								
Iron, Ferrous	**<0.012**	mg/L	0.20	0.012	1		11/17/18 11:04		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**2.4**	mg/L	1.0	0.29	1		12/01/18 13:51	16887-00-6	
Fluoride	**0.25**	mg/L	0.20	0.19	1		12/01/18 13:51	16984-48-8	
Sulfate	**46.0**	mg/L	5.0	1.2	5		12/01/18 14:07	14808-79-8	
365.4 Total Phosphorus	Analytical Method: EPA 365.4								
Phosphorus	**<0.050**	mg/L	0.10	0.050	1		11/24/18 12:41	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Sample: S-SCL4A-FB-1 **Lab ID: 60287003006** Collected: 11/14/18 10:45 Received: 11/15/18 10:00 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**<12.5**	ug/L	100	12.5	1	11/30/18 10:47	11/30/18 22:13	7440-42-8	
Calcium	**<53.5**	ug/L	200	53.5	1	11/30/18 10:47	11/30/18 22:13	7440-70-2	
Iron	**<6.1**	ug/L	50.0	6.1	1	11/30/18 10:47	11/30/18 22:13	7439-89-6	
Magnesium	**<14.0**	ug/L	50.0	14.0	1	11/30/18 10:47	11/30/18 22:13	7439-95-4	
Manganese	**<0.73**	ug/L	5.0	0.73	1	11/30/18 10:47	11/30/18 22:13	7439-96-5	
Potassium	**<79.3**	ug/L	500	79.3	1	11/30/18 10:47	11/30/18 22:13	7440-09-7	
Sodium	**<157**	ug/L	500	157	1	11/30/18 10:47	11/30/18 22:13	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**<4.9**	mg/L	20.0	4.9	1		11/28/18 13:23		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**<5.0**	mg/L	5.0	5.0	1		11/19/18 10:30		
Iron, Ferric (Calculation)	Analytical Method: SM 3500-Fe B#4								
Iron, Ferric	**<0.012**	mg/L	0.050	0.012	1		12/03/18 14:32	7439-89-6	
Iron, Ferrous	Analytical Method: SM 3500-Fe B#4								
Iron, Ferrous	**<0.012**	mg/L	0.20	0.012	1		11/17/18 11:05		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**<0.29**	mg/L	1.0	0.29	1		12/01/18 14:23	16887-00-6	
Fluoride	**<0.19**	mg/L	0.20	0.19	1		12/01/18 14:23	16984-48-8	
Sulfate	**<0.24**	mg/L	1.0	0.24	1		12/01/18 14:23	14808-79-8	
365.4 Total Phosphorus	Analytical Method: EPA 365.4								
Phosphorus	**<0.050**	mg/L	0.10	0.050	1		11/24/18 12:42	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Sample: S-BMW-1S **Lab ID: 60286568001** Collected: 11/12/18 13:45 Received: 11/13/18 03:47 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**72.9J**	ug/L	100	12.5	1	11/28/18 15:52	11/28/18 20:48	7440-42-8	
Calcium	**157000**	ug/L	200	53.5	1	11/28/18 15:52	11/28/18 20:48	7440-70-2	
Iron	**13.8J**	ug/L	50.0	6.1	1	11/28/18 15:52	11/28/18 20:48	7439-89-6	B
Magnesium	**29000**	ug/L	50.0	14.0	1	11/28/18 15:52	11/28/18 20:48	7439-95-4	
Manganese	**607**	ug/L	5.0	0.73	1	11/28/18 15:52	11/28/18 20:48	7439-96-5	
Potassium	**580**	ug/L	500	79.3	1	11/28/18 15:52	11/28/18 20:48	7440-09-7	B
Sodium	**5600**	ug/L	500	157	1	11/28/18 15:52	11/28/18 20:48	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**464**	mg/L	20.0	4.9	1		11/20/18 12:32		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**556**	mg/L	5.0	5.0	1		11/16/18 10:25		
Iron, Ferric (Calculation)	Analytical Method: SM 3500-Fe B#4								
Iron, Ferric	**0.014J**	mg/L	0.050		1		11/29/18 16:43	7439-89-6	
Iron, Ferrous	Analytical Method: SM 3500-Fe B#4								
Iron, Ferrous	**<0.012**	mg/L	0.20	0.012	1		11/17/18 10:33		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**6.7**	mg/L	1.0	0.29	1		11/27/18 22:16	16887-00-6	
Fluoride	**0.34**	mg/L	0.20	0.19	1		11/27/18 22:16	16984-48-8	
Sulfate	**28.8**	mg/L	2.0	0.48	2		11/27/18 22:32	14808-79-8	
365.4 Total Phosphorus	Analytical Method: EPA 365.4								
Phosphorus	**0.50**	mg/L	0.10	0.050	1		11/15/18 11:48	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Sample: S-BMW-3S **Lab ID: 60286568002** Collected: 11/12/18 11:05 Received: 11/13/18 03:47 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Boron	**61.5J**	ug/L	100	12.5	1	11/28/18 15:52	11/28/18 20:50	7440-42-8	
Calcium	**124000**	ug/L	200	53.5	1	11/28/18 15:52	11/28/18 20:50	7440-70-2	
Iron	**57.5**	ug/L	50.0	6.1	1	11/28/18 15:52	11/28/18 20:50	7439-89-6	B
Magnesium	**21400**	ug/L	50.0	14.0	1	11/28/18 15:52	11/28/18 20:50	7439-95-4	
Manganese	**400**	ug/L	5.0	0.73	1	11/28/18 15:52	11/28/18 20:50	7439-96-5	
Potassium	**772**	ug/L	500	79.3	1	11/28/18 15:52	11/28/18 20:50	7440-09-7	B
Sodium	**5070**	ug/L	500	157	1	11/28/18 15:52	11/28/18 20:50	7440-23-5	
2320B Alkalinity	Analytical Method: SM 2320B								
Alkalinity, Total as CaCO3	**368**	mg/L	20.0	4.9	1		11/20/18 12:37		
2540C Total Dissolved Solids	Analytical Method: SM 2540C								
Total Dissolved Solids	**436**	mg/L	5.0	5.0	1		11/16/18 10:25		
Iron, Ferric (Calculation)	Analytical Method: SM 3500-Fe B#4								
Iron, Ferric	**0.057**	mg/L	0.050		1		11/29/18 16:43	7439-89-6	
Iron, Ferrous	Analytical Method: SM 3500-Fe B#4								
Iron, Ferrous	**<0.012**	mg/L	0.20	0.012	1		11/17/18 10:34		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Chloride	**10.1**	mg/L	1.0	0.29	1		11/27/18 22:48	16887-00-6	
Fluoride	**0.36**	mg/L	0.20	0.19	1		11/27/18 22:48	16984-48-8	
Sulfate	**25.6**	mg/L	2.0	0.48	2		11/27/18 23:04	14808-79-8	
365.4 Total Phosphorus	Analytical Method: EPA 365.4								
Phosphorus	**0.23**	mg/L	0.10	0.050	1		11/15/18 11:49	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 557225 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 Metals, Total
Associated Lab Samples: 60286568001, 60286568002

METHOD BLANK: 2286038 Matrix: Water
Associated Lab Samples: 60286568001, 60286568002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Boron	ug/L	<12.5	100	12.5	11/28/18 20:44	
Calcium	ug/L	<53.5	200	53.5	11/28/18 20:44	
Iron	ug/L	8.6J	50.0	6.1	11/28/18 20:44	
Magnesium	ug/L	<14.0	50.0	14.0	11/28/18 20:44	
Manganese	ug/L	<0.73	5.0	0.73	11/28/18 20:44	
Potassium	ug/L	179J	500	79.3	11/28/18 20:44	
Sodium	ug/L	<157	500	157	11/28/18 20:44	

LABORATORY CONTROL SAMPLE: 2286039

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	1000	917	92	85-115	
Calcium	ug/L	10000	9880	99	85-115	
Iron	ug/L	10000	9860	99	85-115	
Magnesium	ug/L	10000	9400	94	85-115	
Manganese	ug/L	1000	916	92	85-115	
Potassium	ug/L	10000	10100	101	85-115	
Sodium	ug/L	10000	10300	103	85-115	

MATRIX SPIKE SAMPLE: 2286040

Parameter	Units	60286569002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	47.3J	1000	985	94	70-130	
Calcium	ug/L	108000	10000	118000	98	70-130	
Iron	ug/L	7630	10000	17500	99	70-130	
Magnesium	ug/L	23600	10000	32900	93	70-130	
Manganese	ug/L	459	1000	1360	90	70-130	
Potassium	ug/L	3640	10000	13800	102	70-130	
Sodium	ug/L	6500	10000	16800	103	70-130	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2286041 2286042

Parameter	Units	60286571003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L	70.3J	1000	1000	1020	1030	95	96	70-130	1	20	
Calcium	ug/L	274000	10000	10000	289000	288000	150	133	70-130	1	20	M1
Iron	ug/L	17400	10000	10000	27700	27600	103	102	70-130	0	20	

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2286041 2286042

Parameter	Units	60286571003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Magnesium	ug/L	68900	10000	10000	79200	79200	103	103	70-130	0	20	
Manganese	ug/L	1160	1000	1000	2080	2090	92	93	70-130	0	20	
Potassium	ug/L	6110	10000	10000	16400	16500	103	104	70-130	1	20	
Sodium	ug/L	20700	10000	10000	31300	31300	106	105	70-130	0	20	

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 557642 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 Metals, Total
Associated Lab Samples: 60287003001, 60287003002, 60287003003, 60287003004, 60287003005, 60287003006

METHOD BLANK: 2287717 Matrix: Water
Associated Lab Samples: 60287003001, 60287003002, 60287003003, 60287003004, 60287003005, 60287003006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Boron	ug/L	<12.5	100	12.5	11/30/18 21:51	
Calcium	ug/L	<53.5	200	53.5	11/30/18 21:51	
Iron	ug/L	16.0J	50.0	6.1	11/30/18 21:51	
Magnesium	ug/L	<14.0	50.0	14.0	11/30/18 21:51	
Manganese	ug/L	2.4J	5.0	0.73	11/30/18 21:51	
Potassium	ug/L	141J	500	79.3	11/30/18 21:51	
Sodium	ug/L	<157	500	157	11/30/18 21:51	

LABORATORY CONTROL SAMPLE: 2287718

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	1000	917	92	85-115	
Calcium	ug/L	10000	10500	105	85-115	
Iron	ug/L	10000	10500	105	85-115	
Magnesium	ug/L	10000	9850	99	85-115	
Manganese	ug/L	1000	905	91	85-115	
Potassium	ug/L	10000	10700	107	85-115	
Sodium	ug/L	10000	10900	109	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2287719 2287720

Parameter	Units	60287003004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L	425	1000	1000	1390	1340	97	92	70-130	3	20	
Calcium	ug/L	129000	10000	10000	144000	138000	157	95	70-130	4	20	M1
Iron	ug/L	7.3J	10000	10000	10300	9830	103	98	70-130	5	20	
Magnesium	ug/L	23300	10000	10000	33900	32700	106	94	70-130	4	20	
Manganese	ug/L	545	1000	1000	1450	1430	91	89	70-130	2	20	
Potassium	ug/L	6300	10000	10000	16900	16100	106	98	70-130	5	20	
Sodium	ug/L	40800	10000	10000	52900	50700	121	99	70-130	4	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2287721 2287722

Parameter	Units	60287011001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L	163	1000	1000	1080	1080	92	92	70-130	0	20	
Calcium	ug/L	75300	10000	10000	83200	83400	78	81	70-130	0	20	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2287721 2287722

Parameter	Units	60287011001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Iron	ug/L	843	10000	10000	11100	11200	102	103	70-130	1	20	
Magnesium	ug/L	21300	10000	10000	30400	30300	91	90	70-130	0	20	
Manganese	ug/L	114	1000	1000	987	986	87	87	70-130	0	20	
Potassium	ug/L	5490	10000	10000	15600	15700	101	103	70-130	1	20	
Sodium	ug/L	15200	10000	10000	25500	25600	102	103	70-130	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2287723 2287724

Parameter	Units	60287013001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L		1000	1000	1460	1470	93	93	70-130	0	20	
Calcium	ug/L		10000	10000	88500	89900	91	105	70-130	2	20	
Iron	ug/L		10000	10000	10400	10400	104	104	70-130	0	20	
Magnesium	ug/L		10000	10000	29400	29600	93	95	70-130	1	20	
Manganese	ug/L		1000	1000	940	937	88	88	70-130	0	20	
Potassium	ug/L		10000	10000	17100	17200	103	104	70-130	1	20	
Sodium	ug/L		10000	10000	43500	44000	102	106	70-130	1	20	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 556192 Analysis Method: SM 2320B
QC Batch Method: SM 2320B Analysis Description: 2320B Alkalinity
Associated Lab Samples: 60286568001, 60286568002

METHOD BLANK: 2282069 Matrix: Water
Associated Lab Samples: 60286568001, 60286568002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Alkalinity, Total as CaCO3	mg/L	<4.9	20.0	4.9	11/20/18 10:40	

LABORATORY CONTROL SAMPLE: 2282070

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	mg/L	500	513	103	90-110	

SAMPLE DUPLICATE: 2282071

Parameter	Units	60286215025 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	mg/L	58.8	64.8	10	10	

SAMPLE DUPLICATE: 2282072

Parameter	Units	60286372001 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	mg/L		545	2	10	

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 557213 Analysis Method: SM 2320B
QC Batch Method: SM 2320B Analysis Description: 2320B Alkalinity
Associated Lab Samples: 60287003001, 60287003002, 60287003003, 60287003004, 60287003005, 60287003006

METHOD BLANK: 2286022 Matrix: Water
Associated Lab Samples: 60287003001, 60287003002, 60287003003, 60287003004, 60287003005, 60287003006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Alkalinity, Total as CaCO3	mg/L	<4.9	20.0	4.9	11/28/18 12:45	

LABORATORY CONTROL SAMPLE: 2286023

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	mg/L	500	496	99	90-110	

SAMPLE DUPLICATE: 2286024

Parameter	Units	60287003004 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	mg/L	365	368	1	10	

SAMPLE DUPLICATE: 2286025

Parameter	Units	60287132005 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	mg/L	86.9	84.7	3	10	

SAMPLE DUPLICATE: 2286026

Parameter	Units	60287257002 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO3	mg/L	11.1J	11.0J		10	

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 555505 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60286568001, 60286568002

METHOD BLANK: 2278841 Matrix: Water
Associated Lab Samples: 60286568001, 60286568002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<5.0	5.0	5.0	11/16/18 10:25	

LABORATORY CONTROL SAMPLE: 2278842

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	991	99	80-120	

SAMPLE DUPLICATE: 2278843

Parameter	Units	60286668009 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	498	503	1	10	

SAMPLE DUPLICATE: 2278845

Parameter	Units	60286571003 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	1280	1290	0	10	

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 555802 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60287003001, 60287003002, 60287003003

METHOD BLANK: 2280445 Matrix: Water
Associated Lab Samples: 60287003001, 60287003002, 60287003003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<5.0	5.0	5.0	11/19/18 10:30	

LABORATORY CONTROL SAMPLE: 2280446

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	986	99	80-120	

SAMPLE DUPLICATE: 2280447

Parameter	Units	60286571009 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	540	425	24	10	D6

SAMPLE DUPLICATE: 2280448

Parameter	Units	60287078003 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	989	1030	4	10	

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 555805 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60287003004, 60287003005, 60287003006

METHOD BLANK: 2280475 Matrix: Water
Associated Lab Samples: 60287003004, 60287003005, 60287003006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<5.0	5.0	5.0	11/19/18 10:30	

LABORATORY CONTROL SAMPLE: 2280476

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	997	100	80-120	

SAMPLE DUPLICATE: 2280477

Parameter	Units	60287003004 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	575	594	3	10	

SAMPLE DUPLICATE: 2280482

Parameter	Units	60287011001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	348	273	24	10	D6

SAMPLE DUPLICATE: 2280487

Parameter	Units	60287013001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L		294	16	10	D6

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 555661 Analysis Method: SM 3500-Fe B#4
QC Batch Method: SM 3500-Fe B#4 Analysis Description: Iron, Ferrous
Associated Lab Samples: 60286568001, 60286568002

METHOD BLANK: 2279572 Matrix: Water
Associated Lab Samples: 60286568001, 60286568002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Iron, Ferrous	mg/L	<0.012	0.20	0.012	11/17/18 10:32	H6

LABORATORY CONTROL SAMPLE: 2279573

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Iron, Ferrous	mg/L	2	2.0	100	90-110	H6

SAMPLE DUPLICATE: 2279574

Parameter	Units	60286571003 Result	Dup Result	RPD	Max RPD	Qualifiers
Iron, Ferrous	mg/L	0.048J	0.048J		20	H6

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 555663 Analysis Method: SM 3500-Fe B#4
QC Batch Method: SM 3500-Fe B#4 Analysis Description: Iron, Ferrous
Associated Lab Samples: 60287003001, 60287003002, 60287003003, 60287003004, 60287003005, 60287003006

METHOD BLANK: 2279582 Matrix: Water
Associated Lab Samples: 60287003001, 60287003002, 60287003003, 60287003004, 60287003005, 60287003006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Iron, Ferrous	mg/L	<0.012	0.20	0.012	11/17/18 10:59	H6

LABORATORY CONTROL SAMPLE: 2279583

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Iron, Ferrous	mg/L	2	2.0	100	90-110	H6

SAMPLE DUPLICATE: 2279584

Parameter	Units	60287003004 Result	Dup Result	RPD	Max RPD	Qualifiers
Iron, Ferrous	mg/L	<0.012	<0.012		20	H6

SAMPLE DUPLICATE: 2279585

Parameter	Units	60287011001 Result	Dup Result	RPD	Max RPD	Qualifiers
Iron, Ferrous	mg/L	<0.012	<0.012		20	H6

SAMPLE DUPLICATE: 2279586

Parameter	Units	60287013001 Result	Dup Result	RPD	Max RPD	Qualifiers
Iron, Ferrous	mg/L		<0.012		20	H6

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 557070 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60286568001, 60286568002

METHOD BLANK: 2285634 Matrix: Water
Associated Lab Samples: 60286568001, 60286568002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Chloride	mg/L	<0.29	1.0	0.29	11/27/18 18:48	
Fluoride	mg/L	<0.19	0.20	0.19	11/27/18 18:48	
Sulfate	mg/L	<0.24	1.0	0.24	11/27/18 18:48	

LABORATORY CONTROL SAMPLE: 2285635

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.7	95	90-110	
Fluoride	mg/L	2.5	2.5	100	90-110	
Sulfate	mg/L	5	4.9	98	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2285636 2285637

Parameter	Units	60286803001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	2990	2500	2500	5700	5570	108	103	90-110	2	15	
Fluoride	mg/L	ND	1250	1250	1230	1230	94	95	90-110	0	15	
Sulfate	mg/L	4350	2500	2500	7140	6960	112	104	90-110	3	15	M1

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 557820 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60287003003, 60287003004, 60287003005, 60287003006

METHOD BLANK: 2288554 Matrix: Water
Associated Lab Samples: 60287003001, 60287003002, 60287003003, 60287003004, 60287003005, 60287003006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Chloride	mg/L	<0.29	1.0	0.29	12/01/18 02:25	
Fluoride	mg/L	<0.19	0.20	0.19	12/01/18 02:25	
Sulfate	mg/L	<0.24	1.0	0.24	12/01/18 02:25	

LABORATORY CONTROL SAMPLE: 2288555

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	10	9.5	95	90-110	
Fluoride	mg/L	5	5.0	100	90-110	
Sulfate	mg/L	10	9.7	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2288556 2288557

Parameter	Units	60287003004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	67.0	25	25	96.8	92.4	119	102	90-110	5	15	M1
Fluoride	mg/L	0.21	2.5	2.5	2.7	2.7	100	101	90-110	0	15	
Sulfate	mg/L	63.9	25	25	90.6	89.0	107	100	90-110	2	15	

MATRIX SPIKE SAMPLE: 2288558

Parameter	Units	60287011001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	21.8	25	46.4	98	90-110	
Fluoride	mg/L	0.19J	2.5	2.7	101	90-110	
Sulfate	mg/L	63.4	25	90.5	108	90-110	

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REPORT OF LABORATORY ANALYSIS

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(913)599-5665

QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 557949 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60287003001, 60287003002, 60287003003

METHOD BLANK: 2289235 Matrix: Water
Associated Lab Samples: 60287003001, 60287003002, 60287003003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Chloride	mg/L	<0.29	1.0	0.29	12/06/18 15:48	
Fluoride	mg/L	<0.19	0.20	0.19	12/06/18 15:48	

LABORATORY CONTROL SAMPLE: 2289236

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	10	11.0	110	90-110	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 558975 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60287003001, 60287003002

METHOD BLANK: 2293707 Matrix: Water
Associated Lab Samples: 60287003001, 60287003002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Sulfate	mg/L	<0.24	1.0	0.24	12/07/18 22:49	

LABORATORY CONTROL SAMPLE: 2293708

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	5.0	100	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2293709 2293710

Parameter	Units	60287773001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	6060	2500	2500	8430	8400	95	94	90-110	0	15	

MATRIX SPIKE SAMPLE: 2293711

Parameter	Units	60287013001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L		50	113	102	90-110	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 554984 Analysis Method: EPA 365.4
QC Batch Method: EPA 365.4 Analysis Description: 365.4 Phosphorus
Associated Lab Samples: 60286568001, 60286568002

METHOD BLANK: 2276694 Matrix: Water
Associated Lab Samples: 60286568001, 60286568002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Phosphorus	mg/L	<0.050	0.10	0.050	11/15/18 11:25	

LABORATORY CONTROL SAMPLE: 2276695

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	2	1.9	96	90-110	

MATRIX SPIKE SAMPLE: 2276696

Parameter	Units	60286318019 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	0.18	2	2.1	98	90-110	

MATRIX SPIKE SAMPLE: 2276698

Parameter	Units	60286571003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	0.28	2	2.3	100	90-110	

SAMPLE DUPLICATE: 2276697

Parameter	Units	60286372001 Result	Dup Result	RPD	Max RPD	Qualifiers
Phosphorus	mg/L		<0.050		10	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

QC Batch: 556504 Analysis Method: EPA 365.4
QC Batch Method: EPA 365.4 Analysis Description: 365.4 Phosphorus
Associated Lab Samples: 60287003001, 60287003002, 60287003003, 60287003004, 60287003005, 60287003006

METHOD BLANK: 2283253 Matrix: Water
Associated Lab Samples: 60287003001, 60287003002, 60287003003, 60287003004, 60287003005, 60287003006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Phosphorus	mg/L	<0.050	0.10	0.050	11/24/18 12:09	

LABORATORY CONTROL SAMPLE: 2283254

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	2	1.8	90	90-110	

MATRIX SPIKE SAMPLE: 2283255

Parameter	Units	60286897001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	0.21	2	1.9	86	90-110	M1

MATRIX SPIKE SAMPLE: 2283257

Parameter	Units	60287003004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	<0.050	2	1.8	88	90-110	M1

SAMPLE DUPLICATE: 2283256

Parameter	Units	60286899002 Result	Dup Result	RPD	Max RPD	Qualifiers
Phosphorus	mg/L	ND	0.059J		10	

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REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

ANALYTE QUALIFIERS

B	Analyte was detected in the associated method blank.
D6	The precision between the sample and sample duplicate exceeded laboratory control limits.
H6	Analysis initiated outside of the 15 minute EPA required holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60286568001	**S-BMW-1S**	EPA 200.7	557225	EPA 200.7	557391
60286568002	**S-BMW-3S**	EPA 200.7	557225	EPA 200.7	557391
60287003001	**S-TMW-1**	EPA 200.7	557642	EPA 200.7	557772
60287003002	**S-TMW-2**	EPA 200.7	557642	EPA 200.7	557772
60287003003	**S-TMW-3**	EPA 200.7	557642	EPA 200.7	557772
60287003004	**S-UG-3**	EPA 200.7	557642	EPA 200.7	557772
60287003005	**S-SCL4A-DUP-1**	EPA 200.7	557642	EPA 200.7	557772
60287003006	**S-SCL4A-FB-1**	EPA 200.7	557642	EPA 200.7	557772
60286568001	**S-BMW-1S**	SM 2320B	556192		
60286568002	**S-BMW-3S**	SM 2320B	556192		
60287003001	**S-TMW-1**	SM 2320B	557213		
60287003002	**S-TMW-2**	SM 2320B	557213		
60287003003	**S-TMW-3**	SM 2320B	557213		
60287003004	**S-UG-3**	SM 2320B	557213		
60287003005	**S-SCL4A-DUP-1**	SM 2320B	557213		
60287003006	**S-SCL4A-FB-1**	SM 2320B	557213		
60286568001	**S-BMW-1S**	SM 2540C	555505		
60286568002	**S-BMW-3S**	SM 2540C	555505		
60287003001	**S-TMW-1**	SM 2540C	555802		
60287003002	**S-TMW-2**	SM 2540C	555802		
60287003003	**S-TMW-3**	SM 2540C	555802		
60287003004	**S-UG-3**	SM 2540C	555805		
60287003005	**S-SCL4A-DUP-1**	SM 2540C	555805		
60287003006	**S-SCL4A-FB-1**	SM 2540C	555805		
60286568001	**S-BMW-1S**	SM 3500-Fe B#4	557638		
60286568002	**S-BMW-3S**	SM 3500-Fe B#4	557638		
60287003001	**S-TMW-1**	SM 3500-Fe B#4	558081		
60287003002	**S-TMW-2**	SM 3500-Fe B#4	558081		
60287003003	**S-TMW-3**	SM 3500-Fe B#4	558081		
60287003004	**S-UG-3**	SM 3500-Fe B#4	558081		
60287003005	**S-SCL4A-DUP-1**	SM 3500-Fe B#4	558081		
60287003006	**S-SCL4A-FB-1**	SM 3500-Fe B#4	558081		
60286568001	**S-BMW-1S**	SM 3500-Fe B#4	555661		
60286568002	**S-BMW-3S**	SM 3500-Fe B#4	555661		
60287003001	**S-TMW-1**	SM 3500-Fe B#4	555663		
60287003002	**S-TMW-2**	SM 3500-Fe B#4	555663		
60287003003	**S-TMW-3**	SM 3500-Fe B#4	555663		
60287003004	**S-UG-3**	SM 3500-Fe B#4	555663		
60287003005	**S-SCL4A-DUP-1**	SM 3500-Fe B#4	555663		
60287003006	**S-SCL4A-FB-1**	SM 3500-Fe B#4	555663		
60286568001	**S-BMW-1S**	EPA 300.0	557070		
60286568002	**S-BMW-3S**	EPA 300.0	557070		
60287003001	**S-TMW-1**	EPA 300.0	557949		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: AMEREN SIOUX SCL4A
Pace Project No.: 60287003

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60287003001	**S-TMW-1**	EPA 300.0	558975		
60287003002	**S-TMW-2**	EPA 300.0	557949		
60287003002	**S-TMW-2**	EPA 300.0	558975		
60287003003	**S-TMW-3**	EPA 300.0	557820		
60287003003	**S-TMW-3**	EPA 300.0	557949		
60287003004	**S-UG-3**	EPA 300.0	557820		
60287003005	**S-SCL4A-DUP-1**	EPA 300.0	557820		
60287003006	**S-SCL4A-FB-1**	EPA 300.0	557820		
60286568001	**S-BMW-1S**	EPA 365.4	554984		
60286568002	**S-BMW-3S**	EPA 365.4	554984		
60287003001	**S-TMW-1**	EPA 365.4	556504		
60287003002	**S-TMW-2**	EPA 365.4	556504		
60287003003	**S-TMW-3**	EPA 365.4	556504		
60287003004	**S-UG-3**	EPA 365.4	556504		
60287003005	**S-SCL4A-DUP-1**	EPA 365.4	556504		
60287003006	**S-SCL4A-FB-1**	EPA 365.4	556504		

Pace Analytical®
www.pacelabs.com

Sample Condition Upon Receipt

WO# : 60287003

60287003

Client Name: Golder

Courier: FedEx ☐ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☒ Client ☐ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☐

Custody Seal on Cooler/Box Present: Yes ☒ No ☐ Seals intact: Yes ☒ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☒ Other ☐

Thermometer Used: 301 **Type of Ice:** (Wet) Blue None

Cooler Temperature (°C): **As-read** 3.0 4.2 **Corr. Factor** +0.0 **Corrected** 3.0 4.2

JLS

Date and initials of person examining contents: JS 11/16

Temperature should be above freezing to 6°C

Chain of Custody present:	☒Yes ☐No ☐N/A	
Chain of Custody relinquished:	☒Yes ☐No ☐N/A	
Samples arrived within holding time:	☒Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☒Yes ☐No ☐N/A	Fe2+
Rush Turn Around Time requested:	☐Yes ☒No ☐N/A	
Sufficient volume:	☒Yes ☐No ☐N/A	
Correct containers used:	☒Yes ☐No ☐N/A	
Pace containers used:	☒Yes ☐No ☐N/A	
Containers intact:	☒Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☒N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☒N/A	
Sample labels match COC: Date / time / ID / analyses	☒Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☐Yes ☒No ☐N/A	
Containers requiring pH preservation in compliance? ☒Yes ☐No ☐N/A (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)		List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only) Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No ☐Yes ☐No	
Trip Blank present:	☐Yes ☐No ☒N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☒N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☒N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☒N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Jann Church 11/16/18

Project Manager Review: _____ Date: _____

CHAIN-OF-CUSTODY / Analytical Request Document

Pace Analytical™ www.pacelabs.com

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

Section A Required Client Information:

Company:	Golder Associates
Address:	13515 Barrett Parkway Drive, Ste 260
	Ballwin, MO 63021
Email To:	maddock@golder.com
Phone: 636-724-9191	Fax: 636-724-9323
Requested Due Date/TAT:	Standard

Section B Required Project Information:

Report To:	Mark Haddock (mhaddock@golder.com)
Copy To:	Jeffrey Ingram
Purchase Order No.:	
Project Name:	Ameren Sioux EC ~~SCCP~~ SCL4A
Project Number:	153-1406.0003G (COC ~~#1~~ 19

Section C Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Jamie Church
Pace Profile #:	9285

REGULATORY AGENCY

NPDES | GROUND WATER | DRINKING WATER

UST | RCRA | OTHER _____

Site Location STATE: MO

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes: DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WP; AR; OT; TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Metals*	Chloride/Fluoride/Sulfate	TDS	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	~~S-UG-1A~~ S-TMW-1	WT	G			11/14/18	0940		4	2	1	1						✓	✓	✓	(2) BP2U BP3S BP3N		60287003
2	~~S-UG-2~~ S-TMW-2	WT	G				1050		1	1	1	1						1	1	1			
3	~~S-DG-1~~ S-TMW-3	WT	G				1150		1	1	1	1						1	1	1			
4	~~S-DG-2~~ S-UG-3	WT	G				1250		12	6	3	3						1	1	1	(6) BP2U (3) BP3S (3) BP3N		MS/MSD @ S-UG-3
5	~~S-DG-3~~	WT	G																				
6	~~S-DG-4~~	WT	G																				
7	S-SCL4A ~~S-SCPC~~-DUP-1	WT	G			11/14/18	—		4	2	1	1						✓	✓	✓	(2) BP2U BP3S BP3N		
8	S-SCL4A ~~S-SCPC~~-FB-1	WT	G			1	1045		1	1	1	2						1	1	1			
9	~~S-BMW-1S~~	WT	G																				
10	~~S-BMW-3S~~	WT	G																				
11		WT	G																				
12		WT	G																				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
*EPA 200.7: B, Ca	Golder /	11/14/18	1750		11/15/18	1000	3.8	Y	Y	Y
							4.2	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Eric Schneider

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 11/14/18

001 002 003 004 005 006

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: / of /

Section A Required Client Information:

Company:	Golder Associates
Address:	13515 Barrett Parkway Drive, Ste 260
	Ballwin, MO 63021
Email To:	maddock@golder.com
Phone: 636-724-9191	Fax: 636-724-9323
Requested Due Date/TAT:	Standard

Section B Required Project Information:

Report To:	Mark Haddock (mhaddock@golder.com)
Copy To:	Jeffrey Ingram
Purchase Order No.:	
Project Name:	Ameren Sioux EC [redacted] SCL4A
Project Number:	153-1406.0003L (COC [redacted] 20

Section C Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Jamie Church
Pace Profile #:	9285

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER _____

Site Location STATE: MO

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
	WP
	AR
	OT
	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Y/N	Analysis Test: Metals*	Alkalinity	Total Phosphorus	Ferrous Iron	Ferric Iron	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	~~S-UG-1A~~ S-TMW-1	WT	G			11/14/18	0940		4	2	1	1						N	✓	✓	✓	✓	✓		
2	~~S-UG-2~~ S-TMW-2	WT	G			"	1050		"	"	"	"						N	✓	✓	✓	✓	✓		
3	~~S-DG-1~~ S-TMW-3	WT	G			"	1150		"	"	"	"						N	✓	✓	✓	✓	✓		
4	~~S-DG-2~~ S-UG-3	WT	G			"	1250		12	6	3	3						N	✓	✓	✓	✓	✓		MS/MSD Collected @ UG-3
5	~~S-DG-3~~	WT	G															N							
6	~~S-DG-4~~	WT	G															N							
7	S-SCL4A ~~S-SCPG-~~DUP-1	WT	G			11/14/18	—		4	2	1	1						N							
8	S-SCL4A ~~S-SCPG-~~FB-1	WT	G			"	1045		"	"	"	"						N							
9	~~S-BMW-1S~~	WT	G															N							
10	~~S-BMW-3S~~	WT	G															N							
11		WT	G															N							
12		WT	G															N							

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
*EPA 200.7: Ba, Li, Mo, Fe, Mg, Mn, K, Na *EPA 200.8: As	Golder/	11/14/18	1750				

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Eric Schneider

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 11/14/18

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

MEMORANDUM

DATE January 15, 2019 **Project No.** 1531406

TO Project File
Golder Associates

CC

FROM Tommy Goodwin **EMAIL tgoodwin@golder.com**

DATA VALIDATION SUMMARY: AMEREN – SIOUX ENERGY CENTER – GROUNDWATER MONITORING – DATA PACKAGE 60287003R2

The following is a summary of instances where quality control criteria in the functional guidelines were not met and data qualification was required:

- When analytes exceeded the recovery criteria for MS/MSD of a sample, the sample result was not qualified on MS/MSD data alone.
- When a compound was detected in a sample result between the MDL and the PQL the results were recorded at the detection value and qualified as estimates (J).
- Analysis of Ferrous Iron for all samples was initiated outside of the 15-minute EPA required holding time, the detections in samples were qualified as estimates (J) or non-detect and estimates (UJ).
- When a compound was detected in a blank (i.e. method, field, rinsate), and the sample results were greater than the MDL and less than the PQL the results were recorded at the PQL value and qualified as non-detects (U). When a compound was detected in a blank (i.e. method, field, rinsate), and the sample results were greater than the PQL and less than ten times the blank results the results were recorded at the result value and qualified as estimates (J).
- When a sample or field duplicate RPD was not met, associated samples were qualified as estimates (J). If the results were less than the MDL (MDC for radionuclide analysis) or detected in a blank below the PQL the results were qualified as non-detects and estimates (UJ).

Golder Associates Inc.
13515 Barrett Parkway Drive, Suite 260,
Ballwin, Missouri, USA 63021
T: +1 314 984-8800 F: +1 314 984-8770

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Company Name: Golder Associates
Project Name: Ameren - SEC-SCL4A - DM - Nov 2018
Reviewer: T Goodwin

Project Manager: J Ingram
Project Number: 1531406
Validation Date: 4/15/19

Laboratory: Pace Analytical (12)
SDG #: 60287003r2 (12)
Analytical Method (type and no.): Metals (200.7&~~200.8~~), ~~Hg (7470)~~, Alk (SM 2320B), TDS (SM 2540C), Fe (SM 3500-Fe B#4), Anions (300.0), P (365.4), ~~Ra (903.1&904.0)~~
Matrix: ☐ Air ☐ Soil/Sed. ☒ Water ☐ Waste ☐
Sample Names S-TMW-1, S-TMW-2, S-TMW-3, S-UG-3, S-BMW-1S, S-BMW-3S, S-SCL4A-DUP-1, S-SCL4A-FB-1

NOTE: Please provide calculation in Comment areas or on the back (if on the back please indicate in comment areas).

Field Information	YES	NO	NA	COMMENTS
a) Sampling dates noted?	☒	☐	☐	11/12/18 - 11/14/18
b) Sampling team indicated?	☒	☐	☐	
c) Sample location noted?	☒	☐	☐	
d) Sample depth indicated (Soils)?	☐	☐	☒	
e) Sample type indicated (grab/composite)?	☒	☐	☐	Grab
f) Field QC noted?	☒	☐	☐	
g) Field parameters collected (note types)?	☒	☐	☐	pH, Cond, Turb, Temp, DO, ORP, Q, DTW
h) Field Calibration within control limits?	☒	☐	☐	
i) Notations of unacceptable field conditions/performances from field logs or field notes?	☐	☒	☐	
j) Does the laboratory narrative indicate deficiencies?	☐	☐	☒	

Note Deficiencies:

Chain-of-Custody (COC)	YES	NO	NA	COMMENTS
a) Was the COC properly completed?	☒	☐	☐	
b) Was the COC signed by both field and laboratory personnel?	☒	☐	☐	
c) Were samples received in good condition?	☒	☐	☐	

General (reference QAPP or Method)	YES	NO	NA	COMMENTS
a) Were hold times met for sample pretreatment?	☐	☐	☒	
b) Were hold times met for sample analysis?	☒	☐	☐	Fe 2+
c) Were the correct preservatives used?	☒	☐	☐	
d) Was the correct method used?	☒	☐	☐	
e) Were appropriate reporting limits achieved?	☒	☐	☐	
f) Were any sample dilutions noted?	☒	☐	☐	
g) Were any matrix problems noted?	☒	☐	☐	

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Blanks	YES	NO	NA	COMMENTS
a) Were analytes detected in the method blank(s)?	☑	☐	☐	[8001-02] Fe (8.6), K (17a)
b) Were analytes detected in the field blank(s)?	☐	☑	☐	[3001-06] Fe (16.0), Mn (2.4), K (141)
c) Were analytes detected in the equipment blank(s)?	☐	☐	☒	
d) Were analytes detected in the trip blank(s)?	☐	☐	☒	

Laboratory Control Sample (LCS)	YES	NO	NA	COMMENTS
a) Was a LCS analyzed once per SDG?	☒	☐	☐	
b) Were the proper analytes included in the LCS?	☒	☐	☐	
c) Was the LCS accuracy criteria met?	☑	☐	☐	

Duplicates	YES	NO	NA	COMMENTS
a) Were field duplicates collected (note original and duplicate sample names)?				Dup-1@ TMW-1
	☑	☐	☐	FB-1@ TMW-2
b) Were field dup. precision criteria met (note RPD)?	☐	☑	☐	F⁻(46), P(200)
c) Were lab duplicates analyzed (note original and duplicate samples)?				
	☒	☐	☐	
d) Were lab dup. precision criteria met (note RPD)?	☑	☐	☐	

Blind Standards	YES	NO	NA	COMMENTS
a) Was a blind standard used (indicate name, analytes included and concentrations)?	☐	☐	☒	
b) Was the %D within control limits?	☐	☐	☒	

Matrix Spike/Matrix Spike Duplicate (MS/MSD)	YES	NO	NA	COMMENTS
a) Was MS accuracy criteria met?	☐	☑	☐	Ca, SO_4^{2-}, Cl⁻, P,
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☒	
b) Was MSD accuracy criteria met?	☐	☑	☐	Ca, Cl⁻
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☒	
c) Were MS/MSD precision criteria met?	☑	☐	☐	

Comments/Notes:

QA LEVEL II - INORGANIC DATA EVALUATION CHECKLIST

Data Qualification:

Sample Name	Constituent(s)	Result	Qualifier	Reason
All Samples	Ferrous Iron (Fe^{2+})	—	J/UJ	Analyzed outside EPA hold time
S-TMW-1	Fluoride (F^-)	0.40	J	RPD exceeded limit; Result > MDL
⊥	Phosphorus (P)	0.050	J	⊥ ⊥
⊥	Iron (Fe)	86.9	J	Detected in Method Blank (MB); 10×MB > Result > PQL
S-UG-3	⊥	50.0	U	; PQL > Result > MDL
S-BMW-1S	⊥	50.0	U	⊥
⊥	Potassium (K)	580	J	; 10×MB > Result > PQL
S-BMW-3S	Fe	57.5	J	⊥
⊥	K	772	J	⊥
S-SCL4A-DUP-1	Fe	80.2	J	⊥
⊥	F^-	0.25	J	RPD exceeded limit; Result > MDL
	P	0.050	UJ	⊥ ; MDL > Result

Signature: Tommy J. Woodson Date: 1/15/19

APPENDIX B

Alternative Source Demonstration – May 2018 Sampling Event

REPORT

SCL4A - Alternative Source Demonstration

Sioux Energy Center, St. Charles County, Missouri, USA

Submitted to:

Ameren Missouri

1901 Chouteau Ave, St. Louis, MO 63103

Submitted by:

Golder Associates Inc.

13515 Barrett Parkway Drive, Suite 260, Ballwin, Missouri, USA 63021

+1 314 984-8800

153-1406

November 1, 2018

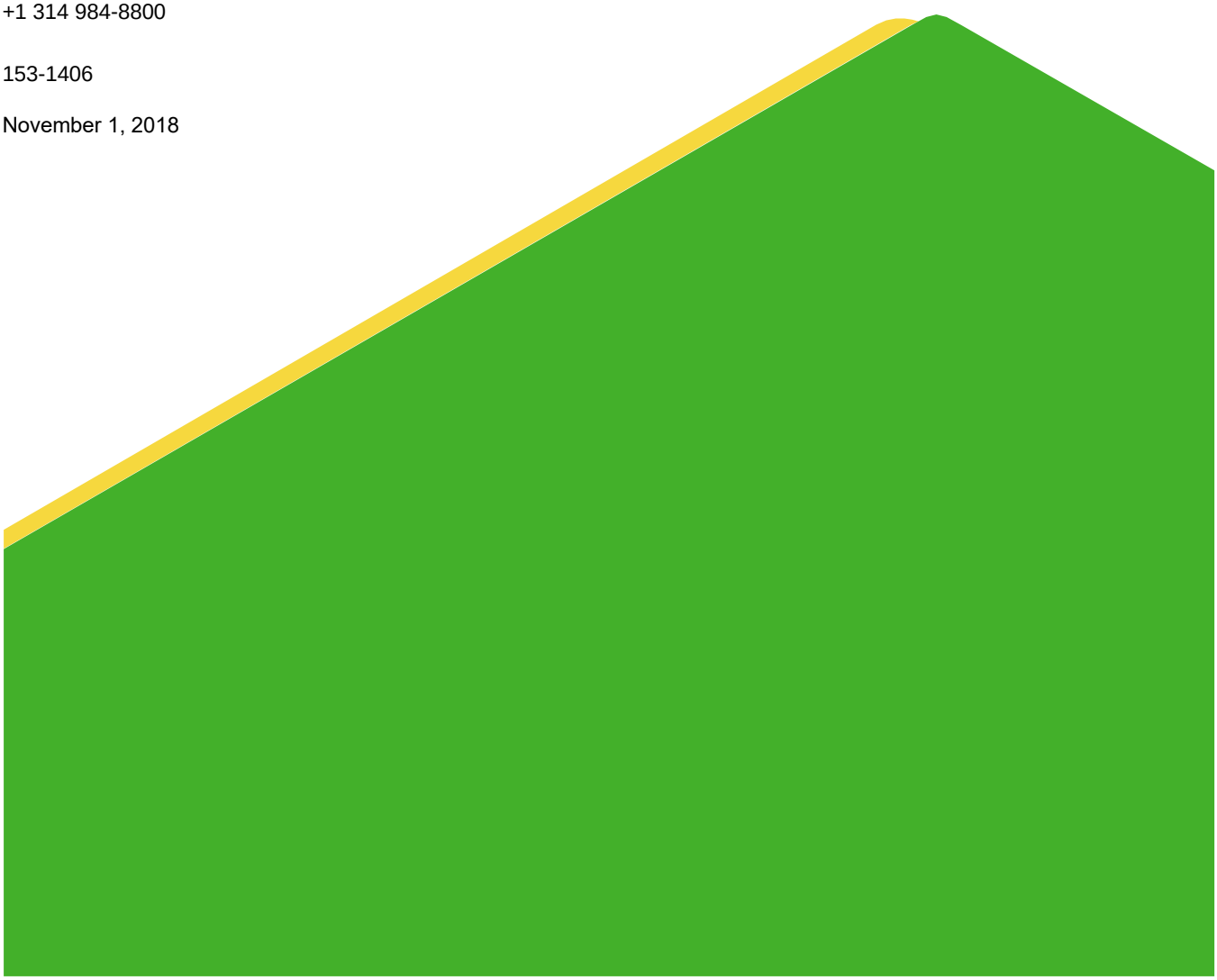

Table of Contents

Tables

Figures

1.0 CERTIFICATION STATEMENT

This *SCL4A– Alternative Source Demonstration, Sioux Energy Center, St. Charles County, Missouri, USA* has been prepared to comply with the United States Environmental Protection Agency (EPA) coal combustion residual (CCR) rule under the direction of a licensed professional engineer with Golder Associates Inc.

I hereby certify that this *SCL4A – Alternative Source Demonstration, Sioux Energy Center, St. Charles County, Missouri, USA* located at 8501 Missouri 94, West Alton, Missouri 63386 has been prepared to meet the requirements of 40 CFR §257.94(e)(2).

GOLDER ASSOCIATES INC.

_____

Mark Haddock, P.E., R.G.

Principal, Practice Leader

2.0 INTRODUCTION

In accordance with the United States Environmental Protection Agency (EPA) coal combustion residual (CCR) rule (CCR Rule or The Rule), this SCL4A – Alternative Source Demonstration has been prepared to document an Alternative Source Demonstration (ASD) for a Statistically Significant Increase's (SSI) calculated at Ameren Missouri's (Ameren) Sioux Energy Center (SEC), Utility Waste Landfill (UWL) Cell 4A - SCL4A. This document satisfies the requirements of §257.94(e)(2) which allows the owner or operator to demonstrate that a source other than the CCR Unit has caused the SSI's and that the apparent SSI's were the result of an alternative source or resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

3.0 SITE DESCRIPTION AND BACKGROUND

Ameren owns and operates the SEC in St. Charles County, Missouri located approximately 12 miles west-northwest of the confluence of the Mississippi and Missouri Rivers. **Figure 1** depicts the site location and layout, including the location of the SCL4A. The SEC is approximately 1,025 acres and is located in the floodplain between the Mississippi and Missouri Rivers. The SEC is bounded to the north by wooded areas associated with the Mississippi River. The property is bounded to the south by a railroad. The SEC is bounded to the east and west by agricultural fields.

3.1 Geological and Hydrogeological Setting

The SCL4A lies between the Mississippi River to the north and the Missouri River to the south. Flow and deposition from these rivers have resulted in thick alluvial deposits which lie unconformably on top of bedrock. These alluvial deposits, which can range from approximately 100 to 130 feet thick, make up the uppermost aquifer called the alluvial aquifer. Overall, this aquifer is described as a fining upwards sequence of stratified sands and gravels with varying amounts of silts and clays. Drilling in the alluvial aquifer identified different sub-units, including floodplain deposits, natural levee deposits, and channel deposits along with volumetrically less important loess deposits. Grain sizes of these alluvial deposits are highly variable.

Beneath the alluvial aquifer lies the bedrock aquifer. Bedrock in this region includes Mississippian-aged rocks of the Meramecian Series. Formations include primarily limestone, dolomite, and shale and are comprised of the Salem Formation overlying the Warsaw Formation and the Burlington-Keokuk Formation.

3.2 Utility Waste Landfill Cell 4A – SCL4A

UWL Cell 4A is referred to by Ameren as the SCL4A, or "Landfill Cell 4A." The SCL4A is approximately 15 acres in size and is located south of the generating plant on the south side of Highway 94 (**Figure 1**). The CCR Unit manages Coal Combustion Residuals (CCR) from the SEC including "fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels" (Gredell and Reitz & Jens, 2014). These wastes are managed using a dry disposal process and are moisture conditioned (30-40% moisture content) to minimize dust and ease in disposal. The CCR waste is trucked across highway 94 from the plant and disposed of in the SCL4A.

The SCL4A was constructed with a composite liner system consisting of two feet of compacted clay soil with a hydraulic conductivity of less than 1 X 10-7 centimeters per second (cm/sec) overlain by a 60-mil HDPE

geomembrane liner. Information on the design of the UWL is available in the 2014 Proposed Construction Permit Modification, Construction Permit Number 0918301 (Gredell and Reitz & Jens, 2014).

A groundwater monitoring well network was installed in 2007 and 2008 in order to permit the UWL construction. This monitoring well network was approved by the Missouri Department of Natural Resources (MDNR) and consists of 16 monitoring wells ringing the current and proposed future extents of the UWL (**Figure 1**). These monitoring wells are installed in the uppermost portions of the alluvial aquifer, just below the seasonally low elevation for groundwater. Quarterly groundwater samples have been collected in these monitoring wells since June 2008 for the state required UWL parameters.

The permit for the Sioux UWL was issued July 30, 2010 (permit #0918301). Nine sampling events were performed prior to July 30, 2010 and represent groundwater quality prior to CCR placement in the UWL. The results from these pre-disposal monitoring events are used in conjunction with other site information in the ASD presented below. Additionally, the SCL4A was the second cell that was constructed at this UWL. The SCPC was constructed first. The SCL4A construction was not completed and no CCR was placed in the unit until 2014.

3.3 CCR Rule Groundwater Monitoring

As required by the CCR Rule, the following were completed prior to the October 17, 2017 deadline; (1) a groundwater monitoring well system was installed and certified by a Professional Engineer, (2) a Statistical Method Certification was prepared and certified by a Professional Engineer, (3) a Groundwater Monitoring Plan (GMP) was prepared recording the design, installation, development, sampling procedures, as well as statistical methods, and placed in the owner's operating record, and (8) eight baseline groundwater sampling events were completed for all Appendix III and Appendix IV parameters of CCR Rule.

The groundwater monitoring system for the SCL4A consists of six monitoring wells screened in the uppermost aquifer (alluvial aquifer) as shown on **Figure 1**. One existing monitoring well (UG-3) was installed by Gredell Engineering Resources, Inc., in December 2007 as a part of the state UWL monitoring program. The remaining monitoring wells (TMW-1, TMW-2, TMW-3, BMW-1S, and BMW-3S) were installed by Golder in 2015 and 2016 for CCR Rule groundwater monitoring purposes. More information on the design and installation of the monitoring wells is provided in the SCL4A GMP and the SCL4A 2017 Annual Report.

Between May 2016 and June 2017 eight (8) baseline sampling events were completed for the SCL4A. After baseline sampling, the first Detection Monitoring event was completed in November 2017. Laboratory testing was performed for the following Appendix III constituents during detection monitoring:

- Boron
- Calcium
- Chloride
- pH
- Sulfate
- Total Dissolved Solids (TDS)
- Fluoride

In January 2018, background results from the eight baseline sampling events were used to calculate statistical upper prediction limits (UPL's). These UPL's were then compared to the Detection Monitoring results from the November 2017 samples. If results from Detection Monitoring were higher than the calculated UPL, it was considered an initial exceedance, in which case a verification sample was then collected and tested in accordance with the SCL4A statistical analysis plan. During this process, no Statistically Significant Increase's (SSI) were identified. In May 2018, another Detection Monitoring event was completed, and three initial exceedances were identified including chloride at UG-3, as well as sulfate and total dissolved solids (TDS) at TMW-2. Verification sampling results confirmed all three SSI's.

4.0 REVIEW OF THE STATISTICALLY SIGNIFICANT INCREASES

Two monitoring wells had confirmed SSIs during the May 2018 sampling event; UG-3 and TMW-2. UG-3 and TMW-2 are screened in the upper portion of the alluvial aquifer just below the average seasonal low for groundwater. As shown on **Figure 1**, UG-3 is located north of the SCL4A while TMW-2 is located to the south of the SCL4A. Both monitoring wells are south of Highway 94, the generating plant, and the two surface impoundments near the plant (SCPA and SCPB).

Based on Golder's review of the pre-disposal data discussed in Section 3.2 above, and our comparison of those pre-disposal data with the results from the eight CCR-rule baseline events, it was concluded that the groundwater at the SCL4A contained low-level pre-existing impacts from CCR that pre-dated SCL4A operation. As a result of these pre-existing impacts, the SCL4A statistical analysis plan uses intrawell upper prediction limits (UPL) to determine SSIs. Intrawell UPLs are calculated from historical data within a particular well, and not by pooling data from the background wells, such that individual limits are calculated for each constituent in each well in the monitoring program.

For each of the three SSIs, the UPL was calculated using a dataset that could be normalized. The intrawell UPLs for the SSIs in question are provided below in **Table 1**. This table also displays the range of values obtained during baseline sampling and the values obtained since baseline sampling as a part of the detection monitoring program.

Table 1: Review of Statistically Significant Increases

Constituent	Well ID	UPL Based on Baseline Events (mg/L)	Baseline Sampling Event Range (mg/L)	November 2017 Result (mg/L)	May 2018 Result (mg/L)	June 2018 Result (mg/L)
Chloride	UG-3	78.76	30.95 - 71.9	70.0	84.8	81.0
Sulfate	TMW-2	37.9	30.0 - 35.5	31.4	44.2	51.7
Total Dissolved Solids	TMW-2	476.5	403 - 450	411	721	484

Notes:

1) mg/L – milligrams per liter.
2) UPL – upper prediction limit. UPL's calculated using sanitas software.
3) NA – Not Applicable.

5.0 EVIDENCE OF SSI FROM ALTERNATIVE SOURCE

Several different lines of evidence indicate that the SSIs at the SCL4A are not caused by a release from the SCL4A, but rather from an alternative source. The following section describes the different lines of evidence, listed below, that demonstrate this position.

- Documentation of pre-existing, low level concentrations of CCR indicators in groundwater that pre-date the SCL4A operation.
- Review of concentrations in adjacent and background monitoring wells.
- Documentation of the construction of the SCL4A with a 60-mil geomembrane liner and a 2-foot thick clay barrier.
- Preparation of geochemical models displaying current and historical groundwater chemistries.
- Use of road salt on on Highway 94 located near UG-3.

5.1 CCR Indicators

Several types of CCR byproducts are generated by coal-fired power plants. The different types of CCR typically display distinct geochemical signatures and indicator parameters. **Table 2** below describes the different types of CCRs and their typical indicator parameters (USEPA 2018, EPRI 2011, EPRI 2012, and EPRI 2017).

Table 2: Types of CCR and Typical Indicator Parameters

Type of CCR	Description of CCR (USEPA 2018)	Key Indicators (EPRI 2011, 2012, 2017)
Fly Ash	Fine grained, powdery material composed mostly of silica made from the burning of finely ground coal in the boiler.	■ Boron ■ Molybdenum ■ Lithium ■ Sulfate ■ Bromide ■ Potassium ■ Sodium ■ Fluoride
Boiler Slag / Bottom Ash	Molten bottom ash from the slag tap and cyclone type furnaces that turns into pellets that have a smooth glassy appearance after quenching with water	
Flue Gas Desulfurization Material (FGD)	A material leftover from the process of reducing sulfur dioxide emissions from a coal-fired boiler that can be a wet sludge consisting of calcium sulfite or calcium sulfate or a dry powered material that is a mixture of sulfites and sulfates.	■ Sulfate ■ Fluoride ■ Calcium ■ Boron ■ Bromide ■ Chloride

Notes:

1) Fly ash and boiler slag/bottom ash typically have the same indicator parameters.
2) Definitions from USEPA website, available at https://www.epa.gov/coalash/coal-ash-basics.
3) Key indicators from EPRI 2011, 2012, and 2017 as well as Gredell and Reitz & Jens, 2014.

As described above the SCL4A has historically received fly ash. FGD type wastes at the SEC are managed at the SCPC, located to the west of the SCL4A.

5.2 Chloride Concentration at UG-3

At UG-3, chloride was the only initial SSI in the May 2018 Detection Monitoring event. Chloride is not known to be an indicator of fly ash or boiler slag/bottom ash (EPRI 2012), but can be an indicator for WFGD type wastes and is commonly found near salt and brine treated roadways. Concentrations for the May 2018 sampling event and subsequent verification sampling event are 84.0 and 81.0 mg/L respectively. These values are just above the original calculated Upper Prediction Limit (UPL) used for chloride concentrations at UG-3 of 78.76 mg/L. This UPL is calculated based on eight baseline sampling events collected in 2016 and 2017 during which time chloride concentrations ranged from 30.95 to 71.9 mg/L (**Figure 2**). Historically, including state sampling results dating back to June 2008, chloride concentrations have ranged from 17 to 98 mg/L. This range during baseline and state sampling events demonstrates that the natural variability of chloride concentrations at UG-3 is large and the SSI sampled in May 2018 is not out of the typical range for chloride values at this well.

Additionally, chloride concentrations collected from the pore-water of the SCPA and SCPB CCR Units (SCPB ASD) have concentrations ranging between 20.5 and 51.7 mg/L, which is less than obtained at UG-3. These units contain the same materials that are being placed in the SCL4A and if impacts were from the SCL4A, it would be expected that concentrations in the source would be higher than the surrounding compliance wells.

Road salt (NaCl) applied to roadways for ice control is a common alternative source for elevated chloride concentrations. UG-3 is located within 200 feet to the south (downgradient) of highway 94. **Figure 2** displays a multi-constituent time series plot comparing chloride and sodium values which are the common constituents in road salt. The results from this plot display a good correlation between sodium and chloride and that these results typically spike and decline together, indicating that these two are moving together through the aquifer. The correlation and seasonal spikes associated with this data are a very clear indication that elevated chloride levels in UG-3 are caused by the road salt application on the nearby highway 94, which subsequently dissolves and infiltrates into the shallow alluvial aquifer and not from the SCL4A CCR Unit. SCL4A is not the source for chloride concentrations in UG-3.

5.3 SSIs at TMW-2

5.3.1 Boron Concentrations

Boron is a key indicator for fly ash and boiler slag/bottom ash impacts because it is typically present in the leachate from these types of waste, is not a common anthropogenic contaminant, and is non-reactive and mobile in most hydrogeological environments (EPRI 2012). This non-reactive and mobile nature makes boron an early indicator of impacts from a CCR Unit. If groundwater was impacted by the SCL4A, current boron concentrations should be statistically elevated with respect to pre-CCR placement, background monitoring wells, and compared to those in the baseline sampling.

Figure 3 displays the historical set of boron concentrations at TMW-2 and the background wells BMW-1S and BMW-3S. If the SSI was caused by impacts from the SCL4A, boron concentrations would be expected to be the first indicator. **Figure 3** demonstrates that current boron concentrations are at similar levels to those from previous sampling events and are similar to background levels. This information displays that TMW-2 does not have boron impacts, and therefore, a different source other than CCR is likely the cause of SSIs for sulfate and TDS.

5.3.2 Sulfate Concentrations

Sulfate, much like boron is a key indicator for potential CCR impacts because sulfate is highly mobile in most hydrogeological environments except where conditions are strongly reducing. The groundwater around the SCL4A does not demonstrate strongly reducing conditions, such as negative oxidation reduction potential (ORP), dissolved iron concentrations above 1 mg/L, nor are hydrogen sulfide odors reported at the SCL4A. Therefore, if the SSI was caused by impacts from the SCL4A, it would be expected that sulfate values would increase following placement of CCR materials. Additionally, if sulfate values were to increase it would also be expected that boron values would increase as these two are typically the first indicators of any CCR impacts.

At TMW-2 an SSI for Sulfate was confirmed via the detection and verification monitoring process. Although the sulfate concentration has been increasing over the past three events, these values are still below those of the nearby monitoring well TMW-3 located just 500 feet to the east. **Figure 4** displays sulfate concentrations at TMW-1, TMW-2, and TMW-3 and demonstrates that concentrations at TMW-2 are between those typically found at TMW-1 and TMW-3. Additionally, as discussed above, due to the lack of correlated increasing boron concentrations and because concentrations are at similar levels to the adjacent monitoring wells, these values are likely caused by natural variation of sulfate within the aquifer.

5.3.3 Total Dissolved Solids Concentrations

Total Dissolved Solids (TDS) alone is not known to be a CCR or WFGD indicator (EPRI 2017, EPRI 2012). During baseline sampling at TMW-2, TDS ranged from 403-450 mg/L. During the May 2018 sampling event TDS was higher at 721 mg/L. This result appeared higher than previous events and could be considered an outlier.

Background TDS results at monitoring wells BMW-1S and BMW-3S ranged between 409 and 565 mg/L during baseline sampling and a calculated prediction limit of 565 mg/L is used as the statistical limit for shallow wells using interwell statistical methods (SCPB). However, during the May 2018 event both background wells installed in the alluvial aquifer where no CCR impacts exist had higher values of 1,170 and 565 mg/L. **Figure 5** displays TDS concentrations over time at TMW-1, TMW-2, TMW-3, BMW-1S, and BMW-3s. This chart shows that during the May 2018 there were not only higher than usual values in TMW-2, but also in the background wells where TDS values at BMW-2 were 449 mg/L higher than at TMW-2. This demonstrates that increases in May 2018 were not just located at TMW-2, but also were present in other, non-impacted locations within the alluvial aquifer.

Additionally, the verification sampling result of 484 mg/L at TMW-2 is below the calculated prediction limit in the shallow background wells at Sioux and below those values obtained in the May 2018 sampling event. This value is also within calculated prediction limit of the nearby TMW-1 (506.2 ug/L) and TMW-3 (514.3 ug/L). This indicates that the higher concentration in TMW-2 in May 2018 was not caused by a release from the SCL4A, but instead can be attributed to natural variability and seasonality in the alluvial aquifer during the May 2018 sampling event, or possibly lab testing variability.

5.4 Geochemical Modeling

In June 2006, temporary groundwater piezometers that were installed as part of the Detailed Site Investigation (DSI) were sampled for major cation and anion concentrations. These data are available in Appendix 13 of the DSI and the piezometer locations are provided in **Figure 1**. Additionally, during the detection monitoring event in November 2017 and May 2018, major cation and anion concentrations were collected from the CCR Rule monitoring network for SCL4A. These data were used to compare current major ion chemistry with the chemistry from 2006, 4 years prior to placement of CCR in the UWL.

Table 3 contains the values of the major cations and anions from both the recent and historical sampling events. These data were used in the generation of the Stiff and Piper diagrams discussed below. Most of the numbers are similar between the two datasets, chloride and sodium values are significantly higher for some of the wells located near roads (UG-1A, UG-2, and UG-3). As discussed above, these changes in groundwater chemistry are likely caused by the use of road salt on Highway 94 and are not a result of the SCL4A or any other source of CCR.

5.4.1 Stiff Diagrams

Stiff diagrams visually display the major cation and anion data. **Figure 6** displays the Stiff diagrams from the historical 2006 data, as well as the current SCPC CCR Rule monitoring data. Data from 2006 display a similar distribution to that of 2017 monitoring wells. The only major difference between the two sampling events is the increase in the sodium and potassium and chloride plots, causing a slightly different shape in monitoring wells UG-1A, UG-2, and UG-3 relative to piezometers PZ-4, PZ-21, and PZ-36. As discussed above, sodium and chloride concentrations are very seasonally dependent and are influenced by the use of road salt on the nearby Highway 94. Therefore, except for seasonal changes in chloride and sodium, overall groundwater chemistry at the UWL has remained similar since 2006, which is 4 years prior to CCR placement in the SCL4A.

5.5 Piper Diagram

A Piper diagram is a graphical technique used to classify different groundwater chemistry. The same data used to generate the Stiff diagram are plotted on a ternary Piper diagram according to major cation and anion concentrations. In addition to showing instantaneous concentrations, Piper diagrams can be used to determine if groundwater chemistry is changing, either spatially or temporally. **Figure 7** and **Figure 8** are Piper diagrams displaying data from both 2006 and 2018.

As shown by the similar placement on the Piper diagrams, the data from 2006 (**Figure 7**) display a similar distribution to that of 2018 (**Figure 8**). The only notable difference between the two sampling events is the placement of UG-1A, UG-2, and UG-3 relative to other wells. UG-1A, UG-2, and UG-3 plot slightly higher on the sodium plus potassium and chloride axes, causing them to be slightly shifted. As discussed above, sodium and chloride concentrations are seasonally dependent and are influenced by the use of road salt on the nearby Highway 94. Except for seasonal differences in chloride and sodium, overall groundwater chemistry at the UWL has remained similar since 2006, which was 4 years prior to CCR placement in the SCL4A.

6.0 DEMONSTRATION THAT SSI WAS NOT CAUSED BY SCL4A IMPACT

Based on the information presented in Section 5 above, the SSIs at UG-3 and TMW-2 were not caused by impacts from the SCL4A. These SSIs appear to be caused by the following:

- The use of road salt (NaCL) on highway 94. This causes increase in chloride concentrations in monitoring wells located near the highway such as UG-3. Additionally, UG-3 is located south of highway 94, which is typically the downgradient direction of groundwater flow in that area.
- Relatively low calculated UPLs that do not reflect the full natural variability within the alluvial aquifer. This is caused because only 8 baseline samples were collected prior to detection monitoring. When results of TMW-2 for sulfate and TDS were compared to the nearby TMW-1 and TMW-3 wells, it is apparent that there are no impacts from the SCL4A at TMW-2.

Other supplemental lines of evidence also demonstrate that there are no impacts on groundwater from the SCL4A. Geochemical comparisons display that there has been no significant change in groundwater chemistry between pre-CCR conditions (2006) and present-day sampling, except for seasonal changes in sodium and chloride concentrations caused by road salt usage on highway 94. Further, the construction of the SCL4A, 2-feet of compacted clay overlain by a 60-mil HDPE liner, also limits the likelihood that the SSI is a result of impact from SCL4A. SSIs observed in UG-3 and TMW-2 are not caused by impacts from the SCL4A.

7.0 REFERENCES

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Tables

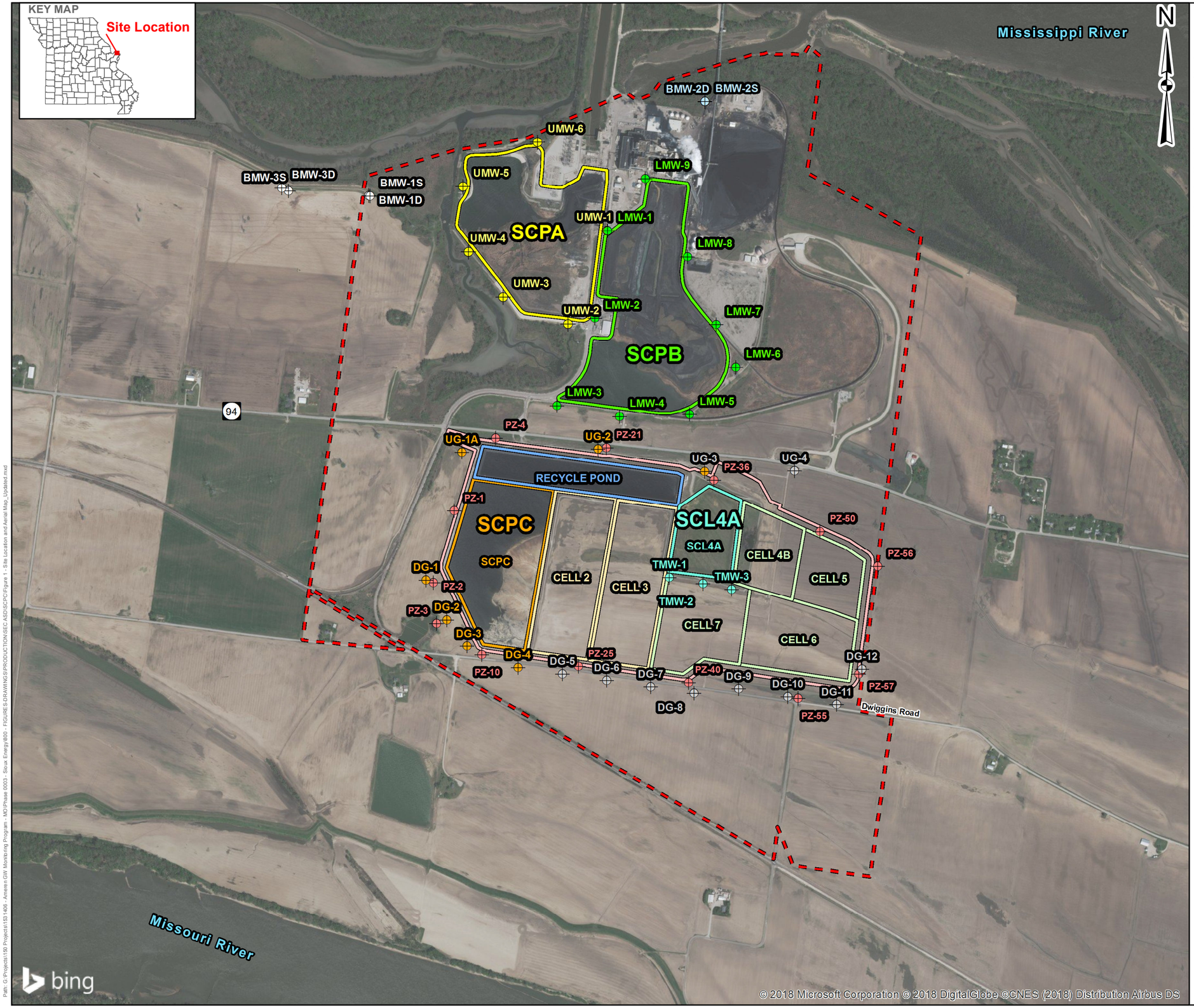
Table 3
Major Cation and Anion Concentrations
SCL4A - Alternative Source Demonstration
Sioux Energy Center, St. Charles County, MO

Monitoring Well ID	Total Sodium (mg/L)	Total Potassium (mg/L)	Total Calcium (mg/L)	Total Magnesium (mg/L)	Total Chloride (mg/L)	Total Sulfate (mg/L)	Total Alkalinity [2] (mg/L)
Detection Monitoring - May 2018							
S-BMW-1S	4.58	0.313 J	147	28.6	6.3	23.6	459
S-BMW-3S	4.69	0.552	126	23.2	10.0	28.5	409
S-DG-1	4.59	5.83	130	29.1	7.4	46.7	426
S-DG-2	4.73	6.11	124	29.6	7.0	30.3	466
S-DG-3	4.78	5.28	143	29.4	15.7	53.0	418
S-DG-4	15.2	7.14	127 J	41.9	18.9	55.8	487
S-TMW-1	2.79	5.06	91.7	16.3	2.4	40.7	273
S-TMW-2	3.36	5.40	120	22.8	2.2	44.2	374
S-TMW-3	5.35	6.02	128	24.0	2.2	54.0	409
S-UG-1A	22.9	9.07	121	28.0	53.9	61.8	352
S-UG-2	47.7	5.36	117	25.9	43.7	31.4	387
S-UG-3	36.0	5.75	130	24.5	84.8	45.3	354
Historical Data - June 2006							
PZ-1	5.2	4.1	140	38	11	69	480
PZ-2	3.8	2.8	120	32	6.6	36	420
PZ-3	5.4	5.2	140	27	12	53	440
PZ-4	16	4.5	140	35	13	220	320
PZ-10	3.4	3.9	99	31	4.6	43	370
PZ-21	8.0	2.9	130	26	25	100	350
PZ-25	4.2	4.9	120	38	19	29	470
PZ-36	7.2	4.2	110	22	21	34	310
PZ-40	3.2	4.0	120	21	1.7	33	370
PZ-50	3.4	3.8	97	24	18	43	290
PZ-55	3.9	4.5	120	24	6.1	52	370
PZ-56	4.4	4.5	110	22	25	49	340
PZ-57	4.8	4.4	120	24	4.0	42	370

Notes:
1) 2006 Historical Data from Appendix 13 of the Detailed Site Investigation (DSI).
2) Alkalinity is equal to the sum of Carbonate and Bicarbonate.
3) mg/L - milligrams per liter.
4) J - Result is an estimated value

Prepared by: JSI
Checked by: JAP
Reviewed by: MNH

Figures



LEGEND

- Sioux Energy Center Property Boundary

Surface Impoundments

- SCPB - Lined Fly Ash Surface Impoundment
- SCPA - Unlined Bottom Ash Surface Impoundment

Utility Waste Landfill (UWL)

- Active Dry CCR Disposal Area
- Active WFGD Disposal Area
- Active Water Recycle Pond
- Proposed Dry CCR Disposal Area
- Proposed WFGD Disposal Area
- UWL Perimeter Fence

CCR Rule Monitoring Wells

- Background Monitoring Well
- SCPA - Bottom Ash Surface Impoundment Monitoring Well
- SCPB - Fly Ash Surface Impoundment Monitoring Well
- Existing UWL Monitoring Well Currently Used for CCR Monitoring
- Temporary Monitoring Well for SCL4A

Other Piezometers and Monitoring Wells

- Existing UWL Monitoring Well Not Currently Used for CCR Monitoring
- Groundwater Elevation Piezometer
- 2006 Detailed Site Investigation Piezometer and Sample Locations

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) UWL - UTILITY WASTE LANDFILL.
3.) WFGD - WET FLUE GAS DESULFURIZATION.
4.) CCR - COAL COMBUSTION RESIDUALS.
5.) UWL BOUNDARIES, DESIGNATIONS AND EXISTING MONITORING WELL LOCATIONS BASED ON DRAWINGS IN THE UWL PROPOSED LANDFILL PERMIT (#0918301).

REFERENCES

1.) AMEREN MISSOURI SIOUX ENERGY CENTER, SIOUX PROPERTY CONTROL MAP, FEBRUARY 2011.
2.) COORDINATE SYSTEM: NAD 1983 STATE PLANE MISSOURI EAST FIPS 2401 FEET.
3.) AMEREN MISSOURI SIOUX POWER PLANT UTILITY WASTE LANDFILL PROPOSED CONSTRUCTION PERMIT MODIFICATION (#0918301), AUGUST 2014.
4.) 2006 PIEZOMETER AND SAMPLE LOCATIONS FROM APPENDIX 13 OF THE DETAILED GEOLOGIC AND HYDROLOGIC SITE INVESTIGATION REPORT

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Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
GROUNDWATER MONITORING PROGRAM

TITLE
SITE LOCATION AND AERIAL MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-06
PREPARED	RJF
DESIGN	JSI
REVIEW	JSI
APPROVED	MNH

PROJECT No.
153-1406

FIGURE
1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
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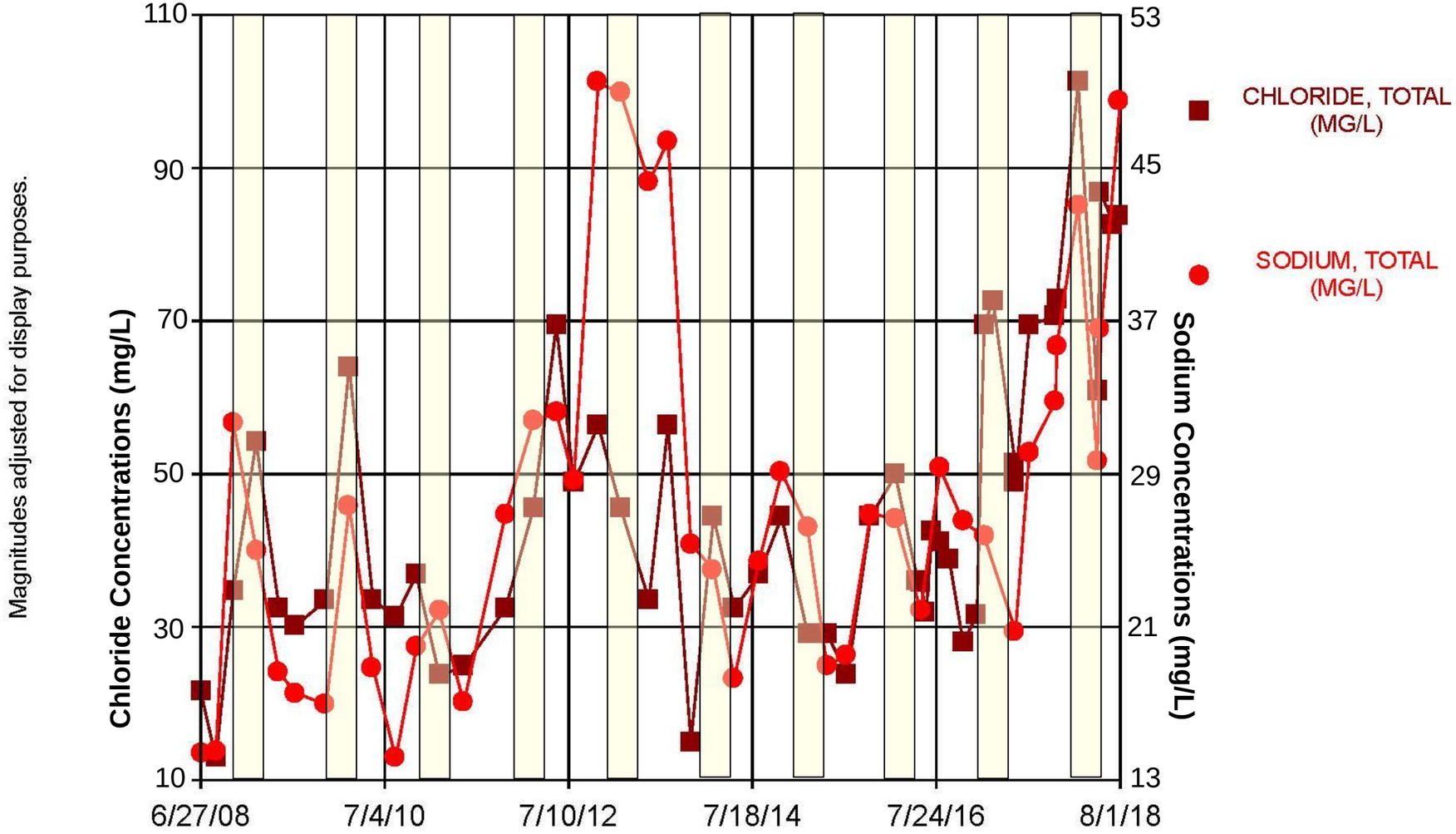
Path: G:\Projects\153 Projects\1531406 - Ameren GW Monitoring Program - MO\Phase 0003 - Sioux Energy\800 - FIGURES-DRAWINGS\PRODUCTION\SEC ASD\SCPC\Figure 1 - Site Location and Aerial Map_Updated.mxd

Time Series

S-UG-3



Notes
1) mg/l – milligrams per liter.
2) Time series plot generated using Sanitas.

CLIENT/PROJECT **AMEREN MISSOURI SIOUX ENERGY CENTER** Ameren				GOLDER			TITLE **UG-3 Time Series Plot Comparing Chloride and Sodium**			
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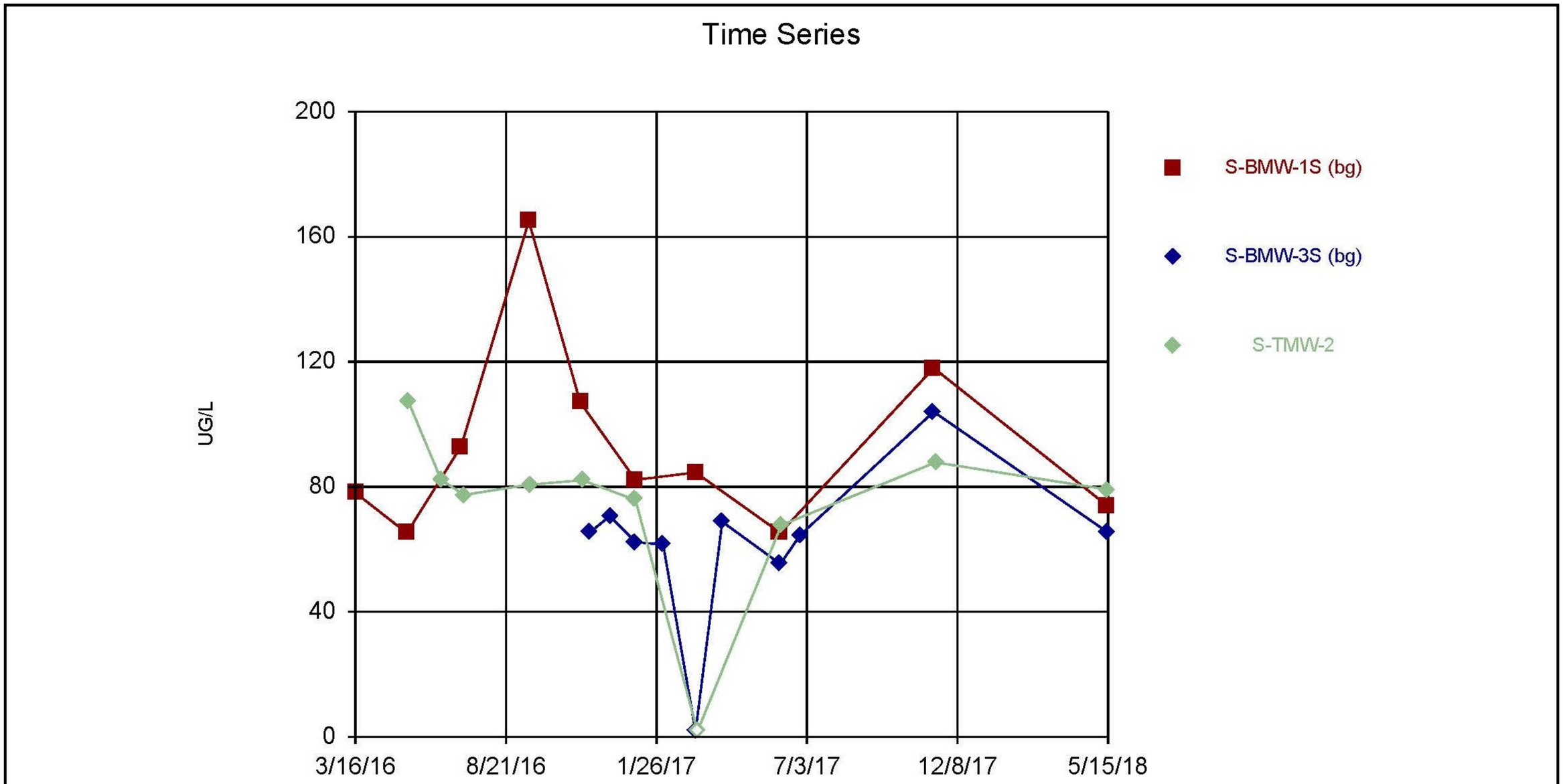
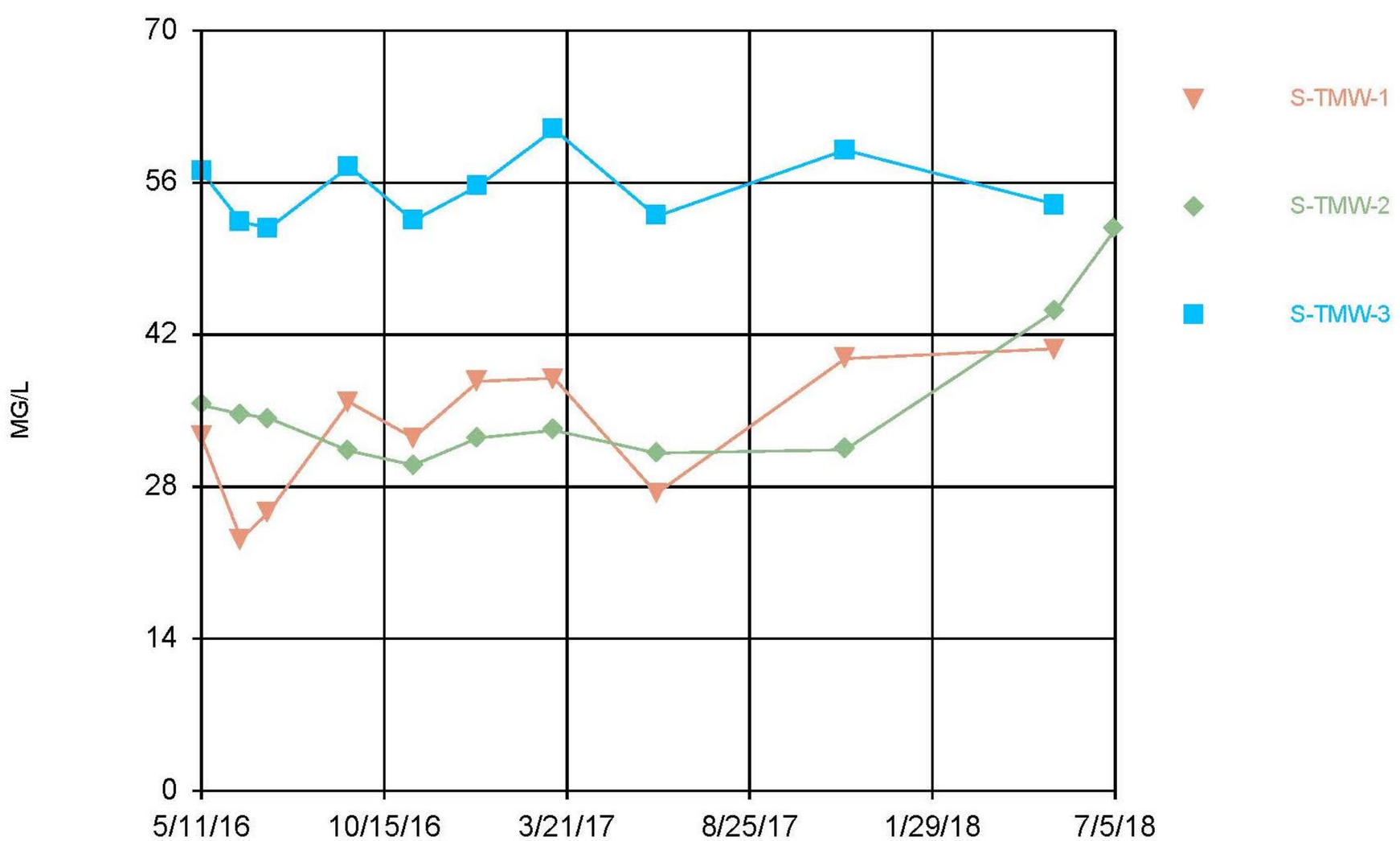


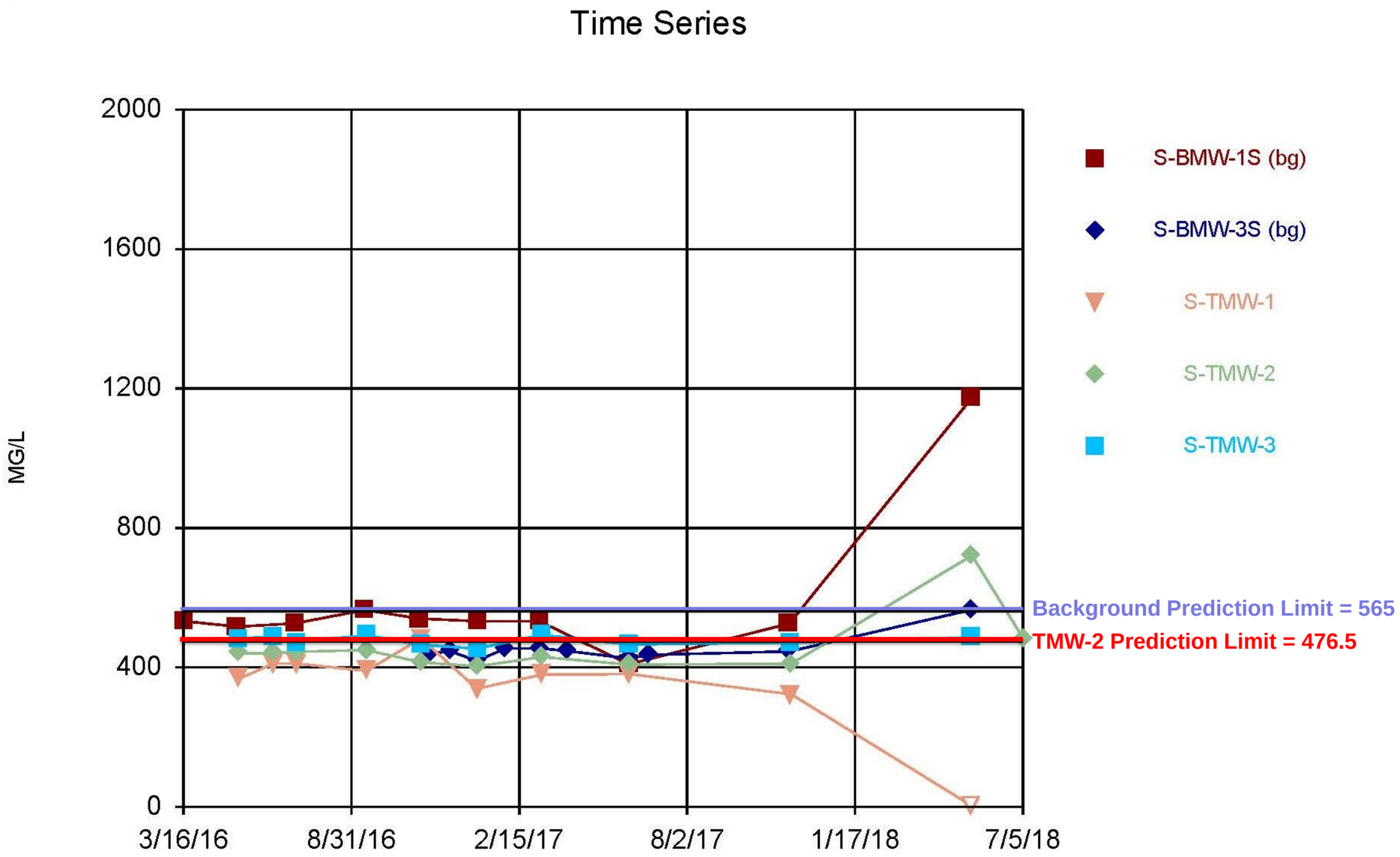
Notes
1) UG/L – micrograms per liter.

CLIENT/PROJECT **AMEREN MISSOURI** **SIOUX ENERGY CENTER**							TITLE **TMW-2 vs Background Time Series Plot for Boron**			
DRAWN JSI	CHECKED JAP	REVIEWED MNH	DATE 2018/11/1	SCALE N/A	FILE NO. N/A	JOB NO. 1531406.0003H	DWG NO. N/A	SUBTITLE N/A	REV. NO. N/A	FIGURE **3**



Notes
1) MG/L – micrograms per liter.

CLIENT/PROJECT **AMEREN MISSOURI** **SIOUX ENERGY CENTER**						TITLE **TMW-2 Time Series Plot for Sulfate**				
DRAWN JSI	CHECKED JAP	REVIEWED MNH	DATE 2018/10/31	SCALE N/A	FILE NO. N/A	JOB NO. 1531406.0003H	DWG NO. N/A	SUBTITLE N/A	REV. NO. N/A	FIGURE **4**



Notes
1) MG/L – micrograms per liter.
2) Calculated Prediction Limits based on initial 8 baseline sampling events.

CLIENT/PROJECT						TITLE			
AMEREN MISSOURI **SIOUX ENERGY CENTER**				GOLDER		**Total Dissolved Solids Time Series**			
DRAWN JSI	CHECKED JAP	REVIEWED MNH	DATE 2018/10/30	SCALE N/A	FILE NO. N/A	JOB NO. 1531406.0003H	DWG NO. N/A	SUBTITLE N/A	REV. NO. N/A	FIGURE **5**

KEY MAP

SCPB

PZ-4

UG-1A

UG-2

PZ-21

UG-3

RECYCLE POND

94

PZ-36

PZ-1

SCL4A

PZ-50

SCPC

CELL 4B

CELL 2

CELL 3

CELL 5

PZ-56

PZ-2

TMW-1

TMW-2

TMW-3

DG-1

DG-2

CELL 7

CELL 6

PZ-3

DG-3

PZ-10

DG-4

PZ-25

PZ-40

PZ-57

PZ-55

Dwiggins Road

N

bing

LEGEND

- Sioux Energy Center Property Boundary

Surface Impoundments

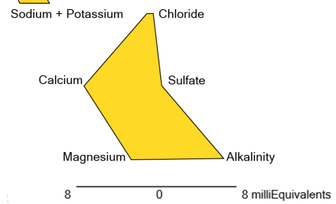
- SCPB - Lined Fly Ash Surface Impoundment

Utility Waste Landfill (UWL)

- Active Dry CCR Disposal Area
- Active WFGD Disposal Area
- Active Water Recycle Pond
- Proposed Dry CCR Disposal Area
- Proposed WFGD Disposal Area
- UWL Perimeter Fence

Green Stiff Diagrams are from the May 2018 Detection Monitoring Event

Yellow Stiff Diagrams are from the Historical 2006 Detailed Site Investigation Event



NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) UWL - UTILITY WASTE LANDFILL.
3.) WFGD - WET FLUE GAS DESULFURIZATION.
4.) CCR - COAL COMBUSTION RESIDUALS.
5.) UWL BOUNDARIES, DESIGNATIONS AND EXISTING MONITORING WELL LOCATIONS BASED ON DRAWINGS IN THE UWL PROPOSED LANDFILL PERMIT (#0918301).
6.) STIFF DIAGRAMS CALCULATED USING SANITAS. DATA USED TO GENERATE DIAGRAMS IN TABLE 3.

REFERENCES

1.) AMEREN MISSOURI SIOUX ENERGY CENTER, SIOUX PROPERTY CONTROL MAP, FEBRUARY 2011.
2.) COORDINATE SYSTEM: NAD 1983 STATE PLANE MISSOURI EAST FIPS 2401 FEET.
3.) AMEREN MISSOURI SIOUX POWER PLANT UTILITY WASTE LANDFILL PROPOSED CONSTRUCTION PERMIT MODIFICATION (#0918301), AUGUST 2014.
4.) 2006 PIEZOMETER AND SAMPLE LOCATIONS FROM APPENDIX 13 OF THE DETAILED GEOLOGIC AND HYDROLOGIC SITE INVESTIGATION REPORT

0 250 500 1,000
Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
GROUNDWATER MONITORING PROGRAM

TITLE
SPATIAL DISTRIBUTION OF STIFF DIAGRAMS

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-01
PREPARED	JSI
DESIGN	JSI
REVIEW	JAP
APPROVED	MNH

PROJECT No.
153-1406

FIGURE
6

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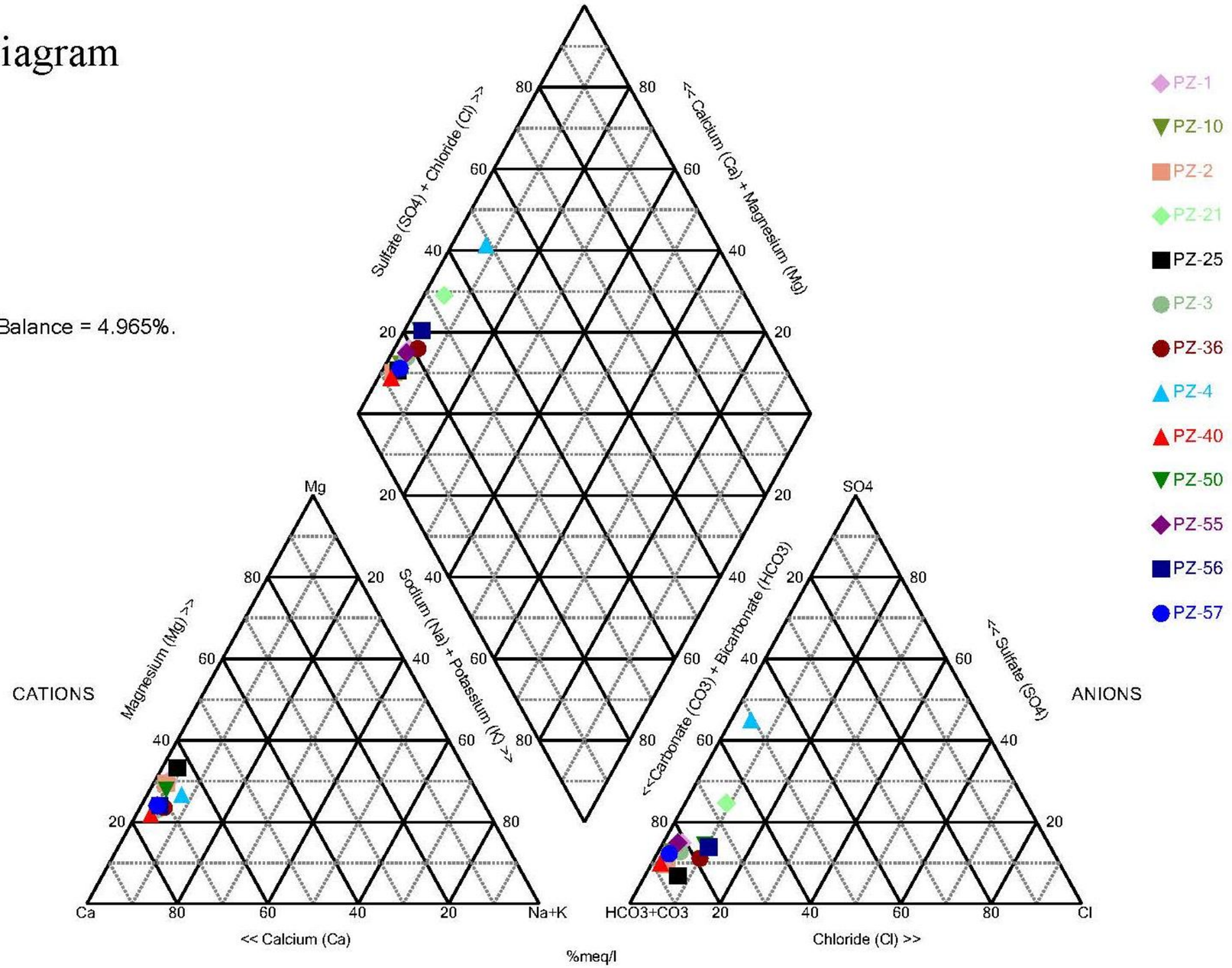
Piper Diagram

6/7/2006

Cation-Anion Balance = 4.965%.



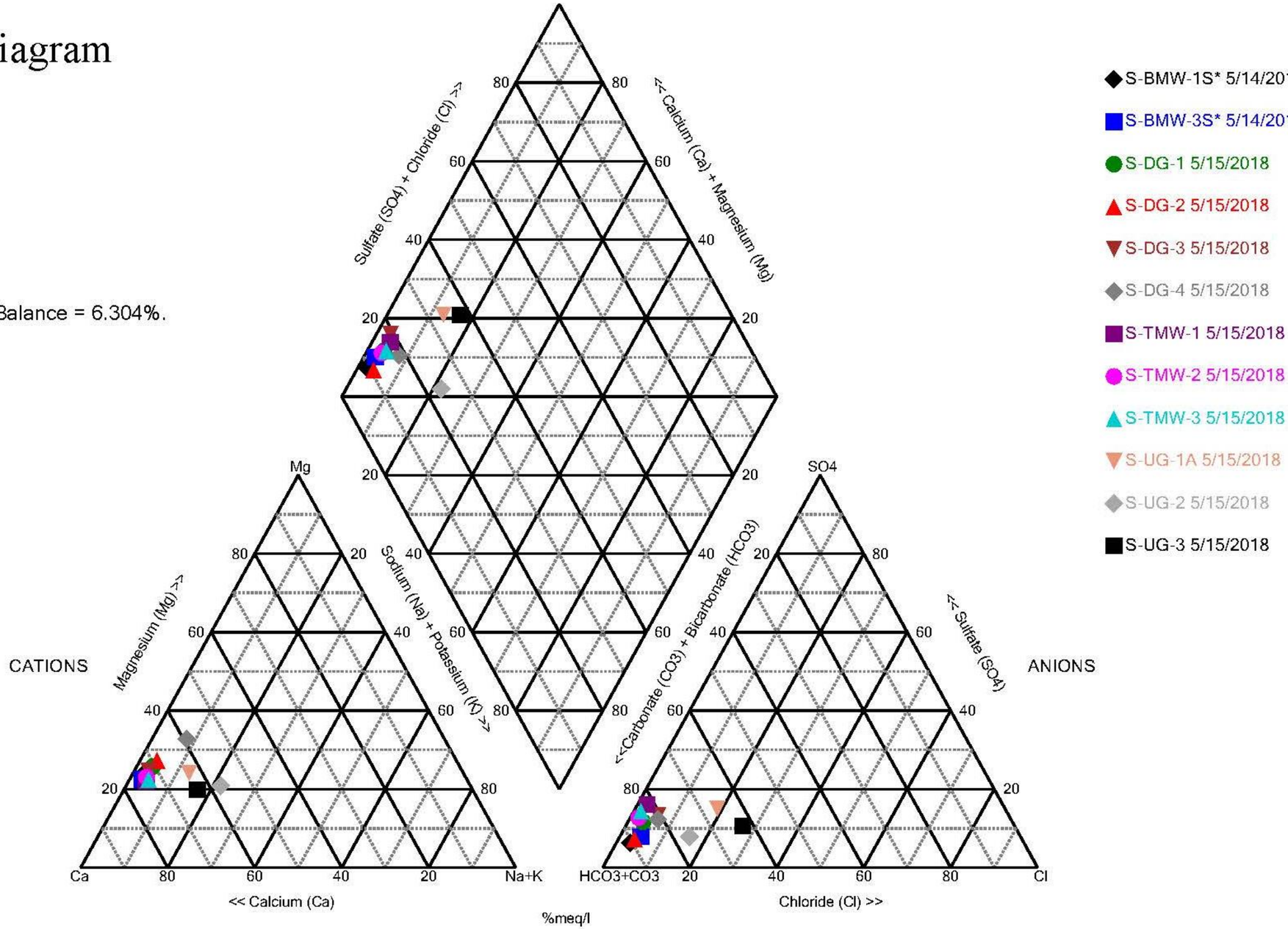
Notes

1) Data used to generate diagram is available in Table 3.
2) Piper diagram was generated using Sanitas software.

CLIENT/PROJECT **AMEREN MISSOURI SIOUX ENERGY CENTER**							TITLE **June 2006 - Historical Piper Diagram**			
DRAWN JSI	CHECKED JAP	REVIEWED MNH	DATE 2018/10/28	SCALE N/A	FILE NO. N/A	JOB NO. 1531406.0003H	DWG NO. N/A	SUBTITLE N/A	REV. NO. N/A	FIGURE **7**

Piper Diagram

Cation-Anion Balance = 6.304%.



Notes
1) Data used to generate diagram is available in Table 3.
2) Piper diagram was generated using Sanitas software.

CLIENT/PROJECT **AMEREN MISSOURI SIOUX ENERGY CENTER**				GOLDER			TITLE **May 2018 – Detection Monitoring Piper Diagram**			
DRAWN JSI	CHECKED JAP	REVIEWED MNH	DATE 2018/10/28	SCALE N/A	FILE NO. N/A	JOB NO. 1531406.0003H	DWG NO. N/A	SUBTITLE N/A	REV. NO. N/A	FIGURE **8**

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