Electric Energy, Inc.
1500 Eastport Plaza Drive
Collinsville, IL 62234

October 21, 2023
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: Joppa Power Plant East Ash Pond; IEPA ID # W1270100004-02

Dear Mr. LeCrone:

In accordance with Title 35 of the Illinois Administrative Code (35 I.A.C.) Section (§) 845.650(e), Electric Energy, Inc. (EEI) is submitting this Alternative Source Demonstration (ASD) for exceedances observed from the Quarter 2 2023 sampling event at the Joppa Power Plant East Ash Pond, identified by Illinois Environmental Protection Agency (IEPA) ID No. W1270100004-02.

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,

Dianna Tickner

Dianna Tickner
Sr. Director – Decommission and Demolition

Enclosures
Alternate Source Demonstration, Quarter 2 2023, East Ash Pond Joppa Power Plant, Joppa Illinois

Intended for
Electric Energy, Inc.

Date
October 21, 2023

Project No.
1940103649-011

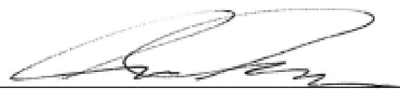
35 I.A.C. § 845.650(e): ALTERNATIVE SOURCE DEMONSTRATION

EAST ASH POND
JOPPA POWER PLANT
JOPPA, ILLINOIS
IEPA ID: W1270100004-02

Bright ideas. Sustainable change.

CERTIFICATIONS

I, Anne Frances Ackerman, 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.



Anne Frances Ackerman
Qualified Professional Engineer
062-060586
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: October 21, 2023

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
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Ramboll Americas Engineering Solutions, Inc.
Date: October 21, 2023

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ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
ASD	Alternative Source Demonstration
CCR	coal combustion residuals
E001	Event 1
EAP	East Ash Pond
Geosyntec	Geosyntec Consultants
GWPS	groundwater protection standard
JPP	Joppa Power Plant
LAU	Lower aquifer unit
LCU	lower confining unit
LOE(s)	Line(s) of evidence
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NRT/OBG	Natural Resource Technology, an OBG Company
NTU	nephelometric turbidity units
OBG	O'Brien and Gere Engineers, Inc.
ORP	oxidation reduction potential
PCA	principal component analysis
PMP	potential migration pathway
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SI	surface impoundment
UA	uppermost aquifer
UCU	upper confining unit
WAP	West Ash Pond

1. INTRODUCTION

Under Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.650(e), 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, an owner or operator of a coal combustion residuals (CCR) surface impoundment (SI) may complete a written demonstration that a source other than the CCR SI caused the contamination and the CCR SI did not contribute to the contamination, or that the exceedance of the GWPS resulted from error in sampling, analysis, statistical evaluation, natural variation in groundwater quality, or a change in the potentiometric surface and groundwater flow direction (Alternative Source Demonstration [ASD]).

This ASD has been prepared on behalf of Electric Energy Inc. by Ramboll Americas Engineering Solutions, Inc (Ramboll), to provide pertinent information pursuant to 35 I.A.C. § 845.650(e) for the Joppa Power Plant (JPP) East Ash Pond (EAP) (*i.e.,* Site) located near Joppa, Illinois.

The most recent quarterly sampling event (Event 1 [E001]) was completed on May 3, 2023, and analytical data were received on June 23, 2023. In accordance with 35 I.A.C. § 845.610(b)(3)(C), comparison of statistically derived values with the GWPSs described in 35 I.A.C. § 845.600 to determine exceedances of the GWPS was completed by August 22, 2023, within 60 days of receipt of the analytical data (Ramboll, 2023). The statistical comparison identified the following GWPS exceedances at compliance groundwater monitoring wells:

- Boron at wells G06, G07, G08, G09, G10
- Cobalt at well G05
- pH at wells G11 and G51D

Pursuant to 35 I.A.C. § 845.650(e), the lines of evidence (LOE) presented in **Section 3** and **Section 4** demonstrate that sources other than the EAP are the cause of the cobalt and pH GWPS exceedances (respectively) listed above. Cobalt is believed to be naturally occurring and pH is associated with iron oxidation. This ASD was completed by October 21, 2023, within 60 days of determination of the exceedances (August 22, 2023), as required by 35 I.A.C. § 845.650(e).

Boron GWPS exceedances at the EAP will be addressed in accordance with 35 I.A.C. § 845.660.

2. BACKGROUND

2.1 Site Location and Description

The JPP is west of the Village of Joppa in Massac County, Illinois, northeast of the Ohio River in Section 14, Township 15 South, Range 3 East. The JPP property is bordered by LaFarge North America cement plant to the west, Trunkline Gas Company-Joppa Compressor Station to the north and west, the Village of Joppa to the east, and the Ohio River to the south. The EAP is located in the west half of Section 14 directly north of the JPP and is bounded immediately to the east by the railway right-of-way, which is adjacent to forested portions of residential property in the Village of Joppa.

2.2 Description of East Ash Pond CCR Unit

The JPP operated the EAP for management of CCR waste streams between 1973 and 2022. Another inactive SI, referred to as the West Ash Pond (WAP), is present in the western portion of the JPP property, and a permit exempt landfill is present in the northwestern portion of the JPP property. The landfill and the WAP are not the subject of this ASD but are relevant to the discussion of the LOEs presented below.

The EAP is an unlined CCR SI which was used to manage both fly ash and bottom ash. The EAP perimeter embankment height varies from approximately 15 to 45 feet above the outboard toe of slope and the crest is at an approximate elevation of 380 feet North American Vertical Datum of 1988 (NAVD88) (O'Brien and Gere Engineers, Inc. [OBG], 2010).

2.3 Geology and Hydrogeology

The information used to describe the hydrogeology is based on the local geology obtained from published sources, hydrogeologic investigation data, and boring data collected during site investigations conducted from 1997 to 2022 (Natural Resource Technology, an OBG Company [NRT/OBG], 2017; Ramboll, 2021a; Geosyntec, 2023).

Quaternary deposits in the Joppa area consist mainly of diamictons and lacustrine/alluvial deposits that were deposited during Illinoian and Pre-Illinoian glaciations (Lineback, 1979; Willman et al., 1975). The unconsolidated deposits include the following units (beginning at the ground surface):

- **Upper Confining Unit (UCU):** The uppermost hydrostratigraphic unit is comprised of the Equality Formation, the Silt Unit, and Metropolis Formation deposits. The average thickness of this unit is approximately 40 feet with a range of 8 to 58 feet. The UCU underlies the CCR fill in all locations and is thinnest in the southeast portion of the unit. These deposits are predominantly fine-grained, comprised of clay, silt, and silty clay with limited intervals of sandy material. This hydrostratigraphic unit was encountered at all locations and extends down to the McNairy Formation.
- **Uppermost Aquifer (UA):** The UA consists of the McNairy Formation and Mounds Gravel which are composed of highly permeable sands and gravels with isolated lenses of finer grained material. The Mounds Gravel has been interpreted as a braided river deposit, located within eroded portions of the McNairy Formation (Nelson and Masters, 2008). The McNairy formation, underlying the Mounds Gravel, at the site is mostly composed of medium to fine grained sand with mica and lenses of silt and clay. At the EAP, this unit has been further divided into the Upper McNairy Formation consisting of relatively thick fine to medium grained

sand with some gravel while the Lower McNairy exhibits more variability including lenses and zones with higher silt and clay content.

A northwest to southeast trending stratigraphic high in the UA is present through the center of the EAP and bifurcates near the eastern extent of the unit. This stratigraphic high (elevations higher than 305 ft) is illustrated on **Figure 1** where the UA is bounded by the UCU which is shaded purple where elevations extend below 305 feet. Wells screened within the UA along the southern fork of the stratigraphic high (G07, G08, G12S/D, G13S/D) generally encountered thicker gravel layers at higher elevations and reported higher hydraulic conductivities (Ramboll, 2021a; Geosyntec, 2023). The thicker gravels at higher elevations also extend east and southeast of the EAP (G12S/D, G13S/D, G16S/D) and connect to the Ohio River as illustrated in **Figure 1**. The UA was encountered at a thickness of up to 58 feet thick, with elevations ranging from 215 to 316.6 feet, and is underlain by the lower confining unit (LCU).

- **Lower Confining Unit (LCU):** Clay, silt, or chert gravel residuum in on-Site wells (Nelson, 1997) has been interpreted and characterized as part of the Lower McNairy Formation, Post Creek (Tuscaloosa) Formation, or weathered limestone residuum. This material has been encountered in all borings advanced to bedrock. Based on material descriptions (high clay and/or silt content, and partial cementation), continuous lateral extent, and vertical gradients observed between the UA and the lower aquifer unit (LAU), this unit is identified as the LCU.
- **Lower Aquifer Unit (LAU):** The LAU, composed of the Salem Limestone bedrock, is the lowermost hydrostratigraphic unit identified and is considered a potential migration pathway (PMP). The limestone bedrock is encountered at an elevation of approximately 200 feet NAVD88 below the EAP, slopes towards a syncline to the east (Nelson and Masters, 2008), and has a reported thickness of 200 to 500 feet. The Salem Limestone is used to supply water for various uses in the region and provides non-potable water for the JPP and potable water for the Village of Joppa.

Groundwater elevations in the UA (referenced to NAVD88) across the EAP ranged from approximately 312 to 322 feet during E001 (**Figure 2**). Historically they have ranged from approximately 305 feet near the Ohio River to 330 feet near the northern property boundary. Depth to groundwater measurements used to generate the groundwater elevation contours shown on **Figure 2** were collected on May 1, 2023. Groundwater elevations vary seasonally and may fluctuate by about 10 feet within a well.

Groundwater flow directions are largely a result of the aquifer geology described above. The shallow highly permeable gravels present a path of least resistance (preferential flow pathway) for groundwater migrating toward the Ohio River which is the receiving body of water in the region (**Figure 1**). Wells located to the north of the UA stratigraphic high, such as G05, were terminated shortly after penetrating the UA and did not encounter significant gravel layers indicating gravel may be at a lower elevation or not present, and flow through this area may not be as significant. Interpreted groundwater flow directions are illustrated on **Figure 1** with flow to the southeast, generally parallel to the UA stratigraphic high across the EAP, and then south toward the Ohio River.

2.4 Groundwater and EAP Monitoring

The monitoring system for the EAP is shown on **Figure 2** and consists of two background monitoring wells (G01D and G02D) and 12 compliance monitoring wells (G03, G05, G06, G07, G08, G09, G10 G11, G51D, G52D, G53D, and G54D) screened within the UA. The monitoring system also includes two temporary water level only surface water staff gage (XSG01 and SG02) to monitor potential impacts from the EAP (Ramboll, 2021b). Porewater samples are collected from locations XPW01 and XPW02 on the northern side of the EAP, and from XPW03 on the southern side of the EAP (**Figure 2**). To further delineate potential boron exceedances, 10 monitoring wells were installed in September 2021 (nests G12 through G16) and 21 wells (10 off-Site) were installed between May 2022 and September 2023 (nests G17 through G24, and G13; Geosyntec Consultants [Geosyntec], 2023).

3. ALTERNATIVE SOURCE DEMONSTRATION: LINES OF EVIDENCE FOR COBALT

As allowed by 35 I.A.C. § 845.650(e), this ASD demonstrates that sources other than the EAP (the CCR unit) caused the cobalt exceedance at G05. LOEs supporting the ASD for the pH exceedances at G11 and G51D are presented in **Section 4**. This section presents the LOEs supporting the ASD for cobalt at G05, which include the following:

1. Cobalt concentrations at G05 are consistent with cobalt mobilization from native soils due to reductive dissolution of manganese oxides.
2. Cobalt concentrations at G05 are greater than source concentrations.
3. Cobalt concentrations at G05 are not correlated with concentrations of CCR indicator parameters.

3.1 LOE #1: Cobalt Concentrations at G05 are Consistent with Cobalt Mobilization from Native Soils Due to Reductive Dissolution of Manganese Oxides

Cobalt and manganese are often closely associated with each other in soils due to their similar chemical properties (Uren, 2013). Under oxidizing conditions, manganese is present in the solid phase as manganese oxides. Cobalt sorbs strongly to manganese oxides and is thus often associated with manganese in the solid phase. When solid-phase manganese oxides in soils are dissolved by reduction of manganese to a more soluble species (a process called reductive dissolution), the cobalt previously sorbed to the manganese oxide surface is also released. If cobalt concentrations in groundwater are primarily controlled by the reductive dissolution of manganese oxides, cobalt and manganese concentrations in both soils and groundwater will be correlated with one another. This LOE demonstrates that cobalt concentrations at G05 are consistent with reductive dissolution of manganese, and the cobalt exceedance at G05 is therefore likely due to natural variation in groundwater quality. Solid phase data were used to determine if cobalt and manganese are associated in the solid phase. Groundwater redox potential and pH were assessed to determine if reductive dissolution of manganese oxides is thermodynamically favorable under observed groundwater conditions. To inform further analysis of groundwater data, wells with a geochemical signature similar to G05 were identified using principal component analysis (PCA). The relationship between cobalt and manganese in similar groundwater was then evaluated using regression analysis.

Figure A on the following page shows the relationship between total cobalt and total manganese in soil samples from the UA at five soil boring locations (data tabulated in **Appendix A**). The strong correlation between cobalt and manganese in these data (R^2 of 0.99) indicates that they are likely physically associated in soils, consistent with literature data (Uren, 2013). It is possible that cobalt released from CCR porewater could become associated with naturally occurring manganese oxides in the downgradient environment and accumulate in the soils; however, this is not likely at the site based on the following observations: 1) Cobalt is not present in CCR porewater (described further in **Section 3.2**), indicating that the EAP could not be a source of cobalt to the downgradient solid phase; 2) The ratio of cobalt to manganese is consistent across five different samples, some of which are from areas of the site with no known influence from

CCR porewater (*i.e.*, have had no reported exceedances). Therefore, the cobalt present in the UA soil is likely naturally occurring.

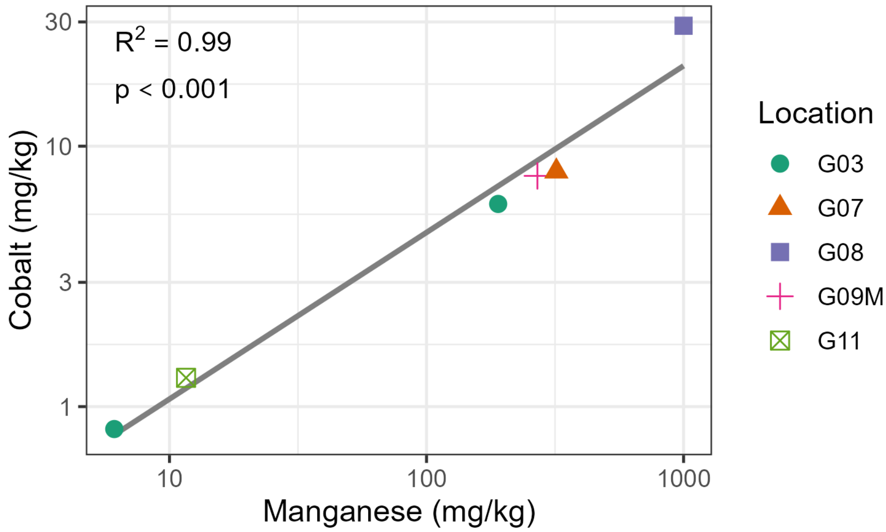

Figure A. Scatter Plot and Linear Regression Results of Cobalt and Manganese in UA Solids

mg/kg = milligrams per kilogram

The thermodynamic favorability of manganese oxide reductive dissolution depends on the oxidation reduction potential (ORP) and pH of the groundwater. The pH and ORP of the groundwater samples collected from the EAP monitoring network all indicate that manganese is expected to exist in the reduced Mn^{2+} form in groundwater (**see Appendix B**), supporting the conclusion that reductive dissolution of manganese oxides can occur in the groundwater.

To determine if cobalt and manganese are correlated in groundwater, locations with a similar groundwater signature to G05 were identified for appropriate inclusion in the correlation analysis. PCA, a multivariate statistical approach, was used to evaluate how the groundwater composition at G05 related to the groundwater composition of EAP porewater, background groundwater, and downgradient groundwater north versus south of the UA stratigraphic high (**Section 2.3**). Details about the PCA analysis are included in **Appendix B**. The PCA results indicate that the geochemical signatures of the UA wells located on either side of the northwest to southeast trending stratigraphic high in the UA that extends through the EAP are largely distinct from one another, with wells to the north of the stratigraphic high being more similar to background. This difference may be related to the differences in stratigraphic conditions, with wells to the north of the stratigraphic high having less gravel beds, while the wells to the south of the stratigraphic high have shallow highly permeable gravels which create a preferential flow pathway to the south. Groundwater from well G05 is most like other northeast wells, suggesting similar geochemical influences.

Figure B on the following page shows the relationship between total cobalt and total manganese in wells to the north of the stratigraphic high (data tabulated in **Appendix C**). To avoid potential confounding effects due to the presence of suspended solids in the groundwater sample, only samples with a turbidity less than 50 nephelometric turbidity units (NTU) were used in the correlation analysis. The strong (R^2 of 0.77) statistically significant ($p < 0.001$) correlation between total cobalt and total manganese in the groundwater suggests similar controls on concentrations.

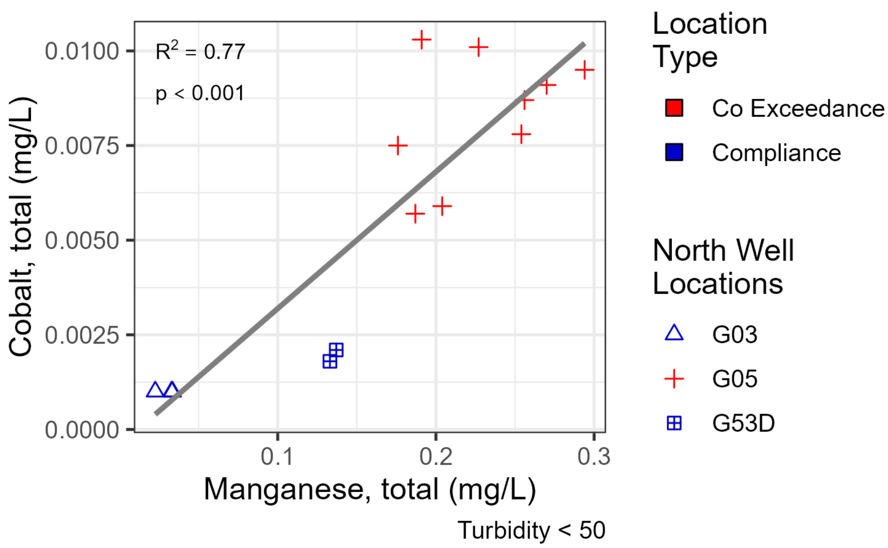

Figure B. Scatter Plot and Linear Regression Results of Total Cobalt and Total Manganese in Groundwater

The strong association between cobalt and manganese in both the soil and groundwater, in addition to groundwater conditions in the area of G05 favoring manganese reduction, supports the conclusion that reductive dissolution of manganese oxides in native soil is occurring and is strongly influencing the cobalt concentrations in the groundwater rather than the EAP.

3.2 LOE #2: Cobalt Concentrations at G05 are Greater Than Source Concentrations

Table A on the following page provides the range of cobalt concentrations detection in G05 between March 2021 and May 2023. Porewater samples collected from XPW01, XPW02 and XPW03 between March 2021 and May 2023 did not have cobalt concentrations above the reporting limit. A summary of the laboratory data is included in **Appendix C**.

Table A. Cobalt Concentration Ranges in G05 and EAP Porewater (March 2021 to May 2023).

Sample Location	Cobalt (mg/L)			
	Samples	Non-Detects	Minimum	Maximum
Composite Porewater[1]	24	24	<0.0001	<0.001
G05	11	0	0.0057	0.0103

[1] Composite Porewater includes summary statistics of data collected at EAP porewater locations XPW01, XPW02, and XPW03
mg/L = milligrams per liter

The following observations can be made from **Table A**:

- The concentration of cobalt in compliance monitoring well G05 ranged from 0.0057 mg/L to 0.0103 mg/L.
- Cobalt was not detected in EAP porewater, with reporting limits ranging from 0.0001 mg/L to 0.001 mg/L.
- The minimum cobalt concentration observed at G05 is five times the highest reporting limit for cobalt in porewater.

If the EAP were the source of cobalt in downgradient groundwater, EAP porewater concentrations of cobalt would be expected to be higher than the groundwater concentrations. Cobalt was not detected above the reporting limit in any porewater samples, indicating that cobalt concentrations are not related to the EAP.

3.3 LOE #3: Cobalt Concentrations at G05 Are Not Correlated with Concentrations of CCR Indicator Parameters

Boron is commonly used as an indicator parameter for contaminant transport of CCR because: (i) it is commonly present at elevated concentrations in coal ash leachate; (ii) it is mobile and typically not very reactive but conservative (*i.e.*, low rates of sorption or degradation) in groundwater; and (iii) it is less likely than other constituents to be present at elevated concentrations in background groundwater from natural or other anthropogenic sources. Porewater in the EAP is elevated in both boron and sulfate (**Appendix C**), indicating that these parameters are Site-specific key indicators for CCR. If an exceedance is identified for a monitored CCR 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 GWPS exceedance.

A scatter plot of cobalt versus boron and sulfate concentrations for G05 between March 2021 and May 2023 is presented in **Figure C** on the following page and laboratory data is included in **Appendix C.** The p-value of a Kendall correlation test for non-parametric data are also included on **Figure C**. Typically, a p-value greater than 0.05 is considered to be a statistically insignificant relationship.

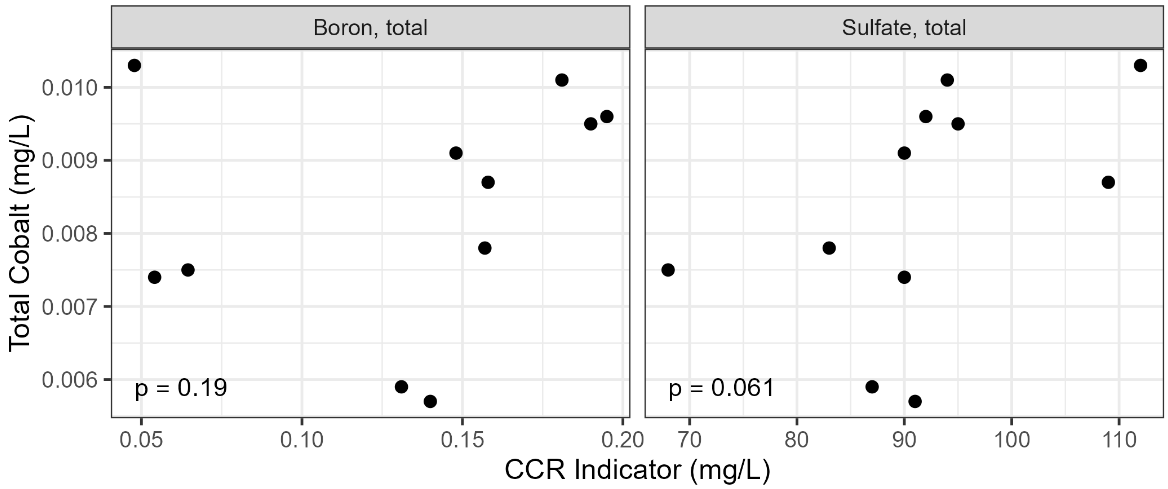

Figure C. Scatter Plot of Cobalt Versus Boron and Sulfate Concentrations at Monitoring Well G05

Calculated p-values greater than 0.05 indicate that cobalt is not correlated with boron and sulfate at monitoring well G05. A lack of correlation between cobalt and CCR indicators in the compliance monitoring well indicates the EAP is not the source of the cobalt exceedance.

4. ALTERNATIVE SOURCE DEMONSTRATION: LINES OF EVIDENCE FOR pH

As allowed by 35 I.A.C. § 845.650(e), this ASD demonstrates that sources other than the EAP (the CCR unit) caused the pH exceedances at G11 and G51D. This section presents the LOEs supporting the ASD for pH at G11 and G51D, which include the following:

1. G11 and G51D are upgradient of the EAP.
2. Groundwater chemistry at G11 and G51D is aligned with the groundwater signature observed west of the monitoring wells.
3. pH exceedances at G11 and G51D are consistent with iron oxidation.

These LOEs are summarized below and described in greater detail in **Appendix D**.

4.1 LOE #1: G11 and G51D are Upgradient of the EAP

As described in **Section 2.3** dominant UA groundwater flow direction at the EAP is to the southeast, generally parallel to the UA stratigraphic high across the EAP, and then south toward the Ohio River (**Figure 1**). Wells G11 and G51D are located on the western edge of the EAP and are upgradient of the EAP. Therefore, it is unlikely that porewater from the EAP would flow in the direction of G11 and G51D. Because the wells with pH exceedances are upgradient of the unit, it is unlikely that the EAP is the source of the exceedances.

4.2 LOE #2: Groundwater Chemistry at G11 and G51D is Aligned with the Groundwater Signature Observed West of the Monitoring Wells

Groundwater from exceedance wells G11 and G51D exhibit a high degree of similarity with groundwater from upgradient UA wells west of G11 and G51D (western groundwater) as opposed to eastern groundwater or CCR porewaters from other compliance wells in the EAP monitoring network (eastern groundwater). PCA (**Appendix D**) was used to compare the geochemical compositions of the western groundwater, CCR porewaters, and pH exceedance wells G11 and G51D. The PCA found that:

- Exceedance wells G51D and G11 exhibit a high degree of similarity with the western (*i.e.*, upgradient) wells screened in the UA.
- The CCR porewaters are distinctly separate from the groundwater samples.

The similarity of the groundwater composition at G11 and G51D to upgradient western groundwater, as opposed to eastern groundwater or CCR porewater, suggests that the EAP does not influence the groundwater at G11 and G51D and therefore is not the source of the pH exceedances.

4.3 LOE #3: pH Exceedances at G11 and G51D are Consistent with Iron Oxidation

The PCA analysis (**Appendix D**) suggests chemical evolution and/or communication within the western groundwater. The western UCU groundwater composition is dominated by the redox-sensitive parameters manganese, iron, and sulfate. The UA groundwater composition is spread between a composition similar to the UCU and a composition similar to background. Groundwater composition at wells G11 and G51D is very similar to (*i.e.*, plots close to on the PCA diagram) the background wells, all of which are dominated by alkalinity, chloride, fluoride and sodium.

Redox conditions were evaluated along the flow path from upgradient (further northwest) to downgradient (further southeast) groundwater wells. A distinct redox transition was identified, shifting from more reducing conditions in upgradient waters to more oxidizing conditions in downgradient wells, including the exceedance wells. The reducing upgradient waters are characterized by lower ORP and higher iron concentrations, while downgradient waters are largely the opposite with higher ORP and lower iron concentrations.

This change in redox condition is the likely source of acidity in G11 and G51D. It is likely that dissolved iron present in reducing environments moves downgradient with groundwater and subsequently oxidizes. The oxidation of dissolved iron to iron oxides is known to produce acidity. In this way, reduced upgradient waters from the northwest provides the constituent (*i.e.*, reduced iron) necessary to cause a drop in pH (*i.e.*, through iron oxidation) in G11 and G51D, once transported into an area with sufficient dissolved oxygen to drive the precipitation reaction. The oxidized environment in wells G11 and G51D likely results from mixing with the upgradient oxidized background groundwater. Therefore, mixing of groundwater resulting in natural variability in the groundwater conditions is the likely driver of the pH exceedances at G11 and G51D.

5. CONCLUSIONS

Based on the LOEs presented below and described in **Section 3**, it has been demonstrated that sources other than the EAP (the CCR unit) caused the cobalt exceedance at G05.

1. Cobalt concentrations at G05 are consistent with cobalt mobilization from native soils due to reductive dissolution of manganese oxides.
2. Cobalt concentrations at G05 are greater than source concentrations.
3. Cobalt concentrations at G05 are not correlated with concentrations of CCR indicator parameters.

Furthermore, based on the LOEs presented below and described in **Section 4**, it has been demonstrated that sources other than the EAP caused the pH exceedances at G11 and G51D.

1. G11 and G51D are upgradient of the EAP.
2. Groundwater chemistry at G11 and G51D is aligned with the groundwater signature observed west of the monitoring wells.
3. pH exceedances at G11 and G51D are consistent with iron oxidation.

Pursuant to 35 I.A.C. § 845.650(e), the LOEs presented in **Section 3** and **Section 4** demonstrate that sources other than the EAP were the cause of the cobalt and pH GWPS exceedances (respectively) listed above. Boron GWPS exceedances at the EAP will be addressed in accordance with 35 I.A.C. § 845.660.

6. REFERENCES

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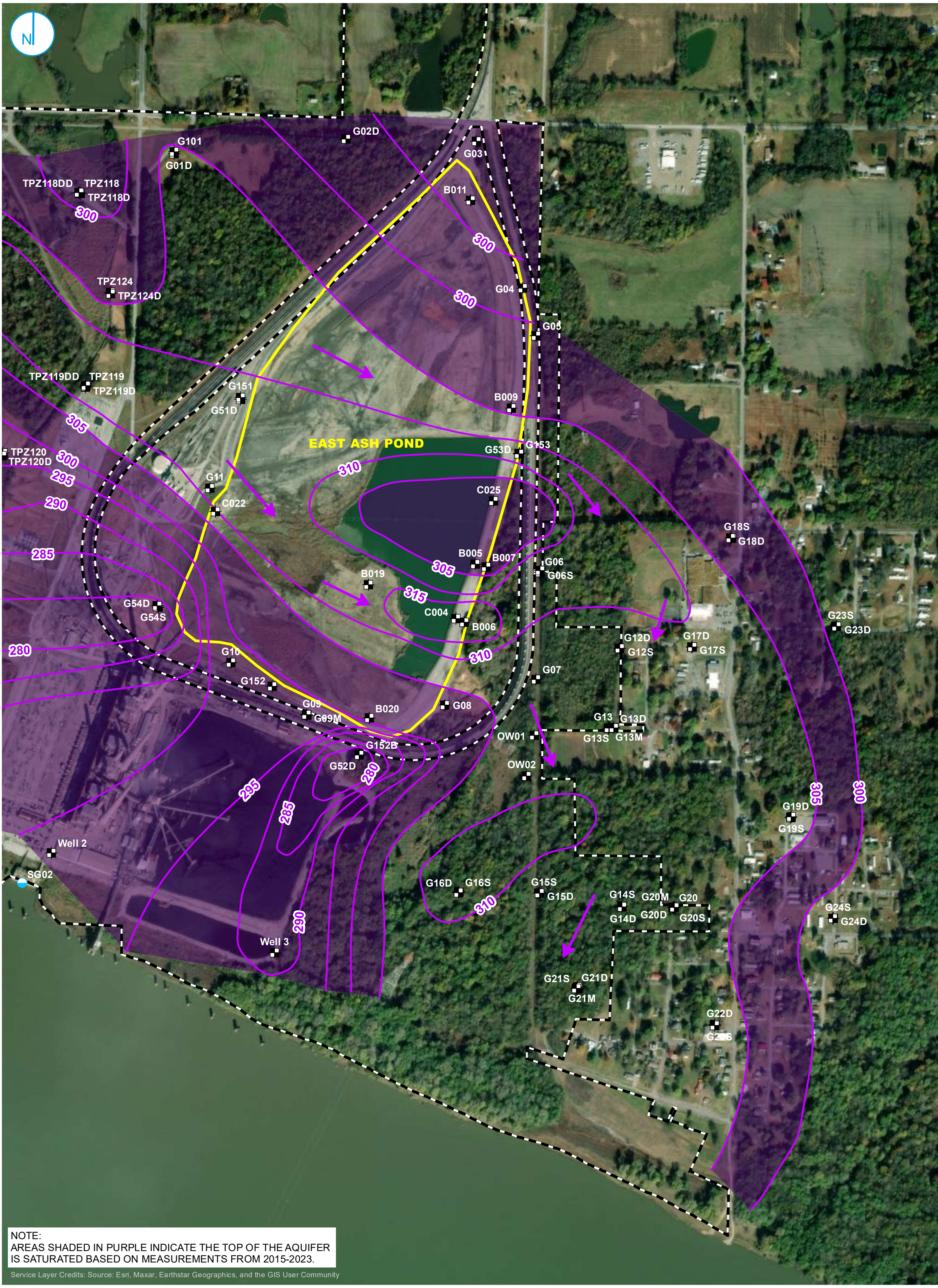
FIGURES



MONITORING WELL
STAFF GAGE, RIVER
TOP OF MCNAIRY FORMATION ELEVATION (5-FT CONTOUR INTERVAL)
FLOW DIRECTION
AREA WHERE TOP OF AQUIFER IS SATURATED BASED ON MEASUREMENTS FROM 2015-2023
REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

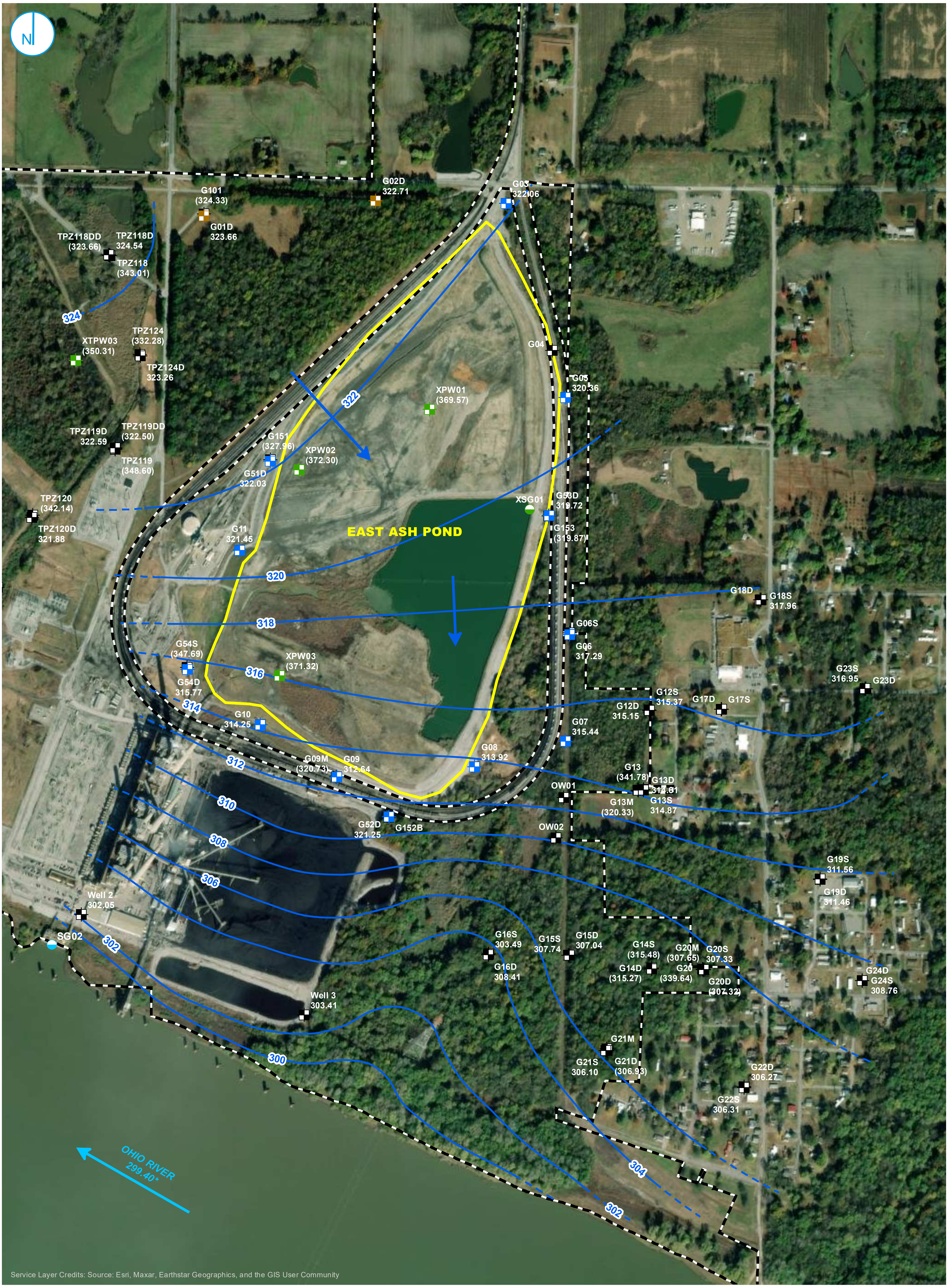
0 300 600 Feet

TOP OF UPPERMOST AQUIFER

FIGURE 1

35 I.A.C. § 845.650(e): ALTERNATIVE SOURCE DEMONSTRATION
EAST ASH POND
JOPPA POWER PLANT JOPPA, ILLINOIS

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.



COMPLIANCE MONITORING WELL
BACKGROUND MONITORING WELL
PORE WATER WELL
STAFF GAGE, RIVER
MONITORING WELL
STAFF GAGE, CCR UNIT

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
REGULATED UNIT (SUBJECT UNIT)
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)
*GAGING DATA FROM USGS 03612600 OHIO RIVER AT OLMSTED, IL LOCATED APPROXIMATELY 12 MILES DOWNSTREAM OF JOPPA POWER PLANT.

0 300 600 Feet

SAMPLING LOCATIONS AND POTENTIOMETRIC SURFACE MAP - MAY 1, 2023

FIGURE 2

35 I.A.C. § 845.650(e): ALTERNATIVE SOURCE DEMONSTRATION
EAST ASH POND
JOPPA POWER PLANT
JOPPA, ILLINOIS

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

APPENDICES

APPENDIX A
SUPPORTING SOLID PHASE ANALYTICAL DATA

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SUPPORTING SOLIDS PHASE ANALYTICAL DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Boring ID	Sample Elevation (feet NAVD88)	Cobalt (mg/kg)	Manganese (mg/kg)
G03	284.84 - 297.34	6.0	190
G03	294.84 - 296.84	0.82	6.1
G07	294.34 - 300.34	8.0	320
G08	261.72 - 266.72	29	1000
G09M	264.60 - 266.60	7.7	270
G11	303.38 - 305.38	1.3	11.6

Notes:
NAVD88 = North American Vertical Datum of 1988
mg/kg = milligrams per kilogram

APPENDIX B
SUPPORTING ANALYSIS OF REDUCTIVE DISSOLUTION OF MANGANESE OXIDES AS A LIKELY SOURCE OF COBALT CONCENTRATIONS AT G05

RAMBOLL

ENVIRONMENT
& HEALTH

TECHNICAL MEMORANDUM

Project no. 1940103649-011
Client Electric Energy, Inc.
Prepared by Alison O'Connor, Ph.D.

Supporting Analysis for Reductive Dissolution of Manganese Oxides as a Likely Source of Cobalt Concentrations at G05
Joppa Power Plant, East Ash Pond

October 12, 2023

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1 INTRODUCTION

This document serves as an appendix for the October 21, 2023, Alternative Source Demonstration (ASD) for Joppa Power Plant (JPP) East Ash Pond (EAP) for monitoring Event 1 (E001), completed to fulfil the requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.650(e).

Cobalt and manganese are often closely associated in soils due to their similar chemical properties (Uren, 2013). In igneous rocks, cobalt and manganese occur together in minerals due to carrying +2 charge and having similar atomic radii (Uren, 2013). Cobalt and manganese are released together during weathering processes and are often transported together through the environment. In highly oxidizing environments, manganese 2+ can be oxidized to manganese 4+ which exists as solid phase manganese oxide minerals. Cobalt sorbs strongly to manganese oxides compared to other divalent cations (McKenzie, 1967; Backes et al., 1995). Therefore, manganese-associated cobalt is released when solid-phase manganese oxides in soils are dissolved by reduction to a more soluble species.

This line of evidence (LOE) demonstrates that cobalt concentrations at G05 are consistent with reductive dissolution of manganese, and the cobalt exceedance at G05 is therefore likely due to natural variation in groundwater quality. Solid phase data were used to determine if cobalt and manganese are associated in the solid phase. To inform further analysis of groundwater data, wells with a geochemical signature like G05 were identified using principal component analysis (PCA). The relationship between cobalt and manganese in similar groundwater was then evaluated using regression analysis.

2 METHODS

2.1 Solid Phase Measurements

Total cobalt and total manganese data were available for samples collected from the uppermost aquifer (UA) at five boring locations. Six total samples were available (two samples were collected from G03). These soil data represent the acid-digestible portion of the solids phase, which may be mobilized under environmental relevant geochemical conditions. Any metals entrained within the highly refractory aluminosilicate matrix are not extracted.

2.2 Regression Analysis

Least squares linear regression (abbreviated here as regression analysis) was used in this work to understand correlations between data. Regression analysis determines the equation for the line that minimizes the sum of the squared differences between the data and the regression estimate. Regression analysis assumes that the errors in the regression (called residuals) have a mean of zero and are randomly distributed around the mean following a normal distribution. The distribution of regression residuals can be visualized by plotting the residuals against the fitted values.

The relationship between the variables is assessed using the p value and the R^2 of the regression. The p value represents the chance the relationship between the data is due to random variability. A cut off p value of 0.05 often is used to determine if a regression is statistically significant (*i.e.,* it has less than a 5 percent (%) chance of being due to random variability). The R^2 value represents the proportion of the variance in the dependent variable that is explained by the independent variable. A higher R^2 value indicates a close relationship between the two variables (with an R^2 of 1 representing a perfectly straight line).

2.3 Principal Component Analysis

Groundwater data is frequently defined by many chemical parameters and may therefore be described statistically as "multivariate". PCA is a common multivariate statistical approach that simplifies multivariate data by combining those variables into a smaller number of new variables called principal components. This is possible because in multivariate data sets, there is often some correlation between variables. These correlations represent "redundant" information that may be mathematically removed by PCA. The principal components represent linear combinations of the original data which maximize the variance between the samples, and which are uncorrelated with one another. PCA thereby allows patterns in the data to be more easily recognized and correlations between input variables to be assessed.

The goal of this PCA was to identify wells similar to G05 and which are therefore likely affected by similar geochemical processes. The groundwater potentiometric map (E001 ASD Figure 2) and stratigraphic conditions in the UA (E001 ASD Section 2.3) suggest that wells in different areas downgradient of the EAP may be influenced by different areas of upgradient water. Additionally, as discussed in Appendix D, compliance wells G11 and G51D are strongly influenced by groundwater west of the EAP. To focus this analysis on identifying distinct populations of downgradient groundwater, the dataset for this PCA included only background wells, EAP porewater, and compliance wells east and south of the EAP (*i.e.*, downgradient from the unit; see E001 ASD Figure 2) screened in the UA.

Samples with a turbidity greater than 50 nephelometric turbidity units (NTU) were excluded from the analysis to mitigate the confounding influence of suspended solids. Geochemical parameters excluded from the PCA were to have measurements in over half the samples or to have an overall proportion of detected measurements exceeding 50 %. Individual samples missing data for more than half of the parameters (7 of 14 included in the PCA) were excluded from the analysis. Any measurements that were below the reporting limit were assumed to be half the reporting limit. Results for pH were converted to milligrams per liter (mg/L) H^+ ion for consistency with other analytes. Any missing values were imputed (*i.e.,* interpolated based on the available data) using the nearest neighbor method. The final data set (**Attachment A**) contained 1,232 parameter measurements (67 of which were imputed) from 88 individual groundwater samples at 15 wells in the vicinity of the EAP (three porewater wells, two background wells, and 10 compliance wells). All data were log transformed, scaled, and centered so that parameters with larger concentrations did not have disproportionate influence on the results.

Results of the PCA analysis are presented in a biplot. In a PCA biplot, the axes represent the new "variables," or principal components (PCs). The length of the arrows represents how strongly each individual variable contributes to the PCs, and the direction of the arrow along the respective axis represents the direction of the contribution (positive or negative). Each data point represents a sample plotted according to the PCs.

2.4 Pourbaix Diagrams

Pourbaix diagrams, also called Eh-pH diagrams, are visual representations of redox speciation under equilibrium conditions at a given pH (x axis) an Eh (y axis). Eh is the measure of redox potential based on the standard hydrogen electrode and is calculated by converting an oxidation reduction potential (ORP) measurement using an equation appropriate to the type of electrode used in the ORP sensor (typically silver/silver chloride or calomel). An Aqua TROLL field meter was used to measure ORP in the field. The equation to convert ORP to Eh for this meter is[1]:

Eh = ORP (mV) + 221.4 – 0.9*Temperature (°C)

3 RESULTS AND DISCUSSION

3.1 Regression quality

The results of the regressions of aquifer solids and groundwater data are presented in the main text of the ASD. This section discusses how the regressions meet the standard assumptions.

For the regression of aquifer solids data, the residuals are most extreme in the negative direction, but the mean of the residuals is zero and there is considerable scatter (**Figure B-1**). Therefore, the regression meets the assumptions relatively well.

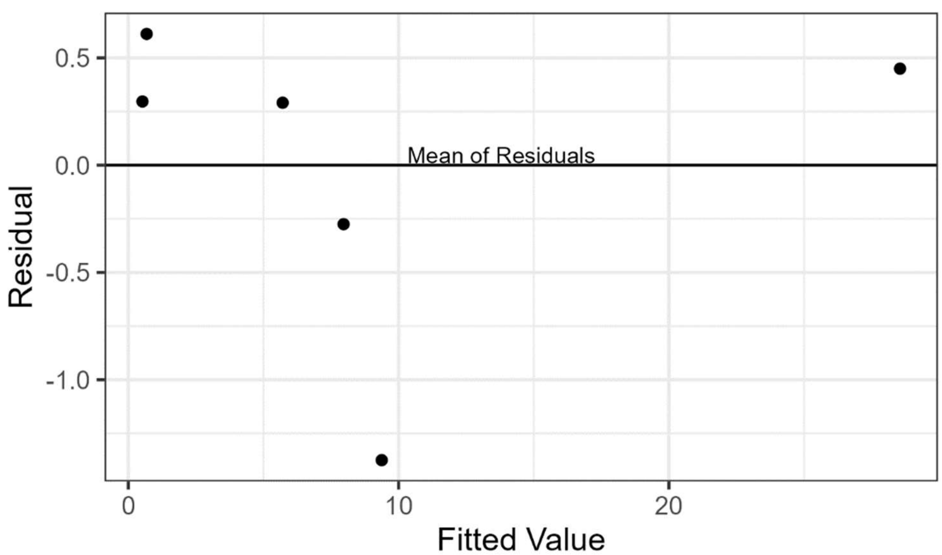

Figure B-1. Plot of residuals against fitted values for the UA solids cobalt versus manganese regression model.

[1] As reported at https://in-situ.com/us/news/orp-field-measurements-reporting-redox-potential-eh-correctly

For the regression of groundwater data, the residuals are most extreme toward the middle of the fitted values, but the mean of the residuals is zero and there is considerable scatter (**Figure B-2**). Therefore, the regression meets the assumptions relatively well.

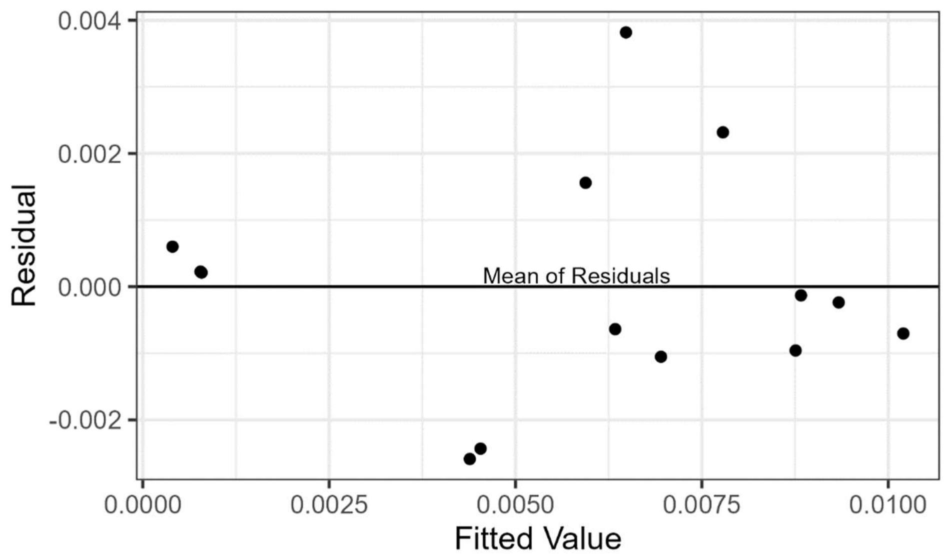

Figure B-2. Plot of residuals against fitted values for the groundwater cobalt versus manganese regression model.

3.2 Pourbaix Diagram

Figure B-3 shows the Pourbaix diagram for manganese with 2023 groundwater data plotted. Manganese is expected to exist in the reduced Mn^{2+} form at all groundwater locations (including G05), as opposed to insoluble manganese oxide mineral forms (*i.e.*, birnessite and todorokite). This indicates that reductive dissolution of manganese oxide minerals is thermodynamically favorable at G05, which supports this mechanism as a source of cobalt in the groundwater.

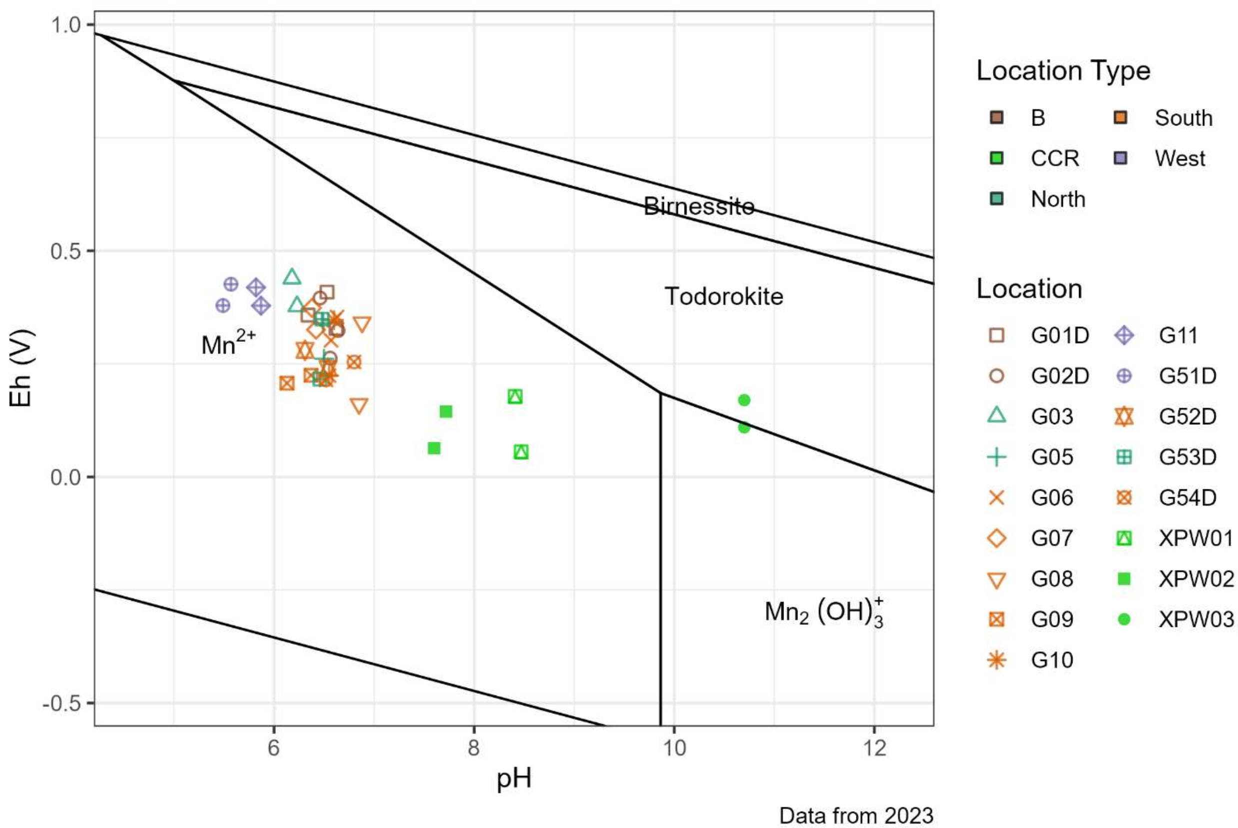

Figure B-3. Manganese Pourbaix diagram with 2023 Eh and pH data from groundwater and porewater.

3.3 PCA

The PCA biplot (**Figure B-4**) shows the results of the PCA analysis with wells colored by location type: background, CCR porewater, north of the UA stratigraphic high ("north"), south of the UA stratigraphic high ("south"), and G05 as the cobalt exceedance location. Approximately 58% of the variability in the data is encompassed in the first two principal component (PC1 explains approximately 40% of the variability in the data, and PC2 explains approximately 18%). Ninety-five % confidence ellipses for the north wells and south wells are shown in their respective location type colors. The minimal overlap of the 95% confidence ellipses shows that the groundwater compositions from the north wells and the south wells are largely distinct from one another. Well G05 plots within the 95% confidence ellipse for the north wells, indicating similarity of groundwater composition. The similarity between the north wells and dissimilarity from the south wells indicates that groundwater from these two groups of wells should be considered as distinct populations of data.

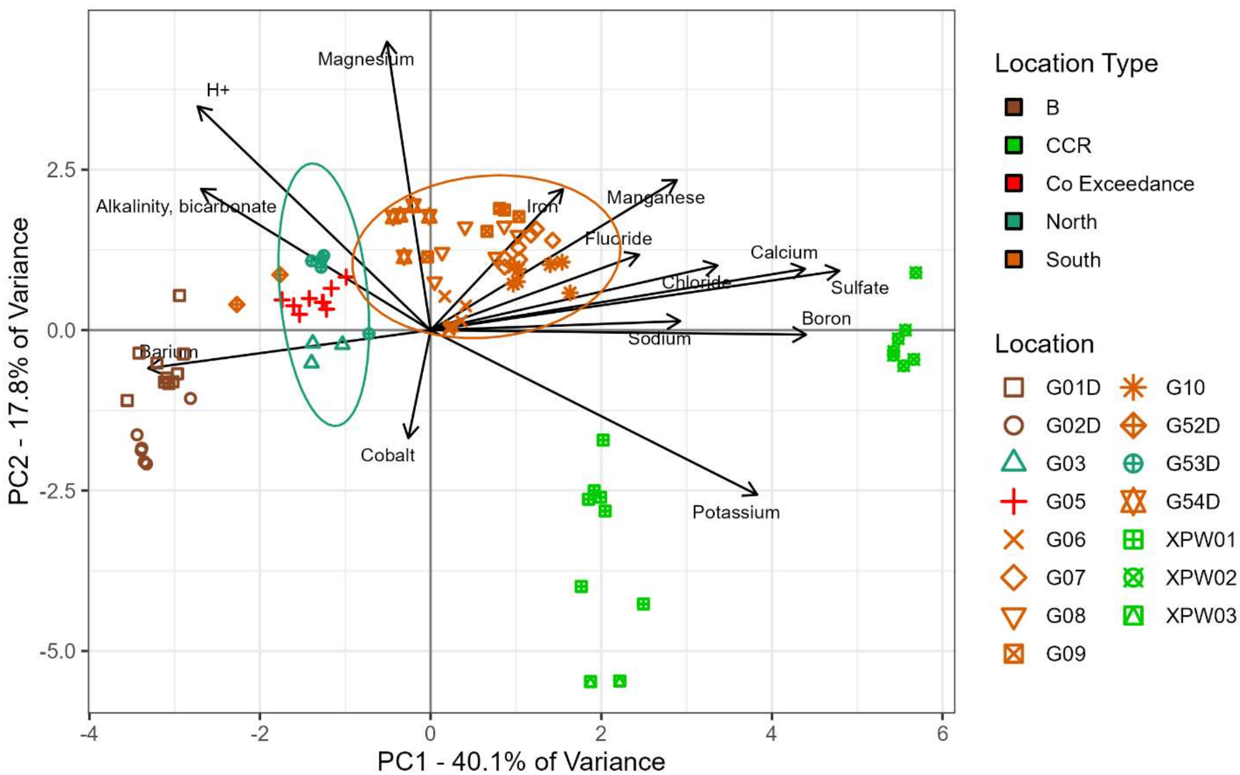

Figure B-4. Biplot of PCA results.

3.4 Redox Environment at JPP EAP

Appendix D of the associated E001 ASD, which addresses pH exceedances on the west side of the EAP, identifies a redox front west of the pond as driving iron oxidation and an associated drop in pH. The redox potential at which iron reduction/oxidation occurs is more reducing than the manganese reduction/oxidation potential. The redox potential and pH at wells G51D and G11 are consistent with an iron redox transition (Appendix D, Attachment 6-B) but all recent EAP groundwater samples fall within manganese-reducing conditions (Figure B-3). G05 is not substantially more reducing than other nearby wells without elevated cobalt. Appendix A of the E001 ASD shows that cobalt and manganese concentrations in the soil encompass 1.5 and 2.5 orders of magnitude difference, respectively, across the UA. In contrast to a redox front driving an iron speciation transition west of the EAP, local variations in solid phase cobalt and manganese concentrations appear to drive the differences in cobalt concentrations in groundwater.

4 CONCLUSIONS

The methods and results reported in this appendix support the conclusion that cobalt concentrations at G05 are consistent with mobilization due to reductive dissolution of manganese oxides. The regression analyses for cobalt and manganese correlation in solid phase material and groundwater are validated by illustrating the quality of the regressions. The Pourbaix diagram shows the manganese speciation in greater detail and concludes that reductive dissolution of manganese is thermodynamically favorable. The detailed PCA results show that the wells north and south of the UA stratigraphic high have distinct groundwater quality signatures and should be analyzed as distinct populations. Along with the strong association between cobalt and manganese in both the soil and groundwater, these results support the conclusion that the reductive dissolution of manganese oxides is a primary control on cobalt concentrations in the groundwater.

5 REFERENCES

Backes, C.A., McLaren, R.G., Rate, A.W. and Swift, R.S., 1995. Kinetics of Cadmium and Cobalt Desorption from Iron and Manganese Oxides. *Soil Sci. Soc. Am. J.*, **59**: 778-785.

McKenzie, R.M., 1967. The sorption of cobalt by manganese minerals in soils. *Aust. J. Soil Res.* **5**: 235-246.

Uren, N.C., 2013. *Heavy Metals in Soils: Trace Metals and Metalloids in Soils and their Bioavailability*. Ed. B.J. Alloway. Springer Science+Business Media. Chapter 12: Cobalt and Manganese. p 335-366.

ATTACHMENTS

Attachment A Electronic PCA Data

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G01D	3/3/2021	Alkalinity, bicarbonate	209	FALSE	FALSE
G01D	3/3/2021	Calcium	25.8	FALSE	FALSE
G01D	3/3/2021	Magnesium	7.79	FALSE	FALSE
G01D	3/3/2021	Sodium	79	FALSE	FALSE
G01D	3/3/2021	Potassium	1.24	FALSE	FALSE
G01D	3/3/2021	Chloride	10	FALSE	FALSE
G01D	3/3/2021	Sulfate	18	FALSE	FALSE
G01D	3/3/2021	Fluoride	0.2	FALSE	FALSE
G01D	3/3/2021	Barium	0.137	FALSE	FALSE
G01D	3/3/2021	Boron	0.158	FALSE	TRUE
G01D	3/3/2021	Cobalt	0.0015	FALSE	FALSE
G01D	3/3/2021	Iron	1.09	FALSE	FALSE
G01D	3/3/2021	Manganese	0.0232	FALSE	FALSE
G01D	3/3/2021	H+	0.000000251	FALSE	FALSE
G01D	3/24/2021	Alkalinity, bicarbonate	219	FALSE	FALSE
G01D	3/24/2021	Calcium	24.8	FALSE	FALSE
G01D	3/24/2021	Magnesium	7.06	FALSE	FALSE
G01D	3/24/2021	Sodium	73.9	FALSE	FALSE
G01D	3/24/2021	Potassium	1.05	FALSE	FALSE
G01D	3/24/2021	Chloride	9	FALSE	FALSE
G01D	3/24/2021	Sulfate	21	FALSE	FALSE
G01D	3/24/2021	Fluoride	0.21	FALSE	FALSE
G01D	3/24/2021	Barium	0.136	FALSE	FALSE
G01D	3/24/2021	Boron	0.158	FALSE	TRUE
G01D	3/24/2021	Cobalt	0.0316	FALSE	TRUE
G01D	3/24/2021	Iron	1.15	FALSE	FALSE
G01D	3/24/2021	Manganese	0.0181	FALSE	FALSE
G01D	3/24/2021	H+	0.000000324	FALSE	FALSE
G01D	4/14/2021	Alkalinity, bicarbonate	240	FALSE	FALSE
G01D	4/14/2021	Calcium	23.3	FALSE	FALSE
G01D	4/14/2021	Magnesium	7.56	FALSE	FALSE
G01D	4/14/2021	Sodium	94.5	FALSE	FALSE
G01D	4/14/2021	Potassium	0.979	FALSE	FALSE
G01D	4/14/2021	Chloride	6	FALSE	FALSE
G01D	4/14/2021	Sulfate	39	FALSE	FALSE
G01D	4/14/2021	Fluoride	0.23	FALSE	FALSE
G01D	4/14/2021	Barium	0.112	FALSE	FALSE
G01D	4/14/2021	Boron	0.158	FALSE	TRUE
G01D	4/14/2021	Cobalt	0.0316	FALSE	TRUE
G01D	4/14/2021	Iron	0.698	FALSE	FALSE
G01D	4/14/2021	Manganese	0.0117	FALSE	FALSE
G01D	4/14/2021	H+	0.0000002	FALSE	FALSE
G01D	5/12/2021	Alkalinity, bicarbonate	200	FALSE	FALSE
G01D	5/12/2021	Calcium	24.9	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G01D	5/12/2021	Magnesium	7.55	FALSE	FALSE
G01D	5/12/2021	Sodium	82.5	FALSE	FALSE
G01D	5/12/2021	Potassium	1.13	FALSE	FALSE
G01D	5/12/2021	Chloride	7	FALSE	FALSE
G01D	5/12/2021	Sulfate	20	FALSE	FALSE
G01D	5/12/2021	Fluoride	0.21	FALSE	FALSE
G01D	5/12/2021	Barium	0.133	FALSE	FALSE
G01D	5/12/2021	Boron	0.0167	FALSE	FALSE
G01D	5/12/2021	Cobalt	0.0316	FALSE	TRUE
G01D	5/12/2021	Iron	0.65	FALSE	FALSE
G01D	5/12/2021	Manganese	0.012	FALSE	FALSE
G01D	5/12/2021	H+	0.000000324	FALSE	FALSE
G01D	6/1/2021	Alkalinity, bicarbonate	198	FALSE	FALSE
G01D	6/1/2021	Calcium	24.4	FALSE	FALSE
G01D	6/1/2021	Magnesium	7.36	FALSE	FALSE
G01D	6/1/2021	Sodium	75.3	FALSE	FALSE
G01D	6/1/2021	Potassium	1.26	FALSE	FALSE
G01D	6/1/2021	Chloride	7	FALSE	FALSE
G01D	6/1/2021	Sulfate	18	FALSE	FALSE
G01D	6/1/2021	Fluoride	0.23	FALSE	FALSE
G01D	6/1/2021	Barium	0.134	FALSE	FALSE
G01D	6/1/2021	Boron	0.158	FALSE	TRUE
G01D	6/1/2021	Cobalt	0.0316	FALSE	TRUE
G01D	6/1/2021	Iron	1.92	FALSE	FALSE
G01D	6/1/2021	Manganese	0.0249	FALSE	FALSE
G01D	6/1/2021	H+	0.000000457	FALSE	FALSE
G01D	6/14/2021	Alkalinity, bicarbonate	219	FALSE	FALSE
G01D	6/14/2021	Calcium	24.4	FALSE	FALSE
G01D	6/14/2021	Magnesium	7.41	FALSE	FALSE
G01D	6/14/2021	Sodium	78.8	FALSE	FALSE
G01D	6/14/2021	Potassium	1.26	FALSE	FALSE
G01D	6/14/2021	Chloride	9	FALSE	FALSE
G01D	6/14/2021	Sulfate	20	FALSE	FALSE
G01D	6/14/2021	Fluoride	0.23	FALSE	FALSE
G01D	6/14/2021	Barium	0.136	FALSE	FALSE
G01D	6/14/2021	Boron	0.158	FALSE	TRUE
G01D	6/14/2021	Cobalt	0.0316	FALSE	TRUE
G01D	6/14/2021	Iron	0.831	FALSE	FALSE
G01D	6/14/2021	Manganese	0.0147	FALSE	FALSE
G01D	6/14/2021	H+	0.000000347	FALSE	FALSE
G01D	7/21/2021	Alkalinity, bicarbonate	204	FALSE	FALSE
G01D	7/21/2021	Calcium	26	FALSE	FALSE
G01D	7/21/2021	Magnesium	7.54	FALSE	FALSE
G01D	7/21/2021	Sodium	75.1	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
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Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G01D	7/21/2021	Potassium	1.24	FALSE	FALSE
G01D	7/21/2021	Chloride	9	FALSE	FALSE
G01D	7/21/2021	Sulfate	18	FALSE	FALSE
G01D	7/21/2021	Fluoride	0.21	FALSE	FALSE
G01D	7/21/2021	Barium	0.125	FALSE	FALSE
G01D	7/21/2021	Boron	0.158	FALSE	TRUE
G01D	7/21/2021	Cobalt	0.0316	FALSE	TRUE
G01D	7/21/2021	Iron	1.35	FALSE	FALSE
G01D	7/21/2021	Manganese	0.0121	FALSE	FALSE
G01D	7/21/2021	H+	0.000000427	FALSE	FALSE
G01D	9/20/2021	Alkalinity, bicarbonate	215	FALSE	FALSE
G01D	9/20/2021	Calcium	26	FALSE	FALSE
G01D	9/20/2021	Magnesium	7.54	TRUE	NA
G01D	9/20/2021	Sodium	75.1	TRUE	NA
G01D	9/20/2021	Potassium	1.12	TRUE	NA
G01D	9/20/2021	Chloride	9	FALSE	FALSE
G01D	9/20/2021	Sulfate	18	FALSE	FALSE
G01D	9/20/2021	Fluoride	0.21	FALSE	FALSE
G01D	9/20/2021	Barium	0.145	FALSE	FALSE
G01D	9/20/2021	Boron	0.158	FALSE	TRUE
G01D	9/20/2021	Cobalt	0.0316	FALSE	TRUE
G01D	9/20/2021	Iron	1.15	TRUE	NA
G01D	9/20/2021	Manganese	0.0147	TRUE	NA
G01D	9/20/2021	H+	0.000000309	FALSE	FALSE
G01D	9/20/2022	Alkalinity, bicarbonate	171	TRUE	NA
G01D	9/20/2022	Calcium	25.5	FALSE	FALSE
G01D	9/20/2022	Magnesium	7.79	TRUE	NA
G01D	9/20/2022	Sodium	82.5	TRUE	NA
G01D	9/20/2022	Potassium	1.13	TRUE	NA
G01D	9/20/2022	Chloride	8	FALSE	FALSE
G01D	9/20/2022	Sulfate	23	FALSE	FALSE
G01D	9/20/2022	Fluoride	0.19	FALSE	FALSE
G01D	9/20/2022	Barium	0.142	FALSE	FALSE
G01D	9/20/2022	Boron	0.014	FALSE	FALSE
G01D	9/20/2022	Cobalt	0.0007	FALSE	FALSE
G01D	9/20/2022	Iron	1.15	TRUE	NA
G01D	9/20/2022	Manganese	0.0181	TRUE	NA
G01D	9/20/2022	H+	0.000000316	FALSE	FALSE
G01D	3/7/2023	Alkalinity, bicarbonate	223	FALSE	FALSE
G01D	3/7/2023	Calcium	23	FALSE	FALSE
G01D	3/7/2023	Magnesium	7.66	FALSE	FALSE
G01D	3/7/2023	Sodium	85.8	FALSE	FALSE
G01D	3/7/2023	Potassium	1.06	FALSE	FALSE
G01D	3/7/2023	Chloride	5	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
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Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G01D	3/7/2023	Sulfate	36	FALSE	FALSE
G01D	3/7/2023	Fluoride	0.21	FALSE	FALSE
G01D	3/7/2023	Barium	0.134	FALSE	FALSE
G01D	3/7/2023	Boron	0.029	FALSE	FALSE
G01D	3/7/2023	Cobalt	0.0022	FALSE	FALSE
G01D	3/7/2023	Iron	1.09	TRUE	NA
G01D	3/7/2023	Manganese	0.0181	TRUE	NA
G01D	3/7/2023	H+	0.000000295	FALSE	FALSE
G01D	5/2/2023	Alkalinity, bicarbonate	240	FALSE	FALSE
G01D	5/2/2023	Calcium	28.8	FALSE	FALSE
G01D	5/2/2023	Magnesium	8.43	FALSE	FALSE
G01D	5/2/2023	Sodium	90.3	FALSE	FALSE
G01D	5/2/2023	Potassium	1.28	FALSE	FALSE
G01D	5/2/2023	Chloride	10	FALSE	FALSE
G01D	5/2/2023	Sulfate	26	FALSE	FALSE
G01D	5/2/2023	Fluoride	0.22	FALSE	FALSE
G01D	5/2/2023	Barium	0.213	FALSE	FALSE
G01D	5/2/2023	Boron	0.021	FALSE	FALSE
G01D	5/2/2023	Cobalt	0.0058	FALSE	FALSE
G01D	5/2/2023	Iron	4.09	FALSE	FALSE
G01D	5/2/2023	Manganese	0.345	FALSE	FALSE
G01D	5/2/2023	H+	0.000000457	FALSE	FALSE
G02D	5/12/2021	Alkalinity, bicarbonate	153	FALSE	FALSE
G02D	5/12/2021	Calcium	34.6	FALSE	FALSE
G02D	5/12/2021	Magnesium	10.4	FALSE	FALSE
G02D	5/12/2021	Sodium	53.6	FALSE	FALSE
G02D	5/12/2021	Potassium	1.17	FALSE	FALSE
G02D	5/12/2021	Chloride	18	FALSE	FALSE
G02D	5/12/2021	Sulfate	27	FALSE	FALSE
G02D	5/12/2021	Fluoride	0.18	FALSE	FALSE
G02D	5/12/2021	Barium	0.208	FALSE	FALSE
G02D	5/12/2021	Boron	0.0356	FALSE	FALSE
G02D	5/12/2021	Cobalt	0.0316	FALSE	TRUE
G02D	5/12/2021	Iron	0.316	FALSE	TRUE
G02D	5/12/2021	Manganese	0.0707	FALSE	TRUE
G02D	5/12/2021	H+	0.000000447	FALSE	FALSE
G02D	7/21/2021	Alkalinity, bicarbonate	148	FALSE	FALSE
G02D	7/21/2021	Calcium	36.6	FALSE	FALSE
G02D	7/21/2021	Magnesium	10.1	FALSE	FALSE
G02D	7/21/2021	Sodium	38.7	FALSE	FALSE
G02D	7/21/2021	Potassium	1.14	FALSE	FALSE
G02D	7/21/2021	Chloride	22	FALSE	FALSE
G02D	7/21/2021	Sulfate	20	FALSE	FALSE
G02D	7/21/2021	Fluoride	0.2	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G02D	7/21/2021	Barium	0.181	FALSE	FALSE
G02D	7/21/2021	Boron	0.0329	FALSE	FALSE
G02D	7/21/2021	Cobalt	0.0316	FALSE	TRUE
G02D	7/21/2021	Iron	0.0594	FALSE	FALSE
G02D	7/21/2021	Manganese	0.0026	FALSE	FALSE
G02D	7/21/2021	H+	0.000000661	FALSE	FALSE
G02D	9/20/2021	Alkalinity, bicarbonate	156	FALSE	FALSE
G02D	9/20/2021	Calcium	34.3	FALSE	FALSE
G02D	9/20/2021	Magnesium	10.2	TRUE	NA
G02D	9/20/2021	Sodium	38.7	TRUE	NA
G02D	9/20/2021	Potassium	1.12	TRUE	NA
G02D	9/20/2021	Chloride	20	FALSE	FALSE
G02D	9/20/2021	Sulfate	19	FALSE	FALSE
G02D	9/20/2021	Fluoride	0.18	FALSE	FALSE
G02D	9/20/2021	Barium	0.189	FALSE	FALSE
G02D	9/20/2021	Boron	0.0313	FALSE	FALSE
G02D	9/20/2021	Cobalt	0.0316	FALSE	TRUE
G02D	9/20/2021	Iron	0.158	TRUE	NA
G02D	9/20/2021	Manganese	0.0032	TRUE	NA
G02D	9/20/2021	H+	0.000000479	FALSE	FALSE
G02D	1/24/2023	Alkalinity, bicarbonate	136	FALSE	FALSE
G02D	1/24/2023	Calcium	35.9	FALSE	FALSE
G02D	1/24/2023	Magnesium	10.2	FALSE	FALSE
G02D	1/24/2023	Sodium	29	FALSE	FALSE
G02D	1/24/2023	Potassium	1.11	FALSE	FALSE
G02D	1/24/2023	Chloride	23	FALSE	FALSE
G02D	1/24/2023	Sulfate	12	FALSE	FALSE
G02D	1/24/2023	Fluoride	0.21	FALSE	FALSE
G02D	1/24/2023	Barium	0.19	FALSE	FALSE
G02D	1/24/2023	Boron	0.0311	FALSE	FALSE
G02D	1/24/2023	Cobalt	0.0316	FALSE	TRUE
G02D	1/24/2023	Iron	0.158	FALSE	TRUE
G02D	1/24/2023	Manganese	0.0014	FALSE	FALSE
G02D	1/24/2023	H+	0.000000229	FALSE	FALSE
G02D	3/8/2023	Alkalinity, bicarbonate	141	FALSE	FALSE
G02D	3/8/2023	Calcium	37.3	FALSE	FALSE
G02D	3/8/2023	Magnesium	10.3	FALSE	FALSE
G02D	3/8/2023	Sodium	28.3	FALSE	FALSE
G02D	3/8/2023	Potassium	1.12	FALSE	FALSE
G02D	3/8/2023	Chloride	21	FALSE	FALSE
G02D	3/8/2023	Sulfate	11	FALSE	FALSE
G02D	3/8/2023	Fluoride	0.2	FALSE	FALSE
G02D	3/8/2023	Barium	0.171	FALSE	FALSE
G02D	3/8/2023	Boron	0.027	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G02D	3/8/2023	Cobalt	0.0316	FALSE	TRUE
G02D	3/8/2023	Iron	0.158	TRUE	NA
G02D	3/8/2023	Manganese	0.0032	TRUE	NA
G02D	3/8/2023	H+	0.000000275	FALSE	FALSE
G02D	5/3/2023	Alkalinity, bicarbonate	140	FALSE	FALSE
G02D	5/3/2023	Calcium	38.7	FALSE	FALSE
G02D	5/3/2023	Magnesium	10.4	FALSE	FALSE
G02D	5/3/2023	Sodium	39.1	FALSE	FALSE
G02D	5/3/2023	Potassium	1.14	FALSE	FALSE
G02D	5/3/2023	Chloride	21	FALSE	FALSE
G02D	5/3/2023	Sulfate	13	FALSE	FALSE
G02D	5/3/2023	Fluoride	0.22	FALSE	FALSE
G02D	5/3/2023	Barium	0.21	FALSE	FALSE
G02D	5/3/2023	Boron	0.0412	FALSE	FALSE
G02D	5/3/2023	Cobalt	0.0316	FALSE	TRUE
G02D	5/3/2023	Iron	0.049	FALSE	FALSE
G02D	5/3/2023	Manganese	0.0032	FALSE	FALSE
G02D	5/3/2023	H+	0.000000347	FALSE	FALSE
G03	6/15/2021	Alkalinity, bicarbonate	148	FALSE	FALSE
G03	6/15/2021	Calcium	46.7	FALSE	FALSE
G03	6/15/2021	Magnesium	15.1	FALSE	FALSE
G03	6/15/2021	Sodium	40.4	FALSE	FALSE
G03	6/15/2021	Potassium	1.26	FALSE	FALSE
G03	6/15/2021	Chloride	22	FALSE	FALSE
G03	6/15/2021	Sulfate	79	FALSE	FALSE
G03	6/15/2021	Fluoride	0.22	FALSE	FALSE
G03	6/15/2021	Barium	0.0705	FALSE	FALSE
G03	6/15/2021	Boron	0.225	FALSE	FALSE
G03	6/15/2021	Cobalt	0.0316	FALSE	TRUE
G03	6/15/2021	Iron	1.69	FALSE	FALSE
G03	6/15/2021	Manganese	0.033	FALSE	FALSE
G03	6/15/2021	H+	0.000000575	FALSE	FALSE
G03	7/6/2021	Alkalinity, bicarbonate	140	FALSE	FALSE
G03	7/6/2021	Calcium	42.1	FALSE	FALSE
G03	7/6/2021	Magnesium	14	FALSE	FALSE
G03	7/6/2021	Sodium	38	FALSE	FALSE
G03	7/6/2021	Potassium	1.13	FALSE	FALSE
G03	7/6/2021	Chloride	22	FALSE	FALSE
G03	7/6/2021	Sulfate	77	FALSE	FALSE
G03	7/6/2021	Fluoride	0.22	FALSE	FALSE
G03	7/6/2021	Barium	0.0564	FALSE	FALSE
G03	7/6/2021	Boron	0.235	FALSE	FALSE
G03	7/6/2021	Cobalt	0.0316	FALSE	TRUE
G03	7/6/2021	Iron	1.06	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G03	7/6/2021	Manganese	0.0226	FALSE	FALSE
G03	7/6/2021	H+	0.000000457	FALSE	FALSE
G03	7/21/2021	Alkalinity, bicarbonate	141	FALSE	FALSE
G03	7/21/2021	Calcium	50	FALSE	FALSE
G03	7/21/2021	Magnesium	15.7	FALSE	FALSE
G03	7/21/2021	Sodium	40.2	FALSE	FALSE
G03	7/21/2021	Potassium	1.39	FALSE	FALSE
G03	7/21/2021	Chloride	24	FALSE	FALSE
G03	7/21/2021	Sulfate	92	FALSE	FALSE
G03	7/21/2021	Fluoride	0.2	FALSE	FALSE
G03	7/21/2021	Barium	0.0555	FALSE	FALSE
G03	7/21/2021	Boron	0.294	FALSE	FALSE
G03	7/21/2021	Cobalt	0.0316	FALSE	TRUE
G03	7/21/2021	Iron	2.42	FALSE	FALSE
G03	7/21/2021	Manganese	0.0334	FALSE	FALSE
G03	7/21/2021	H+	0.000000437	FALSE	FALSE
G05	3/4/2021	Alkalinity, bicarbonate	180	FALSE	FALSE
G05	3/4/2021	Calcium	55.3	FALSE	FALSE
G05	3/4/2021	Magnesium	17.2	FALSE	FALSE
G05	3/4/2021	Sodium	44.1	FALSE	FALSE
G05	3/4/2021	Potassium	1.37	FALSE	FALSE
G05	3/4/2021	Chloride	13	FALSE	FALSE
G05	3/4/2021	Sulfate	94	FALSE	FALSE
G05	3/4/2021	Fluoride	0.28	FALSE	FALSE
G05	3/4/2021	Barium	0.13	FALSE	FALSE
G05	3/4/2021	Boron	0.181	FALSE	FALSE
G05	3/4/2021	Cobalt	0.0101	FALSE	FALSE
G05	3/4/2021	Iron	0.905	FALSE	FALSE
G05	3/4/2021	Manganese	0.227	FALSE	FALSE
G05	3/4/2021	H+	0.000000316	FALSE	FALSE
G05	4/13/2021	Alkalinity, bicarbonate	206	FALSE	FALSE
G05	4/13/2021	Calcium	68.5	FALSE	FALSE
G05	4/13/2021	Magnesium	19.5	FALSE	FALSE
G05	4/13/2021	Sodium	53.7	FALSE	FALSE
G05	4/13/2021	Potassium	2.14	FALSE	FALSE
G05	4/13/2021	Chloride	21	FALSE	FALSE
G05	4/13/2021	Sulfate	95	FALSE	FALSE
G05	4/13/2021	Fluoride	0.33	FALSE	FALSE
G05	4/13/2021	Barium	0.126	FALSE	FALSE
G05	4/13/2021	Boron	0.19	FALSE	FALSE
G05	4/13/2021	Cobalt	0.0095	FALSE	FALSE
G05	4/13/2021	Iron	2	FALSE	FALSE
G05	4/13/2021	Manganese	0.294	FALSE	FALSE
G05	4/13/2021	H+	0.000000316	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G05	5/11/2021	Alkalinity, bicarbonate	193	FALSE	FALSE
G05	5/11/2021	Calcium	60.3	FALSE	FALSE
G05	5/11/2021	Magnesium	19.4	FALSE	FALSE
G05	5/11/2021	Sodium	49.6	FALSE	FALSE
G05	5/11/2021	Potassium	1.97	FALSE	FALSE
G05	5/11/2021	Chloride	19	FALSE	FALSE
G05	5/11/2021	Sulfate	109	FALSE	FALSE
G05	5/11/2021	Fluoride	0.34	FALSE	FALSE
G05	5/11/2021	Barium	0.132	FALSE	FALSE
G05	5/11/2021	Boron	0.158	FALSE	FALSE
G05	5/11/2021	Cobalt	0.0087	FALSE	FALSE
G05	5/11/2021	Iron	1.14	FALSE	FALSE
G05	5/11/2021	Manganese	0.256	FALSE	FALSE
G05	5/11/2021	H+	0.000000417	FALSE	FALSE
G05	6/1/2021	Alkalinity, bicarbonate	190	FALSE	FALSE
G05	6/1/2021	Calcium	57.1	FALSE	FALSE
G05	6/1/2021	Magnesium	18.6	FALSE	FALSE
G05	6/1/2021	Sodium	45.5	FALSE	FALSE
G05	6/1/2021	Potassium	2.18	FALSE	FALSE
G05	6/1/2021	Chloride	21	FALSE	FALSE
G05	6/1/2021	Sulfate	83	FALSE	FALSE
G05	6/1/2021	Fluoride	0.34	FALSE	FALSE
G05	6/1/2021	Barium	0.144	FALSE	FALSE
G05	6/1/2021	Boron	0.157	FALSE	FALSE
G05	6/1/2021	Cobalt	0.0078	FALSE	FALSE
G05	6/1/2021	Iron	0.81	FALSE	FALSE
G05	6/1/2021	Manganese	0.254	FALSE	FALSE
G05	6/1/2021	H+	0.000000331	FALSE	FALSE
G05	7/6/2021	Alkalinity, bicarbonate	178	FALSE	FALSE
G05	7/6/2021	Calcium	51.8	FALSE	FALSE
G05	7/6/2021	Magnesium	17.6	FALSE	FALSE
G05	7/6/2021	Sodium	45.9	FALSE	FALSE
G05	7/6/2021	Potassium	2.04	FALSE	FALSE
G05	7/6/2021	Chloride	22	FALSE	FALSE
G05	7/6/2021	Sulfate	90	FALSE	FALSE
G05	7/6/2021	Fluoride	0.34	FALSE	FALSE
G05	7/6/2021	Barium	0.139	FALSE	FALSE
G05	7/6/2021	Boron	0.148	FALSE	FALSE
G05	7/6/2021	Cobalt	0.0091	FALSE	FALSE
G05	7/6/2021	Iron	0.729	FALSE	FALSE
G05	7/6/2021	Manganese	0.27	FALSE	FALSE
G05	7/6/2021	H+	0.00000038	FALSE	FALSE
G05	7/20/2021	Alkalinity, bicarbonate	186	FALSE	FALSE
G05	7/20/2021	Calcium	55.9	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G05	7/20/2021	Magnesium	18.5	FALSE	FALSE
G05	7/20/2021	Sodium	43.4	FALSE	FALSE
G05	7/20/2021	Potassium	1.75	FALSE	FALSE
G05	7/20/2021	Chloride	20	FALSE	FALSE
G05	7/20/2021	Sulfate	87	FALSE	FALSE
G05	7/20/2021	Fluoride	0.32	FALSE	FALSE
G05	7/20/2021	Barium	0.133	FALSE	FALSE
G05	7/20/2021	Boron	0.131	FALSE	FALSE
G05	7/20/2021	Cobalt	0.0059	FALSE	FALSE
G05	7/20/2021	Iron	0.747	FALSE	FALSE
G05	7/20/2021	Manganese	0.204	FALSE	FALSE
G05	7/20/2021	H+	0.000000447	FALSE	FALSE
G05	7/26/2022	Alkalinity, bicarbonate	181	FALSE	FALSE
G05	7/26/2022	Calcium	50.6	FALSE	FALSE
G05	7/26/2022	Magnesium	17.6	FALSE	FALSE
G05	7/26/2022	Sodium	35.4	FALSE	FALSE
G05	7/26/2022	Potassium	1.07	FALSE	FALSE
G05	7/26/2022	Chloride	15	FALSE	FALSE
G05	7/26/2022	Sulfate	68	FALSE	FALSE
G05	7/26/2022	Fluoride	0.37	FALSE	FALSE
G05	7/26/2022	Barium	0.141	FALSE	FALSE
G05	7/26/2022	Boron	0.0645	FALSE	FALSE
G05	7/26/2022	Cobalt	0.0075	FALSE	FALSE
G05	7/26/2022	Iron	1.38	FALSE	FALSE
G05	7/26/2022	Manganese	0.176	FALSE	FALSE
G05	7/26/2022	H+	0.000000234	FALSE	FALSE
G05	3/9/2023	Alkalinity, bicarbonate	179	FALSE	FALSE
G05	3/9/2023	Calcium	52.6	FALSE	FALSE
G05	3/9/2023	Magnesium	19.4	FALSE	FALSE
G05	3/9/2023	Sodium	41.8	FALSE	FALSE
G05	3/9/2023	Potassium	1.59	FALSE	FALSE
G05	3/9/2023	Chloride	22	FALSE	FALSE
G05	3/9/2023	Sulfate	90	FALSE	FALSE
G05	3/9/2023	Fluoride	0.32	FALSE	FALSE
G05	3/9/2023	Barium	0.175	FALSE	FALSE
G05	3/9/2023	Boron	0.0541	FALSE	FALSE
G05	3/9/2023	Cobalt	0.0074	FALSE	FALSE
G05	3/9/2023	Iron	0.81	TRUE	NA
G05	3/9/2023	Manganese	0.204	TRUE	NA
G05	3/9/2023	H+	0.000000316	FALSE	FALSE
G05	5/3/2023	Alkalinity, bicarbonate	163	FALSE	FALSE
G05	5/3/2023	Calcium	54.4	FALSE	FALSE
G05	5/3/2023	Magnesium	19.3	FALSE	FALSE
G05	5/3/2023	Sodium	46.7	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G05	5/3/2023	Potassium	1.68	FALSE	FALSE
G05	5/3/2023	Chloride	24	FALSE	FALSE
G05	5/3/2023	Sulfate	112	FALSE	FALSE
G05	5/3/2023	Fluoride	0.38	FALSE	FALSE
G05	5/3/2023	Barium	0.212	FALSE	FALSE
G05	5/3/2023	Boron	0.0478	FALSE	FALSE
G05	5/3/2023	Cobalt	0.0103	FALSE	FALSE
G05	5/3/2023	Iron	1.5	FALSE	FALSE
G05	5/3/2023	Manganese	0.191	FALSE	FALSE
G05	5/3/2023	H+	0.000000324	FALSE	FALSE
G06	5/11/2021	Alkalinity, bicarbonate	156	FALSE	FALSE
G06	5/11/2021	Calcium	93.4	FALSE	FALSE
G06	5/11/2021	Magnesium	26.8	FALSE	FALSE
G06	5/11/2021	Sodium	52.8	FALSE	FALSE
G06	5/11/2021	Potassium	2.5	FALSE	FALSE
G06	5/11/2021	Chloride	22	FALSE	FALSE
G06	5/11/2021	Sulfate	219	FALSE	FALSE
G06	5/11/2021	Fluoride	0.26	FALSE	FALSE
G06	5/11/2021	Barium	0.0311	FALSE	FALSE
G06	5/11/2021	Boron	3.37	FALSE	FALSE
G06	5/11/2021	Cobalt	0.0316	FALSE	TRUE
G06	5/11/2021	Iron	0.702	FALSE	FALSE
G06	5/11/2021	Manganese	0.0957	FALSE	FALSE
G06	5/11/2021	H+	0.000000372	FALSE	FALSE
G06	6/1/2021	Alkalinity, bicarbonate	167	FALSE	FALSE
G06	6/1/2021	Calcium	92.6	FALSE	FALSE
G06	6/1/2021	Magnesium	25.3	FALSE	FALSE
G06	6/1/2021	Sodium	46.4	FALSE	FALSE
G06	6/1/2021	Potassium	2.5	FALSE	FALSE
G06	6/1/2021	Chloride	22	FALSE	FALSE
G06	6/1/2021	Sulfate	216	FALSE	FALSE
G06	6/1/2021	Fluoride	0.28	FALSE	FALSE
G06	6/1/2021	Barium	0.0323	FALSE	FALSE
G06	6/1/2021	Boron	3.56	FALSE	FALSE
G06	6/1/2021	Cobalt	0.0316	FALSE	TRUE
G06	6/1/2021	Iron	1.69	FALSE	FALSE
G06	6/1/2021	Manganese	0.0892	FALSE	FALSE
G06	6/1/2021	H+	0.000000275	FALSE	FALSE
G06	6/15/2021	Alkalinity, bicarbonate	170	FALSE	FALSE
G06	6/15/2021	Calcium	91.5	FALSE	FALSE
G06	6/15/2021	Magnesium	25.2	FALSE	FALSE
G06	6/15/2021	Sodium	50.7	FALSE	FALSE
G06	6/15/2021	Potassium	2.57	FALSE	FALSE
G06	6/15/2021	Chloride	21	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G06	6/15/2021	Sulfate	230	FALSE	FALSE
G06	6/15/2021	Fluoride	0.28	FALSE	FALSE
G06	6/15/2021	Barium	0.028	FALSE	FALSE
G06	6/15/2021	Boron	2.97	FALSE	FALSE
G06	6/15/2021	Cobalt	0.0316	FALSE	TRUE
G06	6/15/2021	Iron	0.379	FALSE	FALSE
G06	6/15/2021	Manganese	0.0682	FALSE	FALSE
G06	6/15/2021	H+	0.000000309	FALSE	FALSE
G06	7/6/2021	Alkalinity, bicarbonate	163	FALSE	FALSE
G06	7/6/2021	Calcium	86.7	FALSE	FALSE
G06	7/6/2021	Magnesium	23.7	FALSE	FALSE
G06	7/6/2021	Sodium	50	FALSE	FALSE
G06	7/6/2021	Potassium	2.57	FALSE	FALSE
G06	7/6/2021	Chloride	22	FALSE	FALSE
G06	7/6/2021	Sulfate	223	FALSE	FALSE
G06	7/6/2021	Fluoride	0.27	FALSE	FALSE
G06	7/6/2021	Barium	0.0272	FALSE	FALSE
G06	7/6/2021	Boron	3.93	FALSE	FALSE
G06	7/6/2021	Cobalt	0.0316	FALSE	TRUE
G06	7/6/2021	Iron	0.495	FALSE	FALSE
G06	7/6/2021	Manganese	0.0631	FALSE	FALSE
G06	7/6/2021	H+	0.000000479	FALSE	FALSE
G06	7/20/2021	Alkalinity, bicarbonate	162	FALSE	FALSE
G06	7/20/2021	Calcium	90.6	FALSE	FALSE
G06	7/20/2021	Magnesium	24.4	FALSE	FALSE
G06	7/20/2021	Sodium	47	FALSE	FALSE
G06	7/20/2021	Potassium	2.37	FALSE	FALSE
G06	7/20/2021	Chloride	21	FALSE	FALSE
G06	7/20/2021	Sulfate	213	FALSE	FALSE
G06	7/20/2021	Fluoride	0.26	FALSE	FALSE
G06	7/20/2021	Barium	0.0244	FALSE	FALSE
G06	7/20/2021	Boron	3.41	FALSE	FALSE
G06	7/20/2021	Cobalt	0.0316	FALSE	TRUE
G06	7/20/2021	Iron	0.613	FALSE	FALSE
G06	7/20/2021	Manganese	0.0456	FALSE	FALSE
G06	7/20/2021	H+	0.000000389	FALSE	FALSE
G06	3/9/2023	Alkalinity, bicarbonate	161	FALSE	FALSE
G06	3/9/2023	Calcium	87.6	FALSE	FALSE
G06	3/9/2023	Magnesium	24.1	FALSE	FALSE
G06	3/9/2023	Sodium	42.1	FALSE	FALSE
G06	3/9/2023	Potassium	2.2	FALSE	FALSE
G06	3/9/2023	Chloride	21	FALSE	FALSE
G06	3/9/2023	Sulfate	221	FALSE	FALSE
G06	3/9/2023	Fluoride	0.22	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G06	3/9/2023	Barium	0.0257	FALSE	FALSE
G06	3/9/2023	Boron	2.95	FALSE	FALSE
G06	3/9/2023	Cobalt	0.0006	FALSE	FALSE
G06	3/9/2023	Iron	0.537	TRUE	NA
G06	3/9/2023	Manganese	0.0682	TRUE	NA
G06	3/9/2023	H+	0.000000269	FALSE	FALSE
G07	3/24/2021	Alkalinity, bicarbonate	171	FALSE	FALSE
G07	3/24/2021	Calcium	92.8	FALSE	FALSE
G07	3/24/2021	Magnesium	24.2	FALSE	FALSE
G07	3/24/2021	Sodium	71.4	FALSE	FALSE
G07	3/24/2021	Potassium	3.87	FALSE	FALSE
G07	3/24/2021	Chloride	21	FALSE	FALSE
G07	3/24/2021	Sulfate	258	FALSE	FALSE
G07	3/24/2021	Fluoride	0.42	FALSE	FALSE
G07	3/24/2021	Barium	0.0643	FALSE	FALSE
G07	3/24/2021	Boron	4.67	FALSE	FALSE
G07	3/24/2021	Cobalt	0.0035	FALSE	FALSE
G07	3/24/2021	Iron	2.71	FALSE	FALSE
G07	3/24/2021	Manganese	4.48	FALSE	FALSE
G07	3/24/2021	H+	0.000000398	FALSE	FALSE
G07	4/13/2021	Alkalinity, bicarbonate	164	FALSE	FALSE
G07	4/13/2021	Calcium	126	FALSE	FALSE
G07	4/13/2021	Magnesium	24.4	FALSE	FALSE
G07	4/13/2021	Sodium	90.4	FALSE	FALSE
G07	4/13/2021	Potassium	3.98	FALSE	FALSE
G07	4/13/2021	Chloride	20	FALSE	FALSE
G07	4/13/2021	Sulfate	274	FALSE	FALSE
G07	4/13/2021	Fluoride	0.42	FALSE	FALSE
G07	4/13/2021	Barium	0.0497	FALSE	FALSE
G07	4/13/2021	Boron	5.04	FALSE	FALSE
G07	4/13/2021	Cobalt	0.0024	FALSE	FALSE
G07	4/13/2021	Iron	1.2	FALSE	FALSE
G07	4/13/2021	Manganese	4.56	FALSE	FALSE
G07	4/13/2021	H+	0.000000501	FALSE	FALSE
G07	5/11/2021	Alkalinity, bicarbonate	162	FALSE	FALSE
G07	5/11/2021	Calcium	90.4	FALSE	FALSE
G07	5/11/2021	Magnesium	22.9	FALSE	FALSE
G07	5/11/2021	Sodium	68.6	FALSE	FALSE
G07	5/11/2021	Potassium	3.9	FALSE	FALSE
G07	5/11/2021	Chloride	19	FALSE	FALSE
G07	5/11/2021	Sulfate	248	FALSE	FALSE
G07	5/11/2021	Fluoride	0.41	FALSE	FALSE
G07	5/11/2021	Barium	0.0448	FALSE	FALSE
G07	5/11/2021	Boron	4.55	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G07	5/11/2021	Cobalt	0.00185	FALSE	FALSE
G07	5/11/2021	Iron	0.537	FALSE	FALSE
G07	5/11/2021	Manganese	3.71	FALSE	FALSE
G07	5/11/2021	H+	0.000000525	FALSE	FALSE
G07	6/1/2021	Alkalinity, bicarbonate	173	FALSE	FALSE
G07	6/1/2021	Calcium	96.6	FALSE	FALSE
G07	6/1/2021	Magnesium	22.9	FALSE	FALSE
G07	6/1/2021	Sodium	67.5	FALSE	FALSE
G07	6/1/2021	Potassium	4.32	FALSE	FALSE
G07	6/1/2021	Chloride	22	FALSE	FALSE
G07	6/1/2021	Sulfate	257	FALSE	FALSE
G07	6/1/2021	Fluoride	0.43	FALSE	FALSE
G07	6/1/2021	Barium	0.054	FALSE	FALSE
G07	6/1/2021	Boron	5.23	FALSE	FALSE
G07	6/1/2021	Cobalt	0.0023	FALSE	FALSE
G07	6/1/2021	Iron	2.49	FALSE	FALSE
G07	6/1/2021	Manganese	3.54	FALSE	FALSE
G07	6/1/2021	H+	0.000000562	FALSE	FALSE
G07	6/15/2021	Alkalinity, bicarbonate	177	FALSE	FALSE
G07	6/15/2021	Calcium	89.3	FALSE	FALSE
G07	6/15/2021	Magnesium	21.8	FALSE	FALSE
G07	6/15/2021	Sodium	66.7	FALSE	FALSE
G07	6/15/2021	Potassium	3.97	FALSE	FALSE
G07	6/15/2021	Chloride	20	FALSE	FALSE
G07	6/15/2021	Sulfate	246	FALSE	FALSE
G07	6/15/2021	Fluoride	0.41	FALSE	FALSE
G07	6/15/2021	Barium	0.0429	FALSE	FALSE
G07	6/15/2021	Boron	3.91	FALSE	FALSE
G07	6/15/2021	Cobalt	0.0013	FALSE	FALSE
G07	6/15/2021	Iron	0.294	FALSE	FALSE
G07	6/15/2021	Manganese	3.7	FALSE	FALSE
G07	6/15/2021	H+	0.000000562	FALSE	FALSE
G07	7/6/2021	Alkalinity, bicarbonate	166	FALSE	FALSE
G07	7/6/2021	Calcium	84.8	FALSE	FALSE
G07	7/6/2021	Magnesium	20.5	FALSE	FALSE
G07	7/6/2021	Sodium	66.5	FALSE	FALSE
G07	7/6/2021	Potassium	3.87	FALSE	FALSE
G07	7/6/2021	Chloride	21	FALSE	FALSE
G07	7/6/2021	Sulfate	258	FALSE	FALSE
G07	7/6/2021	Fluoride	0.4	FALSE	FALSE
G07	7/6/2021	Barium	0.0373	FALSE	FALSE
G07	7/6/2021	Boron	4.95	FALSE	FALSE
G07	7/6/2021	Cobalt	0.0012	FALSE	FALSE
G07	7/6/2021	Iron	0.134	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G07	7/6/2021	Manganese	4.1	FALSE	FALSE
G07	7/6/2021	H+	0.00000105	FALSE	FALSE
G07	7/20/2021	Alkalinity, bicarbonate	166	FALSE	FALSE
G07	7/20/2021	Calcium	96.5	FALSE	FALSE
G07	7/20/2021	Magnesium	23	FALSE	FALSE
G07	7/20/2021	Sodium	67.4	FALSE	FALSE
G07	7/20/2021	Potassium	4.03	FALSE	FALSE
G07	7/20/2021	Chloride	21	FALSE	FALSE
G07	7/20/2021	Sulfate	252	FALSE	FALSE
G07	7/20/2021	Fluoride	0.4	FALSE	FALSE
G07	7/20/2021	Barium	0.047	FALSE	FALSE
G07	7/20/2021	Boron	4.48	FALSE	FALSE
G07	7/20/2021	Cobalt	0.0014	FALSE	FALSE
G07	7/20/2021	Iron	0.639	FALSE	FALSE
G07	7/20/2021	Manganese	3.28	FALSE	FALSE
G07	7/20/2021	H+	0.000000724	FALSE	FALSE
G08	4/13/2021	Alkalinity, bicarbonate	177	FALSE	FALSE
G08	4/13/2021	Calcium	142	FALSE	FALSE
G08	4/13/2021	Magnesium	31.9	FALSE	FALSE
G08	4/13/2021	Sodium	33.6	FALSE	FALSE
G08	4/13/2021	Potassium	1.6	FALSE	FALSE
G08	4/13/2021	Chloride	15	FALSE	FALSE
G08	4/13/2021	Sulfate	286	FALSE	FALSE
G08	4/13/2021	Fluoride	0.34	FALSE	FALSE
G08	4/13/2021	Barium	0.0772	FALSE	FALSE
G08	4/13/2021	Boron	5.25	FALSE	FALSE
G08	4/13/2021	Cobalt	0.0041	FALSE	FALSE
G08	4/13/2021	Iron	4.82	FALSE	FALSE
G08	4/13/2021	Manganese	6.03	FALSE	FALSE
G08	4/13/2021	H+	0.0000001	FALSE	FALSE
G08	5/11/2021	Alkalinity, bicarbonate	185	FALSE	FALSE
G08	5/11/2021	Calcium	101	FALSE	FALSE
G08	5/11/2021	Magnesium	25.4	FALSE	FALSE
G08	5/11/2021	Sodium	24.3	FALSE	FALSE
G08	5/11/2021	Potassium	1.45	FALSE	FALSE
G08	5/11/2021	Chloride	12	FALSE	FALSE
G08	5/11/2021	Sulfate	203	FALSE	FALSE
G08	5/11/2021	Fluoride	0.36	FALSE	FALSE
G08	5/11/2021	Barium	0.0685	FALSE	FALSE
G08	5/11/2021	Boron	3.77	FALSE	FALSE
G08	5/11/2021	Cobalt	0.0022	FALSE	FALSE
G08	5/11/2021	Iron	1.33	FALSE	FALSE
G08	5/11/2021	Manganese	3.09	FALSE	FALSE
G08	5/11/2021	H+	0.000000115	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G08	6/1/2021	Alkalinity, bicarbonate	201	FALSE	FALSE
G08	6/1/2021	Calcium	114	FALSE	FALSE
G08	6/1/2021	Magnesium	27.2	FALSE	FALSE
G08	6/1/2021	Sodium	25.4	FALSE	FALSE
G08	6/1/2021	Potassium	1.48	FALSE	FALSE
G08	6/1/2021	Chloride	15	FALSE	FALSE
G08	6/1/2021	Sulfate	204	FALSE	FALSE
G08	6/1/2021	Fluoride	0.34	FALSE	FALSE
G08	6/1/2021	Barium	0.0588	FALSE	FALSE
G08	6/1/2021	Boron	4.63	FALSE	FALSE
G08	6/1/2021	Cobalt	0.0041	FALSE	FALSE
G08	6/1/2021	Iron	4.43	FALSE	FALSE
G08	6/1/2021	Manganese	3.15	FALSE	FALSE
G08	6/1/2021	H+	0.00000011	FALSE	FALSE
G08	7/23/2022	Alkalinity, bicarbonate	191	FALSE	FALSE
G08	7/23/2022	Calcium	118	FALSE	FALSE
G08	7/23/2022	Magnesium	29	FALSE	FALSE
G08	7/23/2022	Sodium	30.5	FALSE	FALSE
G08	7/23/2022	Potassium	1.46	FALSE	FALSE
G08	7/23/2022	Chloride	16	FALSE	FALSE
G08	7/23/2022	Sulfate	229	FALSE	FALSE
G08	7/23/2022	Fluoride	0.3	FALSE	FALSE
G08	7/23/2022	Barium	0.0387	FALSE	FALSE
G08	7/23/2022	Boron	4.74	FALSE	FALSE
G08	7/23/2022	Cobalt	0.0028	FALSE	FALSE
G08	7/23/2022	Iron	2.25	FALSE	FALSE
G08	7/23/2022	Manganese	2.89	FALSE	FALSE
G08	7/23/2022	H+	2.57E-08	FALSE	FALSE
G08	3/9/2023	Alkalinity, bicarbonate	174	FALSE	FALSE
G08	3/9/2023	Calcium	119	FALSE	FALSE
G08	3/9/2023	Magnesium	28.9	FALSE	FALSE
G08	3/9/2023	Sodium	28.5	FALSE	FALSE
G08	3/9/2023	Potassium	1.47	FALSE	FALSE
G08	3/9/2023	Chloride	15	FALSE	FALSE
G08	3/9/2023	Sulfate	297	FALSE	FALSE
G08	3/9/2023	Fluoride	0.23	FALSE	FALSE
G08	3/9/2023	Barium	0.0495	FALSE	FALSE
G08	3/9/2023	Boron	4.33	FALSE	FALSE
G08	3/9/2023	Cobalt	0.0036	FALSE	FALSE
G08	3/9/2023	Iron	2.25	TRUE	NA
G08	3/9/2023	Manganese	0.0892	TRUE	NA
G08	3/9/2023	H+	0.000000141	FALSE	FALSE
G08	5/3/2023	Alkalinity, bicarbonate	154	FALSE	FALSE
G08	5/3/2023	Calcium	140	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G08	5/3/2023	Magnesium	32.2	FALSE	FALSE
G08	5/3/2023	Sodium	41.7	FALSE	FALSE
G08	5/3/2023	Potassium	1.67	FALSE	FALSE
G08	5/3/2023	Chloride	16	FALSE	FALSE
G08	5/3/2023	Sulfate	363	FALSE	FALSE
G08	5/3/2023	Fluoride	0.29	FALSE	FALSE
G08	5/3/2023	Barium	0.0974	FALSE	FALSE
G08	5/3/2023	Boron	5.43	FALSE	FALSE
G08	5/3/2023	Cobalt	0.0113	FALSE	FALSE
G08	5/3/2023	Iron	16.8	FALSE	FALSE
G08	5/3/2023	Manganese	2.62	FALSE	FALSE
G08	5/3/2023	H+	0.000000132	FALSE	FALSE
G09	3/4/2021	Alkalinity, bicarbonate	188	FALSE	FALSE
G09	3/4/2021	Calcium	103	FALSE	FALSE
G09	3/4/2021	Magnesium	33.8	FALSE	FALSE
G09	3/4/2021	Sodium	72	FALSE	FALSE
G09	3/4/2021	Potassium	2.78	FALSE	FALSE
G09	3/4/2021	Chloride	24	FALSE	FALSE
G09	3/4/2021	Sulfate	351	FALSE	FALSE
G09	3/4/2021	Fluoride	0.25	FALSE	FALSE
G09	3/4/2021	Barium	0.0675	FALSE	FALSE
G09	3/4/2021	Boron	3.19	FALSE	FALSE
G09	3/4/2021	Cobalt	0.0108	FALSE	FALSE
G09	3/4/2021	Iron	1.93	FALSE	FALSE
G09	3/4/2021	Manganese	4.15	FALSE	FALSE
G09	3/4/2021	H+	0.000000631	FALSE	FALSE
G09	6/1/2021	Alkalinity, bicarbonate	177	FALSE	FALSE
G09	6/1/2021	Calcium	91.3	FALSE	FALSE
G09	6/1/2021	Magnesium	31.4	FALSE	FALSE
G09	6/1/2021	Sodium	65.3	FALSE	FALSE
G09	6/1/2021	Potassium	1.87	FALSE	FALSE
G09	6/1/2021	Chloride	23	FALSE	FALSE
G09	6/1/2021	Sulfate	284	FALSE	FALSE
G09	6/1/2021	Fluoride	0.33	FALSE	FALSE
G09	6/1/2021	Barium	0.0548	FALSE	FALSE
G09	6/1/2021	Boron	3.65	FALSE	FALSE
G09	6/1/2021	Cobalt	0.0096	FALSE	FALSE
G09	6/1/2021	Iron	5.65	FALSE	FALSE
G09	6/1/2021	Manganese	3.87	FALSE	FALSE
G09	6/1/2021	H+	0.000000575	FALSE	FALSE
G09	6/15/2021	Alkalinity, bicarbonate	179	FALSE	FALSE
G09	6/15/2021	Calcium	137	FALSE	FALSE
G09	6/15/2021	Magnesium	49.3	FALSE	FALSE
G09	6/15/2021	Sodium	58.5	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G09	6/15/2021	Potassium	1.56	FALSE	FALSE
G09	6/15/2021	Chloride	21	FALSE	FALSE
G09	6/15/2021	Sulfate	294	FALSE	FALSE
G09	6/15/2021	Fluoride	0.32	FALSE	FALSE
G09	6/15/2021	Barium	0.0136	FALSE	FALSE
G09	6/15/2021	Boron	0.282	FALSE	FALSE
G09	6/15/2021	Cobalt	0.0011	FALSE	FALSE
G09	6/15/2021	Iron	0.0556	FALSE	FALSE
G09	6/15/2021	Manganese	0.104	FALSE	FALSE
G09	6/15/2021	H+	0.00000107	FALSE	FALSE
G09	7/6/2021	Alkalinity, bicarbonate	163	FALSE	FALSE
G09	7/6/2021	Calcium	79	FALSE	FALSE
G09	7/6/2021	Magnesium	28.7	FALSE	FALSE
G09	7/6/2021	Sodium	68.3	FALSE	FALSE
G09	7/6/2021	Potassium	1.65	FALSE	FALSE
G09	7/6/2021	Chloride	22	FALSE	FALSE
G09	7/6/2021	Sulfate	289	FALSE	FALSE
G09	7/6/2021	Fluoride	0.36	FALSE	FALSE
G09	7/6/2021	Barium	0.0444	FALSE	FALSE
G09	7/6/2021	Boron	4.05	FALSE	FALSE
G09	7/6/2021	Cobalt	0.0089	FALSE	FALSE
G09	7/6/2021	Iron	5.69	FALSE	FALSE
G09	7/6/2021	Manganese	4.06	FALSE	FALSE
G09	7/6/2021	H+	0.000000513	FALSE	FALSE
G09	7/21/2021	Alkalinity, bicarbonate	164	FALSE	FALSE
G09	7/21/2021	Calcium	92.1	FALSE	FALSE
G09	7/21/2021	Magnesium	32	FALSE	FALSE
G09	7/21/2021	Sodium	64.3	FALSE	FALSE
G09	7/21/2021	Potassium	1.55	FALSE	FALSE
G09	7/21/2021	Chloride	21	FALSE	FALSE
G09	7/21/2021	Sulfate	286	FALSE	FALSE
G09	7/21/2021	Fluoride	0.31	FALSE	FALSE
G09	7/21/2021	Barium	0.0454	FALSE	FALSE
G09	7/21/2021	Boron	3.75	FALSE	FALSE
G09	7/21/2021	Cobalt	0.0085	FALSE	FALSE
G09	7/21/2021	Iron	5.11	FALSE	FALSE
G09	7/21/2021	Manganese	3.17	FALSE	FALSE
G09	7/21/2021	H+	0.00000102	FALSE	FALSE
G10	3/4/2021	Alkalinity, bicarbonate	108	FALSE	FALSE
G10	3/4/2021	Calcium	107	FALSE	FALSE
G10	3/4/2021	Magnesium	35.7	FALSE	FALSE
G10	3/4/2021	Sodium	60.3	FALSE	FALSE
G10	3/4/2021	Potassium	2.54	FALSE	FALSE
G10	3/4/2021	Chloride	35	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G10	3/4/2021	Sulfate	391	FALSE	FALSE
G10	3/4/2021	Fluoride	0.29	FALSE	FALSE
G10	3/4/2021	Barium	0.0608	FALSE	FALSE
G10	3/4/2021	Boron	4.98	FALSE	FALSE
G10	3/4/2021	Cobalt	0.0109	FALSE	FALSE
G10	3/4/2021	Iron	2.38	FALSE	FALSE
G10	3/4/2021	Manganese	1.14	FALSE	FALSE
G10	3/4/2021	H+	0.0000002	FALSE	FALSE
G10	3/24/2021	Alkalinity, bicarbonate	132	FALSE	FALSE
G10	3/24/2021	Calcium	115	FALSE	FALSE
G10	3/24/2021	Magnesium	39.3	FALSE	FALSE
G10	3/24/2021	Sodium	62.1	FALSE	FALSE
G10	3/24/2021	Potassium	2.91	FALSE	FALSE
G10	3/24/2021	Chloride	31	FALSE	FALSE
G10	3/24/2021	Sulfate	369	FALSE	FALSE
G10	3/24/2021	Fluoride	0.3	FALSE	FALSE
G10	3/24/2021	Barium	0.0553	FALSE	FALSE
G10	3/24/2021	Boron	4.31	FALSE	FALSE
G10	3/24/2021	Cobalt	0.0122	FALSE	FALSE
G10	3/24/2021	Iron	4.61	FALSE	FALSE
G10	3/24/2021	Manganese	1.38	FALSE	FALSE
G10	3/24/2021	H+	0.0000002	FALSE	FALSE
G10	5/11/2021	Alkalinity, bicarbonate	134	FALSE	FALSE
G10	5/11/2021	Calcium	120	FALSE	FALSE
G10	5/11/2021	Magnesium	41.1	FALSE	FALSE
G10	5/11/2021	Sodium	56.8	FALSE	FALSE
G10	5/11/2021	Potassium	2.13	FALSE	FALSE
G10	5/11/2021	Chloride	25	FALSE	FALSE
G10	5/11/2021	Sulfate	364	FALSE	FALSE
G10	5/11/2021	Fluoride	0.28	FALSE	FALSE
G10	5/11/2021	Barium	0.0453	FALSE	FALSE
G10	5/11/2021	Boron	3.95	FALSE	FALSE
G10	5/11/2021	Cobalt	0.00754	FALSE	FALSE
G10	5/11/2021	Iron	1.12	FALSE	FALSE
G10	5/11/2021	Manganese	0.702	FALSE	FALSE
G10	5/11/2021	H+	0.000000457	FALSE	FALSE
G10	6/1/2021	Alkalinity, bicarbonate	127	FALSE	FALSE
G10	6/1/2021	Calcium	124	FALSE	FALSE
G10	6/1/2021	Magnesium	38.5	FALSE	FALSE
G10	6/1/2021	Sodium	55	FALSE	FALSE
G10	6/1/2021	Potassium	2.27	FALSE	FALSE
G10	6/1/2021	Chloride	29	FALSE	FALSE
G10	6/1/2021	Sulfate	401	FALSE	FALSE
G10	6/1/2021	Fluoride	0.29	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G10	6/1/2021	Barium	0.0444	FALSE	FALSE
G10	6/1/2021	Boron	4.73	FALSE	FALSE
G10	6/1/2021	Cobalt	0.0071	FALSE	FALSE
G10	6/1/2021	Iron	2.82	FALSE	FALSE
G10	6/1/2021	Manganese	0.608	FALSE	FALSE
G10	6/1/2021	H+	0.000000316	FALSE	FALSE
G10	6/15/2021	Alkalinity, bicarbonate	149	FALSE	FALSE
G10	6/15/2021	Calcium	128	FALSE	FALSE
G10	6/15/2021	Magnesium	40.8	FALSE	FALSE
G10	6/15/2021	Sodium	59.3	FALSE	FALSE
G10	6/15/2021	Potassium	2.25	FALSE	FALSE
G10	6/15/2021	Chloride	26	FALSE	FALSE
G10	6/15/2021	Sulfate	407	FALSE	FALSE
G10	6/15/2021	Fluoride	0.28	FALSE	FALSE
G10	6/15/2021	Barium	0.0439	FALSE	FALSE
G10	6/15/2021	Boron	3.74	FALSE	FALSE
G10	6/15/2021	Cobalt	0.005	FALSE	FALSE
G10	6/15/2021	Iron	0.864	FALSE	FALSE
G10	6/15/2021	Manganese	0.47	FALSE	FALSE
G10	6/15/2021	H+	0.000000347	FALSE	FALSE
G10	7/6/2021	Alkalinity, bicarbonate	144	FALSE	FALSE
G10	7/6/2021	Calcium	119	FALSE	FALSE
G10	7/6/2021	Magnesium	37.3	FALSE	FALSE
G10	7/6/2021	Sodium	57.6	FALSE	FALSE
G10	7/6/2021	Potassium	2.09	FALSE	FALSE
G10	7/6/2021	Chloride	26	FALSE	FALSE
G10	7/6/2021	Sulfate	415	FALSE	FALSE
G10	7/6/2021	Fluoride	0.27	FALSE	FALSE
G10	7/6/2021	Barium	0.0356	FALSE	FALSE
G10	7/6/2021	Boron	4.81	FALSE	FALSE
G10	7/6/2021	Cobalt	0.0049	FALSE	FALSE
G10	7/6/2021	Iron	0.556	FALSE	FALSE
G10	7/6/2021	Manganese	0.416	FALSE	FALSE
G10	7/6/2021	H+	0.000000309	FALSE	FALSE
G10	7/20/2021	Alkalinity, bicarbonate	141	FALSE	FALSE
G10	7/20/2021	Calcium	132	FALSE	FALSE
G10	7/20/2021	Magnesium	40	FALSE	FALSE
G10	7/20/2021	Sodium	56.5	FALSE	FALSE
G10	7/20/2021	Potassium	2.06	FALSE	FALSE
G10	7/20/2021	Chloride	26	FALSE	FALSE
G10	7/20/2021	Sulfate	410	FALSE	FALSE
G10	7/20/2021	Fluoride	0.26	FALSE	FALSE
G10	7/20/2021	Barium	0.0368	FALSE	FALSE
G10	7/20/2021	Boron	4.2	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
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JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G10	7/20/2021	Cobalt	0.0045	FALSE	FALSE
G10	7/20/2021	Iron	0.473	FALSE	FALSE
G10	7/20/2021	Manganese	0.348	FALSE	FALSE
G10	7/20/2021	H+	0.000000324	FALSE	FALSE
G52D	9/20/2021	Alkalinity, bicarbonate	147	FALSE	FALSE
G52D	9/20/2021	Calcium	47.8	FALSE	FALSE
G52D	9/20/2021	Magnesium	16.4	TRUE	NA
G52D	9/20/2021	Sodium	49.2	TRUE	NA
G52D	9/20/2021	Potassium	0.355	TRUE	NA
G52D	9/20/2021	Chloride	13	FALSE	FALSE
G52D	9/20/2021	Sulfate	83	FALSE	FALSE
G52D	9/20/2021	Fluoride	0.26	FALSE	FALSE
G52D	9/20/2021	Barium	0.232	FALSE	FALSE
G52D	9/20/2021	Boron	0.158	FALSE	TRUE
G52D	9/20/2021	Cobalt	0.0011	FALSE	FALSE
G52D	9/20/2021	Iron	0.537	TRUE	NA
G52D	9/20/2021	Manganese	3.71	TRUE	NA
G52D	9/20/2021	H+	0.000000513	FALSE	FALSE
G52D	3/10/2023	Alkalinity, bicarbonate	156	FALSE	FALSE
G52D	3/10/2023	Calcium	49.3	FALSE	FALSE
G52D	3/10/2023	Magnesium	15.3	FALSE	FALSE
G52D	3/10/2023	Sodium	27.7	FALSE	FALSE
G52D	3/10/2023	Potassium	0.768	FALSE	FALSE
G52D	3/10/2023	Chloride	12	FALSE	FALSE
G52D	3/10/2023	Sulfate	74	FALSE	FALSE
G52D	3/10/2023	Fluoride	0.22	FALSE	FALSE
G52D	3/10/2023	Barium	0.307	FALSE	FALSE
G52D	3/10/2023	Boron	0.0319	FALSE	FALSE
G52D	3/10/2023	Cobalt	0.0022	FALSE	FALSE
G52D	3/10/2023	Iron	0.639	TRUE	NA
G52D	3/10/2023	Manganese	3.71	TRUE	NA
G52D	3/10/2023	H+	0.000000288	FALSE	FALSE
G53D	3/25/2021	Alkalinity, bicarbonate	166	FALSE	FALSE
G53D	3/25/2021	Calcium	38.6	FALSE	FALSE
G53D	3/25/2021	Magnesium	15.7	FALSE	FALSE
G53D	3/25/2021	Sodium	50.8	FALSE	FALSE
G53D	3/25/2021	Potassium	0.278	FALSE	FALSE
G53D	3/25/2021	Chloride	19	FALSE	FALSE
G53D	3/25/2021	Sulfate	71	FALSE	FALSE
G53D	3/25/2021	Fluoride	0.71	FALSE	FALSE
G53D	3/25/2021	Barium	0.112	FALSE	FALSE
G53D	3/25/2021	Boron	0.355	FALSE	FALSE
G53D	3/25/2021	Cobalt	0.0026	FALSE	FALSE
G53D	3/25/2021	Iron	1.69	TRUE	NA

Attachment A.
ELECTRONIC PCA DATA
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JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G53D	3/25/2021	Manganese	0.0334	TRUE	NA
G53D	3/25/2021	H+	0.000000295	FALSE	FALSE
G53D	9/20/2021	Alkalinity, bicarbonate	171	FALSE	FALSE
G53D	9/20/2021	Calcium	38.5	FALSE	FALSE
G53D	9/20/2021	Magnesium	16.4	TRUE	NA
G53D	9/20/2021	Sodium	50.8	TRUE	NA
G53D	9/20/2021	Potassium	0.355	TRUE	NA
G53D	9/20/2021	Chloride	19	FALSE	FALSE
G53D	9/20/2021	Sulfate	78	FALSE	FALSE
G53D	9/20/2021	Fluoride	0.7	FALSE	FALSE
G53D	9/20/2021	Barium	0.103	FALSE	FALSE
G53D	9/20/2021	Boron	0.402	FALSE	FALSE
G53D	9/20/2021	Cobalt	0.0021	FALSE	FALSE
G53D	9/20/2021	Iron	1.69	TRUE	NA
G53D	9/20/2021	Manganese	0.0334	TRUE	NA
G53D	9/20/2021	H+	0.000000537	FALSE	FALSE
G53D	3/15/2022	Alkalinity, bicarbonate	176	FALSE	FALSE
G53D	3/15/2022	Calcium	38.1	FALSE	FALSE
G53D	3/15/2022	Magnesium	16.5	FALSE	FALSE
G53D	3/15/2022	Sodium	51.3	FALSE	FALSE
G53D	3/15/2022	Potassium	0.317	FALSE	FALSE
G53D	3/15/2022	Chloride	18	FALSE	FALSE
G53D	3/15/2022	Sulfate	74	FALSE	FALSE
G53D	3/15/2022	Fluoride	0.71	FALSE	FALSE
G53D	3/15/2022	Barium	0.0922	FALSE	FALSE
G53D	3/15/2022	Boron	0.332	FALSE	FALSE
G53D	3/15/2022	Cobalt	0.0022	FALSE	FALSE
G53D	3/15/2022	Iron	1.69	TRUE	NA
G53D	3/15/2022	Manganese	0.0334	TRUE	NA
G53D	3/15/2022	H+	0.000000316	FALSE	FALSE
G53D	7/25/2022	Alkalinity, bicarbonate	149	FALSE	FALSE
G53D	7/25/2022	Calcium	39.7	FALSE	FALSE
G53D	7/25/2022	Magnesium	17	FALSE	FALSE
G53D	7/25/2022	Sodium	49.4	FALSE	FALSE
G53D	7/25/2022	Potassium	0.3	FALSE	FALSE
G53D	7/25/2022	Chloride	19	FALSE	FALSE
G53D	7/25/2022	Sulfate	77	FALSE	FALSE
G53D	7/25/2022	Fluoride	0.72	FALSE	FALSE
G53D	7/25/2022	Barium	0.0913	FALSE	FALSE
G53D	7/25/2022	Boron	0.341	FALSE	FALSE
G53D	7/25/2022	Cobalt	0.0021	FALSE	FALSE
G53D	7/25/2022	Iron	0.281	FALSE	FALSE
G53D	7/25/2022	Manganese	0.137	FALSE	FALSE
G53D	7/25/2022	H+	1.32E-08	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
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JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
G53D	3/9/2023	Alkalinity, bicarbonate	177	FALSE	FALSE
G53D	3/9/2023	Calcium	38.3	FALSE	FALSE
G53D	3/9/2023	Magnesium	16.4	FALSE	FALSE
G53D	3/9/2023	Sodium	49.2	FALSE	FALSE
G53D	3/9/2023	Potassium	0.355	FALSE	FALSE
G53D	3/9/2023	Chloride	17	FALSE	FALSE
G53D	3/9/2023	Sulfate	72	FALSE	FALSE
G53D	3/9/2023	Fluoride	0.59	FALSE	FALSE
G53D	3/9/2023	Barium	0.101	FALSE	FALSE
G53D	3/9/2023	Boron	0.37	FALSE	FALSE
G53D	3/9/2023	Cobalt	0.0022	FALSE	FALSE
G53D	3/9/2023	Iron	2.25	TRUE	NA
G53D	3/9/2023	Manganese	0.0334	TRUE	NA
G53D	3/9/2023	H+	0.000000347	FALSE	FALSE
G54D	3/24/2021	Alkalinity, bicarbonate	214	FALSE	FALSE
G54D	3/24/2021	Calcium	78.1	FALSE	FALSE
G54D	3/24/2021	Magnesium	24.2	FALSE	FALSE
G54D	3/24/2021	Sodium	62.4	FALSE	FALSE
G54D	3/24/2021	Potassium	1.12	FALSE	FALSE
G54D	3/24/2021	Chloride	23	FALSE	FALSE
G54D	3/24/2021	Sulfate	186	FALSE	FALSE
G54D	3/24/2021	Fluoride	0.32	FALSE	FALSE
G54D	3/24/2021	Barium	0.0941	FALSE	FALSE
G54D	3/24/2021	Boron	0.404	FALSE	FALSE
G54D	3/24/2021	Cobalt	0.0045	FALSE	FALSE
G54D	3/24/2021	Iron	5.11	TRUE	NA
G54D	3/24/2021	Manganese	3.87	TRUE	NA
G54D	3/24/2021	H+	0.000000275	FALSE	FALSE
G54D	9/20/2021	Alkalinity, bicarbonate	207	FALSE	FALSE
G54D	9/20/2021	Calcium	72.8	FALSE	FALSE
G54D	9/20/2021	Magnesium	24.1	TRUE	NA
G54D	9/20/2021	Sodium	49.2	TRUE	NA
G54D	9/20/2021	Potassium	1.12	TRUE	NA
G54D	9/20/2021	Chloride	24	FALSE	FALSE
G54D	9/20/2021	Sulfate	175	FALSE	FALSE
G54D	9/20/2021	Fluoride	0.29	FALSE	FALSE
G54D	9/20/2021	Barium	0.0879	FALSE	FALSE
G54D	9/20/2021	Boron	0.35	FALSE	FALSE
G54D	9/20/2021	Cobalt	0.0083	FALSE	FALSE
G54D	9/20/2021	Iron	5.11	TRUE	NA
G54D	9/20/2021	Manganese	3.87	TRUE	NA
G54D	9/20/2021	H+	0.000000331	FALSE	FALSE
G54D	3/15/2022	Alkalinity, bicarbonate	208	FALSE	FALSE
G54D	3/15/2022	Calcium	83.4	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
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JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	**Date**	**Parameter**	**Result (mg/L)**	**Imputed Value**	**Half RL Used**
G54D	3/15/2022	Magnesium	25.8	FALSE	FALSE
G54D	3/15/2022	Sodium	54.2	FALSE	FALSE
G54D	3/15/2022	Potassium	1.21	FALSE	FALSE
G54D	3/15/2022	Chloride	21	FALSE	FALSE
G54D	3/15/2022	Sulfate	213	FALSE	FALSE
G54D	3/15/2022	Fluoride	0.31	FALSE	FALSE
G54D	3/15/2022	Barium	0.064	FALSE	FALSE
G54D	3/15/2022	Boron	0.451	FALSE	FALSE
G54D	3/15/2022	Cobalt	0.011	FALSE	FALSE
G54D	3/15/2022	Iron	5.11	TRUE	NA
G54D	3/15/2022	Manganese	3.87	TRUE	NA
G54D	3/15/2022	H+	0.000000245	FALSE	FALSE
G54D	9/20/2022	Alkalinity, bicarbonate	171	TRUE	NA
G54D	9/20/2022	Calcium	69.7	FALSE	FALSE
G54D	9/20/2022	Magnesium	19.4	TRUE	NA
G54D	9/20/2022	Sodium	49.2	TRUE	NA
G54D	9/20/2022	Potassium	0.355	TRUE	NA
G54D	9/20/2022	Chloride	22	FALSE	FALSE
G54D	9/20/2022	Sulfate	218	FALSE	FALSE
G54D	9/20/2022	Fluoride	0.27	FALSE	FALSE
G54D	9/20/2022	Barium	0.0768	FALSE	FALSE
G54D	9/20/2022	Boron	0.252	FALSE	FALSE
G54D	9/20/2022	Cobalt	0.0048	FALSE	FALSE
G54D	9/20/2022	Iron	5.11	TRUE	NA
G54D	9/20/2022	Manganese	3.87	TRUE	NA
G54D	9/20/2022	H+	0.000000316	FALSE	FALSE
G54D	5/3/2023	Alkalinity, bicarbonate	206	FALSE	FALSE
G54D	5/3/2023	Calcium	81.5	FALSE	FALSE
G54D	5/3/2023	Magnesium	26.4	FALSE	FALSE
G54D	5/3/2023	Sodium	57	FALSE	FALSE
G54D	5/3/2023	Potassium	1.21	FALSE	FALSE
G54D	5/3/2023	Chloride	22	FALSE	FALSE
G54D	5/3/2023	Sulfate	194	FALSE	FALSE
G54D	5/3/2023	Fluoride	0.3	FALSE	FALSE
G54D	5/3/2023	Barium	0.0794	FALSE	FALSE
G54D	5/3/2023	Boron	0.555	FALSE	FALSE
G54D	5/3/2023	Cobalt	0.0106	FALSE	FALSE
G54D	5/3/2023	Iron	1.39	FALSE	FALSE
G54D	5/3/2023	Manganese	1.19	FALSE	FALSE
G54D	5/3/2023	H+	0.000000158	FALSE	FALSE
XPW01	3/5/2021	Alkalinity, bicarbonate	155	FALSE	FALSE
XPW01	3/5/2021	Calcium	162	FALSE	FALSE
XPW01	3/5/2021	Magnesium	2.25	FALSE	FALSE
XPW01	3/5/2021	Sodium	35.5	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
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JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW01	3/5/2021	Potassium	31.1	FALSE	FALSE
XPW01	3/5/2021	Chloride	10	FALSE	FALSE
XPW01	3/5/2021	Sulfate	345	FALSE	FALSE
XPW01	3/5/2021	Fluoride	0.67	FALSE	FALSE
XPW01	3/5/2021	Barium	0.165	FALSE	FALSE
XPW01	3/5/2021	Boron	10.4	FALSE	FALSE
XPW01	3/5/2021	Cobalt	0.0316	FALSE	TRUE
XPW01	3/5/2021	Iron	2.18	FALSE	FALSE
XPW01	3/5/2021	Manganese	1.24	FALSE	FALSE
XPW01	3/5/2021	H+	0.00000001	FALSE	FALSE
XPW01	3/24/2021	Alkalinity, bicarbonate	141	FALSE	FALSE
XPW01	3/24/2021	Calcium	158	FALSE	FALSE
XPW01	3/24/2021	Magnesium	1.7	FALSE	FALSE
XPW01	3/24/2021	Sodium	37.2	FALSE	FALSE
XPW01	3/24/2021	Potassium	38.1	FALSE	FALSE
XPW01	3/24/2021	Chloride	9	FALSE	FALSE
XPW01	3/24/2021	Sulfate	355	FALSE	FALSE
XPW01	3/24/2021	Fluoride	0.55	FALSE	FALSE
XPW01	3/24/2021	Barium	0.161	FALSE	FALSE
XPW01	3/24/2021	Boron	9.58	FALSE	FALSE
XPW01	3/24/2021	Cobalt	0.0316	FALSE	TRUE
XPW01	3/24/2021	Iron	1.18	FALSE	FALSE
XPW01	3/24/2021	Manganese	0.59	FALSE	FALSE
XPW01	3/24/2021	H+	3.98E-09	FALSE	FALSE
XPW01	4/14/2021	Alkalinity, bicarbonate	136	FALSE	FALSE
XPW01	4/14/2021	Calcium	156	FALSE	FALSE
XPW01	4/14/2021	Magnesium	1.28	FALSE	FALSE
XPW01	4/14/2021	Sodium	28.3	FALSE	FALSE
XPW01	4/14/2021	Potassium	34.7	FALSE	FALSE
XPW01	4/14/2021	Chloride	7	FALSE	FALSE
XPW01	4/14/2021	Sulfate	355	FALSE	FALSE
XPW01	4/14/2021	Fluoride	0.57	FALSE	FALSE
XPW01	4/14/2021	Barium	0.154	FALSE	FALSE
XPW01	4/14/2021	Boron	9.42	FALSE	FALSE
XPW01	4/14/2021	Cobalt	0.0316	FALSE	TRUE
XPW01	4/14/2021	Iron	1.36	FALSE	FALSE
XPW01	4/14/2021	Manganese	0.725	FALSE	FALSE
XPW01	4/14/2021	H+	6.31E-09	FALSE	FALSE
XPW01	5/12/2021	Alkalinity, bicarbonate	145	FALSE	FALSE
XPW01	5/12/2021	Calcium	166	FALSE	FALSE
XPW01	5/12/2021	Magnesium	1.31	FALSE	FALSE
XPW01	5/12/2021	Sodium	29.3	FALSE	FALSE
XPW01	5/12/2021	Potassium	36.9	FALSE	FALSE
XPW01	5/12/2021	Chloride	6	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
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JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW01	5/12/2021	Sulfate	309	FALSE	FALSE
XPW01	5/12/2021	Fluoride	0.62	FALSE	FALSE
XPW01	5/12/2021	Barium	0.162	FALSE	FALSE
XPW01	5/12/2021	Boron	10.2	FALSE	FALSE
XPW01	5/12/2021	Cobalt	0.0316	FALSE	TRUE
XPW01	5/12/2021	Iron	1.98	FALSE	FALSE
XPW01	5/12/2021	Manganese	1.09	FALSE	FALSE
XPW01	5/12/2021	H+	3.98E-09	FALSE	FALSE
XPW01	3/15/2022	Alkalinity, bicarbonate	104	FALSE	FALSE
XPW01	3/15/2022	Calcium	159	FALSE	FALSE
XPW01	3/15/2022	Magnesium	0.443	FALSE	FALSE
XPW01	3/15/2022	Sodium	27.4	FALSE	FALSE
XPW01	3/15/2022	Potassium	36.9	FALSE	FALSE
XPW01	3/15/2022	Chloride	5	FALSE	FALSE
XPW01	3/15/2022	Sulfate	360	FALSE	FALSE
XPW01	3/15/2022	Fluoride	0.25	FALSE	FALSE
XPW01	3/15/2022	Barium	0.113	FALSE	FALSE
XPW01	3/15/2022	Boron	10.4	FALSE	FALSE
XPW01	3/15/2022	Cobalt	0.0316	FALSE	TRUE
XPW01	3/15/2022	Iron	1.36	TRUE	NA
XPW01	3/15/2022	Manganese	0.725	TRUE	NA
XPW01	3/15/2022	H+	4.68E-09	FALSE	FALSE
XPW01	3/8/2023	Alkalinity, bicarbonate	64	FALSE	FALSE
XPW01	3/8/2023	Calcium	164	FALSE	FALSE
XPW01	3/8/2023	Magnesium	0.254	FALSE	FALSE
XPW01	3/8/2023	Sodium	27.2	FALSE	FALSE
XPW01	3/8/2023	Potassium	37.2	FALSE	FALSE
XPW01	3/8/2023	Chloride	11	FALSE	FALSE
XPW01	3/8/2023	Sulfate	414	FALSE	FALSE
XPW01	3/8/2023	Fluoride	0.16	FALSE	FALSE
XPW01	3/8/2023	Barium	0.128	FALSE	FALSE
XPW01	3/8/2023	Boron	8.79	FALSE	FALSE
XPW01	3/8/2023	Cobalt	0.0002	FALSE	FALSE
XPW01	3/8/2023	Iron	1.36	TRUE	NA
XPW01	3/8/2023	Manganese	0.725	TRUE	NA
XPW01	3/8/2023	H+	3.39E-09	FALSE	FALSE
XPW01	5/3/2023	Alkalinity, bicarbonate	130	FALSE	FALSE
XPW01	5/3/2023	Calcium	151	FALSE	FALSE
XPW01	5/3/2023	Magnesium	0.405	FALSE	FALSE
XPW01	5/3/2023	Sodium	27	FALSE	FALSE
XPW01	5/3/2023	Potassium	38.5	FALSE	FALSE
XPW01	5/3/2023	Chloride	14	FALSE	FALSE
XPW01	5/3/2023	Sulfate	345	FALSE	FALSE
XPW01	5/3/2023	Fluoride	0.34	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
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JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW01	5/3/2023	Barium	0.137	FALSE	FALSE
XPW01	5/3/2023	Boron	10.6	FALSE	FALSE
XPW01	5/3/2023	Cobalt	0.0002	FALSE	FALSE
XPW01	5/3/2023	Iron	1	FALSE	FALSE
XPW01	5/3/2023	Manganese	0.544	FALSE	FALSE
XPW01	5/3/2023	H+	3.89E-09	FALSE	FALSE
XPW02	3/4/2021	Alkalinity, bicarbonate	121	FALSE	FALSE
XPW02	3/4/2021	Calcium	591	FALSE	FALSE
XPW02	3/4/2021	Magnesium	10.9	FALSE	FALSE
XPW02	3/4/2021	Sodium	888	FALSE	FALSE
XPW02	3/4/2021	Potassium	23.4	FALSE	FALSE
XPW02	3/4/2021	Chloride	130	FALSE	FALSE
XPW02	3/4/2021	Sulfate	2380	FALSE	FALSE
XPW02	3/4/2021	Fluoride	0.42	FALSE	FALSE
XPW02	3/4/2021	Barium	0.0342	FALSE	FALSE
XPW02	3/4/2021	Boron	12.1	FALSE	FALSE
XPW02	3/4/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	3/4/2021	Iron	1.63	FALSE	FALSE
XPW02	3/4/2021	Manganese	0.47	FALSE	FALSE
XPW02	3/4/2021	H+	0.00000001	FALSE	FALSE
XPW02	3/24/2021	Alkalinity, bicarbonate	128	FALSE	FALSE
XPW02	3/24/2021	Calcium	484	FALSE	FALSE
XPW02	3/24/2021	Magnesium	11.3	FALSE	FALSE
XPW02	3/24/2021	Sodium	798	FALSE	FALSE
XPW02	3/24/2021	Potassium	26.3	FALSE	FALSE
XPW02	3/24/2021	Chloride	176	FALSE	FALSE
XPW02	3/24/2021	Sulfate	2830	FALSE	FALSE
XPW02	3/24/2021	Fluoride	0.45	FALSE	FALSE
XPW02	3/24/2021	Barium	0.0271	FALSE	FALSE
XPW02	3/24/2021	Boron	12.2	FALSE	FALSE
XPW02	3/24/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	3/24/2021	Iron	1.25	FALSE	FALSE
XPW02	3/24/2021	Manganese	0.499	FALSE	FALSE
XPW02	3/24/2021	H+	0.00000001	FALSE	FALSE
XPW02	4/14/2021	Alkalinity, bicarbonate	128	FALSE	FALSE
XPW02	4/14/2021	Calcium	551	FALSE	FALSE
XPW02	4/14/2021	Magnesium	11.3	FALSE	FALSE
XPW02	4/14/2021	Sodium	705	FALSE	FALSE
XPW02	4/14/2021	Potassium	25.3	FALSE	FALSE
XPW02	4/14/2021	Chloride	110	FALSE	FALSE
XPW02	4/14/2021	Sulfate	2410	FALSE	FALSE
XPW02	4/14/2021	Fluoride	0.44	FALSE	FALSE
XPW02	4/14/2021	Barium	0.0283	FALSE	FALSE
XPW02	4/14/2021	Boron	11.5	FALSE	FALSE

Attachment A.
ELECTRONIC PCA DATA
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JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW02	4/14/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	4/14/2021	Iron	1.69	FALSE	FALSE
XPW02	4/14/2021	Manganese	0.583	FALSE	FALSE
XPW02	4/14/2021	H+	1.26E-08	FALSE	FALSE
XPW02	5/12/2021	Alkalinity, bicarbonate	123	FALSE	FALSE
XPW02	5/12/2021	Calcium	495	FALSE	FALSE
XPW02	5/12/2021	Magnesium	11.8	FALSE	FALSE
XPW02	5/12/2021	Sodium	641	FALSE	FALSE
XPW02	5/12/2021	Potassium	24.5	FALSE	FALSE
XPW02	5/12/2021	Chloride	134	FALSE	FALSE
XPW02	5/12/2021	Sulfate	2410	FALSE	FALSE
XPW02	5/12/2021	Fluoride	0.41	FALSE	FALSE
XPW02	5/12/2021	Barium	0.0287	FALSE	FALSE
XPW02	5/12/2021	Boron	10.8	FALSE	FALSE
XPW02	5/12/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	5/12/2021	Iron	2.15	FALSE	FALSE
XPW02	5/12/2021	Manganese	0.632	FALSE	FALSE
XPW02	5/12/2021	H+	1.41E-08	FALSE	FALSE
XPW02	7/21/2021	Alkalinity, bicarbonate	139	FALSE	FALSE
XPW02	7/21/2021	Calcium	494	FALSE	FALSE
XPW02	7/21/2021	Magnesium	11.1	FALSE	FALSE
XPW02	7/21/2021	Sodium	762	FALSE	FALSE
XPW02	7/21/2021	Potassium	24.7	FALSE	FALSE
XPW02	7/21/2021	Chloride	179	FALSE	FALSE
XPW02	7/21/2021	Sulfate	2330	FALSE	FALSE
XPW02	7/21/2021	Fluoride	0.4	FALSE	FALSE
XPW02	7/21/2021	Barium	0.0226	FALSE	FALSE
XPW02	7/21/2021	Boron	12	FALSE	FALSE
XPW02	7/21/2021	Cobalt	0.0316	FALSE	TRUE
XPW02	7/21/2021	Iron	2.7	FALSE	FALSE
XPW02	7/21/2021	Manganese	0.744	FALSE	FALSE
XPW02	7/21/2021	H+	1.74E-08	FALSE	FALSE
XPW02	3/15/2022	Alkalinity, bicarbonate	144	FALSE	FALSE
XPW02	3/15/2022	Calcium	483	FALSE	FALSE
XPW02	3/15/2022	Magnesium	10.7	FALSE	FALSE
XPW02	3/15/2022	Sodium	828	FALSE	FALSE
XPW02	3/15/2022	Potassium	27.1	FALSE	FALSE
XPW02	3/15/2022	Chloride	115	FALSE	FALSE
XPW02	3/15/2022	Sulfate	2590	FALSE	FALSE
XPW02	3/15/2022	Fluoride	0.48	FALSE	FALSE
XPW02	3/15/2022	Barium	0.023	FALSE	FALSE
XPW02	3/15/2022	Boron	16	FALSE	FALSE
XPW02	3/15/2022	Cobalt	0.0316	FALSE	TRUE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW02	3/15/2022	Iron	1.69	TRUE	NA
XPW02	3/15/2022	Manganese	0.583	TRUE	NA
XPW02	3/15/2022	H+	1.82E-08	FALSE	FALSE
XPW02	5/3/2023	Alkalinity, bicarbonate	139	FALSE	FALSE
XPW02	5/3/2023	Calcium	451	FALSE	FALSE
XPW02	5/3/2023	Magnesium	12.3	FALSE	FALSE
XPW02	5/3/2023	Sodium	953	FALSE	FALSE
XPW02	5/3/2023	Potassium	27.4	FALSE	FALSE
XPW02	5/3/2023	Chloride	104	FALSE	FALSE
XPW02	5/3/2023	Sulfate	2650	FALSE	FALSE
XPW02	5/3/2023	Fluoride	0.48	FALSE	FALSE
XPW02	5/3/2023	Barium	0.0212	FALSE	FALSE
XPW02	5/3/2023	Boron	13.4	FALSE	FALSE
XPW02	5/3/2023	Cobalt	0.0002	FALSE	FALSE
XPW02	5/3/2023	Iron	3.49	FALSE	FALSE
XPW02	5/3/2023	Manganese	0.748	FALSE	FALSE
XPW02	5/3/2023	H+	1.91E-08	FALSE	FALSE
XPW03	5/12/2021	Alkalinity, bicarbonate	141	TRUE	FALSE
XPW03	5/12/2021	Calcium	16.4	FALSE	FALSE
XPW03	5/12/2021	Magnesium	0.316	FALSE	TRUE
XPW03	5/12/2021	Sodium	113	FALSE	FALSE
XPW03	5/12/2021	Potassium	27.5	FALSE	FALSE
XPW03	5/12/2021	Chloride	25	FALSE	FALSE
XPW03	5/12/2021	Sulfate	155	FALSE	FALSE
XPW03	5/12/2021	Fluoride	0.25	FALSE	FALSE
XPW03	5/12/2021	Barium	0.012	FALSE	FALSE
XPW03	5/12/2021	Boron	11.7	FALSE	FALSE
XPW03	5/12/2021	Cobalt	0.0316	FALSE	TRUE
XPW03	5/12/2021	Iron	0.316	FALSE	TRUE
XPW03	5/12/2021	Manganese	0.0707	FALSE	TRUE
XPW03	5/12/2021	H+	2E-11	FALSE	FALSE
XPW03	7/21/2021	Alkalinity, bicarbonate	141	TRUE	FALSE
XPW03	7/21/2021	Calcium	15.3	FALSE	FALSE
XPW03	7/21/2021	Magnesium	0.224	FALSE	TRUE
XPW03	7/21/2021	Sodium	104	FALSE	FALSE
XPW03	7/21/2021	Potassium	26.9	FALSE	FALSE
XPW03	7/21/2021	Chloride	26	FALSE	FALSE
XPW03	7/21/2021	Sulfate	148	FALSE	FALSE
XPW03	7/21/2021	Fluoride	0.26	FALSE	FALSE
XPW03	7/21/2021	Barium	0.0114	FALSE	FALSE
XPW03	7/21/2021	Boron	11.6	FALSE	FALSE
XPW03	7/21/2021	Cobalt	0.0316	FALSE	TRUE
XPW03	7/21/2021	Iron	0.158	FALSE	TRUE
XPW03	7/21/2021	Manganese	0.0447	FALSE	TRUE

Attachment A.
ELECTRONIC PCA DATA
35 I.A.C. § 845: ALTERNATIVE SOURCE DEMONSTRATION
JOPPA POWER PLANT
EAST ASH POND
JOPPA, IL

Well ID	Date	Parameter	Result (mg/L)	Imputed Value	Half RL Used
XPW03	7/21/2021	H+	1.07E-10	FALSE	FALSE

Note:
mg/L = milligrams per liter
RL = reporting limit

APPENDIX C
SUPPORTING GROUNDWATER AND POREWATER ANALYTICAL DATA

Well ID	Well Type	Date	Parameter	Result	Unit
G03	Compliance	06/15/2021	Cobalt, total	0.001 U	mg/L
G03	Compliance	07/06/2021	Cobalt, total	0.001 U	mg/L
G03	Compliance	07/21/2021	Cobalt, total	0.001 U	mg/L
G03	Compliance	06/15/2021	Manganese, total	0.0330	mg/L
G03	Compliance	07/06/2021	Manganese, total	0.0226	mg/L
G03	Compliance	07/21/2021	Manganese, total	0.0334	mg/L
G05	Compliance	03/04/2021	Boron, total	0.181	mg/L
G05	Compliance	03/24/2021	Boron, total	0.195	mg/L
G05	Compliance	04/13/2021	Boron, total	0.190	mg/L
G05	Compliance	05/11/2021	Boron, total	0.158	mg/L
G05	Compliance	06/01/2021	Boron, total	0.157	mg/L
G05	Compliance	06/15/2021	Boron, total	0.140	mg/L
G05	Compliance	07/06/2021	Boron, total	0.148	mg/L
G05	Compliance	07/20/2021	Boron, total	0.131	mg/L
G05	Compliance	07/26/2022	Boron, total	0.0645	mg/L
G05	Compliance	03/09/2023	Boron, total	0.0541	mg/L
G05	Compliance	05/03/2023	Boron, total	0.0478	mg/L
G05	Compliance	03/04/2021	Cobalt, total	0.0101	mg/L
G05	Compliance	03/24/2021	Cobalt, total	0.00960	mg/L
G05	Compliance	04/13/2021	Cobalt, total	0.00950	mg/L
G05	Compliance	05/11/2021	Cobalt, total	0.00870	mg/L
G05	Compliance	06/01/2021	Cobalt, total	0.00780	mg/L
G05	Compliance	06/15/2021	Cobalt, total	0.00570	mg/L
G05	Compliance	07/06/2021	Cobalt, total	0.00910	mg/L
G05	Compliance	07/20/2021	Cobalt, total	0.00590	mg/L
G05	Compliance	07/26/2022	Cobalt, total	0.00750	mg/L
G05	Compliance	03/09/2023	Cobalt, total	0.00740	mg/L
G05	Compliance	05/03/2023	Cobalt, total	0.0103	mg/L
G05	Compliance	03/04/2021	Manganese, total	0.227	mg/L
G05	Compliance	04/13/2021	Manganese, total	0.294	mg/L
G05	Compliance	05/11/2021	Manganese, total	0.256	mg/L
G05	Compliance	06/01/2021	Manganese, total	0.254	mg/L
G05	Compliance	06/15/2021	Manganese, total	0.187	mg/L
G05	Compliance	07/06/2021	Manganese, total	0.270	mg/L
G05	Compliance	07/20/2021	Manganese, total	0.204	mg/L
G05	Compliance	07/26/2022	Manganese, total	0.176	mg/L
G05	Compliance	05/03/2023	Manganese, total	0.191	mg/L
G05	Compliance	03/04/2021	Sulfate, total	94.0	mg/L
G05	Compliance	03/24/2021	Sulfate, total	92.0	mg/L
G05	Compliance	04/13/2021	Sulfate, total	95.0	mg/L
G05	Compliance	05/11/2021	Sulfate, total	109	mg/L
G05	Compliance	06/01/2021	Sulfate, total	83.0	mg/L
G05	Compliance	06/15/2021	Sulfate, total	91.0	mg/L
G05	Compliance	07/06/2021	Sulfate, total	90.0	mg/L
G05	Compliance	07/20/2021	Sulfate, total	87.0	mg/L
G05	Compliance	07/26/2022	Sulfate, total	68.0	mg/L

Well ID	Well Type	Date	Parameter	Result	Unit
G05	Compliance	03/09/2023	Sulfate, total	90.0	mg/L
G05	Compliance	05/03/2023	Sulfate, total	112	mg/L
G53D	Compliance	07/25/2022	Cobalt, total	0.00210	mg/L
G53D	Compliance	05/03/2023	Cobalt, total	0.00180	mg/L
G53D	Compliance	07/25/2022	Manganese, total	0.137	mg/L
G53D	Compliance	05/03/2023	Manganese, total	0.133	mg/L
XPW01	Porewater	03/05/2021	Boron, total	10.4	mg/L
XPW01	Porewater	03/24/2021	Boron, total	9.58	mg/L
XPW01	Porewater	04/14/2021	Boron, total	9.42	mg/L
XPW01	Porewater	05/12/2021	Boron, total	10.2	mg/L
XPW01	Porewater	07/21/2021	Boron, total	10.1	mg/L
XPW01	Porewater	03/15/2022	Boron, total	10.4	mg/L
XPW01	Porewater	03/08/2023	Boron, total	8.79	mg/L
XPW01	Porewater	05/03/2023	Boron, total	10.6	mg/L
XPW01	Porewater	03/05/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	03/24/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	04/14/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	05/12/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	07/21/2021	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	03/15/2022	Cobalt, total	0.001 U	mg/L
XPW01	Porewater	03/08/2023	Cobalt, total	0.0002 J	mg/L
XPW01	Porewater	05/03/2023	Cobalt, total	0.0002 J	mg/L
XPW01	Porewater	03/05/2021	Sulfate, total	345	mg/L
XPW01	Porewater	03/24/2021	Sulfate, total	355	mg/L
XPW01	Porewater	04/14/2021	Sulfate, total	355	mg/L
XPW01	Porewater	05/12/2021	Sulfate, total	309	mg/L
XPW01	Porewater	07/21/2021	Sulfate, total	328	mg/L
XPW01	Porewater	03/15/2022	Sulfate, total	360	mg/L
XPW01	Porewater	03/08/2023	Sulfate, total	414	mg/L
XPW01	Porewater	05/03/2023	Sulfate, total	345	mg/L
XPW02	Porewater	03/04/2021	Boron, total	12.1	mg/L
XPW02	Porewater	03/24/2021	Boron, total	12.2	mg/L
XPW02	Porewater	04/14/2021	Boron, total	11.5	mg/L
XPW02	Porewater	05/12/2021	Boron, total	10.8	mg/L
XPW02	Porewater	07/21/2021	Boron, total	12.0	mg/L
XPW02	Porewater	03/15/2022	Boron, total	16.0	mg/L
XPW02	Porewater	03/08/2023	Boron, total	10.8	mg/L
XPW02	Porewater	05/03/2023	Boron, total	13.4	mg/L
XPW02	Porewater	03/04/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	03/24/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	04/14/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	05/12/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	07/21/2021	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	03/15/2022	Cobalt, total	0.001 U	mg/L
XPW02	Porewater	03/08/2023	Cobalt, total	0.0003 J	mg/L
XPW02	Porewater	05/03/2023	Cobalt, total	0.0002 J	mg/L

Well ID	Well Type	Date	Parameter	Result	Unit
XPW02	Porewater	03/04/2021	Sulfate, total	2,380	mg/L
XPW02	Porewater	03/24/2021	Sulfate, total	2,830	mg/L
XPW02	Porewater	04/14/2021	Sulfate, total	2,410	mg/L
XPW02	Porewater	05/12/2021	Sulfate, total	2,410	mg/L
XPW02	Porewater	07/21/2021	Sulfate, total	2,330	mg/L
XPW02	Porewater	03/15/2022	Sulfate, total	2,590	mg/L
XPW02	Porewater	03/08/2023	Sulfate, total	2,450	mg/L
XPW02	Porewater	05/03/2023	Sulfate, total	2,650	mg/L
XPW03	Porewater	03/04/2021	Boron, total	12.2	mg/L
XPW03	Porewater	03/24/2021	Boron, total	11.6	mg/L
XPW03	Porewater	04/14/2021	Boron, total	9.30	mg/L
XPW03	Porewater	05/12/2021	Boron, total	11.7	mg/L
XPW03	Porewater	07/21/2021	Boron, total	11.6	mg/L
XPW03	Porewater	03/15/2022	Boron, total	11.1	mg/L
XPW03	Porewater	03/09/2023	Boron, total	8.06	mg/L
XPW03	Porewater	05/03/2023	Boron, total	9.22	mg/L
XPW03	Porewater	03/04/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	03/24/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	04/14/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	05/12/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	07/21/2021	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	03/15/2022	Cobalt, total	0.001 U	mg/L
XPW03	Porewater	03/09/2023	Cobalt, total	0.0001 U	mg/L
XPW03	Porewater	05/03/2023	Cobalt, total	0.0001 U	mg/L
XPW03	Porewater	03/04/2021	Sulfate, total	133	mg/L
XPW03	Porewater	03/24/2021	Sulfate, total	138	mg/L
XPW03	Porewater	04/14/2021	Sulfate, total	152	mg/L
XPW03	Porewater	05/12/2021	Sulfate, total	155	mg/L
XPW03	Porewater	07/21/2021	Sulfate, total	148	mg/L
XPW03	Porewater	03/15/2022	Sulfate, total	152	mg/L
XPW03	Porewater	03/09/2023	Sulfate, total	142	mg/L
XPW03	Porewater	05/03/2023	Sulfate, total	144	mg/L

Notes:
mg/L = milligrams per liter
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the level of the adjusted detection limit or quantitation limit, as appropriate.

APPENDIX D
GEOCHEMICAL ANALYSIS OF JOPPA EAST ASH POND GROUNDWATER IN SUPPORT OF AN ALTERNATIVE SOURCE DEMONSTRATION (LIFE CYCLE GEO, LLC, 2023)

TECHNICAL MEMORANDUM

DATE October 21, 2023 **Reference No.** 23RAM01-1

TO Brian G. Hennings – Ramboll
Frances Ackerman – Ramboll
Allison Kreinberg - Geosyntec

CC Stu Cravens - Vistra

FROM Shannon Zahuranec, Allie Wyman, Tom Meuzelaar **EMAIL:** shannon@lifecyclegeo.com

GEOCHEMICAL ANALYSIS OF JOPPA EAST ASH POND GROUNDWATER IN SUPPORT OF AN ALTERNATIVE SOURCE DEMONSTRATION

1.0 EXECUTIVE SUMMARY

This document serves as an Appendix to the October 21, 2023, Alternative Source Demonstration (ASD) for Joppa (JOP) Power Plant East Ash Pond (EAP) for monitoring Event 1 (E001) (referred to as the E001 ASD), completed to fulfill the requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.650(e). Life Cycle Geo, LLC (LCG) has completed a review of geochemical conditions to evaluate the feasibility of an ASD at monitoring wells G11 and G51D associated with the JOP EAP. Compliance wells G11 and G51D monitor conditions in the Uppermost Aquifer (UA) to the west of the EAP and currently exhibit pH levels lower than the groundwater protection standard (GWPS) range for pH. This technical evaluation considered all available groundwater and solid-phase chemical analyses and utilized multivariate statistical analysis to conclude that low pH levels at G11 and G51D are not attributed to influence from the EAP. Further, observed pH levels are likely the result of the oxidation of dissolved iron released from chemically reducing conditions in the upgradient area to the north and west of the G11 and G51D monitoring wells (also referred to in this document as exceedance wells). Oxidation of dissolved ferrous iron and subsequent precipitation of solid-phase iron generates acidity through fundamentally established geochemical reactions discussed in Section 4.0. This scope of work was executed by subcontract to Ramboll Americas Engineering Solutions, Inc. (Ramboll) on behalf of Electric Energy, Inc.

2.0 HYDROGEOLOGY AND GROUNDWATER CONDITION

Monitoring wells G11 and G51D are screened in the UA. The UA is composed predominantly of sand and is overlain by the upper confining unit (UCU), a clay-rich, low permeability stratigraphic unit (Ramboll, 2021). Monitoring wells G11 and G51D are on the western border of the EAP, hydraulically upgradient of the EAP and the other EAP monitoring wells (Attachment 1). Monitoring wells G11 and G51D are downgradient of the northernmost part of the JOP West Ash Pond (WAP), and the sewage treatment pond (Attachment 2) situated on the northwest corner of the WAP.

Table 1: Concentration Ranges for Select Constituents in Joppa Groundwater and CCR Ponds.

	pH	Boron (mg/L)	Magnesium (mg/L)
G11	5.78-6.33	0.25-0.42	27.8-72.4
G51D	5.30-6.92	0.03-0.96	12.3-14.4
CCR porewater	6.76-11.1	4.02-34.3	ND-27.8
Western Groundwater*	5.04-7.4	ND-24.7	4.0-126
Eastern Groundwater	5.62-7.88	ND-5.43	7.1-49.3
TPZ120	2.77-3.63	2.08-3.55	52.4-63.5

ND=Not Detected
Data provided in Appendix D-1
*Western groundwater ranges presented do not include TPZ120, which is listed separately.

From March 2021 through May 2023, pH at G11 and G51D is generally below the GWPS lower limit of 6.0 standard pH units (SU) (Attachment 3). Groundwater pH elsewhere at the site has been measured as low as 5.0 SU (Table 1) but is typically between 6 and 8 SU (Attachment 3; Appendix D-1). The UCU monitoring well TPZ120 is an exception with a much lower groundwater pH (less than 4.0 SU).

This analysis focused predominantly on assessing the source of acidity in G11 and G51D as originating from either east or west of the exceedance wells to determine if the EAP (east of the exceedance wells) is the source of the low pH levels observed. To this end, monitoring wells to the east of the exceedance wells are discussed as the Eastern Wells and the monitoring wells to the west are discussed as the Western Wells. The Eastern Wells include the EAP porewater wells [XPW01, XPW02, and XPW03] as an endmember for evaluation, EAP compliance-based groundwater wells [G03, G05, G06, G07, G08, G09, G10, G52D, G53D, and G54D], and two EAP monitoring wells [G04 and G06S] that are not included in the regulatory network but are in close proximity to the compliance EAP monitoring wells. While most of these wells are downgradient of G11 and G51D, they provide a necessary comparison for assessing potential EAP impacts to G11 and G51D. The Western Wells are hydraulically upgradient or side-gradient of G11 and G51D and are used to evaluate potential alternate sources for the pH exceedances originating to the west. Western Wells included in this analysis are installed in the UA [TPZ118D, TPZ118DD, TPZ119D, TPZ119DD, TPZ120D, TPZ123, and TPZ124D] and UCU [TPZ118, TPZ120, and TPZ124], as well as the WAP porewater wells [XTPW01, XTPW02, XTPW03, and XTPW04]. The upgradient background wells G01D and G02D are assessed as the upgradient endmember reflective of groundwater uninfluenced by activity at the JOP site. This selection of Eastern and Western wells provides the best analysis of geochemical conditions and potential sources in the immediate area of G11 and G51D. Potential sources of acidity (which could drive the observed low pH levels at G11 and G51D) are assessed through comprehensive geochemical analysis, including time series analysis, correlation plots (scatterplot comparisons), Principal Components Analysis (PCA), and spatial and chemical distribution of iron.

3.0 GEOCHEMICAL ANALYSIS

3.1 CCR INDICATOR CONSTITUENT BORON

Boron is commonly used as an indicator parameter for contaminant transport of CCR because: (i) it is commonly present at elevated concentrations in coal ash leachate; (ii) it is mobile and typically not very

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reactive but conservative (i.e., low rates of sorption or degradation) in groundwater; and (iii) it is less likely than other constituents to be present at elevated concentrations in background groundwater from natural or other anthropogenic sources. Boron is often assessed in groundwater to identify possible end-member sources of influence in downgradient areas that could be attributed to CCR. Porewater samples collected from both the EAP and WAP exhibit elevated concentrations of boron, whereas boron concentrations in monitoring wells G11 and G51D are low relative to CCR porewater and most groundwater monitoring wells located both to the east and west (Attachment 3). While boron concentrations suggest no immediate influence from either of the CCR units, it is not otherwise relied upon for distinguishing influence as originating from either the east (i.e., EAP) or west.

3.2 OTHER PERTINENT CHEMICAL TRACERS OF INFLUENCE

Magnesium is not commonly used as a CCR indicator, yet the substantial range in magnesium concentrations observed in groundwater to the west relative to east makes it a particularly useful tracer of influence (Attachment 3). Table 1 presents the range in magnesium measured for several different endmember components assessed for influence in relation to exceedance wells G11 and G51D.

Magnesium concentrations are notably elevated in several of the western groundwater monitoring wells, both within the UA and UCU stratigraphic units. Magnesium concentrations in G11 are similarly elevated when contrasted with groundwater concentrations measured to the east. Concentrations of magnesium at G51D are more similar to background (i.e., overall low). While some Eastern Wells do exhibit magnesium concentrations above background, the range is substantially lower than G11 and the Western Wells overall. The low magnesium concentrations observed in background groundwater, eastern groundwater, and CCR porewater lead in the direction of the western groundwater as a source of high magnesium to, and therefore a dominant influence on, the exceedance wells (G11 in particular).

A strong linear relationship is observed between sulfate and magnesium in groundwater (Attachment 4; Appendix D-1), except TPZ120, which appears as an outlier for the JOP groundwater. The linear relationship between magnesium and sulfate is observed in both western and eastern groundwaters, though the magnitude of measured concentrations in the Western Wells extends beyond that of the Eastern Wells, as discussed in the previous paragraph. Concentrations from monitoring well G11 plot among the Western Wells and are distinctly separate from Eastern Wells. Furthermore, the G11 magnesium-sulfate relationship is similar to Western UCU wells. This data suggests that G11 groundwater chemistry is more similar to western groundwater chemistry than eastern groundwater chemistry. Conditions at G51D are suspected to be under the same influence from the western groundwater chemistry, but are simultaneously influenced from upgradient background groundwater, discussed further in Section 4.0. This mixing of groundwaters produces a lower magnesium concentration in G51D relative to G11.

3.3 MULTIVARIATE DATA ANALYSIS

3.3.1 METHOD

Groundwater chemistry data are by nature multivariate datasets given the high number of parameters observed per sampling location and within a given timeframe. With such a large number of variables, advanced statistical analysis of multivariate groundwater data can provide important insights into spatial,

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temporal, and chemical relationships influencing constituent distribution and compliance in groundwater. The multivariate technique Principal Component Analysis (PCA) is used to interrogate the groundwater chemistry around the exceedance wells.

PCA is a multivariate technique that reduces dataset dimensionality to its principal, independent components thereby revealing the inner structure of the dataset. Multivariate techniques such as PCA are valuable because they identify variables that are highly dependent on each other but do not inherently provide insights into water origin, type, or evolution. Reducing multivariate data dimensionality reduces redundant information, revealing inner structures in the data that might otherwise be obscured by these dependencies. These structures might include groups of related variables, chemical evolution through time, or spatial locations with similar chemical signatures.

PCA results are most easily viewed on a biplot (such as those provided in Attachment 5), which depicts the sample population plotted on two axes, each representing a principal component. The principal components are created from a linear combination of the original variables in the dataset and variance in the data. For natural compositional datasets, approximately 70% of the population variance can often be expressed in the first three or four principal components (in some cases less and in others, more), each representing decreasing amounts of variance in the data while remaining uncorrelated to previous principal components. The first two principal components often represent the majority of the dataset and are visualized using biplots with the variables expressed as vectors; the location of groups of samples (i.e., factor scores) relative to component vectors provides insight into geochemical relationships among groups of variables and samples.

3.3.2 DATA PREPARATION

When conducting multivariate analysis, it is first necessary to prepare the dataset. Raw chemical data requires preparation prior to analysis because the data often contains values in two forms unsuitable for advanced analytics: 1) measurements reported below a method detection limit (MDL), referred to as censored data, and 2) missing values. For this work, any sample or analyte with a high percentage (≥40%) of missing and/or censored data was assessed for meaningful statistical variance. If overall analyte variance was determined to be low, the analyte was removed, otherwise the data was included in the analysis. Any remaining censored data was converted to half the MDL. Remaining missing values were imputed, a method of assigning an estimated value that accounts for the entire distribution of the material's composition (Sanford et al., 1993) and also takes into consideration the values associated with samples of similar composition. Imputation was done with a nearest neighbor algorithm (Troyanskaya, 2001) and resulting values were checked against the overall data distribution for both the analyte and sample to ensure representative results. Imputed data represents 1.9% or less of the overall dataset in the PCA biplots presented here. Processed data for the PCA are presented in Electronic Attachment 1 and 2.

PCA also requires transformation of the dataset to address the numeric closure problem inherent within chemical compositional datasets (Aitchison, 1986). Numeric closure can often occur in water quality data since water quality concentrations are not completely independent. To address this issue, all data was converted to the same units (mg/L) and the centered-log ratio transformation (CLR; Aitchison 1986; Egozcue et al. 2011) was applied to the cleaned dataset. In practice, closure only significantly affects elements present in large concentrations (e.g., major ions in typical water quality samples), but for consistency the entire dataset (i.e., including trace metals) was CLR-transformed.

The resulting dataset includes both compliance wells and other monitoring wells and spans sampling events from 2017 through 2023. The dataset contains 18 measured analytes, including the hydrogen ion (H+), which represents acidity in groundwater and is proportional to pH. This data represents both the most recent data measured at JOP as well as the most complete set of regularly measured and detectable analytes. All data preparation was conducted using python programming language. Only total concentrations of major ions and metals were used in this analysis as those data are both relatively complete and consistent across the wells on site and are the parameters of interest for regulatory purposes.

3.3.3 RESULTS

Biplots showing principal components 1 and 2 (PC1 and PC2) are provided in Attachment 5. The PC1 and PC2 are represented on the X and Y axis and explain approximately 30% and 25% of the statistical variance in the water quality dataset, respectively. For each biplot, the first three components explain over 65% variance in the dataset, while the first four explain over 70%. Constituent variables are expressed as vectors. The grouping of samples relative to the component vectors is useful for providing immediate insight into geochemical relationships among groups of variables and samples.

Two iterations of biplots are provided; Attachment 5a depicts all Western and Eastern Wells and porewater locations with sufficient data. Attachment 5b depicts all potential endmember influences on the pH exceedances at G11 and G51D, as represented by background groundwater, EAP porewater, WAP porewater, and hydraulically upgradient groundwater wells (all of which exist to the north and west). Side-gradient western well TPZ120 is also included as it represents a geochemical endmember. While constituent vectors are arranged in a similar orientation across both biplots, biplot 5A which includes the downgradient eastern groundwater contains more noise in the dataset making it difficult to decipher meaningful inter-well trends. This biplot is provided as a reference but is not discussed further. The remaining analysis focuses on biplot 5B which contains hydraulically upgradient wells, background wells, and porewater wells as geochemical endmembers of G11 and G51D (Attachment 5b). This biplot exhibits the following key features:

- Exceedance wells G51D and G11 exhibit a high degree of similarity with the Western Wells screened in the UA.
- Groundwater samples are distributed linearly from the bottom right to the middle of the upper left quadrant, with clear separation between stratigraphic units within the spread of data. Background data plots as an endmember in the lower right quadrant, transitions into UA wells in the lower left quadrant, and continues through the UCU wells in the middle upper left quadrant.
- The EAP and WAP porewaters dominate the upper right quadrant and are distinctly separate from the groundwater samples. There is also a clear separation between EAP and WAP porewaters. The WAP porewater has a strong association with the boron and lithium vectors whereas the EAP porewater is more closely associated with arsenic, potassium, molybdenum, and selenium.
- The WAP UCU monitoring well TPZ120 plots alone in the upper left corner of the plot at the far end of the iron vector, indicating (a) iron is a key contributor to the variance associated with this location and (b) TPZ120 has a distinct chemical composition relative to the other groundwater compositions considered.

The linear spread of groundwater data suggests chemical evolution and/or communication within the aquifer system. The western UCU groundwater composition is dominated by redox sensitive vectors such as manganese, iron, and sulfate. The UA groundwater is observed to undergo a gradual chemical evolution from the UCU redox-sensitive composition endmember back to background conditions, which are dominated by alkalinity, sodium, chloride, and fluoride. The exceedance wells plot among the western UA groundwater, suggesting geochemistry is broadly similar in these wells. Furthermore, the exceedance wells plot in near association with the background groundwater wells, also indicating some multi-variate geochemical similarity to background. This positioning may indicate potential mixing between reduced upgradient groundwaters from the northwest with oxidized background water from the north, discussed further in Section 4.0. Exceedance wells G51D and G11 do not demonstrate association with the EAP porewater composition, supporting the conclusion that the EAP porewater is not a primary influence on the groundwater composition observed at G51D and G11, and is therefore not found to be responsible for the pH exceedances.

4.0 POTENTIAL ALTERNATE SOURCES

This technical review identified the likely source of acidity contributing to the low pH levels at G11 and G51D is dissolved iron in groundwater under reducing conditions and the redox transition that occurs in groundwater immediately upgradient of the G11 and G51D monitoring wells. This is demonstrated in Attachment 6, which includes figures depicting the redox condition at the site. The map included in Attachment 6A (Appendix D-2) demonstrates a distinct redox transition from more reducing conditions in upgradient waters and more oxidizing conditions near the exceedance wells. The reducing upgradient waters are characterized by lower oxidation reduction potential (ORP) and higher iron concentrations, while downgradient waters are largely the opposite with higher ORP and lower iron concentrations. This spatial gradient in redox conditions is also reflected in the Pourbaix diagram for the upgradient western groundwater network (Attachment 6B; Appendix D-3). This diagram demonstrates the predominant iron species and mineral forms under changing pH and Eh conditions (Eh is calculated from field measurements of ORP using the AquaTROLL conversion rate). There is a clear gradient from more reducing conditions in the north and west to more oxidized conditions in G11 and G51D with dissolved iron (Fe^{++}) and iron hydroxide ($Fe(OH)_3$) as the dominant forms of iron. Simultaneously, there is a drop in pH as conditions become more oxidizing.

The source of the dissolved iron and reducing condition could be attributed to three possible upgradient influences existing to the west and north of the two exceedance wells: 1) low pH and relatively high dissolved iron existing in the general area around Western Well TPZ120, 2) the WAP, and 3) the sewage treatment pond. Results of the PCA suggest groundwater monitored in the area of Western Well TPZ120 and the WAP are both potential geochemical endmembers of the chemical evolution observed upgradient and to the west (Attachment 5). Monitoring well TPZ120 has an average iron concentration of 1.2 mg/L (determined from samples with turbidity <10 NTU) and is near enough in proximity to the exceedance wells to suggest cross-gradient flow between these wells may be possible (Attachment 2). The WAP and the sewage treatment pond are both upgradient sources of reduced groundwater, though high turbidity in field samples limits the use of existing iron data for full understanding of transport and speciation of dissolved iron in response to the redox gradient. These three locations represent possible alternate sources of reduced iron to the exceedance wells.

This change in redox condition is the likely source of acidity in G11 and G51D. It is interpreted that dissolved iron is released from the sediments through the process of reductive dissolution by upgradient waters, in response to the reducing conditions (as observed by low ORP). The dissolved iron is transported downgradient with groundwater and subsequently oxidizes and precipitates when it moves into an area with sufficient dissolved oxygen to drive the oxidation reaction.

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The oxidation of dissolved iron to iron hydroxide is known to produce acidity via the following reactions:

$$Fe^{2+} + \frac{1}{4}O_2 + H^+ \rightarrow Fe^{3+} + \frac{1}{2}H_2O$$

$$Fe^{3+} + 3H_2O \rightarrow Fe(OH)_3 + 3H^+$$

Acidity is highlighted in red, and the equations demonstrate a net increase in acidity through iron oxidation and precipitation. In this way, reduced upgradient waters from the north and west provides the constituent (i.e., reduced iron) necessary to cause a drop in pH (i.e., through iron oxidation) in G11 and G51D. The oxidized environment near the exceedance wells results from sufficient mixing with the upgradient oxidized background groundwater. This is particularly evident in G51D, which has a more immediate influence of dissolved iron from reduced upgradient wells and has a compositional similarity to background wells (as seen in PCA and magnesium concentrations) resulting in the lowest pH in the JOP EAP groundwater network.

5.0 CONCLUSIONS

This technical review presents evidence that demonstrates the EAP is not the source of pH exceedances at compliance wells G11 and G51D. Results of the geochemical and multivariate analysis (i.e., PCA) demonstrate that groundwater associated with monitoring wells G11 and G51D are more similar to upgradient groundwater to the north and west than the EAP porewater. This analysis was supported by examination of magnesium concentrations and the magnesium-sulfate relationship, both of which indicate G11 and G51D have a chemical signature indicative of western groundwater and background groundwater. The pH exceedances are found to be the result of chemically reduced upgradient waters carrying dissolved iron (released from the aquifer solids through the geochemical process of reductive dissolution) subsequently mixing with oxidized background groundwater in the area of G51D and G11. Further analysis revealed three potential sources of dissolved iron to the north and west of the exceedance locations; however, this investigation did not attempt to identify the primary or singular source of dissolved iron driving the pH exceedances. Upon mixing, the dissolved iron originating from more reducing groundwater subsequently oxidizes and precipitates as iron hydroxide, consequently generating acidity and lowering the groundwater pH in this specific area. The information and analysis presented thus rules out the EAP as the source of the acidity, and therefore pH exceedances, in this area.

6.0 ABBREVIATIONS

Alk	Total Alkalinity
As	Arsenic
B	Boron
Ca	Calcium
CCR	Coal combustion residual
Cl	Chloride
Co	Cobalt
Cr	Chromium
EAP	East Ash Pond
F	Fluoride
Fe	Iron
H+	Hydrogen ion, represents acidity in groundwater
JOP	Joppa
K	Potassium
Li	Lithium
Mg	Magnesium
Mn	Manganese
Mo	Molybdenum
Na	Sodium
ORP	Oxidation reduction potential
PCA	Principal components analysis
Redox	Oxidation-Reduction
Se	Selenium
SO4	Sulfate
UA	Upper Aquifer
UCU	Upper confining unit
WAP	West Ash Pond

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7.0 REFERENCES

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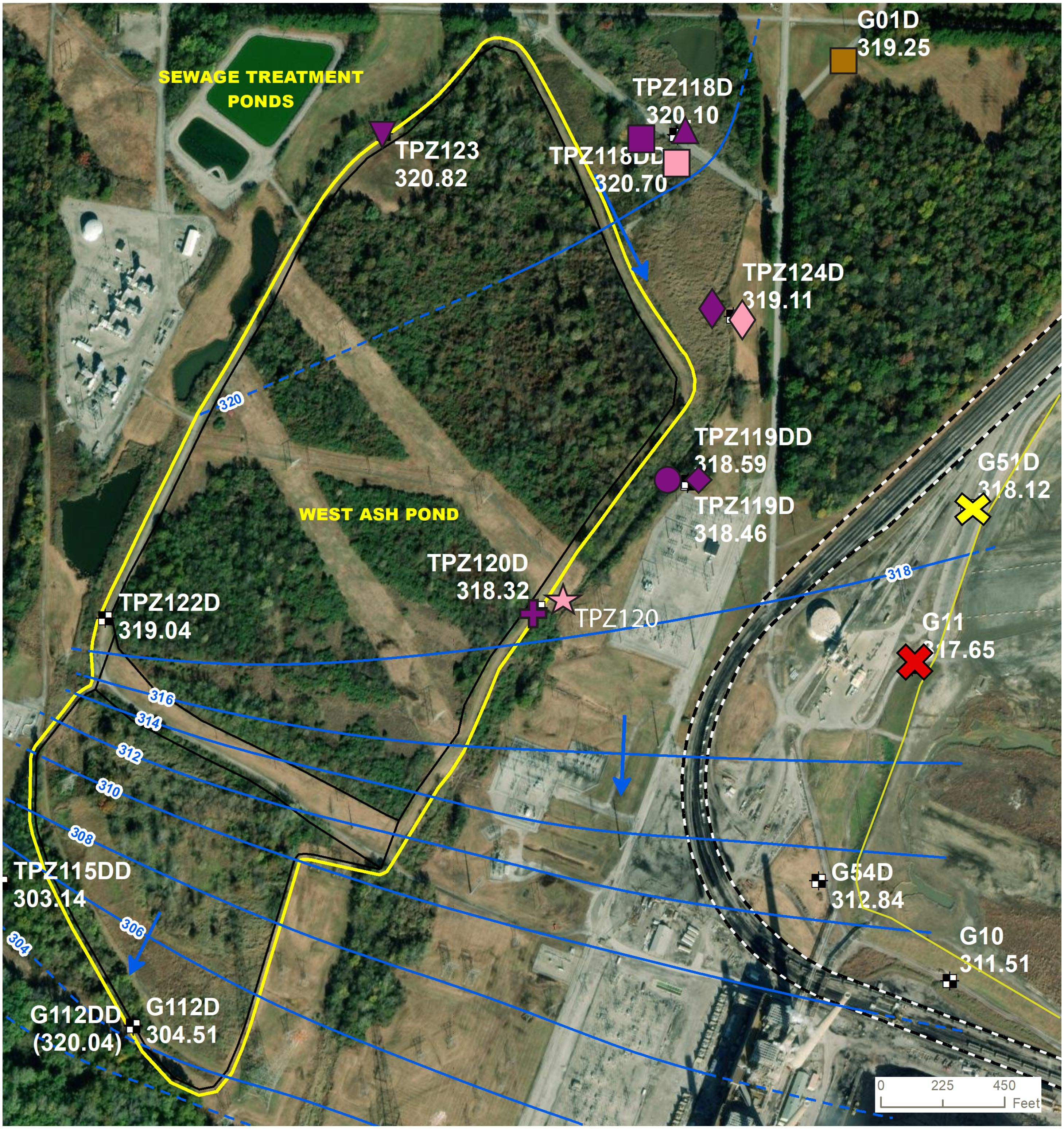
Notes:
Wells with pH exceedances are shown with an X.
East ash pond compliance wells are light blue and monitoring wells are dark blue.
Western monitoring wells are purple (UA) and pink (UCU).
Background wells are brown. Ash ponds are outlined in yellow.
Contours are from March 2023.

LIFECYCLEGEO

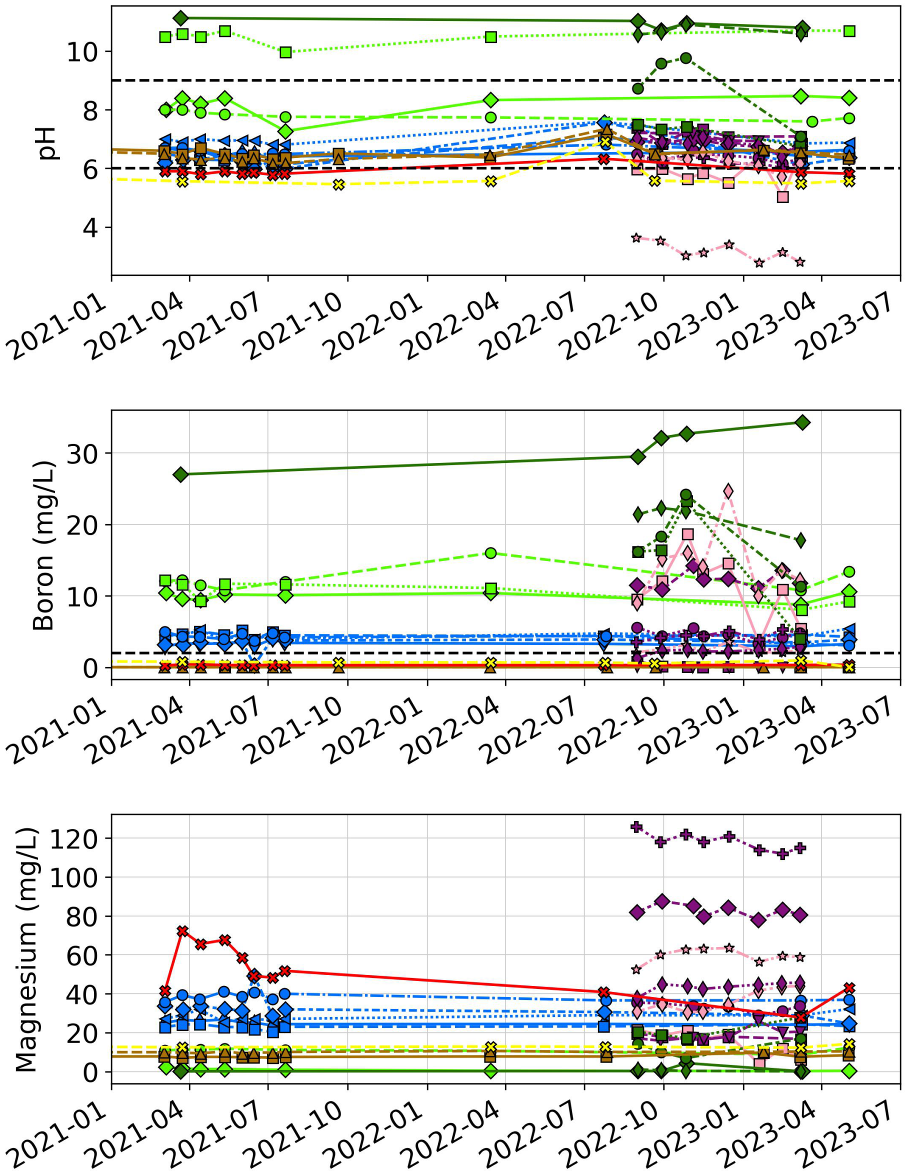
Title		
Joppa East Ash Pond Well Locations and Hydrology		
Project Name: Joppa- East Ash Pond Evaluation	Project Number: [23RAM01-1] Vistra CCR	Attachment: 1
Client Name: Ramboll Americas Engineering Solutions, Inc.	Date: 10/21/2023	



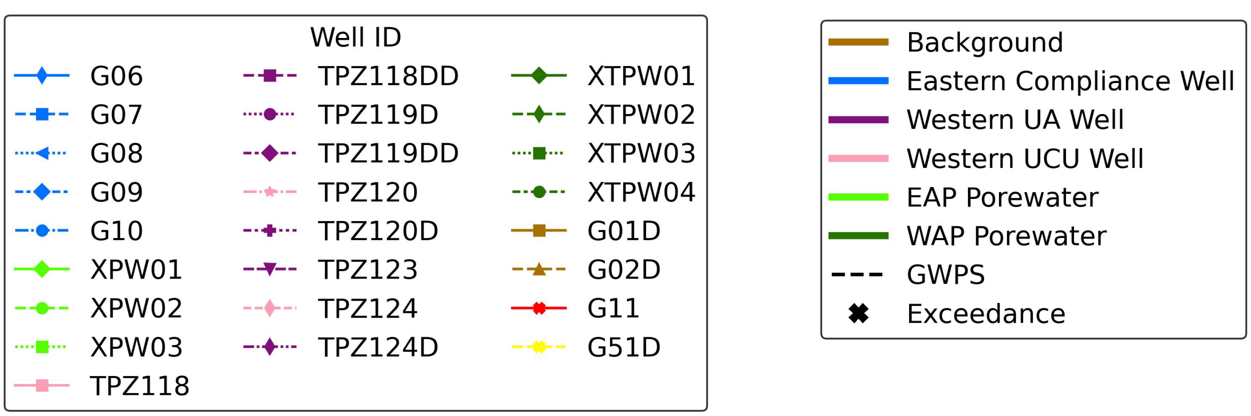
Notes:
Wells with pH exceedances are shown with an X.
Western wells are purple (UA) and pink (UCU).
Background wells are brown. Ash ponds are outlined in yellow.
Contours are from September 2022.

LIFECYCLEGEO

Title	Joppa West Ash Pond Well Locations and Upper Aquifer Groundwater Elevation
Project Name	Joppa- East Ash Pond Evaluation
Project Number	[23RAM01-1] Vistra CCR
Client Name	Ramboll Americas Engineering Solutions, Inc.
Date	10/21/2023
Attachment	2

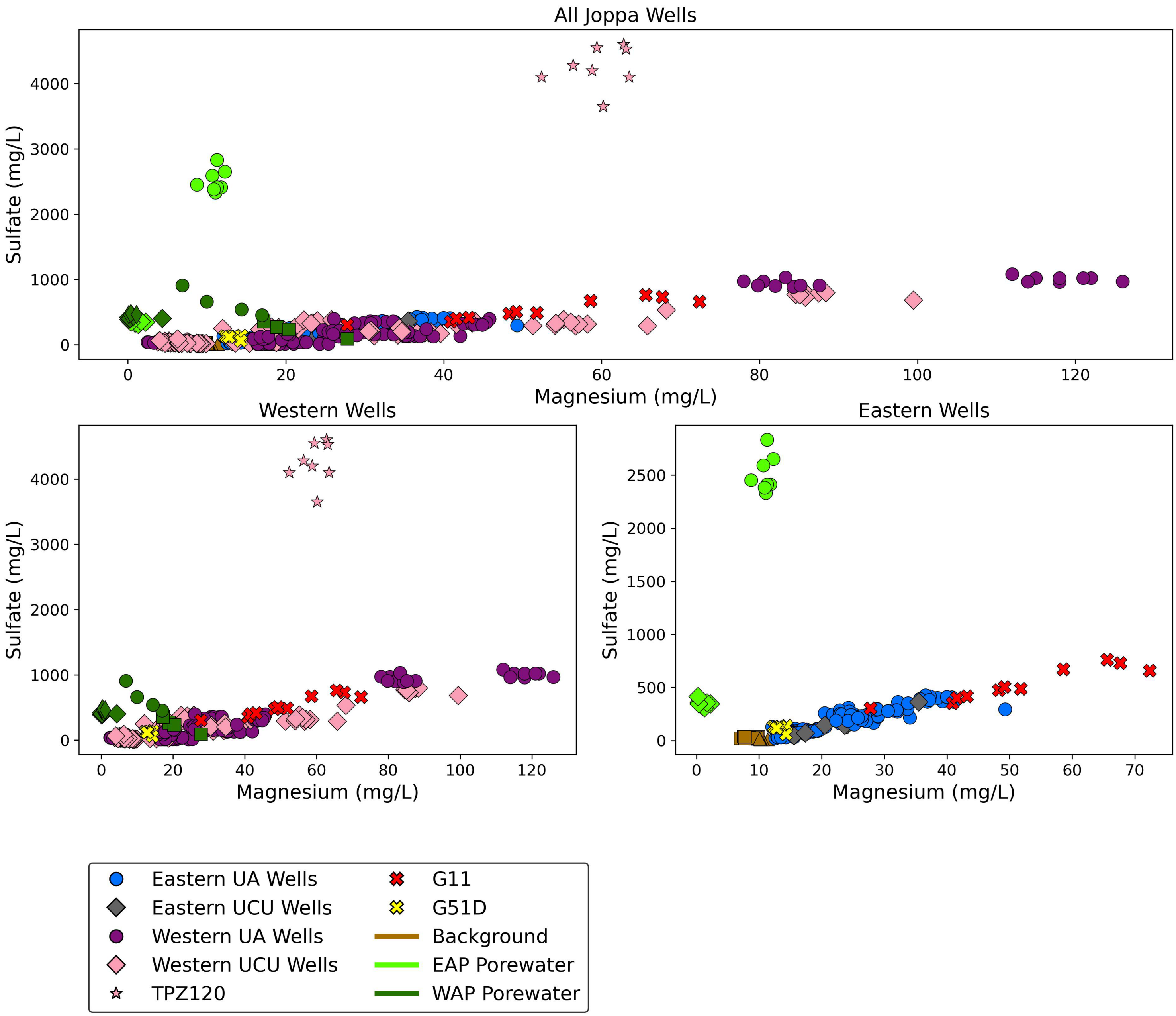


Notes:
Data is colored according to well classification.
All data shown is for eastern compliance wells, upgradient western upgradient wells, background, and porewaters



LIFECYCLEGEO

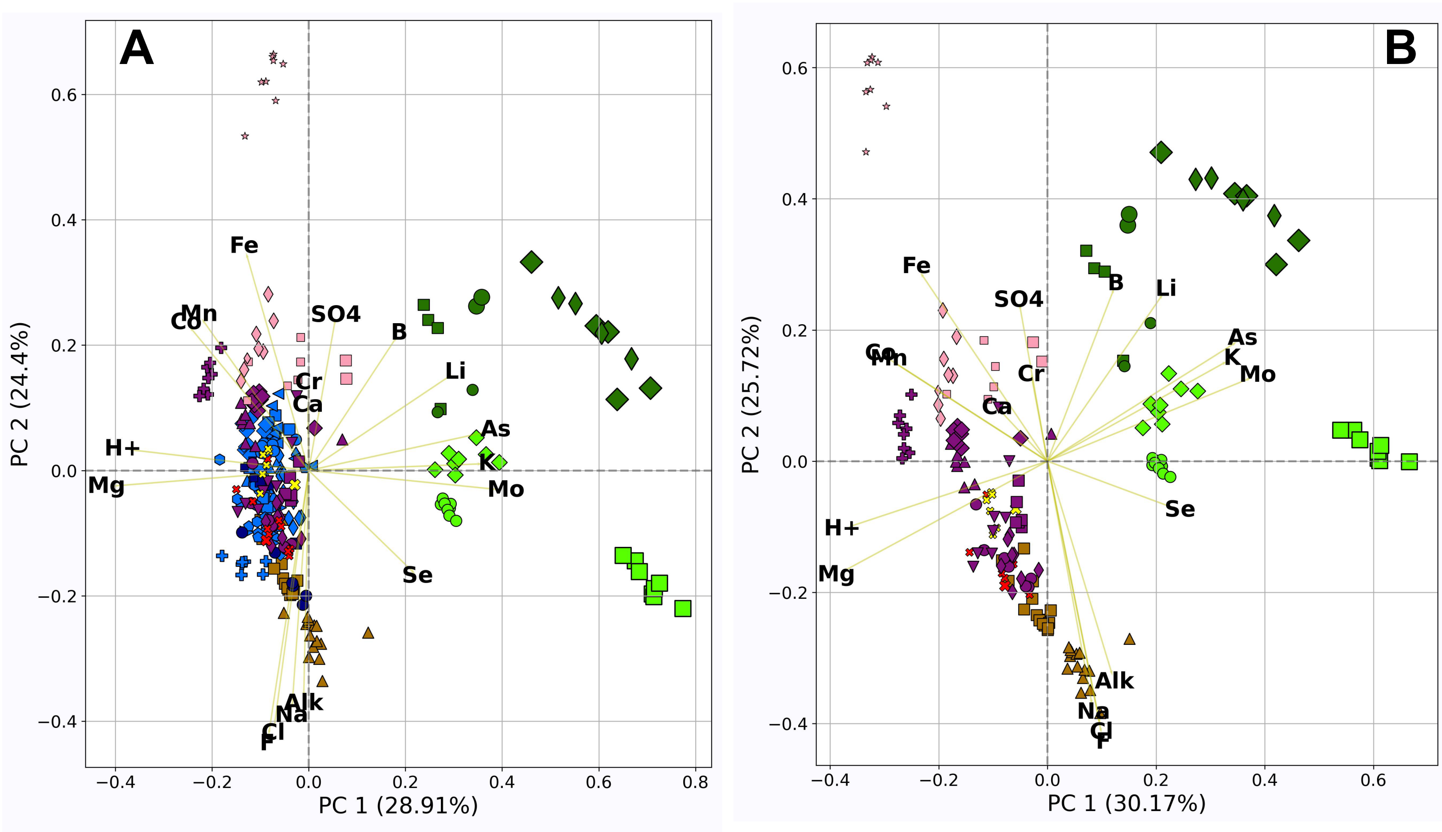
Title Time Series for pH, Boron, and Magnesium		
Project Name Joppa- East Ash Pond Evaluation	Project Number [23RAM01-1] Vistra CCR	Attachment 3
Client Name Ramboll Americas Engineering Solutions, Inc.	Date 10/21/2023	

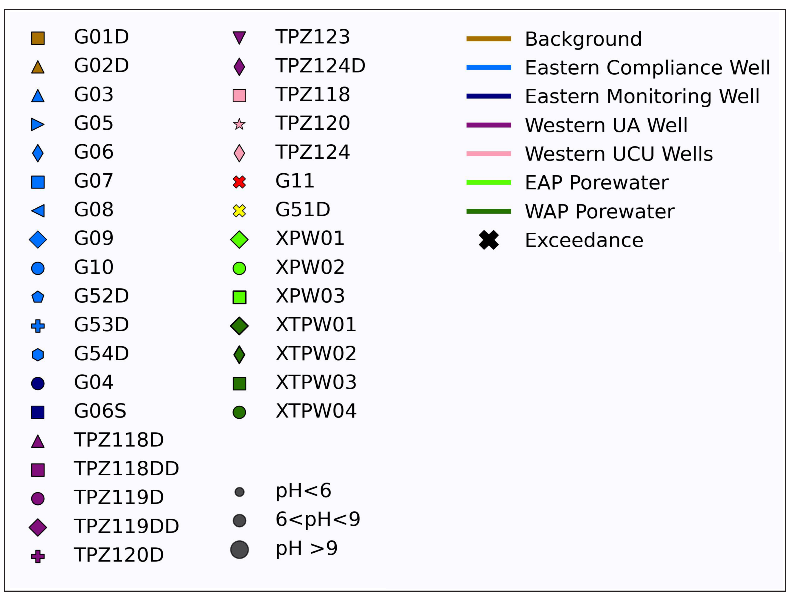


Scatterplots of magnesium and sulfate for all Joppa wells (top), the western wells (bottom left) and eastern wells (bottom right).

LIFECYCLEGEO

Title		
Joppa Magnesium-Sulfate Scatterplot		
Project Name Joppa- East Ash Pond Evaluation	Project Number [23RAM01-1] Vistra CCR	Attachment 4
Client Name Ramboll Americas Engineering Solutions, Inc.	Date 10/21/2023	

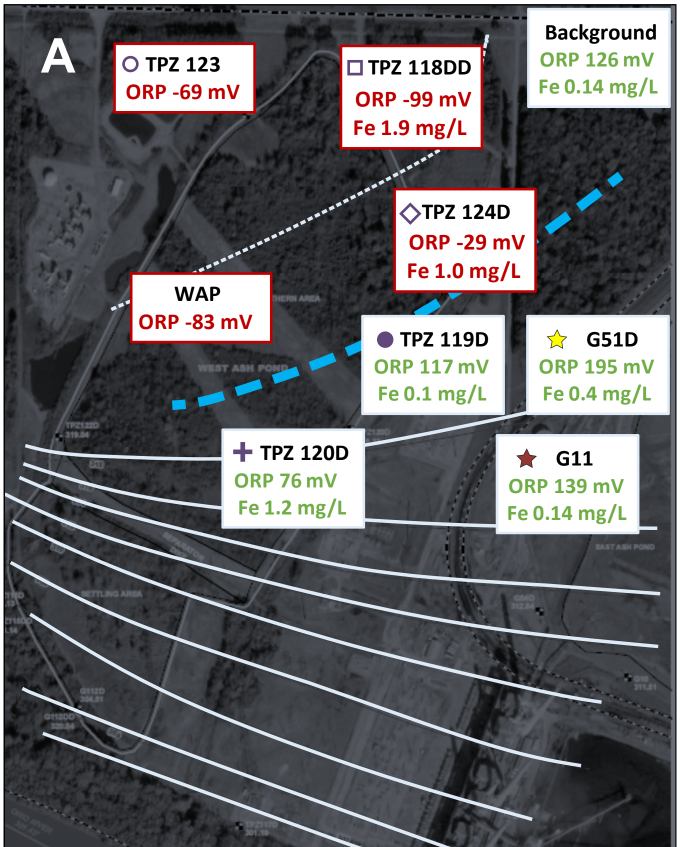




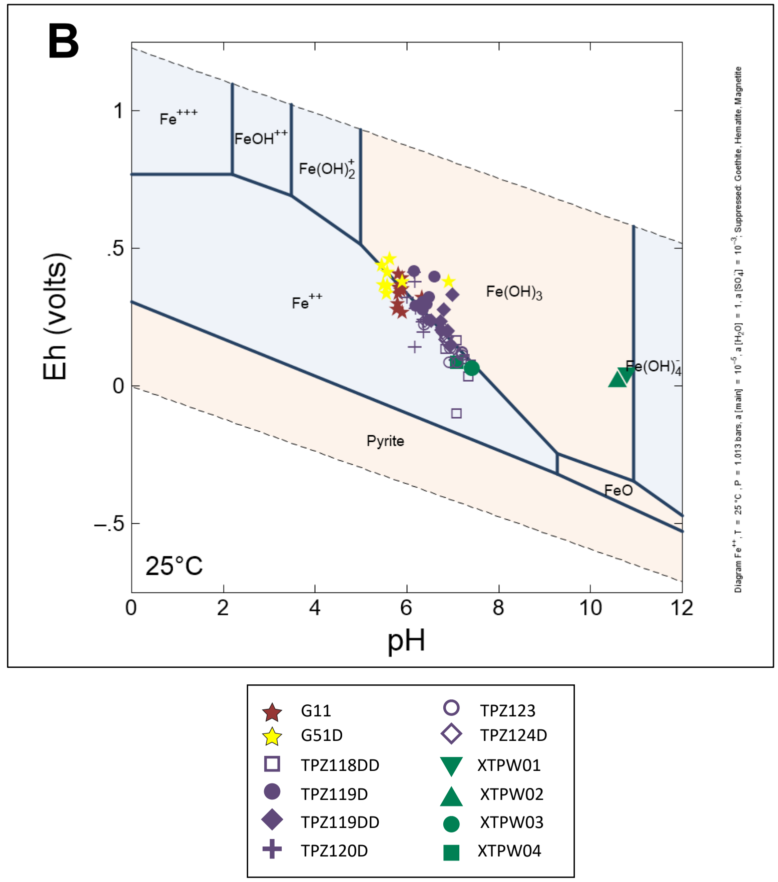
Notes:
Data is colored according to well classification and sized according to pH. See abbreviations list for complete analyte and unit names.
A) PCA with all eastern and western wells, including porewater.
B) PCA with only western wells, background, and porewater.

LIFECYCLEGEO

Title Joppa Principal Components Analysis Results		
Project Name Joppa- East Ash Pond Evaluation	Project Number [23RAM01-1] Vistra CCR	Attachment 5
Client Name Ramboll Americas Engineering Solutions, Inc.	Date 10/21/2023	



Iron concentration averaged for samples with turbidity <10 NTU



Notes:

A) Redox conditions upgradient of G11 and G51D. White lines are upper aquifer groundwater contours, blue line indicates where conditions change from reducing to oxidizing. Contours from September 2022. Iron concentration not shown where turbidity >10 NTU.

B) Pourbaix diagram depicting iron solubility upgradient of G11 and G51D. WAP porewater is shown in green, western monitoring wells are shown in purple, G11 is red, and G51D is yellow. Blue areas are indicate aqueous phase iron; brown areas indicate solid phase iron.

LIFECYCLEGEO	Title Joppa Oxidation Reduction Conditions		
	Project Name Joppa- East Ash Pond Evaluation	Project Number [23RAM01-1] Vistra CCR	Attachment 6
	Client Name Ramboll Americas Engineering Solutions, Inc.	Date 10/21/2023	

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G01D	12/3/2015	Background	6.7	<0.025	--	20
G01D	3/15/2016	Background	6.7	0.036	--	126
G01D	6/15/2016	Background	6.9	0.0296	--	157
G01D	9/14/2016	Background	6.8	0.0416	--	129
G01D	12/14/2016	Background	6.8	<0.025	--	53
G01D	3/7/2017	Background	6.2	<0.025	--	72
G01D	6/15/2017	Background	6.7	<0.025	--	56
G01D	7/20/2017	Background	6.8	<0.025	9.87	31
G01D	11/30/2017	Background	6.8	<0.025	--	117
G01D	6/19/2018	Background	6.8	<0.025	--	70
G01D	9/5/2018	Background	7	<0.025	--	94
G01D	3/27/2019	Background	6.7	<0.025	--	30
G01D	9/9/2019	Background	6.4	<0.025	--	37
G01D	3/30/2020	Background	6.8	<0.025	7.6	35
G01D	9/23/2020	Background	6.72	<0.025	--	34
G02D	7/6/2021	Background	6.17	0.0431	9.77	22
G02D	7/21/2021	Background	6.18	0.0329	10.1	20
G02D	6/1/2021	Background	6.23	0.0433	9.39	23
G02D	4/14/2021	Background	6.3	0.0318	9.39	19
G02D	9/20/2021	Background	6.32	0.0313	--	19
G01D	7/6/2021	Background	6.33	<0.025	7.18	20
G01D	6/1/2021	Background	6.34	<0.025	7.36	18
G01D	5/2/2023	Background	6.34	0.021	8.43	26
G02D	3/24/2021	Background	6.35	0.033	9.76	18
G02D	5/12/2021	Background	6.35	0.0356	10.4	27
G02D	6/14/2021	Background	6.36	0.0352	9.84	23
G01D	7/21/2021	Background	6.37	<0.025	7.54	18
G01D	3/14/2022	Background	6.37	<0.025	7.77	22
G02D	5/3/2023	Background	6.46	0.0412	10.4	13
G01D	6/14/2021	Background	6.46	<0.025	7.41	20
G02D	12/3/2015	Background	6.7	0.0536	--	16
G02D	3/15/2016	Background	6.6	0.0494	--	17
G02D	6/15/2016	Background	6.8	0.0508	--	15
G02D	9/14/2016	Background	6.6	0.0534	--	22
G02D	12/14/2016	Background	6.3	0.0552	--	22
G02D	7/20/2017	Background	6.7	0.044	11.4	12
G02D	11/30/2017	Background	6.9	0.0496	--	17
G02D	6/19/2018	Background	6.7	0.0404	--	17
G02D	9/5/2018	Background	6.6	0.0468	--	19

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G02D	3/27/2019	Background	6.6	0.0473	--	20
G02D	9/9/2019	Background	6.5	0.0429	--	20
G02D	3/30/2020	Background	6.59	0.0449	9.96	22
G02D	9/23/2020	Background	6.62	0.0442	--	22
G02D	3/14/2022	Background	6.47	0.0283	10.6	11
G02D	9/21/2022	Background	6.48	0.0266	--	15
G01D	5/12/2021	Background	6.49	0.0167	7.55	20
G01D	3/24/2021	Background	6.49	<0.025	7.06	21
G02D	3/3/2021	Background	6.5	0.0296	9.98	21
G01D	9/20/2022	Background	6.5	<0.014	--	23
G01D	9/20/2021	Background	6.51	<0.025	--	18
G01D	3/7/2023	Background	6.53	0.029	7.66	36
G02D	3/8/2023	Background	6.56	0.027	10.3	11
G01D	3/3/2021	Background	6.6	<0.025	7.79	18
G01D	1/24/2023	Background	6.62	<0.022	9.75	24
G02D	3/8/2017	Background	6.9	0.0546	--	18
G02D	6/14/2017	Background	6.3	0.0467	--	20
G02D	1/24/2023	Background	6.64	0.0311	10.2	12
G01D	4/14/2021	Background	6.7	<0.025	7.56	39
G01D	7/26/2022	Background	7.17	<0.015	7.74	36
G02D	7/27/2022	Background	7.35	0.0322	10.1	19
G03	3/24/2021	Eastern Compliance	6.3	0.343	17.6	104
G03	4/14/2021	Eastern Compliance	6.2	0.603	28.3	168
G03	5/12/2021	Eastern Compliance	6.39	0.26	15.8	112
G03	6/1/2021	Eastern Compliance	6.35	0.232	14.9	73
G03	7/6/2021	Eastern Compliance	6.34	0.235	14	77
G03	7/21/2021	Eastern Compliance	6.36	0.294	15.7	92
G03	7/26/2022	Eastern Compliance	6.51	0.532	22.9	164
G03	5/3/2023	Eastern Compliance	6.18	0.38	16.6	97
G03	3/5/2021	Eastern Compliance	6.4	0.213	15.1	66
G03	6/15/2021	Eastern Compliance	6.24	0.225	15.1	79
G03	3/9/2023	Eastern Compliance	6.23	0.33	15.2	82
G04	3/24/2021	Eastern Monitoring	6.5	<0.025	14.6	41
G04	7/26/2022	Eastern Monitoring	6.82	<0.0092	34.1	216
G04	3/4/2021	Eastern Monitoring	6.5	<0.025	12.6	21
G04	4/13/2021	Eastern Monitoring	6.5	<0.025	17.3	63
G04	5/11/2021	Eastern Monitoring	6.28	0.0157	17.6	73
G04	7/20/2021	Eastern Monitoring	6.33	<0.025	20.6	131
G05	3/24/2021	Eastern Compliance	6.4	0.195	18.8	92

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G05	6/1/2021	Eastern Compliance	6.48	0.157	18.6	83
G05	7/6/2021	Eastern Compliance	6.42	0.148	17.6	90
G05	7/26/2022	Eastern Compliance	6.63	0.0645	17.6	68
G05	5/3/2023	Eastern Compliance	6.49	0.0478	19.3	112
G05	6/15/2021	Eastern Compliance	6.34	0.14	18.4	91
G05	3/9/2023	Eastern Compliance	6.5	0.0541	19.4	90
G05	3/4/2021	Eastern Compliance	6.5	0.181	17.2	94
G05	4/13/2021	Eastern Compliance	6.5	0.19	19.5	95
G05	5/11/2021	Eastern Compliance	6.38	0.158	19.4	109
G05	7/20/2021	Eastern Compliance	6.35	0.131	18.5	87
G06	3/24/2021	Eastern Compliance	6.6	3.4	26.6	215
G06	6/1/2021	Eastern Compliance	6.56	3.56	25.3	216
G06	7/6/2021	Eastern Compliance	6.32	3.93	23.7	223
G06	5/3/2023	Eastern Compliance	6.63	3.28	24.4	208
G06	6/15/2021	Eastern Compliance	6.51	2.97	25.2	230
G06	3/9/2023	Eastern Compliance	6.57	2.95	24.1	221
G06	3/4/2021	Eastern Compliance	6.7	2.9	25.1	250
G06	4/13/2021	Eastern Compliance	6.6	3.27	26	229
G06	5/11/2021	Eastern Compliance	6.43	3.37	26.8	219
G06	7/20/2021	Eastern Compliance	6.41	3.41	24.4	213
G06	7/23/2022	Eastern Compliance	--	3.29	24.5	216
G06S	3/24/2021	Eastern Monitoring	5.8	0.253	13.5	31
G06S	3/4/2021	Eastern Monitoring	6.2	0.229	12.9	35
G06S	4/13/2021	Eastern Monitoring	5.8	0.265	14.3	30
G06S	5/11/2021	Eastern Monitoring	5.62	0.245	15.6	31
G06S	7/20/2021	Eastern Monitoring	5.73	0.248	13	30
G06S	7/23/2022	Eastern Monitoring	6.54	0.269	13.5	30
G07	3/24/2021	Eastern Compliance	6.4	4.67	24.2	258
G07	6/1/2021	Eastern Compliance	6.25	5.23	22.9	257
G07	7/6/2021	Eastern Compliance	5.98	4.95	20.5	258
G07	5/3/2023	Eastern Compliance	6.38	4.27	23.4	260
G07	6/15/2021	Eastern Compliance	6.25	3.91	21.8	246
G07	3/9/2023	Eastern Compliance	6.42	4.55	24.3	308
G07	3/4/2021	Eastern Compliance	6.5	4.37	22.9	285
G07	4/13/2021	Eastern Compliance	6.3	5.04	24.4	274
G07	5/11/2021	Eastern Compliance	6.28	4.55	22.9	248
G07	7/20/2021	Eastern Compliance	6.14	4.48	23	252
G07	7/23/2022	Eastern Compliance	7.06	4.35	23.2	246
G08	3/24/2021	Eastern Compliance	6.9	4.39	29	225

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G08	6/1/2021	Eastern Compliance	6.96	4.63	27.2	204
G08	7/6/2021	Eastern Compliance	6.81	4.56	26.2	227
G08	5/3/2023	Eastern Compliance	6.88	5.43	32.2	363
G08	6/15/2021	Eastern Compliance	6.94	3.97	27.2	226
G08	3/9/2023	Eastern Compliance	6.85	4.33	28.9	297
G08	3/4/2021	Eastern Compliance	7	4.53	27.2	241
G08	4/13/2021	Eastern Compliance	7	5.25	31.9	286
G08	5/11/2021	Eastern Compliance	6.94	3.77	25.4	203
G08	7/20/2021	Eastern Compliance	6.81	3.98	27.1	227
G08	7/23/2022	Eastern Compliance	7.59	4.74	29	229
G09	4/14/2021	Eastern Compliance	6.3	3.48	33.7	297
G09	5/12/2021	Eastern Compliance	6.45	3.26	32.1	272
G09	6/1/2021	Eastern Compliance	6.24	3.65	31.4	284
G09	7/6/2021	Eastern Compliance	6.29	4.05	28.7	289
G09	7/21/2021	Eastern Compliance	5.99	3.75	32	286
G09	5/3/2023	Eastern Compliance	6.37	3.87	24.7	241
G09	6/15/2021	Eastern Compliance	5.97	0.282	49.3	294
G09	3/9/2023	Eastern Compliance	6.13	3.49	28.9	295
G09	3/4/2021	Eastern Compliance	6.2	3.19	33.8	351
G09	3/25/2021	Eastern Compliance	6.3	3.15	32	286
G09	7/24/2022	Eastern Compliance	7.57	3.89	30.6	278
G10	3/24/2021	Eastern Compliance	6.7	4.31	39.3	369
G10	6/1/2021	Eastern Compliance	6.5	4.73	38.5	401
G10	7/6/2021	Eastern Compliance	6.51	4.81	37.3	415
G10	7/26/2022	Eastern Compliance	6.81	4.4	36.6	388
G10	3/8/2023	Eastern Compliance	6.55	3.28	36.6	425
G10	5/3/2023	Eastern Compliance	6.6	3.08	36.9	365
G10	6/15/2021	Eastern Compliance	6.46	3.74	40.8	407
G10	3/4/2021	Eastern Compliance	6.7	4.98	35.7	391
G10	4/13/2021	Eastern Compliance	6.6	4.26	37.2	382
G10	5/11/2021	Eastern Compliance	6.34	3.95	41.1	364
G10	7/20/2021	Eastern Compliance	6.49	4.2	40	410
G11	3/8/2023	Exceedance	5.87	0.327	27.8	303
G11	7/23/2022	Exceedance	6.33	0.31	40.9	352
G11	3/4/2021	Exceedance	5.9	0.247	41.6	400
G11	5/3/2023	Exceedance	5.82	0.373	43.2	416
G11	7/6/2021	Exceedance	5.78	0.358	48.3	474
G11	7/20/2021	Exceedance	5.82	0.302	51.8	487
G11	6/14/2021	Exceedance	5.86	0.266	49.2	505

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G11	3/24/2021	Exceedance	5.9	0.42	72.4	658
G11	6/1/2021	Exceedance	5.82	0.309	58.6	671
G11	5/12/2021	Exceedance	5.9	0.321	67.7	730
G11	4/14/2021	Exceedance	5.8	0.411	65.6	761
G51D	12/3/2015	Exceedance	6.2	0.117	--	117
G51D	3/15/2016	Exceedance	5.9	0.184	--	145
G51D	6/15/2016	Exceedance	5.8	0.213	--	139
G51D	9/14/2016	Exceedance	5.6	0.263	--	136
G51D	12/14/2016	Exceedance	5.9	0.171	--	101
G51D	6/15/2017	Exceedance	5.6	0.58	--	149
G51D	7/20/2017	Exceedance	5.9	0.332	14.4	140
G51D	11/30/2017	Exceedance	5.6	0.302	--	138
G51D	6/19/2018	Exceedance	5.7	0.337	--	124
G51D	9/5/2018	Exceedance	6	0.263	--	134
G51D	3/27/2019	Exceedance	5.7	0.778	--	125
G51D	9/9/2019	Exceedance	5.3	0.501	--	109
G51D	3/30/2020	Exceedance	5.62	0.697	13.4	130
G51D	9/23/2020	Exceedance	5.72	0.863	--	121
G51D	9/20/2021	Exceedance	5.46	0.689	--	131
G51D	3/8/2023	Exceedance	5.49	0.963	12.3	131
G51D	3/24/2021	Exceedance	5.56	0.786	12.5	122
G51D	3/8/2017	Exceedance	6.2	0.309	--	146
G51D	5/3/2023	Exceedance	5.57	0.0297	14.3	59
G51D	3/15/2022	Exceedance	5.57	0.689	12.9	123
G51D	9/20/2022	Exceedance	5.58	0.551	--	125
G51D	7/25/2022	Exceedance	6.92	0.663	12.8	116
G52D	12/3/2015	Eastern Compliance	6.5	<0.025	--	65
G52D	3/15/2016	Eastern Compliance	6.3	<0.025	--	99
G52D	6/15/2016	Eastern Compliance	6.6	<0.025	--	88
G52D	9/14/2016	Eastern Compliance	6.4	<0.025	--	84
G52D	12/14/2016	Eastern Compliance	6.7	<0.025	--	82
G52D	3/7/2017	Eastern Compliance	5.9	<0.025	--	115
G52D	11/30/2017	Eastern Compliance	6	<0.025	--	97
G52D	6/19/2018	Eastern Compliance	6.4	<0.025	--	97
G52D	9/5/2018	Eastern Compliance	6.3	<0.025	--	101
G52D	3/27/2019	Eastern Compliance	6.4	<0.025	--	81
G52D	9/9/2019	Eastern Compliance	6	<0.025	--	78
G52D	3/30/2020	Eastern Compliance	6.38	<0.025	15.3	84
G52D	9/23/2020	Eastern Compliance	6.54	<0.025	--	84

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G52D	9/20/2021	Eastern Compliance	6.29	<0.025	--	83
G52D	6/14/2017	Eastern Compliance	6.2	<0.025	--	112
G52D	9/21/2022	Eastern Compliance	6.26	<0.011	--	72
G52D	5/3/2023	Eastern Compliance	6.31	0.682	12.1	129
G52D	3/25/2021	Eastern Compliance	6.25	<0.025	14.6	75
G52D	3/15/2022	Eastern Compliance	6.22	<0.025	15.1	68
G52D	3/10/2023	Eastern Compliance	6.54	0.0319	15.3	74
G52D	7/19/2017	Eastern Compliance	6.4	<0.025	17	108
G53D	12/3/2015	Eastern Compliance	6.8	0.332	--	103
G53D	3/15/2016	Eastern Compliance	6.7	0.334	--	107
G53D	6/15/2016	Eastern Compliance	6.6	0.342	--	107
G53D	9/14/2016	Eastern Compliance	6.5	0.368	--	104
G53D	12/14/2016	Eastern Compliance	6.8	0.364	--	106
G53D	6/15/2017	Eastern Compliance	6.6	0.309	--	79
G53D	7/20/2017	Eastern Compliance	6.8	0.366	19.2	94
G53D	11/30/2017	Eastern Compliance	6.6	0.427	--	98
G53D	6/19/2018	Eastern Compliance	6.6	0.361	--	84
G53D	9/5/2018	Eastern Compliance	6.8	0.392	--	81
G53D	3/27/2019	Eastern Compliance	6.6	0.269	--	54
G53D	9/9/2019	Eastern Compliance	6.2	0.385	--	80
G53D	3/30/2020	Eastern Compliance	6.7	0.334	15.7	66
G53D	9/23/2020	Eastern Compliance	6.67	0.411	--	79
G53D	9/20/2021	Eastern Compliance	6.27	0.402	--	78
G53D	9/20/2022	Eastern Compliance	6.48	0.431	--	79
G53D	3/8/2017	Eastern Compliance	7.2	0.138	--	35
G53D	5/3/2023	Eastern Compliance	6.48	0.367	15.3	68
G53D	3/9/2023	Eastern Compliance	6.46	0.37	16.4	72
G53D	3/25/2021	Eastern Compliance	6.53	0.355	15.7	71
G53D	7/25/2022	Eastern Compliance	7.88	0.341	17	77
G53D	3/15/2022	Eastern Compliance	6.5	0.332	16.5	74
G54D	12/3/2015	Eastern Compliance	7	0.663	--	191
G54D	3/15/2016	Eastern Compliance	6.8	0.513	--	176
G54D	6/15/2016	Eastern Compliance	6.6	0.508	--	160
G54D	9/14/2016	Eastern Compliance	6.6	0.557	--	149
G54D	12/14/2016	Eastern Compliance	6.7	0.564	--	144
G54D	6/15/2017	Eastern Compliance	6.8	0.685	--	170
G54D	7/20/2017	Eastern Compliance	6.8	0.58	25.2	151
G54D	11/30/2017	Eastern Compliance	6.7	0.646	--	136
G54D	6/19/2018	Eastern Compliance	6.7	0.631	--	146

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G54D	9/5/2018	Eastern Compliance	6.5	0.66	--	152
G54D	3/27/2019	Eastern Compliance	6.8	1.03	--	142
G54D	9/9/2019	Eastern Compliance	6.4	0.614	--	136
G54D	3/30/2020	Eastern Compliance	6.78	0.766	27.1	184
G54D	9/23/2020	Eastern Compliance	6.7	0.819	--	173
G54D	3/24/2021	Eastern Compliance	6.56	0.404	24.2	186
G54D	9/20/2021	Eastern Compliance	6.48	0.35	--	175
G54D	7/26/2022	Eastern Compliance	7.09	0.178	22.3	188
G54D	9/20/2022	Eastern Compliance	6.5	0.252	--	218
G54D	3/8/2017	Eastern Compliance	7.1	0.499	--	131
G54D	5/3/2023	Eastern Compliance	6.8	0.555	26.4	194
G54D	3/9/2023	Eastern Compliance	6.52	0.555	26.4	231
G54D	3/15/2022	Eastern Compliance	6.61	0.451	25.8	213
G101	7/26/2022	Other	7.31	<0.0092	5.09	30
G101	3/7/2023	Other	6.58	0.0294	5.4	28
G101	3/22/2021	Other	6.99	<0.02	7.65	39
G101	8/31/2022	Other	6.64	<0.0092	5.88	37
G101	9/28/2022	Other	6.49	<0.019	5.77	30
G101	10/26/2022	Other	6.9	0.0366	5.21	56
G101	11/15/2022	Other	6.85	<0.0092	5.51	37
G101	12/14/2022	Other	6.63	<0.0092	5.19	37
G101	1/18/2023	Other	6.58	<0.0092	5.01	32
G101	2/14/2023	Other	6.24	<0.0092	5.29	41
G101	12/14/2016	Other	6.7	<0.025	--	35
G101	3/7/2017	Other	6	<0.025	--	37
G101	11/30/2017	Other	6.6	<0.025	--	35
G101	6/19/2018	Other	6.7	<0.025	--	49
G101	3/27/2019	Other	6.7	<0.025	--	46
G101	9/9/2019	Other	6.3	<0.025	--	35
G101	3/30/2020	Other	6.76	<0.025	3.79	41
G101	9/23/2020	Other	6.51	<0.025	--	37
G101	9/20/2021	Other	6.4	<0.025	--	36
G101	3/14/2022	Other	6.48	<0.025	4.34	38
G101	9/20/2022	Other	6.58	<0.0092	--	38
G101	6/14/2017	Other	6.4	<0.025	--	51
G101	3/25/2021	Other	6.51	<0.025	4.36	37
G101	7/19/2017	Other	6.7	<0.025	4.68	52
G101	12/22/2015	Other	6.5	<0.025	--	33
G101	3/16/2016	Other	6.6	<0.025	--	86

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G101	6/14/2016	Other	6.3	<0.025	--	53
G101	9/13/2016	Other	6.4	<0.025	--	47
G101	12/6/2018	Other	6.7	<0.025	--	54
G101	3/21/2023	Other	6.59	0.0525	13.2	49
G102	3/7/2017	Other	5.8	<0.025	--	22
G102	11/30/2017	Other	6.3	<0.025	--	20
G102	6/19/2018	Other	6.5	<0.025	--	50
G102	3/27/2019	Other	6.5	<0.025	--	44
G102	9/9/2019	Other	6.1	<0.025	--	34
G102	3/30/2020	Other	6.48	<0.025	2.5	38
G102	9/23/2020	Other	6.24	<0.025	--	34
G102	9/20/2021	Other	6.38	<0.025	--	38
G102	3/14/2022	Other	6.37	<0.025	3.21	30
G102	9/20/2022	Other	6.44	<0.0092	--	41
G102	6/14/2017	Other	6.1	<0.025	--	27
G102	3/25/2021	Other	6.46	<0.025	2.64	35
G102	3/10/2023	Other	6.31	<0.02	3.6	40
G102	7/19/2017	Other	6.4	<0.025	3.3	28
G102	12/22/2015	Other	6.9	<0.025	--	15
G102	3/16/2016	Other	6.4	<0.025	--	58
G102	6/14/2016	Other	6.1	<0.025	--	65
G102	9/13/2016	Other	5.8	<0.025	--	49
G102	12/6/2018	Other	6.4	<0.025	--	28
G102	12/15/2016	Other	6.2	<0.025	--	24
G103	12/23/2015	Other	7.25	--	--	--
G104	6/23/2014	Other	6.8	<0.02	--	<50.0
G104	9/9/2014	Other	6.89	<0.02	--	<50.0
G104	12/9/2014	Other	6.9	0.0837	--	<50.0
G104	3/20/2015	Other	6.29	<0.02	--	--
G105	3/7/2017	Other	5.7	<0.025	--	12
G105	11/30/2017	Other	6.3	<0.025	--	12
G105	6/19/2018	Other	6.3	<0.025	--	12
G105	3/27/2019	Other	6.3	<0.025	--	11
G105	9/9/2019	Other	6.1	<0.025	--	12
G105	3/30/2020	Other	6.32	<0.025	9.11	13
G105	9/23/2020	Other	6.22	<0.025	--	16
G105	9/20/2021	Other	6.06	<0.025	--	13
G105	3/14/2022	Other	6.18	<0.025	8.95	12
G105	9/20/2022	Other	6.14	<0.0092	--	11

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G105	6/14/2017	Other	6.1	<0.025	--	16
G105	3/25/2021	Other	6.13	<0.025	8.53	12
G105	3/10/2023	Other	6.03	<0.011	8.78	12
G105	7/19/2017	Other	6.4	<0.025	8.8	13
G105	12/22/2015	Other	6.6	<0.025	--	12
G105	3/16/2016	Other	6.4	<0.025	--	11
G105	6/14/2016	Other	6.4	<0.025	--	12
G105	9/13/2016	Other	6.4	<0.025	--	13
G105	12/6/2018	Other	6.2	<0.025	--	11
G105	12/15/2016	Other	6.2	<0.025	--	11
G106	12/23/2015	Other	6.34	--	--	--
G107	3/7/2017	Other	6.1	<0.025	--	93
G107	11/30/2017	Other	6.5	0.0295	--	88
G107	6/19/2018	Other	6.6	<0.025	--	77
G107	3/27/2019	Other	6.4	<0.025	--	30
G107	9/9/2019	Other	6.5	0.0373	--	112
G107	3/30/2020	Other	6.68	<0.025	24.8	89
G107	9/23/2020	Other	6.73	0.0353	--	101
G107	9/20/2021	Other	6.64	0.0282	--	67
G107	3/14/2022	Other	6.42	<0.025	21.3	40
G107	9/20/2022	Other	6.59	<0.023	--	49
G107	6/14/2017	Other	6.4	<0.025	--	50
G107	3/25/2021	Other	6.48	0.0291	19.5	54
G107	3/10/2023	Other	6.42	<0.023	20.6	42
G107	7/19/2017	Other	6.8	<0.025	26.7	123
G107	12/22/2015	Other	6.9	0.0365	--	29
G107	3/16/2016	Other	6.3	<0.025	--	11
G107	6/14/2016	Other	6.9	0.0311	--	58
G107	9/13/2016	Other	6.7	<0.025	--	127
G107	12/6/2018	Other	6.6	0.027	--	72
G107	12/15/2016	Other	6.6	<0.025	--	67
G108	12/23/2015	Other	7.04	--	--	--
G109	3/7/2017	Other	6	<0.025	--	37
G109	11/30/2017	Other	6.5	<0.025	--	48
G109	6/19/2018	Other	6.9	0.0277	--	100
G109	9/5/2018	Other	7	--	--	77
G109	3/27/2019	Other	6.7	0.0309	--	55
G109	9/9/2019	Other	6.5	0.0255	--	59
G109	3/30/2020	Other	6.76	0.0272	8.21	41

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G109	9/23/2020	Other	6.6	<0.025	--	42
G109	9/20/2021	Other	6.54	<0.025	--	27
G109	3/14/2022	Other	6.55	<0.025	7.91	30
G109	9/20/2022	Other	6.49	<0.014	--	21
G109	6/14/2017	Other	6.5	<0.025	--	68
G109	3/25/2021	Other	6.35	<0.025	6.16	32
G109	3/10/2023	Other	6.32	<0.018	7.7	37
G109	7/19/2017	Other	6.7	<0.025	7.34	65
G109	12/22/2015	Other	6.7	0.0315	--	23
G109	3/16/2016	Other	6.5	<0.025	--	22
G109	6/14/2016	Other	6.4	<0.025	--	29
G109	9/13/2016	Other	6.5	<0.025	--	41
G109	12/6/2018	Other	6.7	<0.025	--	68
G109	12/15/2016	Other	6.5	<0.025	--	33
G110	12/23/2015	Other	6.87	--	--	--
G111	3/7/2023	Other	7.05	<0.0092	8.94	16
G111	3/22/2021	Other	7.34	<0.02	9.48	17
G111	1/18/2023	Other	6.88	<0.0092	8.76	14
G111	9/1/2022	Other	7.02	0.0873	9.92	16
G111	9/27/2022	Other	7.03	0.0341	9	14
G111	10/28/2022	Other	6.9	0.0389	9.32	13
G111	11/16/2022	Other	7.11	<0.0092	8.67	16
G111	12/15/2022	Other	6.89	<0.0092	8.89	15
G111	2/15/2023	Other	6.48	<0.0092	9.14	16
G111	3/7/2017	Other	6.2	0.0308	--	29
G111	11/30/2017	Other	6.7	<0.025	--	<10.0
G111	6/19/2018	Other	6.8	<0.025	--	40
G111	3/27/2019	Other	6.8	0.0256	--	46
G111	9/9/2019	Other	5.9	0.0258	--	33
G111	3/30/2020	Other	6.68	0.03	7.49	44
G111	9/23/2020	Other	6.63	<0.025	--	31
G111	9/20/2021	Other	6.51	<0.025	--	21
G111	3/14/2022	Other	6.49	<0.025	6.03	29
G111	9/20/2022	Other	6.53	<0.013	--	19
G111	6/14/2017	Other	6.6	<0.025	--	37
G111	3/25/2021	Other	6.4	<0.025	6.06	33
G111	7/19/2017	Other	6.8	<0.025	5.97	29
G111	12/22/2015	Other	6.5	<0.025	--	27
G111	3/16/2016	Other	6.5	<0.025	--	37

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
G111	6/14/2016	Other	6.7	0.0265	--	39
G111	9/13/2016	Other	6.8	0.0251	--	23
G111	12/6/2018	Other	6.5	0.0404	--	32
G111	3/21/2023	Other	6.56	0.047	4.71	23
G111	12/15/2016	Other	6.8	<0.025	--	13
G112C	3/8/2023	Other	6.41	4.8	85.6	822
G112C	3/22/2021	Other	6.85	4.25	68.2	532
G112C	9/28/2022	Other	6.31	4.82	99.5	682
G112C	10/26/2022	Other	6.69	4.86	84.7	820
G112C	12/14/2022	Other	6.63	4.99	87.5	791
G112C	1/18/2023	Other	6.49	4.31	84.6	769
G112C	2/15/2023	Other	6.26	5.04	88.4	797
G112C	8/30/2022	Other	6.62	4.26	85.8	726
G112C	11/17/2022	Other	6.76	4.6	85.1	764
G112D	3/8/2023	Other	6.62	0.0464	24.3	13
G112D	9/28/2022	Other	6.8	0.101	26	<8.0
G112D	10/26/2022	Other	6.97	0.0457	24.3	<8.0
G112D	12/14/2022	Other	6.81	<0.0092	24.7	<6.0
G112D	1/18/2023	Other	6.71	0.0268	24.3	11
G112D	2/15/2023	Other	6.49	<0.0092	25.4	13
G112D	8/30/2022	Other	6.89	0.0367	24.8	<9.0
G112D	11/17/2022	Other	6.95	<0.012	24	<8.0
G112DD	3/8/2023	Other	7.03	0.104	17.7	10
G112DD	9/28/2022	Other	7.24	0.162	21	12
G112DD	10/26/2022	Other	7.42	0.12	18.6	13
G112DD	12/14/2022	Other	8.06	0.116	18.3	10
G112DD	8/30/2022	Other	7.31	0.109	19.9	12
G112DD	11/17/2022	Other	7.41	0.135	17.5	11
G113	3/7/2023	Other	6.53	<0.013	55.2	386
G113	3/22/2021	Other	6.86	<0.02	51.3	292
G113	9/28/2022	Other	6.36	0.0258	65.8	289
G113	10/26/2022	Other	6.57	0.0919	56.7	288
G113	9/1/2022	Other	6.6	<0.022	58.2	316
G113	11/16/2022	Other	6.58	<0.014	54.1	296
G113	12/15/2022	Other	6.38	<0.0092	57.1	314
G113	2/15/2023	Other	6.21	<0.0092	56.1	346
G113	1/19/2023	Other	6.32	<0.0092	54.2	327
TPZ114	3/10/2023	Other	6.15	<0.024	6.82	20
TPZ114	3/22/2021	Other	7.42	0.177	15.4	19

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
TPZ114	9/1/2022	Other	6.32	0.0746	7.86	13
TPZ114	9/27/2022	Other	6.02	0.0451	7.95	19
TPZ114	11/16/2022	Other	6.51	0.0269	8.71	21
TPZ114	12/15/2022	Other	6.22	<0.0092	7.5	24
TPZ114	2/15/2023	Other	6.09	0.0254	6.36	24
TPZ114	1/19/2023	Other	6.26	<0.0092	6.42	19
TPZ114	10/27/2022	Other	6.21	0.0251	6.52	21
TPZ115	3/8/2023	Other	6.96	<0.015	38.4	197
TPZ115	1/18/2023	Other	6.93	<0.0092	36.6	178
TPZ115	9/27/2022	Other	6.91	0.0383	34.2	147
TPZ115	12/15/2022	Other	6.87	<0.0092	38.1	180
TPZ115	2/15/2023	Other	6.68	<0.0092	37.6	179
TPZ115	8/30/2022	Other	7.12	0.0354	31.2	135
TPZ115	11/17/2022	Other	7.16	<0.013	35.5	181
TPZ115	10/27/2022	Other	6.93	0.0267	39.6	170
TPZ115D	3/8/2023	Other	7.11	0.356	21.8	37
TPZ115D	1/18/2023	Other	7.13	0.349	20.8	37
TPZ115D	9/27/2022	Other	7.24	0.467	22.5	35
TPZ115D	12/15/2022	Other	7.1	0.387	22.4	39
TPZ115D	2/15/2023	Other	6.79	0.4	22.3	37
TPZ115D	8/30/2022	Other	7.13	0.382	21.9	38
TPZ115D	11/17/2022	Other	7.37	0.387	20.9	37
TPZ115D	10/27/2022	Other	7.13	0.421	22.6	36
TPZ115DD	3/8/2023	Other	7.18	0.0915	17	13
TPZ115DD	9/27/2022	Other	7.34	0.0563	17.6	11
TPZ115DD	12/15/2022	Other	7.2	0.0657	19.2	12
TPZ115DD	8/30/2022	Other	7.36	0.0423	17.7	<8.0
TPZ115DD	11/17/2022	Other	7.36	0.0684	16.4	11
TPZ115DD	10/27/2022	Other	7.24	0.0847	18.3	11
TPZ116	3/22/2021	Other	6.99	<0.02	13.6	24
TPZ117	3/22/2021	Other	6.67	<0.02	18.8	32
TPZ117D	3/7/2023	Other	6.54	0.724	29.3	228
TPZ117D	7/27/2022	Other	7.56	0.409	36.3	134
TPZ117D	3/22/2021	Other	7.09	0.0763	19.3	187
TPZ117D	11/15/2022	Other	6.7	0.36	35.6	133
TPZ117D	12/14/2022	Other	6.53	0.353	37	127
TPZ117D	1/18/2023	Other	6.48	0.495	29.8	186
TPZ117D	9/1/2022	Other	6.62	0.41	38.7	124
TPZ117D	2/15/2023	Other	6.29	0.331	35.1	126

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
TPZ117D	9/29/2022	Other	6.57	0.394	42.1	130
TPZ117D	11/4/2022	Other	6.69	0.423	35.2	135
TPZ118	3/8/2023	Western UCU	6.56	5.44	6.3	88
TPZ118	8/31/2022	Western UCU	5.97	9.54	21.6	242
TPZ118	11/15/2022	Western UCU	5.84	13.1	16.7	233
TPZ118	12/14/2022	Western UCU	5.52	14.6	19.1	263
TPZ118	10/28/2022	Western UCU	5.65	18.7	21.1	259
TPZ118	2/15/2023	Western UCU	5.04	10.9	12	250
TPZ118	1/19/2023	Western UCU	6.41	3.35	4.04	63
TPZ118	9/29/2022	Western UCU	5.99	12.1	18.6	215
TPZ118D	3/8/2023	Western UA	6.28	7.44	30.7	358
TPZ118D	8/31/2022	Western UA	6.3	5.41	32.7	351
TPZ118D	11/15/2022	Western UA	6.55	6.13	29.8	332
TPZ118D	12/14/2022	Western UA	6.6	5.85	27.1	300
TPZ118D	10/28/2022	Western UA	6.35	7.08	31.3	352
TPZ118D	2/15/2023	Western UA	6.07	7.56	30.8	329
TPZ118D	1/19/2023	Western UA	6.31	6.35	28.7	329
TPZ118D	9/29/2022	Western UA	6.17	5.74	33.6	357
TPZ118DD	3/8/2023	Western UA	7.09	0.0776	16.8	10
TPZ118DD	8/31/2022	Western UA	7.4	0.831	19.5	73
TPZ118DD	11/15/2022	Western UA	7.34	0.054	16.4	12
TPZ118DD	12/14/2022	Western UA	7.08	0.122	17.9	12
TPZ118DD	10/28/2022	Western UA	7.26	0.112	16.5	10
TPZ118DD	9/29/2022	Western UA	6.84	0.146	17.9	17
TPZ119D	3/7/2023	Western UA	6.34	4.76	33.7	175
TPZ119D	8/31/2022	Western UA	6.49	5.58	35.5	192
TPZ119D	12/14/2022	Western UA	6.44	4.59	33.6	156
TPZ119D	1/18/2023	Western UA	6.35	3.32	29	142
TPZ119D	11/16/2022	Western UA	6.48	4.35	32.4	159
TPZ119D	2/15/2023	Western UA	6.16	4.22	31.2	154
TPZ119D	9/29/2022	Western UA	6.19	4.37	35	186
TPZ119D	11/4/2022	Western UA	6.61	5.48	33.7	156
TPZ119DD	3/7/2023	Western UA	6.76	11.8	80.5	969
TPZ119DD	8/31/2022	Western UA	6.9	11.5	82	899
TPZ119DD	12/14/2022	Western UA	6.81	12.4	84.3	886
TPZ119DD	1/18/2023	Western UA	6.74	11.1	78	972
TPZ119DD	11/16/2022	Western UA	6.94	12.3	79.8	906
TPZ119DD	2/15/2023	Western UA	6.54	13.6	83.3	1030
TPZ119DD	9/29/2022	Western UA	6.88	10.9	87.6	907

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
TPZ119DD	11/4/2022	Western UA	7	14.2	85.2	906
TPZ120	3/7/2023	Western UCU	2.8	2.36	58.8	4200
TPZ120	10/26/2022	Western UCU	3.02	3.13	62.8	4600
TPZ120	9/27/2022	Western UCU	3.53	2.53	60.2	3650
TPZ120	11/16/2022	Western UCU	3.13	2.21	63.1	4530
TPZ120	12/15/2022	Western UCU	3.4	3.55	63.5	4100
TPZ120	2/15/2023	Western UCU	3.14	2.1	59.4	4550
TPZ120	8/30/2022	Western UCU	3.63	2.08	52.4	4100
TPZ120	1/19/2023	Western UCU	2.77	2.1	56.4	4280
TPZ120D	3/7/2023	Western UA	6.2	4.77	115	1020
TPZ120D	10/26/2022	Western UA	6.35	4.51	122	1020
TPZ120D	9/27/2022	Western UA	6.37	4.14	118	960
TPZ120D	11/16/2022	Western UA	6.37	4.39	118	1020
TPZ120D	12/15/2022	Western UA	6.16	5.09	121	1020
TPZ120D	2/15/2023	Western UA	6.01	5.31	112	1080
TPZ120D	8/30/2022	Western UA	6.18	3.52	126	967
TPZ120D	1/19/2023	Western UA	6.17	3.9	114	964
TPZ122	3/7/2023	Other	6.77	5.15	27	214
TPZ122	8/31/2022	Other	6.52	0.806	19.7	234
TPZ122	1/18/2023	Other	6.12	1.17	22.3	379
TPZ122	9/27/2022	Other	6.46	1.16	18.2	270
TPZ122	11/16/2022	Other	6.35	0.945	23.4	332
TPZ122	12/15/2022	Other	6.2	1.32	24	367
TPZ122	2/15/2023	Other	5.73	1.34	25.8	381
TPZ122	10/27/2022	Other	6.24	0.988	23.2	325
TPZ122D	3/7/2023	Other	6.11	1.32	26.1	395
TPZ122D	8/31/2022	Other	6.95	4.66	26.4	193
TPZ122D	1/18/2023	Other	6.77	4.36	24.7	225
TPZ122D	9/27/2022	Other	6.65	5.43	25.7	193
TPZ122D	11/16/2022	Other	6.94	5.25	25.4	193
TPZ122D	12/15/2022	Other	6.76	4.92	25.9	213
TPZ122D	2/15/2023	Other	6.46	5.54	26.8	215
TPZ122D	10/27/2022	Other	6.78	6.6	27.7	191
TPZ123	3/7/2023	Western UA	6.84	<0.023	20.5	156
TPZ123	11/3/2022	Western UA	7.2	0.027	17.6	102
TPZ123	8/31/2022	Western UA	7.21	0.0691	17.1	85
TPZ123	1/18/2023	Western UA	6.93	0.0384	26	163
TPZ123	9/27/2022	Western UA	7.2	0.0934	15.9	89
TPZ123	11/16/2022	Western UA	7.11	<0.015	16.8	121

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
TPZ123	12/15/2022	Western UA	6.95	0.0457	17.8	122
TPZ123	2/15/2023	Western UA	6.38	0.0337	20.2	166
TPZ124	3/7/2023	Western UCU	6.17	12.2	44	357
TPZ124	8/31/2022	Western UCU	6.27	8.99	30.8	219
TPZ124	11/15/2022	Western UCU	6.57	14.1	30.8	221
TPZ124	12/14/2022	Western UCU	6.25	24.7	34.4	257
TPZ124	1/18/2023	Western UCU	6.09	10	41.6	311
TPZ124	2/14/2023	Western UCU	5.71	13.6	43.6	331
TPZ124	10/28/2022	Western UCU	6.31	16	30.5	205
TPZ124	9/29/2022	Western UCU	6.35	15.2	34.7	202
TPZ124D	3/7/2023	Western UA	6.77	2.88	45.8	394
TPZ124D	8/31/2022	Western UA	7.04	1.31	37.8	238
TPZ124D	11/15/2022	Western UA	7.07	2.21	42.5	321
TPZ124D	12/14/2022	Western UA	6.88	2.22	43.6	314
TPZ124D	1/18/2023	Western UA	6.8	2.41	44.7	313
TPZ124D	2/14/2023	Western UA	6.4	2.59	45.4	341
TPZ124D	10/28/2022	Western UA	6.84	2.46	43.9	306
TPZ124D	9/29/2022	Western UA	6.91	2.34	44.9	303
XPW01	7/21/2021	Eastern Porewater	7.27	10.1	0.917	328
XPW02	3/21/2023	Eastern Porewater	7.6	--	--	--
XPW02	5/3/2023	Eastern Porewater	7.72	13.4	12.3	2650
XPW02	3/15/2022	Eastern Porewater	7.74	16	10.7	2590
XPW02	7/21/2021	Eastern Porewater	7.76	12	11.1	2330
XPW02	5/12/2021	Eastern Porewater	7.85	10.8	11.8	2410
XPW02	4/14/2021	Eastern Porewater	7.9	11.5	11.3	2410
XPW01	3/5/2021	Eastern Porewater	8	10.4	2.25	345
XPW02	3/4/2021	Eastern Porewater	8	12.1	10.9	2380
XPW02	3/24/2021	Eastern Porewater	8	12.2	11.3	2830
XPW01	4/14/2021	Eastern Porewater	8.2	9.42	1.28	355
XPW01	3/15/2022	Eastern Porewater	8.33	10.4	0.443	360
XPW01	5/12/2021	Eastern Porewater	8.4	10.2	1.31	309
XPW01	3/24/2021	Eastern Porewater	8.4	9.58	1.7	355
XPW01	5/3/2023	Eastern Porewater	8.41	10.6	0.405	345
XPW01	3/8/2023	Eastern Porewater	8.47	8.79	0.254	414
XPW03	7/21/2021	Eastern Porewater	9.97	11.6	<0.05	148
XPW03	3/4/2021	Eastern Porewater	10.5	12.2	<0.05	133
XPW03	3/15/2022	Eastern Porewater	10.5	11.1	<0.05	152
XPW03	4/14/2021	Eastern Porewater	10.5	9.3	<0.05	152
XPW03	3/24/2021	Eastern Porewater	10.6	11.6	<0.05	138

Appendix D-1. Supporting groundwater analytical data for Table 1 and Attachments 3 and 4.

Well ID	Date	Well Type	pH (field) (SU)	Boron, total (mg/L)	Magnesium, total (mg/L)	Sulfate, total (mg/L)
XPW03	3/9/2023	Eastern Porewater	10.7	8.06	<0.021	142
XPW03	5/3/2023	Eastern Porewater	10.7	9.22	<0.03	144
XPW03	5/12/2021	Eastern Porewater	10.7	11.7	<0.1	155
XPW02	3/8/2023	Eastern Porewater	--	10.8	8.75	2450
XTPW01	3/10/2023	Western Porewater	10.8	34.3	0.0986	420
XTPW01	3/22/2021	Western Porewater	11.13	27	0.122	387
XTPW01	9/28/2022	Western Porewater	10.71	32.1	0.29	395
XTPW01	9/1/2022	Western Porewater	11.03	29.5	0.292	402
XTPW01	10/27/2022	Western Porewater	10.95	32.7	4.36	403
XTPW02	3/8/2023	Western Porewater	10.6	17.8	0.123	462
XTPW02	9/28/2022	Western Porewater	10.65	22.3	0.7	427
XTPW02	10/26/2022	Western Porewater	10.91	21.9	0.381	478
XTPW02	9/1/2022	Western Porewater	10.56	21.4	1.1	461
XTPW03	3/7/2023	Western Porewater	6.76	4.02	27.8	89
XTPW03	9/28/2022	Western Porewater	7.33	16.4	18.9	269
XTPW03	9/1/2022	Western Porewater	7.5	16.2	20.4	234
XTPW03	10/27/2022	Western Porewater	7.42	23.3	17.2	356
XTPW04	3/8/2023	Western Porewater	7.09	11.3	17	452
XTPW04	9/28/2022	Western Porewater	9.58	18.3	10	658
XTPW04	10/26/2022	Western Porewater	9.77	24.2	6.91	907
XTPW04	9/1/2022	Western Porewater	8.73	16.2	14.4	539

Notes:

mg/L = milligrams per liter

SU= standard units

< = less than analytical detection limit; data not included in Attachment 3 and 4 analyses.

-- = data not measured

Well Type: Western and Eastern as defined in main text, UA=uppermost aquifer, UCU= upper confining unit

Attachment 3: pH, boron, and magnesium data from March 2021 to May 2023. See Attachment 3 legend for full list of included wells.

Attachment 4: Magnesium and sulfate data for all sampling dates and all wells listed here.

Table 1: Inline Table 1 presents pH, boron, and magnesium data for G11, G51D, CCR Porewater, Western Groundwater, Eastern Groundwater, and TPZ120. G11, G51D, and TPZ120 data are from from March 2021 to May 2023 for those individual wells. For the same time frame, CCR Porewater includes both eastern and western porewater; Western Groundwater includes all Western UA and UCU wells except TPZ120; Eastern Groundwater includes all Eastern Compliance and Background Wells.

Appendix D-2. Supporting groundwater analytical data for Attachment 6A.

Well ID	Date	Iron (mg/L)	Oxidation Reduction Potential (mV)
G11	2021/07/06	0.071	78
G11	2021/04/14	0.084	100
G11	2021/07/20	0.036	135
G11	2023/05/03	*3.35*	207
G11	2021/06/01	0.086	159
G11	2021/06/14	0.052	149
G11	2023/03/08	--	166
G11	2021/03/04	0.51	69.0
G11	2021/03/24	<0.025	154
G11	2021/05/12	<0.1	194
G11	2022/07/23	0.16	122
G51D	2023/03/08	--	167
G51D	2021/03/24	--	136
G51D	2022/07/25	0.41	178
G51D	2022/03/15	--	165
G51D	2020/03/30	--	261
G51D	2023/05/03	*0.82*	214
G51D	2017/07/20	--	180
G51D	2019/09/09	--	157
G51D	2021/09/20	--	238
G51D	2022/09/20	--	215
G51D	2016/09/14	--	231
G51D	2017/06/15	--	168
G51D	2017/11/30	--	168
G51D	2018/06/19	--	247
G51D	2019/03/27	--	130
G51D	2020/09/23	--	292
G51D	2016/06/15	--	213
G51D	2016/12/14	--	134
G51D	2016/03/15	--	122
G51D	2018/09/05	--	217
G51D	2015/12/03	--	133
G51D	2017/03/08	--	282
TPZ118DD	2022/09/29	*0.97*	-65.5
TPZ118DD	2022/12/14	2.07	<-300.0
TPZ118DD	2023/03/08	*2.11*	-36.2
TPZ118DD	2022/10/28	1.88	-103
TPZ118DD	2022/11/15	1.60	-168

Appendix D-2. Supporting groundwater analytical data for Attachment 6A.

Well ID	Date	Iron (mg/L)	Oxidation Reduction Potential (mV)
TPZ118DD	2022/08/31	*1.70*	-124
TPZ119D	2023/02/15	0.10	217
TPZ119D	2022/09/29	0.12	90.1
TPZ119D	2023/03/07	0.051	104
TPZ119D	2023/01/18	0.12	76.0
TPZ119D	2022/12/14	0.095	96.0
TPZ119D	2022/11/16	*0.086*	38.0
TPZ119D	2022/08/31	*0.80*	123
TPZ119D	2022/11/04	--	196
TPZ120D	2023/02/15	0.89	123
TPZ120D	2022/12/15	1.30	212
TPZ120D	2023/01/19	1.30	178
TPZ120D	2022/08/30	*16.5*	-59.2
TPZ120D	2023/03/07	*1.30*	83.1
TPZ120D	2022/10/26	1.51	32.0
TPZ120D	2022/11/16	1.32	-3.20
TPZ120D	2022/09/27	2.68	43.2
TPZ123	2022/08/31	*31.9*	-78.4
TPZ123	2022/11/03	--	-89.2
TPZ123	2022/09/27	*5.11*	-81.7
TPZ123	2023/03/07	*2.74*	-24.2
TPZ123	2023/01/18	*102*	-116
TPZ123	2022/11/16	*2.46*	-116
TPZ123	2022/12/15	*5.56*	-64.0
TPZ123	2023/02/15	*2.17*	21.0
TPZ124D	2023/02/14	0.40	35.0
TPZ124D	2023/03/07	0.32	11.6
TPZ124D	2023/01/18	0.32	-8.00
TPZ124D	2022/10/28	1.13	-32.9
TPZ124D	2022/12/14	0.76	-24.0
TPZ124D	2022/09/29	*1.71*	-42.7
TPZ124D	2022/08/31	3.14	-63.7
TPZ124D	2022/11/15	0.82	-106
G01D	2017/03/07	--	80.0
G01D	2021/07/06	*1.79*	139
G01D	2023/05/02	*4.09*	145

Appendix D-2. Supporting groundwater analytical data for Attachment 6A.

Well ID	Date	Iron (mg/L)	Oxidation Reduction Potential (mV)
G01D	2021/06/01	*1.92*	164
G01D	2021/07/21	*1.35*	122
G01D	2022/03/14	--	117
G01D	2019/09/09	--	193
G01D	2021/06/14	*0.83*	160
G01D	2021/03/24	*1.15*	160
G01D	2021/05/12	*0.65*	180
G01D	2022/09/20	--	173
G01D	2021/09/20	--	170
G01D	2023/03/07	--	195
G01D	2021/03/03	*1.09*	145
G01D	2023/01/24	*7.38*	114
G01D	2016/03/15	--	-103
G01D	2017/06/15	--	123
G01D	2015/12/03	--	60.0
G01D	2019/03/27	--	118
G01D	2021/04/14	0.70	134
G01D	2020/09/23	--	202
G01D	2016/09/14	--	-26.0
G01D	2017/11/30	--	21.0
G01D	2016/12/14	--	113
G01D	2018/06/19	--	29.0
G01D	2017/07/20	--	102
G01D	2020/03/30	--	138
G01D	2016/06/15	--	-110
G01D	2018/09/05	--	131
G01D	2022/07/26	*1.85*	15.5
G02D	2021/07/06	<0.025	128
G02D	2021/07/21	0.059	100
G02D	2021/06/01	0.043	140
G02D	2017/06/14	--	95.0
G02D	2021/04/14	<0.025	151
G02D	2016/12/14	--	218
G02D	2021/09/20	--	191
G02D	2021/03/24	0.026	175
G02D	2021/05/12	<0.1	183

Appendix D-2. Supporting groundwater analytical data for Attachment 6A.

Well ID	Date	Iron (mg/L)	Oxidation Reduction Potential (mV)
G02D	2021/06/14	0.071	169
G02D	2023/05/03	0.049	182
G02D	2022/03/14	--	138
G02D	2022/09/21	--	199
G02D	2021/03/03	0.11	151
G02D	2019/09/09	--	186
G02D	2023/03/08	--	49.1
G02D	2020/03/30	--	179
G02D	2016/03/15	--	28.0
G02D	2016/09/14	--	69.0
G02D	2018/09/05	--	169
G02D	2019/03/27	--	130
G02D	2020/09/23	--	246
G02D	2023/01/24	<0.0115	109.8
G02D	2015/12/03	--	146
G02D	2018/06/19	--	187
G02D	2017/07/20	--	132
G02D	2016/06/15	--	82.0
G02D	2017/03/08	--	254
G02D	2017/11/30	--	70.0
G02D	2022/07/27	0.03	97.3
XTPW03	2023/03/07	*0.49*	50.0
XTPW03	2022/09/28	*12.8*	-69.5
XTPW03	2022/10/27	*5.64*	-136
XTPW03	2022/09/01	*18.7*	-174

Notes:

mg/L = milligrams per liter

mV = millivolts ; V = volts

Italicized samples not included in average iron presented in Attachment 6a due to turbidity >10NTU

WAP: West ash pond, represented by data from XTPW03

Backgroud: Represented by data from G01D and G02D

Appendix D-3. Supporting groundwater analytical data for Attachment 6B.

Well ID	Date	pH (SU)	Temperature (Celcius)	Oxidation Reduction Potential (mV)	Eh (V)
G11	3/4/2021	5.90	16.30	69.0	0.276
G11	3/24/2021	5.90	16.50	154	0.361
G11	4/14/2021	5.80	16.10	100	0.307
G11	5/12/2021	5.90	16.50	194	0.401
G11	6/1/2021	5.82	16.40	159	0.366
G11	6/14/2021	5.86	16.60	149	0.355
G11	7/6/2021	5.78	16.70	78.0	0.284
G11	7/20/2021	5.82	16.90	135	0.341
G11	7/23/2022	6.33	17.32	122	0.328
G11	3/8/2023	5.87	16.00	166	0.373
G11	5/3/2023	5.82	16.50	207	0.414
G51D	7/20/2017	5.90	18.92	180	0.384
G51D	3/30/2020	5.62	16.40	261	0.468
G51D	3/24/2021	5.56	17.00	136	0.342
G51D	9/20/2021	5.46	17.70	238	0.443
G51D	3/15/2022	5.57	16.10	165	0.372
G51D	7/25/2022	6.92	18.07	178	0.383
G51D	3/8/2023	5.49	15.90	167	0.374
G51D	5/3/2023	5.57	16.30	214	0.421
TPZ118DD	8/31/2022	7.40	15.94	-124	0.083
TPZ118DD	9/29/2022	6.84	15.83	-65.5	0.142
TPZ118DD	10/28/2022	7.26	15.70	-103	0.104
TPZ118DD	11/15/2022	7.34	14.77	-168	0.040
TPZ118DD	12/14/2022	7.08	14.80	-300	-0.092
TPZ118DD	3/8/2023	7.09	14.70	-36.2	0.172
TPZ119D	8/31/2022	6.49	16.55	123	0.329
TPZ119D	9/29/2022	6.19	16.92	90.1	0.296
TPZ119D	11/4/2022	6.61	16.12	196	0.403
TPZ119D	11/16/2022	6.48	14.41	38.0	0.246
TPZ119D	12/14/2022	6.44	14.80	96.0	0.304
TPZ119D	1/18/2023	6.35	14.30	76.0	0.285
TPZ119D	2/15/2023	6.16	15.10	217	0.425
TPZ119D	3/7/2023	6.34	14.90	104	0.312
TPZ119DD	8/31/2022	6.90	17.25	-1.3	0.205
TPZ119DD	9/29/2022	6.88	18.56	-3.0	0.202
TPZ119DD	11/4/2022	7.00	17.05	131	0.337
TPZ119DD	11/16/2022	6.94	12.75	-54.0	0.156
TPZ119DD	12/14/2022	6.81	14.60	76.0	0.284
TPZ119DD	1/18/2023	6.74	14.00	32.0	0.241

Appendix D-3. Supporting groundwater analytical data for Attachment 6B.

Well ID	Date	pH (SU)	Temperature (Celcius)	Oxidation Reduction Potential (mV)	Eh (V)
TPZ119DD	2/15/2023	6.54	14.90	36.0	0.244
TPZ119DD	3/7/2023	6.76	14.60	2.0	0.210
TPZ120D	8/30/2022	6.18	16.31	-59.2	0.148
TPZ120D	9/27/2022	6.37	17.00	43.2	0.249
TPZ120D	10/26/2022	6.35	17.60	32.0	0.238
TPZ120D	11/16/2022	6.37	15.23	-3.2	0.204
TPZ120D	12/15/2022	6.16	14.70	212	0.420
TPZ120D	1/19/2023	6.17	14.80	178	0.386
TPZ120D	2/15/2023	6.01	15.50	123	0.330
TPZ120D	3/7/2023	6.20	14.90	83.1	0.291
TPZ123	8/31/2022	7.21	17.13	-78.4	0.128
TPZ123	9/27/2022	7.20	16.42	-81.7	0.125
TPZ123	11/3/2022	7.20	19.43	-89.2	0.115
TPZ123	11/16/2022	7.11	13.87	-116	0.093
TPZ123	12/15/2022	6.95	14.70	-64.0	0.144
TPZ123	1/18/2023	6.93	14.30	-116	0.093
TPZ123	2/15/2023	6.38	14.70	21.0	0.229
TPZ123	3/7/2023	6.84	14.60	-24.2	0.184
TPZ124D	8/31/2022	7.04	16.98	-63.7	0.142
TPZ124D	9/29/2022	6.91	16.40	-42.7	0.164
TPZ124D	10/28/2022	6.84	14.80	-32.9	0.175
TPZ124D	11/15/2022	7.07	13.82	-106	0.103
TPZ124D	12/14/2022	6.88	14.50	-24.0	0.184
TPZ124D	1/18/2023	6.80	14.00	-8.0	0.201
TPZ124D	2/14/2023	6.40	14.00	35.0	0.244
TPZ124D	3/7/2023	6.77	14.40	11.6	0.220
XTPW01	3/10/2023	10.80	14.00	-156	0.053
XTPW02	3/8/2023	10.60	13.90	-182	0.027
XTPW03	10/27/2022	7.42	14.40	-136	0.072
XTPW04	3/8/2023	7.09	13.50	-118	0.091

Notes:

SU= standard units

mV = millivolts ; V = volts