Prepared for
Illinois Power Generating Company

Date
January 31, 2021

Project No.
1940074915

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

COFFEEN ASH POND NO. 1, COFFEEN POWER STATION

RAMBOLL Bright ideas. Sustainable change.

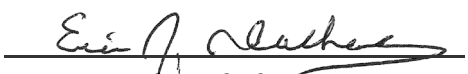
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
COFFEEN ASH POND NO. 1, COFFEEN POWER STATION

Project name	**Coffeen Power Station**
Project no.	**1940074915**
Recipient	**Illinois Power Generating Company**
Document type	**Annual Groundwater Monitoring and Corrective Action Report**
Version	**FINAL**
Date	**January 31, 2021**
Prepared by	**Kristen L. Theesfeld**
Checked by	**Eric J. Tlachac, PE**
Approved by	**Lauren D. Cook**
Description	**Annual Report in Support of the CCR Rule Groundwater Monitoring Program**

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
https://ramboll.com

Kristen L. Theesfeld
Hydrogeologist



Eric J. Tlachac, PE
Managing Engineer

CONTENTS

TABLES (IN TEXT)

TABLES (ATTACHED)

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
AP1	Ash Pond No. 1
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
CMA	Corrective Measures Assessment
GWPS	Groundwater Protection Standard
SSI	Statistically Significant Increase
SSL	Statistically Significant Level

EXECUTIVE SUMMARY

This report has been prepared to provide the information required by Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.90(e) for the Coffeen Ash Pond No. 1 (AP1) located at Coffeen Power Station near Coffeen, Illinois.

Groundwater is being monitored at Coffeen AP1 in accordance with the Assessment Monitoring Program requirements specified in 40 C.F.R. § 257.95. Assessment Monitoring was initiated at AP1 on April 9, 2018.

No changes were made to the monitoring system in 2020 (no wells were installed or decommissioned).

The following Statistically Significant Levels (SSLs) of 40 C.F.R. Part 257 Appendix IV parameters were determined in 2020:

- Cobalt at well G307

Alternate Source Demonstrations (ASDs) were completed for the SSLs referenced above. Consequently, a Corrective Measures Assessment (CMA) is not required and Coffeen AP1 remains in the Assessment Monitoring Program.

1. INTRODUCTION

This report has been prepared by Ramboll Americas Engineering Solutions Inc. (Ramboll) on behalf of Illinois Power Generating Company, to provide the information required by 40 C.F.R.§ 257.90(e) for AP1 located at Coffeen Power Station near Coffeen, Illinois.

In accordance with 40 C.F.R. § 257.90(e), the owner or operator of a Coal Combustion Residuals (CCR) unit must prepare an Annual Groundwater Monitoring and Corrective Action Report for the preceding calendar year that documents the status of the Groundwater Monitoring and Corrective Action Program for the CCR unit, summarizes key actions completed, describes any problems encountered, discusses actions to resolve the problems, and projects key activities for the upcoming year. At a minimum, the annual report must contain the following information, to the extent available:

1. A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit.
2. Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken.
3. In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the Detection Monitoring or Assessment Monitoring Programs.
4. A narrative discussion of any transition between monitoring programs (*e.g.*, the date and circumstances for transitioning from Detection Monitoring to Assessment Monitoring in addition to identifying the constituent(s) detected at a Statistically Significant Increase [SSI] relative to background levels).
5. Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.
6. A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:
    i. At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95.
    ii. At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95.
    iii. If it was determined that there was a SSI over background for one or more constituents listed in Appendix III of §257 pursuant to §257.94(e):
        A. Identify those constituents listed in Appendix III of §257 and the names of the monitoring wells associated with the SSI(s).
        B. Provide the date when the assessment monitoring program was initiated for the CCR unit.

iv. If it was determined that there was a SSL above the Groundwater Protection Standard (GWPS) for one or more constituents listed in Appendix IV of §257 pursuant to §257.95(g) include all of the following:

   A. Identify those constituents listed in Appendix IV of §257 and the names of the monitoring wells associated with the SSL(s).

   B. Provide the date when the CMA was initiated for the CCR unit.

   C. Provide the date when the public meeting was held for CMA for the CCR unit.

   D. Provide the date when the CMA was completed for the CCR unit.

v. Whether a remedy was selected pursuant to §257.97 during the current annual reporting period, and if so, the date of remedy selection.

vi. Whether remedial activities were initiated or are ongoing pursuant to §257.98 during the current annual reporting period.

This report provides the required information for Coffeen AP1 for calendar year 2020.

2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

No changes have occurred to the Monitoring Program status in calendar year 2020, and Coffeen AP1 remains in the Assessment Monitoring Program in accordance with 40 C.F.R. § 257.95.

3. KEY ACTIONS COMPLETED IN 2020

The Assessment Monitoring Program is summarized in Table A. The groundwater monitoring system, including the CCR unit and all background and downgradient monitoring wells, is presented in Figure 1. No changes were made to the monitoring system in 2020 (no wells were installed or decommissioned). In general, one groundwater sample was collected from each background and downgradient well during each monitoring event.[1] All samples were collected and analyzed in accordance with the Sampling and Analysis Plan (NRT/OBG, 2017a). All monitoring data obtained under 40 C.F.R. §§ 257.90 through 257.98 (as applicable) in 2020, and analytical results for the August 2019 sampling event, are presented in Tables 1 and 2. Analytical data were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017b) to determine any SSLs of Appendix IV parameters over GWPSs.

Statistical background values are provided in Table 3 and GWPSs in Table 4.

Potential alternate sources were evaluated as outlined in the 40 C.F.R. § 257.95(g)(3)(ii). ASDs were completed and certified by a qualified professional engineer. The date the ASD was completed is provided in Table A. The ASD completed in 2020 is included in Appendix A.

[1] Sampling was limited to G307 during the May 2020 sampling event to confirm cobalt concentrations initially detected at concentrations greater than the GWPS in the preceding sampling event, as allowed by the Statistical Analysis Plan.

Table A – 2019-2020 Assessment Monitoring Program Summary

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s)	SSL(s) Determination Date	ASD Completion Date
August 13 and 19, 2019	October 15, 2019	Appendix III Appendix IV Detected [1]	Cobalt (G307)	January 13, 2020	April 13, 2020
January 21 and 23-24, 2020 and February 26, 2020 [2] May 6, 2020 [3]	April 15, 2020 May 19, 2020	Appendix III Appendix IV Appendix IV Greater than the GWPS [4]	None	July 14, 2020	NA
August 11-12, 2020	October 15, 2020	Appendix III Appendix IV Detected [1]	TBD	TBD	TBD

Notes:

NA: Not Applicable

TBD: To Be Determined

1. Groundwater sample analysis was limited to Appendix IV parameters detected in previous events in accordance with 40 C.F.R. § 257.95(d)(1).

2. G307 was sampled on February 26, 2020 due to the well head being frozen during the sampling event on January 21 and 23-24, 2020.

3. Sampling was limited to G307 during the May 2020 sampling event to confirm Appendix IV parameters initially detected at concentrations greater than the GWPS in the preceding sampling event to confirm SSLs, as allowed by the Statistical Analysis Plan.

4. To confirm the SSL, as allowed by the Statistical Analysis Plan, a groundwater sample was collected and analyzed for the Appendix IV parameter initially detected at a concentration greater than the GWPS in the preceding sampling event.

4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the Groundwater Monitoring Program during 2020. Groundwater samples were collected and analyzed in accordance with the Sampling and Analysis Plan (NRT/OBG, 2017a), and all data were accepted.

5. KEY ACTIVITIES PLANNED FOR 2021

The following key activities are planned for 2021:

- Continuation of the Assessment Monitoring Program with semi-annual sampling scheduled for the first and third quarters of 2021.
- Complete evaluation of analytical data from the downgradient wells, using GWPSs to determine whether an SSL of Appendix IV parameters has occurred.
- If an SSL is identified, potential alternate sources (*i.e.*, a source other than the CCR unit caused the SSL or that that SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated.
  - If an alternate source is demonstrated to be the cause of the SSL, a written demonstration will be completed within 90 days of SSL determination and included in the 2021 Annual Groundwater Monitoring and Corrective Action Report.
  - If an alternate source(s) is not identified to be the cause of the SSL, the applicable requirements of 40 C.F.R. §§ 257.94 through 257.98 (*e.g.*, assessment of corrective measures) as may apply in 2021 will be met, including associated recordkeeping/notifications required by 40 C.F.R. §§ 257.105 through 257.108.

6. REFERENCES

Natural Resource Technology, an OBG Company (NRT/OBG), 2017a. Sampling and Analysis Plan, Coffeen Ash Pond No. 1, Coffeen Power Station, Coffeen, Illinois, Project No. 2285, Revision 0, October 17, 2017.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017b. Statistical Analysis Plan, Coffeen Power Station, Newton Power Station, Illinois Power Generating Company, October 17, 2017.

TABLES

TABLE 1.
ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
COFFEEN POWER STATION
101 - ASH POND NO. 1
COFFEEN, IL

Well ID	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Depth to Groundwater (ft) 6020A	Groundwater Elevation (ft NAVD88) 6020A	Boron, total (mg/L) 6020A	Calcium, total (mg/L) 6020A	Chloride, total (mg/L) 9251	Fluoride, total (mg/L) 9214	pH (field) (STD) SM4500 H+B	Sulfate, total (mg/L) 9036	Total Dissolved Solids (mg/L) SM 2540C
G281 Background	39.0654052	-89.3993221	8/5/2019	6.2	620.16							
			8/13/2019			<0.01	140	72	0.546	6.9	310	900
			1/20/2020	5.1	621.26							
			1/24/2020			0.011	140	75	0.317	7.3	300	880
			8/10/2020	7.1	619.26							
			8/12/2020			0.037	130	81	0.324	6.9	260	700
G301 Downgradient	39.0595023	-89.3954154	8/5/2019	8.83	613.82							
			8/19/2019			2	110	12	0.351	6.9	570	950
			1/20/2020	4.58	618.07							
			1/23/2020			2.1	160	16	<0.25	6.7	820	1400
			8/10/2020	7.49	615.16							
			8/11/2020			2.1	150	14	0.263	6.6	750	1200
G302 Downgradient	39.0595373	-89.3931921	8/5/2019	10.09	609.95							
			8/19/2019			1.8	120	5.9	0.381	7.0	280	800
			1/20/2020	4.63	615.41							
			1/23/2020			1.7	150	14	<0.25	7.1	350	960
			8/10/2020	11.99	608.05							
			8/11/2020			1.2	140	5.9	0.28	6.9	260	780
G303 Downgradient	39.0571366	-89.39172	8/5/2019	4.65	617.37							
			8/19/2019			1.8	190	32	0.334	7.0	730	1700
			1/20/2020	3.97	618.05							
			1/23/2020			2.3	160	29	0.256	7.0	690	1200
			8/10/2020	6.86	615.16							
			8/11/2020			1.7	210	24	0.294	6.9	790	1700
G306 Background	39.0564867	-89.3935556	8/5/2019	6.73	618.99							
			8/19/2019			2.5	160	4.4	0.413	7.0	260	780
			1/20/2020	5.63	620.09							
			1/21/2020			3.5	150	2.5	<0.25	7.0	260	830
			8/10/2020	8.65	617.07							

TABLE 1.
ANALYTICAL RESULTS - GROUNDWATER ELEVATION AND APPENDIX III PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
COFFEEN POWER STATION
101 - ASH POND NO. 1
COFFEEN, IL

Well ID	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Depth to Groundwater (ft) 6020A	Groundwater Elevation (ft NAVD88) 6020A	Boron, total (mg/L) 6020A	Calcium, total (mg/L) 6020A	Chloride, total (mg/L) 9251	Fluoride, total (mg/L) 9214	pH (field) (STD) SM4500 H+B	Sulfate, total (mg/L) 9036	Total Dissolved Solids (mg/L) SM 2540C
	39.0564867	-89.3935556	8/11/2020			2.6	140	1.5	<0.25	6.9	250	700
G307 Downgradient	39.057207	-89.395545	8/5/2019	0.39	624.33							
			8/19/2019			2.1	280	18	1.37	7.0	1100	1600
			2/26/2020			2.1	250	18	0.264	7.0	1000	1500
			5/6/2020	0	624.72					7.3		
			8/10/2020	0.24	624.48							
			8/11/2020			2.1	230	15	0.414	7.3	910	1200

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
ft = foot/feet
mg/L = milligrams per liter
NAVD88 = North American Vertical Datum of 1988
S.U. = Standard Units
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Increases (SSIs) over background.
4-digit numbers below parameter represent SW-846 analytical methods and alpha-numeric values that begin with SM represent Standard Methods for the Examination of Water and Wastewater.

TABLE 2.
ANALYTICAL RESULTS - APPENDIX IV PARAMETERS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
COFFEEN POWER STATION
101 - ASH POND NO. 1
COFFEEN, IL

Well ID	Date	Antimony, total (mg/L) 6020A	Arsenic, total (mg/L) 6020A	Barium, total (mg/L) 6020A	Beryllium, total (mg/L) 6020A	Cadmium, total (mg/L) 6020A	Chromium, total (mg/L) 6020A	Cobalt, total (mg/L) 6020A	Fluoride, total (mg/L) 6020A	Lead, total (mg/L) 6020A	Lithium, total (mg/L) 6020A	Mercury, total (mg/L) 7470A	Molybdenum, total (mg/L) 6020A	Radium-226 + Radium 228, total (pCi/L) 6020A	Selenium, total (mg/L) 6020A	Thallium, total (mg/L) 6020A
G281 Background	8/13/2019		0.0015	0.091	<0.001	<0.001	0.0048	<0.002	0.546	0.0016	0.014		<0.001	0.879	<0.001	
	1/24/2020	<0.003	<0.001	0.07	<0.001	<0.001	<0.004	<0.002	0.317	<0.001	<0.02	<0.0002	<0.001	0	<0.001	<0.001
	8/12/2020		<0.001	0.057	<0.001	<0.001	<0.004	<0.002	0.324	<0.001	<0.02	<0.0002	<0.001	0.304	<0.001	
G301 Downgradient	8/19/2019		<0.001	0.02	<0.001	<0.001	<0.004	<0.002	0.351	<0.001	0.014		<0.001	1.6	<0.001	
	1/23/2020	<0.003	0.0012	0.034	<0.001	<0.001	0.0044	0.0032	<0.25	0.0015	<0.02	<0.0002	<0.001	0.391	<0.001	<0.001
	8/11/2020		<0.001	0.016	<0.001	<0.001	<0.004	<0.002	0.263	<0.001	<0.02		<0.001	0.781	<0.001	
G302 Downgradient	8/19/2019		<0.001	0.028	<0.001	<0.001	<0.004	0.0056	0.381	<0.001	0.02		<0.001	1.89	<0.001	
	1/23/2020	<0.003	0.0038	0.045	<0.001	<0.001	0.0073	0.0028	<0.25	0.003	0.023	<0.0002	0.0012	0.0859	<0.001	<0.001
	8/11/2020		0.001	0.022	<0.001	<0.001	<0.004	<0.002	0.28	<0.001	<0.02		<0.001	0.652	<0.001	
G303 Downgradient	8/19/2019		0.0036	0.016	<0.001	<0.001	<0.004	0.0024	0.334	<0.001	0.058		0.0021	1.14	<0.001	
	1/23/2020	<0.003	0.0012	0.015	<0.001	<0.001	<0.004	<0.002	0.256	<0.001	0.028	<0.0002	0.0016	0.6	<0.001	<0.001
	8/11/2020		0.0041	0.033	<0.001	<0.001	0.0043	0.0056	0.294	0.0037	0.041		0.0023	1.37	<0.001	
G306 Background	8/19/2019		0.0025	0.088	<0.001	<0.001	0.013	0.0024	0.413	0.0031	0.015		0.0016	0.533	<0.001	
	1/21/2020	<0.003	0.006	0.089	<0.001	<0.001	0.019	0.0062	<0.25	0.0067	<0.02	<0.0002	0.0015	0.576	0.0016	<0.001
	8/11/2020		<0.001	0.039	<0.001	<0.001	<0.004	<0.002	<0.25	<0.001	<0.02		<0.001	0.145	<0.001	
G307 Downgradient	8/19/2019		0.0049	0.11	<0.001	0.027	0.025	0.0072	1.37	0.01	0.03		0.002	1.06	0.0012	
	2/26/2020	<0.003	<0.001	0.033	<0.001	0.009	0.004	0.0031	0.264	0.0014	<0.02	<0.0002	0.0014	0.885	<0.001	<0.001
	5/6/2020							0.0026								
	8/11/2020		<0.001	0.021	<0.001	<0.001	<0.004	0.0024	0.414	<0.001	<0.02		0.0013	0.593	<0.001	

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
NA = Not Analyzed
pCi/L = picoCuries per liter
< = concentration is less than concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since not utilized in statistics to determine Statistically Significant Levels (SSLs) over Groundwater Protection Standards.
4-digit numbers below parameter represent SW-846 analytical methods and 3-digit numbers represent Clean Water Act analytical methods.

TABLE 3.
STATISTICAL BACKGROUND VALUES
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
COFFEEN POWER STATION
101 - ASH POND NO. 1
COFFEEN, ILLINOIS
ASSESSMENT MONITORING PROGRAM

Parameter	Statistical Background Value (UPL)
40 C.F.R. Part 257 Appendix III	
Boron (mg/L)	2.90
Calcium (mg/L)	151
Chloride (mg/L)	75
Fluoride (mg/L)	0.459
pH (S.U.)	6.5 / 7.1
Sulfate (mg/L)	700
Total Dissolved Solids (mg/L)	884

[O: KLT 12/11/19, C: RAB 12/12/19]

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
S.U. = Standard Units
UPL = Upper Prediction Limit

TABLE 4.
GROUNDWATER PROTECTION STANDARDS
2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
COFFEEN POWER STATION
101 - ASH POND NO. 1
COFFEEN, ILLINOIS
ASSESSMENT MONITORING PROGRAM

Parameter	Groundwater Protection Standard[1]
40 C.F.R. Part 257 Appendix IV	
Antimony (mg/L)	0.006
Arsenic (mg/L)	0.010
Barium (mg/L)	2
Beryllium (mg/L)	0.004
Cadmium (mg/L)	0.005
Chromium (mg/L)	0.10
Cobalt (mg/L)	0.006
Fluoride (mg/L)	4
Lead (mg/L)	0.015
Lithium (mg/L)	0.040
Mercury (mg/L)	0.002
Molybdenum (mg/L)	0.10
Radium 226+228 (pCi/L)	5
Selenium (mg/L)	0.05
Thallium (mg/L)	0.002

[O: KLT 12/11/19, C: RAB 12/12/19]

Notes:
40 C.F.R. = Title 40 of the Code of Federal Regulations
mg/L = milligrams per liter
pCi/L = picoCuries per liter
[1]Groundwater Protection Standard is the higher of the Maximum Contaminant Level / Health-Based Level or background.

FIGURES

BACKGROUND MONITORING WELL
DOWNGRADIENT MONITORING WELL
ABANDONED MONITORING WELL
CCR MONITORED UNIT
SURFACE WATER FEATURE

0 500 1,000 Feet

MONITORING WELL LOCATION MAP
COFFEEN ASH POND NO. 1
UNIT ID:101

2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDICES

Intended for
Illinois Power Generating Company

Date
April 13, 2020

Project No.
74915

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION

COFFEEN ASH POND NO. 1

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Nicole M. Pagano, 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 for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Nicole M. Pagano
Professional Geologist
196-000750
Illinois
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: April 13, 2020

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

Eric J. Tlachac
Qualified Professional Engineer
062-063091
Illinois
O'Brien & Gere Engineers, Inc., a Ramboll Company
Date: April 13, 2020

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

CONTENTS

TABLES (IN TEXT)

FIGURES (IN TEXT)

FIGURES (ATTACHED)

APPENDICES

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
AP1	Ash Pond No. 1
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
cm/s	centimeters per second
CV	coefficient of variation
ft	foot/feet
GMF	Gypsum Management Facility
GWPS	Groundwater Protection Standard
HDPE	high-density polyethylene
IEPA	Illinois Environmental Protection Agency
ISGS	Illinois State Geological Survey
LOE	Line of Evidence
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NRT/OBG	Natural Resource Technology, an OBG Company
OBG	O'Brien & Gere Engineers, Inc., part of Ramboll
ppm	parts per million
Site	Coffeen Power Station
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
UPL	Upper Prediction Limit

1. INTRODUCTION

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

This ASD has been prepared on behalf of Illinois Power Generating Company, by O'Brien & Gere Engineers, Inc., a Ramboll Company (Ramboll), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Coffeen Ash Pond No. 1 (AP1), located near Coffeen, Illinois.

The second Assessment Monitoring sampling event for detected assessment parameters (A2D) was completed on August 13, 15 and 19, 2019, and analytical data were received on October 15, 2019. Analytical data from all sampling events, from December 2015 through A2D, were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017a), to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations, or SSLs of Appendix IV parameters over Groundwater Protection Standards (GWPSs). That evaluation identified an SSL at a downgradient monitoring well as follows:

- Cobalt at well G307

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence demonstrate that sources other than Coffeen AP1 were the cause of the SSL of cobalt identified during the A2D sampling event. This ASD was completed by April 13, 2020, within 90 days of determination of the SSL (January 13, 2020), as required by 40 C.F.R. § 257.95(g)(3)(ii).

2. BACKGROUND

2.1 Site Location and Description

The Coffeen Power Station (Site) is located in Montgomery County, in central Illinois, approximately 2 miles south of the city of Coffeen. The Site is located between the two lobes of Coffeen Lake (identified as "Coffeen Lake" and "Unnamed Tributary" on Figures 1 and 2) to the west, east, and south, and is bordered by agricultural land to the north. Coffeen Lake was built by damming the McDavid Branch of the East Fork of Shoal Creek in 1963 for use as an artificial cooling lake for the Coffeen Power Station. Several underground coal mines were historically operated both on site and in the vicinity of the Site.

2.2 Description of Ash Pond No. 1 CCR Unit

AP1 is an unlined reclaimed ash pond that was reconstructed in 1978. The pond has an area of 23 acres and a 300-acre-foot capacity. AP1 primarily receive bottom ash. Operations at the station were ceased on or before November 1, 2019

2.3 Geology and Hydrogeology

The Site geologic and hydrogeologic setting summarized below is from the Coffeen Hydrogeologic Monitoring Plan (NRT/OBG, 2017b).

Pleistocene deposits of unlithified glacial diamictons, lacustrine/alluvial deposits, and windblown loess overlie Pennsylvanian-age bedrock throughout central Illinois. The most extensive glacial deposits are those from the Illinoian Stage which cover much of the state and are present at the Site. Windblown (aeolian) deposits, the Peoria and Roxana Silts, cover the glacial deposits over a majority of the state. These units are fine-grained deposits blown from river valleys by prevailing winds.

Till members of the Glasford Formation include the Smithboro Member, the Mulberry Grove Member, the Vandalia Member, and the Hagarstown Member (oldest to youngest). The Smithboro Member is described as a gray, compact, silty till. The Smithboro is bounded below by the Yarmouth Soil. The Mulberry Grove Member is intermittent at the Site and is described as a calcareous gray silt and fine sand containing some fossil mollusks.

The Vandalia Member is a sandy till with thin lenticular bodies of silt, sand, and gravel. It is calcareous, except where weathered, generally gray, and moderately compact. The Hagarstown Member is bounded at the top by the Sangamon Soil. The member consists of gravelly till, poorly sorted gravel, well sorted gravel, and sand.

Bedrock consists of the Pennsylvanian-age McLeansboro, Kewanee, and McCormick Groups, which are characterized by limestone and calcareous clays and shales. The Bond and Modesto Formations of the McLeansboro Group contain multiple thin (typically less than 2 feet) intermittent coal beds. The upper formation of the Kewanee Group is the Carbondale Formation which contains multiple coal beds, including the Herrin (No. 6) Coal, of varying thicknesses (up to 7 feet).

Several coal mines, both strip and underground types, previously operated in Montgomery County, Illinois. The Consolidation Coal Company mined an approximately 5- to 7-foot thick seam of Herrin Coal from the underground Hillsboro Mine. The Hillsboro Mine underlies (at approximately 500 ft below ground surface), or is in close proximity to, the CCR units at the Site as shown on Figure 3 (ISGS, 2016).

The Quaternary deposits in the Coffeen area consist mainly of diamictons and intercalated outwash deposits that were deposited during Illinoian and Pre-Illinoian glaciations. The unconsolidated deposits and bedrock which occur at the Site near AP1 include the following units (beginning at the ground surface):

- Ash Fill Unit – Ash is present within AP1.
- Upper Confining Unit – Low permeability clays and silts, including the Roxana Silt and Peoria Silt (Loess Unit) and the upper clayey till portion of the Hagarstown Member. Thicknesses of the combined Loess Unit and upper Hagarstown Member range from a minimum of less than 2.9 foot to a maximum of approximately 18 feet thick.
- Uppermost Aquifer – Thin (generally less than 3 feet), moderate to high permeability sand, silty sand, and sandy silt/clay units which include the Hagarstown Member (also referred to as the Hagarstown Beds) and the upper Vandalia Till Member (where weathered). This unit is present south of AP1 in monitoring wells G306 and G307, but is intermittent north of the pond.
- Lower Confining Unit – Thick (generally greater than 15 feet), very low permeability sandy, silt till, or clay till that includes the unweathered Vandalia Member, Mulberry Grove Member (discontinuous), and Smithboro Member.

Groundwater elevations were obtained from measurements in monitoring wells on August 5, 2019 prior to a sampling event at Coffeen Power Station. As noted above, groundwater sampling for A2D occurred on August 13, 15, and 19, 2019. Groundwater elevations from monitoring wells near AP1 ranged from approximately 610 to 624 feet North American Vertical Datum of 1988 (ft NAVD88). Groundwater flow is influenced by discharge to the channel located north of AP1 and may also be influenced by the hydraulic head from AP1. Monitoring well G304 was replaced with G307, in part, due to artesian conditions present at G304. Replacement well G307 also presents under artesian conditions, and further contributes to groundwater flowing from south to north across AP1. Groundwater elevations and flow during A2D are provided on Figure 1.

Figure 1 shows additional monitoring wells present at the site, including those in the groundwater monitoring systems established in accordance with 40 C.F.R. § 257.91 at Ash Pond No. 1, Ash Pond No. 2, the Gypsum Management Facility (GMF) Recycle Pond, the Landfill and the GMF Gypsum Stack Pond.

2.4 Groundwater Monitoring

The 40 C.F.R. Part 257 monitoring well network for AP1 consists of six monitoring wells installed in the uppermost aquifer, as shown on Figure 2. Monitoring wells were installed around AP1 beginning in 2010 with APW3 (renamed G303) and APW4 (renamed G304). Additional wells (G281, G301, G302, G306, and G307) were installed in 2015 and 2016 to comply with the CCR Rule. Background monitoring well G281 provides groundwater quality data that is representative of baseline Site conditions while upgradient monitoring well G306 provides characterization of groundwater quality immediately hydraulically upgradient of AP1. Wells G301, G302, G303, and G304/G307 monitor groundwater conditions downgradient of AP1. G304 was replaced by G307 in July 2016; G307 is screened in the same geologic unit, and at a similar elevation, as G304. The boring logs, well construction forms, and other related monitoring well forms are available in the Operating Record as required by 40 C.F.R. § 257.91. Details on the procedures and techniques used to fulfill the groundwater sampling and analysis program requirements are found in the Sampling and Analysis Plan (NRT/OBG, 2017c) for AP1.

3. ALTERNATE SOURCE DEMONSTRAION: LINES OF EVIDENCE

As allowed by 40 C.F.R. § 257.95(g)(3)(ii), this ASD demonstrates that sources other than Coffeen AP1 (the CCR unit) caused the SSL identified during A2D. Lines of evidence supporting this ASD include the following:

1. Cobalt was not detected in water collected from AP1.
2. Proximity of AP1 to historic coal mining activity
3. Concentrations of boron, a common indicator for CCR impacts to groundwater, are near or below background concentrations and are stable in the downgradient wells

These lines of evidence are described and supported in greater detail below. Monitoring wells and pond water sample locations are shown in Figure 2.

3.1 LOE#1: Cobalt Was Not Detected in Water Collected from AP1

Pond water samples were collected from multiple locations within AP1 (Figure 2). Locations AP1a-AP1h were sampled on October 24, 2016. Locations AP1d-AP1g were sampled on November 25, 2019. Cobalt was not detected in any of these samples.

Cobalt was not detected in pond water samples from AP1, therefore AP1 cannot be the source of cobalt in the groundwater.

3.2 LOE #2: Proximity of AP1 to Historic Coal Mining Activity

The area under and surrounding AP1 consists of an underground Herrin (No. 6) Coal mine. The extent of the underlying mine, and its associated features, are shown in Figure 3. The underground mine was in production through 1983 and coal was mined at depths of approximately 500 feet below ground surface (ISGS, 2011). A review by the Illinois State Geological Survey (ISGS) of coal quality in Montgomery County near AP1 indicated the presence of cobalt within the Herrin (No. 6) Coal at concentrations between 1.4 and 7.0 parts per million (ppm) (ISGS, 2018a).

Two mine shafts were located in close proximity to SSL well G307 and background well G306 (see Figure 3) and historic aerial photographs show coal storage in proximity to G306 and upgradient of G307 with regard to groundwater flow (Figure A). Furthermore, small amounts of coal were observed to be mixed within the upper layers of soil in the boring for G306 (the boring log is provided in Attachment A) and elevated concentrations of cobalt (0.020 mg/L [i.e., ppm]) have been detected in groundwater samples collected from G306.

Figure A. Coal Storage Near AP1. An aerial photograph from April 2005 shows potential coal storage near G307 and G306, and a mine shaft (black box, circled in red) near G305. Groundwater generally flows from the southwest to the northeast across AP1 (ISGS, 2018b).

The presence of cobalt in coal in the region and evidence of on-site surface coal storage, suggests that cobalt concentrations in AP1 monitoring wells are influenced by the surrounding coal mines and associated mining activity (e.g., storage on the ground surface).

3.3 LOE #3: Concentrations of Boron, a Common Indicator for CCR Impact to Groundwater, are Near or Below Background Concentrations and are Stable in the Downgradient Wells

Boron concentrations in downgradient wells and background wells are shown on Figure B. All boron concentrations in downgradient wells are at or below the Upper Prediction Limit (UPL) of 2.9 milligrams per liter (mg/L), determined from concentrations in background monitoring wells G281 and G306. Maximum boron concentrations measured in groundwater at each downgradient well between 2015 and 2019 ranged from 2.5 mg/L to 2.9 mg/L.

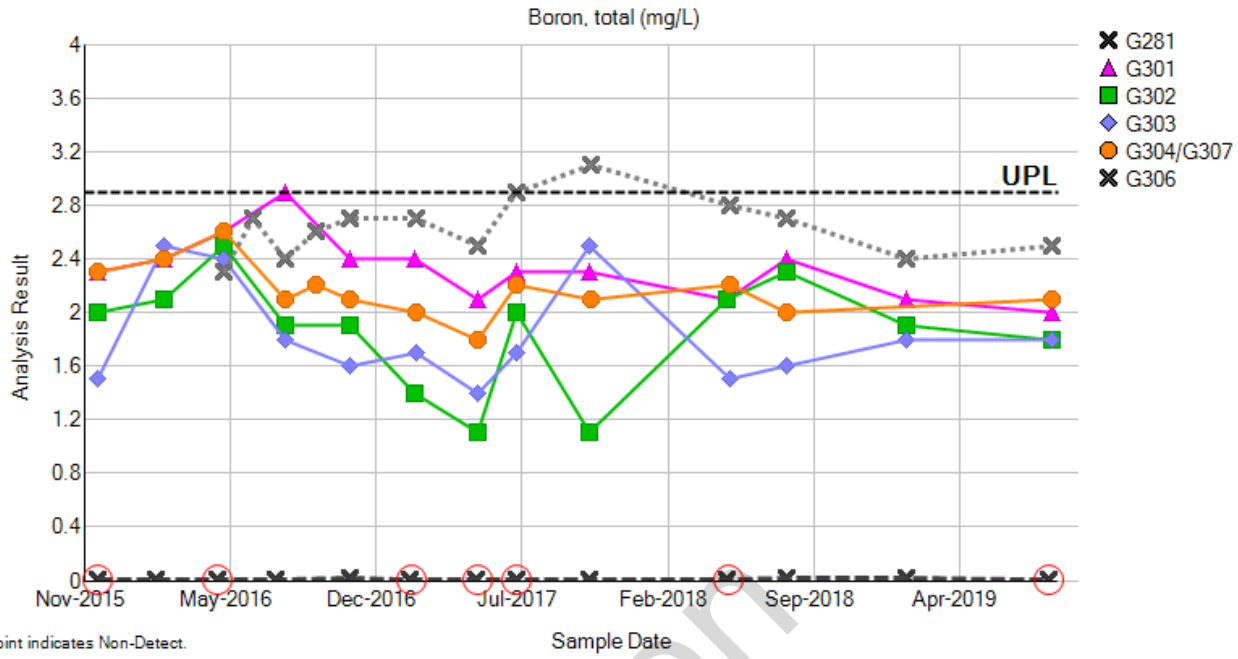


Figure B. Boron Time Series.

Boron is stable in downgradient wells. Mann-Kendall trend analysis tests were performed to determine if sulfate concentrations at each well are increasing, decreasing, or stable (i.e., no statistically significant upward or downward trend). If the Mann-Kendall test did not identify a trend, the coefficient of variation (CV) was calculated to determine if the concentrations are too variable to identify a trend (i.e., CV greater than or equal to 1). If a trend was identified, the CV was calculated to indicate whether data used to establish the trend are suggestive of a low- or high-magnitude trend. Data with a CV less than or equal to 1 suggest a low-magnitude trend.

Boron concentrations were stable in background wells G281 and G306 and downgradient wells 302 and G303. A statistically significant downward trend was identified in downgradient wells G301 and G304/G307. Although the boron trends at G301 and G304/G307 were determined to be significant based on the Mann-Kendall tests, the concentrations demonstrated low variability (CV less than or equal to 1), suggesting low-magnitude trends. Table A provides summary statistics, including CV and trend per well.

Table A – Summary Statistics, Trend, and Coefficient of Variation of Boron in Groundwater.

Monitoring Well	Boron (mg/L)					
	Minimum	Maximum	Median	Standard Deviation	Trend	CV
Background/Upgradient Wells						
G281	<0.010	0.022	0.010	0.0033	None	0.28
G306	2.3	3.1	2.7	0.22	None	0.08
Downgradient Wells						
G301	2.0	2.9	2.3	0.24	Downward	0.10
G302	1.1	2.5	1.9	0.42	None	0.23
G303	1.4	2.5	1.7	0.38	None	0.21
G304/G307	1.8	2.6	2.1	0.20	Downward	0.09

4. CONCLUSIONS

Based on these three lines of evidence, it has been demonstrated that Coffeen Ash Pond No. 1 has not caused the SSL in G307.

1. Cobalt was not detected in water collected from AP1.
2. Proximity of AP1 to historic coal mining activity
3. Concentrations of boron, a common indicator for CCR impacts to groundwater, are near or below background concentrations and are stable in the downgradient wells

This information serves as the written Alternate Source Demonstration prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii) that the SSL observed during the Assessment Monitoring Program was not due to the CCR unit. Therefore, a Corrective Measures Assessment is not required and Coffeen AP1 will remain in assessment monitoring.

5. REFERENCES

Natural Resource Technology, an OBG Company (NRT/OBG), 2017a. Statistical Analysis Plan, Coffeen Power Station, Newton Power Station, Illinois Power Generating Company, October 17, 2017.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017b. Hydrogeologic Monitoring Plan. Coffeen Ash Pond No. 1 – CCR Unit ID 101, Coffeen Ash Pond No. 2 – CCR Unit ID 102, Coffeen GMF Gypsum Stack Pond – CCR Unit ID 103, Coffeen GMF Recycle Pond – CCR Unit ID 104, Coffeen Landfill – CCR Unit ID 105. Coffeen Power Station, Coffeen, Illinois. Illinois Power Generating Company, October 17, 2017.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017c, Sampling and Analysis Plan, Coffeen Landfill, Coffeen Power Station, Coffeen, Illinois, Project No. 2285, Revision 0, October 17, 2017.

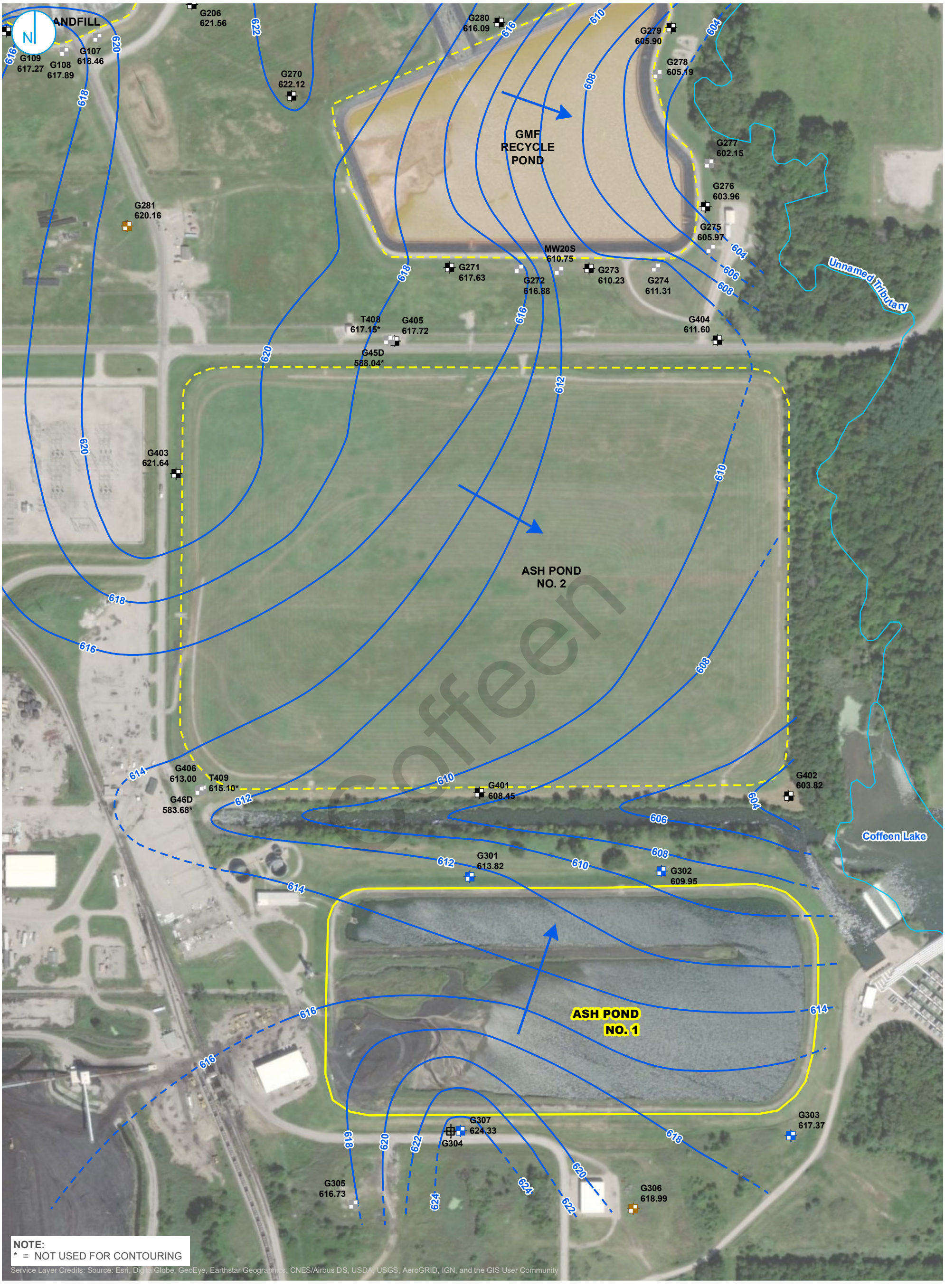
ISGS, 2011. Directory of Coal Mines in Illinois, 7.5-Minute Quadrangle Series: Coffeen Quadrangle, Montgomery & Bond Counties, Prairie Research Institute, p. 11.

ISGS, 2016. Coal Mines in Illinois Coffeen Quadrangle, Montgomery & Bond Counties, Illinois, Scale 1:24,000.

ISGS, 2018a. Coal Maps and Data: Downloadable GIS Data, Illinois Coal Quality Data. https://www.isgs.illinois.edu/research/coal/maps (accessed April 16, 2018).

ISGS, 2018b. Coal Quality Data: Coal Maps and Data, Prairie Research Institute. https://www.isgs.illinois.edu/sites/isgs/files/maps/coal-maps/strat-database/coal-quality-nonconf.xls (accessed April 16, 2018).

FIGURES



- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- CCR RULE MONITORING WELL
- NON-CCR RULE MONITORING WELL
- ABANDONED MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION

0 150 300 Feet

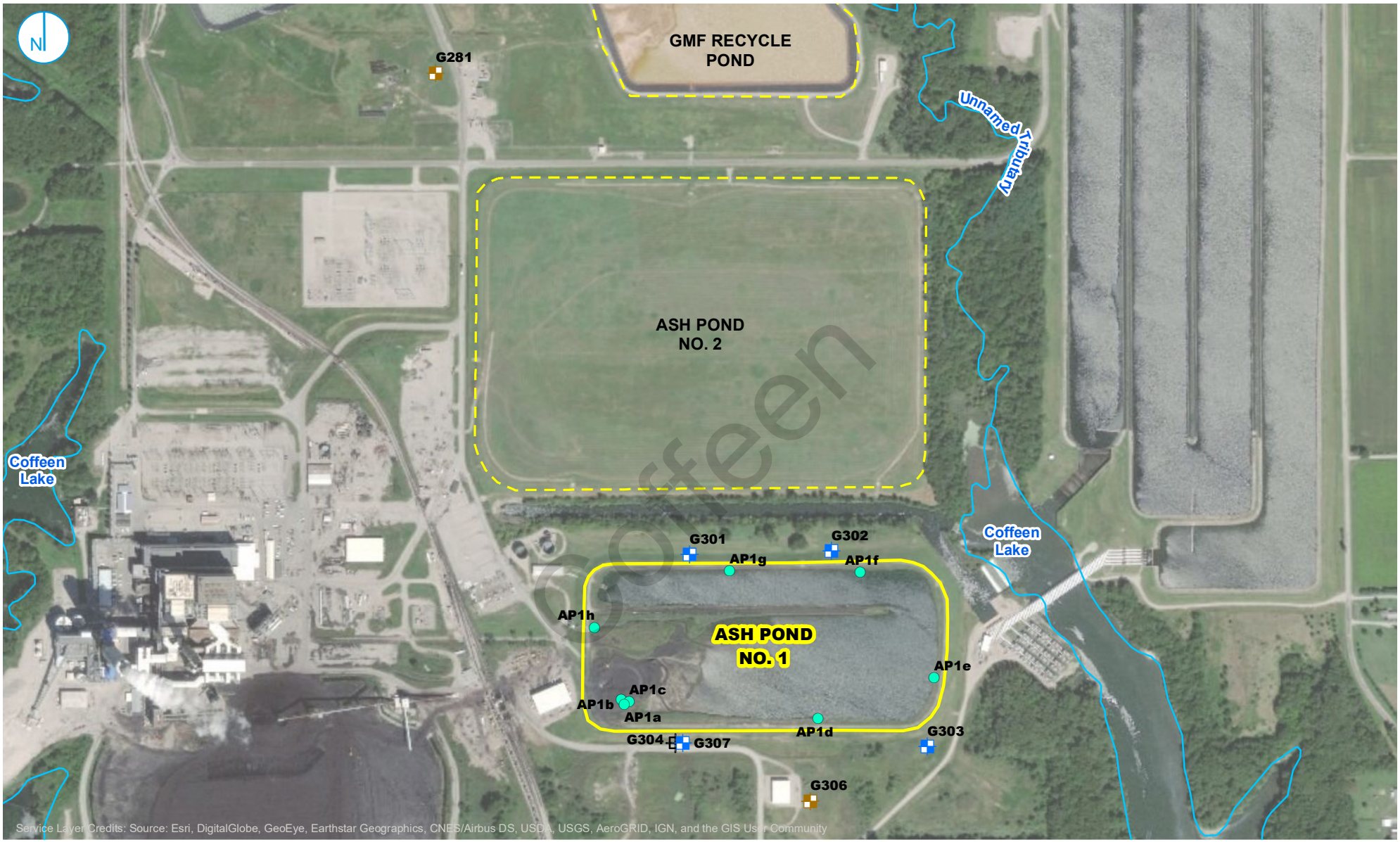
- CCR UNIT BOUNDARY, SUBJECT SITE
- CCR UNIT BOUNDARY
- SURFACE WATER FEATURE

GROUNDWATER ELEVATION CONTOUR MAP
AUGUST 5, 2019

FIGURE 1

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION
COFFEEN ASH POND NO. 1
COFFEEN POWER STATION
COFFEEN, ILLINOIS

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



- SOURCE WATER SAMPLE LOCATIONS
- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- ABANDONED MONITORING WELL
- CCR UNIT BOUNDARY, SUBJECT SITE
- CCR UNIT BOUNDARY
- SURFACE WATER FEATURE

0 300 600 Feet

SAMPLE LOCATION MAP

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION

COFFEEN ASH POND NO. 1
COFFEEN POWER STATION
COFFEEN, ILLINOIS

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

DOWNGRADIENT MONITORING WELL
BACKGROUND MONITORING WELL
NON-CCR RULE MONITORING WELL LOCATION
ABANDONED MONITORING WELL
UNDERGROUND MINE BOUNDARY
UNDERGROUND MINE BUFFER REGION
CCR UNIT BOUNDARY, SUBJECT SITE
CCR MONITORED UNIT
COAL MINE SHAFT
SURFACE WATER FEATURE

0 175 350 Feet

HERRIN COAL MINE EXTENT MAP

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION
COFFEEN ASH POND NO. 1
COFFEEN POWER STATION
COFFEEN, ILLINOIS

FIGURE 3

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

APPENDIX A
G306 BORING LOG

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Power Station
Location: Coffeen, Illinois
Project: 15E0030
DATES: **Start:** 5/3/2016
Finish: 5/3/2016
WEATHER: Sunny, calm, warm, lo 60s

CONTRACTOR: Ramsey Geotechnical Engineering LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: **Driller:** B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: G306
Well ID: G306
Surface Elev: 622.84 ft. MSL
Completion: 18.00 ft. BGS
Station: 2,516,120.41N
871,140.98E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 14, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 5.50 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	TESTING Blows / 6 in N - Value RQD	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	12/24 50%	ss	1-3 3-4 N=6	14			0	Very dark brown (10YR2/2), moist, medium, SILT with little clay and few very fine- to medium-grained sand, roots, trace coal fragments.		622	
2A	24/24 100%	ss	5-4 5-4 N=9	21			2	Dark gray (10YR4/1) with 5% dark yellowish brown (10YR3/6) mottles, moist, stiff, SILT with little clay and trace very fine- to medium-grained sand.		620	
2B				19			4	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, very stiff, SILT with little clay and trace very fine-grained sand.		618	
3A	22/24 92%	ss	2-2 3-3 N=5	30			6	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, very stiff, SILT with some clay and trace very fine-grained sand.		616	
4A	20/24 83%	ss	3-4 6-6 N=10	26			8	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with trace very fine- to coarse-grained sand.		614	
5A	24/24 100%	ss	2-2 3-3 N=5	23			10			612	
6A	22/24 92%	ss	1-2 3-4 N=5	20			12	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with few very fine- to coarse-grained sand.		610	
7A	20/24 83%	ss	5-6 6-6 N=12	21			14	Yellowish brown (10YR5/6), wet, soft, very fine- to coarse-grained sandy CLAY with little silt.		608	
8A	20/24 83%	ss	2-2 8-14 N=10	15							
8B				12			16	Yellowish brown (10YR5/6), wet, medium dense, silty, very fine- to medium-grained SAND with trace coarse-grained sand. Yellowish brown (10YR5/6), moist, dense, fine- to coarse-grained SAND with little silt, little very fine-grained sand, and trace small gravel.		606	
9A	23/24 96%	ss	14-17 28-50/5" N=45	10							
9B				13			18	Brown (10YR5/3) with 20% dark yellowish brown (10YR4/6) mottles, moist, hard, SILT with little clay, few very fine- to coarse-grained sand, and trace small gravel.			

End of boring = 18.0 feet

NOTE(S): G306 installed in borehole.