Luminant

Dynegy Midwest Generation, LLC
1500 Eastport Plaza Drive
Collinsville, IL 62234

February 8, 2024
Illinois Environmental Protection Agency
DWPC – Permits MC#15
Attn: 35 I.A.C. § 845.650(e) Alternative Source Demonstration Submittal
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: Baldwin Power Plant Bottom Ash Pond; IEPA ID # W1578510001-06

Dear Mr. LeCrone:

In accordance with Title 35 of the Illinois Administrative Code (35 I.A.C.) Section (§) 845.650(e), Dynegy Midwest Generation, LLC (DMG) is submitting this Alternative Source Demonstration (ASD) for exceedances observed from the Quarter 3 2023 sampling event at the Baldwin Power Plant Bottom Ash Pond, identified by Illinois Environmental Protection Agency (IEPA) ID No. W1578510001-06.

This ASD is being submitted within 60 days from the date of determination of an exceedance of a groundwater protection standard (GWPS) for constituents listed in 35 I.A.C. § 845.600. As required by 35 I.A.C. § 845.650 (e)(1), the ASD was placed on the facility's website within 24 hours of submittal to the agency.

One hard copy is provided with this submittal.

Sincerely,

Phil Morris, PE
Senior Director, Environmental

Enclosures
Alternate Source Demonstration, Quarter 2 2023, Bottom Ash Pond Baldwin Power Plant, Baldwin Illinois

Geosyntec consultants

engineers | scientists | innovators

ALTERNATIVE SOURCE DEMONSTRATION

Baldwin Power Plant Bottom Ash Pond
(Unit ID #601)
IEPA ID: W1578510001-06
35 IAC 845.650

Prepared for

Dynegy Midwest Generation, LLC
1500 Eastport Plaza Drive
Collinsville, Ilinois 62234

Prepared by

Geosyntec Consultants, Inc.
500 W Wilson Bridge Road, Suite 250
Worthington, OH 43085

Project Number: GLP8068

February 6, 2024

Geosyntec consultants

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License No.: 062.040562
Expires: 11/30/2025

John Seymour, P.E.
Senior Principal

Project Number: GLP8068

February 6, 2024

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ACRONYMS AND ABBREVIATIONS

ASD	alternative source demonstration
BAP	Bottom Ash Pond
bgs	below ground surface
BPP	Baldwin Power Plant
CCR	coal combustion residuals
cm/s	centimeters per second
DMG	Dynegy Midwest Generation, LLC
EPRI	Electric Power Research Institute
FAPS	Fly Ash Pond System
GWPS	groundwater protection standard
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
NAVD88	North American Vertical Datum of 1988
NPDES	National Pollutant Discharge Elimination System
NRT	Natural Resource Technology, Inc.
SU	standard units
USEPA	United States Environmental Protection Agency

1. INTRODUCTION

Geosyntec Consultants, Inc. has prepared this alternative source demonstration (ASD) on behalf of Dynegy Midwest Generation, LLC (DMG), regarding the Bottom Ash Pond coal combustion residuals (CCR) unit at the Baldwin Power Plant (BPP) near Baldwin, Illinois. The ASD is completed pursuant to the Illinois Administrative Code (IAC) Title 35, Part 845 ("Standards for the Disposal of CCR in Surface Impoundments") and was completed by February 8, 2024, within 60 days of determination of the exceedances (December 10, 2023), as required by 35 I.A.C.§ 845.650(e). This report applies specifically to the CCR Unit referred to as the Bottom Ash Pond (BAP), identification (ID) number (No.) 601, Illinois Environmental Protection Agency (IEPA) ID No. W1578510001-06, and National Inventory of Dams (NID) ID No. IL50721. This ASD was prepared in conformance with guidance provided in the Electric Power Research Institute (EPRI) guidance for development of ASDs at CCR sites (EPRI 2017), guidance provided by the United States Environmental Protection Agency (USEPA; USEPA 1993, USEPA 2012; USEPA 2015; USEPA 2016), and others (Miller 2019).

A pH value of 6.4 standard units (SU) was identified below the site-specific groundwater protection standard (GWPS) of 6.5 SU at downgradient monitoring well PZ-182 following the Third Quarter (Q3) 2023 sampling event (Ramboll 2023a).

Under 35 IAC 845.650(e), the owner or operator of a CCR surface impoundment may submit a demonstration that a source other than the CCR surface impoundment caused the contamination and the CCR surface impoundment did not contribute to the contamination, or that the exceedance of the groundwater protection standard resulted from error in sampling, analysis, or statistical evaluation, natural variation in groundwater quality, or a change in the potentiometric surface and groundwater flow direction.

Pursuant to 35 IAC 845.650(e), this ASD demonstrates that sampling error was the cause of the pH value lower than the GWPS at well PZ-182.

2. BACKGROUND

2.1 Site Location and Description

The BPP is located in Randolph County and St. Clair County in southwest Illinois approximately 0.5 miles west-northwest of the village of Baldwin. The BPP property is bordered by Baldwin Road to the east; the village of Baldwin to the southeast; Illinois Central Gulf railroad tracks, State Road 154, and scattered residences to the south; the Kaskaskia River to the west; and farmland to the north. CCR impoundments present at the BPP include the BAP and the closed Fly Ash Pond System (FAPS), which included the West Fly Ash Pond, East Fly Ash Pond, and Old East Fly Ash Pond.

Non-CCR impoundments present at the BPP include the Secondary Pond, Tertiary Pond, and Baldwin Lake (BPP Cooling Pond). The location of the CCR and non-CCR impoundments are shown in **Attachment 1**. The BAP is immediately north of the FAPS, which is a closed in-place CCR unit approved for closure by the IEPA on August 16, 2016.

2.2 Description of the CCR Unit

The BPP began operation in 1970 and initially burned bituminous coal from Illinois, switching to subbituminous coal in 1999. The BAP is an unlined surface impoundment with a surface area of approximately 177 acres used to store and dispose of sluiced bottom ash from the BPP, some of which is mined for beneficial reuse. The BAP is also used to temporarily store spray dry adsorption waste and to clarify plant process water, including other non-CCR station process wastewaters, which is then discharged in accordance with the station's National Pollutant Discharge Elimination System (NPDES) permit (AECOM 2016; IEPA 2016). The original construction date of the BAP is unknown (AECOM 2016).

2.3 Geology and Hydrogeology

This section provides a summary of the site geology and hydrogeology; additional detail is provided in the Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan (Natural Resource Technology, Inc. [NRT] 2016), the Hydrogeologic Site Characterization Report (Ramboll 2021), and the Hydrogeologic Site Characterization Report Revision 1 (Ramboll 2023b).

Three hydrostratigraphic units are present at the BPP, which include the CCR, an unconsolidated Upper Unit, and a Bedrock Unit.

- CCR: Consists primarily of bottom ash, fly ash, and boiler slag and also includes fill materials comprising predominantly of clays and silts excavated on-site for use in berm and road construction around the impoundment. Up to 28.2 feet of bottom ash has been observed towards the center of the BAP (Ramboll 2023b).
- Upper Unit: Predominantly clay with silt and minor sand, silt layers, and occasional sand lenses, and includes lithologies identified as the Cahokia Formation, Peoria Loess,

Equality Formation, and Vandalia Till. Thin sand seams present at the contact between the Upper Unit and Bedrock Unit have been identified as potential migration pathways (PMPs) due to higher hydraulic conductivities in comparison to those in the surrounding clays (e.g., 10^{-4} centimeters per second [cm/s] in sands compared with 10^{-5} cm/s in clays) (Ramboll 2023b). Continuous sand seams have not been observed in the Upper Unit or immediately adjacent to the BAP. Due to the predominance of clay and only thin and intermittent sand lenses, this unit is not considered a continuous aquifer unit within the site boundary (NRT, 2016; Ramboll, 2021).

- Bedrock Unit: Pennsylvanian and Mississippian-aged interbedded shale and limestone continuously underlies the BPP and is considered the uppermost aquifer at the site. The top of bedrock ranges from 12.5 feet below ground surface (bgs) near the Kaskaskia River to 70 feet bgs underlying the East Fly Ash Pond (part of the FAPS). The Bedrock Unit is the uppermost aquifer.

Groundwater at the site has previously been classified as Class II groundwater in accordance with 35 IAC 620 based on the geometric mean hydraulic conductivity values measured in the monitoring wells screened in both the Upper Unit (3.2×10^{-5} cm/s) and the Bedrock Unit (5.0×10^{-6}) (NRT 2014).

The groundwater monitoring network for the BAP consists of 16 monitoring wells: thirteen downgradient monitoring wells (MW-192, MW-193, MW-356, MW-369, MW-370, MW-382, MW-392, MW-393, MW-394, OW-256, OW-257, PZ-170, and PZ-182) and three background monitoring wells (MW-304, MW-306, and MW-358) (**Attachment 1**). Monitoring wells are screened in both the uppermost aquifer (Bedrock Unit) from approximately 350 to 404 feet North American Vertical Datum of 1988 (NAVD88) and the unconsolidated unit from 388 to 414 feet NAVD88.

The potentiometric groundwater contours and generalized groundwater flow directions at the site during the 2023 Q3 sampling event are shown in **Attachment 2**. Groundwater flow in the UA is toward the northwest in the eastern and central areas of the BAP, and southwest in the east area of the FAPS. Bedrock groundwater flows toward the Secondary and Tertiary Ponds, which were created in a former surface water drainage channel. Groundwater flow directions are generally consistent across seasons.

3. ALTERNATIVE SOURCE DEMONSTRATION

The pH measurement of 6.4 SU, which was taken on August 15, 2023 as part of the Q3 sampling event, was the lowest recorded value and was below the GWPS (6.5 SU) (Ramboll 2023a) (**Attachment 3**). However, the water quality meter (YSI Professional Digital Sampling System [ProDSS]) used during the sampling event has an established accuracy of ± 0.2 SU for pH according to the manufacturer specifications (**Attachment 4**). A pH field measurement of 6.5 SU using the ProDDS would have an accuracy range of 6.3 to 6.7 SU. When accounting for the accuracy of the instrument, the GWPS (6.5 SU) is within the margin of error of the pH recorded during the August event. Therefore, this would not have resulted in an exceedance.

Additionally, the pH value of 6.6 SU recorded on October 31, 2023 for the Q4 sampling event was not below the GWPS (**Figure 1**). The 2023 Q4 result is consistent with previously reported pH values at PZ-182. This supports the conclusion that the low pH value reported during the 2023 Q3 sampling event was due to sampling error and not attributable to the BAP.

4. CONCLUSIONS

It has been demonstrated that the low pH GWPS value at PZ-182 is not caused by a release from the BAP CCR unit and that the unit has not contributed to the low pH value, but instead is due to sampling error. The 2023 Q3 pH value recorded at PZ-182 is equal to that of the GWPS (6.5 SU) when considering the accuracy of the water quality meter used during sampling. Henceforth, for future sampling events the accuracy range of the field instrumentation used for water quality measurements of pH will be taken into account prior to determining if a statistically significant increase of pH has resulted in an exceedance of the GWPS.

This demonstration fulfills the requirement of both 35 IAC 845.650(e) and the technical manual for the Municipal Solid Waste Landfill federal regulatory program (Code of Federal Regulations, Title 40, Section 258) that a statistically significant increase may be due to sampling error.

The information serves as the written ASD prepared in accordance with 35 IAC 845.650(e) demonstrating that the reported pH value at PZ-182 below the GWPS is not due to the BAP CCR unit. Therefore, implementation of corrective measures is not required for pH at the BAP CCR unit.

5. REFERENCES

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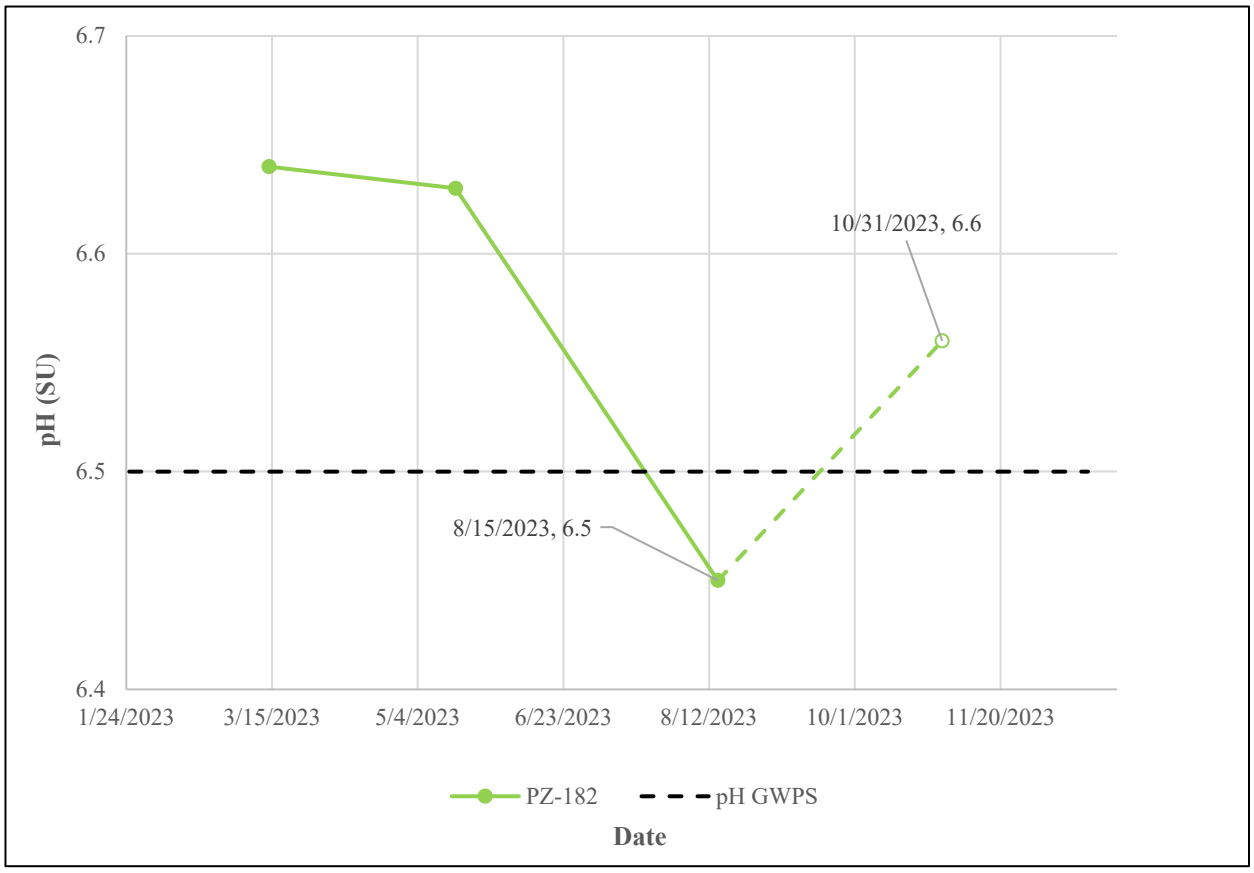
FIGURES



Notes:
1. pH values are shown for monitoring well of concern PZ-182.
2. Sampling events Q3 (8/15/2023) and Q4 (10/31/2023) are noted on the figure. Q4 is represented by a dashed line.

GWPS: groundwater protection standard
SU: standard units

PZ-182 pH Time Series Graph
Baldwin Bottom Ash Pond

Geosyntec consultants

Columbus, Ohio | January 2024

Figure **1**

ATTACHMENT 1
Part 845 Groundwater Monitoring Network

Y:\Mapping\Projects\2212285\MXD\845_Operating_Permit\Baldwin\BAP\2023_Update\GMP\Figure 2-1_BAL BAP Proposed Monitoring Well Network.mxd

PROJECT: 169000XXXX | DATED: 6/20/2023 | DESIGNER: GALARNMC

BACKGROUND WELL
COMPLIANCE WELL
PORE WATER WELL

REGULATED UNIT (SUBJECT UNIT)
FLY ASH POND SYSTEM (CLOSED)
SITE FEATURE
CAPPED AREA
PROPERTY BOUNDARY

0 400 800 Feet

EXPANDED 40 C.F.R. § 257 GROUNDWATER MONITORING SYSTEM

40 C.F.R. § 257 GROUNDWATER MONITORING PLAN REVISION 1

BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

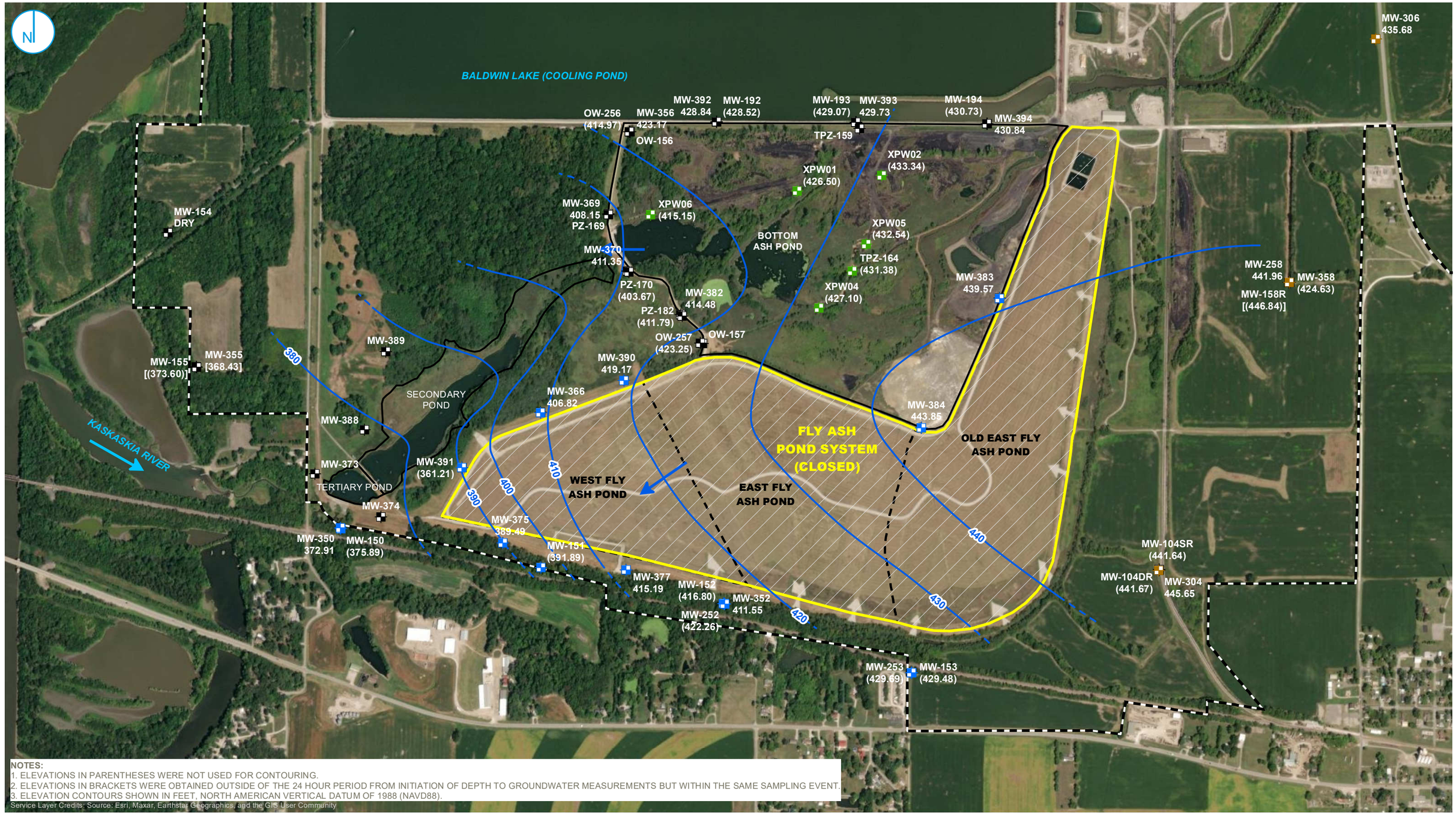
FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

ATTACHMENT 2

Uppermost Aquifer Potentiometric Surface Map – August 2-3, 2023



NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATIONS IN BRACKETS WERE OBTAINED OUTSIDE OF THE 24 HOUR PERIOD FROM INITIATION OF DEPTH TO GROUNDWATER MEASUREMENTS BUT WITHIN THE SAME SAMPLING EVENT.
3. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- PORE WATER WELL
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED
- PROPERTY BOUNDARY

0 400 800 Feet

POTENTIOMETRIC SURFACE MAP
AUGUST 2-3, 2023

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\2202285\MXD\GW_Contours\Round_2023\Baldwin\FAPS_605\BAL 605 FAPS Pot Surface 20230802.mxd

PROJECT: 169000XXXX | DATED: 12/19/2023 | DESIGNER: GALARNMC

ATTACHMENT 3
PZ-182 Groundwater Sampling Field Forms

Site Sampling Event	Baldwin 3Q 2023
LIMS Workorder	23071339-045A
Technician	BG, JC, TAC

Groundwater Sampling Field Form - Groundwater Quality Parameters

Well ID	Date	Time	Time (adj)	DTW	Drawdown	Temp (deg C)	Temp (deg F)	pH (SU)	Sp Cond (µS/cm)	Sp Cond (µmhos/cm @25C)	ODO (mg/L)	Turbidity (NTU)	ORP (mV)	Purge Volume (gal)
PZ-182 (resample)	8/15/2023	12:31	1231	18.99		15.1	59.18	6.45	1763.4	1763.4	0.47	4.41	32.7	
PZ-182 (resample)	8/15/2023	12:34	1234	18.99		15.1	59.18	6.45	1768	1768	0.47	3.87	34.6	
PZ-182 (resample)	8/15/2023	12:37	1237	18.99		15.2	59.36	6.45	1770.3	1770.3	0.47	9.45	26.8	

Site Samping Event: Baldwin- 4Q 2023
LIMS Workorder: 23101244
Technician(s): JC, TC, BG, JR

Groundwater Sampling Field Form- Groundwater Quality Parameters
Baldwin- 4Q 2023

Well ID	Date	Time (adj)	DTW	Temp (deg C)	Temp (deg F)	pH (SU)	Sp Cond (µS/cm)	Sp Cond (µmhos/cm @25C)	ODO (mg/L)	Turbidity (NTU)	ORP (mV)
PZ-182	10/31/2023	1051	19.72	15.4	59.72	6.55	1267.6	1267.6	0.85	24.12	-84.4
PZ-182	10/31/2023	1054	19.72	15.4	59.72	6.55	1266.2	1266.2	0.76	14.25	-78.2
PZ-182	10/31/2023	1057	19.72	15.5	59.9	6.56	1258.8	1258.8	0.7	8.87	-71.2

ATTACHMENT 4
YSI ProDSS Manufacturer Specifications

ProDSS System Specifications (Instrument, Cables & Sensors)

Parameter (units)	Sensor Type	Range	Accuracy	Resolution	Calibration	Maximum Depth
Dissolved Oxygen (% saturation)	Optical Luminescence - Lifetime Method	0 to 500%	0 to 200% (±1% of reading or 1% air saturation, whichever is greater) 200% to 500% (±8% of reading)	0.1% or 1% air saturation (user selectable)	1 or 2 points	100 m
Dissolved Oxygen (mg/L, ppm) *temp comp range -5 to 50°C*	Optical Luminescence - Lifetime Method	0 to 50 mg/L	0 to 20 mg/L (±0.1 mg/L or 1% of reading, whichever is greater) 20 – 50 mg/L (±8% of reading)	0.1 or 0.01 mg/L (user selectable)	1 or 2 points (user selectable)	100 m
Temperature (°C, °F, K)	Thermistor; Combination Sensor with Conductivity	-5 to 70°C (23 to 158°F)	±0.2°C	0.1°C or 0.1°F (user selectable)	None	100 m

Accessed from: Multiparameter Digital Water Quality Meter | ysi.com on January 16, 2023.

Parameter (units)	Sensor Type	Range	Accuracy	Resolution	Calibration	Maximum Depth
Turbidity (FNU, NTU)	Nephelometric - Optical, 90° Scatter	0 to 4000 FNU	0 to 999 (0.3 or ±2% of reading, whichever is greater) 1000 to 4000 (±5% of reading)	0.1 FNU	1, 2, or 3 points (user selectable)	-
Conductivity* (µS, mS)	Four Nickel Electrode Cell	0-100 mS/cm	0 to 100 mS/cm (±0.5% of reading or 0.001 mS/cm, whichever is greater) 100 to 200 mS/cm (±1% of reading)	0.001, 0.01 or 0.1 mS/cm (range dependent)	1 point	100 m
Specific Conductance (µS, mS)	Calculated from Conductivity and Temperature	0 to 200 mS/cm	±0.5% of reading or 0.001 mS/cm, whichever is greater	0.001, 0.01, 0.1 mS/cm	1 point	-
Resistivity (ohm-cm, kohm-cm, Mohm-cm)	Calculated from Conductivity and Temperature	0 to 2 Mohms	±0.1% Full Scale	0.001, 0.01, 0.1 ohms	-	-

Accessed from: Multiparameter Digital Water Quality Meter | ysi.com on January 16, 2023.

Parameter (units)	Sensor Type	Range	Accuracy	Resolution	Calibration	Maximum Depth
Salinity (ppt, PSU)	Calculated from Conductivity and Temperature	0 to 70 ppt	±1.0% of reading or ±0.1 ppt, whichever is greater	0.01 ppt	1 point	-
Water Density (Sigma, Sigma T)	Sigma is Calculated from Salinity, Temperature, and Pressure Sigma T is Calculated from Salinity and Temperature	0.0 to 50.0 sigma, sigma T	-	0.1 sigma or sigma T	-	-
pH (mV, pH units)	Glass Bulb Combination Electrode; Ag/AgCl Reference Gel	0 to 14 units	±0.2 units	0.01 units	1, 2, or 3 points (user selectable)	100 m
ORP (mV)	Platinum Button; Ag/AgCl Reference	--1999 to +1999 mV	±20 mV	0.1 mV	1 point	100 m

Accessed from: Multiparameter Digital Water Quality Meter | ysi.com on January 16, 2023.

Parameter (units)	Sensor Type	Range	Accuracy	Resolution	Calibration	Maximum Depth
Ammonium** (NH_4-N mg/L, NH_4-N mV) *ammonia with pH sensor*	Ion Selective Electrode	0 to 200 mg/L NH_4-N	±10% of reading or 2 mg/L, whichever is greater	0.01 mg/L	1, 2, or 3 point (user selectable)	20 m
Ammonia*** (NH_3-N mg/L)	Calculated from Ammonium, Temperature, Salinity and pH	0 to 200 mg/L NH_4-N	-	0.01 mg/L	-	-
Nitrate** (NO_3-N mg/L, NO_3-N mV)	Ion Selective Electrode	0 to 200 mg/L NO_3-N	±10% of reading or 2 mg/L, whichever is greater	0.01 mg/L	1, 2, or 3 point (user selectable)	20 m
Chloride**	Ion Selective Electrode	0 to 1000 mg/L Cl	±15% of reading or 5 mg/L, whichever is greater	0.01 mg/L	1, 2, or 3 point (user selectable)	20 m
Total Dissolved Solids (TDS) (mg/L, kg/L, g/L)	Calculated from Conductivity	0 to 100 g/L	User-Selectable TDS Multiplier	0.001, 0.01, 0.1g/L	-	-

Accessed from: Multiparameter Digital Water Quality Meter | ysi.com on January 16, 2023.

Parameter (units)	Sensor Type	Range	Accuracy	Resolution	Calibration	Maximum Depth
	and Temperature		(0.30 to 1.00; 0.65 default)			
Total Suspended Solids (TSS) (mg/L)	Correlated from Turbidity Field Measurements and Lab TSS Measurements from Grab Samples	0 to 30000 mg/L	Calculated from Turbidity and User-Entered Correlation Points	0.01, 0.1 mg/L	-	-
Chlorophyll (RFU or µg/L chl)	Optical Luminescence	0 to 100 RFU or 0 to 400 µg/L chl	Linearity: r2 ≥ 0.999 for Rhodamine WT across full range	0.01 RFU or 0.01 µg/L chl	2 point	-
Phycocyanin (RFU or µg/L PC)	Optical Luminescence	0 to 100 RFU or 0 to 100 µg/L PC	Linearity: r2 ≥ 0.999 for Rhodamine WT across full range	0.01 RFU or 0.01 µg/L PC	2 point	-
Phycoerythrin (RFU or µg/L PE)	Optical Luminescence	0 to 100 RFU or 0	Linearity: r2 ≥ 0.999 for	0.01 RFU or 0.01 µg/L PE	2 point	-

Accessed from: Multiparameter Digital Water Quality Meter | ysi.com on January 16, 2023.

Parameter (units)	Sensor Type	Range	Accuracy	Resolution	Calibration	Maximum Depth
		to 280 µg/L PE	Rhodamine WT across full range			
Depth (m, ft)	Pressure Transducer	0 to 100 m (0 to 328 ft)	±0.004 m (±0.013 ft) for 1, 4 and 10-m cables ±0.04 m (±0.13 ft) for cables 20-m and longer	0.001 m or 0.01 ft	1 point	-
Barometer (mmHg, inHg, mbar, psi, kPa, ATM)	Piezoresistive	375 to 825 mmHg	±1.5 mmHg from 0 to 50°C	0.1 mmHg	1 point	-

* Derived parameters can include resistivity, salinity, specific conductance, and total dissolved solids
**ISE sensors for freshwater only; 20-meter maximum depth
*** Ammonia calculated from ammonium, temp, salinity, and pH

Accessed from: Multiparameter Digital Water Quality Meter | ysi.com on January 16, 2023.