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SEMI-ANNUAL REMEDY SELECTION AND DESIGN PROGRESS REPORT

PLANT WATSON FORMER CCR UNIT MISSISSIPPI POWER COMPANY

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Project Number: FR3795B

September 30, 2024

Semi-Annual Remedy Selection and Design Progress Report

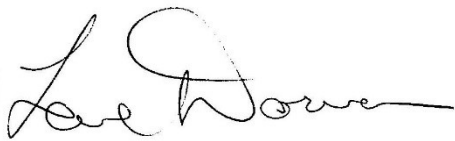
Plant Watson Former CCR Unit Mississippi Power Company

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ACRONYMS AND ABBREVIATIONS

ACM	assessment of corrective measures
CCR	coal combustion residuals
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
GWPS	groundwater protection standards
LLDPE	linear low-density polyethylene
MDEQ	Mississippi Department of Environmental Quality
MNA	Monitored Natural Attenuation
NPDES	National Pollutant Discharge Elimination System
PRB	permeable reactive barrier
SSL	statistically significant level

1. INTRODUCTION

In accordance with the U.S. Environmental Protection Agency (EPA) Coal Combustion Residuals (CCR) Rule, 40 Code of Federal Regulations (CFR) § 257.97(a), this *Semi-Annual Remedy Selection and Design Progress Report* was prepared to provide a semi-annual progress update on the remedy selection process for the former CCR unit at Mississippi Power Company (Mississippi Power) Plant Watson in Gulfport, Mississippi (Site). The location of the former CCR unit is shown on **Figure 1**.

In August 2020, Mississippi Power completed an *Assessment of Corrective Measures* (ACM) to address the occurrence of arsenic, lithium, molybdenum, and combined radium 226 and 228 in Unit 3¹ groundwater at statistically significant levels (SSLs) (Geosyntec, 2020a). In December 2020, Mississippi Power completed a *Radium Alternate Source Demonstration* showing that naturally occurring sources of combined radium 226 and 228 result in the radium SSLs downgradient of the former CCR unit (Geosyntec, 2020b). Since 2021, Mississippi Power has completed *Semi-Annual Remedy Selection and Design Progress Reports* detailing remedy selection activities from August 2020 through March 2024. The ACM and progress reports were placed in the operating record and posted to Mississippi Power's CCR Rule Compliance Data and Information website.

Pursuant to 40 CFR § 257.97, Mississippi Power is continuing to evaluate potential groundwater remedies, or combinations of remedies, presented in the ACM to select a final remedy. As discussed in the ACM, the following groundwater remedies are potentially viable at the Site:

- Geochemical approaches (e.g., in-situ injections);
- Pump-and-treat (hydraulic containment and dewatering);
- Monitored natural attenuation (MNA);
- Permeable reactive barrier (PRB);
- Phytoremediation; and
- Subsurface vertical barrier walls.

Groundwater monitoring activities completed from July 2023 through June 2024 were summarized in the *2024 Annual Groundwater Monitoring and Corrective Action Report* (Annual Report; Southern Company Services, 2024) in accordance with 40 CFR § 257.90(e). The Annual Report was placed in the operating record on August 1, 2024.

¹ Four distinct geologic units have been encountered near the former CCR unit. Unit 1 is comprised of dike fill material and is underlain by Unit 2, a sandy clay aquitard. Material in the former CCR unit is at the same elevation as Unit 1 and above Unit 2. Unit 3, below Unit 2, is the uppermost aquifer beneath the former CCR unit and consists primarily of sand. The CCR monitoring well network is screened in Unit 3. Finally, Unit 4 (the deepest unit) acts as a clay aquitard underlying Unit 3.

The following sections describe: (i) former CCR unit closure and source control; (ii) summary of work completed since the March 2024 progress report (Geosyntec, 2024); and (iii) the anticipated schedule for currently planned activities.

2. FORMER CCR UNIT CLOSURE AND SOURCE CONTROL

Mississippi Power completed closure of the former CCR unit in 2018 via closure in place and capping. During closure, the former CCR unit was dewatered sufficiently to remove free liquids. The CCR material remaining in the former CCR unit was graded and a final cover system installed. The final cover system consists of a ClosureTurf cover system by WatershedGeo that utilizes an impermeable 50-mil linear low-density polyethylene (LLDPE) geomembrane overlain by an engineered synthetic turf. The final cover system was designed to limit infiltration of precipitation by providing sufficient grades and slopes to promote precipitation runoff to discharge points along the intake and discharge canals along the perimeter of the former CCR unit.

The closure of the former CCR unit in the manner described above provides a source control measure that minimizes infiltration, reduces the migration potential of CCR constituents, and provides an opportunity for natural attenuation processes to remediate SSL constituents.

3. SUMMARY OF WORK COMPLETED

Since completion of the most recent *Semi-Annual Remedy Selection and Design Progress Report*, further remedy selection-related activities have been performed as described below.

3.1 Semi-Annual Groundwater Monitoring

Semi-annual assessment monitoring of the certified CCR groundwater monitoring network continued at the Site in accordance with 40 CFR § 257.95. Groundwater samples were analyzed for Appendix III and Appendix IV constituents. Groundwater monitoring data and associated statistical analyses are documented in the Annual Groundwater Monitoring and Corrective Action Reports.

3.2 SSL Nature and Extent Assessment

Assessment of the nature and extent of SSLs, which was initiated prior to ACM completion in August 2020, is complete. Confirmatory activities completed during the most recent reporting period include groundwater and surface water sampling completed in March 2024 and data analysis associated with background monitoring wells, CCR monitoring wells, surface water sampling locations (horizontal delineation), and deep groundwater monitoring wells (vertical delineation). Surface water concentrations were below applicable groundwater protection standards (GWPS) and/or background concentration, indicating the SSLs of arsenic, lithium and molybdenum observed in Unit 3 groundwater are spatially limited to the area immediately surrounding the former CCR unit. Therefore, the March 2024 data, as well as the former isotopic analysis provided in the addendum to the *Comprehensive Groundwater Investigation Report* (Geosyntec, 2020c), confirmed that horizontal and vertical delineation are complete.

3.3 Monitored Natural Attenuation (MNA) Assessment

A natural attenuation evaluation for Site SSLs was completed prior to the September 2022 progress report and has been subsequently updated as new Site data has been collected. Results of the recent data collection and updated evaluation indicated ongoing natural attenuation of arsenic, lithium, and molybdenum based on statistically significant decreasing concentration trends for select constituents since 2018 (at the 95% confidence level) at APMW-3, APMW-4, APMW-8, and APMW-10.

Temporal concentration trends at APMW-5 and APMW-6R (along with recent data trend observations at APMW-3) are more variable and have led to further evaluation through treatability and pilot study programs. Site SSLs can be precipitated and/or immobilized under different combinations of pH and redox conditions. A variety of pH and/or redox-altering technologies are available which can incorporate biological processes, chemical oxidants and reductants, and/or mechanical processes such as air sparging. These processes can be used to remove these constituents from groundwater. Potential attenuation/remediation mechanisms are currently being evaluated as part of treatability and pilot study programs (discussed further in Sections 3.4 and 3.5).

3.4 Laboratory Treatability Study

A Site-specific laboratory-scale treatability study will be conducted to evaluate groundwater amendments that should create conditions favorable for the co-precipitation and/or sorption of SSL constituents. Once precipitated, these reactions are often stable even if geochemical conditions revert to alternative pH and/or redox environments.

The laboratory treatability study will focus on two areas, including the area around well APMW-6R, which has historically shown the highest concentrations of select SSL constituents, and the area around well APMW-3. APMW-5 is also an area of interest due to historical concentration trends, but historical sample results and geochemical analyses from APMW-5 appear more similar to APMW-3 than APMW-6R. As such, treatability testing results from APMW-3 are considered applicable to APMW-5, whereas APMW-5 may respond differently to treatments applied at APMW-6R.

The proposed laboratory treatability study will evaluate biogeochemical transformations using two amendment approaches:

- in-situ chemical reduction (ISCR) using ZVI to reductively precipitate arsenic and molybdenum; and
- electron donor, trace nutrients (i.e., nitrogen and phosphorus), iron, sulfate, and/or pH buffer (i.e., sodium bicarbonate) amendments to stimulate bacterial activity.

Site geologic materials and groundwater for the treatability study will be collected and utilized. A long-term Site remedial strategy may be developed based on the findings of these studies and/or further analytical evaluations and implemented utilizing an adaptive management approach.

3.5 Air Sparge Pilot Study

Oxygenation of groundwater may be an important mechanism to attenuate SSL constituents in groundwater at the Site. By increasing the concentration of oxygen in groundwater, ferrous iron can be oxidized and precipitated out of solution. In addition, other dissolved compounds such as arsenic, molybdenum, and lithium may co-precipitate with the iron and/or adsorb to the precipitated iron. In-situ air sparge (AS) is a recognized remediation process for increasing the oxygen concentration in groundwater and includes injecting air under pressure through injection wells (AS wells) into an aquifer. In the treatment zone, the AS process should generate high concentrations of DO resulting in the precipitation of dissolved iron and potentially the co-precipitation of arsenic, molybdenum, and lithium.

One AS well (designated AS-1) will be installed in the vicinity of APMW-6R to conduct the AS pilot study. Four observation wells will be installed near the AS well to collect data necessary to evaluate the effectiveness of AS technology at the Site. A long-term Site remedial strategy may be developed based on the findings of this pilot study and implemented utilizing an adaptive management approach.

3.6 Temporary Remedy

In a letter to the Mississippi Department of Environmental Quality (MDEQ) dated December 14, 2020 (Mississippi Power, 2020), Mississippi Power proposed installing a groundwater extraction system at the former CCR unit as a temporary remedy. The temporary remedy was designed and installed to extract groundwater from Unit 3 below the footprint of the former CCR unit and within the existing slurry wall. Extracted groundwater undergoes treatment prior to discharge to the Site leachate pond. The system has been operational since October 2022.

The goals of the temporary remedy extraction system pursuant to the 2020 correspondence were to:

- Begin groundwater corrective action while a long-term remedy strategy is developed.
- Reduce head in the uppermost aquifer (Unit 3) within the slurry wall footprint.
- Establish an inward flow gradient, thereby minimizing outward flow potential from the former CCR unit.
- Provide further data and information regarding uppermost aquifer and hydrogeology at the Site.

Temporary remedy discharge to the Site leachate pond was included in the approved National Pollutant Discharge Elimination System (NPDES) permit renewal in 2023 for the Site. Prior to the NPDES permit renewal in 2023, MPC received approval from the Mississippi Department of Environmental Quality to convey the temporary remedy discharge to the Site leachate pond.

As part of the temporary remedy system, four groundwater extraction wells (TW-4, TW-5, TW-6, and TW-7) were installed in November and December 2021 in the footprint of the former CCR unit as shown on **Figure 2**. As of August 2023, TW-3, TW-4, TW-6, and TW-7 comprise the extraction well network incorporated into the temporary remedy system. TW-5 was initially included in the temporary remedy system operation, but in August 2023, operation was moved from TW-5 to TW-7 to optimize system performance.

4. PLANNED ACTIVITIES AND ANTICIPATED SCHEDULE

The following activities are planned to support the remedy selection process:

- Semi-annual groundwater assessment monitoring, including sampling of horizontal and vertical delineation locations.
- Continued evaluation of SSL constituent concentration trends.
- Implementation of a laboratory treatability study to assess potential groundwater amendments designed to immobilize SSL constituents observed in APMW-3, APMW-5, and APMW-6R to support remedy selection.
- Implementation of an air sparge pilot study to assess the potential application of introducing dissolved oxygen into the subsurface to immobilize SSL constituents in the vicinity of APMW-6R to support remedy selection.
- Continued operation and optimization of the temporary remedy system.

As appropriate, data obtained during these activities will be included in the *2025 Annual Groundwater Monitoring and Corrective Action Report* due August 1, 2025.

Final selection of a remedy will occur in accordance with the CCR Rule. Until remedy selection is complete, semi-annual remedy selection and design progress reports will continue to be prepared. The next semi-annual progress report will be completed by March 31, 2025.

5. REFERENCES

Geosyntec, 2020a. Assessment of Corrective Measures. Former CCR Unit. Mississippi Power Company. Plant Watson. August 2020.

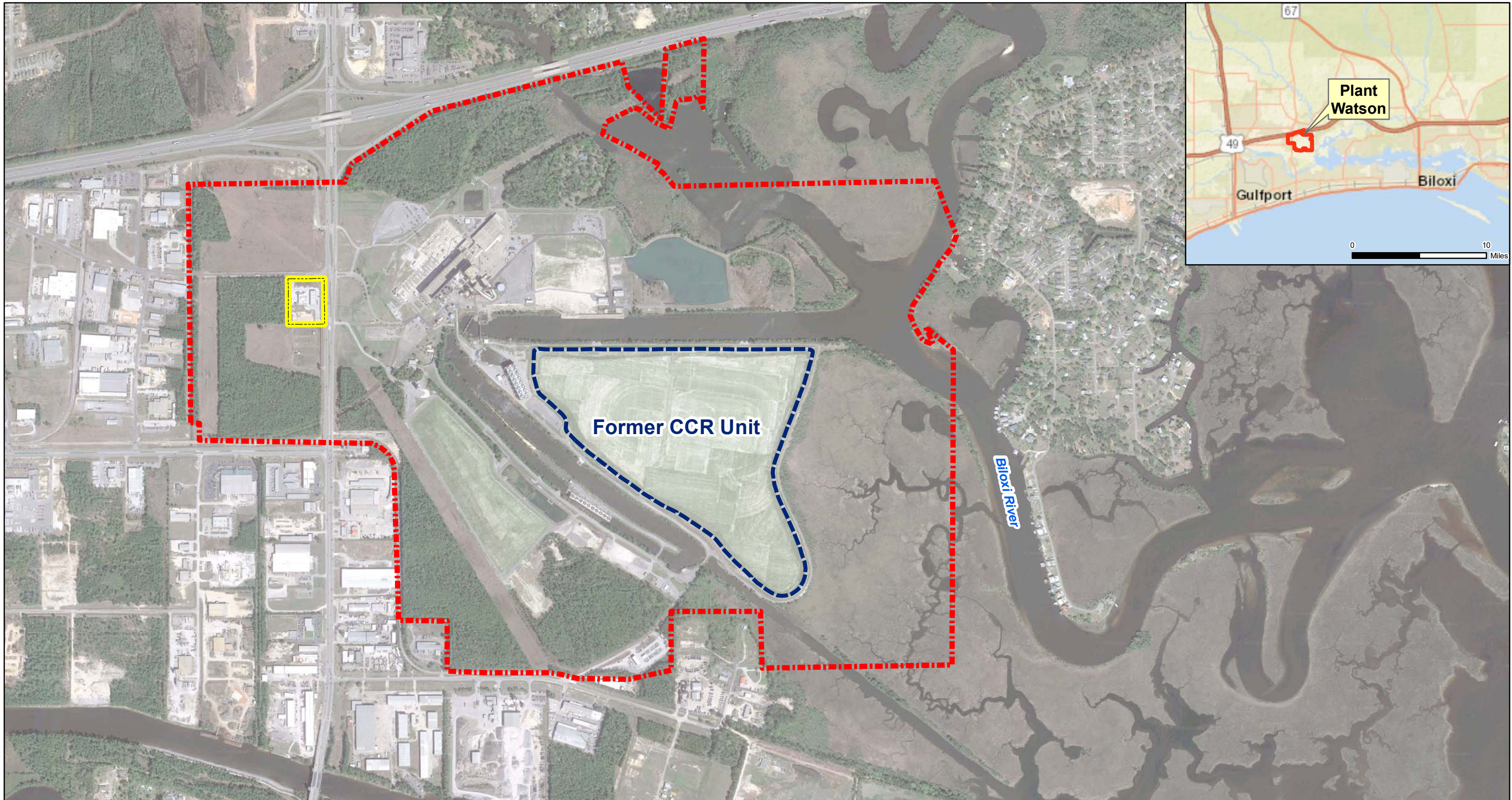
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Geosyntec, 2020c. Comprehensive Groundwater Investigation Report and Addendum. Former CCR Unit. Mississippi Power Company. Plant Watson. December 2020.

Mississippi Power, 2020. Mississippi Power – Plant Watson. Agreed Order No 7010-19. Temporary Remedy. December 2020.

Southern Company Services, 2024. 2024 Annual Groundwater Monitoring and Corrective Action Report. Mississippi Power Company. Plant Watson Former CCR Unit. August 1, 2023.

FIGURES



- Legend**
-  Former CCR Unit Boundary
 -  RaceTrac Gas Station Property Boundary
 -  Plant Watson Property Boundary

Notes:
1. Property boundary georeferenced from Southern Company Services, 2020. Groundwater Monitoring Report. Mississippi Power Company. Plant Watson Ash Pond. 21 February.
2. CCR - Coal Combustion Residuals
3. Aerial Source: Google Earth Imagery 3/18/2019



0 1,000 Feet

Plant Watson Location Map

Plant Watson
Gulfport, Mississippi

Geosyntec
consultants

Pensacola, FL

September 2024

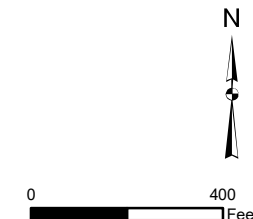
Figure

1



- Legend**
- Extraction Well
 - CCR Monitoring Well
 - ✱ Electrical Rack and Hot Box
 - ✱ Treatment Tank and Building
 - Temporary Remedy
 - Former CCR Unit Boundary

Notes:
 1. CCR - Coal Combustion Residuals
 2. Aerial Source: Google Earth Imagery 3/18/2019



Temporary Remedy System Overview

Plant Watson
 Gulfport, Mississippi

Geosyntec
 consultants

Pensacola, FL

September 2024

Figure
2