March 5, 2023

SEMIANNUAL REMEDY SELECTION PROGRESS REPORT
OLD WEST ASH POND (POND NO. 1 AND POND NO. 3) AND POLISHING POND
HENNEPIN POWER PLANT

In accordance with Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.97(a), the owner or operator of a coal combustion residuals (CCR) unit must prepare a semiannual report describing the progress in selecting and designing a remedy for statistically significant levels (SSLs) of constituents listed in Appendix IV of 40 C.F.R. § 257 over the groundwater protection standards established in accordance with 40 C.F.R. § 257.95(h).

The Old West Ash Pond is located in the State of Illinois and is also subject to the state's CCR program located at Title 35 of the Illinois Administrative Code (35 I.A.C.) Part 845. An application for an operating permit for the Old West Ash Pond required by 35 I.A.C § 845.230 was submitted to the Illinois Environmental Protection Agency (IEPA) by October 31, 2021 and is pending approval. An evaluation of background groundwater quality was completed and presented in the operating permit application. Exceedances of groundwater protection standards established under Part 845 require corrective action through a permitting process administered by IEPA. The operating permit application and related documents can be found on the company's publicly available CCR website: https://www.luminant.com/ccr/illinois-ccr/

This report is for activities occurring between September 6, 2022, and March 5, 2023, at the Old West Ash Pond (Pond No. 1 and Pond No. 3) and Polishing Pond, collectively referred to as the OWAP, at Hennepin Power Plant.

As stated in the March 5, 2020, Semiannual Remedy Selection Progress Report, a Corrective Measures Assessment (CMA) was completed for the OWAP on September 5, 2019, to address SSLs for total arsenic, total lithium, and total molybdenum (see related notification dated February 6, 2019), as required by 40 C.F.R. § 257.96. The CMA evaluated closure in place with a geomembrane cover system and Monitored Natural Attenuation (MNA) in accordance with the Closure and Post Closure Care Plan submitted to the Illinois Environmental Protection Agency (IEPA) in January 2018. IEPA approved the Closure and Post Closure Care Plan on June 19, 2018. Closure construction began in August of 2019 and was completed in November of 2020.

As stated in the September 5, 2020, Semiannual Remedy Selection Progress Report, existing groundwater and source water data were reviewed, as well as identification and collection of additional groundwater and source water samples to evaluate the feasibility of MNA. These data indicate that site-specific conditions appear favorable for implementation of MNA in combination with the completed closure referenced above.

Additional activities were completed during the reporting period. These activities include bench scale testing, including characterization of the materials and batch adsorption tests, to better understand natural attenuation mechanisms, rates, and aquifer capacity. A site-specific attenuation capacity for molybdenum was calculated during the previous reporting period using the results of the bench scale testing. A site-specific attenuation capacity for arsenic was calculated during the current reporting period using the results of the bench scale testing. Testing is ongoing to determine site-specific attenuation capacities for lithium. Additional analysis of the bench scale testing results is ongoing, including evaluating the reversibility of these constituents' attenuation mechanisms under varying site conditions. Analysis of natural attenuation mechanisms, rates, and aquifer capacity is needed to complete the tiered evaluation referenced in United States Environmental Protection Agency (USEPA) guidance, including development of a geochemical conceptual site model. These activities are necessary to understand the natural attenuation mechanisms

occurring at the site and their potential ability to reduce the aqueous concentrations of total arsenic, total lithium, and total molybdenum to below the applicable groundwater protection standards.

As stated in the notification dated September 29, 2022, SSLs for total arsenic, total cadmium, and total lithium were identified at the OWAP following assessment monitoring completed during the reporting period in accordance with 40 C.F.R. § 257.95, with total cadmium being a new SSL for the OWAP. An Alternate Source Demonstration (ASD) for the new total cadmium SSL was completed with related documentation submitted to the OWAP operating record on November 28, 2022. This ASD is provided in Attachment A and was included in the 2022 Annual Groundwater Monitoring and Corrective Action Report, as required by 40 C.F.R. § 257.90(e).

Remedy selection will take into consideration compliance with both 40 C.F.R. § 257 and 35 I.A.C. Part 845, the latter of which cannot be completed until IEPA approves the groundwater monitoring program and issues an operating permit. In accordance with 40 C.F.R. § 257.97, remedy selection is to be completed as soon as feasible following completion of the corrective measures assessment. As required by 35 I.A.C. § 845.670, a corrective action plan that identifies the selected remedy must be submitted to IEPA within one year after completing the assessment of corrective measures. It is anticipated that these activities related to 35 I.A.C. Part 845 compliance will occur in 2023 with submittal of a corrective action plan in 2024 that meets both 40 C.F.R. § 257 and 35 I.A.C. Part 845.

ATTACHMENT A

40 C.F.R. § 257.95(G)(3)(II): ALTERNATE SOURCE DEMONSTRATION OLD WEST ASH POND (POND NO. 1 AND POND NO. 3) AND OLD WEST POLISHING POND
HENNEPIN POWER PLANT
HENNEPIN, ILLINOIS
CCR UNIT 804

Prepared for
Dynegy Midwest Generation, LLC

Date
November 28, 2022

Project No.
1940102203-011

40 C.F.R. § 257.95(g)(3)(ii): Alternate Source Demonstration

OLD WEST ASH POND (POND NO. 1 AND POND NO. 3) AND OLD WEST POLISHING POND

HENNEPIN POWER PLANT

HENNEPIN, ILLINOIS

CCR UNIT 804

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Brian G. Hennings, a professional geologist in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used other than for its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Brian G. Hennings
Professional Geologist
196-001482
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: November 28, 2022

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

Eric J. Tlachac
Qualified Professional Engineer
062-063091
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: November 28, 2022

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA
T 414-837-3607
F 414-837-3608
https://ramboll.com

CONTENTS

TABLES (IN TEXT)

FIGURES (IN TEXT)

FIGURES (ATTACHED)

APPENDICES

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
A5	Assessment Monitoring Round 5
AP2	Ash Pond No. 2
AP4	Ash Pond No. 4
ASD	Alternate Source Demonstration
CCR	coal combustion residuals
CCR Rule	40 C.F.R. § 257 Subpart D
Closure Plan	Closure and Post-Closure Care Plan
CMA	Corrective Measures Assessment
DMG	Dynegy Midwest Generation, LLC
EPRI	Electric Power Research Institute
Geosyntec	Geosyntec Consultants, Inc.
GWPS	Groundwater Protection Standard
HPP	Hennepin Power Plant
IEPA	Illinois Environmental Protection Agency
LOE	line(s) of evidence
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MNA	monitored natural attenuation
mV	millivolts
NAVD88	North American Vertical Datum of 1988
No.	Number
NRT/OBG	Natural Resource Technology, an OBG Company
OWAP	Old West Ash Pond (Pond Number No. 1 and Pond No. 3) and Old West Polishing Pond
Ramboll	Ramboll Americas Engineering Solutions, Inc.
redox	reduction-oxidation
RL	reporting limit
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
USGS	United States Geological Survey

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a coal combustion residuals (CCR) unit 90 days from the date of determination of a Statistically Significant Level (SSL) over the Groundwater Protection Standard (GWPS) of groundwater constituents listed in Appendix IV of 40 C.F.R. § 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (Alternate Source Demonstration [ASD]).

This ASD has been prepared on behalf of Dynegy Midwest Generation, LLC (DMG), by Ramboll Americas Engineering Solutions, Inc. (Ramboll) to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Old West Ash Pond (Pond Number [No.] 1 and Pond No. 3) and Old West Polishing Pond, collectively referred to as the OWAP, located at Hennepin Power Plant (HPP) near Hennepin, Illinois.

The most recent Assessment Monitoring sampling event (Assessment Monitoring Round 5 [A5]) was completed on March 22, 2022, and analytical data were received on June 1, 2022. Analytical data from A5 were evaluated in accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017a) to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over GWPSs. That evaluation identified the following SSLs at downgradient monitoring wells:

- Arsenic at wells 21R and 51
- Cadmium at well 22
- Lithium at well 22

A Corrective Measures Assessment (CMA) was completed in 2019 for the arsenic and lithium SSLs, and further evaluation of monitored natural attenuation (MNA) as an associated groundwater remedy is in progress. The cadmium SSL was not observed in previous sampling events. In accordance with the Statistical Analysis Plan (NRT/OBG, 2017a), well 22 was resampled on June 7, 2022 and analyzed for cadmium to confirm the SSL observed during the A5 sampling event. Following evaluation of analytical data from the resample event, the cadmium SSL was confirmed. Consequently, alternate sources were evaluated for the cadmium SSL.

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the lines of evidence (LOE) described in Section 3 demonstrate that sources other than the OWAP were the cause of the cadmium SSL listed above. This ASD was completed by November 28, 2022, within 90 days of determination of the SSL, as required by 40 C.F.R. § 257.95(g)(3)(ii).

2. BACKGROUND

2.1 Site Location and Description

The HPP is located in the northwest quarter of Section 26, Township 33 North, Range 2 West, Putnam County, Illinois and approximately 3 miles north-northeast of the Village of Hennepin.

The OWAP is one of four CCR units regulated under 40 C.F.R. §257 Subpart D (CCR Rule) at the HPP. Three CCR units (the Landfill, Ash Pond No. 2 [AP2], and the East Ash Pond) and one unit not regulated by the CCR Rule (Ash Pond No. 4 [AP4]) are located adjacent to each other and east of the HPP and are collectively known as Hennepin East. The OWAP is located west of the HPP. Areas surrounding the OWAP include agricultural land with scattered groupings or rows of trees to the southeast and low-lying floodplains of the Donnelley Wildlife Management Area to the southwest and west. The OWAP and surrounding properties are shown on **Figure 1**.

2.2 Groundwater Monitoring

The OWAP groundwater monitoring system for compliance with the CCR Rule consists of two background monitoring wells (32 and 34) and six compliance monitoring wells (21R, 22, 23, 35, 49, and 51). This monitoring network also includes two monitoring wells (22D and 50) installed to delineate groundwater impacts as required by 40 C.F.R. § 257.95(g)(1). A map showing the groundwater monitoring system, including the CCR unit and monitoring wells, is presented in **Figure 1**.

Groundwater samples are collected and analyzed in accordance with the Sampling and Analysis Plan prepared for the OWAP (NRT/OBG, 2017b). Statistical evaluation of analytical data is performed in accordance with the Statistical Analysis Plan (NRT/OBG, 2017a).

2.3 Site History

The HPP has two coal-fired generating units constructed in 1953 and 1959 with a total capacity of 210 Megawatts. Operations were ceased in November 2019. The coal source changed several times during the plant's operational history.

DMG operated the OWAP from 1952 through 1996. It consists of two closed units, the Old West Ash Pond and the Old West Polishing Pond (**Figure 1**). The Old West Ash Pond consists of the 9.3-acre Pond No. 1 at the eastern end of the impoundment and the 16.4-acre Pond No. 3 within the central portion of the impoundment. The 4.7-acre Old West Polishing Pond is situated at the western end of the impoundment. All ponds are bermed to approximately 15 feet above grade and are constructed from locally occurring sandy soils.

During operation, service water was used to sluice fly ash, bottom ash, and low-volume wastes to the OWAP. At the time it was removed from service in late 1996, there was no surface water discharge and all sluice water ex-filtrated via evapotranspiration, seepage through the berms, or leakage through the base of the ponds. Coal ash sluiced to the OWAP was a by-product of the combustion of high-sulfur Illinois coal. The operational history of the OWAP is summarized in **Table A** below.

Table A. Operational History of OWAP

Date	Event
1952-1955	Construction of OWAP, Pond No. 1. Berms were constructed from locally sandy materials to an original elevation (since modified) of 457 feet.
1968	Construction of OWAP, Pond No. 3. Berms were constructed to an elevation of 457 feet.
1979	Berms surrounding the OWAP were raised by three feet to an elevation of 460 feet.
1988-1989	Ponds No. 1 and No. 3 within the OWAP were consolidated and divided into primary and secondary cells, and the berm around the primary portion was raised five feet to an elevation of 465 feet. It was after this consolidation that surface water discharge from the impoundment ceased.
1996	OWAP Ponds No. 1 and No. 3 were removed from service.
2020	OWAP Ponds No. 1 and No. 3 were closed in-place and Old West Polishing Pond was closed by removal (CCR consolidated into Ponds No. 1 and No. 3) in accordance with the IEPA-approved closure plan.

The *Closure and Post-Closure Care Plan, Old West Ash Pond, Old West Polishing Pond at DMG, Hennepin Power Station* (Closure Plan) was submitted to Illinois Environmental Protection Agency (IEPA) in 2017 (Geosyntec Consultants, Inc. [Geosyntec], 2017). The Closure Plan was approved by IEPA in a letter dated June 19, 2018. The approved Closure Plan summarized the planned closure of the OWAP, which included dewatering the CCR, if needed, mechanical excavation of material from the Old West Polishing Pond for use as structural fill in the OWAP, grading within the OWAP, constructing an alternative cover system consisting of geomembrane and vegetated cover soils in direct contract with the graded CCR, and establishment of a vegetative cover. Closure construction was completed on November 17, 2020.

2.4 Site Hydrogeology and Stratigraphy

A detailed hydrogeological assessment of the HPP was completed and submitted as part of the 2017 Closure Plan for the West Ash Pond System (NRT/OBG, 2017c) Information pertinent to this ASD is included in this report; however, more complete information on site hydrogeology and stratigraphy is available in the 2017 Closure Plan (Geosyntec, 2017).

There are three dominant geomorphic features in the immediate vicinity of the HPP: an upper river terrace at an elevation of about 500 to 550 feet North American Vertical Datum of 1988 NAVD88, a lower river terrace at an elevation of about 450 to 460 feet NAVD88, and the current river valley filled with alluvium to an elevation of about 445 feet NAVD88. The HPP and the eastern portion of the OWAP (Pond No. 1) are on the lower terrace. The western portion of the OWAP (Pond No. 3 and Old West Polishing Pond) overlies alluvium.

The hydrogeological assessment identified that the stratigraphy within and immediately surrounding the OWAP consists of fill, unlithified river alluvium, and Pleistocene-age glacial outwash deposits overlying Pennsylvanian-age shale bedrock. The perimeter berms of the OWAP contain variable amounts of CCR and re-worked native silt, clay, and sand. Where undisturbed or partially excavated, the native surficial soil at the site is poorly drained, moderately permeable silty clay loam formed as alluvium in floodplains.

There are two hydrogeologic units present at the HPP: alluvium and Henry Formation sands and gravels. The river laid deposits are identified as Cahokia Alluvium. The Henry Formation sands and gravels make up the upper and lower terraces and fill the valley beneath the alluvium. The Henry Formation and alluvium together comprise the Uppermost Aquifer at the OWAP and extend from the water table to the bedrock.

The OWAP overlies both glacial deposits (Henry Formation) and alluvium (Cahokia Alluvium). The OWAP, specifically Pond No. 1, rests on top of lower terrace glacial deposits, and the eastern portion of Pond No. 3 overlies alluvial sand. While the western portion of Pond No. 3 and the Old West Polishing Pond overlie silty clay alluvial channel fill deposits.

The Pennsylvanian-age bedrock consists of interbedded layers of shale with thin limestone, sandstone, and coal beds. The shale bedrock unit has low hydraulic conductivity and defines the lower boundary of the Uppermost Aquifer.

The direction of groundwater flow and hydraulic gradient within the Uppermost Aquifer varies with the elevation of the Illinois River (select groundwater elevation contour maps are provided in **Appendix A**). During normal river stage the direction of groundwater flow is most often toward the river, but comparison of groundwater and river elevation data indicate reversals in this flow direction during times of high river elevations. The relative duration of these events is short, which leads to the determination of a predominant groundwater flow direction toward the river.

Groundwater elevations were obtained from measurements in monitoring wells on March 21, 2022 prior to the A5 sampling event at the site. Groundwater elevations for the OWAP during the A5 sampling event are shown in **Figure 2** and ranged from 444.15 feet NAVD88 (in well 34) to 448.50 feet NAVD88 (in well 32). Groundwater flow was generally toward the Illinois River.

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

As allowed by 40 C.F.R. § 257.95(g)(3)(ii), this ASD demonstrates that sources other than the OWAP (the CCR unit) caused the SSL. LOEs supporting this ASD include the following:

1. Concentrations of cadmium are lower than those observed in leachate samples.
2. Cadmium concentrations are negatively correlated with concentrations of CCR indicator parameters.
3. Cadmium concentrations were detected in nearby aquifer materials and geochemical conditions support mobilization.

Data and information supporting these LOEs are discussed in more detail below.

3.1 LOE #1: Concentrations of Cadmium are Lower than those Observed in Leachate Samples

Leachate samples were collected from multiple locations within the OWAP in April and September of 2017 (**Figure 3**). Analytical results from locations L4, LPZ1, LPZ3, and LPZ17, sampled on April 25, 2017, indicate that total cadmium concentrations were less than laboratory reporting limits (RL) (less than 0.001 milligrams per liter [mg/L]). Analytical results from locations L4 and LPZ17, sampled on September 6, 2017, indicate that the total cadmium concentration in the sample from L4 was less than the RLs (less than 0.001 mg/L) and the total cadmium concentration in the sample from LPZ17 was 0.0013 mg/L.

The cadmium concentrations detected in the leachate samples are less than the lower confidence level of cadmium concentrations observed in well 22 (0.00527 mg/L).

3.2 LOE #2: Cadmium Concentrations are Negatively Correlated with Concentrations of CCR Indicator Parameters

Boron and sulfate are common indicators of CCR impacts to groundwater due to their leachability from CCR and mobility in groundwater (Electric Power Research Institute [EPRI], 2012). If an SSL is identified for a monitored parameter but concentrations of boron and sulfate are not correlated with that parameter, it is unlikely that the CCR unit is the source of the SSL.

Figure A below provides a scatter plot of cadmium versus boron and sulfate concentrations (collected from 2015 through the A5 sampling event) in monitoring well 22 (the location of the cadmium SSL), along with the results of a Spearman correlation test for non-parametric data (these data were determined to be not normally distributed). The results of the test at each well are described by the p-value and rho (Spearman correlation coefficient) included in each plot. Typically, a p-value greater than 0.05 is considered to be a statistically insignificant relationship. The range of rho falls between -1 and 1, with a perfect correlation equal to -1 or 1. The closer rho is to 0, the less of a correlation exists in the data.

The results of the correlation analyses indicates that concentrations of cadmium observed at monitoring well 22 are negatively correlated with concentrations of boron and sulfate, common indicators of CCR impacts to groundwater. **Figure A** below illustrates the inverse relationship

between cadmium concentrations and boron or sulfate concentrations in groundwater at monitoring well 22, where the p-values are less than 0.001 and rho is close to -1.

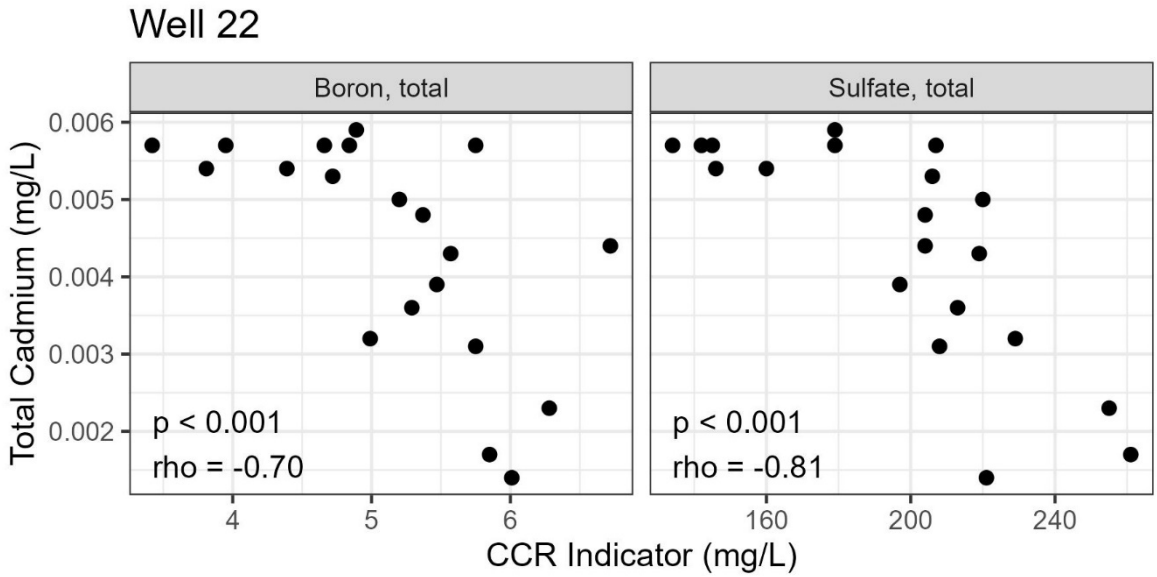


Figure A. Scatter Plot of Cadmium Versus Boron and Sulfate Concentrations at Monitoring Well 22

Cadmium concentrations are negatively correlated with boron and sulfate concentrations in the downgradient monitoring well, indicating the OWAP is not the source of the cadmium SSL.

3.3 LOE #3: Cadmium Concentrations were Detected in Nearby Aquifer Materials and Geochemical Conditions Support Mobilization

Soil samples were collected from four borings near Hennepin East in 2021 to support a hydrogeologic characterization report (Ramboll, 2021). Results of chemical analyses of the soil samples indicate that cadmium concentrations in the Henry Formation sands and gravels ranged from 1.13 to 1.65 milligrams per kilogram (mg/kg) with an average cadmium concentration of 1.36 mg/kg. Results of cadmium analyses from samples within the Cahokia Alluvium were slightly more variable, ranging from 0.57 to 1.34 mg/kg, with an average cadmium concentration of 0.97 mg/kg. Additionally, a sample of bedrock was obtained and yielded a cadmium concentration of 0.75 mg/kg.

Geochemical conditions that would affect cadmium mobility in groundwater at monitoring well 22 were evaluated. The primary geochemical conditions influencing cadmium mobility in non-sulfidic groundwater are pH and the association of cadmium with ligands. Cadmium will desorb from solid phases, and therefore exhibit greater mobility in groundwater, under lower pH conditions (Kubier et al., 2019). Additionally, cadmium can be mobilized from the solid phase via forming soluble complexes with certain ligands (*e.g.,* $CdCl^{+}$, $Cd(SO4)_2^{-2}$, or dissolved organic molecules) (Kubier et al., 2019). Because reduction-oxidation (redox) conditions at monitoring well 22 are insufficiently reducing to drive sulfide formation, sulfide is unlikely to occur at monitoring well 22. Therefore, the potential for pH and the formation of soluble cadmium complexes to mobilize cadmium at well 22 were assessed as described below.

Changes in pH at monitoring well 22 were evaluated using a Mann-Kendall trend test. Over the same time frame that cadmium concentrations have been increasing, pH values exhibit a significant downward trend (**Figure B**). Because cadmium is more mobile in groundwater under lower pH conditions, the decrease in pH could have contributed to the increased mobilization and concentrations of cadmium in groundwater at monitoring well 22.

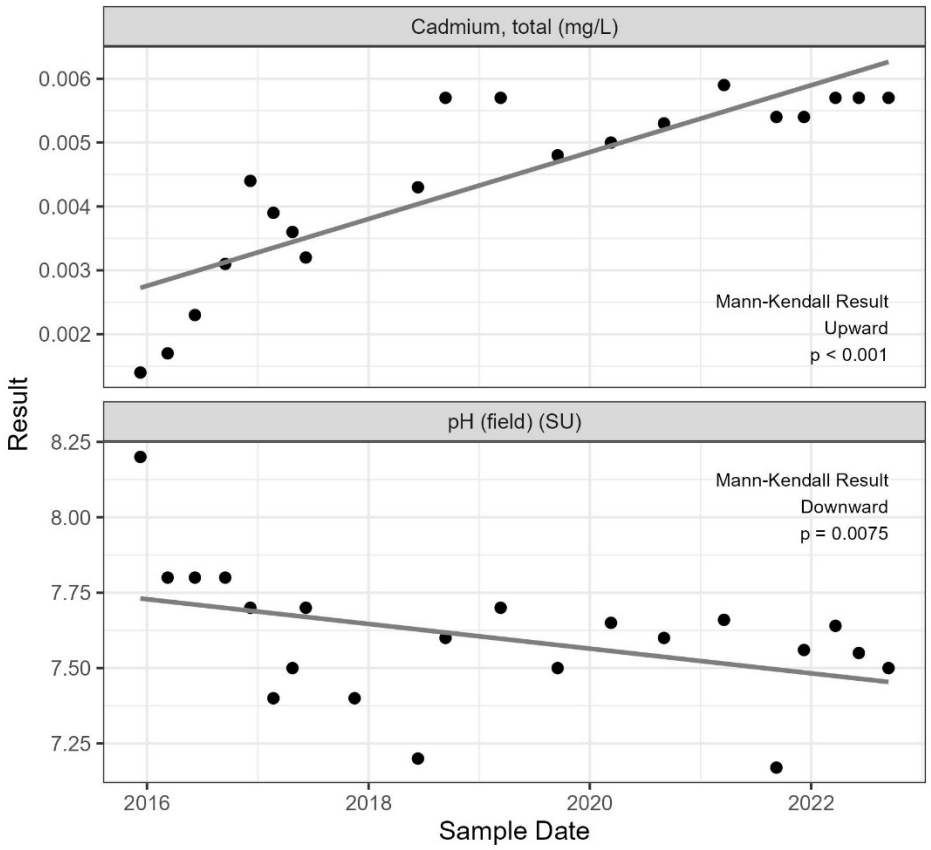


Figure B. Time Series Showing Mann-Kendall Trend Test Results for Cadmium and pH at Monitoring Well 22

Complexation with chloride and sulfate can also contribute to cadmium mobilization from the solid phase due to the formation of more mobile species (Kubier et al., 2019). Therefore, a basic cadmium speciation analysis was conducted using PHREEQC using the LLNL thermodynamic database[1] (United States Geological Survey [USGS], 2021). Samples included in the analysis were those collected under 40 C.F.R. § 257 monitoring, plus two samples collected in 2013. These earlier samples were included to achieve a more complete picture of geochemical conditions associated with low cadmium concentrations at monitoring well 22. Inputs to the speciation model were temperature, pH, redox potential, and concentrations of cadmium, chloride, and sulfate. For samples in which cadmium was not detected, the RL was used as the cadmium concentration input to the speciation model. Because redox measurements were not available for all samples, the median value (59.5 millivolts [mV], out of a range of -67 mV to 168 mV) was used as the redox input to the speciation model for all samples.

[1] Except for $Cd(SO_4)_2^{2-}$, which used thermodynamic data from the Oak Ridge National Laboratory AQUA-MER database.

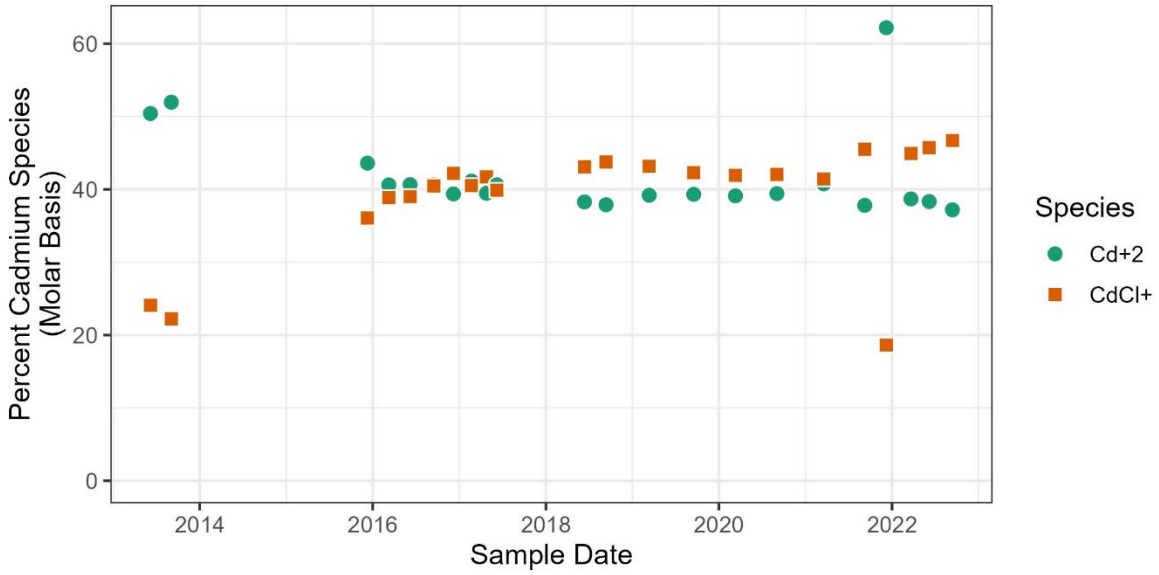


Figure C. Cadmium Speciation Results at Monitoring Well 22 (presented as the percent of total cadmium present on a molar basis).

Eight cadmium species[2] were evaluated for their contribution to total cadmium, and only Cd^{2+} and $CdCl^{+}$ contributed more than 1 percent to any sample (on a molar basis). **Figure C** shows the proportion of total cadmium that was present as Cd^{2+} and $CdCl^{+}$ in each sample. When total cadmium concentrations were low, Cd^{2+} was the dominant cadmium species. Due to its higher charge, Cd^{2+} is more likely to sorb to aquifer solids (Kubier et al., 2019). Increasing total cadmium concentrations coincide with an increasing prevalence, and eventual predominance, of $CdCl^{+}$, a more mobile cadmium species.

The downward trend in pH and the cadmium speciation analysis indicate that cadmium concentrations in groundwater samples from well 22 increased when geochemical conditions facilitated greater mobility of cadmium through dissolution out of the aquifer material due to lower pH and the increased formation of mobile $CdCl^{+}$. The increase in cadmium concentrations was likely due to the cadmium naturally present in the Henry Formation becoming mobilized due to changing geochemical conditions.

[2] Cd^{2+}, $CdOH^{+}$, $Cd(OH)_2$, $Cd(OH)Cl$, $CdCl^{+}$, $CdCl_2$, $CdSO_4$, $Cd(SO4)_2^{2-}$

4. CONCLUSIONS

Based on these three LOEs, it has been demonstrated that the OWAP is not the source of the cadmium SSL identified in well 22.

1. Concentrations of cadmium are lower than those observed in leachate samples.
2. Cadmium concentrations are negatively correlated with concentrations of CCR indicator parameters.
3. Cadmium concentrations were detected in nearby aquifer materials and geochemical conditions support mobilization.

Based on the LOEs presented, the following alternate sources are the cause of the SSL observed in the OWAP compliance well:

- Cadmium: SSL for cadmium may be caused by mobilization of naturally occurring cadmium out of aquifer materials due to favorable geochemical conditions.

This information serves as the written ASD report prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii) that the cadmium SSL observed during the A5 monitoring event was not caused by the OWAP but was from other sources.

5. REFERENCES

Electric Power Research Institute (EPRI), 2012. Groundwater Quality Signatures for Assessing Potential Impacts from Coal Combustion Product Leachate. EPRI, Palo Alto, CA. 1017923.

Geosyntec Consultants, Inc. (Geosyntec), 2017. Closure and Post Closure Care Plan, Old West Ash Pond, Old West Polishing Pond at Dynegy Midwest Generation, LLC, Hennepin Power Station.

Kubier A, Wilkin RT, and Pichler T., 2019. Cadmium in soils and groundwater: A review. *Appl Geochem* 108: 1-16. 10.1016/j.apgeochem.2019.104388.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017a. Statistical Analysis Plan, Baldwin Energy Complex, Havana Power Station, Hennepin Power Station, Wood River Power Station, Dynegy Midwest Generation, LLC. October 17, 2017.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017b. Sampling and Analysis Plan, Old West Ash Pond (Pond No. 1 and Pond No. 3) and Hennepin Old West Polishing Pond, Hennepin Power Station, Hennepin, Illinois, Project No. 2285, Revision 0. October 17, 2017.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017c. Hydrogeologic Site Characterization Report, West Ash Pond System, Hennepin Power Station, Hennepin, Illinois. December 20, 2017.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021. Hydrogeologic Site Characterization Report, East Ash Pond, Hennepin Power Plant, Hennepin, Illinois. October 25, 2021.

United States Environmental Protection Agency, 2020. Disposal of Coal Combustion Residuals from Electric Utilities, 40 C.F.R. § 257 Subpart D, published April 17, 2015, updated 2020. Accessed from URL https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-257/subpart-D#page-top

United States Geological Survey (USGS), 2021. PHREEQC. Version 3. Accessed from URL https://www.usgs.gov/software/phreeqc-version-3

FIGURES

BACKGROUND WELL
COMPLIANCE WELL
MONITORING WELL
PART 257 REGULATED UNIT (SUBJECT UNIT)
LIMITS OF FINAL COVER
SITE FEATURE
PROPERTY BOUNDARY

0 200 400
Feet

MONITORING WELL LOCATION MAP

ALTERNATE SOURCE DEMONSTRATION
OLD WEST ASH POND
HENNEPIN POWER PLANT
HENNEPIN, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\22851\MXD\2021_Annual\GWM_CAR\Hennepin\OWAP_804\Figure 1 HEN OWAP MW Location Map.mxd

PROJECT: 169000XXXX | DATED: 1/5/2022 | DESIGNER: galarmmc

BACKGROUND WELL
COMPLIANCE WELL
MONITORING WELL
GROUNDWATER ELEVATION CONTOUR (1 FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
PART 257 REGULATED UNIT (SUBJECT UNIT)
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

NOTES:

1.ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.

2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

*ILLINOIS RIVER ELEVATION OBTAINED FROM STAFF GAGE SG02, LOCATED AT THE HENNEPIN POWER PLANT

0 200 400 Feet

POTENTIOMETRIC SURFACE MAP MARCH 21, 2022

ALTERNATE SOURCE DEMONSTRATION
OLD WEST ASH POND

HENNEPIN POWER PLANT
HENNEPIN, ILLINOIS

FIGURE 2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 10/13/2022 | DESIGNER: galarnmc

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2022\Hennepin\OWAP_804\HEN OWAP 804 Pot Surface 20220321.mxd

LEACHATE WELL

PART 257 REGULATED UNIT (SUBJECT UNIT)

LIMITS OF FINAL COVER

PROPERTY BOUNDARY

0 200 400 Feet

LEACHATE SAMPLE LOCATION MAP

ALTERNATE SOURCE DEMONSTRATION
OLD WEST ASH POND
HENNEPIN POWER PLANT
HENNEPIN, ILLINOIS

FIGURE 3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

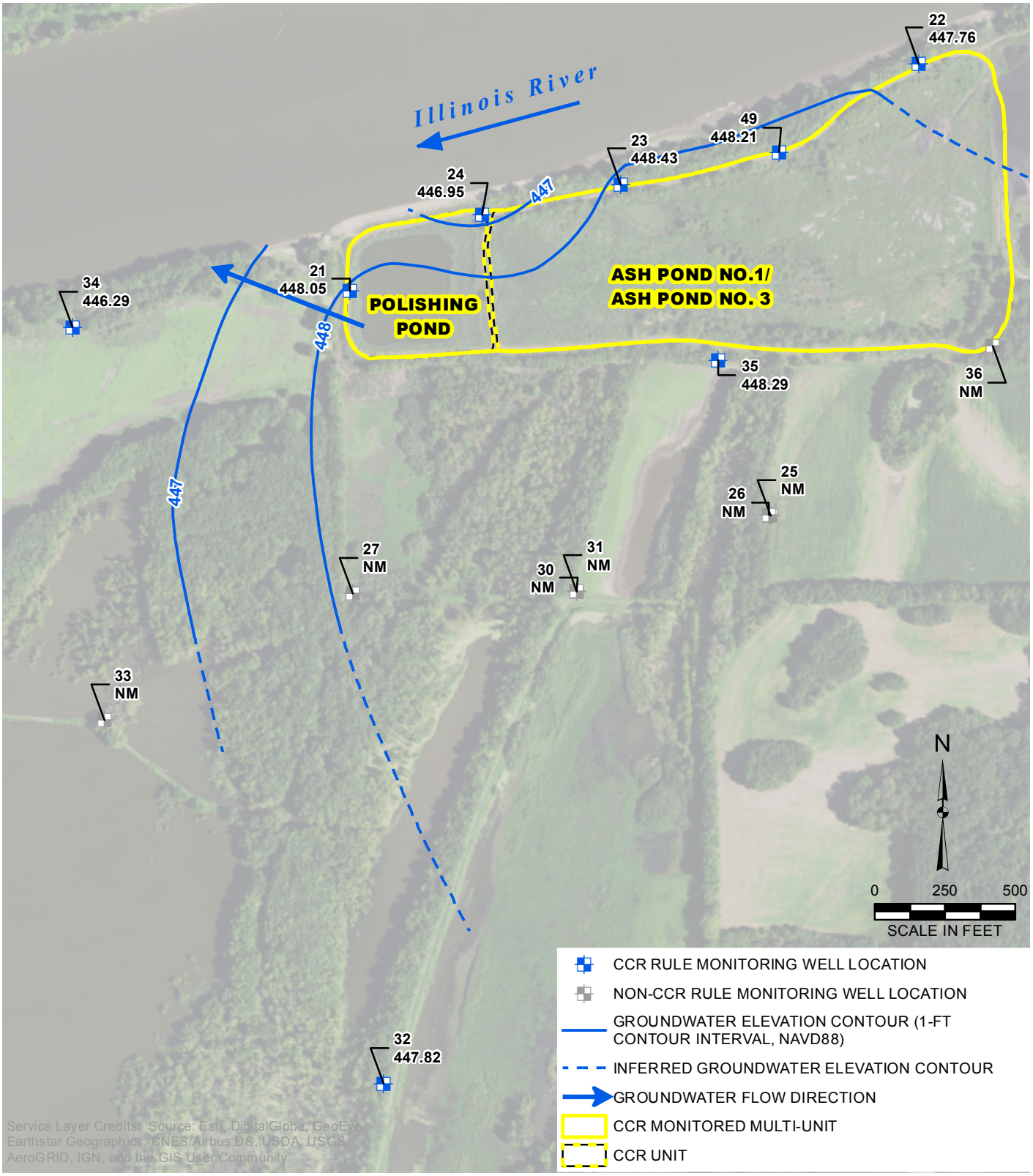
RAMBOLL

Y:\Mapping\Projects\22\02885\MXD\Alt_Source_Dem\Hen\West\HEN OWAP Leachate Sample Location Map.mxd

PROJECT: 169000XXXX | DATED: 10/17/2022 | DESIGNER: galarnmc

APPENDICES

APPENDIX A
GROUNDWATER CONTOUR MAPS



Y:\Mapping\Projects\2285\MXD\GW_Contours\Round_01\R1_HennepinWest_GW_Contours.mxd Author: sstolz Date/Time: 3/2/2017, 2:59:34 PM

DRAWN BY/DATE:
SDS 1/25/17
REVIEWED BY/DATE:
TBN 1/26/17
APPROVED BY/DATE:
JJW 2/8/17

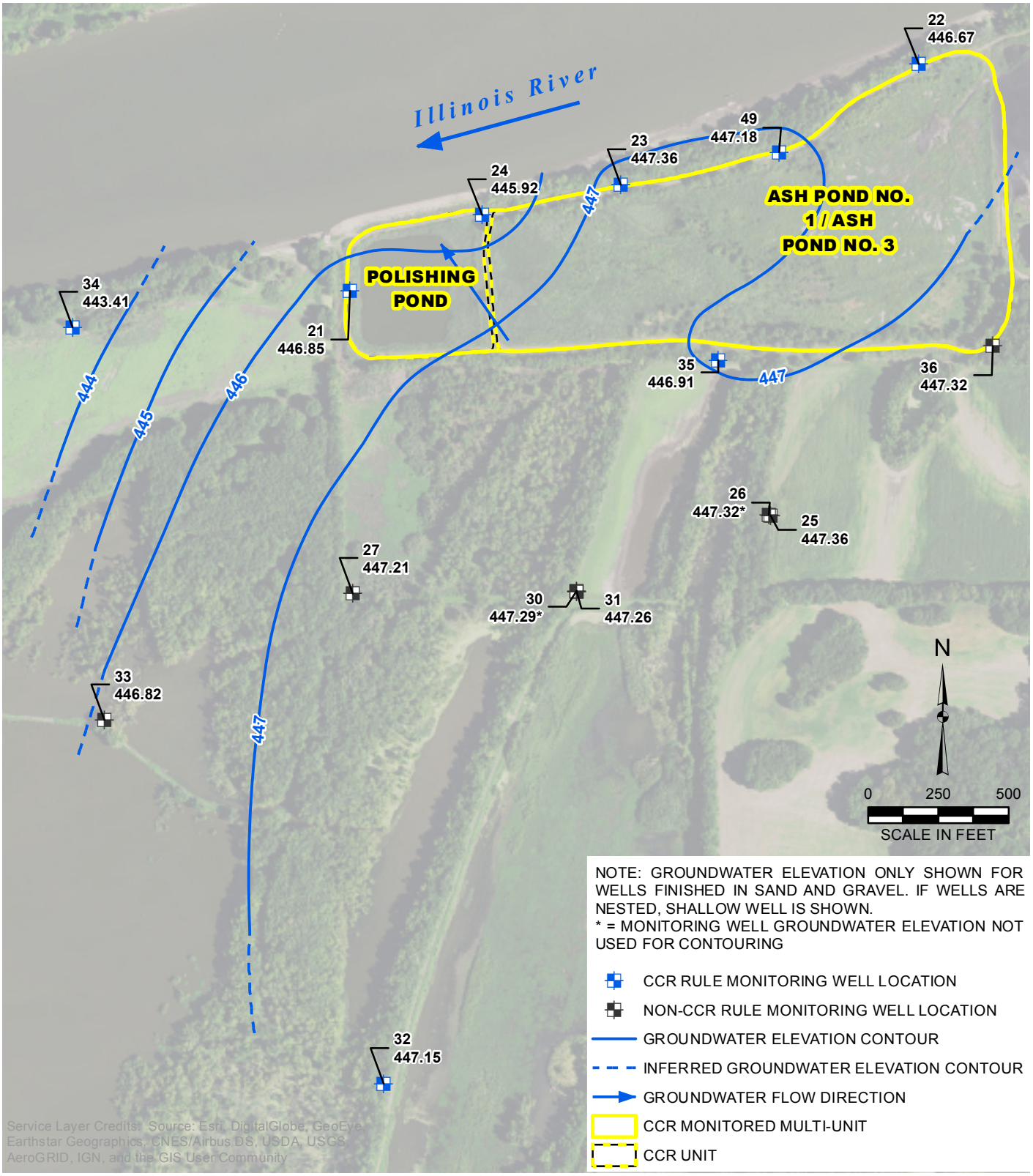
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 1: DECEMBER 8, 2015

DYNEGY MIDWEST GENERATION, LLC
HENNEPIN POWER STATION, HENNEPIN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



NOTE: GROUNDWATER ELEVATION ONLY SHOWN FOR WELLS FINISHED IN SAND AND GRAVEL. IF WELLS ARE NESTED, SHALLOW WELL IS SHOWN.
* = MONITORING WELL GROUNDWATER ELEVATION NOT USED FOR CONTOURING

- CCR RULE MONITORING WELL LOCATION
- NON-CCR RULE MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED MULTI-UNIT
- CCR UNIT

DRAWN BY/DATE:
SDS 1/19/17
REVIEWED BY/DATE:
TBN 1/20/17
APPROVED BY/DATE:
JJW 2/8/17

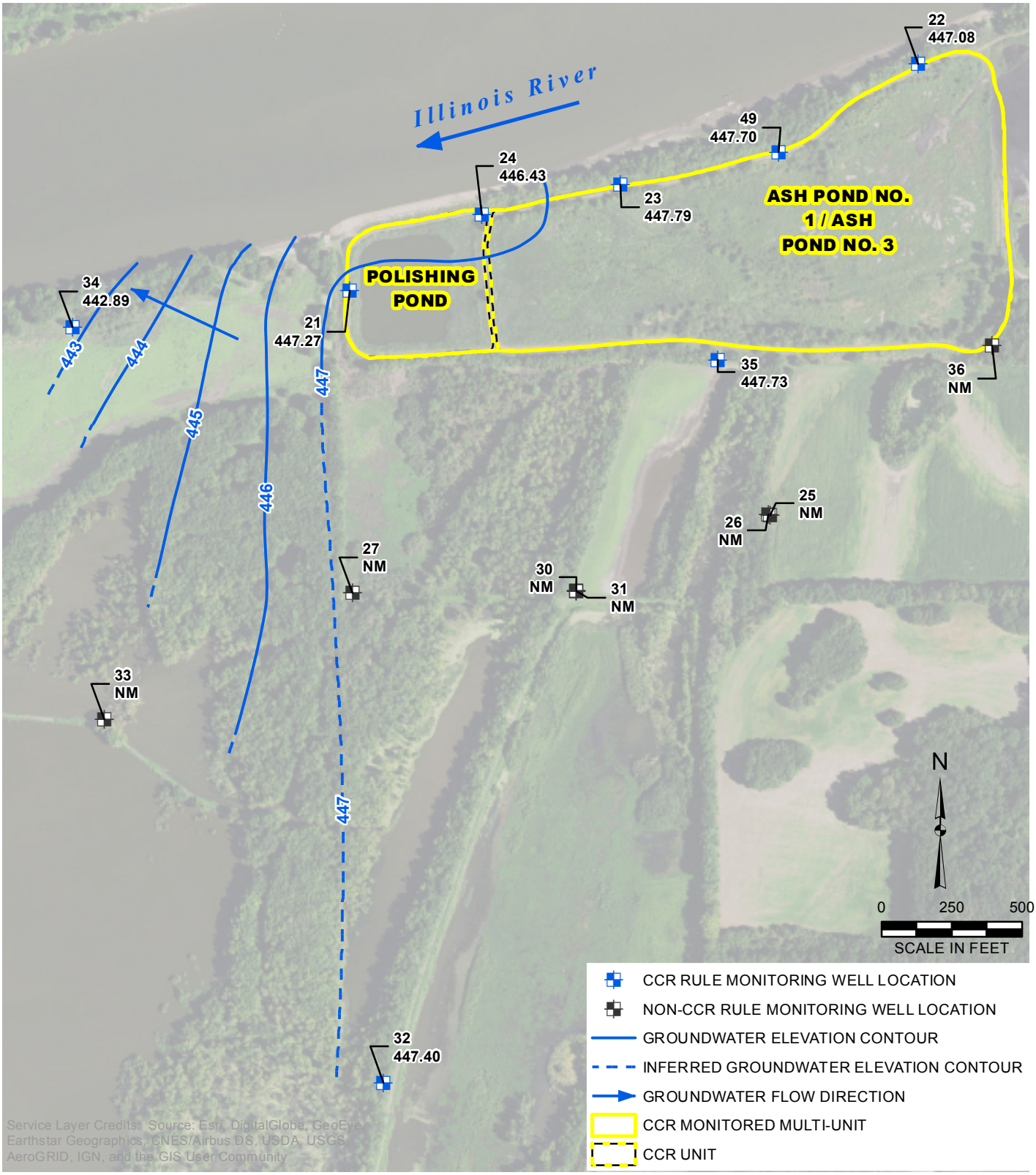
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 2: MARCH 8, 2016

DYNEGY MIDWEST GENERATION, LLC
HENNEPIN POWER STATION, HENNEPIN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



DRAWN BY/DATE:
SDS 1/25/17
REVIEWED BY/DATE:
TBN 1/27/17
APPROVED BY/DATE:
JJW 2/8/17

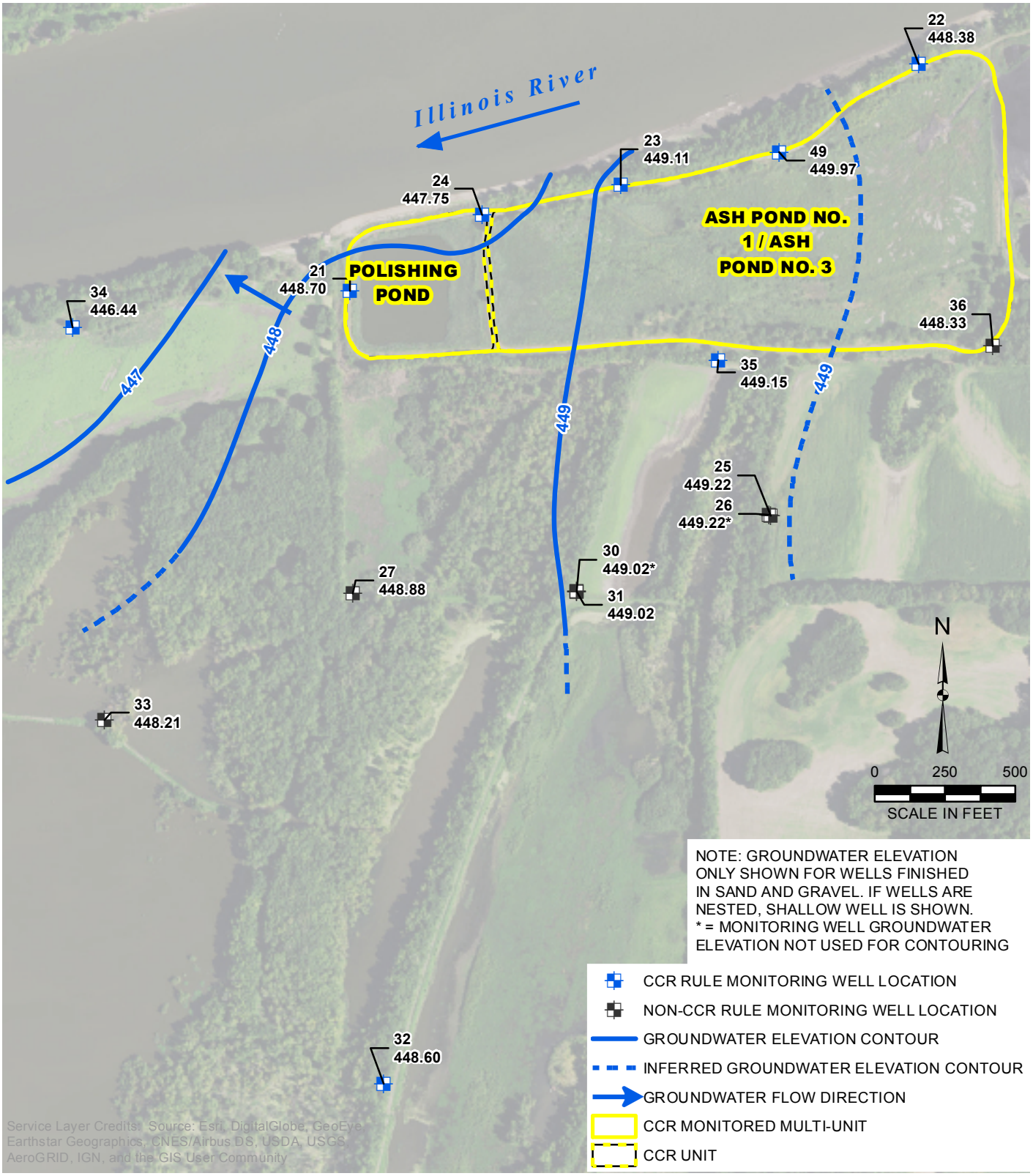
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 3: JUNE 7, 2016

DYNEGY MIDWEST GENERATION, LLC
HENNEPIN POWER STATION, HENNEPIN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



DRAWN BY/DATE:
SDS 1/25/17
REVIEWED BY/DATE:
TBN 1/26/17
APPROVED BY/DATE:
JJW 2/8/17

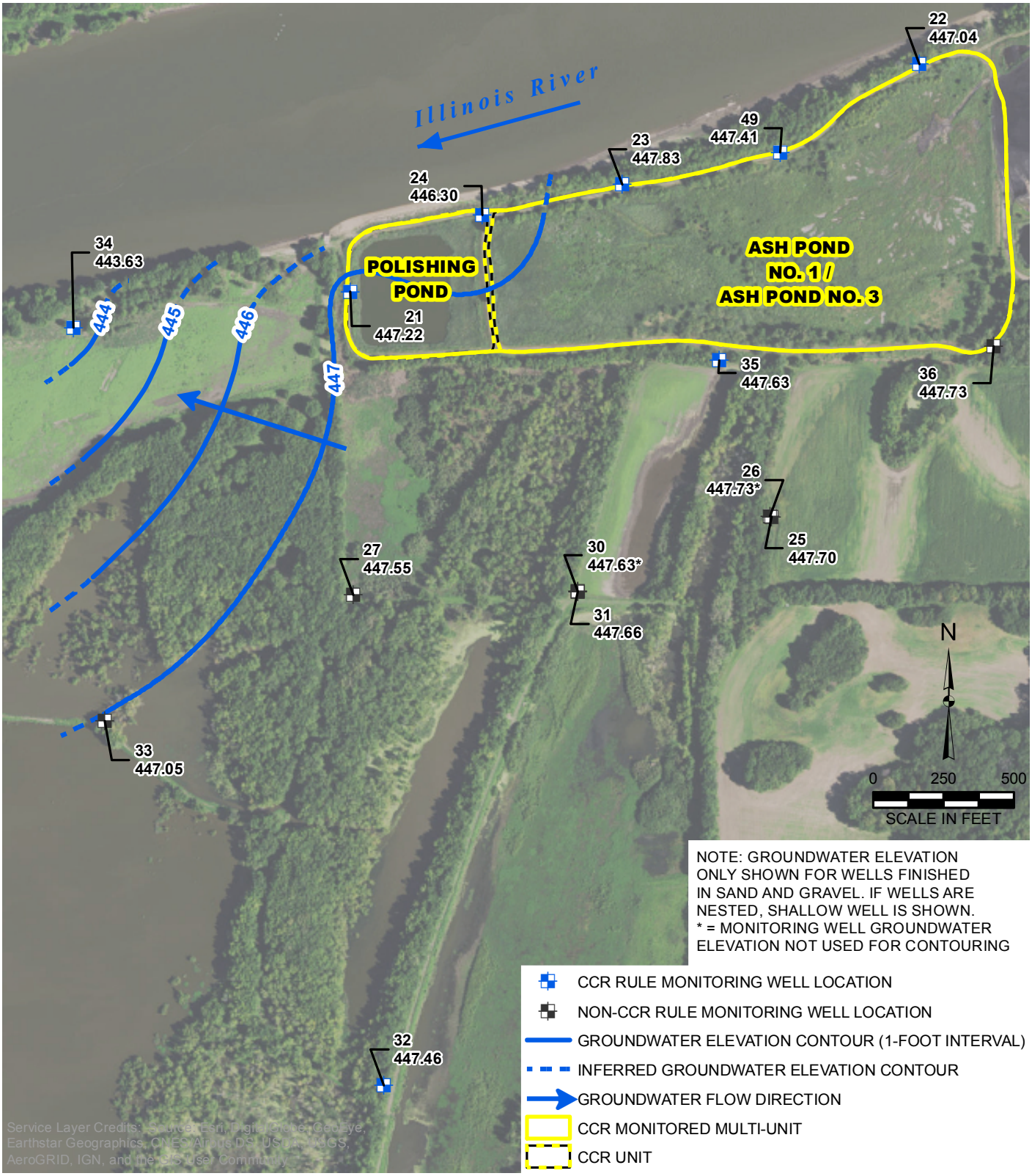
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 4: SEPTEMBER 15, 2016

DYNEGY MIDWEST GENERATION, LLC
HENNEPIN POWER STATION, HENNEPIN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



DRAWN BY/DATE:
SDS 3/6/17
REVIEWED BY/DATE:
TBN 3/6/17
APPROVED BY/DATE:
JJW 9/1/17

HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804)
UPPERMOST AQUIFER UNIT
GROUNDWATER ELEVATION CONTOUR MAP
ROUND 5: DECEMBER 7, 2016

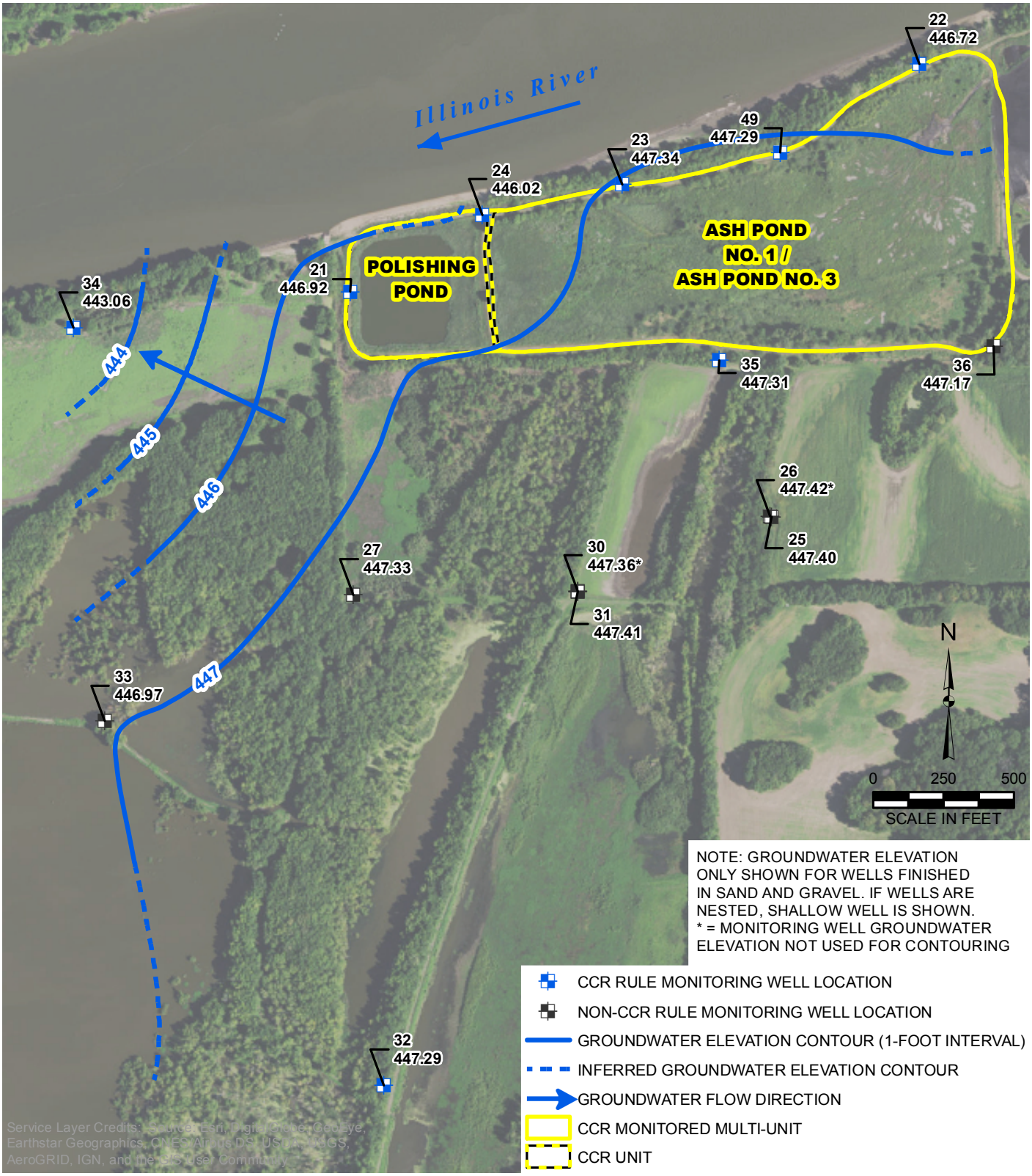
DYNEGY MIDWEST GENERATION, LLC
HENNEPIN POWER STATION, HENNEPIN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY

Y:\Mapping\Projects\2212285\MXD\GW_Contours\Round_05R5_HennepinWest_GW_Contours.mxd Author: stolzsd; Date/Time: 9/8/2017, 4:39:25 PM



DRAWN BY/DATE:
SDS 3/6/17
REVIEWED BY/DATE:
TBN 3/6/17
APPROVED BY/DATE:
JJW 9/1/17

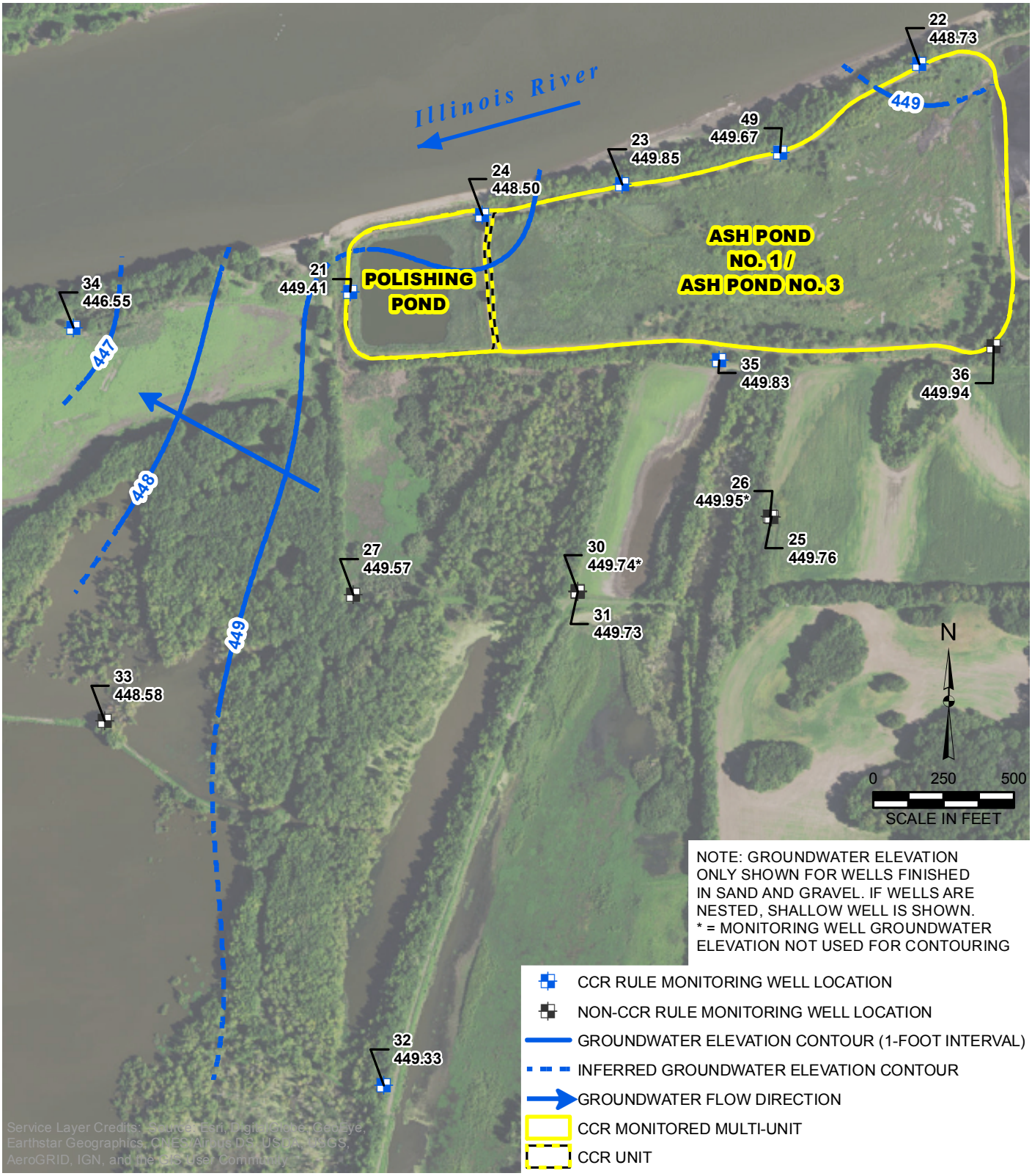
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 6: FEBRUARY 20, 2017

DYNEGY MIDWEST GENERATION, LLC
HENNEPIN POWER STATION, HENNEPIN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



DRAWN BY/DATE:
SDS 6/14/17
REVIEWED BY/DATE:
TBN 6/14/17
APPROVED BY/DATE:
JJW 9/1/17

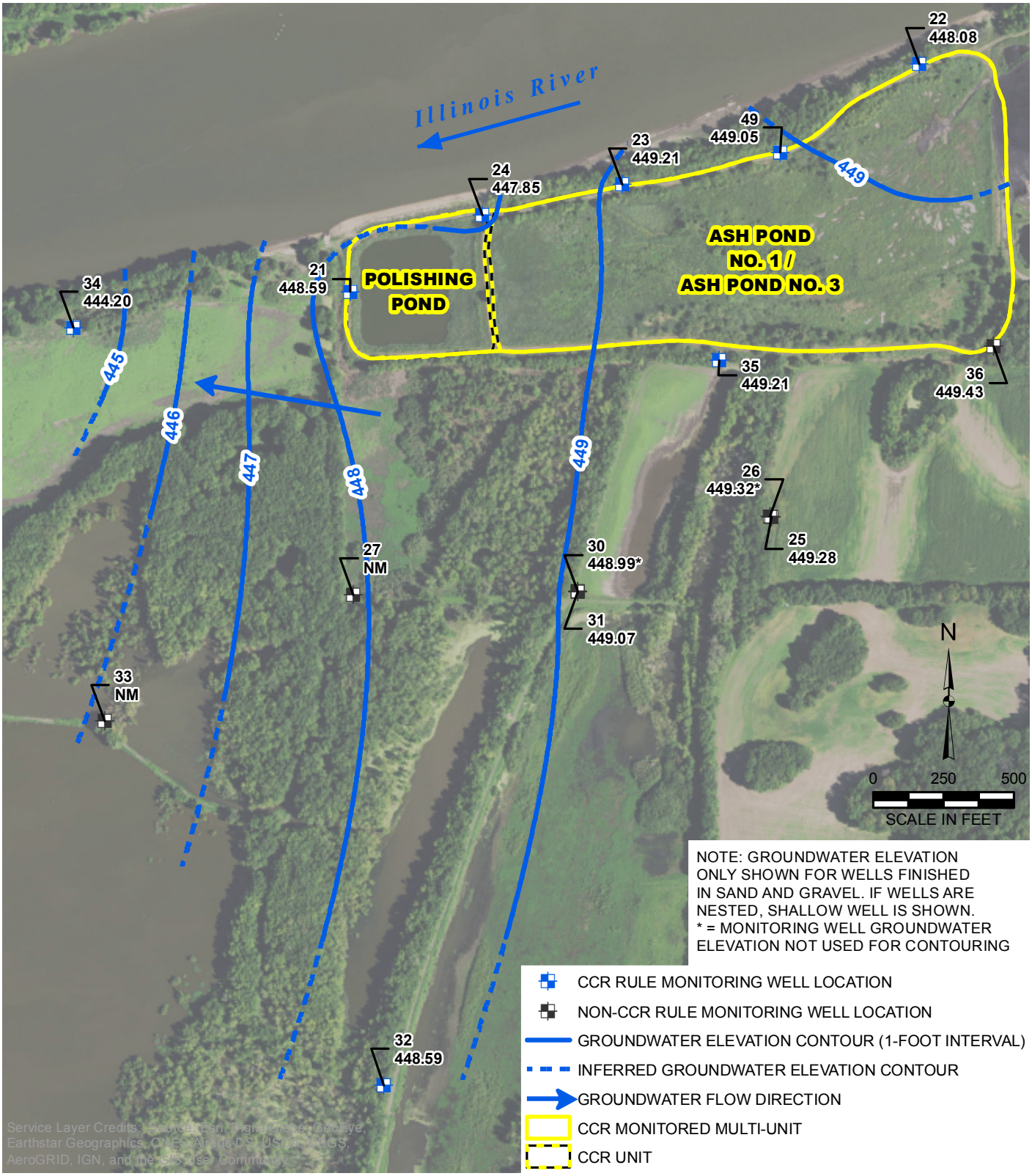
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 7: APRIL 25, 2017

DYNEGY MIDWEST GENERATION, LLC
HENNEPIN POWER STATION, HENNEPIN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



NOTE: GROUNDWATER ELEVATION ONLY SHOWN FOR WELLS FINISHED IN SAND AND GRAVEL. IF WELLS ARE NESTED, SHALLOW WELL IS SHOWN.
* = MONITORING WELL GROUNDWATER ELEVATION NOT USED FOR CONTOURING

- CCR RULE MONITORING WELL LOCATION
- NON-CCR RULE MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (1-FOOT INTERVAL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED MULTI-UNIT
- CCR UNIT

DRAWN BY/DATE:
SDS 7/20/17
REVIEWED BY/DATE:
TBN 7/20/17
APPROVED BY/DATE:
JJW 9/1/17

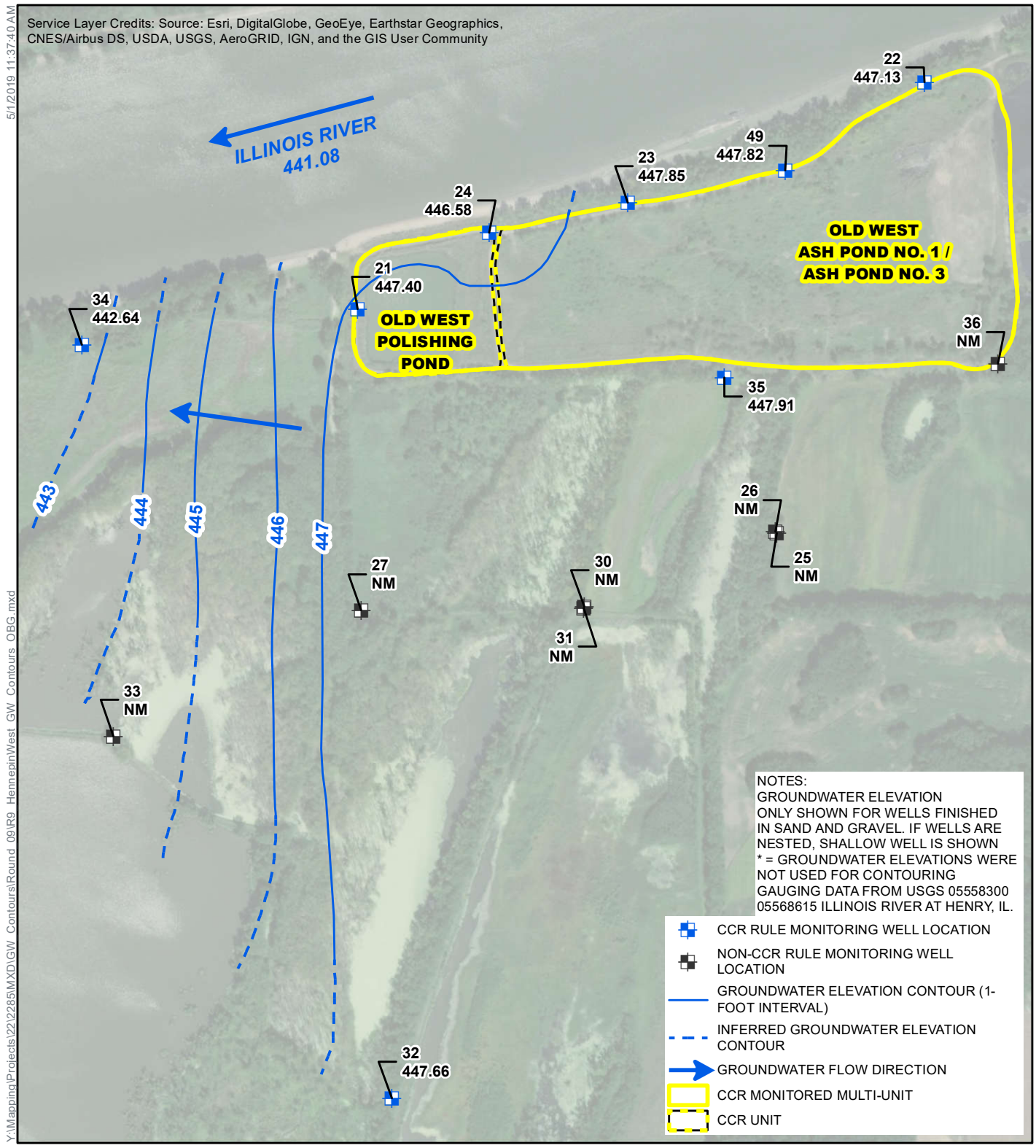
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 8: JUNE 8, 2017

DYNEGY MIDWEST GENERATION, LLC
HENNEPIN POWER STATION, HENNEPIN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



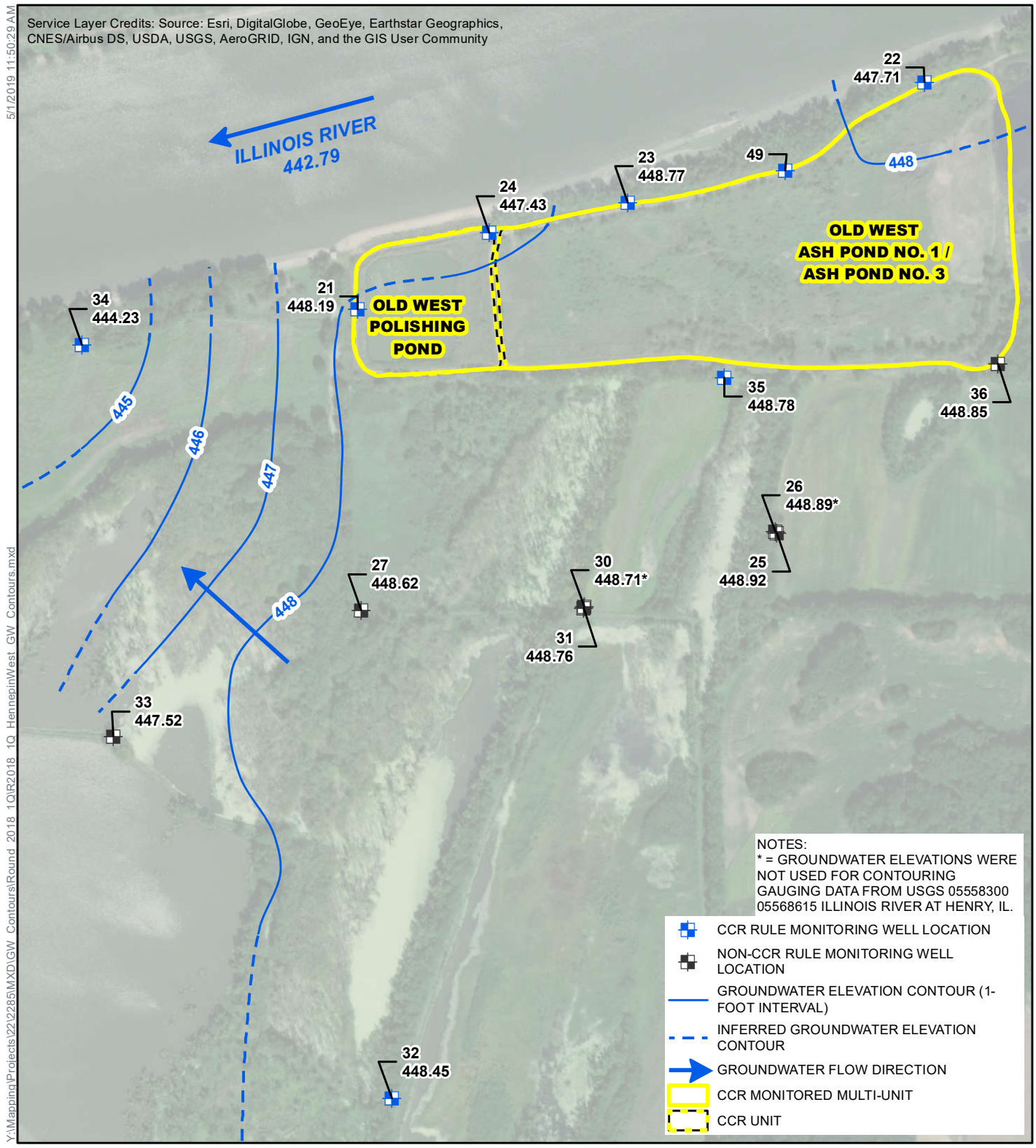
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 15, 2017

CCR RULE GROUNDWATER MONITORING
HENNEPIN POWER STATION
HENNEPIN, ILLINOIS

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



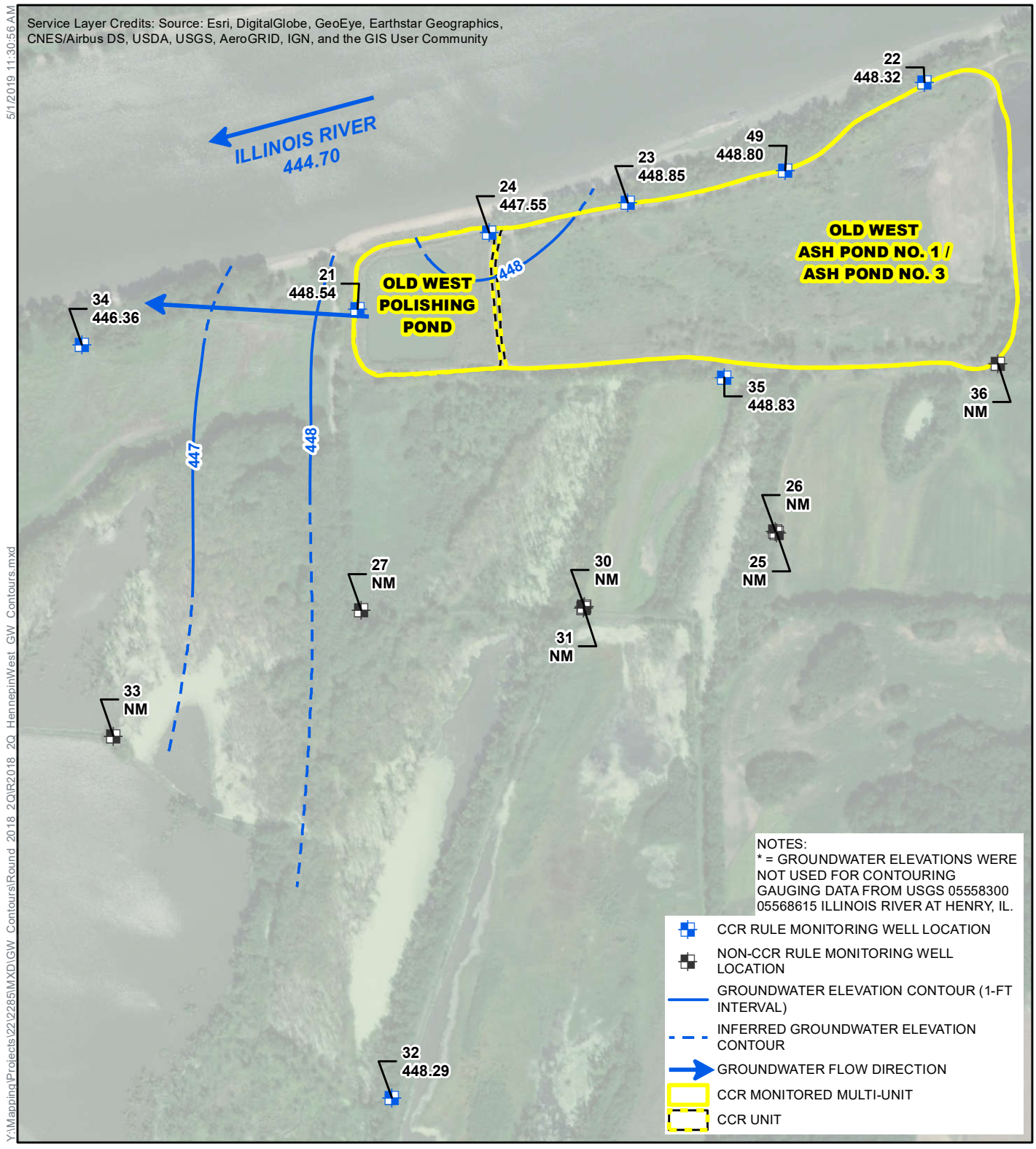
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 26, 2018

CCR RULE GROUNDWATER MONITORING
HENNEPIN POWER STATION
HENNEPIN, ILLINOIS

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



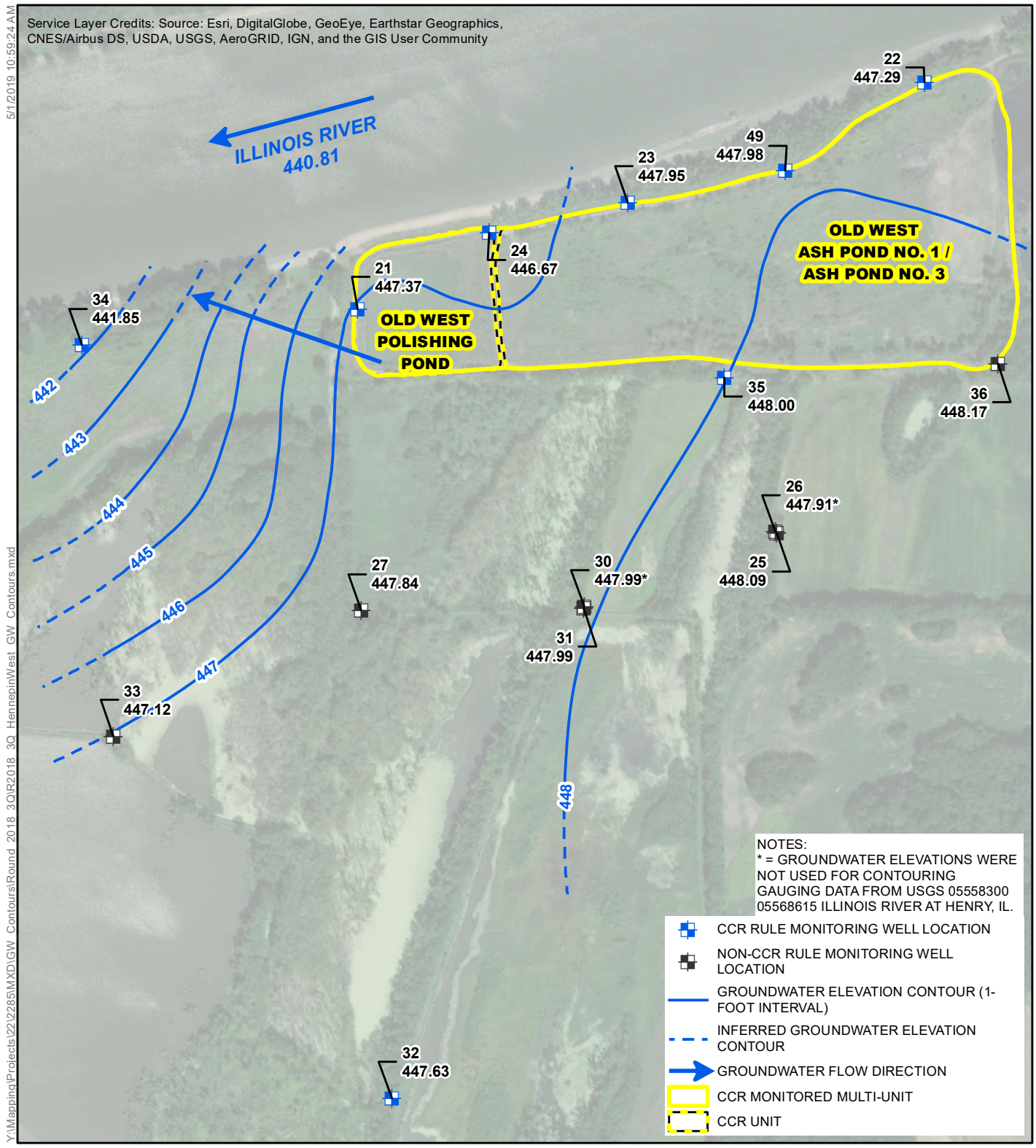
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804)
GROUNDWATER ELEVATION CONTOUR MAP
JUNE 13, 2018

CCR RULE GROUNDWATER MONITORING
HENNEPIN POWER STATION
HENNEPIN, ILLINOIS

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



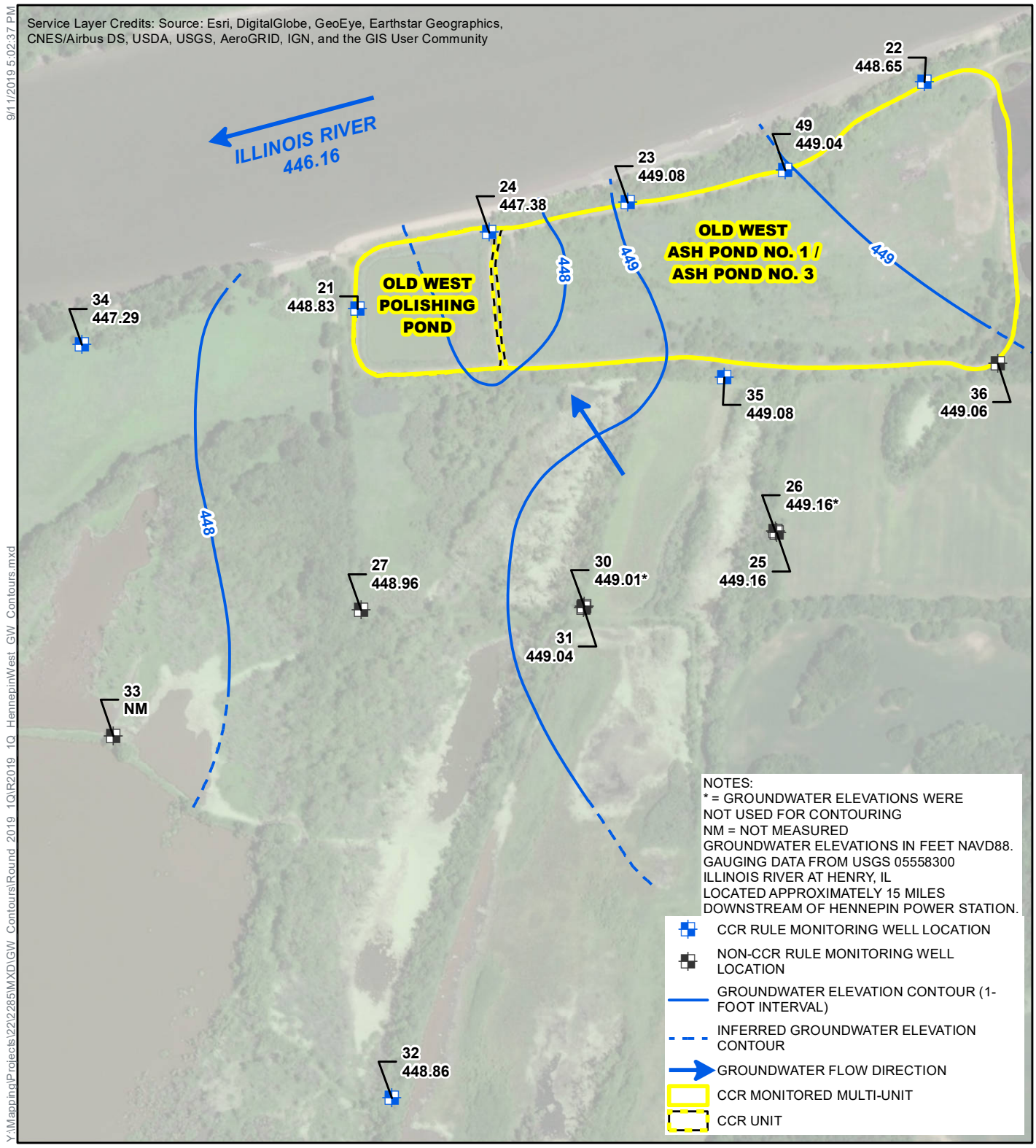
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 12, 2018

CCR RULE GROUNDWATER MONITORING
HENNEPIN POWER STATION
HENNEPIN, ILLINOIS

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



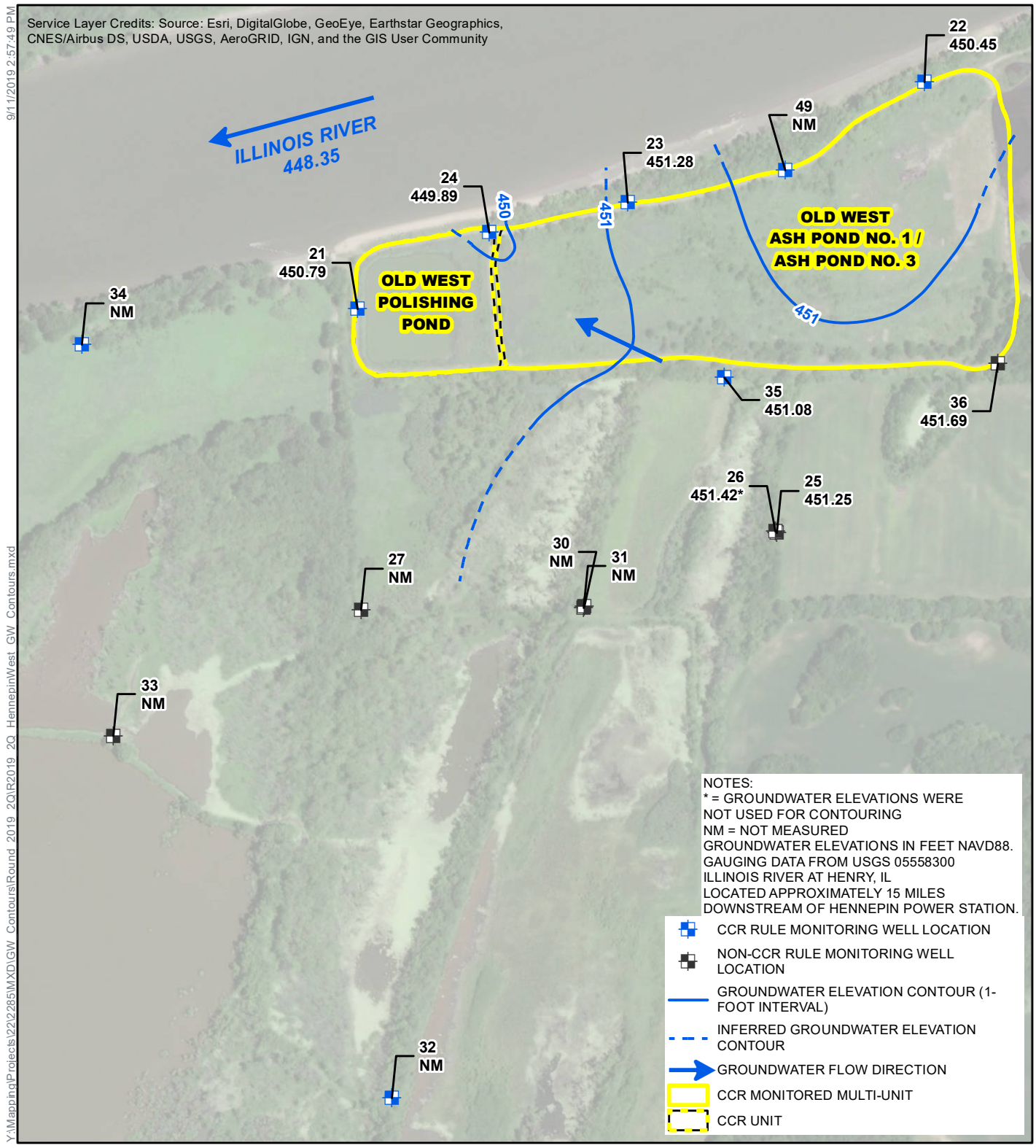
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 13, 2019

CCR RULE GROUNDWATER MONITORING
HENNEPIN POWER STATION
HENNEPIN, ILLINOIS

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



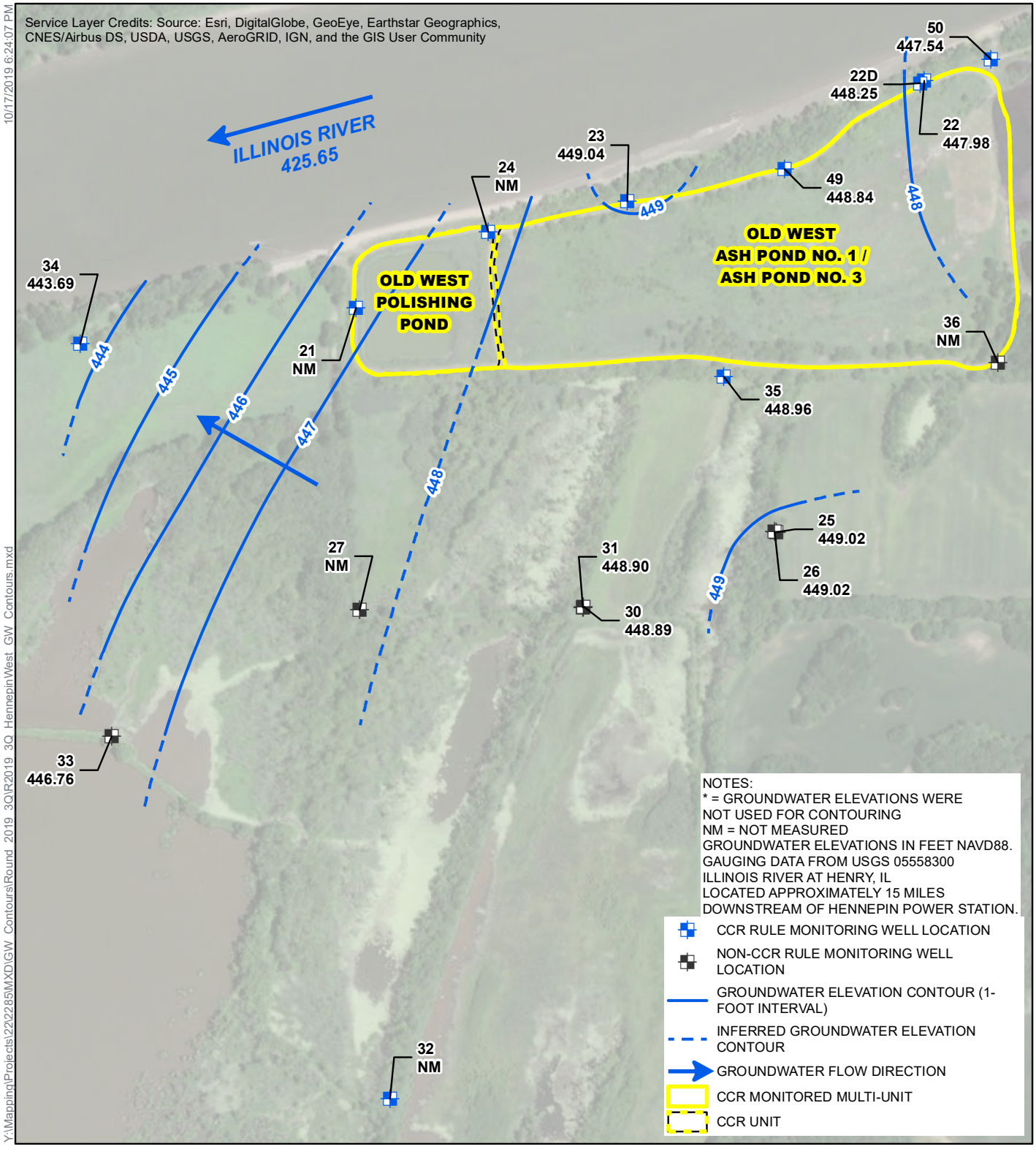
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804) GROUNDWATER ELEVATION CONTOUR MAP JUNE 18, 2019

CCR RULE GROUNDWATER MONITORING
HENNEPIN POWER STATION
HENNEPIN, ILLINOIS

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



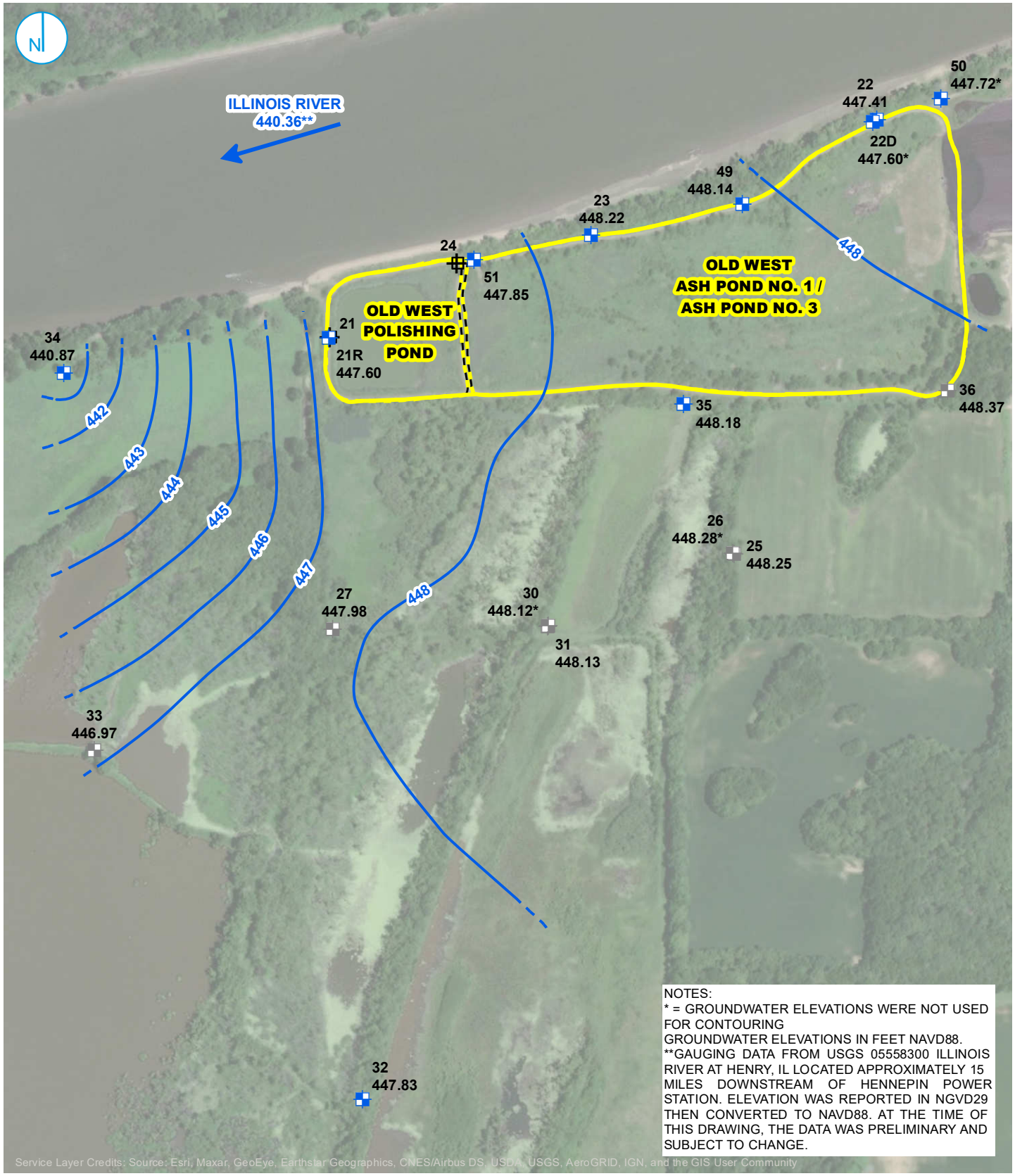
HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 17, 2019

CCR RULE GROUNDWATER MONITORING
HENNEPIN POWER STATION
HENNEPIN, ILLINOIS

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.



Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2020_3Q\R2020_3Q_HennepinWest_GW_Contours.mxd

PROJECT: 169000XXXX | DATED: 12/16/2020 | DESIGNER: MARRAMJ

- CCR RULE MONITORING WELL
- NON-CCR RULE MONITORING WELL
- ABANDONED MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED MULTI-UNIT
- CCR MONITORED UNIT

0 250 500 Feet

GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 2, 2020

HENNEPIN OLD WEST ASH POND (POND NO.1 AND POND NO. 3) AND HENNEPIN OLD WEST POLISHING POND (UNIT ID: 804)
HENNEPIN POWER STATION
HENNEPIN, ILLINOIS

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

BACKGROUND WELL
COMPLIANCE WELL
MONITORING WELL
GROUNDWATER ELEVATION CONTOUR (1 FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
PART 257 REGULATED UNIT (SUBJECT UNIT)
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

NOTES:
1.ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
*ILLINOIS RIVER ELEVATION OBTAINED FROM STAFF GAGE SG02, LOCATED AT THE HENNEPIN POWER PLANT

0 200 400 Feet

POTENTIOMETRIC SURFACE MAP MARCH 17, 2021

PRIVILEGED AND CONFIDENTIAL
PREPARED AT THE REQUEST OF COUNSEL

2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
OLD WEST ASH POND
HENNEPIN POWER PLANT
HENNEPIN, ILLINOIS

DRAFT

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\221285\MXD\GW_Contours\Round_2021\Hennepin\OWAP_804\HEN OWAP GWE Contours D8A4 20210317.mxd

PROJECT: 169000XXXX | DATED: 3/25/2022 | DESIGNER: galammc

- BACKGROUND WELL
- COMPLIANCE WELL
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (1 FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW ARROW
- PART 257 REGULATED UNIT (SUBJECT UNIT)
- LIMITS OF FINAL COVER
- PROPERTY BOUNDARY

NOTES:

1.ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.

2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

0 200 400 Feet

POTENTIOMETRIC SURFACE MAP SEPTEMBER 8, 2021

2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
OLD WEST ASH POND
HENNEPIN POWER PLANT
HENNEPIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\22285\MXD\GW_Contours\Round_2021\Hennepin\OWAP_804\HEN OWAP GWE Contours D9A4D 20210908.mxd

PROJECT: 169000XXXX | DATED: 3/25/2022 | DESIGNER: galammc