

Intended for
Illinois Power Resources Generating, LLC,

Date
December 28, 2022

Project No.
1940103307

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

GYP SUM MANAGEMENT FACILITY POND DUCK CREEK POWER PLANT CANTON, ILLINOIS

40 C.F.R. § 257 GROUNDWATER MONITORING PLAN DUCK CREEK POWER PLANT GYPSUM MANAGEMENT FACILITY POND

Project Name **Duck Creek Power Plant Gypsum Management Facility Pond**
Project No. **1940103307**
Recipient **Illinois Power Resources Generating, LLC**
Document Type **Groundwater Monitoring Plan**
Revision **FINAL**
Date **December 28, 2022**

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

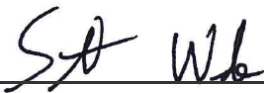
T 414-837-3607
F 414-837-3608
<https://ramboll.com>



Brian G. Hennings, PG
Senior Managing Hydrogeologist



Eric J. Tlachac, PE
Senior Managing Engineer



Scott S. Woods
Hydrogeologist

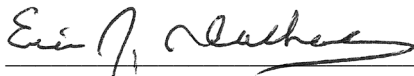
LICENSED PROFESSIONAL CERTIFICATIONS

40 C.F.R. § 257.91(f) Groundwater Monitoring System Certification

In accordance with Title 40 of the Code of Federal Regulations (40 C.F.R.), Part 257, Subpart D, Section (§) 257.91(f) the owner or operator of a coal combustion residuals (CCR) unit must obtain certification from a qualified professional engineer stating that the groundwater monitoring system at the CCR unit has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91. If the groundwater monitoring system includes the minimum number of monitoring wells specified in 40 C.F.R. § 257.91(c)(1), the certification must document the basis supporting use of the minimum number of monitoring wells. Further, in accordance with 40 C.F.R. § 257.91(e)(1), when completing the groundwater monitoring system certification, the qualified professional engineer must be given access to documentation regarding the design, installation, development, and decommissioning of any monitoring wells, piezometers, and other measurement, sampling, and analytical devices.

The groundwater monitoring system designed and constructed for the Duck Creek Power Plant (DCPP) Gypsum Management Facility (GMF) Pond includes more than the minimum number of wells specified in 40 C.F.R. § 257.91(c)(1). The undersigned has been given access to documentation regarding the design, installation, development, and decommissioning of monitoring wells, piezometers and other measurement, sampling, and analytical devices concerning the DCPP GMF Pond.

I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Illinois, certify that the groundwater monitoring system at the DCPP GMF Pond has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91.



Eric J. Tlachac
Qualified Professional Engineer
062-063091
Illinois
Date: December 28, 2022



I, Brian G. Hennings, a qualified professional geologist in good standing in the State of Illinois, certify that the groundwater monitoring system at the DCPP GMF Pond has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91.



Brian G. Hennings
Professional Geologist
196-001482
Illinois
Date: December 28, 2022



CONTENTS

Licensed Professional Certifications	2
1. Introduction	6
1.1 Overview	6
1.2 Site Location and Background	6
1.3 Conceptual Site Model	7
2. Groundwater Monitoring Systems	8
2.1 Existing Monitoring Well Network and Analysis	8
2.1.1 IEPA WPCP Monitoring Program	8
2.1.2 Existing 40 C.F.R. § 257 Monitoring Program	9
2.1.3 35 I.A.C. § 845 Well Installation and Monitoring	9
2.2 Expansion of Existing 40 C.F.R. § 257 Monitoring Well Network	10
2.3 Well Abandonment	11
2.4 Groundwater Monitoring System Maintenance Plan	11
3. Groundwater Monitoring Plan	12
3.1 Sampling Schedule	12
3.2 Groundwater Sample Collection	13
3.3 Laboratory Analysis	13
3.4 Quality Assurance Program	14
3.5 Statistical Analysis	14
3.6 Data Reporting	14
3.7 Compliance with Groundwater Quality Standards	14
3.7.1 SSI Determination in Detection Monitoring	14
3.7.2 GWPS and SSL Determination in Assessment Monitoring	14
3.8 Alternate Source Demonstrations	15
3.8.1 Detection Monitoring Program	15
3.8.2 Assessment Monitoring Program	15
3.9 Corrective Action	15
3.10 Annual Report	16
4. References	18

TABLES (IN TEXT)

Table A	IEPA Groundwater Monitoring Program Parameters
Table B	40 C.F.R. § 257 Groundwater Monitoring Program Parameters
Table C	35 I.A.C. § 845 Groundwater Monitoring Program Parameters
Table D	Expanded 40 C.F.R. § 257 Monitoring Well Network
Table E	40 C.F.R. § 257 Sampling Schedule

TABLES (ATTACHED)

Table 2-1	Monitoring Well Locations and Construction Details
-----------	--

FIGURES (ATTACHED)

Figure 1-1	Site Location Map
Figure 1-2	Site Map
Figure 1-3	Uppermost Aquifer Potentiometric Surface Map, April 14, 2021
Figure 2-1	Expanded 40 C.F.R. § 257 Groundwater Monitoring Well Network

ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
§	section
ASD	Alternate Source Demonstration
bgs	below ground surface
bmp	below measuring point
CCA	compliance commitment agreement
CCR	coal combustion residuals
CMA	Corrective Measures Assessment
CSM	conceptual site model
DCPP	Duck Creek Power Plant
GMF	Gypsum Management Facility
GMP	Groundwater Monitoring Plan
GWPS	groundwater protection standard
HBL	health-based level
HCR	Hydrogeologic Site Characterization Report
HDPE	High-density polyethylene
ID	identification
IEPA	Illinois Environmental Protection Agency
IPRG	Illinois Power Resources Generating, LLC
LCL	lower confidence limit
LPL	lower prediction limit
MCL	maximum contaminant level
NA	not applicable
NAVD88	North American Vertical Datum of 1988
NID	National Inventory of Dams
No.	number
NRT/OBG	Natural Resource Technology, an OBG Company
oz/yd ²	ounces per square yard
PMP	potential migration pathway
QAPP	Multi-Site Quality Assurance Project Plan
QA/QC	quality assurance/quality control
Ramboll	Ramboll Americas Engineering Solutions, Inc.
RL	reporting limit
SAP	Multi-Site Sampling and Analysis Plan
SI	surface impoundment
SSI	statistically significant increase
SSL	statistically significant level
TDS	total dissolved solids
UA	Uppermost Aquifer
UPL	upper prediction limit
UTL	upper tolerance limit
USEPA	United States Environmental Protection Agency
WLO	water level only
WPCP	Water Pollution Control Permit

1. INTRODUCTION

1.1 Overview

Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this Groundwater Monitoring Plan (GMP) on behalf of DCP, operated by Illinois Power Resources Generating, LLC (IPRG) to align the 40 C.F.R. § 257 compliance groundwater monitoring program with the Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845 compliance groundwater monitoring program.

This GMP applies specifically to the CCR unit referred to as GMF Pond (CCR unit identification [ID] Number [No.] 203, Illinois Environmental Protection Agency [IEPA] ID No. W0578010001-04, and National Inventory of Dams [NID] No. IL50573). The GMF Pond is a double-lined, 1,500-foot by 900-foot earthen berm surface impoundment (SI) used to manage gypsum waste streams at the DCP. This GMP includes content requirements specific to 40 C.F.R. § 257.91 (Groundwater Monitoring Systems), 40 C.F.R. § 257.93 (Groundwater Sampling and Analysis Requirements), 40 C.F.R. § 257.94 (Detection Monitoring Program), and 40 C.F.R. § 257.95 (Assessment Monitoring Program) for the GMF Pond at the DCP.

1.2 Site Location and Background

The DCP is located in Fulton County, Illinois, approximately six miles southeast of the town of Canton, Illinois. The GMF Pond is located north of the DCP within Section 18, Township 6 North, Range 5 East (**Figure 1-1**). Prior to construction of the DCP and associated facilities, strip mining of coal took place within the current property boundary. Currently, land use adjacent to the DCP is primarily agriculture, pasture, and forested land with minimal development. The GMF Pond decant water discharges to the lined GMF Recycle Pond located to the south of the GMF Pond (**Figure 1-2**).

Construction of the GMF Pond, also referred to as the gypsum stack/management system, took place in 2008 and 2009. The GMF Pond operates under IEPA Water Pollution Control Permit (WPCP) No. 2017-E0-62640, issued in December 2017. It consists of 1,500-foot by 900-foot earthen berm with 3.5:1 side slopes, a maximum elevation of 620 feet above mean sea level, a double geomembrane liner consisting of a 60-mil high-density polyethylene (HDPE) geomembrane liner, 12 inches of clay cushion, 4 ounces per square yard (oz/yd²) non-woven geotextile filter fabric, 12 inches highly permeable granular drainage (sand), 10 oz/yd² non-woven geotextile filter fabric, 60-mil HPDE geomembrane liner, reinforced bentonite mat, 36 inches compacted clay all installed over in-situ foundation soil, and all pipes, pumps, and appurtenances necessary for the storage of approximately 3.6 million tons of gypsum at a maximum elevation of 715 feet above mean sea level with discharge to the GMF Recycle Pond. The GMF Recycle Pond is lined with a 60-mil HDPE geomembrane liner, reinforced bentonite mat, and 36 inches of compacted clay.

Strip mining has occurred in this area since the 1930s. Strip mining in the site vicinity extracted coal from the Springfield (No. 5) coal seam. Mining operations in the area have ceased. Strip mining has completely disrupted the natural stratigraphy down to the Springfield (No. 5) coal unit at some portions of the DCP property. Previous investigations completed outside of the GMF Pond indicated that bedrock in the area is overlain by mine spoil ranging in thickness from approximately 10 to 75 feet. The mine spoil consists of excavated bedrock (weathered shale,

shale fragments, and some coal fines) mixed with the sand, silts and silty clays of the unconsolidated glacial and aeolian deposits. The GMF Pond is located immediately adjacent to and downgradient of several former large surface mining areas.

1.3 Conceptual Site Model

Multiple site investigations have been completed at the DCPD to characterize the geology, hydrogeology, and groundwater quality as required by 40 C.F.R. § 257.91 (Groundwater Monitoring Systems). The DCPD has been well characterized and detailed in the Hydrogeologic Site Characterization Report (HCR) (Ramboll, 2021) [<https://www.luminant.com/ccr/illinois-ccr/?dir=il-ccr%2FDuck-Creek%2F2021>], that was included with the Operating Permit application submitted to the IEPA in October 2021. The HCR was prepared to comply with the requirements specified in 35 I.A.C. § 845.620 and expands upon the Hydrogeologic Monitoring Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017). A conceptual site model (CSM) has been developed and is discussed below.

The three distinct hydrostratigraphic units summarized below have been identified at the GMF Pond based on stratigraphic relationships and common hydrogeologic characteristics:

- **Uppermost Aquifer (UA):** At the GMF Pond, this unit includes the Peoria/Roxana Loess, the upper Radnor Till, and the shallow sands. These units are hydraulically connected and underlain by a thick till sequence of the Radnor Till (NRT/OBG, 2017). The shallow sands are laterally extensive across the GMF Pond, vary in thickness from less than one to 18 feet, and are generally located at an elevation of 570 to 590 feet North American Vertical Datum of 1988 (NAVD88). Sand was completely removed where it was encountered during construction of the GMF Pond, putting the base of liner in contact with clay of the lower Radnor Till. Sand outside the GMF Pond footprint remains in place. While the primary migration pathway is the shallow sand of the UA, the groundwater within the overlying Peoria/Roxanna Loess has the potential to be impacted and is considered a potential migration pathway (PMP).
- **Lower Radnor Till/Lower Confining Unit:** Underlying the UA, the lower Radnor Till is approximately 42 to 58 feet thick. Previous hydrogeologic studies indicate discontinuous sand lenses observed within the till are not hydraulically connected to the shallow sand unit (NRT/OBG, 2017).
- **Bedrock Confining Unit:** The thick and low permeability shaley siltstone, silty shale, and coal beds of the Carbondale Formation, are estimated to have a thickness of approximately 300 to 400 feet.

Groundwater migrates downward through the loess and upper Radnor Till into the shallow sands of the UA. Groundwater flow in the sands is generally in a northwest to southeast direction (**Figure 1-3**). Seasonal variation of groundwater levels at the GMF Pond are present and may fluctuate approximately one to 10 feet. There is no observable seasonal variation of groundwater flow direction at the GMF Pond associated with the elevation changes. Groundwater flows toward the Duck Creek Cooling Pond located approximately 2,100 feet east of the GMF Pond. The surface water elevation of the Duck Creek Cooling Pond is estimated from 562.5 to 565 feet NAVD88, which is approximately 20 feet lower than downgradient groundwater at the GMF Pond.

2. GROUNDWATER MONITORING SYSTEMS

2.1 Existing Monitoring Well Network and Analysis

Three monitoring programs specific to the GMF Pond exist: IEPA WPCP monitoring program, the 40 C.F.R. § 257 monitoring program, and the 35 I.A.C. § 845 monitoring program. This GMP is being provided to expand the 40 C.F.R. § 257 groundwater monitoring network and monitoring program specific to the GMF Pond to align with the monitoring network established for 35 I.A.C. § 845. Monitoring networks and programs that apply to other units are not discussed in this GMP. IPRG entered into a compliance commitment agreement (CCA) with the IEPA on December 28, 2022. Groundwater monitoring in accordance with the CCA and the proposed 35 I.A.C. § 845 groundwater monitoring plan and sampling methodologies provided in the operating permit application for the GMF Pond is scheduled to commence no later than the second quarter of 2023. After the GMF Pond has been issued an approved operating permit, groundwater monitoring shall be conducted in accordance with that operating permit. As specified in the CCA, groundwater sampling requirements that apply to the CCR SI under other existing permit programs will become void upon issuance of an approved operating permit pursuant to 35 I.A.C § 845.

2.1.1 IEPA WPCP Monitoring Program

Routine quarterly groundwater monitoring is completed at GMF Pond wells G50L/S, G51L/S, G52L/S, G53L/S, G54L/S, G55L/S, G56L/S, G57L/S, G58L/S, G59L/S, G60L/S, R61L/G61S, G62L, G63L/S, and G64L/S in accordance with the IEPA WPCP No. 2017-E0-62640. This permit also requires sampling G65L/S, G66L/S, G67L/S, G70L, G71L/S, and G72L/R72S at the GMF Recycle Pond. The boring logs, well construction forms, and other related monitoring well forms for the GMF Pond well network are included in Appendix B of the HCR (Ramboll, 2021). Groundwater samples are collected quarterly and annually and are analyzed for the laboratory and field parameters listed in **Table A** below.

Table A. IEPA Groundwater Monitoring Program Parameters

Field Parameters			
pH	Temperature	Specific Conductance	
Groundwater Elevation	Depth to Water (bmp)	Bottom of Well Elevation	
Quarterly Parameters (Dissolved)			
Arsenic	Cadmium	Lead	Sulfate
Boron	Chloride	Manganese	Total Dissolved Solids (TDS)
Annual Parameters (Dissolved)			
Alkalinity, bicarbonate	Chromium	Mercury	Selenium
Alkalinity, carbonate	Cobalt	Nickel	Sodium
Ammonia as Nitrogen	Iron	Nitrate nitrogen	Zinc
Calcium	Magnesium	Potassium	

bmp – below measuring point

2.1.2 Existing 40 C.F.R. § 257 Monitoring Program

The 40 C.F.R. § 257 well network for the GMF Pond consists of seven monitoring wells installed nearby or adjacent to the GMF Pond in the UA (**Figure 2-1**). The GMF Pond 40 C.F.R. § 257 well network consists of three background monitoring wells (G02S, G50S, and G51S) and four compliance monitoring wells (G54S, G57S, G60S, and G64S). The boring logs, well construction forms, and other related monitoring well forms are available in the Operating Records as required by 40 C.F.R. § 257.91 for each monitored CCR Unit or CCR Multi-Unit, and are included in Appendix B of the HCR (Ramboll, 2021).

Groundwater is being monitored at the GMF Pond in accordance with the Detection Monitoring Program requirements specified in 40 C.F.R. § 257.94. Details on the procedures and techniques used to fulfill the groundwater sampling and analysis program requirements are found in the or CCR Multi-Site Sampling and Analysis Plan (SAP) (Ramboll, 2022a).

Groundwater samples are collected semiannually and analyzed for the laboratory and field parameters from Appendix III of 40 C.F.R. § 257, summarized in **Table B** below.

Table B. 40 C.F.R. § 257 Groundwater Monitoring Program Parameters

Field Parameters ¹		
pH	Groundwater Elevation	
Appendix III Parameters (Total, except TDS)		
Boron	Chloride	Sulfate
Calcium	Fluoride	TDS

¹Dissolved oxygen, temperature, specific conductance, oxidation/reduction potential, and turbidity were recorded during sample collection.

Results and analysis of groundwater sampling are reported annually by January 31 of the following year and made available on the CCR public website as required by 40 C.F.R. § 257.

2.1.3 35 I.A.C. § 845 Well Installation and Monitoring

In 2021, one additional monitoring well (G54C) was installed between the GMF Pond and the GMF Recycle Pond to assess the vertical and horizontal lithology, stratigraphy, chemical properties, and physical properties of geologic layers to a minimum of 100 feet below ground surface (bgs) as specified in 35 I.A.C. § 845.620(b). Additionally, a porewater sample was collected from a temporary leachate monitoring location (XTPW02) installed within the GMF Pond to characterize the CCR materials.

Prospective 35 I.A.C. § 845 monitoring wells were sampled for eight rounds from February to August 2021 and the results were assessed for selection of the 35 I.A.C. § 845 monitoring well network for the GMF Pond. Groundwater samples were collected and analyzed for 35 I.A.C. § 845.600 parameters as summarized in **Table C** on the following page.

Data and results from the 35 I.A.C. § 845 background monitoring were included in the water quality discussion included in the HCR (Ramboll, 2021). The data collected from background locations during the 35 I.A.C. § 845 monitoring were used to evaluate and calculate background concentrations for the GMF Pond.

Table C. 35 I.A.C. § 845 Groundwater Monitoring Program Parameters

Field Parameters¹			
Groundwater Elevation	pH	Turbidity	
Metals (Total)			
Antimony	Boron	Cobalt	Molybdenum
Arsenic	Cadmium	Lead	Selenium
Barium	Calcium	Lithium	Thallium
Beryllium	Chromium	Mercury	
Inorganics (Total)			
Fluoride	Sulfate	Chloride	TDS
Other (Total)			
Radium 226 and 228 combined			

¹ Dissolved oxygen, temperature, specific conductance, and oxidation/reduction potential were recorded during sample collection.

2.2 Expansion of Existing 40 C.F.R. § 257 Monitoring Well Network

The existing 40 C.F.R. § 257 network is being expanded to include seven wells screened in the UA (G02S, G50S, G51S, G54S, G57S, G60S, and G64S), three wells screened in the PMP (G54L, G60L, and G64L), and one temporary water level only monitoring point (X301) that is located in a riser along the south end of the pond for monitoring the phreatic surface within the GMF Pond. The proposed network is summarized in **Table D** on the following page and displayed on **Figure 2-1**. Ten wells (three background and seven compliance) will be used to monitor groundwater concentrations within the hydrostratigraphic units.

The groundwater samples collected from the ten wells will be used to monitor and evaluate groundwater quality and demonstrate compliance with the groundwater quality standards included in 40 C.F.R. § 257.94(e) and 40 C.F.R. § 257.95(h). The proposed monitoring wells will yield groundwater samples that accurately represent the quality of background groundwater that has not been affected by leakage from the GMF Pond, as well as downgradient groundwater at the waste boundary of the GMF Pond (as required in 40 C.F.R. § 257.91(a)(1) and (2)). Monitoring well depths and construction details are listed in **Table 2-1** and summarized in **Table D** on the following page.

Any future changes to the groundwater monitoring well network as approved by the IEPA under 35 I.A.C. § 845 will also be incorporated into the 40 C.F.R. § 257 network.

Table D. Expanded 40 C.F.R. § 257 Monitoring Well Network

Well ID	Monitored Unit	Well Screen Interval (feet bgs)	Well Type ¹
G02S	UA	23.0 – 28.0	Background
G50S	UA	29.2 – 34.0	Background
G51S	UA	24.0 – 28.8	Background
G54L	PMP	27.3 – 36.8	Compliance
G54S	UA	43.5 – 48.0	Compliance
G57S	UA	29.7 – 34.2	Compliance
G60L	PMP	20.1 – 24.9	Compliance
G60S	UA	31.1 – 35.9	Compliance
G64L	PMP	18.1 – 27.5	Compliance
G64S	UA	34.5 – 39.0	Compliance
X301 ^{2,3}	CCR	NA	WLO

¹ Well Type refers to the role of the well in the monitoring network.

² Well is to be used for water level data collection only.

³ Location is temporary pending implementation of impoundment closure per an approved Construction Permit Application.

NA = not applicable

UA = Uppermost Aquifer

WLO = water level only

2.3 Well Abandonment

No wells are currently proposed for abandonment.

2.4 Groundwater Monitoring System Maintenance Plan

Maintenance procedures have provided in the SAP will be performed as needed to assure that the monitoring wells provide representative groundwater samples (Ramboll, 2022a).

3. GROUNDWATER MONITORING PLAN

The GMP will monitor and evaluate groundwater quality to demonstrate compliance with the groundwater quality standards included in 40 C.F.R. § 257.94(e) and 40 C.F.R. § 257.95(h). The groundwater monitoring program will include sampling and analysis procedures that are consistent and that provide an accurate representation of groundwater quality at the background and downgradient wells as required by 40 C.F.R. § 257.91. As discussed in **Section 2** three monitoring programs specific to the GMF Pond exist: IEPA WPCP monitoring program, the 40 C.F.R. § 257 monitoring program, and the 35 I.A.C. § 845 monitoring program. As specified in the CCA, groundwater sampling requirements that apply to the CCR SI under other existing permit programs will become void upon issuance of an approved operating permit pursuant to 35 I.A.C § 845.

3.1 Sampling Schedule

Groundwater sampling for the 40 C.F.R. § 257 monitoring well network was initially performed quarterly between 2015 and 2017 to establish baseline groundwater quality. Detection monitoring began in the first quarter of 2017 with semiannual sampling. The GMF Pond is currently in detection monitoring and sampling will continue in 2023 according to the schedule summarized in **Table D** on the following page.

Table E. 40 C.F.R. § 257 Sampling Schedule

Frequency	Duration
Quarterly (groundwater quality)	<p>Baseline</p> <p>Began: monitoring began in 2015.</p> <hr/> <p>Ended: monitoring was completed in 2017 to establish baseline groundwater quality for existing landfills and Sis.</p>
At least Semiannually (groundwater quality)	<p>Detection Monitoring</p> <p>Begins: monitoring began no later than October 17, 2017, for existing landfills and SIs, following collection of a minimum of eight independent samples for constituents from Appendix III and Appendix IV from each background and downgradient well.</p> <p>At least semiannual sampling continues for Appendix III constituents throughout the active life of the CCR unit and the post-closure period.</p> <p>For new landfills and SIs, and lateral expansion of existing CCR units, a minimum of eight independent samples from each background well must be collected and analyzed for the constituents in Appendix III and Appendix IV during the first six months of sampling.</p> <hr/> <p>Ends: Following 30-year post-closure care period or statistically significant increase (SSI) determination and unsuccessful Alternate Source Demonstration (ASD) evaluation within 90 days of SSI determination.</p> <hr/> <p>Assessment Monitoring</p> <p>Begins: within 90 days of unsuccessful ASD evaluation for SSIs determined during Detection Monitoring; samples must be collected and analyzed for all constituents listed in Appendix IV. Within 90 days of obtaining the of the initial sample results, and on at least a semiannual basis thereafter, wells must be resampled for Appendix III and for those constituents in Appendix IV that have been detected during sampling.</p> <hr/> <p>Ends: Following demonstration that concentrations of all constituents in Appendices III and IV are below background values for two consecutive sampling events.</p>

Groundwater monitoring for the 40 C.F.R. § 257 well network will continue to follow a schedule in accordance with the requirements of 40 C.F.R. § 257.94 and 40 C.F.R. § 257.95. Upon United States Environmental Protection Agency (USEPA) approval of 35 I.A.C. § 845 as a State CCR Permit Program, the 40 C.F.R. § 257 monitoring will be discontinued and replaced by the 35 I.A.C. § 845 monitoring.

3.2 Groundwater Sample Collection

Groundwater sampling procedures have been developed in the SAP (Ramboll, 2022a) and the collection of groundwater samples is being implemented to meet the requirements of 40 C.F.R. § 257.93. In addition to groundwater well samples, quality assurance samples will be collected as described in the Multi-Site Quality Assurance Project Plan (QAPP) (Ramboll, 2022b).

3.3 Laboratory Analysis

Laboratory analysis will be performed consistent with the specifications of the QAPP. Laboratory methods may be modified based on laboratory equipment availability or procedures, but the Reporting Limit (RL) for all parameters analyzed, regardless of method, will be lower than the

applicable groundwater quality standard. Data reporting requirements and workflow are provided in the Multi-Site Data Management Plan (Ramboll, 2022c).

3.4 Quality Assurance Program

The QAPP includes procedures and techniques for laboratory quality assurance/quality control (QA/QC). Additionally, the SAP includes requirements for field data collection QA/QC.

3.5 Statistical Analysis

A Multi-Site Statistical Analysis Plan (Ramboll, 2022d) has been developed to describe procedures that will be used to establish background conditions and determine SSIs over background concentrations and statistically significant levels (SSLs) over groundwater protection standards (GWPSs) as required by 40 C.F.R. § 257.94 and 257.95. The Multi-Site Statistical Analysis Plan was prepared in accordance with the requirements of 40 C.F.R. § 257.93(f), with reference to the acceptable statistical procedures provided in *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (USEPA, 2009). The determination of SSIs over background concentrations and SSLs over GWPSs will be completed at least semiannually in accordance with the sampling schedule provided in Section 3.1.

3.6 Data Reporting

Data reporting for the 40 C.F.R. § 257 monitoring well network will be consistent with recordkeeping, notification, and internet posting requirements described in 40 C.F.R. § 257.105 through 257.107.

3.7 Compliance with Groundwater Quality Standards

Compliance with the groundwater quality standards for the detection monitoring program referenced in 40 C.F.R. § 257.94(e) and the assessment monitoring program referenced in 40 C.F.R. § 257.95(h) will be determined as described in the following sections.

3.7.1 SSI Determination in Detection Monitoring

One-sided upper prediction limits (UPL) will be calculated for each Appendix III constituent using the background samples, with the exception of pH, for which both upper and lower prediction limits will be calculated. A tabular summary of UPLs will be provided in the Annual Groundwater Monitoring and Corrective Action Reports. Individual sampling event concentrations for each constituent detected in the downgradient monitoring wells will then be compared to the background UPL. An exceedance of the UPL for any constituent measured at any downgradient well constitutes an SSI. For pH, a measurement above the UPL or below the lower prediction limit (LPL) constitutes an SSI. As required by 40 C.F.R. § 257.93(h)(2), SSI determination will be completed within 90 days of sampling and analysis.

3.7.2 GWPS and SSL Determination in Assessment Monitoring

A GWPS will be established for Appendix IV constituents. The GWPS will be either the USEPA maximum contaminant levels (MCLs) or the health-based levels (HBLs) established in 40 C.F.R. § 257.95(h)(2) for cobalt, lead, lithium, and molybdenum. The exception to this is when the background concentration is greater than the established MCL or HBL. For this exception, background concentrations will be used to define the GWPS. The background will be calculated using a parametric or non-parametric upper tolerance limit (UTL), depending on the data

distribution. A tabular summary of GWPSs will be provided in the Annual Groundwater Monitoring and Corrective Action Reports.

Compliance will be determined by comparing the lower confidence limit (LCL) of the downgradient concentrations to the GWPS. An SSL will be identified when the LCL exceeds the GWPS. The method of calculating the LCL is described in the Multi-Site Statistical Analysis Plan. If there are too few data points to calculate an LCL (a minimum of four data points is required), the most recent data point is compared to the GWPS. If all the downgradient samples for a well constituent pair are non-detect, the most recent RL is compared to the GWPS. Additionally, an SSL will be identified if all previous samples at a downgradient well were not-detect, and the two most recent samples have both detections and GWPS exceedances. SSL determination will be completed within 90 days of sampling and analysis.

3.8 Alternate Source Demonstrations

An ASD may be completed for a unit under the detection monitoring program in 40 C.F.R. § 257.94(e)(2) or assessment monitoring program in 40 C.F.R. § 257.95(g)(3)(ii) to provide lines of evidence that a source other than the monitored unit caused the SSI/SSL or that the SSI/SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The ASD will include information and analysis that supports the conclusions and a certification of accuracy by a qualified professional engineer. ASDs will be completed within 90 days of SSI/SSL determination and be provided in the Annual Groundwater Monitoring and Corrective Action Reports as required by 40 C.F.R. § 257.94(e)(2) and 40 C.F.R. § 257.95(g)(3)(ii).

3.8.1 Detection Monitoring Program

As allowed in 40 C.F.R. § 257.94(e)(2), following the determination of an SSI over background for groundwater constituents listed in Appendix III of 40 C.F.R. § 257, an ASD will be evaluated, and if completed within 90 days of the SSI determination, detection monitoring will continue.

If an ASD has not been successfully completed within 90 days of the SSI determination, Assessment Monitoring in accordance with 40 C.F.R. § 257.95 will be initiated within 90 days and the associated notification will be made to the CCR unit operating record and state director (and/or appropriate tribal authority, if applicable).

3.8.2 Assessment Monitoring Program

As allowed in 40 C.F.R. § 257.95(g)(3)(ii), following the determination of an SSL over the GWPS of constituents listed in Appendix IV of 40 C.F.R. § 257, an ASD will be evaluated and, if completed within 90 days of the SSL determination, assessment monitoring will continue.

If an ASD has not been successfully completed within the 90 days of the SSL determination, a Corrective Measures Assessment (CMA) in accordance with 40 C.F.R. § 257.96 will be initiated and the associated notification will be made to the CCR unit operating record and state director (and/or appropriate tribal authority, if applicable).

3.9 Corrective Action

As described in 40 C.F.R. § 257.96, if the ASD summarized in **Section 3.8** has not been successfully completed, the CMA must be completed within 90 days, unless the owner or

operator demonstrates the need for up to an additional 60 days to complete the CMA due to site-specific conditions of circumstances.

Remedy selection will follow the CMA and be documented in a remedy selection report in accordance 40 C.F.R. § 257.97. A corrective action monitoring plan will be developed to monitor the performance of the selected remedy.

3.10 Annual Report

An Annual Groundwater Monitoring and Corrective Action Report will be completed and placed in the CCR unit operating record by January 31st of the following calendar 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 40 C.F.R. §§ 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 an SSI relative to background levels).
5. Other information required to be included in the annual report as specified in 40 C.F.R. §§ 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 40 C.F.R. § 257.95.
 - ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in 40 C.F.R. § 257.94 or the assessment monitoring program in 40 C.F.R. § 257.95.
 - iii) If it was determined that there was an SSI over background for one or more constituents listed in Appendix III of 40 C.F.R. § 257 pursuant to 40 C.F.R. § 257.94(e):
 - A. Identify those constituents listed in Appendix III of 40 C.F.R. § 257 and the names of the monitoring wells associated with such an increase.
 - B. Provide the date when the assessment monitoring program was initiated for the CCR unit.

- iv) If it was determined that there was an SSL above the groundwater protection standard for one or more constituents listed in Appendix IV of 40 C.F.R. § 257 pursuant to 40 C.F.R. § 257.95(g) include all of the following:
 - A. Identify those constituents listed in Appendix IV of 40 C.F.R. § 257 and the names of the monitoring wells associated with such an increase.
 - B. Provide the date when the CMA was initiated for the CCR unit.
 - C. Provide the date when the public meeting was held for the CMA.
 - D. Provide the date when the CMA was completed.
- v) Whether a remedy was selected pursuant to 40 C.F.R. § 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 40 C.F.R. § 257.98 during the current annual reporting period.

4. REFERENCES

- Illinois Environmental Protection Agency, 2021. *Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: Title 35 of the Illinois Administrative Code § 845*. April 15, 2021.
- Natural Resource Technology, an OBG Company (NRT/OGB), 2017. *Hydrogeologic Monitoring Plan, Duck Creek GMF Pond – CCR Unit ID 203 and Duck Creek Landfill – CCR Unit ID 204*. October 17, 2017.
- Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021. *Hydrogeologic Site Characterization Report. Gypsum Management Facility Pond. Duck Creek Power Plant. Canton, Illinois*. October 25, 2021.
- Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2022a. *Multi-Site Sampling and Analysis Plan*. December 28, 2022.
- Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2022b. *Multi-Site Quality Assurance Project Plan*. December 28, 2022.
- Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2022c. *Multi-Site Data Management Plan*. December 28, 2022.
- Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2022d. *Multi-Site Statistical Analysis Plan*. December 28, 2022.
- United States Environmental Protection Agency (USEPA), 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance*. Office of Resource Conservation and Recovery, Program Implementation and Information Division, United States Environmental Protection Agency, Washington D.C. EPA/530/R-09/007. March 2009.
- United States Environmental Protection Agency (USEPA), 2015. *Title 40 of the Code of Federal Regulations, Part 257*.

TABLES

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS

GROUNDWATER MONITORING PLAN
 DUCK CREEK POWER PLANT
 GMF POND
 CANTON, ILLINOIS

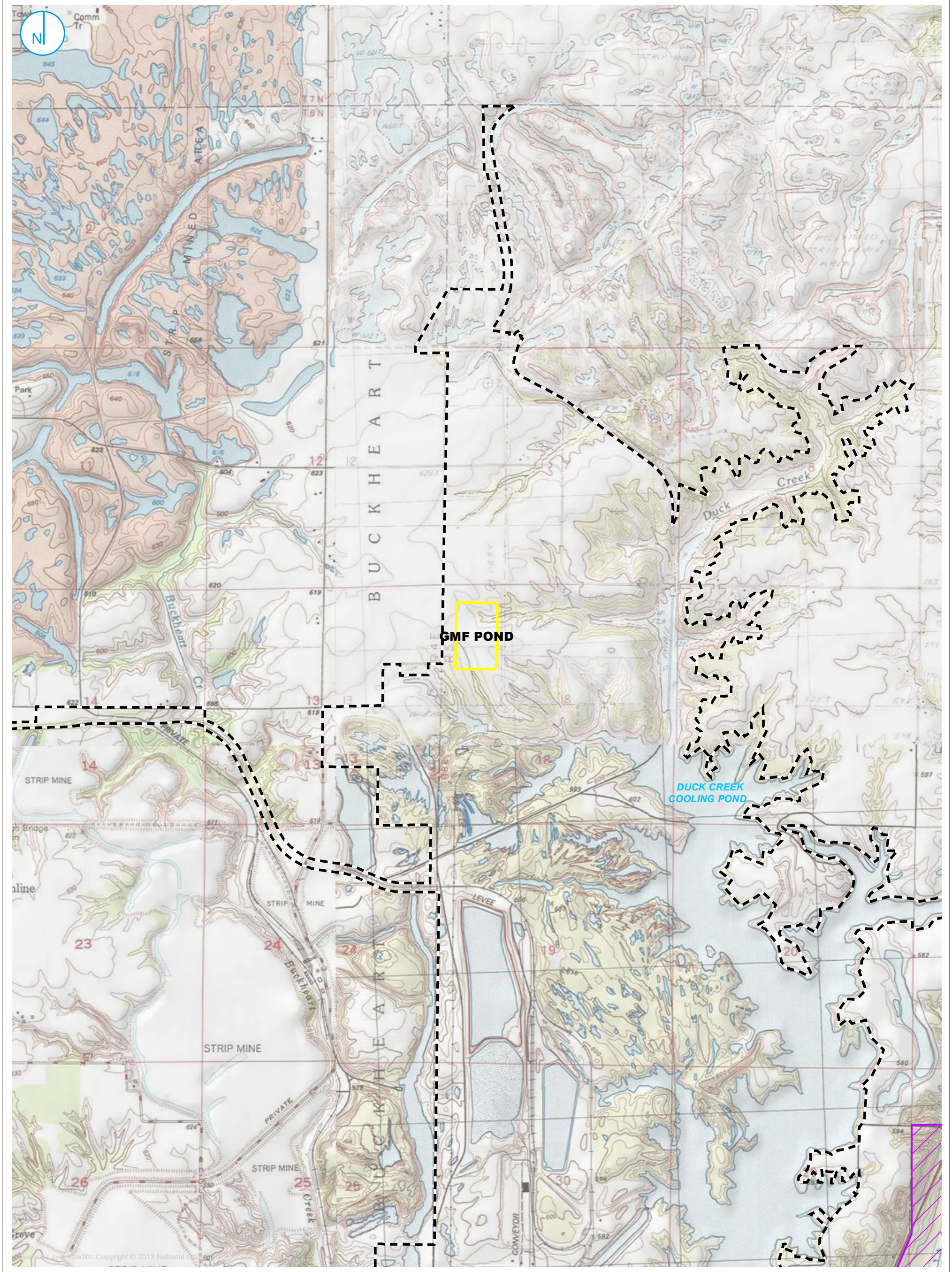
Well Number	Type	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
G02S	B	UA	09/29/2003	--	621.66	Top of Disk	619.18	23.00	28.00	596.18	591.18	28.00	589.20	5	2	40.512879	-89.991105
G50S	B	UA	03/13/2007	623.65	623.65	Top of Riser	620.83	29.17	33.98	591.66	586.85	34.30	586.50	4.8	2	40.508672	-89.990607
G51S	B	UA	01/28/2008	619.66	619.66	Top of Riser	616.83	24.01	28.79	592.82	588.04	29.16	587.70	4.8	2	40.50656	-89.990864
G54L	C	UA/PMP	02/12/2009	622.95	622.95	Top of Riser	620.18	27.32	36.75	592.86	583.43	37.22	583.00	9.4	2	40.504524	-89.988927
G54S	C	UA	02/12/2009	622.98	622.98	Top of Riser	620.25	43.50	47.97	576.75	572.28	48.41	571.80	4.5	2	40.504525	-89.98894
G57S	C	UA	01/30/2009	622.76	622.76	Top of Riser	620.20	29.65	34.18	590.55	586.02	34.62	582.20	4.5	2	40.505608	-89.987043
G60L	C	UA/PMP	01/17/2008	615.39	615.39	Top of Riser	612.69	20.12	24.91	592.57	587.78	25.28	587.40	4.8	2	40.506745	-89.986816
G60S	C	UA	01/16/2008	615.03	615.03	Top of Riser	612.33	31.12	35.91	581.21	576.42	36.29	574.30	4.8	2	40.506732	-89.986815
G64L	C	UA/PMP	01/22/2009	622.46	622.46	Top of Riser	620.24	18.12	27.48	602.12	592.76	27.95	592.30	9.4	2	40.508378	-89.987007
G64S	C	UA	01/22/2009	623.06	623.06	Top of Riser	620.25	34.50	38.99	585.75	581.26	39.48	580.30	4.5	2	40.508365	-89.987011
X301	WLO	S	--	--	--	--	--	--	--	--	--	--	--	--	--	40.504777	-89.990046

Notes:

All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
 Type refers to the role of the well in the monitoring network: background (B), compliance (C), or water level measurements only (WLO)
 WLO wells are temporary pending implementation of impoundment closure per an approved Construction Permit application
 -- = data not available
 BGS = below ground surface
 ft = foot or feet
 HSU = Hydrostratigraphic Unit
 PVC = polyvinyl chloride
 S = source water
 UA = Uppermost Aquifer
 UA/PMP = Uppermost Aquifer/Potential Migration Pathway

generated 10/18/2021, 11:06:33 AM CDT

FIGURES



- 40 C.F.R. § 257 REGULATED UNIT (SUBJECT UNIT)
- PROPERTY BOUNDARY
- RICE LAKE STATE RECREATION AREA

SITE LOCATION MAP

FIGURE 1-1

0 1,000 2,000
 Feet

40 C.F.R. § 257 GROUNDWATER MONITORING PLAN
GMF POND
 DUCK CREEK POWER PLANT
 CANTON, ILLINOIS

RAMBOLL AMERICAS
 ENGINEERING SOLUTIONS, INC.





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

- 40 C.F.R. § 257 REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- PROPERTY BOUNDARY

0 150 300
 |-----|-----|
 Feet

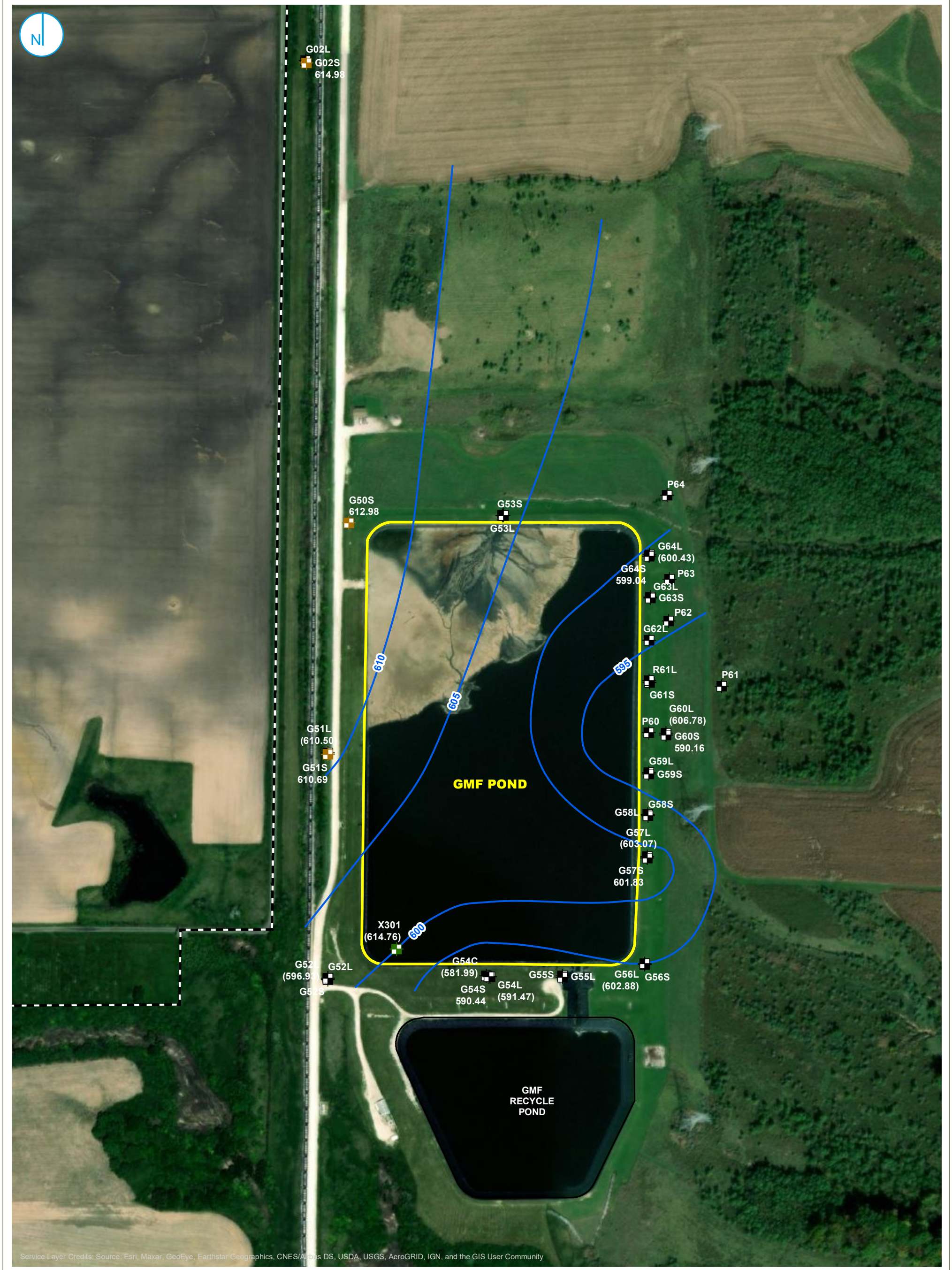
SITE MAP

FIGURE 1-2

40 C.F.R. § 257 GROUNDWATER MONITORING PLAN
GMF POND
 DUCK CREEK POWER PLANT
 CANTON, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.





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

- BACKGROUND WELL
- MONITORING WELL
- SOURCE SAMPLE LOCATION
- GROUNDWATER ELEVATION CONTOUR (5-FT CONTOUR INTERVAL, NAVD88)
- 40 C.F.R. § 257 REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- PROPERTY BOUNDARY

0 150 300
Feet

**UPPERMOST AQUIFER
POTENTIOMETRIC SURFACE MAP
APRIL 14, 2021**

**40 C.F.R. § 257 GROUNDWATER MONITORING PLAN
GMF POND
DUCK CREEK POWER PLANT
CANTON, ILLINOIS**

FIGURE 1-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.





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

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- LEACHATE WELL
- 40 C.F.R. § 257 REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- PROPERTY BOUNDARY

EXPANDED 40 C.F.R. § 257 GROUNDWATER MONITORING WELL NETWORK

FIGURE 2-1

0 150 300
Feet

40 C.F.R. § 257 GROUNDWATER MONITORING PLAN
GMF POND
DUCK CREEK POWER PLANT
CANTON, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

