REPORT

40 CFR Part 257 Groundwater Monitoring Plan

SCPD - Sioux Energy Center

St. Charles County, Missouri USA

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1.0 INTRODUCTION

This Groundwater Monitoring Plan (GMP) presents information on the design of the groundwater monitoring system, groundwater sampling and analysis procedures, and groundwater statistical analysis methods for the Utility Waste Landfill (UWL) Cell 2 Surface Impoundment at Ameren Missouri's (Ameren) Sioux Energy Center (SEC or Facility) in St. Charles County, Missouri (see location on **Figure 1**). This surface impoundment is referred to by Ameren as the SCPD and manages Coal Combustion Residuals (CCR) from the SEC. The SCPD is approximately 36 acres in size and is located at the UWL south of the generating plant across Highway 94.

This GMP 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 new CCR Surface Impoundments or landfills to install a groundwater monitoring system and develop a sampling and analysis program (§§ 257.90 - 257.94). Ameren Missouri has determined that the SCPD is subject to the requirements of the CCR Rule. For this GMP, the Sioux Energy Center generating plant is referred to as the SEC and the SEC and its surrounding facilities, including the UWL, are referred to as the Facility or Site.

2.0 SITE SETTING

Ameren owns and operates the Facility in St. Charles County, Missouri located approximately 12 miles west-northwest of the confluence of the Mississippi and Missouri Rivers. **Figure 1** depicts Facility structures relative to the site boundaries, the monitoring well locations, as well as the Mississippi and Missouri Rivers. The Facility encompasses approximately 1,100 acres and is located within the floodplain between the Mississippi and Missouri Rivers. The Facility is bounded to the north by wooded areas associated with the Mississippi River. The property is bounded to the south by a railroad. The Facility is bounded to the east and west by agricultural fields.

2.1 Coal Combustion Residuals (CCR) UWL Cell 2 - SCPD

The SCPD surface impoundment is located to the south of the SEC and south of the Highway 94, in the area permitted as a UWL. The SCPD is constructed as a wet disposal cell which accepts Wet Flue Gas Desulfurization (WFGD) by-products. Unlike the adjacent SCPC Cell, gypsum stacking will not be performed at the SCPD. Most of the information provided in the following paragraphs about the proposed construction and use of the UWL is based on a January-May 2020 revision entitled "Ameren Missouri Sioux Energy Center – Permit Modification for Permitted Utility Waste Landfill - Solid Waste Disposal Area - Operating Permit Number 0918301 – St. Charles County, Missouri" by Reitz & Jens, Inc. (Reitz and Jens) and GREDELL Engineering Resources Inc (Gredell) and the 2022 "Sioux Energy Center – Utility Waste Landfill – Cell 2" drawing set completed by Reitz and Jens, Inc.

The proposed SCPD cell will be bounded immediately on the west by the SCPC surface Impoundment (UWL Cell 1), northeast by the SCL4A (UWL Cell 4a) landfill cell, the north by the UWL recycle pond, and south/southeast by low lying agricultural floodplain. The perimeter berm surrounding the SCPD will be built up to an elevation of 446 feet above mean sea level (MSL), which is approximately 5 feet above 100-year flood elevation of 441.2 feet MSL and about 12 to 18 feet above the surrounding low-lying farmland. This berm elevation will be equivalent to the adjacent SCPC, SCL4A, and Recycle Pond areas. Additionally, the SCPD is proposed to be lined with a bottom composite liner system consisting of two feet of compacted clay soil and a flexible geomembrane liner. This liner system will have a base elevation (top of liner/base of CCR) of approximately 432 feet MSL at its lowest point.

2.2 Geology

2.2.1 Physiographic Setting and Regional Geology

The Facility is located in the extreme southeastern corner of the Central Lowland Physiographic Province and the Dissected Till Plains (Gredell 2006). However, because the Facility lies between two major river systems in an area that has been formed by the deposition of river deposits, the regional physiographic setting is not representative of local Site geology and the glacial till deposits of the region are not present.

2.2.2 Local Geology

Based on the site drilling data, (EPRI 1998, Gredell 2006, Golder 2017A, Golder 2017B, Golder 2017C, Golder 2017D, Golder 2019A, Golder 2019B, Gredell 2019, and **Appendix A**), alluvial deposits associated with the Missouri and Mississippi Rivers overlie older sedimentary bedrock. These alluvial deposits comprise the surficial alluvial aquifer, which lies unconformably on top of bedrock and is typically 100 to 120 feet thick. 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 flood basin deposits, floodplain deposits, natural levee deposits, and channel deposits along with volumetrically less important loess deposits. Grain sizes of the alluvial deposits are highly variable.

According to the Detailed Site Investigation (DSI, Gredell 2006), completed as part of the UWL permitting process, bedrock below the alluvial aquifer includes Mississippian-aged rocks of the Meramecian Series. Lithologies include primarily limestone, dolomite, and shale which comprise the Salem Formation, Warsaw Formation, and the Osagean aged Burlington-Keokuk Formation.

2.3 Site Hydrogeology

Site hydrogeology has been characterized based on information obtained from over 50 piezometers and 50 geotechnical borings completed as part of the DSI process (Gredell 2006), monitoring wells installed for UWL landfill monitoring (Gredell, 2009), a 1998 investigation at the site completed by the Electric Power Research Institute (EPRI), a Site Characterization Report required for the sites National Pollutant Discharge Elimination System (NPDES) Permit (Gredell, 2019) and numerous wells and piezometers installed by Golder as part of the CCR Rule monitoring program (Golder 2017A, Golder 2017B, Golder 2017C, Golder 2017D, Golder 2019A, Golder 2019B). **Figure 2** provides a generalized north-south depiction of the SCPD referenced to local geology and groundwater, as well as the Mississippi and Missouri Rivers.

2.3.1 Uppermost Aquifer

The CCR Rule requires that a groundwater monitoring system be completed in the uppermost aquifer around each CCR Unit (§257.91(a)). As shown on **Figure 2**, the uppermost aquifer beneath all of the CCR impoundments and landfills is the alluvial deposits consisting primarily of alluvial sands with some silt, clay, and gravel associated with the Missouri and Mississippi River Valley alluvium. This alluvium overlies Mississippian-aged sedimentary bedrock formations. As generally described above, these alluvial deposits typically exhibit a fining-upward sequence with some silts and clays present within the shallow zone and mostly coarse sands and gravels present at depth. The thickness of the alluvial aquifer typically ranges from approximately 100 to 120 feet BGS with base elevations of approximately 300 to 330 feet MSL.

2.3.2 Surface Water and Groundwater Elevations

2.3.2.1 CCR Surface Impoundment Water

The SCPD is designed to be a lined CCR Unit that will typically have a ponded water level approximately 10 feet or more above the surrounding natural groundwater level. Water within the unit is not interconnected with the surrounding alluvial aquifer due to the liner system. No mounding effects are expected in the wells surrounding this CCR Unit based on previous studies completed at the SCPC and SCL4A.

2.3.2.2 Alluvial Aquifer Groundwater Elevations

During the DSI investigation in the area around the UWL, groundwater in the shallow alluvial aquifer had a relatively flat hydraulic gradient. Maximum groundwater elevation variation at any piezometer location was approximately three feet (3'). Over the year-long groundwater monitoring period, the minimum and maximum groundwater elevation at any well was approximately 411 feet MSL and 417 feet MSL, respectively. Groundwater potentiometric surface maps from the DSI are included in **Appendix B**.

In 2018 and 2019, Gredell completed a Site Characterization Report north of highway 94 near the SCPA and SCPB CCR Units. Groundwater elevations were collected monthly in this yearlong monitoring period and ranged from approximately 417 to 430 feet MSL. Maximum groundwater elevation variation at any piezometer location during this timeframe was approximately 12.5 feet. Potentiometric surface maps from this report are included in **Appendix C**.

Golder obtained groundwater elevation measurements from March 2016 through July 2022, as a part of the CCR rule sampling program, within the alluvial aquifer. For each of the sampling events, groundwater elevations were measured at monitoring wells within a 24-hour timeframe and a potentiometric map was generated from the data (**Table 1** and **Appendix D**). Groundwater elevations ranged from approximately 412 feet MSL to 427 feet MSL. Maximum groundwater variation at any piezometer locations during this timeframe was approximately 14.5 feet, however, during any specific sampling event, Site wide groundwater elevations varied between 1 and 9 feet across the entire site.

2.3.3 Alluvial Aquifer Groundwater Flow Directions

Site groundwater flow conditions are directly controlled by river stages of the Mississippi and Missouri Rivers and river levels display large seasonal changes in elevation. Under normal aquifer conditions, groundwater flow in the alluvial aquifer would be expected to have a flow direction component in a similar direction to the river flow and a flow component from the higher of the two rivers towards the lower river. 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.

Although the groundwater flow within the alluvial aquifer at the Facility is complex, the movement has been characterized by frequent groundwater elevation measurements and the generation of potentiometric surface maps generated by Gredell and Golder (**Appendix B, Appendix C** and **Appendix D**). The potentiometric surface maps display a large variability in the groundwater flow direction, though flow is very slow and limited by low gradients discussed below. These changes in flow direction are related to the water levels within the adjacent Missouri and Mississippi Rivers.

Beginning in August 2005, DSI groundwater measurements were taken every month to determine the changes in groundwater flow (**Appendix B**). During the year-long monitoring period, the direction of groundwater flow was

always southward from the Mississippi River toward the Missouri River. In this study, groundwater level was mostly controlled by the elevation of the Mississippi River with minor fluctuations in gradients caused by changes in elevation of the Missouri River. The majority of the time during the monitoring period, the elevation of the Mississippi River to the north of the Facility was a higher water elevation than the Missouri River to the south of the Facility. The DSI reports that the Missouri River elevation exceeded the Mississippi River elevation less than 5% of the time.

Potentiometric surface maps generated as a part of the initial baseline sampling events for this GMP do not always display the same results as those completed for the UWL (**Appendix D**). Since 2016, these maps display larger variations in groundwater flow direction. Of the 39 groundwater elevation collection events, the Missouri River level was estimated to be higher than the Mississippi River level for 20 of the events, the Mississippi River was higher for 18 of the events, and in one (1) event the Mississippi and Missouri Rivers had the same elevation.

Groundwater flow direction and hydraulic gradient were estimated for the alluvial aquifer wells using commercially available software (Devlin 2002). Estimated results from this analysis are provided in **Table 2**. These results indicate that while groundwater flow direction is variable, the overall net groundwater flow across the SEC is slightly to the southeast due to the reversals in flow as a result of variable river levels in the Missouri and Mississippi River Levels.

2.3.3.1 Horizontal Gradients

Horizontal groundwater gradients in the alluvial aquifer are typically low and flat. The gradients are dependent on river water levels (bank recharge and bank discharge conditions described earlier). Horizontal flow gradients calculated for the UWL DSI ranged from 0.0004 to 0.0013 feet/foot near the UWL.

Site-wide horizontal gradients were also calculated based on available CCR groundwater monitoring elevation data since 2016 (**Table 2**). The site-wide horizontal groundwater gradients are low, ranging from 0.00006 to 0.00094 feet/foot across the entire site. A review of the potentiometric surface maps confirms the gradient estimates, but also demonstrates that localized horizontal gradients can be higher in areas nearest the Mississippi and Missouri Rivers.

2.3.3.2 Vertical Gradients

A review of vertical gradients observed in piezometers was completed by comparing groundwater elevations obtained by Golder during CCR Rule monitoring. This analysis was completed by comparing water levels from shallow and intermediate/deep zone piezometer locations across the site where the piezometers are nested (two or more piezometers in close proximity, screened at different elevations). **Appendix E** displays the vertical gradients over time from the different well pairs. From the review of the data, areas away from the SCPA show variable vertical gradients that fluctuate between upward and downward with no consistent vertical gradient present between shallow and deeper zones of the alluvial aquifer. The vertical gradients across the site, using data from all available CCR monitoring data (since 2016), range from -0.000793 to 0.000097 with an average vertical gradient in these wells of -0.000254 feet per foot (very slightly downward), which further demonstrates the very low vertical gradient.

Vertical gradients were also calculated as part of the Gredell 2019 Site Characterization Report (Gredell, 2019) in which analyses were performed on various monitoring wells within the NPDES network onsite at the SEC. In this report, the monitoring well pair outside of the influence of the SCPA did not display a consistent trend, and the vertical gradient fluctuated between upwards and downwards during the monitoring period.

2.3.4 Hydraulic Conductivities

In-situ hydraulic conductivity tests (slug tests) were conducted as part of the DSI within the shallow portion of the alluvial aquifer to the south of the existing SCPA in the area of the UWL. The hydraulic conductivity in the area is highly dependent of the geology present within the screening interval of the piezometer. The calculated average hydraulic conductivity of the fluvial channel sediments was 4.2 x 10-2 centimeters per second (cm/sec), Natural levee deposits was 1.8 x 10-2 cm/sec, and floodplain deposits were 7.0 x 10-3 cm/sec. Generally, there is a tendency toward higher hydraulic conductivity values where the screened interval intersects with relatively coarse-grained sands interpreted as channel deposits. For relatively homogenous floodplain/levee sequences containing fine-grained sediments, calculated values are demonstrably lower. Similarly, in piezometers where the screen interval intersects finer-grained, clayey backswamp/cut-off deposits, the DSI indicates lower hydraulic conductivity values were measured.

Groundwater flow velocities were calculated as a part of the DSI using these hydraulic conductivity values, hydraulic gradients, and an estimated value for effective porosity (Figure 33 of the DSI). The DSI suggests a representative range of prevailing groundwater movement at the Site is between 14 to 188 feet per year, depending on hydraulic conductivity and effective porosity.

Golder also performed rising head hydraulic conductivity tests within the shallow, intermediate, and deep zones of the alluvial aquifer in order to estimate the hydraulic conductivities as a part of CCR Rule monitoring. The tests were conducted using a pneumatic slug (Hi-K slug) and a downhole pressure transducer. Within the shallow zone of the alluvial aquifer, results from the testing display a range of hydraulic conductivities from 5.5 x 10^{-3} cm/sec to 4.0 x 10^{-2} cm/sec with a geometric mean of 1.8 x 10^{-2} cm/sec. Golder's findings for hydraulic conductivity values are summarized in **Table 3** and are consistent with the conductivities calculated in the DSI.

Estimated groundwater flow velocities were calculated using the shallow zone of the alluvial aquifer geometric mean hydraulic conductivity, hydraulic gradients and an estimated value for effective porosity (**Table 2**). Using these values, groundwater flow velocities were estimated to range between 0.01 and 0.14 feet per day with an estimated net annual groundwater movement of approximately three (3) feet in the prevailing downgradient direction (southeast).

2.3.5 Porosity and Effective Porosity

Porosities were estimated based on the grain size distributions of an aquifer soil sample collected during CCR Rule monitoring well drilling. A representative grain size distribution was collected from the screen interval at BMW-1D, LMW-3S and LMW-8S using the ASTM D6913 Method B and the results are provided in the Detection/Assessment monitoring GMPs for the SCPA and SCPB (Golder 2017A, Golder 2017B). These samples were similar in field classification to other well drilling samples and the results indicate that the screened intervals of the alluvial aquifer are mostly comprised of sand (at least 90%) with lesser amounts of gravel, silt and clay. Also, the typical grain size of the sand ranges from fine to coarse sand. Textbook values of porosities for sands and sand/gravel mixes range from 25-50% (Fetter, 2000, and Freeze and Cherry, 1979) and fine sands typically range from 29-46%, whereas coarse sands typically range from 26-43% (Das, 2008). An average porosity of 35% is estimated for the alluvial aquifer based on the site data.

Effective porosity is the porosity that is available for fluid flow. Studies completed in unconsolidated sediments have determined that water molecules pass through all pores and the effective porosity is approximately equal to the total porosity (Fetter, 2000). Therefore, the effective porosity of the alluvial aquifer is also estimated to be 35%.

3.0 GROUNDWATER MONITORING NETWORK

3.1 Monitoring Network Design Criteria

§257.91 of the CCR Rule sets out the requirements for development of a groundwater monitoring system for both new and existing CCR landfills and Surface Impoundments. The performance standard in the CCR Rule (§257.91(a)) states that the groundwater monitoring system must consist of a sufficient number of wells at appropriate locations to yield groundwater samples in the uppermost aquifer that accurately represent:

- The quality of background groundwater
- The quality of groundwater passing the waste boundary of the CCR unit

3.2 Design of the Groundwater Monitoring System

The detection monitoring well network for the Facility is depicted on **Figure 1**. The network consists of six (6) monitoring wells screened in the uppermost aquifer for the purpose of monitoring the SCPD. The monitoring well network includes 2 background groundwater monitoring wells (BMW-1S and BMW-3S) that are located approximately 3,000 to 4,000 feet northwest of the SCPD in areas unaffected by CCR disposal. Four (4) groundwater monitoring wells border the SCPD and are considered the compliance wells. The groundwater monitoring well locations were selected based on site-specific information presented in **Section 2.0** of this document, as well as the preferential migration pathway analysis below.

3.2.1 Preferential Migration Pathway Analysis

After detailed review of the information outlined in **Section 2.0** of this document, a preferential migration pathway for potential groundwater impacts coming from the SCPD CCR Unit was determined. The SCPD is lined and has a bottom elevation of approximately 432 feet MSL. Potential constituent migration pathways are likely to be downward to groundwater level then laterally in the direction of groundwater flow in the alluvial aquifer. Groundwater flow within the alluvial aquifer is variable depending on levels within the Missouri and Mississippi Rivers and can flow in a variety of directions, however, overall net groundwater flow is slightly to the southeast due to reversals in flow as a result of variable river levels in the Missouri and Mississippi River. Based on water level readings, the groundwater surface in the alluvial aquifer can range from approximately 412 to 427 feet MSL. In order to place monitoring well screens within the migration pathway from the unit, monitoring wells were installed with screen interval elevations that range below the seasonal low groundwater levels so that the well screen is submerged below the water table surface to allow for groundwater sampling (approximately 399-411 feet MSL).

3.3 Groundwater Monitoring Well Placement

3.3.1 Background/Upgradient Monitoring Well Locations

As described above, the flow of groundwater in the alluvial aquifer is generally from either the Mississippi River towards the Missouri River or from the Missouri River towards the Mississippi River. The CCR Rule (§257.91(a)(1)) requires that background groundwater samples from the uppermost aquifer:

- *"Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit."*

At the SEC, groundwater can flow in any given direction based on the variability of the hydraulic gradient which is dependent on the Mississippi and Missouri river elevations, review of the available data shows a slight southeast

flow direction. Background monitoring wells BMW-1S and BMW-3S are located northwest of the SCPD in upgradient locations, just south of the Mississippi River as shown in **Figure 1**. These wells provide background groundwater quality for SCPD monitoring in the alluvial aquifer.

3.3.2 Downgradient Monitoring Well Locations

As discussed above, downgradient monitoring wells are located adjacent to the SCPD to monitor potential migration pathways. **Figure 1** shows that the downgradient well network consists of four groundwater monitoring wells (UG-2, TMW-4, TMW-5, and TMW-6) around the SCPD at locations that are located as close to the waste boundary as practical.

3.3.3 Groundwater Monitoring Well Screen Intervals

The system of monitoring wells at the SCPD are screened in the shallow alluvial aquifer zone below the seasonal low groundwater levels so that the well screen is submerged below the water table surface to allow for groundwater sampling. Details on the construction of the groundwater monitoring wells are provided in **Table 4**, **Appendix F** and **Appendix G**. Screen intervals range from approximately 399 - 411 feet MSL in sandy alluvial deposits.

4.0 INSTALLATION OF THE GROUNDWATER MONITORING SYSTEM

The CCR Rule Groundwater Monitoring System for the SCPD was installed on the following dates:

- UG-2 was installed by Gredell Engineering Resources, Inc. in December 2007.
- BMW-1S was installed by Golder in December 2015.
- BMW-3S was installed by Golder in November 2016.
- TMW-4, TMW-5 and TMW-6 were installed by Golder in March 2022.

Information on Golder monitoring wells is provided in **Appendix F**. Additional information on UG-2 is provided in the Groundwater Sampling and Analysis Plan for the UWL (Appendix S, Reitz and Jens and Gredell, 2014). The following sections further discuss the monitoring well installation of the groundwater monitoring wells installed by Golder for monitoring the SCPD.

4.1 Drilling Methods and Monitoring Well Construction

Cascade Drilling LP installed the Golder monitoring wells using a roto sonic drill rig under direct supervision of a Golder Geologist or Engineer. Continuous soil core samples were obtained at each Golder well borehole location and were logged in the field by Golder. Soils were classified according to the Unified Soil Classification System. Boring logs and well construction diagrams for the Golder wells are provided in **Appendix A**, and **Appendix F**, respectively.

Groundwater monitoring wells were installed in accordance with Missouri Department of Natural Resources (MDNR) Well Construction Rules (10 CSR 23-4.060 Construction Standards for Monitoring Wells). All groundwater monitoring wells were installed with 2-inch diameter PVC well riser pipe and 9.8-foot long, 0.010-inch machine slotted well screens. Wells were installed with a sand filter pack, bentonite seal, and annular space in accordance with MDNR Well Construction Rules. Details on the construction of the groundwater monitoring wells are provided in **Table 4** and **Appendix F**.

Monitoring wells were completed with an aluminum protective cover with a locking lid that extends approximately 2 to 3 feet above ground surface and a small concrete pad. Yellow protective posts (concrete filled steel bollards) have been installed around each monitoring well.

4.2 Groundwater Monitoring Well Development

After well construction, a Golder geologist or engineer developed the Golder groundwater monitoring wells using surging and purging techniques. During development, field parameters (pH, conductivity, temperature, and turbidity) were recorded, and development was complete once a minimum of three well-bore volumes of water were purged, turbidity was typically less than 20 nephelometric turbidity units (NTU) or ± 10% and consecutive measurements of field parameter values were within 10 percent difference. Groundwater monitoring wells were developed using an inertial pump with a surge block ring attached to a foot valve to surge and purge the well. Well development forms are attached in **Appendix G**.

4.3 Dedicated Pump Installation

A dedicated pump was installed in BMW-1S and BMW-3S well after development and hydraulic conductivity testing. The dedicated pumps provide a consistent, repeatable sampling method to reduce likelihood of cross contamination, reduce water sample turbidity, and expedite sampling. For the purposes of this groundwater monitoring network, low-flow QED brand PVC MicroPurge bladder pumps with Dura-Flex Teflon bladders were installed in each well. Monitoring wells UG-2, TMW-4, TMW-5, and TMW-6 are sampled using peristaltic pumping methods and dedicated tubing to be consistent with state UWL sampling methodology.

4.4 Surveying and Well Registration

Zahner and Associates, Inc., a Professional Land Surveyor licensed in Missouri, surveyed the location and top of casing elevation of the Golder monitoring wells. A drawing showing the location of the groundwater monitoring wells is shown in **Figure 1** and a summary of survey information is provided in **Table 4**. Upon completion of monitoring well installation and surveying, MDNR Well Construction Registration Forms were prepared for each well and submitted to MDNR. Copies of these forms are provided in **Appendix G**.

5.0 GROUNDWATER MONITORING PROGRAM

The groundwater monitoring program for the SCPD is described in the following sections.

5.1 Baseline Sampling Events

In accordance with section 257.94(b) of the CCR Rule, before starting detection monitoring, eight baseline (or background) samples were collected for all Appendix III and Appendix IV parameters at all downgradient and upgradient/background monitoring wells within the first six (6) months of sampling. These samples establish initial baseline datasets that are used for the statistical evaluation of groundwater results.

5.2 Detection Monitoring

The Detection Monitoring Program is defined in the CCR Rule in section 257.94 and the following sections outline the procedures for the detection monitoring program.

5.2.1 Sampling Constituents and Monitoring Frequency

Detection monitoring should be completed at a minimum of semi-annually (approximately every 6 months) for all Appendix III constituents (**Table 5**) unless a demonstration that the need for an alternative monitoring schedule is required. **Table 6** (in text) lists the analytical methods used for the monitoring programs.

Table 6: Sampling Parameters and Analytical Methods

Groundwater Parameters			
Parameter	**Method**	**Parameter**	**Method**
Appendix III Parameters		**Appendix IV Parameters**	
Boron	200.7	Antimony	200.8
Calcium	200.7	Arsenic	200.8
Chloride	EPA 300.0	Barium	200.7
Fluoride	EPA 300.0	Beryllium	200.7
Sulfate	EPA 300.0	Cadmium	200.8
Total Dissolved Solids	SM2540C	Chromium	200.8
Cations & Anions		Cobalt	200.7
Alkalinity	SM 2320B	Fluoride	EPA 300.0
Iron	200.7	Lead	200.7
Magnesium	200.7	Lithium	200.7
Manganese	200.7	Mercury	EPA74770A
Potassium	200.7	Molybdenum	200.7
Sodium	200.7	Radium 226	EPA 903.1
		Radium 228	EPA 904.0
		Selenium	200.8
		Thallium	200.8

Notes:

1) The methods provided are the current methods being used for baseline sampling. Methods may be changed if conditions warrant a change.

5.2.2 Data Evaluation and Response

As required in the CCR Rule, a statistical evaluation of the groundwater data must be completed within 90 days of receiving data from the laboratory. The data will be analyzed using the methods and procedures outlined in the statistical analysis plan (**Appendix I**).

5.3 Assessment Monitoring

Assessment monitoring is outlined in section 257.95 of the CCR Rule and is initiated after a confirmed SSI has been identified and no alternate source demonstration has been completed. In accordance with the CCR Rule, a notification must be prepared and placed within the Facility operating record and on the publicly available website stating that an Assessment Monitoring program has been initiated. The purpose of Assessment Monitoring is to determine whether or not groundwater concentrations are at a Statistically Significant Level (SSL) compared to Groundwater Protection Standards (GWPS). Detection Monitoring sampling continues during Assessment Monitoring.

5.3.1 Sampling Constituents and Monitoring Frequency

As outlined in section 257.95 of the CCR Rule, Assessment Monitoring groundwater sampling must begin within 90 days of a confirmed SSI determination. Sampling must be completed at all monitoring wells used in the detection monitoring program, for all Appendix IV analytes (**Table 5**). Within 90 days of receiving data from this initial Assessment Monitoring sampling event, a second sampling event must be completed analyzing the Appendix IV constituents detected in groundwater during the initial sampling event.

Following this initial phase of the Assessment Monitoring Program, the CCR Rule requires sampling of the full list of Appendix IV constituents on an annual basis (Annual Assessment Event). During the other semi-annual Assessment Sampling Event, only those Appendix IV constituents that are detected during the annual sampling event are to be analyzed and reported.

5.3.2 Data Evaluation and Response

As required in the CCR Rule, a statistical evaluation of the groundwater data must be completed within 90 days of receiving data from the laboratory. The data will be analyzed using the methods and procedures outlined in the Statistical Analysis Plan (**Appendix I**).

A GWPS is required for each Appendix IV constituent and must be included in the annual report. The GWPS will be either the Maximum Contaminant Level (MCL), an applicable health-based limit for cobalt, lead, lithium or molybdenum as outlined in 2018 USEPA Phase One, Part One Amendment, or a value based on background data, whichever is higher. The generation of the GWPS is discussed in more detail in the Statistical Analysis Plan (**Appendix I**). Statistical analysis must be completed within 90 days of receiving data from the laboratory. The statistical analysis will determine if any constituents are SSLs greater than the GWPS.

In order to discontinue Assessment Monitoring and return to Detection Monitoring, the concentration of all Appendix III and Appendix IV constituents for all compliance wells must be at levels statistically lower than background levels for two consecutive sampling events (257.95(e)). If any constituent is present at a statistical level above background levels, but below the GWPS, then Assessment Monitoring continues.

5.3.2.1 Responding to an SSL

If the Assessment Monitoring statistical evaluations demonstrate that an SSL has been triggered, then the owner/operator of the CCR unit must complete the following four actions as described in 257.95(g):

1. Prepare a notification identifying the constituents in Appendix IV that have exceeded a CCR Unit specific GWPS. This notification must be placed in the facility operating record within 30 days of identifying the SSL (257.95(g)) and 257.105(h)). Additionally, within 30 days of placing the notification in the operating record, the notification must be posted to the internet site (257.107(h)).
2. Define the character and extent of the release and any relevant site conditions that may affect the corrective action remedy that is ultimately selected. The characterization must be sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up releases from the CCR Unit and must include at least the following: (No timeframe is specified in the CCR Rule for this action).
    A. Installation of additional monitoring wells that are necessary to define the contaminant plume.
    B. Collect data on the nature and estimated quantity of the material released.
    C. Install and sample at least one additional monitoring well at the facility boundary in the direction of the contaminant plume migration.
3. Notify off-site property owners if the contamination plume has migrated offsite on to their property within 30 days of this determination.
4. If possible, provide an alternate source demonstration that determines that the SSL is not caused by a release at the facility within 90 days of completing the statistical evaluation. If no alternate source

demonstration can be made and the plume is determined to have originated from the CCR Unit, then proceed to corrective action steps in the CCR Rule.

D. If no alternate source demonstration is made, and the CCR Unit is an unlined surface impoundment, the closure or retrofit must be initiated.

Actions 1-3 must be completed regardless of whether or not an alternate source demonstration can be made.

5.3.3 Annual Reporting Requirements

In addition to the periodical reporting listed above, an annual groundwater monitoring report will be prepared according to the requirements of 40 CFR §257.90(e) and the August 28th, 2020, CCR Rule Update (RIN 2050-AH10). At a minimum, the annual groundwater monitoring report will contain the following information:

- An executive summary at the beginning of the report that includes the following:
  - Statement of what program the CCR unit is currently in
  - Identifying wells and analytes that are present at an SSI, SSL or statistically above the GWPS as a part of corrective action statistical evaluation
  - The date when assessment monitoring was initiated
  - Description and dates of any corrective measures initiated or completed
- The current status of the groundwater monitoring program
- A projection of key activities planned for the upcoming year
- A map showing the CCR unit and all background (or upgradient) and downgradient monitoring wells included in this monitoring plan
- A discussion of any monitoring wells that were installed or decommissioned during the preceding year or any other changes made to the groundwater monitoring system
- Analytical results from groundwater sampling
- The monitoring data obtained under §§ 257.90 through 257.98, including a summary of the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs
- A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels)
- If required, an alternate source demonstration that is certified by a professional engineer
- If required, a demonstration that an alternate sampling frequency is needed
- If assessment monitoring is required, a listing of GWPS for each Appendix IV constituent

6.0 GROUNDWATER SAMPLING METHODOLOGY

Sampling will be performed in accordance with accepted practices within the industry and with the provisions of Missouri regulations. The following sections provide details regarding procedures that will be used to collect groundwater samples. Although this section provides reference to specific forms, the use of other equivalent forms to record the necessary data is permissible.

6.1 Equipment Calibration

Equipment used to record field water quality parameters will be calibrated each day prior to use following manufacturers' recommendations. Calibration solutions for standardization materials will be freshly prepared or

from non-expired stock. In the absence of manufacturer or regulatory guidance, field equipment should be calibrated to within +/- 10 percent of the standard (or 0.1 standard units for pH meters). Equipment that fails calibration may not be used. Calibration records will be maintained. A sample field Instrument Calibration Form is included in **Appendix J**.

6.2 Monitoring Well Inspection

Prior to performing any water purging or sampling, each monitoring well will be inspected to assess its integrity. The condition of each monitoring well will be evaluated for any physical damage or other breach of integrity. The security of each monitoring well will be assessed to confirm that no outside source constituents have been introduced to the monitoring well.

6.3 Water Level Measurement

To meet the requirements of §257.93(c), water level measurements will be taken at all monitoring wells and prior to the start of any groundwater purging. These measurements will be taken within a 24-hour period and will be recorded on the Record of Water Level Readings form or Groundwater Sample Collection Form (included in Appendix I). Static water levels will be measured in each monitoring well prior to purging using an electric meter accurate to 0.01 foot. The measuring probe will be rinsed with distilled or deionized water before and after use at each well.

6.4 Monitoring Well Purging

Prior to collecting samples, each monitoring well will be purged. Purging will be accomplished using either:

- Low-flow (a.k.a., minimal drawdown, or Micropurge) techniques
- Traditional purging techniques where at least three well volumes are evacuated before samples are collected

6.4.1 Low Flow Sampling Technique

Low-flow groundwater sampling procedures will be used for purging and sampling monitoring wells that are equipped with dedicated pumps and will sustain a pumping rate of at least 100 milliliters per minute (ml/min). Water will be purged from these wells at low rates in order to minimize drawdown in the well during purging and sampling. Depth to water measurements and field water quality parameters (temperature, pH, turbidity, and conductivity) recorded during purging will be used as criteria to determine when purging has been completed. Sample collection will be initiated immediately after purging at each well.

During water purging, wells will be pumped at rates that minimize drawdown in the well. Purging rates in the range of 100-500 ml/min typically will be used; however, higher rates may be used if sustained by the well. Stabilization of the water column will be considered achieved when three consecutive water level measurements vary by 0.3 foot or less at a pumping rate of no less than 100 ml/min.

At a minimum, field water quality parameter measurements of temperature, pH, turbidity, and conductivity, will be measured during purging at each well. Prior to collecting the initial set of field water quality parameters, the water in the sampling pump and discharge tubing (i.e., pump system volume) remaining from the previous sampling event will be removed.

After evacuating the water in the pump system, collecting field measurements will begin. Depth to water measurements and field water quality parameter measurements will be made during purging. If a field meter

equipped with a flow cell is used, an amount of water equal to the volume of the flow cell should be allowed to pass through the flow cell between individual field stabilization measurements. Stabilization will be attained, and purging considered complete when three consecutive measurements of each field parameter vary within the following limits:

- ± 0.2 for pH
- ± 3% for Conductivity
- ± 10% for Temperature
- Less than 10 nephelometric turbidity units (NTU) or ± 10% for Turbidity

All data gathered during monitoring well purging will be recorded on a form, an example of which is included in **Appendix H**.

6.4.2 Traditional Purge Techniques

If low-flow sampling is not performed, wells will be purged a minimum of 3 well volumes before collecting a sample. Purging procedures will generally follow those for low-flow sampling including measurement of the field parameters listed above with two exceptions:

- Higher flow rate may be used during purging
- Purging is completed after a minimum of 3 well volumes have been removed (see below)

Even where low-flow sampling is not performed, the sampling goals are to:

- Stabilize field parameters (listed in previous section) prior to collecting samples
- Minimize drawdown in the well

When traditional purge techniques are used, field stabilization measurements will be collected at the beginning of purging and between each well volume purged. The stability criteria will be those described above for low-flow sampling.

6.4.3 Low Yielding Wells

If a monitoring well purges dry, it will be allowed to recover up to 24 hours before samples are collected. No additional purging will be performed after initially purging the monitoring well dry. If recharge is insufficient to fill all necessary sample bottles, samplers will note this on the field form, and fill as many sample bottles as possible.

6.5 Sample Collection

Sampling should take place immediately after purging is complete. Samples will be transferred directly from field sampling equipment into containers supplied by the analytical laboratory appropriate for the constituents being monitored as listed in **Table 6**. Sample containers will be kept closed until the time each set of sample containers is filled.

6.6 Equipment Decontamination

All non-dedicated field equipment that is used for purging or sample collection shall be cleaned with a phosphate-free detergent and triple-rinsed, inside and out, with deionized or distilled water prior to use and between each monitoring well. Decontamination water shall be disposed of at an Ameren approved location. Any disposable tubing used with non-dedicated pumps should be discarded after use at each monitoring well. Clean latex gloves will be worn by sampling personnel during monitoring well purging and sample collection.

6.7 Sample Preservation and Handling

In accordance with §257.93 of the CCR Rule, groundwater samples collected as part of the monitoring program will not be filtered prior to analysis. Once groundwater samples have been collected and preserved in laboratory supplied containers, and if required by the analysis, they will be packed into insulated, ice-filled coolers to be maintained at a temperature as close as possible to 4 degrees Celsius. Groundwater samples will be collected in the designated size and type of containers required for specific parameters. Sample containers will be filled in such a manner as not to lose preservatives by spilling or overfilling. Samples will be delivered to the laboratory or sent via overnight courier following chain-of-custody procedures.

6.8 Chain of Custody Program

The chain-of-custody (COC) program will allow for tracing sample possession and handling from the time of field collection through laboratory analysis. The COC program includes sample labels, sample seals, field Groundwater Sample Collection Forms, and COC record. A sample Chain-of-Custody (COC) form is provided in **Appendix J**.

Each sample will be assigned a unique sample identification number to be recorded on the sample label. The sample identification number for all samples will be designated differently based on the nature of the samples. Each sample identification number and description will be recorded on the field Groundwater Sample Collection Form and on the COC document.

6.8.1 Sample Labels

Sample labels will be sufficiently durable to remain legible when wet and will contain the following information, written with indelible ink:

- Site and sample identification number
- Monitoring well number or other location
- Date and time of collection
- Name of collector
- Parameters to be analyzed
- Preservative, if applicable

6.8.2 Sample Seals

The shipping container will be sealed to prevent the samples from being disturbed during transport to the laboratory.

6.8.3 Field Forms

All field information must be completely and accurately documented to become part of the final report for the groundwater monitoring event. Example field forms are included in **Appendix J**. The field forms will document the following information:

- Identification of the monitoring well
- Sample identification number
- Field meter calibration information
- Static water level depth
- Purge volume
- Time monitoring well was purged
- Date and time of collection

- Parameters requested for analysis
- Preservative used
- Field water quality parameter measurements
- Field observations on sampling event
- Name of collector(s)
- Weather conditions including air temperature and precipitation

6.8.4 Chain-of-Custody Record

The COC record is required for tracing sample possession from time of collection to time of receipt at the laboratory. The National Enforcement Investigations Center (NEIC) of USEPA considers a sample to be in custody under any of the following conditions:

- It is in the individual's possession
- It is in the individual's view after being in their possession
- It was in the individual's possession and they locked it up
- It is in a designated secure area

All environmental samples will be handled under strict COC procedures beginning in the field. The field team leader will be the field sample custodian and will be responsible for ensuring that COC procedures are followed. A COC record will accompany each individual shipment. The record will contain the following information:

- Sample destination and transporter
- Sample identification numbers
- Signature of collector
- Date and time of collection
- Sample type
- Identification of monitoring well
- Number of sample containers in shipping container
- Parameters requested for analysis
- Signature of person(s) involved in the chain of possession
- Inclusive dates of possession

A copy of the completed COC form will be placed in a water-resistant bag and accompany the shipment and will be returned to the shipper after the shipping container reaches its destination. The COC record will also be used as the analysis request sheet. When shipping by courier, the courier does not sign the COC record: copies of shipping forms are retained to document custody.

6.9 Temperature Control and Transportation

After collection, sample preservation, and labeling, sample containers will be placed in coolers containing water-ice with the goal of reducing the groundwater samples to a temperature of approximately 4°C or less. All samples included in the shipping container will be packed in such a manner to minimize the potential for container breakage. Samples will be either hand-delivered or shipped via commercial carrier to the certified analytical laboratory. Custody seals will be placed on the shipping containers if a third-party courier is used.

7.0 ANALYTICAL AND QUALITY CONTROL PROCEDURES

7.1 Data Quality Objectives

As part of the evaluation component of the Quality Assurance (QA) program, analytical results will be evaluated for precision, accuracy, representativeness, completeness, and comparability (PARCC). These are defined as follows:

- Precision is the agreement or reproducibility among individual measurements of the same property, usually made under the same conditions
- Accuracy is the degree of agreement of a measurement with the true or accepted value
- Representativeness is the degree to which a measurement accurately and precisely represents a characteristic of a population, parameter, or variations at a sampling point, a process condition, or an environmental condition
- Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct normal conditions
- Comparability is an expression of the confidence with which one data set can be compared with another data set in regard to the same property

The accuracy, precision and representativeness of data will be functions of the sample origin, analytical procedures and the specific sample matrices. Quality Control (QC) practices for the evaluation of these data quality indicators include the use of accepted analytical procedures, adherence to hold time, and analysis of QC samples (e.g., blanks, replicates, spikes, calibration standards and reference standards).

Quantitative QA objectives for precision and accuracy, along with sensitivity (detection limits) are established in accordance with the specific analytical methodologies, historical data, laboratory method validation studies, and laboratory experience with similar samples. The representativeness of the analytical data is a function of the procedures used to process the samples.

Completeness is a qualitative characteristic which is defined as the fraction of valid data obtained from a measurement system (e.g., sampling and analysis) compared to that which was planned. Completeness can be less than 100 percent due to poor sample recovery, sample damage, or disqualification of results which are outside of control limits due to laboratory error or matrix-specific interferences. Completeness is documented by including sufficient information in the laboratory reports to allow the data user to assess the quality of the results. The overall completeness goal for each task is difficult to determine prior to data acquisition. For this project, all reasonable attempts will be made to attain 90% completeness or better (laboratory).

Comparability is a qualitative characteristic which allows for comparison of analytical results with those obtained by other laboratories. This may be accomplished through the use of standard accepted methodologies, traceability of standards to the National Bureau of Standards (NBS) or USEPA sources, use of appropriate levels of quality control, reporting results in consistent, standard units of measure, and participation in inter-laboratory studies designed to evaluate laboratory performance.

Data quality and the standard commercial report package will be evaluated with respect to PARCC criteria using the laboratory's QA practices, use of standard analytical methods, certifications, participation in inter-laboratory studies, temperature control, adherence to hold times, and COC documentation (also called Data Validation).

7.2 Quality Assurance/Quality Control Samples

This section describes the various Quality Assurance/Quality Control (QA/QC) samples that will be collected in the field and analyzed in the laboratory and the frequency at which they will be performed.

7.2.1 Field Equipment Rinsate Blanks

In cases where sampling equipment is not dedicated or disposable, an equipment rinsate blank will be collected. The equipment rinsate blanks are prepared in the field using laboratory-supplied analyte-free water. The water is poured over and through each type of sampling equipment following decontamination and submitted to the laboratory for analysis of target constituents. **One rinsate blank will be collected for every 10 samples**.

7.2.2 Field Duplicates

Field duplicates are collected by sampling the same location twice, but the field duplicate is assigned a unique sample identification number. Samplers will document which location is used for the duplicate sample. **One field duplicate will be collected for every 10 samples.**

7.2.3 Field Blank

Field blanks are collected in the field using laboratory-supplied analyte-free water. The water is poured directly into the supplied sample containers in the field and submitted to the laboratory for analysis of target constituents. **One field blank will be collected for every 10 samples.**

7.2.4 Laboratory Quality Control Samples

The laboratory will have an established QC check program using procedural (method) blanks, laboratory control spikes, matrix spikes, and duplicates. Details of the internal QC checks used by the laboratory will be found in the laboratory QAP and the published analytical methods. These QC samples will be used to determine if results may have been affected by field activities or procedures used in sample transportation or if matrix interferences are an issue. **One (1) Matrix Spike (MS)/ Matrix Spike Duplicate (MSD) set** (i.e. one sample plus one MS, and one MSD sample at one location) **will be collected per 20 samples.** MS/MSD samples will have a naming convention as follows:

- Sample: S-SCPD-TMW-4
- MS: S-SCPD-TMW-4-MS
- MSD: S-SCPD-TMW-4-MSD

8.0 DATA EVALUATION AND STATISTICAL ANALYSIS

The following sections describe the evaluation and analysis procedures that are followed upon receipt of the analytical report.

8.1 Evaluation of Rate and Direction of Groundwater Flow

Groundwater elevations will be determined for each sampling event and will be used to develop a groundwater elevation contour map that will be submitted with reports. The direction of groundwater flow will be determined from upgradient and downgradient relationships as depicted on the potentiometric surface map. Based on these maps and commercially available software, groundwater flow velocities will be estimated for each event.

8.2 Data Validation

Before the data are used for statistical analysis, they will be evaluated by examining the quality control data accompanying the data report from the laboratory. Relevant quality control data could include measures of accuracy (percent recovery), precision (relative percent difference, RPD), and sample contamination (blank determinations). Data that fail any of these checks will be flagged for further evaluation. A Data Quality Review (DQR) may be initiated with the laboratory for any anomalous data.

8.3 Statistical Analysis

Upon completion of the data validation, the data will be submitted for statistical analysis in compliance with 40 CFR §257.93. The detailed statistical analysis plan for the Facility will be included in **Appendix I.**

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Tables

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Well ID	Location		Top of Casing	Ground Surface	Date Installed or Modified	Groundwater Elevation Measurements 3/16/2016	
	Northing	Easting	FT MSL	FT MSL		DTW	GWE
UMW-1D	1121321.4	879420.0	447.16	445.36	12/15/2015	27.67	419.49
UMW-1D[12]	1121321.4	879420.3	444.95	445.38	4/29/2020	NA	NA
UMW-2D	1120266.7	878981.6	433.86	431.74	12/17/2015	14.53	419.33
UMW-3D	1120570.4	878251.1	431.67	430.14	12/16/2015	12.58	419.09
UMW-4D	1121077.9	877859.9	423.52	421.71	12/16/2015	4.54	418.98
UMW-5D	1121815.0	877799.1	446.66	444.81	12/17/2015	27.86	418.80
UMW-6D	1122312.0	878639.5	447.02	444.91	12/18/2015	28.23	418.79
BMW-1D	1121713.6	876740.9	428.28	426.04	12/8/2015	9.50	418.78
BMW-2D[13]	1122766.5	880522.6	438.67	436.79	12/9/2015	20.34	418.33
BMW-3D	1121798.8	875798.3	426.41	424.16	11/8/2016	NA	NA
LMW-1S	1121320.4	879427.2	447.10	445.39	12/15/2015	27.53	419.57
LMW-1S[12]	1121320.4	879427.6	445.07	445.41	4/29/2020	NA	NA
LMW-2S	1120332.8	879283.7	447.16	445.24	12/16/2015	27.81	419.35
LMW-3S	1119348.8	878856.4	430.17	428.36	12/8/2015	11.45	418.72
LMW-4S	1119226.6	879561.5	429.40	427.27	12/8/2015	10.68	418.72
LMW-5S	1119250.6	880348.6	447.36	445.54	12/14/2015	28.55	418.81
LMW-6S	1119782.0	880867.8	446.00	444.10	12/14/2015	26.98	419.02
LMW-7S	1120261.0	880650.0	444.26	442.24	12/14/2015	25.11	419.15
LMW-8S	1121024.3	880328.8	446.80	444.77	12/15/2015	27.60	419.20
LMW-9S	1121905.9	879849.3	445.57	443.66	12/18/2015	26.64	418.93
BMW-1S	1121709.2	876755.6	427.77	425.98	12/8/2015	8.48	419.29
BMW-2S[13]	1122772.1	880524.1	437.86	436.13	12/9/2015	19.53	418.33
BMW-3S	1121792.9	875809.5	426.69	424.12	11/8/2016	NA	NA
UG-1A	1118825.2	877789.8	427.74	425.18	6/3/2008	NA	NA
UG-2	1118859.7	879319.5	429.27	426.46	12/16/2007	NA	NA
DG-1	1117388.3	877383.5	431.81	428.93	12/16/2007	NA	NA
DG-2	1116940.7	877617.7	431.75	428.90	12/16/2007	NA	NA
DG-3	1116644.1	877845.2	433.84	430.98	12/16/2007	NA	NA
DG-4	1116403.2	878420.7	432.75	430.11	12/16/2007	NA	NA
TMW-4	1116959.3	878952.1	432.35	429.97	3/4/2022	NA	NA
TMW-5	1116856.0	879563.9	432.30	429.94	3/4/2022	NA	NA
TMW-6	1116909.9	880086.0	433.25	430.84	3/4/2022	NA	NA
UG-3	1118608.5	880519.4	429.71	427.07	12/16/2007	NA	NA
TMW-1	1117385.1	880121.2	428.08	425.86	4/5/2016	NA	NA
TMW-2	1117320.7	880442.9	428.17	425.85	4/5/2016	NA	NA
TMW-3	1117259.2	880762.4	427.88	425.66	4/5/2016	NA	NA
PZ-9D	1119526.8	881125.3	434.30	432.39	6/19/2018	NA	NA
PZ-1S	1121157.5	877799.8	423.94	422.06	6/17/2018	NA	NA
TP-2D	1123221.1	881698.8	429.26	426.66	7/9/2018	NA	NA
TP-3D	1120614.0	882877.1	434.82	432.10	7/9/2018	NA	NA
TP-4D	1118472.8	882589.0	428.72	426.37	7/8/2018	NA	NA
TP-5D (Stickup)[14]	1118812.3	879517.5	429.60	427.08	7/6/2018	NA	NA
TP-5D (Flushmount)[14]	1118812.4	879517.7	429.13	429.31	3/26/2021	NA	NA
TP-6S	1119284.6	876381.5	428.07	426.07	7/11/2018	NA	NA
TP-6D	1119284.6	876381.5	428.06	426.07	7/11/2018	NA	NA
TP-8D	1114533.1	881307.7	431.31	428.84	7/14/2018	NA	NA
AM-1D	1122156.7	877672.7	425.47	423.49	7/11/2018	NA	NA
AM-1S	1122151.7	877672.3	425.56	423.34	7/11/2018	NA	NA
TP-1S	1122831.7	879480.2	447.69	445.48	7/10/2018	NA	NA
TP-1M	1122831.7	879480.2	447.70	445.48	7/10/2018	NA	NA
TP-1D	1122831.7	879480.2	447.70	445.48	7/10/2018	NA	NA
TP-2S	1123221.1	881698.8	429.26	426.66	7/9/2018	NA	NA
TP-2M	1123221.1	881698.8	429.26	426.66	7/9/2018	NA	NA
TP-3S	1120614.0	882877.1	434.83	432.10	7/9/2018	NA	NA
TP-3M	1120614.0	882877.1	434.72	432.10	7/9/2018	NA	NA
TP-4S	1118472.8	882589.0	428.74	426.37	7/8/2018	NA	NA
TP-4M	1118472.8	882589.0	428.70	426.37	7/8/2018	NA	NA
TP-5S (Stickup)[14]	1118812.3	879517.5	429.71	427.08	7/6/2018	NA	NA
TP-5S (Flushmount)[14]	1118812.4	879517.7	429.13	429.31	7/6/2018	NA	NA
TP-5M (Stickup)[14]	1118812.3	879517.5	429.49	427.08	7/6/2018	NA	NA
TP-5M (Flushmount)[14]	1118812.4	879517.7	429.09	429.31	7/6/2018	NA	NA
TP-6M	1119284.6	876381.5	428.08	426.07	7/11/2018	NA	NA
TP-7S	1116352.1	877768.3	432.58	430.13	7/13/2018	NA	NA
TP-7M	1116352.1	877768.3	432.56	430 .13	7/13/2018	NA	NA
TP-7D	1116352.1	877768.3	432.56	430.13	7/13/2018	NA	NA
TP-8S	1114533.1	881307.7	431.31	428.84	7/14/2018	NA	NA
TP-8M	1114533.1	881307.7	431.22	428.84	7/14/2018	NA	NA
UG-4	1118616.1	881530.7	429.75	427.10	12/16/2007	NA	NA
DG-5	1116330.2	878919.2	432.03	429.30	12/16/2007	NA	NA
DG-6	1116257.1	879417.1	431.44	428.66	12/17/2007	NA	NA
DG-7	1116184.8	879911.5	430.93	428.14	12/16/2007	NA	NA
DG-8	1116113.5	880398.2	430.39	427.41	12/16/2007	NA	NA
DG-9	1116162.3	880902.0	429.25	426.54	12/17/2007	NA	NA
DG-10	1116074.8	881453.2	428.31	425.53	12/17/2007	NA	NA
DG-11	1115984.9	882003.6	429.66	427.03	12/17/2007	NA	NA
DG-12	1116385.5	882289.8	429.66	427.03	12/17/2007	NA	NA
PZ-1D	1121152.4	877803.4	424.00	422.10	6/17/2018	NA	NA
PZ-2S	1122251.4	878500.1	448.17	446.23	6/20/2018	NA	NA
PZ-2D	1122252.3	878506.8	448.05	446.26	6/20/2018	NA	NA
PZ-3S	1121966.9	879304.1	447.23	445.12	6/16/2018	NA	NA
PZ-3D	1121967.5	879297.8	447.19	445.10	6/16/2018	NA	NA
PZ-4S	1120281.3	878884.6	434.86	432.83	6/18/2018	NA	NA
PZ-4D	1120280.2	878890.1	434.75	432.79	6/18/2018	NA	NA
PZ-5S	1119354.9	878825.3	431.25	429.28	6/16/2018	NA	NA
PZ-6S	1119235.4	880348.1	448.72	446.01	6/19/2018	NA	NA
PZ-7S	1120272.9	880644.0	445.16	442.82	6/19/2018	NA	NA
PZ-8S	1121907.5	879837.8	444.56	442.93	6/16/2018	NA	NA
PZ-9S	1119526.5	881119.7	434.15	432.41	6/19/2018	NA	NA
Mississippi	1124029.0	879444.0	NA	NA	NA	NA	416.6
Missouri	1112870.0	878170.0	NA	NA	NA	NA	416.6
SCPA Gauge	1121813.0	877906.0	NA	NA	NA	NA	435.4

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Well ID	Groundwater Elevation Measurements 5/9/2016		Groundwater Elevation Measurements 7/5/2016		Groundwater Elevation Measurements 9/14/2016		Groundwater Elevation Measurements 11/7/2016		Groundwater Elevation Measurements 1/3/2017	
	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE
UMW-1D	28.15	419.01	28.28	418.88	28.92	418.24	28.65	418.51	28.89	418.27
UMW-1D[12]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UMW-2D	14.59	419.27	14.90	418.96	15.58	418.28	15.57	418.29	16.40	417.46
UMW-3D	12.59	419.08	12.98	418.69	13.55	418.12	13.52	418.15	14.20	417.47
UMW-4D	4.72	418.80	5.02	418.50	5.58	417.94	5.39	418.13	5.80	417.72
UMW-5D	28.39	418.27	28.50	418.16	29.08	417.58	28.62	418.04	28.55	418.11
UMW-6D	29.02	418.00	28.98	418.04	29.63	417.39	29.00	418.02	28.75	418.27
BMW-1D	9.82	418.46	10.16	418.12	10.69	417.59	10.31	417.97	10.49	417.79
BMW-2D[13]	21.34	417.33	21.25	417.42	21.97	416.70	21.09	417.58	20.68	417.99
BMW-3D	NA	NA	NA	NA	NA	NA	NA	NA	8.69	417.72
LMW-1S	28.05	419.05	28.25	418.85	28.81	418.29	28.55	418.55	28.76	418.34
LMW-1S[12]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LMW-2S	27.92	419.24	28.21	418.95	28.90	418.26	28.83	418.33	29.62	417.54
LMW-3S	10.91	419.26	11.47	418.70	12.18	417.99	12.45	417.72	13.75	416.42
LMW-4S	10.21	419.19	10.77	418.63	11.45	417.95	11.69	417.71	12.93	416.47
LMW-5S	28.26	419.10	28.78	418.58	29.42	417.94	29.64	417.72	30.81	416.55
LMW-6S	27.10	418.90	27.51	418.49	28.12	417.88	28.14	417.86	29.01	416.99
LMW-7S	25.38	418.88	25.72	418.54	26.34	417.92	26.23	418.03	26.93	417.33
LMW-8S	28.08	418.72	28.30	418.50	28.92	417.88	28.64	418.16	29.05	417.75
LMW-9S	27.30	418.27	27.38	418.19	28.03	417.54	27.51	418.06	27.45	418.12
BMW-1S	9.31	418.46	9.62	418.15	10.25	417.52	9.77	418.00	9.98	417.79
BMW-2S[13]	20.52	417.34	20.43	417.43	21.19	416.67	20.33	417.53	19.90	417.96
BMW-3S	NA	NA	NA	NA	NA	NA	NA	NA	8.65	418.04
UG-1A	7.90	419.84	8.75	418.99	9.45	418.29	9.91	417.83	11.46	416.28
UG-2	10.25	419.02	10.89	418.38	11.59	417.68	11.98	417.29	13.36	415.91
DG-1	11.63	420.18	13.01	418.80	13.80	418.01	14.92	416.89	16.96	414.85
DG-2	11.49	420.26	13.04	418.71	13.84	417.91	15.21	416.54	17.30	414.45
DG-3	13.57	420.27	15.14	418.70	15.92	417.92	17.49	416.35	19.57	414.27
DG-4	12.49	420.26	14.10	418.65	14.85	417.90	16.52	416.23	18.58	414.17
TMW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UG-3	10.21	419.50	10.88	418.83	11.58	418.13	11.95	417.76	13.31	416.40
TMW-1	8.60	419.48	9.76	418.32	10.45	417.63	11.40	416.68	13.24	414.84
TMW-2	8.73	419.44	9.86	418.31	10.57	417.60	11.49	416.68	13.29	414.88
TMW-3	8.48	419.40	9.60	418.28	10.31	417.57	11.21	416.67	12.98	414.90
PZ-9D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-1S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-2D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-3D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-4D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5D (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5D (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-8D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AM-1D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AM-1S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-1S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-1M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-1D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-2S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-2M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-3S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-3M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-4S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-4M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5S (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5S (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5M (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5M (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-7S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-7M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-7D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-8S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-8M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UG-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-1D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-2S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-2D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-3S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-3D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-4S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-4D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-5S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-6S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-7S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-8S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-9S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mississippi	NA	416.8	NA	417.3	NA	416.5	NA	417.8	NA	418.5
Missouri	NA	420.3	NA	421.2	NA	418.2	NA	415.4	NA	415.4
SCPA Gauge	NA	435.0	NA	436.0	NA	434.0	NA	433.0	NA	435.0

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Well ID	Groundwater Elevation Measurements 3/8/2017		Groundwater Elevation Measurements 6/5/2017		Groundwater Elevation Measurements 11/13/2017		Groundwater Elevation Measurements 1/8/2018		Groundwater Elevation Measurement 2/12/2018	
	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE
UMW-1D	29.71	417.45	23.95	423.21	28.69	418.47	28.89	418.27	29.37	417.79
UMW-1D[12]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UMW-2D	17.05	416.81	10.85	423.01	16.29	417.57	16.81	417.05	17.30	416.56
UMW-3D	14.85	416.82	8.80	422.87	14.04	417.63	14.53	417.14	15.03	416.64
UMW-4D	6.54	416.98	0.81	422.71	5.57	417.95	5.88	417.64	6.37	417.15
UMW-5D	29.42	417.24	24.32	422.34	28.25	418.41	28.26	418.40	28.75	417.91
UMW-6D	29.73	417.29	24.68	422.34	28.32	418.70	28.24	418.78	28.76	418.26
BMW-1D	11.32	416.96	5.82	422.46	10.33	417.95	10.42	417.86	10.95	417.33
BMW-2D[13]	21.86	416.81	16.81	421.86	20.10	418.57	20.02	418.65	20.56	418.11
BMW-3D	9.47	416.94	3.89	422.52	8.51	417.90	8.69	417.72	9.19	417.22
LMW-1S	29.56	417.54	23.86	423.24	28.57	418.53	28.76	418.34	29.19	417.91
LMW-1S[12]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LMW-2S	30.28	416.88	24.00	423.16	29.48	417.68	29.91	417.25	30.47	416.69
LMW-3S	14.20	415.97	7.17	423.00	13.47	416.70	14.31	415.86	14.81	415.36
LMW-4S	13.46	415.94	6.24	423.16	12.71	416.69	13.50	415.90	14.02	415.38
LMW-5S	31.34	416.02	24.09	423.27	30.50	416.86	31.25	416.11	31.81	415.55
LMW-6S	29.63	416.37	24.89	421.11	28.86	417.14	29.43	416.57	29.89	416.11
LMW-7S	27.61	416.65	21.21	423.05	26.76	417.50	27.28	416.98	27.74	416.52
LMW-8S	29.80	417.00	23.86	422.94	28.84	417.96	29.19	417.61	29.66	417.14
LMW-9S	28.39	417.18	24.23	421.34	27.15	418.42	27.26	418.31	27.74	417.83
BMW-1S	10.82	416.95	5.30	422.47	9.84	417.93	9.97	417.80	10.44	417.33
BMW-2S[13]	21.07	416.79	16.00	421.86	19.37	418.49	19.27	418.59	19.79	418.07
BMW-3S	9.76	416.93	4.17	422.52	8.79	417.90	8.97	417.72	9.48	417.21
UG-1A	11.88	415.86	4.16	423.58	11.01	416.73	12.08	415.66	12.65	415.09
UG-2	13.84	415.43	6.29	422.98	13.04	416.23	13.94	415.33	14.50	414.77
DG-1	17.16	414.65	7.56	424.25	16.06	415.75	17.67	414.14	18.29	413.52
DG-2	17.46	414.29	7.38	424.37	16.32	415.43	18.10	413.65	18.69	413.06
DG-3	19.69	414.15	9.44	424.40	18.57	415.27	20.42	413.42	20.96	412.88
DG-4	18.70	414.05	8.42	424.33	17.62	415.13	19.44	413.31	19.98	412.77
TMW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UG-3	13.80	415.91	5.96	423.75	13.02	416.69	13.91	415.80	14.44	415.27
TMW-1	13.53	414.55	4.34	423.74	12.67	415.41	13.93	414.15	14.49	413.59
TMW-2	13.59	414.58	4.03	424.14	12.60	415.57	14.01	414.16	14.55	413.62
TMW-3	13.30	414.58	4.16	423.72	12.37	415.51	13.68	414.20	14.24	413.64
PZ-9D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-1S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-2D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-3D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-4D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5D (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5D (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-8D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AM-1D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AM-1S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-1S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-1M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-1D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-2S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-2M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-3S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-3M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-4S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-4M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5S (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5S (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5M (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5M (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-7S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-7M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-7D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-8S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-8M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UG-4	NA	NA	NA	NA	NA	NA	NA	NA	14.23	415.52
DG-5	NA	NA	NA	NA	NA	NA	NA	NA	19.20	412.83
DG-6	NA	NA	NA	NA	NA	NA	NA	NA	18.53	412.91
DG-7	NA	NA	NA	NA	NA	NA	NA	NA	17.91	413.02
DG-8	NA	NA	NA	NA	NA	NA	NA	NA	17.39	413.00
DG-9	NA	NA	NA	NA	NA	NA	NA	NA	16.01	413.24
DG-10	NA	NA	NA	NA	NA	NA	NA	NA	14.86	413.45
DG-11	NA	NA	NA	NA	NA	NA	NA	NA	14.79	414.87
DG-12	NA	NA	NA	NA	NA	NA	NA	NA	15.85	413.81
PZ-1D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-2S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-2D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-3S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-3D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-4S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-4D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-5S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-6S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-7S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-8S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-9S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mississippi	NA	416.9	NA	422.0	NA	419.3	NA	419.4	NA	419.0
Missouri	NA	413.9	NA	422.9	NA	415.5	NA	413.2	NA	412.6
SCPA Gauge	NA	436.0	NA	435.7	NA	BG	NA	435.5	NA	BG

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Well ID	Groundwater Elevation Measurements 3/9/2018		Groundwater Elevation Measurements 4/5/2018		Groundwater Elevation Measurements 5/14/2018		Groundwater Elevation Measurements 7/5/2018		Groundwater Elevation Measurements 11/12/2018	
	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE
UMW-1D	29.95	417.21	29.06	418.10	28.80	418.36	28.11	419.05	27.43	419.73
UMW-1D[12]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UMW-2D	17.33	416.53	16.18	417.68	15.93	417.93	15.10	418.76	13.90	419.96
UMW-3D	15.18	416.49	14.00	417.67	13.70	417.97	12.88	418.79	11.96	419.71
UMW-4D	6.84	416.68	5.75	417.77	5.43	418.09	4.60	418.92	4.18	419.34
UMW-5D	29.72	416.94	28.78	417.88	28.39	418.27	27.53	419.13	27.94	418.72
UMW-6D	30.05	416.97	29.14	417.88	28.68	418.34	27.75	419.27	29.55	417.47
BMW-1D	11.68	416.60	10.63	417.65	10.34	417.94	9.55	418.73	9.30	418.98
BMW-2D[13]	22.23	416.44	21.20	417.47	20.82	417.85	19.86	418.81	21.04	417.63
BMW-3D	9.85	416.56	8.70	417.71	8.45	417.96	7.67	418.74	7.43	418.98
LMW-1S	29.83	417.27	28.96	418.14	28.68	418.42	28.02	419.08	27.32	419.78
LMW-1S[12]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LMW-2S	30.52	416.64	29.45	417.71	29.18	417.98	28.44	418.72	27.24	419.92
LMW-3S	14.49	415.68	13.04	417.13	12.72	417.45	11.71	418.46	10.63	419.54
LMW-4S	13.72	415.68	12.33	417.07	12.00	417.40	11.01	418.39	9.68	419.72
LMW-5S	31.58	415.78	30.32	417.04	29.99	417.37	29.07	418.29	27.80	419.56
LMW-6S	29.97	416.03	28.88	417.12	28.61	417.39	27.84	418.16	26.58	419.42
LMW-7S	27.92	416.34	26.94	417.32	26.73	417.53	26.03	418.23	24.80	419.46
LMW-8S	30.08	416.72	29.25	417.55	29.04	417.76	28.39	418.41	27.43	419.37
LMW-9S	28.69	416.88	27.81	417.76	27.54	418.03	26.78	418.79	26.76	418.81
BMW-1S	11.16	416.61	10.10	417.67	9.83	417.94	9.13	418.64	8.73	419.04
BMW-2S[13]	21.41	416.45	20.42	417.44	20.07	417.79	19.12	418.74	20.21	417.65
BMW-3S	10.13	416.56	8.98	417.71	8.73	417.96	7.65	419.04	7.68	419.01
UG-1A	12.04	415.70	10.44	417.30	10.02	417.72	8.81	418.93	7.68	420.06
UG-2	14.05	415.22	12.59	416.68	12.20	417.07	11.11	418.16	9.79	419.48
DG-1	16.94	414.87	15.14	416.67	14.52	417.29	12.87	418.94	11.73	420.08
DG-2	17.05	414.70	15.19	416.56	14.62	417.13	13.82	417.93	11.76	419.99
DG-3	19.18	414.66	15.29	418.55	16.75	417.09	14.90	418.94	13.89	419.95
DG-4	18.14	414.61	16.26	416.49	15.70	417.05	13.80	418.95	12.91	419.84
TMW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UG-3	14.04	415.67	12.56	417.15	12.24	417.47	11.12	418.59	9.87	419.84
TMW-1	13.55	414.53	11.88	416.20	11.26	416.82	9.71	418.37	8.67	419.41
TMW-2	13.64	414.53	12.10	416.07	11.38	416.79	9.85	418.32	8.78	419.39
TMW-3	13.37	414.51	11.79	416.09	11.13	416.75	9.59	418.29	8.54	419.34
PZ-9D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-1S	NA	NA	NA	NA	NA	NA	NA	NA	4.57	419.37
TP-2D	NA	NA	NA	NA	NA	NA	NA	NA	12.13	417.13
TP-3D	NA	NA	NA	NA	NA	NA	NA	NA	16.25	418.57
TP-4D	NA	NA	NA	NA	NA	NA	NA	NA	9.61	419.11
TP-5D (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	10.00	419.60
TP-5D (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6S	NA	NA	NA	NA	NA	NA	NA	NA	8.13	419.94
TP-6D	NA	NA	NA	NA	NA	NA	NA	NA	8.13	419.93
TP-8D	NA	NA	NA	NA	NA	NA	NA	NA	12.34	418.97
AM-1D	NA	NA	NA	NA	NA	NA	NA	NA	7.03	418.44
AM-1S	NA	NA	NA	NA	NA	NA	NA	NA	7.23	418.33
TP-1S	NA	NA	NA	NA	NA	NA	NA	NA	30.64	417.05
TP-1M	NA	NA	NA	NA	NA	NA	NA	NA	29.16	418.54
TP-1D	NA	NA	NA	NA	NA	NA	NA	NA	29.12	418.58
TP-2S	NA	NA	NA	NA	NA	NA	NA	NA	12.13	417.13
TP-2M	NA	NA	NA	NA	NA	NA	NA	NA	12.14	417.12
TP-3S	NA	NA	NA	NA	NA	NA	NA	NA	16.20	418.63
TP-3M	NA	NA	NA	NA	NA	NA	NA	NA	16.10	418.62
TP-4S	NA	NA	NA	NA	NA	NA	NA	NA	9.64	419.10
TP-4M	NA	NA	NA	NA	NA	NA	NA	NA	9.70	419.00
TP-5S (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	9.89	419.82
TP-5S (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5M (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	9.80	419.69
TP-5M (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6M	NA	NA	NA	NA	NA	NA	NA	NA	8.15	419.93
TP-7S	NA	NA	NA	NA	NA	NA	NA	NA	13.01	419.57
TP-7M	NA	NA	NA	NA	NA	NA	NA	NA	12.99	419.57
TP-7D	NA	NA	NA	NA	NA	NA	NA	NA	13.01	419.55
TP-8S	NA	NA	NA	NA	NA	NA	NA	NA	12.29	419.02
TP-8M	NA	NA	NA	NA	NA	NA	NA	NA	12.19	419.03
UG-4	14.02	415.73	NA	NA	NA	NA	NA	NA	10.09	419.66
DG-5	17.44	414.59	NA	NA	NA	NA	NA	NA	12.23	419.80
DG-6	16.89	414.55	NA	NA	NA	NA	NA	NA	11.70	419.74
DG-7	16.41	414.52	NA	NA	NA	NA	NA	NA	11.27	419.66
DG-8	16.01	414.38	NA	NA	NA	NA	NA	NA	10.90	419.49
DG-9	14.81	414.44	NA	NA	NA	NA	NA	NA	9.74	419.51
DG-10	13.81	414.50	NA	NA	NA	NA	NA	NA	8.81	419.50
DG-11	13.83	415.83	NA	NA	NA	NA	NA	NA	9.68	419.98
DG-12	15.06	414.60	NA	NA	NA	NA	NA	NA	10.32	419.34
PZ-1D	NA	NA	NA	NA	NA	NA	NA	NA	4.64	419.36
PZ-2S	NA	NA	NA	NA	NA	NA	NA	NA	29.52	418.65
PZ-2D	NA	NA	NA	NA	NA	NA	NA	NA	29.41	418.64
PZ-3S	NA	NA	NA	NA	NA	NA	NA	NA	28.12	419.11
PZ-3D	NA	NA	NA	NA	NA	NA	NA	NA	28.14	419.05
PZ-4S	NA	NA	NA	NA	NA	NA	NA	NA	14.82	420.04
PZ-4D	NA	NA	NA	NA	NA	NA	NA	NA	14.69	420.06
PZ-5S	NA	NA	NA	NA	NA	NA	NA	NA	11.29	419.96
PZ-6S	NA	NA	NA	NA	NA	NA	NA	NA	28.06	420.66
PZ-7S	NA	NA	NA	NA	NA	NA	NA	NA	25.50	419.66
PZ-8S	NA	NA	NA	NA	NA	NA	NA	NA	23.52	421.04
PZ-9S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mississippi	NA	416.3	NA	417.7	NA	418.5	NA	419.7	NA	417.1
Missouri	NA	415.7	NA	417.6	NA	417.1	NA	419.6	NA	418.3
SCPA Gauge	NA	435.0	NA	435.0	NA	435.0	NA	435.5	NA	436.6

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Well ID	Groundwater Elevation Measurements 1/7/2019		Groundwater Elevation Measurements 8/1/2019		Groundwater Elevation Measurements 10/1/2019		Groundwater Elevation Measurements 11/13/2019		Groundwater Elevation Measurements 1/2/2020	
	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE
UMW-1D	27.87	419.29	25.23	421.93	26.59	420.57	26.20	420.96	27.36	419.80
UMW-1D[12]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UMW-2D	14.54	419.32	11.42	422.44	13.00	420.86	12.45	421.41	13.80	420.06
UMW-3D	12.43	419.24	9.65	422.02	11.04	420.63	10.62	421.05	11.79	419.88
UMW-4D	4.61	418.91	2.20	421.32	3.21	420.31	3.04	420.48	4.12	419.40
UMW-5D	28.26	418.40	26.31	420.35	26.96	419.70	27.20	419.46	27.88	418.78
UMW-6D	29.01	418.01	23.78	423.24	27.36	419.66	27.90	419.12	28.56	418.46
BMW-1D	9.57	418.71	7.32	420.96	8.44	419.84	8.15	420.13	9.15	419.13
BMW-2D[13]	21.51	417.16	19.72	418.95	19.36	419.31	20.31	418.36	20.79	417.88
BMW-3D	7.63	418.78	5.43	420.98	6.42	419.99	6.35	420.06	7.06	419.35
LMW-1S	27.76	419.34	25.10	422.00	26.50	420.60	26.13	420.97	27.28	419.82
LMW-1S[12]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LMW-2S	27.69	419.47	24.53	422.63	26.28	420.88	25.68	421.48	26.98	420.18
LMW-3S	10.81	419.36	7.14	423.03	8.95	421.22	8.39	421.78	9.99	420.18
LMW-4S	10.20	419.20	6.12	423.28	8.28	421.12	7.60	421.80	9.28	420.12
LMW-5S	28.03	419.33	23.93	423.43	26.22	421.14	25.87	421.49	27.13	420.23
LMW-6S	26.83	419.17	22.85	423.15	25.16	420.84	25.52	420.48	25.90	420.10
LMW-7S	25.07	419.19	21.41	422.85	23.53	420.73	22.89	421.37	24.35	419.91
LMW-8S	27.76	419.04	24.83	421.97	26.38	420.42	25.83	420.97	27.20	419.60
LMW-9S	27.15	418.42	24.87	420.70	25.66	419.91	25.69	419.88	26.58	418.99
BMW-1S	9.00	418.77	6.89	420.88	7.97	419.80	7.70	420.07	8.56	419.21
BMW-2S[13]	20.69	417.17	18.90	418.96	18.65	419.21	19.50	418.36	19.97	417.89
BMW-3S	7.92	418.77	5.71	420.98	6.35	420.34	6.07	420.62	7.32	419.37
UG-1A	7.88	419.86	3.72	424.02	5.95	421.79	5.41	422.33	7.07	420.67
UG-2	10.10	419.17	6.05	423.22	8.19	421.08	7.64	421.63	9.25	420.02
DG-1	11.97	419.84	5.88	425.93	9.29	422.52	9.06	422.75	11.25	420.56
DG-2	11.97	419.78	5.46	426.29	9.11	422.64	8.98	422.77	11.34	420.41
DG-3	14.03	419.81	7.59	426.25	11.11	422.73	10.97	422.87	13.43	420.41
DG-4	13.05	419.70	6.65	426.10	10.05	422.70	9.96	422.79	12.37	420.38
TMW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UG-3	10.11	419.60	5.51	424.20	8.04	421.67	7.42	422.29	9.14	420.57
TMW-1	8.78	419.30	3.39	424.69	6.24	421.84	5.82	422.26	7.95	420.13
TMW-2	8.91	419.26	3.51	424.66	6.33	421.84	5.92	422.25	8.05	420.12
TMW-3	8.68	419.20	3.27	424.61	6.09	421.79	5.63	422.25	8.20	419.68
PZ-9D	NA	NA	10.80	423.50	NA	NA	12.56	421.74	13.96	420.34
PZ-1S	4.92	419.02	2.63	421.31	3.59	420.35	3.47	420.47	4.59	419.35
TP-2D	12.63	416.63	11.14	418.12	10.27	418.99	11.50	417.76	11.82	417.44
TP-3D	16.54	418.28	13.14	421.68	14.87	419.95	14.42	420.40	15.40	419.42
TP-4D	9.87	418.85	5.91	422.81	7.76	420.96	7.07	421.65	8.71	420.01
TP-5D (Stickup)[14]	10.19	419.41	5.14	424.46	8.20	421.40	7.78	421.82	9.30	420.30
TP-5D (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6S	8.48	419.59	4.04	424.03	6.54	421.53	5.91	422.16	7.56	420.51
TP-6D	8.49	419.57	4.05	424.01	6.53	421.53	5.92	422.14	7.58	420.48
TP-8D	12.28	419.03	6.04	425.27	9.18	422.13	9.12	422.19	11.56	419.75
AM-1D	7.35	418.12	6.00	419.47	5.94	419.53	6.40	419.07	7.17	418.30
AM-1S	7.48	418.08	6.16	419.40	5.45	420.11	6.79	418.77	7.33	418.23
TP-1S	31.29	416.40	29.78	417.91	28.67	419.02	30.30	417.39	30.64	417.05
TP-1M	30.48	417.22	28.87	418.83	28.25	419.45	29.31	418.39	29.84	417.86
TP-1D	30.45	417.25	28.83	418.87	28.24	419.46	29.30	418.40	29.83	417.87
TP-2S	12.61	416.65	11.13	418.13	10.26	419.00	11.49	417.77	11.80	417.46
TP-2M	12.61	416.65	11.12	418.14	10.29	418.97	11.49	417.77	11.79	417.47
TP-3S	16.55	418.28	13.10	421.73	14.76	420.07	14.44	420.39	15.47	419.36
TP-3M	16.45	418.27	13.00	421.72	14.75	419.97	14.32	420.40	15.35	419.37
TP-4S	9.90	418.84	6.15	422.59	7.74	421.00	7.06	421.68	8.73	420.01
TP-4M	9.87	418.83	6.03	422.67	7.67	421.03	7.03	421.67	8.66	420.04
TP-5S (Stickup)[14]	10.28	419.43	5.05	424.66	8.33	421.38	7.57	422.14	9.48	420.23
TP-5S (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5M (Stickup)[14]	10.08	419.41	5.09	424.40	8.12	421.37	7.69	421.80	9.22	420.27
TP-5M (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6M	8.50	419.58	4.04	424.04	6.54	421.54	5.91	422.17	7.58	420.50
TP-7S	13.29	419.29	6.54	426.04	10.13	422.45	10.05	422.53	12.56	420.02
TP-7M	13.19	419.37	6.50	426.06	10.06	422.50	10.01	422.55	12.49	420.07
TP-7D	13.22	419.34	6.52	426.04	10.09	422.47	10.03	422.53	12.49	420.07
TP-8S	12.29	419.02	6.03	425.28	9.21	422.10	9.13	422.18	11.60	419.71
TP-8M	12.19	419.03	5.91	425.31	9.11	422.11	9.00	422.22	11.49	419.73
UG-4	10.31	419.44	5.50	424.25	8.19	421.56	7.58	422.17	NA	NA
DG-5	12.35	419.68	6.05	425.98	9.41	422.62	9.26	422.77	11.66	420.37
DG-6	11.81	419.63	5.58	425.86	9.89	421.55	8.70	422.74	11.07	420.37
DG-7	11.35	419.58	5.19	425.74	8.44	422.49	8.21	422.72	10.56	420.37
DG-8	10.98	419.41	4.91	425.48	8.12	422.27	7.81	422.58	NA	NA
DG-9	9.79	419.46	3.82	425.43	7.09	422.16	6.71	422.54	8.98	420.27
DG-10	8.84	419.47	2.96	425.35	6.12	422.19	5.70	422.61	NA	NA
DG-11	8.95	420.71	3.12	426.54	6.30	423.36	5.82	423.84	NA	NA
DG-12	10.38	419.28	4.66	425.00	7.71	421.95	7.22	422.44	9.25	420.41
PZ-1D	5.02	418.98	2.69	421.31	3.65	420.35	3.54	420.46	4.55	419.45
PZ-2S	29.99	418.18	28.39	419.78	28.40	419.77	28.95	419.22	29.53	418.64
PZ-2D	29.85	418.20	28.25	419.80	28.26	419.79	28.83	419.22	29.39	418.66
PZ-3S	28.57	418.66	26.54	420.69	27.06	420.17	27.27	419.96	28.08	419.15
PZ-3D	28.63	418.56	27.60	419.59	27.04	420.15	27.32	419.87	28.13	419.06
PZ-4S	15.71	419.15	12.32	422.54	13.92	420.94	13.28	421.58	14.72	420.14
PZ-4D	15.19	419.56	12.18	422.57	13.78	420.97	13.23	421.52	14.57	420.18
PZ-5S	11.68	419.57	8.05	423.20	9.86	421.39	9.31	421.94	NA	NA
PZ-6S	28.31	420.41	24.19	424.53	26.30	422.42	25.91	422.81	NA	NA
PZ-7S	25.78	419.38	22.13	423.03	24.26	420.90	23.80	421.36	NA	NA
PZ-8S	25.95	418.61	NA	NA	NA	NA	NA	NA	NA	NA
PZ-9S	NA	NA	10.66	423.49	NA	NA	12.40	421.75	13.81	420.34
Mississippi	NA	416.0	NA	417.9	NA	419.8	NA	417.4	NA	416.6
Missouri	NA	417.5	NA	423.8	NA	424.2	NA	420.7	NA	420.7
SCPA Gauge	NA	435.5	NA	BG	NA	BG	NA	BG	NA	BG

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Well ID	Groundwater Elevation Measurements 4/22/2020		Groundwater Elevation Measurements 6/15/2020		Groundwater Elevation Measurements 7/21/2020		Groundwater Elevation Measurements 9/28/2020		Groundwater Elevation Measurements 11/11/2020	
	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE
UMW-1D	25.58	421.58	NA	NA	NA	NA	NA	NA	NA	NA
UMW-1D[12]	NA	NA	22.69	422.26	25.15	419.80	25.72	419.23	26.65	418.30
UMW-2D	12.38	421.48	11.83	422.03	13.90	419.96	15.51	418.35	16.52	417.34
UMW-3D	10.26	421.41	9.78	421.89	12.09	419.58	13.42	418.25	14.30	417.37
UMW-4D	2.31	421.21	1.90	421.62	4.36	419.16	5.59	417.93	5.84	417.68
UMW-5D	25.80	420.86	25.58	421.08	28.14	418.52	28.07	418.59	28.51	418.15
UMW-6D	26.19	420.83	25.96	421.06	28.67	418.35	29.66	417.36	28.67	418.35
BMW-1D	7.27	421.01	7.01	421.27	9.49	418.79	10.01	418.27	10.44	417.84
BMW-2D[13]	18.23	420.44	18.13	420.54	20.89	417.78	20.13	418.54	20.32	418.35
BMW-3D	5.22	421.19	5.04	421.37	7.47	418.94	8.34	418.07	8.62	417.79
LMW-1S	25.50	421.60	NA	NA	NA	NA	NA	NA	NA	NA
LMW-1S[12]	NA	NA	22.81	422.26	25.10	419.97	25.72	419.35	26.78	418.29
LMW-2S	25.58	421.58	25.02	422.14	27.24	419.92	28.69	418.47	29.68	417.48
LMW-3S	8.60	421.57	7.93	422.24	10.34	419.83	12.61	417.56	13.69	416.48
LMW-4S	7.82	421.58	7.02	422.38	9.53	419.87	11.79	417.61	12.84	416.56
LMW-5S	25.74	421.62	24.93	422.43	27.42	419.94	29.66	417.70	30.67	416.69
LMW-6S	24.49	421.51	23.79	422.21	26.08	419.92	27.94	418.06	28.88	417.12
LMW-7S	22.78	421.48	22.13	422.13	24.41	419.85	25.94	418.32	26.85	417.41
LMW-8S	25.41	421.39	24.83	421.97	27.19	419.61	28.22	418.58	28.98	417.82
LMW-9S	24.49	421.08	24.09	421.48	26.69	418.88	26.81	418.76	27.37	418.20
BMW-1S	6.78	420.99	6.45	421.32	8.97	418.80	9.41	418.36	9.95	417.82
BMW-2S[13]	17.47	420.39	17.34	420.52	20.03	417.83	19.41	418.45	19.57	418.29
BMW-3S	5.54	421.15	5.32	421.37	7.78	418.91	8.45	418.24	8.87	417.82
UG-1A	5.71	422.03	4.88	422.86	7.64	420.10	10.29	417.45	11.39	416.35
UG-2	7.98	421.29	6.82	422.45	9.69	419.58	12.11	417.16	13.23	416.04
DG-1	9.59	422.22	8.20	423.61	12.03	419.78	16.11	415.70	16.68	415.13
DG-2	9.54	422.21	8.01	423.74	11.95	419.80	16.02	415.73	17.01	414.74
DG-3	11.51	422.33	10.08	423.76	14.20	419.64	18.06	415.78	19.26	414.58
DG-4	10.59	422.16	9.01	423.74	13.19	419.56	17.09	415.66	18.26	414.49
TMW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UG-3	7.74	421.97	6.80	422.91	9.53	420.18	11.96	417.75	13.09	416.62
TMW-1	6.39	421.69	5.13	422.95	8.55	419.53	11.71	416.37	12.94	415.14
TMW-2	6.25	421.92	5.22	422.95	8.58	419.59	11.78	416.39	12.98	415.19
TMW-3	6.21	421.67	4.96	422.92	8.38	419.50	11.52	416.36	12.67	415.21
PZ-9D	12.60	421.70	11.86	422.44	14.21	420.09	16.13	418.17	17.12	417.18
PZ-1S	2.65	421.29	2.36	421.58	4.77	419.17	5.46	418.48	6.10	417.84
TP-2D	9.13	420.13	9.09	420.17	11.86	417.40	10.84	418.42	10.80	418.46
TP-3D	13.81	421.01	13.31	421.51	15.67	419.15	16.48	418.34	17.12	417.70
TP-4D	7.25	421.47	6.38	422.34	8.91	419.81	11.01	417.71	12.12	416.60
TP-5D (Stickup)[14]	7.93	421.67	7.09	422.51	9.89	419.71	12.20	417.40	13.31	416.29
TP-5D (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6S	6.17	421.90	5.40	422.67	8.01	420.06	10.57	417.50	11.71	416.36
TP-6D	6.18	421.88	5.39	422.67	8.00	420.06	10.59	417.47	11.72	416.34
TP-8D	9.70	421.61	8.07	423.24	12.31	419.00	16.31	415.00	17.52	413.79
AM-1D	4.88	420.59	4.74	420.73	7.17	418.30	6.92	418.55	7.17	418.30
AM-1S	4.79	420.77	4.90	420.66	7.29	418.27	6.87	418.69	7.95	417.61
TP-1S	27.61	420.08	27.62	420.07	30.37	417.32	29.12	418.57	29.18	418.51
TP-1M	27.23	420.47	27.12	420.58	30.41	417.29	29.12	418.58	29.32	418.38
TP-1D	27.22	420.48	27.11	420.59	30.36	417.34	29.15	418.55	29.34	418.36
TP-2S	9.13	420.13	9.11	420.15	11.84	417.42	10.82	418.44	10.86	418.40
TP-2M	9.12	420.14	9.14	420.12	11.87	417.39	10.81	418.45	10.84	418.42
TP-3S	13.79	421.04	13.28	421.55	15.64	419.19	16.48	418.35	17.12	417.71
TP-3M	13.71	421.01	13.21	421.51	15.64	419.08	16.38	418.34	17.04	417.68
TP-4S	7.32	421.42	6.42	422.32	8.87	419.87	11.00	417.74	12.24	416.50
TP-4M	7.25	421.45	6.35	422.35	8.90	419.80	11.04	417.66	12.17	416.53
TP-5S (Stickup)[14]	8.15	421.56	7.16	422.55	9.91	419.80	12.33	417.38	13.51	416.20
TP-5S (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5M (Stickup)[14]	7.95	421.54	6.96	422.53	9.95	419.54	12.10	417.39	13.20	416.29
TP-5M (Flushmount)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-6M	6.20	421.88	5.41	422.67	8.03	420.05	10.56	417.52	11.72	416.36
TP-7S	10.72	421.86	9.12	423.46	13.39	419.19	17.42	415.16	18.59	413.99
TP-7M	10.66	421.90	9.08	423.48	13.37	419.19	17.41	415.15	18.57	413.99
TP-7D	10.66	421.90	9.09	423.47	13.41	419.15	17.39	415.17	18.56	414.00
TP-8S	9.70	421.61	8.07	423.24	12.26	419.05	16.29	415.02	17.54	413.77
TP-8M	9.62	421.60	7.98	423.24	12.27	418.95	16.22	415.00	17.43	413.79
UG-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-5	9.89	422.14	8.35	423.68	12.44	419.59	16.31	415.72	17.49	414.54
DG-6	9.33	422.11	7.78	423.66	11.83	419.61	15.60	415.84	16.82	414.62
DG-7	8.45	422.48	7.32	423.61	11.25	419.68	14.97	415.96	16.22	414.71
DG-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-9	7.27	421.98	5.86	423.39	9.59	419.66	13.08	416.17	14.35	414.90
DG-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-12	9.75	419.91	6.50	423.16	9.80	419.86	12.96	416.70	14.23	415.43
PZ-1D	2.72	421.28	2.35	421.65	4.82	419.18	5.50	418.50	6.17	417.83
PZ-2S	27.25	420.92	26.99	421.18	29.70	418.47	29.15	419.02	29.72	418.45
PZ-2D	27.08	420.97	26.86	421.19	29.55	418.50	29.27	418.78	29.55	418.50
PZ-3S	25.89	421.34	25.59	421.64	28.19	419.04	28.08	419.15	28.68	418.55
PZ-3D	25.93	421.26	25.64	421.55	28.24	418.95	28.11	419.08	28.64	418.55
PZ-4S	13.27	421.59	12.74	422.12	14.84	420.02	16.43	418.43	17.44	417.42
PZ-4D	13.11	421.64	12.59	422.16	14.69	420.06	16.28	418.47	17.29	417.46
PZ-5S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-6S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-7S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-8S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-9S	12.45	421.70	11.69	422.46	13.99	420.16	15.98	418.17	16.95	417.20
Mississippi	NA	420.4	NA	420.3	NA	417.4	NA	418.9	NA	419.0
Missouri	NA	421.6	NA	422.2	NA	418.0	NA	414.6	NA	414.5
SCPA Gauge	NA	434.5	NA	BG	NA	433.5	NA	NA	NA	NA

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Well ID	Groundwater Elevation Measurements 1/8/2021		Groundwater Elevation Measurements 4/8/2021		Groundwater Elevation Measurements 6/1/2021		Groundwater Elevation Measurements 11/8/2021		Groundwater Elevation Measurements 2/7/2022	
	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE
UMW-1D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UMW-1D[12]	26.90	418.05	26.96	417.99	26.58	418.37	27.45	417.50	27.62	417.33
UMW-2D	16.89	416.97	15.47	418.39	15.23	418.63	17.04	416.82	17.81	416.05
UMW-3D	14.62	417.05	13.32	418.35	13.12	418.55	14.74	416.93	17.46	414.21
UMW-4D	5.97	417.55	5.36	418.16	5.21	418.31	6.27	417.25	6.75	416.77
UMW-5D	28.42	418.24	28.87	417.79	28.75	417.91	28.93	417.73	28.96	417.70
UMW-6D	28.49	418.53	29.55	417.47	29.34	417.68	29.09	417.93	28.92	418.10
BMW-1D	10.35	417.93	9.17	419.11	10.10	418.18	10.74	417.54	11.04	417.24
BMW-2D[13]	19.93	418.74	21.52	417.15	21.25	417.42	20.67	418.00	20.22	418.45
BMW-3D	9.51	416.90	8.11	418.30	8.00	418.41	8.83	417.58	9.22	417.19
LMW-1S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LMW-1S[12]	27.08	417.99	27.00	418.07	26.71	418.36	27.34	417.73	27.57	417.50
LMW-2S	30.09	417.07	28.85	418.31	28.58	418.58	30.22	416.94	31.94	415.22
LMW-3S	14.11	416.06	11.46	418.71	11.28	418.89	13.95	416.22	15.16	415.01
LMW-4S	13.27	416.13	10.80	418.60	10.58	418.82	13.15	416.25	14.31	415.09
LMW-5S	31.07	416.29	28.90	418.46	28.61	418.75	31.02	416.34	32.03	415.33
LMW-6S	29.23	416.77	27.97	418.03	27.49	418.51	29.36	416.64	30.13	415.87
LMW-7S	27.16	417.10	26.12	418.14	25.85	418.41	27.36	416.90	27.92	416.34
LMW-8S	29.21	417.59	28.85	417.95	28.57	418.23	29.50	417.30	29.88	416.92
LMW-9S	27.35	418.22	27.97	417.60	27.68	417.89	27.81	417.76	27.84	417.73
BMW-1S	9.81	417.96	9.66	418.11	9.57	418.20	10.26	417.51	10.54	417.23
BMW-2S[13]	19.18	418.68	20.73	417.13	20.49	417.37	19.88	417.98	19.50	418.36
BMW-3S	9.74	416.95	8.40	418.29	8.31	418.38	9.13	417.56	9.42	417.27
UG-1A	11.86	415.88	8.42	419.32	8.22	419.52	11.48	416.26	13.00	414.74
UG-2	13.69	415.58	10.78	418.49	10.55	418.72	13.47	415.80	14.78	414.49
DG-1	17.35	414.46	12.16	419.65	11.83	419.98	16.36	415.45	18.69	413.12
DG-2	17.74	414.01	12.06	419.69	11.76	419.99	16.57	415.18	19.13	412.62
DG-3	19.98	413.86	14.16	419.68	13.81	420.03	18.75	415.09	21.41	412.43
DG-4	19.02	413.73	13.17	419.58	12.78	419.97	17.76	414.99	20.43	412.32
TMW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TMW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UG-3	13.52	416.19	10.78	418.93	10.47	419.24	13.39	416.32	14.66	415.05
TMW-1	13.55	414.53	9.21	418.87	8.89	419.19	12.88	415.20	14.86	413.22
TMW-2	13.60	414.57	9.34	418.83	9.03	419.14	12.95	415.22	14.93	413.24
TMW-3	13.26	414.62	9.11	418.77	8.74	419.14	12.66	415.22	14.59	413.29
PZ-9D	17.47	416.83	15.85	418.45	15.52	418.78	17.60	416.70	18.40	415.90
PZ-1S	6.27	417.67	5.70	418.24	5.55	418.39	6.52	417.42	6.97	416.97
TP-2D	10.29	418.97	12.30	416.96	12.05	417.21	11.12	418.14	10.83	418.43
TP-3D	17.15	417.67	17.16	417.66	16.79	418.03	17.64	417.18	17.83	416.99
TP-4D	12.60	416.12	11.50	417.22	10.11	418.61	12.53	416.19	14.82	413.90
TP-5D (Stickup)[14]	13.64	415.96	NA	NA	NA	NA	NA	NA	NA	NA
TP-5D (Flushmount)[14]	NA	NA	10.57	418.56	10.02	419.11	12.90	416.23	14.03	415.10
TP-6S	12.15	415.92	9.00	419.07	8.65	419.42	11.82	416.25	10.13	417.94
TP-6D	12.14	415.92	9.02	419.04	8.62	419.44	11.80	416.26	10.15	417.91
TP-8D	18.17	413.14	12.44	418.87	11.95	419.36	17.03	414.28	19.72	411.59
AM-1D	6.97	418.50	7.82	417.65	7.71	417.76	7.56	417.91	7.42	418.05
AM-1S	7.02	418.54	7.94	417.62	7.80	417.76	7.61	417.95	7.46	418.10
TP-1S	28.56	419.13	30.52	417.17	30.28	417.41	29.32	418.37	29.25	418.44
TP-1M	28.58	419.12	30.49	417.21	30.27	417.43	29.34	418.36	29.23	418.47
TP-1D	28.57	419.13	30.50	417.20	30.27	417.43	29.33	418.37	29.23	418.47
TP-2S	10.29	418.97	12.29	416.97	12.05	417.21	11.11	418.15	10.82	418.44
TP-2M	10.29	418.97	12.30	416.96	12.05	417.21	11.12	418.14	10.86	418.40
TP-3S	17.16	417.67	17.20	417.63	16.85	417.98	17.79	417.04	17.85	416.98
TP-3M	17.11	417.61	17.02	417.70	16.70	418.02	17.51	417.21	17.74	416.98
TP-4S	12.62	416.12	11.55	417.19	10.35	418.39	12.69	416.05	14.83	413.91
TP-4M	12.57	416.13	11.49	417.21	10.12	418.58	12.57	416.13	14.81	413.89
TP-5S (Stickup)[14]	13.68	416.03	NA	NA	NA	NA	NA	NA	NA	NA
TP-5S (Flushmount)[14]	NA	NA	10.56	418.57	10.04	419.09	12.91	416.22	14.29	414.84
TP-5M (Stickup)[14]	13.66	415.83	NA	NA	NA	NA	NA	NA	NA	NA
TP-5M (Flushmount)[14]	NA	NA	10.59	418.50	9.96	419.13	12.88	416.21	14.29	414.80
TP-6M	12.15	415.93	9.02	419.06	8.64	419.44	11.81	416.27	10.14	417.94
TP-7S	17.39	415.19	13.19	419.39	12.82	419.76	17.97	414.61	20.79	411.79
TP-7M	17.31	415.25	13.19	419.37	12.77	419.79	17.96	414.60	20.75	411.81
TP-7D	17.33	415.23	13.17	419.39	12.77	419.79	17.96	414.60	20.76	411.80
TP-8S	18.21	413.10	12.41	418.90	12.01	419.30	17.04	414.27	19.71	411.60
TP-8M	18.13	413.09	12.31	418.91	11.87	419.35	16.97	414.25	19.61	411.61
UG-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-5	18.17	413.86	12.51	419.52	12.12	419.91	17.00	415.03	19.66	412.37
DG-6	17.52	413.92	11.98	419.46	11.61	419.83	16.42	415.02	18.95	412.49
DG-7	16.90	414.03	11.52	419.41	11.16	419.77	15.87	415.06	18.32	412.61
DG-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-9	15.00	414.25	10.12	419.13	9.72	419.53	14.13	415.12	16.43	412.82
DG-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-12	14.79	414.87	10.71	418.95	10.33	419.33	14.26	415.40	16.11	413.55
PZ-1D	6.30	417.70	5.77	418.23	5.63	418.37	6.62	417.38	6.99	417.01
PZ-2S	29.56	418.61	30.51	417.66	30.37	417.80	30.14	418.03	30.00	418.17
PZ-2D	29.39	418.66	30.41	417.64	30.21	417.84	30.02	418.03	30.04	418.01
PZ-3S	28.71	418.52	29.44	417.79	29.19	418.04	29.22	418.01	29.22	418.01
PZ-3D	28.72	418.47	29.46	417.73	29.19	418.00	29.24	417.95	29.21	417.98
PZ-4S	17.81	417.05	16.31	418.55	16.14	418.72	17.95	416.91	18.72	416.14
PZ-4D	17.66	417.09	16.21	418.54	15.98	418.77	17.80	416.95	18.75	416.00
PZ-5S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-6S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-7S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-8S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-9S	17.32	416.83	15.71	418.44	15.40	418.75	17.43	416.72	18.37	415.78
Mississippi	NA	419.7	NA	417.0	NA	417.4	NA	418.8	NA	419.4
Missouri	NA	414.4	NA	418.8	NA	420.6	NA	415.9	NA	413.9
SCPA Gauge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Well ID	Groundwater Elevation Measurements 3/28/2022		Groundwater Elevation Measurements 4/19/2022		Groundwater Elevation Measurements 5/2/2022		Groundwater Elevation Measurements 5/16/2022		Groundwater Elevation Measurements 6/6/2022	
	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE
UMW-1D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UMW-1D[12]	28.05	416.90	NA	NA	NA	NA	NA	NA	26.56	418.39
UMW-2D	17.76	416.10	NA	NA	NA	NA	NA	NA	15.32	418.54
UMW-3D	15.54	416.13	NA	NA	NA	NA	NA	NA	13.14	418.53
UMW-4D	7.06	416.46	NA	NA	NA	NA	NA	NA	5.09	418.43
UMW-5D	29.84	416.82	NA	NA	NA	NA	NA	NA	28.48	418.18
UMW-6D	30.21	416.81	NA	NA	NA	NA	NA	NA	29.09	417.93
BMW-1D	11.50	416.78	11.34	414.70	10.74	417.54	9.94	418.34	9.79	418.49
BMW-2D[13]	21.21	417.46	NA	NA	NA	NA	NA	NA	21.02	417.65
BMW-3D	9.59	416.82	9.35	414.81	8.80	417.61	7.96	418.45	7.77	418.64
LMW-1S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LMW-1S[12]	28.15	416.92	NA	NA	NA	NA	NA	NA	26.52	418.55
LMW-2S	30.97	416.19	NA	NA	NA	NA	NA	NA	28.64	418.52
LMW-3S	14.79	415.38	NA	NA	NA	NA	NA	NA	11.32	418.85
LMW-4S	13.97	415.43	NA	NA	NA	NA	NA	NA	10.67	418.73
LMW-5S	31.76	415.60	NA	NA	NA	NA	NA	NA	28.78	418.58
LMW-6S	29.96	416.04	NA	NA	NA	NA	NA	NA	27.69	418.31
LMW-7S	27.96	416.30	NA	NA	NA	NA	NA	NA	26.04	418.22
LMW-8S	30.12	416.68	NA	NA	NA	NA	NA	NA	28.65	418.15
LMW-9S	28.71	416.86	NA	NA	NA	NA	NA	NA	27.51	418.06
BMW-1S	10.90	416.87	10.79	415.19	10.23	417.54	9.41	418.36	9.28	418.49
BMW-2S[13]	22.04	415.82	NA	NA	NA	NA	NA	NA	20.27	417.59
BMW-3S	9.88	416.81	9.62	414.50	9.06	417.63	8.22	418.47	8.03	418.66
UG-1A	12.48	415.26	11.09	414.09	10.86	416.88	8.92	418.82	8.24	419.50
UG-2	14.35	414.92	13.24	413.22	12.78	416.49	11.30	417.97	10.65	418.62
DG-1	17.69	414.12	NA	NA	NA	NA	NA	NA	11.67	420.14
DG-2	17.94	413.81	NA	NA	NA	NA	NA	NA	11.54	420.21
DG-3	20.08	413.76	NA	NA	NA	NA	NA	NA	13.57	420.27
DG-4	19.02	413.73	NA	NA	NA	NA	NA	NA	12.54	420.21
TMW-4	18.63	413.72	16.58	413.39	16.29	416.06	13.66	418.69	12.66	419.69
TMW-5	18.61	413.69	16.56	413.38	16.29	416.01	13.71	418.59	12.73	419.57
TMW-6	19.44	413.81	17.50	413.34	17.22	416.03	14.76	418.49	13.76	419.49
UG-3	14.23	415.48	13.23	413.84	12.96	416.75	11.32	418.39	10.55	419.16
TMW-1	14.07	414.01	12.35	413.51	12.12	415.96	9.82	418.26	8.93	419.15
TMW-2	14.13	414.04	12.49	413.36	12.22	415.95	9.95	418.22	9.07	419.10
TMW-3	13.83	414.05	12.18	413.48	11.95	415.93	9.70	418.18	8.82	419.06
PZ-9D	18.19	416.11	NA	NA	NA	NA	NA	NA	15.75	418.55
PZ-1S	7.32	416.62	NA	NA	NA	NA	NA	NA	5.63	418.31
TP-2D	12.72	416.54	NA	NA	NA	NA	NA	NA	11.87	417.39
TP-3D	18.19	416.63	18.37	413.73	17.92	416.90	17.27	417.55	17.05	417.77
TP-4D	13.30	415.42	NA	NA	NA	NA	NA	NA	10.55	418.17
TP-5D (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5D (Flushmount)[14]	13.86	415.27	12.74	416.57	12.51	416.62	10.78	418.35	10.12	419.01
TP-6S	12.75	415.32	NA	NA	NA	NA	NA	NA	8.73	419.34
TP-6D	12.74	415.32	NA	NA	NA	NA	NA	NA	8.72	419.34
TP-8D	18.24	413.07	16.06	412.78	15.90	415.41	12.92	418.39	11.69	419.62
AM-1D	8.55	416.92	NA	NA	NA	NA	NA	NA	7.33	418.14
AM-1S	8.62	416.94	NA	NA	NA	NA	NA	NA	7.42	418.14
TP-1S	31.14	416.55	31.18	414.30	30.06	417.63	30.37	417.32	30.36	417.33
TP-1M	31.03	416.67	31.14	414.34	30.12	417.58	30.20	417.50	30.11	417.59
TP-1D	31.03	416.67	31.13	414.35	30.15	417.55	30.16	417.54	30.12	417.58
TP-2S	12.71	416.55	NA	NA	NA	NA	NA	NA	11.89	417.37
TP-2M	12.72	416.54	NA	NA	NA	NA	NA	NA	11.87	417.39
TP-3S	18.20	416.63	18.37	413.73	18.06	416.77	17.32	417.51	17.04	417.79
TP-3M	18.09	416.63	18.26	413.84	17.83	416.89	17.17	417.55	17.03	417.69
TP-4S	13.39	415.35	NA	NA	NA	NA	NA	NA	10.56	418.18
TP-4M	13.35	415.35	NA	NA	NA	NA	NA	NA	10.55	418.15
TP-5S (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5S (Flushmount)[14]	13.91	415.22	12.75	416.56	12.44	416.69	11.24	417.89	10.51	418.62
TP-5M (Stickup)[14]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP-5M (Flushmount)[14]	13.80	415.29	12.71	416.60	12.48	416.61	10.73	418.36	10.07	419.02
TP-6M	12.75	415.33	NA	NA	NA	NA	NA	NA	8.73	419.35
TP-7S	19.27	413.31	16.89	413.24	16.70	415.88	13.65	418.93	12.75	419.83
TP-7M	19.19	413.37	16.85	NA	16.64	415.92	13.62	418.94	12.50	420.06
TP-7D	19.18	413.38	16.86	413.27	16.65	415.91	13.65	418.91	12.51	420.05
TP-8S	18.31	413.00	16.06	412.78	15.86	415.45	12.99	418.32	11.70	419.61
TP-8M	18.16	413.06	15.96	412.88	15.71	415.51	12.84	418.38	11.67	419.55
UG-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-5	18.28	413.75	NA	NA	NA	NA	NA	NA	11.91	420.12
DG-6	17.68	413.76	15.53	413.13	15.30	416.14	12.52	418.92	11.41	420.03
DG-7	17.14	413.79	NA	NA	NA	NA	NA	NA	11.01	419.92
DG-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-9	15.46	413.79	13.51	413.03	13.27	415.98	10.67	418.58	9.66	419.59
DG-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DG-12	15.42	414.24	13.83	413.20	13.56	416.10	11.38	418.28	10.49	419.17
PZ-1D	7.42	416.58	NA	NA	NA	NA	NA	NA	5.67	418.33
PZ-2S	31.22	416.95	NA	NA	NA	NA	NA	NA	30.04	418.13
PZ-2D	31.09	416.96	NA	NA	NA	NA	NA	NA	29.95	418.10
PZ-3S	30.20	417.03	NA	NA	NA	NA	NA	NA	29.01	418.22
PZ-3D	30.20	416.99	NA	NA	NA	NA	NA	NA	28.99	418.20
PZ-4S	18.68	416.18	NA	NA	NA	NA	NA	NA	16.16	418.70
PZ-4D	18.54	416.21	NA	NA	NA	NA	NA	NA	16.07	418.68
PZ-5S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-6S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-7S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-8S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PZ-9S	18.02	416.13	NA	NA	NA	NA	NA	NA	15.56	418.59
Mississippi	NA	416.7	NA	416.7	NA	418.1	NA	417.6	NA	417.5
Missouri	NA	418.3	NA	415.7	NA	418.2	NA	418.4	NA	420.2
SCPA Gauge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Well ID	Groundwater Elevation Measurements 6/20/2022		Groundwater Elevation Measurements 7/13/2022		Groundwater Elevation Measurements 7/25/2022	
	DTW	GWE	DTW	GWE	DTW	GWE
UMW-1D	NA	NA	NA	NA	NA	NA
UMW-1D[12]	NA	NA	NA	NA	NA	NA
UMW-2D	NA	NA	NA	NA	NA	NA
UMW-3D	NA	NA	NA	NA	NA	NA
UMW-4D	NA	NA	NA	NA	NA	NA
UMW-5D	NA	NA	NA	NA	NA	NA
UMW-6D	NA	NA	NA	NA	NA	NA
BMW-1D	10.75	417.53	10.55	417.73	10.91	417.37
BMW-2D[13]	NA	NA	NA	NA	NA	NA
BMW-3D	8.74	417.67	8.51	417.90	8.86	417.55
LMW-1S	NA	NA	NA	NA	NA	NA
LMW-1S[12]	NA	NA	NA	NA	NA	NA
LMW-2S	NA	NA	NA	NA	NA	NA
LMW-3S	NA	NA	NA	NA	NA	NA
LMW-4S	NA	NA	NA	NA	NA	NA
LMW-5S	NA	NA	NA	NA	NA	NA
LMW-6S	NA	NA	NA	NA	NA	NA
LMW-7S	NA	NA	NA	NA	NA	NA
LMW-8S	NA	NA	NA	NA	NA	NA
LMW-9S	NA	NA	NA	NA	NA	NA
BMW-1S	10.22	417.55	10.04	417.73	10.40	417.37
BMW-2S[13]	NA	NA	NA	NA	NA	NA
BMW-3S	8.98	417.71	8.76	417.93	9.12	417.57
UG-1A	8.85	418.89	10.10	417.64	10.74	417.00
UG-2	11.16	418.11	12.12	417.15	12.76	416.51
DG-1	NA	NA	NA	NA	NA	NA
DG-2	NA	NA	NA	NA	NA	NA
DG-3	NA	NA	NA	NA	NA	NA
DG-4	NA	NA	NA	NA	NA	NA
TMW-4	13.59	418.76	15.62	416.73	16.51	415.84
TMW-5	13.58	418.72	15.57	416.73	16.40	415.90
TMW-6	14.54	418.71	16.47	416.78	17.25	416.00
UG-3	11.08	418.63	11.94	417.77	12.61	417.10
TMW-1	9.61	418.47	11.27	416.81	12.00	416.08
TMW-2	9.70	418.47	11.36	416.81	12.07	416.10
TMW-3	9.45	418.43	11.06	416.82	11.73	416.15
PZ-9D	NA	NA	NA	NA	NA	NA
PZ-1S	NA	NA	NA	NA	NA	NA
TP-2D	NA	NA	NA	NA	NA	NA
TP-3D	17.57	417.25	17.12	417.70	17.42	417.40
TP-4D	NA	NA	NA	NA	NA	NA
TP-5D (Stickup)[14]	NA	NA	NA	NA	NA	NA
TP-5D (Flushmount)[14]	10.61	418.52	11.57	417.56	12.23	416.90
TP-6S	NA	NA	NA	NA	NA	NA
TP-6D	NA	NA	NA	NA	NA	NA
TP-8D	12.94	418.37	15.31	416.00	16.31	415.00
AM-1D	NA	NA	NA	NA	NA	NA
AM-1S	NA	NA	NA	NA	NA	NA
TP-1S	31.47	416.22	29.74	417.95	30.05	417.64
TP-1M	31.19	416.51	29.82	417.88	30.11	417.59
TP-1D	31.19	416.51	29.82	417.88	30.11	417.59
TP-2S	NA	NA	NA	NA	NA	NA
TP-2M	NA	NA	NA	NA	NA	NA
TP-3S	17.50	417.33	17.24	417.59	17.50	417.33
TP-3M	17.46	417.26	17.03	417.69	17.33	417.39
TP-4S	NA	NA	NA	NA	NA	NA
TP-4M	NA	NA	NA	NA	NA	NA
TP-5S (Stickup)[14]	NA	NA	NA	NA	NA	NA
TP-5S (Flushmount)[14]	10.47	418.66	11.31	417.82	11.97	417.16
TP-5M (Stickup)[14]	NA	NA	NA	NA	NA	NA
TP-5M (Flushmount)[14]	10.57	418.52	11.53	417.56	12.18	416.91
TP-6M	NA	NA	NA	NA	NA	NA
TP-7S	13.86	418.72	16.26	416.32	17.35	415.23
TP-7M	13.82	418.74	16.24	416.32	17.33	415.23
TP-7D	13.81	418.75	16.23	416.33	17.33	415.23
TP-8S	12.95	418.36	15.33	415.98	16.32	414.99
TP-8M	12.87	418.35	15.24	415.98	16.21	415.01
UG-4	NA	NA	NA	NA	NA	NA
DG-5	NA	NA	NA	NA	NA	NA
DG-6	12.50	418.94	14.72	416.72	15.37	416.07
DG-7	NA	NA	NA	NA	NA	NA
DG-8	NA	NA	NA	NA	NA	NA
DG-9	10.47	418.78	12.46	416.79	13.16	416.09
DG-10	NA	NA	NA	NA	NA	NA
DG-11	NA	NA	NA	NA	NA	NA
DG-12	11.06	418.60	12.64	417.02	13.26	416.40
PZ-1D	NA	NA	NA	NA	NA	NA
PZ-2S	NA	NA	NA	NA	NA	NA
PZ-2D	NA	NA	NA	NA	NA	NA
PZ-3S	NA	NA	NA	NA	NA	NA
PZ-3D	NA	NA	NA	NA	NA	NA
PZ-4S	NA	NA	NA	NA	NA	NA
PZ-4D	NA	NA	NA	NA	NA	NA
PZ-5S	NA	NA	NA	NA	NA	NA
PZ-6S	NA	NA	NA	NA	NA	NA
PZ-7S	NA	NA	NA	NA	NA	NA
PZ-8S	NA	NA	NA	NA	NA	NA
PZ-9S	NA	NA	NA	NA	NA	NA
Mississippi	NA	416.3	NA	418.4	NA	418.3
Missouri	NA	417.4	NA	417.6	NA	414.2
SCPA Gauge	NA	NA	NA	NA	NA	NA

Table 1
Groundwater Elevation Measurements
Sioux Energy Center
St. Charles County, MO

Notes:
1.) BG - Below gauge indicates a pond elevation below 433.0 Feet MSL.
2.) DTW - Depth to water measured in feet below top of casing.
3.) GWE - Groundwater elevation measured in feet above mean sea level.
4.) FT MSL - Feet above mean sea level.
5.) NA - Not Applicable.
6.) Horizontal Datum: State Plane Coordinates NAD83 (2000) Missouri East Zone feet.
7.) Vertical Datum: NAVD88 feet.
8.) River Elevation for the Mississippi River is provided by Ameren.
9.) River Elevation for the Missouri River is calculated based on nearby USGS (United States Geological Survey) river elevation gauges.
10.) Mississippi and Missouri River measurement locations are estimated.
11.) NPDES - National Pollutant Discharge Elimination System.
12.) UMW-1D and LMW-1S were modified to flushmount wells on 4/29/2020 due to construction onsite.
13.) BMW-2D and BMW-2S are used as a groundwater elevation piezometer only and are not used for groundwater sampling.
14.) TP-5S, TP-5M, and TP-5D were converted to flushmount wells on 3/26/2021 and re-surveyed by Zahner & Associates on 3/28/2022.
15.) CCR - Coal Combusion Residuals.
16.) SCPA gauge removed 11/6/2021 as the SCPA was removed from service and closed.

Prepared by: GTM
Checked by: BTT
Reviewed by: MNH

Table 2
Generalized Hydraulic Properties of Uppermost Aquifer
Sioux Energy Center
St. Charles County, Missouri

Sampling Event Date	Average Groundwater Flow Direction (Azimuth)	Estimated Hydraulic Gradient (Feet/Foot)	Hydraulic Conductivity (Feet/Day)	Mean Hydraulic Conductivity (cm/sec)	Estimated Effective Porosity	Estimated Groundwater Velocity (Feet/Day)
3/16/2016	28	0.00006	50.8	1.8E-02	0.35	0.01
5/9/2016	22	0.00036	50.8	1.8E-02	0.35	0.05
7/5/2016	37	0.00010	50.8	1.8E-02	0.35	0.01
9/14/2016	47	0.00008	50.8	1.8E-02	0.35	0.01
11/7/2016	184	0.00030	50.8	1.8E-02	0.35	0.04
1/3/2017	185	0.00071	50.8	1.8E-02	0.35	0.10
3/8/2017	184	0.00056	50.8	1.8E-02	0.35	0.08
6/5/2017	19	0.00040	50.8	1.8E-02	0.35	0.06
11/13/2017	183	0.00060	50.8	1.8E-02	0.35	0.09
1/8/2018	185	0.00091	50.8	1.8E-02	0.35	0.13
2/12/2018	188	0.00082	50.8	1.8E-02	0.35	0.12
3/9/2018	186	0.00042	50.8	1.8E-02	0.35	0.06
4/5/2018	147	0.00025	50.8	1.8E-02	0.35	0.04
5/14/2018	159	0.00023	50.8	1.8E-02	0.35	0.03
7/5/2018	119	0.00013	50.8	1.8E-02	0.35	0.02
11/12/2018	34	0.00020	50.8	1.8E-02	0.35	0.03
1/7/2019	24	0.00027	50.8	1.8E-02	0.35	0.04
8/1/2019	10	0.00094	50.8	1.8E-02	0.35	0.14
10/1/2019	11	0.00046	50.8	1.8E-02	0.35	0.07
11/13/2019	9	0.00056	50.8	1.8E-02	0.35	0.08
1/2/2020	15	0.00029	50.8	1.8E-02	0.35	0.04
4/22/2020	33	0.00023	50.8	1.8E-02	0.35	0.03
6/15/2020	11	0.00042	50.8	1.8E-02	0.35	0.06
7/21/2020	7	0.00018	50.8	1.8E-02	0.35	0.03
9/28/2020	194	0.00050	50.8	1.8E-02	0.35	0.07
11/11/2020	189	0.00064	50.8	1.8E-02	0.35	0.09
1/8/2021	189	0.00075	50.8	1.8E-02	0.35	0.11
4/8/2021	35	0.00036	50.8	1.8E-02	0.35	0.05
6/1/2021	24	0.00036	50.8	1.8E-02	0.35	0.05
11/8/2021	184	0.00050	50.8	1.8E-02	0.35	0.07
2/7/2022	183	0.00091	50.8	1.8E-02	0.35	0.13
3/28/2022	185	0.00055	50.8	1.8E-02	0.35	0.08
4/19/2022	163	0.00019	50.8	1.8E-02	0.35	0.03
5/2/2022	170	0.00026	50.8	1.8E-02	0.35	0.04
5/16/2022	48	0.00024	50.8	1.8E-02	0.35	0.03
6/6/2022	32	0.00039	50.8	1.8E-02	0.35	0.06
6/20/2022	23	0.00030	50.8	1.8E-02	0.35	0.04
7/13/2022	188	0.00024	50.8	1.8E-02	0.35	0.03
7/25/2022	192	0.00034	50.8	1.8E-02	0.35	0.05

Estimated Results	
Resultant Groundwater Flow Direction (Azimuth)	124
Estimated Annual Net Groundwater Movement (Feet/Year)	3.4

Notes:

1. Azimuth and Hydraulic Gradient calculated using the spreadsheet tool from the 2002 report entitled "A Spreadsheet Method For Estimating Hydraulic Gradient With Heads From Multiple Wells" submitted to Ground Water" by J.F. Devlin.
2. Hydraulic conductivity value is the geometric mean of slug test results for the CCR compliance wells within the shallow alluvial aquifer.
3. An effective porosity of 0.35 was used based on grain size distributions and published values (Fetter 2000, Cohen 1953, and Johnson 1967).
4. Azimuth is measured clockwise in degrees from north.
5. cm/sec - centimeters per second.
6. Alluvial aquifer wells were used for the calculations. Nested well pairs were averaged for calculation.

Table 3
CCR Monitoring Well Hydraulic Conductivities for Shallow Alluvial Aquifer Zone
SCPD Surface Impoundment
Sioux Energy Center, St. Charles County, MO

Well ID	Total Depth (FT BTOC)	Well Screen Interval (FT BTOC)	Well Screen Interval (FT MSL)	Estimated Hydraulic Conductivity (feet/day)	Estimated Hydraulic Conductivity (cm/sec)
Background Monitoring Wells					
BMW-1S	26.0	15.8 - 25.6	402.2 - 412.0	16	5.5E-03
BMW-3S	26.7	16.5 - 26.3	400.4 - 410.2	53	1.9E-02
SCPB Fly Ash Surface Impoundment Monitoring Wells					
LMW-1S	42.5	32.3 - 42.1	405.0 - 414.8	31	1.1E-02
LMW-2S	42.7	32.5 - 42.3	404.9 - 414.7	56	2.0E-02
LMW-3S	26.2	16.0 - 25.8	404.4 - 414.2	35	1.2E-02
LMW-4S	27.2	17.0 - 26.8	402.6 - 412.4	28	9.9E-03
LMW-5S	47.5	37.3 - 47.1	400.3 - 410.1	56	2.0E-02
LMW-6S	42.1	31.9 - 41.7	404.3 - 414.1	56	2.0E-02
LMW-7S	42.2	32.0 - 41.8	402.5 - 412.3	45	1.6E-02
LMW-8S	47.2	37.0 - 46.8	400.0 - 409.8	75	2.6E-02
LMW-9S	41.6	31.4 - 41.2	404.4 - 414.2	22	7.9E-03
SCL4A Utility Waste Landfill Monitoring Wells					
UG-3*	30.0	19.8 - 30.0	399.7 - 410.0	51	1.8E-02
TMW-1	28.9	18.7 - 28.5	399.6 - 409.4	75	2.6E-02
TMW-2	30.4	20.2 - 30.0	398.2 - 408.0	45	1.6E-02
TMW-3	30.1	19.9 - 29.7	398.2 - 408.0	56	2.0E-02
SCPD Utility Waste Landfill Monitoring Wells					
TMW-4	31.3	21.1 - 30.8	401.5 - 411.3	56	2.0E-02
TMW-5	31.4	21.1 - 30.9	401.4 - 411.2	112	4.0E-02
TMW-6	32.6	22.4 - 32.1	401.1 - 410.9	94	3.3E-02
UG-2*	30.0	19.8 - 30.0	399.3 - 409.5	51	1.8E-02
Corrective Action Monitoring Wells					
AM-1S	27.3	17.0 - 27.3	398.6 - 408.5	112	4.0E-02
Monitoring Well Used for Water Level Measurements Only					
BMW-2S	46.7	36.9 - 46.7	391.2 - 401.0	60	2.1E-02

Notes
1. FT BTOC - feet below top of casing.
2. FT MSL - feet above mean sea level.
3. cm/sec - centimeters per second.
4. Rising head tests were completed by Golder using a Pneumatic Hi-K Slug®.
5. * - Hydraulic conductivity values represent average hydraulic conductivity values based on results from the UWL Detailed Site Investigation.

Table 4
Monitoring Well Construction Details
SCPD Surface Impoundment
Sioux Energy Center, St. Charles County, MO

Well ID	Installation Date	Location		Top of Casing Elevation	Ground Surface Elevation	Top of Screen Elevation	Bottom of Screen Elevation	Base of Well Elevation	Total Depth
		Northing[4]	Easting[3]	(FT MSL)[1]	(FT MSL)[1]	(FT MSL)[1]	(FT MSL)[1]	(FT MSL)[1]	(FT BGS)[2]
BMW-1S	12/8/2015	1121709.2	876755.6	427.77	426.0	409.4	399.6	399.2	26.8
BMW-3S	11/8/2016	1121792.9	875809.5	426.69	424.1	406.9	397.1	396.7	27.4
TMW-4	3/4/2022	1116959.3	878952.1	432.35	430.0	411.3	401.5	401.1	28.9
TMW-5	3/4/2022	1116856.0	879563.9	432.30	429.9	411.2	401.4	400.9	29.0
TMW-6	3/4/2022	1116909.9	880086.0	433.25	430.8	410.9	401.1	400.6	30.2
UG-2*	12/16/2007	1118859.7	879319.5	429.27	426.5	409.5	399.3	399.3	30.0

Notes:

1.) FT MSL - Feet Above Mean Sea Level.
2.) FT BGS - Feet Below Ground Surface.
3.) Horizontal Datum: State Plane Coordinates NAD83 (2000) Missouri East Zone Feet.
4.) Vertical Datum: NAVD88 Feet.
5.) Background monitoring well (BMW-1S & BMW-3S) elevations and coordinates were surveyed on January 14, 2016 and December 8, 2016 by Zahner and Associates, Inc.
6.) Monitoring wells (TMW-4, TMW-5, TMW-6) elevations and coordinates were surveyed on March 28, 2022 by Zahner and Associates, Inc.
7.) *Groundwater monitoring well installed by GREDELL Engineering Resources and surveyed by KdG.

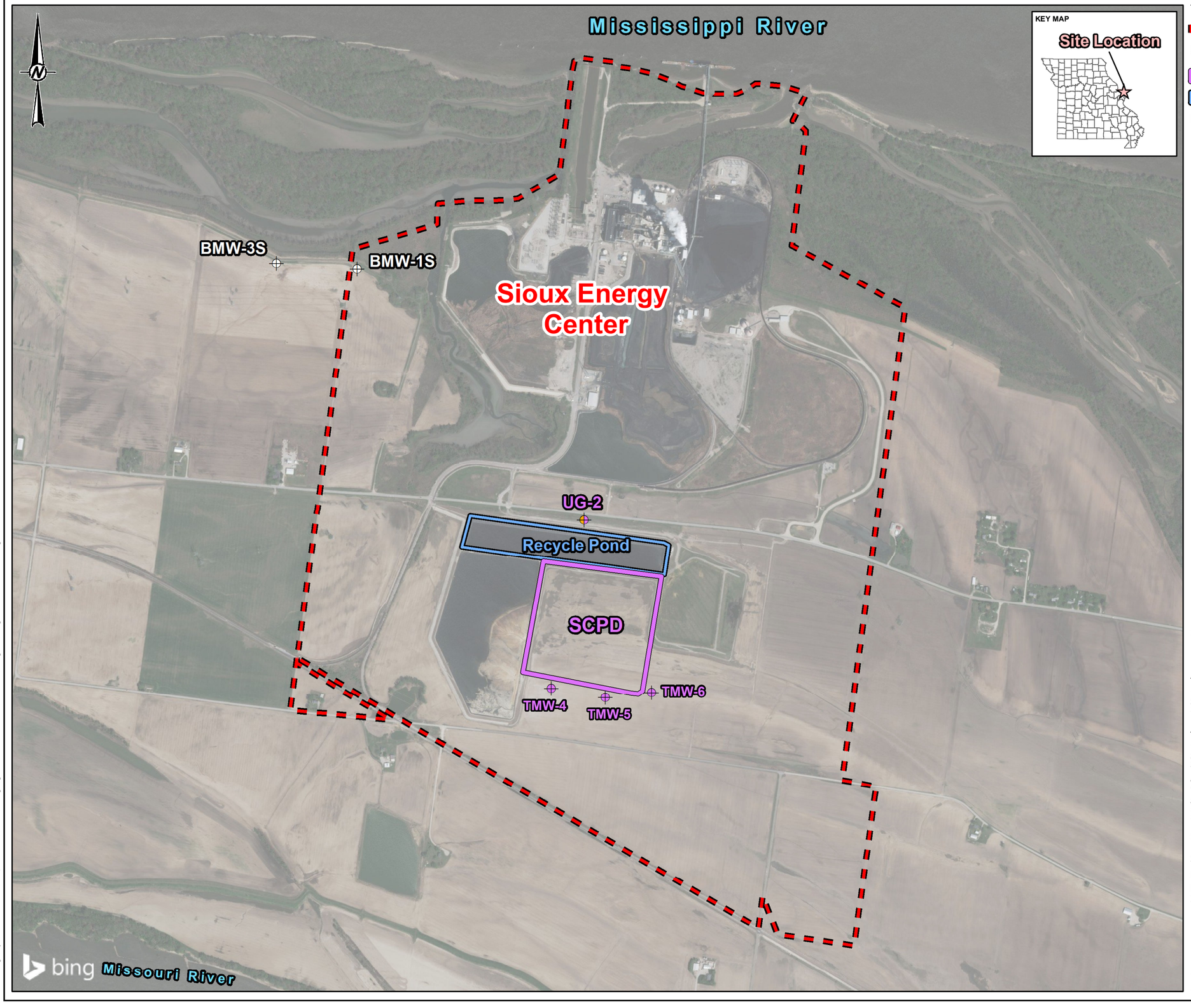
Table 5
Groundwater Quality Monitoring Parameters
SCPD Surface Impoundment
Sioux Energy Center, St. Charles County, MO

Monitoring Parameter		Baseline[2]	Detection[3]	Assessment[4]
Field Parameters	Temperature, pH, Specific Conductivity, Oxidation Reduction Potential, and Dissolved Oxygen	X	X	X
Appendix III[1]	Boron	X	X	X
	Calcium	X	X	X
	Chloride	X	X	X
	Fluoride	X	X	X
	Sulfate	X	X	X
	pH	X	X	X
	Total Dissolved Solids (TDS)	X	X	X
Appendix IV[1]	Antimony	X		X
	Arsenic	X		X
	Barium	X		X
	Beryllium	X		X
	Cadmium	X		X
	Chromium	X		X
	Cobalt	X		X
	Fluoride	X		X
	Lead	X		X
	Lithium	X		X
	Mercury	X		X
	Molybdenum	X		X
	Selenium	X		X
	Thallium	X		X
	Radium 226 & 228	X		X

Notes:

1.) Analyte lists match requirements for monitoring from USEPA Rule 40 CFR parts 257 and 261.
2.) 8 baseline sampling events were completed prior to August 2022.
3.) Detection monitoring sampling events will take place semi-annually once baseline sampling is completed.
4.) If necessary, assessment monitoring will be performed in accordance with USEPA Rule.

Figures



KEY MAP

LEGEND

- Sioux Energy Center Property Boundary

Utility Waste Landfill (UWL)

- SCPD - WFGD Disposal
- UWL Water Recycle Pond

Monitoring Well Networks

- Background Monitoring Well
- SCPC and SCPD Detection Monitoring Well
- SCPD Detection Monitoring Well

0 1,000 2,000 3,000

Feet

NOTE(S)

1.) ALL BOUNDARIES AND LOCATIONS ARE APPROXIMATE.
2.) WFGD - WASTE FLUE GAS DESULFURIZATION.
3.) UWL - UTILITY WASTE LANDFILL.

REFERENCE(S)

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.

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
GROUNDWATER MONITORING PROGRAM

TITLE
SITE LOCATION AERIAL MAP AND MONITORING WELL LOCATIONS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-20
DESIGNED	JSI
PREPARED	GTM
REVIEWED	BTT
APPROVED	MNH

PROJECT NO.	CONTROL		FIGURE
153140604	1240	AMEREN_00001632	1

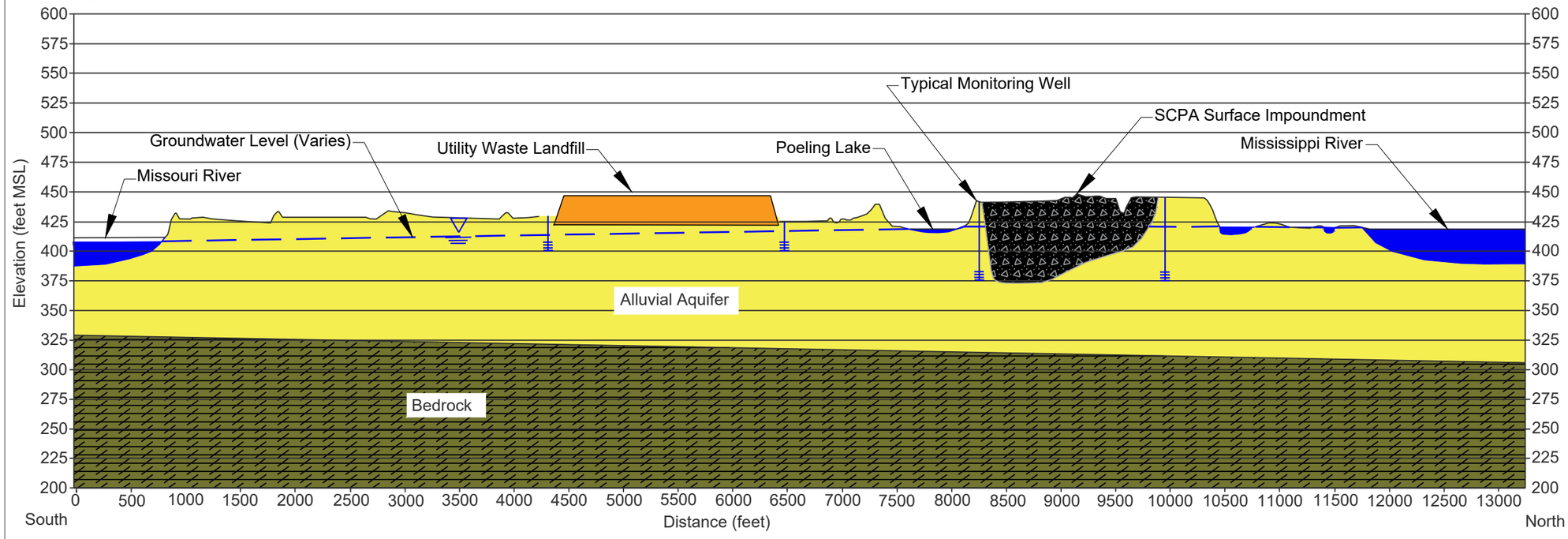
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

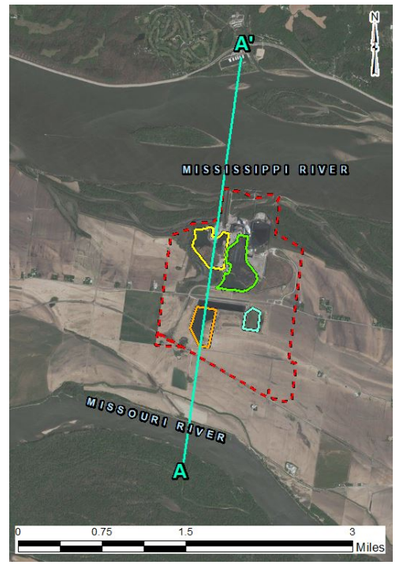
0

PATH: C:\Users\gmorey\Golder Associates\153140601-02 - Ameren CCR GW Monitoring Program 2020 - APP5 Technical Work\0003-SEC3.5-Figure-Drawings\PRODUCTION\SCPD GMP\Figure X - SCPD Overview.mxd PRINTED ON: 2022-08-03 AT: 11:11:07 AM

Generalized Cross-Section



Overview Map



Not To Scale

NOTES
1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) CROSS-SECTION IS NOT TO SCALE AND IS ONLY A VISUAL REPRESENTATION OF THE SUBSURFACE GEOLOGY.
3.) MSL - MEAN SEA LEVEL.

REFERENCES

1.) AMEREN, 2011. AMEREN MISSOURI SIOUX ENERGY CENTER, SIOUX PROPERTY CONTROL MAP, FEBRUARY 2011.
2.) GREDELL ENGINEERING RESOURCES, INC. 2006. DETAILED GEOLOGIC AND HYDROLOGIC SITE INVESTIGATION REPORT. AMEREN UE SIOUX POWER PLANT PROPOSED UTILITY WASTE DISPOSAL AREA. ST. CHARLES COUNTY, MISSOURI. AUGUST 2006.
3.) EPRI, 1998. FIELD EVALUATION OF THE COMANAGEMENT OF UTILITY LOW-VOLUME WASTES WITH HIGH-VOLUME COAL COMBUSTION BY-PRODUCTS: SX SITE. TR-108409.
4.) REITZ & JENS, INC., AND GREDELL ENGINEERING RESOURCES, INC. 2014. AMEREN MISSOURI SIOUX POWER PLANT UTILITY WASTE LANDFILL PROPOSED CONSTRUCTION PERMIT MODIFICATION CONSTRUCTION PERMIT NUMBER 0918301 ST, CHARLES COUNTY, MISSOURI.

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2021-04-22
DESIGNED	JSI
PREPARED	BTT
REVIEWED	GTM
APPROVED	MNH

PROJECT
GROUNDWATER MONITORING PROGRAM

TITLE
GENERALIZED CROSS-SECTION

PROJECT NO.	PHASE	REV.	FIGURE
GL153140604	0003B	1.0	2

AMEREN_00001633

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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APPENDIX A

CCR Monitoring Well Boring Logs

RECORD OF BOREHOLE BMW-1S

SHEET 1 of 1

PROJECT: Ameren CCR GW Monitoring
PROJECT NUMBER: 153-1406.003B
LOCATION: Sioux Energy Center

DRILLING METHOD: 6" Sonic
DRILLING DATE: 12/8/2015
DRILL RIG: Mini Sonic (CDD1415)

DATUM: NAVD88
AZIMUTH: N/A
COORDINATES: N: 1,121,709.18 E: 876,755.57

ELEVATION: 425.98
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL/ROCK PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEVATION / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC / ATT	REMARKS
0	6" Sonic	(0.0-8.5) (ML) sandy SILT, non-plastic to very low plasticity fines, fine sand, trace organics (roots); brownish gray (5YR 4/1); non-cohesive, moist, loose	ML		425.98	1	SO	2.4 / 5.0	
5		(5.0) SAA (Same As Above), no organics			421.0 / 5.0	2	SO	3.7 / 5.0	▽ Water Level 6.33 ft bgs 2/16/2016
		(8.5-15.6) (CL) SILTY CLAY, medium plasticity fines, trace fine sand; light brownish gray (5YR 6/1); cohesive, w~PL, firm	CL		417.5 / 8.5				
10						3	SO	2.8 / 5.0	
15		(15.6-17.5) (SP-SM) SAND, fine sand, some non-plastic fines; light brown (5YR 5/6); non-cohesive, wet, compact	SP-SM		410.4 / 15.6	4	SO	7.5 / 10.0	Run #4, Sample appears to be compacted while being extruded into sample bags. Measured field recovery: 5.2/10.0. Estimated actual recovery: 7.5/10.0.
		(17.5-18.5) (CL) SILTY CLAY, medium plasticity fines, trace fine sand; medium dark gray (N4); cohesive, w~PL, firm	CL		408.5 / 17.5				
20		(18.5-25.0) (SP-SM) SAND, fine sand, some non-plastic fines; medium dark gray (N4); non-cohesive, wet, compact	SP-SM		407.5 / 18.5				
25		END OF BORING AT 25.0 FEET BELOW GROUND SURFACE. FOR WELL DETAILS, SEE WELL CONSTRUCTION LOG BMW-1S.			401.0 / 25.0				
30									

SCALE: 1 in = 3.8 ft
DRILLING CONTRACTOR: Cascade
DRILLER: J. Drabek

LOGGED: JSI/JS
CHECKED: JSI
REVIEWED: PJJ/MNH

Golder Associates

AMEREN_00001635

GOLDER STL RECORD OF BOREHOLE MWD SEC LOGS.GPJ GLDR_CO.GDT 10/9/17

RECORD OF BOREHOLE BMW-3S

SHEET 1 of 1

PROJECT: Ameren CCR GW Monitoring
PROJECT NUMBER: 153-1406.003B
LOCATION: Sioux Energy Center

DRILLING METHOD: 6" Sonic
DRILLING DATE: 11/8/2016
DRILL RIG: Geoprobe (8140CC)

DATUM: NAVD88
AZIMUTH: N/A
COORDINATES: N: 1,121,792.93 E: 875,809.46

ELEVATION: 424.12
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL/ROCK PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEVATION / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC / ATT	REMARKS
0	6" Sonic	(0.0-1.2) (CH) CLAY, high plasticity fines, some organics; dusky brown (5YR 2/2); cohesive, w~PL, firm	CH		422.9				
		(1.2-12.0) (CL) SILTY CLAY, medium plasticity fines; pale brown (5YR 5/2); cohesive, w~PL, moist			1.2	1	SO	4.4 / 5.0	
5			CL			2	SO	3.2 / 5.0	
10					412.1				
		(12.0-22.2) (SP) SAND, fine to medium sub-angular sand, trace non-plastic fines; light brown (5YR 6/4); non-cohesive, wet, compact			12.0	3	SO	3.7 / 5.0	
15		(15.0) Same As Above (SAA) excpet color to pale brown (5YR 5/2)	SP		409.1 15.0	4	SO	3.4 / 5.0	
20					401.9	5	SO	3.3 / 4.0	
		(22.2-24.0) (SM) SILTY SAND, fine to medium sand, some non-plastic fines; medium gray (N5); non-cohesive, wet, compact	SM		22.2				
		END OF BORING AT 24.2 FEET BELOW GROUND SURFACE. FOR WELL DETAILS, SEE WELL CONSTRUCTION LOG BMW-3S.			400.1 24.0				
25									
30									

SCALE: 1 in = 3.8 ft
DRILLING CONTRACTOR: Cascade
DRILLER: M. Rodrigues

LOGGED: MSG
CHECKED: JS
REVIEWED: MNH

Golder Associates

AMEREN_00001636

GOLDER STL RECORD OF BOREHOLE MWD SEC LOGS.GPJ GLDR_CO.GDT 10/9/17

RECORD OF BOREHOLE TMW-4

SHEET 1 of 1

PROJECT: Ameren CCR GW Monitoring
PROJECT NUMBER: GL153140604.0003B
LOCATION: Sioux Energy Center

DRILLING METHOD: 6" Sonic
DRILLING DATE: 3/2/2022
DRILL RIG: Geoprobe 8140DT

DATUM: NAVD88
AZIMUTH: N/A
COORDINATES: N: 1,116,959.30 E: 878,952.11

ELEVATION: 429.97
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL/ROCK PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEVATION / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC / ATT	REMARKS
0	6" Sonic	(0.0-6.0) (CL) SILTY CLAY, medium to high plasticity fines, trace fine sand, trace organics (roots); dark yellowish brown (10YR 4/2); cohesive, w~PL, very soft.	CL		424.0 / 6.0	1	SO	2.4 / 5.0	
5		(6.0-12.0) (ML) SILT, non-plastic fines, trace fine sand; brownish gray (5YR 4/1), some dusky yellowish brown (10YR 2/2) laminations; non-cohesive, dry, loose.	ML		418.0 / 12.0	2	SO	3.4 / 5.0	
10		(12.0-20.0) (SP) SAND, fine poorly graded sand, some low plasticity fines; very pale orange (10YR 8/2); non-cohesive, moist, loose.	SP		410.0 / 20.0	3	SO	0.0 / 10.0	(12.0-20.0) Driller notes changes in drilling action at approximately 12.0'. Sample was lost. Driller believes silt from 10.0'-12.0' plugged bit and prevented sand from entering sampler. Unit assumed to be sand (SP) from nearby logs and drilling action. ▽ Water Level 16.60 ft bgs 3/2/2022
15									
20		(20.0-30.0) (SP) SAND, fine to medium subrounded sand, trace non-plastic fines; moderate yellowish brown (10YR 5/4); non-cohesive, wet, compact.	SP		400.0 / 30.0	4	SO	6.9 / 10.0	
25									
30		END OF BORING AT 30.0 FT BELOW GROUND SURFACE. FOR WELL DETAILS, SEE WELL CONSTRUCTION LOG TMW-4.							
35									

SCALE: 1 in = 4.4 ft
DRILLING CONTRACTOR: Cascade Environmental, LP
DRILLER: R. Gordon

LOGGED: GTM
CHECKED: EMS
REVIEWED: JSI

WSP GOLDER

AMEREN_00001637

GOLDER STL RECORD OF BOREHOLE MWD SEC LOGS.GPJ GLDR_CO.GDT 8/3/22

RECORD OF BOREHOLE TMW-5

SHEET 1 of 1

PROJECT: Ameren CCR GW Monitoring
PROJECT NUMBER: GL153140604.0003B
LOCATION: Sioux Energy Center

DRILLING METHOD: 6" Sonic
DRILLING DATE: 3/2/2022
DRILL RIG: Geoprobe 8140DT

DATUM: NAVD88
AZIMUTH: N/A
COORDINATES: N: 1,116,856.00 E: 879,563.87

ELEVATION: 429.94
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL/ROCK PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEVATION / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC / ATT	REMARKS
0	6" Sonic	(0.0-2.0) (CL) SILTY CLAY, low to medium plasticity fines, trace organics (roots); dark yellowish brown (10YR 4/2); cohesive, w~PL, soft.	CL		427.9				
		(2.0-5.0) (ML) SILT, low plasticity fines, trace fine sand; brownish gray (5YR 4/1), trace reddish brown iron staining (2.5YR 5/8), trace medium light gray mottling (N6); non-cohesive, dry, loose.	ML		2.0 / 424.9	1	SO	3.6 / 5.0	
5		(5.0-10.0) (SM) SILTY SAND, fine poorly graded sand, low plasticity fines; pale yellowish orange (10YR 8/6); non-cohesive, dry, very loose.	SM		5.0 / 419.9	2	SO	3.8 / 5.0	
10		(10.0-12.5) (ML) sandy SILT, low plasticity fines, fine sand; dark yellowish brown (10YR 4/2), trace reddish brown iron staining (2.5YR 5/8); non-cohesive, moist, compact.	ML		10.0 / 417.4	3	SO	4.1 / 5.0	
		(12.5-15.0) (SP) SAND, fine poorly graded sand, trace low plasticity fines; very pale orange (10YR 8/2); non-cohesive, moist, loose.	SP		12.5 / 414.9				
15		(15.0-17.0) (SP) SAND, fine poorly graded sand, trace low plasticity fines; dark yellowish brown (10YR 4/2); non-cohesive, moist, compact.	SP		15.0 / 412.9				
		(17.0-20.0) (SP) SAND, fine to medium poorly graded subrounded sand, trace fine subrounded gravel; pale yellowish brown (10YR 6/2); non-cohesive, wet, compact.	SP		17.0 / 409.9	4	SO	3.9 / 5.0	▽ Water Level 17.40 ft bgs 3/2/2022
20		(20.0-30.0) (SW) SAND, fine to coarse well graded subrounded sand, some fine subrounded gravel; pale yellowish brown (10YR 6/2); non-cohesive, wet, compact.	SW		20.0 / 399.9	5	SO	6.5 / 10.0	
30		END OF BORING AT 30.0 FT BELOW GROUND SURFACE. FOR WELL DETAILS, SEE WELL CONSTRUCTION LOG TMW-5.			30.0				
35									

SCALE: 1 in = 4.4 ft
DRILLING CONTRACTOR: Cascade Environmental, LP
DRILLER: R. Gordon

LOGGED: GTM
CHECKED: EMS
REVIEWED: JSI

GOLDER

AMEREN_00001638

GOLDER STL RECORD OF BOREHOLE MWD SEC LOGS.GPJ GLDR_CO.GDT 5/6/22

RECORD OF BOREHOLE TMW-6

SHEET 1 of 1

PROJECT: Ameren CCR GW Monitoring
PROJECT NUMBER: GL153140604.0003B
LOCATION: Sioux Energy Center

DRILLING METHOD: 6" Sonic
DRILLING DATE: 3/2/2022
DRILL RIG: Geoprobe 8140DT

DATUM: NAVD88
AZIMUTH: N/A
COORDINATES: N: 1,116,909.88 E: 880,086.00

ELEVATION: 430.84
INCLINATION: -90

DEPTH (feet)	BORING METHOD	DESCRIPTION	USCS	GRAPHIC LOG	ELEVATION / DEPTH (ft)	NUMBER	TYPE	REC / ATT	REMARKS
0	6" Sonic	(0.0-2.0) (CL) SILTY CLAY, medium to high plasticity fines, trace coarse gravel, trace fine sand, trace organics (roots); dusky yellowish brown (10YR 2/2); cohesive, w~PL, firm.	CL		428.8				
		(2.0-5.7) (ML) sandy SILT, low plasticity fines, fine sand; very pale orange (10YR 8/2); non-cohesive, dry, loose.	ML		2.0	1	SO	2.1 / 5.0	
5					425.1				
		(5.7-7.0) (ML) SILT, low plasticity fines, some fine sand; brownish gray (5YR 4/1); trace reddish brown iron staining (2.5YR 5/8), trace medium light gray mottling (N6); cohesive, w<PL, soft.	ML		5.7 / 423.8				
		(7.0-10.0) (SM) SILTY SAND, fine sand, low plasticity fines; pale yellowish orange (10YR 8/6); non-cohesive, dry, very loose.	SM		7.0	2	SO	3.4 / 5.0	
10					420.8				
		(10.0-11.7) (SP-SM) SAND, fine poorly graded sand, some low plasticity fines; moderate yellowish brown (10YR 5/4); non-cohesive, moist, loose.	SP-SM		10.0 / 419.1				
		(11.7-13.8) (ML) SILT, low plasticity fines, some fine sand; brownish gray (5YR 4/1), some reddish brown iron staining (2.5YR 5/8), some medium light gray mottling (N6); cohesive, w<PL, soft.	ML		11.7 / 417.0	3	SO	3.2 / 5.0	
		(13.8-15.0) (SM) SILTY SAND, fine sand, low plasticity fines; moderate yellowish brown (10YR 5/4); non-cohesive, moist, loose.	SM		13.8 / 415.8				
15		(15.0-17.8) (SM) SILTY SAND, fine sand, low plasticity fines; moderate yellowish brown (10YR 5/4); non-cohesive, wet, compact.	SM		15.0 / 413.0	4	SO	3.6 / 5.0	▽ Water Level 17.26 ft bgs 3/2/2022
		(17.8-29.5) (SP) SAND, fine to medium poorly graded subrounded sand, trace fine subrounded gravel; pale yellowish brown (10YR 6/2); non-cohesive, wet, compact.	SP		17.8				
20									
25						5	SO	8.3 / 11.0	
					401.3				
30		(29.5-31.0) (SW) SAND, medium to coarse well graded subrounded sand, fine to coarse subrounded gravel; pale yellowish brown (10YR 6/2); non-cohesive, wet, compact.	SW		29.5 / 399.8				
		END OF BORING AT 31.0 FT BELOW GROUND SURFACE. FOR WELL DETAILS, SEE WELL CONSTRUCTION LOG TMW-6.			31.0				
35									

SCALE: 1 in = 4.4 ft
DRILLING CONTRACTOR: Cascade Environmental, LP
DRILLER: R. Gordon

LOGGED: GTM
CHECKED: EMS
REVIEWED: JSI

GOLDER

AMEREN_00001639

GOLDER STL RECORD OF BOREHOLE MWD SEC LOGS.GPJ GLDR_CO.GDT 5/6/22

APPENDIX B

Historic DSI Potentiometric Surface Maps

PRINT DIST.

REVISIONS		
REV.	W.O.	

MISSOURI (60'W) ROUTE 94

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

EASEMENT TO SW BELL

60' ROW

80' ROW

PZ-4 415.96

PZ-21 415.69

PZ-5 (FP) 415.62

PZ-11 415.64

PZ-16 415.62

PZ-36 415.83

PZ-26 415.57

PZ-31 415.61

PZ-41 415.65

PZ-1 415.31

PZ-6 415.32

PZ-12 (FP) 415.31

PZ-17 415.28

PZ-22 415.23

PZ-27 415.22

PZ-32 415.30

PZ-37 415.31

PZ-42 (FP) 415.33

PZ-50 (FP) 415.66

PZ-46 415.36

PZ-51 415.41

PZ-56 415.47

PZ-7 414.95

PZ-13 414.94

PZ-18 (FP) 414.91

PZ-23 414.88

PZ-28 414.87

PZ-33 414.88

PZ-38 (FP) 414.94

PZ-43 414.97

PZ-47 (FP) 415.07

PZ-52 415.13

50' WIDE EASEMENT
THE MISSOURI
PIPE LINE

PZ-8 414.57

PZ-14 414.57

PZ-19 414.62

PZ-24 (FP) 414.62

PZ-29 414.66

PZ-34 (FP) 414.69

PZ-39 414.72

PZ-44 414.74

PZ-48 414.83

PZ-53 (FP) 414.97

SCOUR HOLE
W. L. ELEV.=413.35

PZ-3 414.31

PZ-9 414.33

PZ-15 414.33

PZ-20 414.31

PZ-30 (FP) 414.44

PZ-35 414.47

PZ-45 414.60

PZ-49 414.66

PZ-54 414.75

PZ-10 414.12

PZ-25 (FP) 414.28

PZ-40 414.36

PZ-55 414.56

i = 0.08%

i = 0.06%

415.5

415.0

414.5

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1115919.13
E=872257.95
ELEV=426.26

1119000 1118000 1117000 1116000

877000 878000 879000 880000 881000 882000

LEGEND

PZ ●	PIEZOMETER BORING (57)		PAVED ROAD
B ◔	TEMPORARY BORING (54)	i = 0.08%	HYDRAULIC GRADIENT (%)
B ◎	TEMPORARY BORING (DEEP) (3)		GROUNDWATER FLOW DIRECTION
(FP) ●	FIELD PERMEABILITY TEST LOCATION		ACCESS ROAD
☒	CONTROL POINT	℄	PROPERTY LINE (APPROX.)
•	℄ SURVEY POINT		CENTERLINE OF EXISTING ROAD
	METAL TRANSMISSION TOWER		PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
	EXISTING POWER POLE	G	EXISTING MISSOURI PIPELINE
	CULVERT		
415.0	GROUND WATER ELEVATION (FT.)	UT UT	EXISTING UNDERGROUND UTILITIES
		FO	EXISTING FIBER OPTIC
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.	OE OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: SEPTEMBER 13, 2005.
5. GROUNDWATER ELEVATION READINGS FOR PZ-2 AND PZ-57 WERE BELIEVED TO BE ANOMALOUS AND THEREFORE WERE NOT INCLUDED IN WATER TABLE SURFACE MAP.
6. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.

N

SCALE: 1" = 200'
0 100 200 400

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1055 CORPORATE SQUARE DRIVE
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Jefferson City, Missouri 65101
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PREPARED FOR Ameren UE

DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 21		
CHKD. A.R.C. (G.E.R.)	DETAILED SITE INVESTIGATION		
SUPV. D.E.K. (G.E.R.)	PROPOSED UTILITY WASTE DISPOSAL AREA		
APPD. D.E.K. (G.E.R.)	WATER TABLE SURFACE MAP - SEPTEMBER 2005		
	LOCATION 001009	SIOUX PLANT	CLASS 02010
Ameren UE ST. LOUIS, MISSOURI	8430-Y-0168601-22		REV.

G:\CADDFiles\AMEREN\E\SIOUX PLANT\AR-SIOUXDISASP.dwg, FIG21WTSM091305, 9/19/2006 11:46:05 AM

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REVISIONS		
REV.	W.O.	

MISSOURI (60'W) ROUTE 94

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

EASEMENT TO SW BELL

50' WIDE EASEMENT THE MISSOURI PIPE LINE

SCOUR HOLE
W.L. ELEV.=414.49

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

60' ROW

80' ROW

PZ-1 415.36
PZ-2 (FP) 414.83
PZ-3 414.55
PZ-4 415.98
PZ-5 (FP) 415.65
PZ-6 415.38
PZ-7 415.05
PZ-8 414.76
PZ-9 414.52
PZ-10 414.39
PZ-11 415.64
PZ-12 (FP) 415.31
PZ-13 414.99
PZ-14 414.72
PZ-15 414.52
PZ-16 415.63
PZ-17 415.30
PZ-18 (FP) 414.99
PZ-19 414.70
PZ-20 414.53
PZ-21 415.99
PZ-22 415.26
PZ-23 414.98
PZ-24 (FP) 414.69
PZ-25 (FP) 414.43
PZ-26 415.53
PZ-27 415.20
PZ-28 414.94
PZ-29 414.70
PZ-30 (FP) 414.56
PZ-31 415.56
PZ-32 415.22
PZ-33 414.95
PZ-34 (FP) 414.75
PZ-35 414.56
PZ-36 415.74
PZ-37 415.27
PZ-38 (FP) 414.95
PZ-39 414.72
PZ-40 414.47
PZ-41 415.55
PZ-42 (FP) 415.27
PZ-43 414.97
PZ-44 414.73
PZ-45 414.57
PZ-46 415.25
PZ-47 (FP) 415.00
PZ-48 414.78
PZ-49 414.61
PZ-50 (FP) 415.47
PZ-51 415.27
PZ-52 415.02
PZ-53 (FP) 414.85
PZ-54 414.68
PZ-55 414.56
PZ-56 415.29
PZ-57 (FP) 414.73

415.5
415.0
414.5

i = 0.09%
i = 0.08%

LEGEND

PZ ●	PIEZOMETER BORING (57)
B ◔	TEMPORARY BORING (54)
B ◎	TEMPORARY BORING (DEEP) (3)
(FP) ●	FIELD PERMEABILITY TEST LOCATION
☒	CONTROL POINT
●	℄ SURVEY POINT
	METAL TRANSMISSION TOWER
	EXISTING POWER POLE
	CULVERT
415.0	GROUND WATER ELEVATION (FT.)
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.
	PAVED ROAD
i = 0.08%	HYDRAULIC GRADIENT (%)
	GROUNDWATER FLOW DIRECTION
	ACCESS ROAD
	PROPERTY LINE (APPROX.)
	CENTERLINE OF EXISTING ROAD
	PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
G	EXISTING MISSOURI PIPELINE
UT	EXISTING UNDERGROUND UTILITIES
FO	EXISTING FIBER OPTIC
OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS, INC.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: OCTOBER 11, 2005.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.

SCALE: 1" = 200'
0 100 200 400

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PREPARED FOR AmerenUE

DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 22 DETAILED SITE INVESTIGATION PROPOSED UTILITY WASTE DISPOSAL AREA WATER TABLE SURFACE MAP - OCTOBER 2005		
CHKD. A.R.C. (G.E.R.)			
SUPV. D.E.K. (G.E.R.)			
APPD. D.E.K. (G.E.R.)	LOCATION 001009	SIOUX PLANT	CLASS 02010
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-23		REV.

G:\CADDFiles\AMEREN\E\SIOUX PLANT\AM-SIOUXDISASP.dwg, FIG22-WTSM-101105, 8/8/2006 11:47:06 AM

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REVISIONS

REV.	W.O.	

MISSOURI (60'W) ROUTE 94

EASEMENT TO SW BELL

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

60' ROW

80' ROW

PZ-4 415.37

PZ-21 415.48

PZ-36 415.20

PZ-41 414.97

PZ-5 (FP) 414.87

PZ-11 414.89

PZ-16 414.90

PZ-26 414.81

PZ-31 414.87

PZ-1 414.37

PZ-6 414.42

PZ-12 (FP) 414.35

PZ-17 414.35

PZ-22 414.31

PZ-27 414.30

PZ-32 414.35

PZ-37 414.46

PZ-42 (FP) 414.54

PZ-46 414.60

PZ-50 (FP) 414.96

PZ-51 414.67

PZ-56 414.78

415.0

414.5

414.0

413.5

413.0

i = 0.12%

i = 0.08%

50' WIDE EASEMENT
THE MISSOURI
PIPE LINE

PZ-2 (FP) 413.36

PZ-8 413.26

PZ-14 413.27

PZ-19 413.31

PZ-24 (FP) 413.36

PZ-29 413.43

PZ-34 (FP) 413.35

PZ-39 413.61

PZ-44 413.66

PZ-48 413.80

PZ-53 (FP) 413.93

PZ-7 413.85

PZ-13 413.83

PZ-18 (FP) 413.82

PZ-23 413.85

PZ-28 413.84

PZ-33 413.91

PZ-38 (FP) 413.84

PZ-43 414.03

PZ-47 (FP) 414.13

PZ-52 414.29

SCOUR HOLE
W.L. ELEV. = 412.71

PZ-3 412.76

PZ-9 412.80

PZ-15 412.78

PZ-20 412.83

PZ-30 (FP) 413.11

PZ-35 413.19

PZ-45 413.40

PZ-49 413.55

PZ-54 413.64

PZ-57 (FP) 413.78

PZ-10 412.47

PZ-25 (FP) 412.91

PZ-40 413.33

PZ-55 413.43

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1115919.13
E=872257.95
ELEV=426.26

1119000 1118000 1117000 1116000

877000 878000 879000 880000 881000 882000

N

SCALE: 1" = 200'
0 100 200 400

LEGEND

PZ ●	PIEZOMETER BORING (57)	———	PAVED ROAD
B ◔	TEMPORARY BORING (54)	i = 0.08%	HYDRAULIC GRADIENT (%)
B ◎	TEMPORARY BORING (DEEP) (3)	➘	GROUNDWATER FLOW DIRECTION
(FP) ●	FIELD PERMEABILITY TEST LOCATION	= = = = = = = =	ACCESS ROAD
☒	CONTROL POINT	——— P℄ ———	PROPERTY LINE (APPROX.)
●	℄ SURVEY POINT	——— — ———	CENTERLINE OF EXISTING ROAD
	METAL TRANSMISSION TOWER	▬ ▬ ▬	PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
—○—	EXISTING POWER POLE	——— G ———	EXISTING MISSOURI PIPELINE
⟩—⟨	CULVERT		
415.0	GROUND WATER ELEVATION (FT.)	——UT——UT——	EXISTING UNDERGROUND UTILITIES
		——— FO ———	EXISTING FIBER OPTIC
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.	——OE——OE——	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: NOVEMBER 10, 2005.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.

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PREPARED FOR AmerenUE

DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 23		
CHKD. A.R.C. (G.E.R.)	DETAILED SITE INVESTIGATION		
SUPV. D.E.K. (G.E.R.)	PROPOSED UTILITY WASTE DISPOSAL AREA		
APPD. D.E.K. (G.E.R.)	WATER TABLE SURFACE MAP - NOVEMBER 2005		
LOCATION 001009	SIOUX PLANT	CLASS 02010	
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-24	REV.	

G:\CADDFiles\AMEREN\IE SIOUX PLANT\AM-SIOUX-DSA3D.dwg, FIG23-WTSM-111005, 8/9/2006 11:04:51 AM

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REVISIONS		
REV.	W.O.	

MISSOURI (60'W) ROUTE 94

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

EASEMENT TO SW BELL

50' WIDE EASEMENT THE MISSOURI PIPE LINE

SCOUR HOLE
W.L. ELEV. = 411.42

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

60' ROW

80' ROW

i = 0.13%

i = 0.11%

PZ-1 413.47
PZ-2 (FP) 412.33
PZ-3 411.69
PZ-4 414.63
PZ-5 (FP) 414.04
PZ-6 413.50
PZ-8 412.20
PZ-9
PZ-10 411.41
PZ-11 414.06
PZ-12 (FP) 413.45
PZ-13 412.85
PZ-14 412.22
PZ-15 411.67
PZ-16 414.10
PZ-17 413.49
PZ-18 (FP) 412.88
PZ-19 412.30
PZ-20 411.75
PZ-21 414.81
PZ-22 413.51
PZ-23 412.89
PZ-24 (FP) 412.36
PZ-25 (FP) 411.90
PZ-26 414.01
PZ-27 413.43
PZ-28 412.90
PZ-29 412.43
PZ-30 (FP) 412.04
PZ-31 414.12
PZ-32 413.47
PZ-33 412.96
PZ-34 (FP) 412.53
PZ-35 412.14
PZ-36 414.53
PZ-37 413.65
PZ-38 (FP) 413.05
PZ-39 412.59
PZ-40 412.01
PZ-41 414.29
PZ-42 (FP) 413.73
PZ-44 412.72
PZ-45 412.40
PZ-46 413.78
PZ-47 (FP) 413.33
PZ-48 412.89
PZ-49 412.57
PZ-50 (FP) 414.26
PZ-51 413.90
PZ-52 413.44
PZ-53 (FP) 413.06
PZ-54 412.85
PZ-55 412.47
PZ-56 414.06
PZ-57 (FP) 412.90

414.5 414.0 413.5 413.0 412.5 412.0 411.50

LEGEND

PZ ●	PIEZOMETER BORING (57)		PAVED ROAD
B ◔	TEMPORARY BORING (54)	i = 0.08%	HYDRAULIC GRADIENT (%)
B ◎	TEMPORARY BORING (DEEP) (3)		GROUNDWATER FLOW DIRECTION
(FP) ●	FIELD PERMEABILITY TEST LOCATION		ACCESS ROAD
⊠	CONTROL POINT	℄	PROPERTY LINE (APPROX.)
•	℄ SURVEY POINT		CENTERLINE OF EXISTING ROAD
	METAL TRANSMISSION TOWER		PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
	EXISTING POWER POLE	G	EXISTING MISSOURI PIPELINE
	CULVERT	UT	EXISTING UNDERGROUND UTILITIES
415.0	GROUND WATER ELEVATION (FT.)	FO	EXISTING FIBER OPTIC
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.	OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: DECEMBER 9, 2005.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.
6. GROUNDWATER ELEVATION READINGS FOR PZ-7 AND PZ-43 WERE BELIEVED TO BE ANOMALOUS AND THEREFORE WERE NOT INCLUDED IN WATER TABLE SURFACE MAP.

SCALE: 1" = 200'
0 100 200 400

N

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Jefferson City, Missouri 65101 Facsimile: (573) 659-6079

PREPARED FOR Ameren UE

DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 24	
CHKD. A.R.C. (G.E.R.)	DETAILED SITE INVESTIGATION	
SUPV. D.E.K. (G.E.R.)	PROPOSED UTILITY WASTE DISPOSAL AREA	
APPD. D.E.K. (G.E.R.)	WATER TABLE SURFACE MAP - DECEMBER 2005	
LOCATION 001009	SIOUX PLANT	CLASS 02010
Ameren UE ST. LOUIS, MISSOURI	8430-Y-0168601-25	REV.

G:\CADD\Files\AMEREN\ST_SIOUX\PLANT_AIR-SOUX-CDR\SP-dwg, FIG24WTSM-120906, 8/9/2006 11:04:11 AM

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REVISIONS		
REV.	W.O.	

MISSOURI (60'W) ROUTE 94

EASEMENT TO SW BELL

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

60' ROW

80' ROW

50' WIDE EASEMENT THE MISSOURI PIPE LINE

SCOUR HOLE

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1115919.13
E=872257.95
ELEV=426.26

PZ-1 412.97
PZ-2 (FP) 411.88
PZ-3 411.33
PZ-4 414.16
PZ-5 (FP) 413.57
PZ-6 413.04
PZ-7 412.41
PZ-8 411.82
PZ-9 411.37
PZ-10 411.06
PZ-11 413.58
PZ-13 412.43
PZ-14 411.84
PZ-15 411.39
PZ-16 413.63
PZ-17 413.02
PZ-18 (FP) 412.43
PZ-19 411.86
PZ-20 411.44
PZ-21 414.34
PZ-22 412.98
PZ-23 412.47
PZ-24 (FP) 411.93
PZ-25 (FP) 411.44
PZ-26 413.57
PZ-27 412.98
PZ-28 412.44
PZ-29 412.02
PZ-30 (FP) 411.60
PZ-31 413.68
PZ-32 413.05
PZ-33 412.54
PZ-34 (FP) 412.08
PZ-35 411.75
PZ-36 415.08
PZ-37 413.19
PZ-38 (FP) 412.59
PZ-39 412.18
PZ-40 411.61
PZ-41 413.80
PZ-42 (FP) 413.29
PZ-43 412.72
PZ-44 412.28
PZ-45 411.97
PZ-46 413.33
PZ-47 (FP) 412.87
PZ-48 412.42
PZ-49 412.13
PZ-50 (FP) 413.79
PZ-51 413.42
PZ-52 412.99
PZ-53 (FP) 412.59
PZ-54 412.24
PZ-55 411.99
PZ-56 413.60
PZ-57 (FP) 412.44

i = 0.13%

i = 0.11%

LEGEND

PZ ●	PIEZOMETER BORING (57)
B ◔	TEMPORARY BORING (54)
B ◎	TEMPORARY BORING (DEEP) (3)
(FP) ●	FIELD PERMEABILITY TEST LOCATION
☒	CONTROL POINT
●	℄ SURVEY POINT
	METAL TRANSMISSION TOWER
—○—	EXISTING POWER POLE
	CULVERT
415.0	GROUND WATER ELEVATION (FT.)
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.
	PAVED ROAD
i = 0.08%	HYDRAULIC GRADIENT (%)
	GROUNDWATER FLOW DIRECTION
	ACCESS ROAD
	PROPERTY LINE (APPROX.)
	CENTERLINE OF EXISTING ROAD
	PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
G	EXISTING MISSOURI PIPELINE
UT	EXISTING UNDERGROUND UTILITIES
FO	EXISTING FIBER OPTIC
OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: JANUARY 6, 2006.
5. GROUNDWATER ELEVATION READING FOR PZ-12 WAS BELIEVED TO BE ANOMALOUS AND THEREFORE WAS NOT INCLUDED IN WATER TABLE SURFACE MAP.
6. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.
7. ELEVATION DATA FOR "SCOUR HOLE" WAS NOT AVAILABLE FOR DATE OF GROUNDWATER MEASURMENTS.

SCALE: 1" = 200'
0 100 200 400

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Jefferson City, Missouri 65101 Facsimile: (573) 659-9079

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DRAWN W.J.A. (G.E.R.) 080806	FIGURE 25 DETAILED SITE INVESTIGATION PROPOSED UTILITY WASTE DISPOSAL AREA WATER TABLE SURFACE MAP - JANUARY 2006		
CHKD. A.R.C. (G.E.R.)			
SUPV. D.E.K. (G.E.R.)			
APPD. D.E.K. (G.E.R.)	LOCATION 001009	SIOUX PLANT	CLASS 02010
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-26		REV.

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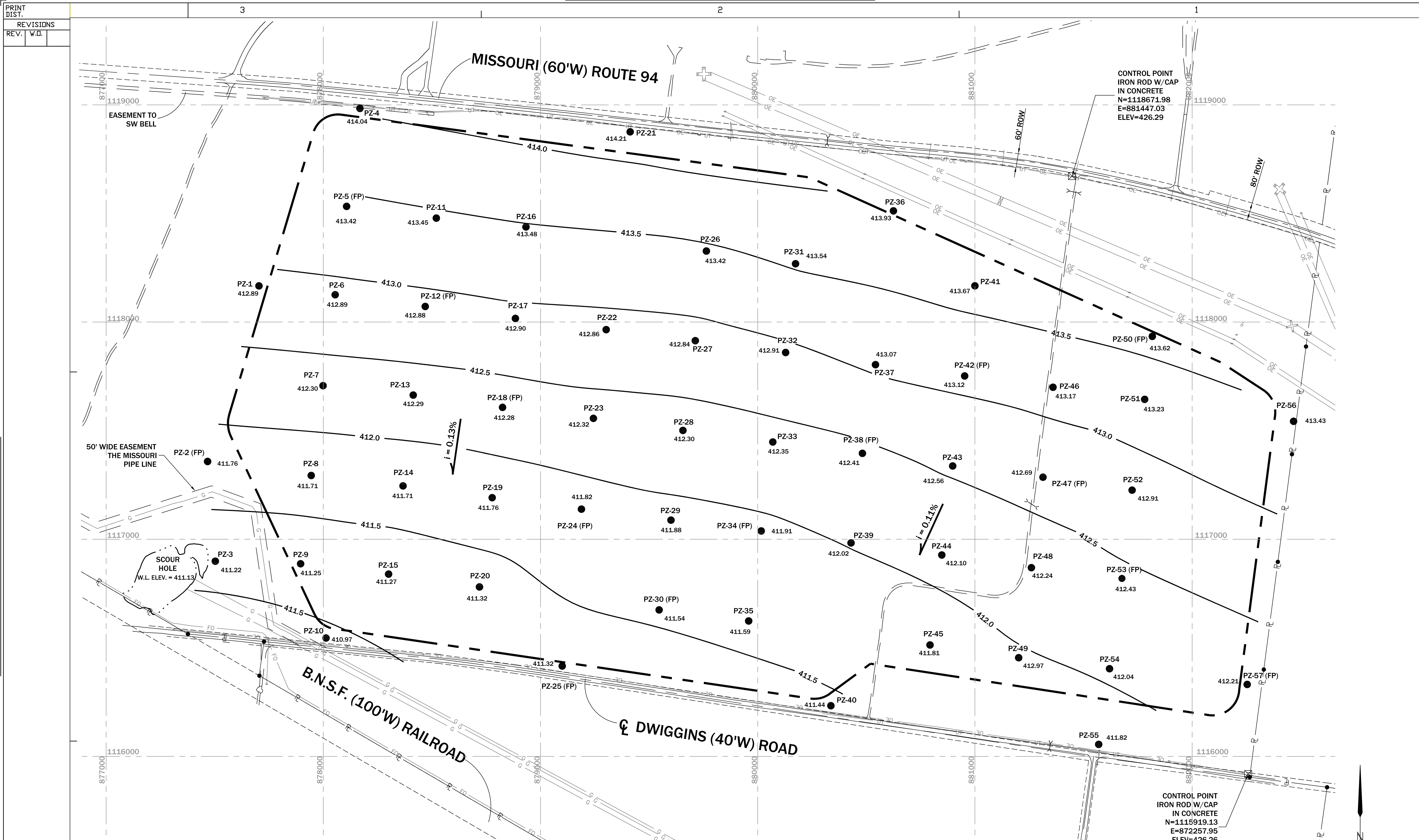

LEGEND

PZ ●	PIEZOMETER BORING (57)		PAVED ROAD
B	TEMPORARY BORING (54)	i = 0.08%	HYDRAULIC GRADIENT (%)
B	TEMPORARY BORING (DEEP) (3)		GROUNDWATER FLOW DIRECTION
(FP) ●	FIELD PERMEABILITY TEST LOCATION		ACCESS ROAD
	CONTROL POINT	℄	PROPERTY LINE (APPROX.)
●	℄ SURVEY POINT		CENTERLINE OF EXISTING ROAD
	METAL TRANSMISSION TOWER		PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
	EXISTING POWER POLE	G	EXISTING MISSOURI PIPELINE
	CULVERT	UT UT	EXISTING UNDERGROUND UTILITIES
415.0	GROUND WATER ELEVATION (FT.)	FO	EXISTING FIBER OPTIC
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.	OE OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: FEBRUARY 2, 2006.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.

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PREPARED FOR AmerenUE

DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 26 DETAILED SITE INVESTIGATION PROPOSED UTILITY WASTE DISPOSAL AREA WATER TABLE SURFACE MAP - FEBRUARY 2006
CHKD. A.R.C. (G.E.R.)	
SUPV. D.E.K. (G.E.R.)	
APPD. D.E.K. (G.E.R.)	LOCATION 001009 / SIOUX PLANT / CLASS 02010
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-27 / REV.

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REV.	W.O.	

MISSOURI (60'W) ROUTE 94

EASEMENT TO SW BELL

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

60' ROW

80' ROW

PZ-4 413.85
PZ-21 414.04
PZ-5 (FP) 413.28
PZ-11 413.29
PZ-16 413.29
PZ-36 413.77
PZ-26 413.26
PZ-31 413.38
PZ-41 413.50
PZ-1 412.68
PZ-6 412.73
PZ-12 (FP) 412.71
PZ-17 412.71
PZ-22 412.67
PZ-27 412.66
PZ-32 412.71
PZ-37 412.87
PZ-42 (FP) 412.94
PZ-50 (FP) 413.45
PZ-7 412.11
PZ-13 412.11
PZ-18 (FP) 412.07
PZ-23 412.11
PZ-28 412.04
PZ-33 412.19
PZ-38 (FP) 412.22
PZ-43 412.40
PZ-46 413.01
PZ-51 413.09
PZ-56 413.26
PZ-2 (FP) 411.54
PZ-8 411.51
PZ-14 411.52
PZ-19 411.56
PZ-24 (FP) 411.63
PZ-29 411.69
PZ-34 (FP) 411.58
PZ-39 411.83
PZ-44 411.92
PZ-47 (FP) 412.54
PZ-52 412.67
PZ-3 410.99
PZ-9 410.93
PZ-15 411.07
PZ-20 411.11
PZ-30 (FP) 411.29
PZ-35 411.41
PZ-48 411.08
PZ-53 (FP) 412.26
PZ-10 410.72
PZ-25 (FP) 411.09
PZ-40 411.23
PZ-45 411.61
PZ-49 411.76
PZ-54 411.85
PZ-57 (FP) 412.08
PZ-55 411.63

413.5 413.0 412.5 412.0 411.5 411.0

i = 0.13%
i = 0.11%

50' WIDE EASEMENT THE MISSOURI PIPE LINE

SCOUR HOLE
W.L. ELEV. = 410.94

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1115919.13
E=872257.95
ELEV=426.26

SCALE: 1" = 200'
0 100 200 400

LEGEND

PZ ●	PIEZOMETER BORING (57)		PAVED ROAD
B ◔	TEMPORARY BORING (54)	i = 0.08%	HYDRAULIC GRADIENT (%)
B ◎	TEMPORARY BORING (DEEP) (3)		GROUNDWATER FLOW DIRECTION
(FP) ●	FIELD PERMEABILITY TEST LOCATION		ACCESS ROAD
☒	CONTROL POINT	℄	PROPERTY LINE (APPROX.)
●	℄ SURVEY POINT		CENTERLINE OF EXISTING ROAD
	METAL TRANSMISSION TOWER		PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
	EXISTING POWER POLE	G	EXISTING MISSOURI PIPELINE
	CULVERT		
415.0	GROUND WATER ELEVATION (FT.)	UT UT	EXISTING UNDERGROUND UTILITIES
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.	FO	EXISTING FIBER OPTIC
		OE OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: MARCH 6, 2006.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.

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DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 27	
CHKD. A.R.C. (G.E.R.)	DETAILED SITE INVESTIGATION	
SUPV. D.E.K. (G.E.R.)	PROPOSED UTILITY WASTE DISPOSAL AREA	
APPD. D.E.K. (G.E.R.)	WATER TABLE SURFACE MAP - MARCH 2006	
LOCATION 001009	SIOUX PLANT	CLASS 02010
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-28	REV.

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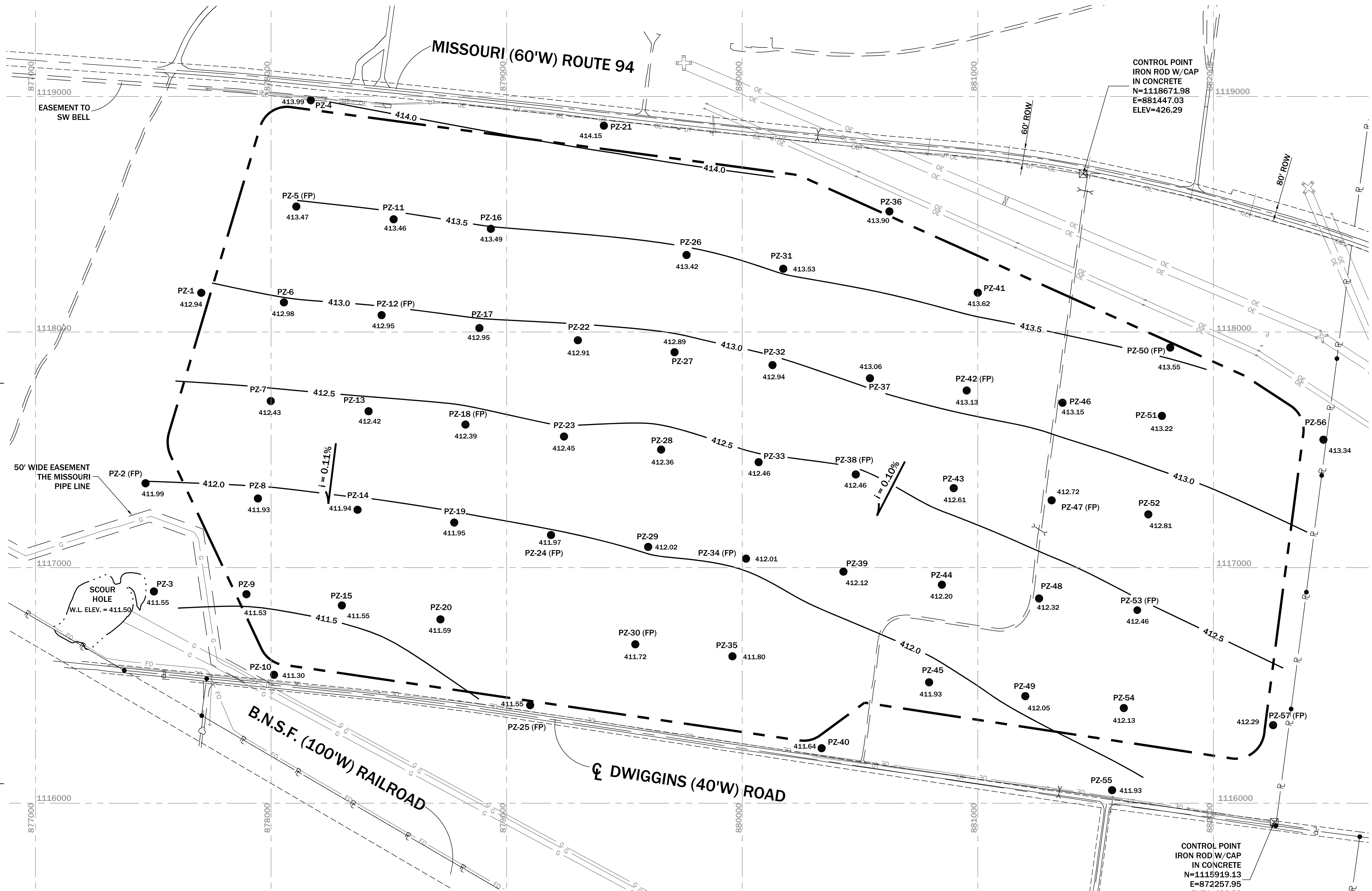
REV.	W.O.	



LEGEND

Symbol	Description	Symbol	Description
PZ ●	PIEZOMETER BORING (57)		PAVED ROAD
B	TEMPORARY BORING (54)	i = 0.08%	HYDRAULIC GRADIENT (%)
B	TEMPORARY BORING (DEEP) (3)		GROUNDWATER FLOW DIRECTION
(FP) ●	FIELD PERMEABILITY TEST LOCATION		ACCESS ROAD
☒	CONTROL POINT	℄	PROPERTY LINE (APPROX.)
●	℄ SURVEY POINT		CENTERLINE OF EXISTING ROAD
	METAL TRANSMISSION TOWER		PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
	EXISTING POWER POLE	G	EXISTING MISSOURI PIPELINE
	CULVERT	UT	EXISTING UNDERGROUND UTILITIES
415.0	GROUND WATER ELEVATION (FT.)	FO	EXISTING FIBER OPTIC
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.	OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: APRIL 4, 2006.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.

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DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 28
CHKD. A.R.C. (G.E.R.)	DETAILED SITE INVESTIGATION
SUPV. D.E.K. (G.E.R.)	PROPOSED UTILITY WASTE DISPOSAL AREA WATER TABLE SURFACE MAP - APRIL 2006
APPD. D.E.K. (G.E.R.)	LOCATION 001009 — SIOUX PLANT — CLASS 02010
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-29 — REV.

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REVISIONS		
REV.	W.O.	

MISSOURI (60'W) ROUTE 94

EASEMENT TO SW BELL

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

60' ROW

80' ROW

50' WIDE EASEMENT THE MISSOURI PIPE LINE

SCOUR HOLE
W.L. ELEV. = 412.65

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1115919.13
E=872257.95
ELEV=426.26

PZ-1 413.50
PZ-2 (FP) 412.90
PZ-3 412.66
PZ-4 414.18
PZ-5 (FP) 413.83
PZ-6 413.50
PZ-7 413.18
PZ-8 412.86
PZ-9 412.57
PZ-10 412.47
PZ-11 413.82
PZ-12 (FP) 413.47
PZ-13 413.16
PZ-14 412.85
PZ-15 412.62
PZ-16 413.83
PZ-17 413.48
PZ-18 (FP) 413.14
PZ-19 412.84
PZ-20 412.64
PZ-21 414.24
PZ-22 413.42
PZ-23 413.15
PZ-24 (FP) 412.83
PZ-25 (FP) 412.59
PZ-26 413.76
PZ-27 413.41
PZ-28 413.06
PZ-29 412.86
PZ-30 (FP) 412.69
PZ-31 413.82
PZ-32 413.45
PZ-33 413.11
PZ-34 (FP) 412.81
PZ-35 412.69
PZ-36 414.05
PZ-37 413.53
PZ-38 (FP) 413.11
PZ-39 412.85
PZ-40 412.63
PZ-41 413.87
PZ-42 (FP) 413.52
PZ-43 413.22
PZ-44 412.96
PZ-45 412.77
PZ-46 413.55
PZ-47 (FP) 413.25
PZ-48 413.03
PZ-49 412.85
PZ-50 (FP) 413.82
PZ-51 413.57
PZ-52 413.31
PZ-53 (FP) 413.08
PZ-54 412.87
PZ-55 412.74
PZ-56 413.63
PZ-57 (FP) 412.93

414.0 413.5 413.0 412.5

i = 0.07%

i = 0.06%

LEGEND

PZ ●	PIEZOMETER BORING (57)		PAVED ROAD
B ◔	TEMPORARY BORING (54)	i = 0.08%	HYDRAULIC GRADIENT (%)
B ◎	TEMPORARY BORING (DEEP) (3)		GROUNDWATER FLOW DIRECTION
(FP) ●	FIELD PERMEABILITY TEST LOCATION		ACCESS ROAD
☒	CONTROL POINT	℄	PROPERTY LINE (APPROX.)
•	℄ SURVEY POINT		CENTERLINE OF EXISTING ROAD
	METAL TRANSMISSION TOWER		PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
	EXISTING POWER POLE	G	EXISTING MISSOURI PIPELINE
	CULVERT	UT UT	EXISTING UNDERGROUND UTILITIES
415.0	GROUND WATER ELEVATION (FT.)	FO	EXISTING FIBER OPTIC
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.	OE OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: MAY 1, 2006.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.

SCALE: 1" = 200'
0 100 200 400

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DRAWN W.J.A. (G.E.R.) 080806	FIGURE 29 DETAILED SITE INVESTIGATION PROPOSED UTILITY WASTE DISPOSAL AREA WATER TABLE SURFACE MAP - MAY 2006		
CHKD. A.R.C. (G.E.R.)			
SUPV. D.E.K. (G.E.R.)			
APPD. D.E.K. (G.E.R.)	LOCATION 001009	SIOUX PLANT	CLASS 02010
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-30		REV.

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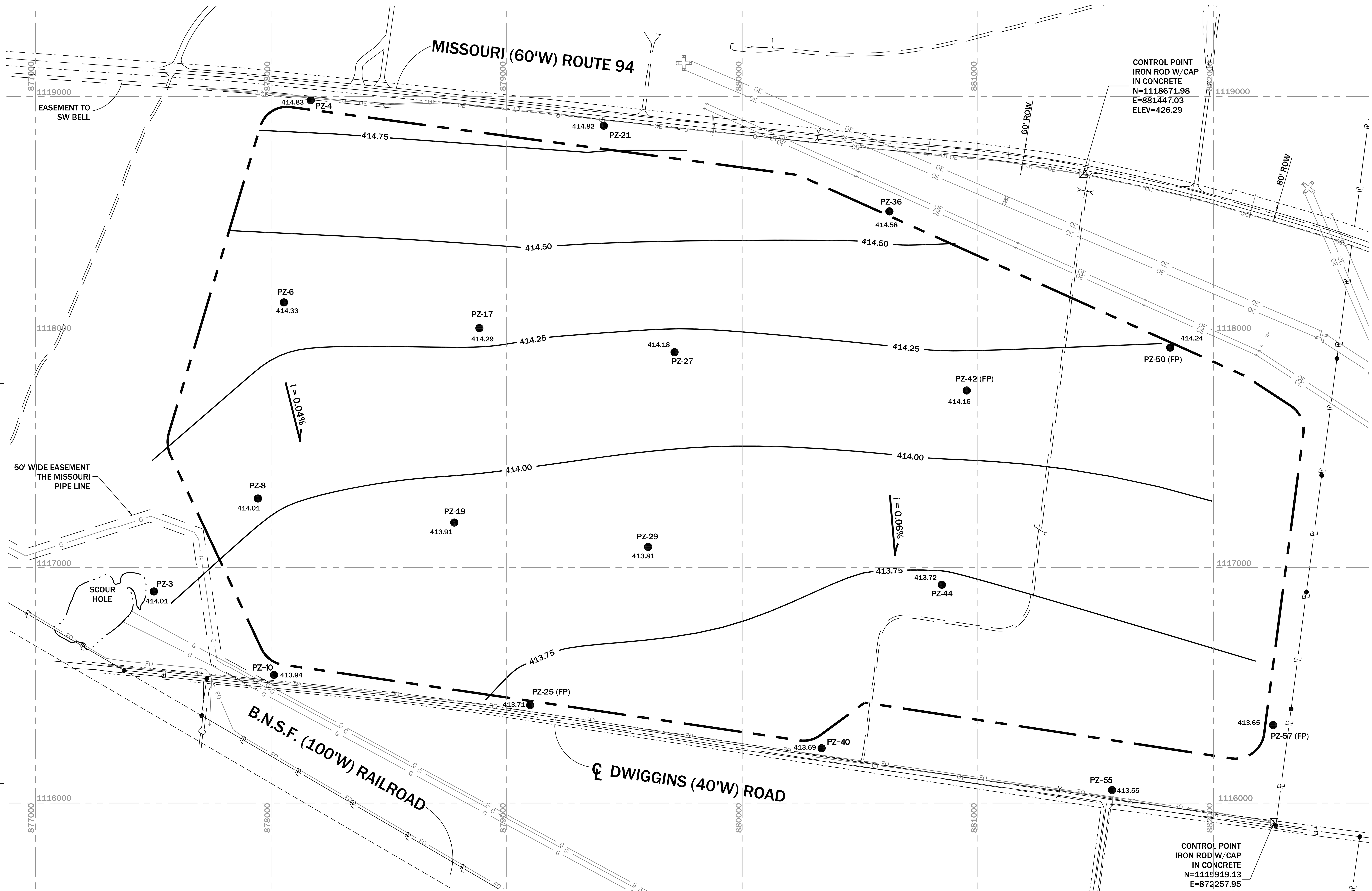

LEGEND

- PZ — PIEZOMETER BORING (57)
- B — TEMPORARY BORING (54)
- B — TEMPORARY BORING (DEEP) (3)
- (FP) — FIELD PERMEABILITY TEST LOCATION
- CONTROL POINT
- ℞ SURVEY POINT
- METAL TRANSMISSION TOWER
- EXISTING POWER POLE
- CULVERT
- 415.0 — GROUND WATER ELEVATION (FT.)
- 415.0 — GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.25 FT.
- PAVED ROAD
- i = 0.08% — HYDRAULIC GRADIENT (%)
- GROUNDWATER FLOW DIRECTION
- ACCESS ROAD
- PROPERTY LINE (APPROX.)
- CENTERLINE OF EXISTING ROAD
- PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
- G — EXISTING MISSOURI PIPELINE
- UT — EXISTING UNDERGROUND UTILITIES
- FO — EXISTING FIBER OPTIC
- OE — EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.25 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: MAY 15, 2006.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.
6. ELEVATION DATA FOR "SCOUR HOLE" WAS NOT AVAILABLE FOR DATE OF GROUNDWATER MEASURMENTS.

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PREPARED FOR AmerenUE

DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 30 DETAILED SITE INVESTIGATION PROPOSED UTILITY WASTE DISPOSAL AREA ACCELERATED GROUNDWATER MONITORING
CHKD. A.R.C. (G.E.R.)	
SUPV. D.E.K. (G.E.R.)	
APPD. D.E.K. (G.E.R.)	LOCATION 001009 — SIOUX PLANT — CLASS 02010
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-31 — REV.

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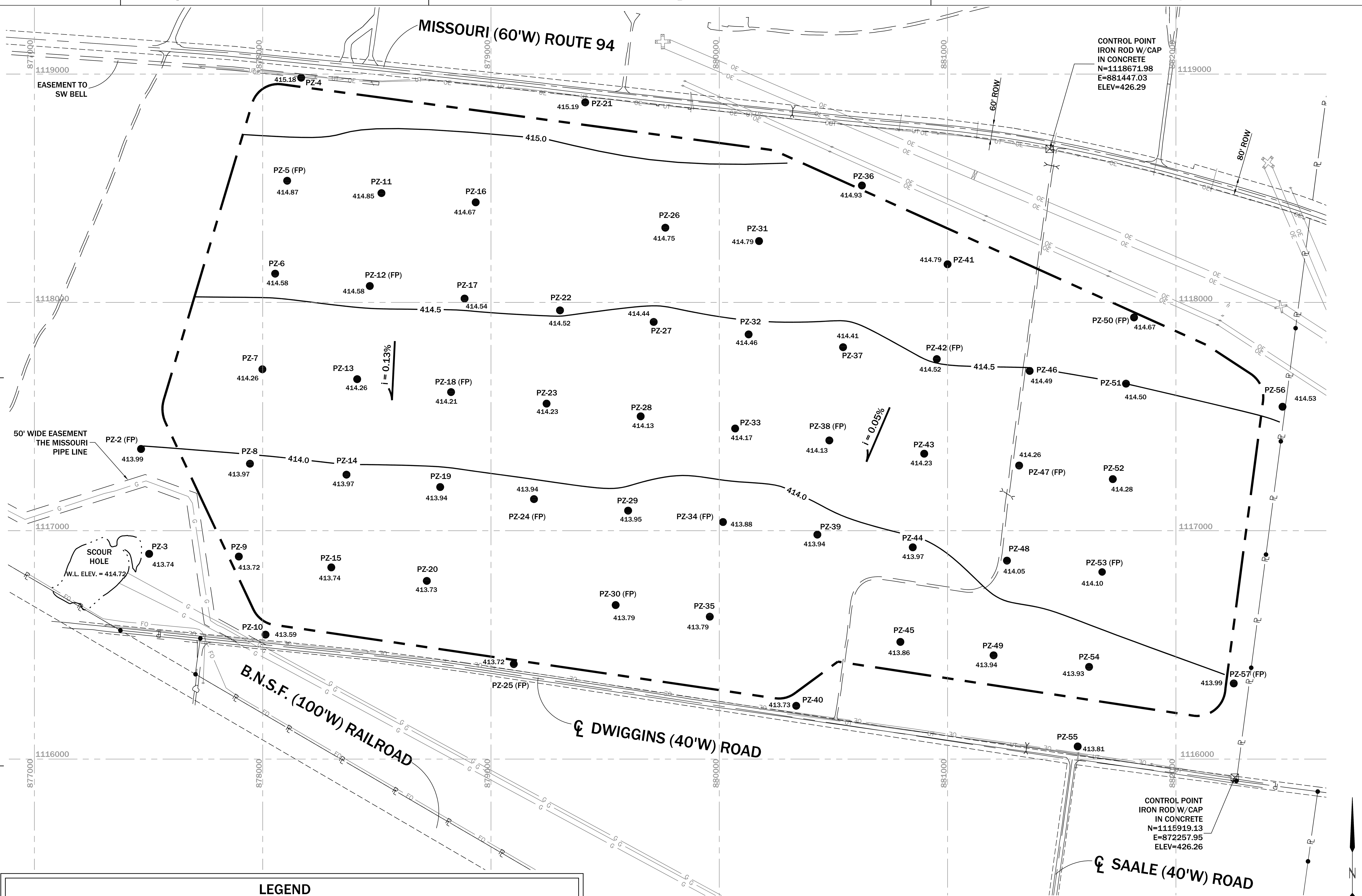

LEGEND

Symbol	Description	Symbol	Description
PZ ●	PIEZOMETER BORING (57)		PAVED ROAD
B	TEMPORARY BORING (54)	i = 0.08%	HYDRAULIC GRADIENT (%)
B ◎	TEMPORARY BORING (DEEP) (3)		GROUNDWATER FLOW DIRECTION
(FP) ●	FIELD PERMEABILITY TEST LOCATION		ACCESS ROAD
⊠	CONTROL POINT	℄	PROPERTY LINE (APPROX.)
●	℄ SURVEY POINT		CENTERLINE OF EXISTING ROAD
	METAL TRANSMISSION TOWER		PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
	EXISTING POWER POLE	G	EXISTING MISSOURI PIPELINE
	CULVERT	UT	EXISTING UNDERGROUND UTILITIES
415.0	GROUND WATER ELEVATION (FT.)	FO	EXISTING FIBER OPTIC
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.	OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: JUNE 1, 2006.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.
6. GROUNDWATER ELEVATION READING FOR PZ-1 WAS BELIEVED TO BE ANOMALOUS AND THEREFORE WAS NOT INCLUDED IN WATER TABLE SURFACE MAP.

THE GEOLOGIST WHO REVIEWED AND APPROVED THIS REPORT ASSUMES RESPONSIBILITY ONLY FOR GEOLOGIC INTERPRETATIONS OF DATA APPEARING ON THE PAGE AND DISCLAIMS PURSUANT TO SECTION 256.456 RSMO ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS NOT PREPARED UNDER THE SUPERVISION OF THE GEOLOGIST RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS FIGURE REFERS.

REITZ & JENS, INC.
CONSULTING ENGINEERS
1055 CORPORATE SQUARE DRIVE
ST. LOUIS, MISSOURI 63132
314.993.4132 (voice) 314.993.4177 (fax)

GREDELL Engineering Resources, Inc.
ENVIRONMENTAL ENGINEERING
LAND AIR WATER
1505 East High Street, Jefferson City, Missouri 65101
Telephone: (573) 659-9078
Facsimile: (573) 659-9079

PREPARED FOR AmerenUE

DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 31
CHKD. A.R.C. (G.E.R.)	DETAILED SITE INVESTIGATION
SUPV. D.E.K. (G.E.R.)	PROPOSED UTILITY WASTE DISPOSAL AREA WATER TABLE SURFACE MAP - JUNE 2006
APPD. D.E.K. (G.E.R.)	LOCATION 001009 — SIOUX PLANT — CLASS 02010
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-32 — REV.

PRINT DIST.
REVISIONS
REV. W.O.

G:\CADDFiles\AMEREN-UE\SIOUX-PLANT\AM-SIOUX-DSI-SP.dwg, FIG31-WTSM-060606, 8/8/2006 11:38:47 AM

PRINT DIST.

REVISIONS		
REV.	W.O.	

MISSOURI (60'W) ROUTE 94

EASEMENT TO SW BELL

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

60' ROW

80' ROW

50' WIDE EASEMENT THE MISSOURI PIPE LINE

SCOUR HOLE
W.L. ELEV. = 413.08

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1115919.13
E=872257.95
ELEV=426.26

i = 0.09%

i = 0.08%

PZ-1 414.28
PZ-2 (FP) 413.50
PZ-3 413.12
PZ-4 415.09
PZ-5 (FP) 414.70
PZ-6 414.30
PZ-7 413.87
PZ-8 413.48
PZ-9 413.12
PZ-10 412.91
PZ-11 414.68
PZ-12 (FP) 414.31
PZ-13 413.85
PZ-14 413.47
PZ-15 413.14
PZ-16 414.70
PZ-17 414.27
PZ-18 (FP) 413.83
PZ-19 413.47
PZ-20 413.16
PZ-21 415.21
PZ-22 414.22
PZ-23 413.84
PZ-24 (FP) 413.52
PZ-25 (FP) 413.19
PZ-26 414.61
PZ-27 414.20
PZ-28 413.80
PZ-29 413.55
PZ-30 (FP) 413.29
PZ-31 414.69
PZ-32 414.25
PZ-33 413.84
PZ-34 (FP) 413.50
PZ-35 413.34
PZ-36 414.94
PZ-37 414.31
PZ-38 (FP) 413.84
PZ-39 413.60
PZ-40 413.23
PZ-41 414.73
PZ-42 (FP) 414.36
PZ-43 413.96
PZ-44 413.63
PZ-45 413.47
PZ-46 414.37
PZ-47 (FP) 414.02
PZ-48 413.71
PZ-49 413.56
PZ-50 (FP) 414.62
PZ-51 414.36
PZ-52 414.07
PZ-54 413.58
PZ-55 413.40
PZ-56 414.41
PZ-57 (FP) 413.66

415.0 414.5 414.0 413.5 413.0

LEGEND

PZ ●	PIEZOMETER BORING (57)		PAVED ROAD
B ◔	TEMPORARY BORING (54)	i = 0.08%	HYDRAULIC GRADIENT (%)
B ◎	TEMPORARY BORING (DEEP) (3)		GROUNDWATER FLOW DIRECTION
(FP) ●	FIELD PERMEABILITY TEST LOCATION		ACCESS ROAD
☒	CONTROL POINT	℄	PROPERTY LINE (APPROX.)
•	℄ SURVEY POINT		CENTERLINE OF EXISTING ROAD
	METAL TRANSMISSION TOWER		PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
	EXISTING POWER POLE	G	EXISTING MISSOURI PIPELINE
	CULVERT	UT UT	EXISTING UNDERGROUND UTILITIES
415.0	GROUND WATER ELEVATION (FT.)	FO	EXISTING FIBER OPTIC
415.0	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.	OE OE	EXISTING OVERHEAD ELECTRIC

NOTES

1. GROUNDWATER DATA NOT AVAILABLE FOR TEMPORARY BORINGS.
2. MEASUREMENTS RECORDED BY REITZ & JENS.
3. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
4. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: JULY 3, 2006.
5. HYDRAULIC GRADIENTS CALCULATED USING GROUNDWATER ELEVATIONS MEASURED IN PIEZOMETERS PZ-4, PZ-21, PZ-10, PZ-36, PZ-50 AND PZ-40.
6. GROUNDWATER ELEVATION READING FOR PZ-53 WAS BELIEVED TO BE ANOMALOUS AND THEREFORE WAS NOT INCLUDED IN WATER TABLE SURFACE MAP.

SCALE: 1" = 200'
0 100 200 400

THE GEOLOGIST WHO REVIEWED AND APPROVED THIS REPORT ASSUMES RESPONSIBILITY ONLY FOR GEOLOGIC INTERPRETATIONS OF DATA APPEARING ON THE PAGE AND DISCLAIMS PURSUANT TO SECTION 256.456 RSMO ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS NOT PREPARED UNDER THE SUPERVISION OF THE GEOLOGIST RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS FIGURE REFERS.

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LAND AIR WATER
1505 East High Street, Jefferson City, Missouri 65101
Telephone: (573) 659-9078
Facsimile: (573) 659-9079

PREPARED FOR AmerenUE

DRAWN 080806 W.J.A. (G.E.R.)	FIGURE 32	
CHKD. A.R.C. (G.E.R.)	DETAILED SITE INVESTIGATION	
SUPV. D.E.K. (G.E.R.)	PROPOSED UTILITY WASTE DISPOSAL AREA	
APPD. D.E.K. (G.E.R.)	WATER TABLE SURFACE MAP - JULY 2006	
LOCATION 001009	SIOUX PLANT	CLASS 02010
AmerenUE ST. LOUIS, MISSOURI	8430-Y-0168601-33	REV.

G:\CADD\Ren_AMEREN-UE_SIOUX-PLANT_MM-SIOUX-0304-SP.dwg, FIG32HWTSMG70306, 6/8/2006 11:07:09 AM

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DRWN.	DES.
REVISIONS	
REV.	DES.

MISSOURI (60'W) ROUTE 94

EASEMENT TO SW BELL

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

80' ROW

80' ROW

427.04
UG-1A

426.01
UG-2

426.14
UG-3

426.32
UG-4

426.20

426.40

426.60

426.80

50' WIDE EASEMENT
THE MISSOURI
PIPE LINE

426.17
DG-1

i = 0.04%

i = 0.01%

SCOUR
HOLE

426.32
DG-2

426.48
DG-3

426.70
DG-4

426.61
DG-5

426.60
DG-6

426.58
DG-7

426.55
DG-8

426.46
DG-9

426.31
DG-10

426.22
DG-11

426.07
DG-12

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1115919.13
E=872257.96
ELEV=426.26

1119000
1118000
1117000
1116000
877000
878000
879000
880000
881000
882000

LEGEND

- UG-XX PIEZOMETER LOCATIONS DG-XX
- CONTROL POINT
- ℄ SURVEY POINT
- METAL TRANSMISSION TOWER
- EXISTING POWER POLE
- CULVERT
- 415.0 GROUND WATER ELEVATION (FT.)
- 415.0 GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.
- FO EXISTING FIBER OPTIC
- OE EXISTING OVERHEAD ELECTRIC
- PAVED ROAD
- i = 0.06% HYDRAULIC GRADIENT (%)
- GROUNDWATER FLOW DIRECTION
- ACCESS ROAD
- PROPERTY LINE (APPROX.)
- CENTERLINE OF EXISTING ROAD
- PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
- PROPOSED NPDES RECYCLE POND PERMIT
- G EXISTING MISSOURI PIPELINE
- UT UT EXISTING UNDERGROUND UTILITIES

AmerenUE - SIOUX PLANT
GROUNDWATER MONITIORING WATER TABLE SURFACE MAP
GROUNDWATER ELEVATION TABLE

Ameren Sioux Power Plant Elevations for Contour Map				
Well ID	Groundwater Elevation NGVD 2Q08	Groundwater Elevation NGVD 3Q08	Groundwater Elevation NGVD 4Q08	Groundwater Elevation NGVD 1Q09
DG-1	426.17	418.75	418.31	415.52
DG-2	426.32	418.34	418.09	415.06
DG-3	426.48	418.14	417.90	414.84
DG-4	426.70	417.89	417.83	414.72
DG-5	426.61	418.01	417.84	414.79
DG-6	426.60	418.15	417.86	414.87
DG-7	426.58	418.31	418.04	415.01
DG-8	426.53	418.44	418.12	415.10
DG-9	426.46	418.85	418.15	415.36
DG-10	426.31	418.85	418.24	415.54
DG-11	426.22	419.03	418.24	415.60
DG-12	426.07	419.44	418.40	415.90
UG-1A	427.04	419.92	419.12	416.95
UG-2	426.01	419.66	418.89	416.67
UG-3	426.14	420.25	419.19	417.15
UG-4	426.22	420.44	419.30	417.39

NOTES

1. USE OF SMALL CONTOUR INTERVAL (0.2 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
2. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: JUNE 28, 2008.
3. ELEVATION DATA FOR "SCOUR HOLE" NOT AVAILABLE FOR DATE OF GROUNDWATER MEASUREMENTS.

N

SCALE: 1" = 200'
0 100 200 400

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REITZ & JENS, INC. ENGINEERING BUSINESS 1035 CORPORATE SQUARE DRIVE ST. LOUIS, MISSOURI 63132 314.888.4133 (voice) 314.888.4177 (fax)

GREDELL Engineering Resources, Inc. ENVIRONMENTAL ENGINEERING LAND AIR

PREPARED FOR Ameren UE

DRAWN	081308 W.L.A. (G.E.R.)
CHKD.	A.R.C. (G.E.R.)
SUPV.	J.S.F. (G.E.R.)
APPD.	J.S.F. (G.E.R.)

GROUNDWATER CONTOUR MAP
PROPOSED UTILITY WASTE DISPOSAL AREA
WATER TABLE SURFACE MAP
JUNE 28, 2008

LOCATION 001009 | SIOUX PLANT | CLASS 02010

Ameren UE | ST. LOUIS, MISSOURI | FIGURE 2

AMEREN_00001653

PRINT REV.	REVISIONS		
REV.	DR.		

MISSOURI (60'W) ROUTE 94

EASEMENT TO SW BELL

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

60' ROW

60' ROW

419.92 UG-1A

419.66 UG-2

420.25 UG-3

420.44 UG-4

419.50

420.00

419.00

418.50

418.00

I = 0.07%

I = 0.06%

50' WIDE EASEMENT THE MISSOURI PIPE LINE

418.75 DG-1

418.34 DG-2

418.14 DG-3

417.89 DG-4

418.01 DG-5

418.15 DG-6

418.31 DG-7

418.44 DG-8

418.85 DG-9

418.85 DG-10

419.03 DG-11

419.44 DG-12

SCOUR HOLE

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1115919.13
E=872257.95
ELEV=426.26

1119000

1118000

1117000

1116000

877000

878000

879000

880000

881000

882000

LEGEND

- UG-XX PIEZOMETER LOCATIONS / DG-XX
- CONTROL POINT
- ℄ SURVEY POINT
- METAL TRANSMISSION TOWER
- EXISTING POWER POLE
- CULVERT
- 415.0 — GROUND WATER ELEVATION (FT.)
- 415.0 — GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.
- FO — EXISTING FIBER OPTIC
- OE — EXISTING OVERHEAD ELECTRIC
- PAVED ROAD
- I = 0.06% — HYDRAULIC GRADIENT (%)
- GROUNDWATER FLOW DIRECTION
- ACCESS ROAD
- ℄ — PROPERTY LINE (APPROX.)
- CENTERLINE OF EXISTING ROAD
- PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
- PROPOSED NPDES RECYCLE POND PERMIT
- G — EXISTING MISSOURI PIPELINE
- UT — UT — EXISTING UNDERGROUND UTILITIES

AmerenUE - SIOUX PLANT
GROUNDWATER MONITIORING WATER TABLE SURFACE MAP
GROUNDWATER ELEVATION TABLE

Ameren Sioux Power Plant Elevations for Contour Map				
Well ID	Groundwater Elevation NGVD 2Q08	Groundwater Elevation NGVD 3Q08	Groundwater Elevation NGVD 4Q08	Groundwater Elevation NGVD 1Q09
DG-1	426.17	418.75	418.31	415.52
DG-2	426.32	418.34	418.09	415.06
DG-3	426.48	418.14	417.90	414.84
DG-4	426.70	417.89	417.83	414.72
DG-5	426.61	418.01	417.84	414.79
DG-6	426.60	418.15	417.86	414.87
DG-7	426.58	418.31	418.04	415.01
DG-8	426.53	418.44	418.12	415.10
DG-9	426.46	418.85	418.15	415.36
DG-10	426.31	418.85	418.24	415.54
DG-11	426.22	419.03	418.24	415.60
DG-12	426.07	419.44	418.40	415.90
UG-1A	427.04	419.92	419.12	416.95
UG-2	426.01	419.66	418.89	416.67
UG-3	426.14	420.25	419.19	417.15
UG-4	426.22	420.44	419.30	417.39

NOTES

1. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
2. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT:AUGUST 28, 2008.
3. ELEVATION DATA FOR "SCOUR HOLE" NOT AVAILABLE FOR DATE OF GROUNDWATER MEASUREMENTS.

N

SCALE: 1" = 200'
0 100 200 400

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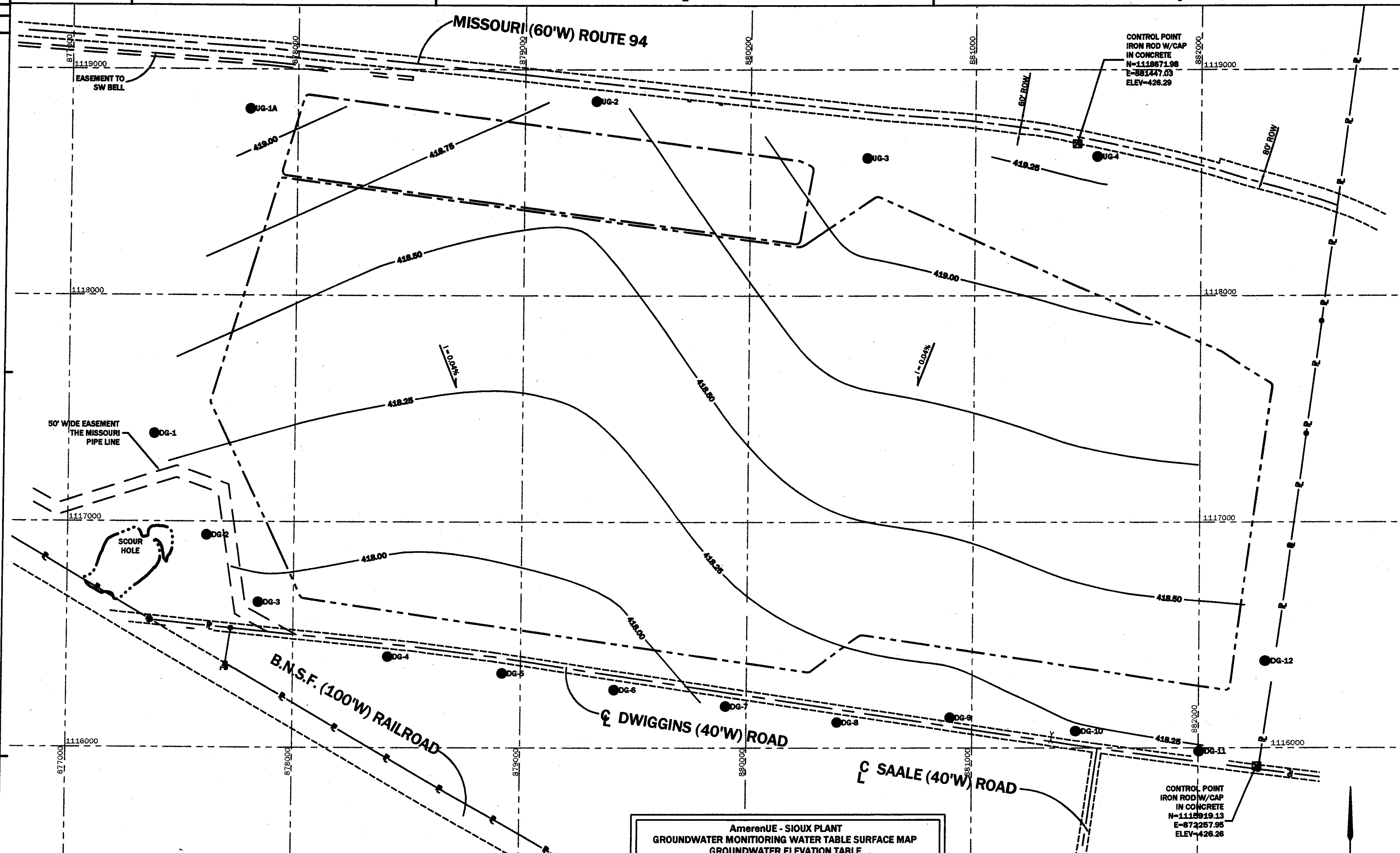
Reitz & Jens, Inc. — Consulting Engineers — 1006 Corporate Square Drive, St. Louis, Missouri 63132 — 314.993.4122 (voice) 314.993.4177 (fax)

GREDELL Engineering Resources, Inc. — Environmental Engineering — Land, Air, Water

PREPARED FOR Ameren UE

DRAWN	DE1308	GROUNDWATER CONTOUR MAP PROPOSED UTILITY WASTE DISPOSAL AREA WATER TABLE SURFACE MAP AUGUST 28, 2008
W.J.A. (G.E.R.)		
CHKD.	A.R.C. (G.E.R.)	
SUPV.	J.B.F. (G.E.R.)	
APPD.	J.B.F. (G.E.R.)	LOCATION 001009 — SIOUX PLANT — CLASS 1Q09
Ameren UE	ST. LOUIS, MISSOURI	FIGURE 3 — REV.

AMEREN_00001654



LEGEND

●	UG-XX PIEZOMETER LOCATIONS DG-XX
⊠	CONTROL POINT
•	℄ SURVEY POINT
	METAL TRANSMISSION TOWER
-o-	EXISTING POWER POLE
	CULVERT
415.0	GROUND WATER ELEVATION (FT.)
—— 415.0 ——	GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.
—— FO ——	EXISTING FIBER OPTIC
—— OE ——	EXISTING OVERHEAD ELECTRIC
	PAVED ROAD
i = 0.08%	HYDRAULIC GRADIENT (%)
	GROUNDWATER FLOW DIRECTION
	ACCESS ROAD
—— ℄ ——	PROPERTY LINE (APPROX.)
	CENTERLINE OF EXISTING ROAD
	PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
	PROPOSED NPDES RECYCLE POND PERMIT
—— G ——	EXISTING MISSOURI PIPELINE
—— UT —— UT ——	EXISTING UNDERGROUND UTILITIES

AmerenUE - SIOUX PLANT
GROUNDWATER MONITIORING WATER TABLE SURFACE MAP
GROUNDWATER ELEVATION TABLE

Ameren Sioux Power Plant Elevations for Contour Map				
Well ID	Groundwater Elevation NGVD 2Q08	Groundwater Elevation NGVD 3Q08	Groundwater Elevation NGVD 4Q08	Groundwater Elevation NGVD 1Q09
DG-1	426.17	418.75	418.31	415.52
DG-2	426.32	418.34	418.09	415.06
DG-3	426.48	418.14	417.90	414.84
DG-4	426.70	417.89	417.83	414.72
DG-5	426.61	418.01	417.84	414.79
DG-6	426.60	418.15	417.86	414.87
DG-7	426.58	418.31	418.04	415.01
DG-8	426.53	418.44	418.12	415.10
DG-9	426.46	418.85	418.15	415.36
DG-10	426.31	418.85	418.24	415.54
DG-11	426.22	419.03	418.24	415.60
DG-12	426.07	419.44	418.40	415.90
UG-1A	427.04	419.92	419.12	416.95
UG-2	426.01	419.66	418.69	416.67
UG-3	426.14	420.25	419.19	417.15
UG-4	426.22	420.44	419.30	417.39

NOTES

1. USE OF SMALL CONTOUR INTERVAL (0.25 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
2. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: NOVEMBER 5, 2008.
3. ELEVATION DATA FOR "SCOUR HOLE" NOT AVAILABLE FOR DATE OF GROUNDWATER MEASUREMENTS.

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GREDELL Engineering Resources, Inc. ENVIRONMENTAL ENGINEERING LAND AIR WATER

PREPARED FOR AmerenUE

DRAWN 081308 W.J.A. (G.E.R.)
CHKD. A.R.C. (G.E.R.)
SUPV. J.B.F. (G.E.R.)
APPD. J.B.F. (G.E.R.)

GROUNDWATER CONTOUR MAP
PROPOSED UTILITY WASTE DISPOSAL AREA
WATER TABLE SURFACE MAP
NOVEMBER 5, 2008

LOCATION 001009 | SIOUX PLANT | CLASS 02010

AmerenUE | ST. LOUIS, MISSOURI | FIGURE 4

REVISIONS		
REV.	YR.	

MISSOURI (60'W) ROUTE 94

EASEMENT TO SW BELL

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1118671.98
E=881447.03
ELEV=426.29

80' ROW

80' ROW

416.95 UG-1A

416.67 UG-2

417.15 UG-3

417.39 UG-4

416.50

417.00

417.00

416.50

416.00

I = 0.06%

I = 0.06%

50' WIDE EASEMENT THE MISSOURI PIPE LINE

415.52 DG-1

415.50

SCOUR HOLE

415.06 DG-2

414.84 DG-3

415.00

416.00

416.00

415.90 DG-12

414.72 DG-4

414.79 DG-5

414.87 DG-6

415.02 DG-7

415.10 DG-8

415.36 DG-9

415.54 DG-10

415.60 DG-11

B.N.S.F. (100'W) RAILROAD

℄ DWIGGINS (40'W) ROAD

℄ SAALE (40'W) ROAD

CONTROL POINT
IRON ROD W/CAP
IN CONCRETE
N=1115919.13
E=872257.95
ELEV=426.26

1119000
1118000
1117000
1116000
877000
878000
879000
880000
881000
882000

LEGEND

- UG-XX PIEZOMETER LOCATIONS / DG-XX
- CONTROL POINT
- ℄ SURVEY POINT
- METAL TRANSMISSION TOWER
- EXISTING POWER POLE
- CULVERT
- 415.0 GROUND WATER ELEVATION (FT.)
- 415.0 GROUNDWATER CONTOUR NOTE: CONTOUR INTERVAL (C.I.)=0.5 FT.
- FO EXISTING FIBER OPTIC
- OE EXISTING OVERHEAD ELECTRIC
- PAVED ROAD
- I = 0.06% HYDRAULIC GRADIENT (%)
- GROUNDWATER FLOW DIRECTION
- ACCESS ROAD
- ℄ PROPERTY LINE (APPROX.)
- CENTERLINE OF EXISTING ROAD
- PROPOSED UTILITY WASTE DISPOSAL AREA FOOTPRINT
- PROPOSED NPDES RECYCLE POND PERMIT
- G EXISTING MISSOURI PIPELINE
- UT EXISTING UNDERGROUND UTILITIES

AmerenUE - SIOUX PLANT
GROUNDWATER MONITIORING WATER TABLE SURFACE MAP
GROUNDWATER ELEVATION TABLE

Ameren Sioux Power Plant Elevations for Contour Map				
Well ID	Groundwater Elevation NGVD 2Q08	Groundwater Elevation NGVD 3Q08	Groundwater Elevation NGVD 4Q08	Groundwater Elevation NGVD 1Q09
DG-1	426.17	418.75	418.31	415.52
DG-2	426.32	418.34	418.09	415.06
DG-3	426.48	418.14	417.90	414.84
DG-4	428.70	417.89	417.83	414.72
DG-5	428.61	418.01	417.84	414.79
DG-6	428.60	418.15	417.86	414.87
DG-7	428.58	418.31	418.04	415.01
DG-8	428.53	418.44	418.12	415.10
DG-9	428.46	418.85	418.15	415.36
DG-10	428.31	418.85	418.24	415.54
DG-11	428.22	419.03	418.24	415.60
DG-12	428.07	419.44	418.40	415.90
UG-1A	427.04	419.92	419.12	416.95
UG-2	428.01	419.66	418.69	416.67
UG-3	428.14	420.25	419.19	417.15
UG-4	428.22	420.44	419.30	417.39

NOTES

1. USE OF SMALL CONTOUR INTERVAL (0.5 FT.) EXAGGERATES APPARENT "SLOPE" OF WATER TABLE SURFACE.
2. MAP REPRESENTATIVE OF GROUNDWATER CONDITIONS OCCURRING ON DATE OF MEASUREMENT: FEBRUARY 5, 2009
3. ELEVATION DATA FOR "SCOUR HOLE" NOT AVAILABLE FOR DATE OF GROUNDWATER MEASUREMENTS.

N

SCALE: 1" = 200'
0 100 200 400

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Reitz & Jens, Inc. Consulting Engineers
1800 CORPORATE SQUARE DRIVE
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GREDELL Engineering Resources, Inc.
ENVIRONMENTAL ENGINEERING
LAND WATER AIR

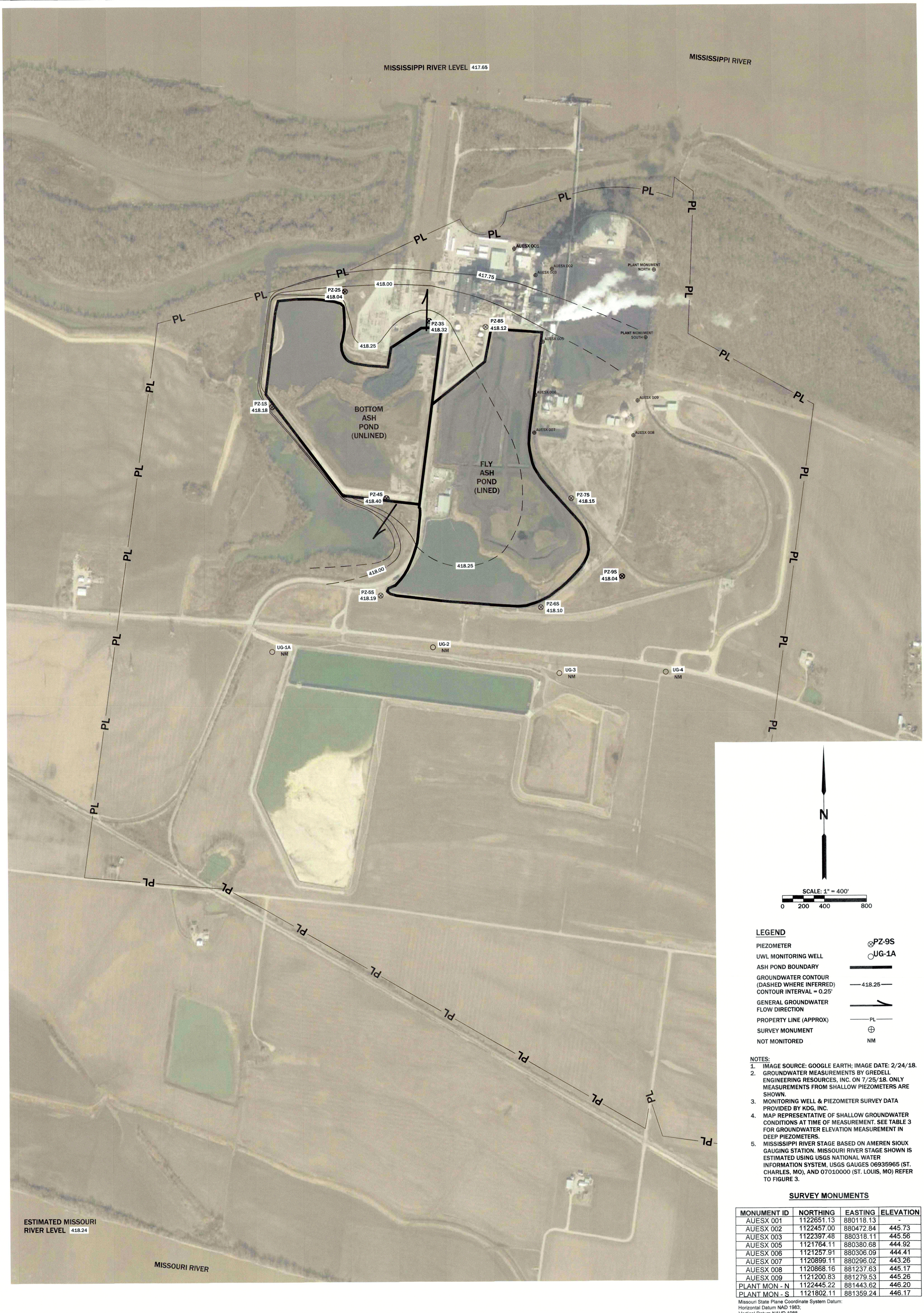
PREPARED FOR Ameren UE

DRAWN W.J.A. (G.E.R.)	081308	GROUNDWATER CONTOUR MAP PROPOSED UTILITY WASTE DISPOSAL AREA WATER TABLE SURFACE MAP FEBRUARY 5, 2009
CHKD. A.R.C. (G.E.R.)		
SUPV. J.S.F. (G.E.R.)		
APPD. J.S.F. (G.E.R.)	LOCATION 001009	SIOUX PLANT — CLASS 02010
Ameren UE	ST. LOUIS, MISSOURI	FIGURE 5

AMEREN_00001656

APPENDIX C

Site Characterization Report
Potentiometric Surface Maps



NOTES:
1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 7/25/18. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
AUESX 001	1122651.13	880118.13	-
AUESX 002	1122457.00	880472.84	445.73
AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

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MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

FIGURE 10
WATER TABLE SURFACE MAP
JULY 25, 2018

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE	PROJECT NAME	FILE NAME	SHEET #
NA	NA	CP	KE	MCC	7/2019	AS NOTED	ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
PG
2016031433
7-1-19
REGISTERED GEOLOGIST

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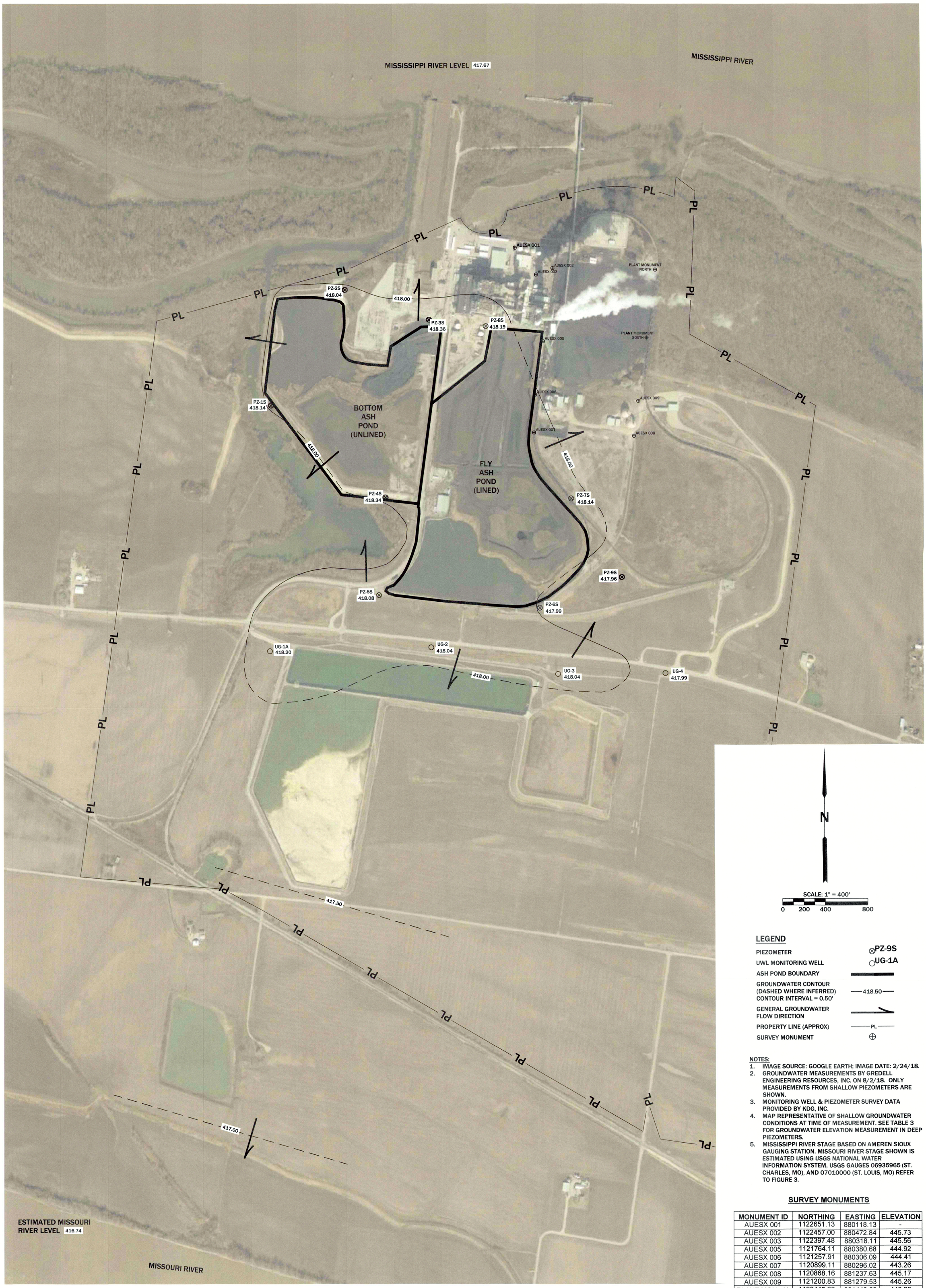
O:\CADD\Revs\AMEREN UE\SIOUX PLANT\ASH POND NPDES\SITE CHARACTERIZATION\MONTHLY GW CONTOURS.dwg, JULY 2018, 6/25/2019 8:19:54 AM



LEGEND

- PIEZOMETER ⊗PZ-9S
- UWL MONITORING WELL ○UG-1A
- ASH POND BOUNDARY
- GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 0.50' —418.50—
- GENERAL GROUNDWATER FLOW DIRECTION
- PROPERTY LINE (APPROX) —PL—
- SURVEY MONUMENT ⊕

NOTES:

1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 8/2/18. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
AUESX 001	1122651.13	880118.13	-
AUESX 002	1122457.00	880472.84	445.73
AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

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SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE
NA	NA	CP	KE	MCC	7/2019	AS NOTED

PROJECT NAME	FILE NAME	SHEET #
ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

FIGURE 11
WATER TABLE SURFACE MAP
AUGUST 2, 2018

STATE OF MISSOURI
KEN A. EWERS
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7-1-19
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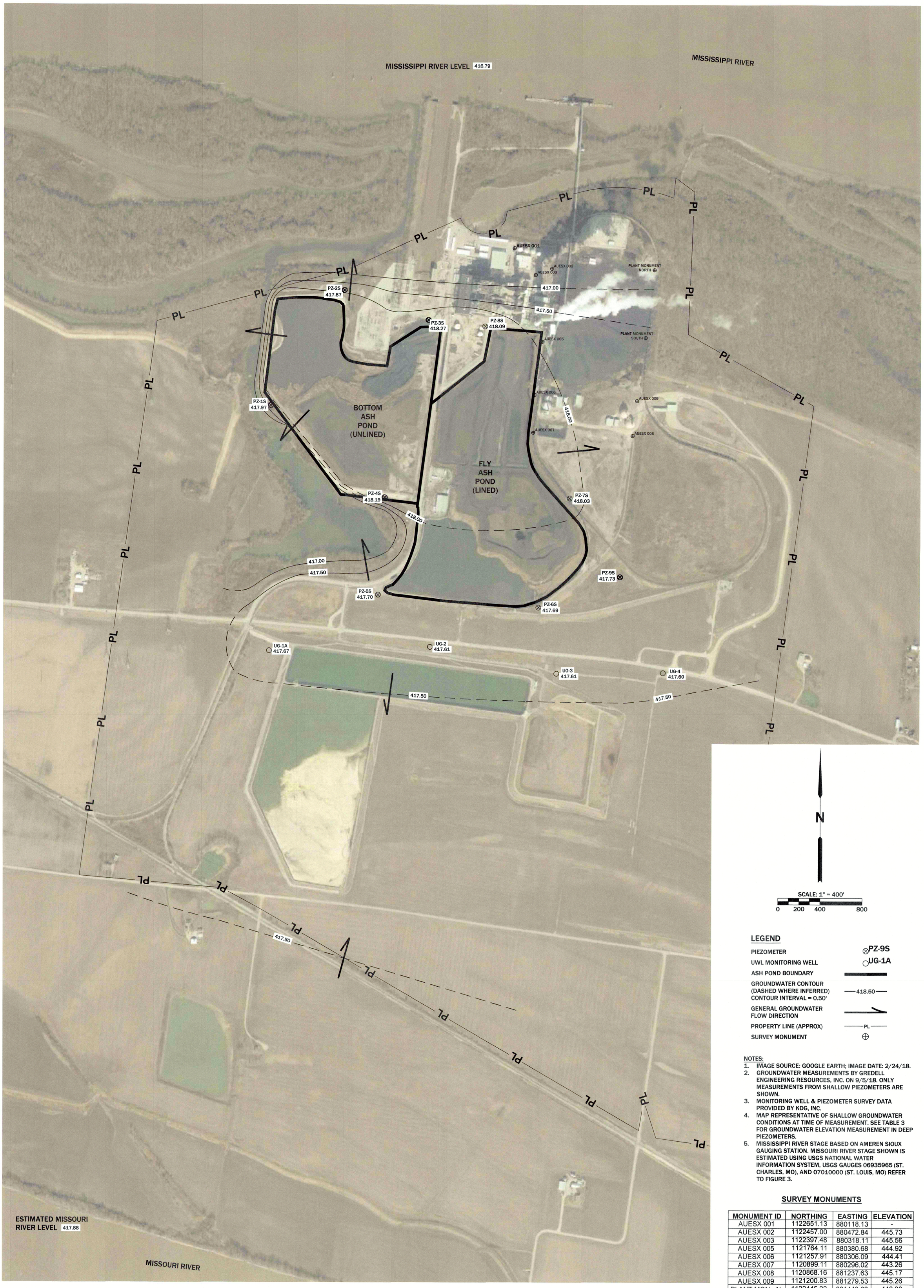

N

SCALE: 1" = 400'

0 200 400 800

LEGEND

PIEZOMETER	⊗PZ-9S
UWL MONITORING WELL	○UG-1A
ASH POND BOUNDARY	
GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 0.50'	—418.50—
GENERAL GROUNDWATER FLOW DIRECTION	
PROPERTY LINE (APPROX)	—PL—
SURVEY MONUMENT	⊕

NOTES:

1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 9/5/18. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
AUESX 001	1122651.13	880118.13	-
AUESX 002	1122457.00	880472.84	445.73
AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

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Jefferson City, Missouri Facsimile: (573) 659-9079

MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

FIGURE 12
WATER TABLE SURFACE MAP
SEPTEMBER 5, 2018

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE	PROJECT NAME	FILE NAME	SHEET #
NA	NA	CP	KE	MCC	7/2019	AS NOTED	ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
PG
2016031433
REGISTERED GEOLOGIST
10-1-19

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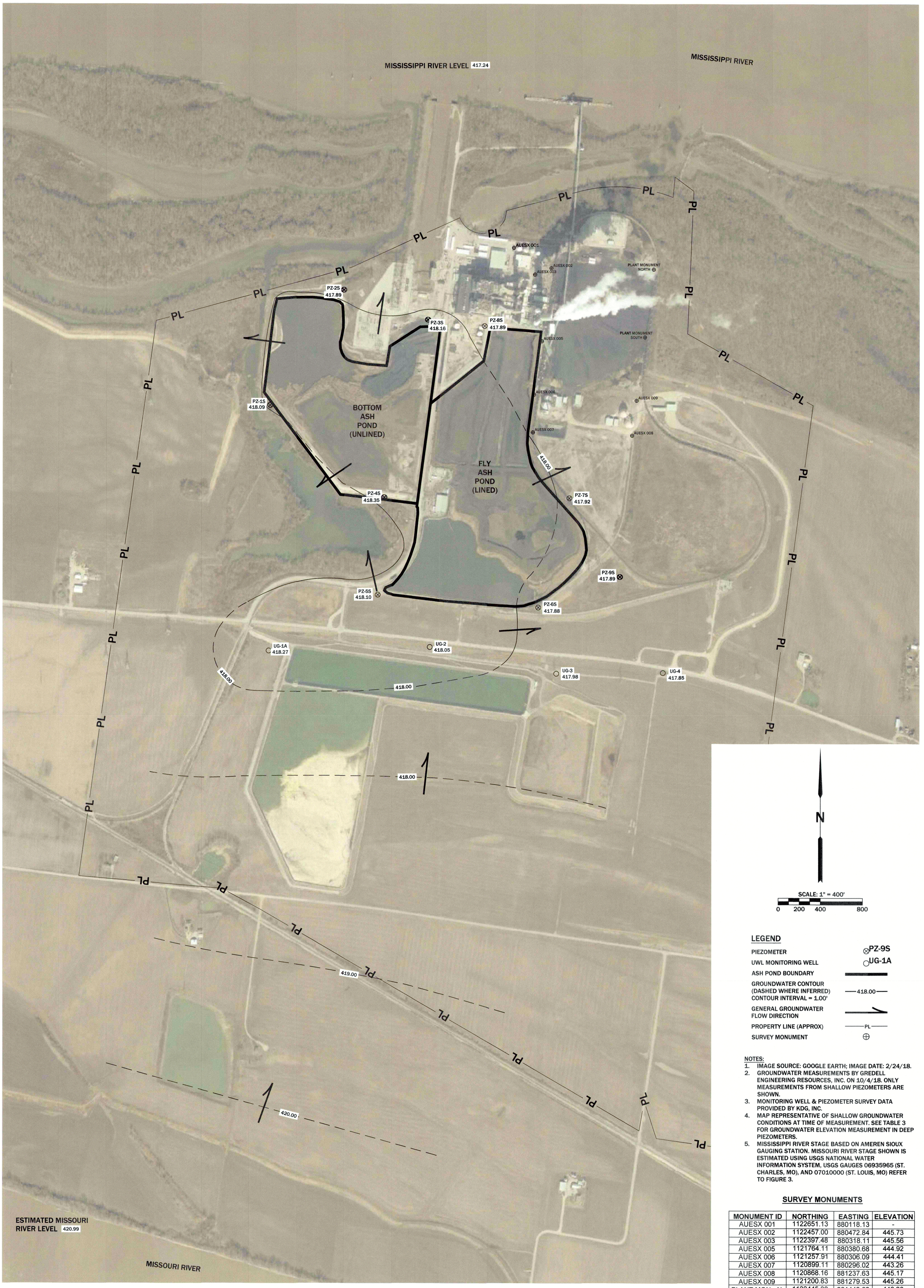

LEGEND

- PIEZOMETER ⊗PZ-9S
- UWL MONITORING WELL ○UG-1A
- ASH POND BOUNDARY
- GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 1.00' —418.00—
- GENERAL GROUNDWATER FLOW DIRECTION
- PROPERTY LINE (APPROX) —PL—
- SURVEY MONUMENT ⊕

NOTES:

1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 10/4/18. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
AUESX 001	1122651.13	880118.13	-
AUESX 002	1122457.00	880472.84	445.73
AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

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Jefferson City, Missouri Facsimile: (573) 659-9079
MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE
NA	NA	CP	KE	MCC	7/2019	AS NOTED

FIGURE 13
WATER TABLE SURFACE MAP
OCTOBER 4, 2018

PROJECT NAME	FILE NAME	SHEET #
ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
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2016031433
10-1-19
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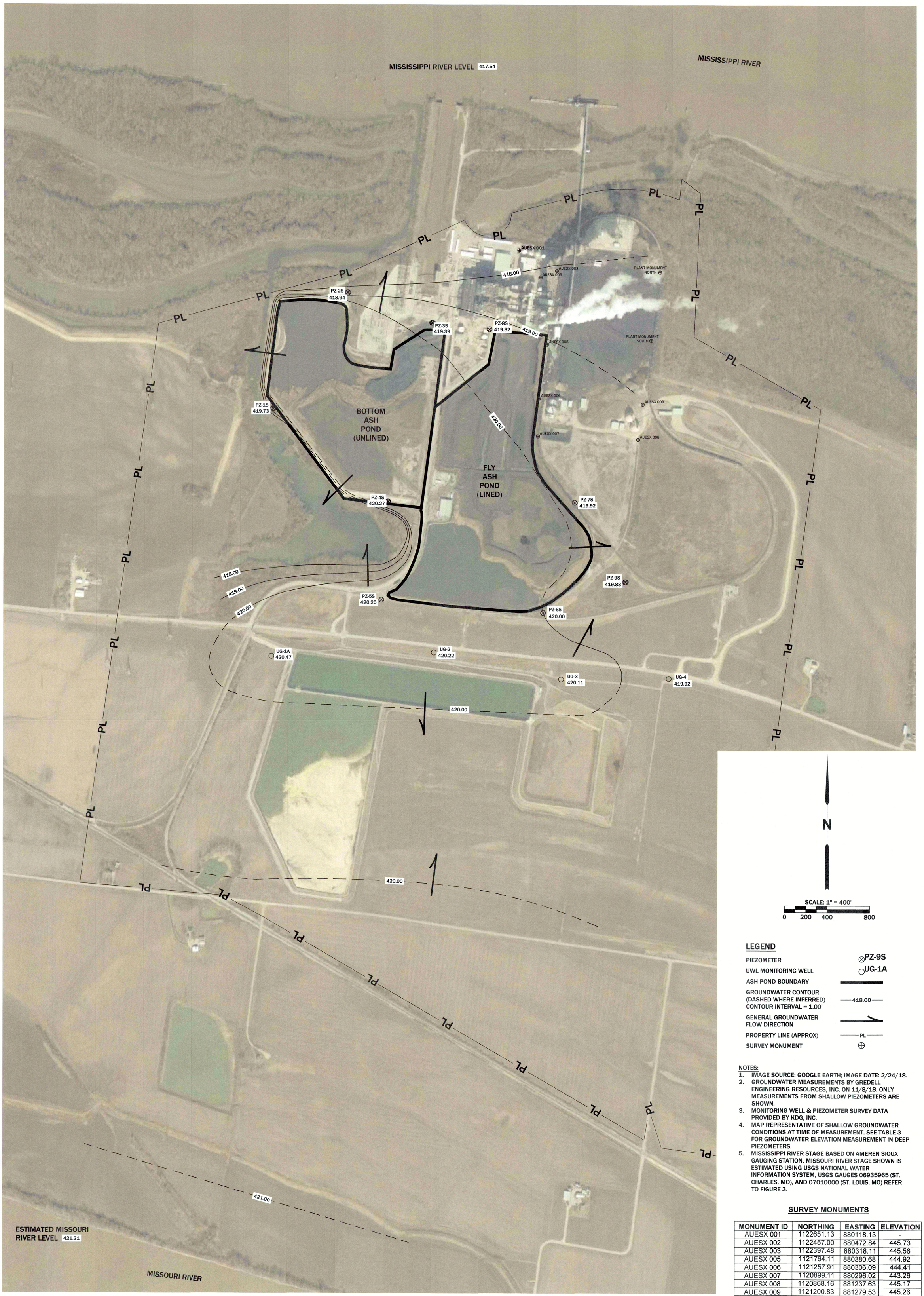

LEGEND

PIEZOMETER	⊗PZ-9S
UWL MONITORING WELL	○UG-1A
ASH POND BOUNDARY	
GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 1.00'	—418.00—
GENERAL GROUNDWATER FLOW DIRECTION	
PROPERTY LINE (APPROX)	—PL—
SURVEY MONUMENT	⊕

NOTES:

1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 11/8/18. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
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AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
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PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

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MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

FIGURE 14
WATER TABLE SURFACE MAP
NOVEMBER 8, 2018

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE	PROJECT NAME	FILE NAME	SHEET #
NA	NA	CP	KE	MCC	7/2019	AS NOTED	ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
PG
2018031433
11-1-18
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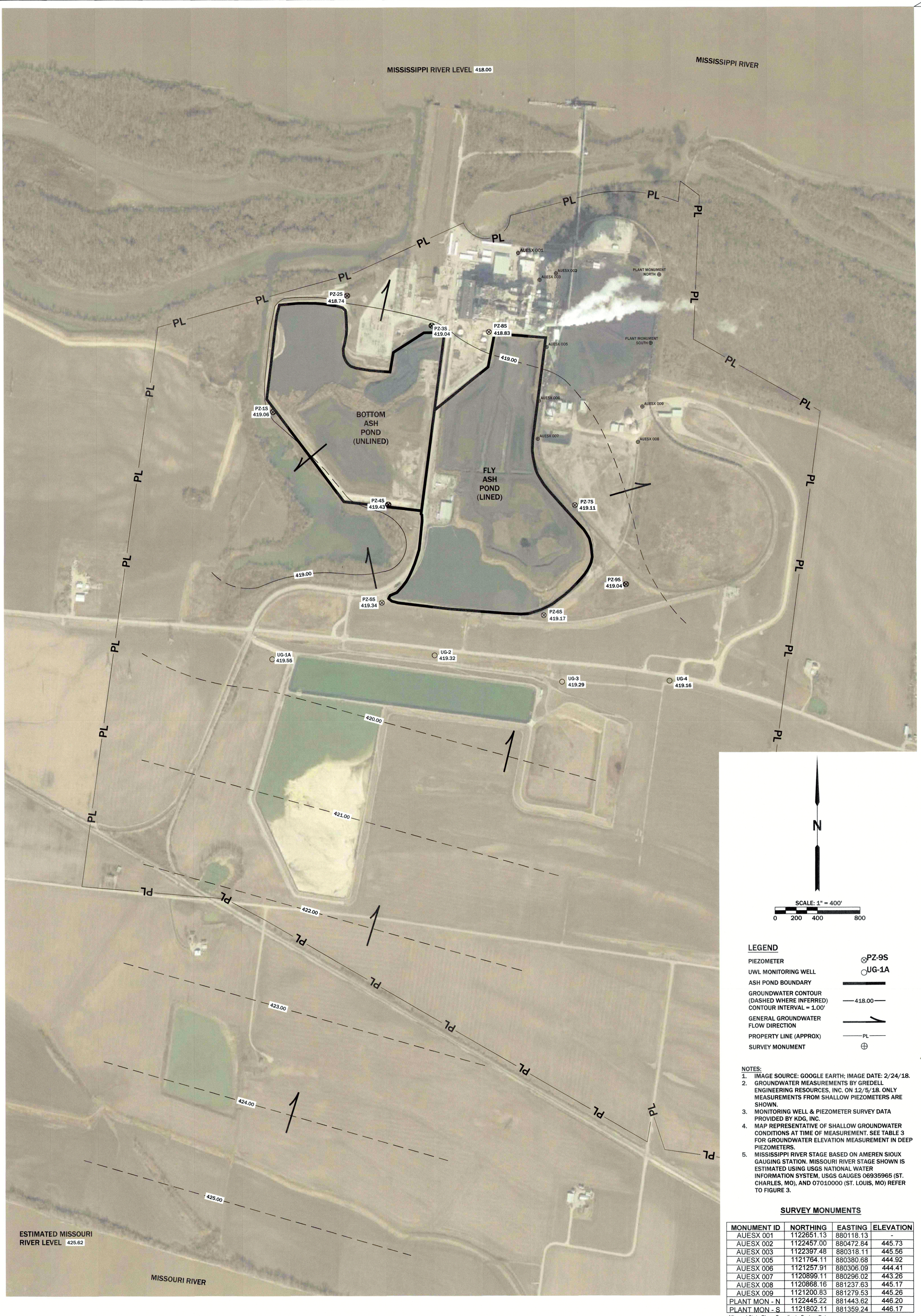

LEGEND

PIEZOMETER	⊗PZ-9S
UWL MONITORING WELL	○UG-1A
ASH POND BOUNDARY	
GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 1.00'	—418.00—
GENERAL GROUNDWATER FLOW DIRECTION	
PROPERTY LINE (APPROX)	—PL—
SURVEY MONUMENT	⊕

NOTES:

1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 12/5/18. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
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AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

GREDELL Engineering Resources, Inc.
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Jefferson City, Missouri Facsimile: (573) 659-9079
MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE
NA	NA	CP	KE	MCC	7/2019	AS NOTED

FIGURE 15
WATER TABLE SURFACE MAP
DECEMBER 5, 2018

PROJECT NAME	FILE NAME	SHEET #
ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
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2016031433
REGISTERED GEOLOGIST
7-1-19

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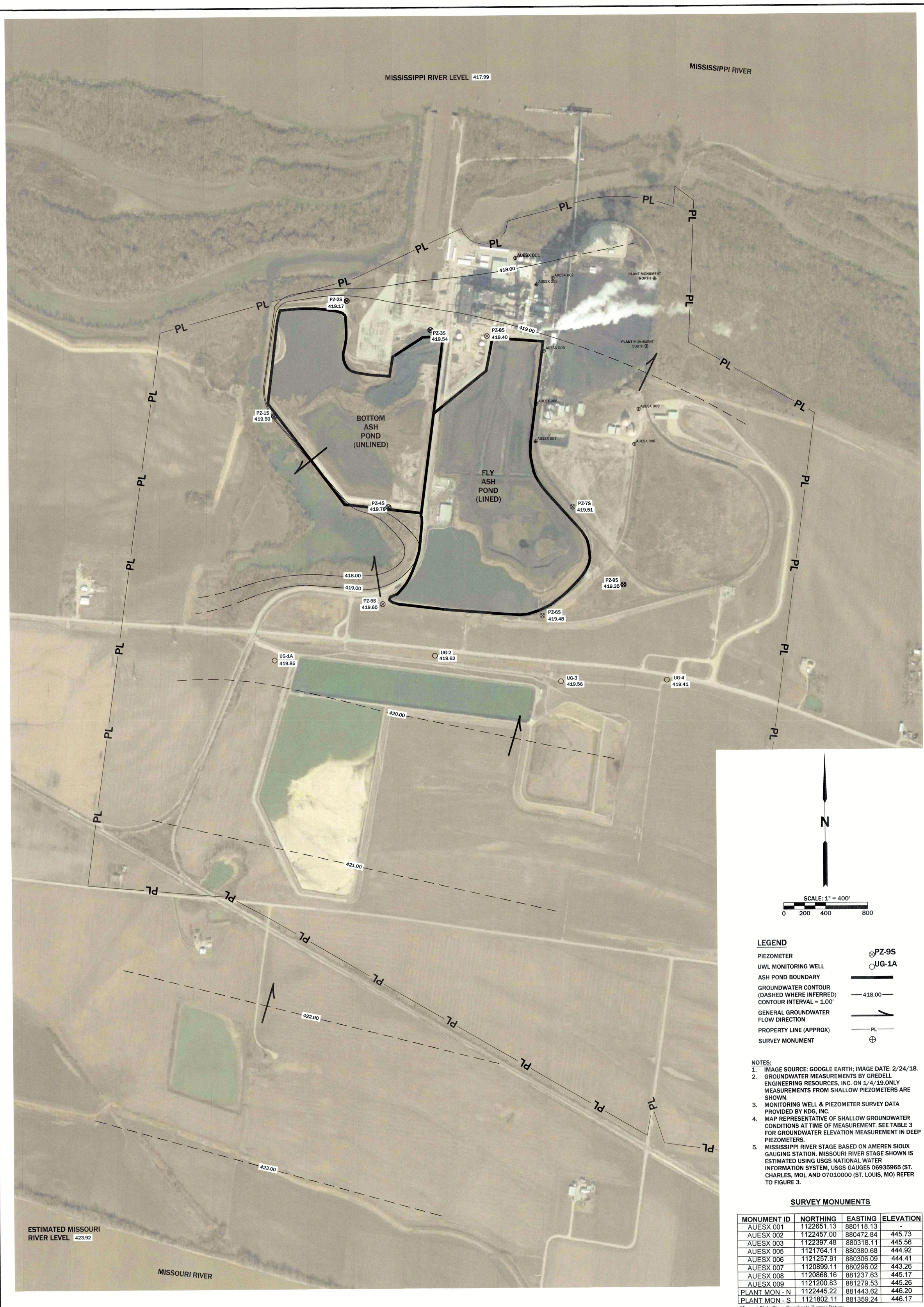

LEGEND

PIEZOMETER	⊗PZ-9S
UWL MONITORING WELL	○UG-1A
ASH POND BOUNDARY	
GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 1.00'	418.00
GENERAL GROUNDWATER FLOW DIRECTION	
PROPERTY LINE (APPROX)	PL
SURVEY MONUMENT	⊕

NOTES:
1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 1/4/19.ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
AUESX 001	1122651.13	880118.13	-
AUESX 002	1122457.00	880472.84	445.73
AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

GREDELL Engineering Resources, Inc.
ENVIRONMENTAL ENGINEERING LAND - AIR - WATER
1505 East High Street Telephone: (573) 659-9078
Jefferson City, Missouri Facsimile: (573) 659-9079
MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

FIGURE 16
WATER TABLE SURFACE MAP
JANUARY 4, 2019

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE	PROJECT NAME	FILE NAME	SHEET #
NA	NA	CP	KE	MCC	7/2019	AS NOTED	ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
PG
2016031433
1-7-19
REGISTERED GEOLOGIST

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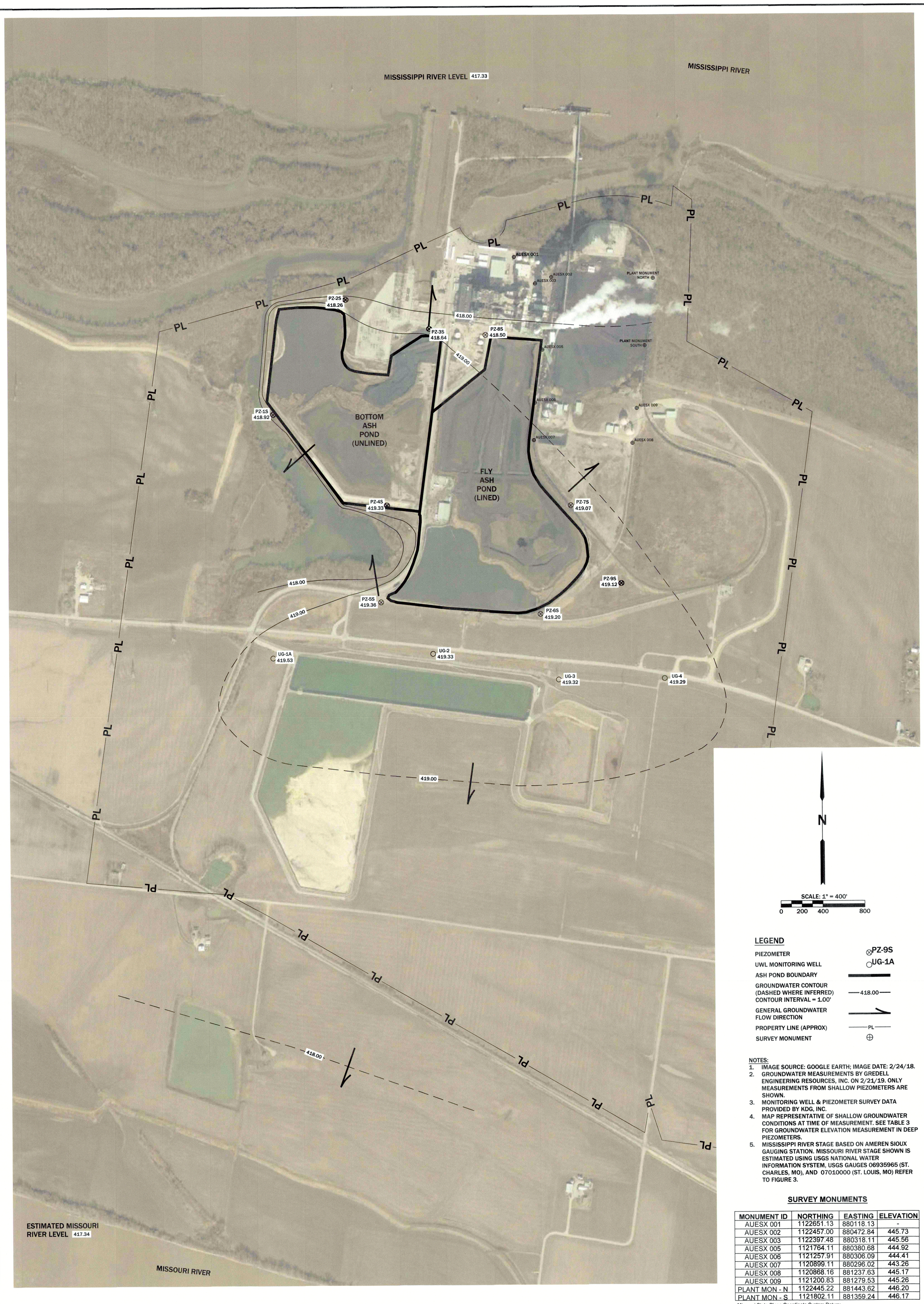
O:\CADDFiles\AMEREN-UE\SIOUX-PLANT\ASH POND NPDES\SITE CHARACTERIZATION\MONTHLY GW CONTOURS.dwg, JANUARY 2019, 6/25/2019 8:12:50 AM



LEGEND

- PIEZOMETER — PZ-9S
- UWL MONITORING WELL — UG-1A
- ASH POND BOUNDARY
- GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 1.00' — 418.00
- GENERAL GROUNDWATER FLOW DIRECTION
- PROPERTY LINE (APPROX) — PL
- SURVEY MONUMENT

NOTES:

1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 2/21/19. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
AUESX 001	1122651.13	880118.13	-
AUESX 002	1122457.00	880472.84	445.73
AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

GREDELL Engineering Resources, Inc.

ENVIRONMENTAL ENGINEERING LAND - AIR - WATER

1505 East High Street Telephone: (573) 659-9078
Jefferson City, Missouri Facsimile: (573) 659-9079

MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

FIGURE 17
WATER TABLE SURFACE MAP
FEBRUARY 21, 2019

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE	PROJECT NAME	FILE NAME	SHEET #
NA	NA	CP	GE	MCC	7/2019	AS NOTED	ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
PG
2016031433
7-1-19
REGISTERED GEOLOGIST

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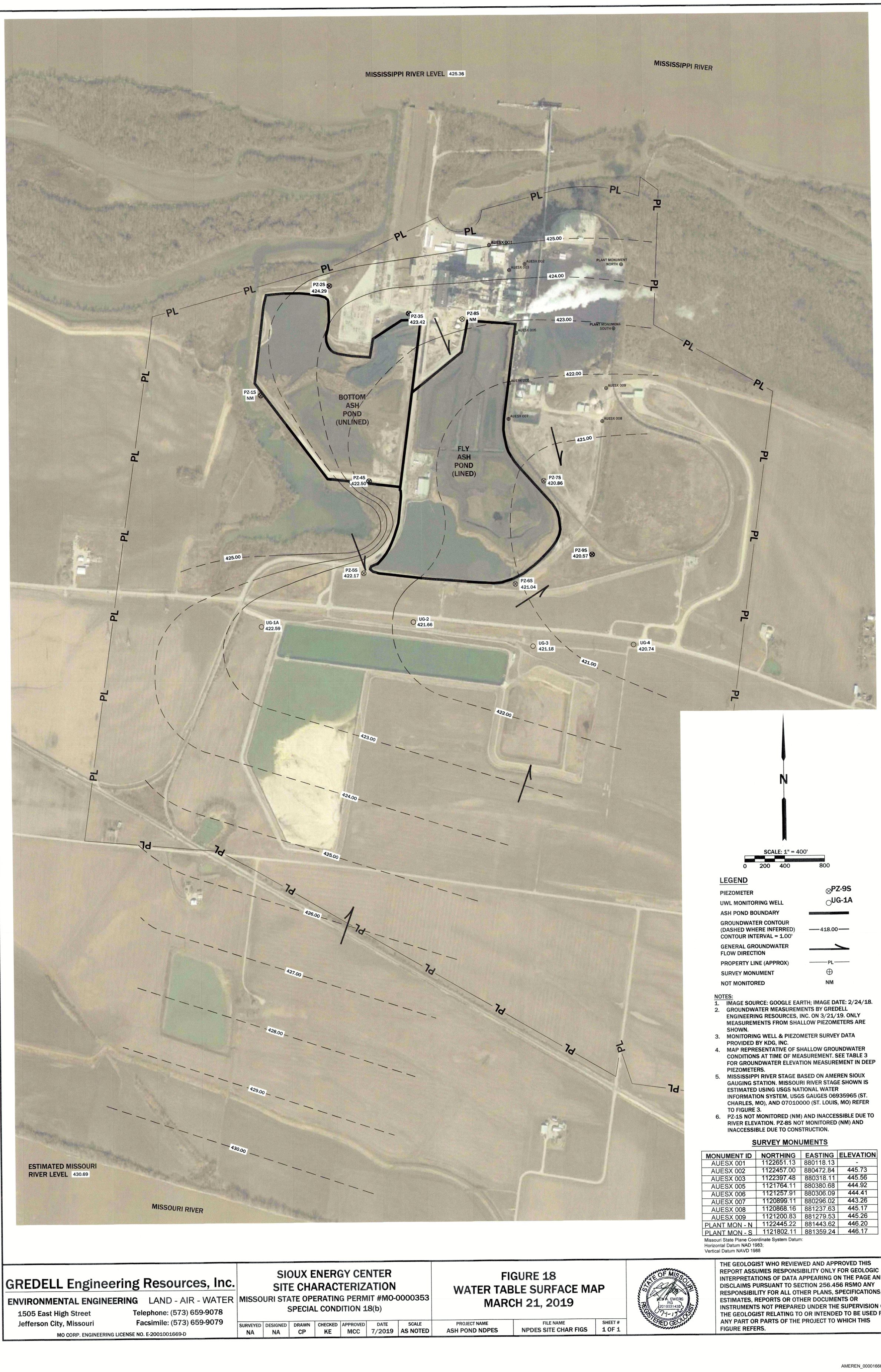
O:\CADD\Files\AMEREN-UE\SIOUX-PLANT\ASH POND NPDES\SITE CHARACTERIZATION\MONTHLY GW CONTOURS.dwg, FEBRUARY 2019, 6/25/2019 8:11:25 AM



LEGEND

PIEZOMETER	⊗PZ-9S
UWL MONITORING WELL	○UG-1A
ASH POND BOUNDARY	
GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 1.00'	418.00
GENERAL GROUNDWATER FLOW DIRECTION	
PROPERTY LINE (APPROX)	PL
SURVEY MONUMENT	⊕
NOT MONITORED	NM

NOTES:

1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 3/21/19. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.
6. PZ-1S NOT MONITORED (NM) AND INACCESSIBLE DUE TO RIVER ELEVATION. PZ-8S NOT MONITORED (NM) AND INACCESSIBLE DUE TO CONSTRUCTION.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
AUESX 001	1122651.13	880118.13	-
AUESX 002	1122457.00	880472.84	445.73
AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

GREDELL Engineering Resources, Inc.

ENVIRONMENTAL ENGINEERING LAND - AIR - WATER

1505 East High Street
Jefferson City, Missouri

Telephone: (573) 659-9078
Facsimile: (573) 659-9079

MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

FIGURE 18
WATER TABLE SURFACE MAP
MARCH 21, 2019

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE	PROJECT NAME	FILE NAME	SHEET #
NA	NA	CP	KE	MCC	7/2019	AS NOTED	ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
PG
2016031433
REGISTERED GEOLOGIST
7-1-19

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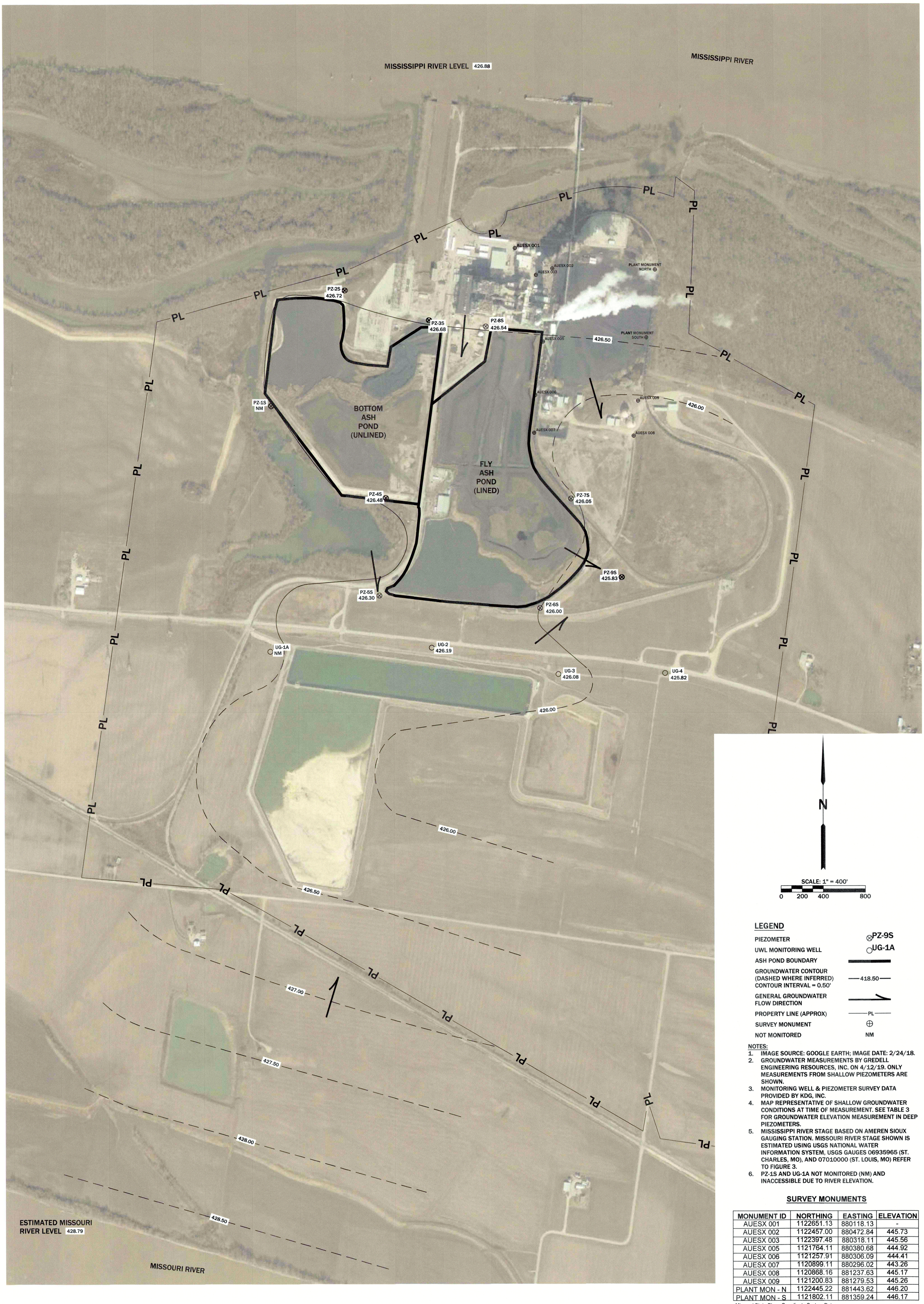

LEGEND

PIEZOMETER	⊗PZ-9S
UWL MONITORING WELL	○UG-1A
ASH POND BOUNDARY	
GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 0.50'	—418.50—
GENERAL GROUNDWATER FLOW DIRECTION	
PROPERTY LINE (APPROX)	—PL—
SURVEY MONUMENT	⊕
NOT MONITORED	NM

NOTES:

1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 4/12/19. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.
6. PZ-1S AND UG-1A NOT MONITORED (NM) AND INACCESSIBLE DUE TO RIVER ELEVATION.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
AUESX 001	1122651.13	880118.13	-
AUESX 002	1122457.00	880472.84	445.73
AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

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1505 East High Street Telephone: (573) 659-9078
Jefferson City, Missouri Facsimile: (573) 659-9079
MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE
NA	NA	CP	KE	MCC	7/2019	AS NOTED

FIGURE 19
WATER TABLE SURFACE MAP
APRIL 12, 2019

PROJECT NAME	FILE NAME	SHEET #
ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
RG
2016031433
7-1-19
REGISTERED GEOLOGIST

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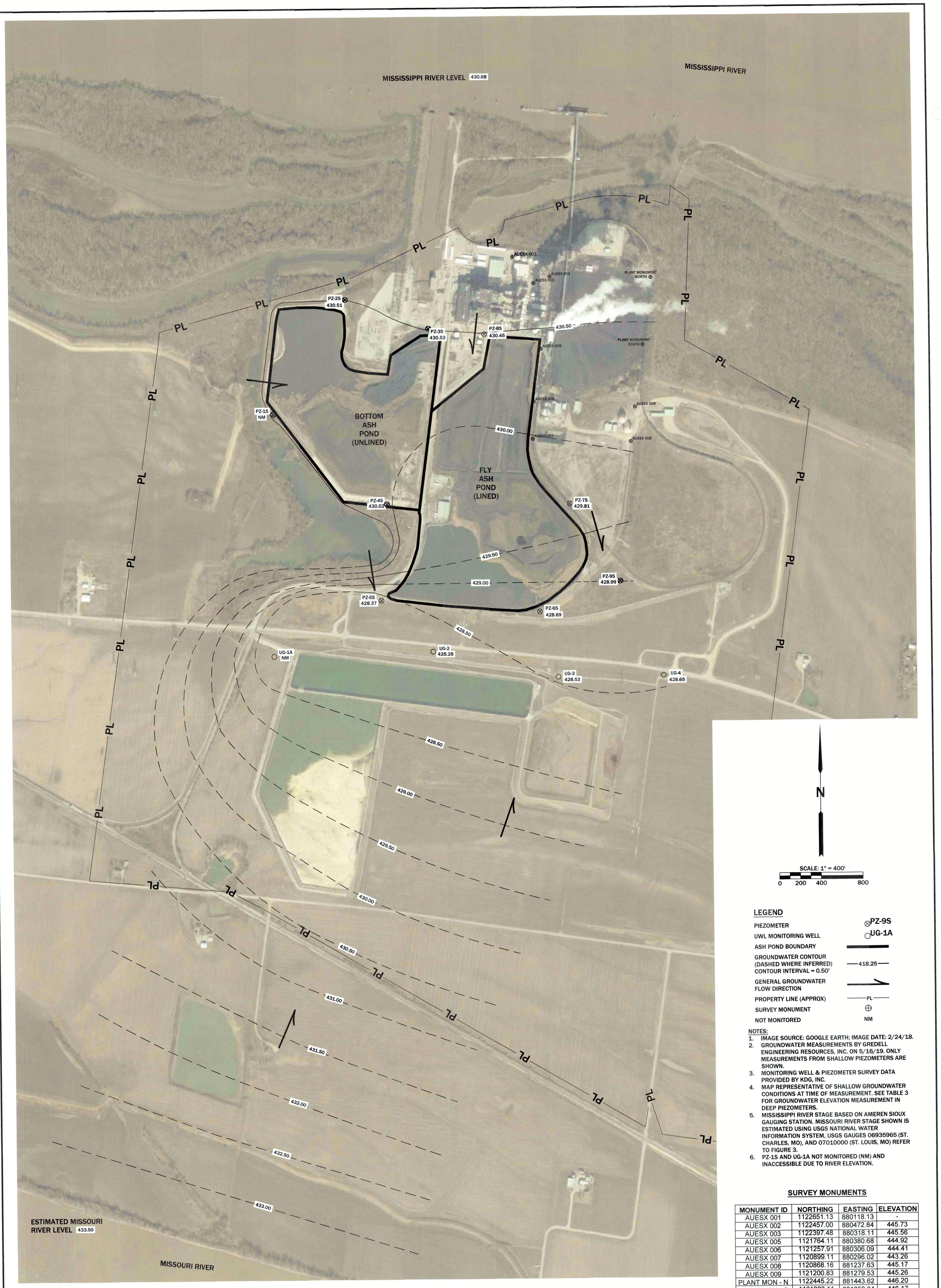

LEGEND

PIEZOMETER	⊗PZ-9S
UWL MONITORING WELL	○UG-1A
ASH POND BOUNDARY	
GROUNDWATER CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL = 0.50'	—418.25—
GENERAL GROUNDWATER FLOW DIRECTION	
PROPERTY LINE (APPROX)	—PL—
SURVEY MONUMENT	⊕
NOT MONITORED	NM

NOTES:

1. IMAGE SOURCE: GOOGLE EARTH; IMAGE DATE: 2/24/18.
2. GROUNDWATER MEASUREMENTS BY GREDELL ENGINEERING RESOURCES, INC. ON 5/16/19. ONLY MEASUREMENTS FROM SHALLOW PIEZOMETERS ARE SHOWN.
3. MONITORING WELL & PIEZOMETER SURVEY DATA PROVIDED BY KDG, INC.
4. MAP REPRESENTATIVE OF SHALLOW GROUNDWATER CONDITIONS AT TIME OF MEASUREMENT. SEE TABLE 3 FOR GROUNDWATER ELEVATION MEASUREMENT IN DEEP PIEZOMETERS.
5. MISSISSIPPI RIVER STAGE BASED ON AMEREN SIOUX GAUGING STATION. MISSOURI RIVER STAGE SHOWN IS ESTIMATED USING USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES, MO), AND 07010000 (ST. LOUIS, MO) REFER TO FIGURE 3.
6. PZ-1S AND UG-1A NOT MONITORED (NM) AND INACCESSIBLE DUE TO RIVER ELEVATION.

SURVEY MONUMENTS

MONUMENT ID	NORTHING	EASTING	ELEVATION
AUESX 001	1122651.13	880118.13	-
AUESX 002	1122457.00	880472.84	445.73
AUESX 003	1122397.48	880318.11	445.56
AUESX 005	1121764.11	880380.68	444.92
AUESX 006	1121257.91	880306.09	444.41
AUESX 007	1120899.11	880296.02	443.26
AUESX 008	1120868.16	881237.63	445.17
AUESX 009	1121200.83	881279.53	445.26
PLANT MON - N	1122445.22	881443.62	446.20
PLANT MON - S	1121802.11	881359.24	446.17

Missouri State Plane Coordinate System Datum:
Horizontal Datum NAD 1983;
Vertical Datum NAVD 1988

GREDELL Engineering Resources, Inc.
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Jefferson City, Missouri Facsimile: (573) 659-9079
MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

SIOUX ENERGY CENTER
SITE CHARACTERIZATION
MISSOURI STATE OPERATING PERMIT #MO-0000353
SPECIAL CONDITION 18(b)

FIGURE 20
WATER TABLE SURFACE MAP
MAY 16, 2019

SURVEYED	DESIGNED	DRAWN	CHECKED	APPROVED	DATE	SCALE	PROJECT NAME	FILE NAME	SHEET #
NA	NA	CP	KE	MCC	7/2019	AS NOTED	ASH POND NDPES	NPDES SITE CHAR FIGS	1 OF 1

STATE OF MISSOURI
KEN A. EWERS
RG
2016031433
5-7-19
REGISTERED GEOLOGIST

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APPENDIX D

Potentiometric Surface Maps from CCR Sampling Events

Path: G:\Projects\150 Projects\1531406 - Ameren GW Monitoring Program - MO\Phase 0003 - Sioux Energy\800 - FIGURES-DRAWINGS\PRODUCTION\Annual Report\SCPA\SCPA-E1.mxd

LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.

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).

0 250 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 1 - MARCH 16, 2016

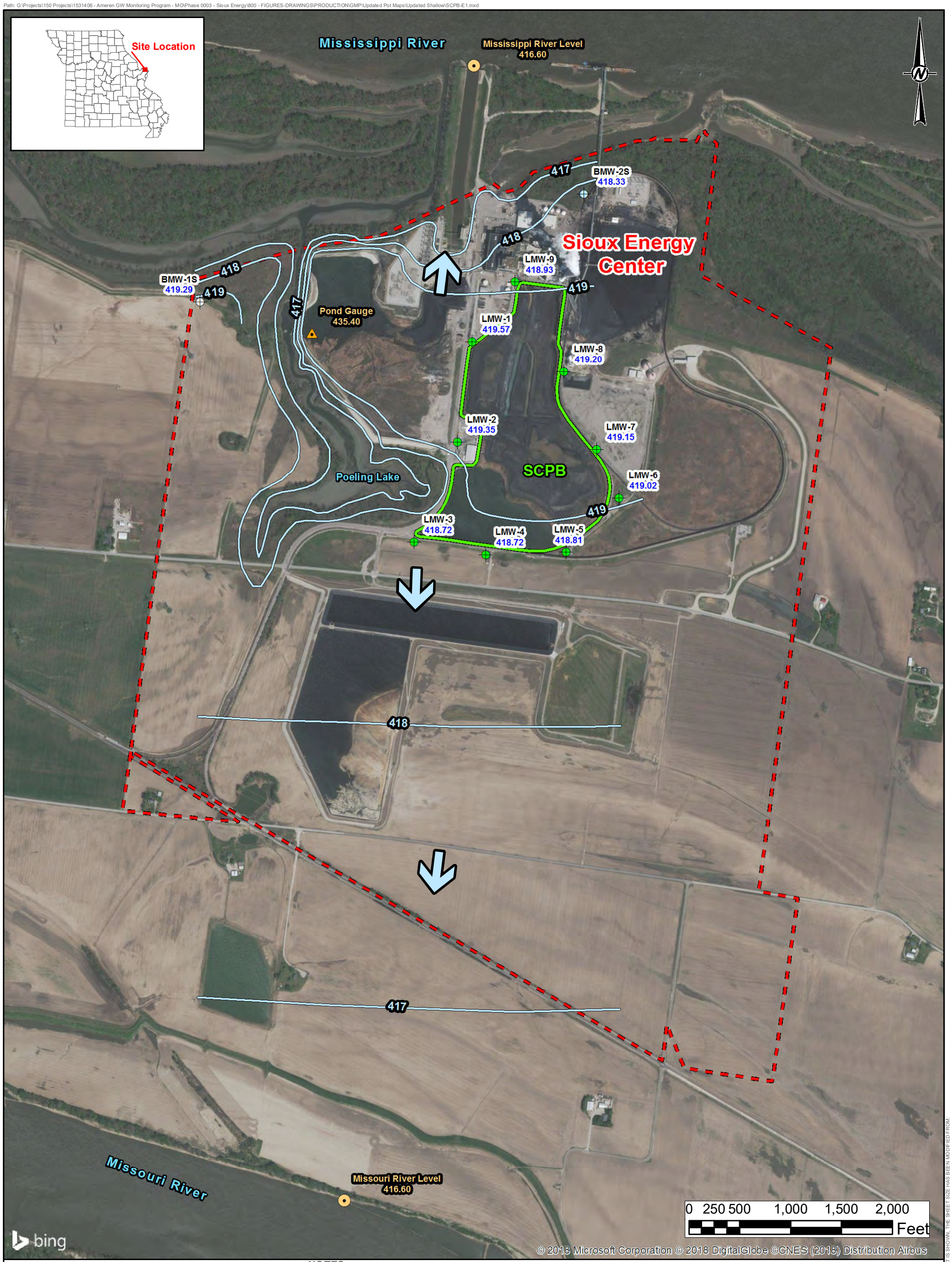
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-03-30
PREPARED	JSI
DESIGN	JSI
REVIEW	JS
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003A | AMEREN_00001670 | FIGURE D1

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

Path: G:\Projects\150 Projects\1531406 - Ameren GW Monitoring Program - MO\Phase 0003 - Sioux Energy\800 - FIGURES-DRAWINGS\PRODUCTION\GMP\Updated Pot Maps\Updated Shallow\SCPB-E1.mxd



LEGEND

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPB - Lined Fly Ash Surface Impoundment Monitoring Well
- River Level
- Unlined Bottom Ash Pond Gauge

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.) 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.

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
SCPB POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 1 - MARCH 16, 2016

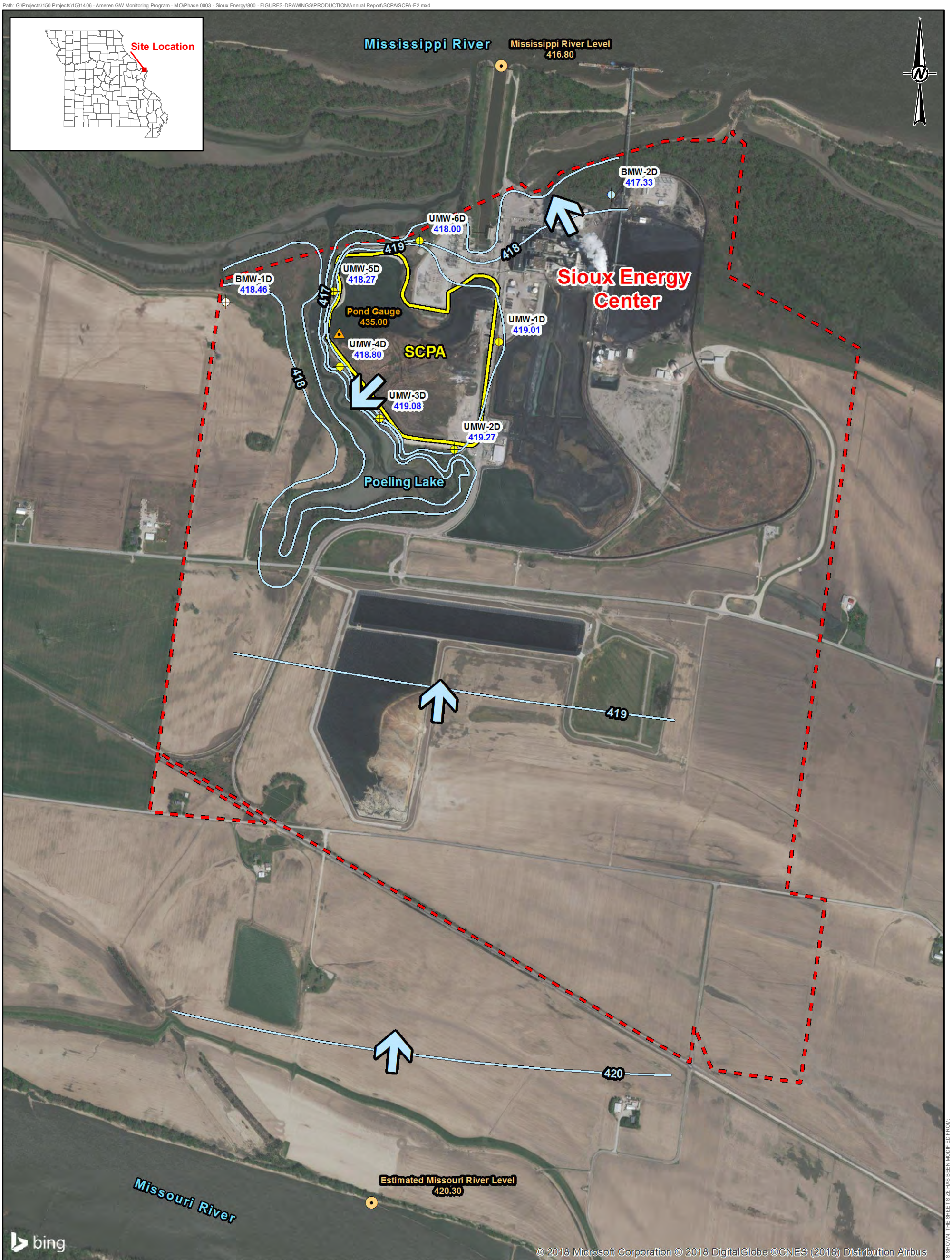
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-03-30
PREPARED	JSI
DESIGN	JSI
REVIEW	JS
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003B | AMEREN_00001671 | FIGURE **D2**

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\Annual Report\SCPA\SCPA-E2.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.

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).

0 250 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 2 - MAY 9, 2016

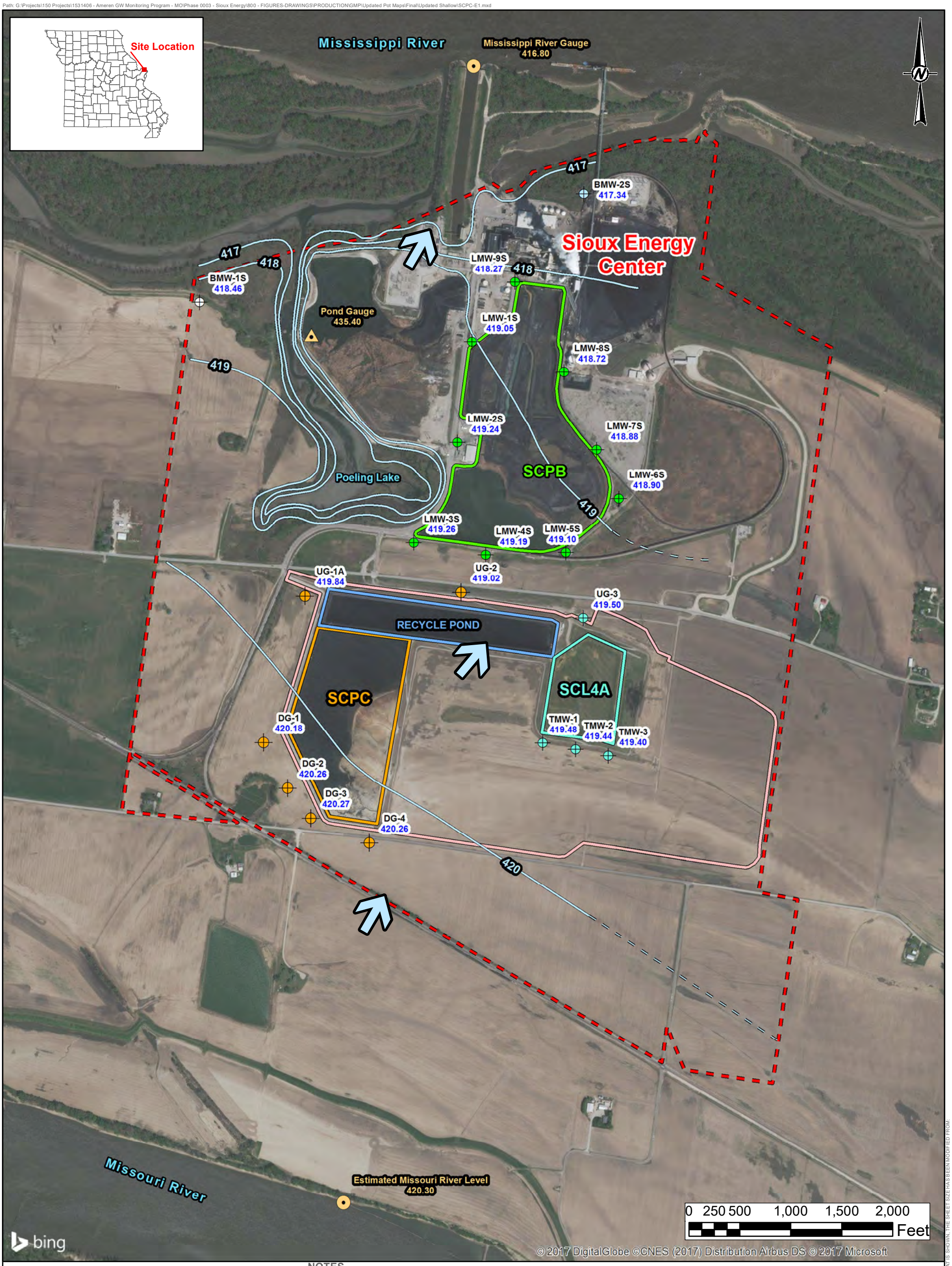
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-25
PREPARED	JS
DESIGN	JS
REVIEW	JSI
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003A | AMEREN_00001672 | FIGURE **D3**

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\Updated Pot Maps\Final\Updated Shallow\SCPC-E1.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
- SPCA 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
SCPB POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 1 - MAY 9, 2016

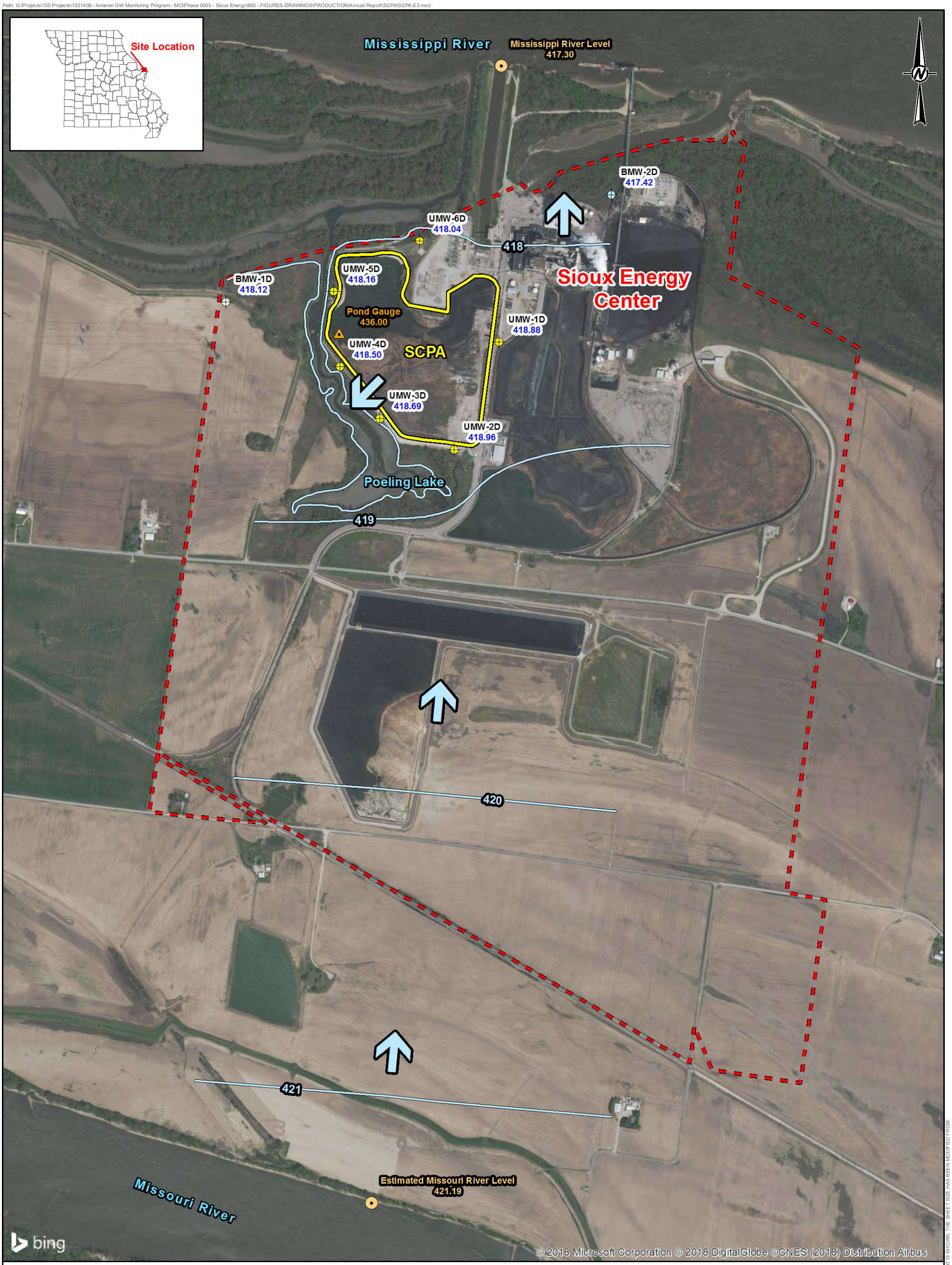
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-25
PREPARED	JSI
DESIGN	JSI
REVIEW	JS
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003B | AMEREN_00001673 | FIGURE **D4**

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\Annual Report\SCPA\SCPA-E3.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.

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).

0 250 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 3 - JULY 5, 2016

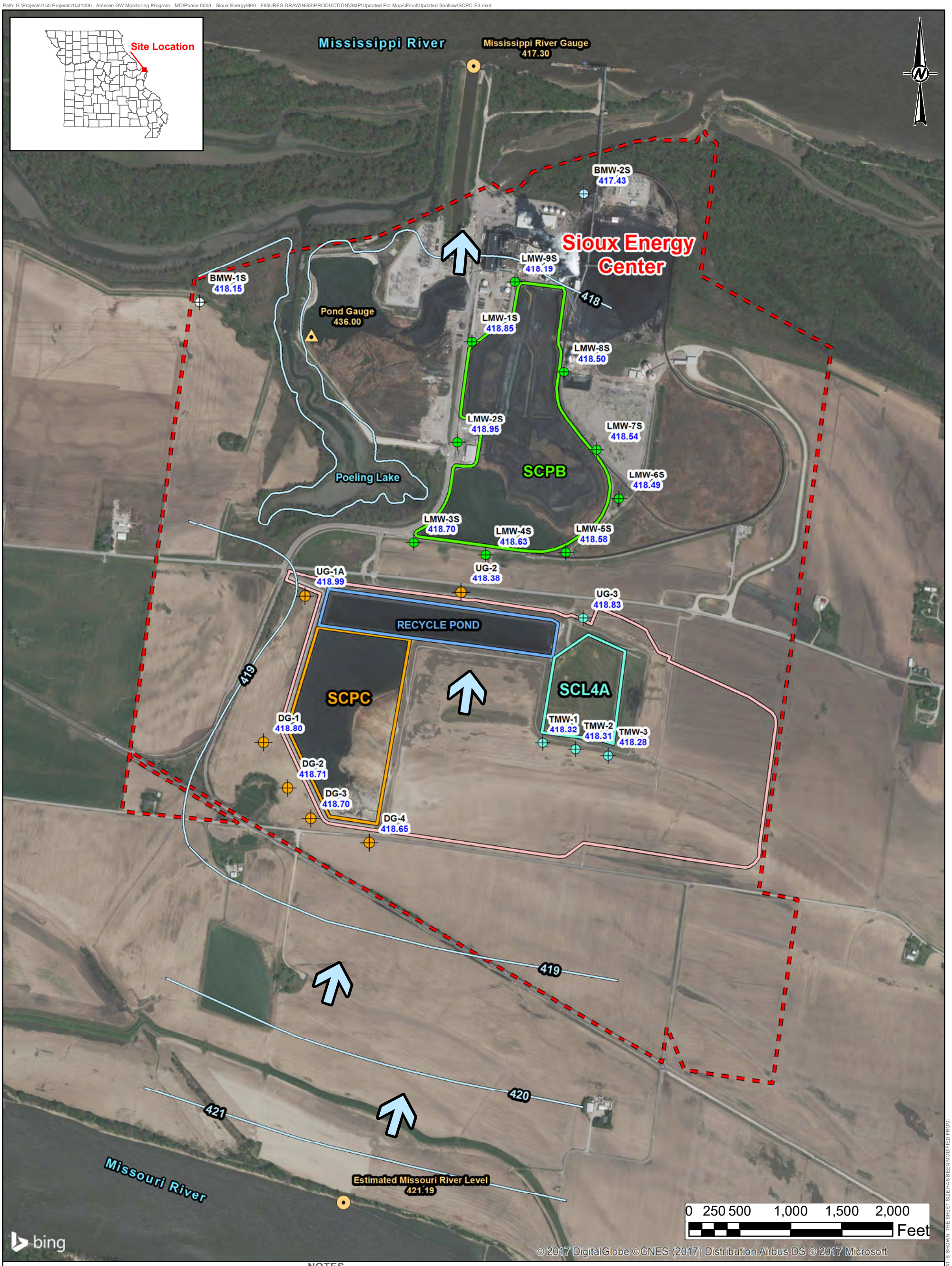
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-08-16
PREPARED	JS
DESIGN	JS
REVIEW	JSI
APPROVED	MNH

PROJECT No. 153-1406
PHASE 0003A
AMEREN_00001674
FIGURE **D5**

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\Updated Pot Maps\Final\Updated Shallow\SCPC-E3.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
- SPCA 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
SCPB POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 3 - JULY 5, 2016

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-08-16
PREPARED	JS
DESIGN	JS
REVIEW	JSI
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003B | AMEREN_00001675 | FIGURE **D6**

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

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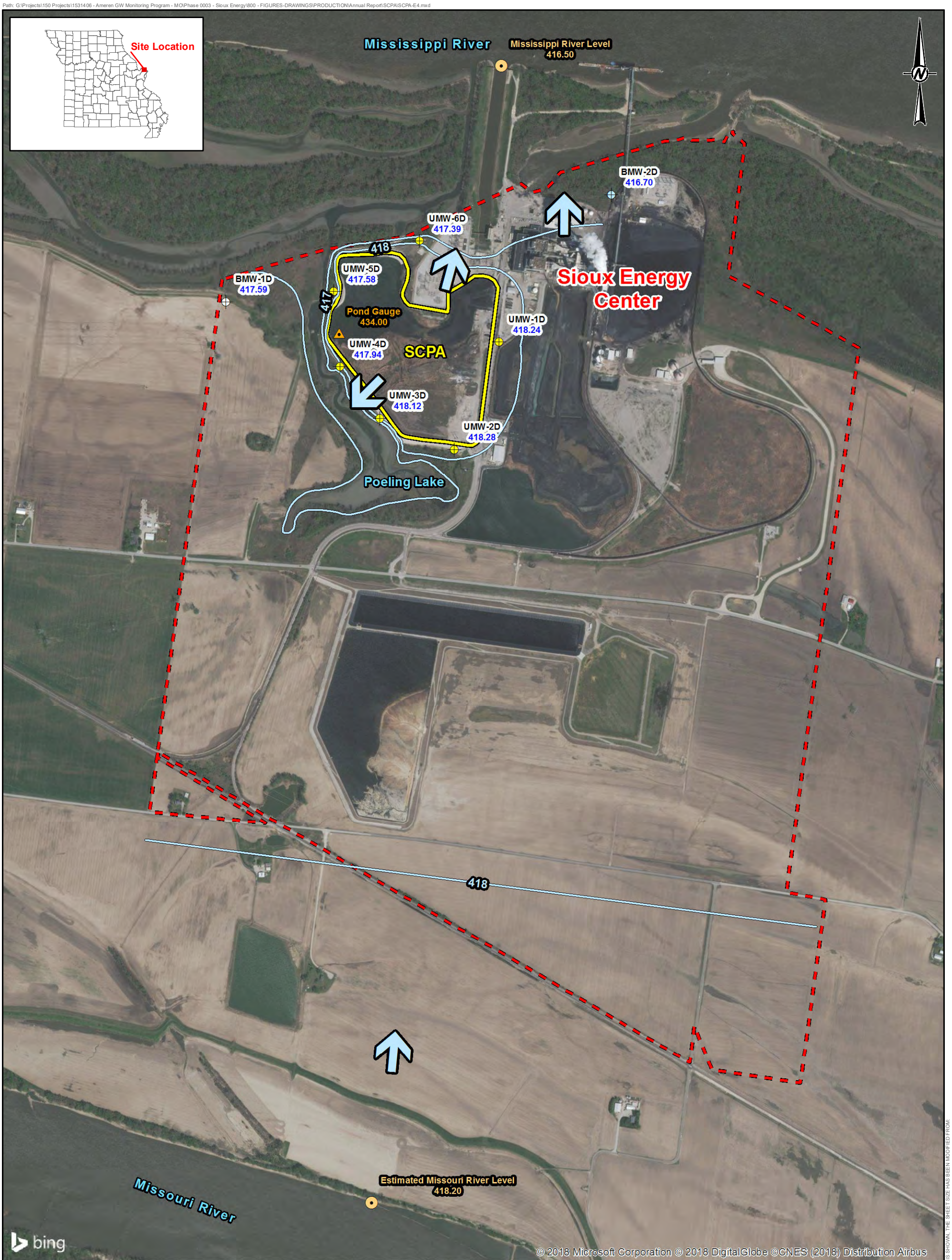

LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
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7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.

REFERENCE

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3.) USGS NATIONAL WATER INFORMATION SYSTEM, USGS GAUGES 06935965 (ST. CHARLES), 07010000 (ST. LOUIS), 05587498 (ALTON), GRAFTON (05587450).

0 250 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 4 - SEPTEMBER 14, 2016

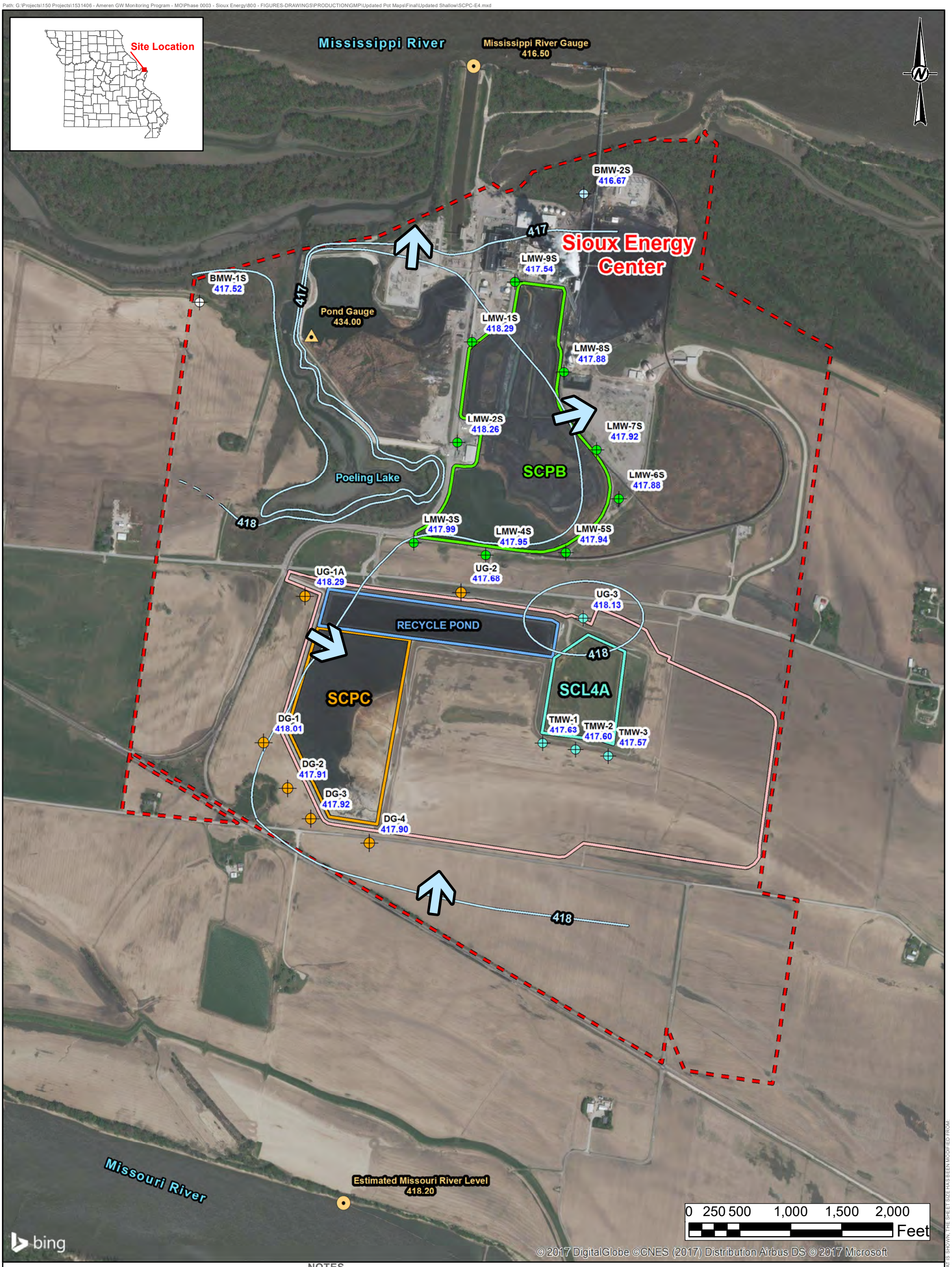
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-27
PREPARED	JSI
DESIGN	JSI
REVIEW	JS
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003A | AMEREN_00001676 | FIGURE D7

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\Updated Pot Maps\Final\Updated Shallow\SCPC-E4.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
- SPCA 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
SCPB POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 4 - SEPTEMBER 14, 2016

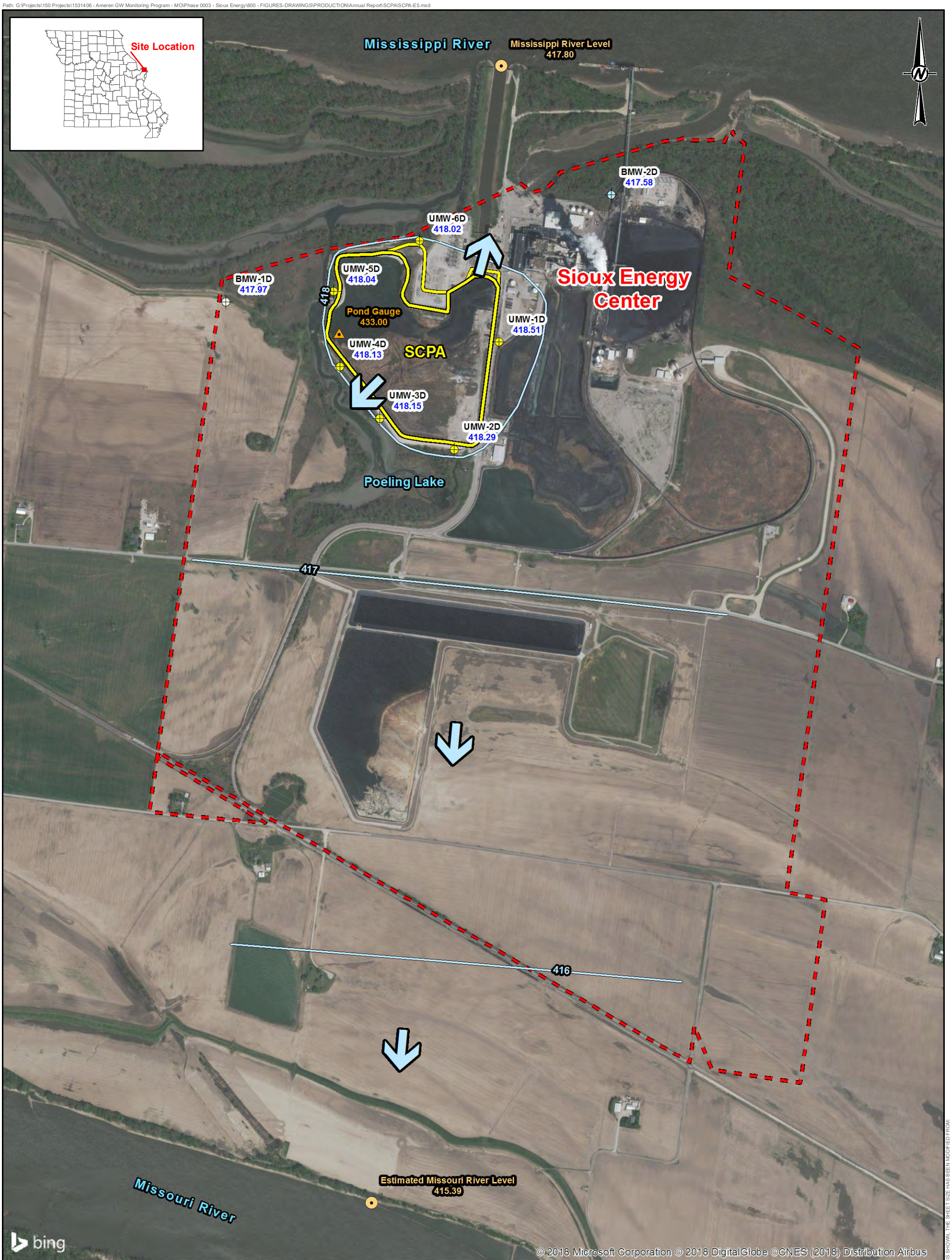
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-27
PREPARED	JSI
DESIGN	JSI
REVIEW	JS
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003B | AMEREN_00001677 | FIGURE D8

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\Annual Report\SCPA\SCPA-E5.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

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6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.

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).

0 250 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 5 - NOVEMBER 7, 2016

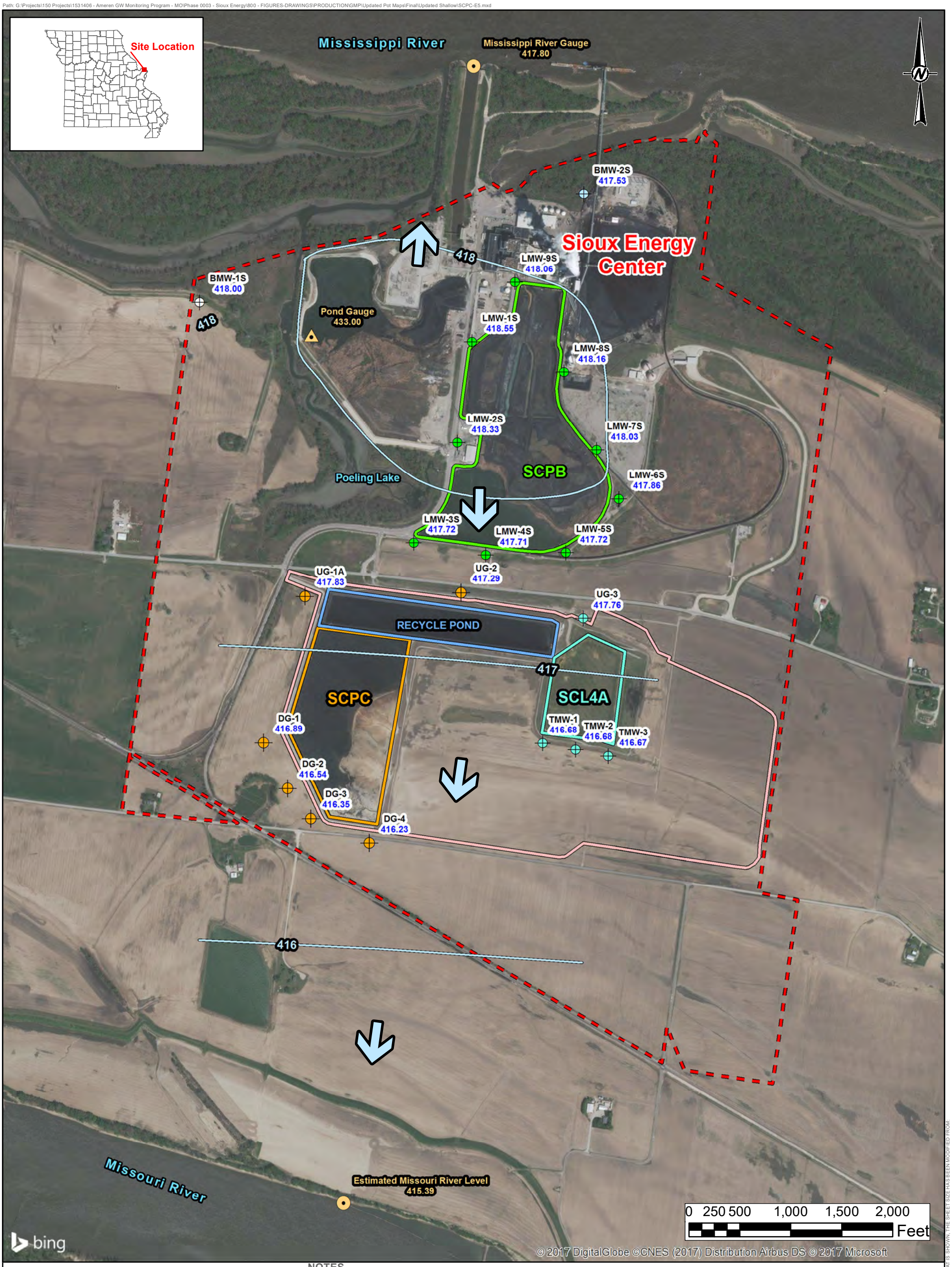
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-11-15
PREPARED	JSI
DESIGN	JSI
REVIEW	MSG
APPROVED	MNH

PROJECT No. 153-1406
PHASE 0003A
AMEREN_00001678
FIGURE D9

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\Updated Pot Maps\Final\Updated Shallow\SCPC-E5.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
- SPCA 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

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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

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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
SCPB POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 5 - NOVEMBER 7, 2016

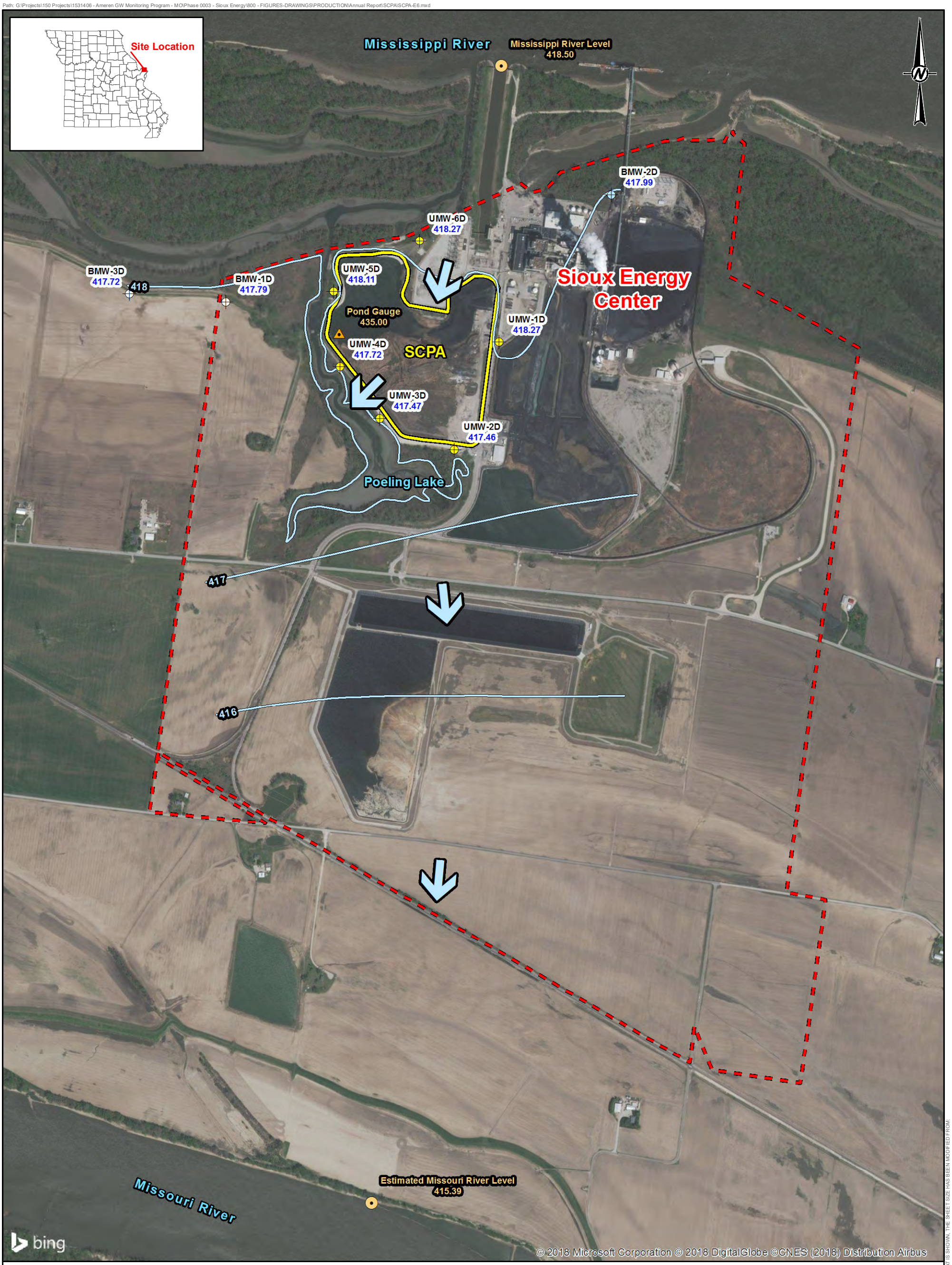
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-11-07
PREPARED	JSI
DESIGN	JSI
REVIEW	MSG
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003B | AMEREN_00001679 | FIGURE D10

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\Annual Report\SCPA\SCPA-E6.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.

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).

0 250 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 6 - JANUARY 3, 2017

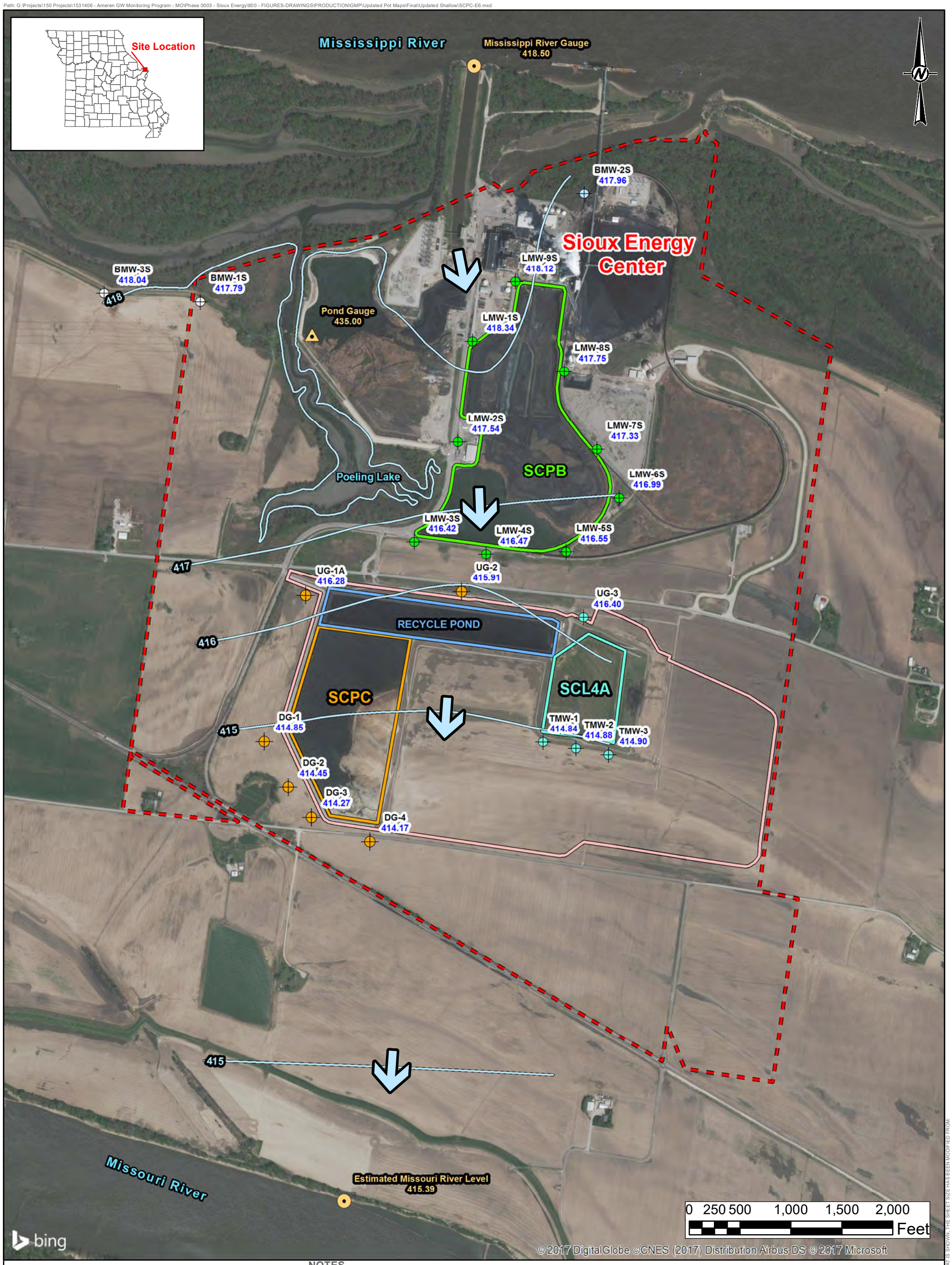
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-01-23
PREPARED	JS
DESIGN	JSI
REVIEW	BEF
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003A | AMEREN_00001680 | FIGURE D11

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\Updated Pot Maps\Final\Updated Shallow\SCPC-E6.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
- SPCA 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
SCPB POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 6 - JANUARY 3, 2017

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-01-03
PREPARED	JS
DESIGN	JSI
REVIEW	JSI
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003B | AMEREN_00001681 | FIGURE D12

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\Annual Report\SCPA\SCPA-E7.mxd

LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- Groundwater Elevation Piezometer
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.

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).

0 250 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 7 - MARCH 8, 2017

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-03-14
PREPARED	JSI
DESIGN	JSI
REVIEW	JS
APPROVED	MNH

PROJECT No. 153-1406
PHASE 0003A
AMEREN_00001682
FIGURE **D13**

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\Updated Pot Maps\Final\Updated Shallow\SCPC-E7.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
- SPCA 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
SCPB POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 7 - MARCH 8, 2017

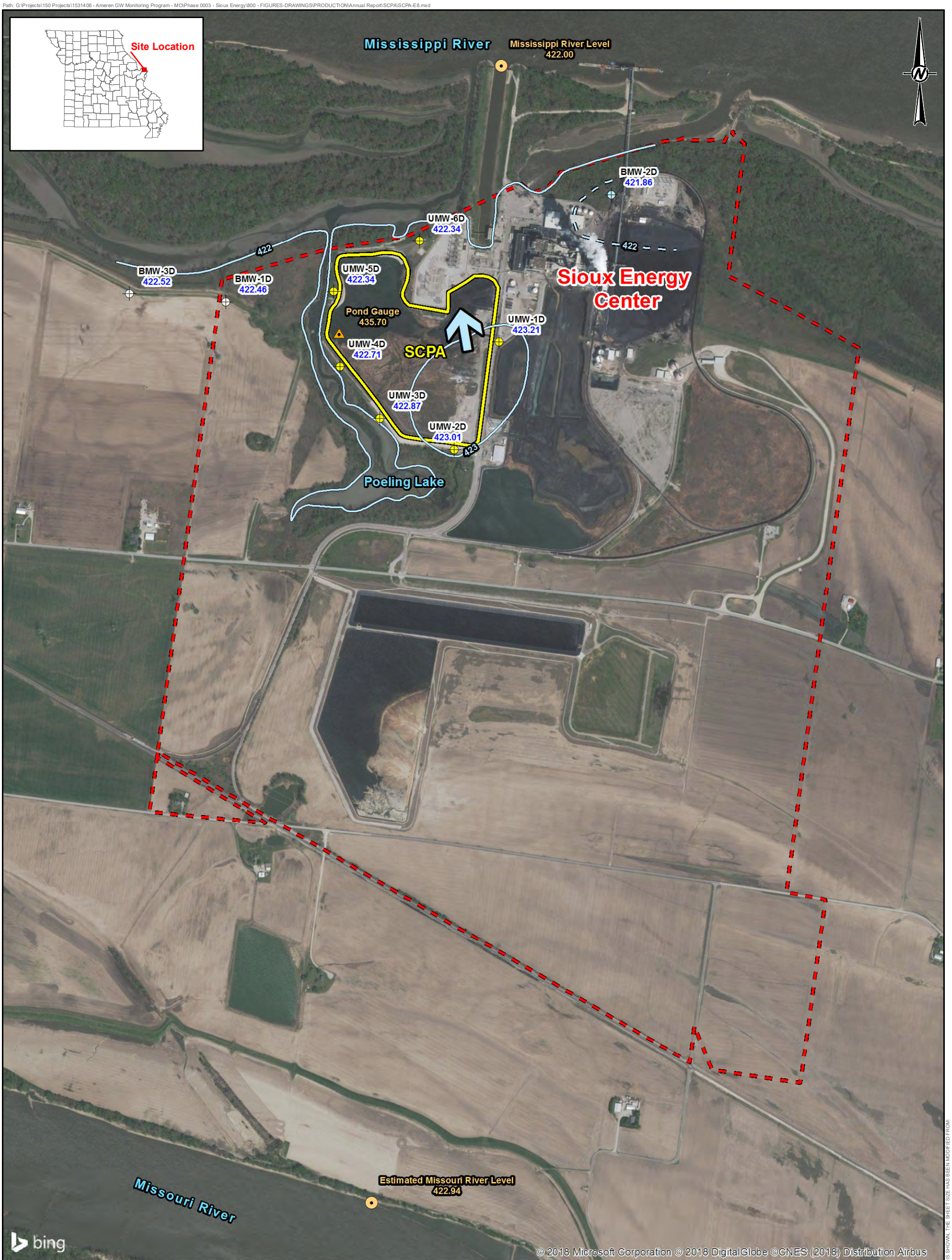
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-03-14
PREPARED	JSI
DESIGN	JSI
REVIEW	JS
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003B | AMEREN_00001683 | FIGURE **D14**

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\Annual Report\SCPA\SCPA-E8.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND GAUGE LEVEL OBTAINED ONSITE BY GOLDER.

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).

0 250 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 8 - JUNE 5, 2017

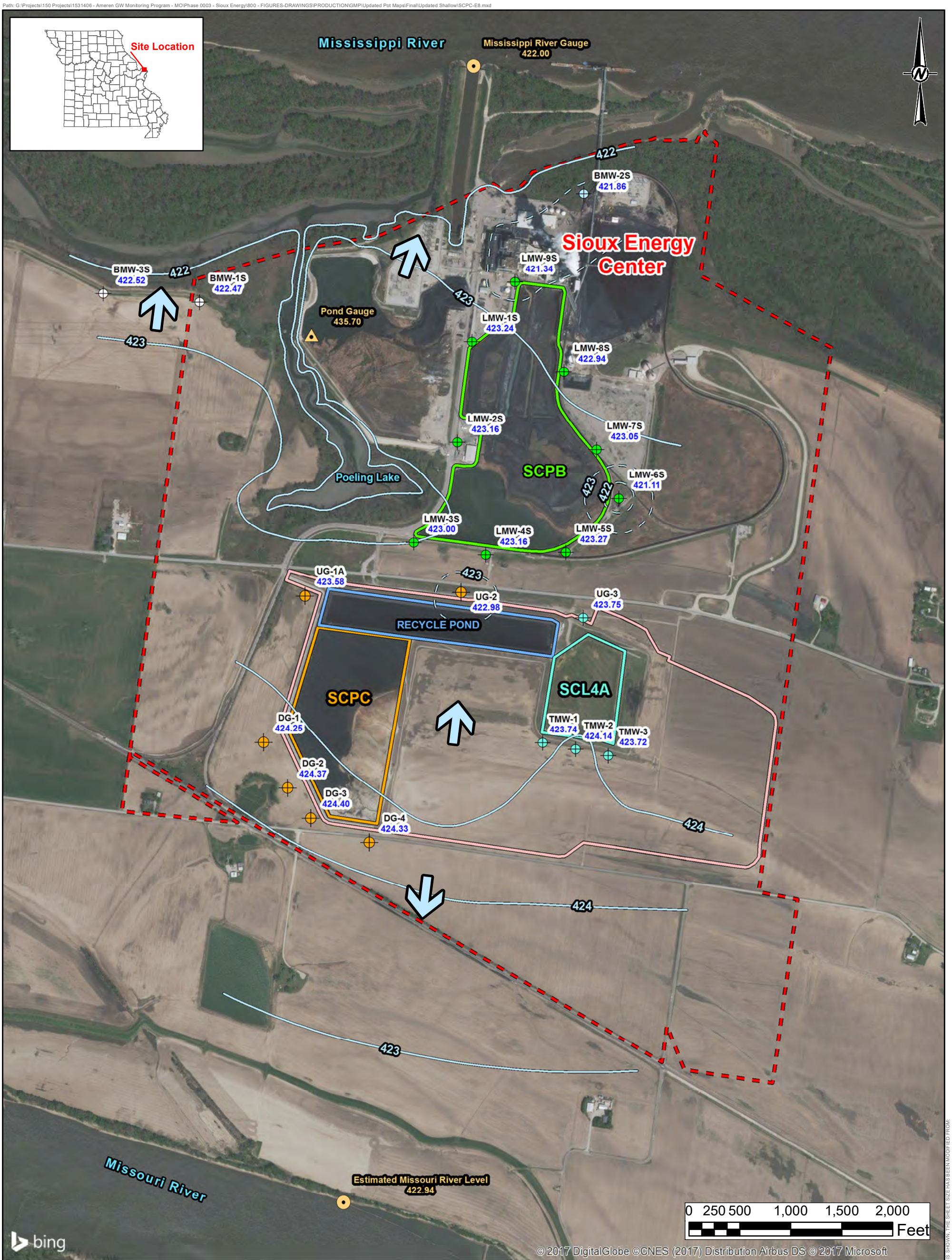
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-06-23
PREPARED	JSI
DESIGN	JSI
REVIEW	RJF
APPROVED	MNH

PROJECT No. 153-1406
PHASE 0003A
AMEREN_00001684
FIGURE D15

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\Updated Pot Maps\Final\Updated Shallow\SCPC-E8.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
- SPCA 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
SCPB POTENTIOMETRIC SURFACE MAP
BACKGROUND EVENT 8 - JUNE 5, 2017

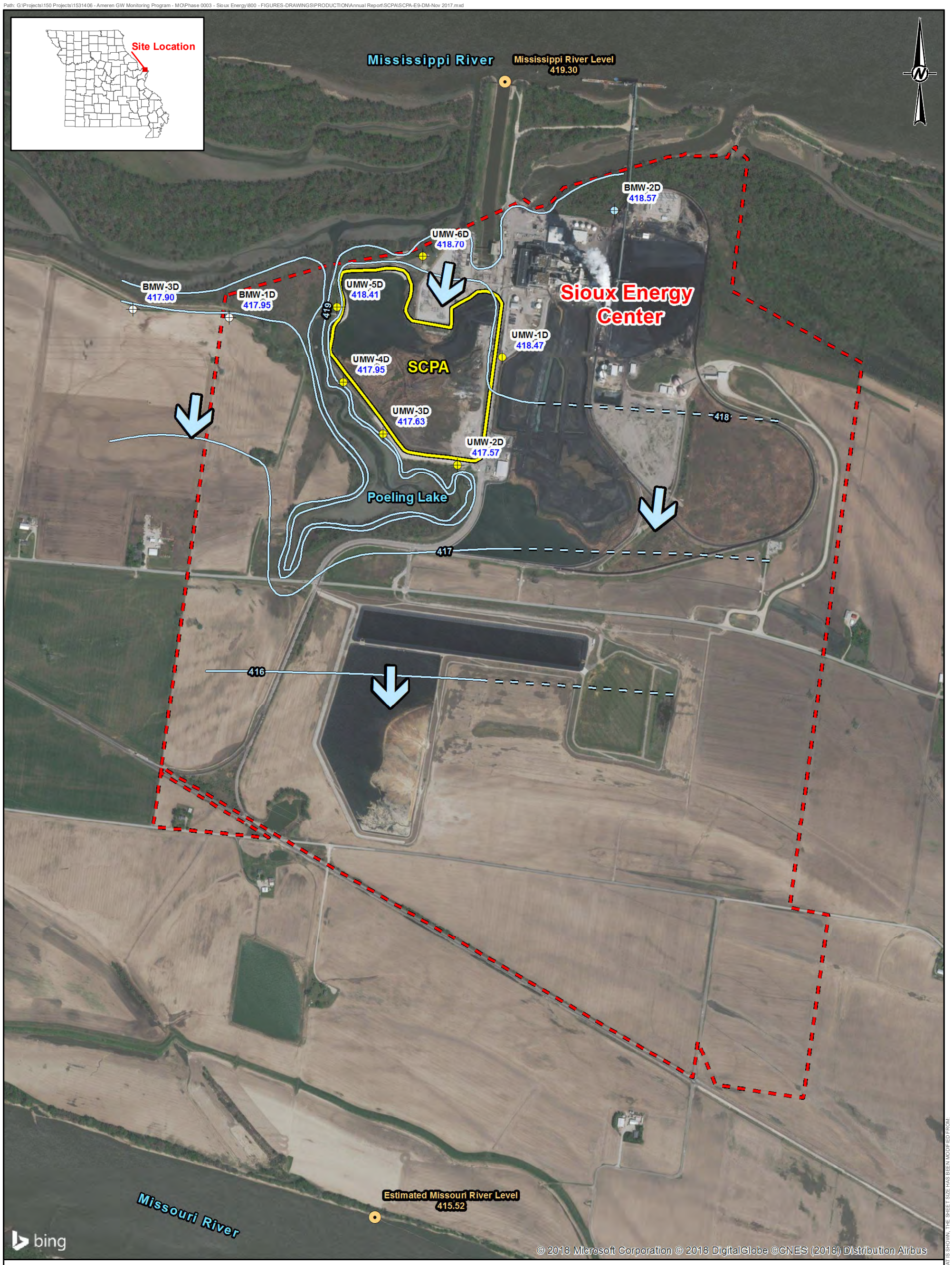
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-07-05
PREPARED	JSI
DESIGN	JSI
REVIEW	RJF
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003B | AMEREN_00001685 | FIGURE **D16**

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\Annual Report\SCPA\SCPA-E9-DM-Nov 2017.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Background Monitoring Well
- Groundwater Elevation Piezometer
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
7.) POND WATER LEVEL WAS BELOW POND GAUGE.

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).

0 250 500 1,000 1,500 2,000
Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP
DETECTION MONITORING - NOVEMBER 13, 2017

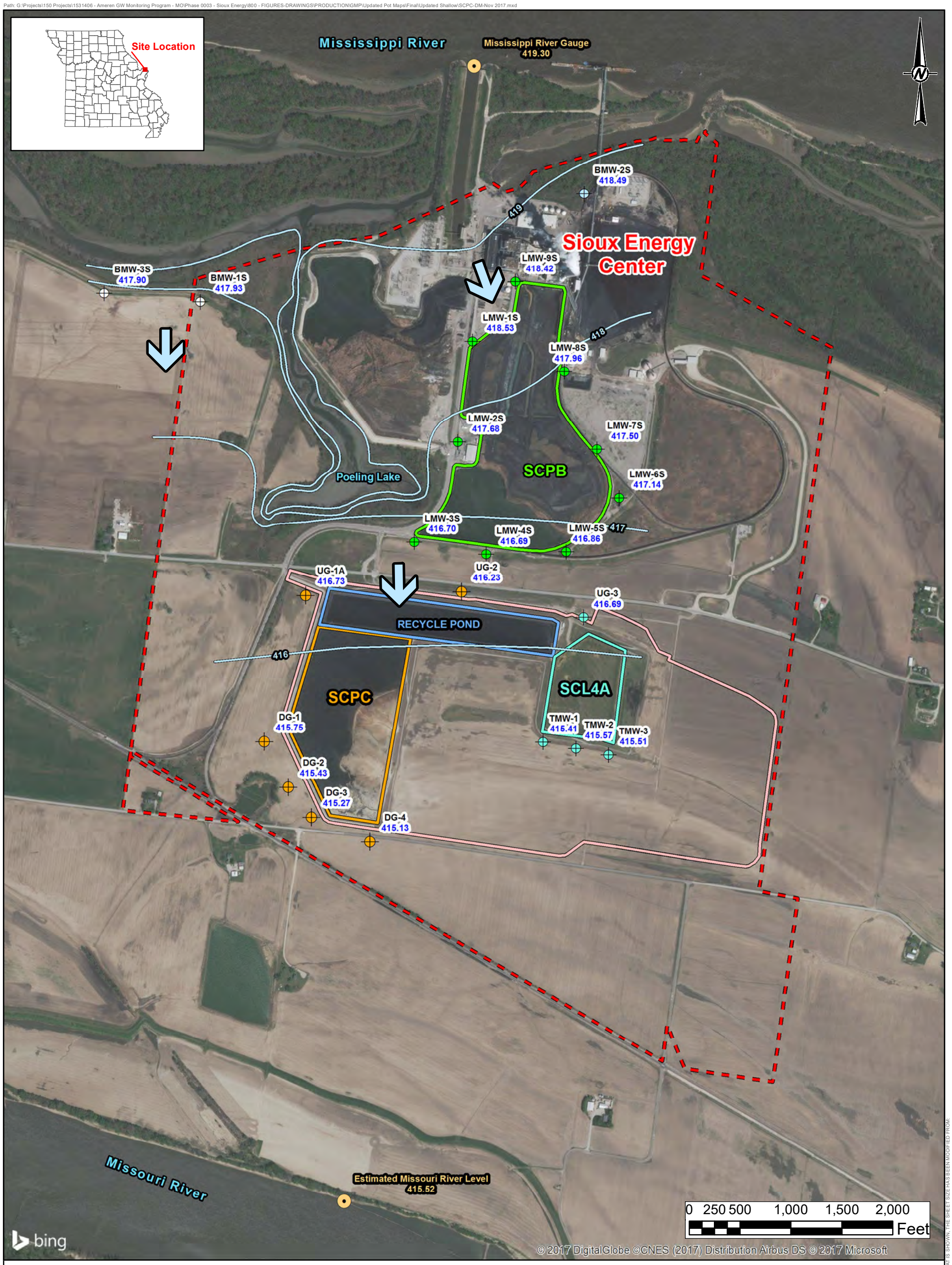
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-11-22
PREPARED	RJF
DESIGN	JSI
REVIEW	JS
APPROVED	MNH

PROJECT No. 153-1406
PHASE 0003A
AMEREN_00001686
FIGURE D17

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\Updated Pot Maps\Final\Updated Shallow\SCPC-DM-Nov 2017.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
- SPCA 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.) UWL BOUNDARIES, DESIGNATIONS AND STATE MONITORING WELL LOCATIONS BASED ON DRAWINGS IN THE UWL PROPOSED LANDFILL PERMIT (#0918301).
8.) 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
SCPB POTENTIOMETRIC SURFACE MAP
DETECTION MONITORING - NOVEMBER 13, 2017

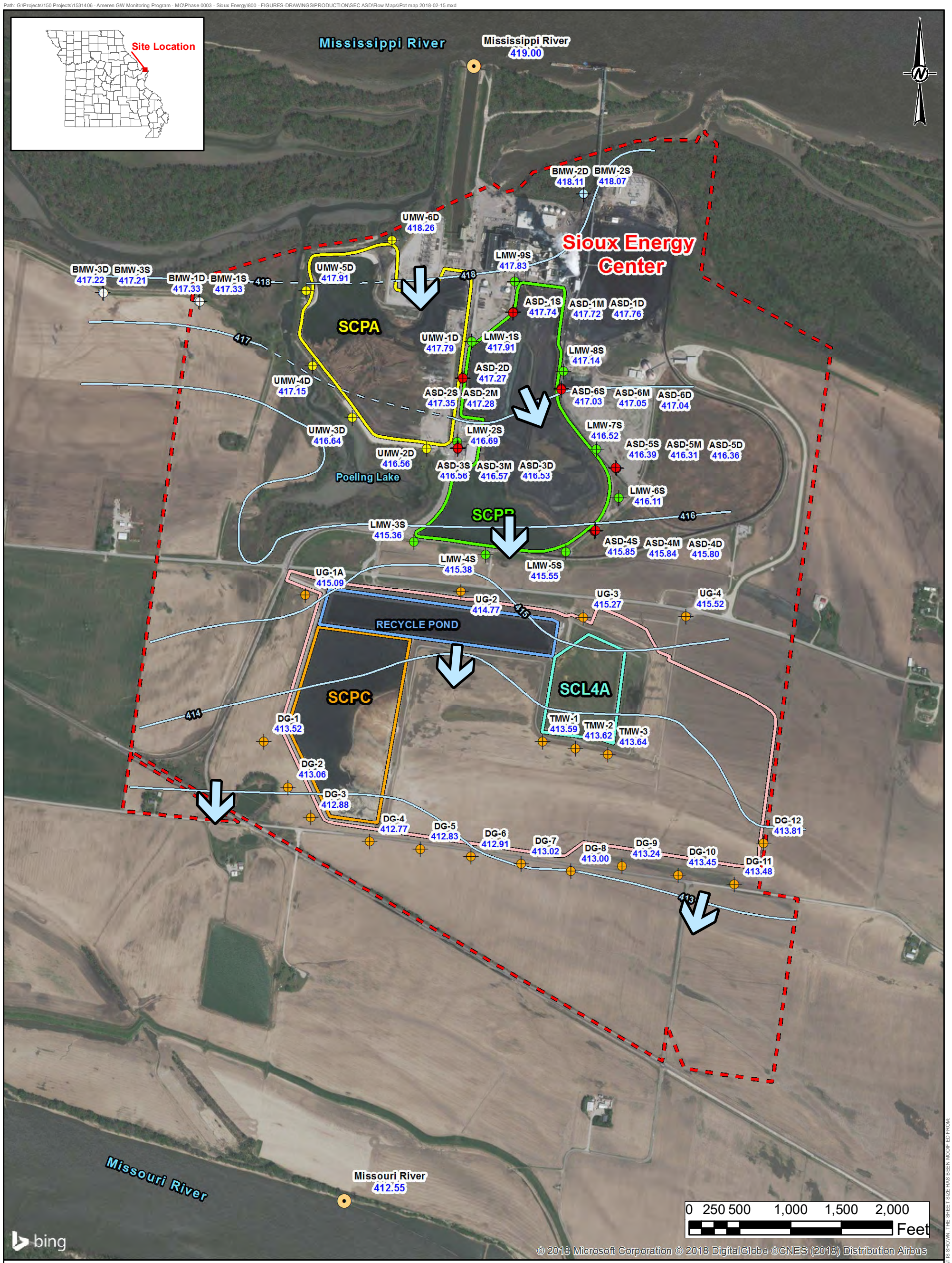
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-11-22
PREPARED	RJF
DESIGN	JSI
REVIEW	JS
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003B | AMEREN_00001687 | FIGURE D18

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\SEC ASD\Flow Maps\Pot map 2018-02-15.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPB - Fly Ash Surface Impoundment
- SCPA - Bottom Ash Surface Impoundment
- UWL Future Perimeter Fence
- Water Recycle Pond
- SCPC - WFGD Surface Impoundment
- SCL4A - UWL Cell 4A

Groundwater Elevation Contours

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

Ground/Surface Water Measurement Locations

- SCPB - Fly Ash Surface Impoundment Monitoring Well
- SCPA - Bottom Ash Surface Impoundment Monitoring Well
- Background Monitoring Well
- Groundwater Elevation Piezometer
- Utility Waste Landfill Monitoring Well
- Alternative Source Demonstration Piezometers

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GOLDER GROUNDWATER MONITORING WELLS AND TEMPORARY PIEZOMETERS SURVEYED BY ZAHNER AND ASSOCIATES, INC.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FT MSL (FEET ABOVE MEAN SEA LEVEL).
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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.) UWL BOUNDARIES, DESIGNATIONS AND STATE MONITORING WELL LOCATIONS BASED ON DRAWINGS IN THE UWL PROPOSED LANDFILL PERMIT (#0918301).
8.) 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.
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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
FEBRUARY 12, 2018 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2018-02-15
PREPARED	RJF
DESIGN	JSI
REVIEW	MSG
APPROVED	MNH

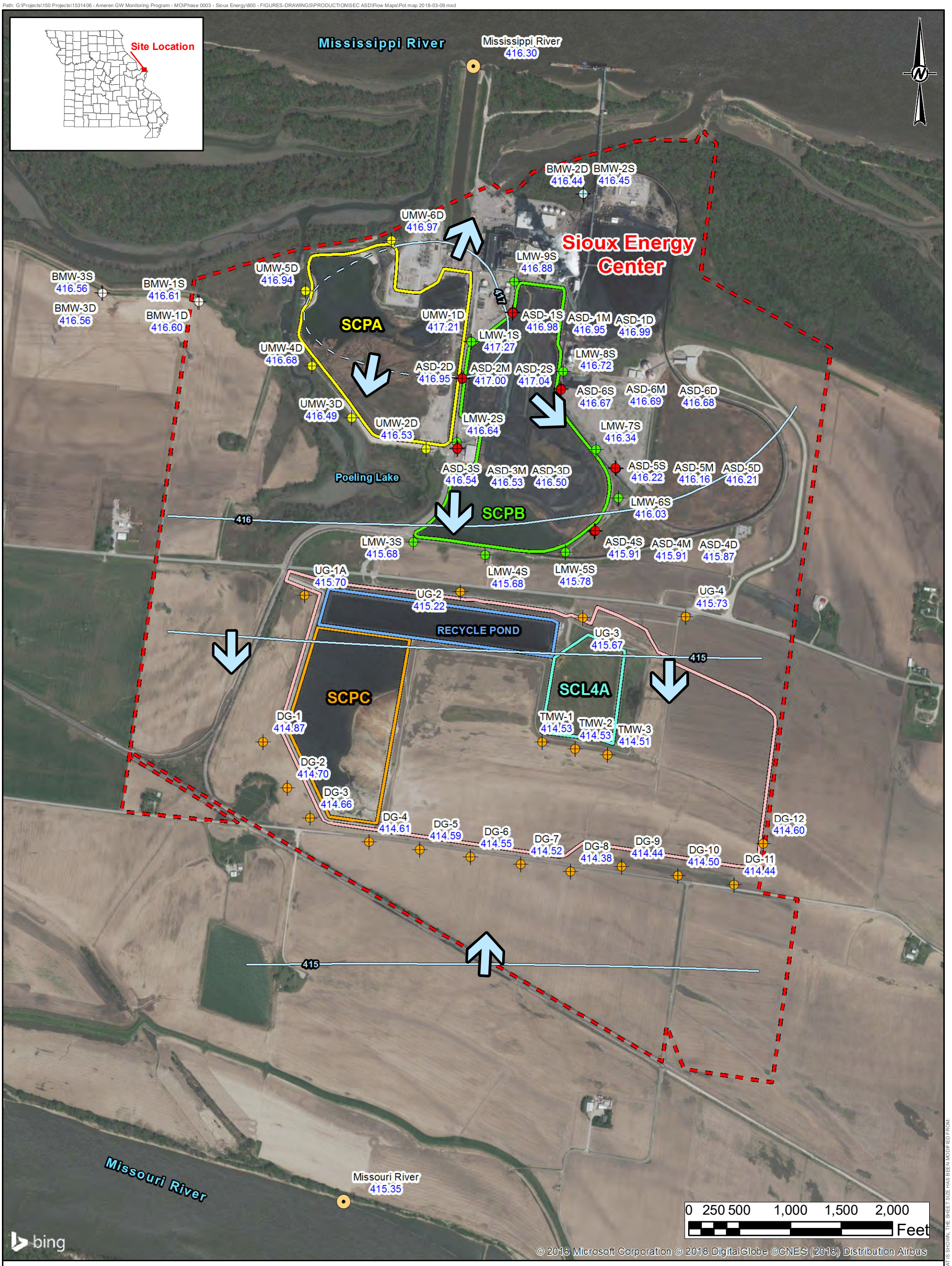
PROJECT No.
153-1406

AMEREN_00001688

FIGURE
D19

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\SEC ASD\Flow Maps\Pot map 2018-03-09.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPB - Fly Ash Surface Impoundment
- SCPA - Bottom Ash Surface Impoundment
- UWL Future Perimeter Fence
- Water Recycle Pond
- SCPC - WFGD Surface Impoundment
- SCL4A - UWL Cell 4A

Groundwater Elevation Contours

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

Ground/Surface Water Measurement Locations

- SCPB - Fly Ash Surface Impoundment Monitoring Well
- SCPA - Bottom Ash Surface Impoundment Monitoring Well
- Background Monitoring Well
- Groundwater Elevation Piezometer
- Utility Waste Landfill Monitoring Well
- Alternative Source Demonstration Piezometers

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GOLDER GROUNDWATER MONITORING WELLS AND TEMPORARY PIEZOMETERS SURVEYED BY ZAHNER AND ASSOCIATES, INC.
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.) UWL BOUNDARIES, DESIGNATIONS AND STATE MONITORING WELL LOCATIONS BASED ON DRAWINGS IN THE UWL PROPOSED LANDFILL PERMIT (#0918301).
8.) 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
MARCH 9, 2018 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-15
PREPARED	RJF
DESIGN	JSI
REVIEW	MSG
APPROVED	MNH

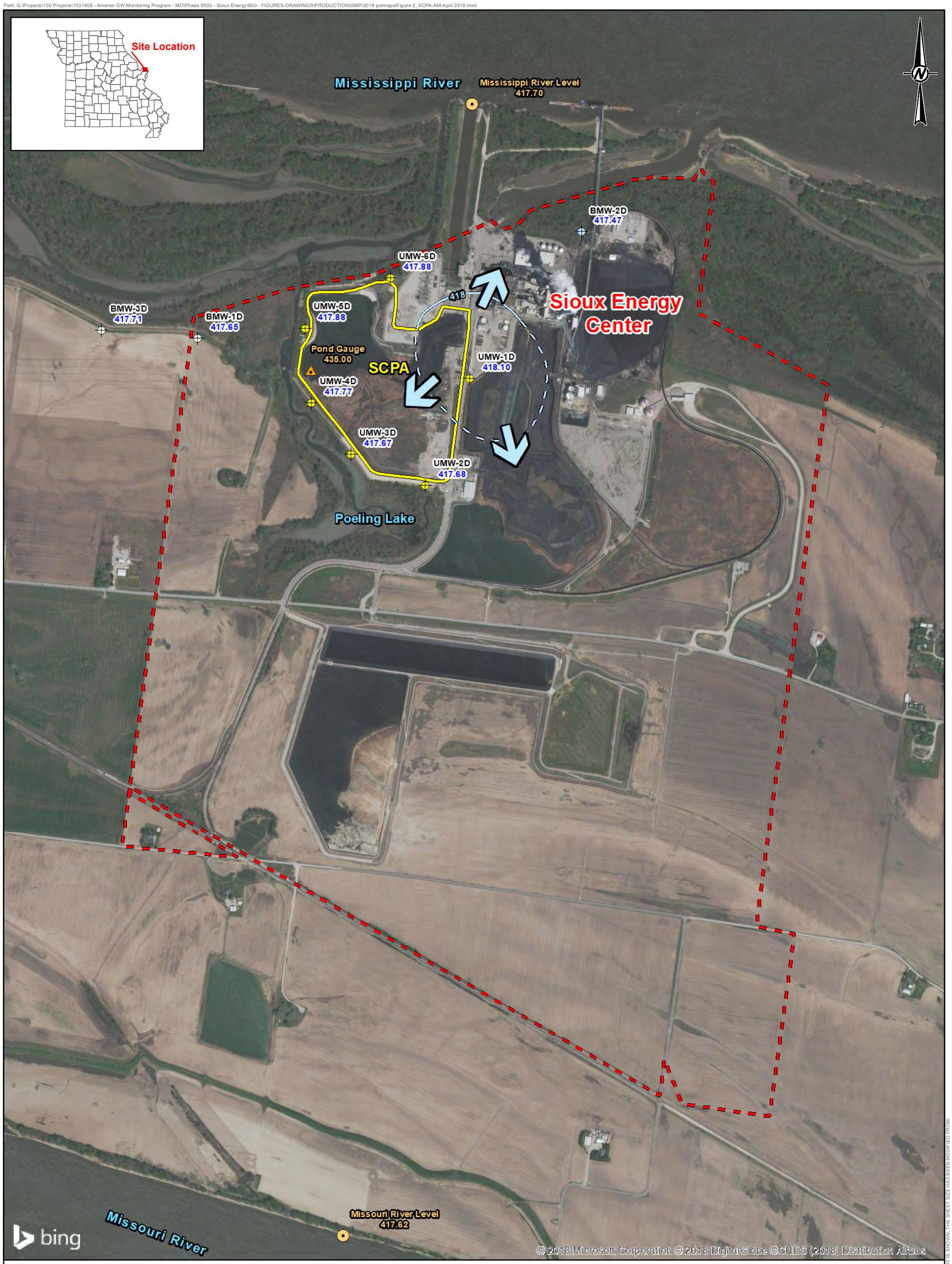
PROJECT No.
153-1406

AMEREN_00001689

FIGURE
D20

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

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



LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.

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).

0 450 900 1,800 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP - APRIL 5, 2018

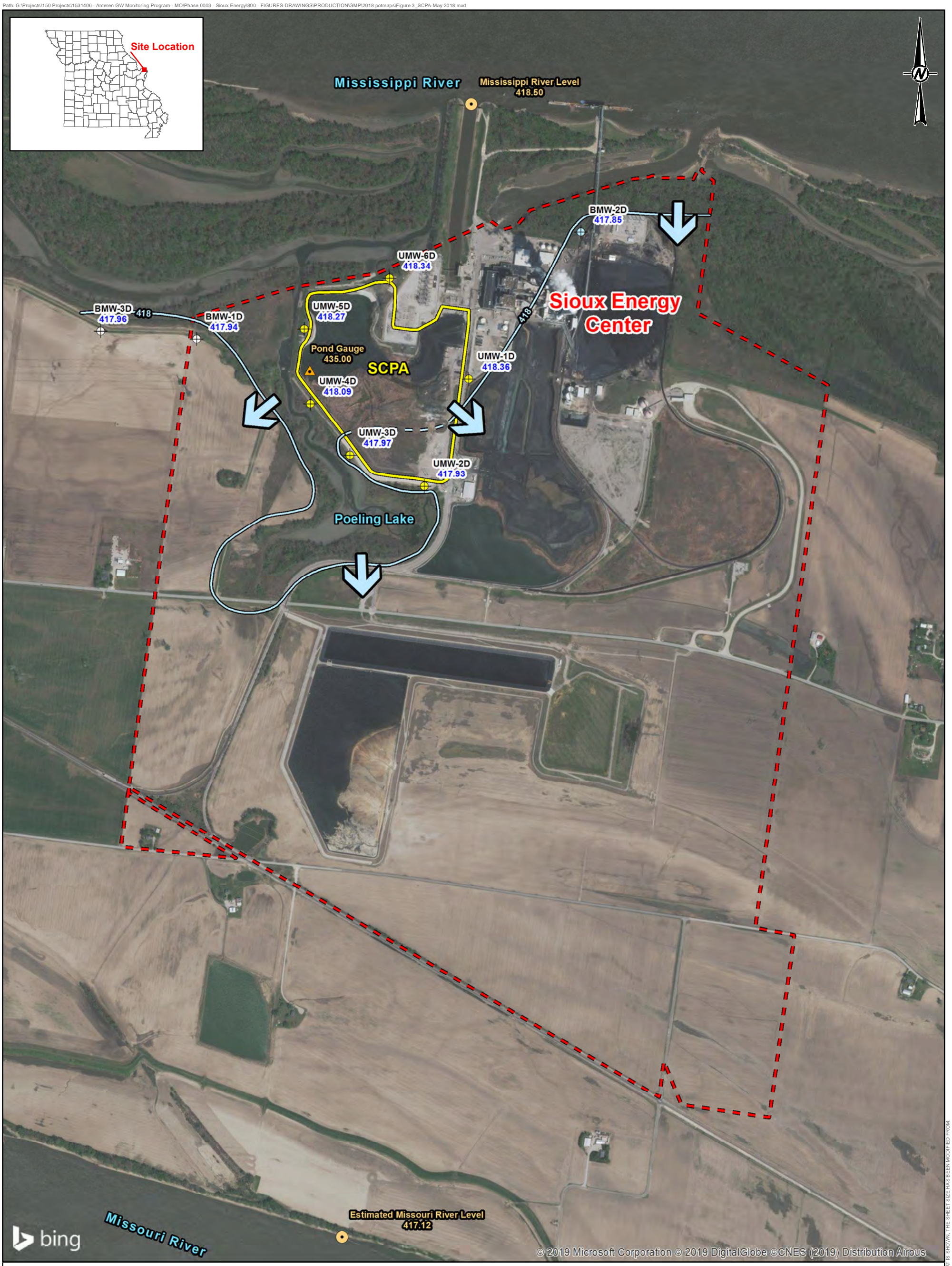
CONSULTANT
GOLDER

YYYY-MM-DD	2018-12-21
PREPARED	EFT
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003 | AMEREN_00001690 | FIGURE D21

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_SCPA-May 2018.mxd



LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.

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).

0 500 1,000 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA POTENTIOMETRIC SURFACE MAP - MAY 14, 2018

CONSULTANT
GOLDER

YYYY-MM-DD	2018-06-28
PREPARED	EFT
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003 | AMEREN_00001691 | FIGURE D22

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 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
SCPB 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 | AMEREN_00001692 | FIGURE **D23**

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 4_SCPA-DM-Nov 2018.mxd

LEGEND

- Sioux Energy Center Property Boundary
- SCPA - Bottom Ash Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- Groundwater Elevation Piezometer
- Background Monitoring Well
- SCPA Bottom Ash Surface Impoundment Monitoring Well
- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER MONITORING WELLS SURVEYED BY ZAHNER AND ASSOCIATES, INC. ON JANUARY 14 AND DECEMBER 8, 2016.
3.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
4.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
5.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
6.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.

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).

0 500 1,000 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SCPA 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 | AMEREN_00001693 | FIGURE **D24**

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.
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
SCPB POTENTIOMETRIC SURFACE MAP - NOVEMBER 12, 2018

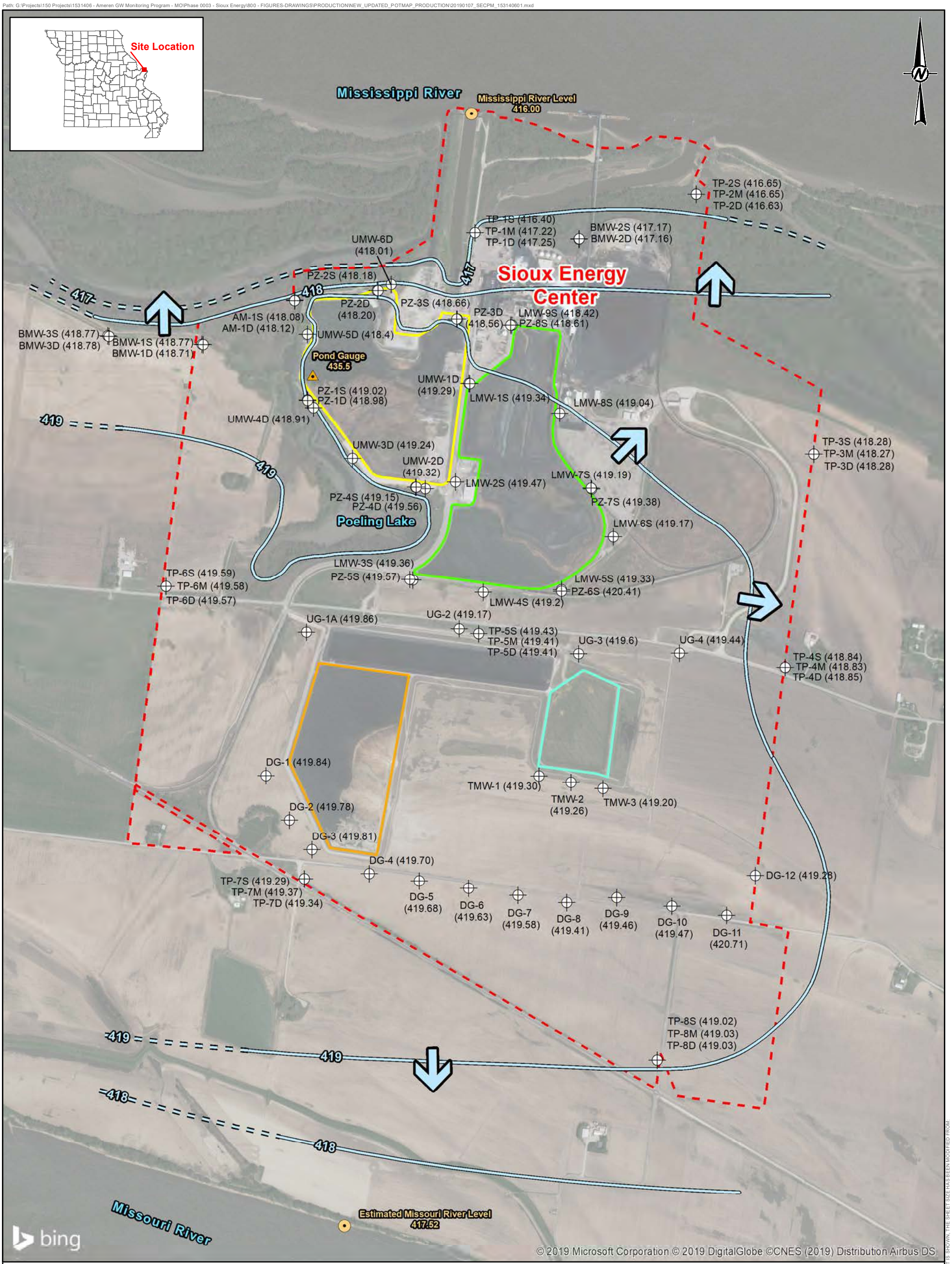
CONSULTANT
GOLDER

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

PROJECT No. 153-1406 | PHASE 0003 | AMEREN_00001694 | FIGURE **D25**

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

Path: G:\Projects\150 Projects\1531406 - Ameren GW Monitoring Program - MO\Phase 0003 - Sioux Energy\800 - FIGURES-DRAWINGS\PRODUCTION\NEW_UPDATED_POTMAP_PRODUCTION\20190107_SECPM_153140601.mxd



LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Surface Impoundment Pond Gauge
- River Gauge Location
- Monitoring Well or Piezometer

0 500 1,000 1,500 2,000 Feet

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) TP-1M, TP-1D, PZ-6S, AND DG-11 WERE NOT USED IN POTENTIOMETRIC COUNTOURING.

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).

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JANUARY 07, 2019 POTENTIOMETRIC SURFACE MAP

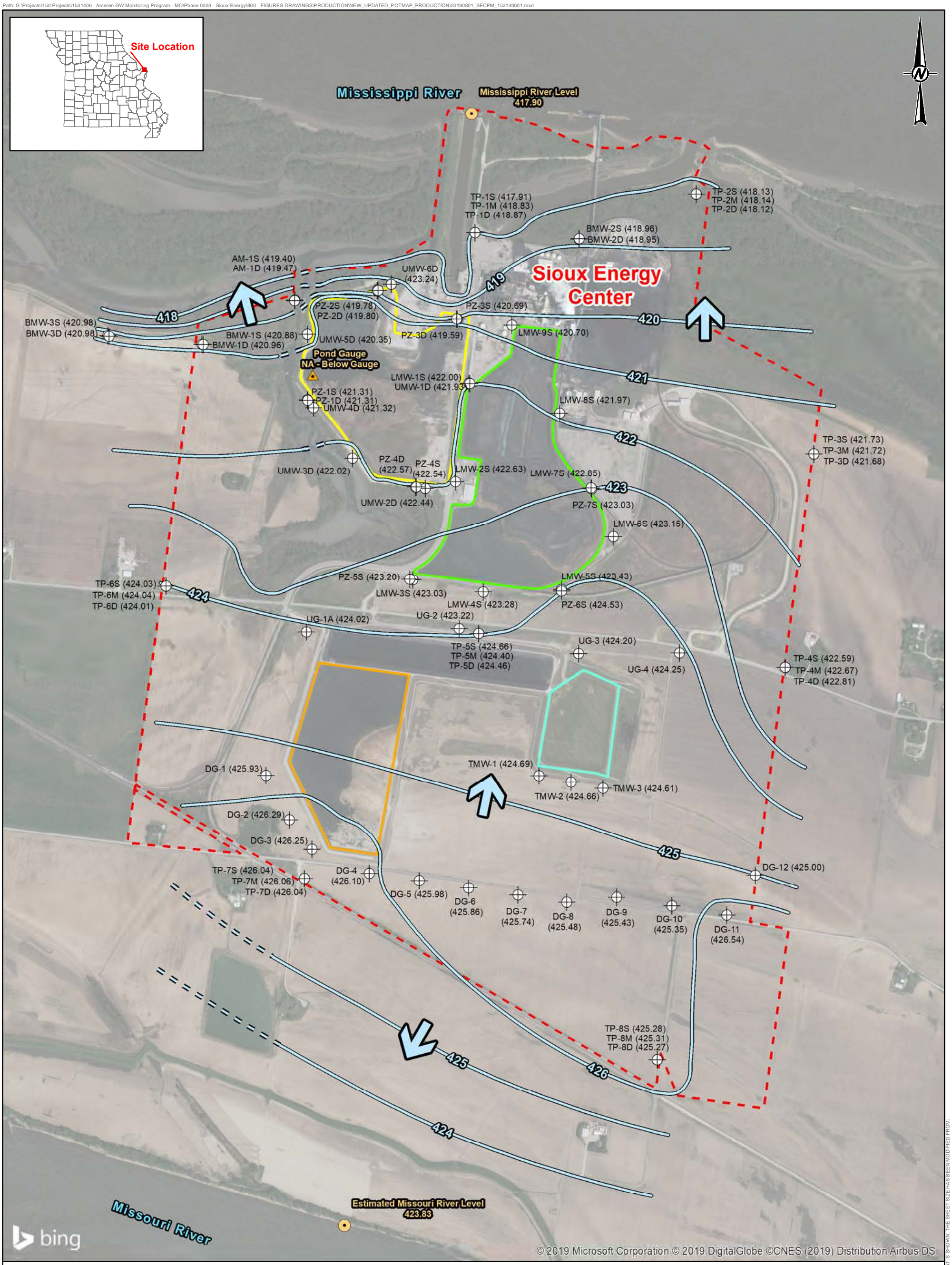
CONSUL˙ GOLDER

YYYY-MM-DD	2019-11-21
PREPARED	JSI
DESIGN	JSI
REVIEW	AMM
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003 | AMEREN_00001695 | FIGURE **D26**

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\NEW_UPDATED_POTMAP_PRODUCTION\20190801_SECPM_153140601.mxd



LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Surface Impoundment Pond Gauge
- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) UMW-6D, TP-1S AND PZ-3D WERE NOT USED IN POTENTIOMETRIC COUNTOURING.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

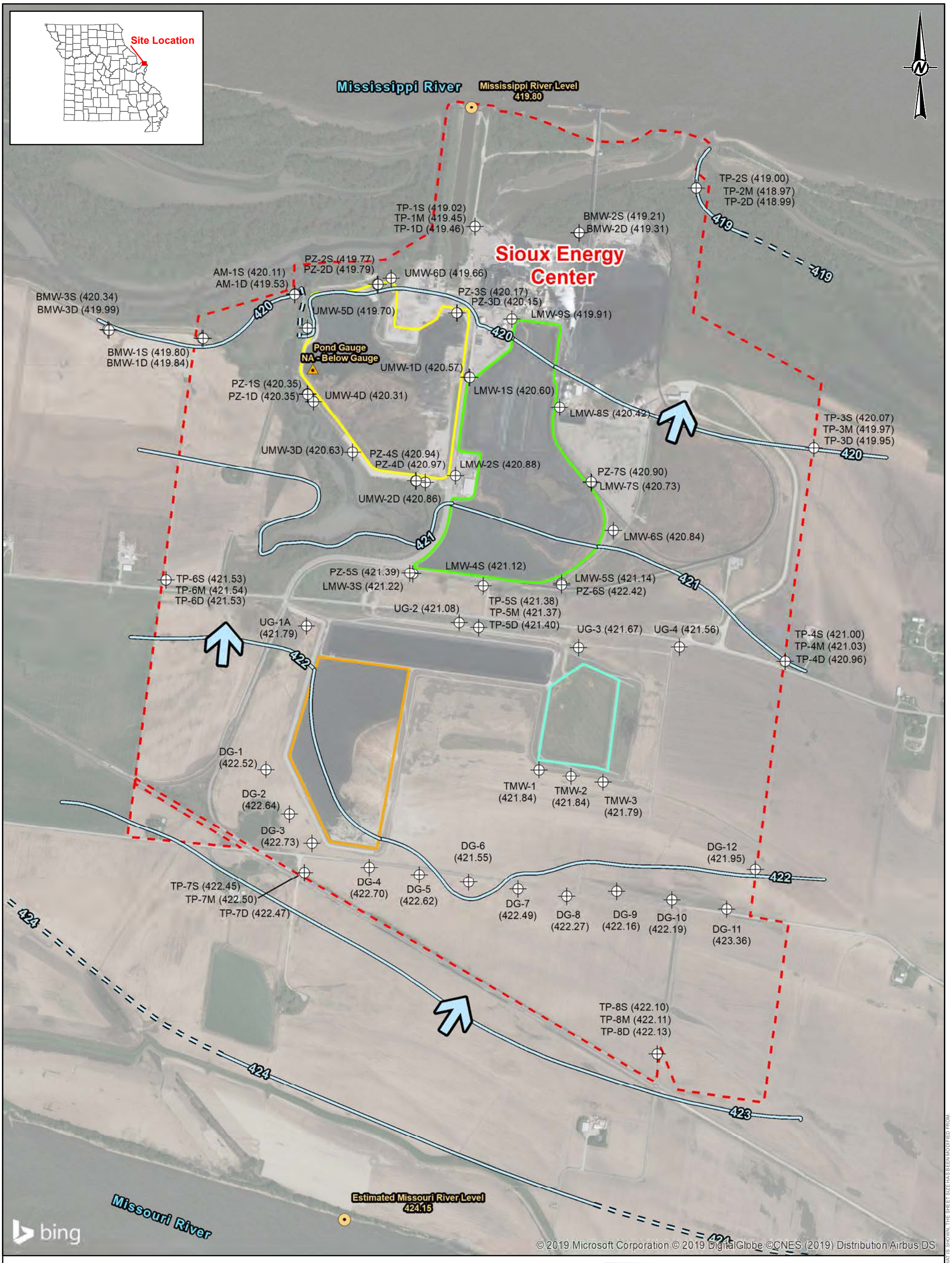
TITLE
AUGUST 1, 2019 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2018-09-04
PREPARED	JSI
DESIGN	JSI
REVIEW	AMM
APPROVED	MNH

PROJECT No. 153-1406 | PHASE 0003 | AMEREN_00001696 | FIGURE D27

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



LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Surface Impoundment Pond Gauge
- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) DG-11, PZ-6S AND TP-2S WERE NOT USED IN POTENTIOMETRIC COUNTOURING.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
OCTOBER 1, 2019 POTENTIOMETRIC SURFACE MAP

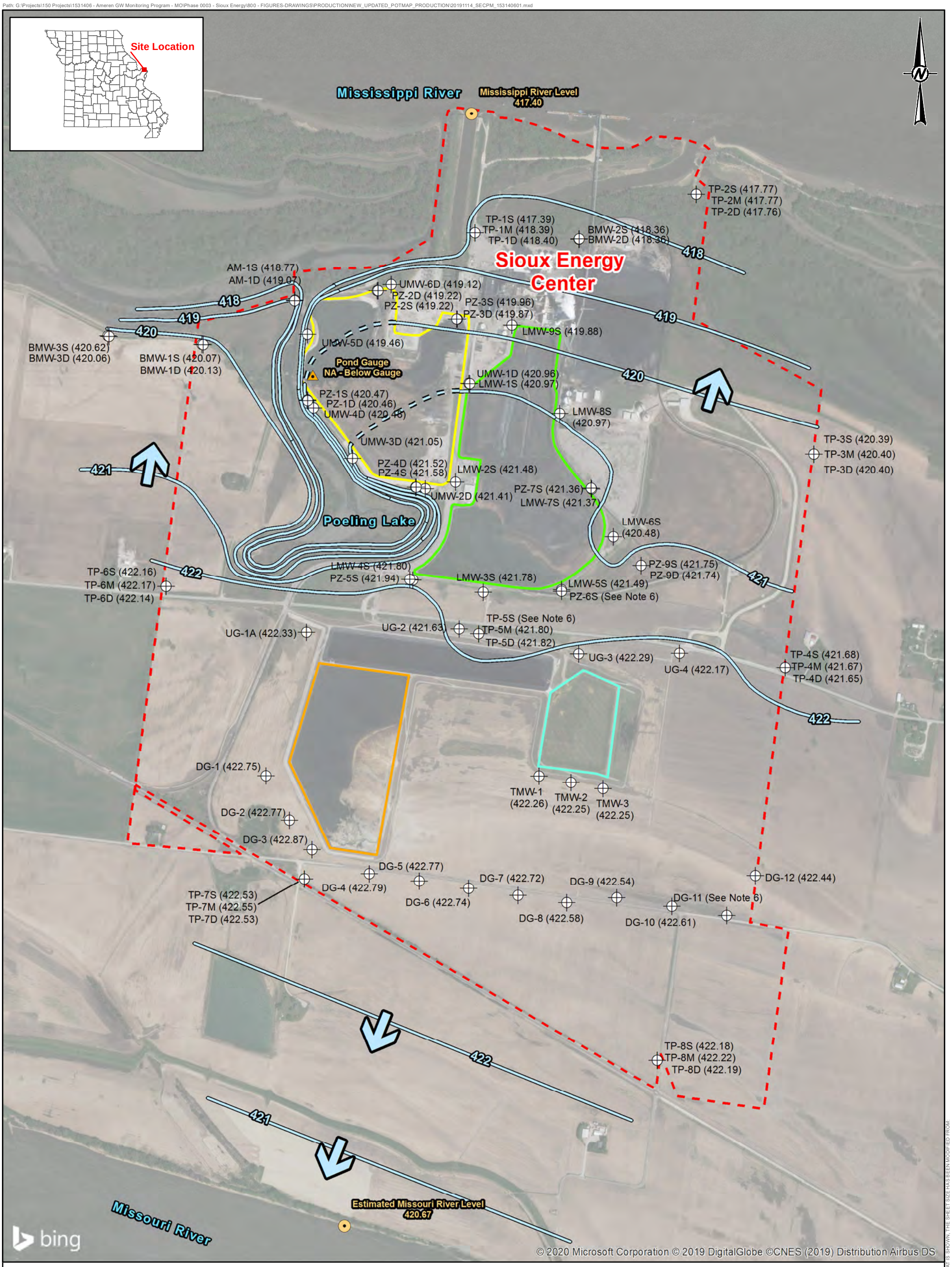
CONSULTANT
GOLDER

YYYY-MM-DD	2019-10-21
PREPARED	AMM
DESIGN	JSI
REVIEW	BCW
APPROVED	MNH

PROJECT No. 153-1406
PHASE 0003
AMEREN_00001697
FIGURE **D28**

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\NEW_UPDATED_POTMAP_PRODUCTION\20191114_SECPM_153140601.mxd



LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Surface Impoundment Pond Gauge
- River Gauge Location
- Monitoring Well or Piezometer

0 500 1,000 1,500 2,000 Feet

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) DG-11, PZ-6S AND TP-5S WERE NOT USED IN POTENTIOMETRIC CONTOURING.

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).

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
NOVEMBER 13, 2019 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-01-07
PREPARED	EMS
DESIGN	JSI
REVIEW	TJG
APPROVED	CMR

PROJECT No. 153-140601
PHASE 0003
AMEREN_00001698
FIGURE **D29**

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

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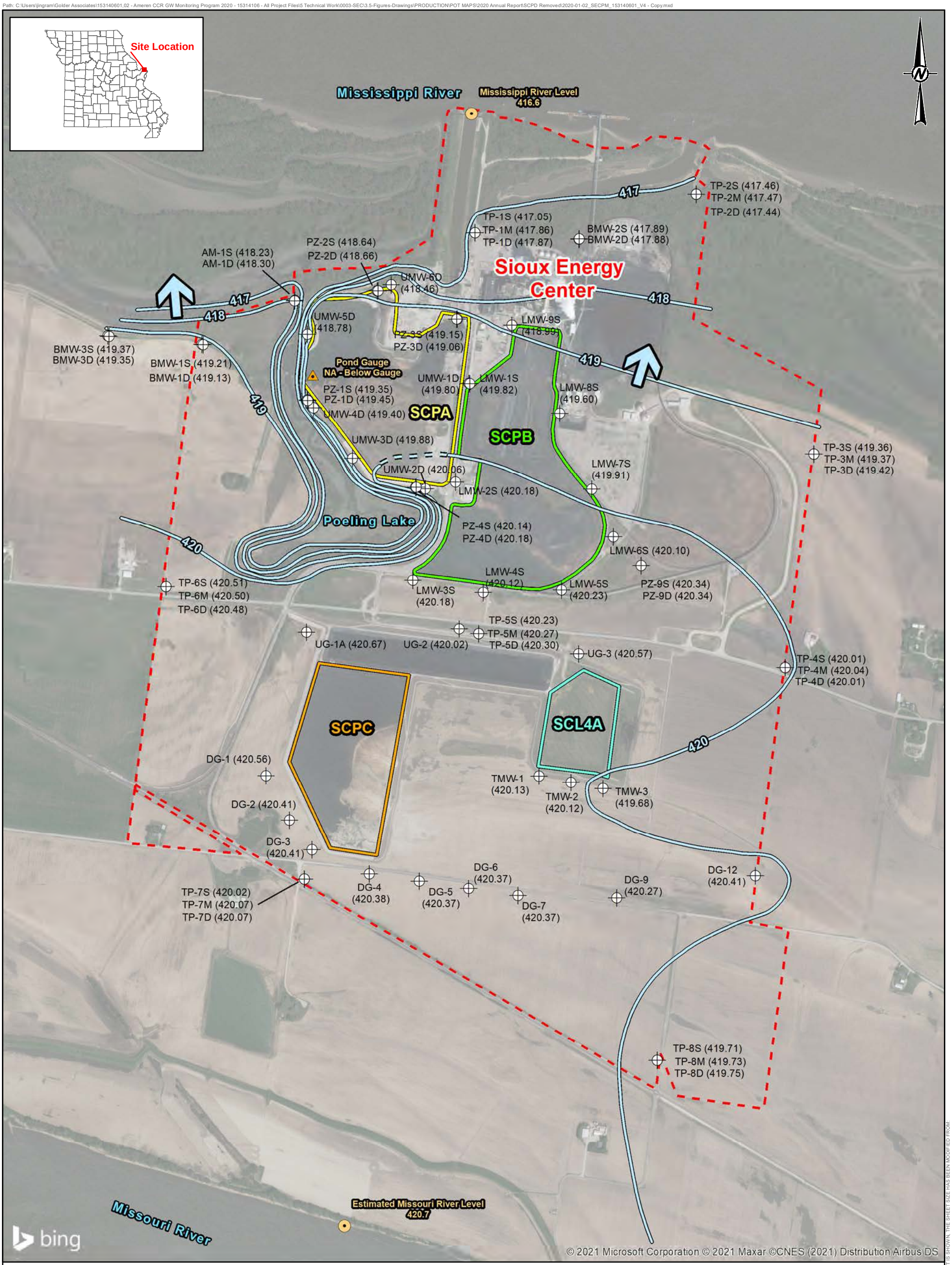

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JANUARY 02, 2020 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-02-10
PREPARED	BTT
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153-140602 | PHASE 0003 | AMEREN_00001699 | FIGURE **D30**

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

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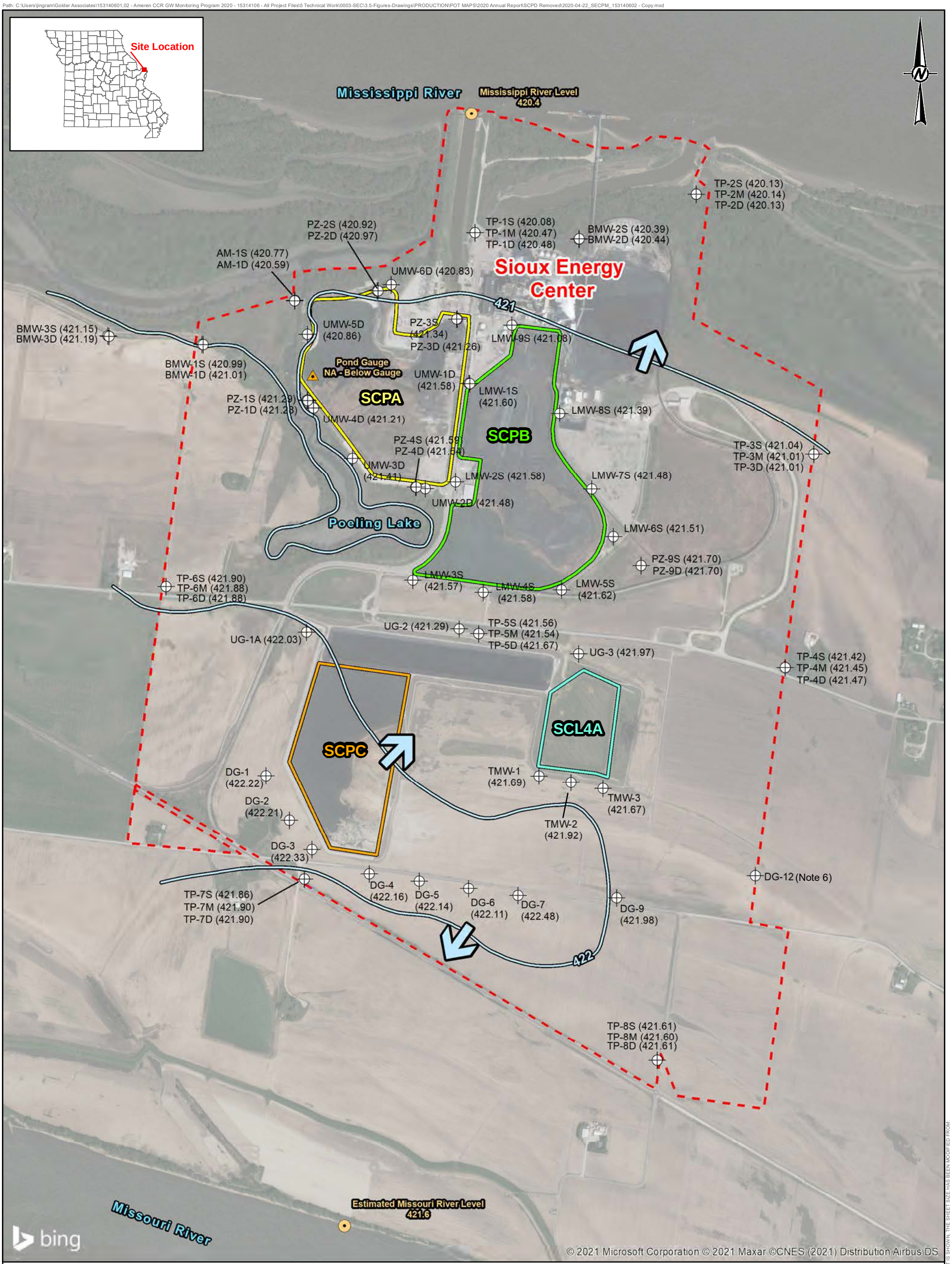

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) DG-12 WAS NOT USED FOR POTENTIOMETRIC SURFACE MAP CONTOURING DUE TO WATER LEVEL MEASUREMENT ERROR.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
APRIL 22, 2020 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-05-14
PREPARED	BTT
DESIGN	JSI
REVIEW	KAB
APPROVED	MNH

PROJECT No. 153-140602 | PHASE 0003 | AMEREN_00001700 | FIGURE **D31**

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

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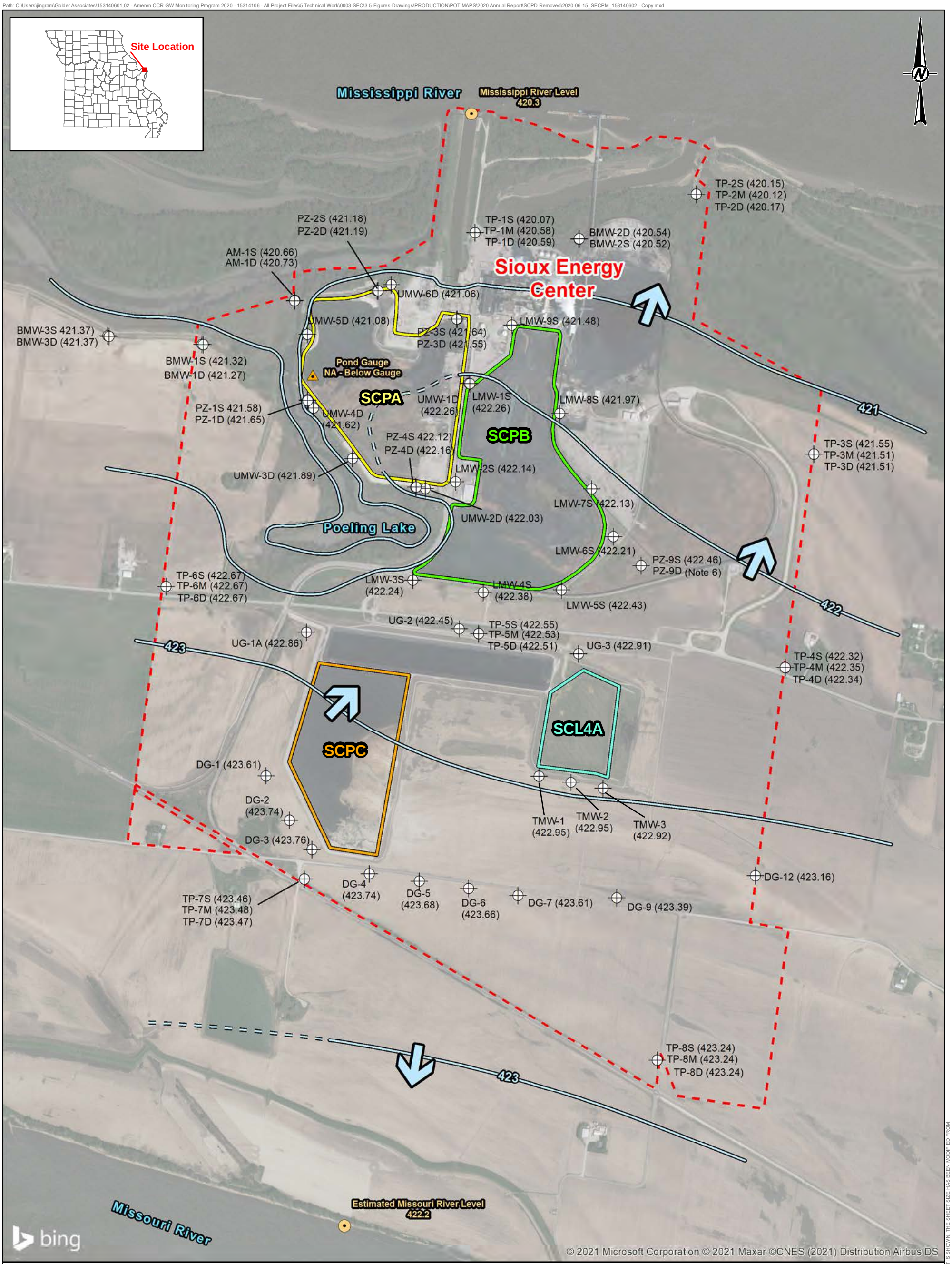

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) PZ-9D WAS NOT USED FOR POTENTIOMETRIC SURFACE MAP CONTOURING DUE TO WATER LEVEL MEASUREMENT ERROR.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JUNE 15, 2020 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-06-24
PREPARED	BTT
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153-140602 | PHASE 0003 | AMEREN_00001701 | FIGURE **D32**

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

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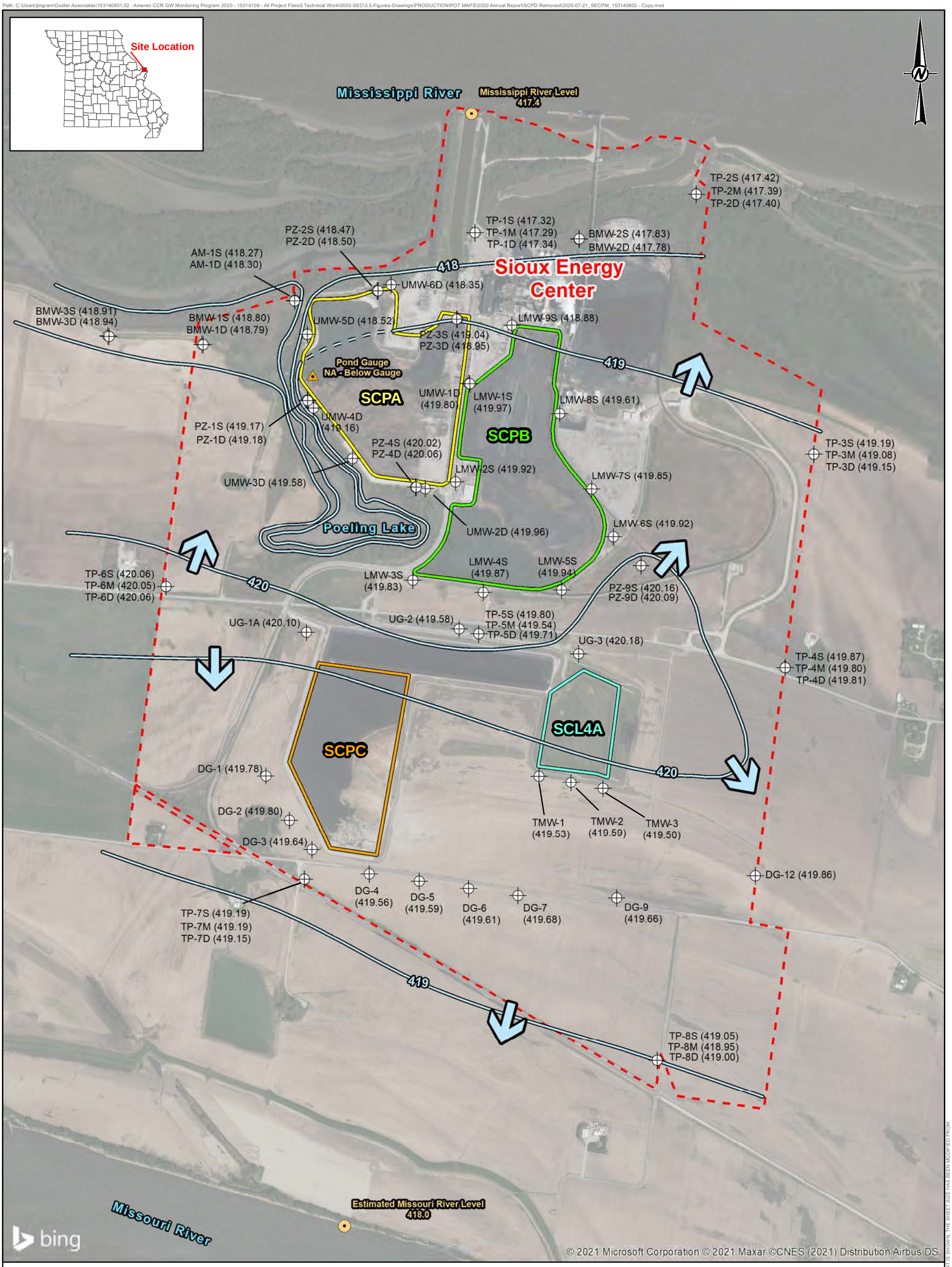

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JULY 21, 2020 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-08-10
PREPARED	BTT
DESIGN	JSI
REVIEW	KAB
APPROVED	MNH

PROJECT No. 153-140602
PHASE 0003
AMEREN_00001702
FIGURE D33

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

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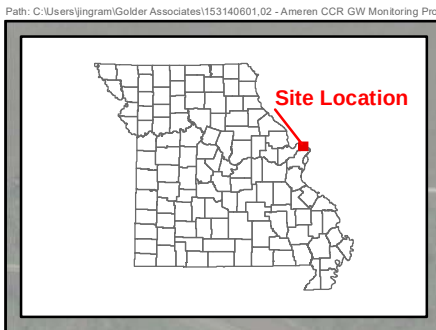

Mississippi River
Mississippi River Level
418.9
Sioux Energy Center
TP-2S (418.44)
TP-2M (418.45)
TP-2D (418.42)
TP-1S (418.57)
TP-1M (418.58)
TP-1D (418.55)
BMW-2S (418.45)
BMW-2D (418.54)
PZ-2S (419.02)
PZ-2D (418.78)
AM-1S (418.69)
AM-1D (418.55)
UMW-6D
(418.74)
PZ-3S (419.15)
PZ-3D (419.08)
BMW-3S (418.24)
BMW-3D (418.07)
BMW-1S (418.36)
BMW-1D (418.27)
UMW-5D
(418.59)
LMW-9S (418.76)
UMW-1D
(419.23)
Pond Gauge
NA - Below Gauge
SCPA
PZ-1S (418.48)
PZ-1D (418.50)
LMW-1S
(419.35)
LMW-8S (418.58)
UMW-4D
(Note 6)
SCPB
PZ-4S (418.43)
PZ-4D (418.47)
TP-3S (418.35)
TP-3M (418.34)
TP-3D (418.34)
UMW-3D (418.25)
LMW-2S (418.47)
LMW-7S (418.32)
Poeling Lake
UMW-2D (418.35)
LMW-6S (418.06)
TP-6S (417.50)
TP-6M (417.52)
TP-6D (417.47)
LMW-3S
(417.56)
LMW-4S
(417.61)
LMW-5S (417.70)
PZ-9S (418.17)
PZ-9D (418.17)
UG-2 (417.16)
TP-5S (417.38)
TP-5M (417.39)
TP-5D (417.40)
UG-1A (417.45)
UG-3 (417.75)
TP-4S (417.74)
TP-4M (417.66)
TP-4D (417.71)
SCPC
SCL4A
DG-1 (415.70)
DG-2 (415.73)
DG-3 (415.78)
TMW-1
(416.37)
TMW-2
(416.39)
TMW-3 (416.36)
DG-12 (416.70)
TP-7S (415.16)
TP-7M (415.15)
TP-7D (415.17)
DG-4
(415.66)
DG-5
(415.72)
DG-6
(415.84)
DG-7
(415.96)
DG-9 (416.17)
TP-8S (415.02)
TP-8M (415.00)
TP-8D (415.00)
Missouri River
Estimated Missouri River Level
414.6
418
417
416
415
419
bing
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LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) UMW-4D WAS NOT USED IN POTENTIOMETRIC SURFACE CONTOURING DUE TO WATER LEVEL MEASUREMENT ERROR.

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), 05587450 (GRAFTON).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
SEPTEMBER 28, 2020 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-12
PREPARED	BTT
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153-140602 | PHASE 0003 | AMEREN_00001703 | FIGURE **D34**

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

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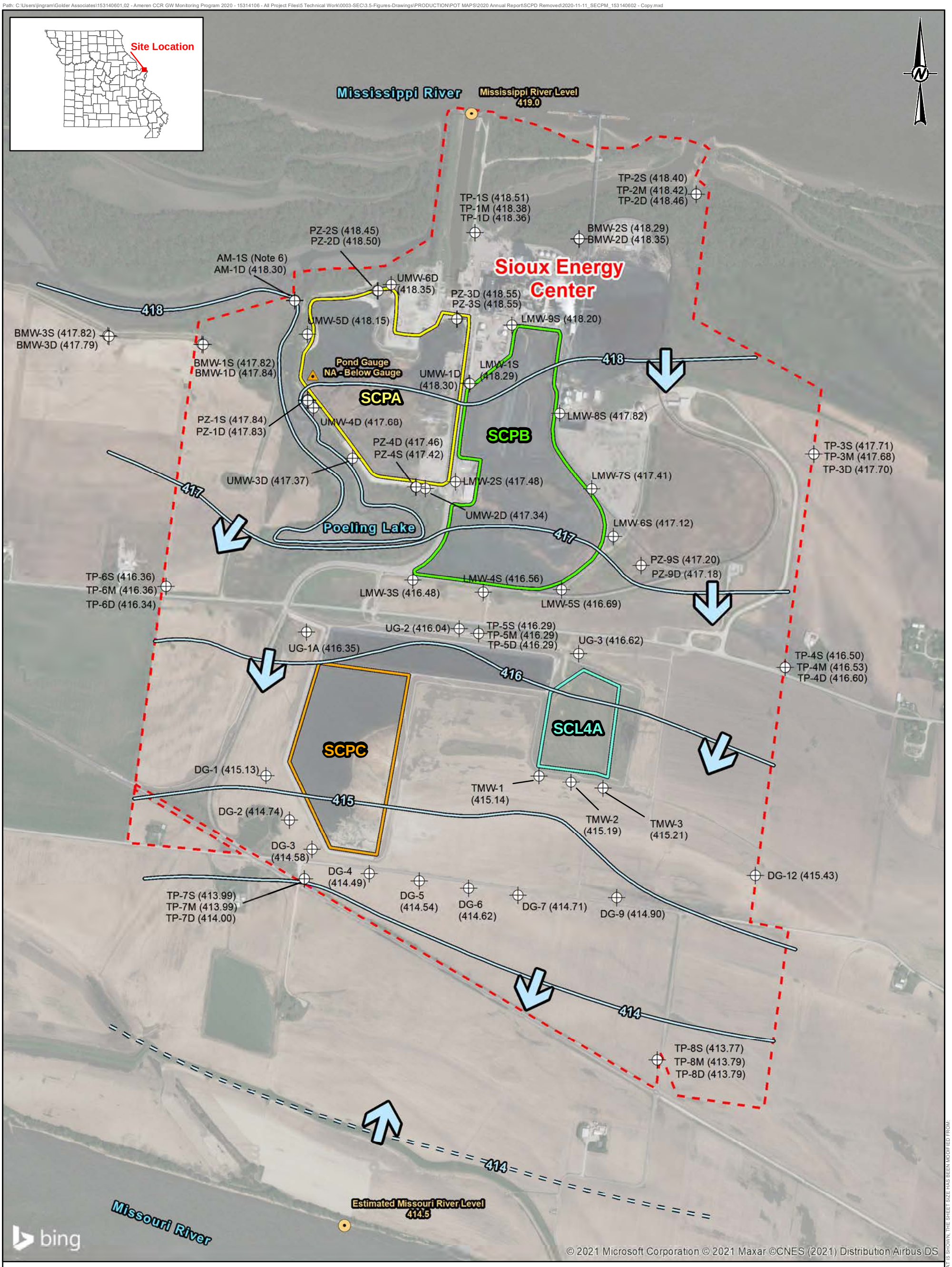

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- SCPA Bottom Ash Surface Impoundment Gauge
- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) AM-1S WAS NOT USED IN POTENTIOMETRIC SURFACE CONTOURING DUE TO WATER LEVEL MEASUREMENT ERROR.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
NOVEMBER 11, 2020 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-11-25
PREPARED	BTT
DESIGN	JSI
REVIEW	BTT
APPROVED	MNH

PROJECT No. 153-140602 | PHASE 0003 | AMEREN_00001704 | FIGURE **D35**

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

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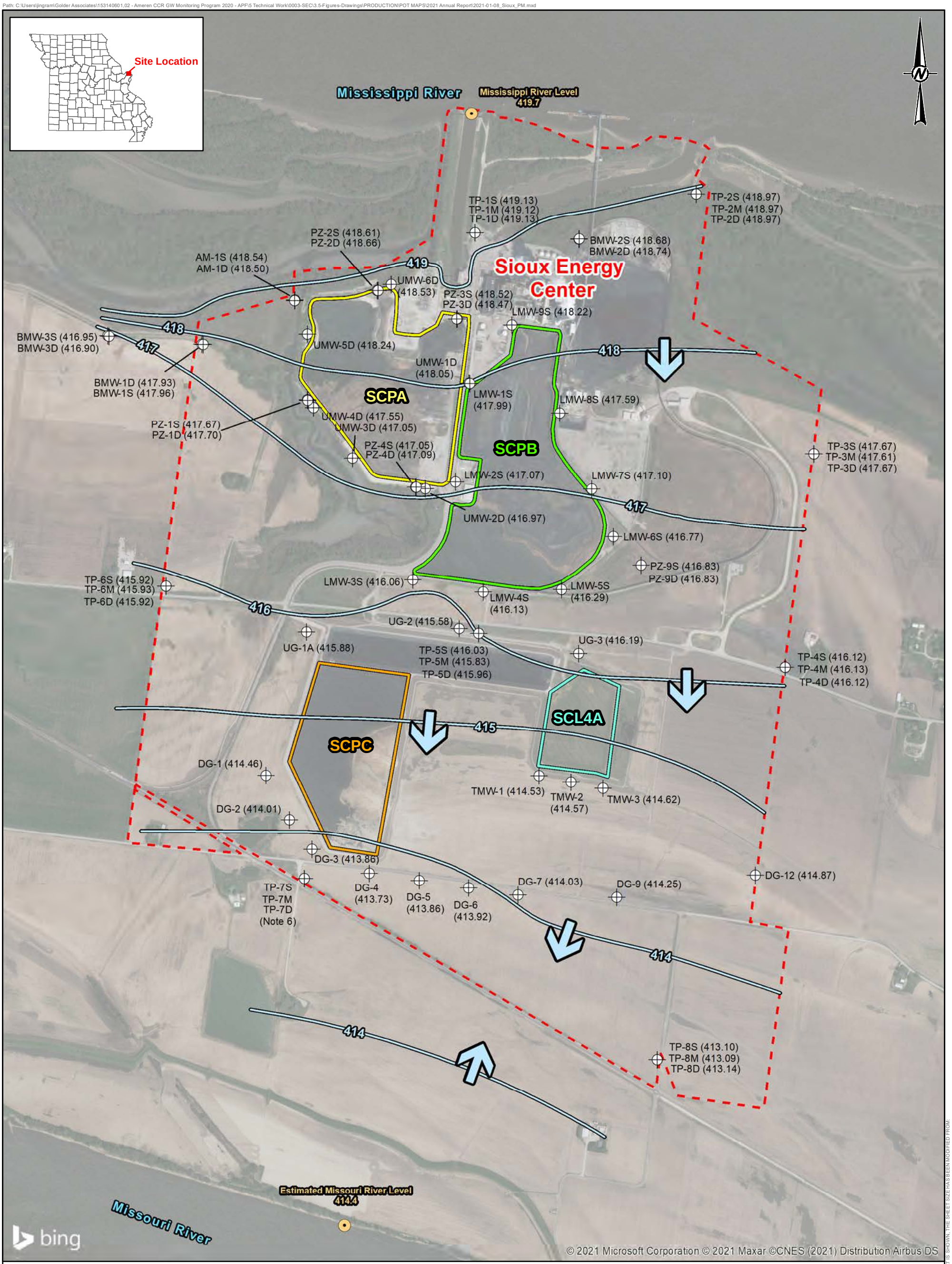

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) TP-7S, TP-7M, AND TP-7D WERE NOT USED IN POTENTIOMETRIC CONTOURING DUE TO MEASUREMENT ERROR.
7.) WFGD - WET FLUE GAS DESULURIZATION.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JANUARY 8, 2021 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-01-28
PREPARED	BTT
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153-140603
PHASE 0003
AMEREN_00001705
FIGURE **D36**

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

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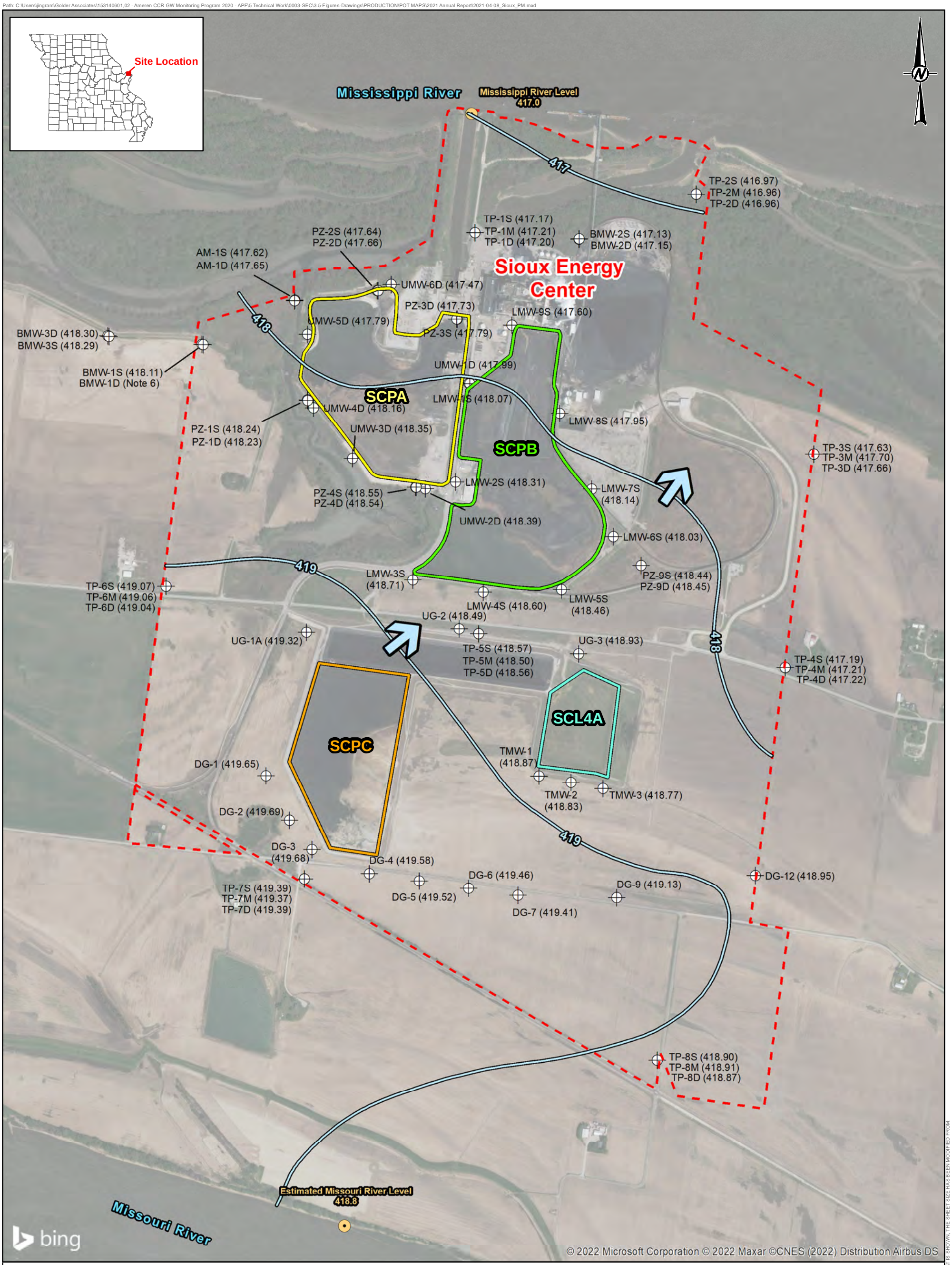

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) BMW-1D IS NOT USED FOR POTENTIOMETRIC CONTOURING DUE TO MEASUREMENT ERROR.
7.) WFGD - WET FLU GAS DESULURIZATION.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
APRIL 8, 2021 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-05-10
PREPARED	BTT
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153-140603 | PHASE 0003 | AMEREN_00001706 | FIGURE **D37**

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

Path: C:\Users\jingram\Golder Associates\153140601,02 - Ameren CCR GW Monitoring Program 2020 - APF\5 Technical Work\0003-SEC\3.5-Figures-Drawings\PRODUCTION\POT MAPS\2021 Annual Report\2021-06-01_Sioux_PM.mxd

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) WFGD - WET FLUE GAS DESULURIZATION.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JUNE 1, 2021 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-10-11
PREPARED	ETF
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153-140603 | PHASE 0003 | AMEREN_00001707 | FIGURE **D38**

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

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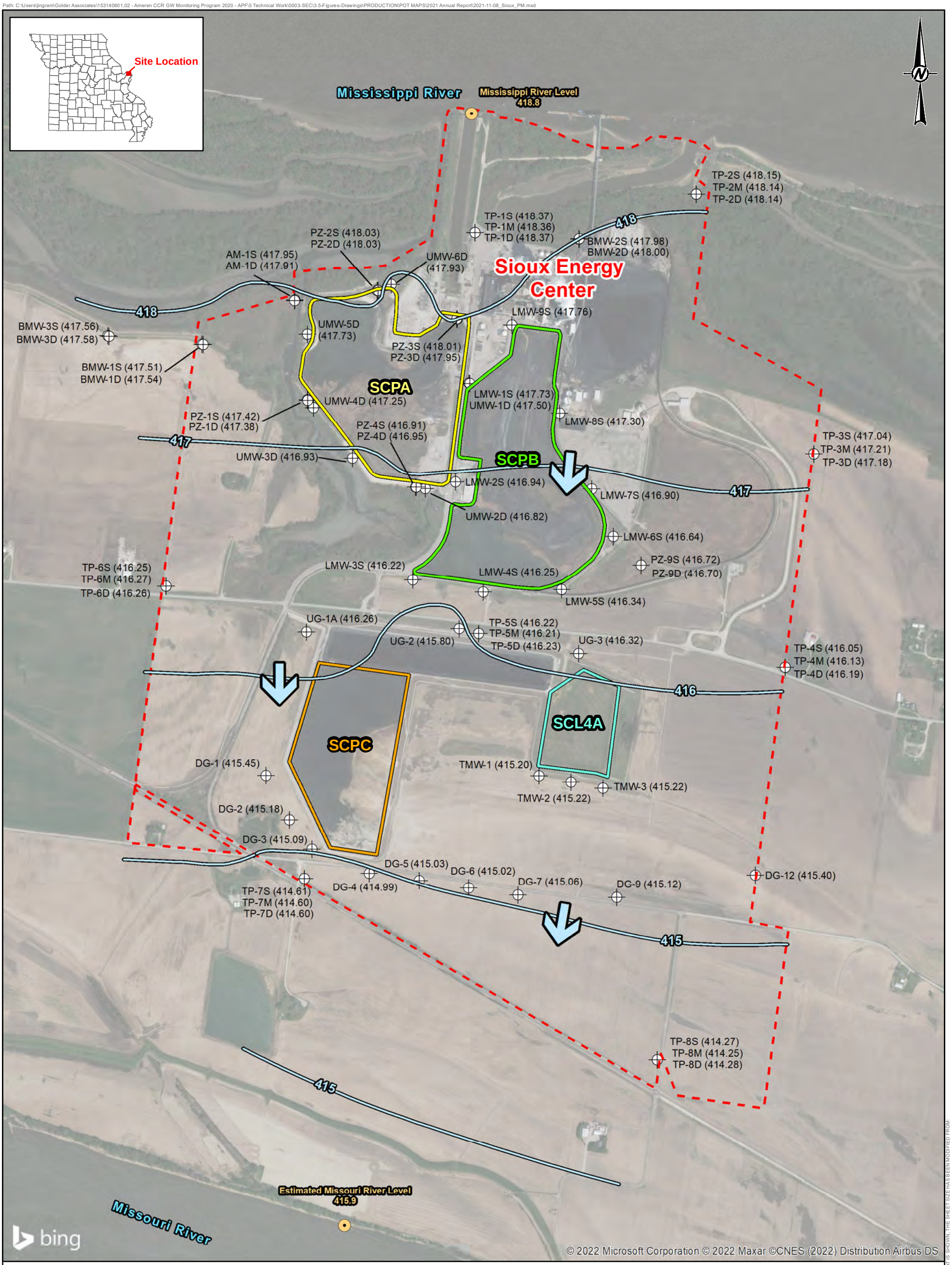

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundmet
- SCL4A - Dry CCR Disposal Area
- Groundwater Flow Direction

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
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5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) WFGD - WET FLUE GAS DESULURIZATION.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
NOVEMBER 8, 2021 POTENTIOMETRIC SURFACE MAP

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-12-02
PREPARED	ETF
DESIGN	JSI
REVIEW	BTT
APPROVED	MNH

PROJECT No. 153-140603 | PHASE 0003 | AMEREN_00001708 | FIGURE **D39**

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

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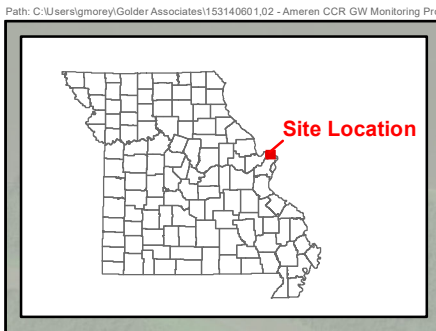

Mississippi River
Mississippi River Level
419.4
Sioux Energy Center
TP-1S (418.44)
TP-1M (418.47)
TP-1D (418.47)
TP-2S (418.44)
TP-2M (418.40)
TP-2D (418.43)
PZ-2S (418.17)
PZ-2D (418.01)
BMW-2S (418.36)
BMW-2D (418.45)
AM-1S (418.10)
AM-1D (418.05)
UMW-6D (418.10)
LMW-9S (417.73)
PZ-3S (418.01)
PZ-3D (417.98)
UMW-5D (417.70)
BMW-3S (417.27)
BMW-3D (417.19)
BMW-1S (417.23)
BMW-1D (417.24)
UMW-1D (417.33)
PZ-1S (416.97)
PZ-1D (417.01)
SCPA
SCPB
UMW-4D (416.77)
LMW-1S (417.50)
LMW-8S (416.92)
UMW-3D (416.24)
LMW-2S (415.22)
LMW-7S (416.34)
TP-3S (416.98)
TP-3M (416.98)
TP-3D (416.99)
PZ-4S (416.14)
PZ-4D (416.00)
UMW-2D (416.05)
LMW-6S (415.87)
LMW-3S (415.01)
PZ-9S (415.78)
PZ-9D (415.90)
TP-6S (417.94)
TP-6M (417.94)
TP-6D (417.91)
LMW-5S (415.09)
LMW-4S (415.09)
UG-2 (414.49)
UG-3 (415.05)
UG-1A (414.74)
TP-5S (414.84)
TP-5M (414.80)
TP-5D (415.10)
TP-4S (413.91)
TP-4M (413.89)
TP-4D (413.90)
SCL4A
SCPC
SCPD
DG-1 (413.12)
TMW-1 (413.22)
TMW-2 (413.24)
TMW-3 (413.29)
DG-2 (412.62)
DG-3 (412.43)
DG-5 (412.37)
DG-12 (413.55)
DG-4 (412.32)
DG-7 (412.61)
DG-6 (412.49)
DG-9 (412.82)
TP-7S (411.79)
TP-7M (411.81)
TP-7D (411.80)
TP-8S (411.60)
TP-8M (411.61)
TP-8D (411.59)
Estimated Missouri River Level
413.9
Missouri River
415
416
417
418
419
414
413
412
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Proposed SCPD - WFGD Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer
- Groundwater Flow Direction

0 500 1,000 1,500 2,000 Feet

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) WFGD - WET FLU 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).

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
FEBRUARY 7, 2022 POTENTIOMETRIC SURFACE MAP

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-03-23
PREPARED	GTM
DESIGN	JSI
REVIEW	SSS
APPROVED	MNH

PROJECT No. 153140604
PHASE 0003
AMEREN_00001709
FIGURE **D40**

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

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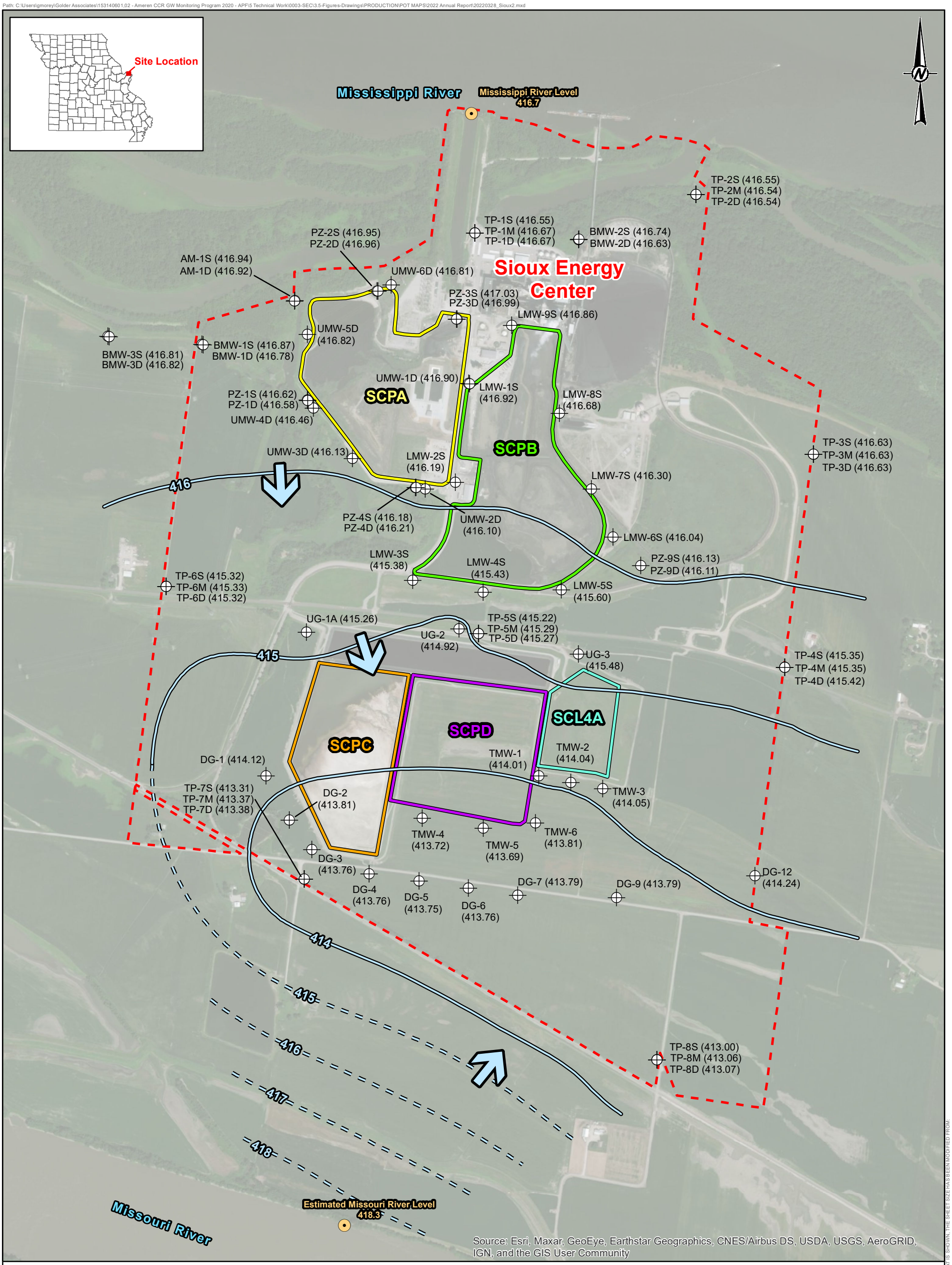

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

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- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Proposed SCPD - WFGD Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer
- Groundwater Flow Direction

0 500 1,000 1,500 2,000 Feet

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
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5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) WFGD - WET FLUE GAS DESULFURIZATION.
7.) PZ-3S NOT USED IN POTENTIOMETRIC SURFACE MAP.

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).

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
MARCH 28, 2022 POTENTIOMETRIC SURFACE MAP

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-04-26
PREPARED	JSI
DESIGN	JSI
REVIEW	BTT
APPROVED	MNH

PROJECT No. 153140604
PHASE 0003
AMEREN_00001710
FIGURE **D41**

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

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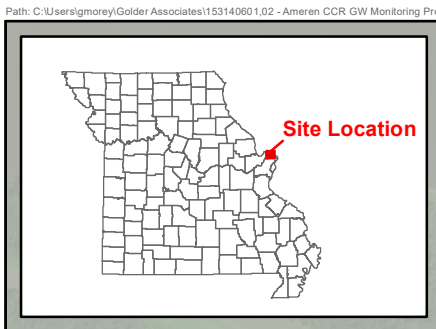

Mississippi River
Mississippi River Level
416.7

TP-1S (416.51)
TP-1M (416.56)
TP-1D (416.57)

Sioux Energy Center

BMW-3S (417.07)
BMW-3D (417.06)
BMW-1S (416.98)
BMW-1D (416.94)

SCPA
SCPB

TP-3S (416.46)
TP-3M (416.46)
TP-3D (416.45)

417

UG-1A (416.65)
UG-2 (416.03)
TP-5S (416.38)
TP-5M (416.38)
TP-5D (416.39)
UG-3 (416.48)

SCL4A
SCPD
SCPC

416

TMW-1 (415.73)
TMW-3 (415.70)
TMW-2 (415.68)
TMW-4 (415.77)
TMW-5 (415.74)
TMW-6 (415.75)

TP-7S (415.69)
TP-7M (415.71)
TP-7D (415.70)
DG-6 (415.91)
DG-9 (415.74)
DG-12 (415.83)

TP-8S (415.25)
TP-8M (415.26)
TP-8D (415.25)

Missouri River
Estimated Missouri River Level
415.7

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

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
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- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Proposed SCPD - WFGD Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) 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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
APRIL 19, 2022 POTENTIOMETRIC SURFACE MAP

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-04-26
PREPARED	JSI
DESIGN	JSI
REVIEW	BTT
APPROVED	MNH

PROJECT No. 153140604
PHASE 0003B
AMEREN_00001711
FIGURE D42

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

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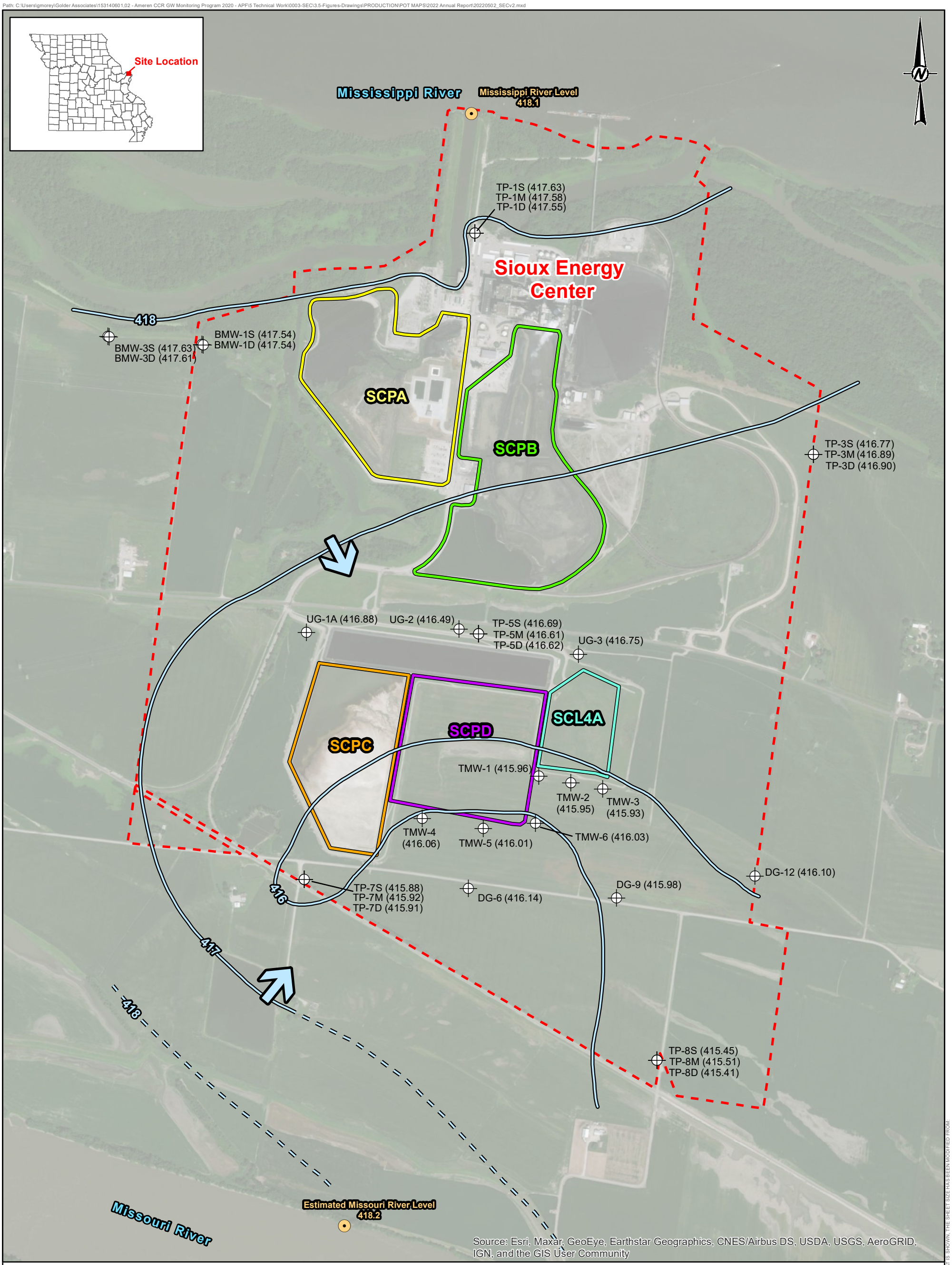

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

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- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- SCPD - Proposed WFGD Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer
- Groundwater Flow Direction

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6.) 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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
MAY 2, 2022 POTENTIOMETRIC SURFACE MAP

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-03
PREPARED	GTM
DESIGN	JSI
REVIEW	JSI
APPROVED	MNH

PROJECT No. 153140604 | PHASE 0003B | AMEREN_00001712 | FIGURE **D43**

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

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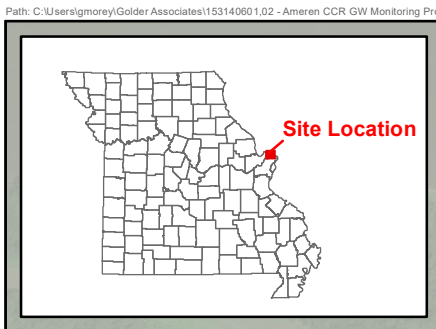

Mississippi River

Mississippi River Level
417.6

TP-1S (417.32)
TP-1M (417.50)
TP-1D (417.54)

Sioux Energy Center

BMW-3S (418.47)
BMW-3D (418.45)

BMW-1S (418.36)
BMW-1D (418.34)

SCPA

SCPB

TP-3S (417.51)
TP-3M (417.55)
TP-3D (417.55)

418

UG-1A (418.82)

UG-2 (417.97)

TP-5S (417.89)
TP-5M (418.36)
TP-5D (418.35)

UG-3 (418.39)

SCPC

SCPD

SCL4A

TMW-1 (418.26)

TMW-2
(418.22)

TMW-3 (418.18)

TMW-4
(418.69)

TMW-5 (418.59)

TMW-6 (418.49)

DG-12 (418.28)

TP-7S (418.93)
TP-7M (418.94)
TP-7D (418.91)

DG-6 (418.92)

DG-9 (418.58)

TP-8S (418.32)
TP-8M (418.38)
TP-8D (418.39)

Missouri River

Estimated Missouri River Level
418.4

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

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Proposed SCPD - WFGD Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer
- Groundwater Flow Direction

NOTES

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4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) 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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
MAY 16, 2022 POTENTIOMETRIC SURFACE MAP

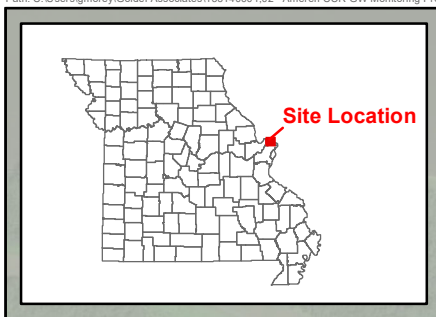
CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-05-18
PREPARED	GTM
DESIGN	JSI
REVIEW	ETF
APPROVED	MNH

PROJECT No. 153140604
PHASE 0003B
AMEREN_00001713
FIGURE D44

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

Path: C:\Users\gmorey\Golder Associates\153140601,02 - Ameren CCR GW Monitoring Program 2020 - APF\5 Technical Work\0003-SEC\3.5-Figures-Drawings\PRODUCTION\POT MAPS\2022 Annual Report\20220606_Sioux.mxd



Mississippi River
Mississippi River Level
417.5
Sioux Energy Center
TP-2S (417.37)
TP-2M (417.39)
TP-2D (417.39)
TP-1S (417.33)
TP-1M (417.59)
TP-1D (417.58)
BMW-2S (417.59)
BMW-2D (417.65)
PZ-2S (418.13)
PZ-2D (418.10)
AM-1S (418.14)
AM-1D (418.14)
UMW-6D (417.93)
PZ-3S (418.22)
PZ-3D (418.20)
LMW-9S (418.06)
418
UMW-5D (418.18)
BMW-1S (418.49)
BMW-1D (418.49)
BMW-3S (418.66)
BMW-3D (418.64)
UMW-1D (418.39)
SCPA
LMW-1S (418.55)
LMW-8S (418.15)
PZ-1S (418.31)
PZ-1D (418.33)
UMW-4D (418.43)
SCPB
TP-3S (417.79)
TP-3M (417.69)
TP-3D (417.77)
UMW-3D (418.53)
LMW-2S (418.52)
LMW-7S (418.22)
419
PZ-4S (418.70)
PZ-4D (418.68)
UMW-2D (418.54)
LMW-6S (418.31)
LMW-3S (418.85)
LMW-4S (418.73)
PZ-9S (418.59)
PZ-9D (418.55)
LMW-5S (418.58)
TP-6S (419.34)
TP-6M (419.35)
TP-6D (419.34)
UG-2 (418.62)
UG-1A (419.50)
TP-5S (418.62)
TP-5M (419.02)
TP-5D (419.01)
UG-3 (419.16)
TP-4S (418.18)
TP-4M (418.15)
TP-4D (418.17)
420
SCPC
SCPD
SCL4A
TMW-1 (419.15)
TMW-2 (419.10)
TMW-3 (419.06)
DG-1 (420.14)
DG-2 (420.21)
TMW-4 (419.69)
TMW-5 (419.57)
TMW-6 (419.49)
DG-3 (420.27)
DG-12 (419.17)
TP-7S (419.83)
TP-7M (420.06)
TP-7D (420.05)
DG-4 (420.21)
DG-5 (420.12)
DG-6 (420.03)
DG-7 (419.92)
DG-9 (419.59)
TP-8S (419.61)
TP-8M (419.55)
TP-8D (419.62)
Estimated Missouri River Level
420.2
Missouri River
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Proposed SCPD - WFGD Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) WFGD - WET FLUE GAS DESULFURIZATION.
7.) TP-7S NOT USED IN POTENTIOMETRIC SURFACE MAP CONTOURING.

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JUNE 6, 2022 POTENTIOMETRIC SURFACE MAP

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-06-14
PREPARED	GTM
DESIGN	JSI
REVIEW	ETF
APPROVED	MNH

PROJECT No. 153140604
PHASE 0003
AMEREN_00001714
FIGURE **D45**

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

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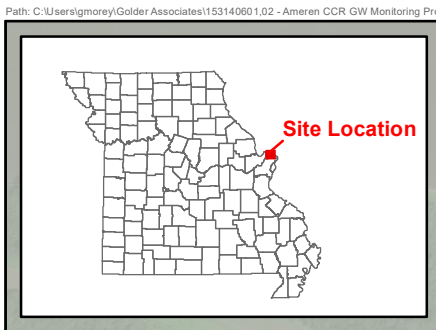


Mississippi River

Mississippi River Level
416.3

TP-1S (416.22)
TP-1M (416.51)
TP-1D (416.51)

Sioux Energy Center

BMW-3S (417.71)
BMW-3D (417.67)

BMW-1S (417.53)
BMW-1D (417.55)

417

SCPA

SCPB

TP-3S (417.33)
TP-3M (417.26)
TP-3D (417.25)

418

UG-1A (418.89)

UG-2 (418.11)

TP-5S (418.66)
TP-5M (418.52)
TP-5D (418.52)

UG-3 (418.63)

SCPC

SCPD

SCL4A

TMW-1
(418.47)

TMW-2
(418.47)

TMW-3 (418.43)

TMW-4
(418.76)

TMW-5 (418.72)

TMW-6 (418.71)

TP-7S (418.72)
TP-7M (418.74)
TP-7D (418.75)

DG-6 (418.94)

DG-9 (418.78)

DG-12 (418.60)

TP-8S (418.36)
TP-8M (418.35)
TP-8D (418.37)

418

Estimated Missouri River Level
417.4

Missouri River

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

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Proposed SCPD - WFGD Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer
- Groundwater Flow Direction

NOTES

1.) ALL LOCATIONS AND BOUNDARIES ARE APPROXIMATE.
2.) GROUNDWATER AND SURFACE WATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
3.) GROUNDWATER ELEVATION MEASUREMENTS OBTAINED BY GOLDER.
4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) 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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JUNE 20, 2022 POTENTIOMETRIC SURFACE MAP

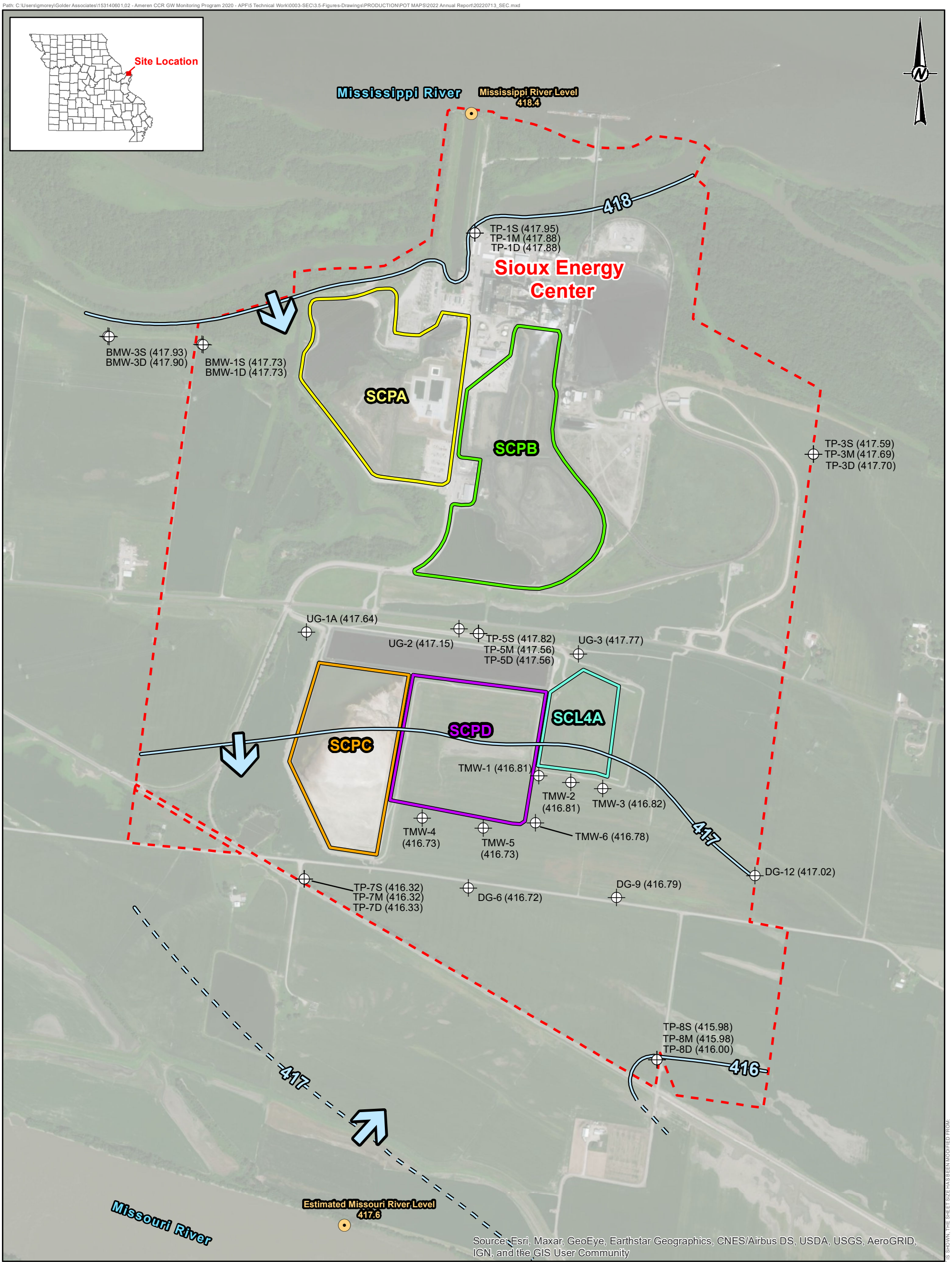
CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-06-20
PREPARED	GTM
DESIGN	JSI
REVIEW	BTT
APPROVED	MNH

PROJECT No. 153140604
PHASE 0003B
AMEREN_00001715
FIGURE **D46**

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

Path: C:\Users\gmorey\Golder Associates\153140601,02 - Ameren CCR GW Monitoring Program 2020 - APF\5 Technical Work\0003-SEC\3.5-Figures-Drawings\PRODUCTION\POT MAPS\2022 Annual Report\20220713_SEC.mxd



LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Proposed SCPD - WFGD Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer
- Groundwater Flow Direction

NOTES

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5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) WFGD - WET FLUE GAS DESULFURIZATION.

REFERENCES

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JULY 13, 2022 POTENTIOMETRIC SURFACE MAP

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-07-15
PREPARED	BTT
DESIGN	JSI
REVIEW	GTM
APPROVED	MNH

PROJECT No. 153140604 | PHASE 0003B | AMEREN_00001716 | FIGURE D47

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

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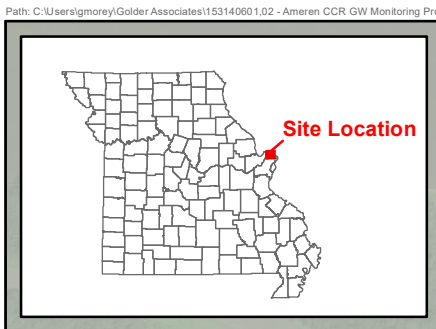

Mississippi River
Mississippi River Level
418.3
TP-1S (417.64)
TP-1M (417.59)
TP-1D (417.59)
Sioux Energy Center
418
BMW-3S (417.57)
BMW-3D (417.55)
BMW-1S (417.37)
BMW-1D (417.37)
SCPA
SCPB
TP-3S (417.33)
TP-3M (417.39)
TP-3D (417.40)
UG-1A (417.00)
UG-2 (416.51)
TP-5S (417.16)
TP-5M (416.91)
TP-5D (416.90)
UG-3 (417.10)
417
SCL4A
SCPD
SCPC
TMW-1 (416.08)
TMW-3 (416.15)
TMW-2 (416.10)
TMW-6 (416.00)
TMW-4 (415.84)
TMW-5 (415.90)
TP-7S (415.23)
TP-7M (415.23)
TP-7D (415.23)
DG-6 (416.07)
DG-9 (416.09)
DG-12 (416.40)
416
TP-8S (414.99)
TP-8M (415.01)
TP-8D (415.00)
415
Missouri River
Estimated Missouri River Level
414.2

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

LEGEND

- Sioux Energy Center Property Boundary

CCR Units

- SCPA - Bottom Ash Surface Impoundment
- SCPB - Fly Ash Surface Impoundment
- SCPC - WFGD Surface Impoundment
- SCL4A - Dry CCR Disposal Area
- Proposed SCPD - WFGD Surface Impoundment

Groundwater Elevation Contour (FT MSL)

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

Ground/Surface Water Measurement Locations

- River Gauge Location
- Monitoring Well or Piezometer
- Groundwater Flow Direction

NOTES

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4.) MISSOURI RIVER ELEVATION ESTIMATED BASED ON NEARBY UNITED STATES GEOLOGICAL SURVEY (USGS) RIVER GAUGING LOCATIONS.
5.) MISSISSIPPI RIVER ELEVATION PROVIDED BY AMEREN MISSOURI.
6.) WFGD - WET FLUE GAS DESULFURIZATION.

REFERENCES

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).

0 500 1,000 1,500 2,000 Feet

CLIENT
AMEREN MISSOURI
SIOUX ENERGY CENTER

PROJECT
CCR GROUNDWATER MONITORING PROGRAM

TITLE
JULY 25, 2022 POTENTIOMETRIC SURFACE MAP

CONSULTANT
WSP GOLDER

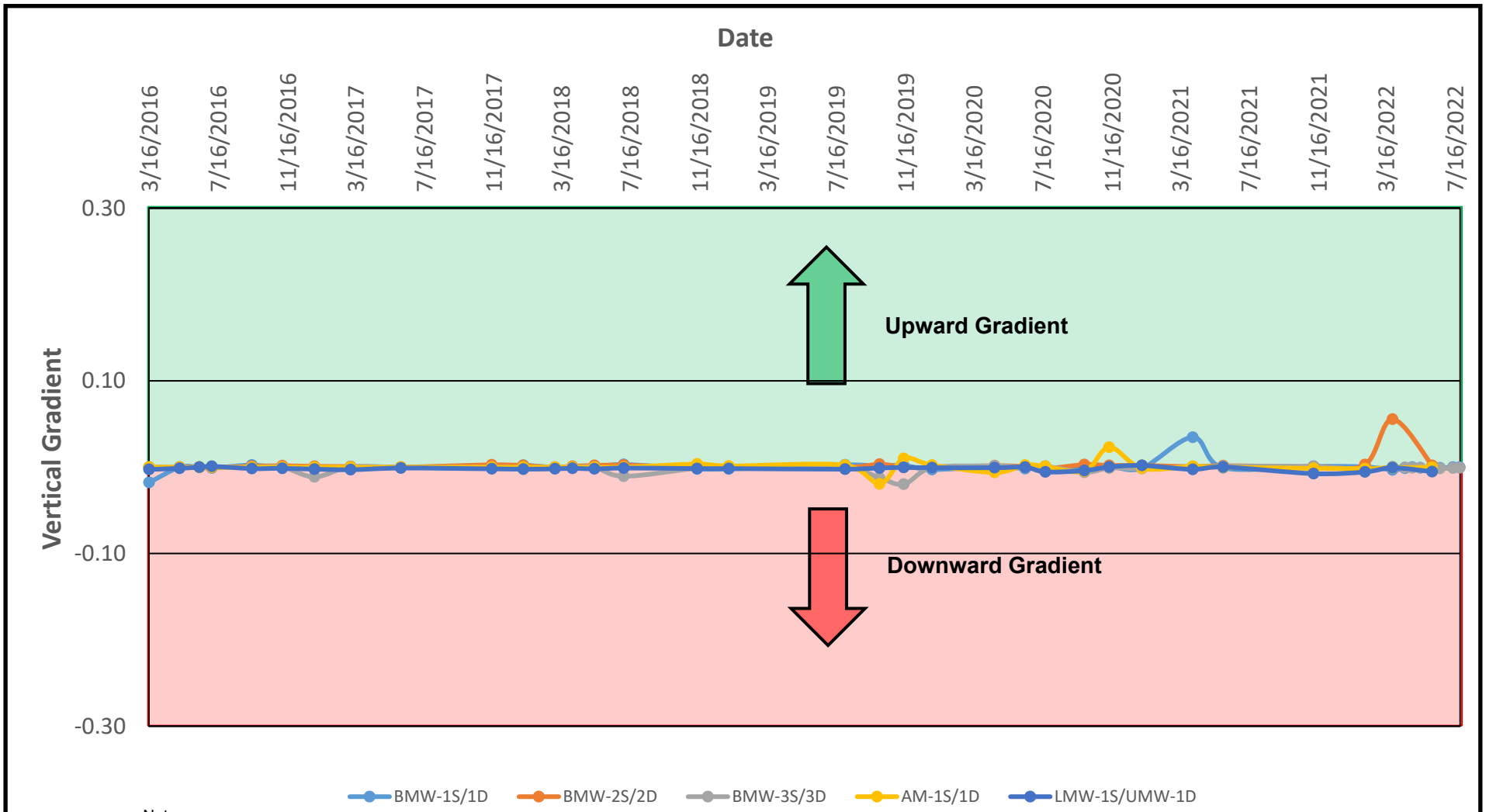
YYYY-MM-DD	2022-07-26
PREPARED	JSI
DESIGN	JSI
REVIEW	EMS
APPROVED	MNH

PROJECT No. 153140604
PHASE 0003B
AMEREN_00001717
FIGURE D48

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

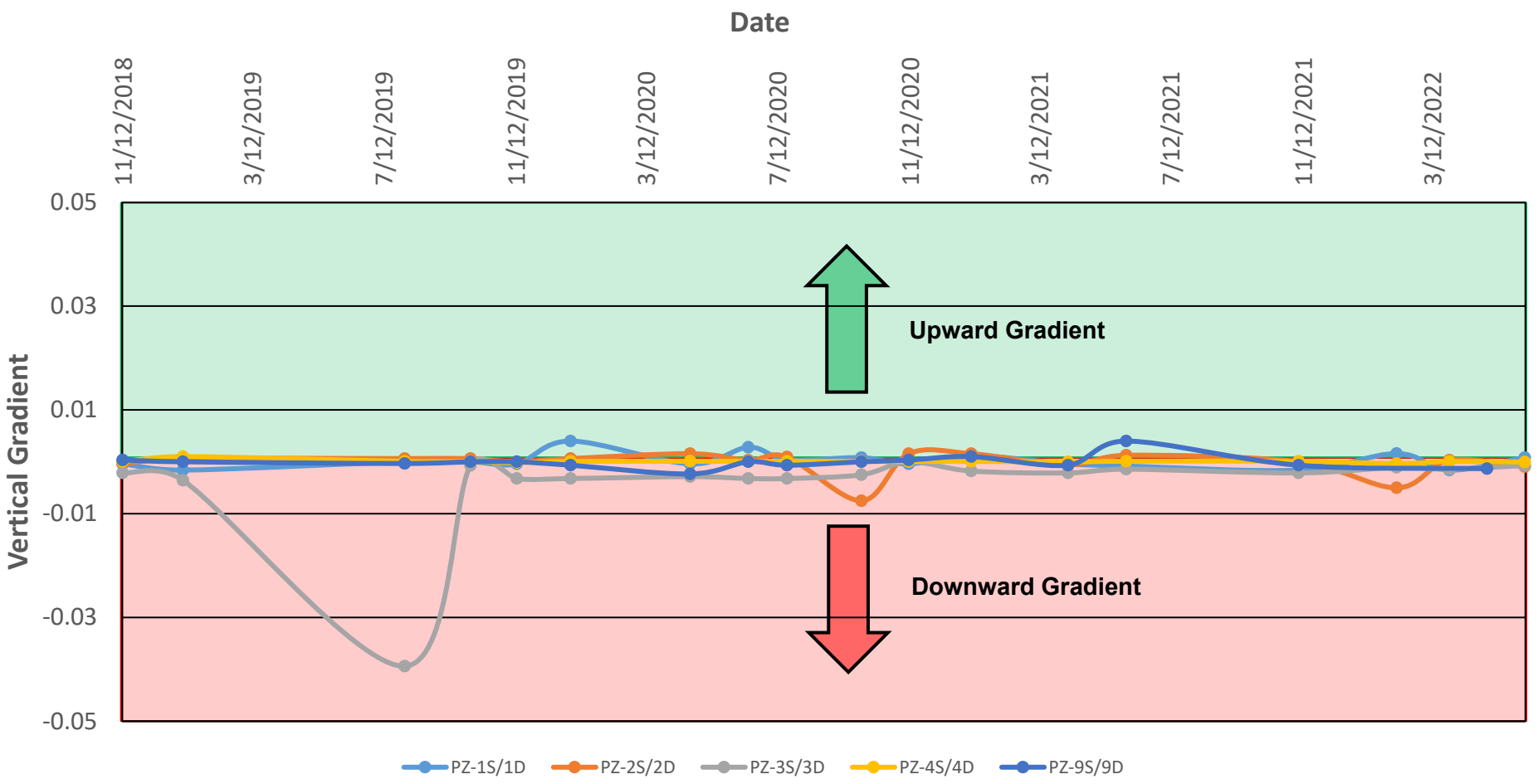
APPENDIX E

Vertical Gradients



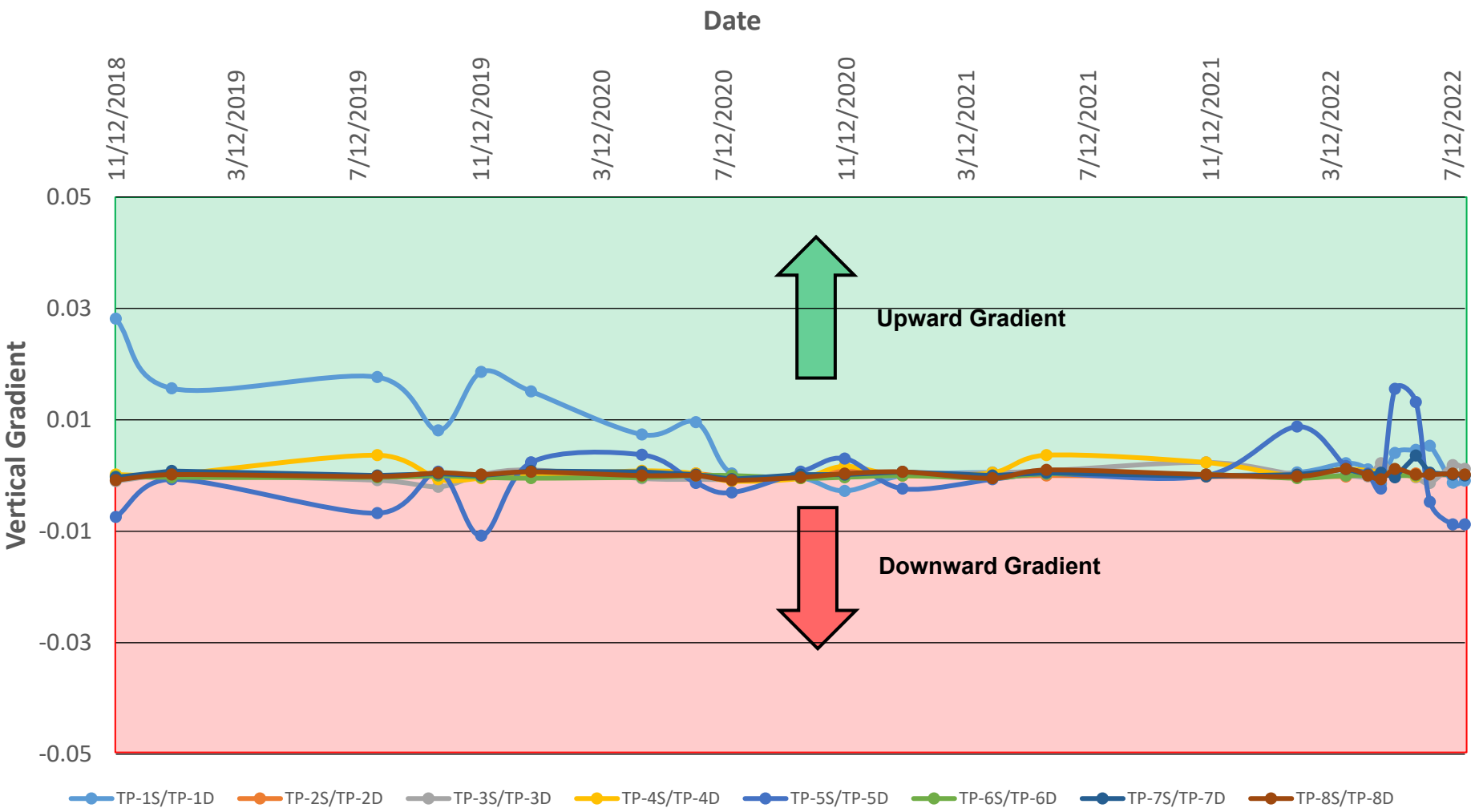
Notes
1) A positive gradient indicates upward flow and is in the green zone.
2) A negative gradient indicates downward flow and is in the red zone.

CLIENT/PROJECT **AMEREN MISSOURI** **SIOUX ENERGY CENTER**							TITLE	**Appendix E: Monitoring Well Vertical Gradients**		
DRAWN BTT	CHECKED GTM	REVIEWED MNH	DATE 2022-07-26	SCALE N/A	FILE NO. N/A	JOB NO. 153140604.0003B	DWG NO. N/A	SUBTITLE N/A	REV. NO. N/A	FIGURE **E1**



Notes
1) A positive gradient indicates upward flow and is in the green zone.
2) A negative gradient indicates downward flow and is in the red zone.

CLIENT/PROJECT							TITLE			
AMEREN MISSOURI **SIOUX ENERGY CENTER**							**Appendix E: Piezometer Vertical Gradients**			
DRAWN	CHECKED	REVIEWED	DATE	SCALE	FILE NO.	JOB NO.	DWG NO.	SUBTITLE	REV. NO.	FIGURE
BTT	GTM	MNH	2022-07-26	N/A	N/A	153140604.0003B	N/A	N/A	N/A	**E2**



Notes
1) A positive gradient indicates upward flow and is in the green zone.
2) A negative gradient indicates downward flow and is in the red zone.

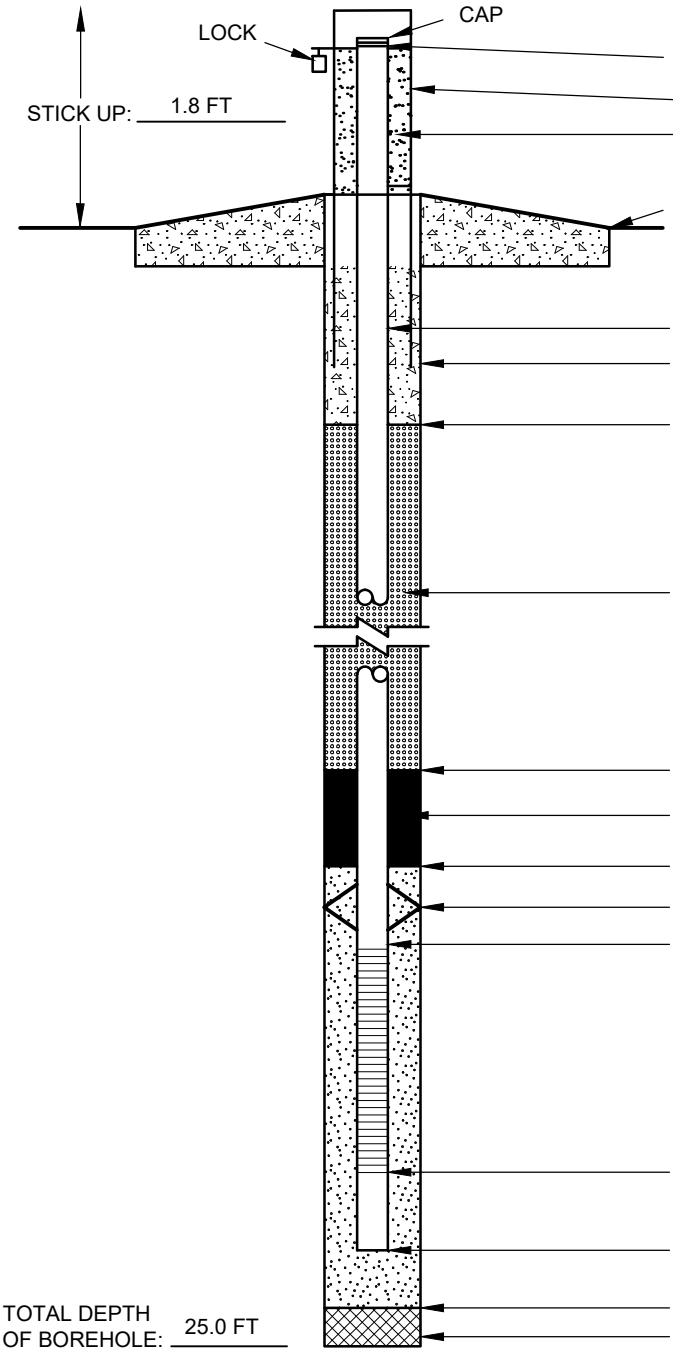
CLIENT/PROJECT **AMEREN MISSOURI** **SIOUX ENERGY CENTER**				GOLDER			TITLE	**Appendix E: Triple Nested Piezometer Vertical Gradients**		
DRAWN BTT	CHECKED GTM	REVIEWED MNH	DATE 2022-07-26	SCALE N/A	FILE NO. N/A	JOB NO. 153140604.0003B	DWG NO. N/A	SUBTITLE N/A	REV. NO. N/A	FIGURE **E3**

APPENDIX F

CCR Monitoring Well Construction Forms

ABOVE GROUND MONITORING WELL CONSTRUCTION LOG BMW-1S

PROJECT NAME: AMEREN CCR GW MONITORING	PROJECT NUMBER: 153-1406.0003B	
SITE NAME: SIOUX ENERGY CENTER	LOCATION: BMW-1S	
CLIENT: AMEREN MISSOURI	SURFACE ELEVATION: 426.0 FT MSL	
GEOLOGIST: J. INGRAM	NORTHING: 1121709.2	EASTING: 876755.6
DRILLER: J. DRABEK	STATIC WATER LEVEL: 7.35 FT BTOC	COMPLETION DATE: 12/8/2015
DRILLING COMPANY: CASCADE	DRILLING METHODS: SONIC	



TOP OF CASING ELEVATION: 427.77 FT MSL

PROTECTIVE CASING (yes) / no): 4" X 5' ALUMINUM

PEA GRAVEL OR SAND

GROUND SURFACE ELEVATION: 426.0 FT MSL

DIAMETER OF RISER PIPE (in.): 2.0

DIAMETER OF BOREHOLE (in.): 6.0

CONCRETE SEAL DEPTH (ft. bgs): 2.5

TYPE AND AMOUNT OF ANNULAR SEAL: NONE

TOP OF BENTONITE SEAL DEPTH (ft. bgs): 2.5

TYPE AND AMOUNT OF BENTONITE SEAL: $\frac{3}{8}$" BENTONITE CHIPS - 2 BAGS

TOP OF SAND PACK DEPTH (ft. bgs): COARSE: 12.5 FINE: 12.0

CENTRALIZER (yes (no) - TYPE: NONE

TOP OF SCREEN DEPTH (ft. bgs): 14.0

TYPE OF SCREEN: 2" X 9.8' SCHEDULE 40 PVC

SCREEN SLOT SIZE (in.): 0.010 IN

SIZE OF SAND PACK: COARSE: #1 FINE: #0

AMOUNT OF SAND: COARSE: 3.5 BAGS FINE: $\frac{1}{3}$ BAG

BOTTOM OF SCREEN DEPTH (ft. bgs): 23.8

BOTTOM OF WELL DEPTH (ft. bgs): 24.2

BOTTOM OF FILTER PACK (ft. bgs): 24.2

TYPE AND AMOUNT OF BACKFILL: 0.8 FT - NATURAL CAVE IN

ADDITIONAL NOTES: FT BGS = FEET BELOW GROUND SURFACE. FT MSL = FEET ABOVE MEAN SEA LEVEL.
50 GALLONS OF H2O USED DURING DRILLING. HORIZONTAL DATUM: STATE PLANE COORDINATES NAD83 US SURVEY FEET (2000) MISSOURI EAST ZONE. VERTICAL DATUM: NAVD88. WELL SURVEYED BY ZAHNER AND ASSOCIATES, INC ON JANUARY 14, 2016. FT BTOC = FEET BELOW TOP OF CASING. SAND AND BENTONITE BAGS WEIGH 50 LBS EACH.

CHECKED BY: J. INGRAM

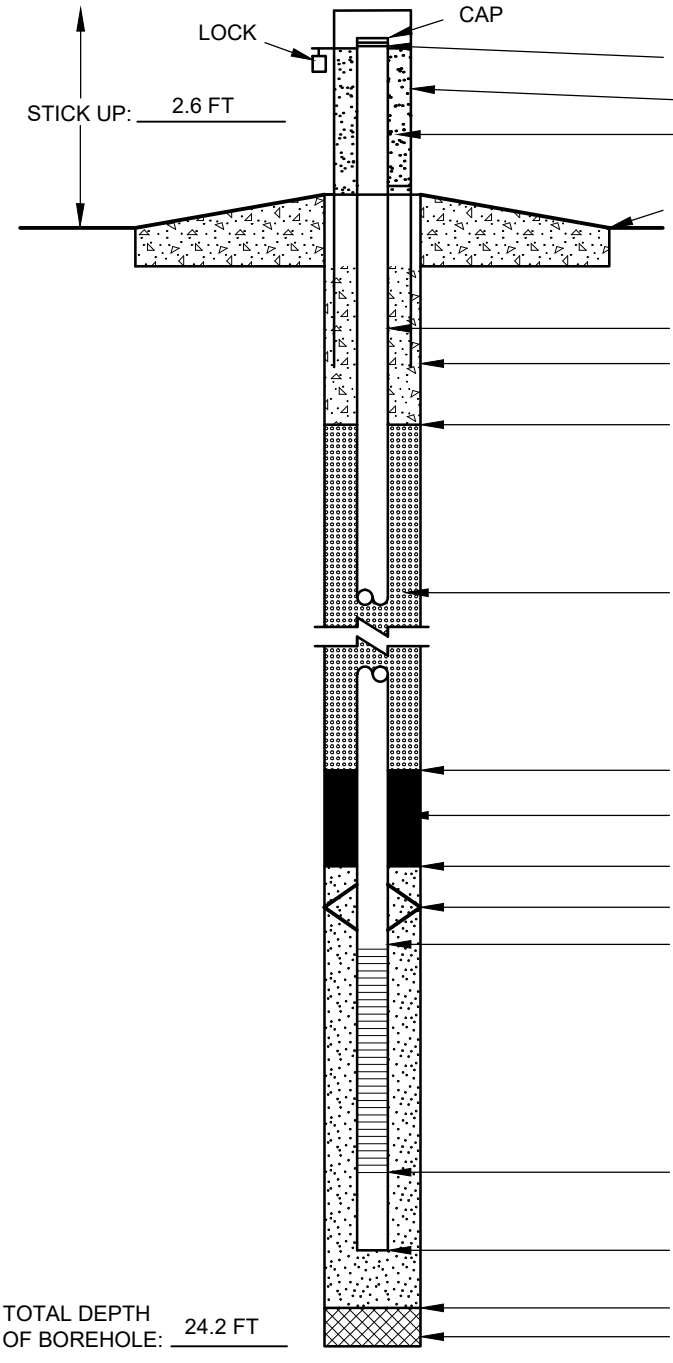
DATE CHECKED: 4/20/2016

AMEREN_00001723

PREPARED BY: J. SUOZZI

ABOVE GROUND MONITORING WELL CONSTRUCTION LOG BMW-3S

PROJECT NAME: AMEREN CCR GW MONITORING		PROJECT NUMBER: 153-1406.0003B
SITE NAME: SIOUX ENERGY CENTER		LOCATION: BMW-3S
CLIENT: AMEREN MISSOURI		SURFACE ELEVATION: 424.1 FT MSL
GEOLOGIST: J. INGRAM/M. GORE	NORTHING: 1121792.9	EASTING: 875809.5
DRILLER: M. RODRIGUES	STATIC WATER LEVEL: 8.65 FT BTOC	COMPLETION DATE: 11/8/2016
DRILLING COMPANY: CASCADE		DRILLING METHODS: SONIC



TOP OF CASING ELEVATION: 426.69 FT MSL

PROTECTIVE CASING (yes / no): 4" X 5' ALUMINUM

PEA GRAVEL OR SAND

GROUND SURFACE ELEVATION: 424.1 FT MSL

DIAMETER OF RISER PIPE (in.): 2.0

DIAMETER OF BOREHOLE (in.): 6.0

CONCRETE SEAL DEPTH (ft. bgs): 2.5

TYPE AND AMOUNT OF ANNULAR SEAL: HIGH SOLIDS BENTONITE

TOP OF BENTONITE SEAL DEPTH (ft. bgs): 2.5

TYPE AND AMOUNT OF BENTONITE SEAL: $\frac{3}{8}$" BENTONITE CHIPS - 1 BUCKET

TOP OF SAND PACK DEPTH (ft. bgs): COARSE: 11.6 FINE: 10.8

CENTRALIZER (yes / no) - TYPE: NONE

TOP OF SCREEN DEPTH (ft. bgs): 14.0

TYPE OF SCREEN: 2" X 9.8' SCHEDULE 40 PVC

SCREEN SLOT SIZE (in.): 0.010 IN

SIZE OF SAND PACK: COARSE: #1 (20-30) FINE: #0 (30/65)

AMOUNT OF SAND: COARSE: 4 BAGS FINE: $\frac{1}{2}$ BAG

BOTTOM OF SCREEN DEPTH (ft. bgs): 23.8

BOTTOM OF WELL DEPTH (ft. bgs): 24.2

BOTTOM OF FILTER PACK (ft. bgs): 24.2

TYPE AND AMOUNT OF BACKFILL: NONE

ADDITIONAL NOTES: FT BGS = FEET BELOW GROUND SURFACE. FT MSL = FEET ABOVE MEAN SEA LEVEL. 50 GALLONS OF H2O USED DURING DRILLING. HORIZONTAL DATUM: STATE PLANE COORDINATES NAD83 US SURVEY FEET (2000) MISSOURI EAST ZONE. VERTICAL DATUM: NAVD88. WELL SURVEYED BY ZAHNER AND ASSOCIATES, INC ON DECEMBER 8, 2016. FT BTOC = FEET BELOW TOP OF CASING. SAND AND BENTONITE BAGS WEIGH 50 LBS EACH.

CHECKED BY: J. INGRAM

DATE CHECKED: 8/3/2017

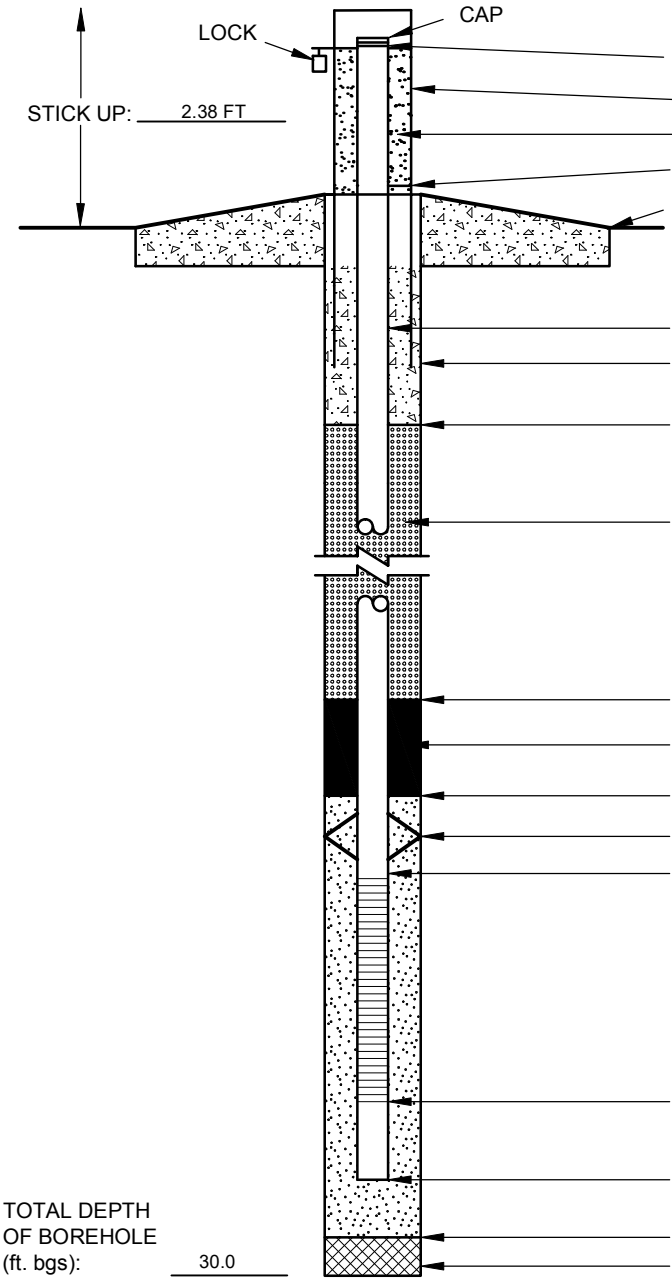
AMEREN_00001724

PREPARED BY: J. SUOZZI

ABOVE GROUND MONITORING WELL CONSTRUCTION LOG

TMW-4

PROJECT NAME: AMEREN CCR GW MONITORING		PROJECT NUMBER: GL153140604.0003B
SITE NAME: SIOUX ENERGY CENTER		LOCATION: TMW-4
CLIENT: AMEREN MISSOURI		SURFACE ELEVATION: 430.0 FT MSL
GEOLOGIST: G. MOREY	NORTHING: 1116959.3	EASTING: 878952.1
DRILLER: R. GORDON	STATIC WATER LEVEL: 16.60 FT BTOC	COMPLETION DATE: 03/04/2022
DRILLING COMPANY: CASCADE ENVIRONMENTAL, LLC		DRILLING METHODS: SONIC



- TOP OF CASING ELEVATION: 432.35 FT MSL
- PROTECTIVE CASING (yes / no): 4.5" X 5' ALUMINUM
- PEA GRAVEL OR SAND
- WEEP HOLE
- GROUND SURFACE ELEVATION: 430.0 FT MSL
- DIAMETER OF RISER PIPE (in.): 2.0
- DIAMETER OF BOREHOLE (in.): 6.0
- CONCRETE SEAL DEPTH (ft. bgs): 2.5
- TYPE AND AMOUNT OF ANNULAR SEAL: N/A
- TOP OF BENTONITE SEAL DEPTH (ft. bgs): 2.5
- TYPE AND AMOUNT OF BENTONITE SEAL: 3.5 BAGS 3/8" BENTONITE CHIPS
- TOP OF SAND PACK DEPTH (ft. bgs): 16.7
- CENTRALIZER (yes (no) - TYPE: NONE
- TOP OF SCREEN DEPTH (ft. bgs): 18.7
- TYPE OF SCREEN: 2" x 9.8' SCHEDULE 40 PVC
- SCREEN SLOT SIZE (in.): 0.010
- SIZE OF SAND PACK: GLOBAL #5
- AMOUNT OF SAND: 4.5 BAGS
- BOTTOM OF SCREEN DEPTH (ft. bgs): 28.5
- BOTTOM OF WELL DEPTH (ft. bgs): 28.9
- BOTTOM OF FILTER PACK (ft. bgs): 28.9
- TYPE AND AMOUNT OF BACKFILL: 1.1 FT NATIVE FILL

ADDITIONAL NOTES: FT BGS = FEET BELOW GROUND SURFACE. FT MSL = FEET ABOVE MEAN SEA LEVEL. IN = INCHES. HORIZONTAL DATUM: STATE PLANE COORDINATES NAD83 US SURVEY FEET (2000) MISSOURI EAST ZONE. VERTICAL DATUM: NAVD88. WELL SURVEYED BY ZAHNER ON MARCH 28, 2022. SAND AND BENTONITE BAGS WEIGH 50 POUNDS EACH. CONCRETE SEAL EXTENDS ABOVE SURFACE GRADE. APPROXIMATELY 75 GALLONS OF WATER USED DURING DRILLING.

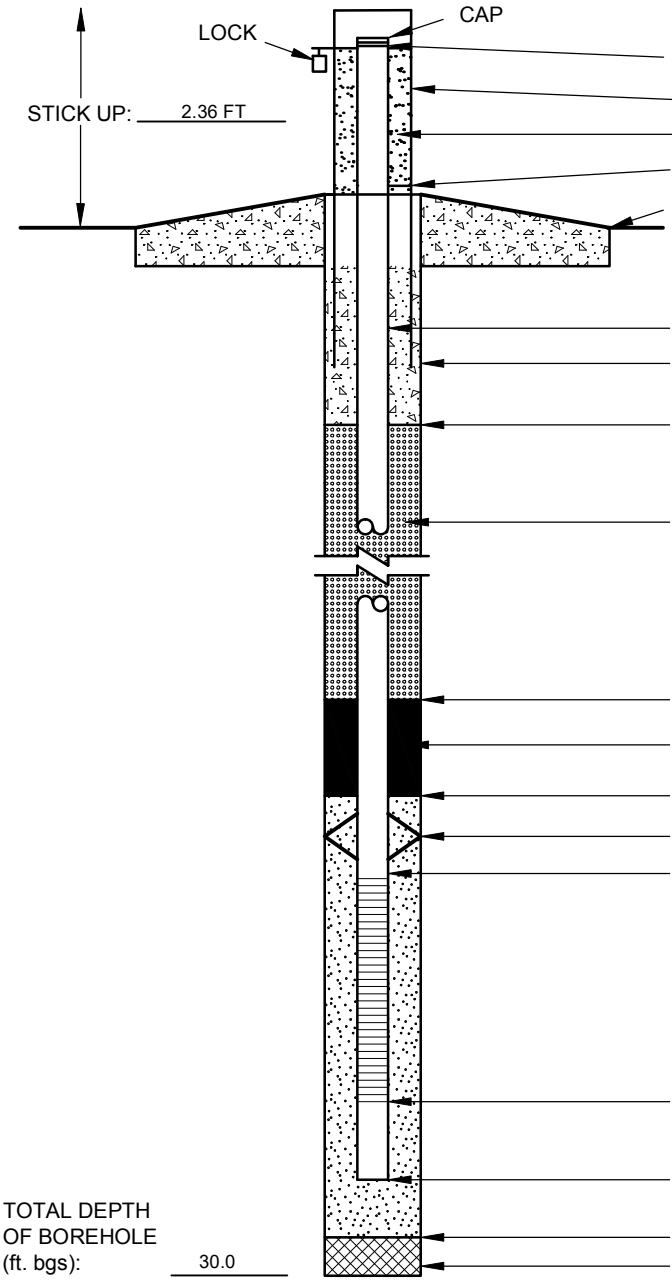
CHECKED BY: E. SCHNEIDER
DATE CHECKED: 7/26/2022

PREPARED BY: G. MOREY

ABOVE GROUND MONITORING WELL CONSTRUCTION LOG

TMW-5

PROJECT NAME: AMEREN CCR GW MONITORING		PROJECT NUMBER: GL153140604.0003B
SITE NAME: SIOUX ENERGY CENTER		LOCATION: TMW-5
CLIENT: AMEREN MISSOURI		SURFACE ELEVATION: 429.9 FT MSL
GEOLOGIST: G. MOREY	NORTHING: 1116856.0	EASTING: 879563.9
DRILLER: R. GORDON	STATIC WATER LEVEL: 17.40 FT BTOC	COMPLETION DATE: 03/04/2022
DRILLING COMPANY: CASCADE ENVIRONMENTAL, LLC		DRILLING METHODS: SONIC



TOP OF CASING ELEVATION: 432.30 FT MSL

PROTECTIVE CASING (yes / no): 4.5" X 5' ALUMINUM

PEA GRAVEL OR SAND

WEEP HOLE

GROUND SURFACE ELEVATION: 429.9 FT MSL

DIAMETER OF RISER PIPE (in.): 2.0

DIAMETER OF BOREHOLE (in.): 6.0

CONCRETE SEAL DEPTH (ft. bgs): 2.5

TYPE AND AMOUNT OF ANNULAR SEAL: N/A

TOP OF BENTONITE SEAL DEPTH (ft. bgs): 2.5

TYPE AND AMOUNT OF BENTONITE SEAL: 3.5 BAGS 3/8" BENTONITE CHIPS

TOP OF SAND PACK DEPTH (ft. bgs): 16.7

CENTRALIZER (yes (no) - TYPE: NONE

TOP OF SCREEN DEPTH (ft. bgs): 18.7

TYPE OF SCREEN: 2" x 9.8' SCHEDULE 40 PVC

SCREEN SLOT SIZE (in.): 0.010

SIZE OF SAND PACK: GLOBAL #5

AMOUNT OF SAND: 4.5 BAGS

BOTTOM OF SCREEN DEPTH (ft. bgs): 28.5

BOTTOM OF WELL DEPTH (ft. bgs): 29.0

BOTTOM OF FILTER PACK (ft. bgs): 29.0

TYPE AND AMOUNT OF BACKFILL: 1.0 FT NATIVE FILL

ADDITIONAL NOTES: FT BGS = FEET BELOW GROUND SURFACE. FT MSL = FEET ABOVE MEAN SEA LEVEL. IN = INCHES. HORIZONTAL DATUM: STATE PLANE COORDINATES NAD83 US SURVEY FEET (2000) MISSOURI EAST ZONE. VERTICAL DATUM: NAVD88. WELL SURVEYED BY ZAHNER ON MARCH 28, 2022. SAND AND BENTONITE BAGS WEIGH 50 POUNDS EACH. CONCRETE SEAL EXTENDS ABOVE SURFACE GRADE. APPROXIMATELY 75 GALLONS OF WATER WAS USED DURING DRILLING.

CHECKED BY: E. SCHNEIDER

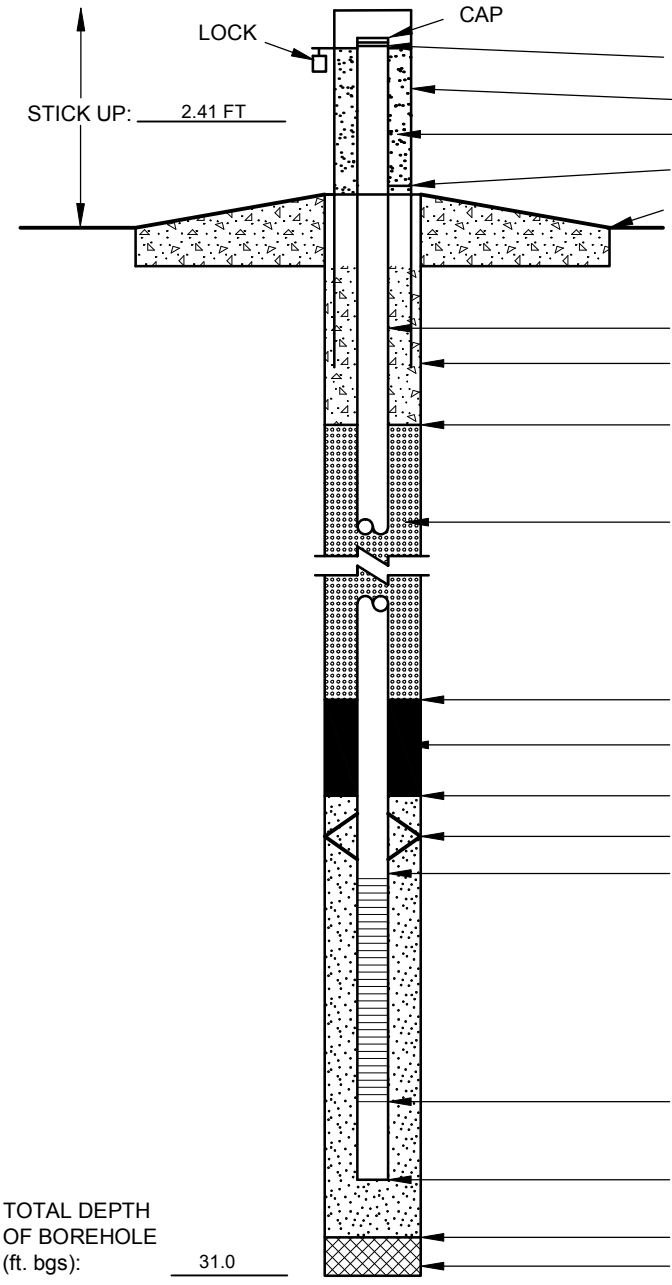
DATE CHECKED: 7/26/2022

PREPARED BY: G. MOREY

ABOVE GROUND MONITORING WELL CONSTRUCTION LOG

TMW-6

PROJECT NAME: AMEREN CCR GW MONITORING	PROJECT NUMBER: GL153140604.0003B	
SITE NAME: SIOUX ENERGY CENTER	LOCATION: TMW-6	
CLIENT: AMEREN MISSOURI	SURFACE ELEVATION: 430.8 FT MSL	
GEOLOGIST: G. MOREY	NORTHING: 1116909.9	EASTING: 880086.0
DRILLER: R. GORDON	STATIC WATER LEVEL: 17.26 FT BTOC	COMPLETION DATE: 03/04/2022
DRILLING COMPANY: CASCADE ENVIRONMENTAL, LLC	DRILLING METHODS: SONIC	



TOP OF CASING ELEVATION: 433.25 FT MSL

PROTECTIVE CASING (yes) / no): 4.5" X 5' ALUMINUM

PEA GRAVEL OR SAND

WEEP HOLE

GROUND SURFACE ELEVATION: 430.8 FT MSL

DIAMETER OF RISER PIPE (in.): 2.0

DIAMETER OF BOREHOLE (in.): 6.0

CONCRETE SEAL DEPTH (ft. bgs): 2.5

TYPE AND AMOUNT OF ANNULAR SEAL: N/A

TOP OF BENTONITE SEAL DEPTH (ft. bgs): 2.5

TYPE AND AMOUNT OF BENTONITE SEAL: 3.5 BAGS 3/8" BENTONITE CHIPS

TOP OF SAND PACK DEPTH (ft. bgs): 17.9

CENTRALIZER (yes (no) - TYPE: NONE

TOP OF SCREEN DEPTH (ft. bgs): 19.9

TYPE OF SCREEN: 2" x 9.8' SCHEDULE 40 PVC

SCREEN SLOT SIZE (in.): 0.010

SIZE OF SAND PACK: GLOBAL #5

AMOUNT OF SAND: 4.5 BAGS

BOTTOM OF SCREEN DEPTH (ft. bgs): 29.7

BOTTOM OF WELL DEPTH (ft. bgs): 30.2

BOTTOM OF FILTER PACK (ft. bgs): 30.2

TYPE AND AMOUNT OF BACKFILL: 0.8 FT NATIVE FILL

ADDITIONAL NOTES: FT BGS = FEET BELOW GROUND SURFACE. FT MSL = FEET ABOVE MEAN SEA LEVEL. IN = INCHES. HORIZONTAL DATUM: STATE PLANE COORDINATES NAD83 US SURVEY FEET (2000) MISSOURI EAST ZONE. VERTICAL DATUM: NAVD88. WELL SURVEYED BY ZAHNER ON MARCH 28, 2022. SAND AND BENTONITE BAGS WEIGH 50 POUNDS EACH. CONCRETE SEAL EXTENDS ABOVE SURFACE GRADE. APPROXIMATELY 75 GALLONS OF WATER USED DURING DRILLING.

CHECKED BY: E. SCHNEIDER

DATE CHECKED: 7/26/2022

PREPARED BY: G. MOREY

APPENDIX G

CCR MDNR Well Certification Forms

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

REF NO	DATE RECEIVED
00512903	02/04/2016
CR NO	CHECK NO.
	170079
STATE WELL NO	REVENUE NO.
A206275 02/09/2016	020416
ENTERED NRBASSM	APPROVED BY / ROUTE
PH1 PH2 PH3	
02/08/2016 02/08/2016 02/08/2016	

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

NOTE: THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME	CONTACT NAME			VARIANCE GRANTED BY DNR
AMEREN MISSOURI C/O BILL KUTOSKY	AMEREN MISSOURI C/O BILL KUTOSKY			
OWNER ADDRESS	CITY	STATE	ZIP	NUMBER
3750 S LINDBERGH BLVD.	ST LOUIS	MO	63127	
SITE NAME		WELL NUMBER		COUNTY
SIOUX ENERGY CENTER		BMW 1S		ST CHARLES
SITE ADDRESS		CITY		STATIC WATER LEVEL
8501 N STATE ROUTE 94		WEST ALTON		7.4 FT

SURFACE COMPLETION

TYPE	LENGTH AND DIAMETER OF SURFACE COMPLETION	DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED	SURFACE COMPLETION GROUT
[X] ABOVE GROUND	LENGTH 5.0 FT.	DIAMETER 12.0 IN.	[X] CONCRETE
[ ] FLUSH MOUNT	DIAMETER 4.0 IN.	LENGTH 2.5 FT.	[ ] OTHER

COPY

LOCATION OF WELL

LAT. 38 ° 54' 50.22"
LONG. 90 ° 18' 4.54"

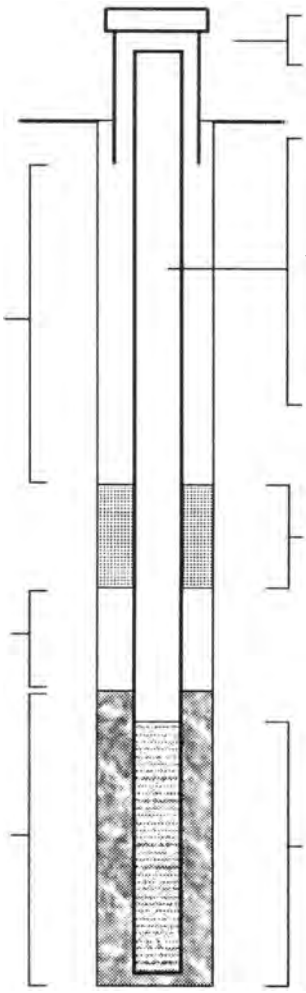
SMALLEST _____ 1/4 _____ 1/4 _____ 1/4 LARGEST

SEC. 19 TWN. 48 NORTH
RANGE 6 Direction E

MONITORING FOR:
[ ] RADIONUCLIDES [X] PETROLEUM PRODUCTS ONLY
[ ] EXPLOSIVES [X] METALS [ ] VOC
[ ] SVOCS [ ] PESTICIDES/HERBICIDESS

PROPOSED USE OF WELL
[ ] GAS MIGRATION WELL [X] OBSERVATION
[ ] EXTRACTION WELL [ ] OPEN HOLE
[ ] PIEZOMETERS
[ ] DIRECT PUSH

[ ] LOCKING CAP
[ ] WEEP HOLE



SURFACE COMPLETTION
[ ] STEEL [X] ALUMINUM [ ] PLASTIC

RISER
RISER PIPE DIAMETER 2.0IN.
RISER PIPE LENGTH 15.8FT.
HOLE DIAMETER 6.0IN.
WEIGHT OR SDR# SCH40

MATERIAL
[ ] STEEL [X] THERMOPLASTIC (PVC)
[ ] OTHER

ELEVATION _____FT.

ANNULAR SEAL
LENGTH 0.0FT.
[ ] SLURRY [ ] CHIPS
[ ] PELLETS [ ] GRANULAR
[ ] CEMENT/SLURRY

IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED:
%OF BENTONITE USED:
WATER USED/BAG: GAL.

BENTONITE SEAL
LENGTH: 9.5
[ ] CHIPS [ ] PELLETS [ ] GRANULAR
[ ] SLURRY
[ ] SATURATED ZONE [ ] HYDRATED

SECONDARY FILTER PACK
LENGTH: 0.1FT.

SCREEN
SCREEN DIAMETER: 2.0IN.
SCREEN LENGTH: 9.8FT.
DIAMETER OF DRILL HOLE: 6.0IN.
DEPTH TO TOP 15.2FT.

DEPTH TO TOP OF PRIMARY FILTER PACK: 12.5FT.

SCREEN MATERIAL
[ ] STEEL [X] THERMOPLASTIC (PVC)
[ ] OTHER

LENGTH OF PRIMARY FILTER PACK: 12.5FT.

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0.0	8.5	SDY SLT
8.5	15.6	STY CLY
15.6	17.5	SND
17.5	18.5	STY CLY
18.5	25.0	SND

TOTAL DEPTH: 25.0 FEET

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETER AND GROUT USED.

SIGNATURE (PRIMARY COUNTRACTOR)	PERMIT NUMBER	DATE WELL DRILLING WAS COMPLETED
x JOHN SUOZZI	006284	12/08/2015

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS

[ ] PUMP INSTALLED

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	SIGNATURE (APPRENTICE)	APPRENTICE PERMIT NUMBER
x JASON DRABEK	004484	x	

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM

MONITORING WELL CERTIFICATION RECORD

NOTE: This form is not to be used for nested wells

OFFICE USE ONLY		DATE RECEIVED	
REFERENCE NO.		CHECK NO.	
STATE WELL NO.		REVENUE NO.	
ENTERED	APPROVED	DATE	ROUTE / /

OWNER AND SITE INFORMATION

PROPERTY OWNER NAME WHERE WELL IS LOCATED	PRIMARY PHONE NUMBER WITH AREA CODE	WELL NUMBER	WELL COMPLETION DATE
Sioux Energy Center		BMW-3S	11/08/2016

PROPERTY OWNER MAILING ADDRESS	CITY	STATE	ZIP CODE
8501 N State Rd 94	West Alton	MO	63386

PHYSICAL ADDRESS OF PROPERTY WHERE WELL IS LOCATED	CITY	COUNTY
8501 N State Rd 94	West Alton	St Charles

NAME OF SITE OR CLEANUP PROJECT	DNR/EPA PROJECT NUMBER OR REGULATORY SITE ID NUMBER (IF APPLICABLE)	VARIANCE NUMBER (IF ISSUED)
Ameren CCR GW Monitoring	153-1406.0003B	

PRIMARY CONTRACTOR NAME (PLEASE PRINT)	PERMIT NUMBER	Section 256.607(3), RSMo, requires all primary contractors to comply with all rules and regulations promulgated pursuant to Sections 256.600 to 256.640 RSMo.

SURFACE COMPLETION

TYPE: ☑ Above Ground ☐ Flush Mount

LENGTH AND DIAMETER OF SURFACE COMPLETION: Length 2.57 FT. Diameter 4 IN.

DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: Diameter 12 IN. Length 24.17 FT.

SURFACE COMPLETION GROUT: ☑ Concrete ☐ Other _____

☑ Locking Cap ☐ Weep Hole

Elevation 424.12 FT.

ANNULAR SEAL

Length 9 FT.

☑ Slurry ☐ Chips ☐ Pellets ☐ Granular ☐ Cement/Slurry

IF CEMENT/BENTONITE MIX:

Bags of Cement Used _____

% of Bentonite Used _____

Water Used Per Bag _____ GAL.

SECONDARY FILTER PACK LENGTH

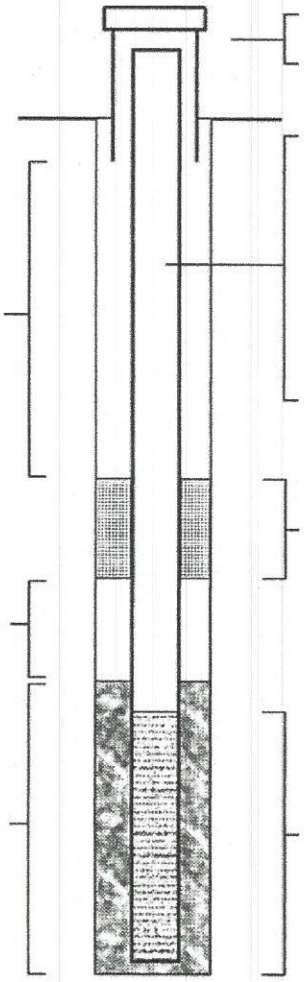
0.8 FT.

DEPTH TO TOP OF PRIMARY FILTER PACK

11.6 FT.

LENGTH OF PRIMARY FILTER PACK

12.57 FT.



SURFACE COMPLETION

☐ Steel ☑ Aluminum ☐ Plastic

RISER OR CASING (IF OPEN HOLE COMPLETION)

Riser/Casing Diameter 2 IN.
Riser/Casing Length 16.5 FT.
Diameter Of Drill Hole 6 IN.
Weight Or SDR# S40

MATERIAL

☐ Steel ☑ Thermoplastic (PVC) ☐ Other _____

BENTONITE SEAL

Length 2.5

☑ Chips ☐ Pellets ☐ Granular ☐ Saturated Zone ☐ Hydrated

SCREEN

Screen Diameter 2 IN.
Screen Length 9.8 FT.
Diameter Of Drill Hole 6 IN.
Depth To Top 24.1 FT.

SCREEN MATERIAL

☐ Steel ☑ Thermoplastic (PVC) ☐ Other _____

For cased wells, submit additional as-built diagrams showing well construction details including type and size of all casing, hole diameter and grout used.

LOCATION OF WELL (D/M/S FORMAT ONLY)

Latitude 38 ° 54 ' 50.93N "

Longitude 90 ° 18 ' 16.53W "

SMALLEST ¼ LARGEST ¼ ¼

Section _____ Township _____ North

Range _____ ☐ E ☐ W

TYPE OF WELL (CHECK ONE)

☐ Direct Push ☐ Extraction ☐ Inclinometer
☐ Gas Migration ☐ Injection ☐ Lysimeter
☑ Observation ☐ Open Hole ☐ Other (specify)
☐ Piezometer ☐ Standard

MONITORING FOR (CHECK ALL THAT APPLY)

☐ Explosives ☐ Metals
☐ Pesticides/Herbicides ☐ Petroleum
☐ Radionuclides ☐ SVOCS
☐ VOCS (non-petroleum) ☐ Geotechnical Data

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION (OR ATTACH BORING LOG*)

TOTAL DEPTH: FT.

☐ *Boring Log Attached

STATIC WATER LEVEL 8.65 FT.

PUMP INSTALLED ☐ Yes ☑ No

I hereby certify that the monitoring well herein described was constructed in accordance with Missouri Department of Natural Resources requirements.

MONITORING WELL INSTALLATION CONTRACTOR	PERMIT NUMBER	DATE	MONITORING WELL INSTALLATION CONTRACTOR APPRENTICE (IF APPLICABLE)	PERMIT NUMBER
	4398	8-28-17		

MO 780-1415 (8-16) **SEND COMPLETED FORM ALONG WITH $100 CERTIFICATION FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, MISSOURI GEOLOGICAL SURVEY, WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 PHONE: 573-368-2165 FAX: 573-368-2317 EMAIL: wellpermits@dnr.mo.gov**
RECORD (AND FEE) MAY BE SUBMITTED ONLINE: dnr.mo.gov/mowells

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM

MONITORING WELL CERTIFICATION REPORT

NOTE: This form is not to be used for nested wells

OFFICE USE ONLY		DATE RECEIVED	
REFERENCE NO.		CHECK NO.	
STATE WELL NO.		REVENUE NO.	
ENTERED	APPROVED	DATE	ROUTE / /

OWNER AND SITE INFORMATION

PROPERTY OWNER NAME WHERE WELL IS LOCATED	PRIMARY PHONE NUMBER WITH AREA CODE	WELL NUMBER	WELL COMPLETION DATE
AMEREN Missouri	(800) 552-7583	TMW-4	03-04-2022

PROPERTY OWNER MAILING ADDRESS	CITY	STATE	ZIP CODE
1901 Chouteau Ave.	St. Louis	MO	63103

PHYSICAL ADDRESS OF PROPERTY WHERE WELL IS LOCATED	CITY	COUNTY
8501 N State Route 94	West Alton	St. Charles

NAME OF SITE, BUSINESS, OR CLEANUP PROJECT	DNR/EPA PROJECT NUMBER OR REGULATORY SITE ID NUMBER (IF APPLICABLE)	VARIANCE NUMBER (IF ISSUED)
Sioux Energy Center	N/A	N/A

PRIMARY CONTRACTOR NAME (PLEASE PRINT)	PERMIT NUMBER	
Cascade Environmental, LLC		Section 256.607(3), RSMo, requires all primary contractors to comply with all rules and regulations promulgated pursuant to Sections 256.600 to 256.640 RSMo.

SURFACE COMPLETION

TYPE: ☑ Above Ground ☐ Flush Mount

LENGTH AND DIAMETER OF SURFACE COMPLETION: Length 5.0 FT. Diameter 4.5 IN.

DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: Diameter 14.0 IN. Length 2.5 FT.

SURFACE COMPLETION GROUT: ☑ Concrete ☐ Other

☑ Locking Cap
☑ Weep Hole

Elevation 429.97 FT.

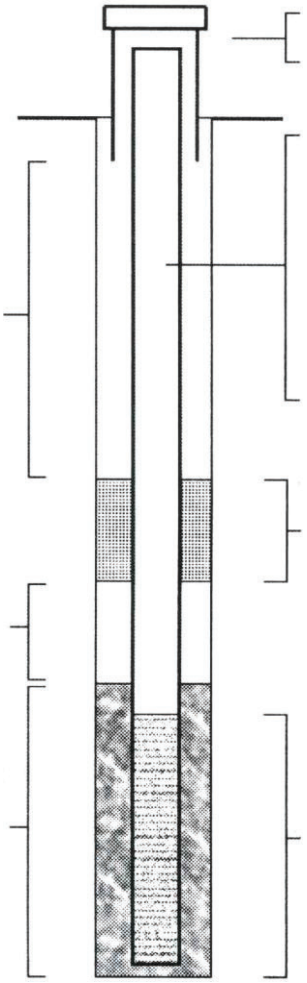
ANNULAR SEAL
Length N/A FT.
☐ Slurry ☐ Chips ☐ Pellets ☐ Granular ☐ Cement/Slurry

IF CEMENT/BENTONITE MIX:
Bags of Cement Used N/A
% of Bentonite Used N/A
Water Used Per Bag N/A GAL.

SECONDARY FILTER PACK LENGTH
N/A FT.

DEPTH TO TOP OF PRIMARY FILTER PACK
16.7 FT.

LENGTH OF PRIMARY FILTER PACK
12.2 FT.



SURFACE COMPLETION
☐ Steel ☑ Aluminum ☐ Plastic

RISER OR CASING (IF OPEN HOLE COMPLETION)
Riser/Casing Diameter 2.0 IN.
Riser/Casing Length 21.5 FT.
Diameter Of Drill Hole 6.0 IN.
Weight Or SDR# 40

MATERIAL
☐ Steel ☑ Thermoplastic (PVC)
☐ Other

BENTONITE SEAL
Length 14.2 FT
☑ Chips ☐ Pellets ☐ Granular
☐ Saturated Zone ☐ Hydrated

SCREEN
Screen Diameter 2.0 IN.
Screen Length 9.8 FT.
Diameter Of Drill Hole 6.0 IN.
Depth To Top 18.7 FT.

SCREEN MATERIAL
☐ Steel ☑ Thermoplastic (PVC)
☐ Other

For cased wells, submit additional as-built diagrams showing well construction details including type and size of all casing, hole diameter and grout used.

LOCATION OF WELL (D/M/S FORMAT ONLY)
Latitude 38 ° 54 ' 03.23 "
Longitude -090 ° 17 ' 36.89 "

SMALLEST ¼ LARGEST ¼ ¼
Section 19 Township 48 North
Range 6 ☑ E ☐ W

TYPE OF WELL (CHECK ONE)
☐ Direct Push ☐ Extraction ☐ Inclinometer
☐ Gas Migration ☐ Injection ☐ Lysimeter
☑ Observation ☐ Open Hole ☐ Other (specify)
☐ Piezometer ☐ Standard

MONITORING FOR (CHECK ALL THAT APPLY)
☐ Explosives ☑ Metals
☐ Pesticides/Herbicides ☐ Petroleum
☐ Radionuclides ☐ SVOCS
☐ VOCS (non-petroleum) ☐ Geotechnical Data

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION (OR ATTACH BORING LOG*)
0.0	6.0	(CL) SILTY CLAY
6.0	12.0	(ML) SILT
12.0	30.0	(SP) SAND

TOTAL DEPTH: 30.0 FT.
☐ *Boring Log Attached

STATIC WATER LEVEL 16.60 FT.
PUMP INSTALLED ☐ Yes ☑ No

I hereby certify that the monitoring well herein described was constructed in accordance with Missouri Department of Natural Resources requirements.

MONITORING WELL INSTALLATION CONTRACTOR	PERMIT NUMBER	DATE	MONITORING WELL INSTALLATION CONTRACTOR APPRENTICE (IF APPLICABLE)	PERMIT NUMBER

SEND COMPLETED FORM AND FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, PO BOX 250, ROLLA MO 65402
FOR REGISTRATTION FEES, PLEASE SEE: https://dnr.mo.gov/pubs/pub2494.htm
PHONE: 573-368-2165 FAX: 573-368-2317 EMAIL: welldrillers@dnr.mo.gov
RECORD (AND FEE) MAY BE SUBMITTED ONLINE: dnr.mo.gov/mowells

AMEREN_00001731

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM

MONITORING WELL CERTIFICATION REPORT

NOTE: This form is not to be used for nested wells

OFFICE USE ONLY		DATE RECEIVED	
REFERENCE NO.		CHECK NO.	
STATE WELL NO.		REVENUE NO.	
ENTERED	APPROVED	DATE	ROUTE / /

OWNER AND SITE INFORMATION

PROPERTY OWNER NAME WHERE WELL IS LOCATED	PRIMARY PHONE NUMBER WITH AREA CODE	WELL NUMBER	WELL COMPLETION DATE
AMEREN Missouri	(800) 552-7583	TMW-5	03-04-2022

PROPERTY OWNER MAILING ADDRESS	CITY	STATE	ZIP CODE
1901 Chouteau Ave.	St. Louis	MO	63103

PHYSICAL ADDRESS OF PROPERTY WHERE WELL IS LOCATED	CITY	COUNTY
8501 N State Route 94	West Alton	St. Charles

NAME OF SITE, BUSINESS, OR CLEANUP PROJECT	DNR/EPA PROJECT NUMBER OR REGULATORY SITE ID NUMBER (IF APPLICABLE)	VARIANCE NUMBER (IF ISSUED)
Sioux Energy Center	N/A	N/A

PRIMARY CONTRACTOR NAME (PLEASE PRINT)	PERMIT NUMBER	
Cascade Environmental, LLC		Section 256.607(3), RSMo, requires all primary contractors to comply with all rules and regulations promulgated pursuant to Sections 256.600 to 256.640 RSMo.

SURFACE COMPLETION

TYPE: ☑ Above Ground ☐ Flush Mount

LENGTH AND DIAMETER OF SURFACE COMPLETION: Length 5.0 FT. Diameter 4.5 IN.

DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: Diameter 14.0 IN. Length 2.5 FT.

SURFACE COMPLETION GROUT: ☑ Concrete ☐ Other

☑ Locking Cap
☑ Weep Hole

Elevation 429.94 FT.

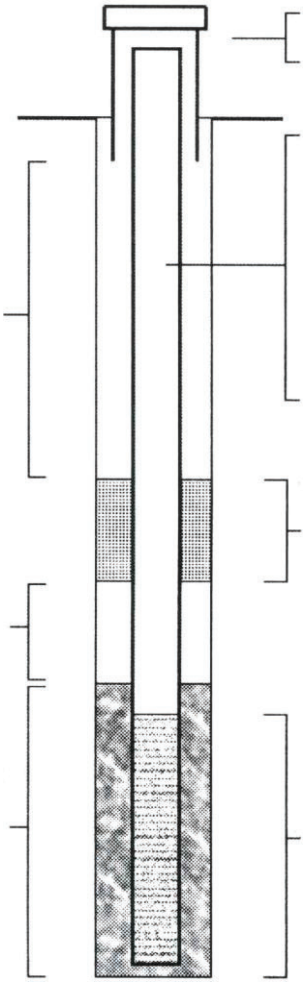
ANNULAR SEAL
Length N/A FT.
☐ Slurry ☐ Chips ☐ Pellets ☐ Granular ☐ Cement/Slurry

IF CEMENT/BENTONITE MIX:
Bags of Cement Used N/A
% of Bentonite Used N/A
Water Used Per Bag N/A GAL.

SECONDARY FILTER PACK LENGTH
N/A FT.

DEPTH TO TOP OF PRIMARY FILTER PACK
16.8 FT.

LENGTH OF PRIMARY FILTER PACK
12.2 FT.



SURFACE COMPLETION
☐ Steel ☑ Aluminum ☐ Plastic

RISER OR CASING (IF OPEN HOLE COMPLETION)
Riser/Casing Diameter 2.0 IN.
Riser/Casing Length 21.6 FT.
Diameter Of Drill Hole 6.0 IN.
Weight Or SDR# 40

MATERIAL
☐ Steel ☑ Thermoplastic (PVC)
☐ Other

BENTONITE SEAL
Length 14.3
☑ Chips ☐ Pellets ☐ Granular
☐ Saturated Zone ☐ Hydrated

SCREEN
Screen Diameter 2.0 IN.
Screen Length 9.8 FT.
Diameter Of Drill Hole 6.0 IN.
Depth To Top 18.8 FT.

SCREEN MATERIAL
☐ Steel ☑ Thermoplastic (PVC)
☐ Other

For cased wells, submit additional as-built diagrams showing well construction details including type and size of all casing, hole diameter and grout used.

LOCATION OF WELL (D/M/S FORMAT ONLY)
Latitude 38 ° 54 ' 2.19 "
Longitude -090 ° 17 ' 29.15 "

SMALLEST ¼ LARGEST ¼ ¼
Section 19 Township 48 North
Range 6 ☑ E ☐ W

TYPE OF WELL (CHECK ONE)
☐ Direct Push ☐ Extraction ☐ Inclinometer
☐ Gas Migration ☐ Injection ☐ Lysimeter
☑ Observation ☐ Open Hole ☐ Other (specify)
☐ Piezometer ☐ Standard

MONITORING FOR (CHECK ALL THAT APPLY)
☐ Explosives ☑ Metals
☐ Pesticides/Herbicides ☐ Petroleum
☐ Radionuclides ☐ SVOCS
☐ VOCS (non-petroleum) ☐ Geotechnical Data

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION (OR ATTACH BORING LOG*)
0.0	2.0	(CL) SILTY CLAY
2.0	5.0	(ML) SILT
5.0	10.0	(SM) SILTY SAND
10.0	12.5	(ML) sandy SILT
12.5	20.0	(SP) SAND
20.0	30.0	(SW) SAND

TOTAL DEPTH: 30.0 FT.
☐ *Boring Log Attached

STATIC WATER LEVEL 17.40 FT.
PUMP INSTALLED ☐ Yes ☑ No

I hereby certify that the monitoring well herein described was constructed in accordance with Missouri Department of Natural Resources requirements.

MONITORING WELL INSTALLATION CONTRACTOR	PERMIT NUMBER	DATE	MONITORING WELL INSTALLATION CONTRACTOR APPRENTICE (IF APPLICABLE)	PERMIT NUMBER

SEND COMPLETED FORM AND FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, PO BOX 250, ROLLA MO 65402
FOR REGISTRATTION FEES, PLEASE SEE: https://dnr.mo.gov/pubs/pub2494.htm
PHONE: 573-368-2165 FAX: 573-368-2317 EMAIL: welldrillers@dnr.mo.gov
RECORD (AND FEE) MAY BE SUBMITTED ONLINE: dnr.mo.gov/mowells

AMEREN_00001732

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM

MONITORING WELL CERTIFICATION REPORT

NOTE: This form is not to be used for nested wells

OFFICE USE ONLY		DATE RECEIVED	
REFERENCE NO.		CHECK NO.	
STATE WELL NO.		REVENUE NO.	
ENTERED	APPROVED	DATE	ROUTE / /

OWNER AND SITE INFORMATION

PROPERTY OWNER NAME WHERE WELL IS LOCATED	PRIMARY PHONE NUMBER WITH AREA CODE	WELL NUMBER	WELL COMPLETION DATE
AMEREN Missouri	(800) 552-7583	TMW-6	03-04-2022

PROPERTY OWNER MAILING ADDRESS	CITY	STATE	ZIP CODE
1901 Chouteau Ave.	St. Louis	MO	63103

PHYSICAL ADDRESS OF PROPERTY WHERE WELL IS LOCATED	CITY	COUNTY
8501 N State Route 94	West Alton	St. Charles

NAME OF SITE, BUSINESS, OR CLEANUP PROJECT	DNR/EPA PROJECT NUMBER OR REGULATORY SITE ID NUMBER (IF APPLICABLE)	VARIANCE NUMBER (IF ISSUED)
Sioux Energy Center	N/A	N/A

PRIMARY CONTRACTOR NAME (PLEASE PRINT)	PERMIT NUMBER	
Cascade Environmental, LLC		Section 256.607(3), RSMo, requires all primary contractors to comply with all rules and regulations promulgated pursuant to Sections 256.600 to 256.640 RSMo.

SURFACE COMPLETION

TYPE: ☑ Above Ground ☐ Flush Mount

LENGTH AND DIAMETER OF SURFACE COMPLETION: Length 5.0 FT. Diameter 4.5 IN.

DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: Diameter 14.0 IN. Length 2.5 FT.

SURFACE COMPLETION GROUT: ☑ Concrete ☐ Other

☑ Locking Cap
☑ Weep Hole

Elevation 430.84 FT.

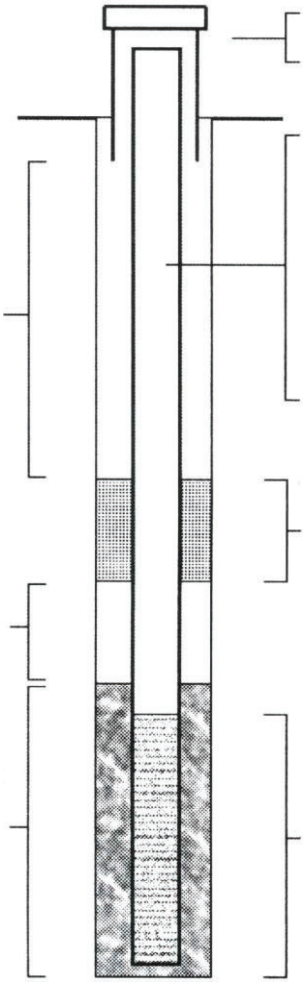
ANNULAR SEAL
Length N/A FT.
☐ Slurry ☐ Chips ☐ Pellets ☐ Granular ☐ Cement/Slurry

IF CEMENT/BENTONITE MIX:
Bags of Cement Used N/A
% of Bentonite Used N/A
Water Used Per Bag N/A GAL.

SECONDARY FILTER PACK LENGTH
N/A FT.

DEPTH TO TOP OF PRIMARY FILTER PACK
18.0 FT.

LENGTH OF PRIMARY FILTER PACK
12.2 FT.



SURFACE COMPLETION
☐ Steel ☑ Aluminum ☐ Plastic

RISER OR CASING (IF OPEN HOLE COMPLETION)
Riser/Casing Diameter 2.0 IN.
Riser/Casing Length 22.8 FT.
Diameter Of Drill Hole 6.0 IN.
Weight Or SDR# 40

MATERIAL
☐ Steel ☑ Thermoplastic (PVC)
☐ Other

BENTONITE SEAL
Length 15.5
☑ Chips ☐ Pellets ☐ Granular
☐ Saturated Zone ☐ Hydrated

SCREEN
Screen Diameter 2.0 IN.
Screen Length 9.8 FT.
Diameter Of Drill Hole 6.0 IN.
Depth To Top 20.0 FT.

SCREEN MATERIAL
☐ Steel ☑ Thermoplastic (PVC)
☐ Other

For cased wells, submit additional as-built diagrams showing well construction details including type and size of all casing, hole diameter and grout used.

LOCATION OF WELL (D/M/S FORMAT ONLY)
Latitude 38 ° 54 ' 2.71 "
Longitude -090 ° 17 ' 22.55 "

SMALLEST ¼ LARGEST ¼ ¼
Section 19 Township 48 North
Range 6 ☑ E ☐ W

TYPE OF WELL (CHECK ONE)
☐ Direct Push ☐ Extraction ☐ Inclinometer
☐ Gas Migration ☐ Injection ☐ Lysimeter
☑ Observation ☐ Open Hole ☐ Other (specify)
☐ Piezometer ☐ Standard

MONITORING FOR (CHECK ALL THAT APPLY)
☐ Explosives ☑ Metals
☐ Pesticides/Herbicides ☐ Petroleum
☐ Radionuclides ☐ SVOCS
☐ VOCS (non-petroleum) ☐ Geotechnical Data

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION (OR ATTACH BORING LOG*)
0.0	2.0	(CL) SILTY CLAY
2.0	7.0	(ML) sandy SILT
7.0	10.0	(SM) SILTY SAND
10.0	11.7	(SP) SAND
11.7	13.8	(ML) SILT
13.8	15.0	(SM) SILTY SAND
15.0	29.5	(SP) SAND
29.5	31.0	(SW) SAND

TOTAL DEPTH: 31.0 FT.
☐ *Boring Log Attached

STATIC WATER LEVEL 17.26 FT.
PUMP INSTALLED ☐ Yes ☑ No

I hereby certify that the monitoring well herein described was constructed in accordance with Missouri Department of Natural Resources requirements.

MONITORING WELL INSTALLATION CONTRACTOR	PERMIT NUMBER	DATE	MONITORING WELL INSTALLATION CONTRACTOR APPRENTICE (IF APPLICABLE)	PERMIT NUMBER

SEND COMPLETED FORM AND FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, PO BOX 250, ROLLA MO 65402
FOR REGISTRATTION FEES, PLEASE SEE: https://dnr.mo.gov/pubs/pub2494.htm
PHONE: 573-368-2165 FAX: 573-368-2317 EMAIL: welldrillers@dnr.mo.gov
RECORD (AND FEE) MAY BE SUBMITTED ONLINE: dnr.mo.gov/mowells

AMEREN_00001733

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

REF NO	DATE RECEIVED
00381411	04/23/2008
CR NO	CHECK NO.
STATE WELL NO	REVENUE NO.
A161852 05/01/2008	042308
ENTERED NRSTOGD	APPROVED BY / ROUTE
PH1 PH2 PH3	
04/23/2008 04/23/2008 04/23/2008	

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

NOTE: THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME	CONTACT NAME			VARIANCE GRANTED BY DNR
AMEREN	PAUL PIKE			
OWNER ADDRESS	CITY	STATE	ZIP	NUMBER
1901 CHOTCAU	ST LOUIS	MO	63116	
SITE NAME		WELL NUMBER		COUNTY
SIOUX POWER PLANT		UG 2		ST CHARLES
SITE ADDRESS		CITY		STATIC WATER LEVEL
8501 W STATE RT 94		WEST ALTON		12.0 FT

SURFACE COMPLETION

TYPE
- [X] ABOVE GROUND
- [ ] FLUSH MOUNT

LENGTH AND DIAMETER OF SURFACE COMPLETION
- LENGTH 0.0 FT.
- DIAMETER 0.0 IN.

DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED
- DIAMETER 0.0 IN.
- LENGTH 0.0 FT.

SURFACE COMPLETION GROUT
- [ ] CONCRETE
- [ ] OTHER

COPY

LOCATION OF WELL
- LAT. 38 ° 54' 24.8"
- LONG. 90 ° 17' 29.4"

SMALLEST ____ 1/4 ____ 1/4 ____ 1/4 LARGEST

SEC. LG001838 TWN. ____ NORTH
RANGE ____ Direction

MONITORING FOR:
- [ ] RADIONUCLIDES
- [ ] EXPLOSIVES
- [ ] SVOCS
- [ ] PETROLEUM PRODUCTS ONLY
- [ ] METALS
- [ ] VOC
- [ ] PESTICIDES/HERBICIDESS

PROPOSED USE OF WELL
- [ ] GAS MIGRATION WELL
- [ ] EXTRACTION WELL
- [ ] PIEZOMETERS
- [ ] DIRECT PUSH
- [X] OBSERVATION
- [ ] OPEN HOLE

- [ ] LOCKING CAP
- [ ] WEEP HOLE

ELEVATION 427FT.

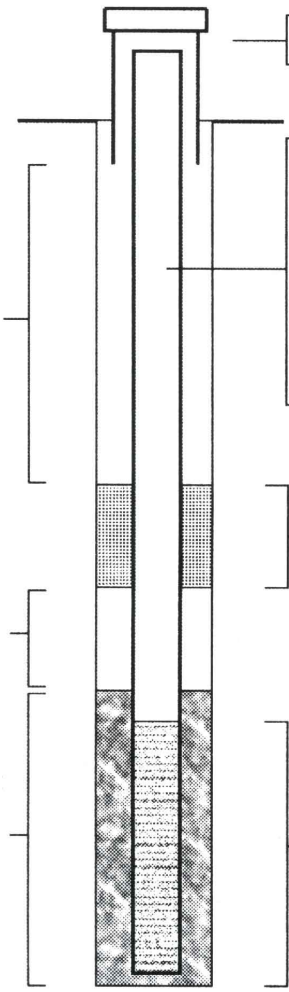
ANNULAR SEAL
LENGTH 9.0FT.
- [X] SLURRY
- [ ] PELLETS
- [ ] CEMENT/SLURRY
- [ ] CHIPS
- [ ] GRANULAR

IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED:
%OF BENTONITE USED:
WATER USED/BAG: GAL.

SECONDARY FILTER PACK
LENGTH: 2.0FT.

DEPTH TO TOP OF PRIMARY
FILTER PACK: 14.0FT.

LENGTH OF PRIMARY FILTER PACK: 12.0FT.



SURFACE COMPLETTION
- [ ] STEEL
- [ ] ALUMINUM
- [ ] PLASTIC

RISER
- RISER PIPE DIAMETER 2.0IN.
- RISER PIPE LENGTH 18.8FT.
- HOLE DIAMETER 8.25IN.
- WEIGHT OR SDR# SCH40

MATERIAL
- [ ] STEEL
- [X] THERMOPLASTIC (PVC)
- [ ] OTHER

BENTONITE SEAL
LENGTH: 3.0
- [ ] CHIPS
- [ ] PELLETS
- [ ] GRANULAR
- [ ] SLURRY
- [ ] SATURATED ZONE
- [ ] HYDRATED

SCREEN
- SCREEN DIAMETER: 2.0IN.
- SCREEN LENGTH: 10.0FT.
- DIAMETER OF DRILL HOLE: 8.25IN.
- DEPTH TO TOP 16.0FT.

SCREEN MATERIAL
- [ ] STEEL
- [X] THERMOPLASTIC (PVC)
- [ ] OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0.0	10.0	CLY
10.0	26.0	SLT SND

TOTAL DEPTH: 26.0 FEET

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETER AND GROUT USED.

SIGNATURE (PRIMARY COUNTRACTOR)	PERMIT NUMBER	DATE WELL DRILLING WAS COMPLETED
x ASHLEY COFFMAN	004158	12/16/2007

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS

- [ ] PUMP INSTALLED

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	SIGNATURE (APPRENTICE)	APPRENTICE PERMIT NUMBER
x DAVID HUNZIKER	002836	x	

APPENDIX H

Well Development Forms

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140601**

Location

BMW-1S

Monitored By: JSI Date 1/22/2016 Time 0800

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	25.95	feet
Depth of Water (from top of PVC or ground)	7.35	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.87	cubic feet
	6.5	gallons

Development / Purging Discharge Data

Purging Method		Waterra Pump		
Start Purging	Date	1/22/2016	Time	821
Stop Purging	Date	1/22/2016	Time	1325

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
1/22/2016	0920	55	12.8	7.21	804	>1000	1.61	124.4	9.30	cloudy, brown
1/22/2016	0930	65	13.2	7.45	704	>1000	1.52	153.9	9.15	
1/22/2016	0940	80	13.1	7.45	763	>1000	1.47	166.0	9.20	cloudy
1/22/2016	0950	85	13.3	7.40	763	>1000	0.86	168.0	9.21	
1/22/2016	1000	95	13.5	7.39	765	>1000	0.83	170.3	9.22	cloudy
1/22/2016	1010	104	13.3	7.38	766	>1000	1.06	179.5	9.23	
1/22/2016	1020	120	13.1	7.35	765	>1000	1.07	174.2	9.23	
1/22/2016	1040	130	13.1	7.34	770	>1000	0.66	171.7	9.25	
1/22/2016	1050	145	13.1	7.33	732	>1000	0.76	170.7	9.25	
1/22/2016	1100	155	13.0	7.33	764	>1000	0.65	170.4	9.25	less cloudy
1/22/2016	1110	165	13.0	7.38	764	578	0.45	170.9	9.25	
1/22/2016	1120	175	13.0	7.31	718	198	0.58	170.7	8.80	clearer
1/22/2016	1130	185	13.0	7.31	763	138	0.68	169.8	8.73	
1/22/2016	1140	195	13.1	7.33	717	98.4	0.59	168.2	8.73	
1/22/2016	1150	198	13.3	7.29	718	204	1.52	171.9	7.50	
1/22/2016	1200	200	10.4	7.33	726	167	1.25	173.7	7.51	
1/22/2016	1230	203	11.1	7.16	757	113	1.26	173.1	7.52	
1/22/2016	1240	206	10.9	7.36	757	125	1.25	166.1	7.52	
1/22/2016	1250	209	10.2	7.32	759	113	1.23	169.1	7.52	
1/22/2016	1300	212	10.6	7.17	732	128.00	1.22	176.1	7.52	
1/22/2016	1310	214	10.6	7.10	724	132	1.23	180.5	7.46	
1/22/2016	1320	216	10.4	7.27	726	112	1.24	195.9	7.41	
1/22/2016	1333	220	12.5	7.87	758	>1000	1.46	50.3	-	muddy
1/22/2016	1345	225	12.4	7.62	765	374	0.99	-33.2	7.41	
1/22/2016	1408	230	12.3	7.76	762	>1000	1.02	-84.8	7.41	
1/22/2016	1435	235	12.4	7.71	756	297	1.10	-83.2	7.45	
1/22/2016	1451	237	12.8	7.54	771	29.7	1.95	-91.2	7.40	clearer

GOLDER

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140601**

Location

BMW-1S

Monitored By: JSI Date 1/22/2016 Time 0800

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	25.95	feet
Depth of Water (from top of PVC or ground)	7.35	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.87	cubic feet
	6.5	gallons

Development / Purging Discharge Data

Purging Method: Waterra Pump

Start Purging Date 1/22/2016 Time 821

Stop Purging Date 1/22/2016 Time 1325

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
1/22/2016	1500	239	10.4	7.44	761	74.6	1.26	-63.9	7.45	clear
1/22/2016	1510	241	10.4	7.40	752	27.8	1.31	-60.3	7.45	
1/22/2016	1520	243	10.3	7.41	763	12.6	1.33	-57.2	7.46	clear
1/22/2016	1530	245	10.3	7.38	760	10.1	1.35	-59.2	7.46	
1/22/2016	1543	247	10.3	7.38	754	4.2	1.36	-57.4	7.46	

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140601**

Location

BMW-3S

Monitored By: MG Date 11/10/2016 Time 1300

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	26.74	feet
Depth of Water (from top of PVC or ground)	8.65	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.90	cubic feet
	6.7	gallons

Development / Purging Discharge Data

Purging Method: Waterra Pump

Start Purging Date 11/10/2016 Time 1300

Stop Purging Date 11/11/2016 Time 1630

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
11/10/2016	1320	40	17.2	7.49	638	>1000	4.59	-202.0	8.96	cloudy
11/10/2016	1330	60	17.3	7.39	744	>1000	5.37	-271.0	8.99	
11/10/2016	1340	80	17.0	7.19	739	>1000	3.22	-418.0	8.94	
11/10/2016	1350	100	16.7	6.96	725	>1000	3.03	-324.0	8.93	
11/10/2016	1400	120	16.8	7.22	613	>1000	1.90	-451.0	8.94	
11/10/2016	1410	140	16.5	7.69	615	>1000	3.02	-478.0	8.95	
11/10/2016	1420	160	16.8	7.54	613	>1000	3.31	-483.0	8.94	
11/10/2016	1430	180	16.3	7.69	606	>1000	3.76	-492.0	8.94	
11/10/2016	1440	200	16.4	7.51	603	>1000	4.75	-486.0	8.96	
11/10/2016	1450	220	16.7	7.21	602	>1000	2.99	-484.0	8.93	
11/10/2016	1500	240	16.5	7.70	595	897	3.74	-478.0	8.91	
11/10/2016	1550	250	16.4	7.73	608	776	5.30	-455.0	8.91	
11/10/2016	1600	260	14.7	7.51	577	478	7.02	-413.0	8.91	
11/10/2016	1610	270	15.3	7.38	580	600	6.54	-401.0	8.90	
11/10/2016	1620	280	14.5	7.36	569	435	6.21	-412.0	8.92	cloudy
11/10/2016	1630	290	14.3	7.34	560	324	6.43	-406.0	8.91	
11/10/2016	1640	300	14.0	7.39	555	264	5.93	-416.0	8.91	
11/10/2016	1650	310	13.6	7.36	549	212	4.61	-414.0	8.90	
11/11/2016	1030	340	18.4	6.75	768	182	4.53	-220.0	8.92	
11/11/2016	1100	350	18.6	7.41	768	169	5.25	-237.0	8.91	
11/11/2016	1110	360	18.8	7.25	761	139	4.66	-291.0	9.90	
11/11/2016	1130	380	18.9	7.26	740	131	4.51	-309.0	8.91	
11/11/2016	1150	400	18.0	7.26	720	132	4.80	-264.0	8.93	
11/11/2016	1210	420	18.7	7.00	733	69.0	5.22	-255.0	8.91	
11/11/2016	1230	440	18.9	7.21	714	62.0	4.42	-287.0	8.92	
11/11/2016	1250	460	18.7	7.25	703	52.3	4.56	-284.0	8.91	cloudy

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140601**

Location

BMW-3S

Monitored By: MG Date 11/10/2016 Time 1300

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	26.74	feet
Depth of Water (from top of PVC or ground)	8.65	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.90	cubic feet
	6.7	gallons

Development / Purging Discharge Data

Purging Method	Waterra Pump			
Start Purging	Date 11/10/2016	Time 1300		
Stop Purging	Date 11/11/2016	Time 1630		

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
11/11/2016	1310	480	16.5	7.66	713	54.2	4.32	-327.0	8.92	cloudy
11/11/2016	1350	500	17.6	7.61	723	46.2	5.02	-277.0	8.90	paused to cool pump
11/11/2016	1420	510	16.4	7.61	714	131	4.55	-250.0	8.92	
11/11/2016	1440	530	15.9	7.56	711	70	3.97	-283.0	8.91	
11/11/2016	1450	540	15.2	7.39	704	107	2.36	-316.0	8.90	cloudy
11/11/2016	1510	550	14.4	7.40	694	77	4.09	-265.0	8.93	
11/11/2016	1530	560	13.8	6.96	674	50.6	3.41	-320.0	8.91	
11/11/2016	1550	570	13.4	7.42	677	35.1	5.10	-239.0	8.90	
11/11/2016	1620	580	13.2	7.52	682	19.7	6.22	-187.0	8.92	
11/11/2016	1650	590	13.0	7.39	683	16.3	6.73	-151.0	8.92	cloudy

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140604.0003B**

Location

TMW-4

Monitored By: GTM Date 3/7/2022 Time 0920

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	31.76	feet
Depth of Water (from top of PVC or ground)	19.06	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.74	cubic feet
	5.5	gallons

Development / Purging Discharge Data

Purging Method		Waterra Pump		
Start Purging	Date	3/7/2022	Time	928
Stop Purging	Date	3/10/2022	Time	1245

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
3/7/2022	933	2.5	11.0	6.81	837	>1000	2.99	136.7	19.11	brown, turbid
3/7/2022	938	5	11.2	7.12	623	>1000	2.53	110.5	19.32	
3/7/2022	943	7.5	12.4	7.16	827	>1000	1.62	60.8	19.40	
3/7/2022	948	10	12.6	7.17	835	>1000	1.93	33.6	19.45	
3/7/2022	953	12.5	11.3	7.22	508	>1000	3.41	10.1	19.52	
3/7/2022	958	15	11.7	7.15	734	>1000	2.39	-13.1	19.45	
3/7/2022	1003	17.5	12.0	7.08	480	>1000	2.82	-11.4	19.38	
3/7/2022	1008	20	12.9	7.20	844	>1000	1.70	-82.4	19.28	
3/7/2022	1013	22.5	12.4	7.15	848	>1000	1.91	-91.7	19.31	
3/7/2022	1018	25	12.7	7.13	833	>1000	1.04	-104.9	19.30	
3/7/2022	1023	27.5	12.6	7.07	844	>1000	1.13	-110.9	19.32	
3/7/2022	1028	30	12.9	7.07	837	>1000	1.31	-104.3	19.28	
3/7/2022	1033	32.5	12.9	7.05	839	>1000	1.13	-103.4	19.30	
3/7/2022	1038	35	12.6	7.04	846	>1000	1.39	-98.8	19.31	
3/7/2022	1043	45	12.5	7.02	841	>1000	1.37	-91.9	19.30	
3/7/2022	1048	47.5	12.7	7.01	842	>1000	1.16	-92.7	19.30	light brown
3/7/2022	1053	50	12.5	7.04	765	>1000	1.47	-86.5	19.31	
3/7/2022	1058	52.5	12.5	7.00	844	>1000	0.89	-90.2	19.29	
3/7/2022	1105	55	12.9	7.04	836	>1000	0.89	-93.1	19.30	
3/7/2022	1108	57.5	12.4	7.08	840	>1000	1.64	-78.0	19.29	
3/7/2022	1113	60	12.7	7.02	841	>1000	1.08	-75.2	19.30	very light brown, cloudy
3/7/2022	1118	62.5	13.0	7.03	845	>1000	0.83	-80.7	19.27	
3/7/2022	1123	65	12.8	7.08	840	>1000	1.06	-80.0	19.32	
3/7/2022	1128	67.5	12.8	7.05	851	>1000	1.21	-71.5	19.36	
3/7/2022	1133	70	12.8	7.03	843	>1000	0.97	-76.2	19.38	
3/7/2022	1138	72.5	12.4	7.09	847	>1000	1.95	-59.1	19.42	
3/7/2022	1145	75	12.9	7.07	831	>1000	1.60	-50.2	19.42	

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140604.0003B**

Location

TMW-4

Monitored By: GTM Date 3/7/2022 Time 0920

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	31.76	feet
Depth of Water (from top of PVC or ground)	19.06	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.74	cubic feet
	5.5	gallons

Development / Purging Discharge Data

Purging Method: Waterra Pump

Start Purging Date 3/7/2022 Time 928

Stop Purging Date 3/10/2022 Time 1245

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
3/7/2022	1153	92.5	12.7	7.05	869	>1000	1.24	-64.4	19.51	light brown
3/7/2022	1158	95	12.7	7.03	871	>1000	1.53	-59.7	19.48	
3/7/2022	1203	92.5	13.2	7.01	853	>1000	0.86	-56.0	19.42	
3/7/2022	1208	100	13.2	7.02	857	>1000	1.99	-65.3	19.39	
3/7/2022	1213	102.5	13.0	7.02	844	>1000	1.30	-61.4	19.50	
3/7/2022	1218	105	11.7	7.08	847	>1000	3.81	-42.9	19.39	
3/7/2022	1223	107	12.0	7.10	851	>1000	6.98	-1.3	19.31	
3/7/2022	1228	109	12.4	7.02	851	>1000	6.87	19.4	19.31	
3/7/2022	1233	111	12.0	7.09	846	>1000	4.26	13.9	19.31	
3/7/2022	1248	113	11.8	7.08	862	>1000	4.43	7.2	19.32	
3/7/2022	1283	115	12.2	7.09	856	>1000	3.67	4.7	19.31	
3/7/2022	1288	117	12.2	7.10	857	>1000	4.44	1.7	19.31	
3/7/2022	1253	119	12.3	7.08	862	>1000	3.45	-7.0	19.31	
3/7/2022	1258	121	12.0	7.10	853	>1000	4.18	-7.7	19.31	light brown, cloudy
3/7/2022	1303	123	12.2	7.10	860	>1000	3.99	-5.7	19.31	
3/7/2022	1308	125	12.6	7.14	843	>1000	3.37	-0.4	19.31	
3/10/2022	0925	125	8.2	7.03	751	578	4.78	164.1	18.98	turbid, off-white
3/10/2022	0930	127.5	10.4	7.01	736	787	3.47	147.4	18.99	
3/10/2022	0935	130	10.9	7.06	527	727	2.83	129.8	18.98	
3/10/2022	0940	132.5	10.5	7.07	760	559	3.27	110.0	18.98	
3/10/2022	0945	135	11.6	7.07	752	503	2.94	95.6	18.98	yellowish, translucent
3/10/2022	0950	137.5	11.6	7.06	765	323	2.55	80.5	18.98	
3/10/2022	0955	140	11.0	7.04	762	294	2.34	72.9	18.98	
3/10/2022	1000	142.5	11.3	7.04	764	289	2.63	62.4	18.98	
3/10/2022	1005	145	11.6	7.06	764	277	2.43	54.4	18.98	
3/10/2022	1010	147.5	11.8	7.09	765	259	2.41	46.7	18.98	

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140604.0003B**

Location

TMW-4

Monitored By: GTM Date 3/7/2022 Time 0920

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	31.76	feet
Depth of Water (from top of PVC or ground)	19.06	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.74	cubic feet
	5.5	gallons

Development / Purging Discharge Data

Purging Method	Waterra Pump			
Start Purging	Date	3/7/2022	Time	928
Stop Purging	Date	3/10/2022	Time	1245

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
3/10/2022	1015	150	11.7	7.03	780	252	2.34	39.8	18.98	off-white, translucent
3/10/2022	1020	152.5	11.4	7.03	779	232	2.45	35.6	18.98	
3/10/2022	1025	155	12.3	7.04	778	222	2.58	31.8	18.98	
3/10/2022	1035	160	12.2	7.03	773	183	2.33	25.2	18.98	
3/10/2022	1040	162.5	11.7	7.02	775	159	2.11	9.0	18.98	
3/10/2022	1045	165	11.7	7.02	773	106	1.97	1.6	18.98	
3/10/2022	1050	167.5	11.7	7.02	778	95	1.86	10.3	18.98	
3/10/2022	1055	170	11.6	7.02	780	91.7	1.90	14.4	18.98	
3/10/2022	1100	172.5	11.7	7.03	771	83.1	1.46	14.0	18.98	
3/10/2022	1105	175	11.7	7.02	772	70.4	1.58	13.7	18.98	
3/10/2022	1120	182.5	12.1	7.03	775	55.9	2.77	10.6	18.96	
3/10/2022	1130	187.5	12.5	7.00	777	49.3	2.17	-3.6	18.96	clear, off white
3/10/2022	1140	192.5	12.7	7.01	781	43.7	2.36	-7.9	18.96	
3/10/2022	1150	197.5	12.9	6.99	697	30.8	2.04	-9.4	18.96	clear, colorless
3/10/2022	1200	200	12.3	7.01	782	24.6	2.14	-11.9	18.98	flow rate slowed
3/10/2022	1210	202.5	12.2	6.99	783	20.3	2.07	-11.8	18.98	clear, colorless
3/10/2022	1220	205	12.2	6.98	782	20.8	1.78	-14.4	18.98	
3/10/2022	1225	206	12.3	6.99	784	22.2	1.85	-13.1	18.98	
3/10/2022	1230	207	12.3	6.98	785	21.0	1.77	-15.2	18.97	
3/10/2022	1235	208	12.3	7.00	784	21.2	1.89	-14.1	18.96	
3/10/2022	1240	209	12.2	6.99	781	22.0	2.01	-16.8	18.96	
3/10/2022	1245	210	12.3	6.99	782	24.3	1.94	-13.9	18.96	

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140604.0003B**

Location

TMW-5

Monitored By: GTM Date 3/7/2022 Time 1347

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	32.26	feet
Depth of Water (from top of PVC or ground)	18.98	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.74	cubic feet
	5.5	gallons

Development / Purging Discharge Data

Purging Method: Waterra Pump

Start Purging Date 3/7/2022 Time 1402

Stop Purging Date 3/9/2022 Time 1618

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
3/7/2022	1407	2.5	12.0	7.17	839	>1000	1.83	-4.3	19.16	brown, turbid
3/7/2022	1412	5	12.3	7.11	839	>1000	0.94	-112.4	19.16	
3/7/2022	1417	7.5	12.9	7.05	842	>1000	0.91	-121.3	19.16	
3/7/2022	1422	10	13.0	7.02	847	>1000	0.84	-120.8	19.20	
3/7/2022	1427	12.5	12.2	7.05	867	>1000	0.79	-133.6	19.18	
3/7/2022	1432	15	12.3	7.04	863	>1000	0.97	-131.1	19.19	
3/7/2022	1437	17.5	12.2	7.03	865	>1000	0.94	-134.0	19.19	
3/7/2022	1442	20	12.0	7.00	879	>1000	0.86	-135.6	19.19	
3/7/2022	1447	22.5	11.4	7.00	877	>1000	1.43	-126.0	19.18	light brown, turbid
3/7/2022	1452	25	11.3	7.01	882	>1000	1.55	-120.4	19.18	
3/7/2022	1457	27.5	10.8	7.00	890	>1000	1.70	-113.4	19.18	
3/7/2022	1502	30	10.6	6.99	886	>1000	1.50	-117.8	19.14	slightly translucent
3/7/2022	1507	32.5	9.7	6.99	892	>1000	2.35	-105.4	19.16	
3/7/2022	1512	35	11.3	6.94	884	>1000	1.19	-105.1	19.18	
3/7/2022	1517	37.5	11.3	6.94	884	>1000	1.01	-103.8	19.18	
3/7/2022	1522	40	11.2	6.94	880	>1000	1.31	-98.4	19.15	silts visible
3/7/2022	1527	42.5	10.9	6.92	888	>1000	0.93	-96.4	19.18	
3/7/2022	1532	45	11.0	6.95	884	902	1.15	-87.5	19.18	silts, fine sands, brown
3/7/2022	1537	47.5	10.9	6.95	887	>1000	1.21	-84.5	19.26	
3/7/2022	1542	50	12.3	6.94	884	>1000	0.86	-86.2	19.26	
3/7/2022	1547	52.5	12.2	6.94	881	>1000	1.07	-85.3	19.26	
3/7/2022	1552	55	12.1	6.95	874	>1000	1.01	-95.6	19.36	
3/7/2022	1557	57.5	12.5	6.94	880	>1000	0.87	-97.9	19.50	
3/7/2022	1602	60	12.2	6.95	845	>1000	1.30	-88.6	19.48	
3/7/2022	1607	62.5	11.3	6.92	876	>1000	1.42	-89.5	19.48	
3/7/2022	1612	65	11.3	6.94	873	>1000	1.37	-85.5	19.48	
3/7/2022	1617	67.5	11.4	6.95	858	>1000	1.42	-82.6	19.50	

GOLDER

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140604.0003B**

Location

TMW-5

Monitored By: GTM Date 3/7/2022 Time 1347

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	32.26	feet
Depth of Water (from top of PVC or ground)	18.98	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.74	cubic feet
	5.5	gallons

Development / Purging Discharge Data

Purging Method: Waterra Pump

Start Purging Date 3/7/2022 Time 1402

Stop Purging Date 3/9/2022 Time 1618

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
3/7/2022	1622	70	10.3	6.97	821	>1000	1.43	-80.9	19.50	light brown, fines present
3/7/2022	1627	72.5	12.5	6.94	859	>1000	1.23	-82.9	19.55	
3/7/2022	1632	75	11.8	6.92	872	839	1.04	-85.5	19.34	translucent, light brown
3/7/2022	1637	77.5	12.1	6.91	863	678	1.30	-84.3	19.39	
3/7/2022	1642	80	11.1	6.95	860	527	1.77	-75.7	19.39	more translucent
3/7/2022	1647	82.5	11.5	6.96	855	500	3.84	-57.1	19.49	
3/7/2022	1658	85	11.3	6.96	850	568	3.01	-37.3	19.48	
3/8/2022	1005	87.5	11.7	6.77	790	179	1.69	15.9	18.94	clear, slightly turbid
3/8/2022	1010	92.5	11.6	6.80	757	216	1.29	116.5	18.70	
3/8/2022	1015	95	12.1	6.80	755	392	1.12	70.4	19.35	
3/8/2022	1020	97.5	12.0	6.81	758	282	0.97	37.9	19.46	
3/8/2022	1025	100	10.2	6.82	759	250	1.62	-10.7	19.45	
3/8/2022	1040	102.5	11.9	6.81	752	201	1.05	-18.2	19.37	
3/8/2022	1045	105	12.3	6.80	756	179	0.86	-28.5	19.36	
3/8/2022	1050	107.5	12.3	6.81	761	163	1.19	-35.7	19.38	
3/8/2022	1055	110	13.4	6.82	747	150	1.13	-32.5	19.38	
3/8/2022	1100	112.5	12.8	6.82	760	122	1.07	-37.2	19.42	clear, slightly turbid
3/8/2022	1105	115	13.0	6.78	759	116	0.96	-37.2	19.36	
3/8/2022	1110	117.5	13.0	6.75	756	119	0.95	-36.8	19.37	
3/8/2022	1115	120	12.9	6.79	761	91.2	0.90	-40.3	19.37	
3/8/2022	1120	122.5	13.2	6.79	758	79.1	0.96	-40.5	19.37	some fine sands
3/8/2022	1125	125	13.0	6.78	753	80.0	1.05	-40.2	19.38	
3/8/2022	1130	127.5	12.5	6.78	763	69.3	0.74	-43.2	19.38	
3/8/2022	1135	130	13.6	6.78	749	47.4	1.00	-36.2	19.37	
3/8/2022	1150	132.5	12.0	6.98	739	31.0	5.14	-26.2	19.38	turbid
3/8/2022	1155	135	12.9	6.93	747	19.3	3.40	-4.0	19.37	
3/8/2022	1200	137.5	12.7	6.91	744	99.3	2.21	0.8	19.37	clear, slightly turbid

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140604.0003B**

Location

TMW-5

Monitored By: GTM Date 3/7/2022 Time 1347

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	32.26	feet
Depth of Water (from top of PVC or ground)	18.98	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.74	cubic feet
	5.5	gallons

Development / Purging Discharge Data

Purging Method: Waterra Pump

Start Purging Date 3/7/2022 Time 1402

Stop Purging Date 3/9/2022 Time 1618

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
3/8/2022	1210	142.5	13.1	6.79	744	52.1	1.36	-9.1	19.37	clear, slightly turbid
3/8/2022	1215	145	13.0	6.80	744	50.8	1.22	-10.8	19.37	
3/8/2022	1220	147.5	13.0	6.76	740	83.1	1.02	-24.2	19.38	
3/8/2022	1225	150	12.6	6.73	750	66.1	1.06	-20.7	19.38	
3/8/2022	1230	152.5	13.4	6.77	755	93.3	1.10	-23.9	19.38	
3/8/2022	1235	155	13.1	6.73	765	26	0.96	-21.3	19.37	
3/8/2022	1240	157.5	13.3	6.75	756	112	1.21	-25.2	19.37	
3/8/2022	1245	160	13.3	6.76	757	132	1.36	-23.8	19.38	slightly turbid
3/8/2022	1250	162.5	13.9	6.77	749	127	5.31	-8.0	19.38	
3/8/2022	1255	165	14.3	6.79	754	126	5.78	1.0	19.36	
3/8/2022	1300	167.5	13.9	6.79	760	87.4	3.82	5.2	19.36	
3/8/2022	1305	170	13.9	6.77	763	116	3.47	5.2	19.37	
3/9/2022	1523	172.5	14.2	6.94	819	232	1.25	59.0	18.87	yellowish, med. Turbidity
3/9/2022	1528	175	13.8	6.93	809	37.4	1.08	41.5	18.92	colorless
3/9/2022	1533	177.5	14.0	6.90	812	11.8	1.15	25.8	18.88	clear, colorless
3/9/2022	1538	180	13.8	6.94	702	6.15	1.34	14.1	18.88	
3/9/2022	1543	182.5	13.7	6.92	809	4.26	1.20	8.0	18.88	
3/9/2022	1548	185	13.5	6.91	815	3.91	1.16	-2.0	18.88	
3/9/2022	1553	187.5	13.6	6.92	813	3.64	1.10	-2.4	18.88	
3/9/2022	1558	190	13.4	6.90	814	3.23	1.08	-4.0	18.89	
3/9/2022	1603	192.5	13.4	6.90	814	2.23	1.04	-7.2	18.89	
3/9/2022	1608	195	13.2	6.90	815	3.06	1.04	-8.0	18.89	
3/9/2022	1613	197.5	13.3	6.91	814	3.34	1.00	-8.6	18.89	
3/9/2022	1618	200	13.3	6.91	809	2.26	1.03	-8.9	18.89	

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140604.0003B**

Location

TMW-6

Monitored By: GTM Date 3/8/2022 Time 1540

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	32.99	feet
Depth of Water (from top of PVC or ground)	19.84	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.74	cubic feet
	5.5	gallons

Development / Purging Discharge Data

Purging Method: Waterra Pump

Start Purging Date 3/8/2022 Time 1540

Stop Purging Date 3/9/2022 Time 1325

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
3/8/2022	1545	3.6	13.8	6.92	777	>1000	2.25	1.4	19.84	brown, turbid
3/8/2022	1550	7.2	13.6	6.80	796	>1000	12.00	-69.1	19.86	
3/8/2022	1555	10.8	13.6	6.79	806	>1000	1.34	-72.8	19.85	
3/8/2022	1600	14.4	13.3	6.77	808	>1000	1.45	-72.5	19.85	
3/8/2022	1605	18	13.5	6.80	798	>1000	1.33	-82.4	19.85	
3/8/2022	1610	21.6	13.7	6.81	797	>1000	1.29	-85.6	19.85	
3/8/2022	1615	25.2	13.6	6.75	809	>1000	1.15	-87.3	19.86	
3/8/2022	1620	28.8	13.5	6.76	806	>1000	1.16	-84.3	19.86	
3/8/2022	1625	32.4	13.6	6.73	807	>1000	0.96	-86.7	19.86	
3/8/2022	1630	36	13.3	6.73	818	>1000	1.38	-78.4	19.86	
3/8/2022	1635	39.6	13.5	6.80	791	>1000	1.48	-68.4	19.86	
3/8/2022	1640	43.2	13.5	6.74	792	>1000	1.15	-55.7	19.85	
3/8/2022	1645	46.8	13.4	6.77	714	>1000	1.69	-55.2	19.83	
3/8/2022	1650	50.6	13.3	6.80	780	>1000	2.02	-35.2	19.85	slightly less turbid
3/8/2022	1655	54.2	13.3	6.78	773	>1000	1.57	-38.0	19.85	light brown
3/8/2022	1700	57.8	13.3	6.78	774	>1000	1.28	-37.2	19.85	
3/9/2022	1005	61.4	13.6	6.87	837	925	1.75	180.0	19.79	translucent, yellowish
3/9/2022	1010	65	13.8	6.94	852	974	1.14	147.3	19.86	
3/9/2022	1015	68.6	14.1	6.94	860	>1000	0.85	179.1	19.86	
3/9/2022	1020	72.2	14.3	6.92	869	>1000	0.91	106.7	19.87	
3/9/2022	1025	75.8	14.2	6.79	862	>1000	0.80	100.1	19.88	
3/9/2022	1035	83	14.3	6.91	882	>1000	0.76	84.4	19.88	
3/9/2022	1040	86.6	14.2	6.84	872	>1000	1.02	82.7	19.87	
3/9/2022	1045	90.2	14.3	6.95	856	>1000	0.94	79.8	19.87	
3/9/2022	1050	93.8	14.2	6.98	841	>1000	1.23	80.6	19.87	
3/9/2022	1055	87.4	14.2	6.98	854	>1000	1.22	75.9	19.91	
3/9/2022	1100	91	14.4	6.89	885	>1000	1.15	-70.1	20.04	yellowish brown

GOLDER

WELL DEVELOPMENT/PURGING/SAMPLING FORM

Project Ref: Ameren GW Monitoring **Project No.: 153-140604.0003B**

Location

TMW-6

Monitored By: GTM Date 3/8/2022 Time 1540

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC or ground)	32.99	feet
Depth of Water (from top of PVC or ground)	19.84	feet
Radius of Casing	2	inches
	0	feet
Casing Volume	0.74	cubic feet
	5.5	gallons

Development / Purging Discharge Data

Purging Method: Waterra Pump

Start Purging Date 3/8/2022 Time 1540

Stop Purging Date 3/9/2022 Time 1325

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments
3/9/2022	1105	94.6	14.4	6.96	901	>1000	1.55	-60.8	20.04	yellowish brown
3/9/2022	1110	98.2	14.2	6.88	916	>1000	1.24	-42.9	20.02	
3/9/2022	1115	101.8	14.1	6.86	913	987	1.18	-20.0	20.11	
3/9/2022	1120	105.6	14.3	8.85	917	696	1.13	-3.0	20.32	less turbid, yellowish
3/9/2022	1125	109.2	14.2	6.86	924	481	0.98	-22.5	20.09	
3/9/2022	1130	112.8	14.0	6.96	924	315	5.34	-15.1	19.98	
3/9/2022	1135	116.4	14.0	6.86	912	246	3.97	-16.6	19.97	
3/9/2022	1140	120	14.1	6.86	909	205	3.97	-15.3	19.97	no fines visble
3/9/2022	1145	123.6	14.2	6.84	917	171	4.30	-15.0	19.96	
3/9/2022	1150	127.2	14.0	6.85	914	123	4.47	-17.1	19.97	colorless, nearly clear
3/9/2022	1155	130.8	13.9	6.87	915	94.2	4.57	-17.9	19.97	
3/9/2022	1200	134.4	13.4	6.87	921	87.8	4.14	-18.2	19.97	
3/9/2022	1205	138	13.3	6.87	924	74.2	4.12	-18.0	19.97	
3/9/2022	1220	150.8	13.1	6.88	929	40.8	4.20	-20.0	19.97	
3/9/2022	1225	154.4	14.5	6.86	914	21.5	1.47	-20.5	19.97	clear, colorless
3/9/2022	1230	158	13.9	6.87	919	12.5	1.25	-2.8	19.97	
3/9/2022	1235	161.6	13.6	6.87	913	7.16	1.76	-23.3	19.76	
3/9/2022	1240	165.2	14.1	6.84	913	3.89	1.06	-28.7	19.76	
3/9/2022	1245	168.8	13.8	6.86	915	3.96	1.12	-24.8	19.74	
3/9/2022	1250	172.4	13.8	6.85	897	3.00	1.27	-37.3	19.74	
3/9/2022	1255	176	13.9	6.86	895	3.12	1.09	-36.4	19.74	
3/9/2022	1300	179.6	13.8	6.82	912	3.21	0.91	-37.4	19.74	
3/9/2022	1305	183.2	13.8	6.85	921	2.34	0.77	-40.2	19.74	
3/9/2022	1310	186.8	13.9	6.85	913	2.73	1.09	-37.2	19.74	
3/9/2022	1315	190.4	13.8	6.83	922	2.73	0.80	-45.3	19.74	
3/9/2022	1320	194	14.0	6.84	915	2.81	1.17	-39.8	19.74	
3/9/2022	1325	200	14.0	6.85	921	2.66	1.09	-41.2	19.74	

APPENDIX I

Statistical Analysis Plan

REPORT

Statistical Analysis Plan

Ameren Missouri
Sioux Energy Center, St. Charles County, Missouri
Utility Waste Landfill Cell SCPD

Prepared in accordance with the United States Environmental Protection Agencies Coal Combustion Rule, Part 40 CFR 257.93

Submitted to:

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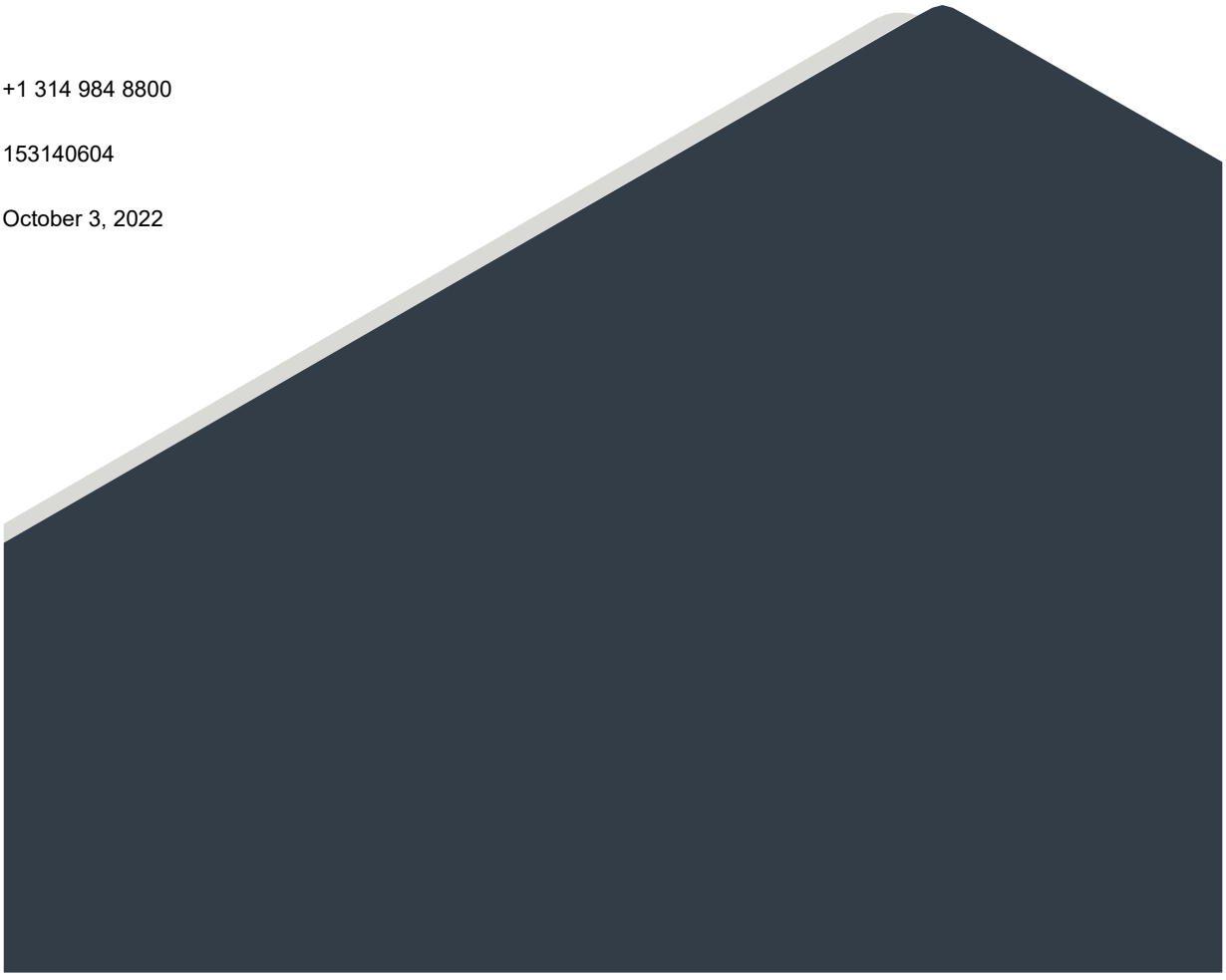
October 3, 2022



Executive Summary

This Statistical Analysis Plan (SAP) 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 Rule or CCR Rule). The Rule requires owners or operators of an existing Coal Combustion Residuals (CCR) Surface Impoundment to install a groundwater monitoring system and develop a sampling and analysis program (§§ 257.90 - 257.94). Ameren Missouri has determined that the newly constructed Utility Waste Landfill’s (UWL) SCPD Surface Impoundment at the Sioux Energy Center in St. Charles County, Missouri is subject to the requirements of the CCR Rule.

As a part of the groundwater sampling and analysis requirements of the Rule, statistical methods as described in Section §257.93(f) of the Rule need to be implemented to statistically evaluate groundwater quality. The selected statistical method must then be certified by a qualified Professional Engineer stating that the statistical method is appropriate for evaluating the groundwater monitoring data for the CCR Unit. Detailed descriptions of the acceptable statistical data methods are provided in the USEPA’s *Statistical Analysis of Groundwater Data at RCRA Facilities, Unified Guidance* (USEPA, 2009) (Unified Guidance). The Unified Guidance is also recommended in the CCR Rule to be used for guidance in the selection of the appropriate statistical evaluation method.

This SAP details the statistical procedures to be used to establish background conditions, to implement detection monitoring, and to implement assessment monitoring (if needed) for Ameren Missouri at the above mentioned CCR Unit. Detailed information on collection, sampling techniques, preservation, etc. are provided in the Groundwater Monitoring Plan (GMP) for the CCR Unit specified above. This SAP is a companion documents to the GMP and assumes that data analyzed by the procedures described in this SAP are from samples that were collected in accordance with the GMP.

This SAP was prepared by Golder Associates USA Inc., member of WSP (Golder) on behalf of Ameren in order to document appropriate method of groundwater data evaluation in compliance with CCR Rules. The methods and groundwater data evaluation techniques used in this SAP are appropriate for evaluation of the groundwater monitoring data for the above mentioned CCR Unit and are in compliance with performance standards outlined in Section §257.93(g) of the CCR Rule.

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1.0 BASELINE STATISTICS

This section discusses the procedures, methods, and processes that will be implemented as part of the Detection Monitoring statistical evaluation. Detection Monitoring will begin after eight rounds of baseline sampling are completed at each monitoring well for each of the Appendix III and Appendix IV parameters. This background monitoring period provides baseline data for each monitoring well which can be used as the basis of the statistical evaluation. Detection monitoring will be completed on a semiannual basis unless adequate groundwater flow is not available for semiannual sampling and proper documentation as outlined in §257.94(d) is completed. Detection monitoring will analyze for Appendix III analytes as outlined in the Groundwater Monitoring Plan for this CCR Unit.

1.1 Statistical Data Preparation and Initial Review

Many of the statistical comparison tests used in detection and assessment monitoring require various analyses to be completed prior to the data being used for the calculation of statistical limits. This section discusses the methods and procedures for completing this initial review of the data. The analyses required include testing for statistical independence, physical independence, and procedures to evaluate potential outliers.

1.1.1 Physical and Statistical Independence of Groundwater Samples

Detection and Assessment Monitoring statistical evaluations assume that background and downgradient sampling results are statistically independent. The Unified Guidance states that "Physical independence of samples does not guarantee statistical independence, but it increases the likelihood of statistical independence." (Section 14.1, Unified Guidance). Physical independence is most likely achieved when consecutive groundwater samples are collected from independent volumes of water within a given aquifer zone. Using the Darcy Equation, minimum time intervals between sampling events can be calculated in order to confirm the minimum time interval for groundwater to travel through the borehole is less than the time between sampling events (Table 1, Physical Independence). This minimum time can be calculated as displayed in Section 14.3.2 of the Unified Guidance. Based on the calculations provided below, a theoretical minimum time of 9 days, is required between sampling events to maintain statistical independence for all monitoring wells except BMW-1S.

Table 1: Physical Independence

Well ID	Hydraulic Conductivity	Average Hydraulic Gradient	Effective Porosity	Well Bore Volume	Minimum Time
Symbol	K	I	n	D	T_{min}
Units	Feet/Day	Feet/Foot	%	Feet	Days
UG-2	51	0.00041	0.35	0.5	8.4
TMW-4	56	0.00041	0.35	0.5	7.6
TMW-5	112	0.00041	0.35	0.5	3.8
TMW-6	94	0.00041	0.35	0.5	4.5
BMW-1S	16	0.00041	0.35	0.5	27.2
BMW-3S	53	0.00041	0.35	0.5	8.1

Notes:
1. Average hydraulic gradient and effective porosity calculated from Table 2 in the Groundwater Monitoring Plan (GMP).
2. Hydraulic conductivity values taken from Table 3 of the Groundwater Monitoring Plan (GMP).

3. Minimum time calculation completed using the Darcy Equation as outlined in section 14.3.2 of the Unified Guidance.

1.1.2 Data Review - Testing for Outliers

Careful review of the data is critical for verifying that there is an accurate representation of the groundwater conditions. Early identification of anomalous data (outliers) helps play a key role in a successful SAP. Possible causes for outliers include:

- Sampling error or field contamination;
- Analytical errors or laboratory contamination;
- Recording or transcription errors;
- Faulty sample preparation, preservation, or shelf-life exceedance; or
- Extreme, but accurately detected environmental conditions (e.g., spills, migration from the facility).

The following sections outline a few graphical and statistical tests that should be completed prior to the data being used to calculate statistical limits.

1.1.2.1 Time Series Plots

Time series plots are a quick and simple method to qualitatively check for possible outliers. Time series plots should be generated with the concentration of the analyte on the Y-axis and the sample date (time) on the X-axis. If any data points look to be potential outliers, the data should be flagged and further evaluated as described in Section 1.1.2.2 below.

1.1.2.2 Dixon's and Rosner's Tests

If graphical methods demonstrate that potential outliers exist, further investigation of these data points can be completed using Dixon's test for datasets with fewer than 25 samples and Rosner's test with datasets greater than 20 samples. Formal testing should only be performed if an observation seems particularly high compared to the rest of the dataset. If statistical testing is to be completed to whether an outlier exists, it should be cautioned that these outlier tests assume that the rest of the data (other than the outlier) are normally distributed. Additionally, because log-normally distributed data often contain one or more values that appear high relative to the rest, it is recommended that the outlier test be run on the transformed values instead of their original observations. This way, one can avoid classifying a high log-normal measurement as an outlier just because the test assumptions were violated. Most groundwater statistical packages can complete Dixon's and Rosner's tests and more information about Dixon's and Rosner's tests is provided in Sections 12.3 and 12.4 of the Unified Guidance. If the test designates an observation as a statistical outlier, the source of the abnormal measurement should be investigated. In general, if a data point is found to be a statistical outlier, it should not be used for statistical evaluation. However, outlier removal should be performed carefully, and typically only when a specific cause for the outlier can be identified.

In some cases where a specific cause for an outlier cannot be identified, professional judgment can be used to determine whether the outlier significantly affects the statistical results to the extent that removal is deemed necessary. If an outlier value with much higher concentration than other background observations is not removed from background prior to statistical testing, it will tend to increase both the background sample mean and standard deviation. In turn, this may substantially raise the magnitude of the prediction limit or control limit calculated from that data set. Thus, experience shows that it is a good practice to remove obvious outliers from the database even when independent evidence of the source of the outlier does not exist. The removal of outliers tends to normalize the data and therefore produce a more robust statistical limit. Outlier

removal also tends to produce a more conservative statistical limit, since the data variability is decreased, thereby decreasing the standard deviation.

1.2 Upgradient Monitoring Wells

Following the identification and removal of outliers, the upgradient data are further reviewed to determine appropriate methods for statistical evaluation to maintain adequate statistical power while minimizing the chance of false positives. The following sections describe the procedures and methods that should be used, based on the background dataset, to compare the background datasets, to calculate the data distribution, to handle non-detect (ND) data, and to select appropriate statistical evaluation methods (interwell vs intrawell).

1.2.1 Calculate for Mean and Standard Deviation

Following outlier removal, initial summary statistics including mean and standard deviation should be calculated for the background monitoring well datasets. While these summary statistics are easily completed in many groundwater statistical software packages, it is important to account for values that have low or zero values as described below.

1.2.1.1 Reporting of Low and Zero Values

1.2.1.1.1 Estimated Values (J Flag)

Estimated values are reported concentrations that are between the method detection limit (MDL[1]) and the practical quantitation limit (PQL[2]) for any given compound. These values are typically displayed with a J flag in laboratory report packages and are often referred to as "J-values". In most cases, the Unified Guidance recommends using the estimated value provided for statistical evaluation. Estimated values are typically used because the accuracy and power of most statistical evaluations lose power as the percentage of non-detects increases. While they are below the PQL, estimated values are considered detectable concentrations for statistical calculations, which has the effect of lowering the percentage of non-detects.

This "rule" should be applied with care, as there is an exception. Estimated values are not considered detectable concentrations if all values for a single constituent are less than the PQL. This is discussed in more detail in Section 1.3.5 of this document.

1.2.1.1.2 Non-Detect Values (ND)

Non-Detect Values (ND) are concentrations that were not detected at a concentration above the MDL. ND values are typically displayed with a "U" or "ND" flag in laboratory data report packages. The following approaches for managing ND values are based on recommendations in the Unified Guidance and are applicable for use with the statistical evaluation procedures that will be further discussed and used in this SAP (prediction intervals, confidence intervals, and tolerance intervals):

- If <15% ND, substitute ½ the PQL;
- If between 15% to 50% ND, use the Kaplan-Meier or robust regression on ordered statistics to estimate the mean and standard deviation;
- If >50% but less than 100% ND, use a non-parametric test; or

[1] MDL = lowest level of an analyte (substance) that the laboratory can reliably detect with calibrated instrumentation; generally based on results of an annual "MDL study" performed in accordance with 40 CFR Part 136, Appendix B; MDLs are generally set using laboratory grade deionized water spiked with a known concentration and thus do not account for effects of matrix interference inherent in typical groundwaters.

[2] PQL = minimum concentration of an analyte (substance) that can be measured with a high degree of confidence that the analyte is present at or above that concentration (typically 5-10x higher than the MDL).

- If 100% of values are less than the PQL, use the Double Quantification Rule.

1.2.2 Data Distribution

Statistical evaluations of groundwater data require an understanding of the data distribution for each analyte in each monitoring well. Data typically fall into one of the following distributions:

- Normal distribution – Sometimes referred to as Gaussian distribution, a normal distribution is a common continuous distribution where data form a symmetrical bell-shaped curve around a mean. Normally distributed data are tested using parametric methods.
- Transformed-normal distribution – Similar to a normal distribution, however, data are asymmetrical until transformation is applied to all data which then causes it to form a bell-curve. Transformed-normal data distributions are also tested use parametric methods.
- Non-Normal Distribution – When the data are not or cannot be transformed into a symmetrical distribution. Non-normal data distributions are tested using Non-parametric methods.

Testing for data distributions can be completed in several different ways including the skewness coefficient, probability plots with Filliben's test, or the Shapiro-Wilk/Shapiro-Francia Test. All of these methods may be employed; however, the Shapiro-Wilk and Shapiro-Francia tests are generally considered the best method according to the Unified Guidance. The Shapiro-Wilk test is best for sample sizes under 50 while the Shapiro-Francia test is best with larger datasets of 50 or more observations. Most groundwater statistical software packages can complete both Shapiro-Wilk and Shapiro-Francia tests and a detailed discussion of the testing procedures is provided in Section 10.5.1 of the Unified Guidance.

Based on the outcome of the data distribution testing, data will use either Parametric or Non-parametric tests. It is important to note that non-parametric testing usually requires larger datasets in order to minimize the Site Wide False Positive Rate (SWFPR); therefore, when the raw data are not normally distributed, a transformed-normal distribution is preferred when possible.

1.2.3 Temporal Trend

Most statistical tests assume that the sample data are statistically independent and identically distributed. Therefore, samples collected over a period of time should not exhibit a time dependence. A time dependence could include the presence of trends or cyclical patterns when observations are graphed on a time series plot. Trend analysis methodologies test to see whether the dataset displays an increasing, decreasing, or seasonal trend. A statistically significant increasing or decreasing trend could indicate a release from the CCR unit (or alternative source) and further investigation of the cause of the trend may be necessary.

If a trend is suspected, a Theil-Sen trend line should be used to estimate slope and the Mann-Kendall Trend Test should be used to evaluate the slope significance (Chapter 14, Unified Guidance). If a statistically significant trend is reported, based on a Sen's slope/Mann-Kendall trend test, the source of the trend should be investigated. If the trend can be shown to be a result of an upgradient or off-site source, the data can be de-trended and used to calculate statistical limits. De-trending can be accomplished by computing a linear regression on the data (see Section 17.3.1 of the Unified Guidance) and then using the regression residuals instead of the original measurements in subsequent statistical analysis.

1.2.4 Comparing Background Datasets (Spatial Variation)

After physical independence, outlier, trend, and summary statistical testing is completed, the datasets from the background monitoring wells should be compared to one another for each individual constituent. The comparison of these background datasets is useful for determining whether spatial variability exists in the

background dataset and can also be used to decide whether an interwell or intrawell approach is more appropriate for statistical evaluation.

Box and whisker plots can be used to perform side by side comparison for each well and can be completed for each individual analyte to determine if the variance is equal across the background datasets. If the box plots appear to be staggered and do not appear to be from the same population (same variance) then a Lavene's test using an α of 0.01 should be used as a check to determine if the background datasets have spatial variation. Testing methods and procedures are provided in Section 11.2 of the Unified Guidance.

The preferred method for comparing background datasets is a Mann-Whitney (or Wilcoxon Rank Sum) Test, which evaluates the ranked medians of both the historical and new dataset populations. An α of 0.05 should be used for this evaluation. After calculation, if the Mann-Whitney statistic does not exceed the critical point, the test assumes that the two data populations have equal medians, and therefore are likely from the same statistical distribution. The testing methods and procedures for this analysis are provided in Section 16.2 of the Unified Guidance.

If spatial variability is identified within the background dataset, an additional investigation may be needed in order to confirm that the variability is not caused by impacts from the CCR unit. If there is spatial variability and it is not caused by impacts from the CCR Unit, then an intrawell approach to statistical evaluation may be appropriate.

1.3 Compliance Monitoring Wells and Statistically Significant Increases

After completing the previously described analyses of the background data, a statistical evaluation of the compliance monitoring data should be completed to determine if there are any Statistically Significant Increases[3] (SSIs) that could trigger assessment monitoring. Section §257.93(F) of the CCR Rule specifies the list of methods that can be used for statistical evaluation. These specific methods to be used for statistical evaluation of data from the SCPD are detailed below. Further, the Unified Guidance is recommended in the CCR Rule to be used for guidance in the selection of the appropriate statistical evaluation method. This section provides a guide to choosing the correct statistical evaluation to analyze the compliance wells for SSIs, the basic principles of each method, and response activities for identified SSIs.

1.3.1 Interwell vs Intrawell Statistical Analysis

1.3.1.1 Interwell Statistical Analysis

An interwell statistical evaluation compares the groundwater results from the compliance (downgradient) monitoring wells to a pool of background (typically upgradient) monitoring well results. If results from the downgradient wells are statistically higher than the background dataset (or significant) then an exceedance is triggered. This upgradient verses downgradient method typically assumes that:

- Naturally, un-impacted groundwater characteristics in the compliance monitoring wells is comparable and equal on average to the background monitoring wells.
- Upgradient and downgradient monitoring well samples are drawn from the same aquifer and are screened in essentially the same hydrostratigraphic position.
- The aquifer unit is homogeneous and isotropic.

[3] SSI = a verified statistical exceedance; under compliance monitoring programs, the first time an exceedance is reported it is an initial statistical exceedance and is only considered an SSI if a confirmatory result verifies the initial exceedance.

- Groundwater flow is in a definable pathway from upgradient to downgradient wells beneath the CCR Unit.

An interwell approach is preferable for statistical evaluation because it compares data to a background dataset that is not influenced by the CCR Unit. Interwell methods should be used with two exceptions: (1) there are significant differences in the datasets of the background wells (as indicated by methods described in Section 1.2.4) or (2) it can be demonstrated that groundwater geochemistry at all wells (background and compliance) is not impacted by the SCPD.

1.3.1.2 Intrawell Statistical Analysis

An intrawell statistical evaluation compares the groundwater results from a compliance monitoring well to historical data collected from that same compliance monitoring well. This method can be used for CCR monitoring when groundwater data from the background monitoring wells is statistically different than that of the compliance monitoring wells or when it can be shown that there is no impact from the SCPD in either upgradient or downgradient/compliance wells.

1.3.2 Statistical Power

As discussed above, one of the primary goals of the selection of a proper statistical evaluation method is to limit the potential for results to falsely trigger a SSI while also maintaining sufficient statistical power to detect a true SSI. Falsely triggering a SSI when no release from the CCR unit has occurred is referred to as a false positive. The False Positive Rate (FPR), typically denoted by the Greek letter α, is also known as the "significance level". The FPR is the probability that a future compliance observation will be declared to be from a different statistical distribution than the background data. If the FPR is set too high, it can lead to the conclusion that there is evidence of impact when none exists. Conversely, if the FPR is set too low, it can lead to a false conclusion that no contamination exists, when it actually does exist (also known as a "false negative"). Ultimately, the ability to accurately identify SSIs depends on the selection of an appropriate FPR, which is referred to as the statistical power. FPRs are set for each parameter (or for each parameter in each well for intrawell analysis). However, statistical analysis programs and the resulting decision making do not depend on error rates for each individual measurement/comparison but are dependent on the collective/sum of error rate from all of the individual comparisons. When the individual FPRs are integrated over the entire statistical monitoring program, it is referred to as the site-wide false positive rate (SWFPR), which is a better measure of the ability of the entire statistical program to detect false positive observations.

1.3.2.1 Site-Wide False Positive Rate

For CCR monitoring, detection monitoring events are based on multiple comparisons, which include the seven (7) Appendix III parameters, at each compliance monitoring well. The SWFPR can be calculated based on several input parameters, including the assumed FPR, the number of downgradient monitoring wells (n), the number of parameters, and the number of statistical comparison events in a given year for the CCR Unit. The Unified Guidance recommends that a statistical evaluation program be designed with an annual, cumulative SWFPR of approximately 10%.

The Unified Guidance recommends measuring statistical power using power curves which display the probability that an individual comparison will detect a concentration increase relative to background results. After determining the statistical method based on the background data, a power curve can be generated in order to determine the statistical power of the compliance monitoring program. The methods and procedures for calculating the SWFPR are described in Section 6.2.2 of the Unified Guidance.

1.3.2.2 Verification Sampling

Verification Sampling is an important aspect of the SAP as it improves statistical power while maintaining the SWFPR. Most statistical evaluations incorporate verification sampling mathematically into their determination of the SWFPR. Verification sampling is typically completed at a 1 of 2 pass strategy. As described above if

an initial statistical exceedance is reported, then verification sampling will be performed to confirm the initial exceedance. Verification samples should be collected on a schedule that allows for physical independence of the samples. In a 1 of 2 pass strategy, if the concentration of the verification sample is less than the calculated compliance limit, then no SSI is triggered. If the initial and subsequent verification observation are above the calculated compliance limit, a SSI is triggered.

Due to the time constraints for reporting put forth in the CCR rule, it is suggested that verification sampling not be completed at the next regularly scheduled sampling event, but instead be collected prior to the next sampling event. Verification sampling within 90 days (assuming a 1 of 2 pass verification sampling strategy) will typically allow sufficient time to complete laboratory and statistical analysis in accordance with the timeframes set forth in the CCR Rules. Additionally, if a monitoring well/analyte pair have previously been reported to be at an SSI, verification sampling may not be necessary, as the SSI has already been validated.

1.3.3 Statistical Evaluation Methods

As outlined above, the CCR rule lists 5 possible methods for statistical evaluation. The different methods that can be employed for CCR monitoring as outlined in §257.93(F) are:

- §257.93(F)(1) “A parametric analysis of variance followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well’s mean and the background mean levels for each constituent.”
- §257.93(F)(2) “An analysis of variance based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well’s median and the background median levels for each constituent.”
- §257.93(F)(3) “A tolerance or prediction interval procedure, in which an interval for each constituent is established from the distribution of the background data and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.”
- §257.93(F)(4) “A control chart approach that gives control limits for each constituent.”
- §257.93(F)(5) “Another statistical test method that meets the performance standards of paragraph (g) of this section.”

1.3.4 Prediction Intervals

Section §257.93(F)(3) outlines using prediction intervals or tolerance intervals for statistical evaluation. Based on recommendation from the Unified Guidance, prediction limits are the preferred method for calculating detection monitoring compliance limits and will be used to calculate compliance limits for the seven Appendix III constituents for the SCPD monitoring program. In addition, the Unified Guidance suggests using prediction limits with verification sampling (Chapter 19 of the Unified Guidance), because prediction limits help to maintain low SWFPR while still providing high statistical power. Tolerance intervals, which are a backward looking procedure, should not be used for detection monitoring, but will likely be used in assessment monitoring, as further described in Section 2.0 below. If, at any point in the future, a different statistical method becomes more applicable to the site conditions, this document may be modified to include that method as recommended by the Unified Guidance.

Prediction interval methods can be used for parametric and non-parametric datasets as well as for intrawell or interwell statistical analysis. Prediction limits use background data from either background monitoring wells for interwell analysis or from historical data for intrawell analysis to calculate a concentration that represents an upper limit of expected future concentrations for a particular population. In contrast to tolerance limits, prediction intervals are a forward looking, predictive analysis, which incorporate uncertainty in future

measurements, and are thus the most appropriate method for detection monitoring programs. Typically, a one-sided upper prediction limit is used to evaluate detection monitoring observations. Observations must be lower than the prediction limit (or within the upper and lower prediction limits for pH) to be considered "in control". Parametric methods are generally preferred over non-parametric methods because they result in lower SWFPRs and higher statistical power.

For detection monitoring, if parametric testing is required, the procedures outlined in Section 19.3.1 of the Unified Guidance should be used to calculate prediction limits for the statistical analysis. If non-parametric testing is required, the procedures outlined in Section 19.4.1 of the Unified Guidance should be used to calculate prediction limits. Most groundwater statistical software includes algorithms for calculating either parametric or non-parametric prediction limits.

1.3.5 Double Quantification Rule

In situations where the entire background dataset is reported as ND or estimated (J-flag), the Double Quantification Rule (DQR) will be used to supplement the prediction limit analyses. Generally, the Appendix III constituents occur at detectable concentrations in natural groundwater; however, if ND results are encountered for a given constituent, the DQR can be implemented. A demonstration that this statistical evaluation is as least as effective as any other test and results as described in §257.93(f)(5) can be made. The DQR is recommended by the Unified Guidance as a supplement to prediction limits because it reduces the number of non-detects used for statistical analysis and provides a lower SWFPR while maintaining statistical power.

Under the DQR, a SSI is triggered if a compliance well observation is higher than the reporting limit (RL)/PQL in either (1) both a detection monitoring sample and its verification resample, or (2) two consecutive sampling events in a program where resampling is not utilized.

1.4 Responding to SSIs

If the statistical evaluation for an Appendix III analyte triggers a SSI, the data must be evaluated to determine if the cause of the SSI is due to a release from the CCR Unit or from an alternative source. Possible alternative sources may include laboratory causes, sampling causes, statistical evaluation causes, or natural variation. If the SSI can be attributed to one of these sources and the SSI was not caused by the CCR Unit, an alternate source demonstration (ASD) can be completed. An ASD must be certified by a qualified professional engineer and completed in writing within 90 days of completing the statistical evaluation for a particular sampling event. If the SSI cannot be attributed to an alternative source and is from the CCR Unit, then Assessment Monitoring is triggered.

1.5 Updating Background Values

The Unified Guidance suggests that updating statistical limits should only be completed after a minimum of 4 to 8 new measurements are available (i.e., every 2 to 4 years of semiannual monitoring, assuming no verification sampling). The periodic update of background, during which additional data are incorporated into the background, improves statistical power and accuracy by providing a more conservative estimate of the true background population. Prior to incorporating new data into the background dataset, a test should be performed to demonstrate that the "new data" are from the same statistical population as the existing background results. Below are three methods that can be used in determining if the "new" data should be included in the background:

- Time Series Graphs – As described in Section 1.1.2.1, time series graphs can be used as a qualitative test to assist with the determination whether a new group of data match the historical data or if there is a concentration trend that could be indicative of a release or evolving groundwater conditions.

- Box-Whisker plots can also be used to determine whether or not the datasets are similar.
- Mann-Whitney (or Wilcoxon Rank) Test – Used to evaluate the ranked medians of both the historical and new dataset populations. An α of 0.05 should be used for this evaluation. After calculation, if the Mann-Whitney statistic does not exceed the critical point, the test assumes that the two data populations have equal medians, and therefore are likely similar.

Ultimately, the Mann-Whitney (Wilcoxon Rank Sum) Test is the statistical test that is used to determine whether new observations should be included in the background dataset. It is important to note that a difference in background datasets does not automatically prevent the new data from being used; however, if differences are noted, a review of the new data will be conducted to determine if the noted difference is a result of a change in the natural conditions of the groundwater or if it is the result of a potential release from the CCR Unit. If the new data are included in the background dataset, the prediction limits will be recalculated, as described in Section 1.3.4 above.

2.0 ASSESSMENT MONITORING STATISTICAL EVALUATION

This section discusses the procedures, methods, and processes that will be implemented as part of the assessment monitoring statistical evaluation, if required. Assessment monitoring will be initiated if a SSI is triggered during detection monitoring. As per the CCR Rule in Section §257.95(b), assessment monitoring must be initiated within 90 days of identifying an SSI (not the sample event which provided the data that resulted in the SSI). This 90-day period includes sampling the groundwater monitoring network for the Appendix IV constituents. Following the initial sampling event for all Appendix IV constituents, the monitoring network is then sampled again within 90 days of receiving the results from the initial Appendix IV sampling event. Following these initial assessment monitoring events, assessment monitoring is performed on a semiannual basis. During one of the two semiannual events, the full list of Appendix IV constituents must be tested. During the second assessment monitoring event of each year, only the Appendix IV constituents that are detected (above the PQL) during the previous semiannual event are required to be monitored. Assessment monitoring is terminated if concentrations for all Appendix III and Appendix IV constituents in all compliance wells are statistically lower than background for two consecutive sampling events (§257.95(e)). The following sections discuss the procedures, methods, and processes that will be implemented as part of the assessment monitoring statistical evaluation. As discussed in Section 1.1 of this document, many of the statistical comparisons used in assessment monitoring require various analyses to be completed prior to the data being accepted into the statistical evaluation. Before using the results from assessment monitoring, the steps outlined in Sections 1.1 and 1.2 will be completed. Please refer to those sections for descriptions on the methods and techniques required to complete these analyses.

2.1 Establishing a Ground Water Protection Standard (GWPS)

Following the removal of outliers and the performance of general statistics described in Sections 1.1 and 1.2, GWPS will be developed for use in the assessment monitoring program. The GWPS is a key element to the assessment monitoring process. GWPS must be generated for each of the detected Appendix IV analytes. If interwell methods are utilized (preferred method), a site-wide GWPS will be generated for each analyte based on Appendix IV results reported for background/hydraulically upgradient wells. If intrawell methods are utilized, a well specific GWPS will be generated for each analyte.

For Appendix IV parameters that have a maximum contaminant level (MCL), as established by the United States Environmental Protection Agency, the GWPS is set equal to the MCL. For those constituents whose background concentration are greater than the MCL, the GWPS will be calculated from the background data. Finally, there are four (4) Appendix IV parameters for which a MCL has not been established (cobalt, lead, lithium, and molybdenum). In 2018, the USEPA revised the CCR Rule with the Phase One, Part One Amendment, which allowed for the use of health based GWPS for those Appendix IV constituents without a

MCL. For cobalt, lead, lithium, and molybdenum, the health based GWPS will be used as the default site GWPS for these for constituents unless the calculated background limit is greater that the health based GWPS.

2.1.1 Maximum Contaminant Level (MCL) Based GWPS

Most of the Appendix IV analytes have USEPA MCL levels. As specified in the CCR Rule in Section §257.95(b), the GWPS must either be the MCL, or a limit based on background data, whichever is greater. This section describes the methods to be used for statistical analysis when the MCL (or applicable heath-based limit for cobalt, lead, lithium or molybdenum) is to be used as the GWPS.

For Assessment Monitoring, the Unified Guidance recommends the confidence interval method to evaluate for potential exceedances, which are referred to as “statistically significant levels” (SSLs) (Chapter 21, Unified Guidance). Using confidence intervals, SSLs are identified by comparing the calculated confidence interval against the GWPS. A confidence interval statistically defines the upper and lower bounds of a specified population within a stipulated level of significance. Confidence intervals are required to be calculated based on a minimum of 4 independent observations, but a more representative confidence interval can be developed when all of the available data are utilized.

The specific type of confidence interval should be based the attributes of the data being analyzed, including: (1) the data distribution, (2) the detection frequency, and (3) potential trends in the data. Table 2 below is based on Table 4-4 from the Electric Power Research Institute’s Groundwater Monitoring Guidance for the Coal Combustion Residual Rule (2015), which displays the criteria for selecting an appropriate confidence interval. The method and procedure for calculating the Upper Confidence Limit (UCL) and Lower Confidence Limit (LCL) is provided in the section reference from the Unified Guidance, which is listed in the last column of Table 2, below.

Table 2- Confidence Interval Method Selection

Data Distribution	Non-detect Frequency	Data Trend	Confidence Interval Method
Normal	Low	Stable	Confidence Interval Around Normal Mean (Section 21.1.1)
Transformed Normal (Log-Normal)	Low	Stable	Confidence Interval Around Lognormal Arithmetic Mean (Section 21.1.3)
Non-normal	N/A	Stable	Nonparametric Confidence Interval Around Median (Section 21.2)
Cannot Be Determined	High	Stable	Nonparametric Confidence Interval Around Median (Section 21.2)
Residuals After Subtracting Trend are Normal (with equal variance)	Low	Trend	Confidence Band Around Linear Regression (Section 21.3.1)

Residuals after Subtracting Trend are Non-Normal	Low	Trend	Confidence Band Around Theil-Sen Line (Section 21.3.2)

In an assessment monitoring program, the LCL is of prime interest. If the LCL exceeds the GWPS, there is statistical evidence that a SSL has been triggered. An initial SSL should be confirmed by verification sampling. If only the UCL exceeds the GWPS while the LCL is below the GWPS, the test is considered inconclusive and the Unified Guidance recommends that this situation be interpreted as "in compliance". If both the UCL and the LCL are below the GPWS, the data are also "in compliance" with the GWPS.

It is important to note that a slightly different set of criteria are used to determine whether assessment monitoring can be terminated. Additional discussion of the criteria used for exiting assessment monitoring and returning to detection monitoring is provided below in Section 2.2.

During Assessment Monitoring, a per test FPR (α) of 0.05 will be used as an initial error level for calculating the two-tailed confidence intervals for the compliance wells (which actually means 2.5% FPR per tail). In some cases, based on recommendations from the Unified Guidance, it is appropriate to adjust the FPR of the confidence interval based on the number of data points available as well as the distribution of the data being evaluated. If deemed necessary based on recommendations from the Unified Guidance, an approach is provided in Section 22 of the Unified Guidance for determining an appropriate per test FPR based on the data characteristics.

When performing assessment monitoring statistical evaluations, it is important to evaluate the compliance data for shifts. If no shifts have occurred, then all of the available Appendix IV data for a particular constituent can be used in the statistical evaluation. If shifts are noted (typically based on qualitative evaluation of a time series plot), only the data collected after the shift should be used in the statistical evaluation.

2.1.2 Non-MCL Based GWPS

Background or historical concentration limits should be assessed using the following techniques for all Appendix IV analytes. These concentration limits should then be compared with the MCL, if available, and the higher of these two values will be used as the GWPS.

The Unified Guidance provides two acceptable approaches for establishing a non-MCL based GWPS (unless all values are ND, in which case the Double Quantification Rule as described above in Section 1.3.5 should be used). The two methods include the tolerance interval approach or the prediction interval approach.

2.1.2.1 Tolerance Interval Approach

If the background dataset is normally or transformed normally distributed, the Unified Guidance recommends Tolerance Intervals over the Prediction Intervals for establishing a GWPS. The GWPS should be based on a 95 percent coverage/95 percent confidence tolerance interval. If the background data are non-normal (even after transformation), then a large number of background observations are required to calculate a non-parametric tolerance interval (typically a minimum of 60 background observations are required to meet these requirements). If there is an insufficient number of background observations to calculate a non-parametric tolerance interval, then a non-parametric Prediction Interval approach should be used, as described in Section 2.1.2.2 below.

The Upper Tolerance Limit (UTL) is calculated for each detected Appendix VI constituent. Tolerance Limits, as outlined in the Unified Guidance (Section 17.2), are a concentration limit that is designed to contain a pre-specified percentage of the dataset population. Two coefficients associated tolerance intervals are (1) the specified population proportion and (2) the statistical confidence. The coverage coefficient (γ), which is used to contain the population portion, and the tolerance coefficient (or confidence level (1-α)), which is used to set the confidence of the test. Typically, the UTL is calculated to have a coverage and confidence of 95%. When

an MCL does not exist or the background concentrations are greater than the MCL, the calculated UTL for each constituent is used as the GWPS. The confidence interval for each compliance well is then compared with the GWPS.

In order to calculate a valid confidence interval, a minimum of four data points are necessary for each of the detected Appendix IV constituents in each compliance monitoring well (or four "new" assessment monitoring observations in each well when intrawell statistical methods are employed). Using the Tolerance Interval Approach, a statistically significant level (SSL) is triggered when calculated lower confidence limit (LCL) for each compliance well is greater than the GWPS.

Tolerance limits can be completed using both parametric (Section 17.2.1 of Unified Guidance) or non-parametric methods (Section 17.2.2 of Unified Guidance). However, as described above, the non-parametric method requires at least 60 background (or historical) measurements in order to achieve 95% confidence with 95% coverage. Tolerance Intervals can be calculated using most groundwater statistical software packages.

2.1.2.2 Prediction Interval Approach

If Tolerance Intervals cannot be used to calculate the GWPS (based on recommendation from the Unified Guidance, such as non-parametric datasets, etc.), then a Prediction Interval method should be used. This method is very similar to Section 1.3.4 of this document; however, for assessment monitoring, the Unified Guidance suggests using a prediction interval about a future mean for normally/transformed-normally distributed datasets or a prediction interval about a future median for datasets with a high percent of ND or non-normally distributed data.

When using prediction intervals to calculate for a GWPS, a one-sided prediction interval is calculated using background (or historical) datasets based on a specified number of future comparisons - four future comparisons is typical. The Upper Prediction Limit that is calculated as a product of this method then becomes the GWPS, and is compared against the confidence interval for the compliance data, as described in Section 2.1.2.1, above. As also described above, if the LCL is greater than the calculated prediction limit then an SSL is triggered.

2.2 Returning to Background Detection Monitoring

As specified in 257.95(e) of the CCR Rule, in order to return to detection monitoring, the concentration of all constituents listed in Appendix III and Appendix IV must be shown to be at or below calculated "background (or historical) values" for two consecutive semiannual sampling events. This determination of background values is based on the statistical evaluation procedure established for detection monitoring. Therefore, if prediction limits (with the double quantification rule for analytes with all non-detects) are used for detection monitoring, prediction limits should be calculated and used for all Appendix III and IV analytes to determine when the monitoring program can return to Detection Monitoring. It is important to remember that the full list of Appendix IV constituents are only required to be sampled annually, with only those Appendix IV constituents detected during the first semiannual event (i.e., the annual event) being required to be analyzed during the second semiannual event of a given year. If statistical results demonstrate that concentrations for all constituents are below background levels for a particular event, all Appendix IV constituents should be sampled during the next event in order to achieve this goal of returning to Detection Monitoring. If this statistical evaluation demonstrates that any of the Appendix III or Appendix IV are at a concentration above background levels, but no SSLs have been triggered, then the CCR unit will remain in assessment monitoring (257.95(f)).

2.3 Response to a SSL

If the assessment monitoring statistical evaluation demonstrates that a SSL has been triggered, then the owner/operator of the CCR unit must complete the following four actions as described in 257.95(g):

1) Prepare a notification identifying the constituents in Appendix IV that have exceeded a CCR Unit specific GWPS. This notification must be placed in the facilities operating record within 30 days of identifying the SSL

2) Define the nature and extent of the release and any relevant site conditions that may affect the corrective action remedy that is ultimately selected. The characterization must be sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up releases from the CCR Unit and must include at least the following:

    a. Install additional monitoring wells that are necessary to define the contaminant plume,

    b. Collect data on the nature and estimated quantity of the material released,

    c. Install and sample at least one additional monitoring well at the facility boundary in the direction of the contaminant plume migration,

3) Notify off-site property owners if the contamination plume has migrated offsite on to their property, and

4) If possible, provide an alternative source demonstration that determines that the SSL is not caused by a release at the facility within 90 days of completing the statistical evaluation. If no alternative source demonstration can be made and the plume is determined to have come from the CCR Unit then initiate corrective action.

Actions 1-3 must be completed regardless of whether or not an alternate source demonstration can be made.

2.4 Updating Background Values

The background for Assessment Monitoring Parameters should be updated using the same methods and techniques described in Section 1.5 for updating detection monitoring background data.

3.0 REFERENCES

EPRI. 2015. Groundwater Monitoring Guidance for the Coal Combustion Residual Rule. Electric Power Research Institute. November.

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USEPA. 2015. Federal Register. Volume 80. No. 74. Friday April 17, 2015. Part II. Environmental Protection Agency. 40 CFR Parts 257 and 261. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule/ [EPA-HQ-RCRA-2009-0640; FRL-9919-44-OSWER]. RIN-2050-AE81. April.

USEPA. 2018. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Minimum Criteria (Phase One, Part One): {EPA-HQ-OLEM-2017-0286]. August.

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APPENDIX J

Example Field Forms

wsp GOLDER

Sheet ___ of ___

WELL DEVELOPMENT/PURGING FORM

Project Ref: ____________________ **Project No.:** ____________________

Location

Monitored By: Date Time

Well Piezometer Data

(*circle one)*

Depth of Well (from top of PVC or ground)		feet
Depth of Water (from top of PVC or ground)		feet
Radius of Casing		inches
		feet
Casing Volume		cubic feet
		gallons

Development / Purging Discharge Data

Purging Method

Start Purging Date Time

Stop Purging Date Time

Monitoring

Date	Time	Volume Discharge (gals)	Temp (^{o}__)	pH	Spec.Cond. (__S/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Redox Potential (+/- mV)	WL (ft BTOC)	Appearance of Water and Comments

GROUNDWATER SAMPLE COLLECTION FORM

Project Ref: __ _____ **Project No. :**_____

WEATHER CONDITIONS

Temperature _____ Weather _____

SAMPLE INFORMATION

Sample Location _____ Sample No. _____

Sample Date _____ Time _____ Sample By_____

Sample Method _____ Sample Type_____

Water Level Before Purging: _____

Well Volume: _____

Volume Water Removed Before Sampling: _____

Water Level Before Sampling: _____

Water Level After Sampling: _____

Appearance of Sample: _____

FIELD MEASUREMENTS

Parameter	Units	Measurement	Measurement	Measurement	Measurement	Sample
Time	hhmm					
Volume Discharge	gals					
pH	Standard					
Spec. Cond.	___S/CM					
Turbidity	NTU					
Temperature	°___					
Dissolved Oxygen	mg/l					
Redox Potential	+/- mV					

LABORATORY CONTAINERS

Sub-Sample	Analysis Requested	Type and Size of Sample Container	Filtered (Yes or No)	Type of Preservative
1				
2				
3				
4				
5				
6				
7				
8				

REMARKS: _____

NA = Not applicable

SAMPLING METHODS:

Bailer: PVC/PE Peristaltic Pump Air-Lift Pump

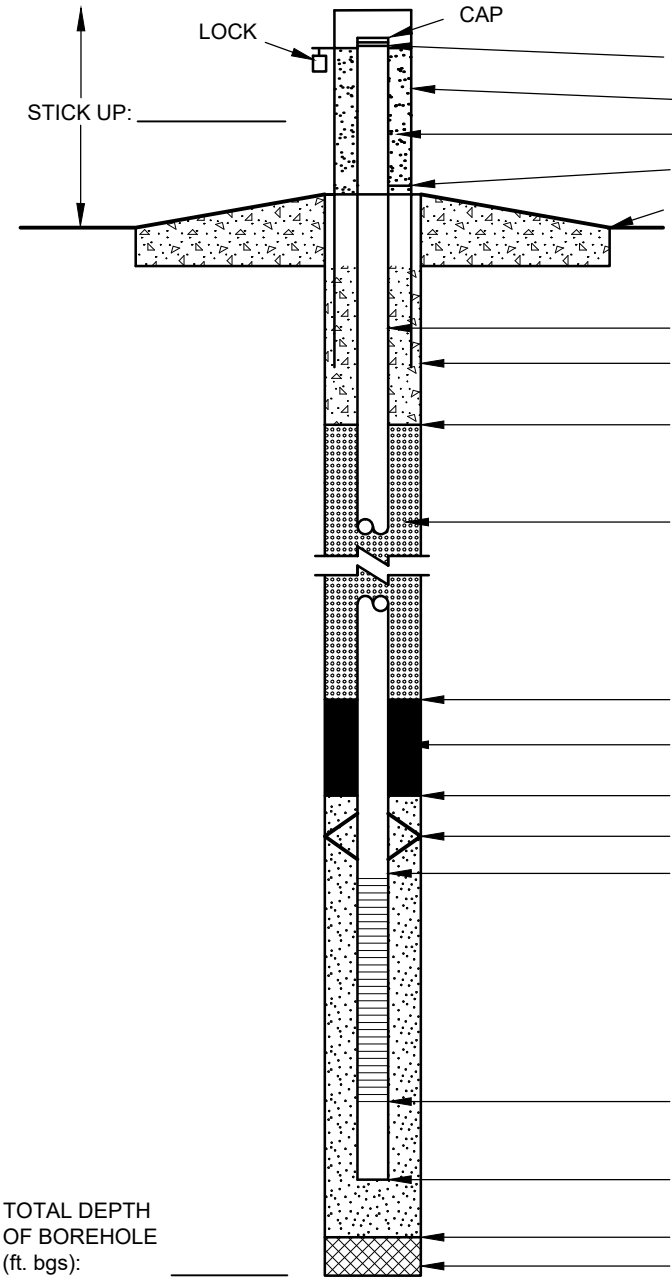
Stainless Steel Submersible Pump Other_____

Teflon Hand Pump

WSP GOLDER

ABOVE GROUND MONITORING WELL CONSTRUCTION LOG _____

PROJECT NAME:	PROJECT NUMBER:	
SITE NAME:	LOCATION:	
CLIENT:	SURFACE ELEVATION:	
GEOLOGIST:	NORTHING:	EASTING:
DRILLER:	STATIC WATER LEVEL:	COMPLETION DATE:
DRILLING COMPANY:	DRILLING METHODS:	



TOP OF CASING ELEVATION: _____

PROTECTIVE CASING (yes / no): _____

PEA GRAVEL OR SAND

WEEP HOLE

GROUND SURFACE ELEVATION: _____

DIAMETER OF RISER PIPE (in.): _____

DIAMETER OF BOREHOLE (in.): _____

CONCRETE SEAL DEPTH (ft. bgs): _____

TYPE AND AMOUNT OF ANNULAR SEAL: _____

TOP OF BENTONITE SEAL DEPTH (ft. bgs): _____

TYPE AND AMOUNT OF BENTONITE SEAL: _____

TOP OF SAND PACK DEPTH (ft. bgs): _____

CENTRALIZER (yes / no) - TYPE: _____

TOP OF SCREEN DEPTH (ft. bgs): _____

TYPE OF SCREEN: _____

SCREEN SLOT SIZE (in.): _____

SIZE OF SAND PACK: _____

AMOUNT OF SAND: _____

BOTTOM OF SCREEN DEPTH (ft. bgs): _____

BOTTOM OF WELL DEPTH (ft. bgs): _____

TOTAL DEPTH OF BOREHOLE (ft. bgs): _____

BOTTOM OF FILTER PACK (ft. bgs): _____

TYPE AND AMOUNT OF BACKFILL: _____

ADDITIONAL NOTES: _____

CHECKED BY: _____

DATE CHECKED: _____

PREPARED BY: _____

GOLDER

RECORD OF WATER LEVEL READINGS

Project Name: _____ **Location:** _____ **Project No.:** _____

Borehole No.	Date	Time	Measuring Device / Serial No.	Measurement Point (M.P)	Water Level Below M.P.	Correction To Survey Mark	Survey Mark Elevation	Water Level Elevation	By	Comments

Sheet ___ of ___

INSTRUMENT CALIBRATION FORM

Project Name: _____ **Project No:** _____

Calibration By: _____

Instrument Details

Instrument Name	
Serial No.	
Model No.	

Calibration Details

Required Calibration Frequency/Last Calibration	
Calibration Standard	
Calibration Standard(s) Expiration Date	

Calibration:

Date	Time	**Calibration Standard** Units: _____	**Instrument Reading** Units: _____

Comments:

>>> Select a Laboratory <<<

#N/A
#N/A
#N/A
#N/A

Chain of Custody Record

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	**Project Manager:**	**Site Contact:**	**Date:**	COC No:
Your Company Name here	**Tel/Fax:**	**Lab Contact:**	**Carrier:**	_____ of _____ COCs
Address	**Analysis Turnaround Time**			Sampler:
City/State/Zip	☐ CALENDAR DAYS ☐ WORKING DAYS			**For Lab Use Only:**
(xxx) xxx-xxxx Phone	TAT if different from Below _____			Walk-in Client:
(xxx) xxx-xxxx FAX	☐ 2 weeks			Lab Sampling:
Project Name:	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)															Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for_____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Golder Associates

Field Boring Log

DEPTH HOLE _____ **PROJ. NO.** _____ **PROJECT** _____ **BORING NO.** _____

DEPTH SOIL DRILL _____ **GA INSP.** _____ **DRILLING METHOD** _____ **SHEET** _____ **OF** _____

DEPTH ROCK CORE _____ **WEATHER** _____ **DRILLING COMPANY** _____ **SURFACE ELEV.** _____

ABANDONMENT _____ **DRILL RIG** _____ **DRILLER** _____ **DATUM** _____

DEPTHS _____/_____/_____/_____ **SAMPLER HAMMER TYPE** _____ **WT.** _____ **DROP** _____ **STARTED** _____/_____
WATER LEVEL CAVE-IN DATE-TIME NOTE TIME DATE

DEPTHS _____/_____/_____/_____ **HOLE LOCATION** _____ **COMPLETED** _____/_____
(DELAYED) WATER LEVEL CAVE-IN DATE-TIME NOTE TIME DATE

SAMPLE TYPES

	A.S.	AUGER SAMPLE
	C.S.	CHUNK SAMPLE
*	D.O.	DRIVE OPEN (SPT)
	D.S.	DENISON SAMPLE
	F.S.	FOIL SAMPLE
	P.S.	PITCHER SAMPLE
	S.C.	SOIL CORE
*	T.O.	THIN-WALLED, OPEN
*	T.P.	THIN-WALLED, PISTON
	W.S.	WASH SAMPLE
*	____	_____
*	____	_____
*	____	_____

* NOTE SIZE

ABBREVIATIONS

ANG	ANGULAR	GR	GRAY	R	RED
BL	BLACK	HE	HETEROGENEOUS	RES	RESIDUAL
BR	BROWN	HO	HOMOGENEOUS	RX	ROCK
C	COARSE	LYD	LAYERED	RND	ROUNDED
CIN	CAVE-IN	M	MEDIUM	SAT	SATURATED
CO	COHESIVE	MIC	MICACEOUS	SD	SAND
CL	CLAY	MOT	MOTTLED	SI	SILT
CLY	CLAYEY	MST	MOIST	SIY	SILTY
D	DRY	NC	NON-COHESIVE	SM	SOME
EL	ELONGATED	NP	NON-PLASTIC	TR	TRACE
F	FINE	OG	ORANGE	WL	WATER LEVEL
FL	FLAT	ORG	ORGANIC	WH	WEIGHT OF HAMMER
FRAG	FRAGMENTS	PP	POCKET PEN.	WR	WEIGHT OF RODS
GL	GRAVEL	PL	PLASTIC LIMIT	Y	YELLOW

ORDER OF DESCRIPTION

CONSTITUENTS
1) GROUP SYMBOL
2) SOIL GROUP NAME
3) PRIMARY COMPONENTS
4) SECONDARY COMPONENTS
5) MINOR COMPONENTS;

PLUS DESCRIPTION:
CL/SI: PLASTICITY
SD: SIZE, GRADING
GL: SIZE, GRADING, SHAPE, ROCK TYPE

GENERAL
6) COLOR
7) WEATHERING
8) STRUCTURE
9) SENSITIVITY
10) CONTAMINATION
11) MINEROLOGY
12) ORIGIN;

BEHAVIOR
13) BEHAVIOR (CO/NC)
14) MOISTURE/WATER CONTENT
15) DENSITY/CONSISTENCY

PROPORTIONS

"TRACE"	0 – 5%
"SOME"	5 – 12%
PREFIX "-Y"	12 – 35%
"AND"	35 – 50%

NON-COHESIVE SOILS

RELATIVE DENSITY		BLOWS
VERY LOOSE	VLS	0 – 4
LOOSE	LS	4 – 10
COMPACT	CP	10 – 30
DENSE	DN	30 – 50
VERY DENSE	VDN	>50

MOISTURE CONDITION

DRY	SOIL FLOWS
MOIST	FEELS COOL
WET	WITH FREE WATER

COHESIVE SOILS

CONSISTENCY		PP(TSF)	FINGER PRESSURE
VERY SOFT	VS	<0.25	EXTRUDES
SOFT	S	0.25 - 0.5	MOLDS EASILY
FIRM	FM	0.5 – 1	MOLDS
STIFF	ST	1 – 2	THUMB INDENTS
VERY STIFF	VST	2 – 4	THUMBNAIL INDENTS
HARD	H	>4	RESISTS THUMBNAIL

WATER CONTENT - W

W < PL	CANNOT ROLL 4 mm THREAD
W ~ PL	CAN ROLL THREAD 2 – 4 mm
W > PL	CAN ROLL THREAD <2 mm

ELEV. / DEPTH	LITHOLOGY	SAMPLES						CONSTITUENTS			BEHAVIOR			USCS	SAMPLE DESCRIPTION AND DRILLING NOTES
		NO.	TYPE	DEPTH	SPT N / PP(TSF)	BLOWS PER 6 IN	REC / ATT	GL	SD	CL/SI	CO or NC	MOIST. or W	DENS./ CONS.		
								PROPORTION; SIZE, SHAPE, GRADING; PLASTICITY							

WSP GOLDER
AMEREN_00001774

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