**PROGRAM**

# CORRECTIVE ACTION GROUNDWATER MONITORING PROGRAM

*Byproduct Storage Area B*

*St. Johns River*

Submitted to:

**JEA / St. Johns River Power Park**
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Submitted by:

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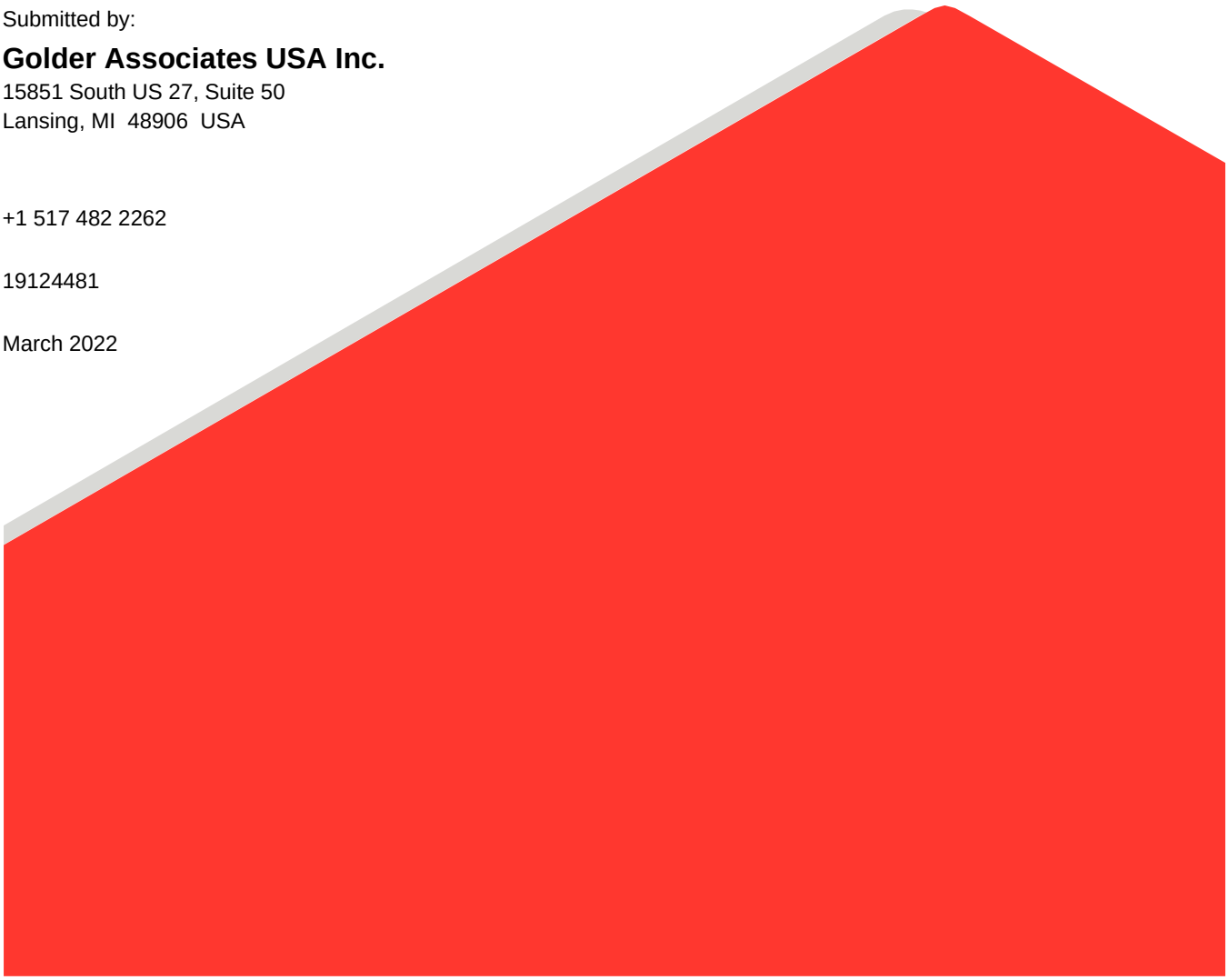
March 2022



# Distribution List

JEA

Stearns Weaver Miller

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# 1.0 INTRODUCTION

On behalf of JEA, Golder Associates USA Inc. (Golder) has prepared this Corrective Action Groundwater Monitoring Program for the Byproduct Storage Area B (BSA-B or Area B) at the St. Johns River Power Park (SJRPP). This report has been prepared to meet the requirements of §257.98(a)(1) of the Coal Combustion Residual (CCR) Rule[1] and also serves as the Tier IV Monitored Natural Attenuation (MNA) Performance Monitoring Plan.

A statistically significant level (SSL) of radium 226+228 above groundwater protection standards (GWPS) was detected in downgradient monitoring well CCR-6 following the June 2018 sampling event (Golder 2018). An Assessment of Corrective Measures Report was completed in June 2019 as required by §257.96 (Golder 2019). An additional SSL of radium 226+228 at downgradient monitoring well CCR-7 was identified following the December 2019 sampling event (Golder 2020a). A SSL of molybdenum at downgradient monitoring well CCR-6 was identified following the June 2020 sampling event (Golder 2020b). An addendum to the Assessment of Corrective Measures Report was completed in December 2020 to address the additional molybdenum and radium 226+228 SSLs (Golder 2020c).

A combination of source control (closure of BSA-B) and MNA was the selected remedy to address the molybdenum and radium 226+228 impacts as documented in the Remedy Selection Report (Golder 2022). MNA refers to the reliance upon natural attenuation processes, including physical and chemical, to achieve site-specific groundwater remedial objectives. Golder performed an evaluation of MNA to address radium 226+228 and molybdenum exceedances at BSA-B (Golder 2021) and concluded:

> *"Therefore, based on the current radium 226+228 and molybdenum concentrations in the BSA-B, the current concentrations observed in downgradient monitoring wells, and the anticipated source control activities, it is concluded that the combined long-term attenuation from physical and chemical processes is sufficient to attenuate radium 226+228 and molybdenum in groundwater at the BSA-B to concentrations below their GWPS."*

The purpose of the Corrective Action Groundwater Monitoring Program and Tier IV MNA Performance Monitoring Plan is to describe the corrective action groundwater monitoring network, sampling and analytical methods, procedures for assessing the long-term effectiveness of the selected remedy (MNA), and reporting for the corrective action/MNA monitoring program.

## 1.1 Site Description

The SJRPP is located at 11201 New Berlin Road in Jacksonville, Florida. SJRPP consisted of two coal-fired steam electric generation units and associated facilities. The SJRPP began decommissioning and demolition in 2018. BSA-B is located approximately 1.5 miles northeast of the SJRPP main entrance, north of Island Drive, and southwest of Clapboard Creek. BSA-B was designed as an above-grade, unlined byproduct storage area. Base grades for BSA-B were designed to provide separation between the base of the BSA and the seasonal high groundwater table, including the settlement of foundation soils. BSA-B began construction in 2008 and operated until December 2020. Closure construction was completed in January 2022.

[1] 40 Code of Federal Regulations Part 257 (40 CFR 257), Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, Published in Federal Register / Vol. 80, No. 74, April 17, 2015.

## 1.2 Site Hydrogeology

A hydrogeological and geotechnical investigation was performed by Golder for the development of the SJRPP BSA-B site (Golder 2007). The main hydrogeologic units at Area B are an unconfined surficial aquifer system and the Floridan aquifer system. The surficial aquifer system, which is the uppermost water-bearing unit at Area B, is subdivided into three zones: upper, intermediate, and deep zones. The underlying Hawthorn Group consists of low-permeability sediments that are confining units for the relatively deeper Floridan aquifer. The primary source of potable water in Duval County is the Floridan aquifer. The upper zone of the surficial aquifer is the most transmissive zone of the surficial aquifer (Golder 2007). The prevailing directions of groundwater flow in the upper zone of the surficial aquifer are generally easterly.

## 1.3 CCR Groundwater Monitoring Network

The CCR groundwater monitoring network for BSA-B at SJRPP consists of three background monitoring wells (CCR-1, CCR-2 and CCR-3) and four downgradient monitoring wells (CCR-4, CCR-5, CCR-6 and CCR-7) (Golder 2017). Background and downgradient monitoring wells have been installed with screen intervals in the upper zone of the surficial aquifer (total depth of approximately 20 feet below ground surface). The background wells (CCR-1, CCR-2 and CCR-3) are located such that they represent background groundwater quality that has not been affected by a CCR unit and represent groundwater quality in the same zone as the downgradient monitoring wells. Downgradient monitoring wells (CCR-4 through CCR-7) have been installed as close as practical to the waste boundary to accurately represent the quality of groundwater passing the waste boundary. CCR groundwater monitoring well locations (CCR-1 through CCR-7) are shown on **Figure 1** and monitoring well construction data are provided in **Table 1**.

Additional monitoring points (piezometers) were installed downgradient of BSA-B as part of the nature and extent evaluation. The piezometers designated AW-1 through AW-9 were constructed using standard monitoring well procedures. Piezometer construction details are provided in **Table 1,** and locations are presented on **Figure 1**.

# 2.0 CCR GROUNDWATER MONITORING PROGRAM

Under provisions of the CCR Rule, BSA-B is currently under assessment monitoring (§257.95). Annual assessment monitoring events in which samples are collected from all CCR wells and analyzed for all Appendix IV parameters are conducted in March of each year. Semi-annual monitoring events in which groundwater samples are collected from all CCR wells and analyzed for all Appendix III parameters and Appendix IV parameters detected during the annual event are conducted in June and December of each year. The assessment monitoring program will continue until such time that Appendix III and Appendix IV concentrations allow for the site to return to detection monitoring in accordance with §257.95(e).

CCR groundwater sampling at BSA-B is performed in accordance with the methodology and procedures detailed in the Groundwater Sampling Methodology and Analytical Procedures Technical Memorandum (Golder 2015).

# 3.0 CORRECTIVE ACTION GROUNDWATER MONITORING PROGRAM

Routine groundwater monitoring is required to verify that the MNA component of the selected remedy is achieving the remedial objectives. The MNA groundwater monitoring network will include all the of the CCR monitoring wells listed in Section 1.3 and AW-6, AW-7 and AW-9 as shown on **Figure 1**. An additional well, AW-10, will be installed further downgradient from AW-7 (proposed location shown on **Figure 1**). Corrective action groundwater samples will be collected semi-annually during assessment monitoring events.

## 3.1 Groundwater Sampling Procedures

Corrective action groundwater sampling at BSA-B will be performed in accordance with the methodology and procedures detailed in the Groundwater Sampling Methodology and Analytical Procedures Technical Memorandum (Golder 2015).

The monitoring wells will be purged and sampled using low-flow sampling techniques. Prior to purging, the depth to water level will be measured for each well using an electronic water level indicator. The monitoring wells will be purged and sampled using dedicated low-flow pneumatic bladder pumps or peristaltic pumps (AW-series). Calibrated water quality meters will be used to monitor field stabilization parameters, including pH, specific conductance, temperature, dissolved oxygen, oxygen reduction potential and turbidity. After the water quality parameters stabilized, groundwater samples will be collected and placed into iced coolers under chain-of-custody control pending delivery to the laboratory. Following sample collection, the samples will be delivered to the JEA Springfield laboratory for analysis. The JEA laboratory will send select samples to Pace Analytical Services, LLC, or similar, for analysis.

## 3.2 MNA Analytical Procedures

Laboratory analytical methods will be consistent with those utilized for the CCR groundwater monitoring program. Typical analytical methods for the Corrective Action/MNA monitoring program are as follows:

- Radium 226+228 via US Environmental Protection Agency (EPA) Method 903.1
- Molybdenum via EPA Method 200.7
- General geochemical parameters for periodic evaluation:
  - Major Cations: calcium, magnesium, potassium and sodium via EPA Method 200.7
  - Major Anions: chloride and sulfate via EPA Method 300.0
  - Alkalinity via Standard Method M2320
  - Hardness via Standard Method M2340
  - Nitrate and nitrate/nitrite via EPA Method 353.2
  - Phosphorus via EPA Method 365.4

## 3.3 Corrective Action Data Assessment

The corrective action monitoring program is designed to confirm concentration reductions and document trends due to attenuation mechanisms. The effectiveness of the remedy will be assessed by:

- Continued statistical evaluation of the radium 226+228 and/or molybdenum concentrations in CCR wells with respect to the GWPS.
- Evaluation of long-term trends of radium 226+228 and molybdenum trends in CCR wells where SSLs have been identified.
- Evaluation of long-term trends and concentrations of radium 226+228 and molybdenum in downgradient AW-series wells to demonstrate the groundwater plume is stable or decreasing and not expanding.

- Periodic evaluation of general geochemical parameters (full or partial list of above parameters) to assess changes in the general geochemical conditions of the shallow surficial aquifer.

## 3.4 Reporting

The results of the corrective action groundwater monitoring program will be summarized in the Annual Groundwater Monitoring and Corrective Action report due by January 31 of each year. The report will document whether the groundwater plumes of radium 226+228 and molybdenum are stable, shrinking, or expanding, contain a summary of Appendix III and Appendix IV results for the corrective action monitoring network, and an evaluation of the effectiveness of the attenuation processes with statistical evaluations of the data, as appropriate.

# 4.0 REFERENCES

Golder. 2015. Technical Memorandum, Groundwater Sampling Methodology and Analytical Procedures, CCR Groundwater Monitoring Plan, Byproduct Storage Area B, St. Johns River Power Park, dated December 14, 2015.

Golder. 2016. Monitoring Well Installation Report, CCR Rule Compliance Support, Byproduct Storage Area B – Phase I, St. Johns River Power Park, Jacksonville, Florida, dated February 4, 2016.

Golder. 2017. CCR Groundwater Monitoring Network Certification, Byproduct Storage Area B, Phase I Development, St. Johns River Power Park, Jacksonville, Florida, dated October 13, 2017.

Golder. 2018. Statistically Significant Level Evaluation, Byproduct Storage Area B, St. Johns River Power Park, Jacksonville, Florida, dated October 15.

Golder. 2019. Assessment of Corrective Measures, Byproduct Storage Area B, St. Johns River Power Park, dated June 2019.

Golder. 2020a. Statistically Significant Level Evaluation, Byproduct Storage Area B, St. Johns River Power Park, Jacksonville, Florida, dated May 6.

Golder. 2020b. Statistically Significant Level Evaluation, Byproduct Storage Area B, St. Johns River Power Park, Jacksonville, Florida, dated September 1.

Golder. 2020c. Assessment of Corrective Measures Addendum, Byproduct Storage Area B, St. Johns River Power Park, dated December 1.

Golder. 2021. Monitored Natural Attenuation Evaluation, St. Johns River Power Park, dated October 4.

Golder. 2022. Remedy Selection Report, Byproduct Storage Area B, St. Johns River Power Park, Jacksonville, Florida, dated January 4.

JEA. 2007. JEA SJRPP Byproduct Storage Area B, dated April 19, 2007. [This document includes as an attachment a report prepared by Golder in April 2007, Hydrogeologic and Geotechnical Site Evaluation, St. Johns River Power Park Area B By-product Storage Area, Duval County, Florida (Golder 2007)].

# Signature Page

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SFS/DJM/ams

https://golderassociates.sharepoint.com/sites/110243/Project Files/6 Deliverables/CA GW Program/Final/SJRPP BSA-B CA GW Monitoring Program.docx

TABLE

# TABLE 1
# SUMMARY OF CCR MONITORING WELL CONSTRUCTION DETAILS

## St. Johns River Power Park
## Byproduct Storage Area B
## Jacksonville, Florida

| Well ID | Date Installed | Northing (ft NAD83) | Easting (ft NAD83) | Ground Surface Elevation (ft NAVD83) | Top of Casing Elevation (ft NAVD83) | Stick-up Height (ft) | Well Depth (ft bgs) | Screen Interval Depth (ft bgs) |
|---|---|---|---|---|---|---|---|---|
| CCR-1 | 10/20/2015 | 2221016.34 | 485450.08 | 13.37 | 16.58 | 3.2 | 19.79 | 9.79-19.79 |
| CCR-2 | 10/20/2015 | 2222219.71 | 485292.98 | 14.45 | 18.06 | 3.6 | 19.49 | 9.49-19.49 |
| CCR-3 | 10/20/2015 | 2222897.83 | 485087.81 | 14.22 | 17.74 | 3.5 | 19.78 | 9.78-19.78 |
| CCR-4 | 10/21/2015 | 2221065.31 | 486365.39 | 17.87 | 20.73 | 2.9 | 20.84 | 10.84-20.84 |
| CCR-5 | 10/21/2015 | 2221064.27 | 486865.44 | 15.44 | 18.29 | 2.9 | 20.35 | 10.35-20.35 |
| CCR-6 | 10/21/2015* | 2221456.13 | 487055.97 | 13.08 | 16.03 | 3.0 | 20.1 | 10.1-20.1 |
| CCR-7 | 10/22/2015 | 2221887.42 | 487053.83 | 12.44 | 15.72 | 3.3 | 20.12 | 10.12-20.12 |
| AW-1 | 11/29/2018 | 2221266.24 | 487136.19 | 14.4 | 17.16 | 2.76 | 20.2 | 10.24-20.24 |
| AW-2 | 11/29/2018 | 2221416.04 | 487138.12 | 13.3 | 16.14 | 2.84 | 20.2 | 10.16-20.16 |
| AW-3 | 11/30/2018 | 2221699.22 | 487139.98 | 11.8 | 14.46 | 2.66 | 20.3 | 10.34-20.34 |
| AW-4 | 2/8/2019 | 2221703.97 | 487052.84 | 10.5 | 13.49 | 2.99 | 20.0 | 10.01-20.01 |
| AW-5 | 2/7/2019 | 2221677.18 | 487248.41 | 10.6 | 13.46 | 2.86 | 20.1 | 10.14-20.14 |
| AW-6 | 2/7/2019 | 2221371.74 | 487620.88 | 10.8 | 13.76 | 2.96 | 20.0 | 10.04-20.04 |
| AW-7 | 2/7/2019 | 2221217.37 | 488105.81 | 10.2 | 13.17 | 2.97 | 20.0 | 10.03-20.03 |
| AW-8 | 10/21/2019 | 2221898.38 | 487253.86 | 10.7 | 13.16 | 2.42 | 20.1 | 10.08-20.08 |
| AW-9 | 5/21/2020 | 2221969.03 | 487506.26 | 9.4 | 12.16 | 2.81 | 20.3 | 10.27-20.27 |

Notes:
* - Well CCR-6 was repaired 7/29/2020 and resurveyed on 8/6/2020.
ft bgs - feet below ground surface
ft TOC - feet below top of casing
NAD83 - Horizontal Control: North American Datum, State Plan Coordinate System Florida, East Zone
NAVD88 - Vertical Control: North American Vertical Datum of 1988

FIGURE


**LEGEND**

- PROPERTY BOUNDARY
- CHAIN LINK FENCELINE
- PHASE I LIMIT OF WASTE
- CCR-1 — CCR GROUNDWATER MONITORING WELL LOCATIONS
- AW-1 — PIEZOMETER LOCATION
- MW-B1 — EXISTING MONITORING WELL

**REFERENCE(S)**

1.) CCR-SERIES MONITORING WELL AS-BUILT SURVEY PERFORMED BY B.V. & ASSOCIATES, INC. ON NOVEMBER 17, 2015.

2.) AERIAL IMAGE TAKEN FROM DRONE IMAGES (JANUARY 2022) AND FLORIDA DEPARTMENT OF TRANSPORTATION - APLUS, DATED FEBRUARY 2020.

3.) AW-SERIES PIEZOMETERS FROM SURVEY PERFORMED BY R.E. HOLLAND & ASSOCIATES, INC. IN MARCH 2019.

0 200 400
SCALE FEET

CLIENT
JEA

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
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| PREPARED | BCL |
| REVIEWED | SFS |
| APPROVED | DJM |

PROJECT
ST. JOHNS RIVER POWER PARK
BYPRODUCT STORAGE AREA B - CCR SUPPORT
JACKSONVILLE, DUVAL COUNTY, FLORIDA

TITLE
**CCR GROUNDWATER MONITORING WELLS**

| PROJECT NO. | Phase | REV. | FIGURE |
|---|---|---|---|
| 19-124481 | 19124481-R002a | | 1 |

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