Prepared for

Georgia Power Company
241 Ralph McGill Blvd NE
Atlanta, Georgia 30308

DRAFT REMEDY SELECTION REPORT

GEORGIA POWER COMPANY
PLANT BRANCH ASH POND E (AP-E)

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1255 Roberts Boulevard, Suite 200
Kennesaw, Georgia 30144

Project Number GW8862

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Geosyntec
consultants

CERTIFICATION STATEMENT

I, Lauren E. Fitzgerald, am a professional engineer and licensed in the State of Georgia. I hereby certify that this Draft Remedy Selection Report was prepared by, or under the direct supervision of, a Qualified Groundwater Scientist, in accordance with the Georgia Environmental Protection Division Rules of Solid Waste Management. According to 391-3-4-.01, a Qualified Groundwater Scientist is "a professional engineer or geologist registered to practice in Georgia who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields that enable individuals to make sound professional judgments regarding groundwater monitoring, contaminant fate and transport, and corrective action." By affixing my professional seal and signature, I hereby acknowledge that this report has been prepared in conformance with the United States Environmental Protection Agency coal combustion residual rule [40 Code of Federal Regulations 257 Subpart D] and the Georgia Environmental Protection Division Rules for Solid Waste Management 391-3-4-.10.



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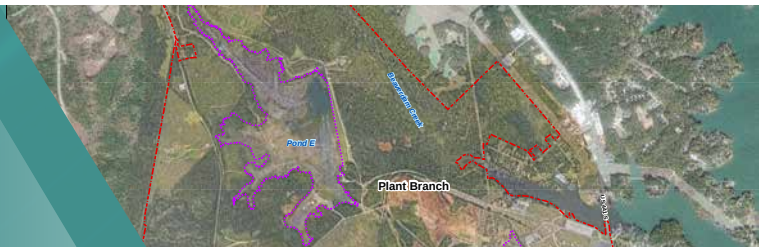
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Lauren E. Fitzgerald — Date

Georgia Professional Engineer No.

Geosyntec consultants

Plant Branch AP-E: Executive Summary



Plant Branch is a former coal-fired electric generation facility, located 8-miles north of Milledgeville, Georgia, that was retired in 2015. Components of the facility are man-made surface impoundments, or "ash ponds", historically used to hold coal combustion residuals (CCR). "CCR", commonly referred to as "coal ash", is a non-hazardous material generated from burning coal for the purpose of generating electricity by electric utilities . The ash ponds were designed, installed, and operated to function as treatment systems for power plant wastewaters, and they have effectively served in this capacity for decades in compliance with the National Pollutant Discharge Elimination System (NPDES) permit under which the ponds are regulated. As part of a comprehensive approach to managing CCR, Georgia Power has undertaken actions to close Ash Pond E (AP-E) in accordance with federal and state regulations and completed a detailed evaluation of corrective measures to remove beryllium and cobalt above the Groundwater Protection Standard (GWPS) at AP-E at Plant Branch.

ASH POND CLOSURE

Georgia Power will close AP-E through excavation of the CCR material from the CCR unit for disposal at a permitted, lined, solid waste disposal facility. The closure of AP-E is regulated by the United States Environmental Protection Agency (USEPA) and the Georgia Environmental Protection Division (GA EPD). The proposed closure approach provides source control benefits that reduce the potential for migration of CCR constituents to groundwater.

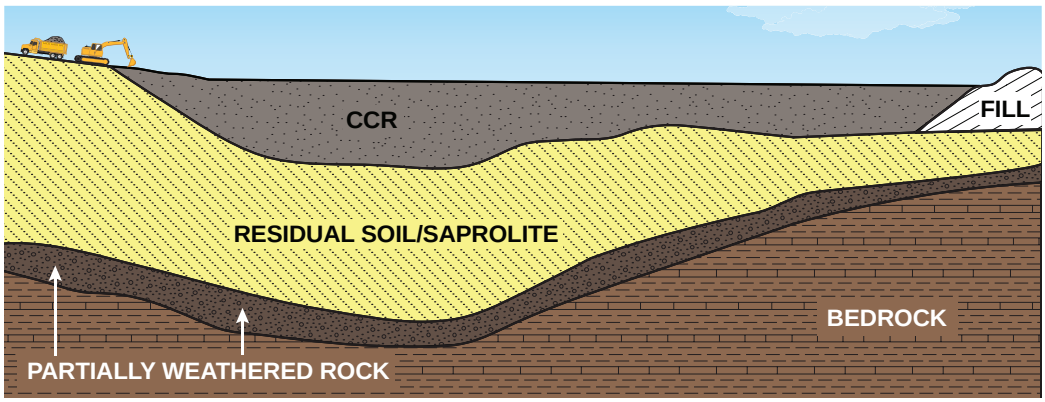
GROUNDWATER MONITORING AND ASSESSMENT

Georgia Power has performed CCR groundwater monitoring at AP-E since 2016. Over the period of Georgia Power's monitoring, concentrations of cobalt (Co) were identified above the GWPS in two wells (BRGWC-33S, BRGWC38S), and beryllium (Be) was identified above the GWPS in one well (BRGWC-38S) downgradient of AP-E. The Co and Be groundwater concentrations above the GWPS are located wholly on Georgia Power property and do not move offsite.

RISK EVALUATION FOR HUMAN HEALTH & ENVIRONMENT

Georgia Power completed a risk evaluation that confirmed that Co and Be identified on-site are not expected to pose a risk to human health or the environment. No further risk evaluation of groundwater or surface water is warranted in connection with the remedy selection process. In short, because no risk to human health or the environment currently exists, human health will be protected though implementation of any of the remedies being evaluated.

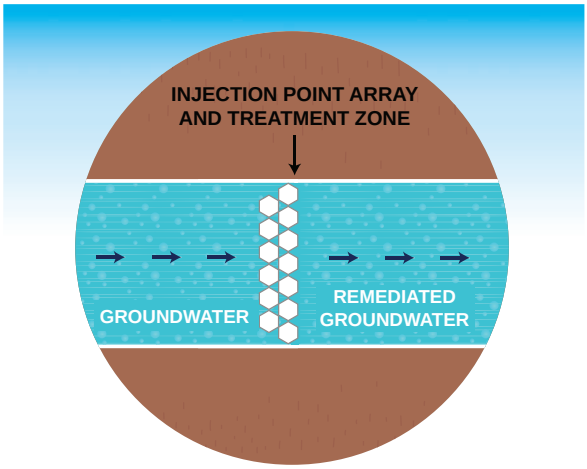
CCR UNIT REMOVAL



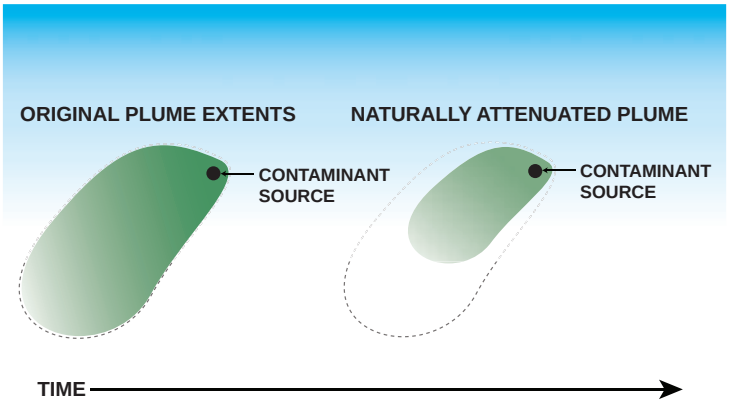
[1] 40 Code of Federal Regulations (CFR) § 257.53

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IN-SITU INJECTION
Overhead View



MONITORED NATURAL ATTENUATION



Georgia Power initiated an assessment of corrective measures (ACM) program for AP-E in July 2022. Since initiating the ACM program, Georgia Power has worked with GA EPD to adhere to regulations and select a comprehensive and technically sound approach for implementing corrective measures to address Co and Be in groundwater. Using the criteria described in the CCR Rule, 40 Code of Federal Regulations (CFR) Part 257.97, the draft remedy proposed includes:

- **Geochemical Approaches (In-Situ Injections)** – In-situ injections are a well-recognized remediation approach utilizing a network of injection wells to introduce reagents into the subsurface to improve groundwater quality. Georgia Power will work with GA EPD on the permitting and approval of the reagent prior to use at the site. Injections will target the area of highest groundwater concentrations of Co at BRGWC-33S to immobilize this constituent. Groundwater monitoring will be performed to confirm the effectiveness of the in-situ injections.
- **Monitored Natural Attenuation (MNA)** – Natural attenuation of Co and Be in groundwater at the site is primarily due to adsorption and co-precipitation of the dissolved metals into the aquifer matrix. These mechanisms have been demonstrated to be occurring in vicinity of BRGW-38S through extensive laboratory testing and study. Groundwater monitoring will continue to document natural attenuation of Co and Be at BRGWC-38S.

ADAPTIVE SITE MANAGEMENT

The remedy performance will be monitored and evaluated, and if needed, the remedy will be adjusted or augmented to meet remedial objectives.

LONG-TERM GROUNDWATER MONITORING

Georgia Power will monitor the performance of applied corrective measures in accordance with regulatory requirements.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	Assessment of Corrective Measures
AP	ash pond
CCR	coal combustion residuals
CFR	Code of Federal Regulations
CSM	conceptual site model
ft/day	feet per day
ft/ft	feet per foot
GA EPD	Georgia Environmental Protection Division
Georgia Power	Georgia Power Company
Geosyntec	Geosyntec Consultants, Inc.
GWPS	Groundwater Protection Standard
ISS	in-situ stabilization
ITRC	Interstate Technology Regulatory Council
MCL	maximum contaminant level
mg/L	milligrams per liter
MNA	monitored natural attenuation
O&M	operations and maintenance
PDI	Pre-design Investigation
PRB	permeable reactive barrier
PWR	partially weathered rock
RCRA	Resource Conservation and Recovery Act
RSL	Regional Screening Level
SSL	statistically significant level
s.u.	standard units
UIC	Underground Injection Control
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Geosyntec Consultants, Inc. (Geosyntec) prepared this *Draft Remedy Selection Report* on behalf of Georgia Power Company (Georgia Power) for Plant Branch Ash Pond E (AP-E, or the coal combustion residual [CCR] unit). As documented herein, Georgia Power has completed a detailed evaluation of corrective measures to address constituents in groundwater at statistically significant levels (SSLs) above the Groundwater Protection Standards (GWPS). The evaluation was completed in accordance with the United States Environmental Protection Agency's (USEPA's) CCR Rule, 40 Code of Federal Regulations (CFR) Parts 257 effective October 19, 2015 (CCR Rule) including subsequent revisions and Georgia Environmental Protection Division's (GA EPD's) Rule for Solid Waste Management Rule 391-3-4-.10 for CCR. The GA EPD Rule 391-3-4-.10 incorporates by reference the CCR Rule. For ease of reference, the CCR Rule regulations are cited within this report, in lieu of citing both sets of regulations.

This *Draft Remedy Selection Report* includes an overview of ongoing geologic and hydrogeologic investigations to refine the conceptual site model (CSM), identifies Appendix IV constituents detected in groundwater at SSLs above the GWPS, discusses the nature and extent of these inorganic constituents in groundwater, evaluates potential corrective measures to address SSLs in groundwater, and presents geochemical approaches (in-situ injections) for cobalt in BRGWC-33S along with monitored natural attenuation (MNA) for beryllium and cobalt in BRGWC-38S as the proposed groundwater remedies for preliminary review by GA EPD. At GA EPD's request, following their preliminary review, a public meeting will be held to discuss the assessment of corrective measures (ACM) and proposed remedy, after which a remedy will be selected, and the Remedy Selection Report will be submitted to GA EPD. Once a remedy is selected and implemented, the remediation will be monitored routinely and is subject to potential modification based on adaptive management strategies, as appropriate.

2.0 BACKGROUND

2.1 Remedy Selection Process

The remedy selection process involves assessment of potentially applicable groundwater remediation approaches. To date, this process has occurred as reported in previous submittals including the *Assessment of Corrective Measures Report (ACM Report)* (Geosyntec, 2022) and *Semiannual Remedy Selection and Design Progress Reports* (Semiannual Progress Reports) (Geosyntec, 2023b; 2024).

The remedy selected for the CCR unit must meet the following required criteria:

§257.97 Selection of Remedy [Required Criteria]
(b) Remedies must:

> *(1) Be protective of human health and the environment;*
> *(2) Attain the groundwater protection standard as specified pursuant to §257.95(h);*
> *(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV to this part into the environment;*
> *(4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;*
> *(5) Comply with standards for management of wastes as specified in §257.98(d).*

Technologies that meet the required criteria are then evaluated using the following comparative criteria:

§257.97 Selection of remedy [Comparative Criteria]
(c) In selecting a remedy that meets the standards of paragraph (b) of this section, the owner or operator of the CCR unit shall consider the following evaluation factors:

> *(1) The long- and short-term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on consideration of the following:*
> > *(i) magnitude of reduction of existing risks;*
> > *(ii) magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy;*
> > *(iii) the type and degree of long-term management required, including monitoring, operation, and maintenance;*

(iv) short-term risks that might be posed to the community or the environment during implementation of such a remedy, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of contaminant;
(v) time until full protection is achieved;
(vi) potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, or containment;
(vii) long-term reliability of the engineering and institutional controls; and
(viii) potential need for replacement of the remedy.

(2) The effectiveness of the remedy in controlling the source to reduce further releases based on consideration of the following factors:

(i) the extent to which containment practices will reduce further releases; and
(ii) the extent to which treatment technologies may be used.

(3) The ease or difficulty of implementing a potential remedy(s) based on consideration of the following types of factors:

(i) degree of difficulty associated with constructing the technology;
(ii) expected operational reliability of the technologies;
(iii) need to coordinate with and obtain necessary approvals and permits from other agencies;
(iv) availability of necessary equipment and specialists; and
(v) available capacity and location of needed treatment, storage, and disposal services.

(4) The degree to which community concerns are addressed by a potential remedy(s).

Using the above criteria, this document evaluates the potential remedies identified in the ACM Report and subsequent updates to identify an appropriate groundwater remedy for the CCR unit. Selection of an appropriate groundwater remedy is significantly influenced by CCR constituent chemistry and characteristics of Appendix IV constituents, which are inorganic trace elements – metals and metalloids that have unique attenuation and remediation characteristics. Common chemical mechanisms of attenuation for CCR constituents include adsorption to, or coprecipitation with, oxides and hydrous oxides (oxyhydroxides) of iron and manganese; coprecipitation with, and adsorption to, iron sulfides such as pyrite (FeS_2); and precipitation as carbonates, sulfides, sulfates, and/or phosphates (USEPA, 2007). The attenuation capacity can be evaluated through site-specific field and lab testing and geochemical modeling. Processes such as precipitation/co-precipitation and adsorption and other methods such as groundwater

extraction and treatment and engineered plant uptake (phytoremediation) are also evaluated for the remediation of Appendix IV constituents. The selected remedy will meet the criteria of §257.97(b) and the effectiveness of criteria specified in §257.97(c).

An evaluation of the degree to which community concerns are addressed by a potential remedy is not included in this Draft Remedy Selection Report. A discussion of this criterion will be substantially informed by a forthcoming public meeting following GA EPD preliminary review and comment on this Draft Remedy Selection Report. Following the public meeting, the Remedy Selection Report will be prepared for submission to GA EPD and will include a discussion of the "degree to which community concerns are addressed by a potential remedy."

2.2 Unit Location and Description

Plant Branch (Site) is located in Putnam County, Georgia, approximately eight miles north of Milledgeville. The property occupies approximately 3,200 acres and is bordered on the south and east by Lake Sinclair (a hydroelectric reservoir created by the impoundment of the Oconee River) and by sparsely populated, forested, rural land on the north and west (**Figure 1**). The physical address of the Site is 1100 Milledgeville Road, Milledgeville, Georgia, 31024.

The Site formerly operated as a coal-fired power plant that commenced power generation in 1965. Over the course of power generation at the facility, five CCR surface impoundments (ash ponds), identified as Ash Ponds A, B, C, D, and E, were utilized. The location of each ash pond is shown on **Figure 1**. The former Ash Pond A (AP-A), the first ash pond constructed at the facility, was taken out of service in the late 1960s and was closed in April 2016 by the removal and relocation of its stored CCR to AP-E. The remaining impoundments, AP-BCD and AP-E are currently not active and will be closed by removal, specifically, by relocation of the CCR stored in those ash ponds to a new, permitted, on-Site CCR landfill.

AP-E is a valley-fill containment area formed by the construction of an earthen embankment dike at the eastern portion of the ash pond and is located on the northwest corner of the Site surrounded by rural land on each side. AP-E has an acreage of approximately 348 acres and covers four converging valleys and side channels. The ash pond was first used for CCR disposal in 1982 and stopped receiving CCR in 2015.

2.3 Unit Closure

Georgia Power has elected to remove the CCR material from AP-E. The CCR material will be excavated and placed into a new permitted, fully-lined, on-Site CCR landfill and/or by selling for beneficial use by others.

Following completion of CCR removal, AP-E will enter into post-closure monitoring as detailed in the closure permit.

2.4 Groundwater Monitoring

The current groundwater monitoring network associated with AP-E includes the background/upgradient and downgradient monitoring wells, as summarized in **Table 1**. Compliance monitoring well locations, including detection and assessment monitoring wells are shown on **Figure 2.**

CCR groundwater monitoring-related activities have been performed at AP-E since 2018 in accordance with the CCR Rule. The following Appendix IV SSL constituent and well pairs are currently identified:

Appendix IV SSL Constituent[1]	Well
Beryllium	BRGWC-38S
Cobalt	BRGWC-33S and BRGWC-38S

Additional details regarding the statistical analyses are provided in the annual and semiannual *Groundwater and Corrective Action Monitoring Reports* submitted to GA EPD and posted on Georgia Power's website.

Beryllium at BRGWC-38S and cobalt at BRGWC-33S and BRGWC-38S are the subject of this *Draft Remedy Selection Report*.

[1] An Appendix IV SSL Constituent is determined by comparing the confidence intervals developed to either the constituent's maximum contaminant level (MCL), if available, the USEPA Regional Screening Level (RSL), if no MCL is available, or the calculated background interwell tolerance limit in cases where background concentrations are higher than the MCL or RSL values.

3.0 GROUNDWATER CONCEPTUAL SITE MODEL

A CSM is a dynamic tool that contextualizes available geological, hydrogeological, and geochemical information at a site to convey how groundwater and constituents (Appendix III and IV constituents) travel in a given geologic setting. A CSM is not static and may evolve as data are collected and more is known about the setting. A CSM was developed for AP-E. As data were gathered during the ACM process, the CSM was refined and used to pre-screen remedial technologies, retaining technologies that were suitable for consideration in remedial alternatives for groundwater or adaptive site management based on site-specific conditions. The groundwater CSM for AP-E is summarized below.

3.1 Geology

The Site is located within the Piedmont Physiographic Province of central Georgia, which is characterized by gently rolling hills and narrow valleys, with locally pronounced linear ridges. Generally, the Site slopes gently eastward and southward towards Beaverdam Creek and Lake Sinclair. The metamorphic and igneous rocks that underlie the area have been subjected to physical and chemical weathering which has created a landscape dissected by creeks and streams. Bedrock is typically overlain by a variably thick blanket of residual soils and saprolite. The overall depth of weathering in the Piedmont is generally about 20 to 60 feet; however, the depth of weathering along discontinuities and/or very mafic rock units may extend to depths greater than 100 feet.

Based on subsurface investigations, the thickness of the residual soil and saprolite encountered in AP-E borings is variable, ranging from a few feet to as much as 90 feet. The saprolite is dominated by clayey to sandy silt textures and grain size generally increases with depth from clayey silt to silty sand. It is generally characterized as mottled brown to red with abundant mica minerals, showing relict foliations and banding indicative of the underlying gneissic rocks. Rock fragments in the saprolite increase in number and size with depth.

Between the residual soil/saprolite zone and the underlying bedrock there is a zone of partially weathered rock (PWR), as defined by standard penetration test data, where available. PWR is a gradational stage of decomposition of the bedrock commonly observed in the Piedmont region. It generally exhibits visible characteristics of the bedrock but may be friable or broken by hand and is intensely fractured and/or weathered. The PWR accounts for a majority of the “transition zone” that lies between the saprolite and the competent bedrock. The transition zone, consisting of PWR and the upper fractured bedrock, is relatively thin with thicknesses generally being less than 10 feet.

The top of the underlying bedrock surface across the Site ranged from within a few feet of ground surface to approximately 90 feet below ground surface. The upper bedrock is moderately fractured and is described as biotite gneiss and biotite gneiss interlayered with amphibolite with few open fractures that dip at low angles. The unweathered rocks show distinct dark and light banding, feldspar phenocrysts, quartz and feldspar augen, and few micro-fold structures. Found at relatively shallow depth, the amphibolite gneiss contains notable amounts of hornblende and pyrite and is more weathered and fractured than the biotite gneiss.

Geologic cross-sections proximal to AP-E are included as **Figures 3** through **5**, and additional details on Site geology and hydrogeology can be found in the *Hydrogeologic Assessment Report, Rev 02, Ash Pond E* (Geosyntec, 2025).

3.2 Hydrogeology and Groundwater Flow

Hydrogeologic investigations at the Site suggest an unconfined uppermost aquifer with groundwater flow primarily in the saprolite and PWR and with substantially lower permeabilities in the underlying fractured gneiss bedrock. Generally, the water table surface at the Site is a subdued reflection of topography. Downward hydraulic gradients dominate in the topographically high areas, while upward gradients are observed in topographic lows. Recharge likely occurs in the ridges along the north, west, and south perimeter of AP-E. The potentiometric surface indicates that groundwater flows from the west, towards the ash pond, before migrating east towards Beaverdam Creek and southeast along the axis of the original pre-construction stream valley and toward the dike that forms the valley-fill CCR impoundment.

A potentiometric surface map from August 2023 (**Figure 6**) presents groundwater elevations measured from the existing monitoring wells and piezometers. Groundwater in the AP-E area flows under the influence of topography from the northwest side of the Site to the east-southeast. After CCR removal, the groundwater flow direction is not anticipated to change significantly.

Based on water level measurements collected on August 21, 2023, the hydraulic gradient is approximately 0.005 feet per foot (ft/ft) southeast (between BRGWA-5S and BRGWC-33S) and 0.011 ft/ft to the east (between PZ-4S and BRGWC-38S) yielding an average groundwater flow velocity of 0.09 feet per day (ft/day) in the vicinity of AP-E (Geosyntec, 2024).

3.3 Geochemical CSM

Groundwater monitoring data confirm beryllium in BRGWC-38S and cobalt in BRGWC-33S and BRGWC-38S are delineated and not migrating off-Site. These impacts are likely limited in extent due to natural attenuation processes in the aquifer, as determined by laboratory studies.

As detailed in the *Geochemical Conceptual Site Model Report* (**Appendix A**) (GCSM Report), beryllium and cobalt in groundwater are strongly influenced by groundwater pH. A decrease in pH (below approximately 5.5 standard units (s.u.)) is likely the primary driver for desorption of beryllium and cobalt from environmentally available fractions leading to mobilization of these constituents from the aquifer matrix to groundwater. Based on Site-specific data, the primary mechanism of attenuation of cobalt and beryllium at the Site is adsorption (surface complexation) to iron and manganese oxides and oxyhydroxides and co-precipitation under neutral to alkaline pH conditions. Characterization of aquifer solids around AP-E indicate that clay minerals and iron and manganese oxides and oxyhydroxides are present in amounts to favor adsorption and attenuation, and sorption and desorption studies confirm that beryllium and cobalt are strongly sorbed to aquifer solids under favorable geochemical conditions and moderate pH.

3.4 Nature and Extent of Groundwater Above the GWPS

Based on statistical analysis of Appendix IV groundwater data, the beryllium and/or cobalt SSLs identified in detection monitoring wells BRGWC-38S and BRGWC-33S are horizontally and vertically delineated to levels below the GWPS. Iso-concentration maps for beryllium and cobalt concentrations obtained in August 2023 are presented on **Figures 7** and **8**. Detection monitoring wells with SSLs and the pertinent horizontal and vertical delineation wells are also provided below:

Detected Constituent	GWPS [1] (mg/L)	Monitoring Well ID	Concentration [2] (mg/L)	Delineation Well IDs
Beryllium	0.004	BRGWC-38S	0.0068	Horizontal: PZ-70I Vertical: PZ-53D
Cobalt	0.006	BRGWC-33S	0.0659	Horizontal: PZ-13S Vertical: PZ-52D
Cobalt	0.006	BRGWC-38S	0.139	Horizontal: PZ-70I Vertical: PZ-53D

Notes:
mg/L = milligrams per liter
1. §257.95 GWPS.
2. Reported concentration is from the August 2023 semiannual monitoring event (Geosyntec, 2024).

4.0 ASSESSMENT OF CORRECTIVE MEASURES SUMMARY

An ACM Report was completed on December 16, 2022, in accordance with §257.96 and identified the following corrective measures as potentially applicable to remediate groundwater at the Site:

- Geochemical Approaches (In-Situ Injection)
- Hydraulic Containment ("Pump and Treat")
- In-Situ Stabilization (ISS)
- Monitored Natural Attenuation (MNA)
- Permeable Reactive Barrier (PRB)
- Phytoremediation
- Subsurface Vertical Barrier Walls

Georgia Power plans to proactively utilize adaptive site management to support the remedial strategy and address potential changes in Site conditions as appropriate. Under an adaptive site management strategy, a remedial approach will be selected whereby: (1) a remedy will be installed or implemented to address current conditions; (2) the performance of the remedy will be monitored, evaluated, and reported semiannually; (3) the CSM will be updated as more data are collected; and (4) adjustments and augmentations will be made to the remedy, as warranted, to meet remedial objectives.

Further evaluations and refinements of the groundwater corrective measures were presented in the Semiannual Progress Reports submitted since the ACM Report in 2022. The corrective measures identified for AP-E in the ACM Report have been further evaluated using the criteria outlined in §257.96(c). The screening of the corrective measures, as presented in the Semiannual Progress Reports, is summarized in **Table 2**. Given the closure method at AP-E of closure by removal, ISS was not applicable and removed as a corrective measure. Therefore, discussion of this corrective measure is not included in **Table 2**.

The corrective measures that were not screened out and were retained for further evaluation under the §257.97 remedy selection criteria in this document include the following:

- **Geochemical Approaches (In-Situ Injection)**: Geochemical approaches rely on a temporary or permanent injection network to introduce reagents or air into the subsurface to promote either anerobic or aerobic attenuation of inorganic constituents either as a sparingly soluble mineral or through sorption mechanisms.

Geochemical injections are a proven groundwater remediation technology for CCR constituents (including beryllium and cobalt), and are especially effective in treating smaller localized areas, such as those present at AP-E.

- **Hydraulic Containment ("Pump and Treat")**: Hydraulic containment refers to the use of groundwater extraction to induce a hydraulic gradient for hydraulic capture or to control the migration of groundwater. This approach uses extraction to capture groundwater, which may subsequently require above-ground treatment and permitted discharge to a receiving water feature, reinjection into the groundwater, or reuse (e.g., land application, CCR conditioning, etc.). Hydraulic containment is applicable to a variable mix of inorganic constituents, including dissolved beryllium and cobalt at AP-E. It is commonly referred to as "pump and treat" when applied to recover constituent mass and achieve GWPS throughout a plume.
- **Monitored Natural Attenuation (MNA)**: MNA relies on natural attenuation processes to achieve Site-specific GWPS within a reasonable time frame relative to more active methods by effectively reducing dissolved concentrations of inorganic constituents. Attenuation mechanisms for inorganic constituents at CCR sites, including beryllium and cobalt at AP-E, are either physical (e.g., dilution, dispersion, flushing, and related processes) or chemical (sorption, mineral precipitation, or oxidation reduction reactions) (USEPA, 2007; USEPA, 2015). As detailed in the GCSM Report provided in **Appendix A**, natural attenuation of beryllium and cobalt is primarily due to adsorption and co-precipitation, and does not rely solely on physical means of attenuation.
- **Permeable Reactive Barrier (PRB)**: PRB technology typically involves the installation of a permeable subsurface wall constructed with reactive media for the removal of constituents as groundwater passes through. This approach has been shown to effectively reduce the dissolved concentration of CCR constituents including beryllium and cobalt. At AP-E, a solid phase composed of an amendment to alter the geochemistry of groundwater (i.e., pH) to promote the attenuation of beryllium and cobalt is considered.

Preliminary or conceptual remedy design drawings of the four corrective measures are shown on **Figures 9** through **12**. Since the layouts are considered conceptual, the configuration of the implemented remedy may vary. The imagery shown on **Figures 9** through **12** may not be fully representative of post-CCR removal conditions and actual layouts would be determined based on Site conditions at the time of implementation.

5.0 CORRECTIVE MEASURES EVALUATION

The purpose of this section is to evaluate and rank the four corrective measures using the required criteria described in §257.97(b) and rank them using the comparative criteria described in §257.97(c).

5.1 Required Criteria (§257.97(b))

As described in §257.97(b), for a groundwater corrective measure to be selected it must meet the following criteria:

1. Be protective of human health and the environment;
2. Attain the GWPS as specified pursuant to §257.95(h);
3. Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV to this part into the environment;
4. Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems; and
5. Comply with standards for management of wastes as specified in §257.98(d).

Below, the corrective measure options are evaluated against the required criteria.

5.1.1 Protective of Human Health and the Environment (§257.97(b)(1))

CCR is classified as a non-hazardous Resource Conservation and Recovery Act (RCRA) solid waste, a determination confirmed in 40 CFR §257 Preamble part III.A. Nevertheless, Georgia Power conservatively and protectively conducted a risk evaluation. A groundwater Risk Evaluation Report (Geosyntec, 2023a) was prepared for AP-E and included as an appendix to the Semiannual Progress Report submitted to GA EPD in February 2023. The Risk Evaluation Report has subsequently been updated to include groundwater monitoring data collected through August 2024, and is included as **Appendix B**. This evaluation is one of many lines of evidence used herein and factored into the remedy selection process. The risk evaluation for the SSL-related constituents in groundwater at AP-E was conducted using methods generally consistent with GA EPD and USEPA guidance.

The Risk Evaluation Report concluded that based on multiple lines of evidence and various conservative assumptions, further risk evaluation for groundwater or surface water is not warranted.

Accordingly, no further risk evaluation of groundwater or surface water is warranted in connection with the remedy selection process. In short, because no risk to human health or the environment currently exists, human health will be further protected though implementation of any of the remedies being evaluated.

5.1.2 Attain the Groundwater Protection Standards (§257.97(b)(2))

The proposed corrective measures for BRGWC-33S and BRGWC-38S would each attain the GWPS at the compliance boundary (waste boundary) and throughout the area of groundwater SSL exceedances. In conjunction with source control, proposed corrective measures include geochemical injection approaches for BRGWC-33S and MNA for BRGWC-38S.

To evaluate the applicability of MNA to achieve the beryllium and cobalt GWPS in BRGWC-38S, a progressive phased evaluation, consistent with USEPA (USEPA, 2015) and Interstate Technology and Regulatory Council (ITRC, 2010), was completed using multiple lines of evidence. Under this guidance, each phase is designed to progressively reduce uncertainty and evaluate the effectiveness of MNA. The evaluation results are detailed in the *Monitored Natural Attenuation Evaluation* (MNA Evaluation) included herein as **Appendix C** and are summarized below:

- **Phase I** – Statistical analysis of historical analytical data indicate that the beryllium and cobalt plumes are *not expanding*.
- **Phase II** – The site-specific *attenuation mechanisms* for Appendix IV constituents include adsorption and co-precipitation (**Appendix A**) and a*ttenuation rates* are sufficient to achieve GWPS, as demonstrated by constituent transport evaluations (**Appendix D**). Attenuation rates will be evaluated and refined as closure construction progresses and more analytical data are collected over time, in accordance with adaptive site management practices.
- **Phase III** – Aquifer *attenuation capacity* was calculated from site-specific data and excluded the effects of source control at AP-E. This conservative calculation demonstrates sufficient aquifer attenuation capacity to achieve a stable plume well beyond the anticipated post-closure care period. Laboratory desorption data confirm the stability of immobilized Appendix IV constituents. Constituent

transport evaluations confirm sufficient *attenuation capacity* and *stability* under post-closure conditions.

- **Phase IV** – The design of a *performance monitoring program* based on the understanding of the mechanism of the attenuation process, and establishment of contingency remedies tailored to site-specific characteristics will follow GA EPD approval of the Remedy Selection Report.

For BRGWC-38S, a constituent transport evaluation assessed attenuation rates under varying assumed conditions in the aquifer and provides an additional line of evidence on natural attenuation mechanisms, rates, and capacity at AP-E. This evaluation demonstrated that natural attenuation alone is expected to achieve GWPS and provide a baseline for comparison with other corrective measures for those constituents exhibiting decreasing concentration trends (beryllium and cobalt in BRGWC-38S). The constituent transport evaluation, and associated input parameters, are described in detail in the *Reactive Transport Model Report* included in **Appendix D.** These evaluations estimated the time to achieve the GWPS under various scenarios including MNA under current conditions excluding the effects of source control, MNA accounting for the effects of source control, and with the implementation of an active remedy. Excluding the positive influence of source control, the results suggest that the GWPS can be met at the compliance boundary under current conditions within approximately 34 years and 18 years for cobalt and beryllium, respectively, in BRGWC-38S. Under a CCR removal scenario (which assumes CCR removal is completed in approximately 12 years but the positive impacts of closure construction are observed prior to CCR removal completion), MNA could achieve the GWPS within approximately four years and eight years for beryllium and cobalt, respectively, in BRGWC-38S from present day. This means that, assuming closure construction commences as expected, beryllium and cobalt could achieve the GWPS prior to completion of closure construction. With an active remedy, the time to achieve the GWPS reduces to two years for both cobalt and beryllium, respectively in BRGWC-38S upon implementation of the remedy. This suggests that the GWPS can be achieved relatively quickly with an active remedial approach (prior to completion of source removal), however, the active remediation may be necessary to continue for some duration during closure construction or until a circumneutral pH in groundwater is attained.

Given recent increases in groundwater concentrations for cobalt in BRGWC-33S, an approximate time to achieve GWPS at the compliance boundary under MNA alone using the current data trend could not be estimated for either a pre- or post-CCR removal scenario. The localized elevated concentrations of cobalt at BRGWC-33S in the last two

years are expected to be transient, associated with dewatering and construction activities within AP-E that have led to changes in hydrogeological conditions, changes in the groundwater flow field in the vicinity of BRGWC-33S, and variability of source water upgradient of BRGWC-33S causing increases in cobalt in groundwater. Therefore, these increased concentrations may stabilize or return to previous decreasing trends as CCR removal progresses and is completed if the favorable hydrogeological conditions return. Natural attenuation processes are likely favorable in the vicinity of BRGWC-33S as evidenced by decreasing concentration trends in the historical monitoring data prior to CCR removal activities commencing. Therefore, while a more active remedial approach will be proposed initially for cobalt at BRGWC-33S during CCR removal activities, it is expected that MNA may become a favorable corrective action again for cobalt to achieve the GWPS in BRGWC-33S. Should that occur, MNA will be further evaluated for cobalt at BRGWC-33S.

At BRGWC-33S, a remedial action evaluation was completed as detailed in the *Reactive Transport Model Report* included in **Appendix D** to assess the time to achieve the GWPS with an active remedial approach. The results of this suggest that the GWPS can be met at the compliance boundary under current conditions within two years of implementation of a geochemical injection approach for cobalt. However, similar to BRGWC-38S, it is possible that the active remedial approach may need to be continued for some duration during CCR removal, until the groundwater conditions become favorable for attenuation.

Adaptive site management approaches will be employed to continue to monitor concentration trends in BRGWC-33S and BRGWC-38S and assess the applicability of the proposed and implemented corrective action measures.

5.1.3 Control the Source of Release (§257.97(b)(3))

In connection with a remedy, the source of the contamination must be controlled to reduce or eliminate, to the maximum extent feasible, further releases by identifying and locating the cause of the release. The following section describes how the source control required criterion is met in connection with each evaluated alternative.

Georgia Power will close AP-E by removal in a manner that is in compliance with applicable federal and state regulations and is protective of public health and the environment. Closure by removal includes excavation and consolidation of the CCR material into a new permitted, fully-lined, on-Site CCR landfill and/or selling for beneficial use by others. Removal of the CCR would, over time, be supportive of

declining concentrations of Appendix IV constituents in groundwater downgradient of AP-E and improve overall groundwater quality.

As noted above, Georgia Power also plans to proactively utilize adaptive site management to support the remedial strategy and address potential changes in Site conditions as appropriate.

The control provided by the removal of CCR ensures that, for the purpose of remedy selection, the control requirement is met for all corrective measures being evaluated. None of the remedies being evaluated will interfere with the control provided by the CCR removal, and Appendix IV constituents at and beyond the waste boundary that are present within the groundwater plume will be controlled by the evaluated groundwater corrective measure(s):

- **Geochemical Approaches (In-Situ Injection)** – Geochemical processes can be altered to immobilize beryllium and cobalt in groundwater through precipitation and sorption, thereby removing them from the dissolved phase in groundwater and controlling contaminant release/movement.
- **Hydraulic Containment ("Pump and Treat")** – Inducing a hydraulic gradient to capture or control the migration of impacted groundwater would limit potential contaminant release/movement from the capture zone.
- **Monitored Natural Attenuation (MNA)** – Natural attenuation processes act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of constituents in groundwater. These in-situ processes effectively attenuate the movement of inorganic CCR constituents in groundwater, thereby controlling constituent release/movement. The primary mechanisms governing attenuation and immobilization of beryllium and cobalt at AP-E include adsorption to iron and manganese oxides and oxyhydroxides and co-precipitation with naturally occurring minerals in the aquifer under neutral to alkaline pH conditions.

- **Permeable Reactive Barrier (PRB)** – A permeable subsurface wall constructed with applicable reactive media can directly remove beryllium and cobalt and/or alter the geochemistry of the groundwater as it passes through the barrier to promote the attenuation of beryllium and cobalt. Both methods would result in removal of the CCR constituents from the dissolved phase in groundwater and control contaminant release/movement.

5.1.4 Removal of Contaminated Material from the Environment (§257.97(b)(4))

The groundwater corrective measures retained for further consideration in the ACM Progress Reports would be effective at removing Appendix IV constituents from groundwater, either through processes of physical removal, immobilization, or attenuation in groundwater. The corrective measures considered herein remove contaminated material as follows:

- **Geochemical Approaches (In-Situ Injection) –** Geochemical processes can be altered to immobilize contaminants by sorption and precipitation, thereby removing them from the dissolved phase in groundwater.
- **Hydraulic Containment ("Pump and Treat") –** Extracting groundwater would physically remove contamination from the environment by reducing the presence of contaminants in groundwater through withdrawal from the aquifer.
- **Monitored Natural Attenuation (MNA) –** Natural attenuation processes act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants groundwater. Sorption and precipitation can immobilize contaminants, thereby removing them from the dissolved phase in groundwater.
- **Permeable Reactive Barrier (PRB) –** Contaminants can be directly removed by interaction with the PRB reactive material and/or the geochemistry of the groundwater can be altered, thereby removing contaminants from the dissolved phase as groundwater passes through the reactive subsurface barrier.

5.1.5 Comply with Waste Management Standards (§257.97(b)(5))

In accordance with §257.98(d), waste generated during the implementation of any of the remedies under consideration would be managed in a manner that complies with applicable requirements of the RCRA and the Georgia Comprehensive Solid Waste Management Act.

REQUIRED CRITERIA	Corrective Measures			
	Geochemical Approaches (In-Situ Injections)	Hydraulic Containment ("Pump and Treat")	Monitored Natural Attenuation (MNA)	Permeable Reactive Barrier (PRB)
Be protective of human health and the environment	✓	✓	✓	✓
Attain the groundwater protection standard	✓	✓	✓	✓
Control the source of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment	✓	✓	✓	✓
Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems	✓	✓	✓	✓
Management of waste to comply with all applicable RCRA requirements	✓	✓	✓	✓

5.2 Comparative Criteria (§257.97(c))

This section compares the corrective measure options using the comparative criteria listed in §257.97(c). Each of the comparative criteria consists of several sub-criteria listed in the CCR Rule, which are considered in this remedy selection below. The goal of this analysis is to further evaluate the corrective measures that meet the required criteria to support remedy selection. Consistent with §257.98(b), the selected and implemented remedy will be continually evaluated and, if warranted, modified consistent with adaptive management practices.

A graphic is included within each subsection to provide a visual depiction of the favorability of each corrective measure, where dark green represents that the "option

performs *highly favorably* under this criterion," medium green represents that the "option performs *favorably* under this criterion," and light green represents that the "option performs *less favorably* under this criterion."

5.2.1 Long- and Short-Term Effectiveness and Protectiveness

This comparative criterion takes into consideration the following sub-criteria relative to the long-term and short-term effectiveness of each corrective measure. Long-term effectiveness means that the remedy will protect human health and the environment after GWPS have been met and prior to completion of the remedy, as defined by §257.98(c).

The short-term effectiveness of a potential remedy is related to the protectiveness of human health and the environment during construction and implementation, the time to achieve remedial action objectives are also considered.

5.2.1.1 Magnitude of reduction of existing risks

As indicated by the nature and extent evaluation, the most recent groundwater sampling results, and the Risk Evaluation Report summarized in Section 5.1.1, Appendix IV constituents in groundwater from AP-E are not expected to pose a risk to human health or the environment. Therefore, this criterion is considered favorable for each of the corrective measures. In addition, each groundwater corrective measure retained for this comparative analysis will be effective at reducing concentrations to levels below the GWPS, as described in section 5.1.2 above.

5.2.1.2 Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy

CCR unit closure through closure by removal provides effective source control, as described in Section 5.1.3 above and prevents further releases. Consequently, each of the remedies is considered equally favorable under this criterion.

5.2.1.3 The type and degree of long-term management required, including monitoring, operations, and maintenance

In accordance with §257.97(c)(1)(iii), this sub-criterion considers the long-term management of each groundwater corrective measure.

MNA is highly favorable with respect to this criterion, as it requires the least amount of long-term management. MNA long-term management would be limited to monitoring

only as the absence of any mechanical systems avoids operations and maintenance (O&M) requirements. In-Situ Injection is considered favorable as some limited longer-term management may be required in addition to monitoring. For example, redevelopment of injection wells due to screen fouling, blower maintenance if oxygen injections are required, and potential maintenance injections may be required. A PRB installation would be considered less favorable with respect to long-term management. Loss of reactivity of the reactive media would be the biggest concern for long-term management as it may require reinstallation. "Pump and Treat" is the least favorable corrective measure under this criterion due to required O&M of the pumping and treatment system along with management of extracted groundwater and treatment residuals.

5.2.1.4 Short-term risks that might be posed to the community or the environment during implementation of such a remedy

In accordance with §257.97(c)(1)(iv), this sub-criterion relates to the potential for risks to human health (including, but not limited to, worker safety and the community) and the environment associated with remedy implementation.

Community impacts include general impacts, such as potentially increased truck traffic on public roads during construction of the remedies, as well as increased vehicle emissions, resource consumption, and noise.

MNA is considered highly favorable as no additional construction activities will be required beyond the existing monitoring well network. In-Situ Injection and PRB installation will require minor to moderate construction activities to install either the injection wells or the PRB along with performance monitoring wells associated with both measures. Both remedies may result in short-term mobilization of other redox- or pH-sensitive constituents; however, this consideration would be mitigated by conducting bench- and pilot-scale testing to screen out unfavorable amendments or approaches prior to full scale field implementation. There is an additional short-term consideration of potential spills or releases of geochemical amendments during injection and PRB installation, which can be mitigated with appropriate engineering controls. As such, geochemical injections and PRB installation are considered favorable.

"Pump and Treat" is considered less favorable as implementation will require substantial importation of materials and construction activities. Similar to In-Situ Injection and PRB installation, implementation of "Pump and Treat" would entail short-term considerations

related to management of extracted groundwater (e.g., potential leaks in conveyance piping) which can be mitigated with appropriate engineering controls.

5.2.1.5 Time until full protection is achieved

As Appendix IV constituents in groundwater at AP-E are not expected to pose a risk to human health or the environment, receptors are already protected. However, in accordance with §257.98(c)(1) and (2), a remedy is considered fully complete when the GWPS is achieved at all points within the plume at and beyond the compliance boundary for three consecutive years.

The time to achieve GWPS at the compliance boundary under MNA (excluding the effects of source control) was considered a baseline for comparison purposes (BRGWC-38S only) and is estimated to be approximately 34 years for cobalt and 18 years for beryllium. Assuming source control progresses as expected, MNA can achieve the GWPS in approximately eight years for cobalt and four years for beryllium in BRGWC-38S from present day (**Appendix D)**. Removal of CCR, or source control, is expected to be complete in 12 years, however the impacts of infilling groundwater geochemical changes are expected to be observed sooner. Still, corrective measures that require less time to achieve GWPS are considered more favorable under this criterion for BRGWC-38S. Given the recent groundwater concentrations for cobalt in BRGWC-33S, an approximate time to achieve GWPS at the compliance boundary under MNA alone could not be estimated. Therefore, the timeframe to achieve GWPS was compared among the more active corrective measures to assess favorability for BRGWC-33S.

In-Situ Injection and PRB implementation are both considered highly favorable as they are likely to achieve GWPS in the shortest amount of time, as evidenced by the "proof of concept" geochemical injection and PRB evaluations included in **Appendix D**. Both the beryllium and cobalt GWPS were predicted to be achieved within two years of beginning injections or PRB installation. Actual reductions of constituent concentrations within a treatment area are likely to proceed very quickly, however, the total time to achieve GWPS will be dependent on many factors, including the size of the plume, the time to complete distribution of amendments throughout the subsurface, the attenuation kinetics of the targeted constituents, and the duration of CCR removal. It is possible that if implemented prior to completing CCR removal, injections may be required for some duration during removal until a consistent circumneutral pH is attained.

"Pump and Treat" is considered favorable. Although hydraulic control will be achieved quickly (within one to two months of sustained pumping), achieving GWPS at all points

outside of the waste boundary is likely to take substantially longer than In-Situ Injection or PRB implementation. The recovery of impacted groundwater will likely be very slow during "Pump and Treat" and require substantial flushing of unimpacted groundwater because beryllium and cobalt strongly sorb to the aquifer matrix. This same phenomenon which is presently naturally attenuating beryllium and cobalt will result in "Pump and Treat" achieving marginally shorter cleanup times than MNA.

MNA is considered less favorable under this criterion as it is likely to take the longest time to achieve GWPS at all points within the plume.

5.2.1.6 Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, or containment

In accordance with §257.97(c)(1)(vi), this sub-criterion considers elements such as the generation and handling of wastes or potentially impacted media encountered during construction and operation of the remedy.

MNA is considered highly favorable under this criterion as no construction waste will be generated and exposure to potentially impacted groundwater would be minimal. In-Situ Injection and PRB installation are considered similarly favorable to each other as some minor quantities of construction waste would be generated during implementation although exposure to potentially impacted media would also be minimal.

"Pump and Treat" will generate similar quantities of potentially impacted construction waste as In-Situ Injection and PRB installation. However, "Pump and Treat" is considered less favorable as extraction of potentially impacted groundwater will require ongoing management of multiple waste streams (e.g., extracted groundwater, spent treatment system components, and treatment residuals).

5.2.1.7 Long-term reliability of the engineering and institutional controls

The following describes the overall long-term reliability for each of the proposed groundwater corrective measures for purposes of comparison. Of note, the reliability of each of the corrective measures is bolstered by the long-term reliability of the closure by removal method and its expected positive effect on groundwater conditions.

In-Situ Injection, PRB Installation, and MNA are considered highly favorable under this criterion as minimal long-term engineering controls would be required. "Pump and Treat"

is favorable under this criterion as engineering controls will be required throughout the duration of the remedy (for example, leak detection systems in conveyance piping).

5.2.1.8 Potential need for replacement of the remedy

Any need to replace a remedy would be based on a systematic site review during the remedy implementation process if warranted to improve remedy protectiveness, effectiveness, or facilitate progress toward meeting remedy objectives. In accordance with §257.98(b), adaptive site management practices will be used to modify or replace the remedy if the requirements of §257.97(b) are not being achieved.

In-Situ Injection is considered favorable under this criterion. While a replacement remedy is unlikely to be necessary, changes in groundwater chemistry and flow conditions may promote limited short-term mobilization of Appendix IV constituents in groundwater. Bench scale treatability studies would minimize this potential occurrence by screening unfavorable amendments. Field data from a pilot study would provide additional data for optimization of geochemical strategies and indication of the long-term performance of In-Situ Injection.

MNA ranks less favorable under this criterion. Natural processes are predicted to decrease the beryllium and cobalt concentrations in groundwater over time following CCR removal without further intervention, reducing the likelihood that a replacement remedy would be required. However, the relatively longer time likely required to achieve the GWPS introduces inherent uncertainty and a greater potential that a contingent remedy may be required to achieve the remedial objectives at BRGWC-38S. MNA will still play a role in achieving GWPS under alternate corrective measures under consideration.

“Pump and Treat” and PRB installation have the greatest risks of requiring replacement and are thus considered less favorable. For example, a substantial change in the groundwater flow direction or velocity may render either of these corrective measures less effective. In addition, for PRBs, an increase in groundwater velocity would reduce residence time in the barrier, potentially reducing treatment effectiveness. Fouling or clogging of the PRB media may also occur, resulting in a reduced hydraulic conductivity through the barrier. Finally, “Pump and Treat” may be less effective at lowering constituent concentrations at the edges of a plume despite remaining protective.

All corrective measures will be evaluated for effectiveness following implementation, and modified if remedial objectives are not being met, in accordance with adaptive site management practices and §257.98(b).

5.2.1.9 Long- and short-term effectiveness summary

The following table provides a summary of the eight §257.97(c)(1) sub-criteria relative to long- and short-term effectiveness that are discussed in Sections 5.2.1.1 to 5.2.1.8.

Category 1 – Long- and Short-term Effectiveness Summary

	Geochemical Approaches (In-Situ Injection)	Hydraulic Containment ("Pump and Treat")	Monitored Natural Attenuation (MNA)	Permeable Reactive Barrier (PRB)
Sub-Criterion i Magnitude of reduction of risks				
Sub-Criterion ii Magnitude of residual risk in terms of likelihood of further release				
Sub-criterion iii Type and degree of long-term management required				
Sub-criterion iv Short term risk to community or environment during implementation				
Sub-criterion v Time until full protection is achieved				
Sub-criterion vi Potential for exposure of humans and environmental receptors to remaining wastes				
Sub-criterion vii Long-term reliability of engineering and institutional controls				
Sub-criterion viii Potential need for replacement of the remedy				
Category 1 Summary				

Color Legend:

Option performs *highly favorably* under this criterion

Option performs *favorably* under this criterion

Option performs *less favorably* under this criterion

5.2.2 Source Control Effectiveness

This comparative criterion takes into consideration the ability of the remedy to control a future release and the extensiveness of treatment technologies that will be required. Closure by removal will be completed in compliance with applicable federal and state regulations and is protective of public health and the environment. Closure by removal includes excavation and removal of the CCR material from AP-E. Physical removal of the CCR would, over time, be supportive of declining concentrations of Appendix IV constituents in groundwater downgradient of AP-E and improve overall groundwater quality. None of the corrective measures under consideration would interfere with or diminish the anticipated benefits of the closure by removal method.

5.2.2.1 The extent to which containment practices will reduce further releases

Through closure by removal, CCR material will be removed from AP-E. Since the source CCR material will be removed from AP-E, the potential for further releases will be eliminated. Appendix IV constituents that are currently present in groundwater at or beyond the waste boundary will be controlled by the selected groundwater remedy. Therefore, each of the groundwater corrective measures are considered equally favorable for this sub-criterion.

5.2.2.2 The extent to which treatment technologies may be used

In accordance with §257.97(c)(2)(ii), corrective measures that include more limited treatment approaches for source control may be considered less favorable. Corrective measures that rely on more extensive treatment approaches may be considered more favorable.

No treatment technologies for source material are under consideration since the source material will be removed during AP-E's closure construction. Therefore, all groundwater remedy alternatives are considered equally favorable for this sub-criterion.

5.2.2.3 Source Control Effectiveness Summary

The following table provides a summary of the two §257.97(c)(2) sub-criteria relative to effectiveness that are discussed in Sections 5.2.2.1 and 5.2.2.2

Category 2 – Source Control Effectiveness

	Geochemical Approaches (In-Situ Injection)	Hydraulic Containment ("Pump and Treat")	Monitored Natural Attenuation (MNA)	Permeable Reactive Barrier (PRB)
Sub-criterion i Extent to which containment practices will reduce further releases				
Sub-criterion ii Extent to which treatment technologies may be used				
Category 2 Summary				

Color Legend:

Option performs *highly favorably* under this criterion

Option performs *favorably* under this criterion

Option performs *less favorably* under this criterion

5.2.3 Ease of Implementation

This comparative criterion takes into consideration technical and logistical challenges required to implement a remedy, including practical considerations such as equipment availability and disposal facility capacity.

5.2.3.1 Degree of difficulty associated with constructing the technology

This sub-criterion considers the relative technical difficulty between implementing each of the remedies.

MNA is considered highly favorable as a monitoring system is already in place and no additional construction would be required. In-Situ Injection is considered favorable under this criterion as some construction would be required for the pilot and full-scale injection well network. "Pump and Treat" is considered less favorable as it would require construction of extraction wells and supporting conveyance lines, which may require more contractors and time to construct. Depending on effluent discharge limits for certain constituents found in groundwater, above-ground water treatment infrastructure would

likely be required for treatment of extracted groundwater under "Pump and Treat." However, both In-situ Injection and "Pump and Treat" can be constructed using common means and methods for well installation and utilities. Similar to "Pump and Treat," PRB installation is considered less favorable as well as it would likely require specialty contractors for trenching at depth (up to 40 feet) to install reactive materials and would require longer construction time than In-Situ Injections. The use of specialized heavy equipment for trenching may also be required.

5.2.3.2 Expected operational reliability of the technologies

This section compares the operational reliability of each of the proposed remedies in accordance with §257.97(c)(3)(ii). Typically, simple remedies that do not require the installation of significant infrastructure are generally more reliable and do not require significant O&M. More complex remedies that rely on groundwater flow manipulation, geochemical manipulation, or mechanical systems would be considered less favorable.

MNA has a proven history of operational reliability and ranks highly favorable under this criterion. It requires little infrastructure and/or ongoing O&M.

In-Situ Injection is considered favorable under this criterion. In-Situ Injection is reliable assuming injected materials can be distributed throughout the aquifer. Injectate distribution may face challenges in PWR geology, which includes variable permeability due to zones of differential weathering. Pilot testing will provide valuable data on amendment distribution and reduce the potential for reliability issues. However, injection wells can be subject to fouling over time and require reconditioning to maintain performance. PRB implementation is also considered favorable under this criterion assuming the PRB is installed to intercept impacted groundwater. While media within a PRB may become less reactive over time and require reinstallation depending on the duration of the remedy, pilot testing will provide valuable data on expected reactive media lifespan. Loss of permeability of the PRB overtime will require additional consideration.

"Pump and Treat" is considered less favorable under the operational reliability criterion. Pumping mechanical systems may fail and otherwise need to be temporarily shut down to conduct preventative maintenance, and as with In-Situ Injection, well screens may require reconditioning if they become fouled. Groundwater treatment systems will also require ongoing operational maintenance and will need to be monitored to reliably meet discharge permit criteria.

5.2.3.3 Need to coordinate with and obtain necessary approvals and permits from other agencies

Section §257.97(c)(3)(iii) requires consideration be given and compared between remedies regarding the various agencies and type of permits that would be required for implementation of the groundwater remedy. A corrective measure that could require several permits would be considered less favorable when compared to a corrective measure that would require fewer permits.

MNA ranks highly favorable under this criterion, as no permits or additional approvals from other agencies will be required. PRB installation also ranks highly favorably under this criterion, as no permits or additional approvals from other agencies are anticipated to be required due to the limited area of land disturbance that would be needed for PRB installation. In-Situ Injection and "Pump and Treat" perform favorably as some permitting will likely be required. For example, In-Situ Injection will require an Underground Injection Control (UIC) permit.

5.2.3.4 Availability of necessary equipment and specialists

Generally speaking, remedies that could be implemented by local contractors and without specialty contractors or experts may be considered more favorable. Consideration should be given to specialty contractor/consultant proximity to the CCR unit, contractor or equipment availability, and the effectiveness of the proposed remedy on similar sites.

MNA ranks highly favorable under this criterion as no specialty equipment or personnel will be required to implement this remedy at AP-E. In-Situ Injection would require equipment for drilling and well installation and may require specialists to conduct injections. "Pump and Treat" would require drilling equipment, well installation equipment, and equipment to install supporting pumping and conveyance features. Installation of a PRB would likely require specialized heavy equipment for trenching at depth (up to 40 feet) to install the mix of reactive materials in the subsurface. Although the construction techniques required for the corrective measures are generally common, more specialized equipment would be required for PRB installation and "Pump and Treat" would also require available above-ground treatment equipment throughout the lifetime of the corrective measure. As such, In-Situ Injection is considered favorable, and "Pump and Treat" and PRB installation are considered less favorable under this criterion.

5.2.3.5 Available capacity and location of needed treatment, storage, and disposal services

This sub-criterion (§257.97(c)(3)(v)) considers disposal options for materials generated by the groundwater remedy and land area that is available for implementation of the remedy.

MNA and In-Situ Injection are considered highly favorable as no additional treatment, storage, and disposal services will be required and adequate land area is available to conduct in-situ treatment with injections. Installation of a PRB is considered favorable under this criterion. While adequate land area is available to install a PRB, excess soil may be generated during PRB installation that would need to be managed. "Pump and Treat" is considered less favorable under this criterion. While the existing treatment system associated with the ongoing closure activities has sufficient capacity, the need to maintain this infrastructure for the lifetime of the remedy could result in an ongoing waste stream of treatment residuals. Further, extracted groundwater will need to be managed, potentially requiring temporary storage areas for treated or untreated groundwater.

5.2.3.6 Ease of implementation summary

The table below provides a summary of the five §257.97(c)(3) sub-criteria relative to the ease of remedy implementation discussed in Sections 5.2.3.1 to 5.2.3.5.

Category 3 – Ease of Implementation

	Geochemical Approaches (In-Situ Injection)	Hydraulic Containment ("Pump and Treat")	Monitored Natural Attenuation (MNA)	Permeable Reactive Barrier (PRB)
Sub-criterion i Degree of difficulty associated with constructing the technology				
Sub-criterion ii Expected operational reliability of the technologies				
Sub-criterion iii Need to coordinate with and obtain necessary approvals and permits from other agencies				
Sub-criterion iv Availability of necessary equipment and specialists				
Sub-criterion v Available capacity and location of needed treatment, storage, and disposal services				
Category 3 Summary				

Color Legend:

Option performs *highly favorably* under this criterion

Option performs *favorably* under this criterion

Option performs *less favorably* under this criterion

5.2.4 Evaluation of Comparison Criteria

The various sub-criteria were evaluated, and relative comparisons were made between the corrective measures to determine which remedy would be expected to be the most and least favorable regarding the certainty of success. The results are included in the following table for all of the comparative criteria.

In-Situ Injection, MNA, and PRB installation are all considered favorable under long- and short-term effectiveness (Category 1). While In-Situ Injections and PRB installation entail some short-term uncertainties as compared to MNA, these corrective measures are expected to achieve GWPS in the shortest time. Conversely, MNA is considered very reliable and entails minimal short-term uncertainties but will require a substantially longer time to achieve GWPS. "Pump and Treat" is considered less favorable primarily due to short-term construction impacts, higher O&M requirements, and long time periods required to achieve GWPS.

Source control (Category 2) will be supported at AP-E through closure by removal of CCR, which over time, will support declining concentrations of Appendix IV constituents in groundwater downgradient of AP-E and improve overall groundwater quality. None of the corrective measures under consideration will interfere with or diminish the anticipated benefits of the closure by removal method. Each of the corrective measures therefore rank equally with respect to source control.

The ease of implementation (Category 3) of MNA is highly favorable as the required infrastructure is already in place. In-Situ Injection is considered favorable based on the relative ease of construction and operational performance. "Pump and Treat" is considered less favorable due to the higher difficulty to construct, lower reliability of mechanical systems, and the required ongoing operational maintenance. PRB installation is also considered less favorable due to the higher difficulty to construct and the potential need for reinstallation if the media becomes less reactive over time.

Category Summary

	Geochemical Approaches (In-Situ Injection)	Hydraulic Containment ("Pump and Treat")	Monitored Natural Attenuation (MNA)	Permeable Reactive Barrier (PRB)
Category 1 Long- and Short-Term Effectiveness, Protectiveness, and Certainty of Success				
Category 2 Effectiveness in controlling the source to reduce further releases				
Category 3 Ease of implementation				

Color Legend:

	Option performs *highly favorably* under this criterion
	Option performs *favorably* under this criterion
	Option performs *less favorably* under this criterion

5.3 Public Meeting and Community Engagement

As noted in Section 2.1 above, this criterion will be addressed in the Final Remedy Selection Report submitted to GA EPD after a public meeting.

6.0 PROPOSED REMEDY SELECTION

This section provides a summary of the proposed groundwater remedy and provides a schedule for remedy implementation in accordance with §257.97(d). Georgia Power will proactively utilize adaptive site management to support the remedial strategy and address potential changes in Site conditions as appropriate. Under an adaptive site management strategy, a remedial approach will be selected whereby: (1) a corrective measure will be installed or implemented to address current conditions; (2) the performance of the corrective measure will be monitored, evaluated, and reported semiannually; (3) the CSM will be updated as more data are collected; and (4) adjustments and augmentations will be made to the corrective measure(s), as needed, to meet performance criteria and Site remedial objectives.

6.1 Summary of Proposed Remedy Selection

The closure by removal of AP-E will provide effective source control that precludes further releases as no CCR will remain in place. Closure by removal of the CCR unit will, over time, be supportive of declining concentrations of Appendix IV constituents in groundwater downgradient of AP-E and improve the overall groundwater quality. The selected corrective measures will address exceedance of the GWPS at and beyond the compliance boundary.

A proposed remedial summary for BRGWC-33S and BRGWC-38S is shown on **Figure 13**. This includes a conceptual layout for the in-situ injection approach for BRGWC-33S and MNA for BRGWC-38S. Actual remedy injection and performance monitoring well locations will be assessed during the remedy design. Remedy performance will be monitored to document that remedial objectives are being met in accordance with adaptive site management practices.

6.1.1 Cobalt at BRGWC-33S

Based on the evaluation of comparative criteria included in §257.97(c), the proposed remedy for cobalt at BRGWC-33S comprises the following corrective measure:

- **Geochemical Approaches (In-Situ Injections)**: A network of either temporary or permanent injection wells will be installed and utilized to introduce reagents to the subsurface to promote attenuation of constituents. Recent increases in cobalt concentrations in BRGWC-33S, while likely transient, suggest the need, at least initially, for a more active remedial approach. Transport modeling results (presented in **Appendix D**) support the feasibility of In-Situ Injections.

Laboratory treatability studies, including batch and column testing, will be performed to aid in selection of an appropriate injection composition, dosing, and protocol. This treatability study will serve as a basis of design for this component of the remedy. Injections will target areas with highest concentrations of cobalt in groundwater to immobilize and sequester this constituent in-situ, effectively accelerating already ongoing attenuation processes. This remedial approach is tailored to the area around BRGWC-33S.

A performance monitoring program will be implemented to assess treatment performance and groundwater quality within and downgradient of the proposed treatment areas for the duration of the remedy. Adaptive site management practices will be utilized over the course of corrective action implementation to evaluate if and when there is an appropriate time to transition from this more active remedy to MNA. MNA will be further evaluated prior to this transition.

6.1.2 Beryllium and Cobalt at BRGWC-38S

Based on the evaluation of comparative criteria included in §257.97(c), the proposed remedy for beryllium and cobalt at BRGWC-38S comprises the following corrective measure:

- **Monitored Natural Attenuation (MNA)**: Natural attenuation processes, coupled with monitoring, are already ongoing at AP-E. Localized concentrations of beryllium and cobalt at BRGWC-38S are decreasing, as documented in the Site-specific MNA Evaluation (**Appendix C**). Natural attenuation of beryllium and cobalt in groundwater is primarily due to sorption and co-precipitation. Aquifer capacity and the attenuation rates following CCR removal are demonstrably sufficient to achieve GWPS, and immobilized beryllium and cobalt are stable, as documented in the GCSM (**Appendix A**) and MNA Evaluation (**Appendix C**). Geochemical modeling results (presented in **Appendix D**) provide another line of evidence indicating that attenuation rates are sufficiently high to achieve GWPS within a reasonable timeframe, and that there is adequate long-term attenuation capacity and stability of immobilized contaminants within the aquifer matrix. Reductions in constituent concentrations and the attenuation mechanisms of the aquifer will continue to be monitored and documented for the duration of the remedy.

The potential need for additional monitoring well locations will be assessed during the development of an MNA performance monitoring program, and contingency remedies tailored to Site-specific characteristics will be established. Remedy performance will be

monitored to document that remedial objectives are being met in accordance with adaptive site management practices.

While In-Situ Injections are not proposed as a component of the beryllium and cobalt remedy in BRGWC-38S for the reasons detailed in Section 5, injections may be further considered through adaptive site management practices, as necessary.

6.2 Schedule

In accordance with §257.97(d), the following factors were considered when developing the schedule:

- Extent and nature of contamination: The horizontal and vertical extent of Appendix IV constituents present in groundwater are delineated at both BRGWC-33S and BRGWC-38S, as described in Section 2 of this report. Additional characterization and refinement of the cobalt treatment area in the vicinity of BRGWC-33S may be required for the design and implementation of the remedy. The selected remedy will address the impacts to groundwater and adaptive site management practices will be utilized to evaluate whether to modify the remedial approach.
- Reasonable probabilities of remedial technologies in achieving compliance with the GWPS and other remedial objectives: The selected remedy is expected to achieve compliance with the cobalt GWPS at BRGWC-33S within two years of the initiation of injections under current conditions. If injections are implemented prior to completion of CCR removal, the remedy may need to be continued until removal is complete and favorable hydrogeological and geochemical conditions in groundwater can be achieved to promote attenuation processes via MNA. At BRGWC-38S, achievement of the beryllium and cobalt GWPS is estimated within approximately four and eight years, respectively, due to MNA assuming source control construction commences as expected (as the positive impacts of CCR removal are observed prior to CCR removal completion). As considered in Section 5 of this report, the selected remedy is expected to address Appendix IV constituents in groundwater. If adequate progress is not being made toward addressing groundwater and achieving the GWPS at and beyond the compliance boundary, Georgia Power will enlist adaptive management strategies to modify the remedial approach, in accordance with §257.98(b). Site and remedy-specific performance metrics will be developed and documented in the Corrective Action Groundwater Monitoring Plan.

- Availability of treatment or disposal capacity for CCR managed during remedy implementation: Because CCR is not expected to be managed during remedy implementation, this factor should not have a material impact on the project schedule.
- Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy: As described in Section 5 of this report, the risk evaluation for beryllium and cobalt in groundwater at AP-E was conducted using methods consistent with GA EPD and USEPA guidance, included multiple conservative assumptions, and concluded that groundwater conditions are not expected to pose a risk to human health or the environment. Thus, this factor should not have a material impact on the project schedule. Additional risks that may be present during remedy implementation were considered in Section 5 of this report, as required under §257.97(c)(1).
- Resource value of the aquifer: As summarized in Section 5 of this report and detailed in the Risk Evaluation Report (**Appendix B**), beryllium and cobalt are not expected to pose a risk to human health or the environment. As such, considerations related to alternative drinking water supply or interim remedial measures, as outlined in §257.98(a)(3), are not currently necessary or expected to become so. Further, Georgia Power will retain ownership of the Site and future development for non-industrial purposes is not currently anticipated. Because AP-E constituents are not expected to pose a risk to human health or the environment, this factor should not have a material impact on the project schedule.

The general approach and implementation schedule will be modified based on new groundwater quality data obtained during the remedial implementation process, following adaptive site management practices and in accordance with §257.98(b).

6.2.1 Planning and Design

Approximately 24 months will be required from GA EPD concurrence to design the selected remedy for cobalt at BRGWC-33S and develop a corrective action plan. Significant planning and design activities as part of the pre-design investigation (PDI) include:

- High Resolution Site Characterization: A field High Resolution Site Characterization (HRSC) will be conducted to characterize and refine the treatment area around BRGWC-33S. This investigation will provide valuable data for the design of geochemical injections. During the HRSC, the plume extent will

be further refined by collecting groundwater samples, possibly using aquifer profiling systems, which will be assessed for cobalt. Permanent wells may be installed for further aquifer characterization, and any such permanent wells may be utilized during pilot testing as injection points or performance monitoring wells. The field component of the HRSC will take approximately two to four months to complete.

- Pilot Study: To expedite remedy design and implementation, Georgia Power requests written concurrence from GA EPD to initiate pilot studies following receipt of the Draft Remedy Selection Report. Following receipt of GA EPD concurrence to proceed, a pilot study workplan will be developed, submitted to GA EPD, and implemented for the cobalt plume in the vicinity of BRGWC-33S to evaluate appropriate injection point spacing and performance of injectates in situ. It is anticipated that the pilot study will target the area of highest cobalt concentration at BRGWC-33S; however, alternate pilot locations may be selected based on the results of the PDI. Injection composition (and sequencing, as needed) and spacing for the final design may be adjusted based on pilot study performance. Prior to implementation of the pilot study workplan, a Pilot Test Notification form will be prepared and submitted to GA EPD for review and approval. Pilot study injections are expected to occur over a period of approximately one to three months with up to 18 months of performance monitoring and assessment. The pilot study will be conducted consistent with adaptive site management practices. As such, a second phase pilot study may be implemented prior to completion of the performance monitoring and prior to finalizing the injection design.
- Finalize Design and Corrective Action Plan: A corrective action plan, including detailed remedy design will be developed and submitted to GA EPD for approval. While design activities will be concurrent with the previously listed activities, the corrective action plan will not be finalized until successful completion of the pilot study.

Approximately six to 12 months from GA EPD's concurrence with the selected remedy will be required to develop an MNA monitoring program in support of addressing SSLs of beryllium and cobalt identified in BRGWC-38S. Significant planning activities include:

- Establish sentinel and GWPS exceedance monitoring points: A review of data from existing wells will be conducted to determine whether additional sentinel or exceedance monitoring points are appropriate and establish proposed locations for any such additional monitoring points. The sentinel monitoring points will consist

of a network of wells that will be monitored to verify that GWPS exceedances do not occur at or beyond these locations. Monitoring wells within areas of GWPS exceedances may be established to verify attenuation mechanisms, document decreasing concentrations, estimate plume mass or mass flux, and provide monitoring data to demonstrate MNA effectiveness. While it is anticipated that the existing well network will be sufficient for MNA, approximately one to four months may be required to install any additional sentinel and monitoring wells.

- Finalize Corrective Action Groundwater Monitoring Plan: A corrective action plan, including detailed remedy design, will be prepared and submitted to GA EPD as an attachment to the Corrective Action Groundwater Monitoring Plan (CAMP). The MNA performance monitoring program will include specific performance objectives with adaptive site management triggers which will be implemented if objectives are not met. MNA will primarily be accomplished by sampling MNA monitoring wells for Appendix IV constituents, general groundwater parameters (e.g., pH, temperature, oxidation-reduction potential, dissolved oxygen, and specific conductivity), and natural attenuation indicator parameters specific to the identified attenuation mechanisms (e.g., ferrous and ferric iron). If additional wells are necessary to monitor performance, the MNA schedule will include a minimum of one year of baseline monitoring to establish baseline conditions and trends.

6.2.2 Construction and Implementation

Construction of the injection and performance monitoring well network (and any additional MNA monitoring or sentinel wells) is anticipated to take approximately one to two months, with initial geochemical injections occurring over the following two to three months. Actual construction and implementation times may vary substantially based on the results of the PDI and other design activities.

6.2.3 Operation

While the estimated timeframe will be refined during design, it is anticipated that, depending on the AP-E CCR removal timeline, the geochemical injection phase of the remedy in the vicinity of BRGWC-33S may require less than two years of operation followed by a longer period of performance monitoring coupled with monitored natural attenuation for the areas downgradient and/or outside of the injection areas. However, depending on the implementation timing of the remedy and assuming a CCR removal duration of 12 years from present day, the injections may need to be continued during the course of CCR removal and until a favorable hydrogeological and geochemical

conditions (i.e., circumneutral pH) in groundwater can be achieved to promote attenuation processes of cobalt. The duration of operation may vary based on the results of pilot studies and other design activities.

It is anticipated that MNA of beryllium and cobalt in BRGWC-38S will require approximately eight years, assuming CCR removal is completed as expected, to achieve GWPS within all points of the plume at and beyond the compliance boundary.

The groundwater remedy will be considered complete when the GWPS is achieved for a minimum of 3 years. In accordance with adaptive site management practices and §257.98(b), the groundwater remedy will be modified if it is determined that GWPS are not being met or will not be met.

6.3 Reporting

In accordance with §257.105(h), Georgia Power will place the Final Remedy Selection Report into the Site operating record. Thereafter, Georgia Power will develop a corrective action groundwater monitoring program and implement and report on the selected remedy in accordance with applicable regulatory requirements.

7.0 REFERENCES

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USEPA. 2015. *Use of Monitored Natural Attenuation for Inorganic Contaminants in Groundwater at Superfund Sites.* USEPA Office of Solid Waste and Emergency Response. Directive 9283.1-36. August 2015.

TABLES

Table 1
Monitoring Well Network Summary
Plant Branch AP-E, Putnam County, Georgia

Well ID	Hydraulic Location	Installation Date	Easting [(1)]	Northing [(1)]	Ground Surface Elevation (ft)	Top of Casing Elevation [(2)] (ft)	Top of Screen Elevation [(2)] (ft)	Bottom of Screen Elevation [(2)] (ft)	Well Depth (ft BGS)	Screen Interval Length (ft)
AP-E Detection Monitoring Well Network										
BRGWA-2S	Upgradient BCD & E	4/2/2014	2549952.60	1167139.70	440.4	443.20	406.2	396.2	44.6	10
BRGWA-2I	Upgradient BCD & E	3/14/2014	2549957.30	1167130.00	440.5	443.14	386.6	376.6	64.3	10
BRGWA-5S	Upgradient BCD & E	4/3/2014	2549415.50	1170177.50	440.8	443.86	411.2	401.2	40.0	10
BRGWA-5I	Upgradient BCD & E	4/3/2014	2549408.00	1170183.70	441.1	443.79	390.3	380.3	61.2	10
BRGWA-6S	Upgradient BCD & E	4/1/2014	2551540.80	1170732.90	455.8	458.96	416.5	406.5	49.7	10
BRGWC-17S	Downgradient E	3/13/2014	2554687.70	1166301.50	362.2	365.32	360.5	355.5	7.1	5
BRGWC-33S	Downgradient E	7/26/2016	2554064.80	1168057.00	414.2	416.68	398.2	388.2	26.4	10
BRGWC-34S	Downgradient E	7/25/2016	2554231.20	1167384.00	389.2	391.96	376.2	366.2	23.0	10
BRGWC-35S	Downgradient E	7/23/2016	2554476.30	1166646.00	363.7	366.31	346.7	336.7	27.4	10
BRGWC-36S	Downgradient E	7/26/2016	2554693.30	1165742.70	383.1	389.84	364.6	354.4	28.7	10
BRGWC-37S	Downgradient E	7/24/2016	2554979.50	1165093.00	444.4	447.05	390.8	380.8	63.6	10
BRGWC-38S	Downgradient E	7/22/2016	2555016.50	1164391.90	429.8	432.24	402.0	392.0	38.2	10
AP-E Assessment Monitoring Well Network										
PZ-13S	Downgradient E	3/19/2014	2555276.70	1168011.40	406.5	409.97	382.2	372.2	34.7	10
PZ-52D	Downgradient E	5/14/2020	2554051.70	1168053.90	414.3	417.03	365.1	355.1	59.5	10
PZ-53D	Downgradient E	5/17/2020	2554984.30	1164393.80	431.6	434.68	302.2	292.2	139.4	10
PZ-70I	Downgradient E	8/16/2022	2555374.08	1164326.66	422.9	425.70	383.4	373.4	52.9	10
Temporary Piezometers										
PZ-76I	Downgradient E	8/2/2023	2554903.80	1164366.20	430.89	433.84	399.5	409.5	41.8	10
PZ-77I	Downgradient E	8/1/2023	2554810.04	1164396.90	430.31	433.33	400.6	410.6	40.0	10

Notes:
ft = feet
ft BGS = feet below ground surface
(1) Coordinates in North American Datum (NAD) 1983, State Plane, Georgia-West, feet.
(2) Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).

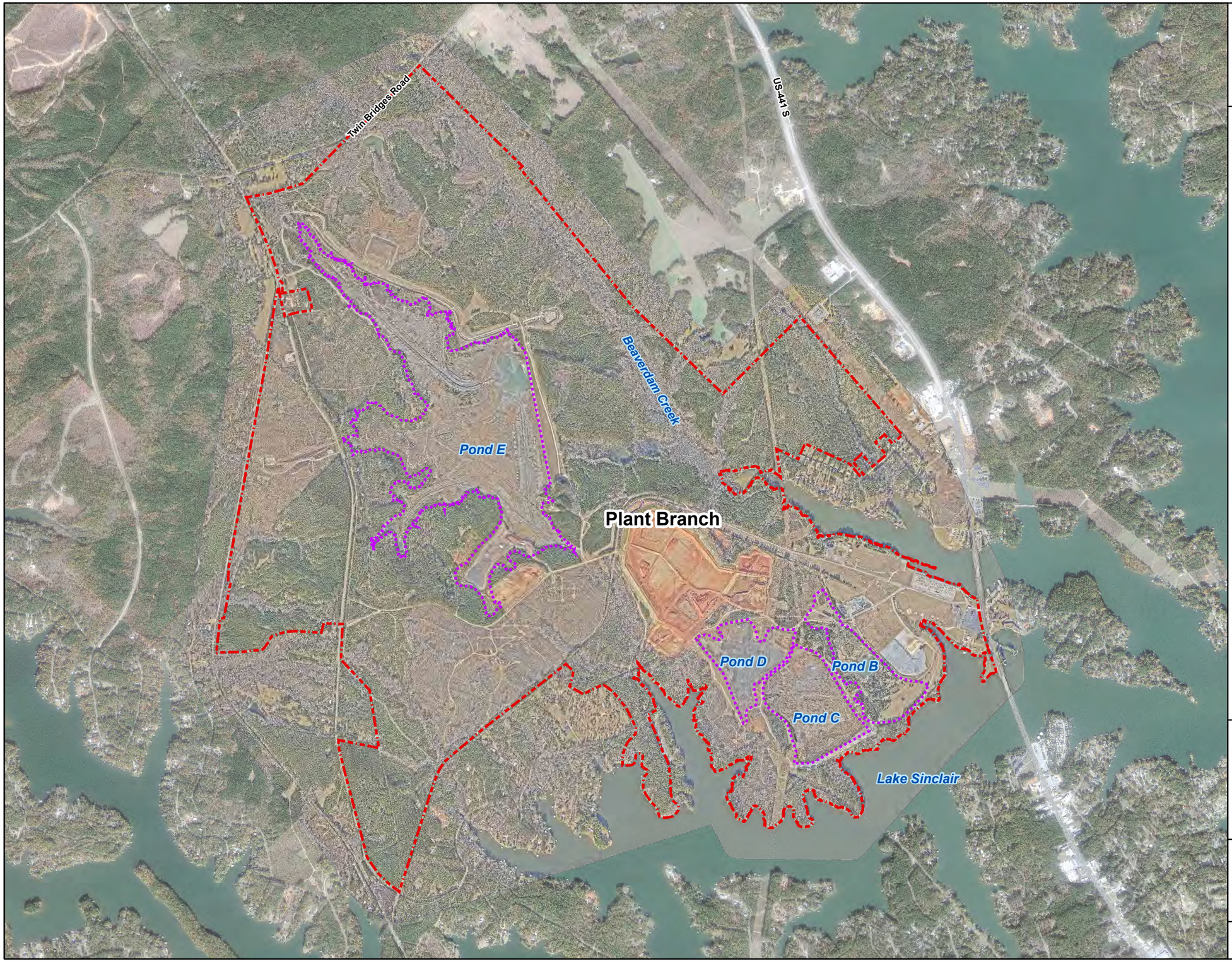
Table 2
Summary of Corrective Measures Screening
Plant Branch AP-E, Putnam County, Georgia

Corrective Measure	Description	Screening Status
Geochemical Approaches (In-Situ Injection)	Use of an injection well network, or other means of introducing reagents or air into the subsurface, to promote either anaerobic or aerobic attenuation of beryllium (Be) and cobalt (Co). However, the main attenuation mechanism for Be and Co is sorption, which is more dependent on pH than redox. Under anaerobic conditions, Be and Co would be attenuated within sparingly soluble sulfide minerals. Under aerobic conditions, soluble iron or manganese and oxygen (either via air sparging or through a chemical oxidant) would be injected to promote the formation of iron or manganese (oxy-) hydroxides for subsequent sorption of Be and Co onto these mineral phases. If sufficient iron is present in groundwater, the use of air sparging alone may be considered to precipitate iron (oxy-) hydroxides for sorption. In-situ chemical oxidation (ISCO) or in-situ chemical reduction (ISCR) can be used to chemically alter the redox environment in the subsurface to affect the mobility of certain inorganic compounds, including Be and Co.	Retained
Hydraulic Containment ("Pump and Treat")	Hydraulic containment refers to the use of groundwater extraction to induce a hydraulic gradient for hydraulic capture or control the migration of impacted groundwater. This approach uses extraction wells or trenches to capture groundwater, which may subsequently require above-ground treatment and permitted discharge to a receiving water feature, reinjection into the groundwater, or reuse (e.g., land application, CCR conditioning, etc.). It is applicable to a variable mix of inorganic constituents, including dissolved Be and Co.	Retained
Monitored Natural Attenuation (MNA)	MNA relies on natural attenuation processes to achieve site-specific remediation objectives within a reasonable time frame relative to more active methods. Under certain conditions (e.g., through sorption, mineral precipitation or oxidation-reduction reactions), MNA effectively reduces the dissolved concentrations of inorganic constituents in groundwater. Attenuation mechanisms for inorganic constituents at CCR sites, including Be and Co at BRGWC-38S and Co at BRGWC-33S, are either physical (e.g., dilution, dispersion, flushing, and related processes) or chemical (sorption or oxidation reduction reactions). Chemical attenuation processes include precipitation and sorption reactions such as adsorption on the surfaces of soil minerals, absorption into the matrix of soil minerals, or partitioning into organic matter. Further, oxidation-reduction (redox) reactions, via abiotic or biotic processes, can transform the valence states of some inorganic constituents to less soluble and thus less mobile forms. For Be and Co, the main attenuation processes include sorption to iron and manganese oxides and for Co, formation of sparingly soluble sulfide minerals.	Retained
Permeable Reactive Barrier	Permeable reactive barrier (PRB) technology typically involves the installation of a permeable subsurface wall constructed with reactive media for the removal of constituents as groundwater passes through. A solid phase composed of calcite or a similar material alter the pH of impacted groundwater is currently proposed for the removal of Co and Be. Treatability testing would be required to confirm Site compatibility for this measure. Exact placement of the PRB is contingent on the groundwater flow direction and refinement of the plume extent to ensure that the reactive media intercepts impacted groundwater.	Retained

Table 2
Summary of Corrective Measures Screening
Plant Branch AP-E, Putnam County, Georgia

Corrective Measure	Description	Screening Status
Phytoremediation / *TreeWells*	Phytoremediation uses trees and other plants to degrade or immobilize constituents or achieve hydraulic control without the need for an above-ground water treatment system and infrastructure. Within the context of AP-E, this corrective measure would likely use an engineered (proprietary) TreeWell phytoremediation system along the point of compliance or downgradient edge of the impacted groundwater for hydraulic control. The system promotes root development to the targeted groundwater zone (depth), allowing for hydraulic control of impacted groundwater. In addition, immobilization of Be and Co within the root zone as well as incidental uptake of dissolved Be and Co with groundwater is expected to occur concurrent with hydraulic control.	Not retained (i) Not feasible to apply the corrective measure due to the infrastructure in the dike upgradient of BRGWC-33S and the ancitipated activities associated with the closure-by-removal strategy in the vicinity of the wells with constituents in groundwater at statistically significant levels (SSLs) above the Groundwater Protection Standards (GWPS).
Subsurface Vertical Barrier Walls	This approach involves placing a barrier to groundwater flow in the subsurface, frequently around a source area, to prevent future migration of dissolved constituents in groundwater from beneath the source to downgradient areas. In general, barrier walls are designed to provide containment; localized treatment achieved through the sorption or chemical precipitation reactions from construction of the walls are incidental to the design objective. A barrier wall might be used in conjunction with a “funnel and gate” system for a PRB rather than a stand-alone technology. Barrier walls can also be used in downgradient applications; to limit discharge to a surface water feature or to reduce aquifer recharge from an adjacent surface water feature when groundwater extraction wells are placed near one. A variety of barrier materials can be used, including cement and/or bentonite slurries, geomembrane composite materials, or driven materials such as steel or vinyl sheet pile. Groundwater extraction from upgradient of the barrier is required to avoid groundwater mounding behind the barrier.	Not retained (i) Not practical to apply the corrective measure due to AP-E closure by removal, limited extent of impacts at BRGWC-33S, and initial geochemical investigation.

FIGURES



N

LEGEND

- Plant Branch Property Boundary
- Approximate Ash Pond Boundary



Notes:
1. Coordinate System: NAD 1983 State Plane Georgia West_FIPS (U.S. Feet).
2. Property Boundary Provided by Southern Company Services.
3. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 2,000 4,000
Scale in Feet

SITE LOCATION MAP

GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

KENNESAW, GA | FEBRUARY 2025

FIGURE 1



N

LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Property Boundary Provided by Southern Company Services.
2. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 1,000 2,000
Scale in Feet

MONITORING WELL NETWORK MAP

GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

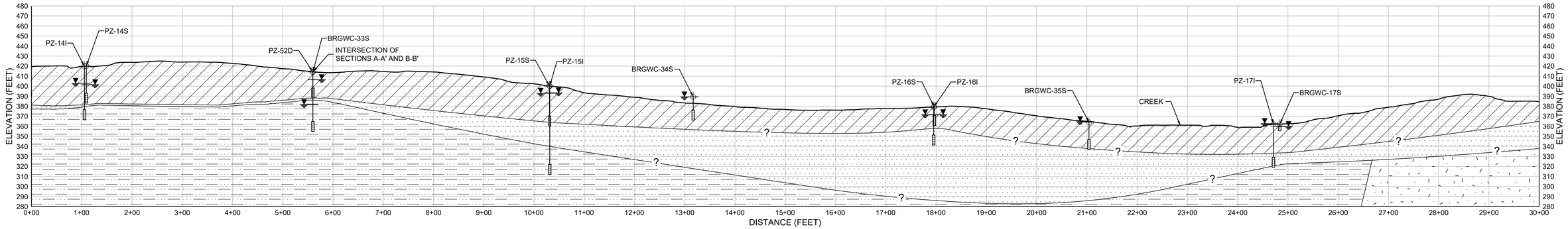
Prepared For: Georgia Power

Prepared By: Geosyntec consultants

KENNESAW, GA | FEBRUARY 2025

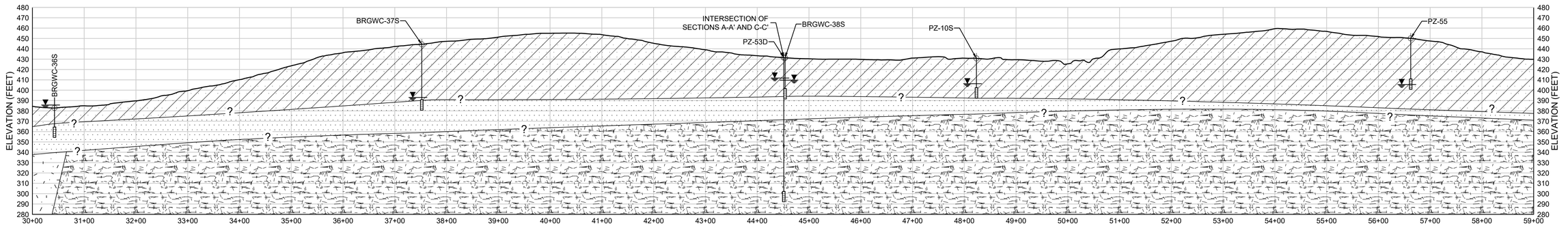
FIGURE 2

A

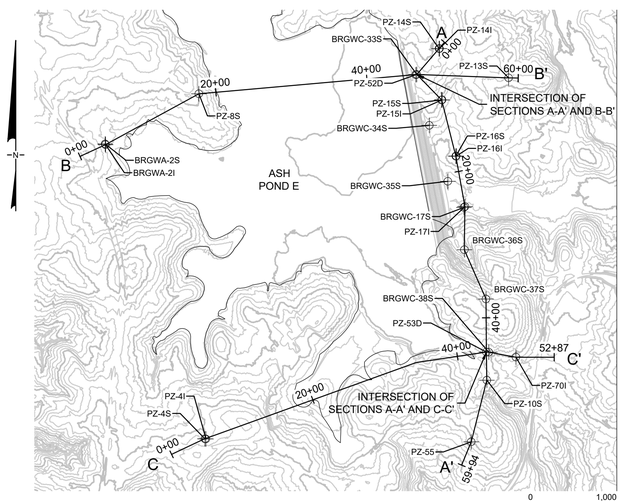


SECTION A-A'

A'



SECTION A-A'



KEY MAP

LEGEND

- DIKE FILL: SANDY SILT WITH TRACE GRAVEL TO SAND WITH TRACE SILT AND GRAVEL, MOIST TO DRY, LOOSE TO COMPACT, NON-COHESIVE
- ASH: SILT, SANDY SILT TO SAND WITH TRACE GRAVEL NON-COHESIVE, DRY, LOOSE TO COMPACT
- SAPROLITE CONSISTING OF SILTY CLAY AND CLAY, TO SILTY SAND AND WELL-GRADED SAND. SAPROLITE IS MICACEOUS, WITH RELICT ROCK STRUCTURES
- PARTIALLY WEATHERED ROCK (PWR) - HIGHLY WEATHERED TO DECOMPOSED BEDROCK WITH SIMILAR CHARACTERISTICS TO THE SAPROLITE
- BIOTITE GNEISS BEDROCK - WELL BANDED AND FOLIATED FELDSPATHIC BIOTITE GNEISS WITH LOW ANGLE FRACTURES AND SOME WEATHERING IN THE UPPER PORTION OF BEDROCK
- DIABASE DIKE
- BIOTITE GNEISS WITH INTERLAYERED AMPHIBOLITE
- GROUNDWATER LEVEL (JANUARY 23, 2023)
- MONITORING WELL/PIEZOMETER SCREEN INTERVAL

NOTES:

1. GROUNDWATER LEVEL SHOWN IS BASED ON DATA COLLECTED ON JANUARY 23, 2023.
2. EXISTING GROUND SURFACE SHOWN ON THIS FIGURE WERE OBTAINED FROM THE LIDAR SURVEY PERFORMED BY GEORGIA POWER COMPANY ON AUGUST 1, 2020 AND PROVIDED WITH THE ELECTRONIC FILE TITLED "BRANCH_1FTCONTOURS".
3. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAV88).

0 100' 200'
SCALE: 1" = 100' (H)

0 50' 100'
SCALE: 1" = 50' (V)

Georgia Power

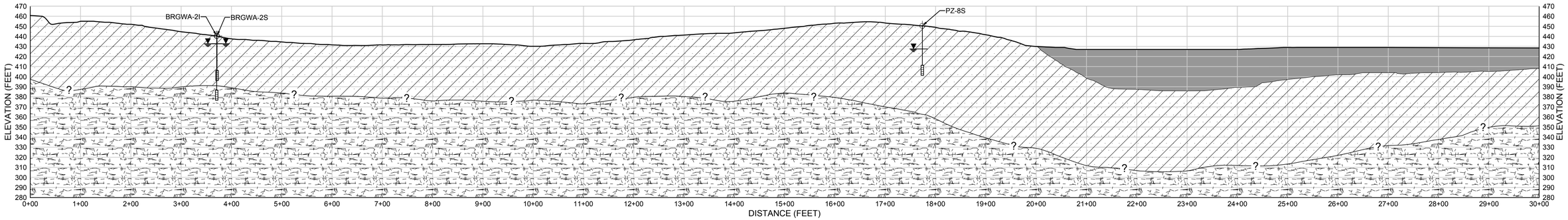
GEOLOGIC SECTION A-A'
GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

Geosyntec consultants

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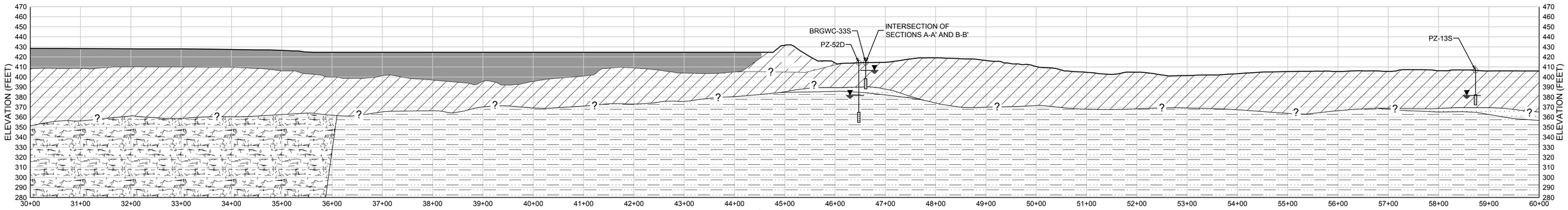
FIGURE 3

B

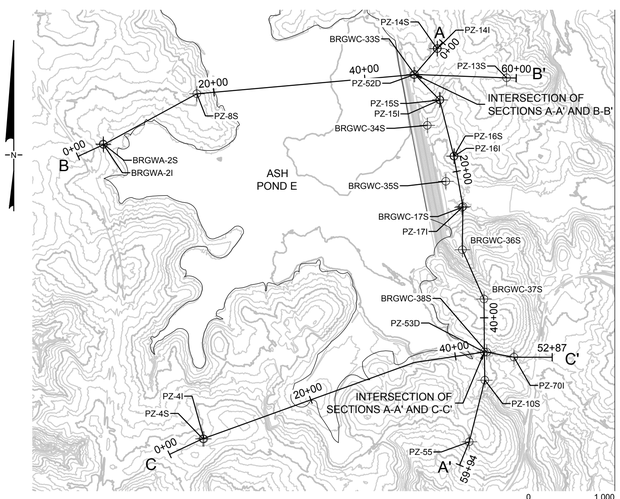


SECTION B-B'

B'



SECTION B-B'



KEY MAP

LEGEND

- DIKE FILL: SANDY SILT WITH TRACE GRAVEL TO SAND WITH TRACE SILT AND GRAVEL, MOIST TO DRY, LOOSE TO COMPACT, NON-COHESIVE
- ASH: SILT, SANDY SILT TO SAND WITH TRACE GRAVEL NON-COHESIVE, DRY, LOOSE TO COMPACT
- SAPROLITE CONSISTING OF SILTY CLAY AND CLAY, TO SILTY SAND AND WELL-GRADED SAND. SAPROLITE IS MICACEOUS, WITH RELICT ROCK STRUCTURES
- PARTIALLY WEATHERED ROCK (PWR) - HIGHLY WEATHERED TO DECOMPOSED BEDROCK WITH SIMILAR CHARACTERISTICS TO THE SAPROLITE
- BIOTITE GNEISS BEDROCK - WELL BANDED AND FOLIATED FELDSPATHIC BIOTITE GNEISS WITH LOW ANGLE FRACTURES AND SOME WEATHERING IN THE UPPER PORTION OF BEDROCK
- DIABASE DIKE
- BIOTITE GNEISS WITH INTERLAYERED AMPHIBOLITE
- GROUNDWATER LEVEL (JANUARY 23, 2023)
- MONITORING WELL/PIEZOMETER SCREEN INTERVAL

NOTES:

1. GROUNDWATER LEVEL SHOWN IS BASED ON DATA COLLECTED ON JANUARY 23, 2023.
2. EXISTING GROUND SURFACE SHOWN ON THIS FIGURE WERE OBTAINED FROM THE LIDAR SURVEY PERFORMED BY GEORGIA POWER COMPANY ON AUGUST 1, 2020 AND PROVIDED WITH THE ELECTRONIC FILE TITLED "BRANCH_1FTCONTOURS".
3. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAV88).

0 100' 200'
SCALE: 1" = 100' (H)

0 50' 100'
SCALE: 1" = 50' (V)

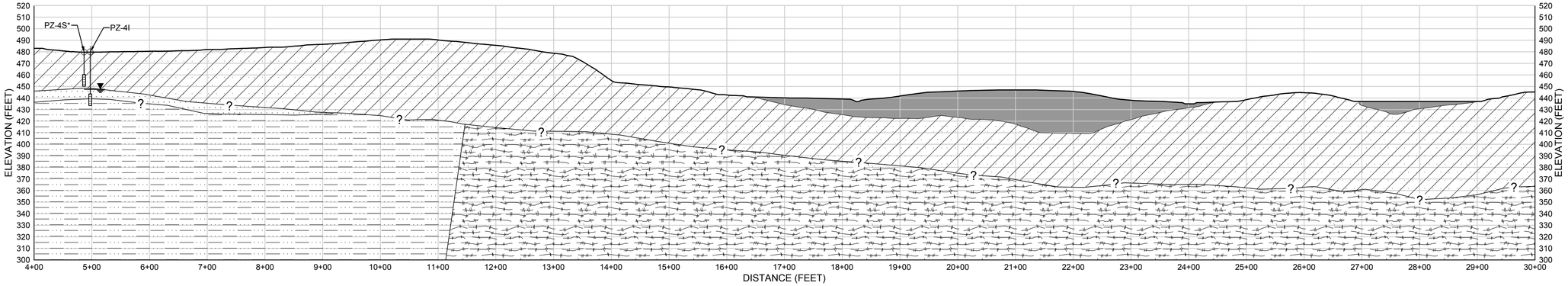
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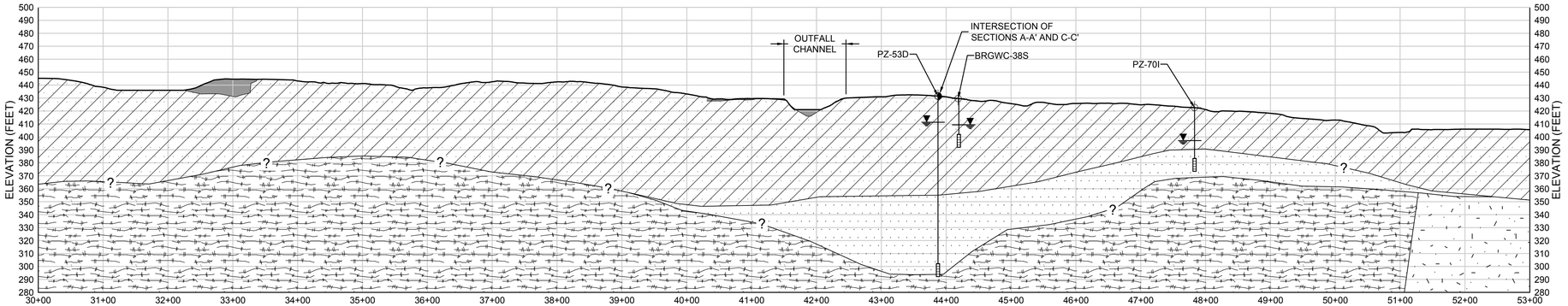
FIGURE 4

C

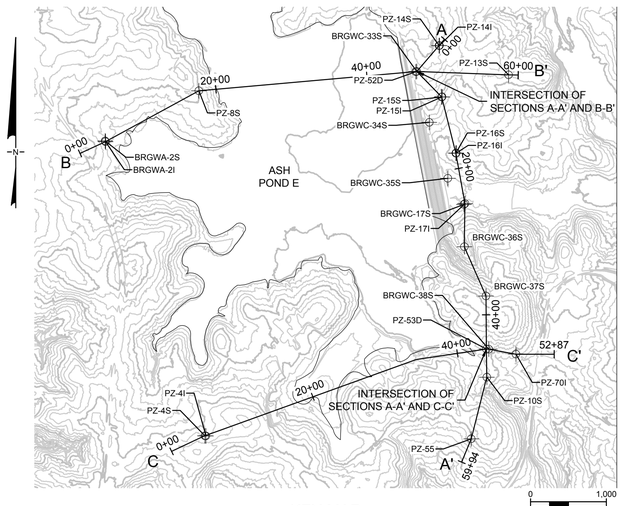


SECTION C-C'

C'



SECTION C-C'



KEY MAP

LEGEND

- DIKE FILL: SANDY SILT WITH TRACE GRAVEL TO SAND WITH TRACE SILT AND GRAVEL, MOIST TO DRY, LOOSE TO COMPACT, NON-COHESIVE
- ASH: SILT, SANDY SILT TO SAND WITH TRACE GRAVEL NON-COHESIVE, DRY, LOOSE TO COMPACT
- SAPROLITE CONSISTING OF SILTY CLAY AND CLAY, TO SILTY SAND AND WELL-GRADED SAND. SAPROLITE IS MICACEOUS, WITH RELICT ROCK STRUCTURES
- PARTIALLY WEATHERED ROCK (PWR) - HIGHLY WEATHERED TO DECOMPOSED BEDROCK WITH SIMILAR CHARACTERISTICS TO THE SAPROLITE
- BIOTITE GNEISS BEDROCK - WELL BANDED AND FOLIATED FELDSPATHIC BIOTITE GNEISS WITH LOW ANGLE FRACTURES AND SOME WEATHERING IN THE UPPER PORTION OF BEDROCK
- DIABASE DIKE
- BIOTITE GNEISS WITH INTERLAYERED AMPHIBOLITE
- GROUNDWATER LEVEL (JANUARY 23, 2023)
- MONITORING WELL/PIEZOMETER SCREEN INTERVAL

NOTES:

1. GROUNDWATER LEVEL SHOWN IS BASED ON DATA COLLECTED ON JANUARY 23, 2023.
2. EXISTING GROUND SURFACE SHOWN ON THIS FIGURE WERE OBTAINED FROM THE LIDAR SURVEY PERFORMED BY GEORGIA POWER COMPANY ON AUGUST 1, 2020 AND PROVIDED WITH THE ELECTRONIC FILE TITLED "BRANCH_1FTCONTOURS".
3. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAV88).

*PIEZOMETER DRY DURING GAUGING EVENT. NO WATER LEVEL RECORDED.

0 100' 200'
SCALE: 1" = 100' (H)

0 50' 100'
SCALE: 1" = 50' (V)

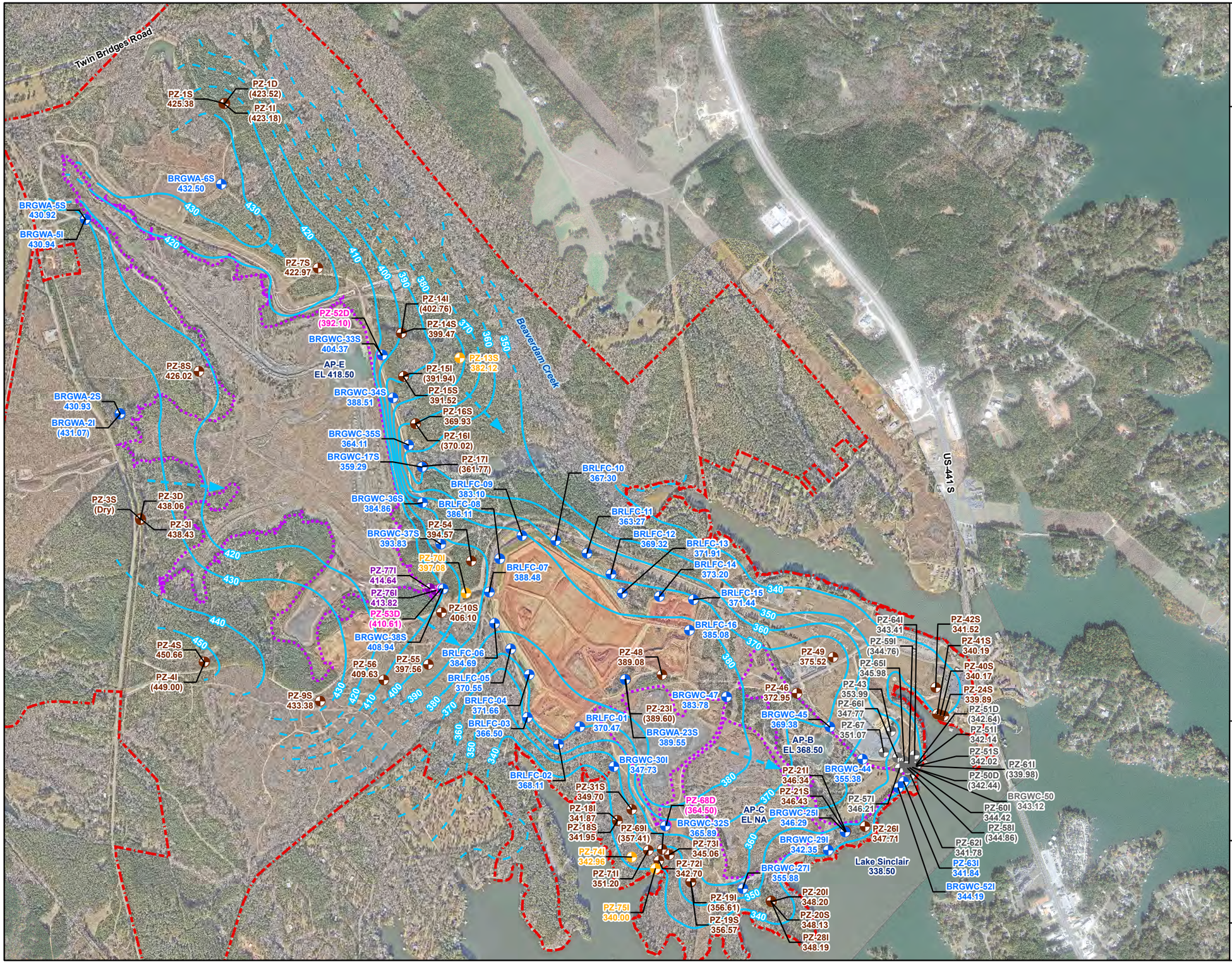
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PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

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FIGURE 5



N

LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Temporary Piezometer
- Piezometer
- Former Coal Pile Area Piezometer
- Groundwater Elevation Iso-Contour
- Groundwater Elevation Iso-Contour (Inferred)
- Approximate Groundwater Flow Direction
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Water level elevation recorded on August 21, 2023, for semiannual groundwater event.
2. Elevation provided in feet (ft) referenced to the North American Vertical Datum of 1988 (NAVD 88).
3. Groundwater iso-contours based on linear interpolation and extrapolation from known groundwater elevation data, and topographic elevations.
4. Groundwater elevations in parentheses were not used to make the groundwater contours because these wells are screened at a different elevation in the formation/aquifer.
5. Coordinate System: NAD 1983 State Plane Georgia West_FIPS (U.S. Feet).
6. Property Boundary Provided by Southern Company Services.
7. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 1,500 3,000

Scale in Feet

POTENTIOMETRIC SURFACE CONTOUR MAP - AUGUST 2023

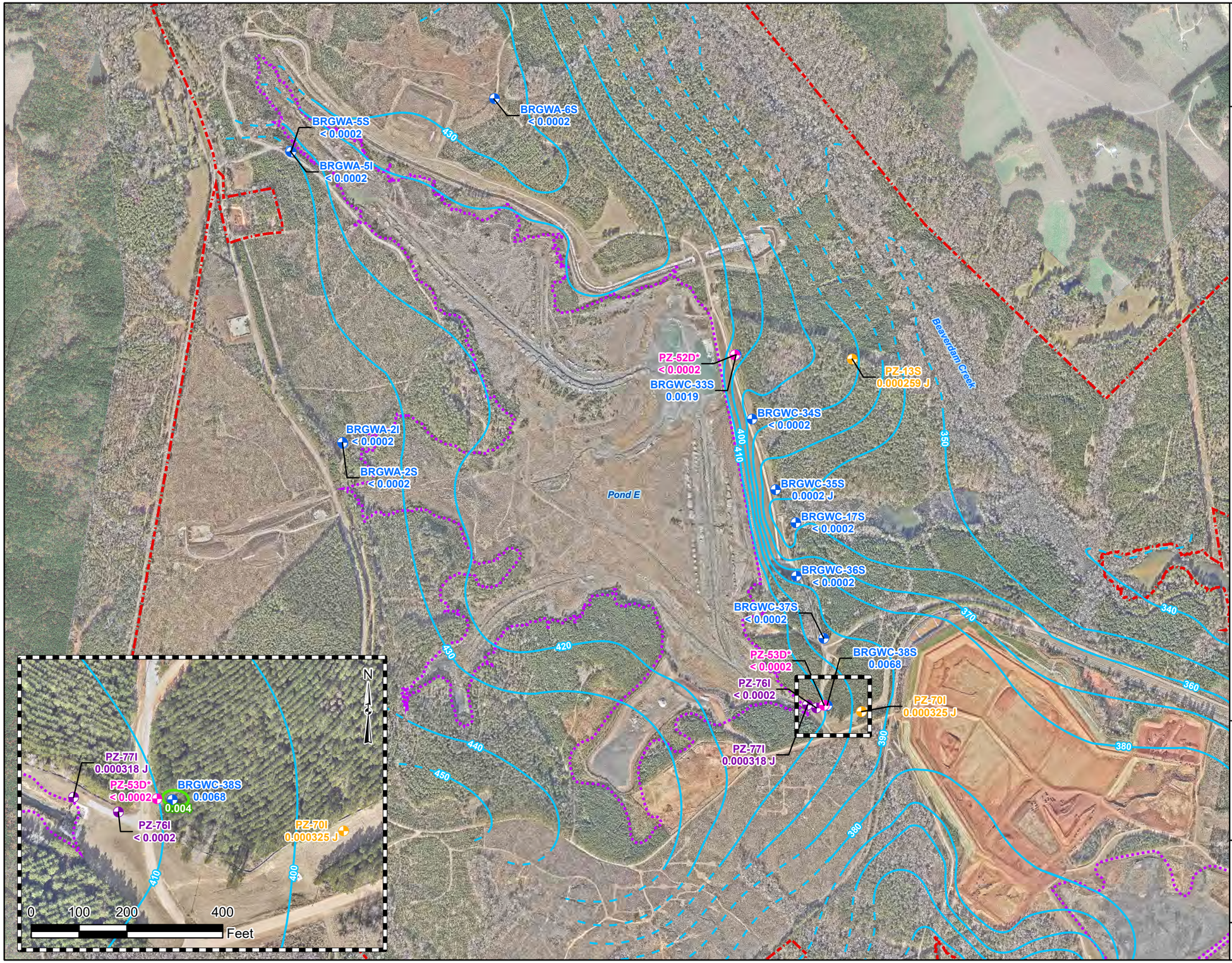
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PUTNAM COUNTY, GEORGIA

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FIGURE 6



LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Temporary Piezometer
- Groundwater Elevation Iso-Contour (August 2023)
- Groundwater Elevation Iso-Contour (Inferred)(August 2023)
- 0.004 Beryllium GWPS Iso-Concentration Contour (mg/L)
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Concentration data from groundwater samples collected during the August 2023, annual monitoring event.
2. Concentrations are reported in milligrams per liter (mg/L).
3. Water level elevation recorded on August 21, 2023.
4. Elevation provided in feet (ft) referenced to the North American Vertical Datum (NAVD) 88.
5. The Groundwater Protection Standard (GWPS) for beryllium is 0.004 mg/L.
6. J - Estimated value.
7. * - Data reported was not used to generate the iso-concentration contour.
8. Property Boundary Provided by Southern Company Services.
9. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

ISO-CONCENTRATION MAP, BERYLLIUM - AUGUST 2023

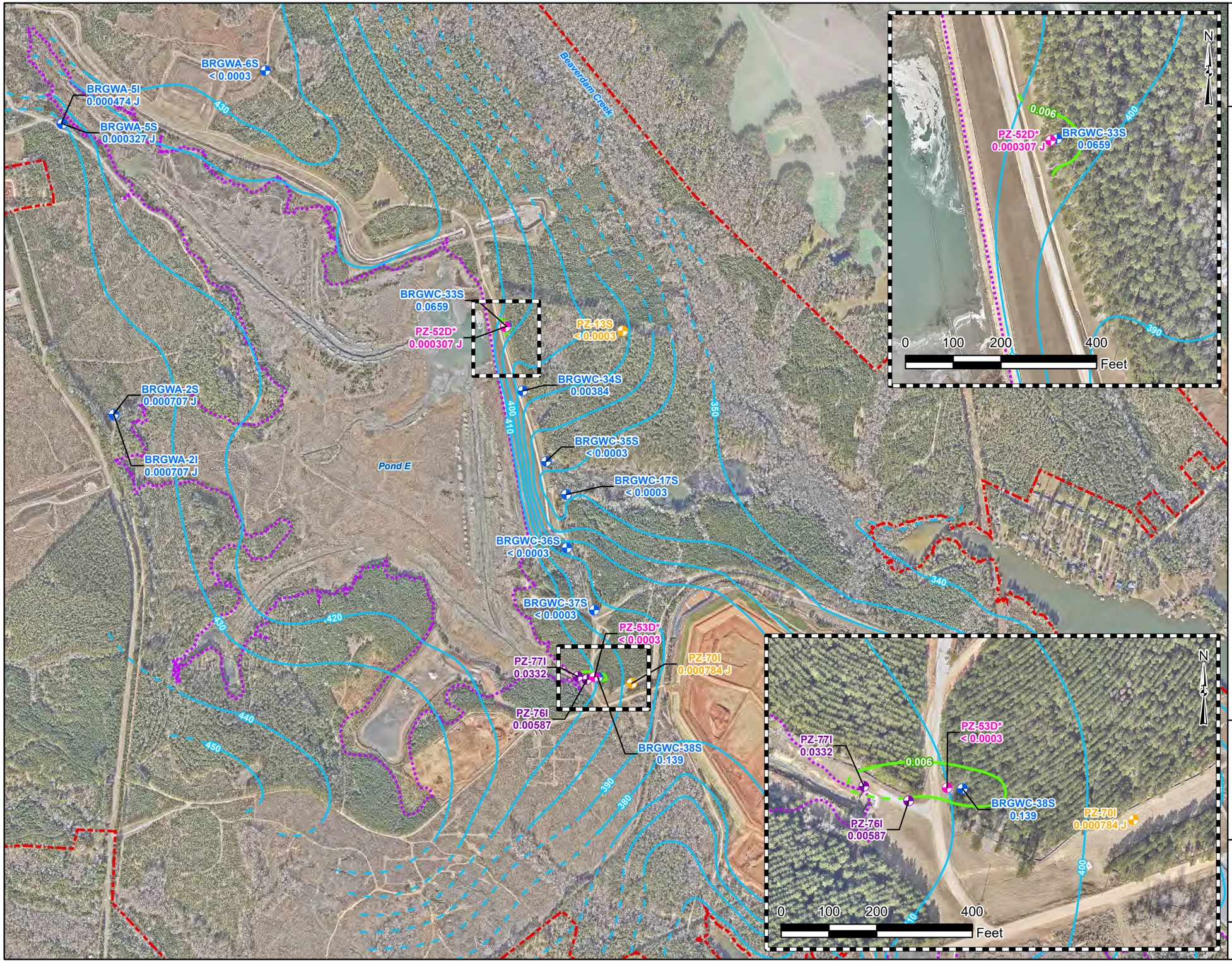
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FIGURE 7



LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Temporary Piezometer
- Groundwater Elevation Iso-Contour (August 2023)
- Groundwater Elevation Iso-Contour (Inferred)(August 2023)
- Cobalt GWPS Iso-Concentration Contour (mg/L) (dashed where inferred)
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Concentration data from groundwater samples collected during the August 2023, semiannual monitoring event.
2. Concentrations are reported in milligrams per liter (mg/L).
3. Water level elevation recorded on August 21, 2023.
4. Elevation provided in feet (ft) referenced to the North American Vertical Datum (NAVD) 88.
5. The Groundwater Protection Standard (GWPS) for cobalt is 0.006 mg/L.
6. J - Estimated value.
7. * - Data reported was not used to generate the iso-concentration contour.
8. Property Boundary Provided by Southern Company Services.
9. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 1,000 2,000
Scale in Feet

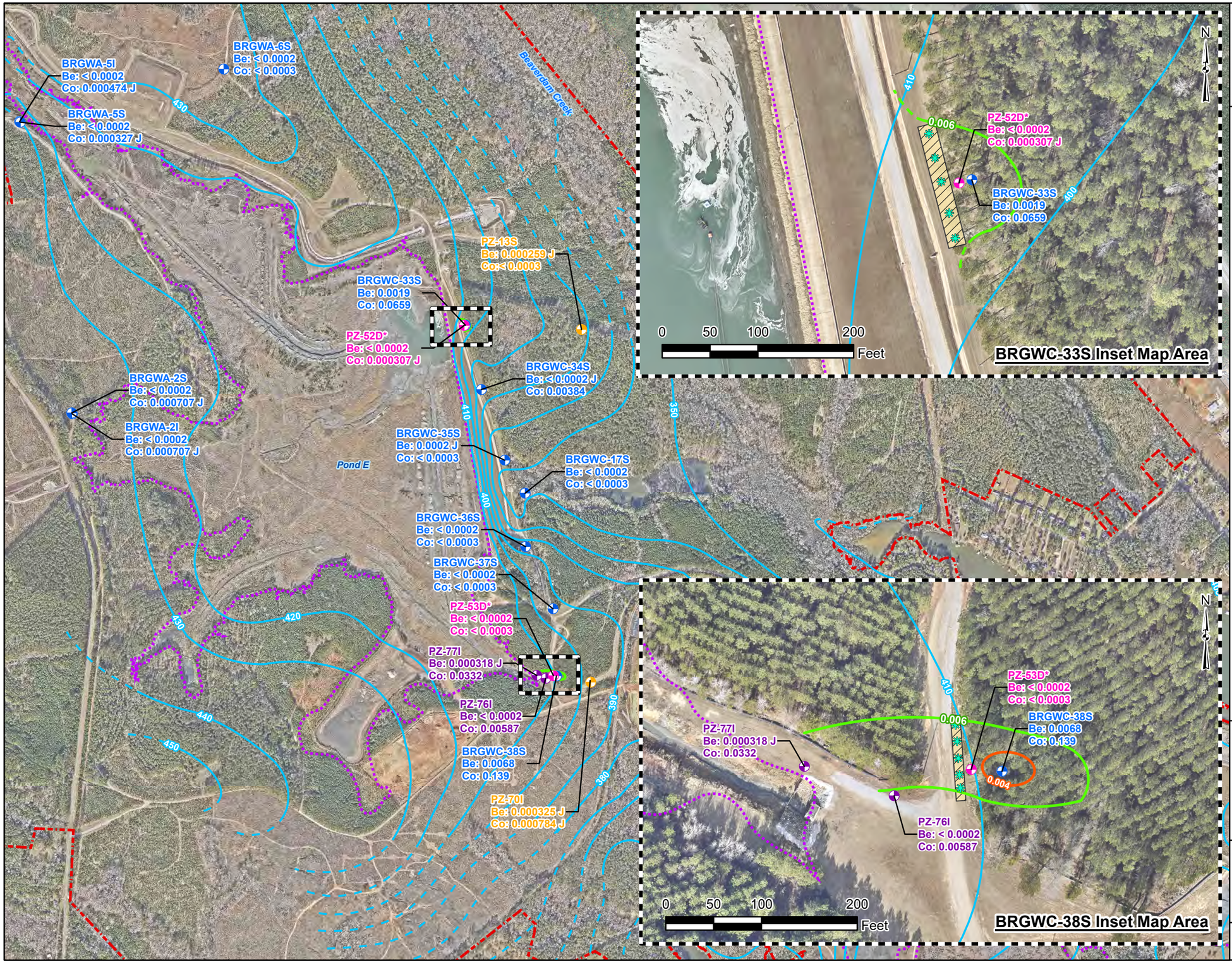
ISO-CONCENTRATION MAP, COBALT - AUGUST 2023

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PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power
Prepared By: Geosyntec consultants

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FIGURE 8



LEGEND

- Proposed Injection Well (Note 1)
- Proposed Injection Array Area
- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Temporary Piezometer
- Groundwater Elevation Iso-Contour (August 2023) (dashed where inferred)
- 0.004 Beryllium (Be) GWPS Iso-Concentration Contour (mg/L)
- 0.006 Cobalt (Co) GWPS Iso-Concentration Contour (mg/L) (dashed where inferred)
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Location and number of injection wells are illustrative and may vary if remedy is selected.
2. Concentration data from groundwater samples collected during the August 2023, semiannual monitoring event.
3. Concentrations are reported in milligrams per liter (mg/L).
4. Water level elevation recorded on August 21, 2023.
5. Elevation provided in feet (ft) referenced to the North American Vertical Datum (NAVD) 88.
6. The Groundwater Protection Standard (GWPS) for beryllium is 0.004 mg/L and cobalt is 0.006 mg/L.
7. J - Estimated value.
8. * - Data reported was not used to generate the iso-concentration contour.
9. Property Boundary Provided by Southern Company Services.
10. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

CONCEPTUAL LAYOUT REMEDIAL ALTERNATIVE 1: GEOCHEMICAL INJECTION APPROACH

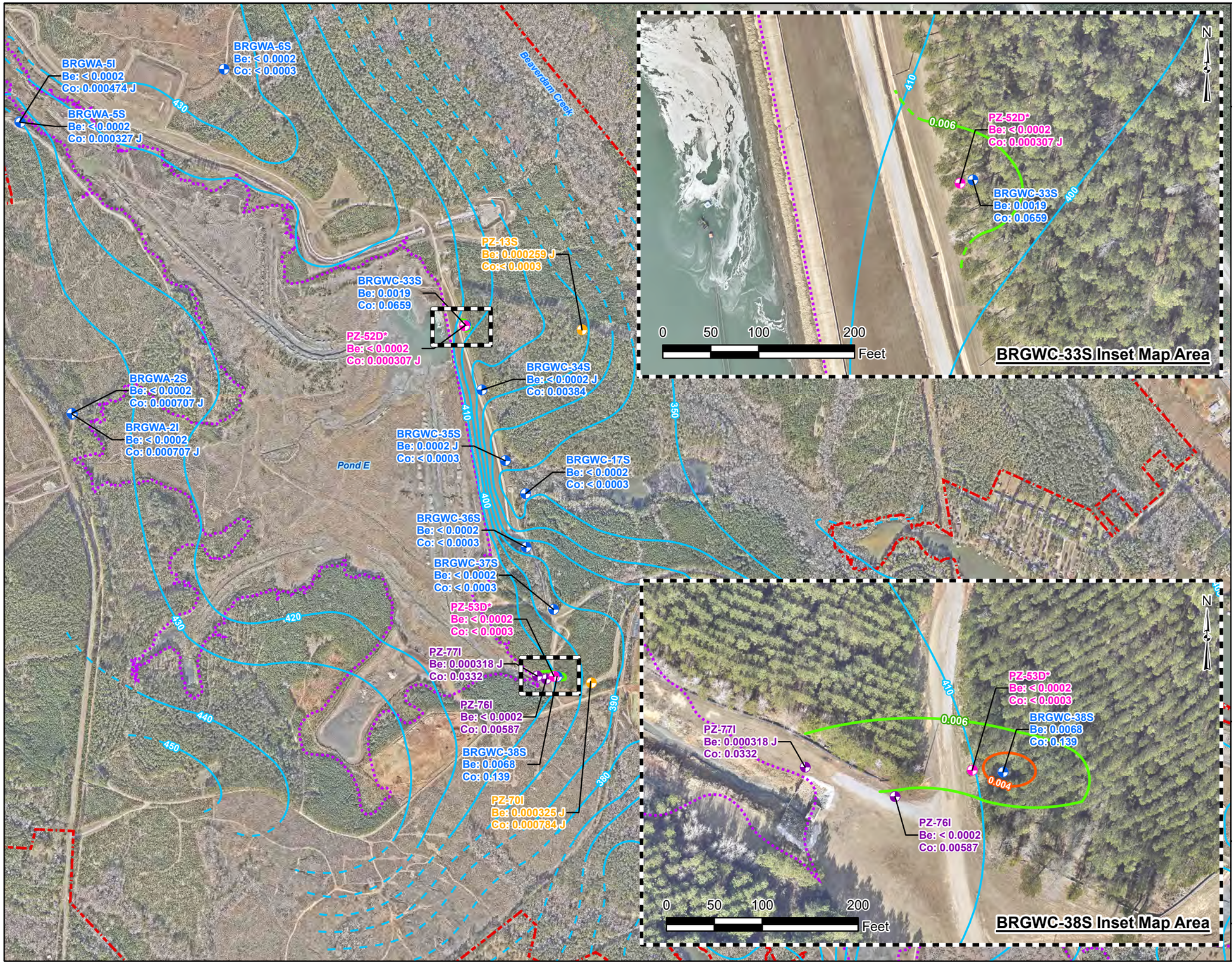
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PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

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FIGURE 9



LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Temporary Piezometer
- Groundwater Elevation Iso-Contour (August 2023) (dashed where inferred)
- 0.004 Beryllium (Be) GWPS Iso-Concentration Contour (mg/L)
- 0.006 Cobalt (Co) GWPS Iso-Concentration Contour (mg/L) (dashed where inferred)
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Additional infrastructure may be needed for monitoring of MNA remedy. This will be evaluated following remedy selection.
2. Concentration data from groundwater samples collected during the August 2023, semiannual monitoring event.
3. Concentrations are reported in milligrams per liter (mg/L).
4. Water level elevation recorded on August 21, 2023.
5. Elevation provided in feet (ft) referenced to the North American Vertical Datum (NAVD) 88.
6. The Groundwater Protection Standard (GWPS) for beryllium is 0.004 mg/L and cobalt is 0.006 mg/L.
7. J - Estimated value.
8. * - Data reported was not used to generate the iso-concentration contour.
9. Property Boundary Provided by Southern Company Services.
10. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 1,000 2,000
Scale in Feet

CONCEPTUAL LAYOUT REMEDIAL ALTERNATIVE 2: MONITORED NATURAL ATTENUATION

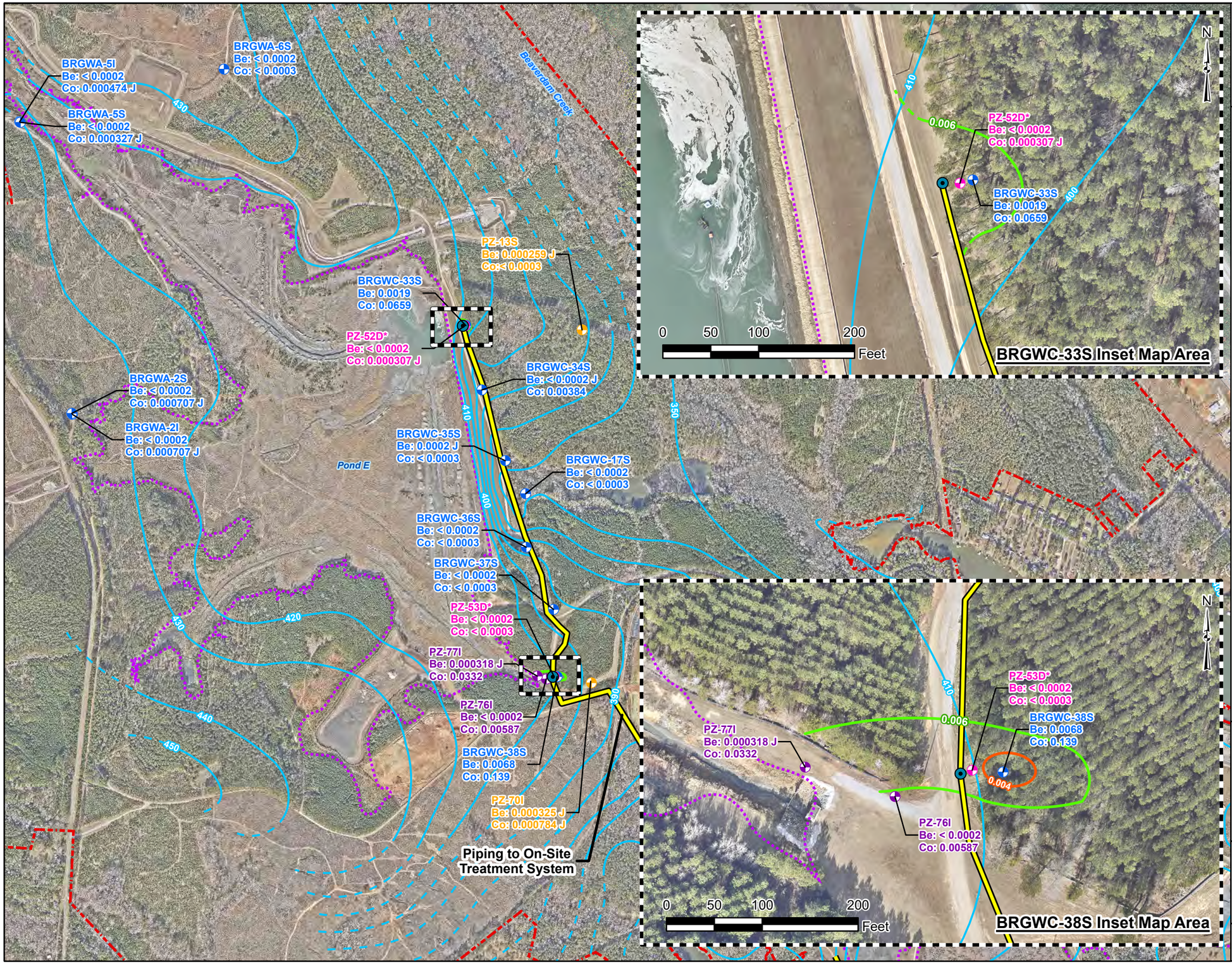
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PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

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FIGURE 10



LEGEND

- Proposed Extraction Well (Note 1)
- Proposed Extraction Well Piping
- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Temporary Piezometer
- Groundwater Elevation Iso-Contour (August 2023) (dashed where inferred)
- 0.004 Beryllium (Be) GWPS Iso-Concentration Contour (mg/L)
- 0.006 Cobalt (Co) GWPS Iso-Concentration Contour (mg/L) (dashed where inferred)
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Location and number of extraction wells along with piping are illustrative and may be modified during design if remedy is selected.
2. Concentration data from groundwater samples collected during the August 2023, semiannual monitoring event.
3. Concentrations are reported in milligrams per liter (mg/L).
4. Water level elevation recorded on August 21, 2023.
5. Elevation provided in feet (ft) referenced to the North American Vertical Datum (NAVD) 88.
6. The Groundwater Protection Standard (GWPS) for beryllium is 0.004 mg/L and cobalt is 0.006 mg/L.
7. J - Estimated value.
8. * - Data reported was not used to generate the iso-concentration contour.
9. Property Boundary Provided by Southern Company Services.
10. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 1,000 2,000
Scale in Feet

CONCEPTUAL LAYOUT REMEDIAL ALTERNATIVE 3: HYDRAULIC CONTROL

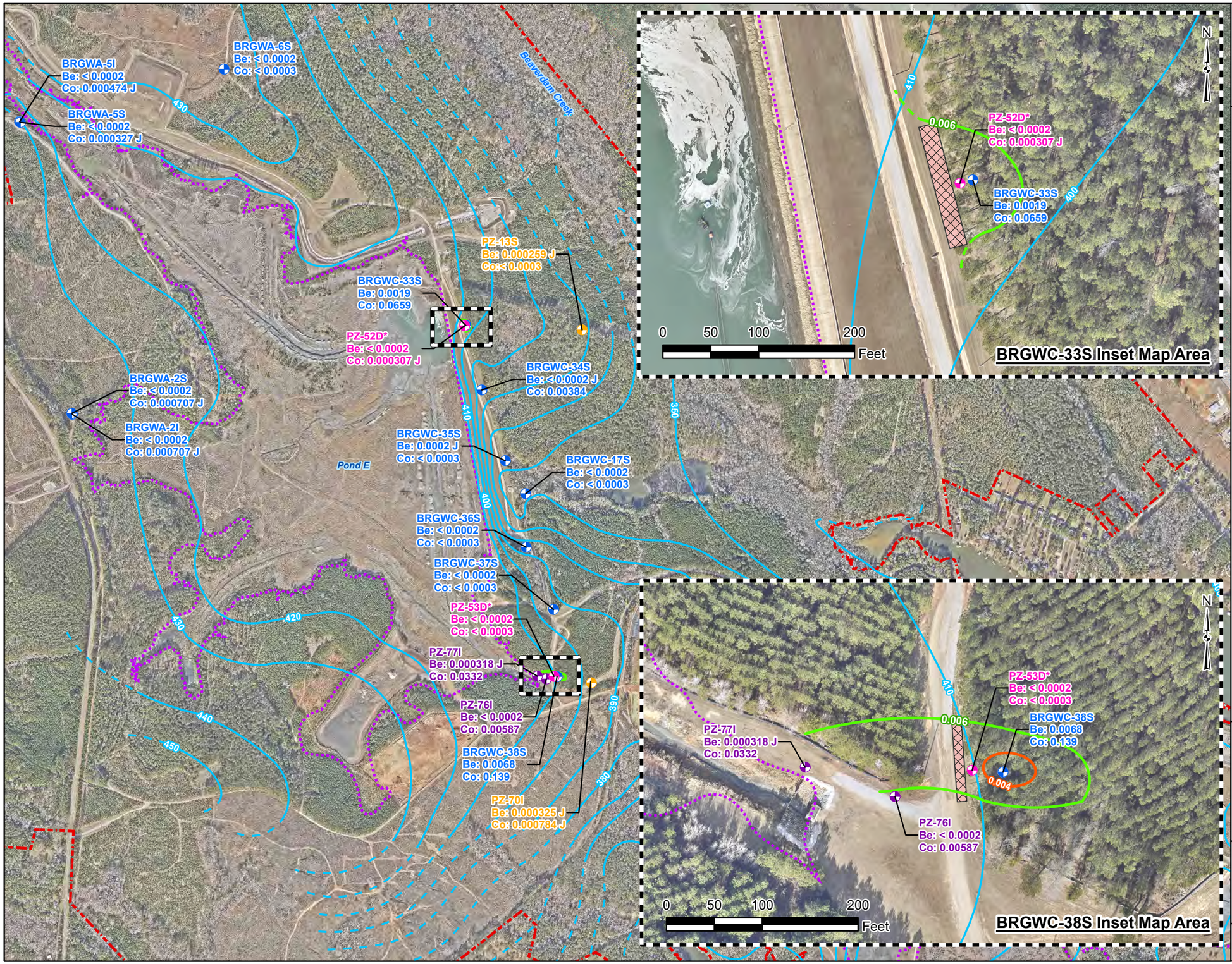
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PUTNAM COUNTY, GEORGIA

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FIGURE 11



LEGEND

- Permeable Reactive Barrier (Note 1)
- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Temporary Piezometer
- Groundwater Elevation Iso-Contour (August 2023) (dashed where inferred)
- 0.004 Beryllium (Be) GWPS Iso-Concentration Contour (mg/L)
- 0.006 Cobalt (Co) GWPS Iso-Concentration Contour (mg/L) (dashed where inferred)
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Permeable Reactive Barrier (PRB) location and extent is illustrative and may vary if remedy is selected.
2. Concentration data from groundwater samples collected during the August 2023, semiannual monitoring event.
3. Concentrations are reported in milligrams per liter (mg/L).
4. Water level elevation recorded on August 21, 2023.
5. Elevation provided in feet (ft) referenced to the North American Vertical Datum (NAVD) 88.
6. The Groundwater Protection Standard (GWPS) for beryllium is 0.004 mg/L and cobalt is 0.006 mg/L.
7. J - Estimated value.
8. * - Data reported was not used to generate the iso-concentration contour.
9. Property Boundary Provided by Southern Company Services.
10. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

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Scale in Feet

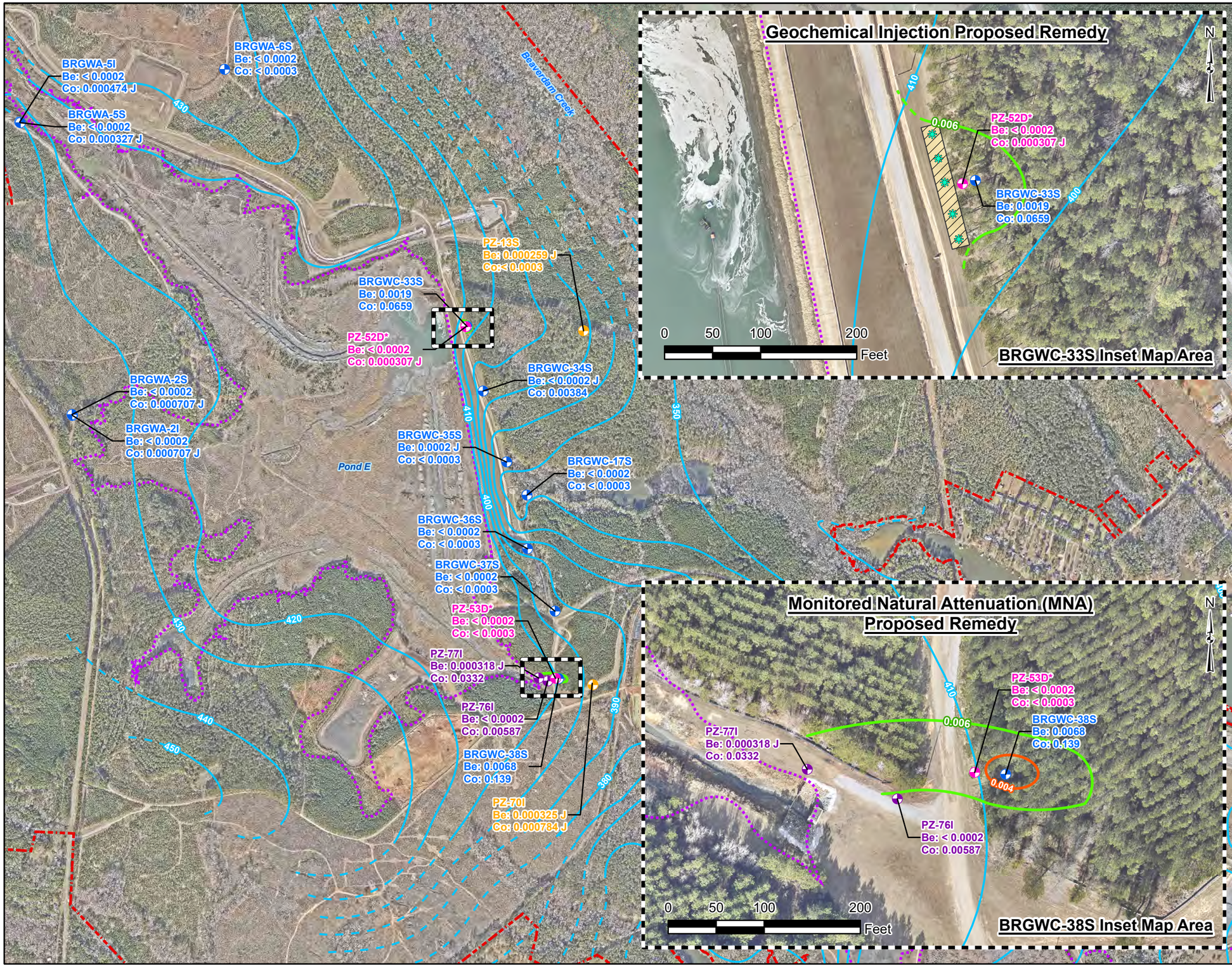
CONCEPTUAL LAYOUT REMEDIAL ALTERNATIVE 4: PERMEABLE REACTIVE BARRIER

GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power
Prepared By: Geosyntec consultants

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FIGURE 12



N

LEGEND

- Proposed Injection Well (Note 1)
- Proposed Injection Array Area
- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Temporary Piezometer
- Groundwater Elevation Iso-Contour (August 2023) (dashed where inferred)
- 0.004 Beryllium (Be) GWPS Iso-Concentration Contour (mg/L)
- 0.006 Cobalt (Co) GWPS Iso-Concentration Contour (mg/L) (dashed where inferred)
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Location and number of injection wells are illustrative and may vary if remedy is selected.
2 Additional infrastructure may be needed for monitoring of MNA remedy. This will be evaluated following remedy selection.
3. Concentration data from groundwater samples collected during the August 2023, semiannual monitoring event.
4. Concentrations are reported in milligrams per liter (mg/L).
5. Water level elevation recorded on August 21, 2023.
6. Elevation provided in feet (ft) referenced to the North American Vertical Datum (NAVD) 88.
7. The Groundwater Protection Standard (GWPS) for beryllium is 0.004 mg/L and cobalt is 0.006 mg/L.
8. J - Estimated value.
9. * - Data reported was not used to generate the iso-concentration contour.
10. Property Boundary Provided by Southern Company Services.
11. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 1,000 2,000
Scale in Feet

PROPOSED REMEDY CONCEPTUAL DESIGN

GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

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FIGURE 13

APPENDIX A

Geochemical Conceptual Site Model Report

Prepared for

Georgia Power Company
241 Ralph McGill Blvd NE
Atlanta, Georgia 30308

GEOCHEMICAL CONCEPTUAL SITE MODEL REPORT

PLANT BRANCH ASH POND E (AP-E)

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1255 Roberts Boulevard, Suite 200
Kennesaw, Georgia 30144

Project Number GW8862

February 2025

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Appendix A SiREM Laboratory Sorption and Desorption Treatability Study and Site Material Characterization Reports

LIST OF ACRONYMS

ACM	Assessment of Corrective Measures
AP	ash pond
ATSDR	Agency for Toxic Substances and Disease Registry
CEC	Cation Exchange Capacity
CCR	coal combustion residuals
EPRI	Electric Power Research Institute
ft bgs	feet below ground surface
GA EPD	Georgia Environmental Protection Division
GCSM	Geochemical Conceptual Site Model
GM:GW	geologic material/groundwater ratio
GWPS	Groundwater Protection Standard
HFO	hydrous ferric oxide
K_d	distribution coefficient
L/kg	liters per kilogram
meq/100g	milliequivalents per 100 grams
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mV	millivolts
PWR	partially weathered rock
redox	reduction/oxidation
SEP	Sequential extraction procedure
SSL	Statistically Significant Level
s.u.	standard unit
TDS	total dissolved solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WRA	Whole Rock Analysis
XRD	X-Ray Diffraction

1.0 INTRODUCTION

1.1 Purpose

This geochemical conceptual site model (GCSM) report has been prepared for Georgia Power Company (Georgia Power) Plant Branch (Site) Ash Pond E (AP-E) to support groundwater remedy selection efforts being completed at the Site. The purpose of this GCSM report is to document Site-specific geochemical conditions that influence the fate and transport of the constituents identified at statistically significant levels (SSL; cobalt and beryllium) downgradient of AP-E. This GCSM will be used to inform further assessments of the feasibility of potential groundwater corrective measures and geochemical transport modeling to predict long-term concentration trends of SSL constituents as part of the remedy selection process. This report summarizes data previously submitted to the Georgia Environmental Protection Division (GA EPD) as part of routine Semiannual Remedy Selection and Design Progress Reports as well as recent data and is included as an appendix to the *Draft Remedy Selection Report – Plant Branch AP-E* (Remedy Selection Report).

For additional details on the site background and pond closure, see Sections 2.2 and 2.3 in the Remedy Selection Report.

1.2 Site Geology and Hydrogeologic Setting

The following section provides a brief overview of the geologic and hydrogeologic conditions at AP-E as described in more detail in Section 3 of the Remedy Selection Report.

1.2.1 Regional and Site Geology

The Site is located within the Piedmont Physiographic Province of central Georgia, and generally slopes gently eastward and southward toward Beaverdam Creek and Lake Sinclair.

Bedrock at the Site is typically overlain by a variably thick blanket of residual soils and saprolite. The thickness of residual soil and saprolite ranges from a few feet to approximately 90 feet. The saprolite is dominated by clayey to sandy silt textures. Between the residual soil/saprolite zone and the underlying bedrock there is a zone of partially weathered rock (PWR), which is a gradational stage of decomposition of the biotite gneiss (with some interlayered amphibolite) bedrock commonly observed in the Piedmont region.

1.2.2 Hydrogeologic Setting

Hydrogeological investigations at the Site suggest an unconfined uppermost aquifer with groundwater flow primarily in the saprolite and PWR and with substantially lower permeabilities in the underlying fractured gneiss bedrock. The potentiometric surface indicates that groundwater flows from the west, towards the ash pond, before migrating east towards Beaverdam Creek and southeast along the axis of the original pre-construction stream valley and toward the dike that forms the valley-fill coal combustion residuals (CCR) impoundment. A potentiometric surface map is provided in the Remedy Selection Report.

1.3 Groundwater Exceedances

Pursuant to the CCR Rule, CCR compliance groundwater monitoring-related activities have been performed for AP-E since 2018 for the monitoring well network identified in **Figure 2**. A summary of groundwater exceedances of the groundwater protection standard (GWPS) is provided in Section 3.4 of the Remedy Selection Report.

The subsequent sections of this report detail the geochemical characteristics of AP-E and the key underlying geochemical processes pertinent to mobilization and attenuation of cobalt and beryllium in the subsurface. Section 2.0 summarizes the Site characteristics, including the geochemistry of groundwater and CCR interstitial water as well as the chemistry and mineralogy of aquifer solids. In addition, this section presents attenuation batch studies, evaluating the extent and stability of sorption of cobalt and beryllium in the presence of Site solids and groundwater. Section 3.0 discusses the development of the GCSM, based on the natural occurrence, speciation, distribution, geochemical modeling and identified Site-specific mobilization and attenuation processes of cobalt and beryllium. A summary of the key features of the GCSM is presented at the end of Section 3.0.

2.0 SUMMARY OF SITE CHARACTERISTICS

The following section summarizes the field investigations and data evaluations completed at the Site utilized to develop this GCSM. This includes the work performed following initiation of the assessment of corrective measures (ACM) program for AP-E in 2020 and incorporates material presented in the Groundwater Monitoring and Corrective Action Reports (semiannual groundwater monitoring reports) submitted to GA EPD semiannually, as well as the Semiannual Remedy Selection and Design Progress Reports (semiannual progress reports) included as an appendix to the semiannual groundwater monitoring reports. These reports are available on Georgia Power's Plant Branch AP-E CCR Rule Compliance public website[1]. The goal of this section is to define the current understanding of both groundwater and aquifer solids based on geochemical and mineralogical characterization. This information will be used to develop the GCSM and describe mobilization and attenuation of SSL constituents downgradient of AP-E.

2.1 Groundwater and CCR Interstitial Water Geochemistry

2.1.1 SSL Concentration Trend Evaluation

During numerous semiannual assessment monitoring events, routine Appendix III and Appendix IV constituent concentrations were sampled along with additional geochemical constituents from groundwater and interstitial water sampling locations. The analytical data from all sampling events between 2016 and present are summarized in **Table 1**. Analytical laboratory reports for all data being used to support this GCSM have been presented in the semiannual progress reports.

Time series graphs through August 2023 of cobalt concentrations at BRGWC-33S and BRGWC-38S, and beryllium at BRGWC-38S are depicted on **Figures 3a** through **3c**. The concentrations trends show significant decreases of cobalt and beryllium since the start of the CCR monitoring program in 2016 in BRGWC-38S. Similar trends are observed for cobalt in BRGWC-33S until 2022. Higher concentrations of cobalt in BRGWC-33S in the most recent sampling events are attributed to dewatering and construction activities near this well location. These activities have resulted in temporal alteration of the hydrogeological conditions, changes in groundwater flow field in the vicinity of BRGWC-33S, and variability of source water upgradient of BRGWC-33S. This increase is expected to be a temporary shift based on similar concentration patterns observed for other constituents including calcium, chloride, sulfate, and total dissolved

[1] https://www.georgiapower.com/company/environmental-compliance/plant-list/plant-branch.html

solids (TDS). Boron and pH concentrations have remained constant in this location. Continued monitoring of the groundwater in this location and refinement of the GCSM will be completed, as necessary.

2.1.2 Geochemical Evaluation

Piper and Stiff diagrams are among the most common tools for assessing geochemical similarities and differences between aqueous samples. Therefore, data from upgradient detection monitoring wells, one interstitial water piezometer screened within the AP-E CCR material, and downgradient detection wells were used to construct Piper and Stiff diagrams. The resulting Piper diagram is presented as **Figure 4**, and the Stiff diagrams developed for select locations are provided on **Figure 5**.

The data presented on **Figure 4** show that groundwater in the vicinity of AP-E is mainly clustered in two areas on the Piper diagram. Data from the upgradient detection monitoring wells represents a calcium-bicarbonate (Ca-HCO_3) type water, as plotted on the middle-left corner of the diamond-shape Piper diagram and reflects the background signature for the Site. Data from select downgradient detection wells along with the interstitial water piezometer plot near the top apex of the Piper plot. This area represents water types enriched in calcium/magnesium and sulfate, exhibiting an ionic signature that can describe interstitial water in AP-E or groundwater variably impacted with migration through AP-E.

Figure 5 presents the Stiff diagrams for select locations including BRGWA-2I, BRGWC-33S, BRGWC-38S, and IW-E-1. These locations were selected to encompass the potential differences in water types including upgradient groundwater, downgradient groundwater, and interstitial water. BRGWA-2I, an upgradient detection monitoring well, has an ionic strength approximately 1.5 times lower than the interstitial water piezometer (IW-E-1), and approximately four times lower than downgradient detection monitoring well BRGWC-38S. Similar to Piper diagrams, Stiff diagrams confirmed that the upgradient groundwater's anionic composition is dominated by bicarbonates, whereas groundwater compositions at select downgradient locations, as well as in interstitial water, are dominated by sulfates.

This geochemical analysis of groundwater and interstitial water data suggests variable groundwater compositions, particularly when comparing upgradient and downgradient locations. This suggests an influence from a CCR signature potentially leading to altered geochemical conditions in the wells that exhibit SSLs of cobalt and/or beryllium downgradient of AP-E. This influence is further described in Section 3.3.

2.2 Aquifer Solids Characterization

2.2.1 Site Characterization of Aquifer Solids

Soil samples were collected from boreholes completed during the installation of monitoring wells and piezometers BRGWA-2S, BRGWA-5S, BRGWA-6S, PZ-52D (sample is from the screen interval of collocated BRGWC-33S) and PZ-53D (sample is from the screen interval of collocated BRGWC-38S) in the vicinity of AP-E. These samples were collected for characterization of the solid matrix in upgradient (relative to SSL-impacted downgradient locations; BRGWA-2S, BRGWA-5S, and BRGWA-6S) and downgradient (PZ-52D and PZ-53D; from the screen interval of the collocated SSL detection well) locations.

In addition, in September 2022, soil borings SB-1 and SB-2 were installed for the collection of soil samples in the vicinity of detection wells exhibiting SSLs. SB-1 was collocated with BRGWC-33S and SB-2 was collocated with BRGWC-38S. Soil samples were collected from SB-1 and SB-2 at the corresponding elevation of the screen interval for BRGWC-33S (16-26 feet below ground surface [ft bgs]) and BGWC-38S (27.8-37.8 ft bgs), respectively. These aquifer solids were collected for characterization purposes and to evaluate the sorption capacity for SSL constituents in these locations.

The aquifer matrix samples were sent to SGS Canada located in Lakefield, Ontario or SiREM analytical laboratory located in Knoxville, Tennessee for baseline chemical and/or mineralogical characterization by application of the following analytical testing/methods:

- *Cation Exchange Capacity (CEC)*: Ion exchange capacity of a soil or aquifer solid matrix is an important variable to understand when evaluating attenuation processes. It is generally defined as the capacity of a soil to retain positively charged ions. This analysis was completed for SB-1 and SB-2 only.

- *Total Sulfur and Sulfide*: The presence of sulfur and sulfide in the aquifer materials may give an indication as to whether metals prone to precipitation as sulfides or co-precipitation with sulfidic minerals might be present in the aquifer matrix. Understanding the presence and speciation of sulfur compounds can allow an estimation of whether certain metals are likely to form sparingly soluble sulfide minerals as a possible attenuation mechanism. This analysis was completed for SB-1 and SB-2 only.

- *Total Metals Concentration*: This analysis helps to understand the presence of Site-specific constituents in aquifer solids as well as the elements of iron, aluminum, and manganese that form major mineral phases known to sorb/retain many metals. This analysis was completed for SB-1 and SB-2 only.

- *Whole Rock Analysis (WRA) and X-Ray Diffraction (XRD)*: Qualitative and quantitative confirmation of mineral phases present was completed, including WRA for quantitative confirmation of XRD results. WRA was only completed on samples from SB-1 and SB-2, while XRD was completed for both suites of solid samples.

A summary of the aquifer solids results is provided below and tabulated in **Tables 2** through **5**. The complete SiREM (sorption study) and SGS Canada analytical reports associated with these analyses are included in **Appendix A** of this report.

2.2.1.1 Cation Exchange Capacity

The results of CEC analysis (**Table 2**) indicated a slightly lower capacity for SB-1 at 5.43 milliequivalents per 100 grams (meq/100g) relative to SB-2 at 12.98 meq/100g. These CEC results are in the range of clays like kaolinite (Ma, 1999).

2.2.1.2 Total Sulfur and Sulfide

Total sulfur and sulfide were non-detect in SB-2. Sulfide was also non-detect in SB-1, but low concentrations of sulfur (0.009%) were observed. The results are presented in **Table 2**.

2.2.1.3 Total Metals Analysis

The total metals concentrations observed in SB-1 and SB-2 soil samples are summarized in **Table 3.** As expected for weathered materials observed in the vicinity of AP-E, the iron content is substantial, ranging from 21,000 milligrams per kilograms (mg/kg) (2.4%) to 46,000 mg/kg. Manganese concentrations range from 460 to 650 mg/kg. Soil samples also indicated the presence of cobalt and beryllium. Detailed discussion on cobalt and beryllium in soils is presented in Section 3.1.

2.2.1.4 WRA and XRD Analyses

Major element oxides of saprolitic samples SB-1 and SB-2 were determined by whole rock analysis (see **Table 4**). The overburden samples are characterized by an abundance

of silicon dioxide (SiO_2) and aluminum oxide (Al_2O_3) downgradient of AP-E. The presence of iron oxide (Fe_2O_3) and manganese oxide (MnO) was noted in the WRA up to approximately 6% and 0.07%, respectively and could potentially provide surface sites for adsorption of beryllium and cobalt onto the solid phase.

The mineralogical results obtained via XRD for aquifer solid samples obtained from BRGWA-2S, BRGWA-5S, BRGWA-6S, PZ-52D, PZ-53D, SB-1 and SB-2 are summarized in **Table 5**. The saprolitic soils are characterized by a high percentage (15 – 23%) of the clay mineral, kaolinite. The upgradient aquifer matrix contains amphibole (hornblende) and clay (kaolinite) minerals, with lesser amounts of quartz. Aquifer matrix samples from the downgradient detection and assessment wells contain predominantly quartz, microcline, and clay minerals.

The occurrence of beryllium and cobalt is likely associated with the on-site soils, which is consistent with regional data reported by Cocker (1996). Total concentrations of cobalt and beryllium reported in the samples (**Table 3, 6a**, and **6b**) support the occurrence of cobalt and beryllium in the aquifer solids. Particularly, the total concentrations of cobalt in the upgradient and downgradient soils (9.6 to 72 mg/kg) are greater than the average crustal concentrations of cobalt (25 mg/kg; Haynes, 2017), indicating that cobalt is present naturally in Site aquifer solids. Beryllium concentrations at the site (0.31 to 3.6 mg/kg) are comparable to the crustal average of 3 mg/kg (Haynes, 2017).

2.2.2 Sequential Extraction Procedure

Selective sequential extractions were also completed on solid samples to assess the distribution of beryllium, cobalt, iron, and manganese in various solid phases. This information can be used to interpret the mechanism and potential reversibility of attenuation processes for these constituents at the Site. The sequential extraction process uses progressively stronger reagents to solubilize metals from increasingly stable phases. Although these procedures do not identify the specific metal phases in a soil/aquifer matrix, they do provide a means to evaluate the class of solids and relative stability in relation to oxidation/reduction (redox) potential and pH fluctuations (Tessier et al, 1979; Kuo et al., 1983; Sposito et al., 1984; Hickey and Kittrick, 1984; Gruebel et al., 1988).

A seven-step sequential extraction procedure (SEP) was conducted by Eurofins on the aquifer solid samples collected from upgradient locations BRGWA-2S, BRGWA-5S, and BRGWA-6S, and downgradient locations PZ-52D and PZ-53D proximal to AP-E (**Figure 2**). To note, the solid samples collected from PZ-52D and PZ-53D, which were installed as vertical assessment wells, were obtained from the screen interval of the

collocated detection monitoring well, BRGWC-33S and BRGWC-38S, respectively. The SEP results are presented in **Table 6a,** and demonstrate that beryllium and cobalt are naturally occurring in Site solids with the potential to be mobilized into groundwater in response to changes in geochemical conditions.

The SEP results show that a significant fraction (49±19%, n=10) of the total cobalt concentrations recovered in steps one to seven are associated with environmentally available fractions which include the amorphous and crystalline iron and manganese oxide and oxyhydroxides phase (steps 3 and 4). Similar to cobalt, a significant fraction of beryllium was associated with environmentally available fractions (55±15%, n=10). The environmentally available fractions would be considered a sorbed source of constituents available for leaching to groundwater in response to changes in geochemical conditions like decreases in groundwater pH (Smith, 1999).

The relative abundance of cobalt and beryllium in different soil fractions were generally comparable between upgradient and downgradient soils. Additionally, 20 to 60% of total beryllium and 20 to 81% of total cobalt, were associated with sulfide and residual phases. These results further confirm the presence of naturally occurring beryllium and cobalt at the Site.

In addition, in 2022, SGS Canada completed a six-step SEP analysis on soil samples collected from SB-1 and SB-2 borings installed in the vicinity of SSL wells downgradient of AP-E (i.e., BRGWC-33S and BGWC-38S, respectively). The results of this analysis, shown in **Table 6b**, were qualitatively in agreement with those described above and confirmed that a significant fraction of cobalt (37-56%) and beryllium (25-27%) were associated with environmentally available fractions including water soluble, exchangeable, carbonate, and iron and manganese oxide and oxyhydroxide phases.

Iron was mainly recovered as amorphous and crystalline iron and manganese oxides (15%) and sulfides (32%), whereas the majority of manganese (approximately 45%) was associated with amorphous and crystalline iron and manganese oxide and oxyhydroxides (**Table 6a**). The presence of iron and manganese oxides and oxyhydroxides was supported by XRD and WRA analyses data. Changes in redox conditions or pH can cause the partial dissolution of these phases and the additional release of associated trace elements (i.e., beryllium and cobalt) into groundwater.

These findings highlight the importance of iron and manganese oxide and oxyhydroxide phases in the attenuation of beryllium and cobalt under the geochemical conditions observed at the Site.

2.3 Sorption and Desorption Batch Studies

In addition to aquifer solids characterization, aquifer solids and groundwater samples collected from the Site were shipped to the SiREM laboratory for batch studies to assess the sorption and desorption behavior of cobalt and beryllium under Site-specific conditions. In general, sorption studies use Site soils and groundwater to evaluate attenuation mechanisms and capacity. Desorption studies are subsequently used to assess attenuation stability of the constituents of interest. Sorption tests are used to calculate a Site-specific distribution coefficient (K_d) between the solid phase and the aqueous phase. The K_d values can be used to estimate the attenuation capacity of Site soils and evaluate potential corrective actions at the Site. The K_d results could also be used to validate other geochemical model results.

2.3.1 Sorption Studies

Two adsorption test reactors were completed for AP-E. The first set used groundwater from BRGWC-33S and collocated SB-1 geologic material and the second was set-up using groundwater from BRGWC-38S and geologic material collected from collocated SB-2. Soil samples were collected from SB-1 and SB-2 at the corresponding elevation of the screen interval for BRGWC-33S (16-26 ft bgs) and BRGWC-38S (27.8-37.8 ft bgs), respectively. The reactors were set-up in duplicate and at five geologic material/groundwater ratios (GM:GW) of 2:1, 1:1, 1:5, 1:10 and 1:20. The reactors were incubated under ambient conditions for seven days. The reactors were initially spiked with cobalt and/or beryllium to increase the baseline concentration to approximately 2 to 3 times higher than corresponding concentrations in the respective wells for improvement in the reliability and applicability of sorption results and also for consistency with desorption tests. A detailed description of the methods and materials used to complete the sorption study is included in the SiREM report provided in **Appendix A**.

Cobalt sorption results are summarized in **Table 7** and depicted on **Figure 6A**, with dissolved concentrations (in milligrams per liter [mg/L]) plotted on the x-axis and the sorbed concentrations (in mg/kg) plotted on the y-axis. The results exhibit a linear sorption isotherm with a calculated K_d value of 5.6 liters per kilogram (L/kg) for the BRGWC-33S reactors and 12.7 L/kg for the BRGWC-38S reactors. While these values are in the same range considering experimental variability for both Site soils, these values are in the lower range of K_d values reported in the literature (USEPA, 2005; EPRI, 2012) for cobalt in soil/water systems. The lower K_d value is likely related to differences in pH and iron oxide levels in the Site-specific system during the completion of the study (**Table 7**). However, this low pH condition resembles a localized acidity at the impacted wells

where SSLs are observed. These results suggest sorption of cobalt in the subsurface downgradient of AP-E would be expected under favorable conditions including the presence of adequate sorption sites on aquifer solids and moderate pH (above 5.5 standard units [s.u.]). This is consistent with groundwater monitoring results downgradient of BRGWC-33S and BRGWC-38S.

Beryllium sorption results are summarized in **Table 7** and depicted in **Figure 6B**. The results also suggest a linear sorption isotherm, with a calculated K_d value of approximately 16.9 L/kg. This value is lower than K_d values reported in literature for beryllium in soil/water systems under circumneutral redox conditions (USEPA, 2005; EPRI, 2012). Similar to the Site-specific cobalt K_d, the lower beryllium K_d in this study, as compared to literature, is likely attributed to the low Site-specific pH in the reactors during completion of the study (i.e., pH range 4.77 – 5.11 s.u.). The results suggest sorption of beryllium in the subsurface downgradient of AP-E, with favorable geochemical conditions and moderate pH, which is consistent with groundwater monitoring results downgradient of BRGWC-38S.

The sorption studies highlighted the importance of pH on the sorption behavior of both cobalt and beryllium. While sorption studies under variable pH conditions were not completed, an evaluation of changing K_d values with changing pH were simulated due to the anticipated importance of pH on sorption. The results of this are summarized in Section 3.3.

2.3.2 Desorption Studies

The results of the desorption batch study are summarized in **Table 8**. Aquifer solids from SB-1 and SB-2 were initially incubated with groundwater samples collected from BRGWC-33S and BRGWC-38S, respectively according to the same method completed for the sorption study discussed above. Reactors were initially spiked with cobalt and beryllium solutions to elevate the initial solid phase concentrations of cobalt and beryllium. This facilitates a more accurate detection of desorption above analytical detection limits, if it occurs.

The materials were mixed for seven days to allow cobalt and beryllium partitioning between the aqueous and solid phases. The geologic material was then separated from the aqueous phase and amended with fresh groundwater from upgradient location BRGWA-2S. Three treatments were tested including unamended slurry reactors (ambient), reactors under reducing conditions (purged periodically by bubbling with nitrogen gas (N_2) then adding 10 mL of hydrogen gas), and reactors under oxidizing conditions (amended with

oxygen gas periodically) to evaluate the stability of sorption with changes in geochemical conditions.

As can be seen in **Table 8**, following the incubation of aquifer materials from SB-1 and SB-2 with upgradient groundwater from BRGWA-2S, cobalt and beryllium concentrations in the aqueous solution remained relatively stable in all systems over the incubation period. This limited desorption indicates the stability of sorption of cobalt and beryllium onto Site geological material at the geochemical conditions of the study. The pH remained relatively unchanged and in the range of 6.6 to 6.8 s.u. in ambient reactors and was slightly higher (7.2 to 7.4 s.u.) in systems amended with oxygen or hydrogen. Overall, both the sorption as well as the desorption study results are consistent with the GCSM that under circumneutral pH conditions, naturally occurring cobalt and beryllium remain immobile due to sorption onto aquifer solids present at the Site.

3.0 GEOCHEMICAL CONCEPTUAL SITE MODEL

The current GCSM describes the occurrence of cobalt and beryllium in Site soils and details potential mechanisms for mobilization of naturally occurring cobalt and beryllium from Site soils to groundwater. This GCSM was developed based on the data and analysis presented in the previous section. Additional data are anticipated to be collected to support the remedy selection process. As new data become available, the GCSM will continue to be evaluated and refined, as appropriate.

3.1 Occurrence of Cobalt and Beryllium

The presence of cobalt in soil samples collected from the upgradient locations suggests that cobalt occurs naturally in the soils at the Site. The concentration of cobalt in soil boring samples collected at the Site ranges from 9 to 72 mg/kg (median=44.5, n=10), and the highest cobalt concentration was detected in upgradient soil samples collected from BRGWA-2S (**Table 6a**). The observed cobalt concentrations in the overburden soils are comparable to average cobalt concentrations in the southeastern United States (6.9 mg/kg) and average crustal concentrations of 25 mg/kg (Haynes, 2017).

The presence of naturally occurring concentrations of cobalt in regional ultramafic rocks (110 mg/kg) and amphibolites (48 mg/kg) is well documented. A study completed by the United States Geological Survey (USGS) has demonstrated that approximately 30% of samples with pH values lower than 5.5 s.u. under anoxic and mixed redox conditions exceeded the highest common reporting level or health-based benchmarks for cobalt in regional groundwater present in ultramafics (Figure 21; USGS 2013).

Similarly, beryllium was detected in soil samples collected from the upgradient locations, suggesting its natural occurrence in the overburden soils at the Site. The concentration of beryllium in soil boring samples collected at the Site ranges from 0.31 to 3.60 mg/kg (median=0.67, n=10) (**Table 6a**), which is comparable to the average crustal concentrations of 3.0 mg/kg (Haynes, 2017).

The occurrence of cobalt and beryllium in the overburden aquifer and at upgradient locations at the Site (**Table 6a**), confirms the presence of a naturally occurring source of cobalt and beryllium in the aquifer solids. The lower groundwater concentrations of these constituents in wells located upgradient to AP-E are attributed to more moderate pH values in upgradient groundwater (**Table 1**). This indicates that naturally occurring cobalt and beryllium are likely immobile in the upgradient aquifer matrix at the Site and that exceedances are localized in BRGWC-33S and BRGWC-38S, where low pH is observed.

Data collected as part of the ongoing remedy selection investigations will continue to be evaluated to assess the nature and occurrence of cobalt and beryllium in Site soils.

3.2 Speciation and Distribution of Cobalt and Beryllium

The speciation of cobalt, beryllium, iron, and manganese was investigated using Eh/pH diagrams, which calculate the most stable/predominant phase for the constituent as a function of Site-specific pH and redox conditions at equilibrium. Downgradient of AP-E, pH ranges from 4.75 s.u. at BRGWC-38S to 7.62 s.u. at PZ-52D (**Table 1**) while Eh ranges from 200.6 millivolts (mV) at PZ-53D to 376.9 mV at BRGWC-33S (**Table 1,** February 2023[2]). Speciation diagrams are presented in **Figures 7a** through **7d**. Due to the similarities in observed speciation diagrams between BRGWC-33S and BRGWC-38S, BRGWC-38S is utilized as representative of conditions in both SSL wells.

Cobalt speciation in natural surface and near-surface environments is dominated by the aqueous cation $Co^{2+}_{(aq)}$ between pH of 2 and 7 s.u. However, at higher pH, cobalt can also be oxidized to Co^{3+}, although this form of cobalt has very low solubility and typically precipitates out of solution (Collins and Kinsela, 2010). Under the Eh-pH conditions evaluated at BRGWC-33S and BRGWC-38S, cobalt in groundwater is predominantly present as soluble Co^{2+} (**Figure 7a**).

Similar to cobalt, beryllium in groundwater occurs in the 2+ oxidation state. At pH values of approximately 6 s.u, and lower, beryllium can form soluble complexes with fluoride (BeF^{+}) or sulfate ($BeSO_4^{0}$) (EPRI, 2006). In alkaline solutions, dissolved beryllium is expected to occur as an aqueous hydroxide complex ($Be(OH)^{+}$, $Be(OH)_2^{0}$, and $Be(OH)^{3-}$). Under the Eh-pH conditions encountered at BRGWC-38S where the beryllium SSL is observed, BeF^{+} is expected to be the predominant beryllium aqueous species (**Figure 7b**).

Additionally, as presented on **Figure 7c** and **7d**, Eh-pH conditions at the wells of interest (BRGWC-33S and BRGWC-38S) are favorable for at least partial dissolution of iron and manganese oxides and oxyhydroxides, if these solid phases are present. Depending on the Site-specific geochemical conditions, most importantly pH, cobalt and beryllium are likely to be present as either dissolved ionic species, adsorbed (complexed) with oxide and oxyhydroxide phases of iron and manganese, or (co)-precipitated, consistent with the literature (ATSDR, 2023; Krupka and Serne, 2002).

Figure 8a presents the relationship between cobalt concentration and pH in groundwater at the Site. The highest cobalt concentrations in groundwater at AP-E correspond to low

[2] Eh is calculated as field ORP + 200 mV (reference electrode)

groundwater pH, as seen in BRGWC-38S, where the pH has generally remained below 5.5 s.u. (**Table 1**) since groundwater monitoring commenced in 2016. Similarly, elevated concentrations of cobalt in exceedance of the GWPS have been observed in BRGWC-33S, where the pH has also consistently been lower than 5.5 s.u. Exceedances of the cobalt GWPS at AP-E, are observed only in wells with pH values less than approximately 5.5 s.u. (**Table 1**). **Figure 8b** presents the relationship between beryllium concentration and pH in groundwater at the Site. Like cobalt, beryllium was only detected in groundwater samples with pH levels less than 5.5 s.u. (**Tables 1** and **2**). Comparatively, the pH of an interstitial water sample collected from AP-E (i.e., IW-E-1) in January 2023 was higher at 5.95 s.u., (**Table 1**) relative to BRGWC-38S and BRGWC-33S. Beryllium was not detected in IW-E-1 and cobalt concentrations were significantly lower (<0.004 mg/L, **Table 1**) in the interstitial water relative to the two downgradient SSL well locations.

Reaction path modeling (Section 3.3) and the relationship of cobalt and beryllium to pH suggest that the low pH (less than approximately 5.5 s.u.) is likely the most important driver of cobalt and beryllium mobilization into groundwater. Additionally, as presented in Eh-pH diagrams for iron and manganese (**Figures 7c** and **7d**), low pH drives the partial dissolution of oxide and oxyhydroxide phases of iron and manganese. As such, cobalt and beryllium that are naturally associated with crystalline and non-crystalline phases of iron and manganese oxides and oxyhydroxides could be mobilized to groundwater under low pH conditions. The pH control on the distribution of cobalt and beryllium in groundwater systems has been documented by numerous published studies. For example, Zhang (2010) reports increased dissolved beryllium concentration in groundwater above 0.004 mg/L, only at pH values of approximately 5 s.u. and lower. Further, Kairies (2005) reports decreased dissolved cobalt concentrations and increased cobalt sorption as pH increases. The potential geochemical mechanism that is expected to drive the observed decrease in pH at the Site is discussed further in Section 3.3.1.

3.3 Site-Specific Mobilization and Attenuation Processes of Cobalt and Beryllium

3.3.1 Site-Specific Mobilization Processes

Data presented in this GCSM suggest that the primary driver for mobilization of naturally-occurring cobalt and beryllium from Site soils to groundwater is a decrease in pH to lower than approximately 5.5 s.u. Multiple potential mechanisms for low pH observed in BRGWC-33S and BRGWC-38S likely exist at the Site. For example, the Site is located in the Piedmont principal aquifer, where studies completed by the USGS have

reported pH values as low as 4.5 to 5.5 s.u. in the aquifers that dominate the crystalline-rock lithology of this region (Figure 21; USGS, 2013 and Figure 4-2; USGS, 2014). Due to silicate weathering, the water in crystalline-rock aquifers (like that observed at the Site) is often poorly buffered resulting in pH variability and generally acidic pH values. In addition to the low buffering capacity and unique mineral weathering that would be expected in the subsurface aquifer downgradient of AP-E, mixing of interstitial water from AP-E with downgradient groundwater could also explain the localized acidity in groundwater at BRGWC-33S and BRGWC-38S, where cobalt and beryllium concentrations are greater than the GWPS.

To confirm the primary mobilization mechanism and identify the source of localized acidity downgradient of AP-E, a reaction path model evaluation was conducted to confirm the key underlying geochemical processes pertinent to the variations in pH conditions at the Site. The reaction path evaluation was completed using equilibrium batch PHREEQC modeling with Site specific groundwater and solid phase data as inputs to evaluate the mobilization of cobalt and beryllium under varying pH levels in two phases. The first phase confirmed that low pH was the driver for mobilization of cobalt and beryllium from Site soils and the second phase identified the source of the low pH as oxidation and precipitation of iron in interstitial water migrating from AP-E. This reaction path modeling was then utilized as the foundation for reactive transport modeling to understand the applicability of potential remedies at the Site. More information on the geochemical modeling approach is provided in the *Transport Modeling Report* provided in Appendix D of the Remedy Selection Report.

The first phase of the reaction path modeling utilized groundwater data from BRGWC-38S (January 2023) and solid phase data (mineralogy data from PZ-53D collocated with the screen interval of BRGWC-38S) to evaluate the mobilization of cobalt and beryllium into the aqueous phase under varying pH levels. The solid phase iron and manganese oxides and oxyhydroxides, modeled as hydrous ferric oxide (HFO), were initially loaded with cobalt and beryllium at levels similar to the environmentally available fraction (associated with amorphous and crystalline iron and manganese oxides from SEP data) of cobalt and beryllium from background location BRGWA-6S. Equilibrium batch reactions were then conducted under varying pH levels. The pH dependent partitioning of cobalt and beryllium between the solid and aqueous phases was then estimated (**Figure 9a**). Results indicate that cobalt is mainly attenuated through sorption to the solid phase (HFO) at pH values greater than approximately 6.5 s.u. The cobalt partitioning under equilibrium conditions, however, was strongly influenced by incremental changes in pH values between 5.0 and 6.5. A qualitatively similar pattern was observed for mobilization and attenuation of beryllium with changes in pH. Thus, the reaction path modeling

confirmed that the decrease in pH serves as the primary mechanism driving the mobilization of naturally occurring cobalt and beryllium from Site soils to groundwater.

The second phase of the reaction path modeling evaluated what happened when reducing water (similar to IW-E-1 or interstitial water from AP-E) with varying iron content was exposed to oxic conditions and dissolved oxygen levels similar to those in the downgradient wells of AP-E. Oxidation of reducing AP-E water with elevated iron content can cause precipitation of iron and reduction in groundwater pH. The results, depicted in **Figure 9b**, indicate that the oxidation and precipitation of iron, initially present at levels >10 mg/L generates acidity similar to what is observed at the SSL wells. The measured iron concentration at IW-E-1 was 22.4 mg/L, and as such iron precipitation from impacted water migrating through AP-E leads to low pH conditions downgradient of AP-E. The low pH conditions result in dissolution and/or desorption of cobalt and beryllium associated with iron and manganese oxides and oxyhydroxides.

The reaction path modeling serves as the foundation for understanding the mobilization and attenuation of beryllium and cobalt in groundwater downgradient of AP-E. This modeling provides the foundation for reactive transport modeling to investigate the applicability of corrective measures to attenuate the beryllium and cobalt in groundwater at the Site. Reactive transport modeling is discussed in further detail in Appendix D to the Remedy Selection Report.

Interstitial water data (**Table 1**) shows more moderate pH and TDS values relative to the downgradient SSL locations. As closure by removal of AP-E proceeds, closure activities have the potential to further enhance the removal of the low pH source of water to the detection wells downgradient of AP-E and will continue to be monitored.

3.3.2 Site-Specific Attenuation Processes

Adsorption and surface complexation of cobalt on iron and manganese oxides and oxyhydroxides under neutral to alkaline pH conditions and co-precipitation of cobalt is expected to drive the attenuation of cobalt in the Site soils. Dissolved Co^{2+} in groundwater binds to negatively charged mineral surfaces of aquifer matrix materials under alkaline pH conditions. Total metals, mineralogical, and SEP data indicate that clay minerals and iron and manganese oxides and oxyhydroxides are present in amounts to favor adsorption and attenuation of cobalt under favorable geochemical conditions. Due to their high surface area, iron and manganese oxides and oxyhydroxides are excellent sorbents of trace elements and subsequently often control their mobility, fate and transport in water (e.g. Smith, 1999). In addition to adsorption, cobalt initially complexed with the mineral

surfaces of iron and manganese oxides and oxyhydroxides can become entrained in the crystal structure as the mineral continues to grow. This process more commonly occurs with poorly crystalline, fast growing iron and manganese oxides and oxyhydroxides that precipitate under oxidizing conditions. This process appears to have been counteracted at AP-E due to the localized acidifying processes observed in the vicinity of BRGWC-33S and BRGWC-38S.

Beryllium also exhibits a strong affinity for sorption onto iron and manganese oxides and oxyhydroxides. The extent of sorption of beryllium is controlled by pH and the concentrations of competing ligands for binding sites. The literature indicates that the majority of beryllium is sequestered on iron and manganese hydroxides at pH 4.5 s.u. and greater, and complete removal by adsorption and/or precipitation can occur at pH above 5.5 s.u. Additionally, beryllium is expected to precipitate as insoluble hydroxides within the pH range of 5 to 8 s.u., depending on geochemical conditions (EPRI, 2006). The extent of attenuation, however, can be limited by pH-dependent complexation with fluoride, sulfate and dissolved organic matter (EPRI, 2006). Consistent with literature, beryllium was not detected in wells where the pH exceeded 5 s.u. at the Site.

These mechanisms of attenuation of cobalt and beryllium through surface complexation and (co-)precipitation are likely occurring around BRGWC-33S and BRGWC-38S, as supported by results from downgradient assessment wells where cobalt and beryllium are not measured above the GWPS. However, the extent of attenuation has not been investigated in detail. Additional data collected as part of remedy selection may be evaluated to further characterize cobalt and beryllium attenuation at the Site, as necessary.

3.4 Conceptual Site Model - Summary

AP-E will be closed by removal of CCR materials from the unit, which will serve as a source control measure to limit the potential for migration of CCR-related constituents to groundwater. Based on the Site-specific data discussed in the previous section, the key findings can be summarized as follows:

- Cobalt and beryllium occur naturally in the soils at the Site. The concentrations of cobalt in soil samples range from 9 to 72 mg/kg, and the concentration of beryllium in soil samples range from 0.31 to 3.6 mg/kg (**Table 6a** and **6b**);

- SEP data indicate that cobalt and beryllium are associated with multiple phases and a significant fraction of cobalt and beryllium are associated with environmentally available fractions in Site soils;

- The concentration of cobalt and beryllium in groundwater is influenced by groundwater pH. A decrease in pH (below approximately 5.5 s.u.) is likely the primary driver for desorption of cobalt and beryllium from iron and manganese oxides/oxyhydroxides leading to mobilization of these constituents from the aquifer matrix to groundwater;

- Reaction path modeling suggests that oxidation of iron in groundwater migrating through AP-E can generate acidity at levels similar to those observed in the vicinity of BRGWC-33S and BRGWC-38S; and

- The primary mechanism of attenuation of cobalt and beryllium at the Site is adsorption (surface complexation) to iron and manganese oxides and oxyhydroxides and (co)precipitation under neutral to alkaline pH conditions.

Attenuation processes for beryllium and cobalt appear to be ongoing at the Site in the vicinity of BRGWC-38S as evidenced by the decreasing trends in constituent concentrations in this location. The historical groundwater monitoring record indicates similar attenuation processes were active at BRGWC-33S as well. However, recent increases in the concentration of cobalt in groundwater have been observed in the last two years. The localized elevated concentrations of cobalt at BRGWC-33S are expected to be transient, associated with dewatering and construction activities within AP-E that have led to changes in hydrogeological conditions, changes in the groundwater flow field in the vicinity of BRGWC-33S, and variability of source water upgradient of BRGWC-33S causing increases in cobalt in groundwater. Therefore, these increased concentrations are anticipated to likely stabilize or return to previous trends as closure construction progresses and is completed. Natural attenuation processes, as documented in this GCSM are likely to become favorable again in the vicinity of BRGWC-33S as evidenced by decreasing concentration trends in the historical monitoring data prior to closure activities commencing.

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TABLES

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I
	Sample Date:	8/31/2016	11/16/2016	2/21/2017	6/12/2017	9/26/2017	2/13/2018	6/26/2018	12/18/2018	3/19/2019	8/27/2019
	Parameter (1,2,3)										
	Boron	0.0072 J	0.0117 J	0.0088 J	0.0133 J	0.0093 J	0.0141 J	0.012 J	0.0086 J	0.0055 J	--
	Calcium	12.6	12.1	11.4	9.34	14.3	< 2.02	16 J	14.5 J	14.3 J	--
	Chloride	2.3	2	2	2.1	2	2.1	2.4	1.8	2.5	--
	Fluoride	0.11 J	0.05 J	0.14 J	0.16 J	0.14 J	< 0.029	0.085 J	0.085 J	0.066 J	< 0.029
	pH (field) (SU)	7.16	6.96	7.15	--	7.02	7.44	6.93	6.76	6.87	6.79
	Sulfate	7.5	6.6	6.1	5	5.4	4.7 J	6.2	5.9	6	--
	TDS	151	69	68	161	167	165	188	145	154	--
APPENDIX IV	Antimony	0.0009 J	< 0.0008	< 0.0008	< 0.0006	< 0.0006	< 0.0006	< 0.00078	< 0.00078	--	< 0.00027
	Arsenic	< 0.0016	< 0.0016	< 0.0016	0.0007 J	0.001 J	< 0.00052	0.00062 J	< 0.00057	--	< 0.00035
	Barium	0.0239	0.0147	0.0109	0.0094 J	0.0156	0.0134	0.014	0.0076 J	--	0.012
	Beryllium	< 0.00008	< 0.00008	< 0.00008	< 0.00009	< 0.00009	< 0.000091	< 0.00005	< 0.00005	--	< 0.000074
	Cadmium	< 0.00007	< 0.00007	< 0.00007	< 0.0001	< 0.0001	< 0.00014	< 0.000093	< 0.000093	--	< 0.00011
	Chromium	0.001 J	< 0.0009	< 0.0009	0.0005 J	0.0005 J	< 0.00045	< 0.0016	< 0.0016	--	0.0004 J
	Cobalt	0.0016 J	0.0006 J	< 0.0005	< 0.0003	< 0.0003	< 0.00026	< 0.00052	< 0.00052	--	< 0.0003
	Fluoride	0.11 J	0.05 J	0.14 J	0.16 J	0.14 J	< 0.029	0.085 J	0.085 J	0.066 J	< 0.029
	Lead	< 0.0001	< 0.0001	< 0.0001	0.00008 J	0.00007 J	< 0.000067	< 0.00027	< 0.00027	--	< 0.000046
	Lithium	0.0268 J	0.0201 J	0.0128 J	0.0245 J	0.0549	0.0595	0.089	0.024 J	--	0.035 J
	Mercury	< 0.000041	< 0.000041	< 0.000041	0.00004 J	< 0.000036	0.00021	< 0.000036	< 0.000036	--	< 0.00014
	Molybdenum	0.0021 J	< 0.0017	0.0021 J	0.0021 J	0.0011 J	0.0019 J	< 0.0019	< 0.0019	--	< 0.00095
	Radium-226+228 (pCi/L)	--	0.824	1.01	< 1.2 U	< 1.26 U	< 1.13 U	< 1.12 U	< 0.82 U	--	1.11
	Selenium	< 0.001	< 0.001	< 0.001	< 0.0018	< 0.0018	< 0.0018	< 0.0014	< 0.0014	--	< 0.0013
	Thallium	< 0.0002	< 0.0002	< 0.0002	< 0.00005	< 0.00005	< 0.000052	< 0.00014	< 0.00014	--	< 0.000052
FIELD	Oxidation-reduction potential (mV)	-24.9	-90.9	-123.7	--	280.7	-89.8	-84.4	68.25	-77.5	-5.7
	pH (SU)	7.16	6.96	7.15	--	7.02	7.44	6.93	6.76	6.87	6.79
	RDO Concentration	0.21	0.26	0.83	--	0.45	0.07	0.67	0.14	0.21	0.28
	Specific Conductance (µS/cm)	191.4	186.1	212.9	--	254.8	236.3	282.9	192.08	181	200.3
	Temperature (deg C)	19.72	18.48	17.71	--	20.39	16.59	22.66	15.03	16.01	20.39
	Turbidity (NTU)	2.8	4.71	3.61	--	0.6	0.48	0.22	--	0.38	0.81
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	--
	Magnesium	--	--	--	--	--	--	--	--	--	--
	Manganese	--	--	--	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	--	--	--	--	--	--	--	--
	Sodium	--	--	--	--	--	--	--	--	--	--
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I	BRGWA-2I
	Sample Date:	10/15/2019	3/3/2020	8/18/2020	9/15/2020	3/1/2021	9/22/2021	2/1/2022	8/23/2022	1/24/2023	8/22/2023
	Parameter (1,2,3)										
	Boron	0.0067 J	0.0082 J	--	< 0.0052	< 0.0052	< 0.0086	< 0.0086	0.00592 J	< 0.0052	0.00649 J
	Calcium	15.1	20	--	14.1	15.4	15.9	14.4	13.9	14.2	12.6
	Chloride	2.2	1.9	--	1.9	1.8	1.7	1.8	2.02	2.09	1.9
	Fluoride	< 0.029	0.066 J	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.033	< 0.033	0.267
	pH (field) (SU)	6.57	6.71	6.59	6.64	6.66	6.78	6.83	6.67	6.7	6.91
	Sulfate	5.2	7.1	--	5.9	4.7	5.2	5.4	5.66	3.58	6.85
	TDS	140	155	--	116	98	129	126	117	93	81
APPENDIX IV	Antimony	0.00047 J	< 0.00027	0.00054 J	< 0.00028	< 0.00028	< 0.00078	< 0.00078	< 0.001	< 0.001	< 0.001
	Arsenic	0.0008 J	0.0027 J	< 0.00078	< 0.00078	< 0.00078	< 0.0011	0.0012 J	< 0.002	< 0.002	< 0.002
	Barium	0.013	0.017	0.01 J	0.0083 J	0.0074	0.0075	0.0066	0.00954	0.00453	0.0068
	Beryllium	< 0.000074	< 0.000074	< 0.000046	< 0.000046	< 0.000046	< 0.000054	< 0.000054	< 0.0002	< 0.0002	< 0.0002
	Cadmium	< 0.00011	< 0.00011	< 0.00012	< 0.00012	< 0.00012	< 0.00011	< 0.00011	< 0.0003	< 0.0003	< 0.0003
	Chromium	< 0.00039	0.00047 J	0.00096 J	< 0.00055	< 0.00055	< 0.0011	0.0013 J	< 0.003	< 0.003	< 0.003
	Cobalt	< 0.0003	< 0.0003	< 0.00038	< 0.00038	< 0.00038	0.0015 J	0.00079 J	0.000767 J	0.00154	0.000707 J
	Fluoride	< 0.029	0.066 J	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.033	< 0.033	0.267
	Lead	< 0.000046	< 0.000046	< 0.000036	< 0.000036	< 0.000036	< 0.00089	< 0.00089	< 0.0005	< 0.0005	< 0.0005
	Lithium	0.028 J	0.055	0.054	0.033	0.027 J	0.021 J	0.023 J	0.0262	0.00919 J	0.0209
	Mercury	--	--	< 0.000078	< 0.000078	< 0.000078	0.0001 J	< 0.00013	< 0.000067	< 0.000067	< 0.000067
	Molybdenum	< 0.00095	< 0.00095	0.0011 J	0.0007 J	< 0.00069	0.0012 J	0.0013 J	0.0024	0.000601 J	0.00169
	Radium-226+228 (pCi/L)	< 2.18 U	--	< 1.47 U	< 2.26 U	< 0.876 U	< 1.24 U	< 1.05 U	1.7 U	2.05 U	0.857 U
	Selenium	< 0.0013	< 0.0013	< 0.0016	< 0.0016	< 0.0016	< 0.0014	< 0.0014	< 0.0015	< 0.0015	< 0.0015
	Thallium	< 0.000052	< 0.000052	< 0.00014	< 0.00014	< 0.00014	< 0.00018	< 0.00018	< 0.0006	< 0.0006	< 0.0006
FIELD	Oxidation-reduction potential (mV)	50.4	51.9	85	2.2	46.2	37.1	69	81.8	42.8	84.58
	pH (SU)	6.57	6.71	6.59	6.64	6.66	6.78	6.83	6.67	6.7	6.91
	RDO Concentration	0.2	0.36	0.11	0.073	0.28	0.57	0.64	0.91	0.79	0.24
	Specific Conductance (µS/cm)	190	187.4	174.99	188.68	170.9	183.2	164.4	118.47	102.25	151.72
	Temperature (deg C)	18.68	17.54	22.54	19.89	17.65	20.71	17.33	20.93	15.89	21.91
	Turbidity (NTU)	0.54	1.12	1.68	0.91	0.68	2.94	2.25	1.22	1.69	1.1
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	79.3	--	72.3	62.4	65.2	71.7
	Aluminum	< 0.032	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	88	--	--	--	79.3	--	72.3	62.4	65.2	71.7
	Alkalinity (Carbonate as CaCO3)	< 20	--	--	--	< 5	--	< 1.8	< 1.45	< 1.45	< 0.725
	Dissolved Organic Carbon	--	--	--	--	< 0.5	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	0	--
	Iron	0.65	--	--	--	0.64	--	0.21	0.183	0.134	0.0904 J
	Magnesium	6.4	--	--	--	7	--	7.4	8.82	8.28	7.27
	Manganese	0.09	--	--	--	0.024 J	--	0.021 J	0.0134	0.028	0.0145
	Nitrate Nitrite	--	--	--	--	0.15	--	--	--	--	--
	Nitrogen Nitrate	0.12	--	--	--	--	--	--	--	1.41	< 0.033
	Orthophosphate	< 0.02	--	--	--	--	--	--	--	--	--
	Potassium	7	--	--	--	6.6	--	5.9	5.88	2.85	5.25
	Sodium	7.6	--	--	--	5.9	--	5.5	5.73	5.29	5.26
	Sulfide	--	--	--	--	--	--	--	--	< 0.033	< 0.033
	Total Hardness	--	--	--	--	67.6	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

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TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

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	Sample Date:	10/30/2023	8/31/2016	11/16/2016	2/21/2017	6/13/2017	9/26/2017	2/13/2018	6/26/2018	12/18/2018	3/19/2019
	Parameter (1,2,3)										
	Boron	--	< 0.0064	0.0109 J	< 0.0064	< 0.006	< 0.006	< 0.006	< 0.0039	< 0.0039	< 0.0039
	Calcium	--	4.09	4.25	4.02	3.84	3.31	3.94	3.6	3.8	3.9
	Chloride	--	2	1.8	1.8	1.7	1.8	1.7	2.2	1.9	2
	Fluoride	--	0.05 J	0.04 J	0.05 J	0.04 J	< 0.03	< 0.029	0.048 J	< 0.029	0.037 J
	pH (field) (SU)	--	6.2	6.12	6.24	6.19	6.15	6.18	6.05	5.92	6.18
	Sulfate	--	0.38 J	0.36 J	1.5	0.67 J	0.62 J	< 0.017	0.69 J	0.72 J	0.78 J
	TDS	--	88	41	< 10	53	45	63	71	78	68
APPENDIX IV	Antimony	--	< 0.0008	< 0.0008	< 0.0008	0.0011 J	< 0.0006	< 0.0006	< 0.00078	< 0.00078	--
	Arsenic	--	< 0.0016	< 0.0016	< 0.0016	< 0.0005	< 0.0005	< 0.00052	< 0.00057	0.00082 J	--
	Barium	--	0.0099 J	0.0102	0.0094 J	0.0094 J	0.0096 J	0.0102	0.0093 J	0.01	--
	Beryllium	--	< 0.00008	< 0.00008	< 0.00008	< 0.00009	< 0.00009	< 0.000091	< 0.00005	< 0.00005	--
	Cadmium	--	< 0.00007	< 0.00007	< 0.00007	< 0.0001	< 0.0001	< 0.00014	< 0.000093	< 0.000093	--
	Chromium	--	0.0034 J	0.0029 J	0.0036 J	0.0038 J	0.0045 J	< 0.00045	0.008 J	0.012	--
	Cobalt	--	0.0034 J	0.003 J	0.0028 J	0.0025 J	0.002 J	< 0.00026	0.0019 J	0.0032 J	--
	Fluoride	--	0.05 J	0.04 J	0.05 J	0.04 J	< 0.03	< 0.029	0.048 J	< 0.029	0.037 J
	Lead	--	< 0.0001	< 0.0001	< 0.0001	< 0.00007	0.00007 J	< 0.000067	< 0.00027	< 0.00027	--
	Lithium	--	< 0.0021	< 0.0021	< 0.0021	< 0.0015	< 0.0015	< 0.0015	< 0.00097	< 0.00097	--
	Mercury	--	< 0.000041	< 0.000041	< 0.000041	< 0.000041	< 0.000036	0.00019 J	< 0.000036	< 0.000036	--
	Molybdenum	--	< 0.0017	< 0.0017	< 0.0017	< 0.001	< 0.001	< 0.001	< 0.0019	< 0.0019	--
	Radium-226+228 (pCi/L)	--	--	0.43	0.96	< 1.11 U	< 1.35 U	< 1.14 U	< 1.18 U	< 0.796 U	--
	Selenium	--	< 0.001	< 0.001	< 0.001	< 0.0018	< 0.0018	< 0.0018	< 0.0014	< 0.0014	--
	Thallium	--	< 0.0002	< 0.0002	< 0.0002	< 0.00005	< 0.00005	< 0.000052	< 0.00014	< 0.00014	--
FIELD	Oxidation-reduction potential (mV)	--	69	53.1	62.4	104.8	598	158.3	135.1	37.2	-63.4
	pH (SU)	--	6.2	6.12	6.24	6.19	6.15	6.18	6.05	5.92	6.18
	RDO Concentration	--	1.27	0.3	1.64	0.67	1.56	0.56	1.05	1.25	1.03
	Specific Conductance (µS/cm)	--	69.4	63.3	71.6	69.1	68.4	64.1	62.8	64.6	64.2
	Temperature (deg C)	--	19.91	18.48	17.36	18.34	18.15	16.18	19.79	16.15	15.29
	Turbidity (NTU)	--	2.87	0.79	0.26	0.32	0.78	3.11	1.08	0.62	0.95
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	--
	Magnesium	--	--	--	--	--	--	--	--	--	--
	Manganese	--	--	--	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	--	--	--	--	--	--	--	--
	Sodium	--	--	--	--	--	--	--	--	--	--
	Sulfide	< 0.81	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-2S	BRGWA-2S	BRGWA-2S	BRGWA-2S	BRGWA-2S	BRGWA-2S	BRGWA-2S	BRGWA-2S	BRGWA-2S	BRGWA-2S
	Sample Date:	8/27/2019	10/15/2019	3/3/2020	8/18/2020	9/15/2020	3/2/2021	9/22/2021	2/1/2022	8/23/2022	10/12/2022
	Parameter (1,2,3)										
	Boron	--	< 0.0049	< 0.0049	--	< 0.0052	< 0.0052	< 0.0086	< 0.0086	0.00532 J	--
	Calcium	--	3.7	4	--	3.9	4	4.3	4.4	4.65	--
	Chloride	--	1.9	1.9	--	1.7	1.7	1.5	1.6	2.18	--
	Fluoride	< 0.029	< 0.029	0.05 J	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.033	--
	pH (field) (SU)	6.09	6.06	6.1	6.06	6.01	6.2	6.06	5.95	5.95	5.69
	Sulfate	--	0.47 J	0.93 J	--	< 0.5	< 0.5	< 0.5	< 0.5	0.452	--
	TDS	--	66	41	--	69	43	66	72	45	--
APPENDIX IV	Antimony	< 0.00027	< 0.00027	< 0.00027	0.00042 J	< 0.00028	< 0.00028	< 0.00078	< 0.00078	< 0.001	--
	Arsenic	< 0.00035	0.00063 J	0.00098 J	< 0.00078	< 0.00078	< 0.00078	< 0.0011	< 0.0011	< 0.002	--
	Barium	0.0095 J	0.0091 J	0.011	0.01	0.0094 J	0.0094	0.0097	0.01	0.012	--
	Beryllium	< 0.000074	< 0.000074	< 0.000074	< 0.000046	< 0.000046	< 0.000046	< 0.000054	< 0.000054	< 0.0002	--
	Cadmium	< 0.00011	< 0.00011	< 0.00011	< 0.00012	< 0.00012	< 0.00012	< 0.00011	< 0.00011	< 0.0003	--
	Chromium	0.0083 J	0.0083 J	0.0098 J	0.0085 J	0.0082 J	0.0074	0.0091	0.0092	0.00908 J	--
	Cobalt	0.0012 J	0.00097 J	0.0015 J	0.0014 J	0.001 J	0.001 J	< 0.00039	0.0011 J	0.000844 J	--
	Fluoride	< 0.029	< 0.029	0.05 J	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.033	--
	Lead	0.000058 J	< 0.000046	< 0.000046	< 0.000036	< 0.000036	< 0.000036	< 0.00089	< 0.00089	< 0.0005	--
	Lithium	< 0.00078	< 0.00078	< 0.00078	< 0.00081	< 0.00081	< 0.00081	< 0.00073	< 0.00073	< 0.003	--
	Mercury	< 0.00014	--	--	< 0.000078	< 0.000078	< 0.000078	0.0001 J	< 0.00013	< 0.000067	--
	Molybdenum	< 0.00095	< 0.00095	< 0.00095	< 0.00069	< 0.00069	< 0.00069	< 0.00074	< 0.00074	< 0.0002	--
	Radium-226+228 (pCi/L)	1.47	< 2.56 U	--	< 1.46 U	< 1.68 U	< 0.849 U	< 1.37 U	< 0.86 U	0.531 U	--
	Selenium	< 0.0013	< 0.0013	< 0.0013	< 0.0016	< 0.0016	< 0.0016	< 0.0014	< 0.0014	< 0.0015	--
	Thallium	< 0.000052	< 0.000052	< 0.000052	< 0.00014	< 0.00014	< 0.00014	< 0.00018	< 0.00018	< 0.0006	--
FIELD	Oxidation-reduction potential (mV)	9.3	73.2	60	39.1	47.33	40.8	49.7	90.6	68.3	107.3
	pH (SU)	6.09	6.06	6.1	6.06	6.01	6.2	6.06	5.95	5.95	5.69
	RDO Concentration	3.2	1.82	2.79	0.28	0.582	0.56	0.87	1.3	3	1.84
	Specific Conductance (µS/cm)	63.7	65.9	51.4	61.6	65.68	59.28	69.21	69.07	55.77	63.73
	Temperature (deg C)	19.47	18.31	17.38	21.63	19.11	16.9	19.95	17.99	20.61	18.16
	Turbidity (NTU)	0.33	0.66	1.32	0.78	0.52	2.11	0.71	0.81	0.48	2.04
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	31.9	--	30.1	32.6	--
	Aluminum	--	< 0.032	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	26	--	--	--	31.9	--	30.1	32.6	--
	Alkalinity (Carbonate as CaCO3)	--	< 20	--	--	--	< 5	--	< 1.8	< 1.45	--
	Dissolved Organic Carbon	--	--	--	--	--	< 0.5	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	0.055	--	--	--	0.19	--	0.13	0.0763 J	--
	Magnesium	--	3.9	--	--	--	3.9	--	4	4.86	--
	Manganese	--	0.086	--	--	--	0.064	--	0.052	0.0391	--
	Nitrate Nitrite	--	--	--	--	--	0.23	--	--	--	--
	Nitrogen Nitrate	--	0.23	--	--	--	--	--	--	--	--
	Orthophosphate	--	< 0.02	--	--	--	--	--	--	--	--
	Potassium	--	0.41	--	--	--	0.36	--	0.29	0.439	--
	Sodium	--	2.9	--	--	--	3.2	--	3.1	3.36	--
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	26.5	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-2S	BRGWA-2S	BRGWA-2S	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I
	Sample Date:	1/24/2023	8/22/2023	10/30/2023	8/31/2016	11/16/2016	2/20/2017	6/12/2017	9/26/2017	2/13/2018	6/26/2018
	Parameter (1,2,3)										
	Boron	< 0.0052	0.00738 J	--	< 0.0321	0.0187 J	--	< 0.006	< 0.006	< 0.006	0.0042 J
	Calcium	4.86	5.02	--	13.5	14.9	--	13.7	14.4	< 2.02	13.5 J
	Chloride	2.16	2.14	--	4.4	4.4	--	4.2	4.4	4.7	4.5
	Fluoride	< 0.033	0.229	--	0.07 J	0.03 J	--	0.008 J	< 0.03	< 0.029	0.045 J
	pH (field) (SU)	5.26	5.97	--	6.53	6.4	6.44	6.4	6.31	6.62	6.29
	Sulfate	0.465	0.526	--	2.7	3.4	--	3.7	4.1	6.6	3.5
	TDS	63	36	--	138	77	--	132	108	141	133
APPENDIX IV	Antimony	< 0.001	< 0.001	--	< 0.0008	< 0.0008	--	< 0.0006	< 0.0006	< 0.0006	< 0.00078
	Arsenic	< 0.002	< 0.002	--	< 0.0016	< 0.0016	--	0.0007 J	0.0009 J	< 0.00052	< 0.00057
	Barium	0.0118	0.0135	--	0.0273	0.0365	--	0.0322	0.0364	0.054	0.032
	Beryllium	< 0.0002	< 0.0002	--	< 0.0004	< 0.00008	--	< 0.00009	< 0.00009	< 0.000091	< 0.00005
	Cadmium	< 0.0003	< 0.0003	--	< 0.00007	< 0.00007	--	< 0.0001	< 0.0001	< 0.00014	< 0.000093
	Chromium	0.0095 J	0.00921 J	--	0.0058 J	0.0051 J	--	0.0052 J	0.0039 J	< 0.00045	0.0053 J
	Cobalt	0.000829 J	0.000707 J	--	0.0013 J	0.0012 J	--	0.0011 J	0.0016 J	< 0.00026	0.0009 J
	Fluoride	< 0.033	0.229	--	0.07 J	0.03 J	--	0.008 J	< 0.03	< 0.029	0.045 J
	Lead	< 0.0005	< 0.0005	--	< 0.0001	< 0.0001	--	< 0.00007	< 0.00007	< 0.000067	< 0.00027
	Lithium	< 0.003	< 0.003	--	< 0.0103	0.0033 J	--	0.0019 J	0.0022 J	0.0041 J	0.0025 J
	Mercury	< 0.000067	< 0.000067	--	< 0.000041	< 0.000041	--	< 0.000041	< 0.000036	< 0.000036	< 0.000036
	Molybdenum	< 0.0002	< 0.0002	--	0.004 J	0.0038 J	--	0.005 J	0.0053 J	0.008 J	0.0041 J
	Radium-226+228 (pCi/L)	1.35 U	0.592 U	--	--	0.493	0.534	< 0.989 U	< 1.28 U	< 1.07 U	< 1.53 U
	Selenium	< 0.0015	< 0.0015	--	< 0.001	< 0.001	--	< 0.0018	< 0.0018	< 0.0018	< 0.0014
	Thallium	< 0.0006	< 0.0006	--	< 0.0002	< 0.0002	--	< 0.00005	< 0.00005	< 0.000052	< 0.00014
FIELD	Oxidation-reduction potential (mV)	105.1	42	--	86.7	118.6	110.5	230.22	1,071.3	83.1	148.9
	pH (SU)	5.26	5.97	--	6.53	6.4	6.44	6.4	6.31	6.62	6.29
	RDO Concentration	4.39	1.31	--	3.92	3.55	3.05	3.11	2.02	0.98	3.42
	Specific Conductance (µS/cm)	65.34	50.35	--	168.9	157.9	170.8	167.62	169.1	174.2	158.7
	Temperature (deg C)	15.58	19.8	--	20.48	18.03	19.31	20.21	23.14	16.15	20.97
	Turbidity (NTU)	0.64	0.94	--	0	1.06	1.02	0.46	0.81	0.54	0.09
Geochem	Alkalinity (total) as CaCO3	35	37.1	--	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	35	37.1	--	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	< 1.45	< 0.725	--	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	0	--	--	--	--	--	--	--	--	--
	Iron	0.0824 J	0.0513 J	--	--	--	--	--	--	--	--
	Magnesium	5.34	4.66	--	--	--	--	--	--	--	--
	Manganese	0.0348	0.0283	--	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	0.327	0.218	--	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	0.432	0.415	--	--	--	--	--	--	--	--
	Sodium	3.63	3.09	--	--	--	--	--	--	--	--
	Sulfide	< 0.033	< 0.033	< 0.81	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

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(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5I
	Sample Date:	12/18/2018	3/19/2019	8/27/2019	10/15/2019	3/3/2020	8/18/2020	9/15/2020	3/2/2021	9/21/2021	2/1/2022
	Parameter (1,2,3)										
	Boron	< 0.0039	< 0.0039	--	< 0.0049	< 0.0049	--	< 0.0052	0.0053 J	< 0.0086	< 0.0086
	Calcium	16.4 J	12.3 J	--	14.4	14.9	--	12.7	13.2	14.1	14.5
	Chloride	4.5	4.5	--	4.2	3.9	--	3.7	3.8	3.2	3.5
	Fluoride	< 0.029	< 0.029	< 0.029	< 0.029	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	pH (field) (SU)	6.57	6.45	6.37	6.77	6.29	6.29	6.27	6.47	6.32	6.38
	Sulfate	4.3	3	--	3.8	2.8	--	1.7	2.2	2.3	2
	TDS	138	130	--	175	< 10	--	100	80	108	129
APPENDIX IV	Antimony	< 0.00078	--	< 0.00027	< 0.00027	< 0.00027	< 0.00028	< 0.00028	< 0.00028	< 0.00078	< 0.00078
	Arsenic	0.00097 J	--	< 0.00035	0.00058 J	0.0024 J	< 0.00078	< 0.00078	< 0.00078	< 0.0011	0.0013 J
	Barium	0.038	--	0.028	0.032	0.028	0.022	0.022	0.023	0.025	0.028
	Beryllium	< 0.00005	--	< 0.000074	< 0.000074	< 0.000074	< 0.000046	< 0.000046	< 0.000046	< 0.000054	< 0.000054
	Cadmium	< 0.000093	--	< 0.00011	< 0.00011	< 0.00011	< 0.00012	< 0.00012	< 0.00012	< 0.00011	< 0.00011
	Chromium	0.0032 J	--	0.0055 J	0.0047 J	0.0069 J	0.0069 J	0.0069 J	0.0064	0.0064	0.0066
	Cobalt	0.00062 J	--	0.00068 J	0.00083 J	0.00043 J	0.00048 J	0.0005 J	0.00053 J	0.00071 J	0.0007 J
	Fluoride	< 0.029	< 0.029	< 0.029	< 0.029	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead	< 0.00027	--	< 0.000046	< 0.000046	< 0.000046	< 0.000036	0.0013 J	0.000037 J	< 0.00089	< 0.00089
	Lithium	0.0032 J	--	0.0019 J	0.002 J	0.0013 J	0.00095 J	0.001 J	0.00081 J	0.0012 J	0.0011 J
	Mercury	< 0.000036	--	< 0.00014	--	--	< 0.000078	< 0.000078	< 0.000078	0.0001 J	< 0.00013
	Molybdenum	0.0048 J	--	0.0028 J	0.0035 J	0.0023 J	0.0015 J	0.0015 J	0.0015 J	0.002 J	0.002 J
	Radium-226+228 (pCi/L)	< 1.53 U	--	1.19	< 2.8 U	--	< 1.43 U	< 1.96 U	< 0.885 U	< 1.28 U	1.23
	Selenium	< 0.0014	--	< 0.0013	< 0.0013	< 0.0013	< 0.0016	< 0.0016	< 0.0016	< 0.0014	< 0.0014
	Thallium	< 0.00014	--	< 0.000052	< 0.000052	< 0.000052	< 0.00014	< 0.00014	< 0.00014	< 0.00018	< 0.00018
FIELD	Oxidation-reduction potential (mV)	154.7	-65.2	41.5	60.6	75.4	62.3	54.6	116.8	100.5	119.1
	pH (SU)	6.57	6.45	6.37	6.77	6.29	6.29	6.27	6.47	6.32	6.38
	RDO Concentration	2.4	4.27	3.96	3.5	5.39	5.14	5.529	5.9	5.01	5.51
	Specific Conductance (µS/cm)	183.6	159.9	163.3	168.91	133.3	146.5	159.23	145.48	186.3	166.4
	Temperature (deg C)	17.46	17.81	19.7	19.55	17.46	20.88	19.14	16.87	19.23	17.73
	Turbidity (NTU)	0.66	0.85	0.24	0.34	1.03	0.39	0.62	1.95	4.36	0.95
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	79.3	--	75
	Aluminum	--	--	--	< 0.032	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	74	--	--	--	79.3	--	75
	Alkalinity (Carbonate as CaCO3)	--	--	--	< 20	--	--	--	< 5	--	< 1.8
	Dissolved Organic Carbon	--	--	--	--	--	--	--	< 0.5	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	0.024 J	--	--	--	< 0.016	--	< 0.025
	Magnesium	--	--	--	9.8	--	--	--	8.9	--	9.2
	Manganese	--	--	--	< 0.0061	--	--	--	< 0.0017	--	< 0.0043
	Nitrate Nitrite	--	--	--	--	--	--	--	0.21	--	--
	Nitrogen Nitrate	--	--	--	0.22	--	--	--	--	--	--
	Orthophosphate	--	--	--	0.062	--	--	--	--	--	--
	Potassium	--	--	--	1.4	--	--	--	0.99	--	0.89
	Sodium	--	--	--	4.7	--	--	--	4.5	--	4.7
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	69.6	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-5I	BRGWA-5I	BRGWA-5I	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S
	Sample Date:	8/23/2022	1/24/2023	8/22/2023	8/31/2016	11/15/2016	2/20/2017	6/12/2017	9/26/2017	2/13/2018	6/26/2018
	Parameter (1,2,3)										
	Boron	< 0.0052	< 0.0052	0.0073 J	< 0.0321	0.0085 J	--	< 0.006	< 0.006	< 0.006	0.0056 J
	Calcium	14.3	15.8	14.3	19.6	21.7	--	21.5	24	< 2.02	23.5 J
	Chloride	3.64	3.93	3.53	3.6	4	--	3.8	4.1	4.1	4.1
	Fluoride	< 0.033	0.149	0.289	0.19 J	0.08 J	--	0.07 J	0.04 J	< 0.029	0.072 J
	pH (field) (SU)	6.24	6.42	6.36	6.59	6.67	6.65	6.64	6.58	6.71	6.43
	Sulfate	2.21	3.34	1.83	0.81 J	0.87 J	--	0.94 J	0.92 J	< 0.017	0.91 J
	TDS	107	124	80	154	123	--	142	138	150	154
APPENDIX IV	Antimony	< 0.001	< 0.001	< 0.001	< 0.0008	< 0.0008	--	< 0.0006	< 0.0006	< 0.0006	< 0.00078
	Arsenic	< 0.002	< 0.002	< 0.002	< 0.0016	< 0.0016	--	0.0006 J	0.0007 J	< 0.00052	< 0.00057
	Barium	0.0241	0.0303	0.0245	0.0495	0.0512	--	0.0567	0.0586	0.054	0.063
	Beryllium	< 0.0002	< 0.0002	< 0.0002	< 0.0004	< 0.00008	--	< 0.00009	< 0.00009	< 0.000091	< 0.00005
	Cadmium	< 0.0003	< 0.0003	< 0.0003	< 0.00007	< 0.00007	--	< 0.0001	< 0.0001	< 0.00014	< 0.000093
	Chromium	0.00647 J	0.00513 J	0.00701 J	0.0028 J	0.003 J	--	0.0041 J	0.0037 J	< 0.00045	0.0043 J
	Cobalt	0.000553 J	0.000677 J	0.000474 J	< 0.0005	< 0.0005	--	0.0006 J	0.0005 J	< 0.00026	0.00052 J
	Fluoride	< 0.033	0.149	0.289	0.19 J	0.08 J	--	0.07 J	0.04 J	< 0.029	0.072 J
	Lead	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	--	0.0001 J	0.0001 J	< 0.000067	< 0.00027
	Lithium	< 0.003	< 0.003	< 0.003	< 0.0103	< 0.0021	--	< 0.0015	< 0.0015	< 0.0015	< 0.00097
	Mercury	< 0.000067	< 0.000067	< 0.000067	< 0.000041	< 0.000041	--	< 0.000041	< 0.000036	0.00013 J	< 0.000036
	Molybdenum	0.00151	0.00192	0.000953 J	< 0.0017	< 0.0017	--	< 0.001	< 0.001	< 0.001	< 0.0019
	Radium-226+228 (pCi/L)	2.3	0.811 U	1.36	--	0.645	1.36	< 0.929 U	< 1.22 U	< 1.02 U	< 1.3 U
	Selenium	< 0.0015	< 0.0015	< 0.0015	< 0.001	< 0.001	--	< 0.0018	< 0.0018	< 0.0018	< 0.0014
	Thallium	< 0.0006	< 0.0006	< 0.0006	< 0.0002	< 0.0002	--	< 0.00005	< 0.00005	< 0.000052	< 0.00014
FIELD	Oxidation-reduction potential (mV)	64.7	135.3	77.51	77.45	95.9	408.9	233.6	619.1	93.1	145.5
	pH (SU)	6.24	6.42	6.36	6.59	6.67	6.65	6.64	6.58	6.71	6.43
	RDO Concentration	5.47	3.33	5.49	2.04	1.91	3	2.21	1.62	2.06	2.41
	Specific Conductance (µS/cm)	141.26	135.71	117.55	193.72	183.2	203.1	210.4	213	169.6	197.7
	Temperature (deg C)	18.97	17.02	20.03	20.3	19.77	19.23	20.22	21.98	16.78	20.55
	Turbidity (NTU)	3.75	1.13	2.63	--	0.53	4.23	4.27	4.73	1.1	1.41
Geochem	Alkalinity (total) as CaCO3	72.8	79.4	77.2	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	72.8	79.4	77.2	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	< 1.45	< 1.45	< 0.725	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	0	--	--	--	--	--	--	--	--
	Iron	< 0.033	< 0.033	0.0953 J	--	--	--	--	--	--	--
	Magnesium	10.4	10.9	9.41	--	--	--	--	--	--	--
	Manganese	< 0.001	0.00165 J	0.00104 J	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	0.371	0.266	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	0.909	1.35	0.933	--	--	--	--	--	--	--
	Sodium	4.93	5.22	4.69	--	--	--	--	--	--	--
	Sulfide	--	< 0.033	< 0.033	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-5S
	Sample Date:	12/18/2018	3/19/2019	8/27/2019	10/15/2019	3/3/2020	8/18/2020	9/15/2020	3/2/2021	9/21/2021	2/1/2022
	Parameter (1,2,3)										
	Boron	0.0062 J	< 0.0039	--	0.006 J	< 0.0049	--	< 0.0052	0.0071 J	< 0.0086	< 0.0086
	Calcium	19.8 J	21.4 J	--	20	23.2	--	16.8	16.8	19.1	19.1
	Chloride	3.8	4.2	--	3.7	3.6	--	3.7	3.7	3.2	3.4
	Fluoride	< 0.029	0.06 J	< 0.029	0.045 J	0.057 J	< 0.05	0.051 J	< 0.05	0.056 J	< 0.05
	pH (field) (SU)	6.7	6.63	6.49	7.01	6.49	6.41	6.25	6.42	6.36	6.39
	Sulfate	0.68 J	0.74 J	--	0.68 J	0.71 J	--	< 0.5	< 0.5	< 0.5	< 0.5
	TDS	147	146	--	144	130	--	116	96	104	124
APPENDIX IV	Antimony	0.00087 J	--	< 0.00027	< 0.00027	< 0.00027	0.0016 J	< 0.00028	< 0.00028	< 0.00078	< 0.00078
	Arsenic	0.0011 J	--	< 0.00035	0.00039 J	0.0027 J	< 0.00078	< 0.00078	< 0.00078	< 0.0011	0.0012 J
	Barium	0.045	--	0.056	0.049	0.051	0.04	0.038	0.037	0.038	0.04
	Beryllium	< 0.00005	--	< 0.000074	< 0.000074	< 0.000074	< 0.000046	< 0.000046	< 0.000046	< 0.000054	< 0.000054
	Cadmium	< 0.000093	--	< 0.00011	< 0.00011	< 0.00011	< 0.00012	< 0.00012	< 0.00012	< 0.00011	< 0.00011
	Chromium	0.0054 J	--	0.0043 J	0.0055 J	0.0057 J	0.005 J	0.0048 J	0.0044 J	0.0044 J	0.0052
	Cobalt	< 0.00052	--	0.00042 J	< 0.0003	< 0.0003	< 0.00038	< 0.00038	< 0.00038	< 0.00039	< 0.00039
	Fluoride	< 0.029	0.06 J	< 0.029	0.045 J	0.057 J	< 0.05	0.051 J	< 0.05	0.056 J	< 0.05
	Lead	< 0.00027	--	0.00036 J	0.000079 J	0.000079 J	0.0001 J	0.000043 J	< 0.000036	< 0.00089	< 0.00089
	Lithium	< 0.00097	--	< 0.00078	< 0.00078	< 0.00078	< 0.00081	< 0.00081	< 0.00081	< 0.00073	< 0.00073
	Mercury	< 0.000036	--	< 0.00014	--	--	< 0.000078	< 0.000078	< 0.000078	0.0001 J	< 0.00013
	Molybdenum	< 0.0019	--	< 0.00095	< 0.00095	< 0.00095	< 0.00069	< 0.00069	< 0.00069	< 0.00074	< 0.00074
	Radium-226+228 (pCi/L)	< 1.24 U	--	1.44	< 2.05 U	--	< 1.41 U	< 1.69 U	< 0.814 U	< 1.55 U	< 1.25 U
	Selenium	< 0.0014	--	< 0.0013	< 0.0013	< 0.0013	< 0.0016	< 0.0016	< 0.0016	< 0.0014	< 0.0014
	Thallium	< 0.00014	--	< 0.000052	< 0.000052	< 0.000052	< 0.00014	< 0.00014	< 0.00014	< 0.00018	< 0.00018
FIELD	Oxidation-reduction potential (mV)	348.4	-68.6	53.5	48	50.9	61.1	42.97	86.2	74.4	129.3
	pH (SU)	6.7	6.63	6.49	7.01	6.49	6.41	6.25	6.42	6.36	6.39
	RDO Concentration	3.97	1.76	1.79	2.82	1.6	2.22	1.776	2.41	1.95	2.16
	Specific Conductance (µS/cm)	180.4	190.3	193.1	182.55	152.7	159.6	164.34	145.03	189.8	165.6
	Temperature (deg C)	18.59	17.49	20.52	18.83	17.73	21.89	19.31	16.95	19.18	16.51
	Turbidity (NTU)	2.81	2.68	2.56	1.97	2.49	4.36	2.44	3.51	2.29	3.15
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	79.4	--	77.5
	Aluminum	--	--	--	< 0.032	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	92	--	--	--	79.4	--	77.5
	Alkalinity (Carbonate as CaCO3)	--	--	--	< 20	--	--	--	< 5	--	< 1.8
	Dissolved Organic Carbon	--	--	--	--	--	--	--	< 0.5	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	0.016 J	--	--	--	0.14	--	0.3
	Magnesium	--	--	--	9.6	--	--	--	7	--	7.4
	Manganese	--	--	--	< 0.0061	--	--	--	0.0063 J	--	0.021 J
	Nitrate Nitrite	--	--	--	--	--	--	--	0.17	--	--
	Nitrogen Nitrate	--	--	--	0.18	--	--	--	--	--	--
	Orthophosphate	--	--	--	0.13	--	--	--	--	--	--
	Potassium	--	--	--	1.3	--	--	--	0.49	--	0.4
	Sodium	--	--	--	4.6	--	--	--	4.5	--	4.1
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	73	--	--

Notes:

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< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-5S	BRGWA-5S	BRGWA-5S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S
	Sample Date:	8/23/2022	1/24/2023	8/22/2023	9/1/2016	11/15/2016	2/20/2017	6/12/2017	9/26/2017	2/13/2018	6/26/2018
	Parameter (1,2,3)										
	Boron	0.00538 J	< 0.0052	0.00764 J	< 0.0064	0.0123 J	--	< 0.006	< 0.006	< 0.006	0.0041 J
	Calcium	18.2	19.4	14.9	3.3	3.44	--	3.11	3.15	3.65	3.3
	Chloride	3.59	3.56	3.37	2.5 B	2.3	--	2.2	2.3	2.3	2.6
	Fluoride	< 0.033	0.158	0.277	0.06 J	0.04 J	--	0.06 J	< 0.03	< 0.029	0.041 J
	pH (field) (SU)	6.36	6.47	6.09	6.49	6.59	6.61	--	6.47	6.54	6.23
	Sulfate	0.521	0.66	0.54	0.6 J	0.49 J	--	0.54 J	0.53 J	< 0.017	0.54 J
	TDS	101	104	73	299	41	--	61	29	61	71
APPENDIX IV	Antimony	< 0.001	< 0.001	< 0.001	< 0.0008	< 0.0008	--	< 0.0006	< 0.0006	< 0.0006	< 0.00078
	Arsenic	< 0.002	< 0.002	< 0.002	< 0.0016	< 0.0016	--	< 0.0005	0.0007 J	< 0.00052	< 0.00057
	Barium	0.0379	0.0394	0.0352	0.0142	0.0126	--	0.0134	0.0133	0.0145	0.014
	Beryllium	< 0.0002	< 0.0002	< 0.0002	< 0.00008	< 0.00008	--	< 0.00009	< 0.00009	< 0.000091	< 0.00005
	Cadmium	< 0.0003	< 0.0003	< 0.0003	< 0.00007	< 0.00007	--	< 0.0001	< 0.0001	< 0.00014	< 0.000093
	Chromium	0.00435 J	0.00572 J	0.00472 J	0.0147	0.0154 B	--	0.016	0.0144	0.0144	0.015
	Cobalt	< 0.0003	< 0.0003	0.000327 J	< 0.0005	< 0.0005	--	0.0003 J	0.0003 J	< 0.00026	< 0.00052
	Fluoride	< 0.033	0.158	0.277	0.06 J	0.04 J	--	0.06 J	< 0.03	< 0.029	0.041 J
	Lead	< 0.0005	< 0.0005	< 0.0005	0.0001 J	< 0.0001	--	0.00008 J	< 0.00007	< 0.000067	< 0.00027
	Lithium	< 0.003	< 0.003	< 0.003	0.003 J	0.0033 J	--	0.0027 J	0.0023 J	0.0027 J	0.0029 J
	Mercury	< 0.000067	< 0.000067	< 0.000067	< 0.000041	< 0.000041	--	< 0.000041	< 0.000036	< 0.000036	< 0.000036
	Molybdenum	< 0.0002	< 0.0002	< 0.0002	< 0.0017	< 0.0017	--	< 0.001	< 0.001	< 0.001	< 0.0019
	Radium-226+228 (pCi/L)	0.735 U	0.402 U	1.31 U	--	0.412	0.633	< 0.873 U	< 1.24 U	< 0.989 U	< 1.28 U
	Selenium	< 0.0015	< 0.0015	< 0.0015	< 0.001	< 0.001	--	< 0.0018	< 0.0018	< 0.0018	< 0.0014
	Thallium	< 0.0006	< 0.0006	< 0.0006	< 0.0002	< 0.0002	--	< 0.00005	< 0.00005	< 0.000052	< 0.00014
FIELD	Oxidation-reduction potential (mV)	74.7	65	51.92	88.7	381.4	116.5	--	779.6	121.6	287.5
	pH (SU)	6.36	6.47	6.09	6.49	6.59	6.61	--	6.47	6.54	6.23
	RDO Concentration	1.63	1.9	1.87	6.97	6.91	6.05	--	6.42	7.99	7
	Specific Conductance (µS/cm)	134.88	157.2	118.14	53.1	50.9	60.5	--	58.1	47.8	55.8
	Temperature (deg C)	20.09	17.59	19.97	21.28	21.29	19.32	--	18.99	17.39	20.85
	Turbidity (NTU)	3	3.61	2.82	3.55	--	4.48	--	1.32	2.71	3.85
Geochem	Alkalinity (total) as CaCO3	73.8	78.4	68.4	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	73.8	78.4	68.4	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	< 1.45	< 1.45	< 0.725	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	0	--	--	--	--	--	--	--	--
	Iron	0.151	0.071 J	0.263	--	--	--	--	--	--	--
	Magnesium	8.51	9.02	6.25	--	--	--	--	--	--	--
	Manganese	0.014	0.00658	0.0105	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	0.173	0.203	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	0.635	0.522	0.435	--	--	--	--	--	--	--
	Sodium	4.03	4.78	3.48	--	--	--	--	--	--	--
	Sulfide	--	< 0.033	< 0.033	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

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J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

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(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S
	Sample Date:	12/18/2018	3/19/2019	8/27/2019	10/15/2019	3/3/2020	8/18/2020	9/15/2020	3/1/2021	9/22/2021	2/1/2022
	Parameter (1,2,3)										
	Boron	< 0.0039	< 0.0039	--	0.01 J	< 0.0049	--	< 0.0052	< 0.0052	< 0.0086	< 0.0086
	Calcium	3.5	3.6	--	3.5	5	--	3.7	4.2	4.1	4.2
	Chloride	2.3	2.6	--	2.4	2.9	--	2.3	2.1	2.1	2.1
	Fluoride	< 0.029	0.03 J	< 0.029	< 0.029	0.09 J	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	pH (field) (SU)	6.71	6.18	6.35	6.36	6.59	6.33	6.43	6.7	6.48	6.54
	Sulfate	0.39 J	0.68 J	--	0.48 J	2.5	--	< 0.5	0.74 J	< 0.5	< 0.5
	TDS	70	72	--	63	54	--	79	39	62	61
APPENDIX IV	Antimony	< 0.00078	--	< 0.00027	< 0.00027	< 0.00027	< 0.00028	< 0.00028	< 0.00028	< 0.00078	< 0.00078
	Arsenic	0.00092 J	--	< 0.00035	< 0.00035	0.0018 J	< 0.00078	< 0.00078	< 0.00078	< 0.0011	< 0.0011
	Barium	0.013	--	0.013	0.013	0.019	0.014	0.013	0.016	0.014	0.014
	Beryllium	< 0.00005	--	< 0.000074	< 0.000074	< 0.000074	< 0.000046	< 0.000046	< 0.000046	< 0.000054	< 0.000054
	Cadmium	< 0.000093	--	< 0.00011	< 0.00011	< 0.00011	< 0.00012	< 0.00012	< 0.00012	< 0.00011	< 0.00011
	Chromium	0.015	--	0.015	0.014	0.011	0.015	0.014	0.011	0.014	0.015
	Cobalt	< 0.00052	--	< 0.0003	< 0.0003	0.0011 J	0.00061 J	< 0.00038	< 0.00038	0.00078 J	< 0.00039
	Fluoride	< 0.029	0.03 J	< 0.029	< 0.029	0.09 J	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead	< 0.00027	--	< 0.000046	< 0.000046	0.000073 J	< 0.000036	< 0.000036	< 0.000036	< 0.00089	< 0.00089
	Lithium	0.0026 J	--	0.0028 J	0.0024 J	0.0026 J	0.0026 J	0.0027 J	0.0036 J	0.0035 J	0.0029 J
	Mercury	< 0.000036	--	< 0.00014	--	--	< 0.000078	< 0.000078	< 0.000078	0.0001 J	< 0.00013
	Molybdenum	< 0.0019	--	< 0.00095	< 0.00095	< 0.00095	< 0.00069	< 0.00069	< 0.00069	< 0.00074	< 0.00074
	Radium-226+228 (pCi/L)	< 1.35 U	--	< 1.27 U	< 2.37 U	--	< 1.34 U	< 1.3 U	< 0.966 U	< 1.16 U	< 0.871 U
	Selenium	< 0.0014	--	< 0.0013	< 0.0013	< 0.0013	< 0.0016	< 0.0016	< 0.0016	< 0.0014	< 0.0014
	Thallium	< 0.00014	--	< 0.000052	< 0.000052	< 0.000052	< 0.00014	< 0.00014	< 0.00014	< 0.00018	< 0.00018
FIELD	Oxidation-reduction potential (mV)	166.8	64.2	18.3	69.6	32.8	53	65.6	115	84.6	90.3
	pH (SU)	6.71	6.18	6.35	6.36	6.59	6.33	6.43	6.7	6.48	6.54
	RDO Concentration	7.21	7.05	7.64	6.55	4.91	6.75	6.56	5.48	6.42	6.89
	Specific Conductance (µS/cm)	56.9	59.26	54.8	59.4	61.5	55.3	57.7	59.96	55.25	62.36
	Temperature (deg C)	17.24	14.12	20.21	19	18.7	21.82	19.54	18.39	21.33	17.68
	Turbidity (NTU)	1.2	0.98	1.36	1.16	3.24	3.15	1.27	2.95	0.99	2.74
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	27.6	--	27.6
	Aluminum	--	--	--	0.052 J	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	--	--	--	27.6	--	27.6
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	--	--	--	< 5	--	< 1.8
	Dissolved Organic Carbon	--	--	--	--	--	--	--	< 0.5	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	0.045	--	--	--	0.094	--	0.23
	Magnesium	--	--	--	3.6	--	--	--	3.8	--	3.7
	Manganese	--	--	--	< 0.0061	--	--	--	0.0051 J	--	0.0082 J
	Nitrate Nitrite	--	--	--	--	--	--	--	0.57	--	--
	Nitrogen Nitrate	--	--	--	0.62	--	--	--	--	--	--
	Orthophosphate	--	--	--	0.13	--	--	--	--	--	--
	Potassium	--	--	--	0.67	--	--	--	1.3	--	0.75
	Sodium	--	--	--	2.2	--	--	--	3	--	2.5
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	26.1	--	--

Notes:

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TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWA-6S	BRGWC-17S	BRGWC-17S	BRGWC-17S	BRGWC-17S	BRGWC-17S	BRGWC-17S
	Sample Date:	8/23/2022	1/24/2023	8/22/2023	10/30/2023	9/7/2016	11/17/2016	2/22/2017	6/15/2017	9/28/2017	2/15/2018
	Parameter (1,2,3)										
	Boron	< 0.0052	< 0.0052	0.00611 J	--	0.0449 J	0.0067 J	< 0.0064	< 0.006	< 0.006	< 0.006
	Calcium	3.97	3.9	3.79	--	26.3	31.8	33.5	29	34.1	33.8
	Chloride	2.39	2.3	2.34	--	3.7	4	3.6	3.7	4.1	5.3
	Fluoride	< 0.033	0.12	0.0787 J	--	0.22 J	0.33 B	0.11 J	0.05 J	0.05 J	< 0.029
	pH (field) (SU)	6.51	6.54	6.27	--	6.36	6.28	6.4	6.35	6.35	6.35
	Sulfate	0.479	0.484	0.467	--	97	120	120	130	120	109
	TDS	52	64	30	--	331	308	341	333	310	292
APPENDIX IV	Antimony	< 0.001	< 0.001	< 0.001	--	< 0.0008	< 0.0008	< 0.0008	0.0009 J	< 0.0006	< 0.0006
	Arsenic	< 0.002	0.0021 J	< 0.002	--	< 0.0016	< 0.0016	< 0.0016	0.0006 J	< 0.0005	< 0.00052
	Barium	0.014	0.0132	0.0143	--	0.0377	0.0405	0.0392	0.0364	0.0408	0.0396
	Beryllium	< 0.0002	< 0.0002	< 0.0002	--	< 0.00008	< 0.00008	< 0.00008	< 0.00009	< 0.00009	< 0.000091
	Cadmium	< 0.0003	< 0.0003	< 0.0003	--	< 0.00007	< 0.00007	< 0.00007	< 0.0001	< 0.0001	< 0.00014
	Chromium	0.0143	0.0139	0.0132	--	0.01 J	0.0185	0.0122	0.0117	0.0114	0.011
	Cobalt	< 0.0003	< 0.0003	< 0.0003	--	< 0.0005	< 0.0005	< 0.0005	< 0.0003	< 0.0003	< 0.00026
	Fluoride	< 0.033	0.12	0.0787 J	--	0.22 J	0.33 B	0.11 J	0.05 J	0.05 J	< 0.029
	Lead	< 0.0005	< 0.0005	< 0.0005	--	< 0.0001	0.0001 J	< 0.0001	< 0.00007	< 0.00007	< 0.000067
	Lithium	0.00314 J	0.00341 J	< 0.003	--	< 0.0021	< 0.0021	< 0.0021	< 0.0015	< 0.0015	< 0.0015
	Mercury	< 0.000067	< 0.000067	< 0.000067	--	< 0.000041	< 0.000041	< 0.000041	0.00006 J	< 0.000036	< 0.000036
	Molybdenum	< 0.0002	< 0.0002	< 0.0002	--	< 0.0017	< 0.0017	< 0.0017	< 0.001	< 0.001	< 0.001
	Radium-226+228 (pCi/L)	0.203 U	1.55 U	1.89 U	--	--	0.145	0.0213	< 1.21 U	< 1.23 U	< 1.03 U
	Selenium	< 0.0015	< 0.0015	< 0.0015	--	0.0024 J	0.0028 J	0.0018 J	0.0024 J	< 0.0018	< 0.0018
	Thallium	< 0.0006	< 0.0006	< 0.0006	--	< 0.0002	< 0.0002	< 0.0002	< 0.00005	< 0.00005	< 0.000052
FIELD	Oxidation-reduction potential (mV)	77	27.6	114.4	--	46.6	57.6	143.7	113.6	1,078	181.8
	pH (SU)	6.51	6.54	6.27	--	6.36	6.28	6.4	6.35	6.35	6.35
	RDO Concentration	7.04	6.98	7.07	--	1.55	1.41	2.85	1.3	0.95	0.89
	Specific Conductance (µS/cm)	56.92	53.27	65.26	--	398.6	392.2	349.9	406.2	412.8	334.2
	Temperature (deg C)	20.04	17.51	21.75	--	23.07	20.87	16.79	19.5	21.34	16.7
	Turbidity (NTU)	1.71	0.96	1.88	--	0.47	0.85	0.45	0.17	0.43	0.13
Geochem	Alkalinity (total) as CaCO3	58.2	25.6	36.8	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	58.2	25.6	36.8	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	< 1.45	< 1.45	< 0.725	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	0	--	--	--	--	--	--	--	--
	Iron	0.0701 J	0.0593 J	< 0.033	--	--	--	--	--	--	--
	Magnesium	4.06	4.14	3.48	--	--	--	--	--	--	--
	Manganese	0.00329 J	0.00159 J	0.0012 J	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	0.638	0.646	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	0.685	0.706	0.607	--	--	--	--	--	--	--
	Sodium	2.44	2.54	2.11	--	--	--	--	--	--	--
	Sulfide	--	< 0.033	< 0.033	< 0.81	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

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	Sample Date:	6/27/2018	12/19/2018	3/19/2019	8/28/2019	10/17/2019	12/3/2019	3/3/2020	8/19/2020	9/16/2020	3/4/2021
	Parameter (1,2,3)										
	Boron	0.0088 J	0.0045 J	< 0.0039	--	< 0.017	0.0063 J	0.0075 J	--	0.0066 J	< 0.0052
	Calcium	34.1	33.1	31.6	--	--	37.7	29.7	--	37.9	41.2
	Chloride	4.2	4.9	5	--	--	4.8	3.8	--	4.2	4.6
	Fluoride	0.093 J	0.16 J	0.1 J	0.085 J	--	0.2 J	0.093 J	0.1	0.1	0.096 J
	pH (field) (SU)	6.35	6.56	6.43	6.25	6.3	6.36	6.34	6.24	6.26	6.45
	Sulfate	118	125	126	--	--	180	95.4	--	151	122
	TDS	353	317	303	--	--	378	263	--	316	316
APPENDIX IV	Antimony	< 0.00078	< 0.00078	--	< 0.00027	--	< 0.00027	< 0.00027	< 0.00028	< 0.00028	< 0.00028
	Arsenic	< 0.00057	< 0.00057	--	0.00073 J	--	0.00058 J	0.0033 J	< 0.00078	< 0.00078	< 0.00078
	Barium	0.041	0.038	--	0.044	--	0.043	0.036	0.047	0.044	0.039
	Beryllium	< 0.00005	< 0.00005	--	< 0.000074	< 0.0026	< 0.000074	< 0.000074	< 0.000046	< 0.000046	< 0.000046
	Cadmium	< 0.000093	< 0.000093	--	< 0.00011	< 0.0009	< 0.00011	< 0.00011	< 0.00012	< 0.00012	< 0.00012
	Chromium	0.0098 J	0.0095 J	--	0.013	--	0.011	0.0081 J	0.012	0.012	0.01
	Cobalt	< 0.00052	< 0.00052	--	< 0.0003	< 0.0052	< 0.0003	< 0.0003	< 0.00038	< 0.00038	< 0.00038
	Fluoride	0.093 J	0.16 J	0.1 J	0.085 J	--	0.2 J	0.093 J	0.1	0.1	0.096 J
	Lead	< 0.00027	< 0.00027	--	< 0.000046	--	< 0.000046	< 0.000046	< 0.000036	0.000054 J	< 0.000036
	Lithium	< 0.00097	< 0.00097	--	0.00097 J	--	0.001 J	< 0.00078	0.001 J	0.00096 J	0.00086 J
	Mercury	< 0.000036	< 0.000036	--	< 0.00014	--	--	--	0.000084 J	< 0.000078	< 0.000078
	Molybdenum	< 0.0019	< 0.0019	--	< 0.00095	--	< 0.00095	< 0.00095	< 0.00069	< 0.00069	< 0.00069
	Radium-226+228 (pCi/L)	< 1.28 U	< 1.49 U	--	< 1.82 U	--	--	--	< 1.09 U	< 1.48 U	< 1.19 U
	Selenium	0.002 J	0.0014 J	--	0.003 J	--	0.0041 J	0.0019 J	0.003 J	< 0.0016	< 0.0016
	Thallium	< 0.00014	< 0.00014	--	< 0.000052	--	0.000066 J	< 0.000052	< 0.00014	< 0.00014	< 0.00014
FIELD	Oxidation-reduction potential (mV)	205.5	90.4	-68.3	24.8	84.3	59.3	41.8	83.9	46.41	29.4
	pH (SU)	6.35	6.56	6.43	6.25	6.3	6.36	6.34	6.24	6.26	6.45
	RDO Concentration	0.72	1.05	1.52	1.15	1.12	1.29	3.33	1.37	1.537	1.89
	Specific Conductance (µS/cm)	415.1	423	407.1	449.5	461.2	468.1	302.1	483.2	493.44	459.5
	Temperature (deg C)	21.82	14.68	16.42	22.38	18.97	16.65	15.62	22.8	19.97	16.47
	Turbidity (NTU)	0.72	0.56	2.19	1.48	0.44	1.48	2.68	0.35	1.1	1.66
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	--	--	89.1
	Aluminum	--	--	--	--	< 0.032	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	75	--	--	--	--	89.1
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	< 20	--	--	--	--	< 5
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	0.86 J
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	< 0.015	--	--	--	--	< 0.016
	Magnesium	--	--	--	--	21.1	--	--	--	--	23.5
	Manganese	--	--	--	--	< 0.0061	--	--	--	--	< 0.0017
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	0.052
	Nitrogen Nitrate	--	--	--	--	0.065	--	--	--	--	--
	Orthophosphate	--	--	--	--	0.15	--	--	--	--	--
	Potassium	--	--	--	--	1.1	--	--	--	--	1.1
	Sodium	--	--	--	--	22.1	--	--	--	--	23.5
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	200

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	Sample Date:	9/22/2021	2/1/2022	8/24/2022	1/24/2023	8/23/2023	9/9/2016	11/17/2016	2/22/2017	6/14/2017	9/27/2017
	Parameter (1,2,3)										
	Boron	0.02 J	0.013 J	0.0273	0.0326	0.0601	1.15 B	1.08	1.44	1.16	1.04
	Calcium	36.4	41.5	43.6	41.3	47.9	53.4	41.3	53.1	47.1	49.5
	Chloride	4.6	4.9	5	6.31	5.18	5.3	5.3	0.12 J	4.5	5.4
	Fluoride	0.1	0.079 J	0.274	0.216	0.484	0.19 J	0.26 J	0.21 J	0.18 J	0.42
	pH (field) (SU)	6.22	6.39	6.62	6.37	6.16	4.92	4.82	4.86	4.86	4.78
	Sulfate	123	139	157	153	180	260	250	210	200	200
	TDS	323	354	370	344	391	382	382	387	316	303
APPENDIX IV	Antimony	< 0.00078	< 0.00078	< 0.001	< 0.001	< 0.001	< 0.0008	< 0.0008	< 0.0008	< 0.0006	< 0.0006
	Arsenic	< 0.0011	< 0.0011	< 0.002	< 0.002	< 0.002	< 0.0016	< 0.0016	< 0.0016	0.0006 J	< 0.0005
	Barium	0.043	0.045	0.0512	0.0422	0.0445	0.0214	0.0211	0.0243	0.0218	0.0219
	Beryllium	< 0.000054	< 0.000054	< 0.0002	< 0.0002	< 0.0002	0.0019 J	0.002 J	0.0022 J	0.0019 J	0.0017 J
	Cadmium	< 0.00011	< 0.00011	< 0.0003	< 0.0003	< 0.0003	0.0005 J	0.0005 J	0.0006 J	0.0004 J	0.0004 J
	Chromium	0.0091	0.013	0.0127	0.00886 J	0.0115	< 0.0009	< 0.0009	< 0.0009	< 0.0005	< 0.0005
	Cobalt	< 0.00039	< 0.00039	< 0.0003	< 0.0003	< 0.0003	0.0612	0.0551	0.0567	0.0557	0.049
	Fluoride	0.1	0.079 J	0.274	0.216	0.484	0.19 J	0.26 J	0.21 J	0.18 J	0.42
	Lead	< 0.00089	< 0.00089	< 0.0005	< 0.0005	< 0.0005	0.0002 J	0.0002 J	0.0001 J	0.00009 J	0.00007 J
	Lithium	0.0011 J	0.00096 J	< 0.003	< 0.003	< 0.003	0.0092 J	0.0097 J	0.0106 J	0.0097 J	0.0099 J
	Mercury	0.0001 J	< 0.00013	< 0.000067	< 0.000067	< 0.000067	< 0.000041	< 0.000041	< 0.000041	0.00007 J	0.00004 J
	Molybdenum	< 0.00074	< 0.00074	< 0.0002	< 0.0002	< 0.0002	< 0.0017	< 0.0017	< 0.0017	< 0.001	< 0.001
	Radium-226+228 (pCi/L)	< 1.64 U	--	0.152 U	0.728 U	1.92 U	--	1.02	0.482	< 1.12 U	1.5
	Selenium	0.0015 J	0.0021 J	0.00208 J	0.00178 J	0.00214 J	0.0032 J	0.0028 J	0.0018 J	0.004 J	0.0036 J
	Thallium	< 0.00018	< 0.00018	< 0.0006	< 0.0006	< 0.0006	0.0002 J	0.0002 J	0.0002 J	0.0002 J	0.0002 J
FIELD	Oxidation-reduction potential (mV)	98.5	90.6	82.1	26.8	59.12	74.1	192.4	151.4	120.5	423.1
	pH (SU)	6.22	6.39	6.62	6.37	6.16	4.92	4.82	4.86	4.86	4.78
	RDO Concentration	1.47	1.79	7.11	1.59	1.51	0.06	0.15	0.49	0.29	0.23
	Specific Conductance (µS/cm)	407.1	498.2	487.35	434.81	440.62	545.4	495.2	508.9	474.5	415.2
	Temperature (deg C)	22.31	15.53	22.62	14.75	22.05	21.55	18.7	21.14	21.95	25.59
	Turbidity (NTU)	4.57	3.2	3.08	0.57	0.36	0.92	0.82	1.26	1.01	0.65
Geochem	Alkalinity (total) as CaCO3	--	78	74	81.4	71.8	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	78	74	81.4	71.8	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	--	< 1.8	< 1.45	< 1.45	< 0.725	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	0	0	--	--	--	--	--
	Iron	--	< 0.025	< 0.033	< 0.033	0.0446 J	--	--	--	--	--
	Magnesium	--	22.3	25.7	26.1	24.7	--	--	--	--	--
	Manganese	--	< 0.0043	< 0.001	< 0.001	< 0.001	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	0.119 J	0.094 J	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	0.99	1.29	1.08	1.19	--	--	--	--	--
	Sodium	--	22.3	24.6	25.5	24.3	--	--	--	--	--
	Sulfide	--	--	--	< 0.033	< 0.033	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

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(3) The pH value presented was recorded at the time of sample collection in the field.

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Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWC-33S	BRGWC-33S	BRGWC-33S	BRGWC-33S	BRGWC-33S	BRGWC-33S	BRGWC-33S	BRGWC-33S	BRGWC-33S	BRGWC-33S
	Sample Date:	2/15/2018	6/27/2018	12/18/2018	3/20/2019	8/27/2019	10/16/2019	3/5/2020	8/19/2020	9/16/2020	3/3/2021
	Parameter (1,2,3)										
	Boron	1.22	0.96	1.2	1.3	--	1.1	1.5	--	1.1	1.1
	Calcium	50.9	55.1	52.7	51.4	--	46.5	48.1	--	37.9	37.5
	Chloride	6.3	4.5	6.1	6.2	--	5.4	4.8	--	4.1	3.9
	Fluoride	0.42	0.32	0.28 J	0.14 J	0.11 J	0.17 J	0.088 J	0.11	0.085 J	0.069 J
	pH (field) (SU)	4.84	4.73	4.84	4.77	4.78	4.78	4.82	4.78	4.78	4.83
	Sulfate	197	200	222	204	--	226	173	--	154	133
	TDS	332	538	358	338	--	281	292	--	88	212
APPENDIX IV	Antimony	< 0.0006	< 0.00078	< 0.00078	--	< 0.00027	< 0.00027	< 0.00027	< 0.00028	< 0.00028	< 0.00028
	Arsenic	< 0.00052	< 0.00057	0.00091 J	--	< 0.00035	0.00056 J	< 0.00035	< 0.00078	< 0.00078	< 0.00078
	Barium	0.0248	0.023	0.023	--	0.02	0.019	0.022	0.02	0.019	0.02
	Beryllium	< 0.000091	0.002 J	0.0021 J	--	0.0019 J	0.0018 J	0.0018 J	0.0014 J	0.0015 J	0.0013
	Cadmium	< 0.00014	0.00038 J	0.00046 J	--	0.00032 J	0.00039 J	0.00038 J	0.00029 J	0.00032 J	0.00022 J
	Chromium	< 0.00045	< 0.0016	< 0.0016	--	< 0.00039	0.00049 J	< 0.00039	< 0.00055	< 0.00055	< 0.00055
	Cobalt	0.0536	0.054	0.049	--	0.045	0.042	0.037	0.036	0.034	0.028
	Fluoride	0.42	0.32	0.28 J	0.14 J	0.11 J	0.17 J	0.088 J	0.11	0.085 J	0.069 J
	Lead	< 0.000067	< 0.00027	< 0.00027	--	0.00013 J	0.000088 J	0.000087 J	0.00006 J	0.000063 J	0.000058 J
	Lithium	0.0106 J	0.01 J	0.011 J	--	0.01 J	0.0098 J	0.011 J	0.009 J	0.0089 J	0.0085 J
	Mercury	< 0.000036	< 0.000036	< 0.000036	--	< 0.00014	--	--	< 0.000078	< 0.000078	< 0.000078
	Molybdenum	< 0.001	< 0.0019	< 0.0019	--	< 0.00095	< 0.00095	< 0.00095	< 0.00069	< 0.00069	< 0.00069
	Radium-226+228 (pCi/L)	< 1.23 U	< 1.37 U	1.64	--	1.38	< 1.39 U	--	< 1.16 U	< 1.63 U	< 1.16 U
	Selenium	< 0.0018	0.0017 J	< 0.0014	--	< 0.0013	0.0028 J	< 0.0013	< 0.0016	0.0028 J	< 0.0016
	Thallium	0.00024 J	0.00022 J	0.00022 J	--	0.00016 J	0.00019 J	0.0002 J	0.00018 J	0.00018 J	0.00018 J
FIELD	Oxidation-reduction potential (mV)	397.5	333.9	322	107.8	94	116.6	93	112.6	116.18	60.2
	pH (SU)	4.84	4.73	4.84	4.77	4.78	4.78	4.82	4.78	4.78	4.83
	RDO Concentration	0.85	0.15	0.28	1.12	0.04	0.07	0.12	0.03	0.018	1.01
	Specific Conductance (µS/cm)	463.1	471.4	489.8	471.2	447.9	457.9	430.3	392.4	391.97	341.7
	Temperature (deg C)	19.57	21.5	20.38	16.9	20.66	20.04	19.01	20.6	19.66	19.12
	Turbidity (NTU)	0.47	0.12	0.59	0.55	0.51	0.23	0.97	0.38	1.09	0.59
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	--	--	< 5
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	--	--	--	--	--	< 5
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	--	--	--	--	--	< 5
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	< 0.5
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	< 0.016
	Magnesium	--	--	--	--	--	--	--	--	--	4.1
	Manganese	--	--	--	--	--	--	--	--	--	1
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	< 0.017
	Nitrogen Nitrate	--	--	--	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	--	--	--	--	--	--	--	10.9
	Sodium	--	--	--	--	--	--	--	--	--	13.5
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	111

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	Sample Date:	9/22/2021	2/1/2022	8/23/2022	10/12/2022	1/24/2023	8/22/2023	9/8/2016	11/17/2016	2/22/2017	6/14/2017
	Parameter (1,2,3)										
	Boron	1.1	1.1	0.975	--	1.19	0.946	1.89	2.17	2.09	2.45
	Calcium	28.9	34.3	119	--	116	135	97.3	97.6	106	98
	Chloride	2.7	13.1	30.3	--	29	32.7	7.2	7.6	7.1	7.3
	Fluoride	0.068 J	0.053 J	0.187	--	0.193	0.123	0.17 J	0.12 J	0.17 J	0.1 J
	pH (field) (SU)	4.81	4.82	4.67	4.72	4.79	4.58	5.84	5.81	5.85	5.87
	Sulfate	94.6	99.7	385	--	375	466	420	460	410	410
	TDS	190	209	614	--	615	778	663	651	706	643
APPENDIX IV	Antimony	< 0.00078	< 0.00078	< 0.001	--	< 0.001	< 0.001	< 0.0008	< 0.0008	< 0.0008	< 0.0006
	Arsenic	< 0.0011	< 0.0011	0.00262 J	--	0.00201 J	< 0.002	< 0.0016	< 0.0016	< 0.0016	< 0.0005
	Barium	0.019	0.023	0.0409	--	0.0368	0.0357	0.0415	0.04	0.0415	0.0341
	Beryllium	0.0012	0.0013	0.00241	--	0.00235	0.0019	0.0001 J	0.0001 J	0.0002 J	< 0.0005
	Cadmium	0.00019 J	0.00023 J	0.000509 J	--	0.000482 J	0.000533 J	< 0.00007	0.0009 J	0.0005 J	0.0004 J
	Chromium	< 0.0011	< 0.0011	< 0.003	--	< 0.003	< 0.003	< 0.0009	< 0.0009	< 0.0009	< 0.0023
	Cobalt	0.024	0.027	0.0639	--	0.0582	0.0659	0.0029 J	0.0028 J	0.0041 J	0.0036 J
	Fluoride	0.068 J	0.053 J	0.187	--	0.193	0.123	0.17 J	0.12 J	0.17 J	0.1 J
	Lead	< 0.00089	< 0.00089	< 0.0005	--	< 0.0005	< 0.0005	< 0.0001	0.0001 J	0.0003 J	< 0.00007
	Lithium	0.008 J	0.0083 J	0.0109	--	0.0115	0.00967 J	< 0.0021	< 0.0021	< 0.0021	< 0.0075
	Mercury	0.00012 J	< 0.00013	< 0.000067	--	< 0.000067	< 0.000067	< 0.000041	< 0.000041	< 0.000041	0.00007 J
	Molybdenum	< 0.00074	< 0.00074	< 0.0002	--	< 0.0002	< 0.0002	< 0.0017	< 0.0017	< 0.0017	< 0.001
	Radium-226+228 (pCi/L)	< 1.35 U	--	1.94	--	3.31 U	0.521 U	--	0.613	1.01	< 0.971 U
	Selenium	< 0.0014	< 0.0014	0.0061	--	0.0049 J	0.00572	< 0.001	< 0.001	< 0.001	< 0.0018
	Thallium	< 0.00018	< 0.00018	< 0.0006	--	< 0.0006	< 0.0006	< 0.0002	< 0.0002	< 0.0002	< 0.00005
FIELD	Oxidation-reduction potential (mV)	120.7	190.6	84.4	178.6	176.9	186.45	26.5	17.4	25.1	97.5
	pH (SU)	4.81	4.82	4.67	4.72	4.79	4.58	5.84	5.81	5.85	5.87
	RDO Concentration	0.17	0.07	0.1	0.03	-0.04	0.15	0.13	0.19	0.02	1.5
	Specific Conductance (µS/cm)	257.7	333.9	742.13	732.76	676.33	1,075.53	878.8	834.7	889.8	848.5
	Temperature (deg C)	20.75	19.09	21.12	20.86	20.53	21.78	23.94	21.93	19.32	22.12
	Turbidity (NTU)	3.55	0.96	1.04	1.05	0.31	0.59	1.48	4.28	2.33	2.04
Geochem	Alkalinity (total) as CaCO3	--	2.8 J	3.4 J	--	3.8 J	1.4 J	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	2.8 J	3.4 J	--	3.8 J	1.4 J	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	--	< 1.8	< 1.45	--	< 1.45	< 0.725	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	0	0	--	--	--	--
	Iron	--	< 0.025	0.0381 J	--	< 0.033	0.0388 J	--	--	--	--
	Magnesium	--	3.7	14.7	--	15	19.5	--	--	--	--
	Manganese	--	0.97	2.75	--	2.68	3.14	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	0.0607 J	0.0707 J	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	9.5	13	--	14.5	14.4	--	--	--	--
	Sodium	--	12.1	24	--	37.2	39.9	--	--	--	--
	Sulfide	--	--	--	--	< 0.033	< 0.033	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

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	Sample Date:	9/27/2017	2/15/2018	6/27/2018	12/18/2018	3/20/2019	8/28/2019	10/16/2019	3/5/2020	8/19/2020	9/16/2020
	Parameter (1,2,3)										
	Boron	2.4	2.55	2.2	2.2	2.3	--	2.3	2.1	--	2.2
	Calcium	95.8	100	90.1	85.1	82	--	78.2	89.6	--	77.7
	Chloride	7.6	7.2	7.1	7.1	6.9	--	7.3	6.4	--	6.6
	Fluoride	0.4	< 0.029	0.21 J	0.12 J	0.074 J	0.057 J	0.13 J	0.072 J	0.074 J	0.077 J
	pH (field) (SU)	5.74	5.93	5.68	5.97	5.84	5.8	5.85	5.89	5.78	5.81
	Sulfate	360	335	296	345	329	--	325	287	--	283
	TDS	579	612	359	535	517	--	473	489	--	392
APPENDIX IV	Antimony	< 0.0006	< 0.0006	< 0.00078	< 0.00078	--	< 0.00027	< 0.00027	< 0.00027	< 0.00028	< 0.00028
	Arsenic	< 0.0005	< 0.00052	< 0.00057	< 0.00057	--	< 0.00035	< 0.00035	< 0.00035	< 0.00078	< 0.00078
	Barium	0.0347	0.0346	0.028	0.029	--	0.026	0.022	0.025	0.024	0.023
	Beryllium	0.0001 J	< 0.000091	0.00013 J	0.00012 J	--	0.00014 J	0.00014 J	0.00015 J	0.00015 J	0.00014 J
	Cadmium	0.0007 J	< 0.00014	0.00017 J	0.00023 J	--	0.00025 J	0.0004 J	0.00018 J	0.00018 J	0.00017 J
	Chromium	< 0.0005	< 0.00045	< 0.0016	< 0.0016	--	< 0.00039	< 0.00039	< 0.00039	< 0.00055	< 0.00055
	Cobalt	0.0028 J	< 0.00026	0.0041 J	0.0032 J	--	0.0037 J	0.0043 J	0.0031 J	0.0041 J	0.0042 J
	Fluoride	0.4	< 0.029	0.21 J	0.12 J	0.074 J	0.057 J	0.13 J	0.072 J	0.074 J	0.077 J
	Lead	0.00009 J	< 0.000067	< 0.00027	< 0.00027	--	< 0.000046	< 0.000046	< 0.000046	< 0.000036	< 0.000036
	Lithium	< 0.0015	< 0.0015	< 0.00097	< 0.00097	--	0.0009 J	0.00078 J	0.00089 J	0.00082 J	< 0.00081
	Mercury	0.00004 J	< 0.000036	< 0.000036	< 0.000036	--	< 0.00014	--	--	0.00012 J	< 0.000078
	Molybdenum	< 0.001	< 0.001	< 0.0019	< 0.0019	--	< 0.00095	< 0.00095	< 0.00095	< 0.00069	< 0.00069
	Radium-226+228 (pCi/L)	1.44	< 1.03 U	< 1.48 U	1.22	--	< 1.54 U	< 1.32 U	--	< 1.34 U	< 2.16 U
	Selenium	< 0.0018	< 0.0018	< 0.0014	< 0.0014	--	< 0.0013	< 0.0013	< 0.0013	< 0.0016	< 0.0016
	Thallium	< 0.00005	< 0.000052	< 0.00014	< 0.00014	--	< 0.000052	< 0.000052	< 0.000052	< 0.00014	< 0.00014
FIELD	Oxidation-reduction potential (mV)	606.8	227.1	202.2	239.6	86.21	76.5	95.6	48.9	92.9	66.76
	pH (SU)	5.74	5.93	5.68	5.97	5.84	5.8	5.85	5.89	5.78	5.81
	RDO Concentration	0.45	0.09	0.08	0.07	0.24	0.71	0.04	0.23	0.02	0.028
	Specific Conductance (µS/cm)	785	777.6	729.8	717.9	686.26	704.2	710.2	689.5	668.6	678.03
	Temperature (deg C)	25.03	18.46	21.73	19.79	16.55	23.25	20.81	17.63	21.19	20.56
	Turbidity (NTU)	1.67	1.98	0.26	0.62	--	0.22	0.17	0.4	0.18	0.29
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	--
	Magnesium	--	--	--	--	--	--	--	--	--	--
	Manganese	--	--	--	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	--	--	--	--	--	--	--	--
	Sodium	--	--	--	--	--	--	--	--	--	--
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

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TDS = total dissolved solids

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(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWC-34S	BRGWC-34S	BRGWC-34S	BRGWC-34S	BRGWC-34S	BRGWC-34S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S
	Sample Date:	3/3/2021	9/22/2021	2/1/2022	8/24/2022	1/24/2023	8/22/2023	9/7/2016	11/17/2016	2/22/2017	6/15/2017
	Parameter (1,2,3)										
	Boron	2.1	2.2	2.2	2.45	2.21	1.9	1.06 B	0.967	1.35	1.49
	Calcium	88.6	76.9	81.7	75	80	83.4	54.1	62.6	64.6	61.3
	Chloride	6.4	5.6	5.9	6.17	7.5	13.2	5.8	6	5.6	5.8
	Fluoride	0.071 J	0.1	0.06 J	0.14	0.122	0.0816 J	0.34	0.24 J	0.09 J	0.03 J
	pH (field) (SU)	5.88	5.93	5.87	5.75	5.93	5.72	6.1	6.04	6.08	6.06
	Sulfate	277	232	243	268	267	299	260	280	270	280
	TDS	422	406	449	452	433	495	486	453	541	548
APPENDIX IV	Antimony	< 0.00028	< 0.00078	< 0.00078	< 0.001	< 0.001	< 0.001	< 0.0008	< 0.0008	< 0.0008	< 0.0006
	Arsenic	< 0.00078	< 0.0011	< 0.0011	< 0.002	< 0.002	< 0.002	< 0.0016	< 0.0016	< 0.0016	0.0006 J
	Barium	0.024	0.021	0.024	0.0249	0.0232	0.0268	0.101	0.0808	0.0701	0.0518
	Beryllium	0.00015 J	0.00015 J	0.00015 J	< 0.0002	< 0.0002	< 0.0002	0.00009 J	0.0001 J	0.0001 J	0.0001 J
	Cadmium	0.00015 J	0.00033 J	0.00012 J	0.000517 J	< 0.0003	< 0.0003	< 0.00007	< 0.00007	< 0.00007	< 0.0001
	Chromium	< 0.00055	< 0.0011	< 0.0011	< 0.003	< 0.003	< 0.003	0.0019 J	0.0024 J	0.004 J	0.0033 J
	Cobalt	0.0046 J	0.0075	0.0044 J	0.00438	0.00351	0.00384	0.0023 J	0.0012 J	0.0008 J	0.0004 J
	Fluoride	0.071 J	0.1	0.06 J	0.14	0.122	0.0816 J	0.34	0.24 J	0.09 J	0.03 J
	Lead	< 0.000036	< 0.00089	< 0.00089	< 0.0005	< 0.0005	< 0.0005	0.0001 J	0.0002 J	0.0001 J	< 0.00007
	Lithium	0.00096 J	< 0.00073	0.00085 J	< 0.003	< 0.003	< 0.003	0.0021 J	0.0022 J	0.0023 J	0.0023 J
	Mercury	< 0.000078	0.00015 J	< 0.00013	< 0.000067	< 0.000067	< 0.000067	< 0.000041	< 0.000041	< 0.000041	0.00007 J
	Molybdenum	< 0.00069	< 0.00074	< 0.00074	< 0.0002	< 0.0002	< 0.0002	< 0.0017	< 0.0017	< 0.0017	< 0.001
	Radium-226+228 (pCi/L)	1.12	< 1.33 U	--	1.86	2.14 U	1.06 U	--	0.729	0.293	1.09
	Selenium	< 0.0016	< 0.0014	< 0.0014	< 0.0015	< 0.0015	< 0.0015	< 0.001	< 0.001	< 0.001	< 0.0018
	Thallium	< 0.00014	< 0.00018	< 0.00018	< 0.0006	< 0.0006	< 0.0006	< 0.0002	< 0.0002	< 0.0002	< 0.00005
FIELD	Oxidation-reduction potential (mV)	55.2	113	74.5	54.7	32.3	64.94	27.7	30.8	31.5	71
	pH (SU)	5.88	5.93	5.87	5.75	5.93	5.72	6.1	6.04	6.08	6.06
	RDO Concentration	0.06	2.15	0.15	1.48	1.65	1.54	0.31	0.54	0.07	0.52
	Specific Conductance (µS/cm)	659.3	603.3	614.1	552.86	561.59	570.67	646.4	599.7	699.4	659.4
	Temperature (deg C)	17.76	21.82	19.05	22.44	18.39	25.89	21.55	23.38	18.02	20.65
	Turbidity (NTU)	0.62	1.48	0.67	0.97	0.65	0.52	4.04	2.43	3.52	0.75
Geochem	Alkalinity (total) as CaCO3	29.2	--	29	28.6	30	28.9	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	29.2	--	29	28.6	30	28.9	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	< 5	--	< 1.8	< 1.45	< 1.45	< 0.725	--	--	--	--
	Dissolved Organic Carbon	< 0.5	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	0	0	--	--	--	--
	Iron	0.017 J	--	< 0.025	< 0.033	< 0.033	< 0.033	--	--	--	--
	Magnesium	18.2	--	16.1	18.6	18.6	18.9	--	--	--	--
	Manganese	3.7	--	3.3	2.97	3.29	3.33	--	--	--	--
	Nitrate Nitrite	< 0.017	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	< 0.033	0.0431 J	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	3.9	--	3.5	3.79	3.54	3.52	--	--	--	--
	Sodium	23.8	--	21.3	22.8	21.7	20.7	--	--	--	--
	Sulfide	--	--	--	--	< 0.033	< 0.033	--	--	--	--
	Total Hardness	296	--	--	--	--	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S
	Sample Date:	9/28/2017	2/15/2018	6/27/2018	12/19/2018	3/20/2019	8/28/2019	10/16/2019	3/5/2020	8/19/2020	9/16/2020
	Parameter (1,2,3)										
	Boron	1.27	1.58	1.7	1.8	1.7	--	2.2	1.9	--	1.9
	Calcium	60.8	56.6	66.2	64.4	61.8	--	61.2	69.9	--	61.8
	Chloride	6.2	6.2	5.9	6.2	6.6	--	6.6	5.8	--	6
	Fluoride	< 0.03	< 0.029	0.22 J	0.11 J	0.088 J	0.056 J	0.08 J	0.067 J	0.06 J	0.062 J
	pH (field) (SU)	6.03	6.02	6.01	6.22	6.06	5.95	6.03	6.04	5.97	5.96
	Sulfate	240	266	278	287	268	--	277	269	--	270
	TDS	487	500	347	489	501	--	481	535	--	474
APPENDIX IV	Antimony	< 0.0006	< 0.0006	< 0.00078	< 0.00078	--	< 0.00027	< 0.00027	< 0.00027	< 0.00028	< 0.00028
	Arsenic	< 0.0005	< 0.00052	< 0.00057	< 0.00057	--	0.00044 J	0.0004 J	< 0.00035	< 0.00078	< 0.00078
	Barium	0.047	0.0485	0.046	0.04	--	0.039	0.037	0.039	0.04	0.033
	Beryllium	0.0001 J	< 0.000091	0.00015 J	0.00014 J	--	0.00016 J	0.00015 J	0.00015 J	0.00015 J	0.00014 J
	Cadmium	< 0.0001	< 0.00014	< 0.000093	< 0.000093	--	< 0.00011	< 0.00011	< 0.00011	< 0.00012	< 0.00012
	Chromium	0.0052 J	< 0.00045	0.0062 J	0.0073 J	--	0.0071 J	0.0064 J	0.0076 J	0.0073 J	0.0058 J
	Cobalt	0.0003 J	< 0.00026	< 0.00052	< 0.00052	--	< 0.0003	< 0.0003	< 0.0003	< 0.00038	< 0.00038
	Fluoride	< 0.03	< 0.029	0.22 J	0.11 J	0.088 J	0.056 J	0.08 J	0.067 J	0.06 J	0.062 J
	Lead	< 0.00007	< 0.000067	< 0.00027	< 0.00027	--	< 0.000046	< 0.000046	< 0.000046	< 0.000036	0.00012 J
	Lithium	0.0021 J	0.0021 J	0.0021 J	0.0021 J	--	0.0021 J	0.0022 J	0.0021 J	0.0021 J	0.002 J
	Mercury	< 0.000036	< 0.000036	< 0.000036	< 0.000036	--	< 0.00014	--	--	0.00013 J	< 0.000078
	Molybdenum	< 0.001	< 0.001	< 0.0019	< 0.0019	--	< 0.00095	< 0.00095	< 0.00095	< 0.00069	< 0.00069
	Radium-226+228 (pCi/L)	< 1.27 U	< 0.974 U	< 1.28 U	< 1.45 U	--	< 1.76 U	1.69	--	< 1.3 U	< 2.24 U
	Selenium	< 0.0018	< 0.0018	< 0.0014	< 0.0014	--	< 0.0013	< 0.0013	< 0.0013	< 0.0016	< 0.0016
	Thallium	< 0.00005	< 0.000052	< 0.00014	< 0.00014	--	< 0.000052	< 0.000052	< 0.000052	< 0.00014	< 0.00014
FIELD	Oxidation-reduction potential (mV)	1,023.3	112.3	135	89.4	83.1	79.4	98.4	52.6	87.7	69.98
	pH (SU)	6.03	6.02	6.01	6.22	6.06	5.95	6.03	6.04	5.97	5.96
	RDO Concentration	0.28	0.12	0.18	1.41	1.57	0.13	0.07	0.25	0.03	0.095
	Specific Conductance (µS/cm)	655.7	553.5	664.1	659.3	643.1	661.2	680.8	688.8	681.9	683.6
	Temperature (deg C)	20.93	17.58	22.53	17.52	15.48	21.31	20.55	16.93	20.25	19.59
	Turbidity (NTU)	0.84	1.38	1.93	1.17	0.18	0.79	0.86	0.92	0.38	0.17
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	--
	Magnesium	--	--	--	--	--	--	--	--	--	--
	Manganese	--	--	--	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	--	--	--	--	--	--	--	--
	Sodium	--	--	--	--	--	--	--	--	--	--
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-35S	BRGWC-36S	BRGWC-36S	BRGWC-36S
	Sample Date:	3/4/2021	9/23/2021	2/1/2022	8/24/2022	10/12/2022	1/24/2023	8/23/2023	9/7/2016	11/18/2016	2/23/2017
	Parameter (1,2,3)										
	Boron	1.9	2	2.1	2.23	--	2.23	2.36	0.725 B	0.831	0.949
	Calcium	71.8	70.5	73.8	68.5	--	67.5	71.4	50.6	53.9	51
	Chloride	5.8	6.1	6	6.53	--	6.46	6.21	3.1	3.4	3.2
	Fluoride	0.076 J	0.073 J	0.055 J	< 0.033	--	0.239	0.347	0.18 J	0.04 J	0.07 J
	pH (field) (SU)	6.14	6.08	6.04	6.05	5.64	6.08	5.9	5.59	5.51	5.65
	Sulfate	251	258	256	279	--	334	269	300	170	330
	TDS	480	511	521	507	--	507	485	528	524	517
APPENDIX IV	Antimony	< 0.00028	< 0.00078	< 0.00078	< 0.001	--	< 0.001	< 0.001	< 0.0008	0.0016 J	< 0.0008
	Arsenic	< 0.00078	< 0.0011	< 0.0011	< 0.002	--	< 0.002	< 0.002	< 0.0016	< 0.0016	< 0.0016
	Barium	0.034	0.036	0.033	0.0339	--	0.0291	0.0286	0.0674	0.0546	0.0489
	Beryllium	0.00012 J	0.00016 J	0.00015 J	0.00021 J	--	< 0.0002	0.0002 J	< 0.00008	0.0001 J	0.0001 J
	Cadmium	< 0.00012	< 0.00011	< 0.00011	< 0.0003	--	< 0.0003	< 0.0003	0.00008 J	< 0.00007	0.0001 J
	Chromium	0.0053	0.0065	0.0056	0.00752 J	--	0.00524 J	0.00592 J	0.0073 J	0.008 J	0.0086 J
	Cobalt	< 0.00038	< 0.00039	< 0.00039	< 0.0003	--	< 0.0003	< 0.0003	< 0.0005	< 0.0005	< 0.0005
	Fluoride	0.076 J	0.073 J	0.055 J	< 0.033	--	0.239	0.347	0.18 J	0.04 J	0.07 J
	Lead	< 0.000036	< 0.00089	< 0.00089	< 0.0005	--	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001
	Lithium	0.0021 J	0.0022 J	0.0021 J	< 0.003	--	< 0.003	< 0.003	0.0024 J	0.0026 J	0.0026 J
	Mercury	< 0.000078	0.00011 J	< 0.00013	< 0.000067	--	< 0.000067	< 0.000067	< 0.000041	< 0.000041	< 0.000041
	Molybdenum	< 0.00069	< 0.00074	< 0.00074	< 0.0002	--	< 0.0002	< 0.0002	< 0.0017	< 0.0017	< 0.0017
	Radium-226+228 (pCi/L)	< 1.21 U	< 1.1 U	--	3.1	--	3.34	3.33	--	1.22	0.554
	Selenium	< 0.0016	< 0.0014	< 0.0014	< 0.0015	--	< 0.0015	< 0.0015	0.0079 J	0.0082 J	0.0061 J
	Thallium	< 0.00014	< 0.00018	< 0.00018	< 0.0006	--	< 0.0006	< 0.0006	< 0.0002	< 0.0002	< 0.0002
FIELD	Oxidation-reduction potential (mV)	20.3	68.9	69.6	84.6	147.1	36.6	73.18	79.1	123	123
	pH (SU)	6.14	6.08	6.04	6.05	5.64	6.08	5.9	5.59	5.51	5.65
	RDO Concentration	0.25	0.11	0.21	0.38	0.15	0.17	0.16	2.35	3.01	2.89
	Specific Conductance (µS/cm)	691.84	638.5	661.8	631.41	570.22	590.15	548.82	624.7	635.9	710
	Temperature (deg C)	18.23	18.96	18.11	21.27	19.94	17.86	21.42	23.7	15.62	17.35
	Turbidity (NTU)	1.76	1.8	0.87	2.66	1.73	0.22	0.61	0.43	1.36	1.12
Geochem	Alkalinity (total) as CaCO3	57.3	--	52.4	50.6	--	51.6	52.7	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	57.3	--	52.4	50.6	--	51.6	52.7	--	--	--
	Alkalinity (Carbonate as CaCO3)	< 5	--	< 1.8	< 1.45	--	< 1.45	< 0.725	--	--	--
	Dissolved Organic Carbon	< 0.5	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	0	0	--	--	--
	Iron	0.019 J	--	0.036 J	0.162	--	< 0.033	0.1	--	--	--
	Magnesium	36.2	--	36	36.9	--	36.5	32	--	--	--
	Manganese	0.013 J	--	0.011 J	0.017	--	0.0113	0.0108	--	--	--
	Nitrate Nitrite	< 0.017	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	0.149	< 0.033	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	4.5	--	4.3	4.24	--	4.05	3.93	--	--	--
	Sodium	19.6	--	20.1	19.8	--	20.1	18.5	--	--	--
	Sulfide	--	--	--	--	--	0.0354 J	< 0.033	--	--	--
	Total Hardness	328	--	--	--	--	--	--	--	--	--

Notes:

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TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S
	Sample Date:	6/15/2017	9/28/2017	2/15/2018	6/28/2018	12/19/2018	3/19/2019	8/28/2019	10/17/2019	12/3/2019	3/5/2020
	Parameter (1,2,3)										
	Boron	0.961	0.948	1.11	0.89	1.1	1	--	1.1	1	1.1
	Calcium	53.8	51.8	50.1	51	57.1	49.5	--	--	47.8	51.7
	Chloride	4	4.6	5.4	9	6.2	7.1	--	--	7.7	7.6
	Fluoride	0.01 J	< 0.03	< 0.029	0.51	< 0.029	< 0.029	< 0.05	--	0.15 J	< 0.05
	pH (field) (SU)	5.55	5.62	5.66	5.57	5.76	5.72	5.52	5.61	5.63	5.39
	Sulfate	310	290	292	284	319	307	--	--	256	262
	TDS	566	475	513	499	521	498	--	--	498	457
APPENDIX IV	Antimony	0.0006 J	< 0.0006	< 0.0006	< 0.00078	< 0.00078	--	0.00035 J	--	0.00049 J	< 0.00027
	Arsenic	0.0007 J	< 0.0005	< 0.00052	0.00074 J	< 0.00057	--	0.00045 J	--	0.001 J	< 0.00035
	Barium	0.0415	0.0397	0.038	0.035	0.035	--	0.034	--	0.031	0.033
	Beryllium	0.00009 J	0.0001 J	< 0.00046	0.000081 J	0.000086 J	--	0.00011 J	< 0.0026	0.000097 J	0.000092 J
	Cadmium	< 0.0001	< 0.0001	< 0.00014	< 0.000093	0.00011 J	--	< 0.00011	< 0.0009	< 0.00011	< 0.00011
	Chromium	0.0082 J	0.0083 J	< 0.00045	0.0076 J	0.0085 J	--	0.0078 J	--	0.007 J	0.0087 J
	Cobalt	< 0.0003	< 0.0003	< 0.00026	< 0.00052	< 0.00052	--	< 0.0003	< 0.0052	< 0.0003	< 0.0003
	Fluoride	0.01 J	< 0.03	< 0.029	0.51	< 0.029	< 0.029	< 0.05	--	0.15 J	< 0.05
	Lead	< 0.00007	< 0.00007	< 0.000067	< 0.00027	< 0.00027	--	< 0.000046	--	< 0.000046	< 0.000046
	Lithium	0.0026 J	0.0025 J	< 0.0075	0.0022 J	0.0026 J	--	0.0025 J	--	0.0024 J	0.0025 J
	Mercury	0.00007 J	< 0.000036	< 0.000036	< 0.000036	< 0.000036	--	< 0.00014	--	--	--
	Molybdenum	< 0.001	< 0.001	< 0.001	< 0.0019	< 0.0019	--	< 0.00095	--	< 0.00095	< 0.00095
	Radium-226+228 (pCi/L)	< 0.96 U	< 1.25 U	< 1 U	< 1.47 U	< 1.58 U	--	< 1.59 U	--	--	--
	Selenium	0.0046 J	0.0042 J	< 0.0018	0.0033 J	0.0042 J	--	0.0041 J	--	0.0035 J	0.0034 J
	Thallium	< 0.00005	< 0.00005	< 0.000052	< 0.00014	< 0.00014	--	< 0.000052	--	< 0.000052	< 0.000052
FIELD	Oxidation-reduction potential (mV)	149.7	1,163	393	223.6	124.2	-68.2	60.2	109.8	81.7	51.6
	pH (SU)	5.55	5.62	5.66	5.57	5.76	5.72	5.52	5.61	5.63	5.39
	RDO Concentration	2.74	2.75	2.68	2.44	2.28	2.19	1.95	2.05	2.14	2.18
	Specific Conductance (µS/cm)	654.1	622.9	633.1	631.7	686.6	624.9	616.4	636.7	634.6	639.67
	Temperature (deg C)	23	24.31	17.79	21.29	16.02	17.1	22.22	18.28	16.02	13.22
	Turbidity (NTU)	0.37	2.64	0.53	0.88	1.46	2.22	0.83	0.79	1.79	0.55
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	< 0.032	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	--	--	--	16	--	--
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	--	--	--	< 1	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	< 0.015	--	--
	Magnesium	--	--	--	--	--	--	--	22.1	--	--
	Manganese	--	--	--	--	--	--	--	< 0.0061	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	--	0.035 J	--	--
	Orthophosphate	--	--	--	--	--	--	--	0.19	--	--
	Potassium	--	--	--	--	--	--	--	4.1	--	--
	Sodium	--	--	--	--	--	--	--	38.9	--	--
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

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TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-36S	BRGWC-37S	BRGWC-37S
	Sample Date:	8/19/2020	9/16/2020	3/3/2021	9/22/2021	2/1/2022	8/24/2022	1/25/2023	8/23/2023	2/23/2017	4/17/2017
	Parameter (1,2,3)										
	Boron	--	0.99	1	1.1	1	1.1	1.18	1.04	< 0.0064	--
	Calcium	--	45.9	53	53.7	49.7	48.1	48.2	43.4	3.26	--
	Chloride	--	7.9	8.1	7.1	7.6	7.96	7.93	8.26	2.1	--
	Fluoride	0.051 J	< 0.05	< 0.05	0.054 J	< 0.05	0.194	0.183	0.301	0.1 J	--
	pH (field) (SU)	5.53	5.58	5.86	5.53	5.65	5.59	5.64	5.26	5.57	5.8
	Sulfate	--	256	252	234	195	224	237	223	0.55 J	--
	TDS	--	463	442	457	441	418	418	398	45	--
APPENDIX IV	Antimony	< 0.00028	< 0.00028	< 0.00028	< 0.00078	< 0.00078	< 0.001	< 0.001	< 0.001	< 0.0008	--
	Arsenic	< 0.00078	< 0.00078	< 0.00078	< 0.0011	< 0.0011	< 0.002	< 0.002	< 0.002	< 0.0016	--
	Barium	0.037	0.03	0.031	0.028	0.029	0.0296	0.0278	0.0243	0.0229	--
	Beryllium	0.00011 J	0.00008 J	0.000079 J	0.000084 J	0.000087 J	< 0.0002	< 0.0002	< 0.0002	< 0.00008	--
	Cadmium	< 0.00012	< 0.00012	< 0.00012	< 0.00011	< 0.00011	< 0.0003	< 0.0003	< 0.0003	< 0.00007	--
	Chromium	0.0094 J	0.0064 J	0.0067	0.0065	0.0068	0.00713 J	0.00682 J	0.00649 J	0.001 J	--
	Cobalt	< 0.00038	< 0.00038	< 0.00038	< 0.00039	< 0.00039	< 0.0003	< 0.0003	< 0.0003	< 0.0005	--
	Fluoride	0.051 J	< 0.05	< 0.05	0.054 J	< 0.05	0.194	0.183	0.301	0.1 J	--
	Lead	0.000047 J	< 0.000036	< 0.000036	< 0.00089	< 0.00089	< 0.0005	< 0.0005	< 0.0005	< 0.0001	--
	Lithium	0.0024 J	0.0022 J	0.0024 J	0.0026 J	0.0023 J	< 0.003	< 0.003	< 0.003	< 0.0021	--
	Mercury	0.00013 J	< 0.000078	< 0.000078	0.0001 J	< 0.00013	< 0.000067	< 0.000067	< 0.000067	< 0.000041	--
	Molybdenum	< 0.00069	< 0.00069	< 0.00069	< 0.00074	< 0.00074	< 0.0002	< 0.0002	< 0.0002	< 0.0017	--
	Radium-226+228 (pCi/L)	1.4	< 1.33 U	< 1.08 U	< 1.47 U	--	1.38 U	4.86	3.87	0.567	--
	Selenium	0.002 J	0.0031 J	0.0024 J	0.0032 J	0.0025 J	0.00246 J	0.00237 J	0.00173 J	< 0.001	--
	Thallium	< 0.00014	< 0.00014	< 0.00014	< 0.00018	< 0.00018	< 0.0006	< 0.0006	< 0.0006	< 0.0002	--
FIELD	Oxidation-reduction potential (mV)	107.6	80.3	84.6	135.8	131.8	93	93	144.65	173.1	37.9
	pH (SU)	5.53	5.58	5.86	5.53	5.65	5.59	5.64	5.26	5.57	5.8
	RDO Concentration	1.78	2.085	2.06	1.77	2.47	1.99	2	1.83	6.57	7.29
	Specific Conductance (µS/cm)	624	608.82	598.1	570.3	596.5	513.38	598.9	552.45	53.5	53.3
	Temperature (deg C)	24.63	19.24	15.93	20.56	14.94	20.76	15.8	22.79	22.76	20.1
	Turbidity (NTU)	1.68	0.74	2.12	2.55	1.42	1.58	3.34	0.83	1.65	4.43
Geochem	Alkalinity (total) as CaCO3	--	--	20.4	--	20.8	20.6	22	20.6	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	20.4	--	20.8	20.6	22	20.6	--	--
	Alkalinity (Carbonate as CaCO3)	--	--	< 5	--	< 1.8	< 1.45	< 1.45	< 0.725	--	--
	Dissolved Organic Carbon	--	--	0.55 J	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	0	0	--	--
	Iron	--	--	< 0.016	--	< 0.025	< 0.033	< 0.033	0.0387 J	--	--
	Magnesium	--	--	22.4	--	19.8	20.5	20.1	17.2	--	--
	Manganese	--	--	0.0022 J	--	< 0.0043	0.00295 J	0.00205 J	0.00167 J	--	--
	Nitrate Nitrite	--	--	0.062	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	0.131	0.136	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	4.2	--	3.7	3.78	3.84	3.4	--	--
	Sodium	--	--	40.9	--	39.2	40.6	40.4	36.9	--	--
	Sulfide	--	--	--	--	--	--	< 0.033	< 0.033	--	--
	Total Hardness	--	--	224	--	--	--	--	--	--	--

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(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWC-37S	BRGWC-37S	BRGWC-37S	BRGWC-37S	BRGWC-37S	BRGWC-37S	BRGWC-37S	BRGWC-37S	BRGWC-37S	BRGWC-37S
	Sample Date:	5/15/2017	6/15/2017	9/28/2017	2/15/2018	6/28/2018	12/19/2018	3/20/2019	8/28/2019	10/16/2019	3/5/2020
	Parameter (1,2,3)										
	Boron	--	< 0.006	< 0.006	< 0.006	0.0067 J	< 0.0039	0.004 J	--	0.0055 J	0.0076 J
	Calcium	--	3.15	3.26	3.39	3.1	3.6	3.3	--	3.4	3.7
	Chloride	--	1.9	1.9	2.3	2.1	1.9	2.3	--	2.3	1.8
	Fluoride	--	0.03 J	< 0.03	< 0.029	< 0.029	0.094 J	0.062 J	< 0.05	0.059 J	0.05 J
	pH (field) (SU)	5.75	5.8	5.86	5.95	5.78	6.07	5.93	5.8	5.81	5.53
	Sulfate	--	0.46 J	0.49 J	1.9 J	0.24 J	0.4 J	0.39 J	--	0.29 J	< 0.5
	TDS	--	63	39	54	59	68	68	--	49	39
APPENDIX IV	Antimony	--	0.0006 J	< 0.0006	< 0.0006	< 0.00078	< 0.00078	--	< 0.00027	< 0.00027	< 0.00027
	Arsenic	--	< 0.0005	< 0.0005	< 0.00052	0.0011 J	< 0.00057	--	0.00038 J	0.00078 J	0.00044 J
	Barium	--	0.0218	0.0222	0.0243	0.023	0.024	--	0.027	0.024	0.025
	Beryllium	--	< 0.00009	< 0.00009	< 0.000091	< 0.00005	< 0.00005	--	< 0.000074	< 0.000074	< 0.000074
	Cadmium	--	< 0.0001	< 0.0001	< 0.00014	< 0.000093	< 0.000093	--	< 0.00011	< 0.00011	< 0.00011
	Chromium	--	0.0013 J	0.0014 J	< 0.00045	< 0.0016	< 0.0016	--	0.0017 J	0.0014 J	0.0016 J
	Cobalt	--	< 0.0003	< 0.0003	< 0.00026	< 0.00052	< 0.00052	--	< 0.0003	< 0.0003	< 0.0003
	Fluoride	--	0.03 J	< 0.03	< 0.029	< 0.029	0.094 J	0.062 J	< 0.05	0.059 J	0.05 J
	Lead	--	< 0.00007	0.0001 J	< 0.000067	< 0.00027	< 0.00027	--	< 0.000046	< 0.000046	< 0.000046
	Lithium	--	< 0.0015	< 0.0015	< 0.0015	< 0.00097	< 0.00097	--	< 0.00078	< 0.00078	< 0.00078
	Mercury	--	0.00006 J	< 0.000036	< 0.000036	< 0.000036	< 0.000036	--	< 0.00014	--	--
	Molybdenum	--	< 0.001	< 0.001	< 0.001	< 0.0019	< 0.0019	--	< 0.00095	< 0.00095	< 0.00095
	Radium-226+228 (pCi/L)	--	< 0.946 U	< 1.09 U	< 0.944 U	< 1.25 U	< 1.34 U	--	< 1.62 U	< 1.39 U	--
	Selenium	--	< 0.0018	< 0.0018	< 0.0018	< 0.0014	< 0.0014	--	< 0.0013	< 0.0013	< 0.0013
	Thallium	--	< 0.00005	< 0.00005	< 0.000052	< 0.00014	< 0.00014	--	< 0.000052	< 0.000052	< 0.000052
FIELD	Oxidation-reduction potential (mV)	78.3	131.1	1,175.8	505	118.6	153.8	-79	95.7	86	28.1
	pH (SU)	5.75	5.8	5.86	5.95	5.78	6.07	5.93	5.8	5.81	5.53
	RDO Concentration	6.94	7.3	7.11	7.83	7.88	8.28	8.25	8.08	7.9	8.17
	Specific Conductance (µS/cm)	54.8	55.3	53.2	53.9	52.7	54.5	55.5	54.5	55.8	54.96
	Temperature (deg C)	22.8	22.01	24.17	21.05	20.75	17.49	19.47	21.52	22.69	16.92
	Turbidity (NTU)	2.19	--	0.21	0	0.01	0.51	0.31	0.24	0.23	0.19
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	--
	Magnesium	--	--	--	--	--	--	--	--	--	--
	Manganese	--	--	--	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	--	--	--	--	--	--	--	--
	Sodium	--	--	--	--	--	--	--	--	--	--
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

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	Sample Date:	8/19/2020	9/16/2020	3/3/2021	9/23/2021	2/2/2022	8/23/2022	1/25/2023	8/22/2023	9/7/2016	9/23/2016
	Parameter (1,2,3)										
	Boron	--	0.0062 J	< 0.0052	< 0.0086	0.032 J	< 0.0052	< 0.0052	0.00802 J	1.73 B	--
	Calcium	--	3.2	3.6	3.7	3.7	3.7	3.65	3.47	45.9	--
	Chloride	--	1.8	1.9	1.9	1.8	1.97	1.92	1.89	5.8	--
	Fluoride	0.055 J	< 0.05	< 0.05	< 0.05	< 0.05	0.105	0.114	0.0445 J	0.66	--
	pH (field) (SU)	5.66	5.84	5.87	5.85	5.8	5.82	5.84	5.42	5.43	5.46
	Sulfate	--	< 0.5	< 0.5	< 0.5	< 0.5	0.307 J	0.325 J	0.355 J	440	--
	TDS	--	31	33	49	46	40	28	42	750	--
APPENDIX IV	Antimony	< 0.00028	< 0.00028	< 0.00028	< 0.00078	< 0.00078	< 0.001	< 0.001	< 0.001	< 0.0008	--
	Arsenic	< 0.00078	< 0.00078	< 0.00078	< 0.0011	< 0.0011	< 0.002	0.003 J	< 0.002	0.0026 J	--
	Barium	0.026	0.024	0.024	0.027	0.025	0.026	0.0247	0.0266	0.044	--
	Beryllium	< 0.000046	< 0.000046	< 0.000046	< 0.000054	< 0.000054	< 0.0002	< 0.0002	< 0.0002	0.0079	--
	Cadmium	< 0.00012	< 0.00012	< 0.00012	< 0.00011	< 0.00011	< 0.0003	< 0.0003	< 0.0003	0.0004 J	--
	Chromium	0.0017 J	0.0018 J	0.0014 J	0.0016 J	0.0015 J	< 0.003	< 0.003	< 0.003	0.0014 J	--
	Cobalt	< 0.00038	< 0.00038	< 0.00038	< 0.00039	< 0.00039	< 0.0003	< 0.0003	< 0.0003	0.236	--
	Fluoride	0.055 J	< 0.05	< 0.05	< 0.05	< 0.05	0.105	0.114	0.0445 J	0.66	--
	Lead	< 0.000036	< 0.000036	< 0.000036	< 0.00089	< 0.00089	< 0.0005	< 0.0005	< 0.0005	0.0004 J	--
	Lithium	< 0.00081	< 0.00081	< 0.00081	< 0.00073	< 0.00073	< 0.003	< 0.003	< 0.003	0.0193 J	--
	Mercury	0.00014 J	< 0.000078	< 0.000078	0.00011 J	< 0.00013	< 0.000067	< 0.000067	< 0.000067	0.00007 J	--
	Molybdenum	< 0.00069	< 0.00069	< 0.00069	< 0.00074	< 0.00074	< 0.0002	< 0.0002	< 0.0002	< 0.0017	--
	Radium-226+228 (pCi/L)	< 1.15 U	< 1.59 U	1.12	< 1.12 U	--	2.37 U	1.67 U	0.578 U	--	--
	Selenium	< 0.0016	< 0.0016	< 0.0016	< 0.0014	< 0.0014	< 0.0015	< 0.0015	< 0.0015	0.0311	--
	Thallium	< 0.00014	< 0.00014	< 0.00014	< 0.00018	< 0.00018	< 0.0006	< 0.0006	< 0.0006	< 0.0002	--
FIELD	Oxidation-reduction potential (mV)	79	55.5	35.7	95.9	142	106.8	156.2	176.4	57.1	87.6
	pH (SU)	5.66	5.84	5.87	5.85	5.8	5.82	5.84	5.42	5.43	5.46
	RDO Concentration	8.19	8.12	7.83	7.38	7.99	7.71	7.14	7.47	0.34	0.46
	Specific Conductance (µS/cm)	54	52.7	52.9	49.37	55.39	48.9	47.92	56	861.3	844.2
	Temperature (deg C)	22.63	19.5	19.25	22.43	16.87	20.48	18.88	29.25	21.93	22.92
	Turbidity (NTU)	0.11	0.11	0.64	0.01	0.32	1.12	0.19	0.51	2.84	1.76
Geochem	Alkalinity (total) as CaCO3	--	--	22.1	--	23.2	21.2	21.2	21.9	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	22.1	--	23.2	21.2	21.2	21.9	--	--
	Alkalinity (Carbonate as CaCO3)	--	--	< 5	--	< 1.8	< 1.45	< 1.45	< 0.725	--	--
	Dissolved Organic Carbon	--	--	< 0.5	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	0	0	--	--
	Iron	--	--	< 0.016	--	< 0.025	< 0.033	< 0.033	< 0.033	--	--
	Magnesium	--	--	1.2	--	1.2	1.29	1.35	1.16	--	--
	Manganese	--	--	< 0.0017	--	< 0.0043	< 0.001	< 0.001	< 0.001	--	--
	Nitrate Nitrite	--	--	0.28	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	0.318	0.294	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	2	--	2.3	1.84	1.94	1.79	--	--
	Sodium	--	--	4.7	--	5	4.51	4.85	4.23	--	--
	Sulfide	--	--	--	--	--	--	< 0.033	< 0.033	--	--
	Total Hardness	--	--	14.1	--	--	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S
	Sample Date:	11/21/2016	2/23/2017	6/15/2017	9/28/2017	2/15/2018	6/28/2018	12/20/2018	3/20/2019	8/29/2019	10/16/2019
	Parameter (1,2,3)										
	Boron	2.02	1.77	1.78	1.45	2.09	1.5	1.7	1.5	--	1.5
	Calcium	46.4	43.5	45.3	45.1	45.3	45.9	41.8	38.2	--	38.4
	Chloride	5.1	4.1	4.8	6.7	8	5.5	8	6.6	--	6.4
	Fluoride	0.95	0.75	0.77	0.8	0.82	1.5	0.68	0.95	0.9	0.61
	pH (field) (SU)	4.84	4.73	4.35	4.37	4.3	4.16	4.21	4.34	4.01	4.21
	Sulfate	510	470	490	470	432	453	463	405	--	432
	TDS	795	733	812	690	722	704	642	615	--	630
APPENDIX IV	Antimony	0.0009 J	< 0.0008	0.0007 J	< 0.0006	< 0.0006	< 0.00078	< 0.00078	--	< 0.00027	< 0.00027
	Arsenic	0.0034 J	0.003 J	0.005 J	0.0046 J	0.0016 J	0.0023 J	0.00098 J	--	0.0013 J	0.0024 J
	Barium	0.0428 J	0.0338	0.0239	0.0247	0.0215	0.018	0.017	--	0.016	0.015
	Beryllium	0.0092	0.01	0.0104	0.0098	< 0.00046	0.0085	0.0092	--	0.0088	0.0079
	Cadmium	0.0005 J	0.0007 J	0.0006 J	0.0007 J	< 0.00014	0.00056 J	0.00062 J	--	0.00053 J	0.00057 J
	Chromium	0.003 J	0.0028 J	0.0038 J	0.0037 J	< 0.00045	0.0041 J	0.0041 J	--	0.0044 J	0.0038 J
	Cobalt	0.298	0.277	0.262	0.279	0.279	0.23	0.25	--	0.21	0.21
	Fluoride	0.95	0.75	0.77	0.8	0.82	1.5	0.68	0.95	0.9	0.61
	Lead	0.0005 J	0.0005 J	0.0004 J	0.0004 J	< 0.000067	0.00036 J	0.00039 J	--	0.00035 J	0.00035 J
	Lithium	0.0223 J	0.0229 J	0.0227 J	0.023 J	0.0254 J	0.021 J	0.022 J	--	0.021 J	0.02 J
	Mercury	0.00012 J	0.00007 J	0.00016 J	0.00011 J	0.00015 J	0.00017 J	0.00017 J	--	0.00018 J	--
	Molybdenum	< 0.0017	< 0.0017	< 0.001	< 0.001	< 0.001	< 0.0019	< 0.0019	--	< 0.00095	< 0.00095
	Radium-226+228 (pCi/L)	2.94	1.92	3.6	3.3	< 0.876 U	< 1.53 U	2.8	--	3.68	2.66
	Selenium	0.0409	0.0354	0.0511	0.0484	0.0435	0.037	0.037	--	0.036	0.033
	Thallium	0.0004 J	0.0003 J	0.0003 J	0.0003 J	0.00026 J	0.00018 J	0.00023 J	--	0.00021 J	0.0002 J
FIELD	Oxidation-reduction potential (mV)	142.2	257.2	311.6	841.3	306.1	391.7	335.2	-67.2	173.5	134.4
	pH (SU)	4.84	4.73	4.35	4.37	4.3	4.16	4.21	4.34	4.01	4.21
	RDO Concentration	0.76	0.92	1.64	1.09	1.56	1.82	1.41	2.07	1.24	1.93
	Specific Conductance (µS/cm)	834.7	926.9	935.4	919.5	761	893.7	861.7	849.3	854.3	855.7
	Temperature (deg C)	17.54	20.26	22.08	23.41	22.89	20.92	16.33	20.21	21.99	21.35
	Turbidity (NTU)	1.21	2.55	0.49	0.72	0.1	0.28	0.58	0.84	0.89	0.33
Geochem	Alkalinity (total) as CaCO3	--	--	--	--	--	--	--	--	--	--
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Carbonate as CaCO3)	--	--	--	--	--	--	--	--	--	--
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	--
	Magnesium	--	--	--	--	--	--	--	--	--	--
	Manganese	--	--	--	--	--	--	--	--	--	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	--	--	--	--
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	--	--	--	--	--	--	--	--
	Sodium	--	--	--	--	--	--	--	--	--	--
	Sulfide	--	--	--	--	--	--	--	--	--	--
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S
	Sample Date:	3/5/2020	8/19/2020	9/17/2020	3/4/2021	9/23/2021	2/1/2022	8/23/2022	10/12/2022	1/25/2023	8/23/2023
	Parameter (1,2,3)										
	Boron	1.6	--	1.4	1.5	1.4	1.6	1.67	--	1.63	1.37
	Calcium	39.8	--	33.1	41	36.8	37.8	37.1	--	32.8	28.7
	Chloride	5.8	--	6.1	5.6	6	5.8	6.42	--	6.53	6.44
	Fluoride	0.92	0.95	0.68	0.83	0.85	0.95	0.609	--	0.708	0.748
	pH (field) (SU)	4.01	4.12	4.17	4.19	4.05	4.06	3.97	4.17	4.75	3.91
	Sulfate	370	--	356	325	318	287	389	--	291	274
	TDS	608	--	587	540	528	560	568	--	484	459
APPENDIX IV	Antimony	< 0.00027	< 0.00028	< 0.00028	< 0.00028	< 0.00078	< 0.00078	< 0.001	--	< 0.001	< 0.001
	Arsenic	0.0011 J	0.0021 J	0.0015 J	0.0029 J	0.002 J	< 0.0011	0.00337 J	--	0.00486 J	< 0.002
	Barium	0.016	0.016	0.014	0.015	0.014	0.015	0.0141	--	0.018	0.0134
	Beryllium	0.0082	0.0079	0.0073	0.0077	0.0071	0.0072	0.00854	--	0.0078	0.0068
	Cadmium	0.00059 J	0.00056 J	0.0005 J	0.00042 J	0.00048 J	0.00058	0.000459 J	--	0.00043 J	0.00041 J
	Chromium	0.0038 J	0.0043 J	0.0042 J	0.004 J	0.004 J	0.0035 J	0.00398 J	--	0.00362 J	0.00338 J
	Cobalt	0.22	0.22	0.2	0.2	0.17	0.18	0.173	--	0.158	0.139
	Fluoride	0.92	0.95	0.68	0.83	0.85	0.95	0.609	--	0.708	0.748
	Lead	0.00041 J	0.00031 J	0.00032 J	0.00034 J	< 0.00089	< 0.00089	< 0.0005	--	< 0.0005	< 0.0005
	Lithium	0.021 J	0.021 J	0.02 J	0.021 J	0.019 J	0.02 J	0.0214	--	0.0256	0.0195
	Mercury	--	0.00018 J	0.00011 J	0.000085 J	0.00022	< 0.00013	0.000117 J	--	< 0.000067	< 0.000067
	Molybdenum	< 0.00095	< 0.00069	< 0.00069	< 0.00069	< 0.00074	< 0.00074	< 0.0002	--	< 0.0002	< 0.0002
	Radium-226+228 (pCi/L)	--	3.17	2.92	1.99	1.4	--	3.12	--	3.79	5.98
	Selenium	0.032	0.041	0.029	0.039	0.031	0.029	0.0296	--	0.0279	0.0186
	Thallium	0.0002 J	0.00019 J	0.00017 J	< 0.00014	0.00022 J	< 0.00018	< 0.0006	--	< 0.0006	< 0.0006
FIELD	Oxidation-reduction potential (mV)	49.9	116.4	114.9	166.5	87	141.5	153.4	297.5	124.2	132.46
	pH (SU)	4.01	4.12	4.17	4.19	4.05	4.06	3.97	4.17	4.75	3.91
	RDO Concentration	2.39	1.25	1.78	1.26	1.3	1.17	1.63	1.52	1.71	1.8
	Specific Conductance (µS/cm)	842.73	808.5	793.9	786.2	720.1	804.8	690.15	577.61	675.19	632.85
	Temperature (deg C)	17.5	22.58	21.1	19.3	20.22	18.37	21.4	21.02	18.53	22.7
	Turbidity (NTU)	0.42	0.03	0.4	0.67	0.58	1.72	0.55	0.83	0.88	0.83
Geochem	Alkalinity (total) as CaCO3	--	--	--	< 5	--	< 1.8	< 1.45	--	3 J	< 0.725
	Aluminum	--	--	--	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	--	< 5	--	< 1.8	< 1.45	--	3 J	< 0.725
	Alkalinity (Carbonate as CaCO3)	--	--	--	< 5	--	< 1.8	< 1.45	--	< 1.45	< 0.725
	Dissolved Organic Carbon	--	--	--	< 0.5	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	--	--	--	--	0	0
	Iron	--	--	--	0.025 J	--	0.064	< 0.033	--	< 0.033	0.0343 J
	Magnesium	--	--	--	43.4	--	40.3	41.3	--	36.9	30.4
	Manganese	--	--	--	2	--	1.9	1.8	--	1.65	1.43
	Nitrate Nitrite	--	--	--	0.078	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	--	--	--	--	--	--	0.145 J	0.123
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	--	--	7.3	--	6.5	5.75	--	6.12	5.28
	Sodium	--	--	--	51.3	--	46.8	44.1	--	42.3	36.3
	Sulfide	--	--	--	--	--	--	--	--	< 0.033	< 0.033
	Total Hardness	--	--	--	281	--	--	--	--	--	--

Notes:

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TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	PZ-13S	PZ-13S	PZ-13S	PZ-13S	PZ-13S	PZ-13S	PZ-52D	PZ-52D	PZ-52D	PZ-52D
	Sample Date:	9/26/2016	1/15/2019	10/22/2019	8/23/2022	1/26/2023	8/22/2023	6/19/2020	9/1/2022	1/25/2023	1/26/2023
	Parameter (1,2,3)										
	Boron	--	< 0.0039	0.0098 J	< 0.0052	0.0104 J	0.00855 J	0.028 J	0.0403	0.0362	--
	Calcium	--	23.5 J	14.8	9.69	16.8	8.74	19.6	69	46.3	--
	Chloride	--	2.4	2.1	4.2	3.36	2.73	8.4	6.24	--	12.3
	Fluoride	--	0.06 J	< 0.029	0.128	< 0.033	< 0.033	0.59	0.14	--	1.93
	pH (field) (SU)	5.68	5.52	5.49	5.46	5.56	5.37	7.17	7.7	7.14	7.14
	Sulfate	--	152	93.2	51	75.3	46.2	17	340	--	142
	TDS	--	284	203	130	148	112	140	754	443	--
APPENDIX IV	Antimony	--	< 0.00078	< 0.00027	< 0.001	< 0.001	< 0.001	--	--	< 0.001	--
	Arsenic	--	< 0.00057	< 0.00035	< 0.002	0.00388 J	< 0.002	--	--	0.00368 J	--
	Barium	--	0.14	0.077	0.0562	0.0525	0.0683	--	--	0.0171	--
	Beryllium	--	0.0005 J	0.0004 J	0.000331 J	0.000422 J	0.000259 J	< 0.000074	--	< 0.0002	--
	Cadmium	--	0.00011 J	< 0.00011	< 0.0003	< 0.0003	< 0.0003	--	--	< 0.0003	--
	Chromium	--	0.025	0.02	0.0128	0.0153	0.0111	--	--	< 0.003	--
	Cobalt	--	< 0.00052	0.00037 J	< 0.0003	< 0.0003	< 0.0003	0.00034 J	0.0015	0.00249	--
	Fluoride	--	0.06 J	< 0.029	0.128	< 0.033	< 0.033	0.59	0.14	--	1.93
	Lead	--	< 0.00027	0.00035 J	< 0.0005	< 0.0005	< 0.0005	--	--	< 0.0005	--
	Lithium	--	0.0017 J	0.001 J	< 0.003	< 0.003	< 0.003	--	--	0.0165	--
	Mercury	--	< 0.000036	--	< 0.000067	< 0.000067	< 0.000067	--	--	< 0.000067	--
	Molybdenum	--	< 0.0019	< 0.00095	< 0.0002	< 0.0002	< 0.0002	--	--	0.0222	--
	Radium-226+228 (pCi/L)	--	--	< 1.38 U	1.83 U	4.77	0.823 U	--	--	--	--
	Selenium	--	0.0033 J	0.0033 J	0.00157 J	0.00215 J	< 0.0015	--	--	< 0.0015	--
	Thallium	--	< 0.00014	< 0.000052	< 0.0006	< 0.0006	< 0.0006	--	--	< 0.0006	--
FIELD	Oxidation-reduction potential (mV)	145.9	114.5	109.6	82.2	121.8	83.2	64.74	141.1	146.5	--
	pH (SU)	5.68	5.52	5.49	5.46	5.56	5.37	7.17	7.7	7.14	7.14
	RDO Concentration	5.88	3.83	4.48	4.32	3.59	4.58	8.55	4.68	7.16	--
	Specific Conductance (µS/cm)	56.1	368.49	262.79	148.22	147.8	134.85	60.51	931.53	651.81	--
	Temperature (deg C)	19.6	14.9	18.96	19.8	15.52	21.52	21.56	25.06	18.47	--
	Turbidity (NTU)	2.19	1.87	8.87	1.31	0.36	2.71	151	4.9	3.79	--
Geochem	Alkalinity (total) as CaCO3	--	--	16	21.4	20.6	21	89.5	--	--	179
	Aluminum	--	--	0.24	--	--	--	--	--	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	--	16	21.4	20.6	21	--	--	--	179
	Alkalinity (Carbonate as CaCO3)	--	--	< 1	< 1.45	< 1.45	< 0.725	--	--	--	< 1.45
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	--	--	--	0	0	--	--	0	0
	Iron	--	--	0.3	< 0.033	< 0.033	< 0.033	--	--	0.22	--
	Magnesium	--	--	8	5.94	9.68	5.04	2.2	--	9.93	--
	Manganese	--	--	0.039	0.00137 J	0.00207 J	0.00237 J	--	--	0.0315	--
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	--	0.016 J	--	0.0655 J	0.0695 J	--	--	--	< 0.033
	Orthophosphate	--	--	0.061	--	--	--	--	--	--	--
	Potassium	--	--	4.4	3.59	4.41	3.58	3.7	--	8.93	--
	Sodium	--	--	18.9	12.5	11.7	11.4	22.4	--	94.4	--
	Sulfide	--	--	--	--	< 0.033	< 0.033	--	--	--	< 0.033
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

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J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

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(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	PZ-52D	PZ-52D	PZ-53D	PZ-53D	PZ-53D	PZ-53D	PZ-76I	PZ-76I	PZ-70I	PZ-70I
	Sample Date:	2/2/2023	8/23/2023	6/4/2020	8/23/2022	1/25/2023	8/24/2023	8/17/2023	8/23/2023	9/1/2022	1/26/2023
	Parameter (1,2,3)										
	Boron	--	0.0668	0.52	1.04	1.11	1.06	--	2.1	1.2	1.04
	Calcium	--	46.7	61.2	76.4	78.5	74.4	--	141	42.6	33.4
	Chloride	--	6.9	29.6	4.94	4.66	4.43	--	5.28	10.8	5.37
	Fluoride	--	1.94	0.19	0.164	0.282	0.334	--	--	1.43	< 0.066
	pH (field) (SU)	--	6.99	7.15	7.18	7.1	6.54	5.4	5.71	6.13	5.6
	Sulfate	--	112	255	348	285	293	--	158	172	147
	TDS	--	372	569	543	517	499	--	304	321	272
APPENDIX IV	Antimony	--	< 0.001	--	< 0.001	< 0.001	< 0.001	--	--	< 0.001	< 0.001
	Arsenic	--	< 0.002	--	< 0.002	< 0.002	< 0.002	--	--	< 0.002	0.00366 J
	Barium	--	0.0163	--	0.0547	0.0536	0.0485	--	--	0.0444	0.025
	Beryllium	--	< 0.0002	< 0.000074	< 0.0002	< 0.0002	< 0.0002	--	< 0.0002	< 0.0002	0.000217 J
	Cadmium	--	< 0.0003	--	< 0.0003	< 0.0003	< 0.0003	--	--	< 0.0003	< 0.0003
	Chromium	--	< 0.003	--	< 0.003	< 0.003	< 0.003	--	--	< 0.003	< 0.003
	Cobalt	--	0.000307 J	0.0012 J	< 0.0003	< 0.0003	< 0.0003	--	0.00587	0.0056	0.000682 J
	Fluoride	--	1.94	0.19	0.164	0.282	0.334	--	--	1.43	< 0.066
	Lead	--	< 0.0005	--	< 0.0005	< 0.0005	< 0.0005	--	--	< 0.0005	< 0.0005
	Lithium	--	0.0182	--	0.0171	0.0207	0.0185	--	--	0.00615 J	0.00381 J
	Mercury	--	< 0.000067	--	< 0.000067	< 0.000067	< 0.000067	--	--	< 0.000067	< 0.000067
	Molybdenum	--	0.0154	--	0.00265	0.00234	0.00211	--	--	0.00142	< 0.0002
	Radium-226+228 (pCi/L)	5.39	1.14 U	--	3.04	2.1 U	3.67	--	--	1.57 U	1.81 U
	Selenium	--	< 0.0015	--	< 0.0015	< 0.0015	< 0.0015	--	--	0.00625	0.00921
	Thallium	--	< 0.0006	--	< 0.0006	< 0.0006	< 0.0006	--	--	< 0.0006	< 0.0006
FIELD	Oxidation-reduction potential (mV)	--	154.76	44.1	28.3	0.6	115.95	79.09	95.74	88.38	79.79
	pH (SU)	--	6.99	7.15	7.18	7.1	6.54	5.4	5.71	6.13	5.6
	RDO Concentration	--	6.83	7.74	2.1	2.16	1.87	0.24	0.23	0.11	1.56
	Specific Conductance (µS/cm)	--	622.07	2	689.9	675.06	742.38	294.75	341.1	365.64	396.73
	Temperature (deg C)	--	35.72	25.51	25.13	18.79	24.46	24.42	22.98	24.2	16.95
	Turbidity (NTU)	--	3.37	--	0.95	2.83	1.61	4.02	6.45	4.78	0.55
Geochem	Alkalinity (total) as CaCO3	--	180	53.4	82.8	49	50.9	--	23.1	37.8	14.4
	Aluminum	--	--	--	--	--	--	--	0.0505	--	--
	Alkalinity (Bicarbonate as CaCO3)	--	180	53.4	82.8	49	50.9	--	23.1	37.8	14.4
	Alkalinity (Carbonate as CaCO3)	--	< 0.725	< 5	< 1.45	< 1.45	< 0.725	--	< 0.725	< 1.45	< 1.45
	Dissolved Organic Carbon	--	--	--	--	--	--	--	--	--	--
	Ferrous Iron	--	0	--	--	0	--	--	--	--	0
	Iron	--	0.0556 J	--	0.294	0.204	0.327	--	0.194	1.48	0.0364 J
	Magnesium	--	10.7	14.5	19.3	19.4	17.3	--	5.68	15.5	11.9
	Manganese	--	0.00623	--	0.641	0.628	0.503	--	4.65	1.06	0.271
	Nitrate Nitrite	--	--	--	--	--	--	--	--	--	--
	Nitrogen Nitrate	--	< 0.033	--	--	< 0.066	0.0807 J	--	< 0.033	--	0.275
	Orthophosphate	--	--	--	--	--	--	--	--	--	--
	Potassium	--	7.47	6.2	6.44	6.66	5.84	--	6.83	5.62	4.27
	Sodium	--	68.2	72.7	52	48.6	42.8	--	19.7	25.8	23
	Sulfide	--	< 0.033	--	--	< 0.033	< 0.033	--	< 0.033	--	< 0.033
	Total Hardness	--	--	--	--	--	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 1
Summary of Groundwater and Interstitial Water Analytical Data
Plant Branch AP-E, Putnam County, Georgia

	Well ID:	PZ-70I	PZ-77I	PZ-77I	IW-E-1	IW-E-1
	Sample Date:	8/23/2023	8/16/2023	8/23/2023	10/22/2019	1/30/2023
	Parameter (1,2,3)					
	Boron	1.01	--	0.936	0.46	0.365
	Calcium	31.4	--	86.8	26.9	21.7
	Chloride	5.75	--	12.1	2.1	1.39
	Fluoride	0.229	--	--	< 0.029	0.0643 J
	pH (field) (SU)	5.36	5.47	5.39	5.91	5.95
	Sulfate	139	--	269	138	80.9
	TDS	252	--	466	334	221
APPENDIX IV	Antimony	< 0.001	--	--	< 0.00027	--
	Arsenic	< 0.002	--	--	0.024	--
	Barium	0.0196	--	--	0.064	--
	Beryllium	0.000325 J	--	0.000318 J	< 0.000074	< 0.0002
	Cadmium	< 0.0003	--	--	< 0.00011	--
	Chromium	< 0.003	--	--	< 0.00039	--
	Cobalt	0.000784 J	--	0.0332	0.003 J	0.00376
	Fluoride	0.229	--	--	< 0.029	0.0643 J
	Lead	< 0.0005	--	--	< 0.000046	--
	Lithium	0.00385 J	--	--	0.24	--
	Mercury	0.00322	--	--	--	--
	Molybdenum	< 0.0002	--	--	0.0046 J	--
	Radium-226+228 (pCi/L)	4.35	--	--	< 1.37 U	--
	Selenium	0.00829	--	--	< 0.0013	--
	Thallium	< 0.0006	--	--	< 0.000052	--
FIELD	Oxidation-reduction potential (mV)	82.38	51.84	135.5	8.5	44.2
	pH (SU)	5.36	5.47	5.39	5.91	5.95
	RDO Concentration	0.16	0.88	0.3	0.12	0.02
	Specific Conductance (µS/cm)	302.46	449.44	715.49	383.9	304.02
	Temperature (deg C)	22.8	20.45	22.8	24.49	21.42
	Turbidity (NTU)	0.23	2.02	4.97	4.76	4.72
Geochem	Alkalinity (total) as CaCO3	14.5	--	21.9	35	40.6
	Aluminum	--	--	0.122	0.027 J	--
	Alkalinity (Bicarbonate as CaCO3)	14.5	--	21.9	35	40.6
	Alkalinity (Carbonate as CaCO3)	< 0.725	--	< 0.725	< 20	< 1.45
	Dissolved Organic Carbon	--	--	--	--	--
	Ferrous Iron	0	--	--	--	5.5
	Iron	0.105	--	0.402	33.2	22.4
	Magnesium	11.1	--	10.6	5.3	5.41
	Manganese	0.291	--	3.51	0.74	0.361
	Nitrate Nitrite	--	--	--	--	--
	Nitrogen Nitrate	0.175	--	0.151	< 0.005	< 0.033
	Orthophosphate	--	--	--	< 0.02	--
	Potassium	3.91	--	13.6	12.4	12.3
	Sodium	19.5	--	27.9	4.1	3.75
	Sulfide	< 0.033	--	< 0.033	--	< 0.033
	Total Hardness	--	--	--	--	--

Notes:

-- = Parameter was not analyzed

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

TDS = total dissolved solids

(1) Apendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), unless otherwise noted in parinthesis followong parameter. Parameters not measured in mg/L include Radium-226+228, pH, Turbidity, NTU, Temperature, ORP, and Specific Conductance.

(2) Metals were analyzed by EPA Method 6010D, 6020B, 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by

(3) The pH value presented was recorded at the time of sample collection in the field.

Table 2

Baseline Characterization Results – Cation Exchange Capacity,Total Sulfur, Total Sulfide
Plant Branch AP-E, Putnam County, Georgia

Location ID	SB-1	SB-2	Units
Sample Depth	16.4 to 26.4 ft bgs	28.2 to 38.2 ft bgs	
Sample Date	9/11/2022	9/14/2022	
Analysis			
CEC Actual	5.43	12.98	meq/100g
Sulfur	0.009	< 0.005	%
Sulfide	< 0.04	< 0.04	%

Notes:
SB-1 is collocated with BRGWC-33S and SB-2 is collocated with BRGWC-38S.
< = Indicates the parameter was not detected above the analytical method detection limit (MDL).
CEC = Cation Exchange Capacity
ft bgs = feet below ground surface
meq = milliequivalent

Table 3

Baseline Characterization Results – Total Metals

Plant Branch AP-E, Putnam County, Georgia

Location ID	SB-1	SB-2
Sample Depth	16.4 to 26.4 ft bgs	28.2 to 38.2 ft bgs
Sample Date	9/11/2022	9/14/2022
Analysis[1,2]		
Antimony	< 0.8	< 0.8
Arsenic	0.6	0.9
Barium	140	1000
Beryllium	2	2
Cadmium	0.02	0.05
Chromium	140	52
Cobalt	17	10
Iron	46000	21000
Lead	17	27
Lithium	17	11
Manganese	650	460
Molybdenum	8400	6000
Selenium	< 0.7	< 0.7
Thallium	0.94	0.57

Notes:

SB-1 is collocated with BRGWC-33S and SB-2 is collocated with BRGWC-38S.

< = Indicates the parameter was not detected above the analytical method detection limit (MDL)

ft bgs = feet below ground surface

(1) Parameters are reported in units of microgram per gram (µg/g).

(2) Micrograms per gram eqautes to milligram per kilograms.

(3) Metals were analyzed by EPA Method 6010D, 6020B, 7470A.

Table 4

Baseline Characterization Results – Whole Rock Analysis
Plant Branch AP-E, Putnam County, Georgia

Location ID	SB-1	SB-2	Units
Sample Depth	16.4 to 26.4 ft bgs	28.2 to 38.2 ft bgs	
Sample Date	9/11/2022	9/14/2022	
Mineral/Compound			
Al_2O_3	17.6	16.5	%
CaO	0.23	0.34	%
Cr_2O_3	0.04	0.03	%
Fe_2O_3	6.32	2.32	%
K_2O	2.61	4.98	%
Loss on Ignition (LOI)	7.14	5.12	%
MgO	1.38	0.76	%
MnO	0.07	0.03	%
Na_2O	0.37	0.52	%
P_2O_5	0.08	0.02	%
SiO_2	62.7	68.1	%
TiO_2	0.76	0.26	%
V_2O_5	0.02	< 0.01	%
Sum	99.3	99	%

Notes:
SB-1 is collocated with BRGWC-33S and SB-2 is collocated with BRGWC-38S.
< = Indicates the parameter was not detected above the analytical method detection limit (MDL).
ft bgs = feet below ground surface

Table 5

Baseline Characterization Results – Rietveld Quantitative X-Ray Diffraction
Plant Branch AP-E, Putnam County, Georgia

Mineral/Compound	BRGWA-2S	BRGWA-5S	BRGWA-6S	PZ-52D	PZ-53D	SB-1	SB-2
	40-43 ft bgs	34-37 ft bgs	44-48 ft bgs	19-24 ft bgs	32-35 ft bgs	16.4 to 26.4 ft bgs	28.2 to 38.2 ft bgs
	June 5 2020	June 5 2020	June 5 2020	June 5 2020	June 5 2020	September 11 2022	September 14 2022
Date	Upgradient			Downgradient (AP-E)			
Quartz	15.10	9.90	9.90	34.90	30.80	36.66	35.96
Hornblende	39.30	33.30	24.70	2.20	-	-	-
Andesine	4.80	-	-	-	-	4.62	9.63
Kaolinite	29.00	19.70	51.90	37.70	25.30	23.30	14.95
Gypsum	1.40	0.70	-	-	-	-	-
Lizardite	0.40	0.30	0.02	0.00	0.40	-	-
Microcline	3.60	2.00	5.60	10.80	17.10	14.11	16.04
Illmenite	3.80	1.30	0.60	-	-	-	-
Montmorillonite	2.60	3.20	6.80	-	-	-	-
Stilpnomelane	-	11.10	-	-	-	-	-
Albite	-	18.20	-	4.00	5.70	-	-
Megnetite	-	0.30	0.30	0.50	0.10	0.04	0.06
Muscovite	-	-	-	3.80	3.50	10.97	16.37
Biotite	-	-	-	6.10	5.80	9.49	6.51
Illite-Montmorillonite	-	-	-	-	11.30		
Chlorite	-	-	-	-	-	-	-
Talc	-	-	-	-	-	-	-
Diopside	-	-	-	-	-	0.60	0.48
Clinochlore	-	-	-	-	-	-	-

Notes:

Results are reported as weight percent (wt%).

SB-1 is collocated with BRGWC-33S and SB-2 is collocated with BRGWC-38S.

-- = Indicates the mineral was not identified.

ft bgs = feet below ground surface

Table 6a

Cobalt and Beryllium Sequential Extraction Procedure Results - 2020

Plant Branch AP-E, Putnam County, Georgia

Analyte	SEP Fraction	Extraction agent (acid/base strength)	BRGWA-2S 39 ft bgs saprolite: silt	BRGWA-2S 43 ft bgs saprolite: silt	BRGWA-5S 32 ft bgs saprolite: silt	BRGWA-5S 38 ft bgs saprolite: silt	BRGWA-6S 42 ft bgs saprolite: silt	BRGWA-6S 48 ft bgs saprolite: silt
			Upgradient					
Beryllium	Exchangeable	$MgSO_4$ (1M)	ND	ND	ND	ND	ND	ND
	Carbonate	pH=5; NaOAc (1 M) in HOAc (25%)	ND	ND *	ND *	ND *	ND *	ND *
	Amorphous Fe/Mn Oxides	pH=3; (NH4)2C2O4 (0.2 M)	0.16 J	0.15 J	0.089 J	0.073 J	0.049 J	0.066 J
	Crystalline Fe/Mn Oxides	$HONH_2{\cdot}HCl$ (1 M) in CH_3COOH (25%)	0.77	0.47	0.25 J	0.21 J	0.45	0.20 J
	Organic-Bound	pH=9.5; NaOCl (5%)	ND	ND *	ND *	ND *	ND *	ND *
	Sulfides	HCl-HNO_3 mix	0.29 J	0.16 J	0.082 J	0.075 J	0.15 J	0.11 J
	Residual	HF, HNO_3, HCl and H_3BO_3 mix	ND	ND	0.35	0.33	0.19 J	ND
	Sum of Steps	--	1.22	0.78	0.77	0.69	0.84	0.38
	Total	--	0.66	0.46	0.67	0.60	0.66 J	0.31 J
Cobalt	Exchangeable	$MgSO_4$ (1M)	ND	ND	ND	ND	ND	ND
	Carbonate	pH=5; NaOAc (1 M) in HOAc (25%)	ND	ND	ND	ND	ND	ND
	Amorphous Fe/Mn Oxides	pH=3; (NH4)2C2O4 (0.2 M)	14.00	14.00	4.90	6.00	19.00	21.00
	Crystalline Fe/Mn Oxides	$HONH_2{\cdot}HCl$ (1 M) in CH_3COOH (25%)	6.50	13.00	2.70 J	2.90 J	9.90	9.90
	Organic-Bound	pH=9.5; NaOCl (5%)	ND *	ND *	ND *	ND *	ND *	ND *
	Sulfides	HCl-HNO_3 mix	8.30	5.20	4.00	5.40	5.20	5.60
	Residual	HF, HNO_3, HCl and H_3BO_3 mix	8.10 J	28.00 J	18.00	15.00	8.70 J	16.00 J
	Sum of Steps	--	36.90	60.20	29.60	29.30	43.00	53.00
	Total	--	72.00	54.00 J	36.00	43.00	58.00	64.00
Iron	Exchangeable	$MgSO_4$ (1M)	ND	ND	ND	ND	ND	ND
	Carbonate	pH=5; NaOAc (1 M) in HOAc (25%)	ND	ND	ND	ND	ND	ND
	Amorphous Fe/Mn Oxides	pH=3; (NH4)2C2O4 (0.2 M)	2000	1100	590	410	490	480
	Crystalline Fe/Mn Oxides	$HONH_2{\cdot}HCl$ (1 M) in CH_3COOH (25%)	17000	10000	4700	4500	10000	5500
	Organic-Bound	pH=9.5; NaOCl (5%)	ND	ND	ND	ND	ND	ND
	Sulfides	HCl-HNO_3 mix	24000	15000	9100	11000	20000	20000
	Residual	HF, HNO_3, HCl and H_3BO_3 mix	39000	71000	53000	45000	34000	54000
	Sum of Steps	--	82000	97100	67390	60910	64490	79980
	Total	--	97000	98000	58000	56000	61000	91000
Mangense	Exchangeable	$MgSO_4$ (1M)	0.37 J	0.80 J	0.43 J	0.44 J	0.25 J	0.67 J
	Carbonate	pH=5; NaOAc (1 M) in HOAc (25%)	ND	ND	ND	ND	ND	ND
	Amorphous Fe/Mn Oxides	pH=3; (NH4)2C2O4 (0.2 M)	320 B	94 B	120 B	78 B	430 B	460 B
	Crystalline Fe/Mn Oxides	$HONH_2{\cdot}HCl$ (1 M) in CH_3COOH (25%)	240	89	65	40	270	210
	Organic-Bound	pH=9.5; NaOCl (5%)	3 J	ND	ND	ND	3.5 J	3.8 J
	Sulfides	HCl-HNO_3 mix	71	32	32	42	54	40
	Residual	HF, HNO_3, HCl and H_3BO_3 mix	290	840	690	580	260	500
	Sum of Steps	--	924.37	1056.24	907.43	740.44	1017.75	1214.47
	Total	--	1700	840	770	750	1100	1000

Notes:

1. The samples from PZ-52D and PZ-53D were collected from the screen interval of collocated BRGWC-33S and BRGWC-38S, respectively

All results are reported in mg of constituent/kg of total sample mass

< - compound not detected, the associated value is the detection limit

SEP = sequential extraction procedure

J = Indicates the parameter was estimated and detected between the method detection limit 'and the reporting limit.

B= Compound was found in the blank and sample

* = LCS and LCSD is outside acceptance limits, high biased.

Table 6a

Cobalt and Beryllium Sequential Extraction Procedure Results - 2020

Plant Branch AP-E, Putnam County, Georgia

Analyte	SEP Fraction	Extraction agent (acid/base strength)	PZ-52D[1] 18 ft bgs saprolite: silty sand	PZ-52D[1] 24-25 ft bgs saprolite: silty sand	PZ-53D[1] 30 ft bgs saprolite: silt	PZ-53D[1] 36 ft bgs saprolite: silt
			Downgradient (AP-E)			
Beryllium	Exchangeable	$MgSO_4$ (1M)	ND	ND	ND	ND
	Carbonate	pH=5; NaOAc (1 M) in HOAc (25%)	ND *	ND *	ND *	0.14 J*
	Amorphous Fe/Mn Oxides	pH=3; (NH4)2C2O4 (0.2 M)	0.35 J	0.21 J	0.13 J	0.23 J
	Crystalline Fe/Mn Oxides	HONH2·HCl (1 M) in CH_3COOH (25%)	1.60	1.10	0.57	0.42
	Organic-Bound	pH=9.5; NaOCl (5%)	ND *	ND *	ND *	ND *
	Sulfides	HCl-HNO_3 mix	1.00	0.53	0.39	0.70
	Residual	HF, HNO_3, HCl and H_3BO_3 mix	0.96	1.40	0.51	0.42
	Sum of Steps	--	4.00	3.20	1.60	1.90
	Total	--	3.60	2.70	2.00	1.70
Cobalt	Exchangeable	$MgSO_4$ (1M)	0.47 J	ND	0.43 J	ND
	Carbonate	pH=5; NaOAc (1 M) in HOAc (25%)	ND	ND	ND	ND
	Amorphous Fe/Mn Oxides	pH=3; (NH4)2C2O4 (0.2 M)	17.00	3.30	17.00	1.00 J
	Crystalline Fe/Mn Oxides	HONH2·HCl (1 M) in CH_3COOH (25%)	4.70	2.6 J	3.50	0.63 J
	Organic-Bound	pH=9.5; NaOCl (5%)	ND *	ND *	ND *	ND *
	Sulfides	HCl-HNO_3 mix	4.4 J	3.00 J	5.10	6.90
	Residual	HF, HNO_3, HCl and H_3BO_3 mix	7.5 J	3.50	0.91 J	0.27 J
	Sum of Steps	--	34.70	12.40	26.94	8.8
	Total	--	46.00	12.00	41.00	9.60 J
Iron	Exchangeable	$MgSO_4$ (1M)	ND	ND	ND	ND
	Carbonate	pH=5; NaOAc (1 M) in HOAc (25%)	ND	ND	ND	ND
	Amorphous Fe/Mn Oxides	pH=3; (NH4)2C2O4 (0.2 M)	1100	460	640	70
	Crystalline Fe/Mn Oxides	HONH2·HCl (1 M) in CH_3COOH (25%)	17000	7100	6200	1800
	Organic-Bound	pH=9.5; NaOCl (5%)	ND	ND	ND	ND
	Sulfides	HCl-HNO_3 mix	27000	9400	14000	20000
	Residual	HF, HNO_3, HCl and H_3BO_3 mix	36000	14000	8500	5000
	Sum of Steps	--	81100	30960	29340	26870
	Total	--	71000	24000	36000	24000
Mangense	Exchangeable	$MgSO_4$ (1M)	11	7.10	5.50	0.89 J
	Carbonate	pH=5; NaOAc (1 M) in HOAc (25%)	2.7 J	1.7 J	ND	ND
	Amorphous Fe/Mn Oxides	pH=3; (NH4)2C2O4 (0.2 M)	680 B	170 B	480 B	74 B
	Crystalline Fe/Mn Oxides	HONH2·HCl (1 M) in CH_3COOH (25%)	400	120	200	56
	Organic-Bound	pH=9.5; NaOCl (5%)	9.8 J	ND	ND	ND
	Sulfides	HCl-HNO_3 mix	190	95	210	290
	Residual	HF, HNO_3, HCl and H_3BO_3 mix	280	310	48	55
	Sum of Steps	--	1573.50	703.80	943.50	475.89
	Total	--	1700	580	1200	460

Notes:

1. The samples from PZ-52D and PZ-53D were collected from the screen interval of collocated BRGWC-33S and BRGWC-38S, respectively

All results are reported in mg of constituent/kg of total sample mass

< - compound not detected, the associated value is the detection limit

SEP = sequential extraction procedure

J = Indicates the parameter was estimated and detected between the method detection limit 'and the reporting limit.

B= Compound was found in the blank and sample

* = LCS and LCSD is outside acceptance limits, high biased.

Table 6b

Cobalt and Beryllium Sequential Extraction Procedure Results - 2022
Plant Branch AP-E, Putnam County, Georgia

Location ID	SEP Fraction	SB-1	SB-2
Sample Depth		16.4 to 26.4 ft BGS	28.2 to 38.2 ft BGS
Sample Date		9/11/2022	9/14/2022
Analyte			
Beryllium	**Water Soluble**	< 0.02	< 0.02
	Exchangeable	< 0.02	< 0.02
	Carbonate	0.1	0.14
	Fe/Mn Oxides	0.44	0.3
	Organic-Bound	0.12	0.09
	Residual	1.5	1.10
Cobalt	**Water Soluble**	< 0.01	0.01
	Exchangeable	0.08	0.10
	Carbonate	1.1	1.4
	Fe/Mn Oxides	4.40	4
	Organic-Bound	0.45	0.70
	Residual	9.10	3.70

Notes:
SB-1 is collocated with BRGWC-33S and SB-2 is collocated with BRGWC-38S.
All results are reported in mg of constituent/kg of total sample mass.
< = Indicates the parameter was not detected above the analytical method detection limit (MDL).
SEP = sequential extraction procedure
ft BGS = feet below ground surface
Fe = Iron
Mn = Manganese

Table 7

Summary of Sorption Test Results: Cobalt and Beryllium
Plant Branch AP-E, Putnam County, Georgia

Groundwater Sample ID	Site Material Sample ID	Treatment	Day	Date	Replicate	Dissolved Cobalt (mg/L) RL: 0.01	Dissolved Beryllium (mg/l) RL: 0.005	Sorbed Cobalt (mg/kg) (1)	Sorbed Beryllium (mg/kg) (1)	pH (s.u.)	ORP (mV)
BRGWC-33S spiked with Cobalt	--	Control Groundwater Only	0	1/20/2023	SB1-CTRL1a	0.1600	0.0017	--	--	6.48	118.0
				1/20/2023	SB1-CTRL2a	0.1600	0.0016	--	--	6.36	108.1
				Average		**0.1600**	0.0017	--	--	**6.42**	**113.1**
			7	1/27/2023	SB1-CTRL1b	0.1600	0.0018	--	--	5.73	214.0
				1/27/2023	SB1-CTRL2b	0.1600	0.0018	--	--	5.69	209.0
				Average		**0.1600**	0.0018	--	--	**5.71**	**211.5**
	SB-1	Soil:Water Ratio 2:1	7	1/27/2023	SB1-R1a	0.0360	0.0006	0.0620	--	5.07	134.0
				1/27/2023	SB1-R1b	0.0380	0.0006	0.0610	--	5.76	177.0
				Average		**0.0370**	0.0006	**0.0615**	--	**5.42**	**155.5**
		Soil:Water Ratio 1:1	7	1/27/2023	SB1-R2a	0.0260	0.0006	0.1340	--	4.95	185.0
				1/27/2023	SB1-R2b	0.0400	0.0006	0.1200	--	5.53	188.0
				Average		**0.0330**	0.0006	**0.1270**	--	**5.24**	**186.5**
		Soil:Water Ratio 1:5	7	1/27/2023	SB1-R3a	0.0820	0.0006	0.7800	--	5.60	191.0
				1/27/2023	SB1-R3b	0.0870	0.0006	0.7300	--	5.61	194.0
				Average		**0.0845**	0.0006	**0.3775**	--	**5.61**	**192.5**
		Soil:Water Ratio 1:10	7	1/27/2023	SB1-R4a	0.1100	0.0006	0.5000	--	5.65	196.0
				1/27/2023	SB1-R4b	0.1000	0.0006	0.6000	--	5.53	201.0
				Average		**0.1050**	0.0006	**0.5500**	--	**5.59**	**198.5**
		Soil:Water Ratio 1:20	7	1/27/2023	SB1-R5a	0.1300	0.0006	0.6000	--	5.56	202.0
				1/27/2023	SB1-R5b	0.1300	0.0006	0.6000	--	5.51	204.0
				Average		**0.1300**	0.0006	**0.6000**	--	**5.54**	**203.0**

Table 7

Summary of Sorption Test Results: Cobalt and Beryllium
Plant Branch AP-E, Putnam County, Georgia

Groundwater Sample ID	Site Material Sample ID	Treatment	Day	Date	Replicate	Dissolved Cobalt (mg/L) RL: 0.01	Dissolved Beryllium (mg/l) RL: 0.005	Sorbed Cobalt (mg/kg) (1)	Sorbed Beryllium (mg/kg) (1)	pH (s.u.)	ORP (mV)
BRGWC-38S spiked with Cobalt and Beryllium	--	Control Groundwater Only	0	1/30/2023	SB2-CTRL1a	0.4300	0.0160	--	--	4.33	167.0
				1/30/2023	SB2-CTRL2a	0.4300	0.0170	--	--	4.35	182.0
				Average		**0.4300**	**0.0165**	--	--	4.34	174.5
			7	2/6/2023	SB2-CTRL1b	0.4300	0.0160	--	--	4.52	208.9
				2/6/2023	SB2-CTRL2b	0.4300	0.0160	--	--	4.88	228.4
				Average		**0.4300**	**0.0160**	--	--	**4.70**	**218.7**
	SB-2	Soil:Water Ratio 2:1	7	2/6/2023	SB2-R1a	0.0160	0.0006	0.2070	0.0080	5.06	225.5
				2/6/2023	SB2-R1b	0.0170	0.0006	0.2065	0.0080	5.07	228.8
				Average		**0.0165**	**0.0006**	**0.2068**	**0.0080**	**5.07**	**227.2**
		Soil:Water Ratio 1:1	7	2/6/2023	SB2-R2a	0.0290	0.0009	0.4010	0.0156	5.10	233.6
				2/6/2023	SB2-R2b	0.0320	0.0009	0.3980	0.0156	5.11	239.0
				Average		**0.0305**	**0.0009**	**0.3995**	**0.0156**	**5.11**	**236.3**
		Soil:Water Ratio 1:5	7	2/6/2023	SB2-R3a	0.1000	0.0023	1.6500	0.0710	5.08	244.1
				2/6/2023	SB2-R3b	0.1200	0.0027	1.5500	0.0690	5.01	243.2
				Average		**0.1100**	**0.0025**	**1.6000**	**0.0700**	**5.05**	**243.7**
		Soil:Water Ratio 1:10	7	2/6/2023	SB2-R4a	0.2000	0.0060	2.3000	0.1050	4.91	250.4
				2/6/2023	SB2-R4b	0.1900	0.0058	2.4000	0.1070	4.87	253.1
				Average		**0.1950**	**0.0059**	**2.3500**	**0.1060**	**4.89**	**251.8**
		Soil:Water Ratio 1:20	7	2/6/2023	SB2-R5a	0.2600	0.0090	3.4000	0.1500	4.78	259.1
				2/6/2023	SB2-R5b	0.2600	0.0087	3.4000	0.1560	4.75	258.5
				Average		**0.2600**	**0.0089**	**3.4000**	**0.1530**	**4.77**	**258.8**

Notes:

-- = not applicable mV = millivolts ORP = Oxidation Reduction Potential

< = indicates the constituent was not detected above the analytical method detection limit (MDL)

s.u. = standard units mg/L = milligrams per liter mg/kg = milligrams per kilogram

RL= Reporting limit

(1) The sorbed concentration per unit mass of aquifer solids is calculated as shown in the equation to the right.

(2) grey - Indicates the analyte was analyzed for but not detected; Method Detection Limit value is presented.

$$S_{Solids} = \frac{(C_{Spike} - C_{Final}) \times V_{Water}}{M_{Solids}}$$

Where:

S_{Solids} = sorbed concentration per unit mass of aquifer solids (mg/kg)

$C_{Spike,Final}$ = dissolved concentration of the intial spike or final dissolved concentration at Day 0 or Day 7 (mg/L)

M_{Solids} = mass of aquifer solids in reactor (g)

V_{Water} = Volume of water (mL)

Table 8

Summary of Desorption Test Results: Cobalt and Beryllium
Plant Branch AP-E, Putnam County, Georgia

Groundwater Sample ID	Site Material Sample ID	Treatment	Day	Date	Replicate	Dissolved Cobalt (mg/L)	Dissolved Beryllium (mg/L)	pH (s.u.)	ORP (mV)
						RL: 0.01	RL: 0.005		
BRGWC-33S	SB-1	Ambient Conditions	-7	3/21/2023	SB1-CTRL1	0.0540	0.0006	5.90	101.6
				3/21/2023	SB1-CTRL2	0.0590	0.0006	5.98	101.3
				Average		**0.0565**	**0.0006**	**5.94**	**101.5**
			0	3/28/2023	SB1-CTRL3	0.0380	0.0006	6.47	96.5
				3/28/2023	SB1-CTRL4	0.0410	0.0006	6.30	92.6
				Average		**0.0395**	**0.0006**	**6.39**	**94.6**
BRGWA-2S			0	3/28/2023	SB1-CTRL5	0.0033	0.0006	6.45	96.4
				3/28/2023	SB1-CTRL6	0.0036	0.0006	6.70	49.4
				Average		**0.0035**	**0.0006**	**6.58**	**72.9**
			7	4/4/2023	SB1-CTRL7	0.0033	0.0006	6.62	88.4
				4/4/2023	SB1-CTRL8	0.0008	0.0006	6.78	74.5
				Average		**0.0020**	**0.0006**	**6.70**	**81.5**
		Oxidizing Conditions	7	3/29/2023	SB1-Oxidizing1	0.0019	0.0006	7.29	113.6
				3/29/2023	SB1-Oxidizing2	0.0008	0.0006	7.35	71.7
				Average		**0.0013**	**0.0006**	**7.32**	**92.7**
		Reducing Conditions	7	3/29/2023	SB1-Reducing1	0.0008	0.0006	7.48	-11.2
				3/29/2023	SB1-Reducing2	0.0013	0.0006	7.59	10.8
				Average		**0.0010**	**0.0006**	**7.54**	**-0.2**

Table 8

Summary of Desorption Test Results: Cobalt and Beryllium

Plant Branch AP-E, Putnam County, Georgia

Groundwater Sample ID	Site Material Sample ID	Treatment	Day	Date	Replicate	Dissolved Cobalt (mg/L)	Dissolved Beryllium (mg/L)	pH (s.u.)	ORP (mV)
						RL: 0.01	RL: 0.005		
BRGWC-38S spiked with Beryllium	SB-2	Ambient Conditions	-7	3/21/2023	SB2-CTRL1	0.0810	0.0220	6.76	108.3
				3/21/2023	SB2-CTRL2	0.0810	0.0230	5.96	91.4
				Average		**0.0810**	**0.0225**	**6.36**	**99.9**
			0	3/28/2023	SB2-CTRL3	0.0750	0.0120	9.32	75.4
				3/28/2023	SB2-CTRL4	0.0780	0.0140	5.51	75.9
				Average		**0.0765**	**0.0130**	**7.42**	**75.7**
BRGWA-2S			0	3/28/2023	SB2-CTRL5	0.0081	0.0006	6.79	38.2
				3/28/2023	SB2-CTRL6	0.0088	0.0006	6.86	40.7
				Average		**0.0085**	**0.0006**	**6.83**	**39.5**
			7	4/4/2023	SB2-CTRL7	0.0054	0.0006	6.68	60.1
				4/4/2023	SB2-CTRL8	0.0056	0.0006	6.52	58.6
				Average		**0.0055**	**0.0006**	**6.60**	**59.4**
		Oxidizing Conditions	7	3/30/2023	SB2-Oxidizing1	0.0079	0.0006	7.13	93.8
				3/30/2023	SB2-Oxidizing2	0.0047	0.0006	7.22	103.3
				Average		**0.0063**	**0.0006**	**7.18**	**98.6**
		Reducing Conditions	7	3/30/2023	SB2-Reducing1	0.0071	0.0006	7.63	55.4
				3/30/2023	SB2-Reducing2	0.0053	0.0006	7.18	27.0
				Average		**0.0062**	**0.0006**	**7.41**	**41.2**

Notes:

mg/kg = milligrams per kilogram

mV = millivolts

ORP = Oxidation Reduction Potential

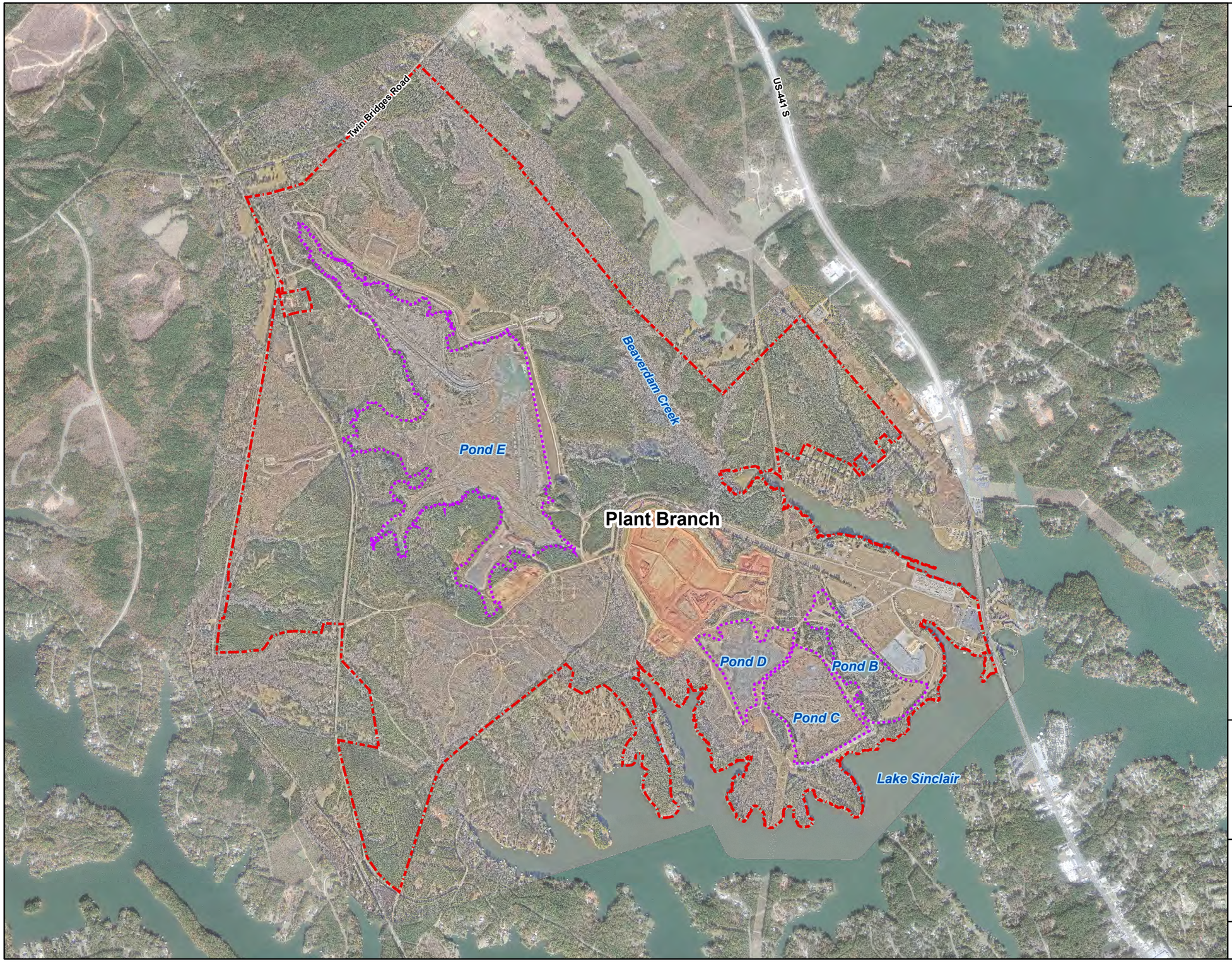
s.u. = standard units

RL= Reporting limit

grey **-** Indicates the analyte was analyzed for but not detected; Method Detection Limit value is presented.

Geological material and groundwater were mixed at 1:10 artio.

FIGURES



N

LEGEND

- Plant Branch Property Boundary
- Approximate Ash Pond Boundary



Notes:
1. Coordinate System: NAD 1983 State Plane Georgia West_FIPS (U.S. Feet).
2. Property Boundary Provided by Southern Company Services.
3. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 2,000 4,000
Scale in Feet

SITE LOCATION MAP

GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

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FIGURE 1



N

LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Temporary Piezometer
- Interstitial Piezometer
- Soil Sample Location
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Property Boundary Provided by Southern Company Services.
2. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 1,000 2,000
Scale in Feet

MONITORING WELL NETWORK MAP

GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

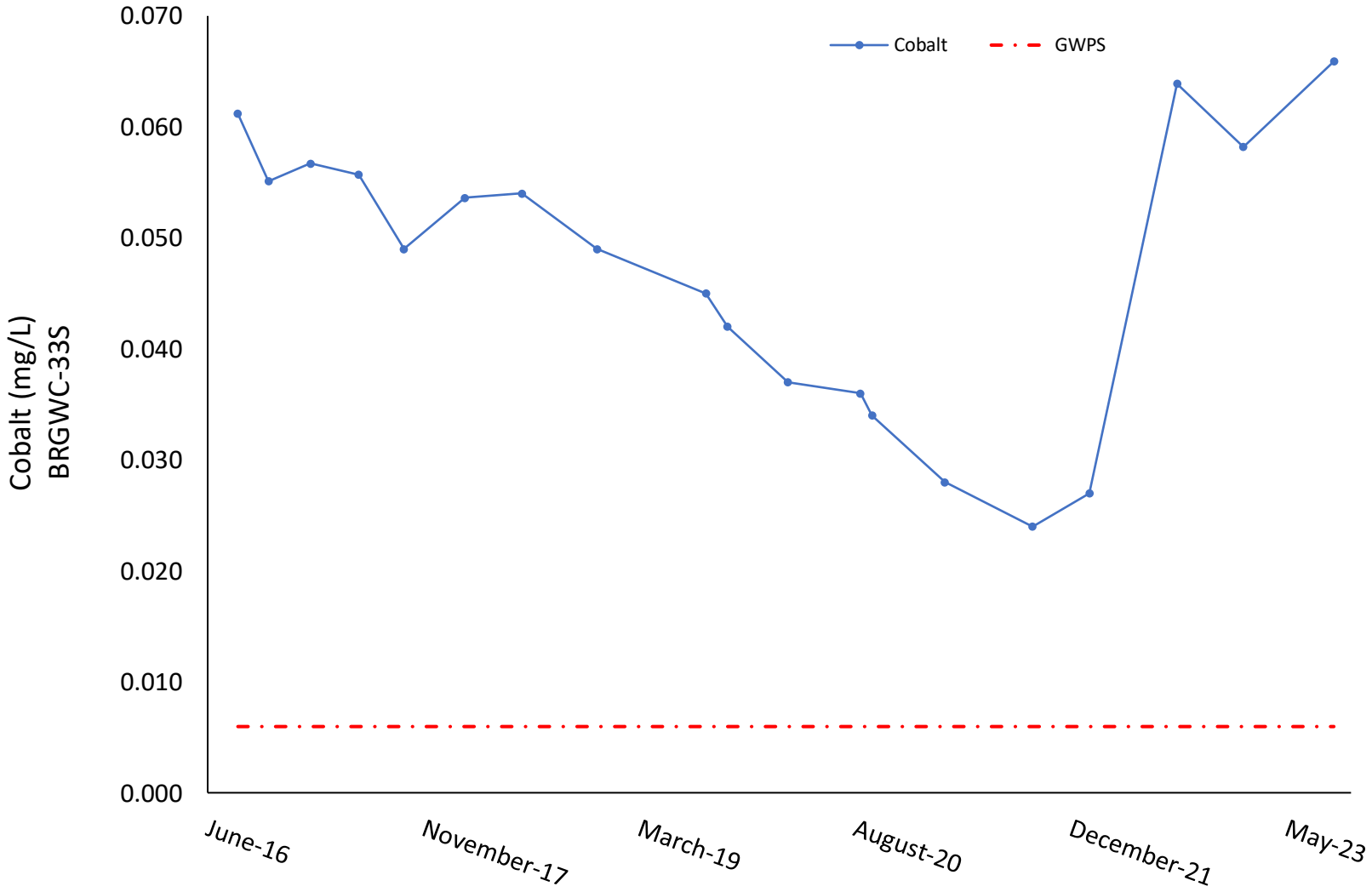
Prepared For: Georgia Power

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FIGURE 2

Cobalt



Notes:
1. mg/L = milligrams per liter
2. GWPS = Groundwater Protection Standard
3. GWPS = 0.006 mg/L

Cobalt Concentration Trend in BRGWC-33S

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Plant Branch AP-E
Putnam County, Georgia

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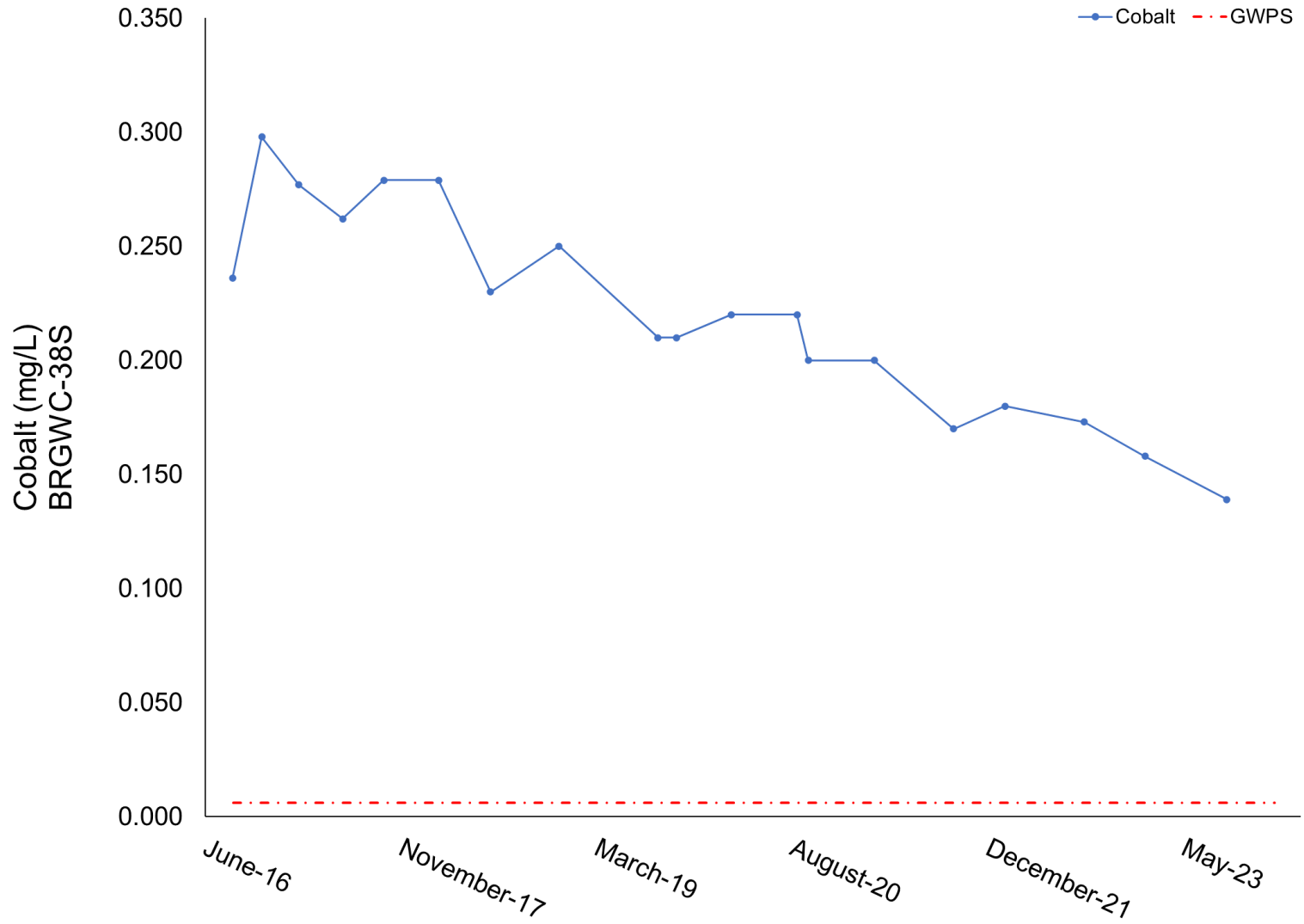
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Figure 3a

Cobalt



Notes:
1. mg/L = milligrams per liter
2. GWPS = Groundwater Protection Standard
3. GWPS = 0.006 mg/L

Cobalt Concentration Trend in BRGWC-38S

Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

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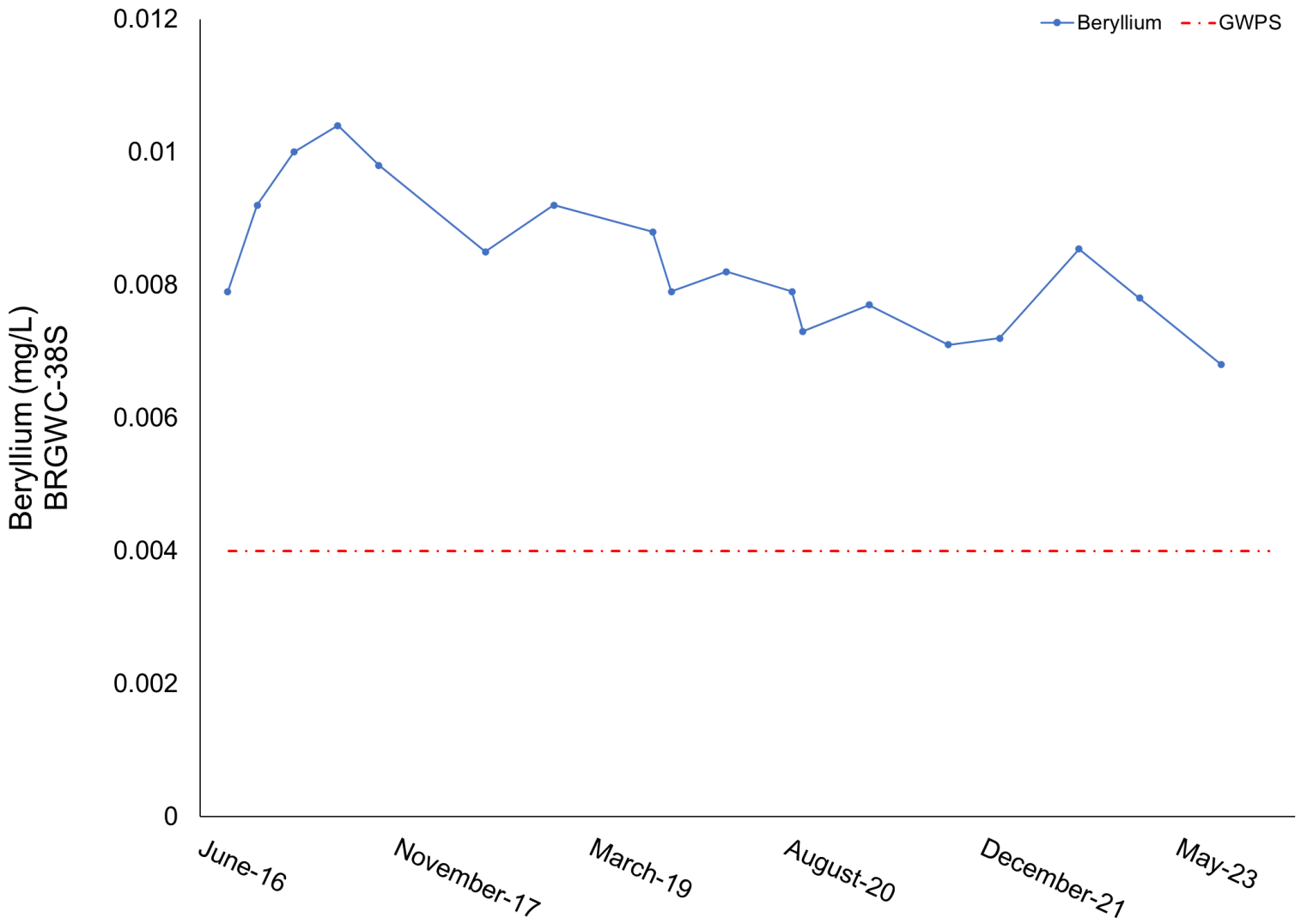
Prepared By: Geosyntec consultants

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Figure 3b

Beryllium



Notes:
1. mg/L = milligrams per liter
2. GWPS = Groundwater Protection Standard
3. GWPS = 0.004 mg/L

Beryllium Concentration Trend in BRGWC-38S

Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

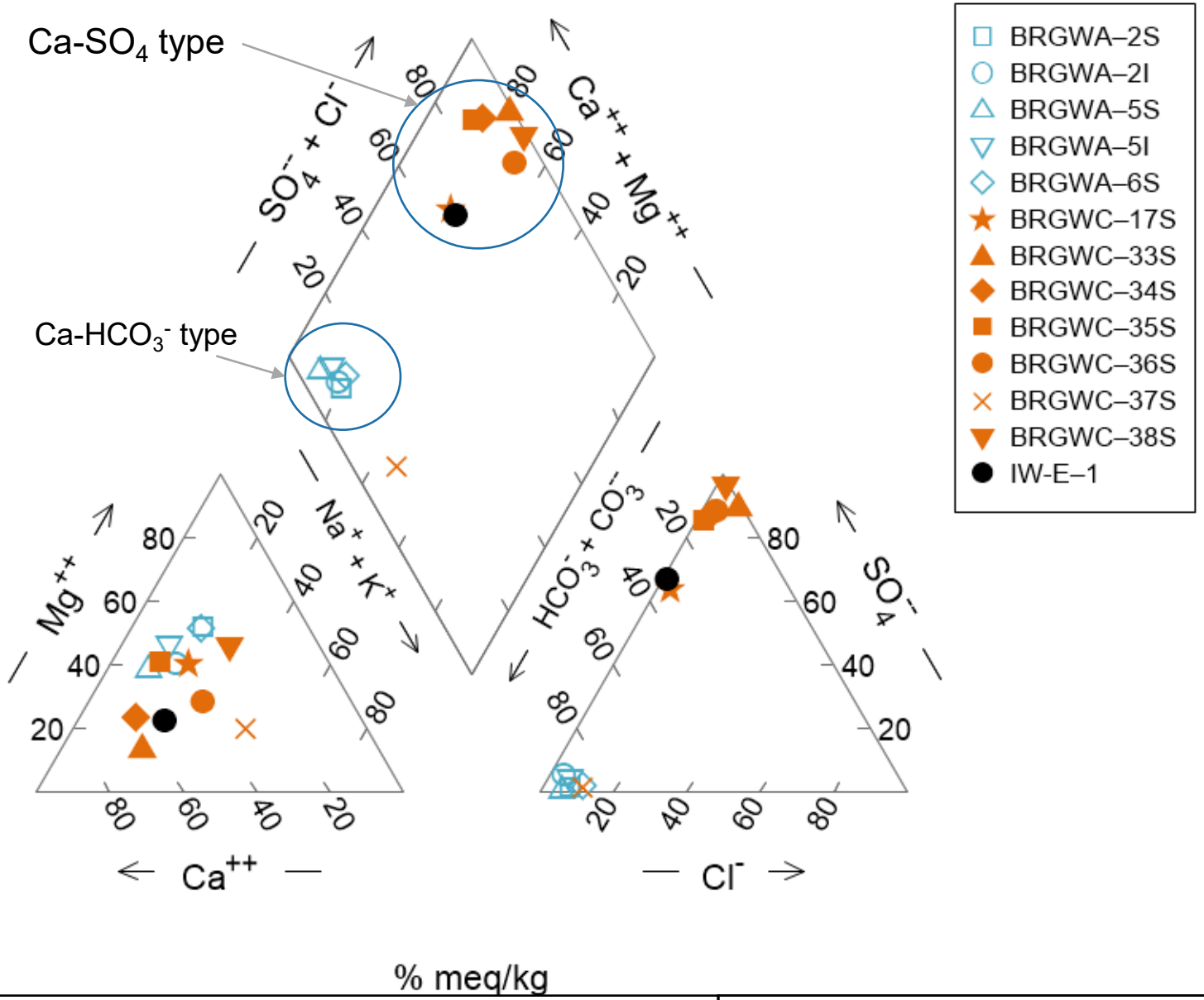
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Figure 3c



Notes:
1. Results are shown in relative percentage of milliequivalents per kilogram water (meq/kg).
2. Upgradient wells are displayed in blue.
3. Detection monitoring wells are displayed in orange.
4. CCR interstitial water sample is displayed in black.

Piper Trilinear Plot

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Plant Branch AP-E
Putnam County, Georgia

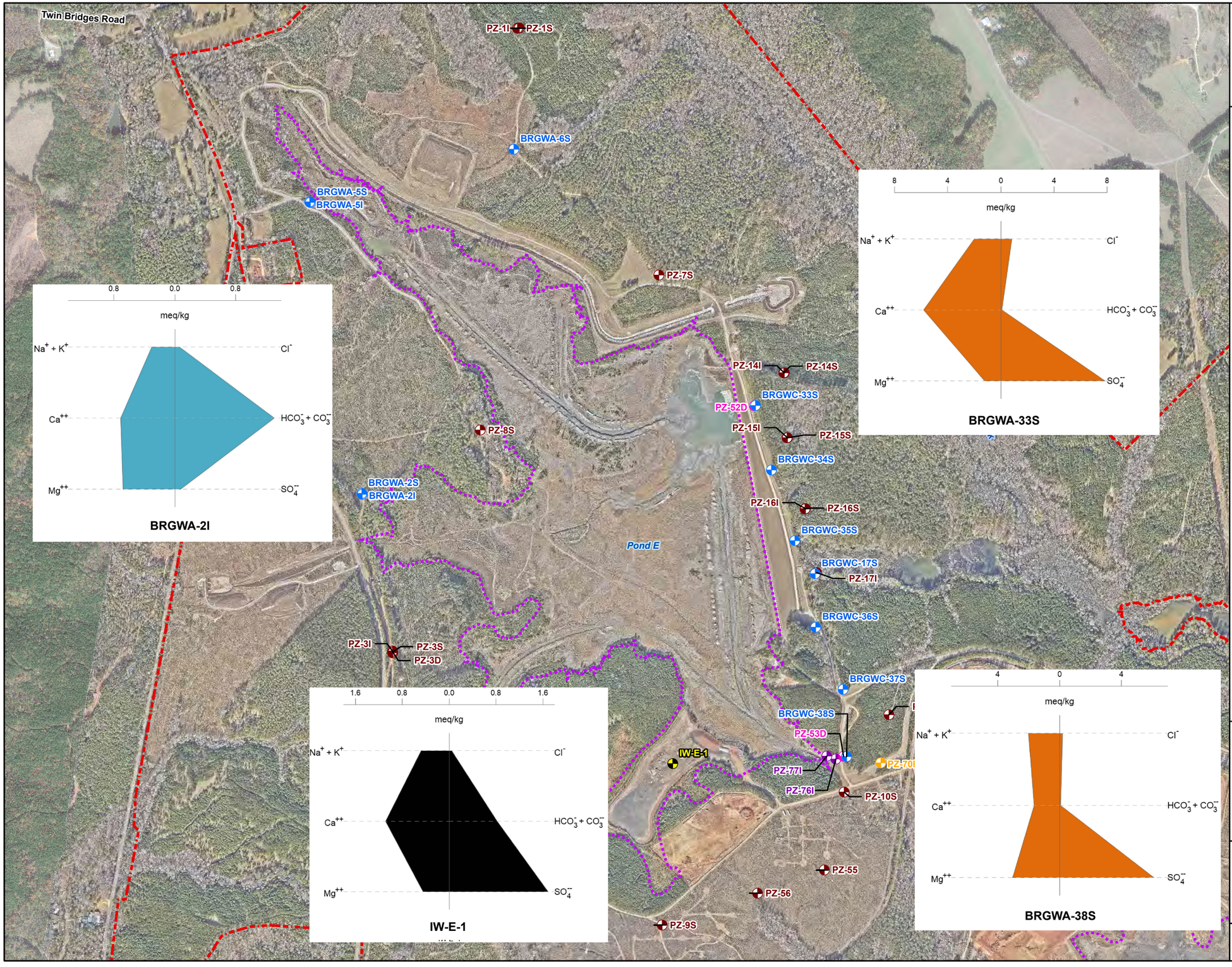
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Figure 4



N

LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Interstitial Piezometer
- Temporary Piezometer
- Piezometer
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Results are shown in units of milliequivalents per kilogram water (meq/kg).
2. Stiff diagram in blue represents the upgradient BRGWA-2I well.
3. Stiff diagram in black represents the CCR pore water sample from IW-E-1 location.
4. Stiff diagrams in orange represent the downgradient BRGWC-33S and BRGWC-38S wells.
5. Property Boundary Provided by Southern Company Services.
6. Aerial: Google Earth Imagery, November 2019 and Georgia Power Company, January 2024.

0 1,000 2,000
Scale in Feet

STIFF DIAGRAMS

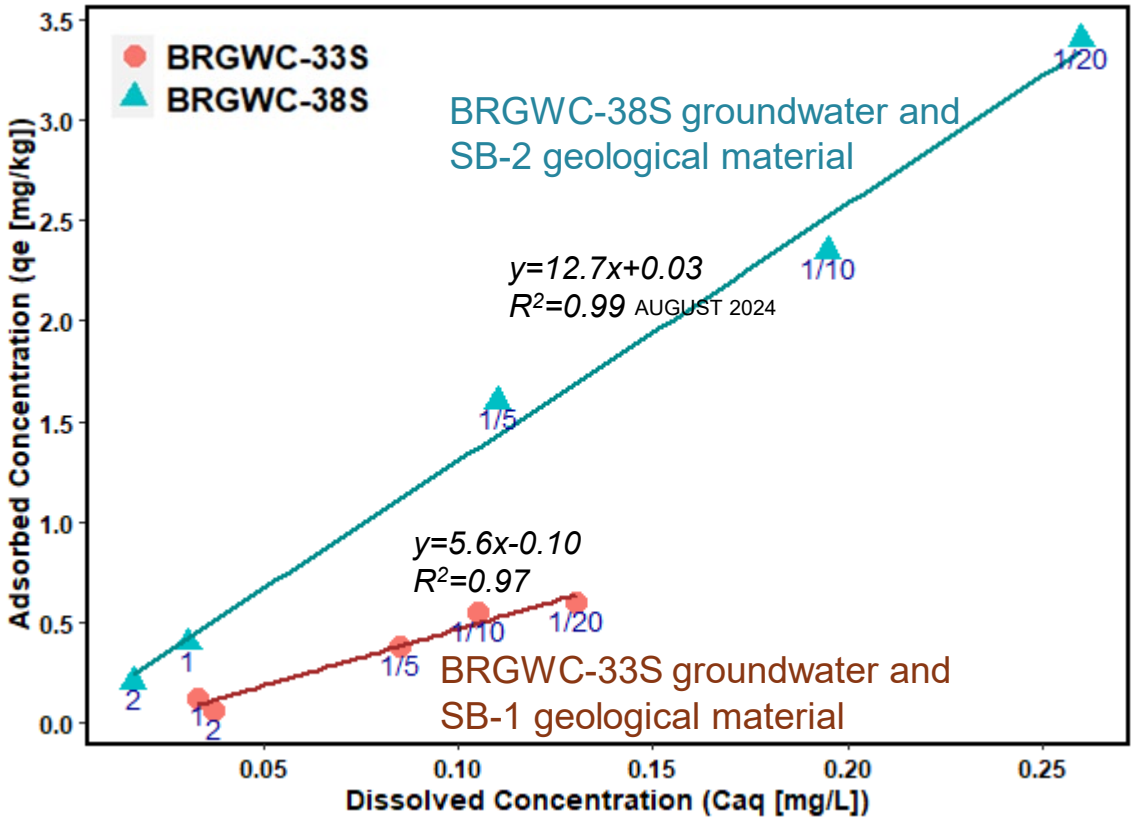
GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

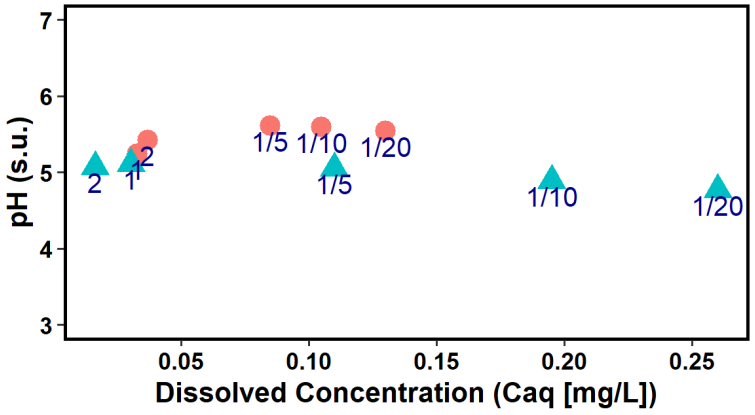
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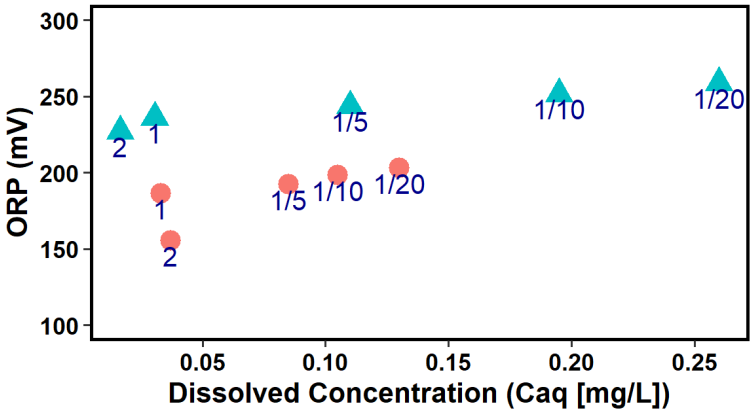
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FIGURE 5







Notes:

1. Green triangles represent the results of reactors where groundwater from BRGWC-38S and soil from the vicinity of the well (SB-2) were mixed at soil/water ratios indicated on the graph.
2. Orange circles represent the results of reactors where groundwater from BRGWC-33S and soil from the vicinity of the well (SB-1) were mixed at soil/water ratios indicated on the graph.
3. The line represents the linear regression through the results averaged for each soil/water ratio.
4. mg/L = milligrams of constituent per liter; mg/kg = milligrams of constituent per kilogram of solids; qe= sorbed concentrations; Caq= dissolved concentrations; s.u.= standard units; mV=milli volts.
5. The distribution coefficient (Kd) is the ratio of sorbed and under equilibrium conditions and is equal to the slope of a line through individual measurements of sorbed and dissolved concentrations.

Cobalt Sorption Test Results

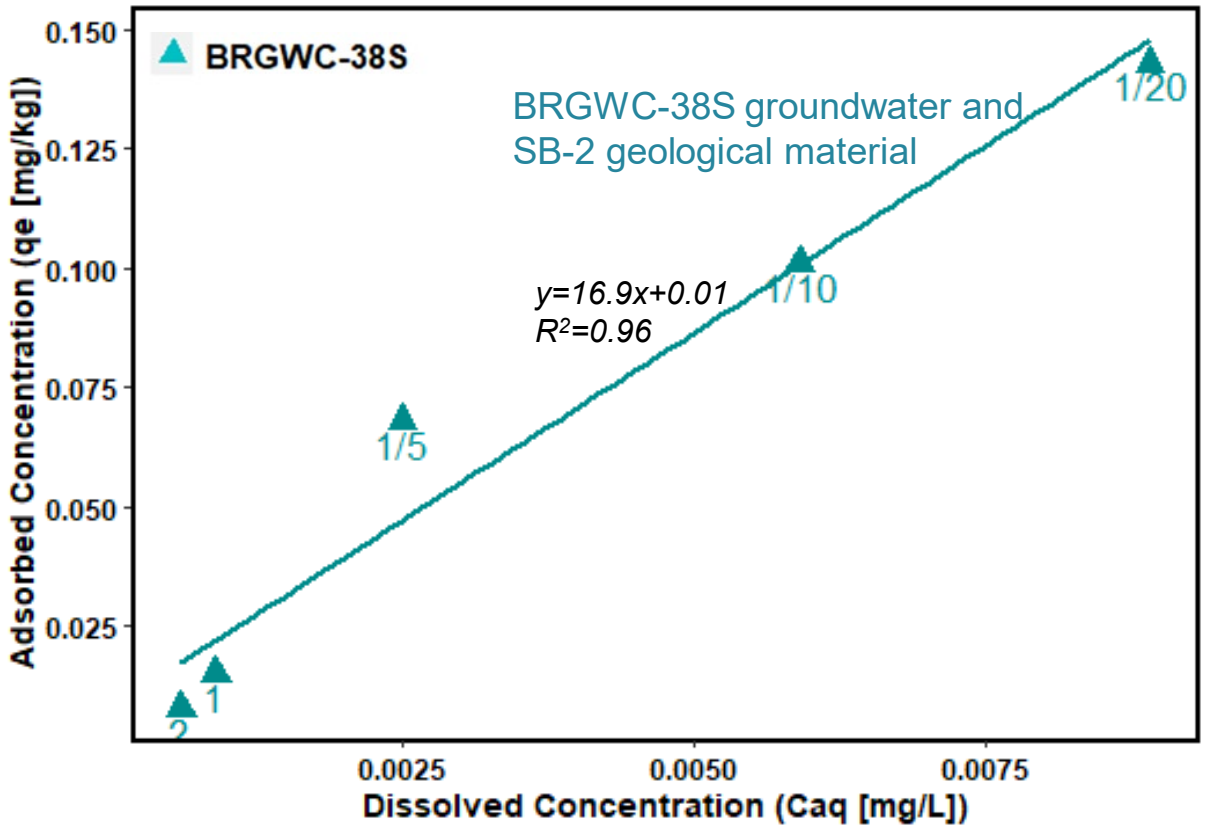
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Putnam County, Georgia

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Figure 6a



Notes:

1. Green triangles represent the results of reactors where groundwater from BRGWC-38S and soil from the vicinity of the well (SB-2) were mixed at soil/water ratios indicated on the graph.
2. The line represents the linear regression through the results of different soil/water ratios.
3. mg/L = milligrams of constituent per liter; mg/kg = milligrams of constituent per kilogram of solids; qe= sorbed concentrations; Caq= dissolved concentrations
4. The distribution coefficient (Kd) is the ratio of sorbed and under equilibrium conditions and is equal to the slope of a line through individual measurements of sorbed and dissolved concentrations.

Beryllium Sorption Test Results

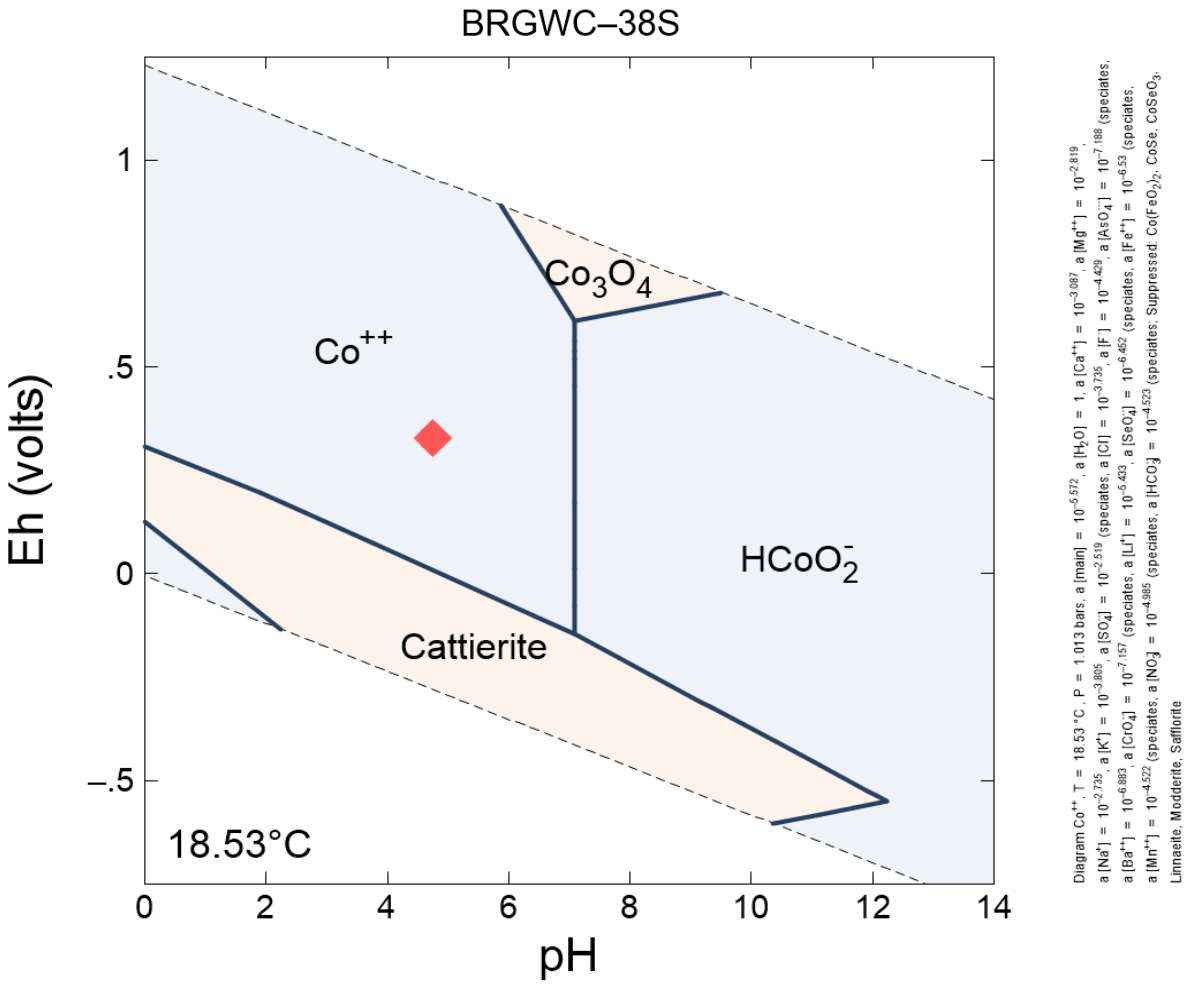
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Putnam County, Georgia

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Prepared By: Geosyntec consultants

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Figure 6b



Notes:

1. Eh-pH diagrams created using the Act2 module of Geochemist's Workbench software package, and Thermo database.
2. Eh was calculated by adding 0.2 volts to oxidative-reuductive potential (ORP) field measurements.
3. Sulfate, arsenic, chromium, selenium, iron, manganese, nitrate and bicarbonate were also speciated, but secondary lines are not shown for enhanced illustration.

Eh-pH Diagram - Cobalt Speciation

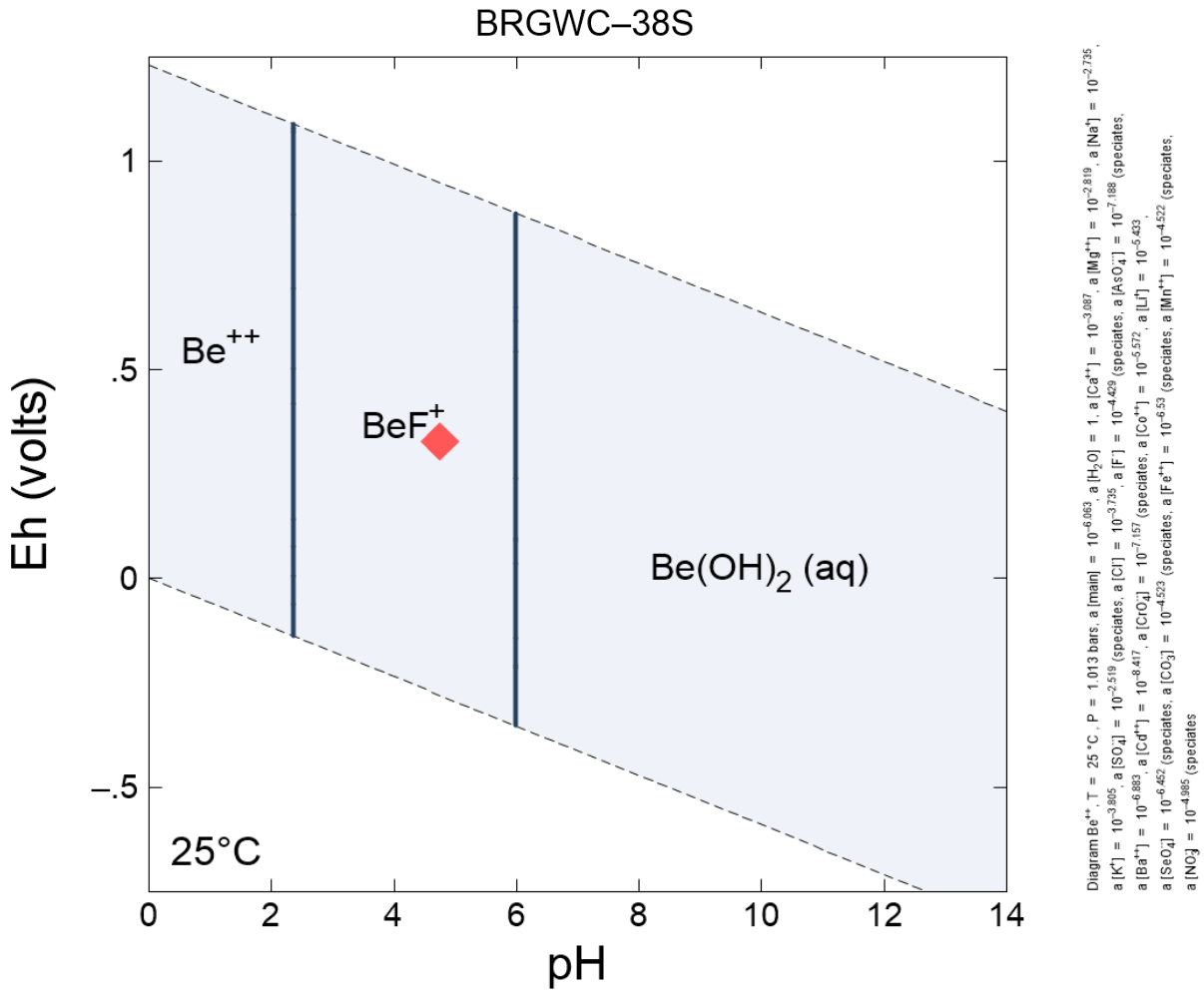
Georgia Power Company
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Putnam County, Georgia

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

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Figure 7a



Notes:

1. Eh-pH diagrams created using the Act2 module of Geochemist's Workbench software package, and Thermo-minteq database.
2. Eh was calculated by adding 0.2 volts to oxidative-reuductive potential (ORP) field measurements.
3. Sulfate, iron, manganese, bicarbonate, fluoride, arsenic, chromium, selenium, nitrate were also speciated, but secondary lines are not shown for enhanced illustration.

Eh-pH Diagram - Beryllium Speciation

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Putnam County, Georgia

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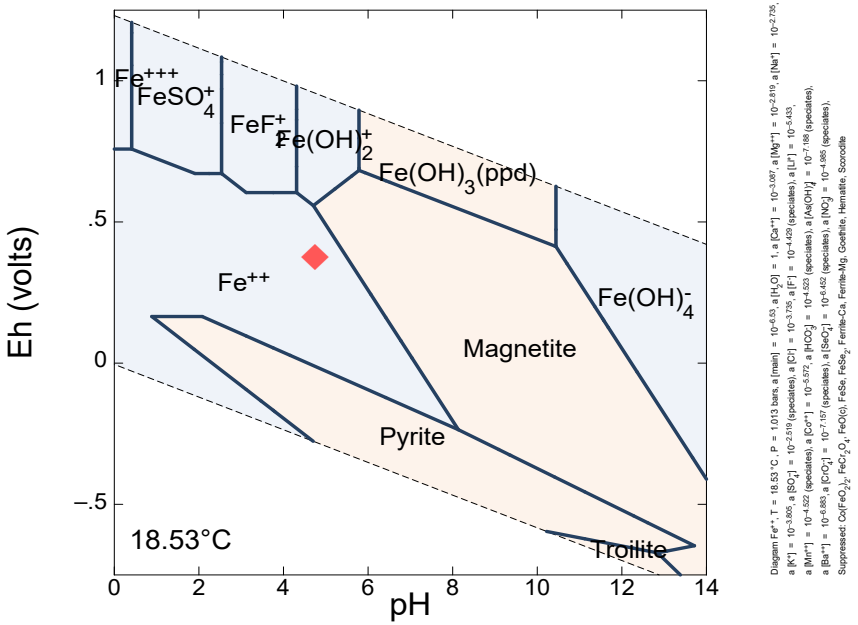
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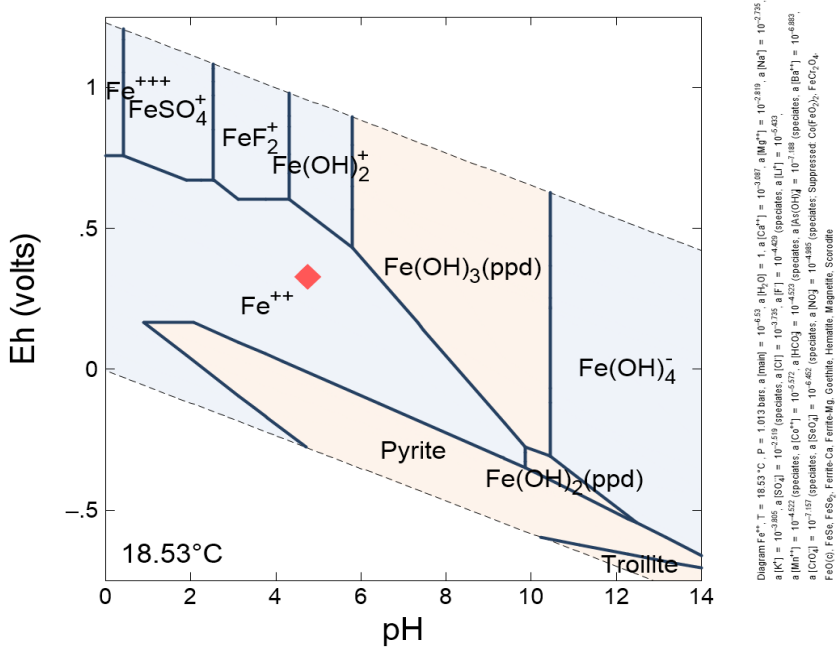
FEBRUARY 2025

Figure 7b

BRGWC–38S



BRGWC–38S



Notes:

1. Eh-pH diagrams created using the Act2 module of Geochemist's Workbench software package, and Thermo database.
2. Eh was calculated by adding 0.2 volts to oxidative-reuductive potential (ORP) field measurements.
3. The graph on the left illustrates iron speciation where goethite and hematite phases are suppressed. The graph on the right represents iron speciation where goethite, hematite, and magnetite were suppressed.
4. Sulfate, manganese, bicarbonate, fluoride, arsenic, chromium, selenium, nitrate and were also speciated, but secondary lines are not shown for enhanced illustration.

Eh-pH Diagram - Iron Speciation

Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

Prepared For: Georgia Power

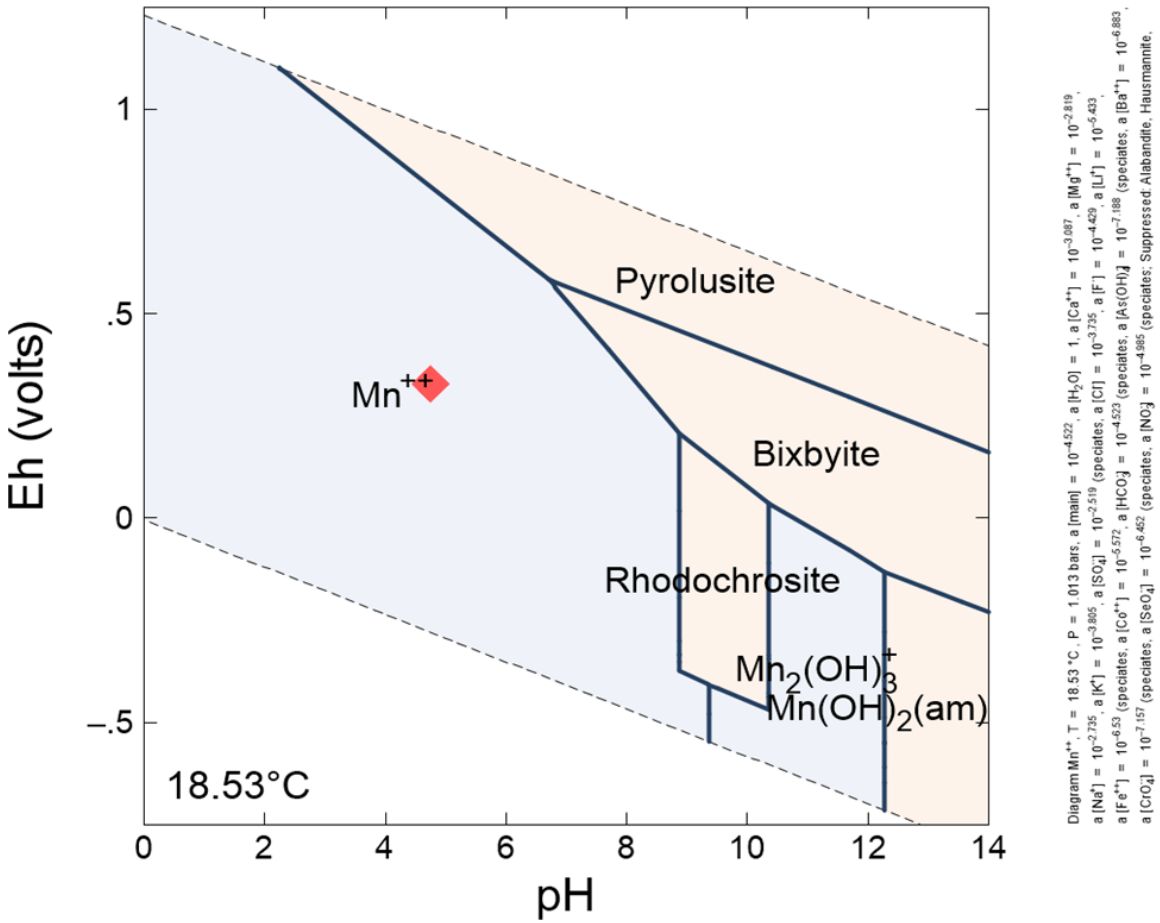
Prepared By: Geosyntec consultants

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Figure 7c

BRGWC–38S



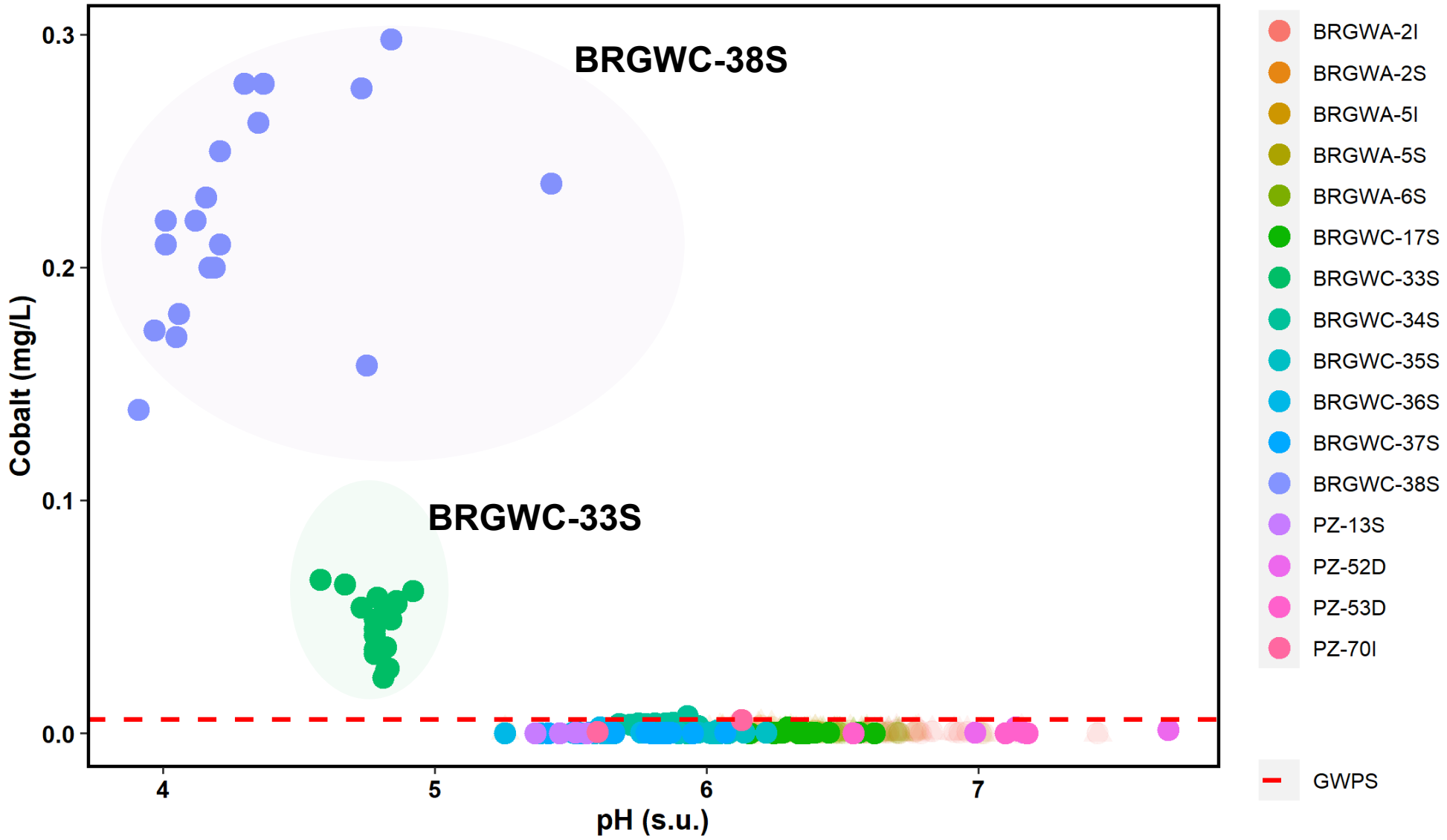
Notes:

1. Eh-pH diagrams created using the Act2 module of Geochemist's Workbench software package, and Thermo database.
2. Eh was calculated by adding 0.2 volts to oxidative-reuductive potential (ORP) field measurements.
3. Sulfate, iron, bicarbonate, arsenic, chromium, selenium, and nitrate and were also speciated, but secondary lines are not shown for enhanced illustration.

Eh-pH Diagram - Manganese Speciation

Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

Prepared For:	Prepared By:	Figure
Georgia Power	Geosyntec consultants	7d
Kennesaw, GA	FEBRUARY 2025	



Notes:

1. The graph represents cobalt concentrations in mg/L, and pH of groundwater samples, collected for the full monitoring period through the August 2023.
2. mg/L = milligrams per liter
3. s.u. = standard unit
4. The dashed, red line represent the groundwater protection standard for cobalt (GWPS=0.006 mg/L).
5. In cases where cobalt concentrations were below the minimum detection limit, it was assumed that the concentrations were equivalent to 50% of the respective detection limit value.

Cobalt Concentration vs. pH

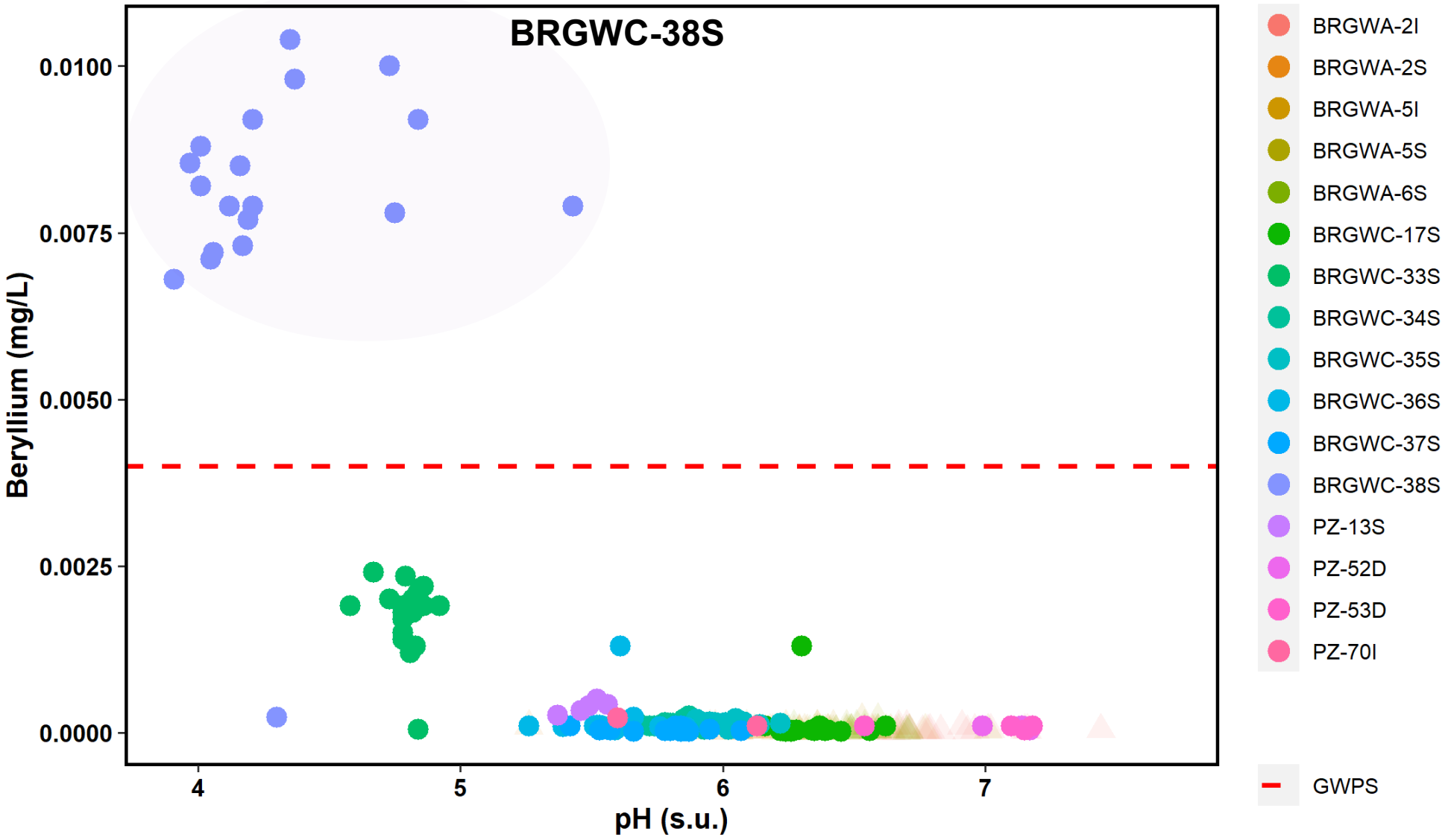
Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

Kennesaw, GA | FEBRUARY 2025

Figure 8a



Notes:

1. The graph represents beryllium concentrations in mg/L, and pH of groundwater samples collected for the full monitoring period through the August 2023.
2. mg/L = milligrams per liter
3. s.u. = standard unit
4. The dashed, red line represent the groundwater protection standard for beryllium (GWPS=0.004 mg/L).
5. In cases where beryllium concentrations were below the minimum detection limit, it was assumed that the concentrations were equivalent to 50% of the respective detection limit value.

Beryllium Concentration vs. pH

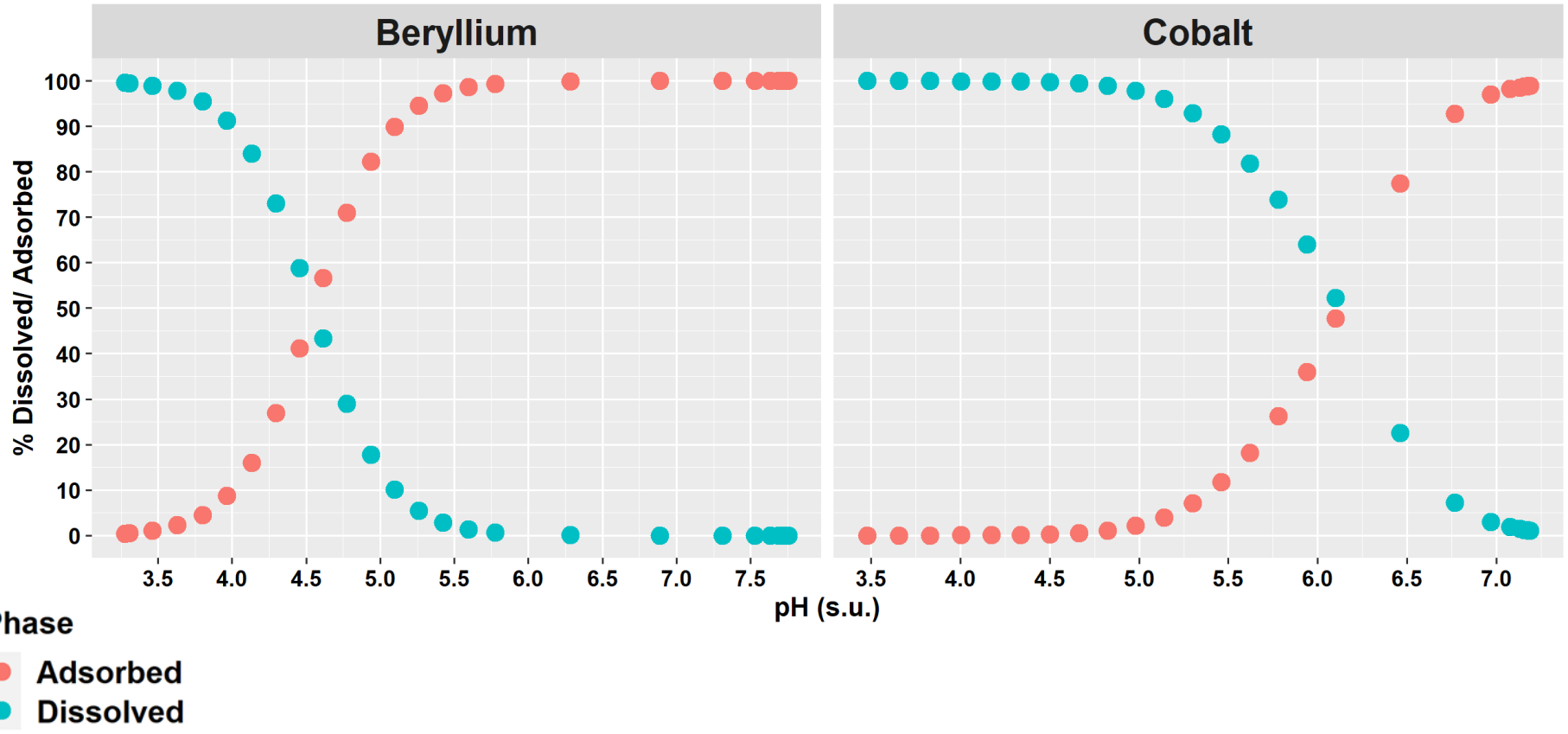
Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

Kennesaw, GA | FEBRUARY 2025

Figure 8b



Notes:
1. s.u. = standard unit

Reaction Path Modeling Results- Effect of pH

Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

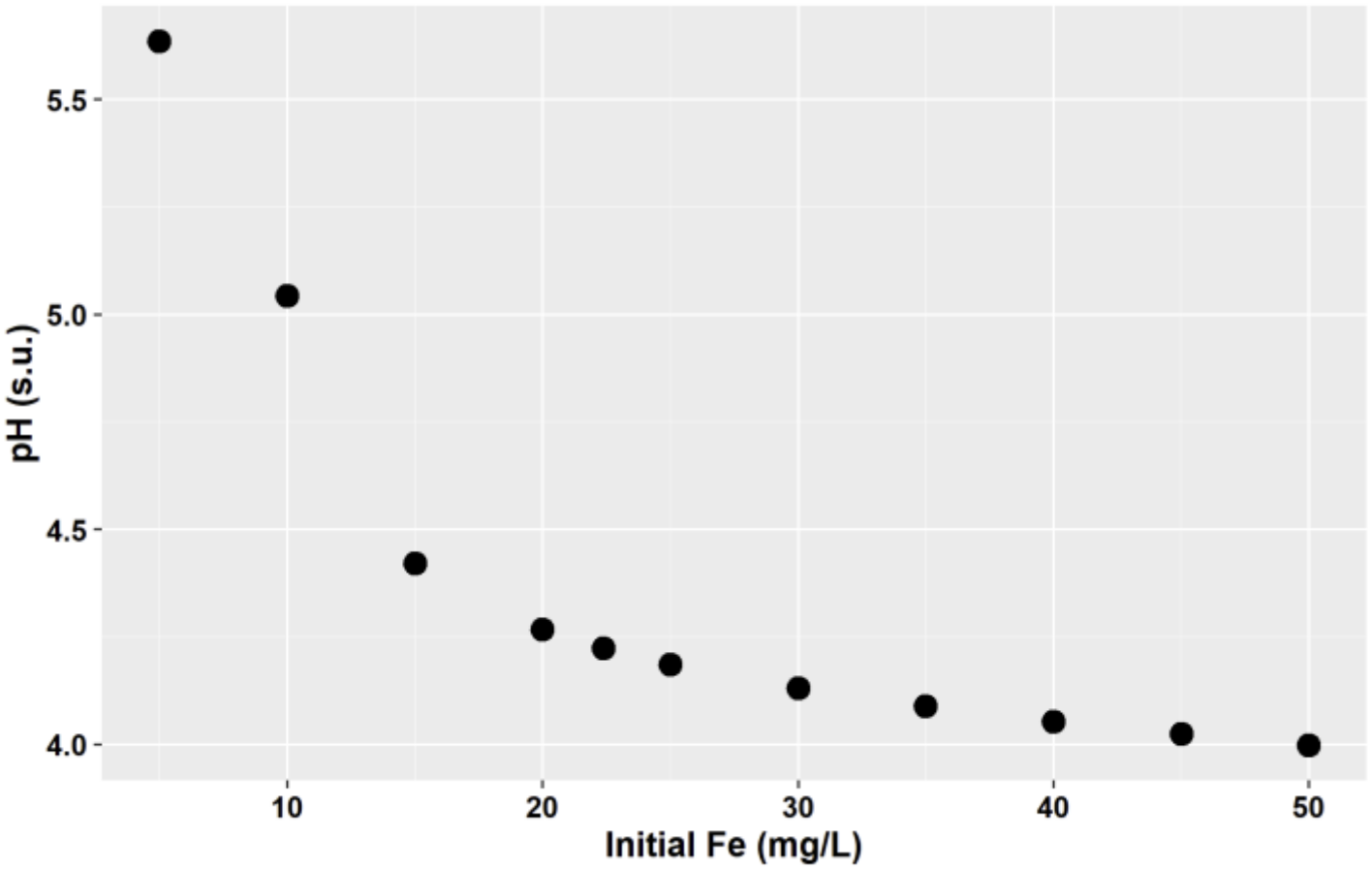
Prepared For: Georgia Power

Prepared By: Geosyntec consultants

Kennesaw, GA

FEBRUARY 2025

Figure 9a



Notes:
1. mg/L = milligrams per liter
2. s.u. = standard unit
3. The graph shows the drop in pH when reducing water (similar to interstitial water from AP-E) with varying iron concentrations is exposed to oxic conditions and dissolved oxygen levels similar to those in the downgradient wells of AP-E. The measured iron concentration at IW-E-1 was 22.4 mg/L (January 2023).

Reaction Path Modeling Results- Iron Oxidation

Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

Kennesaw, GA | FEBRUARY 2025

Figure 9b

APPENDIX A

SiREM Laboratory Sorption and Desorption Treatability Study and Site Material Characterization Reports

Prepared for:

Geosyntec Consultants, Inc.
5420 Corporate Blvd, Suite 202
Baton Rouge, LA 70808
Attn: Lauren Fitzgerald

FINAL

Laboratory Treatability Study to Evaluate Cobalt and Beryllium Adsorption and Desorption in Geological Materials and Groundwater

Plant Branch, GA

Prepared by:

180B Market Place Blvd
Knoxville, TN 37909

SiREM Ref: Si-5766K-091922

April 2023

siremlab.com

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LIST OF ABBREVIATIONS

%	percent
°C	degrees Celsius
Be	beryllium
Co	cobalt
DOC	dissolved organic carbon
EPA	Environmental Protection Agency
g	grams
g/L	grams per liter
GM:GW	geologic material/groundwater ratio
HDPE	high-density polyethylene
H_2	hydrogen gas
ICP-MS	inductively coupled plasma-mass spectrometer
L	liter
mg/L	milligrams per liter
mL	milliliter
mV	millivolts
N_2	nitrogen Gas
O_2	oxygen gas
ORP	oxidation reduction potential
ppm	parts per million (mg/L)
SEP	sequential extraction procedure
SiREM	SiREM Laboratory
TOC	total organic carbon
µg/L	micrograms per liter
WRA	whole rock analysis
XRD	X-ray diffraction analysis

1. INTRODUCTION

Geosyntec Consultants, Inc. (Geosyntec) retained SiREM laboratory (SiREM) in Knoxville TN to perform a laboratory treatability study to assess the adsorption and desorption behavior of cobalt (Co) and beryllium (Be) in groundwater and geologic material from the Plant Branch site in Georgia (the Site). The purpose of the study was to assess the sorption and desorption characteristics of Co and Be under ambient, oxidizing, and reducing conditions.

The geologic materials were collected by Geosyntec personnel at the Site between September 11 – September 14, 2022 and were received by SiREM on September 15, 2022. The groundwater was collected by Geosyntec personnel at the Site on October 12, 2022 and was received by SiREM on October 13, 2022. The materials received and chosen for the study are summarized below in Table 1. The chain of custodies received with these samples are provided in Appendix A.

Table 1: Summary of the Site Materials Received for Testing

Test	Client Sample ID (Sediment)	Client Sample ID (Groundwater)
Adsorption	SB-1	BRGWC-33S
	SB-2	BRGWC-38S
Desorption	SB-1	BRGWC-33S, BRGWA-2S
	SB-2	BRGWC-38S, BRGWA-2S

The remainder of this report contains the experimental materials and methods in Section 2, and the results in Section 3.

2. MATERIALS AND METHODS

The following sections describe the materials and methods used for baseline sampling and homogenization (Section 2.1), adsorption test reactor construction and incubation (Section 2.2), desorption test reactor construction and incubation (Section 2.3), and study sampling and analysis (Section 2.4).

2.1 Baseline Sampling and Homogenization

Site geologic material from locations SB-1 and SB-2 were homogenized then sub-sampled on October 6, 2022, for total metals, sulfur/sulfide, X-ray diffraction (XRD), chemical scan/whole rock (WRA), sequential extraction procedure (SEP), total organic carbon (TOC) and cation and anion exchange capacity analysis. All analyses were completed by SGS Environmental Services in Lakefield, ON.

A homogenized sub-sample of Site groundwater was taken on October 18, 2022, for total and dissolved metal, and dissolved organic carbon (DOC) analysis. These analyses were also completed by SGS Environmental Services in Lakefield, ON.

Following baseline analyses, all samples were stored at room temperature (22°C) until sorption testing commenced.

2.2 Adsorption Test Reactor Construction and Incubation

In consultation with Geosyntec, it was determined that the starting aqueous concentrations of Co and Be in the reactor groundwater should be double the concentrations measured in the groundwater baseline analysis to reliably distinguish Be and Co absorption from analytical variation. Therefore, homogenized groundwater was spiked in 1-liter (L) batches with respective Co and Be solutions prepared as detailed in Table 2 to achieve the intended target concentrations prior to reactor construction.

Table 2: Stock Solutions Prepared to Spike the Groundwater with Be and Co During the Adsorption Testing

Groundwater	Analyte	Target Concentration (mg/L)	Spiking Compound	Chemical Formula
BRGWC-33S	Cobalt	0.126	Cobalt (II) Chloride hexahydrate	($CoCl_2$ -$6H_2O$)
BRGWC-38S	Cobalt	0.362	Cobalt (II) Chloride hexahydrate	($CoCl_2$ -$6H_2O$)
	Beryllium	0.014	Beryllium Nitrate standard solution	($Be(NO_3)_2$)

Adsorption test reactors were constructed on the benchtop in two sets designated Set 1 and Set 2. Set 1 was constructed on January 20, 2023, with the following combination of spiked groundwater and geologic material:

- BRGWC-33S groundwater and SB-1 geologic material

Set 2 was constructed on January 30, 2023, with the following combination of spiked groundwater and geologic material:

- BRGWC-38S groundwater and SB-2 geologic material

Reactors were constructed by filling sterile 250 millilitre (mL) or 1 L (nominal volume) HDPE Nalgene® bottles with a calculated mass of geologic material and spiked groundwater to achieve geologic material/groundwater ratios (GM:GW) of 2:1, 1:1, 1:5, 1:10 and 1:20. Groundwater only controls were also constructed for each set. All the reactors were set up in duplicate.

After construction, the reactors were incubated on the benchtop for a period of 7 days at room temperature (±22°C). During incubation, reactors were inverted once daily to increase contact between the geologic material and groundwater. Adsorption test reactor controls, treatments and amendments are summarized in Table 4.

2.3 Desorption Test Reactor Construction and Incubation

The desorption testing was done in two phases. The first phase was a 7-day adsorption incubation (Day -7 to Day 0) where reactors were incubated with impacted groundwater. The second phase was a 7-day desorption incubation (Day 0 to Day 7) where the impacted groundwater was decanted from the reactors, leaving the geologic material with the sorbed metals, and unimpacted groundwater was added to allow for possible desorption of the metals. In consultation with Geosyntec, it was decided that the starting aqueous concentrations of Be in the adsorption phase reactor groundwater should be at least 0.032 mg/L to be detectable according to method limits. Therefore, homogenized groundwater was spiked in 1 L batches with a Be stock solution prepared as detailed in Table 3 to achieve the intended target concentrations prior to reactor construction.

Table 3: Stock Solution Prepared to Spike the Groundwater with Be During the Desorption Testing

Groundwater	Analyte	Target Concentration (mg/L)	Spiking Compound	Chemical Formula
BRGWC-38S	Beryllium	0.0392	Beryllium Nitrate standard solution	$(Be(NO_3)_2)$

Desorption test reactors were constructed on the benchtop in two sets designated Set 3 and Set 4. Set 3 was constructed on March 15, 2023, with the following combination of groundwater and geologic material:

- BRGWC-33S groundwater and SB-1 geologic material

Set 4 was constructed on March 16, 2023, with the following combination of spiked groundwater and geological material:

- BRGWC-38S groundwater and SB-2 geologic material

Reactors were constructed by filling sterile 250 mL (nominal volume) HDPE Nalgene® bottles with a specified mass of geologic material and groundwater. In consultation with Geosyntec, it was determined that the ideal GM:GW ratio was 1:10 based on adsorption test results.

After construction (Day -7), the reactors began their first 7-day incubation period (Day -7 to Day 0) on the benchtop at room temperature (22°C) allowing the Co and Be to come to equilibrium with the geologic material in the same manner as during the adsorption.

On March 22, 2023 (Set 3 Day 0) the impacted BRGWC-33S groundwater was removed from the Set 3 reactors and replaced with upgradient unimpacted BRGWA-2S groundwater and left to incubate on the benchtop for a period of 7 days to observe the desorption of Co and Be from the geologic material. Set 4 was set up in the same manner as Set 3 on March 23, 2023 (Set 4 Day 0).

During the second 7-day incubation period (Day 0 to Day 7), a set of treatment reactors were amended periodically by bubbling with nitrogen gas (N_2) then adding 10 mL of hydrogen gas (H_2) to stimulate reducing conditions. A second set of treatment reactors were amended periodically by bubbling with oxygen gas (O_2) for 20 seconds to stimulate oxidizing conditions. As a control, a set of reactors were left undisturbed to simulate ambient conditions.

Throughout the incubation periods, reactors were inverted once daily to increase contact between geologic material and groundwater. Desorption test reactor controls, treatments and amendments are summarized in Table 5.

2.4 Sampling and Analysis

2.4.1 Reactor Sampling

For the adsorption test, control reactors were sampled on Day 0 and Day 7 of the incubation period. The GM:GW ratio treatment reactors were sampled only on Day 7 of the incubation period. The desorption test control reactors were sampled on Day -7, Day 0, and Day 7 of their incubation periods. Oxidation and reduction treatment reactors were sampled only on Day 7. All samples were submitted for analysis of pH, oxidation reduction potential (ORP), anions, and dissolved metals.

2.4.2 Analysis of pH and ORP

The pH and ORP of reactors were recorded using an Accumet Excel 15 XL pH and ORP meter (Fisher Scientific, Hampton, NH). The pH probe was calibrated with pH 4.0, pH 7.0, and pH 10.0 buffers prior to use. The pH was measured by inserting the probe into the reactor bottles and recording the pH value upon stabilization. The ORP probe calibration was verified against a standard solution, followed by inserting the ORP probe into the reactor bottles and recording the OPR value once the readout stabilized.

2.4.3 Analysis of Anions

Samples for anion analysis were collected in 2 mL Eppendorf tubes (epi tubes) using a pipette. Two replicates of epi tubes were collected for each reactor and shipped under chain of custody to the SiREM lab in Guelph, ON, where anion analysis was preformed using Thermo-Fisher ICS-2100 ion chromatograph (IC).

2.4.4 Analysis of Groundwater

For baseline testing, dissolved metals and DOC analysis was completed by SGS in Lakefield, ON. Metals analysis was completed using inductively coupled plasma-mass spectrometer (ICP-MS), and DOC using a carbon/sulfur analyzer. All groundwater reports from SGS are presented

in Appendix B. Due to unforeseen delays at SGS, the remainder of groundwater analyses were completed by Eurofins Canton, OH. This included all dissolved metal analysis of adsorption and desorption reactors. Dissolved Co and Be was measured following EPA Method 6010D. All groundwater reports from Eurofins are presented in Appendix C.

2.4.5 Analysis of Geologic Material

Homongenized subsamples of geologic material from SB-1 and SB-2 were sent under chain of custody to SGS for baseline analyses. Metals were measured using an acid digestion and ICP-MS. Sulfur/sulfide was measured using a modified acid-base accounting method. XRD was accomplished via a Rietveld method of mineral identification. SEP was accomplished using the Tessier Leach. All geologic material reports are presented in Appendix B.

3. RESULTS

Tables 6 and 7 present a summary of baseline geologic material and groundwater baseline analysis results, respectively. The baseline analysis of the geologic material indicated that SB-1 contained 0.017 mg/kg Co and 0.002 mg/kg Be and SB-2 contained 0.01 mg/kg of Co and 0.002 mg/kg of Be. The concentrations of Co and Be present in the impacted groundwater samples BRGWC-33S and BRGWC-38S were 0.0629 mg/L Co and 0.0027 mg/L Be and 0.181 mg/L Co and 0.0072 mg/L Be, respectively. Although the Co and Be concentrations were sufficiently high to detect, for the adsorption test, additional Co and Be were spiked into each of the groundwater samples to double that of the baseline concentration to accurately measure the potential sorption of both metals to the Site geologic material. The concentration of Co and Be in the upgradient water sample outside the impacted zone contained 0.0013 mg/L Co and <0.000007 mg/L Be.

Tables 8, 9, and 10 present the dissolved metals, anions, pH, and ORP results, respectively, from the adsorption tests. The data suggested that both Co and Be will potentially sorb to Site geologic material (SB-1 and SB-2). The GM:GW ratios that showed the most promising adsorption behavior for both SB-1 and SB-2 were 2:1 and 1:1, as these ratios showed the biggest decreases in dissolved metal concentrations of the groundwater. The SB-1 material adsorbed on average 78% of the dissolved Co at the 2:1 and 1:1 GM:GW ratios. The SB-2, in comparison, adsorbed on average 94% of the dissolved Co and 95% of the Be relative to the reporting limit. Within the SB-1 and SB-2 reactors, no nitrite or phosphate was detected in the control or test reactors. Both the anions chloride and nitrate decreased marginally relative to the control reactors and were likely also sorbed to the geological material. In the case of the cations, sulfate remained constant in SB-1 and more than doubled in the SB-2 reactors. Bromide decreased marginally in the presence of SB-1 geological material and remained constant in the SB-2 reactors. pH for both sets of reactors was relatively stable throughout testing and averaged at 5.69 for SB-1 reactors and 4.80 for SB-2 reactors. The ORP was positive suggesting the presence of oxic conditions for both SB-1 and SB-2 reactors and averaged 174.2 millivolts (mV) and 229.2 mV, respectively.

To evaluate whether the Co and Be adsorbed to the geological material will desorb when challenged with background groundwater impacted with little to no dissolved Co and Be, SiREM repeated the adsorptions test and replaced the groundwater from the adsorption studies with background groundwater.

Tables 11, 12, and 13 present the dissolved metals, anions, pH, and ORP results after a 7-day incubation using background groundwater following Co and Be adsorption, respectively. No desorption of Co or Be was observed when the geologic material from SB-1 and SB-2 were incubated with background groundwater under ambient, oxidative, or reductive conditions. The concentrations in Co and Be in BRGWA-2S (upgradient, unimpacted groundwater) did not increase following incubation with sorbed geologic materials. Rather, adsorption appeared to continue as the dissolved concentration of Co and Be further decreased relative to the control. The data therefore suggests that the metals sorbed onto SB-1 and SB-2 geologic material will likely not desorb despite changes in the redox conditions. Within the SB-1 and SB-2 desorption reactors, no nitrite or phosphate was detected in the control or test reactors. Estimated levels of nitrate were detected in the treatment reactors for SB-1 and both control and treatment reactors for SB-2, whereas estimated levels of bromide were detected in only one SB-1 control reactor as indicated by the 'J' qualifier. Relative to concentrations at Day 0 of the desorption phase, SB-1 ambient conditions resulted in desorption of chloride, whereas under both oxidizing and reducing treatments chloride decreased in concentration suggesting further sorption of chloride to the geologic material under these redox conditions. In SB-2 reactors, the ambient control, oxidizing, and reducing treatments chloride concentrations decreased suggesting further sorption of chloride to geologic material. The sulfate concentrations remained constant in the control and reducing reactors yet increased by an order of magnitude under oxidizing conditions suggesting that the cation desorbed from the SB-1 material. Sulfate in the SB-2 reactors remained unchanged in oxidizing conditions, however, decreased in the control and reducing treatment reactors. The pH of the ambient treatment reactors were similar to the control (6.70 vs. 6.58), yet increased to 7.32 and 7.54 under oxidizing and reducing conditions, respectively. A similar pH trend was noted for the SB-2 reactors. Under oxidizing and reducing conditions using SB-1 material, the average ORPs were 92.7 mV and -0.2 mV, respectively, relative to the ambient ORP of 81.5 mV in the control reactors. Using SB-2 material the ORP under oxidizing conditions averaged 98.6 mV relative to the control (59.4 mV), whereas the under reducing conditions the ORP averaged 41.2 mV.

4. CONCLUSIONS

SiREM performed a laboratory treatability study to evaluate Co and Be adsorption and desorption in geological materials and groundwater at the Plant Branch site in Georgia. The results suggested that Co and Be could successfully be adsorbed to the Site geologic material and remain sorbed when challenged with unimpacted background groundwater at different oxidation states.

TABLES

TABLE 4: SUMMARY OF ADSORPTION TEST REACTOR CONTROLS, TREATMENTS, AND AMENDMENTS
Plant Branch Site

Ground-water Sample ID	Geologic Material Sample ID	Treatment	Description	Number of Reactors	Incubation Period & Sampling Frequency	Reactors Contents				Number of Analyses		
						Goundwater (mL)	Wet Geologic Material (g)	Cobalt	Beryllium	Dissolved Metals	Anions	pH and ORP
BRGWC-33S	--	Control Groundwater Only	Groundwater only	2(2*)	7 Days (Sampled on Days 0 and 7)	150	--	BRGWC-33S amended with 254 µL of a 1 g/L $CoCl_2$ solution to target a 0.1258 mg/L Co concentration prior to reactor construction	--	4	4	4
	SB-1	Soil:Water Ratio 2:1	Geologic Material and Water in a 2:1 ratio, shaken once daily during incubation	2	7 Days (Sampled on Day 7)	150	300			2	2	2
		Soil:Water Ratio 1:1	Geologic Material and Water in a 1:1 ratio, shaken once daily during incubation	2		150	150			2	2	2
		Soil:Water Ratio 1:5	Geologic Material and Water in a 1:5 ratio, shaken once daily during incubation	2		150	30			2	2	2
		Soil:Water Ratio 1:10	Geologic Material and Water in a 1:10 ratio, shaken once daily during incubation	2		150	15			2	2	2
		Soil:Water Ratio 1:20	Geologic Material and Water in a 1:20 ratio, shaken once daily during incubation	2		150	7.5			2	2	2

TABLE 4: SUMMARY OF ADSORPTION TEST REACTOR CONTROLS, TREATMENTS, AND AMENDMENTS
Plant Branch Site

Ground-water Sample ID	Geologic Material Sample ID	Treatment	Description	Number of Reactors	Incubation Period & Sampling Frequency	Reactors Contents				Number of Analyses		
						Goundwater (mL)	Wet Geologic Material (g)	Cobalt	Beryllium	Dissolved Metals	Anions	pH and ORP
BRGWC-38S	--	Control Groundwater Only	Groundwater only	2(2*)	7 Days (Sampled on Days 0 and 7)	150	--	BRGWC-38S amended with 731 µL of a 1 g/L $CoCl_2$ solution to target a 0.362 mg/L Co concentration prior to reactor construction	BRGWC_38S amended with 11 µL of a 10 g/L $Be(NO_3)_2$ solution to target a 0.014 mg/L Be concentration prior to reactor construction	4	4	4
	SB-2	Soil:Water Ratio 2:1	Geologic Material and Water in a 2:1 ratio, shaken once daily during incubation	2	7 Days (Sampled on Day 7)	150	300			2	2	2
		Soil:Water Ratio 1:1	Geologic Material and Water in a 1:1 ratio, shaken once daily during incubation	2		150	150			2	2	2
		Soil:Water Ratio 1:5	Geologic Material and Water in a 1:5 ratio, shaken once daily during incubation	2		150	30			2	2	2
		Soil:Water Ratio 1:10	Geologic Material and Water in a 1:10 ratio, shaken once daily during incubation	2		150	15			2	2	2
		Soil:Water Ratio 1:20	Geologic Material and Water in a 1:20 ratio, shaken once daily during incubation	2		150	7.5			2	2	2

Notes:

-- - Not applicable
Be - Beryllium
$Be(NO_3)_2$ - Beryllium Nitrate
Co - Cobalt
$CoCl_2$ - Cobalt Choloride
g/L - grams per liter
ID - Identification Number
L - liter
mg/L - miligrams per liter
mL - mililiters
ORP - Oxidation Reduction Potenial
µL - microliter

TABLE 5: SUMMARY OF DESORPTION TEST REACTOR CONTROLS, TREATMENTS, AND AMENDMENTS
Plant Branch Site

Ground-water Sample ID	Geologic Material Sample ID	Treatment	Description	Number of Reactors	Incubation Period & Sampling Frequency	Reactors Contents				Amendments		Number of Analyses		
						Gound-water (mL)	Wet Geologic Material (g)	Cobalt	Beryllium	Oxygen Gas	Hydrogen Gas	Dissolved Metals	Anions	pH and ORP
BRGWC-33S then BRGWA-2S	SB-1	Ambient Control	Shaken once daily during incubation	2 (6*)	7 Days (Sampled on Days 0 and 7)	150	15	--	--	--	--	8	8	8
		Oxidizing Conditions	Oxygen gas addition and shaken once daily during incubation	2	7 Days (Sampled on Day 7)	150	15			Amended periodically bubbling 20 seconds with pure oxygen gas	--	2	2	2
		Reducing Conditions	Hydrogen and Nitrogen gas addition and shaken once daily during incubation	2		150	15			--	Amended periodically bubbling with nitrogen gas 10 mL of pure hydrogen gas	2	2	2
BRGWC-38S then BRGWA-2S	SB-2	Ambient Control	Shaken once daily during incubation	2 (6*)	7 Days (Sampled on Days 0 and 7)	150	15	--	BRGWC-38S amended with 47 µL of a 10 g/L $Be(NO_3)_2$ solution to target a 0.039 mg/L Be concentration prior to reactor construction	--	--	8	8	8
		Oxidizing Conditions	Oxygen gas addition and shaken once daily during incubation	2	7 Days (Sampled on Day 7)	150	15			Amended periodically bubbling 20 seconds with pure oxygen gas	--	2	2	2
		Reducing Conditions	Hydrogen and Nitrogen gas addition and shaken once daily during incubation	2		150	15			--	Amended periodically bubbling with nitrogen gas 10 mL of pure hydrogen gas	2	2	2

Notes:
*- Numbers in brackets represent additional sacrificial control reactors required for analytical sample volumes
$Be(NO_3)_2$ - Beryllium Nitrate
-- - Not Applicable
g - grams
ID - Identification Number
mL - mililiters
ORP - Oxidation Reduction Potential

TABLE 6: SUMMARY OF BASELINE GEOLOGIC MATERIAL RESULTS
Plant Branch Site

Geologic Material	Date	Total Co	Total Be	Total Sulfide	TOC
		mg/kg	mg/kg	%	%
SB-1	6-Oct-22	0.017	0.002	<0.04	7.14
SB-2	6-Oct-22	0.010	0.002	<0.04	5.12

Notes:

% - percent

Be - Beryllium

Co - Cobalt

mg/L - miligrams per liter

TOC - total organic carbon

TABLE 7: SUMMARY OF BASELINE GROUNDWATER RESULTS

Plant Branch Site

Groundwater Sample ID	Date	Dissolved Co	Dissolved Be	DOC
		mg/L	mg/L	mg/L
BRGWC-33S	18-Oct-22	0.0629	0.0027	1.4
BRGWC-38S	18-Oct-22	0.181	0.0072	<1.0
BRGWA-2S	18-Oct-22	0.0013	<0.000007	<1.0

Notes:

Be - Beryllium
Co - Cobalt
DOC - dissolved organic carbon
ID - Identification Number
mg/L - miligrams per liter

TABLE 8: SUMMARY OF ADSORPTION TEST DISSOLVED COBALT AND BERYLLIUM
Plant Branch Site

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Sample Day	Date	Internal Sample ID	Dissolved Co	Dissolved Be	Percent Difference Co*	Percent Difference Be*
						mg/L	mg/L		
						RL: 0.01	RL: 0.005	%	%
BRGWC-33S spiked with Co	--	Control Groundwater Only	0	20-Jan-23	SB1-CTRL1a	0.1600	*0.0017*	--	--
				20-Jan-23	SB1-CTRL2a	0.1600	*0.0016*	--	--
				Average		**0.1600**	**0.0017**	**--**	**--**
			7	27-Jan-23	SB1-CTRL1b	0.1600	*0.0018*	0.00	--
				27-Jan-23	SB1-CTRL2b	0.1600	*0.0018*	0.00	--
				Average		**0.1600**	**0.0018**	**0.00**	**--**
	SB-1	Soil:Water Ratio 2:1	7	27-Jan-23	SB1-R1a	0.0360	0.0006	77.50	--
				27-Jan-23	SB1-R1b	0.0380	0.0006	76.25	--
				Average		**0.0370**	**0.0006**	**76.88**	**--**
		Soil:Water Ratio 1:1	7	27-Jan-23	SB1-R2a	0.0260	0.0006	83.75	--
				27-Jan-23	SB1-R2b	0.0400	0.0006	75.00	--
				Average		**0.0330**	**0.0006**	**79.38**	**--**
		Soil:Water Ratio 1:5	7	27-Jan-23	SB1-R3a	0.0820	0.0006	48.75	--
				27-Jan-23	SB1-R3b	0.0870	0.0006	45.63	--
				Average		**0.0845**	**0.0006**	**47.19**	**--**
		Soil:Water Ratio 1:10	7	27-Jan-23	SB1-R4a	0.1100	0.0006	31.25	--
				27-Jan-23	SB1-R4b	0.1000	0.0006	37.50	--
				Average		**0.1050**	**0.0006**	**34.38**	--
		Soil:Water Ratio 1:20	7	27-Jan-23	SB1-R5a	0.1300	0.0006	18.75	--
				27-Jan-23	SB1-R5b	0.1300	0.0006	18.75	--
				Average		**0.1300**	**0.0006**	**18.75**	**--**
BRGWC-38S spiked with Co and Be	--	Control Groundwater Only	0	30-Jan-23	SB2-CTRL1a	0.4300	0.0160	--	--
				30-Jan-23	SB2-CTRL2a	0.4300	0.0170	--	--
				Average		**0.4300**	**0.0165**	--	--
			7	6-Feb-23	SB2-CTRL1b	0.4300	0.0160	0.00	3.03
				6-Feb-23	SB2-CTRL2b	0.4300	0.0160	0.00	3.03
				Average		**0.4300**	**0.0160**	**0.00**	**3.03**
	SB-2	Soil:Water Ratio 2:1	7	6-Feb-23	SB2-R1a	0.0160	0.0006	96.28	96.36
				6-Feb-23	SB2-R1b	0.0170	0.0006	96.05	96.36
				Average		**0.0165**	**0.0006**	**96.16**	**96.36**
		Soil:Water Ratio 1:1	7	6-Feb-23	SB2-R2a	0.0290	*0.0009*	93.26	94.61
				6-Feb-23	SB2-R2b	0.0320	*0.0009*	92.56	94.67
				Average		**0.0305**	**0.0009**	**92.91**	**94.64**
		Soil:Water Ratio 1:5	7	6-Feb-23	SB2-R3a	0.1000	*0.0023*	76.74	86.06
				6-Feb-23	SB2-R3b	0.1200	*0.0027*	72.09	83.64
				Average		**0.1100**	**0.0025**	**74.42**	**84.85**
		Soil:Water Ratio 1:10	7	6-Feb-23	SB2-R4a	0.2000	0.0060	53.49	63.64
				6-Feb-23	SB2-R4b	0.1900	0.0058	55.81	64.85
				Average		**0.1950**	**0.0059**	**54.65**	**64.24**
		Soil:Water Ratio 1:20	7	6-Feb-23	SB2-R5a	0.2600	0.0090	39.53	45.45
				6-Feb-23	SB2-R5b	0.2600	0.0087	39.53	47.27
				Average		**0.2600**	**0.0089**	**39.53**	**46.36**

Notes:

% - perent

* - Percent difference from Control - Day 0 average levels

-- - Not applicable

italics - Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value

grey - Indicates the analyte was analyzed for but not detected, Method Detection Limit value is presented.

Be - Beryllium

Co - Cobalt

ID - Identification Number

mg/L - miligrams per liter

RL - Reporting Limit

TABLE 9: SUMMARY OF ADSORPTION TEST ANIONS
Plant Branch Site

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Sample Day	Date	Internal Sample ID	Chloride	Nitrite-N	Nitrate-N
						mg/L	mg/L	mg/L
						RL: 0.07	RL: 0.09	RL: 0.09
BRGWC-33S spiked with Co	--	Control Groundwater Only	0	20-Jan-23	SB1-CTRL1a	51.0	<0.09	0.80
				20-Jan-23	SB1-CTRL2a	31.0	<0.09	0.76
				Average		**41.0**	**ND**	**0.78**
			7	27-Jan-23	SB1-CTRL1b	36.0	<0.09	0.85
				27-Jan-23	SB1-CTRL2b	37.0	<0.09	0.73
				Average		**36.5**	**ND**	**0.79**
	SB-1	Soil:Water Ratio 2:1	7	27-Jan-23	SB1-R1a	29.0	<0.09	<0.09
				27-Jan-23	SB1-R1b	31.0	<0.09	0.74
				Average		**30.0**	**ND**	***0.42***
		Soil:Water Ratio 1:1	7	27-Jan-23	SB1-R2a	35.0	<0.09	0.85
				27-Jan-23	SB1-R2b	35.0	<0.09	0.85
				Average		**35.0**	**ND**	**0.85**
		Soil:Water Ratio 1:5	7	27-Jan-23	SB1-R3a	32.0	<0.09	<0.09
				27-Jan-23	SB1-R3b	33.0	<0.09	0.78
				Average		**32.5**	**ND**	***0.44***
		Soil:Water Ratio 1:10	7	27-Jan-23	SB1-R4a	35.0	<0.09	0.84
				27-Jan-23	SB1-R4b	34.0	<0.09	0.79
				Average		**34.5**	**ND**	**0.82**
		Soil:Water Ratio 1:20	7	27-Jan-23	SB1-R5a	29.0	<0.09	0.77
				27-Jan-23	SB1-R5b	37.0	<0.09	0.82
				Average		**33.0**	**ND**	**0.80**
BRGWC-38S spiked with Co and Be	--	Control Groundwater Only	0	30-Jan-23	SB2-CTRL1a	15.0	<0.09	0.86
				30-Jan-23	SB2-CTRL2a	16.0	<0.09	1.30
				Average		**15.5**	**ND**	**1.08**
			7	6-Feb-23	SB2-CTRL1b	7.6	<0.09	0.74
				6-Feb-23	SB2-CTRL2b	9.0	<0.09	1.00
				Average		**8.3**	**ND**	**0.87**
	SB-2	Soil:Water Ratio 2:1	7	6-Feb-23	SB2-R1a	11.0	<0.09	0.82
				6-Feb-23	SB2-R1b	8.9	<0.09	0.78
				Average		**10.0**	**ND**	**0.80**
		Soil:Water Ratio 1:1	7	6-Feb-23	SB2-R2a	9.0	<0.09	0.75
				6-Feb-23	SB2-R2b	10.0	<0.09	0.82
				Average		**9.5**	**ND**	**0.79**
		Soil:Water Ratio 1:5	7	6-Feb-23	SB2-R3a	15.0	<0.09	0.78
				6-Feb-23	SB2-R3b	10.0	<0.09	0.92
				Average		**12.5**	**ND**	**0.85**
		Soil:Water Ratio 1:10	7	6-Feb-23	SB2-R4a	12.0	<0.09	0.91
				6-Feb-23	SB2-R4b	11.0	<0.09	0.81
				Average		**11.5**	**ND**	**0.86**
		Soil:Water Ratio 1:20	7	6-Feb-23	SB2-R5a	9.9	<0.09	0.80
				6-Feb-23	SB2-R5b	9.9	<0.09	0.80
				Average		**9.9**	**ND**	**0.80**

TABLE 9: SUMMARY OF ADSORPTION TEST ANIONS
Plant Branch Site

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Day of Sampling	Date	Internal Sample ID	Sulfate	Phosphate	Bromide
						mg/L	mg/L	mg/L
						RL: 0.07	RL: 0.07	RL:0.08
BRGWC-33S spiked with Co	--	Control Groundwater Only	0	20-Jan-23	SB1-CTRL1a	346.0	<0.07	0.35
				20-Jan-23	SB1-CTRL2a	366.0	<0.07	1.50
				Average		**356.0**	**ND**	**0.93**
			7	27-Jan-23	SB1-CTRL1b	376.0	<0.07	0.45
				27-Jan-23	SB1-CTRL2b	356.0	<0.07	0.41
				Average		**366.0**	**ND**	**0.43**
	SB-1	Soil:Water Ratio 2:1	7	27-Jan-23	SB1-R1a	315.0	<0.07	0.54
				27-Jan-23	SB1-R1b	350.0	<0.07	0.35
				Average		**332.5**	**ND**	**0.45**
		Soil:Water Ratio 1:1	7	27-Jan-23	SB1-R2a	362.0	<0.07	0.51
				27-Jan-23	SB1-R2b	385.0	<0.07	0.42
				Average		**373.5**	**ND**	**0.47**
		Soil:Water Ratio 1:5	7	27-Jan-23	SB1-R3a	369.0	<0.07	0.37
				27-Jan-23	SB1-R3b	376.0	<0.07	0.38
				Average		**372.5**	**ND**	**0.38**
		Soil:Water Ratio 1:10	7	27-Jan-23	SB1-R4a	374.0	<0.07	0.61
				27-Jan-23	SB1-R4b	346.0	<0.07	0.38
				Average		**360.0**	**ND**	**0.50**
		Soil:Water Ratio 1:20	7	27-Jan-23	SB1-R5a	364.0	<0.07	0.39
				27-Jan-23	SB1-R5b	401.0	<0.07	0.57
				Average		**382.5**	**ND**	**0.48**
BRGWC-38S spiked with Co and Be	--	Control Groundwater Only	0	30-Jan-23	SB2-CTRL1a	129.0	1.30	<0.08
				30-Jan-23	SB2-CTRL2a	151.0	1.50	<0.08
				Average		**140.0**	**1.40**	**ND**
			7	6-Feb-23	SB2-CTRL1b	324.0	<0.07	2.00
				6-Feb-23	SB2-CTRL2b	302.0	<0.07	2.80
				Average		**313.0**	**ND**	**2.40**
	SB-2	Soil:Water Ratio 2:1	7	6-Feb-23	SB2-R1a	313.0	<0.07	2.10
				6-Feb-23	SB2-R1b	318.0	<0.07	2.70
				Average		**315.5**	**ND**	**2.40**
		Soil:Water Ratio 1:1	7	6-Feb-23	SB2-R2a	322.0	<0.07	2.40
				6-Feb-23	SB2-R2b	321.0	<0.07	2.40
				Average		**321.5**	**ND**	**2.40**
		Soil:Water Ratio 1:5	7	6-Feb-23	SB2-R3a	315.0	<0.07	2.70
				6-Feb-23	SB2-R3b	304.0	<0.07	2.70
				Average		**309.5**	**ND**	**2.70**
		Soil:Water Ratio 1:10	7	6-Feb-23	SB2-R4a	327.0	<0.07	2.60
				6-Feb-23	SB2-R4b	345.0	<0.07	2.40
				Average		**336.0**	**ND**	**2.50**
		Soil:Water Ratio 1:20	7	6-Feb-23	SB2-R5a	300.0	<0.07	2.20
				6-Feb-23	SB2-R5b	310.0	<0.07	2.60
				Average		**305.0**	**ND**	**2.40**

Notes:

italics - when replicates reported one value and one non-detect, average was calculated using the Method Detection Limit value and the reported value

-- - Not applicable

ID - Identification Number

mg/L - miligrams per liter

ND - Non-detect

RL - Reporting Limit

TABLE 10: SUMMARY OF ADSORPTION TEST pH AND ORP
Plant Branch Site

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Sample Day	Date	Internal Sample ID	pH	ORP
							mV
BRGWC-33S spiked with Co	--	Control Groundwater Only	0	20-Jan-23	SB1-CTRL1a	6.48	118.0
				20-Jan-23	SB1-CTRL2a	6.36	108.1
				20-Jan-23	SB1-CTRL1b	6.26	111.3
				20-Jan-23	SB1-CTRL2b	6.19	113.9
				Average		**6.32**	**112.8**
			7	27-Jan-23	SB1-CTRL1b	5.73	214.0
				27-Jan-23	SB1-CTRL-2b	5.69	209.0
				Average		**5.71**	**211.5**
	SB-1	Soil:Water Ratio 2:1	7	27-Jan-23	SB1-R1a	5.07	134.0
				27-Jan-23	SB1-R1b	5.76	177.0
				Average		**5.42**	**155.5**
		Soil:Water Ratio 1:1	7	27-Jan-23	SB1-R2a	4.95	185.0
				27-Jan-23	SB1-R2b	5.53	188.0
				Average		**5.24**	**186.5**
		Soil:Water Ratio 1:5	7	27-Jan-23	SB1-R3a	5.60	191.0
				27-Jan-23	SB1-R3b	5.61	194.0
				Average		**5.61**	**192.5**
		Soil:Water Ratio 1:10	7	27-Jan-23	SB1-R4a	5.65	196.0
				27-Jan-23	SB1-R4b	5.53	201.0
				Average		**5.59**	**198.5**
		Soil:Water Ratio 1:20	7	27-Jan-23	SB1-R5a	5.56	202.0
				27-Jan-23	SB1-R5b	5.51	204.0
				Average		**5.54**	**203.0**
BRGWC-38S spiked with Co and Be	--	Control Groundwater Only	0	30-Jan-23	SB2-CTRL1a	4.33	167.0
				30-Jan-23	SB2-CTRL2a	4.35	182.0
				30-Jan-23	SB2-CTRL1b	4.32	207.0
				30-Jan-23	SB2-CTRL2b	4.36	214.0
				Average		**4.34**	**192.5**
			7	6-Feb-23	SB2-CTRL1b	4.52	208.9
				6-Feb-23	SB2-CTRL2b	4.88	228.4
				Average		**4.70**	**218.7**
	SB-2	Soil:Water Ratio 2:1	7	6-Feb-23	SB2-R1a	5.06	225.5
				6-Feb-23	SB2-R1b	5.07	228.8
				Average		**5.07**	**227.2**
		Soil:Water Ratio 1:1	7	6-Feb-23	SB2-R2a	5.10	233.6
				6-Feb-23	SB2-R2b	5.11	239.0
				Average		**5.11**	**236.3**
		Soil:Water Ratio 1:5	7	6-Feb-23	SB2-R3a	5.08	244.1
				6-Feb-23	SB2-R3b	5.01	243.2
				Average		**5.05**	**243.7**
		Soil:Water Ratio 1:10	7	6-Feb-23	SB2-R4a	4.91	250.4
				6-Feb-23	SB2-R4b	4.87	253.1
				Average		**4.89**	**251.8**
		Soil:Water Ratio 1:20	7	6-Feb-23	SB2-R5a	4.78	259.1
				6-Feb-23	SB2-R5b	4.75	258.5
				Average		**4.77**	**258.8**

Notes:
Be - Beryllium
Co - Cobalt
ID - Identification Number
mV - milivolts
ORP - Oxidation Reduction Potential

TABLE 11: SUMMARY OF DESORPTION TEST DISSOLVED COBALT AND BERYLLIUM
Plant Branch Site

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Sample Day	Date	Internal Sample ID	Dissolved Co mg/L RL: 0.01	Dissolved Be mg/L RL: 0.005	Percent Difference Co* %	Percent Difference Be* %
BRGWC-33S	SB-1	Ambient Control	-7	21-Mar-23	SB1-CTRL1	0.0540	0.0006	--	--
				21-Mar-23	SB1-CTRL2	0.0590	0.0006	--	--
				Average		**0.0565**	**0.0006**	--	--
			0	28-Mar-23	SB1-CTRL3	0.0380	0.0006	--	--
				28-Mar-23	SB1-CTRL4	0.0410	0.0006	--	--
				Average		**0.0395**	**0.0006**	--	--
BRGWA-2S			0	28-Mar-23	SB1-CTRL5	*0.0033*	0.0006	--	--
				28-Mar-23	SB1-CTRL6	*0.0036*	0.0006	--	--
				Average		**0.0035**	**0.0006**	--	--
			7	4-Apr-23	SB1-CTRL7	*0.0033*	0.0006	4.35	--
				4-Apr-23	SB1-CTRL8	0.0008	0.0006	78.26	--
				Average		**0.0020**	**0.0006**	**41.30**	--
		Oxidizing Conditions	7	29-Mar-23	SB1-Oxidizing1	*0.0019*	0.0006	44.93	--
				29-Mar-23	SB1-Oxidizing2	0.0008	0.0006	78.26	--
				Average		**0.0013**	**0.0006**	**61.59**	--
		Reducing Conditions	7	29-Mar-23	SB1-Reducing1	0.0008	0.0006	78.26	--
				29-Mar-23	SB1-Reducing2	*0.0013*	0.0006	62.32	--
				Average		**0.0010**	**0.0006**	**70.29**	--
BRGWC-38S spiked with Be	SB-2	Ambient Control	-7	21-Mar-23	SB2-CTRL1	0.0810	0.0220	--	--
				21-Mar-23	SB2-CTRL2	0.0810	0.0230	--	--
				Average		**0.0810**	**0.0225**	--	--
			0	28-Mar-23	SB2-CTRL3	0.0750	0.0120	--	--
				28-Mar-23	SB2-CTRL4	0.0780	0.0140	--	--
				Average		**0.0765**	**0.0130**	--	--
BRGWA-2S			0	28-Mar-23	SB2-CTRL5	*0.0081*	0.0006	--	--
				28-Mar-23	SB2-CTRL6	*0.0088*	0.0006	--	--
				Average		**0.0085**	**0.0006**	--	--
			7	4-Apr-23	SB2-CTRL7	*0.0054*	0.0006	36.09	0.00
				4-Apr-23	SB2-CTRL8	*0.0056*	0.0006	33.73	0.00
				Average		**0.0055**	**0.0006**	**34.91**	**0.00**
		Oxidizing Conditions	7	30-Mar-23	SB2-Oxidizing1	*0.0079*	0.0006	6.51	0.00
				30-Mar-23	SB2-Oxidizing2	*0.0047*	0.0006	44.38	0.00
				Average		**0.0063**	**0.0006**	**25.44**	**0.00**
		Reducing Conditions	7	30-Mar-23	SB2-Reducing1	*0.0071*	0.0006	15.98	0.00
				30-Mar-23	SB2-Reducing2	*0.0053*	0.0006	37.28	0.00
				Average		**0.0062**	**0.0006**	**26.63**	**0.00**

Notes:
% - perent
* - Percent difference from Control - Day 0 with BRGWA-2S average levels
-- - Not applicable
italics - Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value
grey - Indicates the analyte was analyzed for but not detected, Method Detection Limit value is presented.
Be - Beryllium
Co - Cobalt
ID - Identification Number
mg/L - miligrams per liter
RL - Reporting Limit

TABLE 12: SUMMARY OF DESORPTION TEST ANIONS
Plant Branch Site

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Sample Day	Date	Internal Sample ID	Chloride	Nitrite-N	Nitrate-N
						mg/L	mg/L	mg/L
						RL: 0.07	RL: 0.09	RL: 0.09
BRGWC-33S	SB-1	Ambient Control	-7	21-Mar-23	SB1-CTRL1	31.0	<0.38	<0.30
				21-Mar-23	SB1-CTRL2	30.0	<0.38	<0.30
				Average		**30.5**	**ND**	**ND**
			0	28-Mar-23	SB1-CTRL3	30.0	<0.38	<0.30
				28-Mar-23	SB1-CTRL4	32.0	<0.38	<0.30
				Average		**31.0**	**ND**	**ND**
BRGWA-2S			0	28-Mar-23	SB1-CTRL5	31.0	<0.38	<0.30
				28-Mar-23	SB1-CTRL6	9.0	<0.38	<0.30
				Average		**20.0**	**ND**	**ND**
			7	4-Apr-23	SB1-CTRL7	59.0	<0.38	<0.30
				4-Apr-23	SB1-CTRL8	27.0	<0.38	1.00 J
				Average		**43.0**	**ND**	***0.65***
		Oxidizing Conditions	7	29-Mar-23	SB1-Oxidizing1	8.6	<0.38	0.96 J
				29-Mar-23	SB1-Oxidizing2	8.8	<0.38	1.00 J
				Average		**8.7**	**ND**	**0.98**
		Reducing Conditions	7	29-Mar-23	SB1-Reducing1	<1.5	<0.38	<0.30
				29-Mar-23	SB1-Reducing2	<1.5	<0.38	0.92 J
				Average		**ND**	**ND**	***0.61***
BRGWC-38S	SB-2	Ambient Control	-7	21-Mar-23	SB2-CTRL1	8.2	<0.38	1.00 J
				21-Mar-23	SB2-CTRL2	9.1	<0.38	1.00 J
				Average		**8.7**	**ND**	**1.00**
			0	28-Mar-23	SB2-CTRL3	17.0	<0.38	<0.30
				28-Mar-23	SB2-CTRL4	26.0	<0.38	<0.30
				Average		**21.5**	**ND**	**ND**
BRGWA-2S			0	28-Mar-23	SB2-CTRL5	20.0	<0.38	<0.30
				28-Mar-23	SB2-CTRL6	7.5	<0.38	<0.30
				Average		**13.8**	**ND**	**ND**
			7	4-Apr-23	SB2-CTRL7	6.9	<0.38	<0.30
				4-Apr-23	SB2-CTRL8	8.4	<0.38	0.86 J
				Average		**7.7**	**ND**	***0.58***
		Oxidizing Conditions	7	30-Mar-23	SB2-Oxidizing1	8.3	<0.38	0.87 J
				30-Mar-23	SB2-Oxidizing2	6.0	<0.38	0.81 J
				Average		**7.2**	**ND**	***0.84***
		Reducing Conditions	7	30-Mar-23	SB2-Reducing1	5.2	<0.38	0.87 J
				30-Mar-23	SB2-Reducing2	5.1	<0.38	0.88 J
				Average		**5.2**	**ND**	***0.88***

TABLE 12: SUMMARY OF DESORPTION TEST ANIONS
Plant Branch Site

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Sample Day	Date	Internal Sample ID	Sulfate	Phosphate	Bromide
						mg/L	mg/L	mg/L
						RL: 0.07	RL: 0.07	RL:0.08
BRGWC-38S	SB-1	Ambient Control	-7	21-Mar-23	SB1-CTRL1	364.0	<0.06	<0.49
				21-Mar-23	SB1-CTRL2	350.0	<0.06	1.80 J
				Average		**357.0**	**ND**	***1.15***
			0	28-Mar-23	SB1-CTRL3	346.0	<0.06	<0.49
				28-Mar-23	SB1-CTRL4	347.0	<0.06	<0.49
				Average		**346.5**	**ND**	**ND**
BRGWA-2S			0	28-Mar-23	SB1-CTRL5	38.0	<0.06	<0.49
				28-Mar-23	SB1-CTRL6	27.0	<0.06	<0.49
				Average		**32.5**	**ND**	**ND**
			7	4-Apr-23	SB1-CTRL7	36.0	<0.06	<0.49
				4-Apr-23	SB1-CTRL8	28.0	<0.06	<0.49
				Average		**32.0**	**ND**	**ND**
		Oxidizing Conditions	7	29-Mar-23	SB1-Oxidizing1	285.0	<0.06	<0.49
				29-Mar-23	SB1-Oxidizing2	317.0	<0.06	<0.49
				Average		**301.0**	**ND**	**ND**
		Reducing Conditions	7	29-Mar-23	SB1-Reducing1	22.0	<0.06	<0.49
				29-Mar-23	SB1-Reducing2	21.0	<0.06	<0.49
				Average		**21.5**	**ND**	**ND**
BRGWC-38S	SB-2	Ambient Control	-7	21-Mar-23	SB2-CTRL1	302.0	<0.06	<0.49
				21-Mar-23	SB2-CTRL2	307.0	<0.06	<0.49
				Average		**304.5**	**ND**	**ND**
			0	28-Mar-23	SB2-CTRL3	23.0	<0.06	<0.49
				28-Mar-23	SB2-CTRL4	53.0	<0.06	<0.49
				Average		**38.0**	**ND**	**ND**
BRGWA-2S			0	28-Mar-23	SB2-CTRL5	43.0	<0.06	<0.49
				28-Mar-23	SB2-CTRL6	41.0	<0.06	<0.49
				Average		**42.0**	**ND**	**ND**
			7	4-Apr-23	SB2-CTRL7	28.0	<0.06	<0.49
				4-Apr-23	SB2-CTRL8	25.0	<0.06	<0.49
				Average		**26.5**	**ND**	**ND**
		Oxidizing Conditions	7	30-Mar-23	SB2-Oxidizing1	61.0	<0.06	<0.49
				30-Mar-23	SB2-Oxidizing2	30.0	<0.06	<0.49
				Average		**45.5**	**ND**	**ND**
		Reducing Conditions	7	30-Mar-23	SB2-Reducing1	27.0	<0.06	<0.49
				30-Mar-23	SB2-Reducing2	31.0	<0.06	<0.49
				Average		**29.0**	**ND**	**ND**

Notes:

italics - when replicates reported one value and one non-detect, average was calculated using the Method Detection Limit value and the reported value

-- - Not applicable

ID - Identification Number

J - value is an estimated result between the Qunatitation Limit and the Reporting Limit

mg/L - miligrams per liter

ND - Non-detect

RL - Reporting Limit

TABLE 13: SUMMARY OF DESORPTION TEST pH AND ORP
Plant Branch Site

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Sample Day	Date	Internal Sample ID	pH	ORP
							mV
BRGWC-33S	SB-1	Ambient Control	-7	21-Mar-23	SB1-CTRL1	5.90	101.6
				21-Mar-23	SB1-CTRL2	5.98	101.3
				Average		**5.94**	**101.5**
			0	28-Mar-23	SB1-CTRL3	6.47	96.5
				28-Mar-23	SB1-CTRL4	6.30	92.6
				Average		**6.39**	**94.6**
BRGWA-2S			0	28-Mar-23	SB1-CTRL5	6.45	96.4
				28-Mar-23	SB1-CTRL6	6.70	49.4
				Average		**6.58**	**72.9**
			7	4-Apr-23	SB1-CTRL7	6.62	88.4
				4-Apr-23	SB1-CTRL8	6.78	74.5
				Average		**6.70**	**81.5**
		Oxidizing Conditions	7	29-Mar-23	SB1-Oxidizing1	7.29	113.6
				29-Mar-23	SB1-Oxidizing2	7.35	71.7
				Average		**7.32**	**92.7**
		Reducing Conditions	7	29-Mar-23	SB1-Reducing1	7.48	-11.2
				29-Mar-23	SB1-Reducing2	7.59	10.8
				Average		**7.54**	**-0.2**
BRGWC-38S	SB-2	Ambient Control	-7	21-Mar-23	SB2-CTRL1	6.76	108.3
				21-Mar-23	SB2-CTRL2	5.96	91.4
				Average		**6.36**	**99.9**
			0	28-Mar-23	SB2-CTRL3	9.32	75.4
				28-Mar-23	SB2-CTRL4	5.51	75.9
				Average		**7.42**	**75.7**
BRGWA-2S			0	28-Mar-23	SB2-CTRL5	6.79	38.2
				28-Mar-23	SB2-CTRL6	6.86	40.7
				Average		**6.83**	**39.5**
			7	4-Apr-23	SB2-CTRL7	6.68	60.1
				4-Apr-23	SB2-CTRL8	6.52	58.6
				Average		**6.60**	**59.4**
		Oxidizing Conditions	7	30-Mar-23	SB2-Oxidizing1	7.13	93.8
				30-Mar-23	SB2-Oxidizing2	7.22	103.3
				Average		**7.18**	**98.6**
		Reducing Conditions	7	30-Mar-23	SB2-Reducing1	7.63	55.4
				30-Mar-23	SB2-Reducing2	7.18	27.0
				Average		**7.41**	**41.2**

Notes:
ID - Identification Number
mV - milivolts
ORP - Oxidation Reduction Potential

APPENDIX A: Chain of Custody Documentation

SiREM
180B Market Place Blvd
Knoxville, TN 37922
PH: 865.330.0037
www.siremlab.com

Chain of Custody (COC) Record

Lab # S-9445

Project Name: Plant Branch Groundwater Services		Project # (Optional): GW8862	
Project Manager: Lauren Fitzgerald		Company: Geosyntec	
Email Address: lafitzgerald@geosyntec.com			
Address (Street): 5420 Corporate Blvd #202			
City: Baton Rouge	State/Province: LA	Country: USA	
Phone #: 828-455-4941			
Sampler's Signature: Taylor Goble / Jordan Bernhardt	Sampler's Printed Name: Taylor Goble / Jordan Bernhardt		

Analysis

1 of 1 COCs

For Lab Use Only
SIREM Database Info
Recorded By: KC
Date: 101422

Client Sample ID	Sampling Date	Sampling Time	Matrix	# of Cont.	Treatability Services								Other Information (Optional)	Lab Identifier (if applicable)	Sample ID
BRGWA-25	10/12/22	1033	GW	2	✓										
BRGWC-335	10/12/22	1135	GW	2	✓										
BRGWC-355	10/12/22	1336	GW	2	✓										
BRGWC-385	10/12/22	1335	GW	2	✓										

Billing Information (Optional)
P.O. #:
Bill To:

For Lab Use Only
Observed Cooler Temperature (°C): _____
Corrected Cooler Temperature (°C): _____
Thermometer ID: _____
Cooler Number (if applicable): _____
Custody Seals Intact: ☐ Yes ☐ No ☐ Not Applicable
Custody Seal Number (if applicable): _____

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature:	Signature: UPS	Signature:	Signature:	Signature:	Signature:
Printed Name: Jordan Bernhardt	Printed Name: UPS	Printed Name:	Printed Name: Jacques Smith	Printed Name:	Printed Name:
Firm: ACC	Firm: UPS	Firm:	Firm: SiREM	Firm:	Firm:
Date/Time: 10/12/22 1700	Date/Time: 10/12/22	Date/Time:	Date/Time: 10.13.22 1115	Date/Time:	Date/Time:

Please note: The SiREM Knoxville location does not have a loading dock and cannot accept shipments from trucks without a lift gate.

SiREM
180B Market Place Blvd
Knoxville, TN 37922
PH: 865.330.0037
www.siremlab.com

Chain of Custody (COC) Record

Lab # S-9377

Project Name	Plant Branch Groundwater Services	**Project # (Optional)**	GW8862
Project Manager	Lauren Fitzgerald	**Company**	Geosyntec
Email Address	lafitzgerald@geosyntec.com		
Address (Street)	5420 Corporate Blvd #202		
City	Baton Rouge	**State/Province** LA	**Country** USA
Phone #	828-455-4941		
Sampler's Signature		**Sampler's Printed Name**	Lauren Fitzgerald

Analysis

1 of 1 COCs

Client Sample ID	Sampling Date	Sampling Time	Matrix	# of Cont.	Treatability Services								Other Information (Optional)	Lab Identifier (if applicable)	Sample ID
SB-1	9/11/22	1350	Soil	2	X										
SB-2	9/14/22	835	Soil	2	X										

For Lab Use Only
SiREM Database Info
Recorded By: _____
Date: _____

Billing Information (Optional)
P.O. #:
Bill To:

For Lab Use Only
Observed Cooler Temperature (°C): 17.6
Corrected Cooler Temperature (°C): 19.7
Thermometer ID: KX00056
Cooler Number (If applicable): _____
Custody Seals Intact: ☐ Yes ☐ No ☒ Not Applicable
Custody Seal Number (If applicable): _____

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature	Signature KWilmoth	Signature	Signature	Signature	Signature
Printed Name	Printed Name Rattlandcracchiola	Printed Name	Printed Name	Printed Name	Printed Name
Firm	Firm SiREM	Firm	Firm	Firm	Firm
Date/Time	Date/Time 09/15/22 1145	Date/Time	Date/Time	Date/Time	Date/Time

Please note: The SiREM Knoxville location does not have a loading dock and cannot accept shipments from trucks without a lift gate.

SiREM
180B Market Place Blvd
Knoxville, TN 37922
PH: 865.330.0037
www.siremlab.com

Chain of Custody (COC) Record

Lab # S-9377

Project Name Plant Branch Groundwater Services	**Project # (Optional)** GW8862
Project Manager Lauren Fitzgerald	**Company** Geosyntec
Email Address lafitzgerald@geosyntec.com	
Address (Street) 5420 Corporate Blvd #202	
City Baton Rouge	**State/Province** LA — **Country** USA
Phone # 828-455-4941	
Sampler's Signature	**Sampler's Printed Name** Lauren Fitzgerald

Analysis

1 of 1 COCs

Client Sample ID	Sampling Date	Sampling Time	Matrix	# of Cont.	XRD	Chem Scan	Total Metals	sulfur	sulfide	SEP	Whole rock analysis	CEC/AEC	Other Information (Optional)	Lab Identifier (if applicable)	Sample ID
SB-1	9/11/22	1350	Soil	1	X	X	X	X	X	X	X	X			
SB-2	9/14/22	835	Soil	1	X	X	X	X	X	X	X	X			

For Lab Use Only
SiREM Database Info
Recorded By: _____
Date: _____

Billing Information (Optional)
P.O. #:
Bill To:

For Lab Use Only
Observed Cooler Temperature (°C): 17.6
Corrected Cooler Temperature (°C): 19.7
Thermometer ID: KX00056
Cooler Number (if applicable): _____
Custody Seals Intact: ☐ Yes ☐ No ☒ Not Applicable
Custody Seal Number (if applicable): _____

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature	Signature	Signature	Signature	Signature	Signature
Printed Name	Printed Name Kaitland Cracchiola	Printed Name	Printed Name	Printed Name	Printed Name
Firm	Firm SiREM	Firm	Firm	Firm	Firm
Date/Time	Date/Time 09/16/22 1145	Date/Time	Date/Time	Date/Time	Date/Time

Please note: The SiREM Knoxville location does not have a loading dock and cannot accept shipments from trucks without a lift gate.

SiREM
180B Market Place Blvd
Knoxville, TN 37922
PH: 865.330.0037
www.siremlab.com

Chain of Custody (COC) Record

Lab # S-9377

Project Name Plant Branch Groundwater Services	**Project # (Optional)** GW8862
Project Manager Lauren Fitzgerald	**Company** Geosyntec
Email Address lafitzgerald@geosyntec.com	
Address (Street) 5420 Corporate Blvd #202	
City Baton Rouge / **State/Province** LA / **Country** USA	
Phone # 828-455-4941	
Sampler's Signature	**Sampler's Printed Name** Lauren Fitzgerald

Analysis

1 of 1 COCs

Client Sample ID	Sampling Date	Sampling Time	Matrix	# of Cont.	Treatability Services	XRD	Chem Scan						Other Information (Optional)	Lab Identifier (if applicable)	Sample ID
PZ-64 (64-65)	9/10/22		Soil	1		x	x								
PZ-65 (64-65)	9/9/22		Soil	1		x	x								
PZ-66 (64-65)	9/8/22		Soil	1		x	x								

For Lab Use Only
SiREM Database Info
Recorded By: _____
Date: _____

Billing Information (Optional)
P.O. #:
Bill To:

For Lab Use Only
Observed Cooler Temperature (°C): 17.6
Corrected Cooler Temperature (°C): 19.7
Thermometer ID: KX00056
Cooler Number (if applicable): _____
Custody Seals Intact: ☐ Yes ☐ No ☒ Not Applicable
Custody Seal Number (if applicable): _____

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature	Signature KMcracchiola	Signature	Signature	Signature	Signature
Printed Name	Printed Name Kathland cracchiola	Printed Name	Printed Name	Printed Name	Printed Name
Firm	Firm SiREM	Firm	Firm	Firm	Firm
Date/Time	Date/Time 09/16/22 1145	Date/Time	Date/Time	Date/Time	Date/Time

Please note: The SiREM Knoxville location does not have a loading dock and cannot accept shipments from trucks without a lift gate.

APPENDIX B: SGS Laboratory Reports

Analysis Report
GS22-04767

F402001 SGS LAKEFIELD RESEARCH
PO BOX 4300
185 CONCESSION STREET
LAKEFIELD, ONTARIO ON K0L 2H0
CANADA

Received : 24-Oct-2022
Completed : 28-Oct-2022
Order Reference : Catherine -CA19109

Laboratory ID:	GS22-04767.001	GS22-04767.002
Client Sample #:	SB-1	SB-2
Description:	CA19109-OCT22	
CEC Actual (meq/100g)	5.43	12.98

NOTE:
The analysis report above refers to the time and place of testing, and strictly to the supplied sample(s) only, without reference to any other matter. This report does not evidence or refer to any consignment or shipment or/and SGS sampling and inspection.

Report File Reference Number: 0000243969

Signed and dated in Guelph, ON
On 28-Oct-2022

For and on behalf of SGS Canada Inc., Agriculture and Food

Jack Legg, CCA-ON, 4R NMS
Branch Manager, Agronomist

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

22-November-2022

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

Date Rec. : 19 October 2022
LR Report: **CA13736-OCT22**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: BRGWC-33S	6: BRGWC-38S	7: BRGWC-2S
Temp Upon Receipt [°C]	---	---	---	---	8.0	8.0	8.0
Ag (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	< 0.00005	< 0.00005	< 0.00005
Ag (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Al (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.281	1.41	0.004
Al (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
As (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.0009	0.0012	< 0.0002
As (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Ba (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.0414	0.0143	0.0124
Ba (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Be (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.00238	0.00730	< 0.000007
Be (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
B (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	1.04	1.46	0.005
B (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Bi (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	< 0.00001	< 0.00001	< 0.00001
Bi (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Ca (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	121	35.2	4.85
Ca (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Cd (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.000514	0.000480	0.000008
Cd (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Co (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.0642	0.179	0.00140
Co (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Cr (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	< 0.00008	0.00323	0.00726
Cr (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Cu (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.0012	0.0155	< 0.0002
Cu (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Fe (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.007	0.018	0.112
Fe (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
K (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	13.8	6.19	0.431
K (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---

OnLine LIMS

0003129367

Results relate only to the sample tested. Data reported represents the sample submitted to SGS. Reproduction of this analytical report in full or in part is prohibited without prior written approval. Please refer to SGS General Conditions of Services located at https://www.sgs.ca/en/terms-and-conditions (Printed copies are available upon request.)
Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
SGS Canada Inc. Environment-Health & Safety statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA13736-OCT22**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: BRGWC-33S	6: BRGWC-38S	7: BRGWC-2S
Li (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.0117	0.0202	0.0006
Li (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Mg (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	14.8	37.4	4.69
Mg (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Mn (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	2.80	1.73	0.0498
Mn (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Mo (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	< 0.00004	< 0.00004	< 0.00004
Mo (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Na (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	29.5	44.2	3.37
Na (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Ni (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.0127	0.0792	0.0023
Ni (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
P (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.004	< 0.003	0.017
P (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Pb (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.00021	0.00036	< 0.00009
Pb (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Sb (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	< 0.0009	< 0.0009	< 0.0009
Sb (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Se (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.00010	0.0275	< 0.00004
Se (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Si (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	8.55	33.0	16.9
Si (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Sn (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.00017	0.00009	0.00015
Sn (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Sr (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	2.41	0.426	0.0147
Sr (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Ti (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.00016	0.00021	0.00022
Ti (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Tl (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.000254	0.000159	< 0.000005
Tl (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
U (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.000054	0.000924	0.000002
U (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
V (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.00014	0.00008	0.00057
V (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Zn (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	0.034	0.189	0.003
Zn (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---
Zr (tot) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	< 0.002	< 0.002	< 0.002
Zr (diss) [mg/L]	28-Oct-22	18:00	03-Nov-22	10:34	---	---	---

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA13736-OCT22**

Analysis	8: BRGWC-35C	9: BRGWC-33S (filtered)	10: BRGWC-38S (filtered)	11: BRGWC-2S (filtered)	12: BRGWC-35C (filtered)
Temp Upon Receipt [°C]	8.0	8.0	8.0	8.0	8.0
Ag (tot) [mg/L]	< 0.00005	---	---	---	---
Ag (diss) [mg/L]	---	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al (tot) [mg/L]	0.004	---	---	---	---
Al (diss) [mg/L]	---	0.274	1.41	0.001	0.002
As (tot) [mg/L]	< 0.0002	---	---	---	---
As (diss) [mg/L]	---	0.0009	0.0013	< 0.0002	< 0.0002
Ba (tot) [mg/L]	0.0333	---	---	---	---
Ba (diss) [mg/L]	---	0.0403	0.0144	0.0123	0.0331
Be (tot) [mg/L]	0.000140	---	---	---	---
Be (diss) [mg/L]	---	0.00227	0.00718	< 0.000007	0.000140
B (tot) [mg/L]	1.97	---	---	---	---
B (diss) [mg/L]	---	1.07	1.43	0.003	1.87
Bi (tot) [mg/L]	0.00001	---	---	---	---
Bi (diss) [mg/L]	---	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ca (tot) [mg/L]	68.9	---	---	---	---
Ca (diss) [mg/L]	---	121	35.5	4.82	68.4
Cd (tot) [mg/L]	0.000037	---	---	---	---
Cd (diss) [mg/L]	---	0.000498	0.000506	0.000012	0.000042
Co (tot) [mg/L]	0.000219	---	---	---	---
Co (diss) [mg/L]	---	0.0629	0.181	0.00128	0.000209
Cr (tot) [mg/L]	0.00424	---	---	---	---
Cr (diss) [mg/L]	---	< 0.00008	0.00353	0.00119	0.00435
Cu (tot) [mg/L]	< 0.0002	---	---	---	---
Cu (diss) [mg/L]	---	0.0011	0.0155	< 0.0002	< 0.0002
Fe (tot) [mg/L]	0.008	---	---	---	---
Fe (diss) [mg/L]	---	< 0.007	0.016	0.053	< 0.007
K (tot) [mg/L]	4.17	---	---	---	---
K (diss) [mg/L]	---	13.6	6.15	0.426	4.19
Li (tot) [mg/L]	0.0021	---	---	---	---
Li (diss) [mg/L]	---	0.0104	0.0188	0.0006	0.0019
Mg (tot) [mg/L]	35.1	---	---	---	---
Mg (diss) [mg/L]	---	14.9	36.9	4.73	34.8
Mn (tot) [mg/L]	0.0104	---	---	---	---
Mn (diss) [mg/L]	---	2.74	1.78	0.04742	0.0104
Mo (tot) [mg/L]	0.00004	---	---	---	---
Mo (diss) [mg/L]	---	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Na (tot) [mg/L]	19.1	---	---	---	---
Na (diss) [mg/L]	---	29.7	45.2	3.41	20.1
Ni (tot) [mg/L]	0.0098	---	---	---	---
Ni (diss) [mg/L]	---	0.0122	0.0798	0.0025	0.0097
P (tot) [mg/L]	0.119	---	---	---	---

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA13736-OCT22**

Analysis	8: BRGWC-35C	9: BRGWC-33S (filtered)	10: BRGWC-38S (filtered)	11: BRGWC-2S (filtered)	12: BRGWC-35C (filtered)
P (diss) [mg/L]	---	< 0.003	< 0.003	0.010	0.119
Pb (tot) [mg/L]	< 0.00009	---	---	---	---
Pb (diss) [mg/L]	---	0.00018	0.00036	< 0.00009	< 0.00009
Sb (tot) [mg/L]	< 0.0009	---	---	---	---
Sb (diss) [mg/L]	---	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	0.00031	---	---	---	---
Se (diss) [mg/L]	---	0.00012	0.0294	< 0.00004	0.00021
Si (tot) [mg/L]	26.0	---	---	---	---
Si (diss) [mg/L]	---	7.61	30.5	15.9	25.4
Sn (tot) [mg/L]	0.00017	---	---	---	---
Sn (diss) [mg/L]	---	0.00013	0.00017	0.00014	0.00016
Sr (tot) [mg/L]	0.668	---	---	---	---
Sr (diss) [mg/L]	---	2.37	0.440	0.0147	0.664
Ti (tot) [mg/L]	0.00025	---	---	---	---
Ti (diss) [mg/L]	---	0.00007	0.00014	0.00007	0.00008
Tl (tot) [mg/L]	< 0.000005	---	---	---	---
Tl (diss) [mg/L]	---	0.000235	0.000170	< 0.000005	< 0.000005
U (tot) [mg/L]	0.000015	---	---	---	---
U (diss) [mg/L]	---	0.000046	0.000920	0.000002	0.000012
V (tot) [mg/L]	0.00334	---	---	---	---
V (diss) [mg/L]	---	0.00012	0.00007	0.00046	0.00334
Zn (tot) [mg/L]	0.005	---	---	---	---
Zn (diss) [mg/L]	---	0.035	0.197	0.003	0.005
Zr (tot) [mg/L]	< 0.002	---	---	---	---
Zr (diss) [mg/L]	---	< 0.002	< 0.002	< 0.002	< 0.002

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

22-November-2022

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

Date Rec. : 12 October 2022
LR Report: **CA19107-OCT22**
Reference: Plant Branch
SIREMLABUS. 02. 10. 8151

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: PZ-64	6: PZ-65	7: PZ-66	8: PZ-68	9: SB-1	10: SB-2
Ag [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Al [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	98000	92000	91000	48000	74000	91000
As [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	1.0	0.7	1.1	1.0	0.6	0.9
Ba [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	1100	540	930	450	140	1000
Be [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	2	2	2	0.75	2	2
Bi [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	< 0.09	0.20	0.09	0.17	0.13	0.10
Ca [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	8100	25000	4300	15000	700	3900
Cd [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	0.13	0.12	0.08	0.15	0.02	0.05
Co [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	20	15	6	22	17	10
Cr [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	53	92	70	47	140	52
Cu [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	18	12	15	16	52	24
Fe [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	21000	46000	29000	49000	46000	21000
K [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	33000	19000	31000	15000	8600	31000
Li [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	13	13	13	14	17	11
Mg [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	5700	19000	5100	17000	8400	6000
Mn [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	660	790	430	840	650	460
Mo [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	0.4	0.4	3.2	0.7	0.3	0.5
Na [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	14000	13000	8700	4200	260	4100
Ni [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	16	64	21	34	29	14
P [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	150	190	200	1500	250	130
Pb [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	24	17	35	6	17	27
Sb [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	< 6	< 6	< 6	< 6	< 6	< 6
Sr [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	270	180	160	120	35	190
Ti [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	2200	2900	3900	6500	3100	2200
Tl [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	0.56	0.43	0.61	0.42	0.94	0.57

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19107-OCT22**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: PZ-64	6: PZ-65	7: PZ-66	8: PZ-68	9: SB-1	10: SB-2
U [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	1.97	3.07	5.94	1.74	2.57	2.71
V [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	45	110	67	100	90	39
Y [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	23.2	25.2	18.4	31.7	21.5	23.6
Zn [µg/g]	26-Oct-22	17:22	01-Nov-22	08:24	59	78	81	98	76	48

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : P.O# SIREMLABUS/02/10/8151

22-November-2022

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

Date Rec. : 21 October 2022
LR Report: **CA13962-OCT22**
Reference: Plant Brance

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CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Temp Upon Receipt °C	DOC mg/L
1: Analysis Start Date	---	26-Oct-22
2: Analysis Start Time	---	21:34
3: Analysis Completed Date	---	27-Oct-22
4: Analysis Completed Time	---	13:33
5: BRGWC-33S	9.0	1.4
6: BRGWC-38S	9.0	< 1.0
7: BRGWC-2S	9.0	< 1.0
8: BRGWC-35C	9.0	< 1.0

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

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0003129380

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

22-November-2022

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

Date Rec. : 12 October 2022
LR Report: **CA19110-OCT22**
Reference: Plant Branch
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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: PZ-64	6: PZ-65	7: PZ-66	8: PZ-68	9: SB-1	10: SB-2
SiO2 [%]	19-Oct-22	19:03	24-Oct-22	09:51	66.0	56.2	67.7	57.3	62.7	68.1
Al2O3 [%]	19-Oct-22	19:03	24-Oct-22	09:51	17.9	17.0	16.2	17.2	17.6	16.5
Fe2O3 [%]	19-Oct-22	19:03	24-Oct-22	09:51	2.75	8.01	3.57	7.65	6.32	2.32
MgO [%]	19-Oct-22	19:03	24-Oct-22	09:51	0.92	4.06	0.70	2.84	1.38	0.76
CaO [%]	19-Oct-22	19:03	24-Oct-22	09:51	0.99	3.91	0.51	4.78	0.23	0.34
Na2O [%]	19-Oct-22	19:03	24-Oct-22	09:51	1.96	1.47	1.19	3.25	0.37	0.52
K2O [%]	19-Oct-22	19:03	24-Oct-22	09:51	3.90	2.60	3.94	1.69	2.61	4.98
TiO2 [%]	19-Oct-22	19:03	24-Oct-22	09:51	0.34	0.54	0.53	1.14	0.76	0.26
P2O5 [%]	19-Oct-22	19:03	24-Oct-22	09:51	0.04	0.06	0.05	0.35	0.08	0.02
MnO [%]	19-Oct-22	19:03	24-Oct-22	09:51	0.08	0.13	0.05	0.13	0.07	0.03
Cr2O3 [%]	19-Oct-22	19:03	24-Oct-22	09:51	0.02	0.07	0.03	0.03	0.04	0.03
V2O5 [%]	19-Oct-22	19:03	24-Oct-22	09:51	0.01	0.03	< 0.01	0.03	0.02	< 0.01
LOI [%]	19-Oct-22	19:03	24-Oct-22	09:51	4.48	5.17	4.74	2.96	7.14	5.12
Sum [%]	19-Oct-22	19:03	24-Oct-22	09:51	99.4	99.3	99.2	99.4	99.3	99.0

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

07-December-2022

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

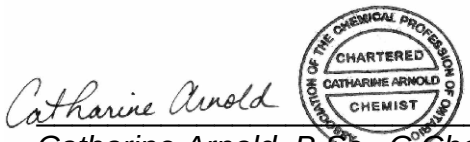
Phone: 865-291-4695
Fax:

Date Rec. : 12 October 2022
LR Report: **CA19108-OCT22**
Reference: Plant Branch
SIREMLABUS. 02. 10. 8151

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	9: SB-1	10: SB-2
Sample Date & Time					06-Oct-22 08:30	06-Oct-22 08:30
S [%]	23-Nov-22	19:32	25-Nov-22	09:30	0.009	< 0.005
Sulphide [%]	24-Nov-22	07:53	25-Nov-22	09:30	< 0.04	< 0.04



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

00031485555

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Quantitative X-Ray Diffraction by Rietveld Refinement

Report Prepared for:	*Environmental Services*
Project Number/ LIMS No.	*Custom XRD/MI4533-OCT22*
Sample Receipt:	*October 20, 2022*
Sample Analysis:	*October 28, 2022*
Reporting Date:	*December 21, 2022*

Instrument:	BRUKER AXS D8 Advance Diffractometer
Test Conditions:	Co radiation, 35 kV, 40 mA; Detector: LYNXEYE Regular Scanning: Step: 0.02°, Step time: 0.75s, 2θ range: 6-80°
Interpretations :	PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva and Topas software.
Detection Limit :	0.5-2%. Strongly dependent on crystallinity.

Contents:

1) Method Summary
2) Quantitative XRD Results
3) XRD Pattern(s)

Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

Huyun Zhou, Ph.D., P.Geo.
Senior Mineralogist

ACCREDITATION: SGS Natural Resources Lakefield is accredited to the requirements of ISO/IEC 17025 for specific tests as listed on our scope of accreditation, including geochemical, mineralogical and trade mineral tests. To view a list of the accredited methods, please visit the following website and search SGS Canada Inc. - Minerals: https://www.scc.ca/en/search/palcan.

Method Summary

The Rietveld Method of Mineral Identification by XRD (ME-LR-MIN-MET-MN-D05) method used by SGS Natural Resources is accredited to the requirements of ISO/IEC 17025.

Mineral Identification and Interpretation:

Mineral identification and interpretation involves matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

Quantitative Rietveld Analysis:

Quantitative Rietveld Analysis is performed by using Topas 4.2 (Bruker AXS), a graphics based profile analysis program built around a non-linear least squares fitting system, to determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile until it matches the obtained experimental patterns.

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.05wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

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Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

Mineral/Compound	PZ-64 OCT4533-1 (wt %)	PZ-65 OCT4533-2 (wt %)	PZ-66 OCT4533-3 (wt %)	PZ-68 OCT4533-4 (wt %)	SB-1 OCT4533-5 (wt %)	SB-2 OCT4533-6 (wt %)
Quartz	26.4	16.4	33.4	21.9	36.7	36.0
Plagioclase	21.2	17.0	13.1	35.7	4.6	9.6
Potassium-feldspar	16.5	10.6	16.7	3.1	14.1	16.0
Mica	16.1	17.2	19.1	26.5	20.5	22.9
Kaolinite	16.9	18.4	16.4	-	23.3	15.0
Gypsum	1.7	0.3	0.5	1.3	-	-
Magnetite	0.3	0.0	0.0	0.4	0.0	0.1
Diopside	1.0	0.1	0.6	1.8	0.6	0.5
Actinolite	-	20.1	-	4.3	-	-
Chlorite	-	-	-	3.9	-	-
Grossular	-	-	-	0.5	0.1	-
Ilmenite	-	-	-	0.7	0.1	-
TOTAL	100	100	100	100	100	100

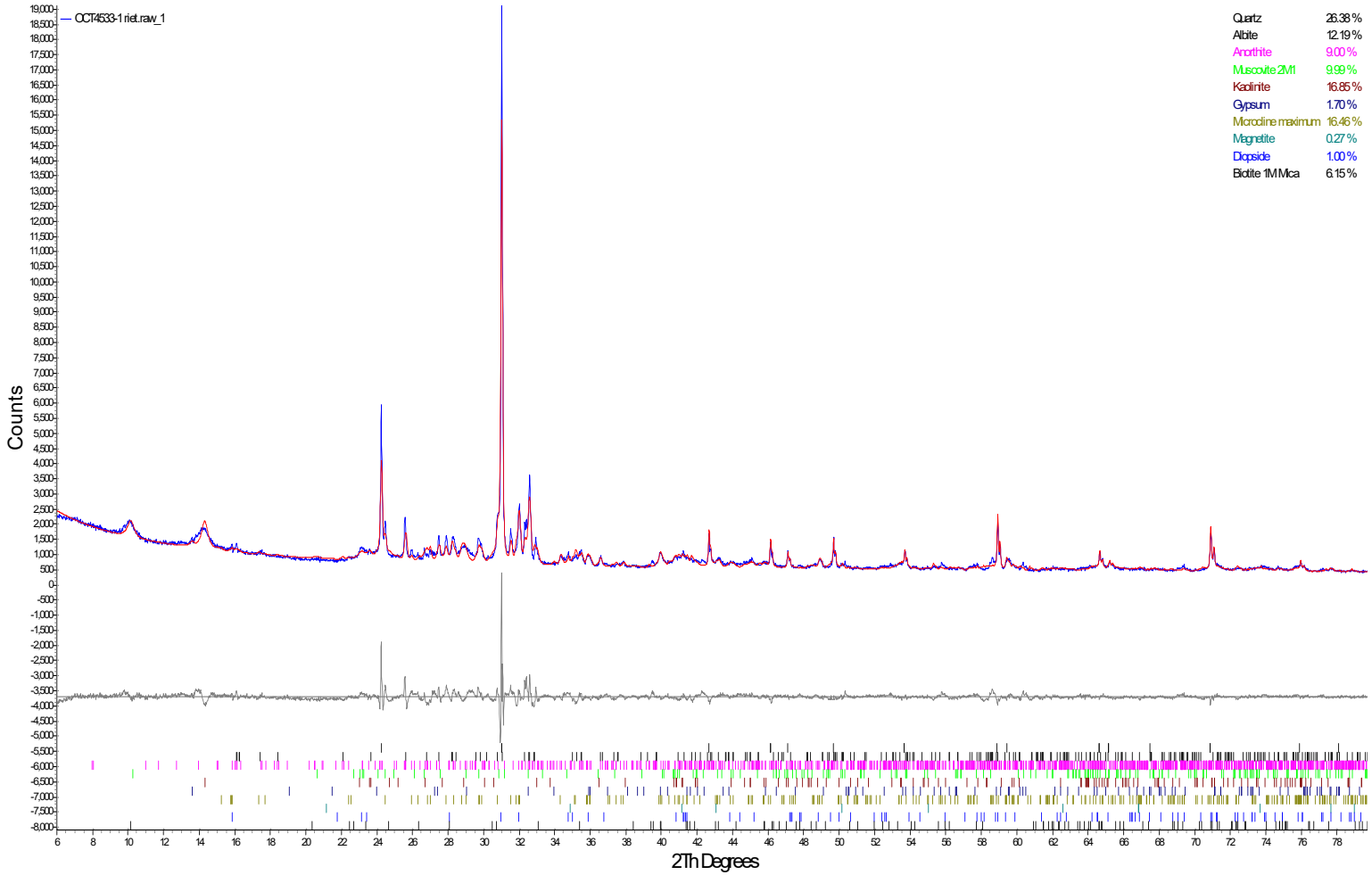
Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.

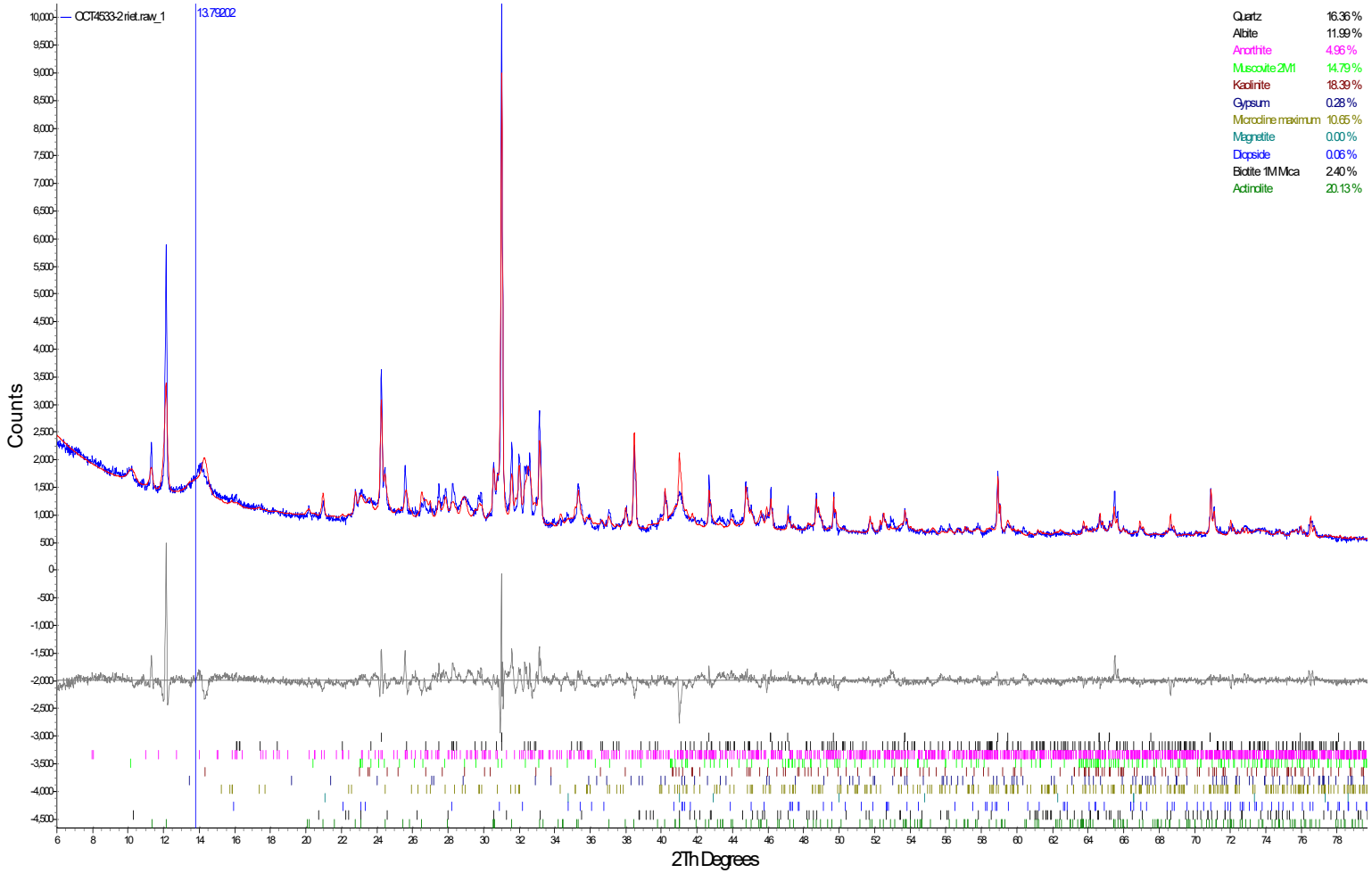
The weight percent quantities indicated have been normalized to a sum of 100%.

Mineral/Compound	Formula
Quartz	SiO_2
Plagioclase	$(NaSi,CaAl)AlSi_2O_8$
Potassium-feldspar	$KAlSi_3O_8$
Mica	$K(Mg,Fe)Al_2Si_3AlO_{10}(OH)_2$
Kaolinite	$Al_2Si_2O_5(OH)_4$
Gypsum	$CaSO_4 \cdot 2H_2O$
Magnetite	Fe_3O_4
Diopside	$CaMgSi_2O_6$
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Grossular	$Ca_3Al_2Si_3O_{12}$
Ilmenite	$FeTiO_3$

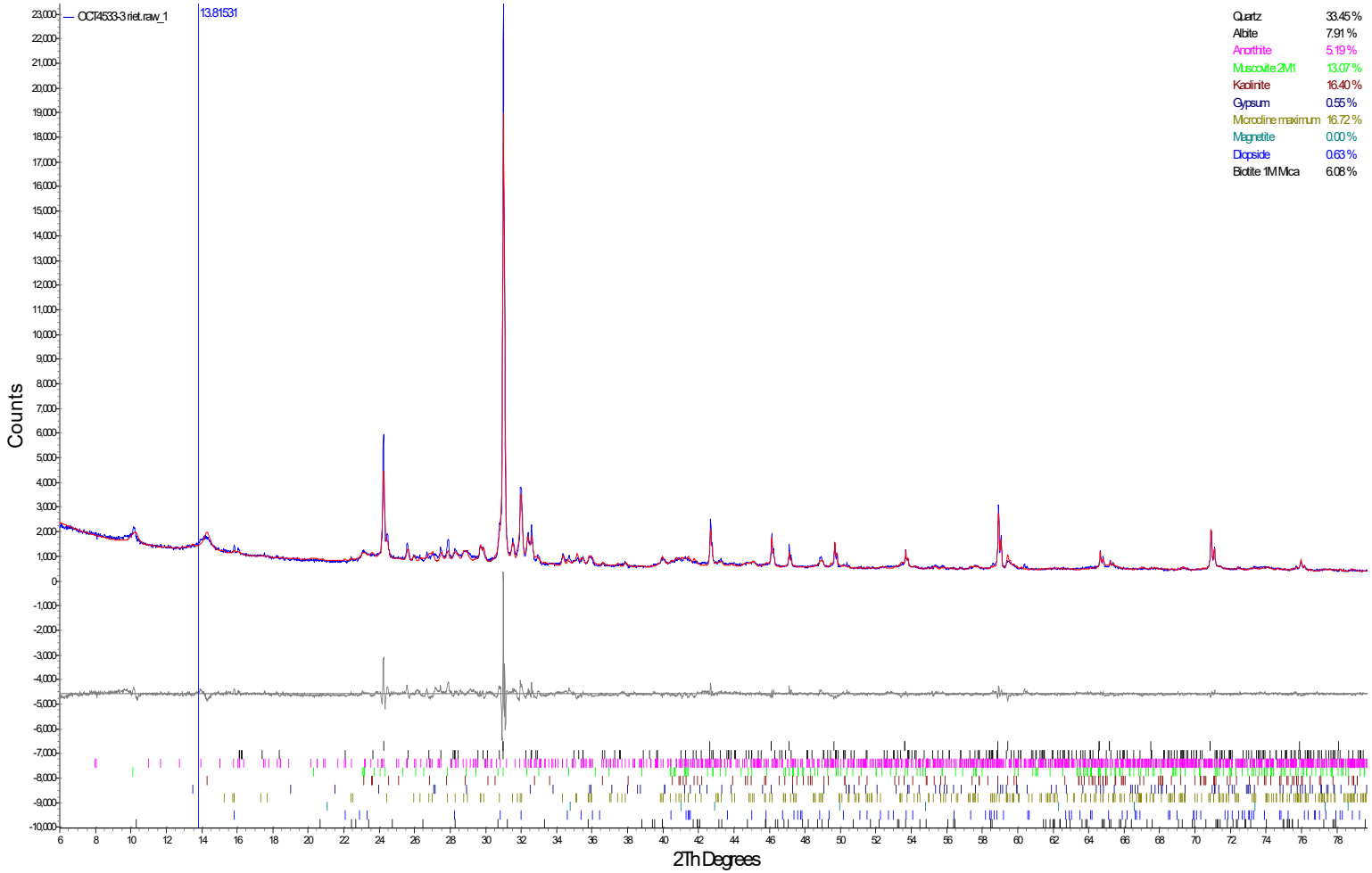
PZ-64


OCT4533-1 riet.raw_1
Counts
2Th Degrees
Quartz 26.38 %
Albite 12.19 %
Anorthite 9.00 %
Muscovite 2M1 9.99 %
Kaolinite 16.85 %
Gypsum 1.70 %
Microcline maximum 16.46 %
Magnetite 0.27 %
Diopside 1.00 %
Biotite 1M Mca 6.15 %

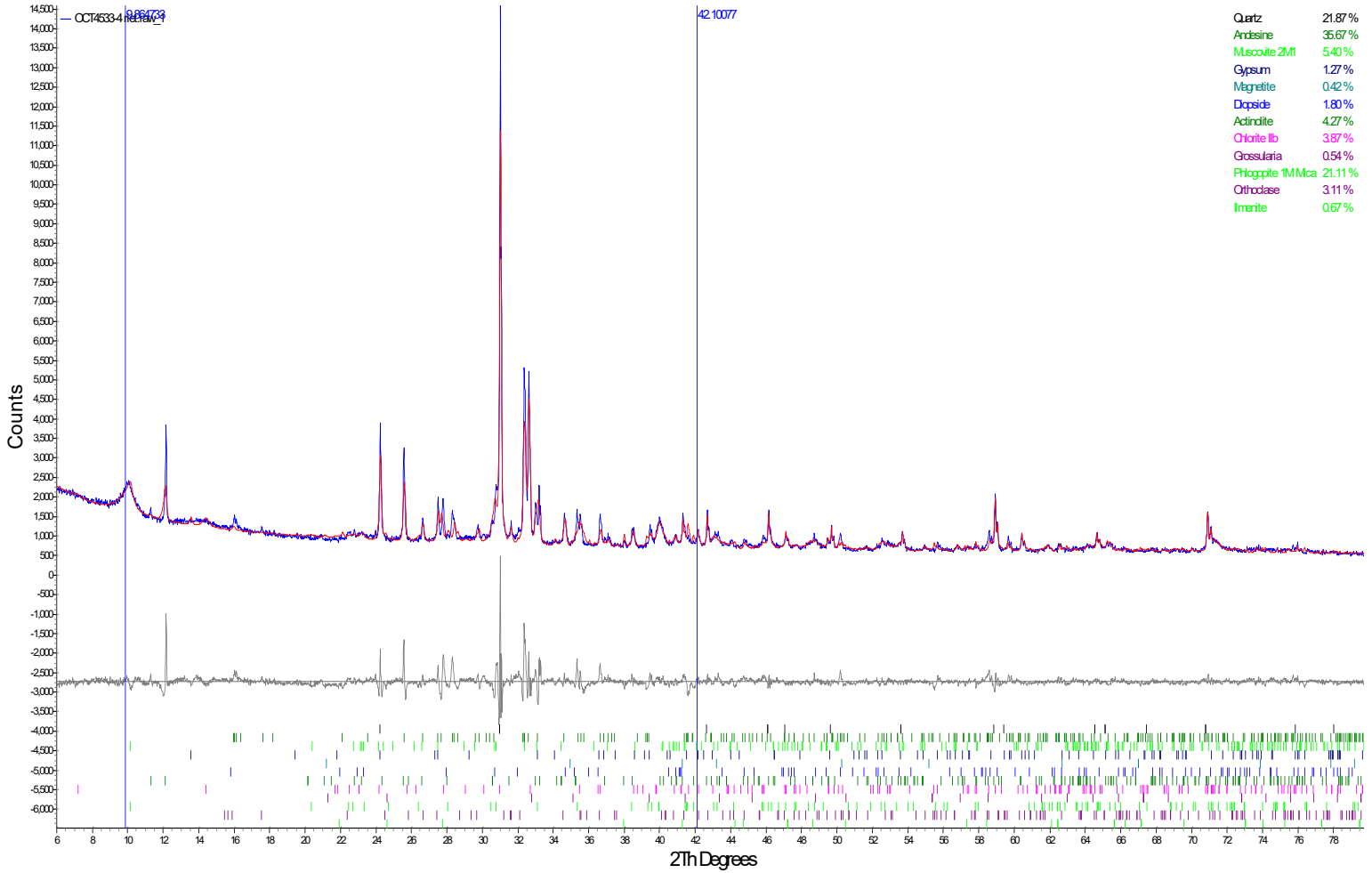
PZ-65


OCT4533-2 riet.raw_1
13.79202
Counts
2Th Degrees
Quartz 16.36 %
Albite 11.99 %
Anorthite 4.96 %
Muscovite 2M1 14.79 %
Kaolinite 18.39 %
Gypsum 0.28 %
Microcline maximum 10.65 %
Magnetite 0.00 %
Diopside 0.06 %
Biotite 1M Mca 2.40 %
Actinolite 20.13 %

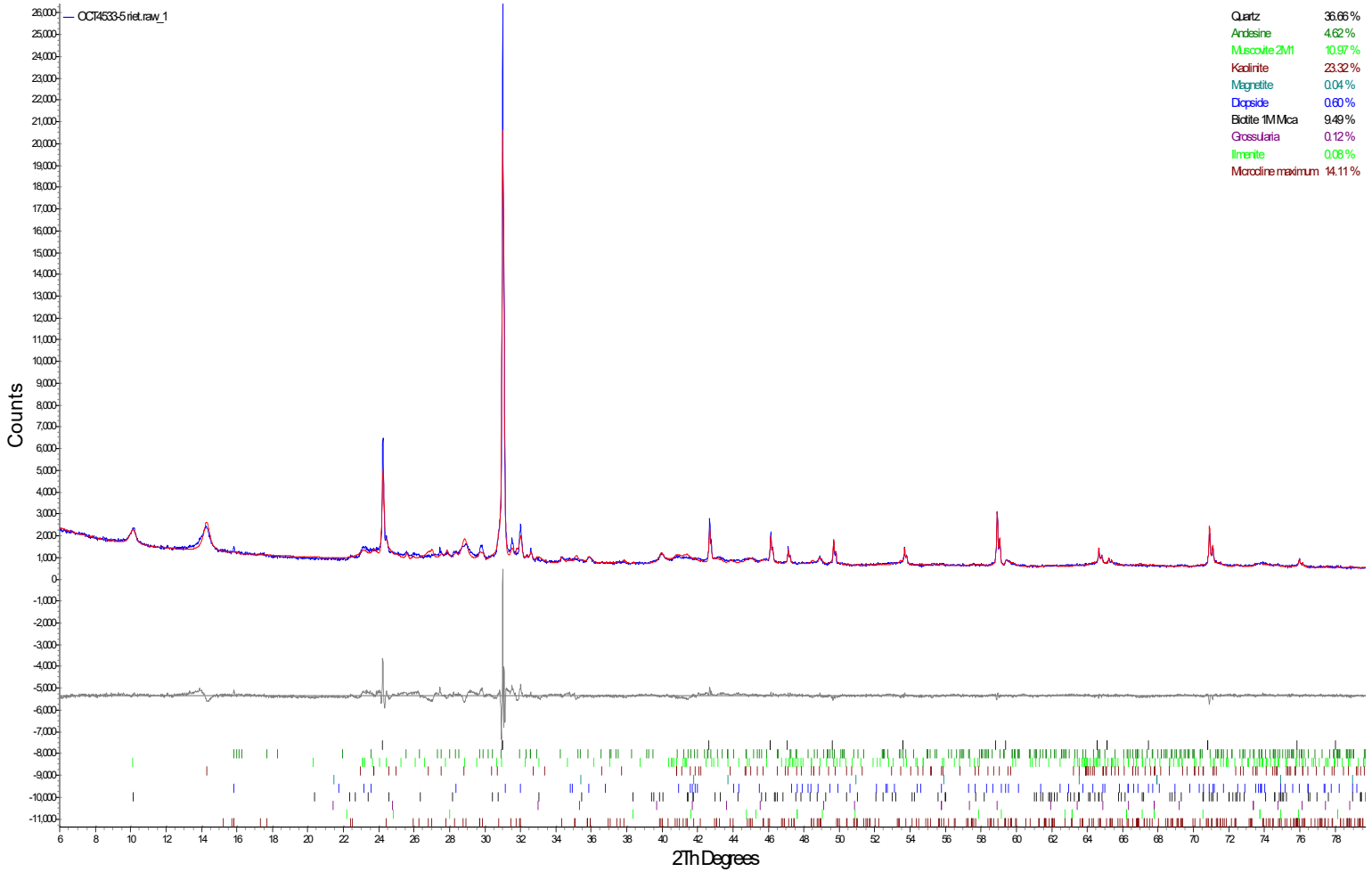
PZ-66


OCT4533-3 riet.raw_1
13.81531
Quartz 33.45 %
Albite 7.91 %
Anorthite 5.19 %
Muscovite 2M1 13.07 %
Kaolinite 16.40 %
Gypsum 0.55 %
Microcline maximum 16.72 %
Magnetite 0.00 %
Diopside 0.63 %
Biotite 1M Mca 6.08 %
Counts
2Th Degrees

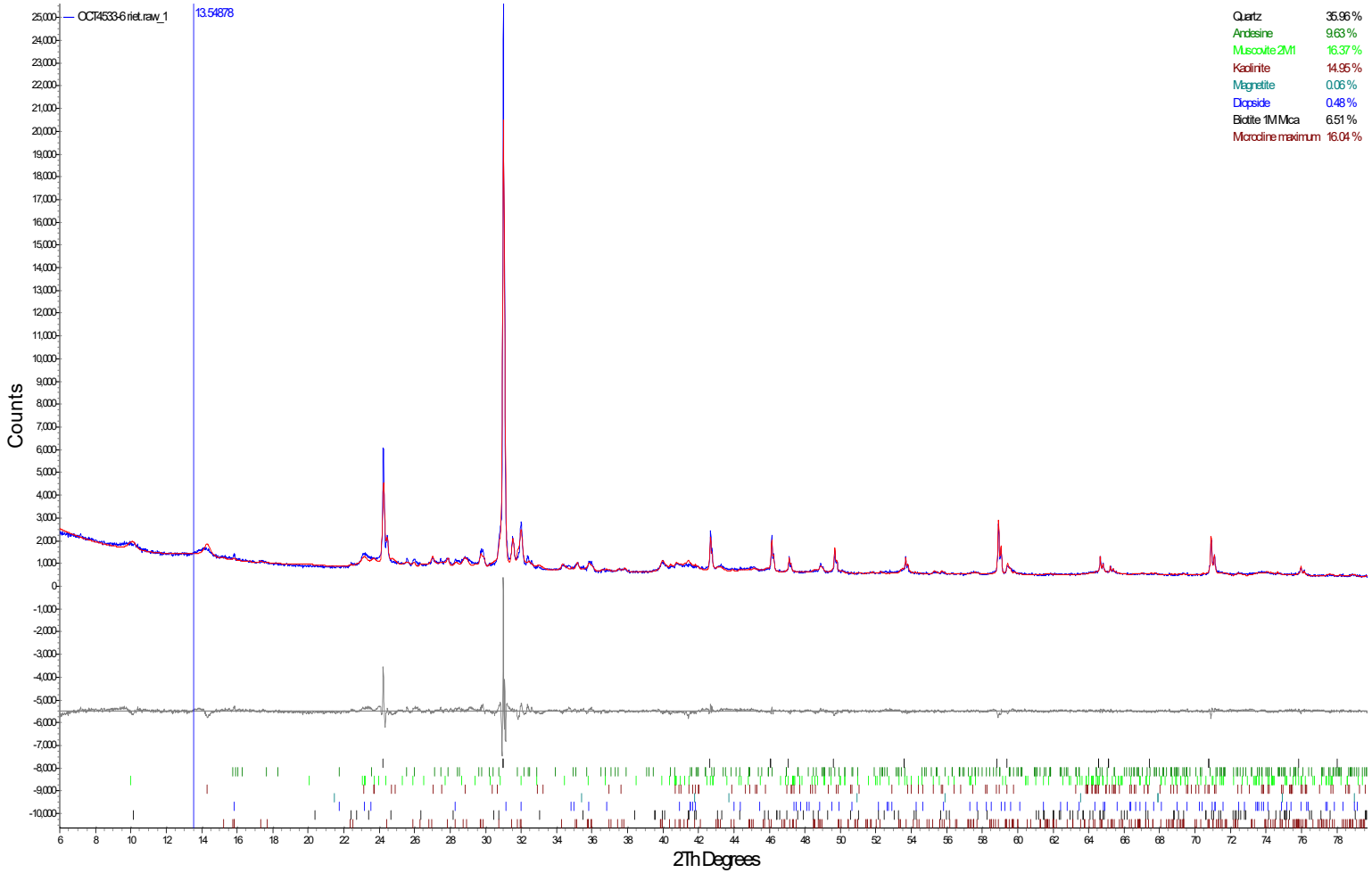
PZ-68


OCT4533-4 nat raw_1
9.884733
42.10077
Counts
2Th Degrees
Quartz 21.87 %
Andesine 35.67 %
Muscovite 2M1 5.40 %
Gypsum 1.27 %
Magnetite 0.42 %
Diopside 1.80 %
Actinolite 4.27 %
Chlorite IIb 3.87 %
Grossularia 0.54 %
Phlogopite 1M Mca 21.11 %
Orthoclase 3.11 %
Ilmenite 0.67 %

SB-1


OCT4533-5 riet.raw_1
Counts
2Th Degrees
Quartz 36.66 %
Andesine 4.62 %
Muscovite 2M1 10.97 %
Kaolinite 23.32 %
Magnetite 0.04 %
Diopside 0.60 %
Biotite 1M Mica 9.49 %
Grossularia 0.12 %
Ilmenite 0.08 %
Microcline maximum 14.11 %

SB-2


OCT4533-6 riet.raw_1
13.54878
Quartz 35.96 %
Andesine 9.63 %
Muscovite 2M1 16.37 %
Kaolinite 14.95 %
Magnetite 0.06 %
Diopside 0.48 %
Biotite 1M Mica 6.51 %
Microcline maximum 16.04 %
Counts
2Th Degrees

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

31-January-2023

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

Date Rec. : 28 November 2022
LR Report: **CA19278-NOV22**
Reference: yPlant Branch SIREMLABUS. 02. 10. 8151

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	8: PZ-68	9: SB-1	10: SB-2
Sample Date & Time					31-Aug-22	06-Oct-22 08:30	06-Oct-22 08:30
As [µg/g]	19-Jan-23	23:42	31-Jan-23	09:49	< 0.5	< 0.5	< 0.5
Be [µg/g]	19-Jan-23	23:42	31-Jan-23	09:49	< 0.02	< 0.02	< 0.02
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	09:49	0.02	< 0.01	0.01
Se [µg/g]	19-Jan-23	23:42	31-Jan-23	09:49	< 0.7	< 0.7	< 0.7

Water Soluble Fraction

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003214641

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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

31-January-2023

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

Date Rec. : 28 November 2022
LR Report: **CA19279-NOV22**
Reference: Plant Branch SIREMLABUS. 02. 10. 8151

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	8: PZ-68	9: SB-1	10: SB-2
Sample Date & Time					31-Aug-22	06-Oct-22 08:30	06-Oct-22 08:30
As [µg/g]	19-Jan-23	23:42	31-Jan-23	09:50	< 0.5	< 0.5	< 0.5
Be [µg/g]	19-Jan-23	23:42	31-Jan-23	09:50	< 0.02	< 0.02	< 0.02
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	09:50	0.02	0.08	0.10
Se [µg/g]	19-Jan-23	23:42	31-Jan-23	09:50	< 0.7	< 0.7	< 0.7

Fraction 2 Exchangeable Metals

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003214656

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Phone: 705-652-2000 FAX: 705-652-6365

31-January-2023

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

Date Rec. : 28 November 2022
LR Report: **CA19280-NOV22**
Reference: Plant Branch SIREMLABUS. 02. 10. 8151

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	8: PZ-68	9: SB-1	10: SB-2
Sample Date & Time					31-Aug-22	06-Oct-22 08:30	06-Oct-22 08:30
As [µg/g]	19-Jan-23	23:42	31-Jan-23	09:50	< 0.5	< 0.5	< 0.5
Be [µg/g]	19-Jan-23	23:42	31-Jan-23	09:50	0.02	0.10	0.14
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	09:50	0.76	1.1	1.4
Se [µg/g]	19-Jan-23	23:42	31-Jan-23	09:50	< 0.7	< 0.7	< 0.7

Fraction 3 Metals Bound to Carbonates

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003214665

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Tessier Leach Fraction 4 - Metals Bound to Fe and Mn Oxides

31-January-2023

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

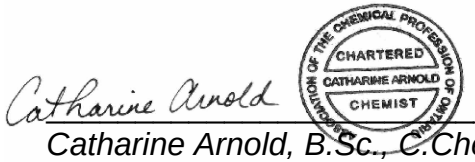
Date Rec. : 28 November 2022
LR Report: **CA19281-NOV22**
Reference: Plant Branch SIREMLABUS. 02. 10. 8151

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	8: PZ-68	9: SB-1	10: SB-2
Sample Date & Time			31-Aug-22	06-Oct-22 08:30	06-Oct-22 08:30
As [µg/g]	31-Jan-23	09:51	< 0.5	< 0.5	< 0.5
Be [µg/g]	31-Jan-23	09:51	0.10	0.44	0.30
Co [µg/g]	31-Jan-23	09:51	2.4	4.4	4.0
Se [µg/g]	31-Jan-23	09:51	< 0.7	< 0.7	< 0.7

Fraction 4 Metals Bound to Fe and Mn Oxides



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003214669

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Phone: 705-652-2000 FAX: 705-652-6365

31-January-2023

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

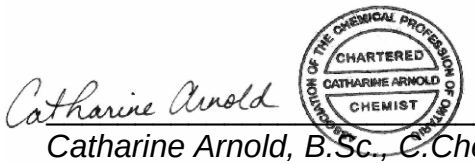
Date Rec. : 28 November 2022
LR Report: **CA19282-NOV22**
Reference: Plant Branch SIREMLABUS. 02. 10. 8151

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	8: PZ-68	9: SB-1	10: SB-2
Sample Date & Time			31-Aug-22	06-Oct-22 08:30	06-Oct-22 08:30
As [µg/g]	31-Jan-23	09:52	< 0.5	< 0.5	< 0.5
Be [µg/g]	31-Jan-23	09:52	0.05	0.12	0.09
Co [µg/g]	31-Jan-23	09:52	0.27	0.45	0.70
Se [µg/g]	31-Jan-23	09:52	< 0.7	< 0.7	< 0.7

Fraction 5 Bound to Organic Material



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003214682

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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

31-January-2023

SiREM Laboratory
Attn : Jacques Smith

180B Market Place Blvd
Knoxville, Tennesse
37922, USA

Phone: 865-291-4695
Fax:

Date Rec. : 28 November 2022
LR Report: **CA19283-NOV22**
Reference: Plant Branch SIREMLABUS. 02. 10. 8151

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	8: PZ-68	9: SB-1	10: SB-2
Sample Date & Time			31-Aug-22	06-Oct-22 08:30	06-Oct-22 08:30
As [µg/g]	31-Jan-23	09:52	0.7	< 0.5	< 0.5
Be [µg/g]	31-Jan-23	09:52	1.4	1.5	1.1
Co [µg/g]	31-Jan-23	09:52	16	9.1	3.7
Se [µg/g]	31-Jan-23	09:52	< 0.7	< 0.7	< 0.7

Fraction 6 Residual metals

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003214689

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APPENDIX C: Eurofins Laboratory Reports

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Mr. Jacques Smith
Geosyntec Consultants, Inc.
180A Market Place Blvd
Knoxville, Tennessee 37922

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JOB DESCRIPTION

Plant Branch
SDG NUMBER SB-1

JOB NUMBER

240-179490-1

Eurofins Canton
180 S. Van Buren Avenue
Barberton OH 44203

See page two for job notes and contact information.

myEOL

Job Notes

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Authorization

Roxanne Cisneros

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Authorized for release by
Roxanne Cisneros, Senior Project Manager
roxanne.cisneros@et.eurofinsus.com
(615)301-5761

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Table of Contents 3
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Method Summary 6
Sample Summary 7
Detection Summary 8
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QC Sample Results 11
QC Association Summary 12
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Certification Summary 14
Chain of Custody 15

Definitions/Glossary

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Case Narrative

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Job ID: 240-179490-1

Laboratory: Eurofins Canton

Narrative

Job Narrative
240-179490-1

Comments
No additional comments.

Receipt
The samples were received on 1/21/2023 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 1.3º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Field Service / Mobile Lab
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Method Summary

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	EET CAN
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET CAN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Sample Summary

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-179490-1	SB1-CTRL1a	Water	01/20/23 13:20	01/21/23 09:30
240-179490-2	SB1-CTRL2a	Water	01/20/23 13:20	01/21/23 09:30

Detection Summary

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Client Sample ID: SB1-CTRL1a — Lab Sample ID: 240-179490-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	1.7	J	5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	160		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1-CTRL2a — Lab Sample ID: 240-179490-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	1.6	J	5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	160		10	0.75	ug/L	1		6010D	Dissolved

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Client Sample ID: SB1-CTRL1a

Date Collected: 01/20/23 13:20
Date Received: 01/21/23 09:30

Lab Sample ID: 240-179490-1

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	1.7	J	5.0	0.60	ug/L		01/23/23 12:00	01/24/23 16:40	1
Cobalt	160		10	0.75	ug/L		01/23/23 12:00	01/24/23 16:40	1

Client Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Client Sample ID: SB1-CTRL2a

Date Collected: 01/20/23 13:20
Date Received: 01/21/23 09:30

Lab Sample ID: 240-179490-2

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	1.6	J	5.0	0.60	ug/L		01/23/23 12:00	01/24/23 16:44	1
Cobalt	160		10	0.75	ug/L		01/23/23 12:00	01/24/23 16:44	1

QC Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 240-559722/1-A
Matrix: Water
Analysis Batch: 559948

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 559722

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		01/23/23 12:00	01/24/23 15:49	1
Cobalt	0.75	U	10	0.75	ug/L		01/23/23 12:00	01/24/23 15:49	1

Lab Sample ID: LCS 240-559722/2-A
Matrix: Water
Analysis Batch: 559948

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 559722

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Beryllium	1000	1010		ug/L		101	80 - 120
Cobalt	1000	995		ug/L		99	80 - 120

QC Association Summary

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Metals

Prep Batch: 559722

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-179490-1	SB1-CTRL1a	Dissolved	Water	3005A	
240-179490-2	SB1-CTRL2a	Dissolved	Water	3005A	
MB 240-559722/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-559722/2-A	Lab Control Sample	Total Recoverable	Water	3005A	

Analysis Batch: 559948

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-179490-1	SB1-CTRL1a	Dissolved	Water	6010D	559722
240-179490-2	SB1-CTRL2a	Dissolved	Water	6010D	559722
MB 240-559722/1-A	Method Blank	Total Recoverable	Water	6010D	559722
LCS 240-559722/2-A	Lab Control Sample	Total Recoverable	Water	6010D	559722

Lab Chronicle

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Client Sample ID: SB1-CTRL1a

Lab Sample ID: 240-179490-1

Date Collected: 01/20/23 13:20

Matrix: Water

Date Received: 01/21/23 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			559722	AJC	EET CAN	01/23/23 12:00
Dissolved	Analysis	6010D		1	559948	RKT	EET CAN	01/24/23 16:40

Client Sample ID: SB1-CTRL2a

Lab Sample ID: 240-179490-2

Date Collected: 01/20/23 13:20

Matrix: Water

Date Received: 01/21/23 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			559722	AJC	EET CAN	01/23/23 12:00
Dissolved	Analysis	6010D		1	559948	RKT	EET CAN	01/24/23 16:44

Laboratory References:

EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Accreditation/Certification Summary

Client: Geosyntec Consultants, Inc.
Project/Site: Plant Branch

Job ID: 240-179490-1
SDG: SB-1

Laboratory: Eurofins Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-27-23
Connecticut	State	PH-0590	12-31-23
Florida	NELAP	E87225	06-30-23
Georgia	State	4062	02-27-23
Illinois	NELAP	200004	07-31-23
Iowa	State	421	06-01-23
Kentucky (UST)	State	112225	02-27-23
Kentucky (WW)	State	KY98016	12-31-23
Michigan	State	9135	02-27-23
Minnesota	NELAP	039-999-348	12-31-23
Minnesota (Petrofund)	State	3506	08-01-23
New Jersey	NELAP	OH001	06-30-23
New York	NELAP	10975	04-01-23
Ohio	State	8303	02-27-23
Ohio VAP	State	CL0024	02-27-23
Oregon	NELAP	4062	02-27-23
Pennsylvania	NELAP	68-00340	08-31-23
Texas	NELAP	T104704517-22-17	08-31-23
Virginia	NELAP	460175	09-14-23
West Virginia DEP	State	210	12-31-23

>> Select a Laboratory or Service Center <<
#N/A
#N/A
#N/A
##

1.5/1.3 (BLUE ICE)

Chain of Custody Record

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Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Eurofins Environment Testing America

Client Contact	Project Manager: Jacques Smith	Site Contact:	Date:	COC No:
Your Company Name here SiREM	Email: JSmith@siremlab.com	Lab Contact:	Carrier:	_____ of _____ COCs
Address 180B Market Place Blvd	Tel/Fax: (865)330 0037			TALS Project #:
City/State/Zip Knoxville TN 37922	Analysis Turnaround Time			Sampler:
(xxx) xxx-xxxx Phone (866)251 1747	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
(xxx) xxx-xxxx FAX	TAT if different from Below _____			Walk-in Client:
Project Name: Plant Branch	☐ 2 weeks			Lab Sampling:
Site: ~~SB-1~~ SB-1 S.S	☐ 1 week			
P O #	☐ 2 days			Job / SDG No.:
	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	Dissolved Cobalt	Dissolved Beryllium	Sample Specific Notes:
SB1-CTRL1a	01-20-23	1320	C	GW	1	Y		X	X	
SB1-CTRL 2a	01-20-23	1320	C	GW	1	Y		X	X	

240-179490 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:		Cooler Temp. (°C): Obs'd: _____ Corr'd: _____		Therm ID No.: _____
Relinquished by: Sydne Spinella	Company: SiREM	Date/Time: 01-20-23 1820	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company: EA	Date/Time: 1-21-23 9:30

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1/26/2023

13 12 11 10 9 8 7 6 5 4 3 2 1

Eurofins - Canton Sample Receipt Form/Narrative **Login # :** _____
Barberton Facility

Client SiRem Site Name _____ Cooler unpacked by: Charlie K

Cooler Received on 1-21-23 Opened on 1-21-23

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off Eurofins Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

Eurofins Cooler # EC Foam Box Client Cooler Box Other _____

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form

IR GUN # IR-13 (CF **-0.2** °C) Observed Cooler Temp. 1.5 °C Corrected Cooler Temp. 1.3 °C

IR GUN # IR-16 (CF **-0.1**°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

IR GUN # IR-17 (CF **-0.3**°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity _____	Yes	No		
-Were the seals on the outside of the cooler(s) signed & dated?	Yes	No	NA	
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No		
-Were tamper/custody seals intact and uncompromised?	Yes	No	NA	
3. Shippers' packing slip attached to the cooler(s)?	Yes	No		
4. Did custody papers accompany the sample(s)?	Yes	No		
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No		
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No		
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No		
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	Yes	No		
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?				
10. Were correct bottle(s) used for the test(s) indicated?	Yes	No		
11. Sufficient quantity received to perform indicated analyses?	Yes	No		
12. Are these work share samples and all listed on the COC?	Yes	No		
If yes, Questions 13-17 have been checked at the originating laboratory.				
13. Were all preserved sample(s) at the correct pH upon receipt?	Yes	No	NA	pH Strip Lot# **HC203864**
14. Were VOAs on the COC?	Yes	No		
15. Were air bubbles >6 mm in any VOA vials? ● ← Larger than this.	Yes	No	NA	
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____	Yes	No		
17. Was a LL Hg or Me Hg trip blank present? _____	Yes	No		

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page

Samples processed by:

_____

_____

_____

_____

19. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.

Sample(s) _____ were received in a broken container.

Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.

Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Container Temp	Preservative Added (mls)	Lot #
SB1-CTRL1A	240-179490-A-1	Plastic 250ml - w/nitric - dis	<2	____	_____	_____
SB1-CTRL2A	240-179490-A-2	Plastic 250ml - w/nitric - dis	<2	____	_____	_____

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ANALYTICAL REPORT

PREPARED FOR

Attn: Mr. Jacques Smith
Geosyntec Consultants Inc
180A Market Place Blvd
Knoxville, Tennessee 37922

Generated 2/6/2023 9:56:53 AM

JOB DESCRIPTION

Plant Branch Diss Be & Co
SDG NUMBER SB1 & SB2

JOB NUMBER

240-179771-1

Eurofins Canton
180 S. Van Buren Avenue
Barberton OH 44203

See page two for job notes and contact information.

my EOL

Job Notes

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to the NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory. This report is confidential and is intended for the sole use of Eurofins Environment Testing North Central, LLC and its client. All questions regarding this report should be directed to the Eurofins Environment Testing North Central, LLC Project Manager who has signed this report.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing North Central, LLC Project Manager.

Authorization



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Authorized for release by
Roxanne Cisneros, Senior Project Manager
roxanne.cisneros@et.eurofinsus.com
(615)301-5761

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Definitions/Glossary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 240-179771-1

Laboratory: Eurofins Canton

Narrative

Job Narrative
240-179771-1

Receipt
The samples were received on 1/31/2023 1:20 PM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 3.0°C

Metals
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Method Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	EET CAN
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET CAN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Sample Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-179771-1	SB1 - CTRL 1B	Water	01/27/23 11:00	01/31/23 13:20
240-179771-2	SB1 - CTRL 2B	Water	01/27/23 11:00	01/31/23 13:20
240-179771-3	SB1 - R1A	Water	01/27/23 11:00	01/31/23 13:20
240-179771-4	SB1 - R1B	Water	01/27/23 11:00	01/31/23 13:20
240-179771-5	SB1 - R2A	Water	01/27/23 11:00	01/31/23 13:20
240-179771-6	SB1 - R2B	Water	01/27/23 11:00	01/31/23 13:20
240-179771-7	SB1 - R3A	Water	01/27/23 11:00	01/31/23 13:20
240-179771-8	SB1 - R3B	Water	01/27/23 11:00	01/31/23 13:20
240-179771-9	SB1 - R4A	Water	01/27/23 11:00	01/31/23 13:20
240-179771-10	SB1 - R4B	Water	01/27/23 11:00	01/31/23 13:20
240-179771-11	SB1 - R5A	Water	01/27/23 11:00	01/31/23 13:20
240-179771-12	SB1 - R5B	Water	01/27/23 11:00	01/31/23 13:20
240-179771-13	SB2 - CTRL 1A	Water	01/30/23 14:00	01/31/23 13:20
240-179771-14	SB2 - CTRL 2A	Water	01/30/23 14:00	01/31/23 13:20

Detection Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - CTRL 1B — Lab Sample ID: 240-179771-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	1.8	J	5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	160		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - CTRL 2B — Lab Sample ID: 240-179771-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	1.8	J	5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	160		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - R1A — Lab Sample ID: 240-179771-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	36		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - R1B — Lab Sample ID: 240-179771-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	38		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - R2A — Lab Sample ID: 240-179771-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	26		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - R2B — Lab Sample ID: 240-179771-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	40		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - R3A — Lab Sample ID: 240-179771-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	82		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - R3B — Lab Sample ID: 240-179771-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	87		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - R4A — Lab Sample ID: 240-179771-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	110		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - R4B — Lab Sample ID: 240-179771-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	100		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - R5A — Lab Sample ID: 240-179771-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	130		10	0.75	ug/L	1		6010D	Dissolved

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R5B — Lab Sample ID: 240-179771-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	130		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - CTRL 1A — Lab Sample ID: 240-179771-13

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	16		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	430		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - CTRL 2A — Lab Sample ID: 240-179771-14

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	17		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	430		10	0.75	ug/L	1		6010D	Dissolved

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - CTRL 1B

Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-1

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	1.8	J	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 16:41	1
Cobalt	160		10	0.75	ug/L		02/01/23 14:00	02/02/23 16:41	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - CTRL 2B

Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-2

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	1.8	J	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 16:45	1
Cobalt	160		10	0.75	ug/L		02/01/23 14:00	02/02/23 16:45	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R1A

Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-3

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 16:50	1
Cobalt	**36**		10	0.75	ug/L		02/01/23 14:00	02/02/23 16:50	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R1B

Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-4

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 16:54	1
Cobalt	**38**		10	0.75	ug/L		02/01/23 14:00	02/02/23 16:54	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R2A

Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-5

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 16:59	1
Cobalt	**26**		10	0.75	ug/L		02/01/23 14:00	02/02/23 16:59	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R2B
Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-6
Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 17:03	1
Cobalt	**40**		10	0.75	ug/L		02/01/23 14:00	02/02/23 17:03	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R3A

Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-7

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 17:07	1
Cobalt	**82**		10	0.75	ug/L		02/01/23 14:00	02/02/23 17:07	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R3B
Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-8
Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 17:12	1
Cobalt	**87**		10	0.75	ug/L		02/01/23 14:00	02/02/23 17:12	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R4A

Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-9

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 17:16	1
Cobalt	**110**		10	0.75	ug/L		02/01/23 14:00	02/02/23 17:16	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R4B
Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-10
Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 17:20	1
Cobalt	**100**		10	0.75	ug/L		02/01/23 14:00	02/02/23 17:20	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R5A

Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-11

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 17:33	1
Cobalt	**130**		10	0.75	ug/L		02/01/23 14:00	02/02/23 17:33	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R5B

Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-12

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 17:38	1
Cobalt	**130**		10	0.75	ug/L		02/01/23 14:00	02/02/23 17:38	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB2 - CTRL 1A

Date Collected: 01/30/23 14:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-13

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	16		5.0	0.60	ug/L		02/01/23 14:00	02/02/23 17:42	1
Cobalt	430		10	0.75	ug/L		02/01/23 14:00	02/02/23 17:42	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB2 - CTRL 2A

Date Collected: 01/30/23 14:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-14

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	17		5.0	0.60	ug/L		02/01/23 14:00	02/02/23 17:46	1
Cobalt	430		10	0.75	ug/L		02/01/23 14:00	02/02/23 17:46	1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 240-560698/1-A
Matrix: Water
Analysis Batch: 560881

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 560698

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/01/23 14:00	02/02/23 16:03	1
Cobalt	0.75	U	10	0.75	ug/L		02/01/23 14:00	02/02/23 16:03	1

Lab Sample ID: LCS 240-560698/2-A
Matrix: Water
Analysis Batch: 560881

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 560698

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Beryllium	1000	1030		ug/L		103	80 - 120
Cobalt	1000	1010		ug/L		101	80 - 120

Metals

Prep Batch: 560698

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-179771-1	SB1 - CTRL 1B	Dissolved	Water	3005A	
240-179771-2	SB1 - CTRL 2B	Dissolved	Water	3005A	
240-179771-3	SB1 - R1A	Dissolved	Water	3005A	
240-179771-4	SB1 - R1B	Dissolved	Water	3005A	
240-179771-5	SB1 - R2A	Dissolved	Water	3005A	
240-179771-6	SB1 - R2B	Dissolved	Water	3005A	
240-179771-7	SB1 - R3A	Dissolved	Water	3005A	
240-179771-8	SB1 - R3B	Dissolved	Water	3005A	
240-179771-9	SB1 - R4A	Dissolved	Water	3005A	
240-179771-10	SB1 - R4B	Dissolved	Water	3005A	
240-179771-11	SB1 - R5A	Dissolved	Water	3005A	
240-179771-12	SB1 - R5B	Dissolved	Water	3005A	
240-179771-13	SB2 - CTRL 1A	Dissolved	Water	3005A	
240-179771-14	SB2 - CTRL 2A	Dissolved	Water	3005A	
MB 240-560698/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-560698/2-A	Lab Control Sample	Total Recoverable	Water	3005A	

Analysis Batch: 560881

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-179771-1	SB1 - CTRL 1B	Dissolved	Water	6010D	560698
240-179771-2	SB1 - CTRL 2B	Dissolved	Water	6010D	560698
240-179771-3	SB1 - R1A	Dissolved	Water	6010D	560698
240-179771-4	SB1 - R1B	Dissolved	Water	6010D	560698
240-179771-5	SB1 - R2A	Dissolved	Water	6010D	560698
240-179771-6	SB1 - R2B	Dissolved	Water	6010D	560698
240-179771-7	SB1 - R3A	Dissolved	Water	6010D	560698
240-179771-8	SB1 - R3B	Dissolved	Water	6010D	560698
240-179771-9	SB1 - R4A	Dissolved	Water	6010D	560698
240-179771-10	SB1 - R4B	Dissolved	Water	6010D	560698
240-179771-11	SB1 - R5A	Dissolved	Water	6010D	560698
240-179771-12	SB1 - R5B	Dissolved	Water	6010D	560698
240-179771-13	SB2 - CTRL 1A	Dissolved	Water	6010D	560698
240-179771-14	SB2 - CTRL 2A	Dissolved	Water	6010D	560698
MB 240-560698/1-A	Method Blank	Total Recoverable	Water	6010D	560698
LCS 240-560698/2-A	Lab Control Sample	Total Recoverable	Water	6010D	560698

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - CTRL 1B
Lab Sample ID: 240-179771-1
Date Collected: 01/27/23 11:00
Matrix: Water
Date Received: 01/31/23 13:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 16:41

Client Sample ID: SB1 - CTRL 2B
Lab Sample ID: 240-179771-2
Date Collected: 01/27/23 11:00
Matrix: Water
Date Received: 01/31/23 13:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 16:45

Client Sample ID: SB1 - R1A
Lab Sample ID: 240-179771-3
Date Collected: 01/27/23 11:00
Matrix: Water
Date Received: 01/31/23 13:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 16:50

Client Sample ID: SB1 - R1B
Lab Sample ID: 240-179771-4
Date Collected: 01/27/23 11:00
Matrix: Water
Date Received: 01/31/23 13:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 16:54

Client Sample ID: SB1 - R2A
Lab Sample ID: 240-179771-5
Date Collected: 01/27/23 11:00
Matrix: Water
Date Received: 01/31/23 13:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 16:59

Client Sample ID: SB1 - R2B
Lab Sample ID: 240-179771-6
Date Collected: 01/27/23 11:00
Matrix: Water
Date Received: 01/31/23 13:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 17:03

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB1 - R3A
Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 17:07

Client Sample ID: SB1 - R3B
Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 17:12

Client Sample ID: SB1 - R4A
Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 17:16

Client Sample ID: SB1 - R4B
Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-10
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 17:20

Client Sample ID: SB1 - R5A
Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-11
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 17:33

Client Sample ID: SB1 - R5B
Date Collected: 01/27/23 11:00
Date Received: 01/31/23 13:20

Lab Sample ID: 240-179771-12
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 17:38

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Client Sample ID: SB2 - CTRL 1A

Lab Sample ID: 240-179771-13

Date Collected: 01/30/23 14:00
Matrix: Water
Date Received: 01/31/23 13:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 17:42

Client Sample ID: SB2 - CTRL 2A

Lab Sample ID: 240-179771-14

Date Collected: 01/30/23 14:00
Matrix: Water
Date Received: 01/31/23 13:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			560698	AJC	EET CAN	02/01/23 14:00
Dissolved	Analysis	6010D		1	560881	KLC	EET CAN	02/02/23 17:46

Laboratory References:

EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Accreditation/Certification Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-179771-1
SDG: SB1 & SB2

Laboratory: Eurofins Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-27-23
Connecticut	State	PH-0590	12-31-23
Florida	NELAP	E87225	06-30-23
Georgia	State	4062	02-27-23
Illinois	NELAP	200004	07-31-23
Iowa	State	421	06-01-23
Kentucky (UST)	State	112225	02-27-23
Kentucky (WW)	State	KY98016	12-31-23
Michigan	State	9135	02-27-23
Minnesota	NELAP	039-999-348	12-31-23
Minnesota (Petrofund)	State	3506	08-01-23
New Jersey	NELAP	OH001	06-30-23
New York	NELAP	10975	04-01-23
Ohio	State	8303	02-27-23
Ohio VAP	State	CL0024	02-27-23
Oregon	NELAP	4062	02-27-23
Pennsylvania	NELAP	68-00340	08-31-23
Texas	NELAP	T104704517-22-17	08-31-23
Virginia	NELAP	460175	09-14-23
West Virginia DEP	State	210	12-31-23

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

3.1/3.0

Chain of Custody Record

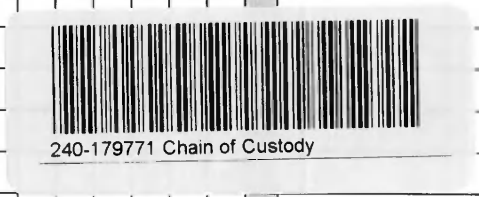
eurofins | Environment Testing

Client Information	Sampler: Sydne Spinella	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 240-103679-37376.3
Client Contact: Sydne Spinella	Phone: 865.291.4724	E-Mail: roxanne.cisneros@et.eurofinsus.com	State of Origin:	Page: Page 3 of 6
Company: Sirem, div of Geosyntec Consultants	PWSID:			Job #:
Address: 180A Market Place Blvd	Due Date Requested:			
City: Knoxville	TAT Requested (days): Standard			
State, Zip: TN, 37922	Compliance Project: Δ Yes Δ No			
Phone:	PO #: Purchase Order Requested			
Email: Sydne.Spinella@Siremlab.com	WO #:			
Project Name: Plant Branch Diss Be & Co	Project #: 24017380			
Site: SB1 & SB2	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010D - Dissolved Be & Co (FF)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D		
SB1 - CTRL 1b	01·27·23	1100	C	Water	Y	N	X		
SB1 - CTRL 2b	01·27·23	1100	C	Water	Y	N	X		
SB1 - R1a	01·27·23	1100	C	Water	Y	N	X		
SB1 - R1b	01·27·23	1100	C	Water	Y	N	X		
SB1 - R2a	01·27·23	1100	C	Water	Y	N	X		
SB1 - R2b	01·27·23	1100	C	Water	Y	N	X		
SB1 - R3a	01·27·23	1100	C	Water	Y	N	X		
SB1 - R3b	01·27·23	1100	C	Water	Y	N	X		
SB1 - R4a	01·27·23	1100	C	Water	Y	N	X		
SB1 - R4b	01·27·23	1100	C	Water	Y	N	X		
SB1 - R5a	01·27·23	1100	C	Water	Y	N	X		



Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Sydne Spinella Sydne Spinella	01·27·23 1100	SiREM	Russell Hall	1/31-23 1320	EET NC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: Sydne Spinella	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 240-103679-37376.4
Client Contact: Sydne Spinella	Phone: 865-291-4724	E-Mail: roxanne.cisneros@et.eurofinsus.com	State of Origin:	Page: Page 4 of 6
Company: Sirem, div of Geosyntec Consultants	PWSID:			Job #:
Address: 180A Market Place Blvd	Due Date Requested:			
City: Knoxville	TAT Requested (days): Standard			
State, Zip: TN, 37922	Compliance Project: ∆ Yes ∆ No			
Phone:	PO #: Purchase Order Requested			
Email: Sydne.Spinella@Siremlab.com	WO #:			
Project Name: Plant Branch Diss Be & Co	Project #: 24017380			
Site: SB1 & SB2	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010D - Dissolved Be & Co (FF)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D		
SB1-RSb	01·27·23	1100	C	Water	Y	N	X		
SB 2-CTRL 1a	01·30·23	1400	C	Water	Y	N	X		
SB2-CTRL 2a	01·30·23	1400	C	Water	Y	N	X		
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Sydne Spinella Sydne Spinella	01·27·23	SIREM	Rachelle Hamlett	1-30-23 1320	PETRX
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ∆ Yes ∆ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins - Canton Sample Receipt Form/Narrative **Login # :** 179331
Barberton Facility

Client Sirem Site Name

Cooler Received on 1-31-23 Opened on 1-31-23

Cooler unpacked by: Rachelle Hardt

FedEx: 1st Grd (Exp) UPS FAS Clipper Client Drop Off Eurofins Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

Eurofins Cooler # EC Foam Box Client Cooler Box Other

Packing material used: ~~Bubble Wrap~~ Foam (Plastic Bag) None Other

COOLANT: (Wet Ice) Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form

IR GUN # IR-13 (CF **-0.2** °C) Observed Cooler Temp. °C Corrected Cooler Temp. °C

IR GUN # IR-16 (CF **-0.1**°C) Observed Cooler Temp. 3.1 °C Corrected Cooler Temp. 3.0 °C

IR GUN # IR-17 (CF **-0.3**°C) Observed Cooler Temp. °C Corrected Cooler Temp. °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity	Yes (No)	
-Were the seals on the outside of the cooler(s) signed & dated?	Yes No (NA)	
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes (No)	
-Were tamper/custody seals intact and uncompromised?	Yes No (NA)	
3. Shippers' packing slip attached to the cooler(s)?	(Yes) No	
4. Did custody papers accompany the sample(s)?	(Yes) No	
5. Were the custody papers relinquished & signed in the appropriate place?	(Yes) No	
6. Was/were the person(s) who collected the samples clearly identified on the COC?	(Yes) No	
7. Did all bottles arrive in good condition (Unbroken)?	(Yes) No	
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	(Yes) No	
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?		
10. Were correct bottle(s) used for the test(s) indicated?	(Yes) No	
11. Sufficient quantity received to perform indicated analyses?	(Yes) No	
12. Are these work share samples and all listed on the COC?	Yes (No)	
If yes, Questions 13-17 have been checked at the originating laboratory.		
13. Were all preserved sample(s) at the correct pH upon receipt?	(Yes) No NA	pH Strip Lot# **HC203864**
14. Were VOAs on the COC?	Yes (No)	
15. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes No (NA)	
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #	Yes (No)	
17. Was a LL Hg or Me Hg trip blank present?	Yes (No)	

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM Date by via Verbal Voice Mail Other

Concerning

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page

Samples processed by:

19. SAMPLE CONDITION

Sample(s) were received after the recommended holding time had expired.

Sample(s) were received in a broken container.

Sample(s) were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) were further preserved in the laboratory.

Time preserved: Preservative(s) added/Lot number(s):

VOA Sample Preservation - Date/Time VOAs Frozen:

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Container Temp	Preservative Added (mls)	Lot #
SB1 - CTRL 1B	240-179771-A-1	Plastic 250ml - w/nitric - dis	<2			
SB1 - CTRL 2B	240-179771-A-2	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 1A	240-179771-A-3	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 1B	240-179771-A-4	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 2A	240-179771-A-5	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 2B	240-179771-A-6	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 3A	240-179771-A-7	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 3B	240-179771-A-8	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 4A	240-179771-A-9	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 4B	240-179771-A-10	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 5A	240-179771-A-11	Plastic 250ml - w/nitric - dis	<2			
SB1 - R 5B	240-179771-A-12	Plastic 250ml - w/nitric - dis	<2			
SB2 - CTRL 1A	240-179771-A-13	Plastic 250ml - w/nitric - dis	<2			
SB2 - CTRL 2A	240-179771-A-14	Plastic 250ml - w/nitric - dis	<2			

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ANALYTICAL REPORT

PREPARED FOR

Attn: Mr. Jacques Smith
Geosyntec Consultants Inc
180A Market Place Blvd
Knoxville, Tennessee 37922

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JOB DESCRIPTION

Plant Branch - SB2

JOB NUMBER

240-180024-1

Eurofins Canton
180 S. Van Buren Avenue
Barberton OH 44203

See page two for job notes and contact information.

myEOL

Job Notes

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to the NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory. This report is confidential and is intended for the sole use of Eurofins Environment Testing North Central, LLC and its client. All questions regarding this report should be directed to the Eurofins Environment Testing North Central, LLC Project Manager who has signed this report.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing North Central, LLC Project Manager.

Authorization



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Authorized for release by
Roxanne Cisneros, Senior Project Manager
roxanne.cisneros@et.eurofinsus.com
(615)301-5761

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Definitions/Glossary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Case Narrative

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Job ID: 240-180024-1

Laboratory: Eurofins Canton

Narrative

Job Narrative
240-180024-1

Receipt
The samples were received on 2/7/2023 10:20 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 4.2°C

Metals
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Method Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	EET CAN
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET CAN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Sample Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-180024-1	SB2 - CTRL1B	Water	02/06/23 11:00	02/07/23 10:20
240-180024-2	SB2 - CTRL2B	Water	02/06/23 11:00	02/07/23 10:20
240-180024-3	SB2 - R1a	Water	02/06/23 11:00	02/07/23 10:20
240-180024-4	SB2 - R1b	Water	02/06/23 11:00	02/07/23 10:20
240-180024-5	SB2 - R2a	Water	02/06/23 11:00	02/07/23 10:20
240-180024-6	SB2 - R2b	Water	02/06/23 11:00	02/07/23 10:20
240-180024-7	SB2 - R3a	Water	02/06/23 11:00	02/07/23 10:20
240-180024-8	SB2 - R3b	Water	02/06/23 11:00	02/07/23 10:20
240-180024-9	SB2 - R4a	Water	02/06/23 11:00	02/07/23 10:20
240-180024-10	SB2 - R4b	Water	02/06/23 11:00	02/07/23 10:20
240-180024-11	SB2 - R5a	Water	02/06/23 11:00	02/07/23 10:20
240-180024-12	SB2 - R5b	Water	02/06/23 11:00	02/07/23 10:20

Detection Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - CTRL1B — Lab Sample ID: 240-180024-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	16		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	430		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - CTRL2B — Lab Sample ID: 240-180024-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	16		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	430		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - R1a — Lab Sample ID: 240-180024-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	0.60	J	5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	16		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - R1b — Lab Sample ID: 240-180024-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	17		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - R2a — Lab Sample ID: 240-180024-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	0.89	J	5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	29		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - R2b — Lab Sample ID: 240-180024-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	0.88	J	5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	32		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - R3a — Lab Sample ID: 240-180024-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	2.3	J	5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	100		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - R3b — Lab Sample ID: 240-180024-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	2.7	J	5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	120		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - R4a — Lab Sample ID: 240-180024-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	6.0		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	200		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - R4b — Lab Sample ID: 240-180024-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	5.8		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	190		10	0.75	ug/L	1		6010D	Dissolved

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R5a — Lab Sample ID: 240-180024-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	9.0		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	260		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - R5b — Lab Sample ID: 240-180024-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	8.7		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	260		10	0.75	ug/L	1		6010D	Dissolved

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - CTRL1B

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-1

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	16		5.0	0.60	ug/L		02/08/23 14:00	02/09/23 10:25	1
Cobalt	430		10	0.75	ug/L		02/08/23 14:00	02/09/23 10:25	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - CTRL2B

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-2

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	16		5.0	0.60	ug/L		02/08/23 14:00	02/09/23 10:29	1
Cobalt	430		10	0.75	ug/L		02/08/23 14:00	02/09/23 10:29	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R1a

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-3

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	J	5.0	0.60	ug/L		02/08/23 14:00	02/09/23 10:33	1
Cobalt	16		10	0.75	ug/L		02/08/23 14:00	02/09/23 10:33	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R1b

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-4

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/08/23 14:00	02/09/23 10:37	1
Cobalt	**17**		10	0.75	ug/L		02/08/23 14:00	02/09/23 10:37	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R2a

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-5

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.89	J	5.0	0.60	ug/L		02/08/23 14:00	02/09/23 10:41	1
Cobalt	29		10	0.75	ug/L		02/08/23 14:00	02/09/23 10:41	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R2b

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-6

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.88	J	5.0	0.60	ug/L		02/08/23 14:00	02/09/23 10:46	1
Cobalt	32		10	0.75	ug/L		02/08/23 14:00	02/09/23 10:46	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R3a

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-7

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	2.3	J	5.0	0.60	ug/L		02/08/23 14:00	02/09/23 10:50	1
Cobalt	100		10	0.75	ug/L		02/08/23 14:00	02/09/23 10:50	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R3b
Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-8
Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	2.7	J	5.0	0.60	ug/L		02/08/23 14:00	02/09/23 10:54	1
Cobalt	120		10	0.75	ug/L		02/08/23 14:00	02/09/23 10:54	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R4a

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-9

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	6.0		5.0	0.60	ug/L		02/08/23 14:00	02/09/23 11:07	1
Cobalt	200		10	0.75	ug/L		02/08/23 14:00	02/09/23 11:07	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R4b

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-10

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	5.8		5.0	0.60	ug/L		02/08/23 14:00	02/09/23 11:11	1
Cobalt	190		10	0.75	ug/L		02/08/23 14:00	02/09/23 11:11	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R5a

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-11

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	9.0		5.0	0.60	ug/L		02/08/23 14:00	02/09/23 11:15	1
Cobalt	260		10	0.75	ug/L		02/08/23 14:00	02/09/23 11:15	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R5b

Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-12

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	8.7		5.0	0.60	ug/L		02/08/23 14:00	02/09/23 11:19	1
Cobalt	260		10	0.75	ug/L		02/08/23 14:00	02/09/23 11:19	1

QC Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 240-561368/1-A
Matrix: Water
Analysis Batch: 561566

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 561368

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		02/08/23 14:00	02/09/23 09:25	1
Cobalt	0.75	U	10	0.75	ug/L		02/08/23 14:00	02/09/23 09:25	1

Lab Sample ID: LCS 240-561368/2-A
Matrix: Water
Analysis Batch: 561566

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 561368

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Beryllium	1000	967		ug/L		97	80 - 120
Cobalt	1000	949		ug/L		95	80 - 120

QC Association Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Metals

Prep Batch: 561368

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-180024-1	SB2 - CTRL1B	Dissolved	Water	3005A	
240-180024-2	SB2 - CTRL2B	Dissolved	Water	3005A	
240-180024-3	SB2 - R1a	Dissolved	Water	3005A	
240-180024-4	SB2 - R1b	Dissolved	Water	3005A	
240-180024-5	SB2 - R2a	Dissolved	Water	3005A	
240-180024-6	SB2 - R2b	Dissolved	Water	3005A	
240-180024-7	SB2 - R3a	Dissolved	Water	3005A	
240-180024-8	SB2 - R3b	Dissolved	Water	3005A	
240-180024-9	SB2 - R4a	Dissolved	Water	3005A	
240-180024-10	SB2 - R4b	Dissolved	Water	3005A	
240-180024-11	SB2 - R5a	Dissolved	Water	3005A	
240-180024-12	SB2 - R5b	Dissolved	Water	3005A	
MB 240-561368/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-561368/2-A	Lab Control Sample	Total Recoverable	Water	3005A	

Analysis Batch: 561566

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-180024-1	SB2 - CTRL1B	Dissolved	Water	6010D	561368
240-180024-2	SB2 - CTRL2B	Dissolved	Water	6010D	561368
240-180024-3	SB2 - R1a	Dissolved	Water	6010D	561368
240-180024-4	SB2 - R1b	Dissolved	Water	6010D	561368
240-180024-5	SB2 - R2a	Dissolved	Water	6010D	561368
240-180024-6	SB2 - R2b	Dissolved	Water	6010D	561368
240-180024-7	SB2 - R3a	Dissolved	Water	6010D	561368
240-180024-8	SB2 - R3b	Dissolved	Water	6010D	561368
240-180024-9	SB2 - R4a	Dissolved	Water	6010D	561368
240-180024-10	SB2 - R4b	Dissolved	Water	6010D	561368
240-180024-11	SB2 - R5a	Dissolved	Water	6010D	561368
240-180024-12	SB2 - R5b	Dissolved	Water	6010D	561368
MB 240-561368/1-A	Method Blank	Total Recoverable	Water	6010D	561368
LCS 240-561368/2-A	Lab Control Sample	Total Recoverable	Water	6010D	561368

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - CTRL1B
Lab Sample ID: 240-180024-1
Date Collected: 02/06/23 11:00
Matrix: Water
Date Received: 02/07/23 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 10:25

Client Sample ID: SB2 - CTRL2B
Lab Sample ID: 240-180024-2
Date Collected: 02/06/23 11:00
Matrix: Water
Date Received: 02/07/23 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 10:29

Client Sample ID: SB2 - R1a
Lab Sample ID: 240-180024-3
Date Collected: 02/06/23 11:00
Matrix: Water
Date Received: 02/07/23 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 10:33

Client Sample ID: SB2 - R1b
Lab Sample ID: 240-180024-4
Date Collected: 02/06/23 11:00
Matrix: Water
Date Received: 02/07/23 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 10:37

Client Sample ID: SB2 - R2a
Lab Sample ID: 240-180024-5
Date Collected: 02/06/23 11:00
Matrix: Water
Date Received: 02/07/23 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 10:41

Client Sample ID: SB2 - R2b
Lab Sample ID: 240-180024-6
Date Collected: 02/06/23 11:00
Matrix: Water
Date Received: 02/07/23 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 10:46

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Client Sample ID: SB2 - R3a
Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 10:50

Client Sample ID: SB2 - R3b
Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 10:54

Client Sample ID: SB2 - R4a
Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 11:07

Client Sample ID: SB2 - R4b
Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-10
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 11:11

Client Sample ID: SB2 - R5a
Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-11
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 11:15

Client Sample ID: SB2 - R5b
Date Collected: 02/06/23 11:00
Date Received: 02/07/23 10:20

Lab Sample ID: 240-180024-12
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			561368	MRL	EET CAN	02/08/23 14:00
Dissolved	Analysis	6010D		1	561566	KLC	EET CAN	02/09/23 11:19

Laboratory References:
EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Accreditation/Certification Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch - SB2

Job ID: 240-180024-1

Laboratory: Eurofins Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-27-23
Connecticut	State	PH-0590	12-31-23
Florida	NELAP	E87225	06-30-23
Georgia	State	4062	02-27-23
Illinois	NELAP	200004	07-31-23
Iowa	State	421	06-01-23
Kentucky (UST)	State	112225	02-27-23
Kentucky (WW)	State	KY98016	12-31-23
Michigan	State	9135	02-27-23
Minnesota	NELAP	039-999-348	12-31-23
Minnesota (Petrofund)	State	3506	08-01-23
New Jersey	NELAP	OH001	06-30-23
New York	NELAP	10975	04-01-23
Ohio	State	8303	02-27-23
Ohio VAP	State	CL0024	02-27-23
Oregon	NELAP	4062	02-27-23
Pennsylvania	NELAP	68-00340	08-31-23
Texas	NELAP	T104704517-22-17	08-31-23
Virginia	NELAP	460175	09-14-23
West Virginia DEP	State	210	12-31-23

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: Sydne Spinella	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 240-103679-37376.5
Client Contact: Sydne Spinella	Phone: 865.330.0037	E-Mail: roxanne.cisneros@et.eurofinsus.com	State of Origin:	Page: Page 5 of 6
Company: Sirem, div of Geosyntec Consultants	PWSID:			Job #:
Address: 180A Market Place Blvd	Due Date Requested:			
City: Knoxville	TAT Requested (days): Standard			
State, Zip: TN, 37922	Compliance Project: Δ Yes Δ No			
Phone:	PO #: Purchase Order Requested			
Email: Sydne.Spinella@Siremlab.com	WO #:			
Project Name: Plant Branch Diss Be & Co	Project #: 24017380			
Site: SB2	SSOW#:			

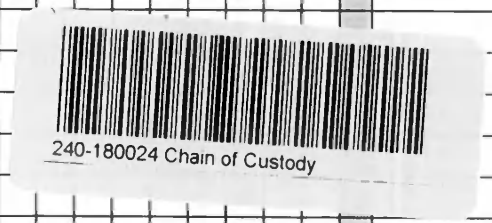
Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010D - Dissolved Be & Co (FF)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D		
SB2-CTRL1b	02-06-23	1100	C	Water	Y	N	X		
SB2-CTRL2b	02-06-23	1100	C	Water	Y	N	X		
SB2-R1a	02-06-23	1100	C	Water	Y	N	X		
SB2-R1b	02-06-23	1100	C	Water	Y	N	X		
SB2-R2a	02-06-23	1100	C	Water	Y	N	X		
SB2-R2b	02-06-23	1100	C	Water	Y	N	X		
SB2-R3a	02-06-23	1100	C	Water	Y	N	X		
SB2-R3b	02-06-23	1100	C	Water	Y	N	X		
SB2-R4a	02-06-23	1100	C	Water	Y	N	X		
SB2-R4b	02-06-23	1100	C	Water	Y	N	X		
SB2-R5a	02-06-23	1100	C	Water	Y	N	X		



Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by	Date/Time	Company	Received by	Date/Time	Company
1	Sydne Spinella Sydne Spinella	02-06-23 1100	SIREM		2-7-23 1020	EETNC
2						
3						

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: Sydne Spinella	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 240-103679-37376.6
Client Contact: Sydne Spinella	Phone: 865.330.0037	E-Mail: roxanne.cisneros@et.eurofinsus.com	State of Origin:	Page: Page 6 of 6
Company: Sirem, div of Geosyntec Consultants	PWSID:			Job #:
Address: 180A Market Place Blvd	Due Date Requested:			
City: Knoxville	TAT Requested (days): Standard			
State, Zip: TN, 37922	Compliance Project: Δ Yes Δ No			
Phone:	PO #: Purchase Order Requested			
Email: Sydne.Spinella@Siremlab.com	WO #:			
Project Name: Plant Branch Diss Be & Co	Project #: 24017380			
Site: SB2	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010D - Dissolved Be & Co (FF)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D		
SB2-R5b	02-06-23	1100	C	Water	Y	N	X		
				Water					
				Water					
				Water					
				Water					

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Sydne Spinella Sydne Spinella	02-06-23 1100	SIREM		2-7-23 1020	EETNC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins - Canton Sample Receipt Form/Narrative Login # :_____
Barberton Facility

Client Geosyntec Site Name Siem
Cooler Received on 2-7-23 Opened on 2-7-23
Cooler unpacked by: TMP
FedEx: 1st Grd (Exp) UPS FAS Clipper Client Drop Off Eurofins Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

Eurofins Cooler # EC Foam Box Client Cooler Box Other
Packing material used: Bubble Wrap Foam (Plastic Bag) None Other
COOLANT: (Wet Ice) Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
IR GUN # IR-13 (CF -0.2 °C) Observed Cooler Temp. 4.4 °C Corrected Cooler Temp. 4.2 °C
IR GUN # IR-16 (CF -0.1°C) Observed Cooler Temp._____°C Corrected Cooler Temp._____°C
IR GUN # IR-17 (CF -0.3°C) Observed Cooler Temp._____°C Corrected Cooler Temp._____°C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1 (Yes) No
-Were the seals on the outside of the cooler(s) signed & dated? (Yes) No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes (No)
-Were tamper/custody seals intact and uncompromised? (Yes) No NA
3. Shippers' packing slip attached to the cooler(s)? (Yes) No
4. Did custody papers accompany the sample(s)? (Yes) No
5. Were the custody papers relinquished & signed in the appropriate place? (Yes) No
6. Was/were the person(s) who collected the samples clearly identified on the COC? (Yes) No
7. Did all bottles arrive in good condition (Unbroken)? (Yes) No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC? (Yes) No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?
10. Were correct bottle(s) used for the test(s) indicated? (Yes) No
11. Sufficient quantity received to perform indicated analyses? (Yes) No
12. Are these work share samples and all listed on the COC? Yes (No)
If yes, Questions 13-17 have been checked at the originating laboratory.
13. Were all preserved sample(s) at the correct pH upon receipt? (Yes) No NA pH Strip Lot# HC291590
14. Were VOAs on the COC? Yes (No)
15. Were air bubbles >6 mm in any VOA vials? ● ← Larger than this. Yes No (NA)
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #_____ Yes (No)
17. Was a LL Hg or Me Hg trip blank present? _____ Yes (No)

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other
Concerning _____

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page
Samples processed by:

19. SAMPLE CONDITION
Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION
Sample(s) _____ were further preserved in the laboratory.
Time preserved: _____ Preservative(s) added/Lot number(s):_____
VOA Sample Preservation - Date/Time VOAs Frozen: _____

WI-NC-099

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Container Temp	Preservative Added (mls)	Lot #
SB2 - CTRL1B	240-180024-A-1	Plastic 250ml - w/nitric - dis	<2			
SB2 - CTRL2B	240-180024-A-2	Plastic 250ml - w/nitric - dis	<2			
SB2 - R1A	240-180024-A-3	Plastic 250ml - w/nitric - dis	<2			
SB2 - R1B	240-180024-A-4	Plastic 250ml - w/nitric - dis	<2			
SB2 - R2A	240-180024-A-5	Plastic 250ml - w/nitric - dis	<2			
SB2 - R2B	240-180024-A-6	Plastic 250ml - w/nitric - dis	<2			
SB2 - R3A	240-180024-A-7	Plastic 250ml - w/nitric - dis	<2			
SB2 - R3B	240-180024-A-8	Plastic 250ml - w/nitric - dis	<2			
SB2 - R4A	240-180024-A-9	Plastic 250ml - w/nitric - dis	<2			
SB2 - R4B	240-180024-A-10	Plastic 250ml - w/nitric - dis	<2			
SB2 - R5A	240-180024-A-11	Plastic 250ml - w/nitric - dis	<2			
SB2 - R5B	240-180024-A-12	Plastic 250ml - w/nitric - dis	<2			

ANALYTICAL REPORT

PREPARED FOR

Attn: Mr. Jacques Smith
Geosyntec Consultants Inc
180A Market Place Blvd
Knoxville, Tennessee 37922

Generated 4/10/2023 9:08:24 AM

JOB DESCRIPTION

Plant Branch Diss Be & Co

JOB NUMBER

240-182802-1

Eurofins Canton
180 S. Van Buren Avenue
Barberton OH 44203

See page two for job notes and contact information.

my EOL

Job Notes

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to the NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory. This report is confidential and is intended for the sole use of Eurofins Environment Testing North Central, LLC and its client. All questions regarding this report should be directed to the Eurofins Environment Testing North Central, LLC Project Manager who has signed this report.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing North Central, LLC Project Manager.

Authorization

Roxanne Cisneros

Generated
4/10/2023 9:08:24 AM

Authorized for release by
Roxanne Cisneros, Senior Project Manager
roxanne.cisneros@et.eurofinsus.com
(615)301-5761

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Lab Chronicle 32
Certification Summary 36
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Definitions/Glossary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Case Narrative

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Job ID: 240-182802-1

Laboratory: Eurofins Canton

Narrative

Job Narrative
240-182802-1

Comments
No additional comments.

Receipt
The samples were received on 3/31/2023 9:50 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 3.5º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Field Service / Mobile Lab
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Method Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	EET CAN
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET CAN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Sample Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-182802-1	SB1 - CTRL1	Water	03/21/23 10:00	03/31/23 09:50
240-182802-2	SB1 - CTRL2	Water	03/21/23 10:00	03/31/23 09:50
240-182802-3	SB2 - CTRL1	Water	03/21/23 10:00	03/31/23 09:50
240-182802-4	SB2 - CTRL2	Water	03/21/23 10:00	03/31/23 09:50
240-182802-5	SB1 - CTRL3	Water	03/28/23 11:00	03/31/23 09:50
240-182802-6	SB1 - CTRL4	Water	03/28/23 11:00	03/31/23 09:50
240-182802-7	SB2 - CTRL3	Water	03/28/23 11:00	03/31/23 09:50
240-182802-8	SB2 - CTRL4	Water	03/28/23 11:00	03/31/23 09:50
240-182802-9	SB2 - CTRL5	Water	03/28/23 11:00	03/31/23 09:50
240-182802-10	SB2 - CTRL6	Water	03/28/23 11:00	03/31/23 09:50
240-182802-11	SB1 - CTRL5	Water	03/28/23 11:00	03/31/23 09:50
240-182802-12	SB1 - CTRL6	Water	03/28/23 11:00	03/31/23 09:50
240-182802-13	SB1 - OXIDIZING1	Water	03/29/23 12:00	03/31/23 09:50
240-182802-14	SB1 - OXIDIZING2	Water	03/29/23 12:00	03/31/23 09:50
240-182802-15	SB1 - REDUCING1	Water	03/29/23 12:00	03/31/23 09:50
240-182802-16	SB1 - REDUCING2	Water	03/29/23 12:00	03/31/23 09:50
240-182802-17	SB2 - OXIDIZING1	Water	03/30/23 11:30	03/31/23 09:50
240-182802-18	SB2 - OXIDIZING2	Water	03/30/23 11:30	03/31/23 09:50
240-182802-19	SB2 - REDUCING1	Water	03/30/23 11:30	03/31/23 09:50
240-182802-20	SB2 - REDUCING2	Water	03/30/23 11:30	03/31/23 09:50

Detection Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - CTRL1 — Lab Sample ID: 240-182802-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	54		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - CTRL2 — Lab Sample ID: 240-182802-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	59		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - CTRL1 — Lab Sample ID: 240-182802-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	22		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	81		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - CTRL2 — Lab Sample ID: 240-182802-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	23		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	81		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - CTRL3 — Lab Sample ID: 240-182802-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	38		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - CTRL4 — Lab Sample ID: 240-182802-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	41		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - CTRL3 — Lab Sample ID: 240-182802-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	12		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	75		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - CTRL4 — Lab Sample ID: 240-182802-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Beryllium	14		5.0	0.60	ug/L	1		6010D	Dissolved
Cobalt	78		10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - CTRL5 — Lab Sample ID: 240-182802-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	8.1	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - CTRL6 — Lab Sample ID: 240-182802-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	8.8	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - CTRL5 — Lab Sample ID: 240-182802-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	3.3	J	10	0.75	ug/L	1		6010D	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Canton

Detection Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - CTRL6 — Lab Sample ID: 240-182802-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	3.6	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - OXIDIZING1 — Lab Sample ID: 240-182802-13

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	1.9	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1 - OXIDIZING2 — Lab Sample ID: 240-182802-14

No Detections.

Client Sample ID: SB1 - REDUCING1 — Lab Sample ID: 240-182802-15

No Detections.

Client Sample ID: SB1 - REDUCING2 — Lab Sample ID: 240-182802-16

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	1.3	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - OXIDIZING1 — Lab Sample ID: 240-182802-17

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	7.9	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - OXIDIZING2 — Lab Sample ID: 240-182802-18

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	4.7	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - REDUCING1 — Lab Sample ID: 240-182802-19

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	7.1	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2 - REDUCING2 — Lab Sample ID: 240-182802-20

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	5.3	J	10	0.75	ug/L	1		6010D	Dissolved

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - CTRL1

Lab Sample ID: 240-182802-1

Date Collected: 03/21/23 10:00

Matrix: Water

Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 00:39	1
Cobalt	**54**		10	0.75	ug/L		04/04/23 14:00	04/07/23 00:39	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - CTRL2

Date Collected: 03/21/23 10:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-2

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 00:43	1
Cobalt	**59**		10	0.75	ug/L		04/04/23 14:00	04/07/23 00:43	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - CTRL1

Date Collected: 03/21/23 10:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-3

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	22		5.0	0.60	ug/L		04/04/23 14:00	04/07/23 00:56	1
Cobalt	81		10	0.75	ug/L		04/04/23 14:00	04/07/23 00:56	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - CTRL2

Lab Sample ID: 240-182802-4

Date Collected: 03/21/23 10:00
Matrix: Water
Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	23		5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:00	1
Cobalt	81		10	0.75	ug/L		04/04/23 14:00	04/07/23 01:00	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - CTRL3

Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-5

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:04	1
Cobalt	**38**		10	0.75	ug/L		04/04/23 14:00	04/07/23 01:04	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - CTRL4

Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-6

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:09	1
Cobalt	**41**		10	0.75	ug/L		04/04/23 14:00	04/07/23 01:09	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - CTRL3

Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-7

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	12		5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:13	1
Cobalt	75		10	0.75	ug/L		04/04/23 14:00	04/07/23 01:13	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - CTRL4

Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-8

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	14		5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:17	1
Cobalt	78		10	0.75	ug/L		04/04/23 14:00	04/07/23 01:17	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - CTRL5

Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-9

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:21	1
Cobalt	**8.1**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 01:21	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - CTRL6

Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-10

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:26	1
Cobalt	**8.8**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 01:26	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - CTRL5

Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-11

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:30	1
Cobalt	**3.3**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 01:30	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - CTRL6

Lab Sample ID: 240-182802-12

Date Collected: 03/28/23 11:00
Matrix: Water
Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:34	1
Cobalt	**3.6**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 01:34	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - OXIDIZING1

Lab Sample ID: 240-182802-13

Date Collected: 03/29/23 12:00

Matrix: Water

Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:47	1
Cobalt	**1.9**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 01:47	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - OXIDIZING2

Date Collected: 03/29/23 12:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-14

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:51	1
Cobalt	0.75	U	10	0.75	ug/L		04/04/23 14:00	04/07/23 01:51	1

Client Sample Results

Client: Geosyntec Consultants Inc
Job ID: 240-182802-1
Project/Site: Plant Branch Diss Be & Co

Client Sample ID: SB1 - REDUCING1
Lab Sample ID: 240-182802-15

Date Collected: 03/29/23 12:00
Matrix: Water
Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:55	1
Cobalt	0.75	U	10	0.75	ug/L		04/04/23 14:00	04/07/23 01:55	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - REDUCING2

Lab Sample ID: 240-182802-16

Date Collected: 03/29/23 12:00

Matrix: Water

Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 00:18	1
Cobalt	**1.3**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 00:18	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - OXIDIZING1

Lab Sample ID: 240-182802-17

Date Collected: 03/30/23 11:30

Matrix: Water

Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 01:59	1
Cobalt	**7.9**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 01:59	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - OXIDIZING2

Lab Sample ID: 240-182802-18

Date Collected: 03/30/23 11:30
Matrix: Water
Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 02:04	1
Cobalt	**4.7**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 02:04	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - REDUCING1

Lab Sample ID: 240-182802-19

Date Collected: 03/30/23 11:30

Matrix: Water

Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 02:08	1
Cobalt	**7.1**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 02:08	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - REDUCING2

Lab Sample ID: 240-182802-20

Date Collected: 03/30/23 11:30

Matrix: Water

Date Received: 03/31/23 09:50

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 02:12	1
Cobalt	**5.3**	**J**	10	0.75	ug/L		04/04/23 14:00	04/07/23 02:12	1

QC Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 240-567924/1-A
Matrix: Water
Analysis Batch: 568408

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 567924

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/04/23 14:00	04/07/23 00:10	1
Cobalt	0.75	U	10	0.75	ug/L		04/04/23 14:00	04/07/23 00:10	1

Lab Sample ID: LCS 240-567924/2-A
Matrix: Water
Analysis Batch: 568408

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 567924

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Beryllium	1000	945		ug/L		95	80 - 120
Cobalt	1000	1030		ug/L		103	80 - 120

Lab Sample ID: 240-182802-16 MS
Matrix: Water
Analysis Batch: 568408

Client Sample ID: SB1 - REDUCING2
Prep Type: Dissolved
Prep Batch: 567924

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Beryllium	0.60	U	1000	919		ug/L		92	75 - 125
Cobalt	1.3	J	1000	999		ug/L		100	75 - 125

Lab Sample ID: 240-182802-16 MSD
Matrix: Water
Analysis Batch: 568408

Client Sample ID: SB1 - REDUCING2
Prep Type: Dissolved
Prep Batch: 567924

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Beryllium	0.60	U	1000	931		ug/L		93	75 - 125	1	20
Cobalt	1.3	J	1000	1010		ug/L		101	75 - 125	1	20

Metals

Prep Batch: 567924

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-182802-1	SB1 - CTRL1	Dissolved	Water	3005A	
240-182802-2	SB1 - CTRL2	Dissolved	Water	3005A	
240-182802-3	SB2 - CTRL1	Dissolved	Water	3005A	
240-182802-4	SB2 - CTRL2	Dissolved	Water	3005A	
240-182802-5	SB1 - CTRL3	Dissolved	Water	3005A	
240-182802-6	SB1 - CTRL4	Dissolved	Water	3005A	
240-182802-7	SB2 - CTRL3	Dissolved	Water	3005A	
240-182802-8	SB2 - CTRL4	Dissolved	Water	3005A	
240-182802-9	SB2 - CTRL5	Dissolved	Water	3005A	
240-182802-10	SB2 - CTRL6	Dissolved	Water	3005A	
240-182802-11	SB1 - CTRL5	Dissolved	Water	3005A	
240-182802-12	SB1 - CTRL6	Dissolved	Water	3005A	
240-182802-13	SB1 - OXIDIZING1	Dissolved	Water	3005A	
240-182802-14	SB1 - OXIDIZING2	Dissolved	Water	3005A	
240-182802-15	SB1 - REDUCING1	Dissolved	Water	3005A	
240-182802-16	SB1 - REDUCING2	Dissolved	Water	3005A	
240-182802-17	SB2 - OXIDIZING1	Dissolved	Water	3005A	
240-182802-18	SB2 - OXIDIZING2	Dissolved	Water	3005A	
240-182802-19	SB2 - REDUCING1	Dissolved	Water	3005A	
240-182802-20	SB2 - REDUCING2	Dissolved	Water	3005A	
MB 240-567924/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-567924/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
240-182802-16 MS	SB1 - REDUCING2	Dissolved	Water	3005A	
240-182802-16 MSD	SB1 - REDUCING2	Dissolved	Water	3005A	

Analysis Batch: 568408

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-182802-1	SB1 - CTRL1	Dissolved	Water	6010D	567924
240-182802-2	SB1 - CTRL2	Dissolved	Water	6010D	567924
240-182802-3	SB2 - CTRL1	Dissolved	Water	6010D	567924
240-182802-4	SB2 - CTRL2	Dissolved	Water	6010D	567924
240-182802-5	SB1 - CTRL3	Dissolved	Water	6010D	567924
240-182802-6	SB1 - CTRL4	Dissolved	Water	6010D	567924
240-182802-7	SB2 - CTRL3	Dissolved	Water	6010D	567924
240-182802-8	SB2 - CTRL4	Dissolved	Water	6010D	567924
240-182802-9	SB2 - CTRL5	Dissolved	Water	6010D	567924
240-182802-10	SB2 - CTRL6	Dissolved	Water	6010D	567924
240-182802-11	SB1 - CTRL5	Dissolved	Water	6010D	567924
240-182802-12	SB1 - CTRL6	Dissolved	Water	6010D	567924
240-182802-13	SB1 - OXIDIZING1	Dissolved	Water	6010D	567924
240-182802-14	SB1 - OXIDIZING2	Dissolved	Water	6010D	567924
240-182802-15	SB1 - REDUCING1	Dissolved	Water	6010D	567924
240-182802-16	SB1 - REDUCING2	Dissolved	Water	6010D	567924
240-182802-17	SB2 - OXIDIZING1	Dissolved	Water	6010D	567924
240-182802-18	SB2 - OXIDIZING2	Dissolved	Water	6010D	567924
240-182802-19	SB2 - REDUCING1	Dissolved	Water	6010D	567924
240-182802-20	SB2 - REDUCING2	Dissolved	Water	6010D	567924
MB 240-567924/1-A	Method Blank	Total Recoverable	Water	6010D	567924
LCS 240-567924/2-A	Lab Control Sample	Total Recoverable	Water	6010D	567924
240-182802-16 MS	SB1 - REDUCING2	Dissolved	Water	6010D	567924
240-182802-16 MSD	SB1 - REDUCING2	Dissolved	Water	6010D	567924

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - CTRL1
Date Collected: 03/21/23 10:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 00:39

Client Sample ID: SB1 - CTRL2
Date Collected: 03/21/23 10:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 00:43

Client Sample ID: SB2 - CTRL1
Date Collected: 03/21/23 10:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 00:56

Client Sample ID: SB2 - CTRL2
Date Collected: 03/21/23 10:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:00

Client Sample ID: SB1 - CTRL3
Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:04

Client Sample ID: SB1 - CTRL4
Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:09

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - CTRL3
Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:13

Client Sample ID: SB2 - CTRL4
Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:17

Client Sample ID: SB2 - CTRL5
Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:21

Client Sample ID: SB2 - CTRL6
Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-10
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:26

Client Sample ID: SB1 - CTRL5
Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-11
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:30

Client Sample ID: SB1 - CTRL6
Date Collected: 03/28/23 11:00
Date Received: 03/31/23 09:50

Lab Sample ID: 240-182802-12
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:34

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB1 - OXIDIZING1
Lab Sample ID: 240-182802-13
Date Collected: 03/29/23 12:00
Matrix: Water
Date Received: 03/31/23 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:47

Client Sample ID: SB1 - OXIDIZING2
Lab Sample ID: 240-182802-14
Date Collected: 03/29/23 12:00
Matrix: Water
Date Received: 03/31/23 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:51

Client Sample ID: SB1 - REDUCING1
Lab Sample ID: 240-182802-15
Date Collected: 03/29/23 12:00
Matrix: Water
Date Received: 03/31/23 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:55

Client Sample ID: SB1 - REDUCING2
Lab Sample ID: 240-182802-16
Date Collected: 03/29/23 12:00
Matrix: Water
Date Received: 03/31/23 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 00:18

Client Sample ID: SB2 - OXIDIZING1
Lab Sample ID: 240-182802-17
Date Collected: 03/30/23 11:30
Matrix: Water
Date Received: 03/31/23 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 01:59

Client Sample ID: SB2 - OXIDIZING2
Lab Sample ID: 240-182802-18
Date Collected: 03/30/23 11:30
Matrix: Water
Date Received: 03/31/23 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 02:04

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-182802-1

Client Sample ID: SB2 - REDUCING1

Lab Sample ID: 240-182802-19

Date Collected: 03/30/23 11:30

Matrix: Water

Date Received: 03/31/23 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 02:08

Client Sample ID: SB2 - REDUCING2

Lab Sample ID: 240-182802-20

Date Collected: 03/30/23 11:30

Matrix: Water

Date Received: 03/31/23 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			567924	MRL	EET CAN	04/04/23 14:00
Dissolved	Analysis	6010D		1	568408	KLC	EET CAN	04/07/23 02:12

Laboratory References:

EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Accreditation/Certification Summary

Client: Geosyntec Consultants Inc
Job ID: 240-182802-1
Project/Site: Plant Branch Diss Be & Co

Laboratory: Eurofins Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-27-23 *
Connecticut	State	PH-0590	06-29-23
Florida	NELAP	E87225	06-30-23
Georgia	State	4062	02-28-24
Illinois	NELAP	200004	07-31-23
Iowa	State	421	06-01-23
Kentucky (UST)	State	112225	02-27-23 *
Kentucky (WW)	State	KY98016	12-31-23
Michigan	State	9135	02-27-23 *
Minnesota	NELAP	039-999-348	12-31-23
Minnesota (Petrofund)	State	3506	08-01-23
New Jersey	NELAP	OH001	06-30-23
New York	NELAP	10975	04-01-24
Ohio	State	8303	02-27-24
Ohio VAP	State	ORELAP 4062	02-27-24
Oregon	NELAP	4062	02-28-24
Pennsylvania	NELAP	68-00340	08-31-23
Texas	NELAP	T104704517-22-17	08-31-23
Virginia	NELAP	460175	09-14-23
West Virginia DEP	State	210	12-31-23

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

3.3/3.5

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: Sydne Spinella	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 240-103679-37376.1
Client Contact: Sydne Spinella	Phone:	E-Mail: roxanne.cisneros@et.eurofinsus.com	State of Origin:	Page: Page 1 of 6
Company: Sirem, div of Geosyntec Consultants	PWSID:			Job #:

Address: 180A Market Place Blvd	Due Date Requested:	Analysis Requested
City: Knoxville	TAT Requested (days): Standard (10)	
State, Zip: TN, 37922	Compliance Project: Δ Yes Δ No	
Phone:	PO #: Purchase Order Requested	
Email: Sydne.Spinella@Siremlab.com	WO #:	
Project Name: Plant Branch Diss Be & Co	Project #: 24017380	
Site:	SSOW#:	

240-182802 Chain of Custody

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010D - Dissolved Be & Co (FF)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D		
SB1-CTRL6	03.28.23	1100	C	Water	Y	Y	X	1	
SB1-Oxidizing1	03.29.23	1200	C	Water	Y	N	X	1	
SB1-Oxidizing 2	03.29.23	1200	C	Water	Y	N	X	1	
SB1-Reducing 1	03.29.23	1200	C	Water	Y	N	X	1	
SB1-Reducing 2	03.29.23	1200	C	Water	Y	N	X	1	
SB2-Oxidizing1	03.30.23	1130	C	Water	Y	N	X	1	
SB2-Oxidizing2	03.30.23	1130	C	Water	Y	N	X	1	
SB2-Reducing1	03.30.23	1130	C	Water	Y	N	X	1	
SB2-Reducing2	03.30.23	1130	C	Water	Y	N	X	1	
				Water					
				Water					

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Sydne Spinella Sydne Spinella	03.30.23 1200	SiREM	[signature]	3.31.23 950	[illegible]
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

4/10/2023

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

3.3/3.5

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: Sydne Spinella	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 240-103679-37376.2
Client Contact: Sydne Spinella	Phone:	E-Mail: roxanne.cisneros@et.eurofinsus.com	State of Origin:	Page: Page 2 of 6
Company: Sirem, div of Geosyntec Consultants	PWSID:	Analysis Requested		Job #:
Address: 180A Market Place Blvd	Due Date Requested:			
City: Knoxville	TAT Requested (days): Standard (10)			
State, Zip: TN, 37922	Compliance Project: Δ Yes Δ No			
Phone:	PO #: Purchase Order Requested			
Email: Sydne.Spinella@Siremlab.com	WO #:			
Project Name: Plant Branch Diss Be & Co	Project #: 24017380			
Site: SB1 & SB2 Desorption	SSOW#:			

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010D - Dissolved Be & Co (FF)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D		
SB1 - CTRL 1	03·21·23	1000	C	Water	Y	Y	X	1	
SB1 - CTRL 2	03·21·23	1000	C	Water	Y	Y	X	1	
SB2 - CTRL 1	03·21·23	1000	C	Water	Y	Y	X	1	
SB2 - CTRL 2	03·21·23	1000	C	Water	Y	Y	X	1	
SB1 - CTRL 3	03·28·23	1100	C	Water	Y	N	X	1	
SB1 - CTRL 4	03·28·23	1100	C	Water	Y	N	X	1	
SB2 - CTRL 3	03·28·23	1100	C	Water	Y	N	X	1	
SB2 - CTRL 4	03·28·23	1100	C	Water	Y	N	X	1	
SB2 - CTRL 5	03·28·23	1100	C	Water	Y	Y	X	1	
SB2 - CTRL 6	03·28·23	1100	C	Water	Y	Y	X	1	
SB1 - CTRL 5	03·28·23	1100	C	Water	Y	Y	X	1	

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: Sydne Spinella Sydne Spinella	Date/Time: 03.30.23 1200	Company: SiREM	Received by: Melissa Loer	Date/Time: 3/31/23 9:50	Company: Eu
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

4/10/2023

Eurofins - Canton Sample Receipt Form/Narrative Login # :_____
Barberton Facility

Client Siem, div Geosynter Site Name_____ Cooler unpacked by: M. Hoch

Cooler Received on 3.31.23 Opened on 3.31.23

FedEx: 1st Grd (Exp) UPS FAS Clipper Client Drop Off Eurofins Courier Other_____

Receipt After-hours: Drop-off Date/Time_____ Storage Location_____

Eurofins Cooler # 22 Foam Box Client Cooler Box Other_____

Packing material used: Bubble Wrap Foam (Plastic Bag) None Other_____

COOLANT: (Wet Ice) Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form

IR GUN # 13 (CF +.02 °C) Observed Cooler Temp. 3.3 °C Corrected Cooler Temp. 3.5 °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity_____	(Yes)	No
-Were the seals on the outside of the cooler(s) signed & dated?	(Yes)	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	(No)
-Were tamper/custody seals intact and uncompromised?	(Yes)	No NA
3. Shippers' packing slip attached to the cooler(s)?	(Yes)	No
4. Did custody papers accompany the sample(s)?	(Yes)	No
5. Were the custody papers relinquished & signed in the appropriate place?	(Yes)	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	(Yes)	No
7. Did all bottles arrive in good condition (Unbroken)?	(Yes)	No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	(Yes)	No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?		
10. Were correct bottle(s) used for the test(s) indicated?	(Yes)	No
11. Sufficient quantity received to perform indicated analyses?	(Yes)	No
12. Are these work share samples and all listed on the COC?	Yes	(No)
If yes, Questions 13-17 have been checked at the originating laboratory.		
13. Were all preserved sample(s) at the correct pH upon receipt?	(Yes)	No NA pH Strip Lot# ~~HC293080~~ HC203864
14. Were VOAs on the COC?	Yes	(No)
15. Were air bubbles >6 mm in any VOA vials? ● ← Larger than this.	Yes	(No) NA
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #_____	Yes	(No)
17. Was a LL Hg or Me Hg trip blank present? _____	Yes	(No)

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page | Samples processed by:

_____

_____

_____

_____

19. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.

Sample(s) _____ were received in a broken container.

Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.

Time preserved: _____ Preservative(s) added/Lot number(s):_____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Mr. Jacques Smith
Geosyntec Consultants Inc
180A Market Place Blvd
Knoxville, Tennessee 37922

Generated 4/12/2023 3:33:17 PM

JOB DESCRIPTION

Plant Branch Diss Be & Co
SDG NUMBER SB1 & SB2 Desorption

JOB NUMBER

240-183063-1

Eurofins Canton
180 S. Van Buren Avenue
Barberton OH 44203

See page two for job notes and contact information.

my EOL

Job Notes

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to the NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory. This report is confidential and is intended for the sole use of Eurofins Environment Testing North Central, LLC and its client. All questions regarding this report should be directed to the Eurofins Environment Testing North Central, LLC Project Manager who has signed this report.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing North Central, LLC Project Manager.

Authorization

Roxanne Cisneros

Generated
4/12/2023 3:33:17 PM

Authorized for release by
Roxanne Cisneros, Senior Project Manager
roxanne.cisneros@et.eurofinsus.com
(615)301-5761

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Definitions/Glossary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 240-183063-1

Laboratory: Eurofins Canton

Narrative

Job Narrative
240-183063-1

Receipt
The samples were received on 4/6/2023 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 7.2°C

Metals
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Method Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	EET CAN
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET CAN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Sample Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-183063-1	SB1-CTRL 7	Water	04/04/23 11:00	04/06/23 09:30
240-183063-2	SB1-CTRL 8	Water	04/04/23 11:00	04/06/23 09:30
240-183063-3	SB2-CTRL 7	Water	04/04/23 11:00	04/06/23 09:30
240-183063-4	SB2-CTRL 8	Water	04/04/23 11:00	04/06/23 09:30

Detection Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Client Sample ID: SB1-CTRL 7 — Lab Sample ID: 240-183063-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	3.3	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB1-CTRL 8 — Lab Sample ID: 240-183063-2

No Detections.

Client Sample ID: SB2-CTRL 7 — Lab Sample ID: 240-183063-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	5.4	J	10	0.75	ug/L	1		6010D	Dissolved

Client Sample ID: SB2-CTRL 8 — Lab Sample ID: 240-183063-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	5.6	J	10	0.75	ug/L	1		6010D	Dissolved

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Client Sample ID: SB1-CTRL 7

Date Collected: 04/04/23 11:00
Date Received: 04/06/23 09:30

Lab Sample ID: 240-183063-1

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/07/23 14:00	04/10/23 18:38	1
Cobalt	**3.3**	**J**	10	0.75	ug/L		04/07/23 14:00	04/10/23 18:38	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Client Sample ID: SB1-CTRL 8

Date Collected: 04/04/23 11:00
Date Received: 04/06/23 09:30

Lab Sample ID: 240-183063-2

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/07/23 14:00	04/10/23 18:42	1
Cobalt	0.75	U	10	0.75	ug/L		04/07/23 14:00	04/10/23 18:42	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Client Sample ID: SB2-CTRL 7

Date Collected: 04/04/23 11:00
Date Received: 04/06/23 09:30

Lab Sample ID: 240-183063-3

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/07/23 14:00	04/10/23 18:46	1
Cobalt	**5.4**	**J**	10	0.75	ug/L		04/07/23 14:00	04/10/23 18:46	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Client Sample ID: SB2-CTRL 8

Date Collected: 04/04/23 11:00
Date Received: 04/06/23 09:30

Lab Sample ID: 240-183063-4

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/07/23 14:00	04/10/23 18:51	1
Cobalt	**5.6**	**J**	10	0.75	ug/L		04/07/23 14:00	04/10/23 18:51	1

QC Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 240-568507/1-A
Matrix: Water
Analysis Batch: 568888

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 568507

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.60	U	5.0	0.60	ug/L		04/07/23 14:00	04/10/23 17:51	1
Cobalt	0.75	U	10	0.75	ug/L		04/07/23 14:00	04/10/23 17:51	1

Lab Sample ID: LCS 240-568507/2-A
Matrix: Water
Analysis Batch: 568888

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 568507

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Beryllium	1000	957		ug/L		96	80 - 120
Cobalt	1000	978		ug/L		98	80 - 120

QC Association Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Metals

Prep Batch: 568507

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-183063-1	SB1-CTRL 7	Dissolved	Water	3005A	
240-183063-2	SB1-CTRL 8	Dissolved	Water	3005A	
240-183063-3	SB2-CTRL 7	Dissolved	Water	3005A	
240-183063-4	SB2-CTRL 8	Dissolved	Water	3005A	
MB 240-568507/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-568507/2-A	Lab Control Sample	Total Recoverable	Water	3005A	

Analysis Batch: 568888

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-183063-1	SB1-CTRL 7	Dissolved	Water	6010D	568507
240-183063-2	SB1-CTRL 8	Dissolved	Water	6010D	568507
240-183063-3	SB2-CTRL 7	Dissolved	Water	6010D	568507
240-183063-4	SB2-CTRL 8	Dissolved	Water	6010D	568507
MB 240-568507/1-A	Method Blank	Total Recoverable	Water	6010D	568507
LCS 240-568507/2-A	Lab Control Sample	Total Recoverable	Water	6010D	568507

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Client Sample ID: SB1-CTRL 7
Date Collected: 04/04/23 11:00
Date Received: 04/06/23 09:30

Lab Sample ID: 240-183063-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			568507	MRL	EET CAN	04/07/23 14:00
Dissolved	Analysis	6010D		1	568888	RKT	EET CAN	04/10/23 18:38

Client Sample ID: SB1-CTRL 8
Date Collected: 04/04/23 11:00
Date Received: 04/06/23 09:30

Lab Sample ID: 240-183063-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			568507	MRL	EET CAN	04/07/23 14:00
Dissolved	Analysis	6010D		1	568888	RKT	EET CAN	04/10/23 18:42

Client Sample ID: SB2-CTRL 7
Date Collected: 04/04/23 11:00
Date Received: 04/06/23 09:30

Lab Sample ID: 240-183063-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			568507	MRL	EET CAN	04/07/23 14:00
Dissolved	Analysis	6010D		1	568888	RKT	EET CAN	04/10/23 18:46

Client Sample ID: SB2-CTRL 8
Date Collected: 04/04/23 11:00
Date Received: 04/06/23 09:30

Lab Sample ID: 240-183063-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Dissolved	Prep	3005A			568507	MRL	EET CAN	04/07/23 14:00
Dissolved	Analysis	6010D		1	568888	RKT	EET CAN	04/10/23 18:51

Laboratory References:

EET CAN = Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH 44203, TEL (330)497-9396

Accreditation/Certification Summary

Client: Geosyntec Consultants Inc
Project/Site: Plant Branch Diss Be & Co

Job ID: 240-183063-1
SDG: SB1 & SB2 Desorption

Laboratory: Eurofins Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-27-23 *
Connecticut	State	PH-0590	06-29-23
Florida	NELAP	E87225	06-30-23
Georgia	State	4062	02-28-24
Illinois	NELAP	200004	07-31-23
Iowa	State	421	06-01-23
Kentucky (UST)	State	112225	02-27-23 *
Kentucky (WW)	State	KY98016	12-31-23
Michigan	State	9135	02-27-23 *
Minnesota	NELAP	039-999-348	12-31-23
Minnesota (Petrofund)	State	3506	08-01-23
New Jersey	NELAP	OH001	06-30-23
New York	NELAP	10975	04-01-24
Ohio	State	8303	02-27-24
Ohio VAP	State	ORELAP 4062	02-27-24
Oregon	NELAP	4062	02-28-24
Pennsylvania	NELAP	68-00340	08-31-23
Texas	NELAP	T104704517-22-17	08-31-23
Virginia	NELAP	460175	09-14-23
West Virginia DEP	State	210	12-31-23

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

7.3/7.5

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

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Client Information	Sampler: Sydne Spinella	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 240-103679-37376.1
Client Contact: Sydne Spinella	Phone:	E-Mail: roxanne.cisneros@et.eurofinsus.com	State of Origin:	Page: Page 1 of 6
Company: Sirem, div of Geosyntec Consultants	PWSID:	Analysis Requested		Job #:
Address: 180A Market Place Blvd	Due Date Requested:			Preservation Codes: A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
City: Knoxville	TAT Requested (days): Standard (10)			
State, Zip: TN, 37922	Compliance Project: Δ Yes Δ No			
Phone:	PO #: Purchase Order Requested			
Email: Sydne.Spinella@Siremlab.com	WO #:			
Project Name: Plant Branch Diss Be & Co	Project #: 24017380			
Site: SB1 & SB2 Desorption	SSOW#:			Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010D - Dissolved Be & Co (FF)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D		
SB1 - CTRL7	4.4.23	1100	C	Water	Y	N	X	1	
SB1 - CTRL8	4.4.23	1100	C	Water	Y	N	X	1	
SB2 - CTRL7	4.4.23	1106	C	Water	Y	N	X	1	
SB2 - CTRL8	4.4.23	1100	C	Water	Y	N	X	1	
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					

240-183063 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Sydne Spinella Sydne Spinella	04-05-23 1130	SIREM	[signature]	4-6-23 930	EETNL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

Page 17 of 21

4/12/2023

13 12 11 10 9 8 7 6 5 4 3 2 1

Eurofins - Canton Sample Receipt Form/Narrative **Login # :** 183063
Barberton Facility

Client Sirem d.J Site Name

Cooler Received on 4-6-23 Opened on 4-6-23

Cooler unpacked by: Tammy Boyer

FedEx: 1st Grd (Exp) UPS FAS Clipper Client Drop Off Eurofins Courier Other

Receipt After-Hours: Drop-off Date/Time Storage Location

Eurofins Cooler # EC Foam Box Client Cooler Box Other

Packing material used: (Bubble Wrap) Foam Plastic Bag None Other

COOLANT: Wet Ice Blue Ice Dry Ice (Water) None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form

IR GUN # 13 (CF +0.2 °C) Observed Cooler Temp. 7.3 °C Corrected Cooler Temp. 7.5 °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1	(Yes)	No
-Were the seals on the outside of the cooler(s) signed & dated?	(Yes)	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	(No)
-Were tamper/custody seals intact and uncompromised?	(Yes)	No NA
3. Shippers' packing slip attached to the cooler(s)?	(Yes)	No
4. Did custody papers accompany the sample(s)?	(Yes)	No
5. Were the custody papers relinquished & signed in the appropriate place?	(Yes)	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	(Yes)	No
7. Did all bottles arrive in good condition (Unbroken)?	(Yes)	No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	(Yes)	No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp(Y/N)?	(Y)	(N) (Y)
10. Were correct bottle(s) used for the test(s) indicated?	(Yes)	No
11. Sufficient quantity received to perform indicated analyses?	(Yes)	No
12. Are these work share samples and all listed on the COC?	Yes	(No)
If yes, Questions 13-17 have been checked at the originating laboratory.		
13. Were all preserved sample(s) at the correct pH upon receipt?	(Yes)	No NA pH Strip Lot# **HC203864**
14. Were VOAs on the COC?	(Yes)	No
15. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	(No) NA
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #	Yes	(No)
17. Was a LL Hg or Me Hg trip blank present?	Yes	(No)

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

Contacted PM Date by via Verbal Voice Mail Other

Concerning

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page

Samples processed by:

19. SAMPLE CONDITION

Sample(s) were received after the recommended holding time had expired.
Sample(s) were received in a broken container.
Sample(s) were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) were further preserved in the laboratory.
Time preserved: Preservative(s) added/Lot number(s):

VOA Sample Preservation - Date/Time VOAs Frozen:

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

7.3/7.5

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: Sydne Spinella	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 240-103679-37376.1
Client Contact: Sydne Spinella	Phone:	E-Mail: roxanne.cisneros@et.eurofinsus.com	State of Origin:	Page: Page 1 of 6
Company: Sirem, div of Geosyntec Consultants	PWSID:	Analysis Requested		Job #:

Address: 180A Market Place Blvd	Due Date Requested:	
City: Knoxville	TAT Requested (days): Standard (10)	
State, Zip: TN, 37922	Compliance Project: Δ Yes Δ No	
Phone:	PO #: Purchase Order Requested	
Email: Sydne.Spinella@Siremlab.com	WO #:	
Project Name: Plant Branch Diss Be & Co	Project #: 24017380	
Site: SB1 & SB2 Desorption	SSOW#:	

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010D - Dissolved Be & Co (FF)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D		
SB1 - CTRL7	4.4.23	1100	C	Water	Y	N	X	1	
SB1 - CTRL8	4.4.23	1100	C	Water	Y	N	X	1	
SB2 - CTRL7	4.4.23	1100	C	Water	Y	N	X	1	
SB2 - CTRL8	4.4.23	1100	C	Water	Y	N	X	1	
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					

240-183063 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: Sydne Spinella Sydne Spinella	Date/Time: 04-05-23 1130	Company: SIREM	Received by: [signature]	Date/Time: 4-6-23 930	Company: EETNL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks:

Eurofins - Canton Sample Receipt Form/Narrative **Login # :** 183063
Barberton Facility

Client Sirem d.J Site Name _____ Cooler unpacked by: Tammy Boyer

Cooler Received on 4-6-23 Opened on 4-6-23

FedEx: 1st Grd (Exp) UPS FAS Clipper Client Drop Off Eurofins Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

Eurofins Cooler # EC Foam Box Client Cooler Box Other _____

Packing material used: (Bubble Wrap) Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice (Water) None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN # 13 (CF +0.2 °C) Observed Cooler Temp. 7.3 °C Corrected Cooler Temp. 7.5 °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1	(Yes)	No
-Were the seals on the outside of the cooler(s) signed & dated?	(Yes)	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	(No)
-Were tamper/custody seals intact and uncompromised?	(Yes)	No NA
3. Shippers' packing slip attached to the cooler(s)?	(Yes)	No
4. Did custody papers accompany the sample(s)?	(Yes)	No
5. Were the custody papers relinquished & signed in the appropriate place?	(Yes)	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	(Yes)	No
7. Did all bottles arrive in good condition (Unbroken)?	(Yes)	No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	(Yes)	No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?	(Y)	(Y) (Y)
10. Were correct bottle(s) used for the test(s) indicated?	(Yes)	No
11. Sufficient quantity received to perform indicated analyses?	(Yes)	No
12. Are these work share samples and all listed on the COC?	Yes	(No)
If yes, Questions 13-17 have been checked at the originating laboratory.		
13. Were all preserved sample(s) at the correct pH upon receipt?	(Yes)	No NA pH Strip Lot# **HC203864**
14. Were VOAs on the COC?	Yes	(No)
15. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	No (NA)
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____	Yes	(No)
17. Was a LL Hg or Me Hg trip blank present? _____	Yes	(No)

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page

Samples processed by:

19. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.
Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Container Temp	Preservative Added (mls)	Lot #
SB1-CTRL 7	240-183063-A-1	Plastic 250ml - w/nitric - dis	<2			
SB1-CTRL 8	240-183063-A-2	Plastic 250ml - w/nitric - dis	<2			
SB2-CTRL 7	240-183063-A-3	Plastic 250ml - w/nitric - dis	<2			
SB2-CTRL 8	240-183063-A-4	Plastic 250ml - w/nitric - dis	<2			

APPENDIX B

Risk Evaluation Report

RISK EVALUATION REPORT
PLANT BRANCH
ASH POND E
MILLEDGEVILLE, PUTNAM COUNTY, GEORGIA

Prepared for

Georgia Power
241 Ralph McGill Boulevard
Atlanta, Georgia 30308

Prepared by

Geosyntec Consultants
1255 Roberts Blvd., Suite 200,
Kennesaw, Georgia 30144

February 2025

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LIST OF ACRONYMS AND ABBREVIATIONS

95% UCL	95 Percent Upper Confidence Limit of the Arithmetic Mean
AP	Ash Pond
CCR	Coal Combustion Residual
CEM	Conceptual Exposure Model
CFR	Code of Federal Regulations
COI	Constituent of Interest
COPI	Constituent of Potential Interest
EPC	Exposure Point Concentration
EPD	[Georgia] Environmental Protection Division
ft	feet
GWPS	Groundwater Protection Standard
HAR	Hydrogeologic Assessment Report
HSRA	Hazardous Site Response Act
mg/L	Milligrams per liter
MSL	Above Mean Sea Level
ProUCL	ProUCL software version 5.2
PWR	Partially Weathered Rock
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable Maximum Exposure
RRS	Risk Reduction Standards
RSL	Regional Screening Level
SSL	Statistically Significant Level
TWR	Transitionally Weathered Rock
USEPA	United States Environmental Protection Agency
VRP	Voluntary Remediation Program

EXECUTIVE SUMMARY

Georgia Power's Plant Branch (site) was formerly operated as a coal-fired power plant from the 1960's until retirement in 2015. It is located approximately eight miles north of Milledgeville in Putnam County, Georgia. Coal combustion residual (CCR) material resulting from such power generation has historically been transferred and stored at Ash Ponds (AP) A, B, C, D, and E in compliance with applicable regulations. The former Ash Pond A, the first ash pond constructed at the facility, was taken out of service in the late 1960s and was closed in April 2016 by the removal and relocation of its stored CCR to AP-E. AP-E will be closed by removal, specifically, by relocation of the CCR stored in those ash ponds to a new, permitted, CCR landfill located on the plant property. This report focuses on AP-E.

Specifically, this report presents the results of a risk evaluation for CCR constituents[1] exhibiting statistically significant levels (SSLs) in groundwater at AP-E from samples collected by Georgia Power in compliance with the State CCR Rule between August 2016 and August 2024. The risk evaluation was performed in support of the *Draft Remedy Selection Report - Plant Branch - Ash Pond E* (Geosyntec, 2025a). A conservative, health-protective approach was used that is consistent with United States Environmental Protection Agency (USEPA) risk assessment guidance, Georgia Environmental Protection Division (EPD) regulations and guidance, and standard practice for risk assessment in the State of Georgia. Beryllium and cobalt have been identified as SSL-related constituents using the groundwater protection standards (GWPSs) established for AP-E in accordance with the State CCR Rule in the *2024 Semiannual Groundwater Monitoring and Corrective Action Report – Plant Branch Ash Pond E* (Geosyntec, 2025b).

Consistent with USEPA guidance, this risk evaluation used a tiered approach to evaluate potential risks, which included the following steps:

1. Development of a conceptual exposure model (CEM) for AP-E.
2. Initial groundwater risk screening: Comparison of groundwater concentrations of SSL-related constituents to conservative, health-protective criteria and/or background concentrations to assess whether they pose a risk to human health.
3. Refined groundwater risk evaluation: Perform a more refined analysis of Constituents of Potential Interest (COPIs) that were not screened out in the initial risk screening to assess whether they pose a potential risk to human health.
4. Development of risk conclusions and identification of associated uncertainties.

[1] The constituents included in the risk evaluation also occur naturally in the site geologic setting.

Using this approach that includes multiple conservative assumptions, SSL-related constituents evaluated from AP-E are not expected to pose a risk to human health or the environment. The SSL-related constituents are delineated to concentrations below the applicable health-protective screening levels in on-site groundwater monitoring wells. Therefore, no further risk evaluation for groundwater is warranted. In addition, because beryllium and cobalt in groundwater were delineated within the plant property boundary, evaluation of off-site ecological receptors associated with the surface water pathway was not necessary. Compliance monitoring for AP-E will continue pursuant to the requirements of the State CCR Rule. Georgia Power will proactively evaluate the data and update this evaluation, if necessary.

1 INTRODUCTION

This report summarizes a risk evaluation of AP-E at Georgia Power's Plant Branch (site) located in Milledgeville, Georgia in Putnam County (**Figure 1**). The risk evaluation was performed in support of the *Draft Remedy Selection Report – Plant Branch Ash Pond E* (Geosyntec, 2025a). AP-E is located to the northwest of Ash Ponds B, C, and D and is bounded by Beaver Dam Creek to the east. Georgia Power is currently in the permitting process to close AP-E in accordance with the State CCR Rule. A CCR Unit Solid Waste Handling Permit application for AP-E was submitted to GA EPD in November 2018 and is under review. AP-E will be closed by removal, specifically, by relocation of the CCR stored in those ash ponds to a new CCR landfill located on the plant property.

This risk evaluation provides additional technical review of the human health and environmental protectiveness associated with the planned closure of AP-E with respect to constituent concentrations in groundwater identified at SSLs above the GWPS. USEPA revised the Federal CCR Rule on July 30, 2018, updating the GWPS for cobalt, lead, lithium, and molybdenum values. On February 22, 2022, EPD adopted the federal GWPS for cobalt, lead, lithium, and molybdenum under 40 CFR §257.95(h) (EPD, 2022), which established the GWPS for these constituents as the higher of background concentrations or 0.006 milligrams per liter (mg/L), 0.015 mg/L, 0.040 mg/L, and 0.100 mg/L, respectively, which correspond to the USEPA Regional Screening Levels (RSLs) for tapwater[2].

The risk evaluation relies on a conservative, health-protective approach that is consistent with the risk approaches outlined in Voluntary Remediation Program (VRP) (Georgia Voluntary Remediation Act, O.C.G.A. § 12-8-100) and components of the Risk Assessment Guidance for Superfund (RAGS) as included in the USEPA RSLs User's Guide (USEPA, 2024). This evaluation also incorporates principles and assumptions consistent with the State CCR Rule. The risk evaluation includes the development of a site-specific CEM and a stepwise risk screening process for identified SSL-related constituents for AP-E.

Beryllium and cobalt were identified as SSL-related constituents under the State CCR Rule in the following wells:

- Beryllium: BRGWC-38S;
- Cobalt: BRGWC-33S and BRGWC-38S.

[2] Although these GWPS are based on the tapwater RSLs, they are not subject to modification via periodic updates to the USEP RSL tables since the specific values are promulgated under 40 CFR §257.95(h).

The remainder of the report is organized as follows:

- ***Section 2, Basis and Background for the Development of the Conceptual Exposure Model*** – Presents site-specific information related to the site history, monitoring network, topography and surface hydrology, geology and hydrogeology, potential transport pathways, and receptors that could potentially be exposed to SSL-related constituents.
- ***Section 3, Risk Evaluation Screening*** – Describes the process for the initial risk-based screening of SSL-related constituents to identify COPIs in groundwater.
- ***Section 4, Refined Risk Evaluation*** – Describes the risk screening process for the COPIs identified in groundwater, including calculation of exposure point concentrations (EPCs) and analysis of concentration trends over time.
- ***Section 5, Uncertainty Assessment*** – Describes the uncertainties associated with the risk screening process.
- ***Section 6, Conclusions*** – Presents the conclusions of the risk evaluation.
- ***Section 7, References*** – Provides reference information for the sources cited in this document.

2 BASIS AND BACKGROUND FOR THE DEVELOPMENT OF THE CONCEPTUAL EXPOSURE MODEL

This section provides a brief overview of the site location and operational history, site regulatory status, and geology/hydrogeology. A CEM representing the site-specific processes and conditions that are relevant to the potential migration of groundwater and potential exposure to SSL-related constituents has been developed based on a review and compilation of information previously presented in site documents, including the *Hydrogeologic Assessment Report (HAR) for Ash Pond E, Rev 01* (Geosyntec, 2020), the *2024 Semiannual Groundwater Monitoring and Corrective Action Report – Plant Branch Ash Pond E* (Geosyntec, 2025b), and the *2024 Annual Groundwater Monitoring Report – Plant Branch Ash Pond E* (Geosyntec, 2024). The CEM includes a conservative evaluation of assumed potential transport pathways, exposure pathways and potential human and ecological receptors.

2.1 Site Description

The site is located in Putnam County, GA, approximately 8 miles north of Milledgeville. The property occupies approximately 3,200 acres and is bounded on the south and east by Lake Sinclair, which is an approximate 15,330-acre hydroelectric reservoir that was created in 1953 by the impoundment of the Oconee River. A site location map and a detailed site map is included as **Figure 1**. The site formerly operated as a coal-fired power plant from the 1960's until its retirement in 2015. Plant Branch is no longer active and has been decommissioned. During its operation, five ash ponds were used for management of the CCR on the plant property. These ponds are identified as Ponds A, B, C, D, and E. Ash Pond A, the first ash pond constructed at the site, was taken out of service in the late 1960's and was closed in April 2016 by the removal and relocation of its stored CCR to Ash Pond E. Ponds B, C, D, and E are currently inactive, and will be closed by removal and relocation of the stored CCR material to a proposed fully lined landfill located on the plant property (Geosyntec, 2025b).

The monitoring well network for AP-E is shown on **Figure 2**. Based on the conceptual site model and the observed hydrogeologic conditions at the site, downgradient well locations are distributed along the eastern and southern perimeter of AP-E in the direction of groundwater flow. Both background and downgradient wells are screened in the overburden, the transition-zone, and the upper bedrock as a single interconnected aquifer system.

2.1.1 Topography and Surface Hydrology

AP-E is located in the western half of the site property, which is generally topographically higher than the eastern portion of the property. Surface water drainage is to the northeast, east, and south. Several hilltops form a ridgeline west of AP-E. These hilltops form a topographic and surface water (and presumably groundwater) divide between the pond and the embayment to the west of the pond. Topographic relief across the site is less than 150 feet, with a

topographic high of nearly 485 feet above mean sea level (ft MSL) occurring along the topographic ridge west of AP-E, and with a topographic low at the downgradient toe of the dike on the east edge of the ash pond (approximately 360 ft MSL) (Geosyntec, 2025b).

2.1.2 Geology and Hydrogeology

The following information is provided in the *2024 Semiannual Groundwater Monitoring & Corrective Action Report – Plant Branch Ash Pond E* (Geosyntec, 2025b) and presented below:

> *The Site is located within the Piedmont Physiographic Province of central Georgia, which is characterized by gently rolling hills and narrow valleys, with locally pronounced linear ridges. Generally, the property slopes gently east and south toward Beaverdam Creek and Lake Sinclair. The metamorphic and igneous rocks that underlie the area have been subjected to physical and chemical weathering which has created a landscape dissected by creeks and streams. Bedrock is typically overlain by a variably thick blanket of residual soils and saprolite. The overall depth of weathering in the Piedmont/Blue Ridge is generally about 20 to 60 feet; however, the depth of weathering along discontinuities and/or very mafic rock units may extend to depths greater than 100 feet. Because of such variations in rock types and structure, the depth of weathering can vary significantly over short horizontal distances. The bedrock underlying the saprolite is fine- to medium-grained, poorly jointed biotite-quartz-feldspar gneiss.*
>
> . . . .
>
> *The uppermost aquifer at the Site is an unconfined regional groundwater aquifer that occurs primarily in the saprolite, PWR, and fractured bedrock. While the aquifer characteristics of each unit may vary, the groundwater is interpreted to be interconnected between these units, and they effectively act as one, unconfined aquifer. Generally, the water table surface at the Site is a subdued reflection of topography, with groundwater generally flowing east, west, and south...*

The potentiometric surface contours provided in the *2024 Semiannual Groundwater Monitoring & Corrective Action Report – Plant Branch Ash Pond E* (Geosyntec, 2025b) are provided on **Figure 3.**

2.2 Potential Transport Pathways

A variety of geologic, hydrogeologic, and geochemical mechanisms can occur in the subsurface and serve to attenuate constituent concentrations in groundwater such as soil or rock characteristics, the local geology and hydrogeology, and the distance the groundwater must travel before reaching a potential receptor. A summary of the potential transport pathways is shown on the CEM in **Figure 4**.

Beaverdam Creek is located to the east of AP-E. The surface water flow direction for Beaverdam Creek is from north to south where it enters Lake Sinclair. A conservative assumption for this assessment was made that the groundwater from the site flows to either Beaverdam Creek or Lake Sinclair. In addition, for the purposes of this evaluation, both Beaverdam Creek and Lake Sinclair were assumed to represent a hydraulic discharge boundary for groundwater flow in the upper aquifer from the nearby region.

Concentrations of the SSL-related constituents were below their respective health-protective screening levels in the farthest downgradient wells on-site, as shown by the findings of the risk evaluation in Section 4.1.4. Therefore, evaluation of surface water was not necessary.

2.3 Potential Exposure Pathways and Receptors

The exposure pathways for groundwater were assumed to be complete for purposes of this risk evaluation and were used to identify potential receptors and estimate potential risk. The CEM (**Figure 4**) depicts the conservatively assumed potential exposure pathways and receptors included in the risk evaluation.

The following potential exposure pathways and receptors were considered:

- On-site industrial worker: The groundwater exposure pathway for the on-site industrial worker was considered incomplete because there are no wells on-site that are classified for use as potable wells.

- On-site construction worker: While there is a potential for limited exposure to groundwater by a future construction worker through dermal contact with on-site shallow groundwater during subsurface activities, future construction workers would be expected to have little to no direct contact with on-site groundwater due to safety procedures outlined in their site-specific health and safety plans.

- On-site resident: The groundwater exposure pathway for on-site residents was considered incomplete because the site is zoned as either Industrial and Manufacturing District or Agricultural District and there is no residential use on-site under current site conditions and future residential use of the site is considered unlikely (Putnam County, 2025).

- Off-site industrial/construction worker: The potential for off-site worker exposure through direct contact with groundwater was addressed qualitatively through the evaluation of hypothetical off-site residential receptors. Health-protective screening levels for residential receptors would be more conservative than industrial and construction worker screening levels.

- Off-site resident: The groundwater exposure pathway for hypothetical off-site residential receptors was conservatively assumed to be potentially complete. Nearby property is either zoned Agricultural District (the surrounding properties) or Single-Family Residential District (southwest of the site) (Putnam County, 2025). An off-site well survey of potential groundwater wells within a three-mile radius of the site (AP-BCD and AP-E) was conducted and consisted of reviewing federal, state, and county records and online sources, in addition to conducting a windshield survey of the area (Newfields, 2020). The off-site well survey is included as **Appendix A**. An updated desktop potable well survey of potential groundwater wells within a two-mile radius of AP-E was conducted in October 2024 through January 2025 and consisted of reviewing federal, state, county records, and online sources. The results of the survey and the 2024-2025 update are presented on **Figure 5**. Hypothetical off-site residential receptors in the downgradient groundwater flow direction identified in the well survey are located on the opposite side of the discharge boundaries for AP-E (i.e., Beaverdam Creek or Lake Sinclair).

  Concentrations of SSL-related constituents in on-site groundwater monitoring wells and piezometers are below health-protective screening levels in wells on-site and upgradient of surface water bodies at AP-E. As a conservative measure, hypothetical off-site residential exposure to the SSL-related constituents was evaluated using data collected from on-site groundwater wells between August 2016 and August 2024 downgradient of AP-E. This comparison makes the conservative assumption that on-site groundwater has the potential to migrate to off-site drinking water wells through advective transport in groundwater without any attenuation in the aquifer media through factors such as dilution, dispersion, or adsorption, and disregards the presence of Beaverdam Creek or Lake Sinclair which represent assumed hydraulic discharge boundaries for groundwater downgradient of AP-E. Accordingly, the risk evaluation screening assumed the hypothetical off-site residential receptor could be exposed by ingestion and dermal contact with SSL-related constituents in groundwater through its use as a future potable water source.

- Recreational surface water receptors: The surface water exposure pathway for hypothetical recreational receptors was addressed qualitatively through the evaluation of on-site groundwater data. SSL-related constituent concentrations are below the health-protective screening criteria in on-site groundwater. Therefore, evaluation of the surface water pathway was not necessary.

- Ecological surface water receptors: The surface water exposure pathway for off-site ecological receptors was addressed qualitatively through the evaluation of on-site groundwater data. SSL-related constituent concentrations are below health-protective

screening criteria in on-site groundwater. Therefore, evaluation of the surface water pathway was not necessary.

3 RISK EVALUATION SCREENING

The CEM developed in Section 2 was used to identify the potential exposure pathways to human receptors that should be considered in the risk evaluation. The initial step in the risk evaluation is the comparison of SSL-related constituent concentrations from groundwater samples collected between August 2016 and August 2024 to relevant, health-protective levels. The approach used is consistent with the Georgia EPD regulations and guidance, USEPA guidance, and standard practice for risk assessment in the State of Georgia. The Georgia EPD allows for the site-specific evaluation of risk in programs such as the Voluntary Remediation Program (VRP) (EPD, 2009).

The initial risk evaluation screening was performed for the potential groundwater exposure pathway by comparing the concentrations of SSL-related constituents in groundwater samples from wells determined to have SSL-related constituents to appropriate health-protective screening criteria. These criteria included the risk reduction standards (RRS)[3] established under the Hazardous Site Response Act (HSRA) for drinking water and site-specific background for the protection of human health. If the maximum concentration of an SSL-related constituent exceeded the screening criterion, the constituent was identified as a COPI for further evaluation in the refined risk evaluation. The methodology and screening criteria used were identified in accordance with regulatory guidance and standard risk assessment practices using an approach designed to conservatively overestimate possible exposures and risks, providing an additional level of confidence in the conclusions. The methodology is summarized in **Figure 6** and discussed in more detail below.

3.1 Data Used in Risk Evaluation Screening

This section provides information on the groundwater dataset used in the risk evaluation screening.

3.1.1 Groundwater Data

For the initial risk screening evaluation, groundwater data from samples collected between August 2016 and August 2024 from the on-site wells that were identified to have SSL-related constituents were used in the risk screening evaluation for hypothetical off-site residential exposure.

[3] HSRA was amended in 2018 to make the methods used for calculating RRSs consistent with USEPA's RAGS for the calculation of RSLs.

The list of wells in the *2024 Semiannual Groundwater Monitoring & Corrective Action Report – Plant Branch Ash Pond E* (Geosyntec, 2025b) with SSL-related constituents identified under the State CCR Rule is as follows:

- Beryllium: BRGWC-38S; and
- Cobalt: BRGWC-33S and BRGWC-38S.

The data for the wells were screened against the relevant health-protective screening criteria. The location of wells with SSL-related constituents included in the risk screen are provided on **Figure 7**.

Groundwater data used in the risk screening level evaluation were collected from the uppermost aquifer and are representative of groundwater conditions at the site. The groundwater dataset used in the risk evaluation is presented in **Appendix B**.

Method detection limits for the groundwater datasets used in the risk evaluation were reviewed and confirmed to be less than the screening levels except for two samples for cobalt where the detection limits in BRGWC-33S and BRGWC-38S samples collected in February 2018 were greater than the screening level. In these two samples, cobalt was detected, and the detected results were used in the EPC calculations and risk evaluation. Therefore, the elevated detection limits in the samples do not impact conclusions of the risk evaluation.

3.1.2 Background Groundwater Quality

Statistical analysis of groundwater monitoring data is performed at the site pursuant to §257.93 following the established statistical method from the Unified Guidance (USEPA, 2009) for AP-E; background values are routinely updated under the program. For the data set presented, five monitoring wells in the certified monitoring well network were designated as upgradient (background) locations for AP-E, BRGWA-2S, BRGWA-2I, BRGWA-5S, BRGWA-5I, and BRGWA-6S. The statistical analyses performed on the groundwater data were described in the *2024 Semiannual Groundwater Monitoring and Corrective Action Report – Plant Branch Ash Pond E* (Geosyntec, 2025b); and are summarized below.

> *The Sanitas groundwater statistical software was used to perform the statistical analyses. Sanitas is a decision-support software package, that incorporates the statistical tests required of Subtitle C and D facilities by USEPA regulations and guidance as recommended in the USEPA document Statistical Analysis of Groundwater Data at RCRA Facilities Unified Guidance (Unified Guidance) (USEPA, 2009). Time series plots generated by Sanitas are used to identify suspected outliers, or extreme values that would result in limits that are not representative of the current background data population. Suspected outliers at all wells for Appendix III and*

Appendix IV parameters are formally tested using Tukey's box plot method and not used to establish statistical limits. Background well data were updated following the Unified Guidance recommendation, evaluating recent background data using Tukey's box plot method for outliers and Sen's Slope/Mann-Kendall methods for potential trends.

3.2 Groundwater Screening Evaluation

The process of screening constituents detected in groundwater against human health screening levels for groundwater is discussed below and presented in **Figure 6**. The HSRA RRSs evaluated under the VRP approach presented herein include Type 1 and Type 2 (beryllium and cobalt) RRS for off-site residential receptors. The Hazardous Site Response Act Rule 391-3-19.07(1) notes that "*[a]ll risk reduction standards will, when implemented, provide adequate protection of human health and the environment.*" In addition, Rule 391-3-19-.07(3) notes a corrective action, if needed, may be considered complete when "*a site meets any or a combination of the applicable risk reduction standards described in Rule 391-3-19-.07."*

In accordance with standard methodologies approved by the Georgia EPD, the screening level hierarchy for the SSL-related constituents is as follows:

- The higher of the Type 1 or Type 2 RRS for hypothetical off-site residential exposure, which are considered protective of human health for those constituents regulated under HSRA (i.e., beryllium).

- In accordance with standard methodologies approved by the Georgia EPD and because cobalt is not a HSRA-regulated substance, a site-specific risk-based screening value was calculated using the default exposure factors for residential receptors and the methodology found in Appendix III of the HSRA rule (EPD, 2018). Accordingly, the calculated screening value is equivalent to a Type 2 groundwater RRS protective of residential exposures. Toxicity values for beryllium and cobalt used in the calculations were the USEPA-preferred values contained in the RSL Calculator (USEPA, 2024). The risk-based screening values were calculated using USEPA's RSL calculator assuming a target hazard quotient of 1, consistent with Georgia EPD guidance applicable in other contexts (EPD, 2018). The calculation of risk-based screening values for beryllium and cobalt is presented in **Appendix C**. Based on the foregoing, the Type 2 RRS for beryllium and the site-specific residential screening level for cobalt were used.

- If site-specific background concentrations are greater than the criteria described above, then the site-specific background concentration is used as the screening level in accordance with the CCR methodology for development of GWPSs (USEPA, 2020). Background was not used as a screening level in this evaluation.

In summation, based on the hierarchy above, groundwater data collected from the wells identified to have SSL-related constituents were compared to residential screening criteria for groundwater.

Table 1 presents the maximum detected concentration of each SSL-related constituent, beryllium 0.011 mg/L and cobalt 0.3 mg/L, which was used to represent potential off-site groundwater quality for comparison to the selected screening levels for beryllium (0.025 mg/L) and cobalt (0.006 mg/L), for hypothetical off-site residential receptors. As noted in **Table 1**, cobalt was detected at concentrations that exceeded its screening level and was retained as a COPI for further evaluation in a refined risk evaluation. However, beryllium was not detected at concentrations that exceeded its screening level and was not retained as a COPI and is not expected to pose a risk to human health or the environment.

4 REFINED RISK EVALUATION

A refined risk evaluation was conducted for the groundwater COPI that was detected at concentrations that exceeded the health-protective screening criteria (cobalt). The refined risk evaluation identified EPCs for cobalt for the purposes of characterizing potential risk to human receptors. Due to cobalt being identified as a COPI in multiple wells spatially separated from one another (BRGWC-33S and BRGWC-38S), two exposure units (north and south) were used in the refined risk evaluation. A cobalt EPC was developed for each exposure unit and if the EPC is greater than the screening level, then the constituent is identified as having the potential for risk that warrants additional evaluation (e.g., performing a surface water evaluation). Cobalt concentrations in the most downgradient well for each exposure unit were below the screening level and a surface water evaluation was not necessary.

4.1 Refined Groundwater Risk Evaluation

Potential risk associated with exposure to cobalt by hypothetical off-site residential receptors was refined using the methodology described in HSRA and VRP and other supporting guidance (EPD, 2018; EPD, 2015; EPD, 2009) and is presented in the following section and on **Figure 8**.

For the refined risk evaluation, groundwater data from samples collected between August 2016 and August 2024 from the on-site wells that were identified to have an SSL-related constituent and downgradient monitoring wells/piezometers that represent groundwater flow in the same hydraulically downgradient direction were used to evaluate hypothetical off-site residential exposure.

As noted above, groundwater data used in the risk screening level evaluation were collected from the uppermost aquifer and are considered to be representative of groundwater conditions at the site. The groundwater dataset used in the refined risk evaluation is presented in **Appendix B.**

4.1.1 Groundwater Exposure Point Calculation

The refined risk evaluation for cobalt included the development of an EPC. The EPC is a conservative estimate of potential exposure that is selected to address uncertainty and variability in the dataset (USEPA, 2002). Consistent with guidance for developing groundwater EPCs (USEPA, 2014), 95 percent upper confidence limits of the arithmetic mean (95% UCLs) were calculated using USEPA ProUCL 5.2 software (ProUCL) and ProUCL user's guide (USEPA, 2022).

For the refined risk evaluation, the 95% UCLs for the COPIs in groundwater were calculated for datasets with the following characteristics:

- 95% UCLs for the individual well(s) with an SSL-related constituent;

- 95% UCLs based on combined data from the well(s) with an SSL-related constituent and other well(s)/piezometer(s) in the general vicinity to include additional downgradient monitoring well(s)/piezometer(s) that represent groundwater flow in the same hydraulically downgradient direction; and

- 95% UCLs based on the combined data from the farthest downgradient well(s)/piezometer(s) that are hydraulically downgradient of the well(s) with an SSL-related constituent.

Other assumptions made in the calculation of the 95% UCLs include:

- Primary samples (no duplicates) were used to calculate EPCs as duplicate samples were analyzed for quality assurance purposes.

- If the calculated 95% UCL exceeded the maximum detected concentration or had less than four detections, then the maximum detected concentration was used as the EPC.

ProUCL software calculates multiple 95% UCLs and provides a recommended 95% UCL which was selected as the EPC. If there were multiple 95% UCLs recommended by ProUCL, the maximum 95% UCL value was selected as a conservative assumption. **Appendix D-1** provides a detailed summary of the 95% UCLs calculated using the methods described above, and **Appendix D-2** presents figures showing the wells used in the calculation of the EPCs for each groundwater COPI. **Appendix D-3** provides the input and output files associated with the ProUCL software.

Table 2 summarizes the groundwater EPCs selected for cobalt. This table shows the number of samples, the maximum detected concentrations, the 95% UCLs recommended by ProUCL software, and the selected EPCs.

4.1.2 COPI Concentration Trend Analysis

Concentration trends over time were evaluated as one line of evidence in the refined risk evaluation for cobalt. The Mann-Kendall trend test with an alpha value equal to 0.05 and the Theil-Sen line test were conducted on the data from BGWC-33S, BGWC-38S, PZ-52D, and PZ-70I for cobalt to evaluate the trends in concentrations over time. The tests were conducted using the USEPA ProUCL 5.2 software (USEPA, 2022).

The Mann-Kendall and Thiel-Sen test results are presented on time series graphs in **Appendix D-4** and indicated:

- There is a statistically decreasing trend in cobalt concentrations over time in BRGWC-38S.

- There is no statistically significant trend in cobalt concentrations over time in BRGWC-33S, PZ-52D, and PZ-70I.

4.1.3 Refined Groundwater Risk Evaluation Results

Cobalt was identified as a groundwater COPI in the initial risk screening. In the refined risk evaluation, comparison of the calculated EPC to the screening level was used to identify constituents of interest (COIs) that may pose a potential risk to hypothetical off-site residential receptors exposed through the potential use of groundwater as potable water. If the EPC from the farthest downgradient well(s) is greater than the respective screening level, then the constituent is identified as having the potential for risk that warrants additional evaluation (e.g., performing a surface water evaluation).

4.1.3.1 North Exposure Unit

Cobalt concentrations were detected in 21 out of 21 groundwater samples in well BRGWC-33S at concentrations that exceeded the off-site groundwater screening level for residential receptors. For the refined risk evaluation, the following EPCs were calculated for cobalt using the wells shown in **Appendices D-1** and **D-2a**:

- Data from BRGWC-33S were used to determine if the 95% UCL is less than the screening level (EPC Step 1 in **Appendix D-1**).

- Data from BRGWC-33S and the downgradient wells PZ-15S, PZ-15I, PZ-13S, and PZ-52D were combined to represent potential groundwater exposure associated with the SSL well and hydraulically downgradient wells (EPC Step 2 in **Appendix D-1**).

- Data from PZ-15S, PZ-15I, and PZ-13S were used to represent groundwater exposure using the well that is the farthest hydraulically downgradient of well BRGWC-33S (EPC Step 3 in **Appendix D-1**).

Although the EPC Step 1 (0.06 mg/L) and the EPC Step 2 (0.0375 mg/L) exceeded the screening level, the EPC Step 3 (0.0022 mg/L), which includes the farthest downgradient well, was less than the health-protective screening level.

Table 3 presents the results of the refined screening comparing the farthest hydraulically downgradient EPC to the screening criterion. As cobalt was not detected above the applicable screening level in the farthest hydraulically downgradient wells on the site, cobalt in the north

exposure unit was not identified as a COI in groundwater for hypothetical off-site residential receptors and is not expected to pose a risk to human health through potable water use.

4.1.3.2 South Exposure Unit

Cobalt concentrations were detected in 21 out of 21 groundwater samples in well BRGWC-38S at concentrations that exceeded the off-site groundwater screening level for residential receptors. For the refined risk evaluation, the following EPCs were calculated for cobalt using the wells shown in **Appendices D-1** and **D-2b**:

- Data from BRGWC-38S were combined to determine if the 95% UCL is lower than the screening level (EPC Step 1 in **Appendix D-1**).
- Data from BRGWC-38S and the downgradient wells PZ-53D, and PZ-70I were combined to represent groundwater potential exposure associated with the SSL well and hydraulically downgradient wells (EPC Step 2 in **Appendix D-1**).
- Data from PZ-70I were used to represent groundwater exposure using the well that is the farthest hydraulically downgradient of well BRGWC-38S (EPC Step 3 in **Appendix D-1**).

Although the EPC Step 1 (0.231 mg/L) and the EPC Step 2 (0.172 mg/L) exceeded the screening level, the EPC Step 3 (0.0056 mg/L), which includes the farthest downgradient well, was less than the health-protective screening level.

Table 3 presents the results of the refined screening comparing the farthest hydraulically downgradient EPC to the screening criterion. As cobalt was not detected above the applicable screening level in the farthest hydraulically downgradient wells on the site, cobalt in the south exposure unit was not identified as a groundwater COI for hypothetical off-site residential receptors and is not expected to pose a risk to human health through potable water use.

4.1.4 Refined Groundwater Risk Evaluation Summary and Conclusions

Detections of the SSL-related constituent cobalt were reported at concentrations above the applicable groundwater screening values. However, the results of the refined groundwater risk evaluation indicate the following:

- Cobalt in the north exposure unit and south exposure unit is not expected to pose a risk to hypothetical off-site residential receptors.
- The individual data points used to calculate the cobalt EPCs to represent potential groundwater exposure for hypothetical off-site residential receptors based on the

farthest hydrologically downgradient monitoring wells were below the health-protective screening level.

Accordingly, based on multiple lines of evidence and various conservative assumptions, further risk evaluation for groundwater is not warranted. Compliance monitoring under the State CCR Rule will continue.

5 UNCERTAINTY ASSESSMENT

USEPA guidance stresses the importance of providing an analysis of uncertainties so that risk managers are better informed when evaluating risk assessment conclusions (USEPA, 1989). The uncertainty assessment provides a better understanding of the key uncertainties that are most likely to affect the risk assessment results and conclusions.

The potential uncertainties associated with the risk evaluation are as follows:

Health-Protective Screening Criteria Uncertainties:

- In accordance with standard methodologies approved by the Georgia EPD, the higher of the Type 1 or Type 2 standard was selected for residential screening criteria. Selection of the screening criteria per industry standards is considered appropriate for risk quantification for Plant Branch. The Hazardous Site Response Act, Rule 391-3-19.07(1) notes that "*[a]ll risk reduction standards will, when implemented, provide adequate protection of human health and the environment*". Thus, this approach is likely to overestimate hypothetical risks for off-site receptors.

- Screening criteria based on RRSs, including beryllium and cobalt, represent the reasonable maximum exposure (RME), which are the highest exposures that are reasonably expected to occur at a site. The RME is defined as "*the highest exposure that is reasonably expected to occur at a site but that is still within the range of possible exposures*" (USEPA, 1989). Further, USEPA (1989) states that the "*intent of the RME is to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures.*" Potential receptors will likely have lower exposures than those presented in this risk evaluation (i.e., a majority of the site concentrations will be less than the 95% UCL), which overestimates potential exposure.

Exposure Uncertainties:

- The maximum detected concentrations of beryllium and cobalt were compared to conservative risk-based screening criteria to identify the COPIs. Use of the maximum detected concentration is consistent with standard practice; however, use of the maximum detected concentration for exposure likely overestimates potential risk.

- The constituents included in the risk evaluation may occur naturally in the site geologic setting. Although background concentrations were evaluated, contributions to exposure and risk were assumed to be entirely CCR-related and natural background sources were not quantified. Thus, SSL concentration-related exposures were likely overestimated.

- Hypothetical off-site residential exposure was evaluated using on-site groundwater data from wells around the perimeter and downgradient of AP-E. This comparison makes the conservative assumption that on-site groundwater may potentially migrate to off-site drinking water wells through advective transport in groundwater, but without any attenuation within the aquifer media through factors such as dilution, dispersion, or adsorption. This assumption may overestimate potential exposure and risk to hypothetical off-site receptors.

- EPCs for metals in groundwater were assumed to be 100 percent bioavailable by ingestion and dermal contact. This assumption may tend to overestimate risk.

- An off-site well survey of potential groundwater wells within a three-mile radius of Plant Branch was conducted in 2020 (NewFields, 2020) and updated in October 2024 through January 2025. The survey consisted of reviewing publicly available federal, state, and county records as well as a windshield survey of the area (**Appendix A**). Geosyntec relied on the data collected by NewFields.

- The evaluation used on-site groundwater data to represent hypothetical off-site exposure, which is a conservative approach that likely results in overestimation of assumed exposure and assumed potential risk. Although off-site potable wells identified in the well survey were not included in the risk evaluation, the presence of these wells does not impact the conclusions of the risk evaluation because concentrations of COPIs are delineated in on-site groundwater.

Toxicity Uncertainties:

- Toxicity factors used to calculate health-protective criteria are established at conservative levels to account for uncertainties and often result in criteria that are many times lower than the levels observed to cause effects in human or animal studies. Therefore, a screening level exceedance does not necessarily equate to an adverse effect.

6 CONCLUSIONS

This risk evaluation for SSL-related constituents in groundwater at AP-E was conducted using methods consistent with Georgia EPD and USEPA guidance and included multiple conservative assumptions. Based on this evaluation, the SSL-constituents evaluated from AP-E (beryllium and cobalt) are not expected to pose a risk to human health or the environment.

Accordingly, no further risk evaluation of groundwater is warranted. Compliance monitoring for AP-E under the State CCR Rule will continue. Georgia Power will proactively evaluate the data and update this risk evaluation, if necessary.

7 REFERENCES

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USEPA, 2022. *Statistical Software ProUCL 5.2 for Environmental Applications for Data Sets with and without Nondetect Observations*, and *ProUCL Version 5.2 User's Guide*, EPA/600/R-07/041, last updated July 14, 2022.

USEPA, 2024. USEPA Regional Screening Levels and supporting online RSL Calculator. Revised November 2024. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLES

Table 1
SSL-Related Constituent Groundwater Screening
Plant Branch AP-E Risk Evaluation Report[1]
Plant Branch, Milledgeville, GA

CCR Rule Designation	Constituent	CAS No.	Detection Frequency	Exceedance Frequency[2]	Maximum Concentration (mg/L)	Screening Level (mg/L)	Source[3]	Site-Specific Background (mg/L)	COPI? (Y/N)	Rationale[4]
Appendix IV	Beryllium	7440-41-7	21 / 21	0 / 21	0.011	0.025	Type 2 RRS	0.0002	N	BSL
	Cobalt	7440-48-4	42 / 42	42 / 42	0.298	0.006	Site-Specific	0.0034	Y	ASL

Notes:

[1] Evaluation includes August 2016 to August 2024 groundwater analytical data from wells BRGWC-33S (cobalt) and BRGWC-38S (beryllium and cobalt).
[2] The exceedance frequency is based on the number of samples with detected concentrations that exceed the identified screening level.
[3] The screening levels are the maximum value from the following sources:
- Type 1 RRSs listed in HSRA Appendix III, Table 1 (HSRA-regulated substances only).
- Type 2 RRSs calculated using the EPA RSL calculator with default residential exposure factors listed in the RSL Users Guide (HSRA-regulated substances
- Site-Specific values calculated using the EPA RSL calculator with default residential exposure factors listed in the RSL Users Guide.
- EPA Maximum Contaminant Levels (MCLs).
- Site-specific background levels for each constituent were calculated as described in Geosyntec, 2025.

[4] Rationale for classification of constituent as a COPI or exclusion as a COPI:
- ASL = Above respective screening level
- BSL = Below respective screening level

Definitions:

Grey shading indicates the constituent exceeded its screening level.

CAS = Chemical Abstract Service
CCR = Coal Combustion Residuals
COPI = Constituent of Potential Concern
EPA = United States Environmental Protection Agency
RRS = Risk Reduction Standard

References:

Geosyntec. 2025. *2024 Semiannual Groundwater Monitoring & Corrective Action Report Plant Branch Ash Pond E* . February.

Table 2
Groundwater Exposure Point Concentration Summary
Plant Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

CCR Rule Designation	Constituent	CAS No.	Exposure Unit	Detection Frequency	Maximum Concentration (mg/L)	Wells Included in 95% UCL Calculation	95% UCL [1,2] (mg/L)	Recommended 95% UCL Method [2]	Selected EPC (mg/L)
Appendix IV	Cobalt	7440-48-4	North	3 / 11	0.0022	PZ-13S, PZ-15S,&PZ-15I	NA	NA	0.0022
			South	5 / 5	0.0056	PZ-70I	NA	NA	0.0056

Notes:
[1] Groundwater exposure point concentrations (EPCs) calculated in accordance with EPA, 2014. *Memorandum for Determining Groundwater Exposure Point Concentrations, Supplemental Guidance* . OSWER Directive 9283.1-42, February 2014. Located at: https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236917. For further detail on the selected EPC, refer to Appendix D-1.
[2] NA = Not available. For cobalt, the 95% upper confidence limit of the arithmetic mean (UCL) was not calculated for Step 3 because the dataset had fewer than 4 detected values (north exposure unit) or a 95% UCL was not recommended (south exposure unit).

Definitions:
CAS = Chemical Abstract Service
CCR = Coal Combustion Residuals
EPC = exposure point concentration
UCL = upper confidence limit on the mean
mg/L = milligram(s) per liter
"<" = detection limit for non-detect result

Table 3
Downgradient Groundwater Residential Refined Evaluation
Plant Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

CCR Rule Designation	Constituent	CAS No.	Exposure Unit	Detection Frequency	Exceedance Frequency[1]	Selected EPC (mg/L)	Screening Level (mg/L)	SL Source[2]	COI? (Y/N)	Rationale[3]
Appendix IV	Cobalt	7440-48-4	North	3 / 11	0 / 11	0.0022	0.006	Site-Specific	N	BSL
			South	5 / 5	0 / 5	0.0056			N	BSL

Notes:
[1] The exceedance frequency is based on the number of samples with detected concentrations that exceed the identified screening level.
[2] The screening values are the maximum value from the following sources:
- Type 1 RRSs listed in HSRA Appendix III, Table 1 (HSRA-regulated substances only).
- Type 2 RRSs calculated using the USEPA RSL calculator with default residential exposure factor listed in the RSL Users Guide (HSRA-regulated substances only).
- Site-Specific values calculated using the USEPA RSL calculator with default residential exposure factor listed in the RSL Users Guide.
- Site-specific background levels for each constituent were calculated as described in Geosyntec, 2025.

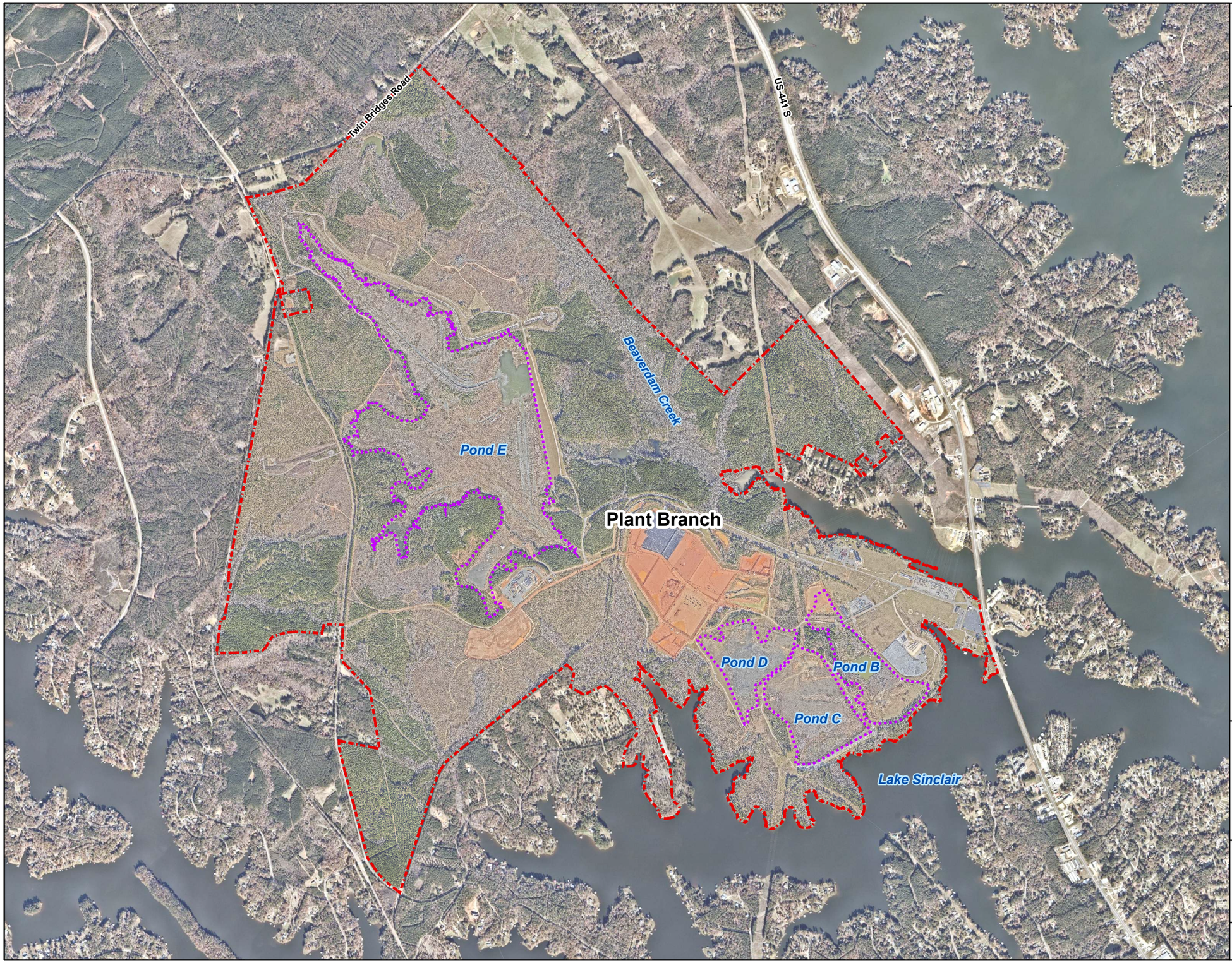
[3] Rationale for classification of constituent as a COI or exclusion as a COI:
- ASL = Above respective screening level
- BSL = Below respective screening level
- ND/BSL = Non-detect and below respective screening level

Definitions:
Grey shading = 'Constituent concentration(s) exceeded its respective screening level in the dataset.

CAS = Chemical Abstract Service
CCR = Coal Combustion Residuals
COI = Constituent of Interest
EPA = United States Environmental Protection Agency
GA EPD= Georgia Environmental Protection Division
HSRA = [GA EPD] Hazardous Site Response Act
mg/L = milligram(s) per liter
RRS = [GA EPD] Risk Reduction Standard
RSL = [EPA] Regional Screening Level

References:
Geosyntec. 2025. *2024 Semiannual Groundwater Monitoring & Corrective Action Report Plant Branch Ash Pond E* . February.

FIGURES



N

LEGEND

- Plant Branch Property Boundary
- Approximate Ash Pond Boundary



Notes:
1. Coordinate System: NAD 1983 State Plane Georgia West_FIPS (U.S. Feet).
2. Property Boundary Provided by Southern Company Services.
3. Aerial: Nearmap Imagery, December 2024 and Georgia Power Company, January 2025.

0 2,000 4,000

Scale in Feet

SITE LOCATION MAP

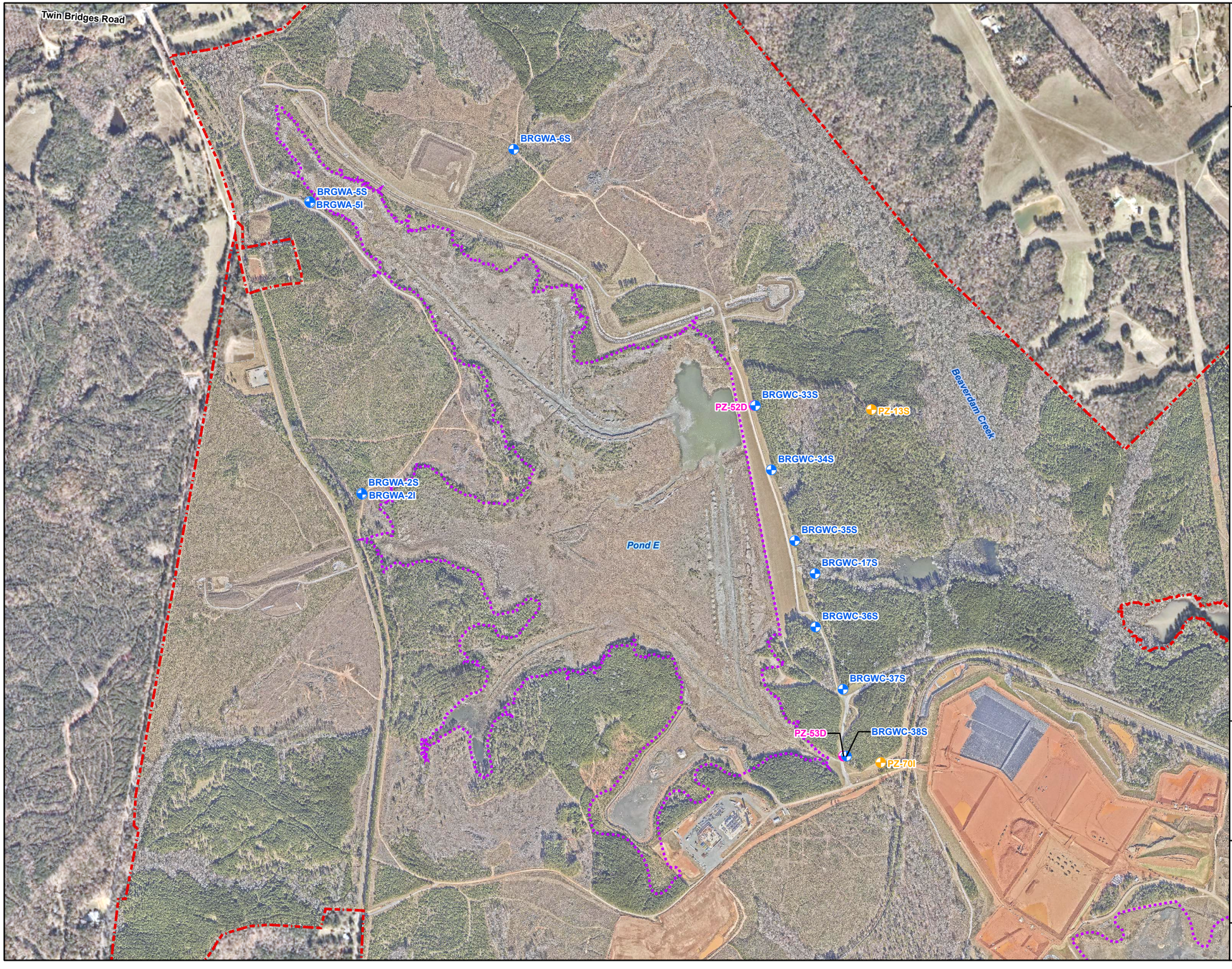
GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

KENNESAW, GA | FEBRUARY 2025

FIGURE 1



N

LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Property Boundary Provided by Southern Company Services.
2. Aerial: Nearmap Imagery, December 2024 and Georgia Power Company, January 2025.

0 1,000 2,000
Scale in Feet

MONITORING WELL NETWORK MAP

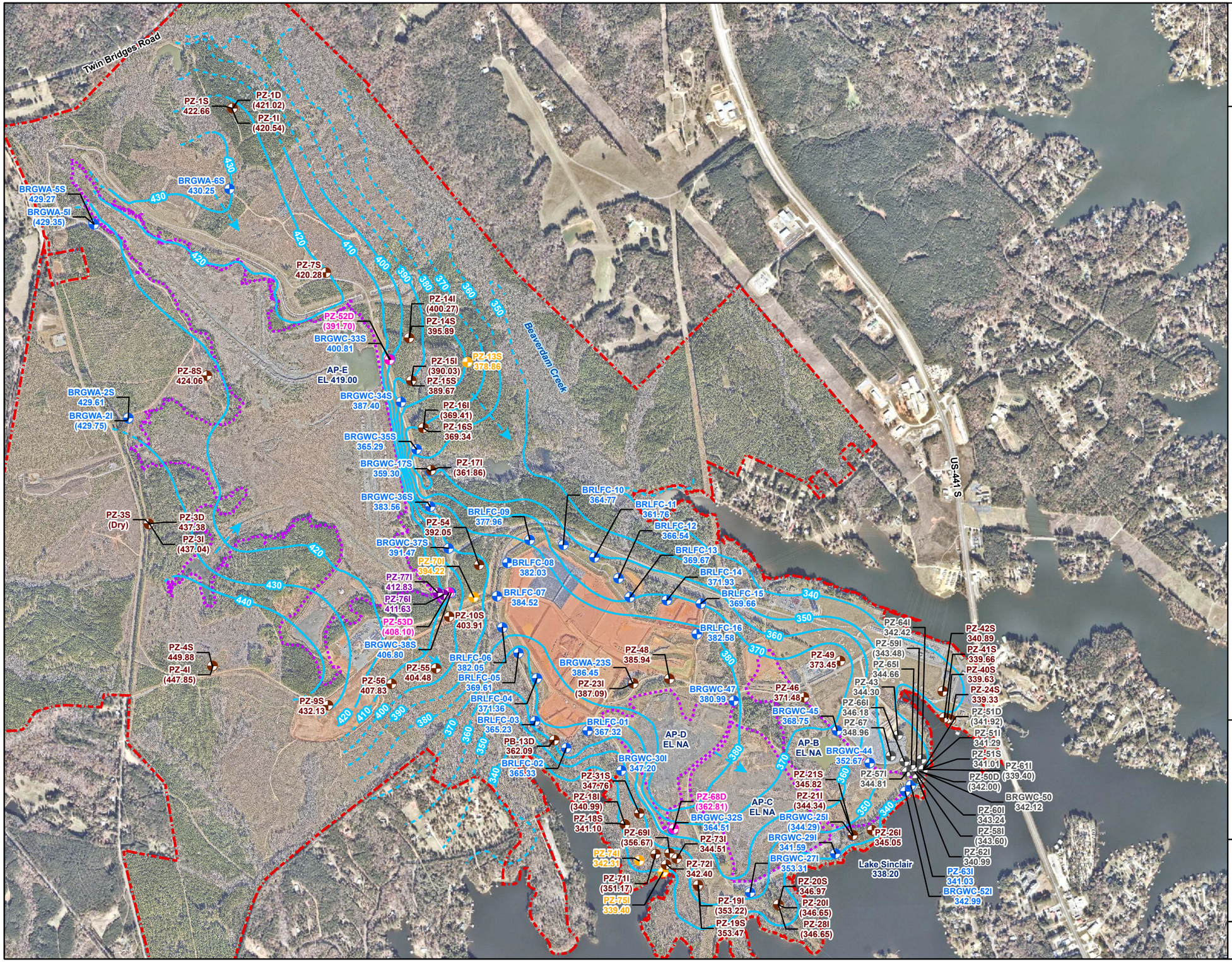
GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

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FIGURE 2



LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Piezometer
- Temporary Piezometer
- Former Coal Pile Area Piezometer
- Groundwater Elevation Iso-Contour
- Groundwater Elevation Iso-Contour (Inferred)
- Approximate Groundwater Flow Direction
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Water level elevation recorded on August 26, 2024, for semiannual groundwater event.
2. Elevation provided in feet (ft) referenced to the North American Vertical Datum of 1988 (NAVD 88).
3. Groundwater iso-contours based on linear interpolation and extrapolation from known groundwater elevation data, and topographic elevations.
4. Groundwater elevations in parentheses were not used to make the groundwater contours because these wells are screened at a different elevation in the formation/aquifer.
5. Coordinate System: NAD 1983 State Plane Georgia West_FIPS (U.S. Feet).
6. Property Boundary Provided by Southern Company Services.
7. Aerial: Nearmap Imagery, December 2024 and Georgia Power Company, January 2025.

0 1,500 3,000
Scale in Feet

POTENTIOMETRIC SURFACE CONTOUR MAP - AUGUST 2024

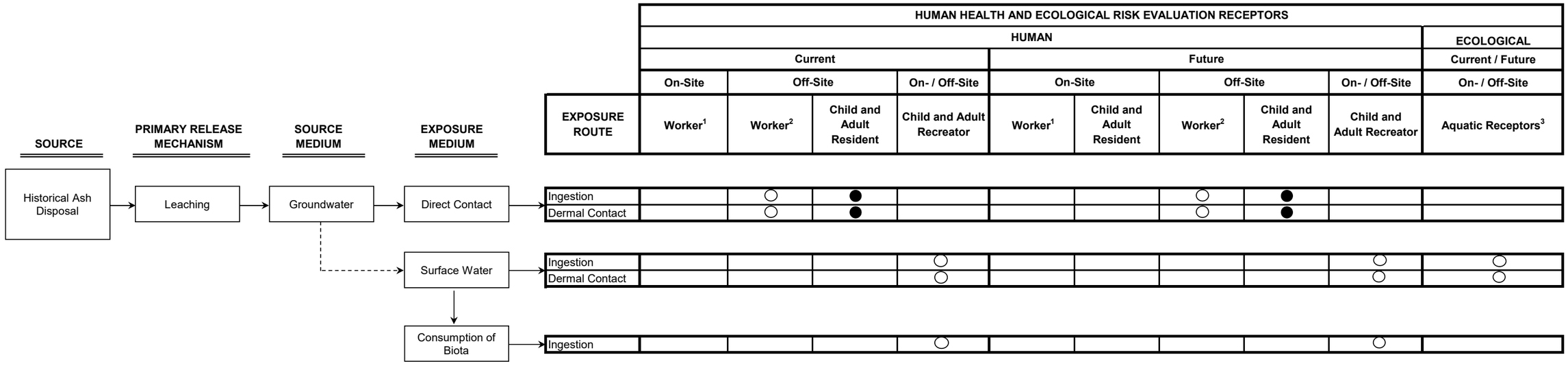
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PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

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FIGURE 3



Legend

A conservative assumption for this assessment was made that groundwater from the site flows to the downgradient surface water.

Indicates potentially complete pathway to receptors, which are evaluated quantitatively.

Indicates potentially complete pathway to receptors, which are evaluated qualitatively.

Footnotes

1. Industrial worker was considered to have no complete pathways because there are no wells on-site that are classified for use as potable wells. On-site construction workers would be expected to have little to no direct contact with on-site groundwater due to safety procedures outlined in their site-specific health and safety plans.
2. Off-site industrial/construction worker addressed through the evaluation of hypothetical off-site residential receptors as health-protective screening levels for residential receptors would be more conservative than industrial and construction worker screening levels.
3. Generalized receptor for ecological health risk evaluation.

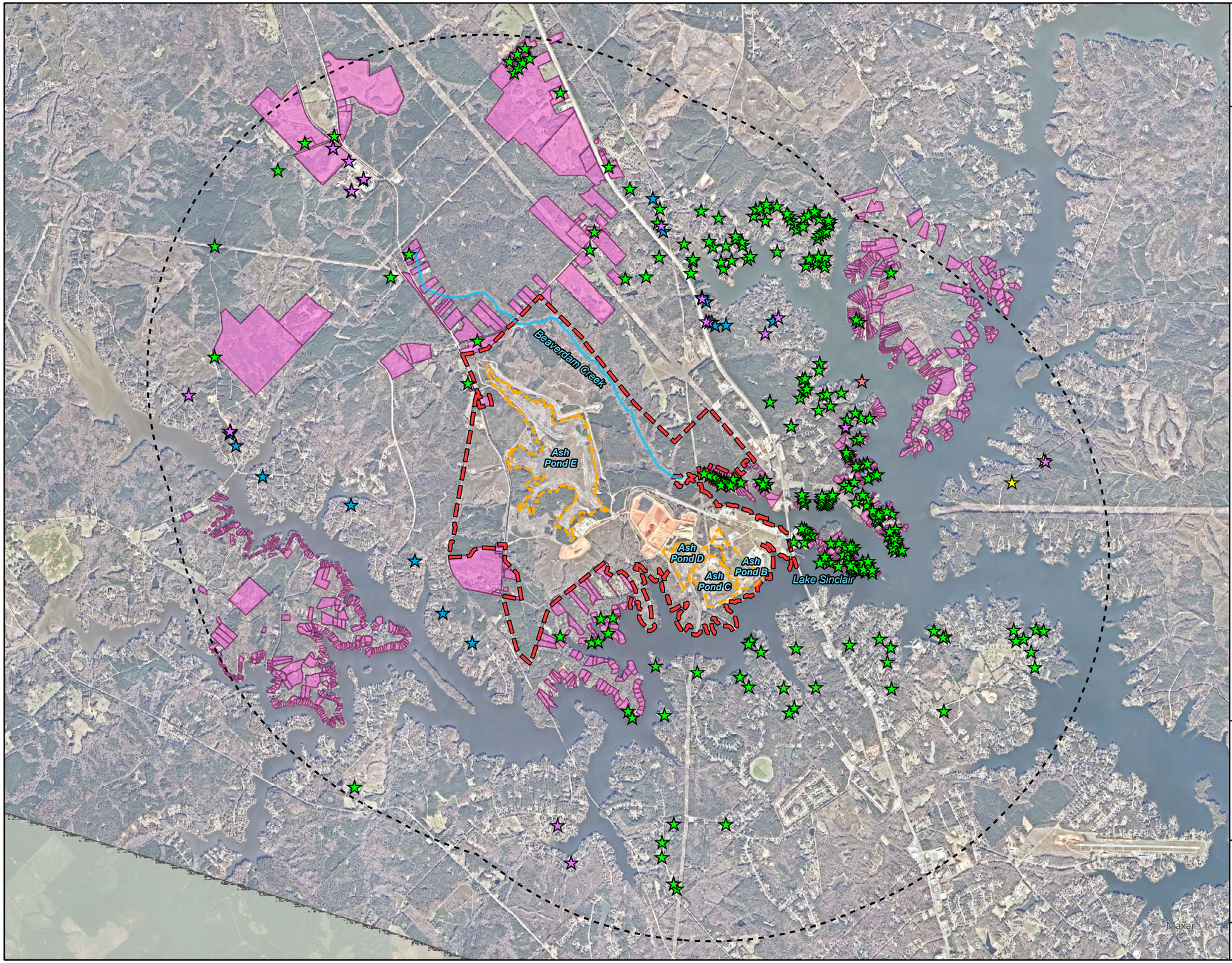
Conceptual Exposure Model

Georgia Power
Plant Branch AP-E

Geosyntec consultants

Kennesaw, GA | February 2025

Figure 4



N

LEGEND

Off Site Wells

- Private Drinking Well
- Inactive Public Drinking Well
- Public Drinking Well
- Surface Water Intake
- Monitoring Well
- Creek
- Approximate Site Boundary
- 3-Mile Radius
- Parcels Identified as Likely Having a Well
- Approximate Ash Pond Boundary

Notes:
1. Coordinate System: NAD 1983 State Plane Georgia West_FIPS (U.S. Feet).
2. Property Boundary Provided by Southern Company Services.
3. Aerial: Nearmap December 2024.

0 2,500 5,000 10,000 Feet

OFF-SITE WELL SURVEY RESULTS

GEORGIA POWER COMPANY
PLANT BRANCH
PUTNAM COUNTY, GEORGIA

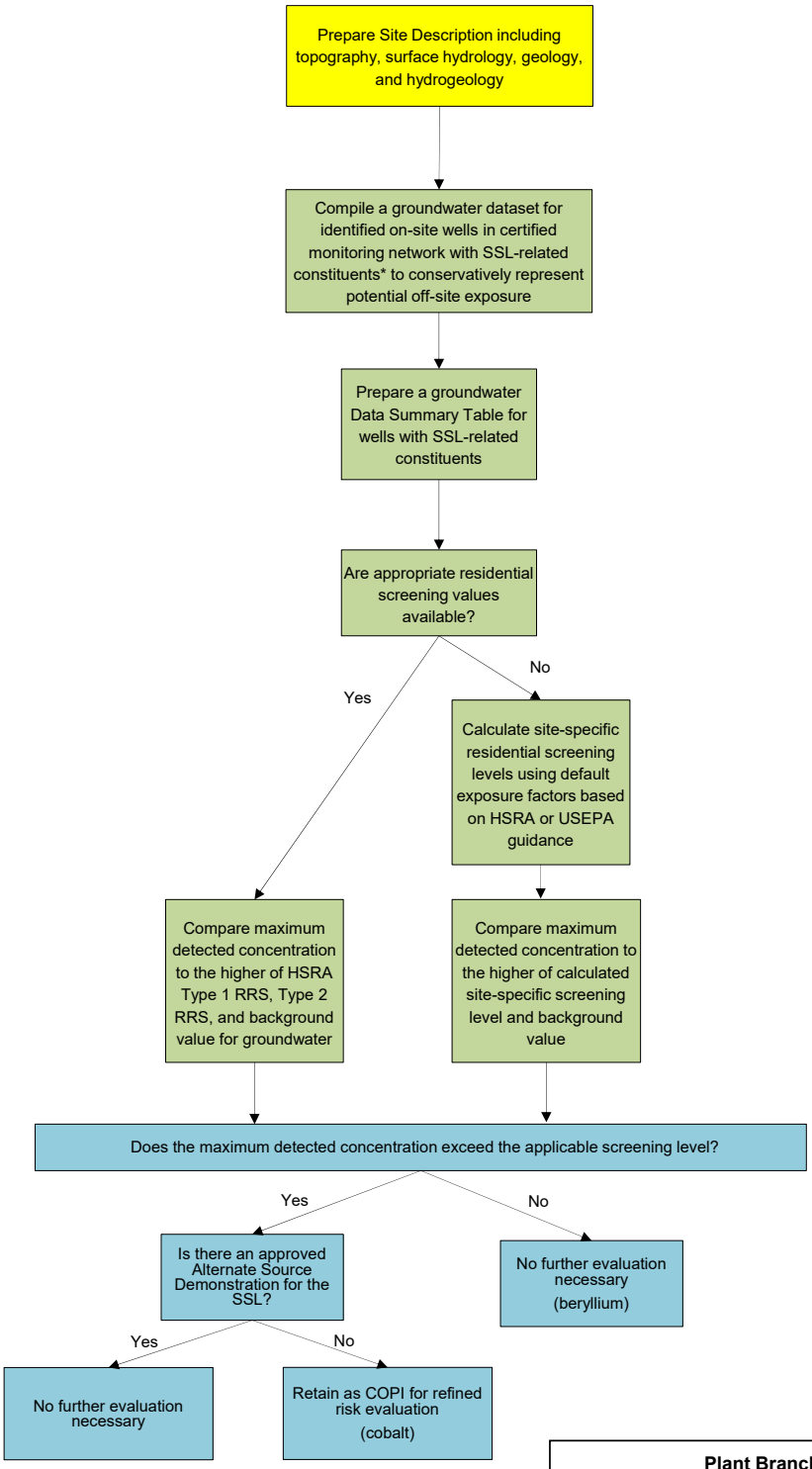
Prepared For: Georgia Power

Prepared By: Geosyntec consultants

KENNESAW, GA | FEBRUARY 2025

FIGURE 5

Groundwater Risk Screening Approach for AP-E

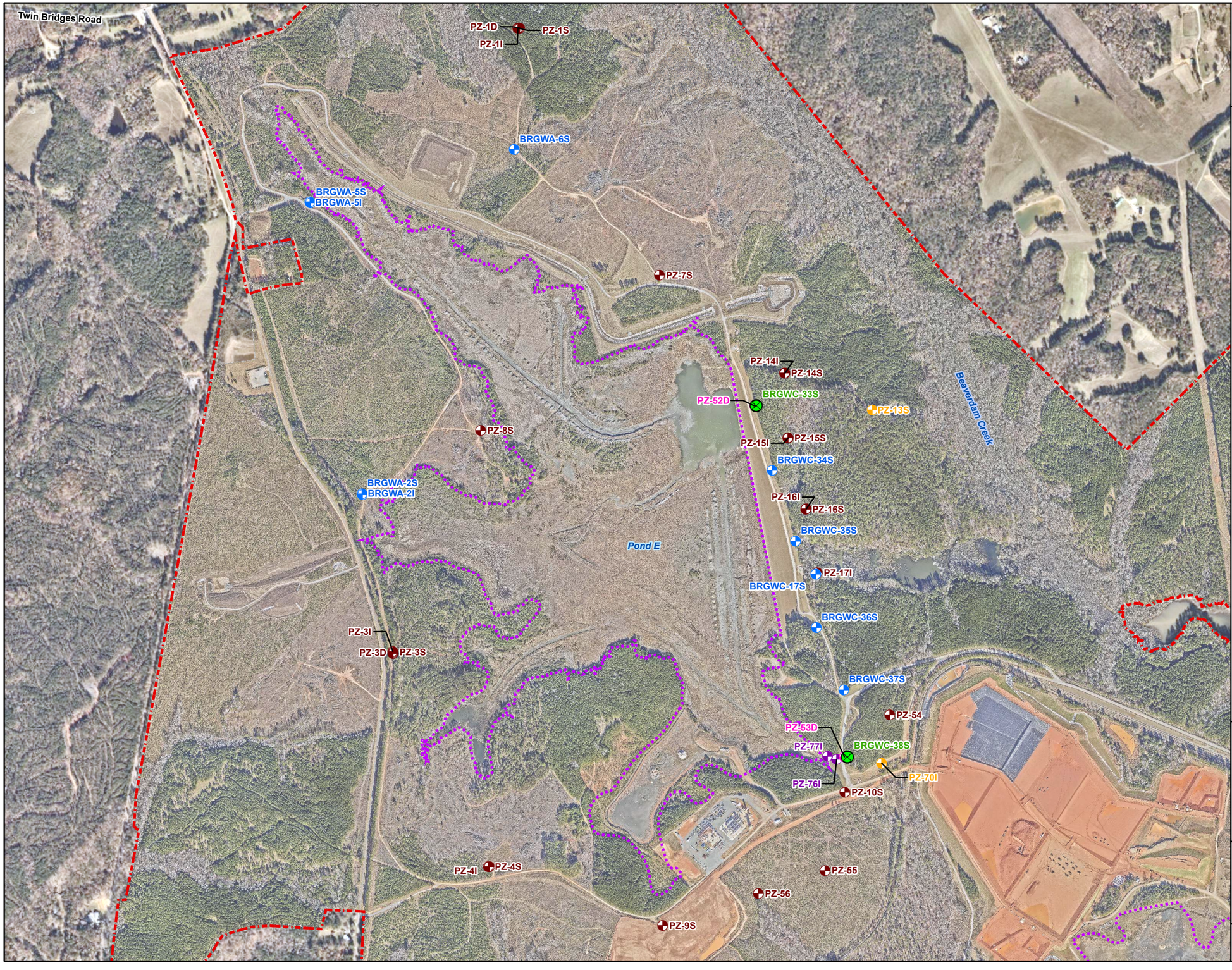


Notes:
* Initial screen evaluates wells at AP-E with SSL-related constituents, beryllium and cobalt
SSL = Statistically Significant Level
COPI = Constituent of Potential Interest
HSRA = Hazardous Site Response Act
RRS = Risk Reduction Standard
USEPA = United States Environmental Protection Agency

Plant Branch AP-E
Groundwater Risk Screening Approach

Figure 6

February 2025



N

LEGEND

- Wells with SSL Related Constituents
- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Piezometer
- Temporary Piezometer
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Notes:
1. Cobalt State CCR Rule SSL-Related Constituent: BRGWC-33S, and BRGWC-38S.
2. Beryllium State CCR Rule SSL-Related Constituent: BRGWC-38S.
3. Property Boundary Provided by Southern Company Services.
4. Aerial: Nearmap Imagery, December 2024 and Georgia Power Company, January 2025.

0 1,000 2,000
Scale in Feet

MONITORING WELLS INCLUDED IN RISK SCREEN - AP-E

GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

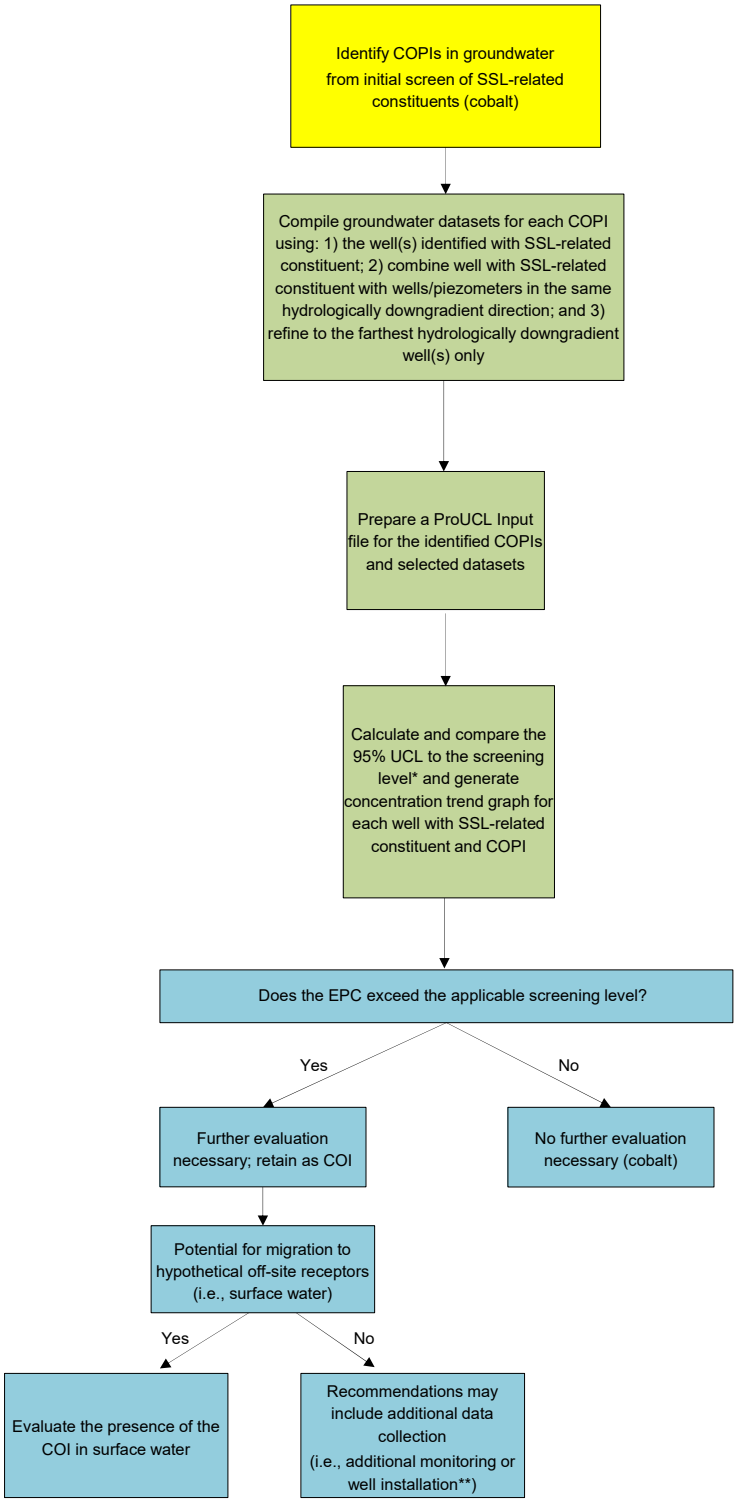
Prepared For: Georgia Power

Prepared By: Geosyntec consultants

KENNESAW, GA | FEBRUARY 2025

FIGURE 7

Refined Risk Evaluation Approach (Groundwater) for AP-E



Notes:
*If the 95% UCL exceeds the maximum concentration, use the maximum as the EPC.
**This step is not necessary for AP-E
SSL = Statistically Significant Level
COPI = Constituent of Potential Interest
EPC = Exposure Point Concentration
UCL = Upper Confidence Limit
COI = Constituent of Interest

Plant Branch AP-E
Refined Groundwater Risk Evaluation Approach

Figure 8

February 2025

APPENDIX A

Plant Branch Well Survey (Off-Site)

Well Survey

Plant Branch

Ash Ponds B, C, D and E

Putnam County, GA

Prepared for

Georgia Power Company

241 Ralph McGill Blvd., Atlanta, GA 30308

Prepared by

NewFields

1349 W. Peachtree Street, Suite 2000

Atlanta, GA 30309

March 5, 2020

Introduction

Plant Branch is located on the northern shore of Lake Sinclair near Milledgeville and Eatonton in Putnam County.

Newfields conducted a well survey of potential drinking water wells within a three-mile radius of the Coal Combustion Residual (CCR) facilities at Plant Branch: Ash Ponds B, C, D and E. This radius is referred to in this report as the Investigated Area, and is shown on Figure 1.

As part of this survey, NewFields accessed and reviewed information from a number of Federal, State, and County records and online sources, as well as a windshield survey of the Investigated Area. Information from each identified well was then compiled into a geographic information system (GIS) database.

Information Collection

This section summarizes the sources utilized for identifying potential drinking water wells within the Investigated Area.

1. Federal Sources
    a. **United States Geological Survey (USGS).** USGS maintains an inventory database of wells sampled by USGS-affiliated programs for ground-water levels or water quality parameters at any time in the past.[1] Well information and coordinates were downloaded for the state of Georgia and compiled into the GIS database. Wells in this database are labeled 'human drinking water' or 'monitoring wells'; however, many of the monitoring wells appear to be co-located with drinking water wells. Some of these USGS monitoring wells may in fact be private drinking water wells utilized for monitoring purposes by USGS. Some listings in this database are over 50 years old and may be inactive.

       In addition, the USGS data contains information about major surface water intakes, including both industrial and municipal drinking water intakes. Specific information about the operator and use of the water is not included, but can be determined using information from other sources. Three surface water intakes are present on Lake Sinclair. One intake is located on Georgia Power property and was assumed to be associated with former plant operations. The others appear to belong to the Sinclair Water Authority.

    b. **Safe Drinking Water Information System (SDWIS).** This EPA database has listings of public water systems but does not have well location information. SDWIS information was used to help identify the suppliers of public water in the vicinity of the facility. Public water in the area is supplied primarily by the Sinclair Water Authority.

2. State Sources

[1] http://waterdata.usgs.gov/ga/nwis/inventory?introduction

a. **Georgia Environmental Protection Division**

i. **Drinking Water Branch.** EPD maintains records about municipal and industrial wells, whose presence or absence within a radius of a site can be ascertained by contacting the agency. An email was sent to Michael Gillis of EPD on October 23rd, 2019 requesting information about wells in the Investigated Area. He confirmed there is one active well at the Georgia Power Skills Development Center at Plant Branch, and two active wells for the Scenic Shores Subdivision. The Skills Development Center well is located on Georgia Power property approximately 0.25 miles northeast from Ash Pond B. This well is a transient well serving approximately 60 people annually (i.e., the population changes and the system is not regularly serving the same people). The locations of the two Scenic Shores wells were established using a combination of information from the EPD Drinking Water Branch website, parcel data, and aerial photography. These two wells are 2.3 and 2.6 miles northeast from Ash Pond B, across Lake Sinclair. The Scenic Shores system serves a residential population of 1,095.

NewFields also used the Drinking Water Branch website to identify the subdivisions in the Investigated Area that have inactive community water systems. As discussed below, even though these subdivisions are older than the primary public water infrastructure in the area, they were designed to use community systems, not maintain private wells. These systems have since been connected to the Sinclair Water Authority system

ii. **EPD Pesticide Project.** From 2000 to 2004, EPD undertook a project to sample private drinking water wells for pesticides. EPD solicited volunteers state-wide to participate in the well sampling program. The final report includes the list of private water wells sampled, their coordinates, and depths when available.[2] Information about wells within the Investigated Area were compiled into the GIS database.

iii. **Hazardous Site Inventory (HSI) files.** EPD maintains the HSI files for sites which are undergoing state-led corrective action. These files usually contain groundwater data and well surveys. There are no HSI sites or related data or well surveys within the Investigated Area.

iv. **Hazardous Site Response Act (HSRA) notifications.** EPD maintains non-HSI HSRA notification reports (i.e., notifications submitted after releases of reportable substances). NewFields reviewed reports associated with sites in Carroll and Coweta County. No wells were identified within the Investigated Area.

b. **Agricultural and Environmental Services Laboratory (AESL) records.** The University of Georgia's AESL Laboratory tests drinking water samples submitted by private individuals to

[2] https://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/PR-55.pdf

their local county extension service. Maps of these sampling results can be viewed online.[3] Precise coordinates are not available, but NewFields was able to use online images to find approximate locations.

3. County Sources
    a. **Health Department Records.** County health departments (DOH) maintain records of the permits for "on-site sewage management systems" (septic tanks). These permits indicate whether the permittee has private or public water supply, and often identify the exact location of the well on a map. Putnam and Branch counties do not maintain these records in a manner where they are easily searchable using geographic criteria and, as a result no wells could be identified from septic records.

    b. **Water Authority Records.** The Sinclair Water Authority stated that water lines in the area were installed approximately 12 years ago. The Authority also confirmed that when the water lines were installed, many smaller community water systems operated by subdivisions stopped using their wells and connected to the Sinclair Water Authority System. Sinclair Water Authority is a surface water system that is drawing their water supply from Lake Sinclair.

    c. **Tax Assessor Records.** NewFields utilized a tax parcel shapefile acquired from a third-party vendor dated January 2019. NewFields joined that information to parcel improvement data provided by the Putnam County Tax Assessor on November 13, 2019. NewFields also acquired a tax parcel shapefile for Baldwin County on October 23, 2019. However, parcel improvement data was not available from Baldwin County. A download of all the parcel data for Hancock County was not available, but parcel was able to use the tax assessors Web site to establish the location of the Scenic Shores Subdivision wells.

4. Windshield Surveys
    a. A windshield survey of the Investigated Area was conducted on November 7, 2019. During the survey wells were visually identified and compiled into the GIS database. The majority of wells identified during the survey were near residences.

Summary

Public water is available throughout the Investigated Area. The water lines are approximately 12 years old; therefore, the majority of the nearby residences were built before municipal water was available. The source of the public water supply in the area is Lake Sinclair. The nearest surface water intake for that system is located approximately 1.75 miles to the northeast of Ash Pond B.

There are three active public wells and eleven inactive public wells in the Investigated Area. The active Skills Development Center well is located on Georgia Power property approximately 0.25 miles northeast from Ash Pond B. This well is a transient well serving approximately 60 people annually. The

[3] http://aesl.ces.uga.edu/water/map/

locations of the two active Scenic Shores wells were established using a combination of information from the EPD Drinking Water Branch website, parcel data, and aerial photography. These two wells are 2.3 and 2.6 miles northeast from Ash Pond B, across Lake Sinclair. The Scenic Shores system serves a residential population of 1,095. Active public wells and the surface water intake are highlighted on Table 1.

Private wells are also present in the Investigated Area. In addition to identifying specific private wells from the above listed sources, NewFields used a combination of parcel data and information about the presence and age of public water infrastructure in Putnam County to identify parcels that may be (or have been) using private well water as their drinking water source. Several subdivisions, including Flat Rock, Forest Village, and Tanglewood, were built with community water systems that are now inactive due the expansion of the Sinclair Water Authority System. These residences were all assumed to now be connected to municipal water and omitted from this analysis regardless of age.

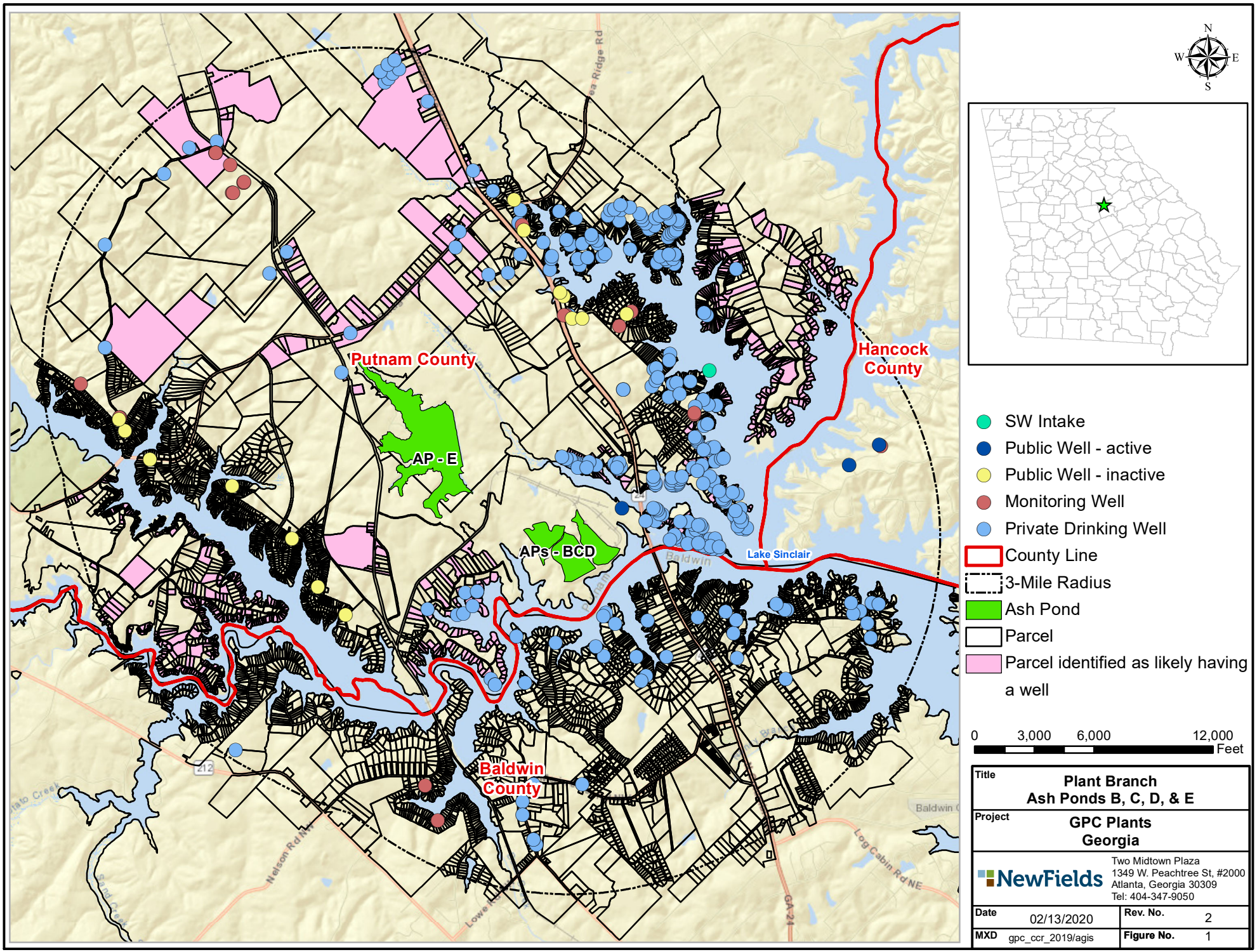
Parcels outside of these subdivisions and built before 2006 were assumed to be associated with a well. Many of these parcels may be (or have been) sharing wells, so a well may not exist for each identified parcel. While these wells are labeled 'drinking water wells' in Table 1, many of those may be inactive.

Parcel improvement data could not be obtained in the Baldwin or Hancock county portions of the Investigated Area, so no parcels were identified in these areas.

Combining well data from all sources with parcel data, NewFields identified 1,143 total parcels with a potentially active or inactive private well within the Investigated Area. Parcel data identified 999 parcels with a potential well. The windshield survey identified 239 wells. Seventeen wells were identified using USGS sources, five from the UGA Laboratory program, and two from the EPD Pesticide Sampling Project. Many wells were identified by multiple sources.[4]

Figure 1 shows points for identified wells in the Investigated Area. The shaded parcels on Figure 1 are the parcels that were identified from parcel data as likely to contain wells. When viewed as a PDF file, the figure is interactive, and wells identified using different sources can be turned on and off.

[4] USGS monitoring wells located on Georgia Power property were also considered not to be drinking water wells and omitted.



Title	Plant Branch Ash Ponds B, C, D, & E
Project	GPC Plants Georgia
NewFields	Two Midtown Plaza 1349 W. Peachtree St, #2000 Atlanta, Georgia 30309 Tel: 404-347-9050
Date	02/13/2020
Rev. No.	2
MXD	gpc_ccr_2019/agis
Figure No.	1

APPENDIX B
Data Used in Risk Evaluation

Appendix B
Groundwater Data
Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

Well ID	Ash Pond	Exposure Unit	Constituent	Beryllium				Cobalt			
			Units	mg/L				mg/L			
			Sample Date	Result	RL	MDL	Qualifier	Result	RL	MDL	Qualifier
BRA-BRGWC-33S	AP-E	North	9/7/2016	Beryllium not an SSL constituent at BRA-BRGWC-33S				**0.0612**	0.01	0.0005	
BRA-BRGWC-33S	AP-E	North	11/17/2016					**0.0551**	0.01	0.0005	
BRA-BRGWC-33S	AP-E	North	2/22/2017					**0.0567**	0.01	0.0005	
BRA-BRGWC-33S	AP-E	North	6/14/2017					**0.0557**	0.01	0.0003	
BRA-BRGWC-33S	AP-E	North	9/27/2017					**0.049**	0.01	0.0003	
BRA-BRGWC-33S	AP-E	North	2/15/2018					**0.0536**	0.01	0.26	
BRA-BRGWC-33S	AP-E	North	6/27/2018					**0.054**	0.01	0.00052	
BRA-BRGWC-33S	AP-E	North	12/18/2018					**0.049**	0.01	0.00052	
BRA-BRGWC-33S	AP-E	North	8/27/2019					**0.045**	0.01	0.0003	
BRA-BRGWC-33S	AP-E	North	10/16/2019					**0.042**	0.005	0.0003	
BRA-BRGWC-33S	AP-E	North	3/5/2020					**0.037**	0.005	0.0003	
BRA-BRGWC-33S	AP-E	North	8/19/2020					**0.036**	0.005	0.00038	
BRA-BRGWC-33S	AP-E	North	9/16/2020					**0.034**	0.005	0.00038	
BRA-BRGWC-33S	AP-E	North	3/3/2021					**0.028**	0.005	0.00038	
BRA-BRGWC-33S	AP-E	North	9/22/2021					**0.024**	0.005	0.00039	
BRA-BRGWC-33S	AP-E	North	2/1/2022					**0.027**	0.005	0.00039	
BRA-BRGWC-33S	AP-E	North	8/23/2022					**0.0639**	0.001	0.0003	
BRA-BRGWC-33S	AP-E	North	1/24/2023					**0.0582**	0.001	0.0003	
BRA-BRGWC-33S	AP-E	North	8/22/2023					**0.0659**	0.001	0.0003	
BRA-BRGWC-33S	AP-E	North	1/31/2024					**0.0988**	0.001	0.0003	
BRA-BRGWC-33S	AP-E	North	8/28/2024					**0.104**	0.001	0.0003	
BRA-PZ-13S	AP-E	North	1/15/2019					< 0.00052	0.01	0.00052	U
BRA-PZ-13S	AP-E	North	10/22/2019					**0.00037**	0.005	0.0003	J
BRA-PZ-13S	AP-E	North	8/23/2022					< 0.0003	0.001	0.0003	U
BRA-PZ-13S	AP-E	North	1/26/2023					< 0.0003	0.001	0.0003	U
BRA-PZ-13S	AP-E	North	8/22/2023					< 0.0003	0.001	0.0003	U
BRA-PZ-13S	AP-E	North	1/30/2024					< 0.0003	0.001	0.0003	U
BRA-PZ-13S	AP-E	North	8/28/2024					<0.0003	0.001	0.0003	U
BRA-PZ-15I	AP-E	North	1/16/2019					< 0.00052	0.01	0.00052	U
BRA-PZ-15I	AP-E	North	10/21/2019					< 0.0003	0.005	0.0003	U
BRA-PZ-15S	AP-E	North	1/16/2019					**0.001**	0.01	0.00052	J
BRA-PZ-15S	AP-E	North	10/21/2019					**0.0022**	0.005	0.0003	J
BRA-PZ-52D	AP-E	North	6/19/2020					**0.00034**	0.005	0.0003	J
BRA-PZ-52D	AP-E	North	9/1/2022					**0.0015**	0.001	0.0003	
BRA-PZ-52D	AP-E	North	1/25/2023					**0.0025**	0.001	0.0003	
BRA-PZ-52D	AP-E	North	8/23/2023					**0.00031**	0.001	0.0003	J
BRA-PZ-52D	AP-E	North	1/31/2024					**0.00104**	0.001	0.0003	
BRA-PZ-52D	AP-E	North	8/28/2024					**0.000337**	0.001	0.0003	J
BRA-BRGWC-38S	AP-E	South	9/7/2016	**0.008**	0.003	0.00008		**0.236**	0.01	0.0005	
BRA-BRGWC-38S	AP-E	South	11/21/2016	**0.0092**	0.003	0.00008		**0.298**	0.01	0.0005	
BRA-BRGWC-38S	AP-E	South	2/23/2017	**0.01**	0.003	0.00008		**0.277**	0.01	0.0005	
BRA-BRGWC-38S	AP-E	South	6/15/2017	**0.010**	0.003	0.00009		**0.262**	0.01	0.0003	
BRA-BRGWC-38S	AP-E	South	9/28/2017	**0.0098**	0.003	0.00009		**0.279**	0.01	0.0003	
BRA-BRGWC-38S	AP-E	South	2/15/2018	**0.011**	0.015	0.46	J	**0.279**	0.01	0.26	
BRA-BRGWC-38S	AP-E	South	6/28/2018	**0.0085**	0.003	0.00005		**0.23**	0.01	0.0005	
BRA-BRGWC-38S	AP-E	South	12/20/2018	**0.0092**	0.003	0.00005		**0.25**	0.01	0.0005	
BRA-BRGWC-38S	AP-E	South	8/29/2019	**0.0088**	0.003	0.00007		**0.21**	0.01	0.0003	
BRA-BRGWC-38S	AP-E	South	10/16/2019	**0.0079**	0.003	0.00007		**0.21**	0.005	0.0003	
BRA-BRGWC-38S	AP-E	South	3/5/2020	**0.0082**	0.003	0.00007		**0.22**	0.005	0.0003	
BRA-BRGWC-38S	AP-E	South	8/19/2020	**0.0079**	0.003	0.00005		**0.22**	0.005	0.00038	
BRA-BRGWC-38S	AP-E	South	9/17/2020	**0.0073**	0.003	0.00005		**0.2**	0.005	0.00038	
BRA-BRGWC-38S	AP-E	South	3/4/2021	**0.0077**	0.0005	0.00005		**0.2**	0.005	0.00038	
BRA-BRGWC-38S	AP-E	South	9/23/2021	**0.0071**	0.0005	0.00005		**0.17**	0.005	0.00039	
BRA-BRGWC-38S	AP-E	South	2/1/2022	**0.0072**	0.0005	0.00005		**0.18**	0.005	0.00039	
BRA-BRGWC-38S	AP-E	South	8/23/2022	**0.0085**	0.0005	0.0002		**0.173**	0.001	0.0003	
BRA-BRGWC-38S	AP-E	South	1/25/2023	**0.0078**	0.0005	0.0002		**0.158**	0.001	0.0003	
BRA-BRGWC-38S	AP-E	South	8/23/2023	**0.0068**	0.0005	0.0002		**0.139**	0.001	0.0003	
BRA-BRGWC-38S	AP-E	South	1/31/2024	**0.0059**	0.0005	0.0002		**0.134**	0.001	0.0003	
BRA-BRGWC-38S	AP-E	South	8/27/2024	**0.0064**	0.0005	0.0002		**0.119**	0.001	0.0003	
BRA-PZ-53D	AP-E	South	6/4/2020	< 0.000074	0.003	0.00007	U	**0.0012**	0.005	0.0003	J
BRA-PZ-53D	AP-E	South	8/23/2022	< 0.0002	0.0005	0.0002	U	< 0.0003	0.001	0.0003	U

Appendix B
Groundwater Data
Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

Well ID	Ash Pond	Exposure Unit	Constituent	Beryllium				Cobalt			
			Units	mg/L				mg/L			
			Sample Date	Result	RL	MDL	Qualifier	Result	RL	MDL	Qualifier
BRA-PZ-53D	AP-E	South	1/25/2023	< 0.0002	0.0005	0.0002	U	< 0.0003	0.001	0.0003	U
BRA-PZ-53D	AP-E	South	8/24/2023	< 0.0002	0.0005	0.0002	U	< 0.0003	0.001	0.0003	U
BRA-PZ-53D	AP-E	South	1/31/2024	< 0.0002	0.0005	0.0002	U	< 0.0003	0.001	0.0003	U
BRA-PZ-53D	AP-E	South	8/27/2024	< 0.0002	0.0005	0.0002	U	< 0.0003	0.001	0.0003	U
BRA-PZ-70I	AP-E	South	9/1/2022	< 0.0002	0.0005	0.0002	U	**0.0056**	0.001	0.0003	
BRA-PZ-70I	AP-E	South	1/26/2023	**0.00022**	0.0005	0.0002	J	**0.000682**	0.001	0.0003	J
BRA-PZ-70I	AP-E	South	8/23/2023	**0.00033**	0.0005	0.0002	J	**0.000784**	0.001	0.0003	J
BRA-PZ-70I	AP-E	South	1/31/2024	**0.00034**	0.0005	0.0002	J	**0.000866**	0.001	0.0003	J
BRA-PZ-70I	AP-E	South	8/28/2024	**0.000344**	0.0005	0.0002	J	**0.000686**	0.001	0.0003	J

Notes:
-- = A value is not available for presentation
Bold = the constituent was detected in the sample.
< = Non-detect result; the MDL is presented
ID = identification
J = Estimated value; the presented value is below the reporting limit but above the MDL.
MDL = method detection limit
mg/L milligrams(s) per liter
RL = reporting limit
SSL = statistically significant level
U = Non-detect result; the reporting limit is presented

APPENDIX C

USEPA RSL Calculator Generated Residential Screening Levels

Appendix C
USEPA RSL Calculator Generated Residential Screening Levels
Plant Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.00001
LT (lifetime) years	70
K (volatilization factor of Andelman) L/m3	0.5
lsc (apparent thickness of stratum corneum) cm	0.001
EDres (exposure duration - resident) years	26
EDres-c (exposure duration - child) years	6
EDres-a (exposure duration - adult) years	20
ED0-2 (mutagenic exposure duration first phase) years	2
ED2-6 (mutagenic exposure duration second phase) years	4
ED6-16 (mutagenic exposure duration third phase) years	10
ED16-26 (mutagenic exposure duration fourth phase) years	10
EFres (exposure frequency) days/year	350
EFres-c (exposure frequency - child) days/year	350
EFres-a (exposure frequency - adult) days/year	350
EF0-2 (mutagenic exposure frequency first phase) days/year	350
EF2-6 (mutagenic exposure frequency second phase) days/year	350
EF6-16 (mutagenic exposure frequency third phase) days/year	350
EF16-26 (mutagenic exposure frequency fourth phase) days/year	350
ETevent-res-adj (age-adjusted exposure time) hours/event	0.67077
ETevent-res-madj (mutagenic age-adjusted exposure time) hours/event	0.67077
ETres (exposure time) hours/day	24
ETres-c (dermal exposure time - child) hours/event	0.54
ETres-a (dermal exposure time - adult) hours/event	0.71
ETres-c (inhalation exposure time - child) hours/day	24
ETres-a (inhalation exposure time - adult) hours/day	24
ET0-2 (mutagenic inhalation exposure time first phase) hours/day	24
ET2-6 (mutagenic inhalation exposure time second phase) hours/day	24
ET6-16 (mutagenic inhalation exposure time third phase) hours/day	24
ET16-26 (mutagenic inhalation exposure time fourth phase) hours/day	24
ET0-2 (mutagenic dermal exposure time first phase) hours/event	0.54
ET2-6 (mutagenic dermal exposure time second phase) hours/event	0.54
ET6-16 (mutagenic dermal exposure time third phase) hours/event	0.71
ET16-26 (mutagenic dermal exposure time fourth phase) hours/event	0.71
BWres-a (body weight - adult) kg	80
BWres-c (body weight - child) kg	15
BW0-2 (mutagenic body weight) kg	15
BW2-6 (mutagenic body weight) kg	15
BW6-16 (mutagenic body weight) kg	80
BW16-26 (mutagenic body weight) kg	80
IFWres-adj (adjusted intake factor) L/kg	327.95
IFWres-adj (adjusted intake factor) L/kg	327.95
IFWMres-adj (mutagenic adjusted intake factor) L/kg	1019.9
IFWMres-adj (mutagenic adjusted intake factor) L/kg	1019.9
IRWres-c (water intake rate - child) L/day	0.78
IRWres-a (water intake rate - adult) L/day	2.5
IRW0-2 (mutagenic water intake rate) L/day	0.78
IRW2-6 (mutagenic water intake rate) L/day	0.78
IRW6-16 (mutagenic water intake rate) L/day	2.5
IRW16-26 (mutagenic water intake rate) L/day	2.5
EVres-a (events - adult) per day	1
EVres-c (events - child) per day	1
EV0-2 (mutagenic events) per day	1
EV2-6 (mutagenic events) per day	1
EV6-16 (mutagenic events) per day	1
EV16-26 (mutagenic events) per day	1
DFWres-adj (age-adjusted dermal factor) cm2-event/kg	2610650
DFWMres-adj (mutagenic age-adjusted dermal factor) cm2-event/kg	8191633
SAres-c (skin surface area - child) cm2	6365
SAres-a (skin surface area - adult) cm2	19652
SA0-2 (mutagenic skin surface area) cm2	6365
SA2-6 (mutagenic skin surface area) cm2	6365
SA6-16 (mutagenic skin surface area) cm2	19652
SA16-26 (mutagenic skin surface area) cm2	19652

Output generated 11FEB2025:11:51:30

Appendix C
USEPA RSL Calculator Generated Residential Screening Levels
Plant Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

Chemical	Beryllium and compounds	Cobalt
CAS Number	7440-41-7	7440-48-4
Mutagen?	No	No
Volatile?	No	No
Chemical Type	Inorganics	Inorganics
Sfo (mg/kg-day)-1	-	-
Sfo Ref		
IUR (ug/m3)-1	0.0024	0.009
IUR Ref	I	P
RfD (mg/kg-day)	0.002	0.0003
RfD Ref	I	P
RfC (mg/m3)	0.00002	0.000006
RfC Ref	I	P
GIABS	0.007	1
Kp (cm/hr)	0.001	0.0004
MW	9.01	58.9
B (unitless)	0.00115	0.00118
t* (hr)	0.283	0.54
τevent (hr/event)	0.118	0.225
FA (unitless)	1	1
In EPD?	Yes	Yes
DAevent (ca)	-	-
DAevent (nc child)	0.0000344	0.000737
DAevent (nc adult)	0.0000594	0.00127
MCL (ug/L)	4	-
Ingestion SL TR=1E-05 (ug/L)	-	-
Dermal SL TR=1E-05 (ug/L)	-	-
Inhalation SL TR=1E-05 (ug/L)	-	-
Carcinogenic SL TR=1E-05 (ug/L)	-	-
Ingestion SL Child THQ=1 (ug/L)	40.1	6.02
Dermal SL Child THQ=1 (ug/L)	63.7	3410
Inhalation SL Child THQ=1 (ug/L)	-	-
Noncarcinogenic SL Child THI=1 (ug/L)	24.6	6.01
Ingestion SL Adult THQ=1 (ug/L)	66.7	10
Dermal SL Adult THQ=1 (ug/L)	83.7	4480
Inhalation SL Adult THQ=1 (ug/L)	-	-
Noncarcinogenic SL Adult THI=1 (ug/L)	37.1	9.99
Screening Level (ug/L)	2.46E+01 nc	6.01E+00 nc

I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

APPENDIX D

Support for Refined Risk Evaluation

Appendix D-1

Exposure Point Concentration Calculation Results

Appendix D
Appendix D-1
Exposure Point Concentration Calculation Results[1]
Plant Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

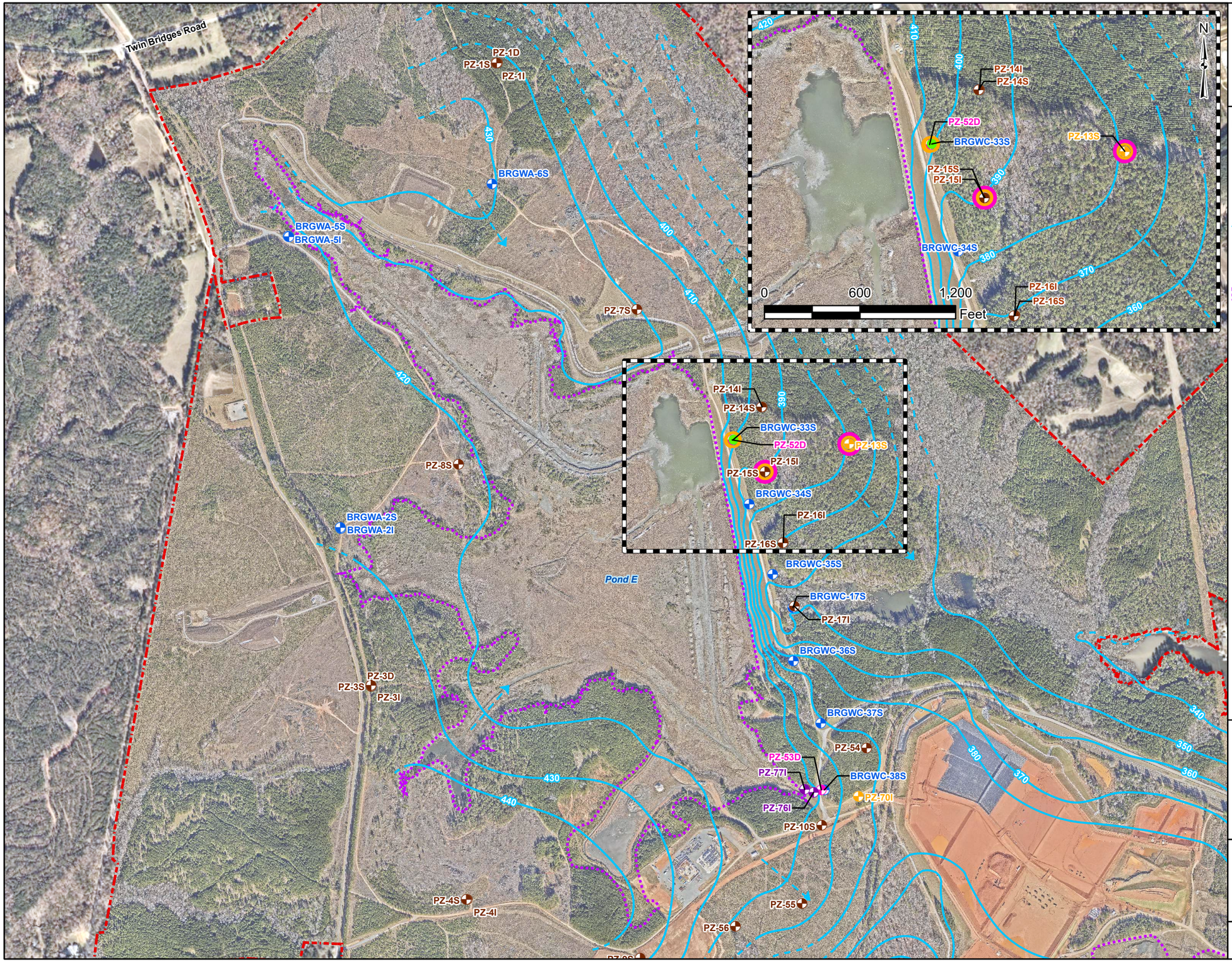
CCR Rule Designation	Constituent	Exposure Unit	Well IDs Included	Maximum Concentration	Detection Frequency	Exceedance Frequency	EPC Step 1	EPC Step 2	EPC Step 3
							Individual Target Well(s) August 2016 - August 2024 (mg/L)	Target Well(s) & Downgradient Well(s) August 2016 - August 2024 (mg/L)	Farthest Downgradient Well(s) August 2016 - August 2024 (mg/L)
Appendix IV	Cobalt	North	BRGWC-33S	0.104	21 / 21	21 / 21	0.06		
			BRGWC-33S PZ-13S PZ-15I PZ-15S PZ-52D	0.104	30 / 38	21 / 38		0.0375	
			PZ-13S PZ-15I PZ-15S	0.0022	3 / 11	0 / 11			0.0022
		South	BRGWC-38S	0.30	21 / 21	21 / 21	0.231		
			BRGWC-38S PZ-53D PZ-70I	0.30	27 / 32	21 / 32		0.172	
			PZ-70I	0.0056	5 / 5	0 / 5			0.0056

Notes:
Yellow highlighted value is the EPC selected for the refined screening.

[1] EPCs calculated in accordance with USEPA, 2014. Memorandum for Determining Groundwater Exposure Point Concentrations, Supplemental Guidance. OSWER Directive 9283.1-42, February 2014. Located at https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236917

Appendix D-2

Exposure Point Concentration Figures



N

LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Piezometer
- Temporary Piezometer
- Groundwater Elevation Iso-Contour
- Groundwater Elevation Iso-Contour (Inferred)
- Approximate Groundwater Flow Direction
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Exposure Point Concentration Wells

- Step 1 Well
- Step 2 Well
- Step 3 Well

Notes:
1. Exposure Point Concentration (EPC).
2. EPC Step 1 - Individual Target Well(s) 2016-2024.
3. EPC Step 2 - Target Well(s) & Adjacent Well(s) & Downgradient Well(s) 2016-2024.
4. EPC Step 3 - Farthest Downgradient Well(s) 2016-2024.
5. Water elevation contours are based on measurements shown on Figure 3. Elevation provided in feet referenced to the North American Vertical Datum (NAVD) 88.
6.Property Boundary Provided by Southern Company Services.
7. Aerial: Nearmap Imagery, December 2024 and Georgia Power Company, January 2025.

0 1,000 2,000
Scale in Feet

EXPOSURE POINT CONCENTRATION MAP
COBALT NORTH EXPOSURE UNIT
AP-E

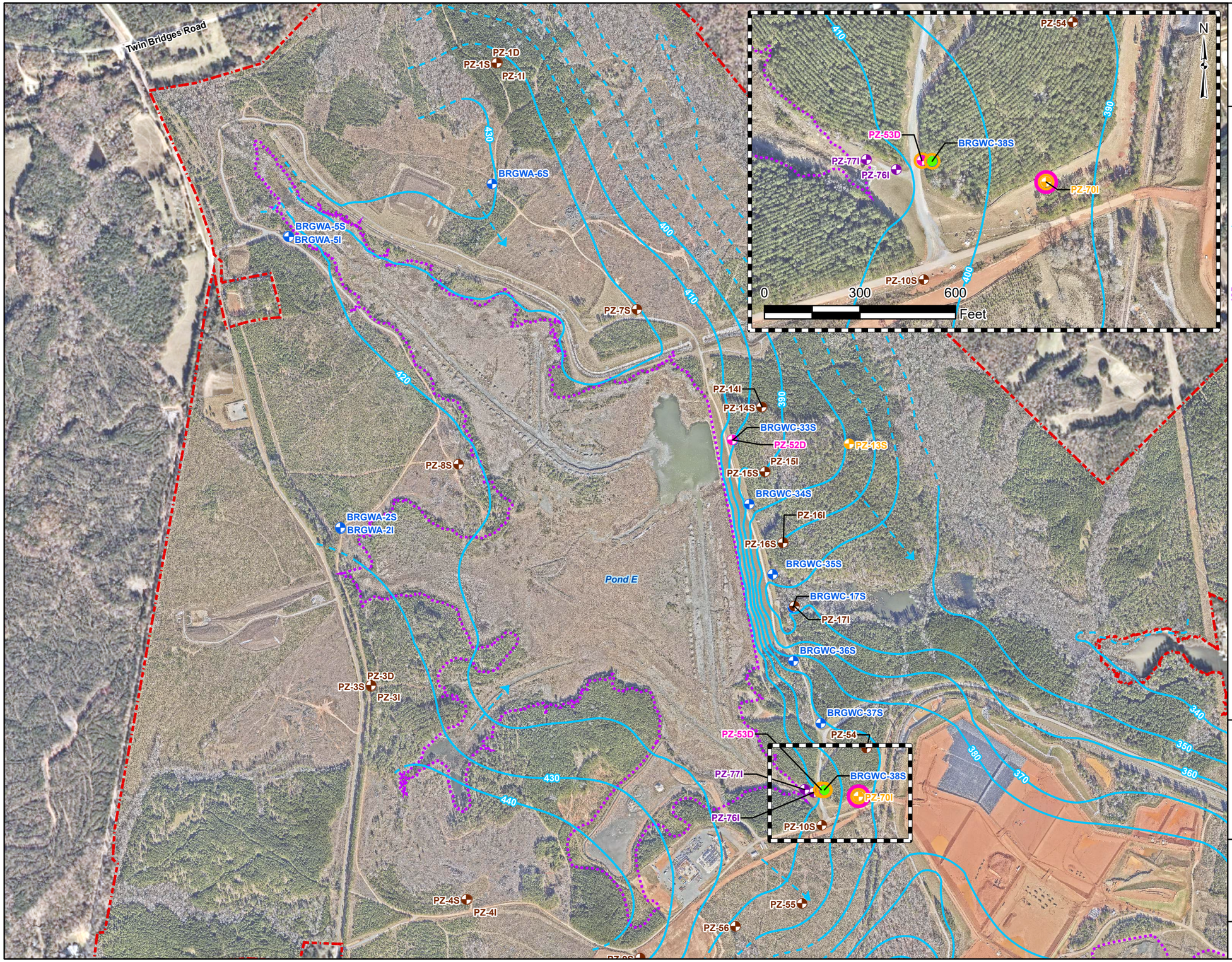
GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

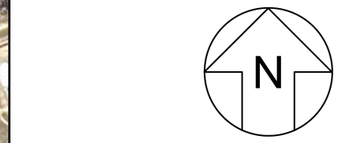
Prepared For: Georgia Power

Prepared By: Geosyntec consultants

KENNESAW, GA | FEBRUARY 2025

FIGURE D-2a





LEGEND

- Detection Monitoring Well
- Horizontal Assessment Monitoring Well
- Vertical Assessment Monitoring Well
- Piezometer
- Temporary Piezometer
- Groundwater Elevation Iso-Contour
- Groundwater Elevation Iso-Contour (Inferred)
- Approximate Groundwater Flow Direction
- Plant Branch Property Boundary
- Approximate Ash Pond Boundary

Exposure Point Concentration Wells

- Step 1 Well
- Step 2 Well
- Step 3 Well

Notes:
1. Exposure Point Concentration (EPC).
2. EPC Step 1 - Individual Target Well(s) 2016-2024.
3. EPC Step 2 - Target Well(s) & Adjacent Well(s) & Downgradient Well(s) 2016-2024.
4. EPC Step 3 - Farthest Downgradient Well(s) 2016-2024.
5. Water elevation contours are based on measurements shown on Figure 3. Elevation provided in feet referenced to the North American Vertical Datum (NAVD) 88.
6.Property Boundary Provided by Southern Company Services.
7. Aerial: Nearmap Imagery, December 2024 and Georgia Power Company, January 2025.

0 1,000 2,000
Scale in Feet

EXPOSURE POINT CONCENTRATION MAP
COBALT SOUTH EXPOSURE UNIT
AP-E

GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

KENNESAW, GA | FEBRUARY 2025

FIGURE D-2b

Appendix D-3

ProUCL Input/Output Files

Appendix D
Appendix D-3
ProUCL Input
Plant Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

Step 1 EPC Calculation Input				Step 2 EPC Calculation Input				Step 3 EPC Calculation Input			
Step1_Cobalt_N	D_Step1_Cobalt_N	Step1_Cobalt_S	D_Step1_Cobalt_S	Step2_Cobalt_N	D_Step2_Cobalt_N	Step2_Cobalt_S	D_Step2_Cobalt_S	Step3_Cobalt_N	D_Step3_Cobalt_N	Step3_Cobalt_S	D_Step3_Cobalt_S
0.0612	1	0.236	1	0.0612	1	0.236	1	0.00052	0	0.0056	1
0.0551	1	0.298	1	0.0551	1	0.298	1	0.00037	1	0.000682	1
0.0567	1	0.277	1	0.0567	1	0.277	1	0.0003	0	0.000784	1
0.0557	1	0.262	1	0.0557	1	0.262	1	0.0003	0	0.000866	1
0.049	1	0.279	1	0.049	1	0.279	1	0.0003	0	0.000686	1
0.0536	1	0.279	1	0.0536	1	0.279	1	0.0003	0		
0.054	1	0.23	1	0.054	1	0.23	1	0.0003	0		
0.049	1	0.25	1	0.049	1	0.25	1	0.00052	0		
0.045	1	0.21	1	0.045	1	0.21	1	0.0003	0		
0.042	1	0.21	1	0.042	1	0.21	1	0.001	1		
0.037	1	0.22	1	0.037	1	0.22	1	0.0022	1		
0.036	1	0.22	1	0.036	1	0.22	1				
0.034	1	0.2	1	0.034	1	0.2	1				
0.028	1	0.2	1	0.028	1	0.2	1				
0.024	1	0.17	1	0.024	1	0.17	1				
0.027	1	0.18	1	0.027	1	0.18	1				
0.0639	1	0.173	1	0.0639	1	0.173	1				
0.0582	1	0.158	1	0.0582	1	0.158	1				
0.0659	1	0.139	1	0.0659	1	0.139	1				
0.0988	1	0.134	1	0.0988	1	0.134	1				
0.104	1	0.119	1	0.104	1	0.119	1				
				0.00052	0	0.0012	1				
				0.00037	1	0.0003	0				
				0.0003	0	0.0003	0				
				0.0003	0	0.0003	0				
				0.0003	0	0.0003	0				
				0.0003	0	0.0003	0				
				0.0003	0	0.0056	1				
				0.00052	0	0.000682	1				
				0.0003	0	0.000784	1				
				0.001	1	0.000866	1				
				0.0022	1	0.000686	1				
				0.00034	1						
				0.0015	1						
				0.00249	1						
				0.000307	1						
				0.00104	1						
				0.000337	1						

Notes:
EPC= Exposure point concentration

Appendix D
Appendix D-3
ProUCL Output
Plant Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.2 2/21/2025 9:22:54 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Step1_Cobalt_N

General Statistics

Total Number of Observations	21	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	0.024	Mean	0.0523
Maximum	0.104	Median	0.0536
SD	0.0204	Std. Error of Mean	0.00446
Coefficient of Variation	0.391	Skewness	1.134

Normal GOF Test

Shapiro Wilk Test Statistic	0.893	**Shapiro Wilk GOF Test**
1% Shapiro Wilk Critical Value	0.873	Data appear Normal at 1% Significance Level
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**
1% Lilliefors Critical Value	0.219	Data appear Normal at 1% Significance Level

Data appear Normal at 1% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.06	95% Adjusted-CLT UCL (Chen-1995)	0.0608
		95% Modified-t UCL (Johnson-1978)	0.0602

Gamma GOF Test

A-D Test Statistic	0.405	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.123	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.19	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.455	k star (bias corrected MLE)	6.422
Theta hat (MLE)	0.00701	Theta star (bias corrected MLE)	0.00814
nu hat (MLE)	313.1	nu star (bias corrected)	269.7
MLE Mean (bias corrected)	0.0523	MLE Sd (bias corrected)	0.0206
		Approximate Chi Square Value (0.05)	232.7
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	230.1

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.0606	95% Adjusted Gamma UCL	0.0613

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk Lognormal GOF Test**
10% Shapiro Wilk Critical Value	0.923	Data appear Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.123	**Lilliefors Lognormal GOF Test**
10% Lilliefors Critical Value	0.173	Data appear Lognormal at 10% Significance Level

Data appear Lognormal at 10% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.73	Mean of logged Data	-3.02
Maximum of Logged Data	-2.263	SD of logged Data	0.38

Assuming Lognormal Distribution

95% H-UCL	0.0616	90% Chebyshev (MVUE) UCL	0.0656
95% Chebyshev (MVUE) UCL	0.0716	97.5% Chebyshev (MVUE) UCL	0.0799
99% Chebyshev (MVUE) UCL	0.0963		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0596	95% BCA Bootstrap UCL	0.0605
95% Standard Bootstrap UCL	0.0594	95% Bootstrap-t UCL	0.0616
95% Hall's Bootstrap UCL	0.0637	95% Percentile Bootstrap UCL	0.0598
90% Chebyshev(Mean, Sd) UCL	0.0657	95% Chebyshev(Mean, Sd) UCL	0.0717
97.5% Chebyshev(Mean, Sd) UCL	0.0802	99% Chebyshev(Mean, Sd) UCL	0.0967

Suggested UCL to Use

95% Student's-t UCL 0.06

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Step1_Cobalt_S

General Statistics

Total Number of Observations	21	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.119	Mean	0.212
Maximum	0.298	Median	0.21
SD	0.0516	Std. Error of Mean	0.0112
Coefficient of Variation	0.244	Skewness	-0.0894

Normal GOF Test

Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**
1% Shapiro Wilk Critical Value	0.873	Data appear Normal at 1% Significance Level
Lilliefors Test Statistic	0.0881	**Lilliefors GOF Test**
1% Lilliefors Critical Value	0.219	Data appear Normal at 1% Significance Level

Data appear Normal at 1% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.231	95% Adjusted-CLT UCL (Chen-1995)	0.23
		95% Modified-t UCL (Johnson-1978)	0.231

Gamma GOF Test

A-D Test Statistic	0.268	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.109	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.189	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	16.54	k star (bias corrected MLE)	14.21
Theta hat (MLE)	0.0128	Theta star (bias corrected MLE)	0.0149
nu hat (MLE)	694.8	nu star (bias corrected)	596.9
MLE Mean (bias corrected)	0.212	MLE Sd (bias corrected)	0.0561
		Approximate Chi Square Value (0.05)	541.2
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	537.1

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.233	95% Adjusted Gamma UCL	0.235

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk Lognormal GOF Test**
10% Shapiro Wilk Critical Value	0.923	Data appear Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.127	**Lilliefors Lognormal GOF Test**
10% Lilliefors Critical Value	0.173	Data appear Lognormal at 10% Significance Level

Data appear Lognormal at 10% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.129	Mean of logged Data	-1.583
Maximum of Logged Data	-1.211	SD of logged Data	0.259

Assuming Lognormal Distribution

95% H-UCL	0.236	90% Chebyshev (MVUE) UCL	0.248
95% Chebyshev (MVUE) UCL	0.265	97.5% Chebyshev (MVUE) UCL	0.288
99% Chebyshev (MVUE) UCL	0.332		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution

Nonparametric Distribution Free UCLs

95% CLT UCL	0.23	95% BCA Bootstrap UCL	0.23
95% Standard Bootstrap UCL	0.23	95% Bootstrap-t UCL	0.231
95% Hall's Bootstrap UCL	0.23	95% Percentile Bootstrap UCL	0.23
90% Chebyshev(Mean, Sd) UCL	0.245	95% Chebyshev(Mean, Sd) UCL	0.261
97.5% Chebyshev(Mean, Sd) UCL	0.282	99% Chebyshev(Mean, Sd) UCL	0.324

Suggested UCL to Use

95% Student's-t UCL 0.231

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Step2_Cobalt_N

General Statistics

Total Number of Observations	38	Number of Distinct Observations	31
Number of Detects	30	Number of Non-Detects	8
Number of Distinct Detects	29	Number of Distinct Non-Detects	2
Minimum Detect	3.0700E-4	Minimum Non-Detect	3.0000E-4
Maximum Detect	0.104	Maximum Non-Detect	5.2000E-4
Variance Detects	8.5850E-4	Percent Non-Detects	21.05%
Mean Detects	0.0369	SD Detects	0.0293
Median Detects	0.0395	CV Detects	0.794
Skewness Detects	0.325	Kurtosis Detects	-0.33
Mean of Logged Detects	-4.259	SD of Logged Detects	2.002

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk GOF Test**
1% Shapiro Wilk Critical Value	0.9	Detected Data appear Normal at 1% Significance Level
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**
1% Lilliefors Critical Value	0.185	Detected Data appear Normal at 1% Significance Level

Detected Data appear Normal at 1% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0292	KM Standard Error of Mean	0.00489
90KM SD	0.0296	95% KM (BCA) UCL	0.0373
95% KM (t) UCL	0.0375	95% KM (Percentile Bootstrap) UCL	0.0373
95% KM (z) UCL	0.0373	95% KM Bootstrap t UCL	0.0377
90% KM Chebyshev UCL	0.0439	95% KM Chebyshev UCL	0.0505
97.5% KM Chebyshev UCL	0.0597	99% KM Chebyshev UCL	0.0779

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.578	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.797	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.244	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.168	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.638	k star (bias corrected MLE)	0.596
Theta hat (MLE)	0.0579	Theta star (bias corrected MLE)	0.0619
nu hat (MLE)	38.26	nu star (bias corrected)	35.77
Mean (detects)	0.0369		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	3.0700E-4	Mean	0.0313
Maximum	0.104	Median	0.0275
SD	0.0282	CV	0.902
k hat (MLE)	0.698	k star (bias corrected MLE)	0.661
Theta hat (MLE)	0.0448	Theta star (bias corrected MLE)	0.0473
nu hat (MLE)	53.08	nu star (bias corrected)	50.22
Adjusted Level of Significance (β)	0.0434		
Approximate Chi Square Value (50.22, α)	34.95	Adjusted Chi Square Value (50.22, β)	34.42
95% Gamma Approximate UCL	0.0449	95% Gamma Adjusted UCL	0.0456

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0292	SD (KM)	0.0296
Variance (KM)	8.7804E-4	SE of Mean (KM)	0.00489
k hat (KM)	0.972	k star (KM)	0.913
nu hat (KM)	73.87	nu star (KM)	69.37
theta hat (KM)	0.0301	theta star (KM)	0.032
80% gamma percentile (KM)	0.0473	90% gamma percentile (KM)	0.0688
95% gamma percentile (KM)	0.0904	99% gamma percentile (KM)	0.141

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (69.37, α)	51.2	Adjusted Chi Square Value (69.37, β)	50.55
95% KM Approximate Gamma UCL	0.0396	95% KM Adjusted Gamma UCL	0.0401

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.758	**Shapiro Wilk GOF Test**
10% Shapiro Wilk Critical Value	0.939	Detected Data Not Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.304	**Lilliefors GOF Test**
10% Lilliefors Critical Value	0.146	Detected Data Not Lognormal at 10% Significance Level

Detected Data Not Lognormal at 10% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0292	Mean in Log Scale	-5.065
SD in Original Scale	0.03	SD in Log Scale	2.404
95% t UCL (assumes normality of ROS data)	0.0374	95% Percentile Bootstrap UCL	0.0371
95% BCA Bootstrap UCL	0.0372	95% Bootstrap t UCL	0.0383
95% H-UCL (Log ROS)	0.634		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-5.068	KM Geo Mean	0.0063
KM SD (logged)	2.348	95% Critical H Value (KM-Log)	4.267
KM Standard Error of Mean (logged)	0.387	95% H-UCL (KM -Log)	0.514
KM SD (logged)	2.348	95% Critical H Value (KM-Log)	4.267
KM Standard Error of Mean (logged)	0.387		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0292	Mean in Log Scale	-5.187
SD in Original Scale	0.0301	SD in Log Scale	2.544
95% t UCL (Assumes normality)	0.0374	95% H-Stat UCL	0.96

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 1% Significance Level

Suggested UCL to Use

95% KM (t) UCL 0.0375

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Step2_Cobalt_S

General Statistics

Total Number of Observations	32	Number of Distinct Observations	24
Number of Detects	27	Number of Non-Detects	5
Number of Distinct Detects	23	Number of Distinct Non-Detects	1
Minimum Detect	6.8200E-4	Minimum Non-Detect	3.0000E-4
Maximum Detect	0.298	Maximum Non-Detect	3.0000E-4
Variance Detects	0.00996	Percent Non-Detects	15.63%
Mean Detects	0.165	SD Detects	0.0998
Median Detects	0.2	CV Detects	0.605
Skewness Detects	-0.702	Kurtosis Detects	-0.79
Mean of Logged Detects	-2.739	SD of Logged Detects	2.242

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk GOF Test**	
1% Shapiro Wilk Critical Value	0.894	Detected Data Not Normal at 1% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**	
1% Lilliefors Critical Value	0.194	Detected Data appear Normal at 1% Significance Level	

Detected Data appear Approximate Normal at 1% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.139	KM Standard Error of Mean	0.0195
90KM SD	0.108	95% KM (BCA) UCL	0.172
95% KM (t) UCL	0.172	95% KM (Percentile Bootstrap) UCL	0.172
95% KM (z) UCL	0.171	95% KM Bootstrap t UCL	0.17
90% KM Chebyshev UCL	0.198	95% KM Chebyshev UCL	0.224
97.5% KM Chebyshev UCL	0.261	99% KM Chebyshev UCL	0.333

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.344	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.793	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.347	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.176	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.652	k star (bias corrected MLE)	0.604
Theta hat (MLE)	0.253	Theta star (bias corrected MLE)	0.273
nu hat (MLE)	35.2	nu star (bias corrected)	32.62
Mean (detects)	0.165		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	6.8200E-4	Mean	0.152
Maximum	0.298	Median	0.172
SD	0.0962	CV	0.631
k hat (MLE)	0.736	k star (bias corrected MLE)	0.687
Theta hat (MLE)	0.207	Theta star (bias corrected MLE)	0.222
nu hat (MLE)	47.08	nu star (bias corrected)	44
Adjusted Level of Significance (β)	0.0416		
Approximate Chi Square Value (44.00, α)	29.79	Adjusted Chi Square Value (44.00, β)	29.16
95% Gamma Approximate UCL	0.225	95% Gamma Adjusted UCL	0.23

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.139	SD (KM)	0.108
Variance (KM)	0.0117	SE of Mean (KM)	0.0195
k hat (KM)	1.662	k star (KM)	1.527
nu hat (KM)	106.3	nu star (KM)	97.71
theta hat (KM)	0.0838	theta star (KM)	0.0912
80% gamma percentile (KM)	0.215	90% gamma percentile (KM)	0.289
95% gamma percentile (KM)	0.361	99% gamma percentile (KM)	0.522

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (97.71, α)	75.91	Adjusted Chi Square Value (97.71, β)	74.88
95% KM Approximate Gamma UCL	0.179	95% KM Adjusted Gamma UCL	0.182

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.624	**Shapiro Wilk GOF Test**
10% Shapiro Wilk Critical Value	0.935	Detected Data Not Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**
10% Lilliefors Critical Value	0.153	Detected Data Not Lognormal at 10% Significance Level

Detected Data Not Lognormal at 10% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.139	Mean in Log Scale	-3.35
SD in Original Scale	0.109	SD in Log Scale	2.523
95% t UCL (assumes normality of ROS data)	0.172	95% Percentile Bootstrap UCL	0.171
95% BCA Bootstrap UCL	0.169	95% Bootstrap t UCL	0.172
95% H-UCL (Log ROS)	6.958		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-3.578	KM Geo Mean	0.0279
KM SD (logged)	2.809	95% Critical H Value (KM-Log)	5.108
KM Standard Error of Mean (logged)	0.506	95% H-UCL (KM -Log)	19
KM SD (logged)	2.809	95% Critical H Value (KM-Log)	5.108
KM Standard Error of Mean (logged)	0.506		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.139	Mean in Log Scale	-3.686
SD in Original Scale	0.11	SD in Log Scale	3.037
95% t UCL (Assumes normality)	0.172	95% H-Stat UCL	50.12

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 1% Significance Level

Suggested UCL to Use

95% KM (t) UCL 0.172

When a data set follows an approximate distribution passing only one of the GOF tests,
it is suggested to use a UCL based upon a distribution passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Step 3_Cobalt_N

General Statistics

Total Number of Observations	11	Number of Distinct Observations	5
Number of Detects	3	Number of Non-Detects	8
Number of Distinct Detects	3	Number of Distinct Non-Detects	2
Minimum Detect	3.7000E-4	Minimum Non-Detect	3.0000E-4
Maximum Detect	0.0022	Maximum Non-Detect	5.2000E-4
Variance Detects	8.6430E-7	Percent Non-Detects	72.73%
Mean Detects	0.00119	SD Detects	9.2968E-4
Median Detects	0.001	CV Detects	0.781
Skewness Detects	0.881	Kurtosis Detects	N/A
Mean of Logged Detects	-6.976	SD of Logged Detects	0.893

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**	
1% Shapiro Wilk Critical Value	0.753	Detected Data appear Normal at 1% Significance Level	
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**	
1% Lilliefors Critical Value	0.429	Detected Data appear Normal at 1% Significance Level	

Detected Data appear Normal at 1% Significance Level

Note GOF tests may be unreliable for small sample sizes

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	5.4455E-4	KM Standard Error of Mean	2.0681E-4
90KM SD	5.5991E-4	95% KM (BCA) UCL	N/A
95% KM (t) UCL	9.1937E-4	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	8.8471E-4	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.00116	95% KM Chebyshev UCL	0.00145
97.5% KM Chebyshev UCL	0.00184	99% KM Chebyshev UCL	0.0026

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.245	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.637	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.224	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.435	Detected data appear Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.214	k star (bias corrected MLE)	N/A
Theta hat (MLE)	5.3756E-4	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	13.28	nu star (bias corrected)	N/A
Mean (detects)	0.00119		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	3.7000E-4	Mean	0.0076
Maximum	0.01	Median	0.01
SD	0.00414	CV	0.544
k hat (MLE)	1.489	k star (bias corrected MLE)	1.144
Theta hat (MLE)	0.0051	Theta star (bias corrected MLE)	0.00664
nu hat (MLE)	32.76	nu star (bias corrected)	25.16
Adjusted Level of Significance (β)	0.0278		
Approximate Chi Square Value (25.16, α)	14.73	Adjusted Chi Square Value (25.16, β)	13.45
95% Gamma Approximate UCL	0.013	95% Gamma Adjusted UCL	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	5.4455E-4	SD (KM)	5.5991E-4
Variance (KM)	3.1350E-7	SE of Mean (KM)	2.0681E-4
k hat (KM)	0.946	k star (KM)	0.749
nu hat (KM)	20.81	nu star (KM)	16.47
theta hat (KM)	5.7570E-4	theta star (KM)	7.2750E-4
80% gamma percentile (KM)	8.9281E-4	90% gamma percentile (KM)	0.00135
95% gamma percentile (KM)	0.00181	99% gamma percentile (KM)	0.00291

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (16.47, α)	8.293	Adjusted Chi Square Value (16.47, β)	7.366
95% KM Approximate Gamma UCL	0.00108	95% KM Adjusted Gamma UCL	0.00122

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.996	**Shapiro Wilk GOF Test**	
10% Shapiro Wilk Critical Value	0.789	Detected Data appear Lognormal at 10% Significance Level	
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**	
10% Lilliefors Critical Value	0.389	Detected Data appear Lognormal at 10% Significance Level	

Detected Data appear Lognormal at 10% Significance Level

Note GOF tests may be unreliable for small sample sizes

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3.6588E-4	Mean in Log Scale	-9.331
SD in Original Scale	6.7435E-4	SD in Log Scale	1.816
95% t UCL (assumes normality of ROS data)	7.3440E-4	95% Percentile Bootstrap UCL	7.2382E-4
95% BCA Bootstrap UCL	9.1707E-4	95% Bootstrap t UCL	0.00215
95% H-UCL (Log ROS)	0.00698		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-7.797	KM Geo Mean	4.1112E-4
KM SD (logged)	0.631	95% Critical H Value (KM-Log)	2.36
KM Standard Error of Mean (logged)	0.233	95% H-UCL (KM -Log)	8.0374E-4
KM SD (logged)	0.631	95% Critical H Value (KM-Log)	2.36
KM Standard Error of Mean (logged)	0.233		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.5364E-4	Mean in Log Scale	-8.206
SD in Original Scale	6.3115E-4	SD in Log Scale	0.91
95% t UCL (Assumes normality)	7.9854E-4	95% H-Stat UCL	9.3290E-4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 1% Significance Level

Suggested UCL to Use

95% KM (t) UCL 0.000919

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Step 3_Cobalt_S

General Statistics

Total Number of Observations	5	Number of Distinct Observations	5
		Number of Missing Observations	0
Minimum	6.8200E-4	Mean	0.00172
Maximum	0.0056	Median	7.8400E-4
SD	0.00217	Std. Error of Mean	9.6970E-4
Coefficient of Variation	1.258	Skewness	2.229

Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,
refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,
but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).
The Chebyshev UCL often results in gross overestimates of the mean.
Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.

Normal GOF Test

Shapiro Wilk Test Statistic	0.583	**Shapiro Wilk GOF Test**
1% Shapiro Wilk Critical Value	0.686	Data Not Normal at 1% Significance Level
Lilliefors Test Statistic	0.454	**Lilliefors GOF Test**
1% Lilliefors Critical Value	0.396	Data Not Normal at 1% Significance Level

Data Not Normal at 1% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.00379	95% Adjusted-CLT UCL (Chen-1995)	0.00435
		95% Modified-t UCL (Johnson-1978)	0.00395

Gamma GOF Test

A-D Test Statistic	1.111	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.688	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.455	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.363	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.306	k star (bias corrected MLE)	0.656
Theta hat (MLE)	0.00132	Theta star (bias corrected MLE)	0.00263
nu hat (MLE)	13.06	nu star (bias corrected)	6.559
MLE Mean (bias corrected)	0.00172	MLE Sd (bias corrected)	0.00213
		Approximate Chi Square Value (0.05)	1.932
Adjusted Level of Significance	0.0086	Adjusted Chi Square Value	1.027

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.00585	95% Adjusted Gamma UCL	0.011

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.648	**Shapiro Wilk Lognormal GOF Test**
10% Shapiro Wilk Critical Value	0.806	Data Not Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.413	**Lilliefors Lognormal GOF Test**
10% Lilliefors Critical Value	0.319	Data Not Lognormal at 10% Significance Level

Data Not Lognormal at 10% Significance Level

Lognormal Statistics

Minimum of Logged Data	-7.29	Mean of logged Data	-6.793
Maximum of Logged Data	-5.185	SD of logged Data	0.904

Assuming Lognormal Distribution

95% H-UCL	0.0129	90% Chebyshev (MVUE) UCL	0.00333
95% Chebyshev (MVUE) UCL	0.00414	97.5% Chebyshev (MVUE) UCL	0.00527
99% Chebyshev (MVUE) UCL	0.00749		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution

Nonparametric Distribution Free UCLs

95% CLT UCL	0.00332	95% BCA Bootstrap UCL	0.00369
95% Standard Bootstrap UCL	0.00318	95% Bootstrap-t UCL	0.0447
95% Hall's Bootstrap UCL	0.0286	95% Percentile Bootstrap UCL	0.00363
90% Chebyshev(Mean, Sd) UCL	0.00463	95% Chebyshev(Mean, Sd) UCL	0.00595
97.5% Chebyshev(Mean, Sd) UCL	0.00778	99% Chebyshev(Mean, Sd) UCL	0.0114

Suggested UCL to Use

Recommendation cannot be provided

The calculated UCLs are based on assumptions that the data were collected in a random and unbiased manner.

Please verify the data were collected from random locations.

If the data were collected using judgmental or other non-random methods,

then contact a statistician to correctly calculate UCLs.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Appendix D-4

Groundwater Trend Analysis

Appendix D
Appendix D-4
Groundwater Trend Analysis
Plant Branch AP-E Risk Evaluation Report
Plant Branch, Milledgeville, GA

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.2 2/20/2025 4:33:38 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

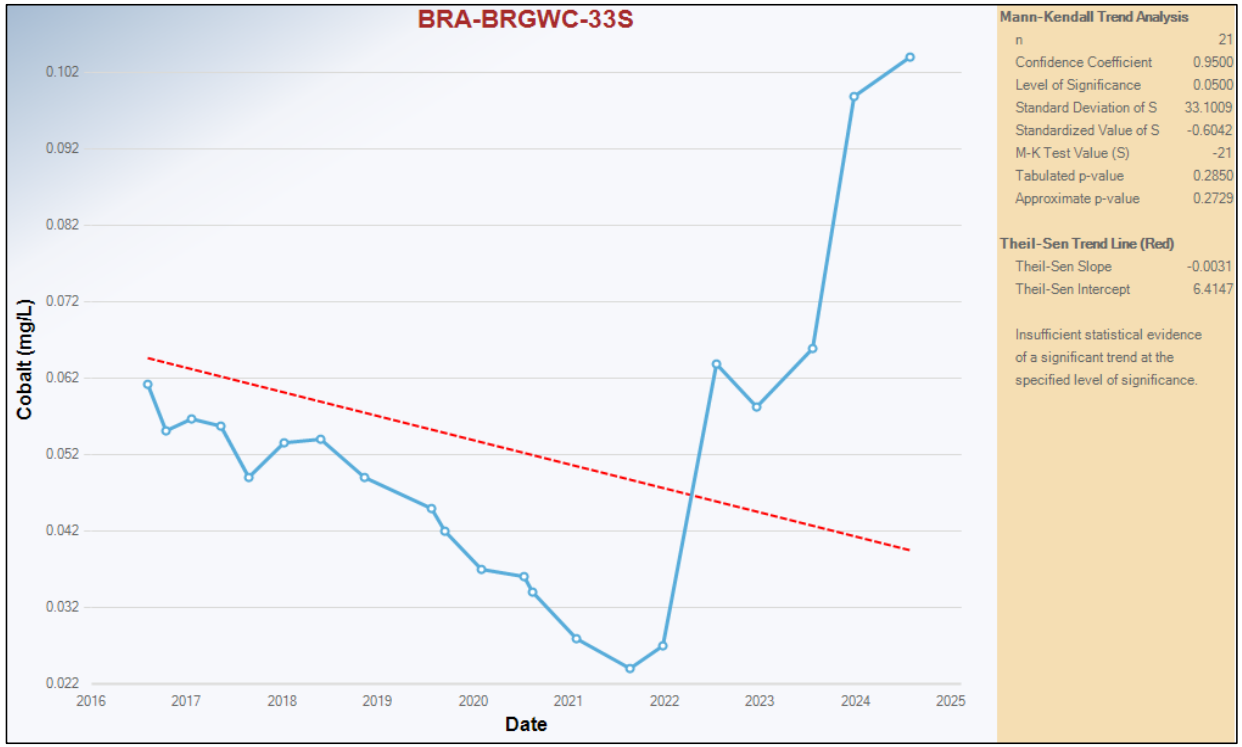
BRA-BRGWC-33S
Cobalt (mg/L)
General Statistics

Number of Events Reported (m)	21
Number of Missing Events	0
Number or Reported Events Used	21
Number Values Reported (n)	21
Minimum	0.024
Maximum	0.104
Mean	0.0523
Geometric Mean	0.0488
Median	0.0536
Standard Deviation	0.0204
Coefficient of Variation	0.391

Mann-Kendall Test

M-K Test Value (S)	-21
Tabulated p-value	0.285
Standard Deviation of S	33.1
Standardized Value of S	-0.604
Approximate p-value	0.273

Insufficient evidence to identify a significant trend at the specified level of significance.



Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.2 2/21/2025 5:10:51 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

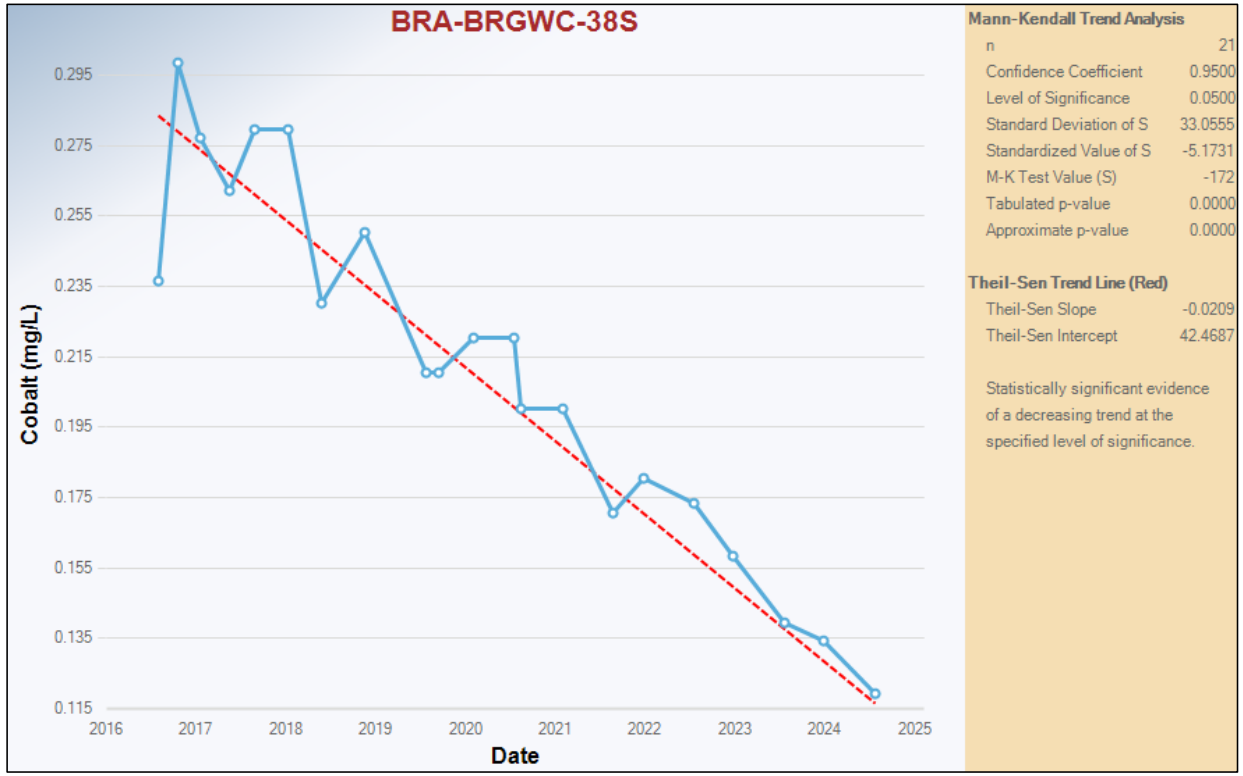
BRA-BRGWC-38S
Cobalt (mg/L)
General Statistics

Number of Events Reported (m)	21
Number of Missing Events	0
Number or Reported Events Used	21
Number Values Reported (n)	21
Minimum	0.119
Maximum	0.298
Mean	0.212
Geometric Mean	0.205
Median	0.21
Standard Deviation	0.0516
Coefficient of Variation	0.244

Mann-Kendall Test

M-K Test Value (S)	-172
Tabulated p-value	0
Standard Deviation of S	33.06
Standardized Value of S	-5.173
Approximate p-value	0.00000012

Statistically significant evidence of a decreasing trend at the specified level of significance.



Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.2 2/21/2025 5:35:06 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

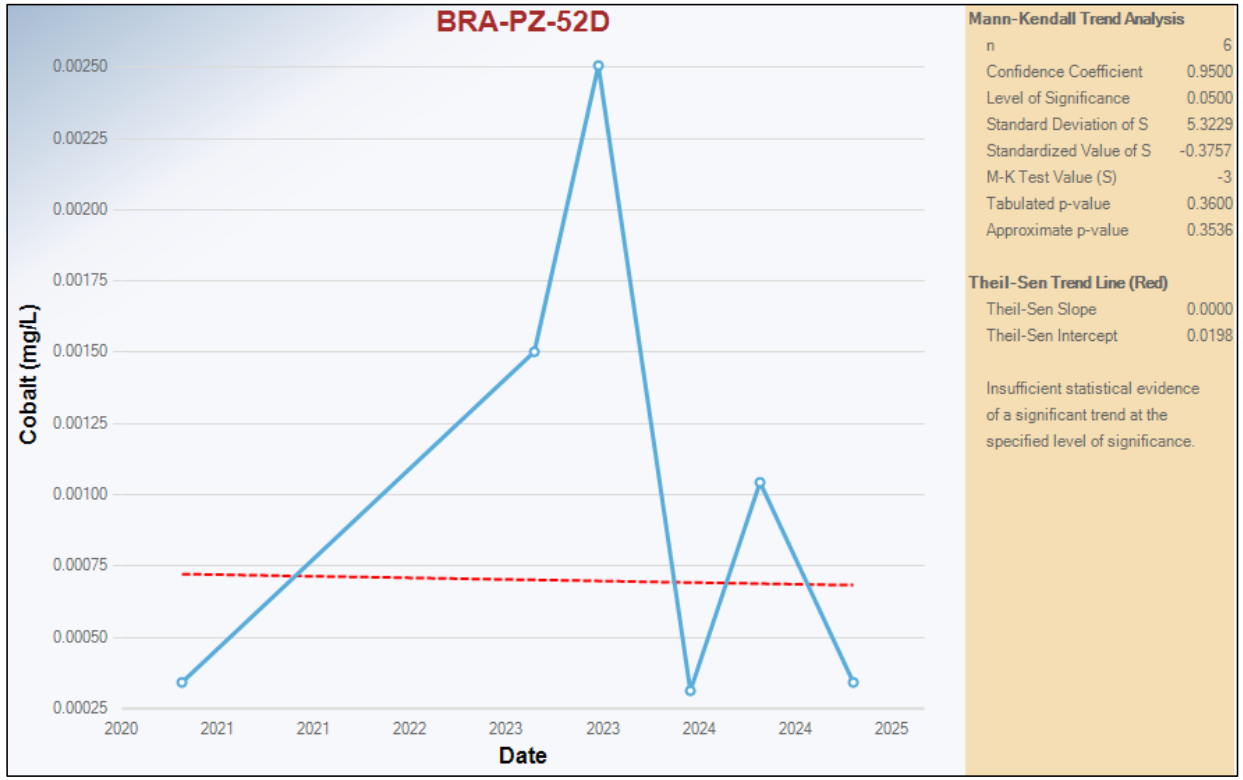
BRA-PZ-52D
Cobalt (mg/L)
General Statistics

Number of Events Reported (m)	6
Number of Missing Events	0
Number or Reported Events Used	6
Number Values Reported (n)	6
Minimum	0.00031
Maximum	0.0025
Mean	0.001
Geometric Mean	0.000719
Median	0.00069
Standard Deviation	0.000878
Coefficient of Variation	0.874

Mann-Kendall Test

M-K Test Value (S)	-3
Tabulated p-value	0.36
Standard Deviation of S	5.323
Standardized Value of S	-0.376
Approximate p-value	0.354

Insufficient evidence to identify a significant trend at the specified level of significance.



Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.2 2/21/2025 5:59:34 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

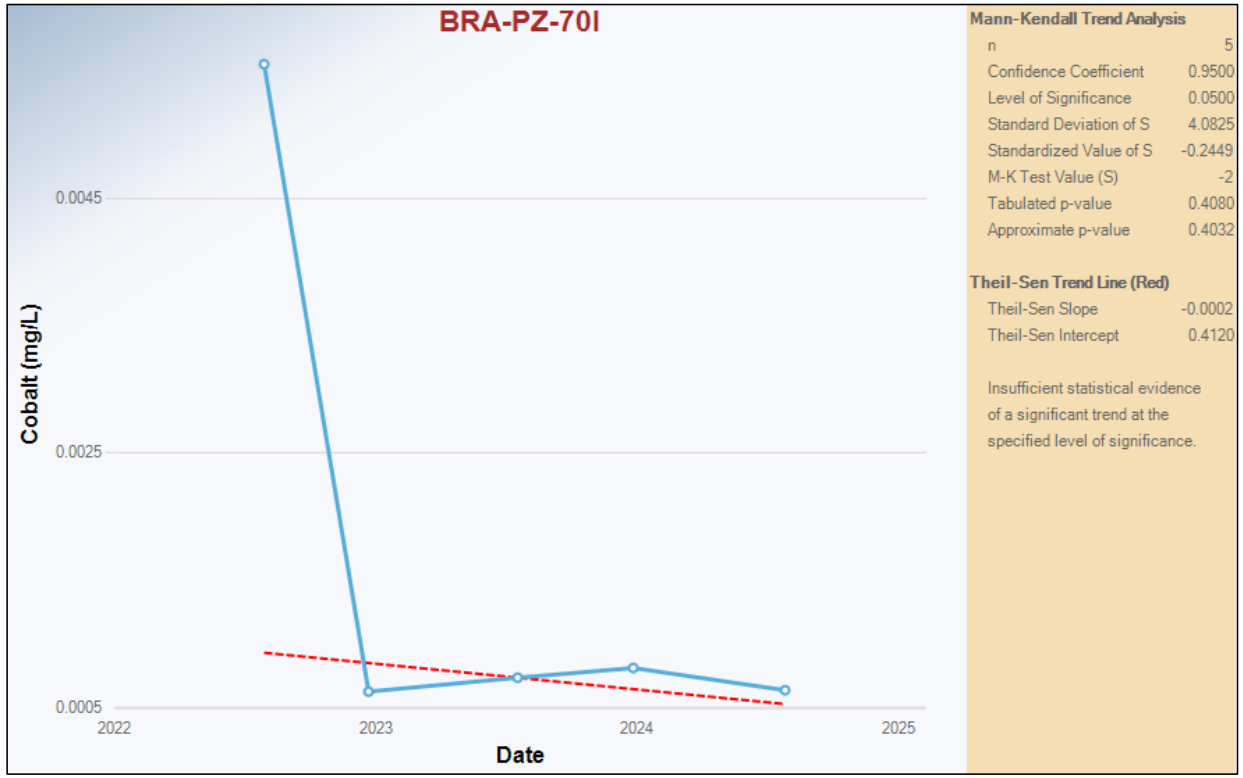
BRA-PZ-70I
Cobalt (mg/L)
General Statistics

Number of Events Reported (m)	5
Number of Missing Events	0
Number or Reported Events Used	5
Number Values Reported (n)	5
Minimum	0.000682
Maximum	0.0056
Mean	0.00172
Geometric Mean	0.00112
Median	0.00078
Standard Deviation	0.00217
Coefficient of Variation	1.258

Mann-Kendall Test

M-K Test Value (S)	-2
Tabulated p-value	0.408
Standard Deviation of S	4.082
Standardized Value of S	-0.245
Approximate p-value	0.403

Insufficient evidence to identify a significant trend at the specified level of significance.



APPENDIX C

Monitored Natural Attenuation Evaluation

Prepared for

Georgia Power Company
241 Ralph McGill Blvd NE
Atlanta, Georgia 30308

MONITORED NATURAL ATTENUATION EVALUATION

PLANT BRANCH ASH POND E (AP-E)

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1255 Roberts Boulevard, Suite 200
Kennesaw, Georgia 30144

Project Number GW8862

February 2025

Geosyntec consultants

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Appendix A ProUCL Input Data and Output Results

LIST OF ACRONYMS AND ABBREVIATIONS

AP	ash pond
ACM	Assessment of Corrective Measures
CCR	coal combustion residuals
ft/day	feet per day
g/cm^3	grams per cubic centimeters
GCSM	Geochemical Conceptual Site Model
GWPS	Groundwater Protection Standard
ITRC	Interstate Technology and Regulatory Council
K_d	partition coefficient
kg	kilogram
L/kg	liters per kilogram
MNA	monitored natural attenuation
mg/L	milligrams per liter
$mg/L\ yr^{-1}$	milligrams per liter per year
SEP	sequential extraction procedure
SSL	statistically significant level
s.u.	standard units
USEPA	United States Environmental Protection Agency
WRA	whole rock analysis
XRD	X-ray diffraction

1.0 INTRODUCTION

1.1 Purpose and Scope

On behalf of Georgia Power Company (Georgia Power), Geosyntec Consultants, Inc. (Geosyntec) prepared this *Monitored Natural Attenuation (MNA) Evaluation Report* (Report) for Georgia Power's Plant Branch Ash Pond E (AP-E or Site), a coal combustion residuals (CCR) unit. This Report is included as an appendix to the *Draft Remedy Selection Report – Plant Branch AP-E* (Remedy Selection Report).

The purpose of this Report is to assess the applicability of MNA as a sole corrective measure for statistically significant levels (SSL) of beryllium and cobalt in groundwater at BRGWC-38S downgradient of AP-E.

An assessment of corrective measures (ACM) identified MNA as a potential corrective measure to remediate groundwater at the Site. MNA relies on natural attenuation processes (*e.g.,* mineral precipitation, sorption, dilution, dispersion, *etc.*) to reduce dissolved concentrations of inorganic constituents in groundwater to below groundwater protection standards (GWPS) within a reasonable timeframe. Attenuation mechanisms are constituent- and Site-specific.

This MNA evaluation was completed using a phased approach, consistent with guidance documents for inorganic constituents published by the United States Environmental Protection Agency (USEPA, 2015) and the Interstate Technology and Regulatory Council (ITRC, 2010). A range of field characterizations, laboratory, and desktop evaluations were conducted to develop a geochemical conceptual site model (GCSM) and assess attenuation mechanisms at the Site (Appendix A to the Remedy Selection Report). The progressive, phased evaluation is aimed at assessing the existing and long-term effectiveness of attenuation processes and reduce uncertainty for decision-making at each screening step. In this evaluation, multiple lines of evidence were considered to demonstrate the applicability of MNA for groundwater corrective action in the following four phases in accordance with USEPA guidance:

- Phase I: Demonstrating that the groundwater plume is not expanding.
- Phase II: Identifying attenuation mechanisms and demonstrating that the attenuation rates are sufficient.
- Phase III: Demonstrating that that the attenuation capacity of the aquifer is sufficient to attenuate the mass of contaminant(s) within the plume and the

stability of the immobilized contaminant(s) is sufficient to resist re-mobilization.

- Phase IV: Designing a performance monitoring program based on an understanding of the mechanism of the attenuation process, and establishment of contingency remedies tailored to site-specific characteristics.

2.0 MNA DEMONSTRATION – BERYLLIUM AND COBALT

A constituent transport evaluation was used to predict and assess changes in constituent concentrations in groundwater in the vicinity of BRGWC-38S over time during and following CCR removal from AP-E (Appendix D to the Remedy Selection Report). This evaluation demonstrates that natural attenuation alone is expected to achieve the GWPS and provide a baseline for comparison with other corrective measures for beryllium and cobalt in BRGWC-38S where they exhibit decreasing concentration trends.

Despite a historical monitoring record characterized by a primarily decreasing trend of cobalt in BRGWC-33S, recent increases in groundwater concentrations have led to a proposed more active remedial approach. An approximate time to achieve the GWPS at the compliance boundary under MNA alone using the recent data for BRGWC-33S was not possible and therefore, was not estimated. The localized elevated concentrations of cobalt at BRGWC-33S in the last two years are expected to be transient, associated with dewatering and construction activities within AP-E that have led to changes in hydrogeological conditions, changes in the groundwater flow field in the vicinity of BRGWC-33S, and variability of source water upgradient of BRGWC-33S. It is expected that these increased concentrations will stabilize or return to previous decreasing trends as closure construction progresses and is completed. Natural attenuation processes may therefore become favorable again in the vicinity of BRGWC-33S as evidenced by the historical monitoring data prior to closure construction activities commencing. Therefore, while a more active remedial approach will be proposed initially for cobalt at BRGWC-33S, MNA will be considered as a corrective action for cobalt to achieve the GWPS in BRGWC-33S if conditions become favorable. Adaptive site management will be utilized to evaluate the corrective action approach at BRGWC-33S. The applicability of MNA for corrective action of cobalt at BRGWC-33S will be evaluated at a future date should historical decreasing trends be reestablished.

Therefore, only the results of the phased MNA evaluation for beryllium and cobalt in BRGWC-38S are summarized below.

2.1 Phase I Analysis

Two objectives were identified for Phase I of the MNA evaluation:

- Assess the source control measures and other key initial considerations; and
- Evaluate if the beryllium and cobalt plumes are stable.

Each objective for Phase I analysis of beryllium and cobalt is discussed in the following subsections.

2.1.1 Source Control and Key Considerations

The first aspect of the Phase I analysis was to assess source control measures and key initial considerations. This step serves as an initial screening approach before moving to subsequent steps.

Closure by removal of AP-E will provide substantial source control. Removal of source material from AP-E and physical containment and control of the CCR within the engineered storage facility is expected to, over time, be supportive of declining concentrations of Appendix IV constituents in groundwater.

Pre-closure activities upgradient of BRGWC-38S commenced in early 2023 with dewatering efforts in AP-E. Removal of CCR from AP-E is anticipated to require approximately ten years upon commencement, although the schedule is dependent on beneficial use completion and closure construction activities at the Site. BRGWC-38S has experienced a decrease in water levels (approximately 5 feet since the beginning of the monitoring period) as a consequence of these pre-closure activities. This drop in water levels in BRGWC-38S has also been accompanied by a decline in boron, beryllium, and cobalt concentrations (**Table 1**, **Figures 1a and 1b**), indicating that certain closure activities are expected to have a positive effect on groundwater quality.

2.1.2 Plume Stability

The second aspect of the Phase I analysis was to evaluate if the beryllium and cobalt plumes are stable. Beryllium and cobalt SSLs in BRGWC-38S have been horizontally and vertically delineated by PZ-70I and PZ-53D, respectively. The plumes are spatially limited (localized). Evaluation of plume stability considered spatial extent, delineation results, and concentration trends.

To evaluate statistical trends for beryllium and cobalt in BRGWC-38S, the software package ProUCL version. 5.2 was used according to the software's user guide (USEPA, 2022a and b). The results of the statistical analyses are provided in **Appendix A**.

Groundwater data, **Figure 1a** and **1b**, from 2016-2023 indicates a decrease in concentrations of Appendix III and Appendix IV constituents in BRGWC-38S. In BRGWC-38S, beryllium and cobalt concentrations have declined approximately 14% and 41%, respectively. In addition, concentrations of boron and sulfate have declined by

20% and 37%, respectively (**Table 1**). Boron and sulfate are conservative primary indicators of CCR constituents, and the reductions indicate that pre-closure construction activities may have already limited the migration of CCR constituents to groundwater.

For the beryllium SSL identified in BRGWC-38S, PZ-53D and PZ-70I vertically and horizontally delineate the extent of the beryllium plume, respectively, to concentrations below the GWPS (0.004 milligrams per liter (mg/L)). The cobalt SSL identified in BRGWC-38S has also been delineated vertically by PZ-53D and horizontally by PZ-70I respectively, to concentrations below the GWPS (0.006 mg/L). Statistically significant decreasing trends of beryllium or cobalt were identified for the entire monitoring period of BRGWC-38S (Mann-Kendall trend analysis, P-value = 0.0025 and 1.8E-6, respectively).

In summary, the trends of beryllium and cobalt data in BRGWC-38S over the monitoring period satisfy Phase 1. Further evaluation of MNA for beryllium and cobalt in BRGWC-38S under Phase 2 criteria is, therefore, warranted based on the following results of the Phase I analysis:

- Source control is ongoing at the Site, limiting the potential release of constituents; MNA is most appropriate as a groundwater corrective measure when coupled with source control.

- The beryllium and cobalt plumes are spatially limited (localized) and remain onsite.

- Beryllium and cobalt concentrations are statistically declining at BRGWC-38S.

2.2 Phase II – Mechanism and Rate of Attenuation

Since the Phase I analysis indicated site conditions are conducive to the natural attenuation of beryllium and cobalt, a Phase II analysis was initiated to document the predominant attenuation mechanism(s) and rates of beryllium and cobalt in BRGWC-38S. This evaluation consisted of the following which are detailed in the *Geochemical Conceptual Site Model Report* (Appendix A of the Remedy Selection Report): (i) evaluation of geochemical equilibria; (ii) characterization of groundwater and aquifer materials; and (iii) batch sorption testing. In addition, a section on the estimated rates of attenuation is included. Each of these evaluations are briefly summarized in the subsections below.

2.2.1 Geochemical Equilibria

As presented in the *Geochemical Conceptual Site Model Report* (Appendix A of the Remedy Selection Report), beryllium and cobalt speciation in groundwater is dominated by the 2+ oxidation state. Under the Eh-pH conditions encountered at BRGWC-38S, beryllium and cobalt are expected to be soluble and be present as Be^{2+} and Co^{2+}.

Additionally, as presented in the *Geochemical Conceptual Site Model Report* (Appendix A of the Remedy Selection Report), Eh-pH conditions at BRGWC-38S are favorable for at least partial dissolution of iron and manganese oxides and oxyhydroxides. Depending on the Site-specific geochemical conditions, most importantly pH, cobalt and beryllium are likely to be present as either dissolved ionic species, adsorbed (complexed) with oxide and oxyhydroxide phases of iron and manganese, or (co)-precipitated, consistent with the literature (ATSDR, 2023; Krupka and Serne, 2002).

2.2.2 Groundwater and Aquifer Material Collection and Data

Field investigations were completed during detection well installation and in September 2022 to collect site materials for chemical and mineralogical characterization that were used for the Phase II MNA evaluation. These materials were analyzed to evaluate groundwater corrective measures and to potentially support evaluation of attenuation mechanism(s) for this MNA demonstration. Samples were analyzed for chemical and mineralogical characterization including total metals, whole rock analysis (WRA), X-ray diffraction (XRD), sequential extraction procedure (SEP), and batch sorption tests. The findings are briefly summarized below, and details are provided and the *Geochemical Conceptual Site Model Report* (Appendix A of the Remedy Selection Report).

Total metals results indicate that beryllium and cobalt are observed in both the upgradient and downgradient Site soils suggesting a naturally occurring source of both constituents. The mineralogical characterization of the overburden samples reflect saprolitic soils with high clay content.

SEP analysis was performed to evaluate which solid phases the constituents of interest are associated with. The SEP results presented in the *Geochemical Conceptual Site Model Report* (Appendix A of the Remedy Selection Report) show that beryllium and cobalt are primarily associated with environmentally available fractions, which include the amorphous and crystalline iron and manganese oxide and oxyhydroxide phases. In addition, iron and manganese in the aquifer solids were observed to be mainly recovered as amorphous and crystalline iron and manganese oxides and oxyhydroxides, which supports the presence of potential sorption sites.

As detailed in the *Geochemical Conceptual Site Model Report* (Appendix A of the Remedy Selection Report), a decrease in pH (below approximately 5.5 standard units (s.u.)) due to oxidation of iron from AP-E is likely the primary driver for desorption of cobalt and beryllium from iron and manganese oxides/oxyhydroxides leading to mobilization of these constituents from the aquifer matrix to groundwater. The results of the aquifer solids characterization suggest interactions with iron/manganese oxides and oxyhydroxides under nonacidic or circumneutral pH conditions serve as the primary mechanism of beryllium and cobalt attenuation.

2.2.3 Batch Sorption Testing

Batch sorption testing was performed to evaluate both the sorption behavior of beryllium and cobalt and whether sorbed beryllium and cobalt are available for desorption under the conditions tested. As part of the sorption testing, a site-specific partition coefficient (K_d) was calculated for beryllium and cobalt. The K_d represents the relative propensity for a constituent to be associated with the solid versus the aqueous phase. Therefore, understanding the magnitude of K_d is essential for estimating the chemical attenuation of beryllium and cobalt.

The materials and methods for the sorption batch studies are detailed in the *Geochemical Conceptual Site Model Report* (Appendix A of the Remedy Selection Report). Briefly, the sorption experiments were conducted with groundwater from BRGWC-38S and collocated aquifer solids that served to provide sorption sites.

Results of the sorption testing indicated a linear sorption isotherm with a K_d of 16.9 liters per kilogram (L/kg) for beryllium and 12.7 L/kg for cobalt in BRGWC-38S. The estimated values are lower than reported values in literature (USEPA, 2005) but are expected given localized aquifer conditions around BRGWC-38S. MINTEQA2 modeling of K_d variability with pH was performed and suggests that the lower values could be due to local acidic conditions; regardless, the estimated sorption constants for beryllium and cobalt do suggest a sorption potential downgradient of AP-E.

2.2.4 Rate of Attenuation

The predicted attenuation rates (assuming no source control) were evaluated in BRGWC-38S and found to be sufficient to achieve GWPS. Linear regression analysis of the analytical groundwater data through August 2023 was used to estimate regression equations and calculate first order attenuation rates for beryllium and cobalt. The predicted attenuation rate for beryllium is 0.041 mg/L per year (yr^{-1}) and cobalt is 0.091 mg/L yr^{-1} at BRGWC-38S. Based on current concentrations, the time estimated for

concentrations to reach the GWPS at these rates are calculated to be 21 and 42 years, respectively, although shorter durations are anticipated once source control measures are implemented/complete. As demonstrated in the *Transport Model Report* (Appendix D to the Remedy Selection Report), the beryllium and cobalt concentrations in BRGWC-38S are predicted to drop below the GWPS in approximately 18 years and 34 years, respectively under these same conditions (i.e. not accounting for source control and therefore comparable to calculations with the rate of attenuation). However, when accounting for the benefits of source control following the anticipated timeline, concentrations of beryllium and cobalt are expected to achieve the GWPS in approximately four years and eight years, respectively from present day. While, CCR removal is estimated to require approximately 12 years, impacts from the less acidic infilling upgradient groundwater are expected to be observed prior to closure construction completion.

2.3 Phase III – Attenuation Capacity and Stability

The applicability of MNA and attenuation mechanisms were evaluated in Phase I and Phase II assessments. Phase III assesses the site-specific capacity for natural attenuation and the stability of the attenuation processes.

2.3.1 Aquifer Attenuation Capacity

A review of aquifer attenuation capacity was completed in accordance with USEPA (USEPA, 2007; USEPA, 2015) to understand if sufficient capacity is available in the aquifer downgradient of BRGWC-38S to attenuate beryllium and cobalt concentrations. These calculations are inherently conservative as they assume (i) a constant mass flux based on maximum observed concentrations instead of lower concentrations observed more recently and (ii) exclude the effect of source control. The following assumptions were used in the calculations of attenuation capacity:

- A groundwater beryllium concentration of 0.0104 mg/L as measured at BRGWC-38S in June 2017 (highest beryllium groundwater concentration reported for the available data);

- A groundwater cobalt concentration of 0.298 mg/L as measured at BRGWC-38S in November 2016 (highest cobalt groundwater concentration reported for the available data);

- An equivalent porous medium with an effective porosity (η) of 0.2 (HAR Rev 02; Geosyntec, 2024);
- An aquifer solids density (ρ) of 2.6 grams per cubic centimeter (g/cm^3);
- An aquifer thickness of 50 feet for BRGWC-38S;
- An aquifer width of approximately 350 feet around for BRGWC-38S (based on the distance between detection monitoring wells);
- An aquifer length of 5085 feet based on the approximate distance between BRGWC-38S and the boundary of AP-B;
- An average groundwater velocity of 0.21 feet per day (ft/day) (HAR Rev 02; Geosyntec, 2024); and
- An aquifer solids attenuation capacity of 0.0080 mg of beryllium per kilogram (kg) of aquifer material in BRGWC-38S and 0.2065 mg of cobalt per kg of aquifer material in BRGWC-38S, was assumed based on the results of the sorption testing. The assumed attenuation capacities correspond to the lowest mass of sorbed cobalt and beryllium per unit mass of aquifer solids under various soil-to-water ratios measured during sorption tests.

The capacity of the aquifer to attenuate beryllium and cobalt was calculated by multiplying the mass of the constituent attenuated per unit mass of aquifer solids (Cs(mg/kg)) by the mass of attenuating aquifer solids in the area of interest.

The mass of aquifer solids was calculated as follows and with the following assumptions:

$M(\text{mass of soil}) = \rho \times (1-\eta) \times L \times W \times H$

The attenuation capacity in the area of interest in downgradient of BRGWC-38S was calculated as:

$\text{Attenuation capacity} = M(kg) \times Cs(mg/kg)$

Based on these assumptions, the mass flux of beryllium into the system dimensions outlined above was calculated as 79 grams/year in the absence of source control. However, at this mass flux rate the attenuation capacity downgradient of BRGWC-38S will support a stable, non-expanding plume footprint for > 100 years, in the absence of

source control. In addition, CCR removal from AP-E is predicted to result in declining concentrations of beryllium.

The mass flux of cobalt into the system dimensions outlined above was calculated as 2270 grams/year in the absence of source control. However, at this mass flux rate the attenuation capacity downgradient of BRGWC-38S is expected to support a stable, non-expanding plume footprint for > 100 years in the absence of source control. As with beryllium, CCR removal from AP-E is predicted to result in declining concentrations of cobalt.

This evaluation further confirms the suitability of MNA as a corrective measure for beryllium and cobalt downgradient of AP-E.

2.3.2 Batch Desorption Testing

Batch desorption testing was completed to evaluate the stability of the chemical attenuation mechanisms. A detailed account of the study and the associated laboratory report are provided in the *Geochemical Conceptual Site Model Report* (Appendix A of the Remedy Selection Report). Aquifer solids sampled adjacent to BRGWC-38S were used to assess the leaching/desorption behavior of beryllium and cobalt. The results of the desorption study indicated stable aqueous phase concentrations of beryllium and cobalt after seven days of incubation under ambient, oxidizing, or reducing conditions, suggesting that beryllium and cobalt are not available for desorption under the conditions tested. Desorption data support the suitability of MNA as a remedial component for beryllium and cobalt.

3.0 PHASE IV – PERFORMANCE MONITORING PROGRAM

In conjunction with source control (i.e., pond closure by removal), MNA is an appropriate corrective measure. A plan outlining the associated performance monitoring program and contingency measures will be developed as part of Phase IV of MNA evaluation, if MNA is selected as a component of the groundwater remedy at the Site. The plan is required to provide data to evaluate the performance of the MNA component of the remedy and the progress of the natural attenuation processes at the Site, particularly following the completion of ongoing closure construction activities. Adaptive site management approaches will be employed to continue to monitor concentration trends in BRGWC-33S and BRGWC-38S and assess the applicability of the proposed and implemented corrective action measures.

4.0 CONCLUSIONS

A tiered MNA evaluation was completed, consistent with USEPA and ITRC, to assess if site conditions are favorable for implementing MNA as a corrective measure to address beryllium and cobalt SSLs downgradient of AP-E in BRGWC-38S. The evaluation indicates MNA is an appropriate corrective measure for beryllium and cobalt SSLs at BRGWC-38S coupled with source control, based on multiple lines of evidence.

The plumes around BRGWC-38S have been delineated and concentrations are declining based on statistical analysis of existing groundwater data in BRGWC-38S. This MNA evaluation is supported by geochemical characterization and sorption/desorption tests presented in *Geochemical Conceptual Site Model Report* (Appendix A of the Remedy Selection Report) that identify attenuation mechanisms and indicate sufficient capacity of Site aquifer solids to attenuate beryllium and cobalt through sorption and co-precipitation. Stable or potentially receding plume footprints downgradient of BRGWC-38S are anticipated based on estimates of attenuation capacity under current conditions, even in the absence of source control.

An MNA performance monitoring program and contingency remedies tailored to site-specific characteristics will be established for the Site.

5.0 REFERENCES

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USEPA, 2022a. ProUCL Version 5.2 *User Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations*. Office of Research and Development, EPA/600/R-07/041, October.

USEPA, 2022b. *Statistical Software ProUCL 5.2.00 for Environmental Applications for Data Sets with and without Nondetect Observations*. last updated June 14, 2022.

TABLES

Table 1

Summary of Groundwater Analytical Data

Plant Branch AP-E, Putnam County, Georgia

Well ID:		BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S	BRGWC-38S
Sample Date:		09/07/16	11/21/16	02/23/17	06/15/17	09/28/17	02/15/18	06/28/18	12/20/18	03/20/19	08/29/19	10/16/19	03/05/20	08/19/20	09/17/20	03/04/21	09/23/21	02/01/22	08/23/22	01/25/23	08/23/23
Parameter [(1,2)]																					
APP. III	**Boron**	1.73 B	2.02	1.77	1.78	1.45	2.09	1.5	1.7	1.5	--	1.5	1.6	--	1.4	1.5	1.4	1.6	1.67	1.63	1.37
	Sulfate	440	510	470	490	470	432	453	463	405	--	432	370	--	356	325	318	287	389	291	274
APP. IV	**Beryllium**	0.0079	0.0092	0.01	0.0104	0.0098	< 0.00046	0.0085	0.0092	--	0.0088	0.0079	0.0082	0.0079	0.0073	0.0077	0.0071	0.0072	0.00854	0.0078	0.0068
	Cobalt	0.236	0.298	0.277	0.262	0.279	0.279	0.23	0.25	--	0.21	0.21	0.22	0.22	0.2	0.2	0.17	0.18	0.173	0.158	0.139

Notes:

-- = No data available

< = Indicates the parameter was not detected above the analytical method detection limit (MDL).

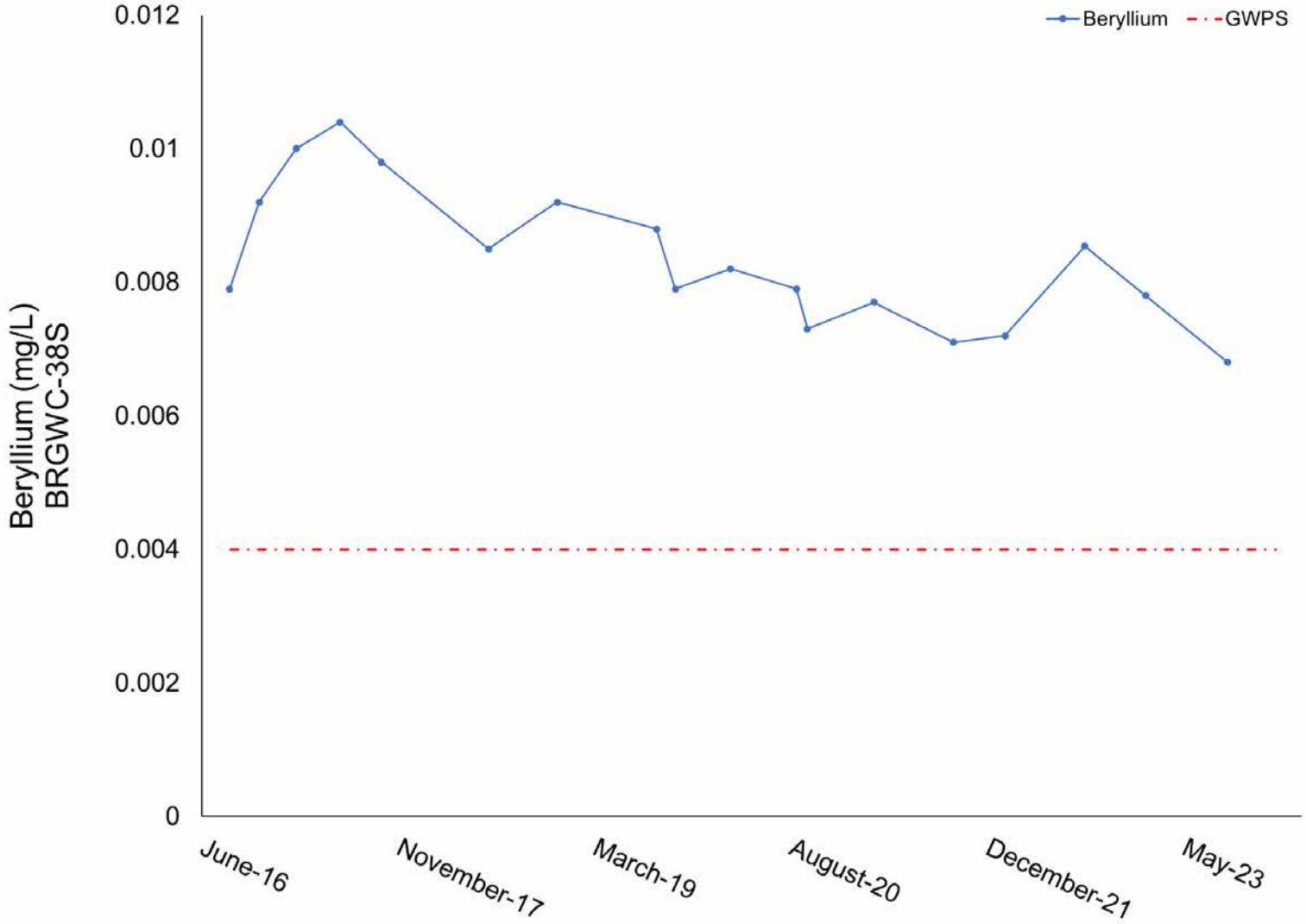
J = Indicates the parameter was estimated and detected between the MDL and the reporting limit (RL).

(1) Appendix III/IV parameter per 40 CFR 257 Subpart D. Parameters are reported in units of milligrams per liter (mg/L), except for pH reported as s.u. (standard units) and combined radium reported as picocuries per liter (pCi/L).

(2) Metals were analyzed by EPA Method 6010D, 6020B, and 7470A, anions were analyzed by EPA Method 300.0, TDS was analyzed by SM2540-2011, and combined radium 226/228 by EPA Methods 9315/9320.

FIGURES

Beryllium



Notes:
1. mg/L = milligrams per liter
2. GWPS = Groundwater Protection Standard
3. GWPS = 0.004 mg/L

Beryllium Concentration Trend at BRGWC-38S

Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

Prepared For: Georgia Power

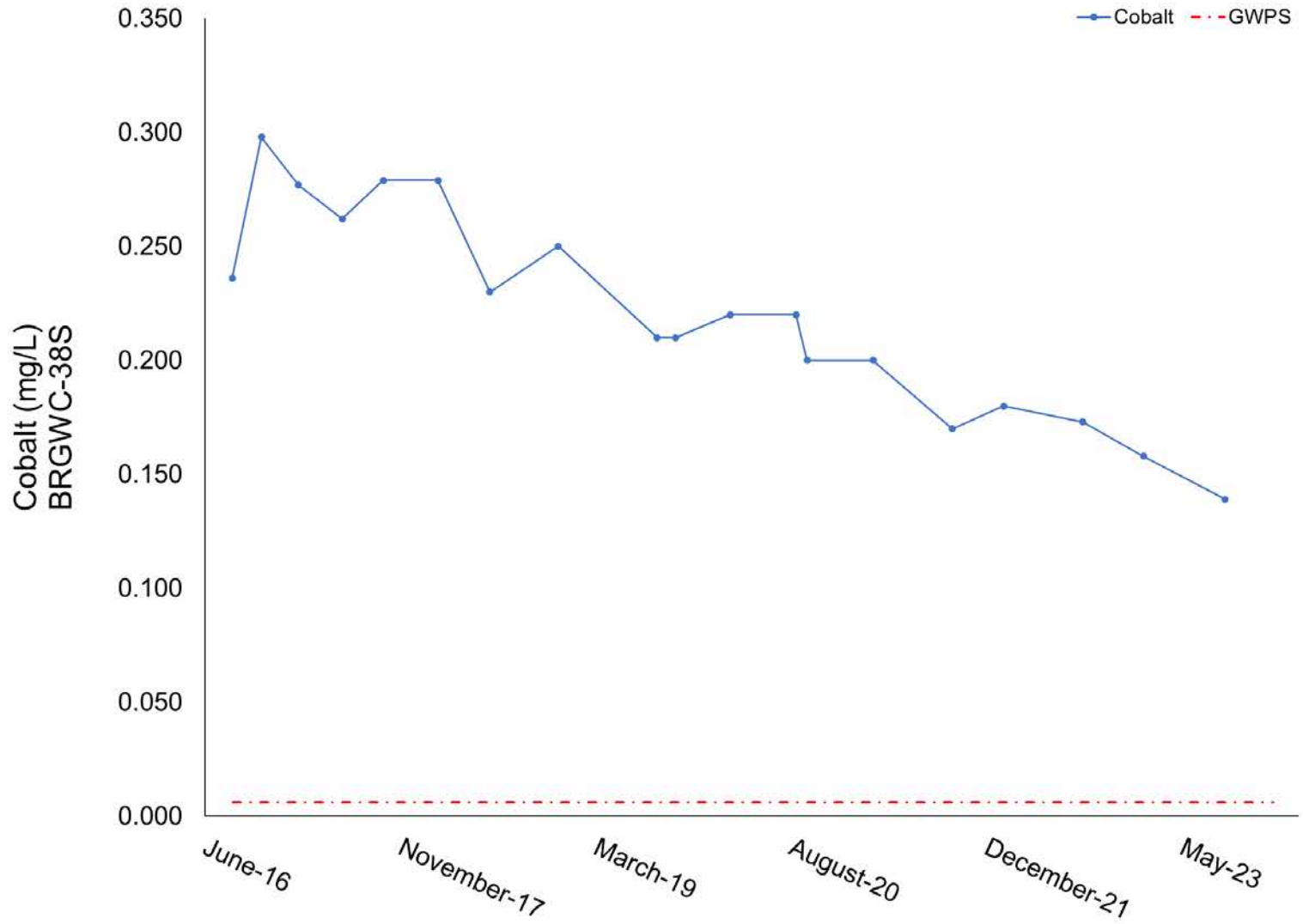
Prepared By: Geosyntec consultants

Kennesaw, GA | February 2025

Figure 1a

Monitored Natural Attenuation Evaluation

Cobalt



Notes:
1. mg/L = milligrams per liter
2. GWPS = Groundwater Protection Standard
3. GWPS = 0.006 mg/L

Cobalt Concentration Trend at BRGWC-38S

Georgia Power Company
Plant Branch AP-E
Putnam County, Georgia

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

Kennesaw, GA | February 2025

Figure 1b

Monitored Natural Attenuation Evaluation

Geosyntec
consultants

APPENDIX A

ProUCL Input Data and Output Results

APPENDIX A

ProUCL Input Data and Output Results

ProUCL Input Data			
Parameter	**Date**	**Beryllium (mg/L)**	**Cobalt (mg/L)**
BRGWC-38S	2016-09-07	0.0079	0.236
BRGWC-38S	2016-11-21	0.0092	0.298
BRGWC-38S	2017-02-23	0.01	0.277
BRGWC-38S	2017-06-15	0.0104	0.262
BRGWC-38S	2017-09-28	0.0098	0.279
BRGWC-38S	2018-02-15	0.00046	0.279
BRGWC-38S	2018-06-28	0.0085	0.23
BRGWC-38S	2018-12-20	0.0092	0.25
BRGWC-38S	2019-08-29	0.0088	0.21
BRGWC-38S	2019-10-16	0.0079	0.21
BRGWC-38S	2020-03-05	0.0082	0.22
BRGWC-38S	2020-08-19	0.0079	0.22
BRGWC-38S	2020-09-17	0.0073	0.2
BRGWC-38S	2021-03-04	0.0077	0.2
BRGWC-38S	2021-09-23	0.0071	0.17
BRGWC-38S	2022-02-01	0.0072	0.18
BRGWC-38S	2022-08-23	0.00854	0.173
BRGWC-38S	2023-01-25	0.0078	0.158
BRGWC-38S	2023-08-22	0.0068	0.139

APPENDIX A

ProUCL Input Data and Output Results

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.2 1/8/2024 3:27:44 PM
From File	BRGWC-38S Mann Kendall Data.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

BRGWC-38S Be (mg/L)

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	19
Number Values Reported (n)	19
Minimum	4.6000E-4
Maximum	0.0104
Mean	0.00793
Geometric Mean	0.00712
Median	0.0079
Standard Deviation	0.00207
Coefficient of Variation	0.261

Mann-Kendall Test

M-K Test Value (S)	-81
Tabulated p-value	0.002
Standard Deviation of S	28.5
Standardized Value of S	-2.807
Approximate p-value	0.0025

Statistically significant evidence of a decreasing trend at the specified level of significance.

APPENDIX A

ProUCL Input Data and Output Results

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.2 1/8/2024 3:31:14 PM
From File	BRGWC-38S Mann Kendall Data_b.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

BRGWC-38S Co (mg/L)

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	19
Number Values Reported (n)	19
Minimum	0.139
Maximum	0.298
Mean	0.221
Geometric Mean	0.216
Median	0.22
Standard Deviation	0.0454
Coefficient of Variation	0.206

Mann-Kendall Test

M-K Test Value (S)	-133
Tabulated p-value	0
Standard Deviation of S	28.51
Standardized Value of S	-4.629
Approximate p-value	1.8333E-6

Statistically significant evidence of a decreasing trend at the specified level of significance.

APPENDIX D

Transport Model Report

Prepared for

Georgia Power Company
241 Ralph McGill Blvd NE
Atlanta, Georgia 30308

TRANSPORT MODEL REPORT

PLANT BRANCH ASH POND E (AP-E)

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1255 Roberts Boulevard, Suite 200
Kennesaw, Georgia 30144

Project Number TR1159

February 2025

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LIST OF ACRONYMS AND ABBREVIATIONS

AP	ash pond
CCR	coal combustion residual
CFR	Code of Federal Regulations
ft/day	feet per day
GA EPD	Georgia Environmental Protection Division
GCSM	Geochemical Conceptual Site Model
GWPS	Groundwater Protection Standard
HAR	Hydrogeologic Assessment Report
HFO	hydrous ferric oxide
hr	hour
K_d	distribution coefficient
k_m	mass transfer coefficient
L/kg	liter per kilogram
m	meters
mg/L	milligrams per liter
MNA	monitored natural attenuation
mol/kg	moles per kilogram
PRB	permeable reactive barrier
PWR	partially weathered rock
SEP	sequential extraction procedure
SSL	Statistically Significant Levels
XRD	x-ray diffraction

1 INTRODUCTION

1.1 Purpose

A transport model was prepared for the Georgia Power Company (Georgia Power) Plant Branch (Site) Ash Pond E (AP-E) to evaluate potential corrective actions to address statistically significant levels (SSLs) of cobalt and beryllium above groundwater protection standards (GWPS) at certain locations downgradient of AP-E.

This transport model report (Report) was prepared as Appendix D to the *Draft Remedy Selection Report – Plant Branch AP-E* (Remedy Selection Report). The purpose of this report is to document the transport model approach, inputs, and results. Model uncertainty and limitations are presented in the context of the available data and assumptions required to complete the model and sensitivity analyses.

Detailed information on Site background and planned closure construction for AP-E is presented in the Draft Remedy Selection Report.

1.2 Site Geology and Hydrogeologic Setting

The following section summarizes the geologic and hydrogeologic conditions at AP-E as described in the *Hydrogeologic Assessment Report (HAR) Revision 01 – AP-E* for the Site (Geosyntec, 2023). Detailed information on the geology and hydrogeology of the Site is presented in the Remedy Selection Report.

1.2.1 Site Geology

AP-E is located within the Piedmont Physiographic Province of central Georgia, which is characterized by metamorphic and igneous rocks that have a surface expression of gently rolling hills and narrow valleys, with locally pronounced linear ridges.

AP-E is underlain primarily by three lithologic units: (i) residual soil/saprolite zone dominated by clayey to sandy silt textures (ii) partially weathered rock (PWR), and (iii) unweathered rocks showing distinct feldspar phenocrysts, quartz, and feldspar augen, and notable amounts of hornblende at some locations. Additional lithology descriptions of these units can be found in the HAR Rev 01 (Geosyntec, 2023).

1.2.2 Hydrogeology and Groundwater Flow

Hydrogeological investigations at the Site suggest an unconfined uppermost aquifer with groundwater flow primarily in the saprolite and PWR and substantially lower permeabilities in the underlying fractured gneiss bedrock. Generally, the water table surface at the Site is a subdued reflection of topography. Downward hydraulic gradients dominate in the topographically high areas, while upward gradients are observed in topographic lows. The potentiometric surface indicates that groundwater flows from the west, towards the ash pond, before migrating east towards Beaverdam Creek and southeast along the axis of the original pre-construction stream valley and toward the dike that forms the valley-fill coal combustion residual (CCR) impoundment.

1.3 Groundwater Exceedances

Georgia Power has performed CCR groundwater monitoring-related activities since 2018[1] at AP-E. As discussed in the Remedy Selection Report, the concentration of cobalt at BRGWC-38S and BRGWC-33S and beryllium at BRGWC-38S exceed the GWPS[2]. Cobalt and beryllium in groundwater have been horizontally and vertically delineated as shown in the Remedy Selection Report. Groundwater monitoring data confirm that cobalt and beryllium are not migrating offsite, and impacts are limited in extent.

1.4 Model Scope & Objectives

Geosyntec has developed transport models for SSLs in BRGWC-33S and BRGWC-38S to support the remedy selection process for AP-E. The Georgia Environmental Protection Division (GA EPD) Groundwater Contaminant Fate and Transport Modeling Guidance (GA EPD, 2016) was used as a guide for development of both models, where appropriate.

The primary objectives of the modeling effort for BRGWC-33S and BRGWC-38S discussed in this report were built off the current data observations and the foundational reaction path modeling presented in the *Geochemical Conceptual Site Model Report –*

[1] Monitoring activities have been performed in accordance with the United States Environmental Protection Agency's (USEPA's) Coal Combustion Residuals (CCR) Rule, 40 Code of Federal Regulations (CFR) Parts 257 effective October 19, 2015 (CCR Rule) including subsequent revisions and Georgia Environmental Protection Division's (GA EPD's) Rule for Solid Waste Management Rule 391-3-4-10 for CCR.

[2] On February 22, 2022, GA EPD adopted the federal GWPS for cobalt, lithium, lead, and molybdenum. The current site-specific GWPS for beryllium and cobalt are 0.004 milligrams per liter (mg/L) and 0.006 mg/L, respectively.

Plant Branch AP-E (GCSM Report). To achieve these objectives, reactive transport models were developed for each SSL location. The objectives include:

BRGWC-38S (where SSL constituents exhibit decreasing trends)

- Assess the feasibility of monitored natural attenuation (MNA) processes to achieve the cobalt and beryllium GWPS at or beyond the compliance boundary under current or pre-closure conditions and predicted post-CCR removal conditions in BRGWC-38S; and

- Evaluate the feasibility of geochemical injections or permeable reactive barrier (PRB) to achieve the cobalt and beryllium GWPS at or beyond the compliance boundary in BRGWC-38S.

BRGWC-33S (where SSL constituents do not exhibit decreasing trends)

- Evaluate the feasibility of geochemical injections or PRB to achieve the cobalt GWPS at or beyond the compliance boundary in BRGWC-33S.

A summary of the geochemical conceptual site model (GCSM) is provided in Section 2 and the transport model approach is described in detail in Section 3.

2 GEOCHEMICAL CONCEPTUAL SITE MODEL

The following section summarizes the GCSM for AP-E, as described in the GCSM Report included as Appendix A of the Remedy Selection Report.

2.1 Cobalt and Beryllium Occurrence, Geochemistry, and Fate and Transport Properties

As discussed in detail in the GCSM Report, cobalt and beryllium have been observed naturally in upgradient and downgradient soil samples typically associated with iron/manganese (Fe/Mn) oxyhydroxides, non-crystalline phases, and sulfide minerals. SSLs for cobalt and beryllium are localized to areas where the pH of the groundwater is less than approximately 5.5 standard units (s.u.). At this low pH (i.e., below approximately 5.5 s.u), cobalt and beryllium from Site soils associated with Fe/Mn oxyhydroxides, non-crystalline phases, or sulfide mineral phases, are expected to mobilize to groundwater through desorption mechanisms.

As summarized in the GCSM Report, reaction path modeling confirmed that the decrease in pH is the primary driver for the mobilization of naturally occurring cobalt and beryllium from Site soils to groundwater. Furthermore, the reaction path modeling indicates that the oxidation of reducing AP-E interstitial water with elevated iron content can cause the precipitation of iron coupled with reduction in groundwater pH. The GCSM indicates that this process followed by migration from AP-E generates acidity similar to that observed at the SSL wells. As such, after CCR removal from AP-E, the source of localized acidity is anticipated to be removed, leading to a decrease in dissolved cobalt and beryllium concentrations. As additional data are collected through the remedy design and implementation process, the groundwater pH will continue to be monitored and the GCSM revised as appropriate. **Figure 1** presents a schematic of cobalt mobilization at the Site.

Data in support of the GCSM and associated analysis are described in detail in the GCSM Report.

3 TRANSPORT MODEL

Reactive transport models were developed to evaluate the feasibility of MNA (BRGWC-38S only), geochemical injections (BRGWC-33S and BRGWC-38S), and a permeable reactive barrier (BRGWC-33S and BRGWC-38S) as potential corrective measures for cobalt and beryllium exceedances of the associated GWPS.

One dimensional (1D) reactive transport models were developed for the two areas where groundwater cobalt and/or beryllium concentrations currently exceed the GWPS. The two areas of interest are: (i) the vicinity of monitoring well BRGWC-33S with cobalt exceedances; and (ii) the vicinity of monitoring well BRGWC-38S with cobalt and beryllium exceedances. The following sections describe the transport model development, scenarios, results, and sensitivity analysis.

3.1 Reactive Transport Model Setup Overview

1D reactive transport models were developed using the PHREEQC version 3 geochemical modeling software (Parkhurst and Appelo, 2013a). Equilibrium constants from the MINTEQ.V4 and MINTEQ thermodynamic database (USEPA, 1999) were used for the cobalt and beryllium models, respectively. Two separate databases were utilized for the different constituents as the constituents were not expected to impact the behavior of the other and to attain pH sensitivity consistent with Site-specific observations.

The advective-dispersive transport capabilities of PHREEQC are derived from a formulation of 1D, advective-dispersive transport presented by Appelo and Postma (1993). The 1D flow field is defined by a horizontal series of cells (cell characterization provided in Section 2 of this report) with the same pore volume. A consistent length for each cell is defined and the time step provides the time necessary for a pore volume of water to move through each cell. The geochemical models use a constant groundwater velocity of 0.21 feet per day (ft/day) for both BRGWC-33S and BRGWC-38S (**Table 1**). The groundwater velocity is the average velocities of the flow path directions, BRGWA-5S/BRGWC-33S and PZ-4I/BRGWC-38S, and calculated using the horizontal hydraulic conductivity, effective porosity, and hydraulic gradient. This site-specific groundwater velocity is used to calculate a velocity in each cell that is determined by the length of the cell divided by the time step.

The following sections describe the transport model setup for both BRGWC-38S and BRGWC-33S, and include information on source areas, solid phases, groundwater composition, and applicable boundary conditions. The model setup for BRGWC-38S is the most comprehensive and will be discussed first for evaluation of applicability of MNA and a more active remedy while only an active remedy is evaluated for BRGWC-33S.

3.1.1 Monitoring Well BRGWC-38S Area

1D Model Setup

A schematic of the 1D model for the BRGWC-38S monitoring well is presented in **Figure 2**. As depicted in the figure, the localized model extends from the boundary of the Ash Pond (IW-E-1 is an interstitial piezometer within the ash pond) to the horizontal assessment monitoring well (PZ-70I) with a total distance of approximately 192 meters (m). The 1D flow field consists of 24 cells, each 8 m in length.

Simulation Settings – Duration & Closure Construction Phasing

The model was run for a total simulation time of approximately 30 years with distinct periods corresponding to the closure construction status of AP-E. The initial 6.8 years of the simulation represents pre-closure conditions. The primary purpose of this first period was to select solid phase and mass transfer parameters such that the modeled concentrations of cobalt and beryllium calibrate with measured historical concentrations in groundwater samples collected from BRGWC-38S. The second phase, from 6.8 to 18.8 years, corresponds with predictive simulations for the closure construction period. The third phase, from years 18.8 to 30, represents predictive simulations for the post-CCR removal period. After the calibration of the mass transfer parameters based on the results from phase one, these parameters were held constant for the remainder of the modeling scenario.

Groundwater Source Definition and Solid Phases – Initial Conditions

Per the GCSM Report (summarized in Section 2), the primary driver for cobalt and beryllium mobilization at the Site is the decrease in pH as a result of acidity generated from oxidation and precipitation of iron from reducing water in AP-E. The model inputs for groundwater were defined based on data collected from BRGWC-38S, PZ-70I, and IW-E-1[3]. Review of groundwater data indicate that cobalt and beryllium concentrations above GWPS appear to be localized to BRGWC-38S, with concentrations below the

[3] IW-E-1 is an interstitial well screened within the CCR at AP-E.

GWPS at PZ-70I and IW-E-1 (**Table 2**). The distribution of solid phases and associated concentrations in the 1D flow field are presented in **Figure 2.**

Solid phases were selected based on available solid characterization data within the vicinity of well BRGWC-38S. Four solid phases were defined for the BRGWC-38S model: (i) quartz; (ii) kaolinite; (iii) magnetite; and (iv) ferrihydrite. Quartz, kaolinite, and magnetite concentrations were defined based on X-ray diffraction (XRD) data for BRGWC-38S (or SB-2) and PZ-53D (vertical assessment monitoring well collocated with BRGWC-38S; sample collected from the same screen interval as BRGWC-38S). The concentration of ferrihydrite was defined assuming that 10 wt.% of the total iron consists of hydrous ferric oxides (HFO). This is consistent with standard practice in the field (Parkhurst and Appelo, 2013b) and is generally comparable to the sequential extraction procedure (SEP) results of iron (amorphous iron and manganese oxide phase in Table 6a of Appendix A of the *Draft Remedy Selection Report*) at the Site.

The reaction path model suggests that under equilibrium conditions cobalt and beryllium are fully desorbed into the dissolved phase at low pH values. Accordingly, the kinetics of sorption and desorption reactions for cobalt (Co^{2+}) and beryllium (Be^{2+}) were included to model the gradual release of naturally occurring cobalt and beryllium at low pH into the aqueous phase consistent with historical site data. The mass transfer rate was defined using the following equations (Tebes-Steven and Valocchi, 1998):

$$R_i = -k_m \left(c_i - \frac{s_i}{K_d} \right) \quad (1)$$

$$K_d = f(pH, \text{HFO}) \quad (2)$$

where k_m is the mass transfer coefficient (hr^{-1}), C_i is the aqueous cobalt or beryllium concentration (moles per kilogram [mol/kg] water), S_i is the solid phase cobalt or beryllium concentration (mol/kg soil), and K_d is the distribution coefficient (liters per kilogram [L/kg]).

The available fraction of cobalt and beryllium in the solid phase at time zero, and mass transfer coefficient were estimated from calibration of the model so that the modeled pre-closure concentrations are consistent with existing historical groundwater data record for BRGWC-38S. In the model solid phase, cobalt and beryllium were defined as sorbed species onto HFO.

The K_d equation was defined as a function of pH from reaction path modeling where Site-specific groundwater and solid phase data for each area were used to estimate the extent

of adsorption/desorption of cobalt or beryllium from strong and weak sites of HFO phase (Dzombak and Morel (1990)) with varying pH values. The partitioning of cobalt and beryllium between the solid and aqueous phase with varying pH levels was calculated from reaction path modeling results that are presented in Figure 9a of the GCSM Report.

Groundwater Composition – Initial & Boundary Conditions

Initial groundwater conditions utilized in the reactive transport model are from January 2023 sampling event and are presented in **Table 2**. Assuming no CCR influence is observed from AP-E at the effluent cell of PZ-70I, water quality data from PZ-70I is defined as the initial groundwater condition for all cells. Groundwater chemistry data from IW-E-1 was used as the infilling solution (cell 0) in the 1D flow field under pre-closure conditions. As the model simulations are conducted, reducing groundwater from IW-E-1 flows through the flow field, reacting with the solid phases and is exposed to oxic conditions downgradient of the pond resulting in geochemical changes to the composition of water along the flow pathway. PZ-70I is defined as the effluent cell of the modeling field.

Under the post-CCR removal, the upgradient, infilling water quality was assumed to be represented by an equal mixture of groundwater from BRGWA-2S, BRGWA-5S, and BRGWA-6S. Note that the 1D reactive transport model in PHREEQC does not include a recharge parameter and as such the effect of rainwater was not included in the model scenario. This leads to a conservative approach in the modeling scenario as dilution effects from infiltration are not considered.

3.1.2 Monitoring Well BRGWC-33S Area

1-D Model Setup

A schematic of the 1D model for the BRGWC-33S monitoring well is presented in **Figure 3**. As depicted in the figure, the localized model extends from the boundary of AP-E (IW-E-1 is an interstitial piezometer within the ash pond) to the horizontal assessment monitoring well (PZ-13S) with a total distance of approximately 432 m. The 1D flow field consists of 54 cells, each 8 m in length.

Simulation Settings – Duration & Closure Construction Phasing

The model was run for a total simulation time of approximately 30 years with distinct periods corresponding to AP-E closure construction status, similar to the BRGWC-38S model. The initial year of the simulation represents pre-closure conditions. The average

cobalt concentration from three most sampling events through August 2023, which showed an increase from historical concentrations, was assumed to represent pre-closure conditions and was used for calibration of solid-phase cobalt concentration and mass transfer coefficients in the same manner as discussed for BRGWC-38S above. As the active remedy has been selected for corrective action at BRGWC-33S, the second phase from year 3 to year 30 represents the active remedy scenario, as described in Section 3.2.

Groundwater Source Definition and Solid Phases – Initial Conditions

The groundwater source inputs were defined based on data collected from BRGWC-33S, PZ-13S, and IW-E-1. Similar to what was observed in BRGWC-38S, cobalt concentrations above GWPS appear to be localized to BRGWC-33S, with concentrations below the GWPS at PZ-13S and IW-E-1 (**Table 2**). The distribution of solid phases and associated concentrations in the 1D flow field are presented in **Table 1** and **Figure 3.**

Solid phases were selected based on available solid characterization data within the vicinity of well BRGWC-33S. Four solid phases were defined for the BRGWC-33S model: (i) quartz; (ii) kaolinite; (iii) magnetite; and (iv) ferrihydrite. Quartz, kaolinite, and magnetite concentrations were defined based on XRD data for BRGWC-33S and PZ-52D (the vertical assessment monitoring well collocated with BRGWC-33S). As with BRGWC-38S, the concentration of ferrihydrite in BRGWC-33S was defined assuming that 10 wt.% of the total iron consists of HFO.

As completed for BRGWC-38S, kinetics of sorption and desorption reactions for cobalt (Co^{2+}) were defined using **Equation 1**. The average cobalt concentration from three most sampling events through August 2023, which showed an increase from historical concentrations, was assumed to represent pre-closure conditions and was used for calibration of solid-phase cobalt concentration and mass transfer coefficients. As with BRGWC-38S, the K_d equation was defined as a function of pH from reaction path modeling where Site-specific groundwater and solid phase data for each area were used to estimate the extent of adsorption/desorption of cobalt from strong and weak sites of the HFO phase with varying pH values (**Equation 2**).

$$R_i = -k_m \left(c_i - \frac{s_i}{K_d} \right) \quad (1)$$

$$K_d = f(pH, \text{HFO}) \quad (2)$$

where k_m is the mass transfer coefficient (hr^{-1}), C_i is the aqueous cobalt concentration (mol/kg water), S_i is the solid phase cobalt concentration (mol/kg soil), and K_d is the distribution coefficient (L/kg).

Groundwater Composition – Initial & Boundary Conditions

Initial groundwater conditions utilized in the reactive transport model are presented in **Table 2**. Assuming no CCR influence is observed from AP-E at the effluent cell of PZ-13S, water quality data from PZ-13S is defined as the initial groundwater condition for all cells. Similar to the BRGWC-38S model, groundwater chemistry data from IW-E-1 was used as the infilling solution in the 1D flow field under pre-closure conditions. As the model simulations are conducted, reducing groundwater from IW-E-1 flows through the model cells, reacting with the solid phases and is exposed to oxic conditions downgradient of the pond resulting in geochemical changes to the composition of water along the flow pathway. PZ-13S is defined as the effluent cell of the modeling field.

Similar to BRGWC-38S, the upgradient, infilling water quality under post-CCR removal conditions was assumed to be represented by an equal mixture of groundwater from BRGWA-2S, BRGWA-5S, and BRGWA-6S.

3.2 Model Scenarios

The reactive transport models described above were used to evaluate the feasibility of MNA at BRGWC-38S only, and two different active remediation alternatives, (i) in situ geochemical injections and (ii) a PRB at both BRGWC-33S and BRGWC-38S. The MNA model was initially applied using the current Site conditions excluding the effects of closure construction as a baseline. The MNA model was then applied to account for the effects of CCR removal based upon estimated closure construction timelines. The injection and PRB models were evaluated without considering the effects of CCR removal, representing a conservative scenario relative to evaluating the remedy effectiveness accounting for CCR removal Site conditions. A summary of the scenarios evaluated is presented below.

Scenario	Closure Construction Phase	Model Infilling Water	Additional Adjustment
Baseline (BRGWC-38S)	Pre-closure conditions (excludes effects of closure construction)	NA	NA
MNA (BRGWC-38S)	Pre-closure conditions	Impacted water from AP-E	NA
	Closure construction period (12 years)	A mixture of upgradient groundwater and impacted water from AP-E	
	Post-CCR removal conditions	Upgradient groundwater	
In-situ Injection/ PRB (BRGWC-33S and 38S)	Pre-closure conditions (excludes effects of closure construction)	Impacted water from AP-E	Injection of sodium bicarbonate / Soil amendment with calcite

3.2.1 MNA Scenario (BRGWC-38S)

Under the MNA scenario for BRGWC-38S, the reactive transport model was run for a duration of 30 years, covering current or pre-closure, closure construction and post-CCR removal conditions. The model assumes that closure construction activities at the Site will be completed over 12 years. As such, the quality of infilling water was defined to systematically transition from interstitial water as defined by IW-E-1 to an equal mixture of groundwater from BRGWA-2S, BRGWA-5S and BRGWA-6S over the period of 12 years. The sources of acidity, cobalt, and beryllium in groundwater were defined as described in earlier sections. No additional adjustments of groundwater geochemistry were performed under this scenario.

3.2.2 Active Remediation Scenarios (BRGWC-33S and BRGWC-38S)

The primary purpose of the remediation scenarios including geochemical injections or a PRB is to assess the viability and feasibility of each technology for cobalt and beryllium remediation. As a result, the simulated parameters defined in the model (e.g., location of wells or amendment addition, dimensions, and amendment composition) and simulated results should be considered preliminary and "proof of concept". If geochemical injections are selected as a component of the remedy, the results of treatability and pilot testing will be used to evaluate and select the actual injectate, number of injection wells, injection regime and injection rate. If a PRB amendment is selected as a component of the remedy, the results of treatability and pilot tests will be used to evaluate and select the amendment, composition, dimensions, and location of the solid phase amendment as part of the remedy design process.

3.2.2.1 Injection Scenario

Under the injection scenario, geochemical injection was simulated by mixing a selected injectate with Site groundwater in PHREEQC. At a proof-of-concept level, the goal of the injection scenario was to utilize an injectate that would result in an increased pH in groundwater while maintaining mild alkaline conditions. Sodium bicarbonate was selected as the injectate to evaluate the feasibility of this remedial approach. In the model, sodium bicarbonate was added at a concentration of 0.10 moles to amend the pH of groundwater upgradient of BRGWC-33S and BRGWC-38S. PHREEQC was then allowed to calculate the composition of groundwater amended with sodium bicarbonate.

The model assumes a single injection well upgradient of BRGWC-33S and a single injection well upgradient of BRGWC-38S. In practice, a network of injection wells will be evaluated as part of the remedy design and installation process. **Figure 4** presents a schematic of the injection scenario.

3.2.2.2 PRB Scenario

Similar to injections, the goal of the PRB scenario was to select an amendment that would result in neutralization of pH conditions in groundwater. Calcite was selected as the amendment to be added at an upgradient location from BRGWC-33S and BRGWC-38S to neutralize the acidity generated from this area of AP-E. In the model, the length of the cells subject to the calcite soil amendment was assumed to be 4 m, and the solid phase was loaded with calcite at 30 wt.% of the solid mass. Calcite was assumed to be in

equilibrium with the groundwater at the amendment location, upgradient of BRGWC-33S and BRGWC-38S.

The model assumes a PRB just upgradient of BRGWC-33S and BRGWC-38S. In practice, the size and location of the PRB will be evaluated as part of the remedy design and installation process. **Figure 4** presents a schematic of the PRB scenario.

3.3 Model Results

3.3.1 Monitoring Well BRGWC-38S Area

3.3.1.1 Baseline

Figure 5 shows the pre-closure (current conditions) baseline modeled and measured results for cobalt and beryllium at monitoring well BRGWC-38S (green circles). The modeled concentrations over the last seven years corresponding to the pre-closure period (i.e., 2016 to 2023) were compared against measured concentrations. The model was calibrated to match the first-order decay regression profile of historical cobalt and beryllium concentrations at BRGWC-38S, replicating measured cobalt and beryllium concentrations over time at BRGWC-38S. As such, the first-order decay rates for the modeled and measured data were within a margin of <0.0001 units for cobalt and 0.002 units for beryllium. The initial concentrations were consistent to within 0.05 units and 0.02 units for cobalt and beryllium, respectively. As shown in the graph, the predicted concentrations from 1D model with selected initial parameters are largely consistent with observed data. The time to achieve GWPS under pre-closure conditions (without accounting for closure construction) was estimated at 18 years for beryllium and 34 years for cobalt in BRGWC-38S.

3.3.1.2 MNA Model

Figure 5 presents time series charts of pH, cobalt, and beryllium concentrations in BRGWC-38S for the MNA scenario (accounting for the effects of CCR removal; blue circles). As depicted in the figure, the pH at BRGWC-38S begins to increase approximately four years following the beginning of closure construction activities including source removal. This is attributed to iron-containing CCR pore water mixing with more oxic upgradient groundwater in the vicinity of BRGWC-38S. Over the 12 years of closure construction activities, pH gradually increases to upgradient groundwater levels. Correspondingly, the cobalt and beryllium concentrations at BRGWC-38S are predicted to decrease and drop to below the GWPS in approximately eight years and four years, respectively under post-CCR removal or source control completion scenario.

The reactive transport model indicates that the high acidity generated from the oxidation of reducing water from AP-E mobilizes cobalt and beryllium from aquifer materials. As closure construction is completed and the source of acidity to groundwater is removed, the pH is anticipated to increase resulting in a decrease in cobalt and beryllium concentrations to below the GWPS. Some of the key drivers for time to achieve the GWPS include groundwater velocity, i.e. travel time of upgradient groundwater from the boundary of the pond to BRGWC-38S, buffering capacity of upgradient infilling water, and initial cobalt and beryllium concentrations. Groundwater monitoring data will continue to be evaluated following CCR removal from AP-E, and the GCSM will be refined, as necessary.

3.3.1.3 Injection and PRB Models

Figure 6 presents the modeled pH, cobalt, and beryllium concentrations in BRGWC-38S for the (i) the geochemical injection scenario, and (ii) the PRB scenario; where remedial activities are assumed to be implemented approximately two years following the beginning of closure construction activities.

Adjusting geochemical conditions, specifically pH, through injection or PRB amendment, resulted in significant reductions in aqueous phase cobalt and beryllium concentrations in BRGWC-38S. Both the cobalt and beryllium concentrations decreased below the GWPS approximately two years after implementation of either remedy excluding the effects of CCR removal (**Figure 10**), compared to eight and four years, respectively, under the MNA scenario that assumes CCR removal will be completed.

These proof-of-concept models show that the injection of an aqueous phase buffering agent such as sodium bicarbonate or PRB amendment with calcite counteracts the acidity generated from oxidation of iron in reducing water from AP-E and are viable groundwater corrective measures for reducing cobalt and beryllium concentrations in BRGWC-38S. The time required to achieve the GWPS is primarily driven by the location of injection wells or the PRB amendment in relation to SSL well. As additional data are collected as part of remedy design and implementation, the number of injection wells, composition, and selected concentration of injectate or dosage of solid-phase amendment will be revised in the model, as appropriate.

3.3.2 Monitoring Well BRGWC-33S Area

3.3.2.1 Injection and PRB Models

Figure 7 presents the modeled pH and cobalt concentrations in BRGWC-33S under (i) the geochemical injection scenario and (ii) the PRB scenario; where remedial activities are assumed to be implemented approximately two years following the beginning of closure construction activities.

In the BRGWC-33S area, the injection and PRB models indicate that the concentration of cobalt at the compliance well is predicted to decrease below the GWPS in approximately 2 years from the implementation of either evaluated remedies excluding the effects of CCR removal. These proof-of-concept models shows that the injection of an aqueous phase buffering agent such as sodium bicarbonate or PRB amendment with calcite are likely viable groundwater corrective measures for reducing cobalt concentrations in BRGWC-33S. The time required to achieve the GWPS is primarily driven by the location of injection wells or the PRB amendment in relation to SSL well. As additional data are collected as part of remedy design and implementation, the number/location of injection wells or amendments, composition, and selected concentration of injectate or dosage of solid phase amendment will be revised, as appropriate.

3.4 Model Sensitivity Analysis

The upgradient water quality and the timing of impacts from closure construction activities are critical components of the model. To better assess the influence of upgradient water quality and the closure construction duration, sensitivity analyses were performed as described below. Sensitivity was only assessed in BRGWC-38S for the MNA scenario. Sensitivity for the active remedial approach at BRGWC-33S or BRGWC-38S was not completed. In addition to these, groundwater velocity has been identified as another primary driver for the time to achieve GWPS. A sensitivity analysis was not directly completed for this component but an increase in groundwater velocity, resulting in infilling upgradient groundwater reaching the SSL well in a shorter period of time would linearly correlate to a reduction in the time to achieve GWPS.

To evaluate the upgradient water quality influence, the sensitivity analysis consisted of three different scenarios in, where upgradient groundwater was represented by (i) an equal mixture of groundwater from BRGWA-2S, BRGWA-5S, and BRGWA-6S as the baseline scenario; (ii) groundwater from BRGWA-2S, which exhibited the lowest

upgradient pH in the February 2023 event; and (iii) groundwater from BRGWA-6S, which exhibited the highest upgradient pH in the February 2023 event.

Figure 8 presents time series charts of pH, cobalt, and beryllium concentrations for BRGWC-38S for the three different upgradient water quality scenarios assuming the same gradual completion of CCR removal over 12 years as described in the model setup. As illustrated in the figure, the time to attain GWPS for cobalt is approximately 8-15 years from the beginning of closure construction activities depending on the acidity of upgradient groundwater. The time to attain GWPS for beryllium is approximately four years from the beginning of closure construction activities under all three scenarios. The projected clean-up time for beryllium demonstrated limited sensitivity to upgradient water quality for beryllium mainly because the beryllium concentration under current conditions was only slightly above the GWPS.

The second sensitivity analysis was performed for the timing of impacts from closure construction duration and consisted of two scenarios: (i) a baseline scenario, assuming a gradual transition in infilling groundwater to the upgradient groundwater quality with the completion of CCR removal over 12 years as currently predicted; and (ii) assuming a gradual transition in infilling groundwater to the upgradient groundwater quality beginning in year 8 and proceeding through year 12 from the beginning of the closure construction. This latter scenario represents conditions where the impacts of closure construction activities on infilling groundwater quality are observed but with a delay of approximately 8 years from the beginning of CCR removal.

The results of the second sensitivity analysis for the BRGWC-38S model are represented in **Figure 9**. The projected clean-up time for cobalt and beryllium in BRGWC-38S under the second closure scenario, which assumes delayed impact from closure construction activity, were approximately 5 and 7 years longer than what was observed under the baseline scenario.

As demonstrated by results from sensitivity analyses, a slight change in pH of infilling upgradient water can lead to an appreciable change in dissolved cobalt and beryllium concentrations in BRGWC-38S. As such, data collected as part of the remedy design and implementation process (especially if changes in pH are observed) will continue to be evaluated and used to refine the GCSM and update this model, as necessary.

3.5 Model Uncertainty and Limitations

The reactive transport models were developed in accordance with standard industry practices, using the best information available at the time of model development, and widely accepted and publicly available numerical modeling software. However, reactive transport models are necessarily simplified mathematical representations of complex natural systems. Therefore, all models have associated uncertainties in model predictions and limits to their accuracy. Some of the primary limitations and sources of uncertainty in the models presented here include:

- The transport model was developed as a comparative analysis to support remedy selection with the goal to evaluate post-CCR removal conditions. However, the transport model was calibrated for BRGWC-38S by comparing modeled concentrations to measured concentrations of cobalt and beryllium under current or pre-closure conditions. A systematic transition from pre-closure to post-CCR removal conditions was assumed to be gradual over the modeled time period.

- Based on reaction path modeling, the primary mechanism of generating acidic pH downgradient of AP-E is iron oxidation and precipitation in reducing water from AP-E. Although iron oxidation and precipitation are consistent with available geochemical data, other mechanisms including low buffering capacity and mineral weathering may contribute to observed acidity. As additional data are collected as part of the remedy design process, the mechanisms for acidity may be refined in the GCSM and this model, as appropriate.

- Time frames predicted in this model are based on assumptions developed using available data. As such, refinements to the GCSM may affect predicted timeframes to achieve cobalt and beryllium concentration below GWPS using MNA in BRGWC-38S.

- The geochemical injection regime and PRB amendment was assumed to develop a proof-of-concept model. The injection and PRB models assume one injection or PRB amendment location in the vicinity of BRGWC-33S and one location in the vicinity of BRGWC-38S. In practice, for geochemical injection, the number of injection wells, location of wells, injectate composition, and injection regime will be evaluated in the design phase and selected to accelerate cleanup goals. Similarly, if a PRB scenario is selected, location and the composition of solid phase amendment will be evaluated and optimized in the remedial design phase.

4 TRANSPORT MODEL FINDINGS AND CONCLUSIONS

The reactive transport modeling presented herein indicates that iron oxidation and precipitation in interstitial water from AP-E can result in a decrease in downgradient pH levels, and consequent mobilization of naturally occurring cobalt and beryllium at levels similar to those measured at the Site. The modeling, with current assumptions and limitations, suggests that MNA along with CCR removal as currently planned, could result in concentrations of cobalt decreasing to below the GWPS in approximately eight years in BRGWC-38S from present day. Additionally, the modeling suggests MNA along with CCR removal as currently planned, could result in concentrations of beryllium decreasing below GWPS in approximately four years in BRGWC-38S from present day. Despite closure construction activities being estimated to require 12 years to complete, the mechanisms causing localized acidity are anticipated to diminish systematically during the closure construction process resulting in a corresponding decrease in cobalt and beryllium concentrations. The time to achieve GWPS under MNA is mainly governed by the time taken for upgradient groundwater to replace acidic groundwater in the vicinity of BRGWC-38S and initial concentrations of cobalt and beryllium. In areas outside the zones of localized acidity, cobalt and beryllium are likely to be attenuated through surface complexation to reactive surfaces, such as ferrihydrite.

The reactive transport models indicate that injecting a buffer such as sodium bicarbonate or adding calcite as a solid phase amendment in a PRB are viable remedies for reducing cobalt and beryllium concentrations in groundwater at AP-E. The models, with current assumptions and limitations, suggest that the system responds favorably to buffer amendment, and cobalt and beryllium concentrations are reduced to below GWPS within approximately two years from implementation in BRGWC-33S and BRGWC-38S. Amendment of a buffer reduces the dissolution of cobalt and beryllium and enhances the effectiveness of natural attenuation processes (e.g., surface complexation to ferrihydrite). The time to achieve cleanup goals is ultimately dependent on the mass of buffer supplied to the system, the location of injection or PRB amendment in relation to the SSL well, along with groundwater velocity. As additional data are collected as part of the remedy design and implementation, optimal buffering agents, concentrations, and number of injection or amendment locations will continue to be evaluated.

In summary, the GCSM suggests that acidity generated by the oxidation and precipitation of iron from water migrating from AP-E could lead to the release of cobalt and beryllium that are naturally occurring in Site soils. Reactive transport modeling, completed as part of this study required numerous assumptions and limitations. However, the results indicate that MNA (with source control) would be an appropriate remedial option for

cobalt and beryllium in BRGWC-38S requiring approximately eight years from present day to achieve the GWPS. The injection of a buffer such as sodium bicarbonate or PRB amendment with calcite could reduce the concentration of cobalt in groundwater in BRGWC-33S to below the GWPS in approximately two years from implementation. Depending on when an active remedy would commence, the remedial duration in BRGWC-33S may need to be assessed as closure construction activities progress. Adaptive site management approaches and data collected as part of the pre-design investigation process will continue to be evaluated and used to refine remedy design and implementation.

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Parkhurst, D.L. and Appelo C., 2013b. PHREEQC (Version 3) - Description of input and examples for PHREEQC version 3—A computer program for speciation, batch-reaction, one-dimensional transport, and inverse geochemical calculations: U.S. Geological Survey Techniques and Methods, book 6, chap. A43, 497 p.Tebes-Stevens, C., A.J. Valocchi, J.M. van Briesen, B.E. Rittmann, 1998. Multicomponent transport with coupled geochemical microbiological reactions: Model description and example simulations, Journal of Hydrology, 209, 8-26.

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TABLES

Table 1
Transport Model - Groundwater Velocity Calculation
Plant Branch AP-E, Putnam County, Georgia

Flow Path Direction [1]	K_h (ft/day)[3]	n_e	i (ft/ft)	Velocity (ft/day)[4]	Average Velocity (ft/day)[5]
BRGWA-5S/BRGWC-33S	5.78	0.20	0.005	0.14	0.21
PZ-4I/BRGWC-38S		0.20	0.010	0.28	

Notes:

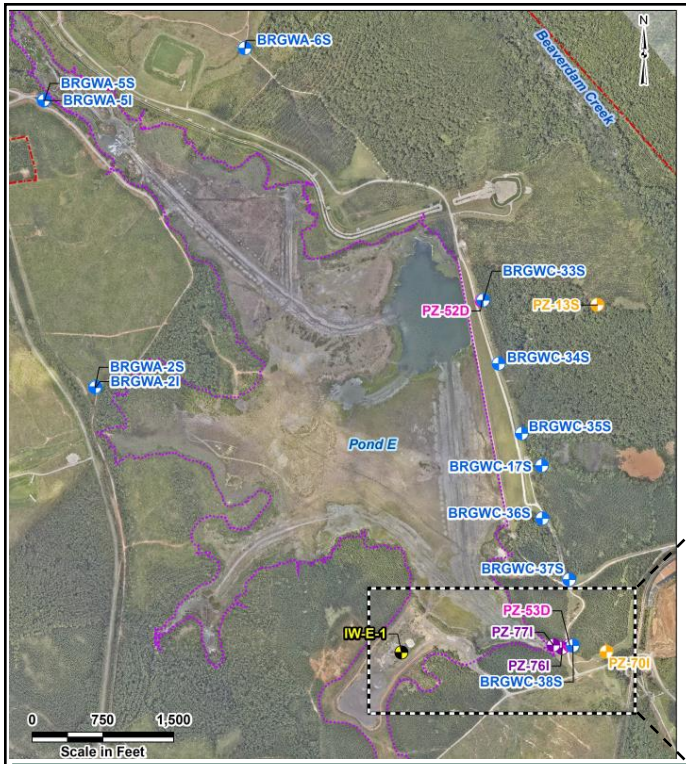
1. Flow path direction relative to the orientation of AP-E.
2. Hydraulic gradient based on water levels measured on 23 January 2023.
3. The mean K_h value of the four wells in the groundwater flow path direction is used to determine the average groundwater velocity.
4. Groundwater flow velocity equation: $V = [K_h * i] / n_e$
5. Average or maximum groundwater flow velocity for unit.
6. ft indicates feet, ft/day indicates feet per day, and ft/ft indicates feet per foot.
7. K_h indicates horizontal hydraulic conductivity
8. n_e = effective porosity

Table 2
Transport Model - Geochemical Composition of Aqueous Phase
Plant Branch AP-E, Putnam County, Georgia

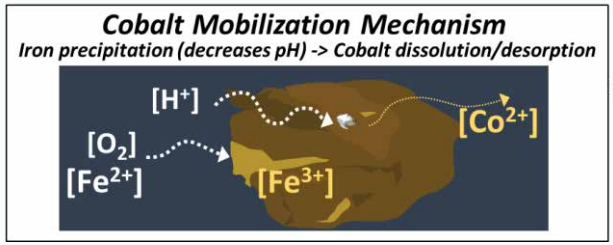
Constituent \ Well		BRGWC-33S	BRGWC-38S	IW-E-1	PZ-13S	PZ-70I	BRGWA-2S	BRGWA-5S	BRGWA-6S
Calcium	mol/l	2.89E-03	8.18E-04	5.41E-04	4.19E-04	8.33E-04	1.21E-04	4.84E-04	9.73E-05
	mg/L	116	33	22	17	33	4.86	19.40	3.90
Chloride	mol/l	8.18E-04	1.84E-04	3.92E-05	9.48E-05	1.51E-04	6.09E-05	1.00E-04	6.49E-05
	mg/L	29.0	6.5	1.4	3.4	5.4	2.2	3.6	2.3
Sulfur, S (VI)	mol/l	3.90E-03	3.03E-03	8.42E-04	7.84E-04	1.53E-03	4.83E-06	6.86E-06	5.03E-06
	mg/L	125	97	27	25	49	0.16	0.22	0.16
Cobalt	mol/l	9.88E-07	2.68E-06	6.38E-08	5.09E-08	5.09E-09	1.41E-08	--	--
	mg/L	0.058	0.158	0.004	0.003	0.0003	0.000829 J	--	--
Beryllium	mol/l	2.61E-07	8.66E-07	--	--	2.41E-08	--	--	--
	mg/L	0.002	0.008	--	--	0.000217 J	--	--	--
Magnesium	mol/l	6.17E-04	1.52E-03	2.23E-04	3.98E-04	4.90E-04	2.20E-04	3.71E-04	1.70E-04
	mg/L	15.0	36.9	5.4	9.7	11.9	5.3	9.0	4.1
Manganese	mol/l	4.88E-05	3.00E-05	6.57E-06	3.64E-08	4.93E-06	6.33E-07	1.20E-07	2.89E-08
	mg/L	2.7	1.7	0.4	0.002	0.3	0.035	0.007	0.00159 J
Potassium	mol/l	3.71E-04	1.57E-04	3.15E-04	1.14E-04	1.09E-04	1.10E-05	1.34E-05	1.81E-05
	mg/L	14.5	6.1	12.3	4.4	4.3	0.4	0.5	0.7
Sodium	mol/l	1.62E-03	1.84E-03	1.63E-04	5.09E-04	1.00E-03	1.58E-04	2.08E-04	1.10E-04
	mg/L	37.2	42.3	3.8	11.7	23.0	3.6	4.8	2.5
Oxygen O (0)	mol/l	0.00E+00	1.07E-04	1.25E-06	2.24E-04	9.75E-05	2.74E-04	1.19E-04	4.36E-04
	mg/L	0.00	1.71	0.02	3.59	1.56	4.39	1.90	6.98
Lithium	mol/l	1.66E-06	3.69E-06	--	--	5.49E-07	--	--	4.91E-07
	mg/L	0.0115	0.0256	--	--	0.00381 J	--	--	0.00341 J
pH	(s.u.)	4.79	4.75	5.95	5.56	5.60	5.26	6.47	6.54

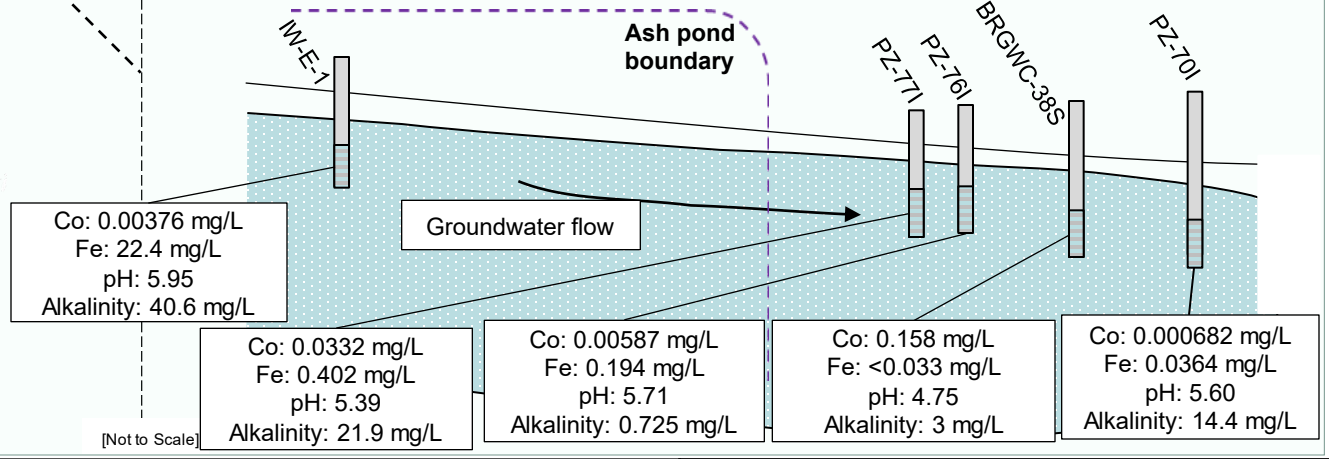
Notes:
1. mol/L indicates moles per liter, mg/L indicates milligrams per liter, and s.u indicates standard units.
2. J indicates the parameter was estimated and detected between the analytical method detection limit (MDL) and the reporting limit (RL).

FIGURES









Notes:

1. Cobalt (Co) and Iron (Fe) concentrations in milligrams per liter (mg/L) and pH values in standard units (s.u.).
2. Alkalinity in mg/L as calcium carbonate ($CaCO_3$).

GEOCHEMICAL CONCEPTUAL SITE MODEL ILLUSTRATION – COBALT MOBILIZATION

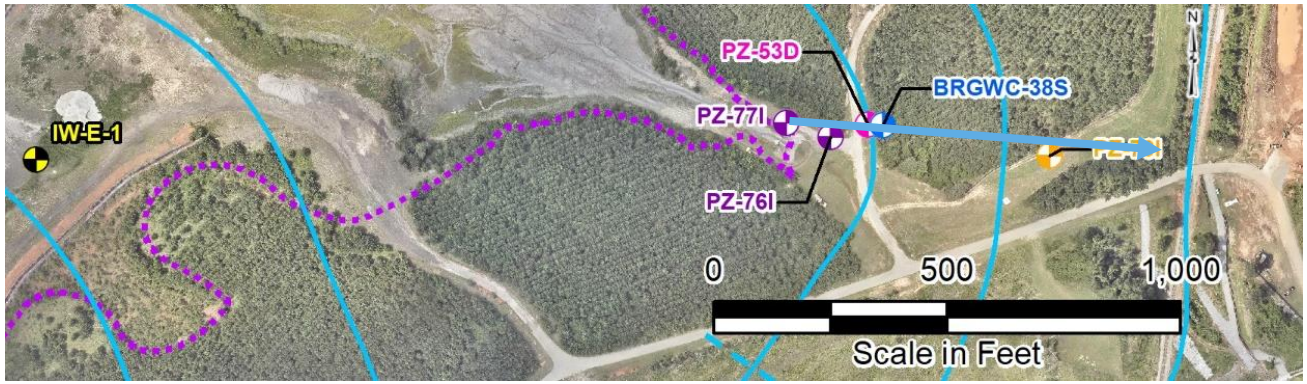
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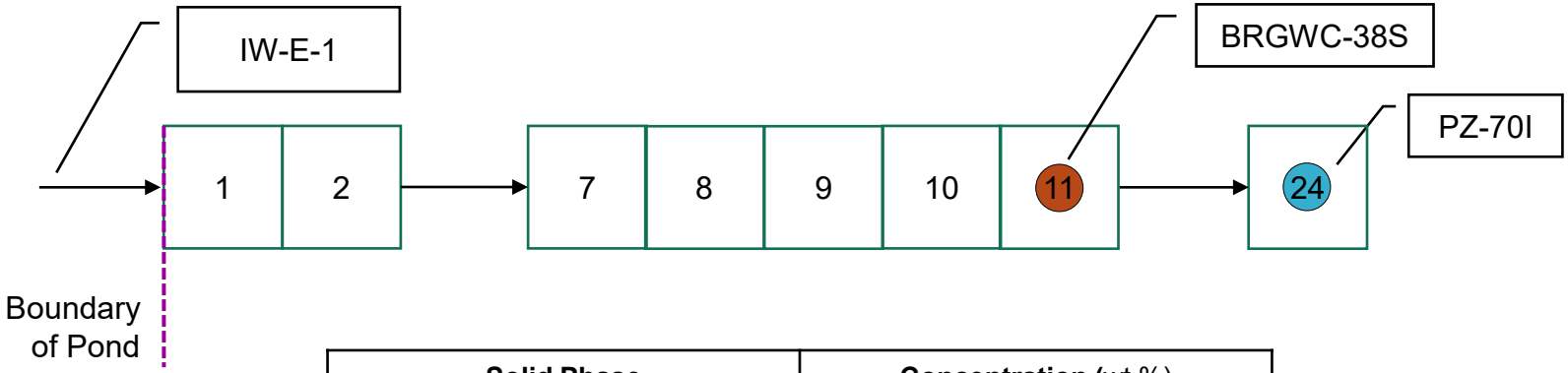
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Prepared By: Geosyntec consultants

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FIGURE 1





Solid Phase	**Concentration** (wt.%)
Quartz	30.0
Kaolinite	35.0
Magnetite	0.10
Ferrihydrite	2,000 mg Fe/kg soil

Notes:
1. wt.% indicates weight percentage (estimated by X-ray diffraction) for solid phase available in database.
2. mg Fe/kg soil indicates milligrams of iron per kilogram of soil.
3. Cells are defined with an 8-meter length.
4. The blue arrow shows the groundwater flow.

BRGWC-38S – 1D MODEL SETUP SCHEMATIC

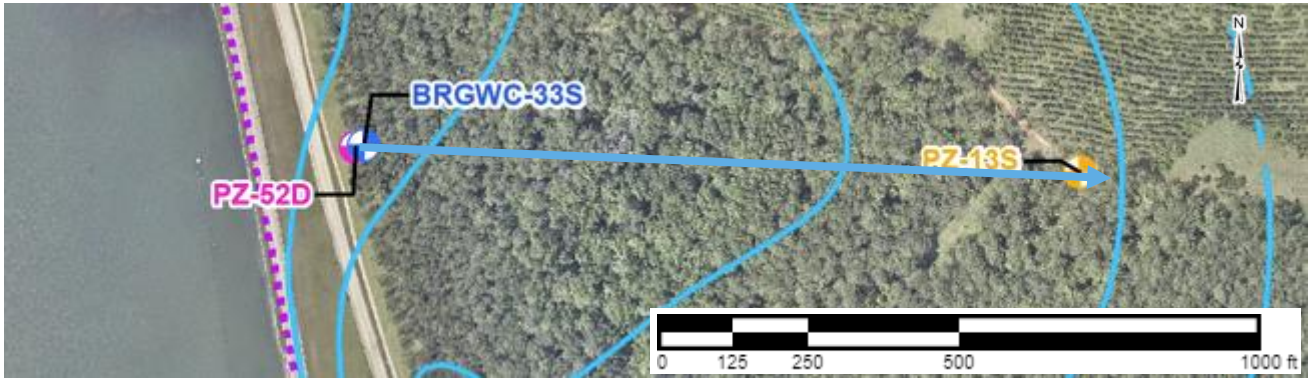
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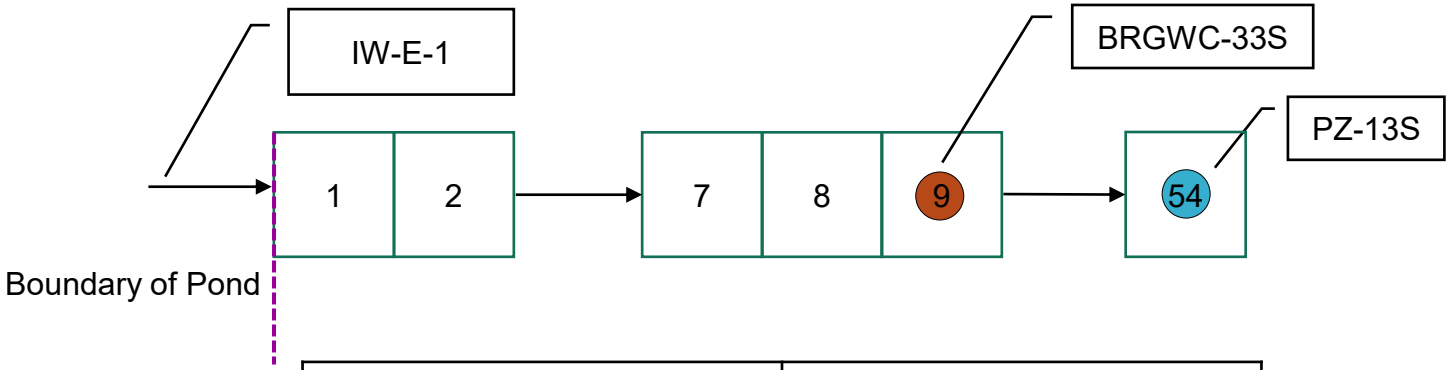
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FIGURE 2





Solid Phase	**Concentration** (wt.%)
Quartz	34.9
Kaolinite	37.7
Magnetite	0.50
Ferrihydrite	4,600 mg Fe/kg soil

Notes:
1. wt.% indicates weight percentage (estimated by X-ray diffraction) for solid phase available in database.
2. mg Fe/kg soil indicates milligrams of iron per kilogram of soil.
3. Cells are defined with an 8-meter length.
4. The blue arrow shows the groundwater flow.

BRGWC-33S – 1D MODEL SETUP SCHEMATIC

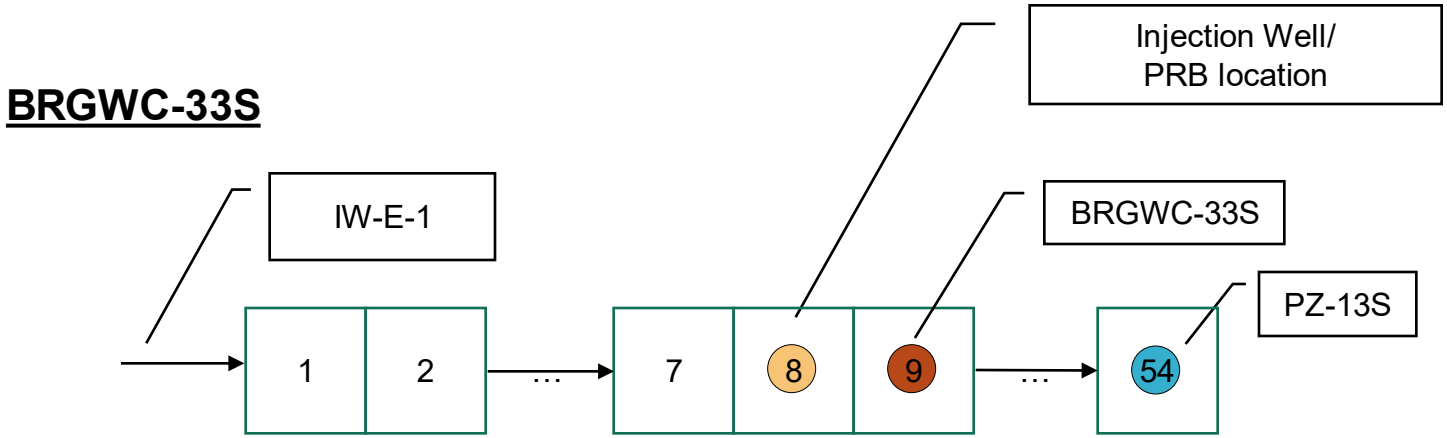
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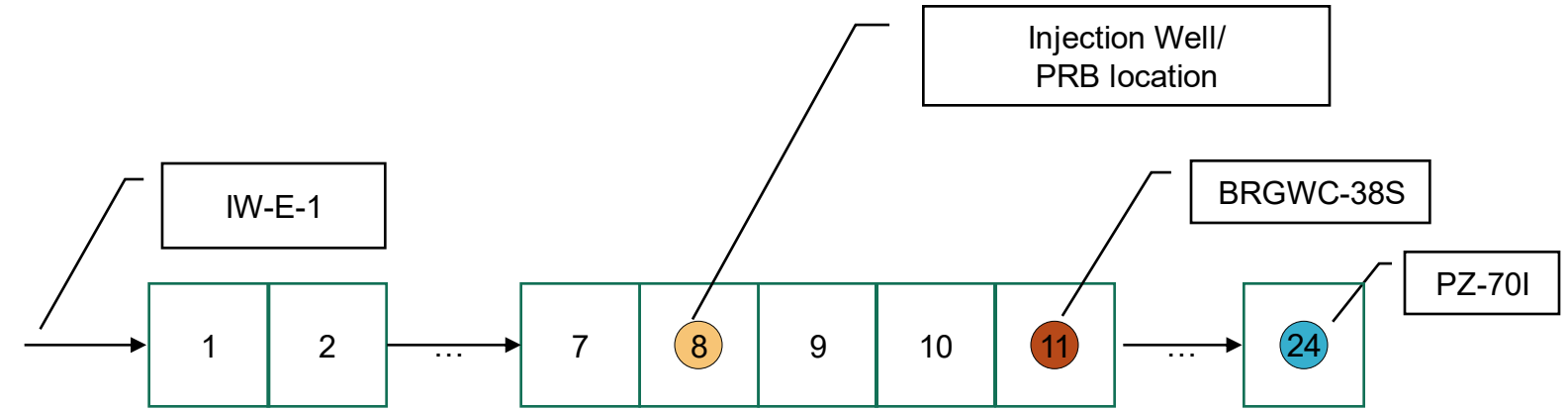
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FIGURE 3





Notes:
1. Proof of concept injection model considers placement of a single injection well upgradient of wells of interest.
2. Actual number of injection wells and injection flow rates to be evaluated as part of remedy design and implementation.
3. Cells are defined with an 8-meter length, and soil mixing was assumed to be implemented within a sub-cell of 4 meters in length.
4. PRB indicates permeable reactive barrier.

1D MODEL INJECTION / PERMEABLE REACTIVE BARRIER SETUP

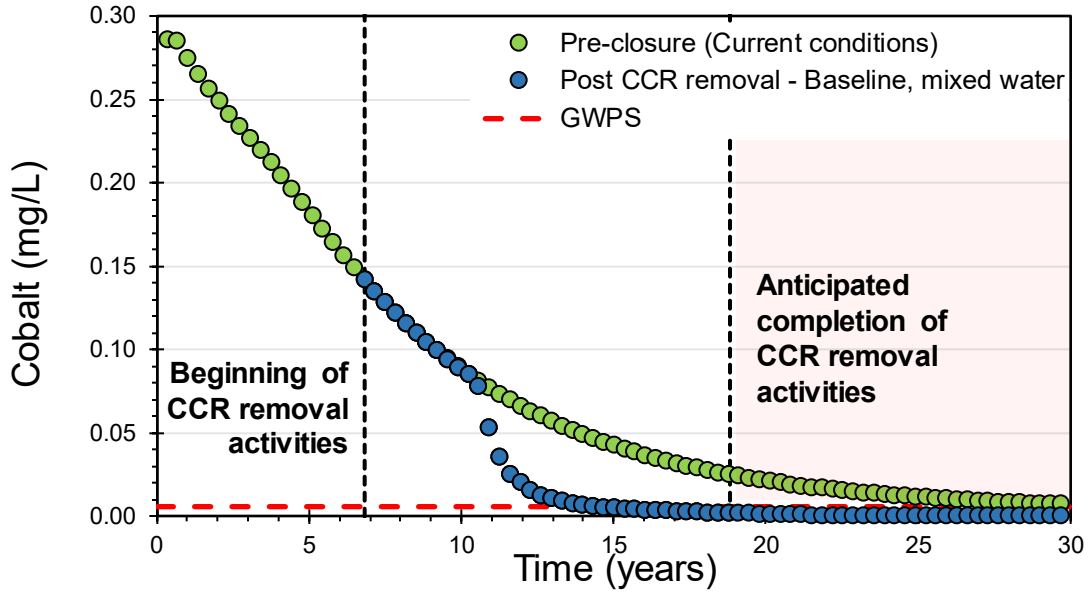
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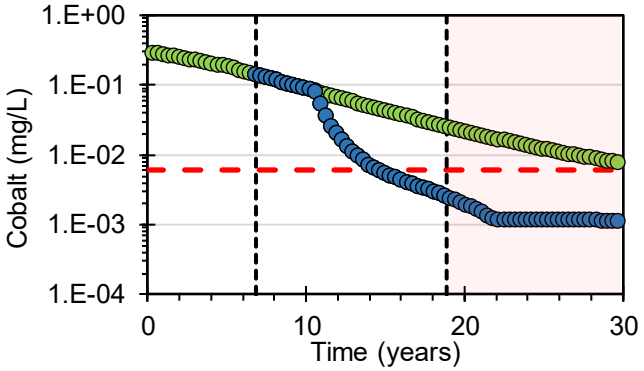
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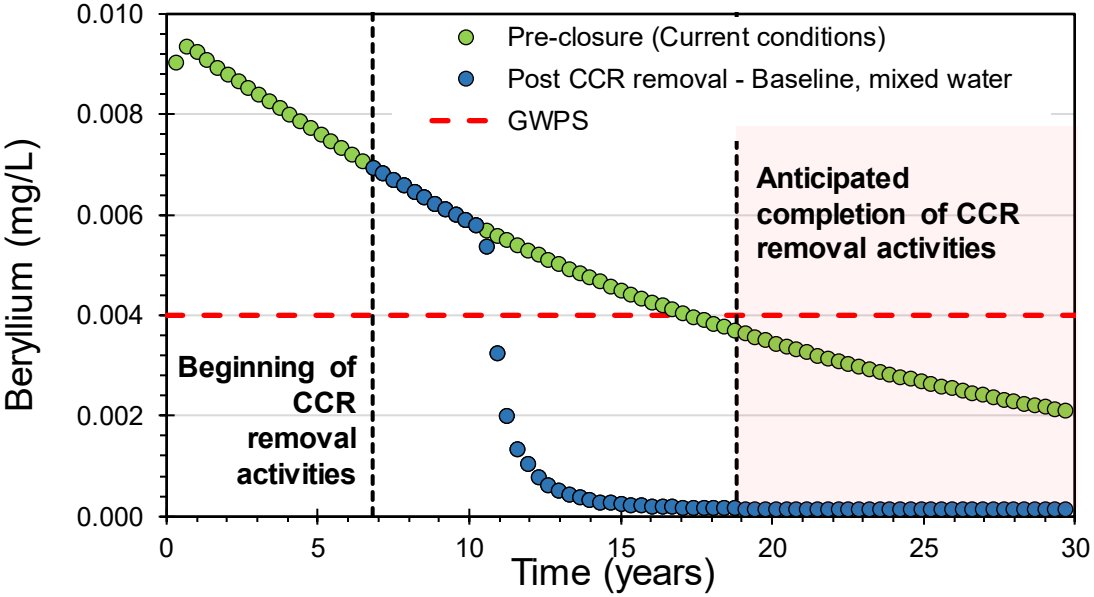
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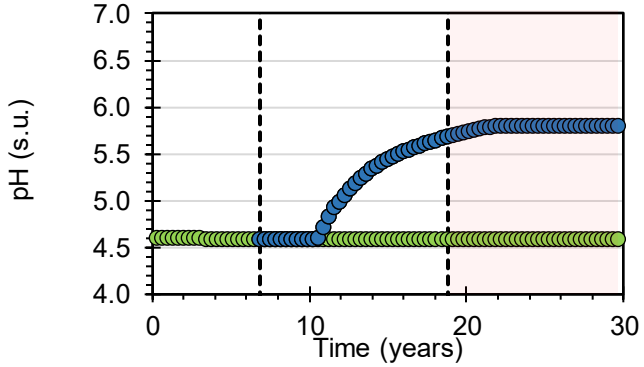
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FIGURE 4









Notes:
1. GWPS indicates groundwater protection standard.
2. mg/L indicates milligrams per liter.
3. s.u. indicates standard units.

PREDICTED CONCENTRATION OF COBALT, BERYLLIUM AND PH VS. TIME – MONITORED NATURAL ATTENUATION AT BRGWC-38S

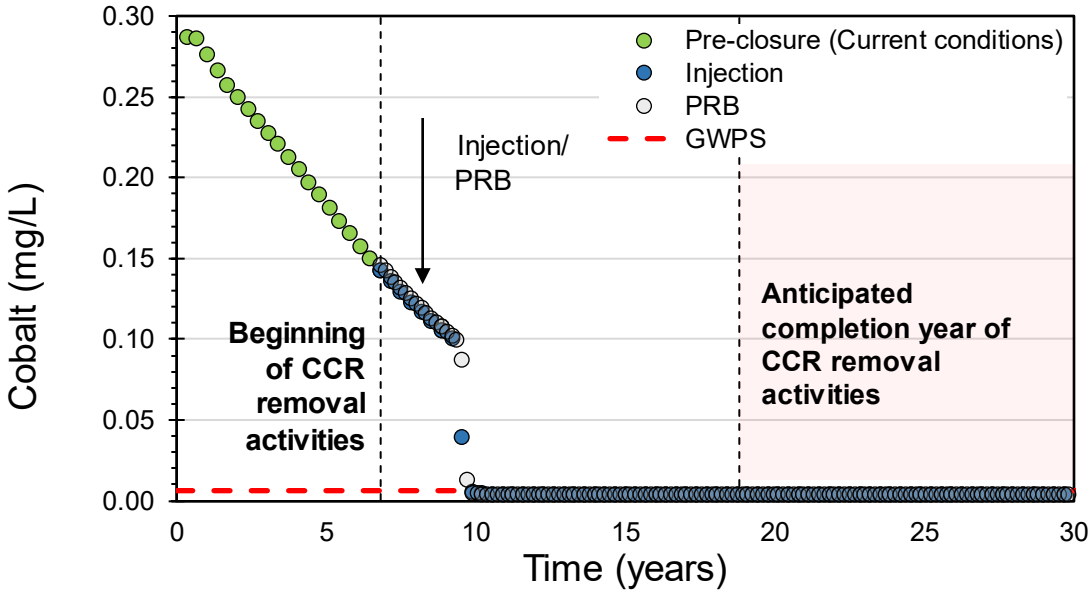
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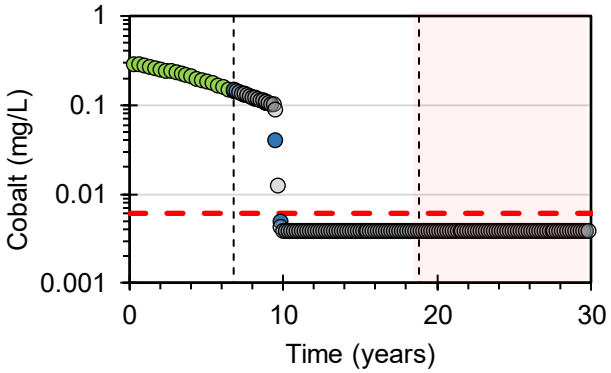
Prepared For: Georgia Power

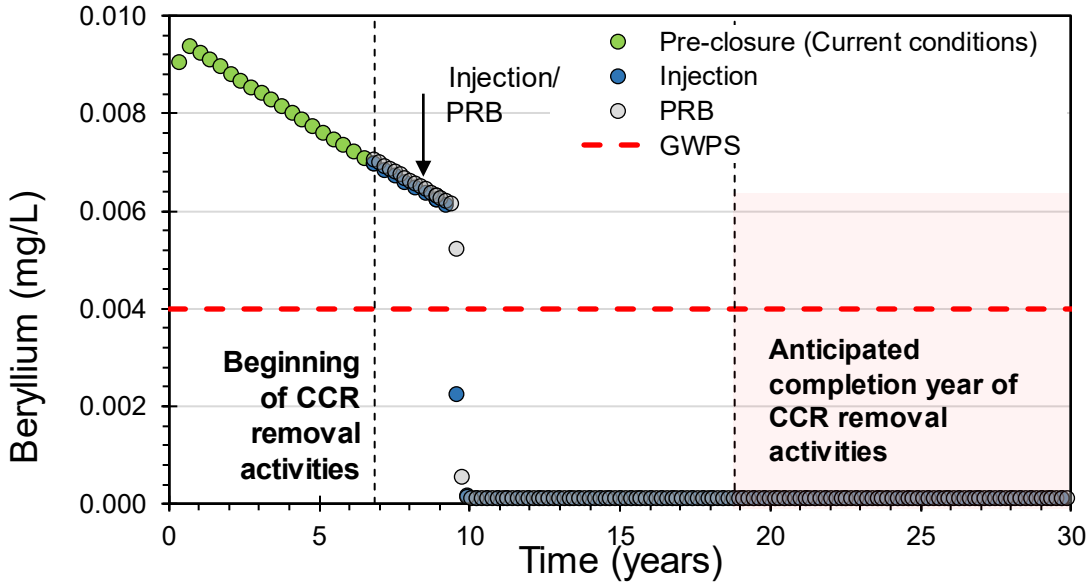
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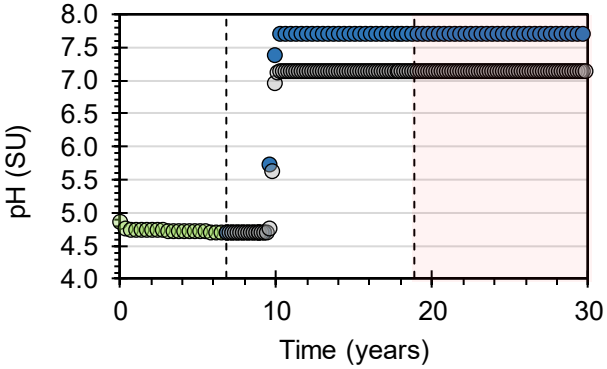
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FIGURE 5









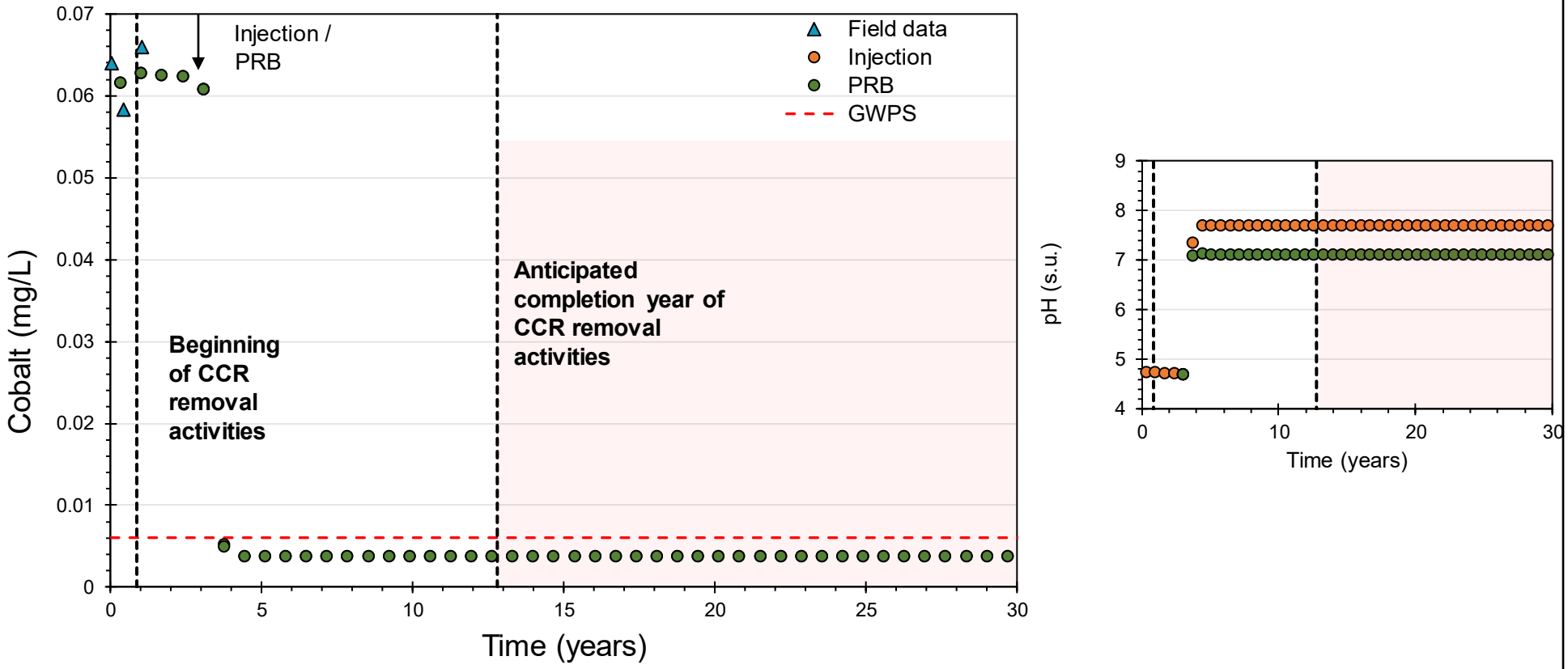
Notes:
1. GWPS indicates groundwater protection standard.
2. mg/L indicates milligrams per liter.
3. s.u. indicates standard units.
4. PRB indicates permeable reactive barrier.

PREDICTED CONCENTRATION OF COBALT, BERYLLIUM AND PH VS. TIME – GEOCHEMICAL INJECTION AND PERMEABLE REACTIVE BARRIER AT BRGWC-38S
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Prepared By: Geosyntec consultants

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FIGURE 6



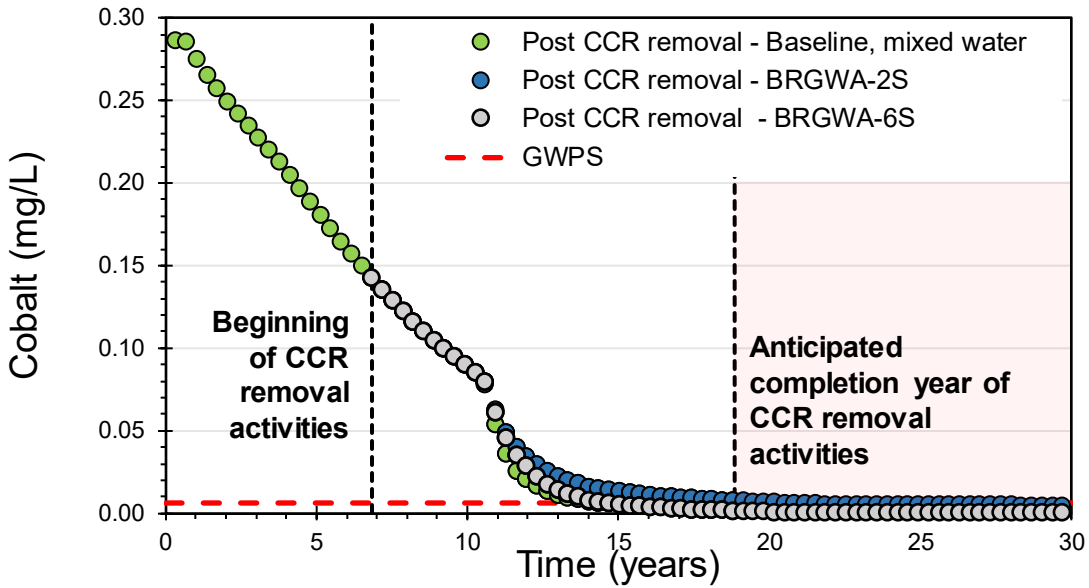
Notes:
1. GWPS indicates groundwater protection standard.
2. mg/L indicates milligrams per liter.
3. s.u. indicates standard units.
4. PRB indicates permeable reactive barrier.

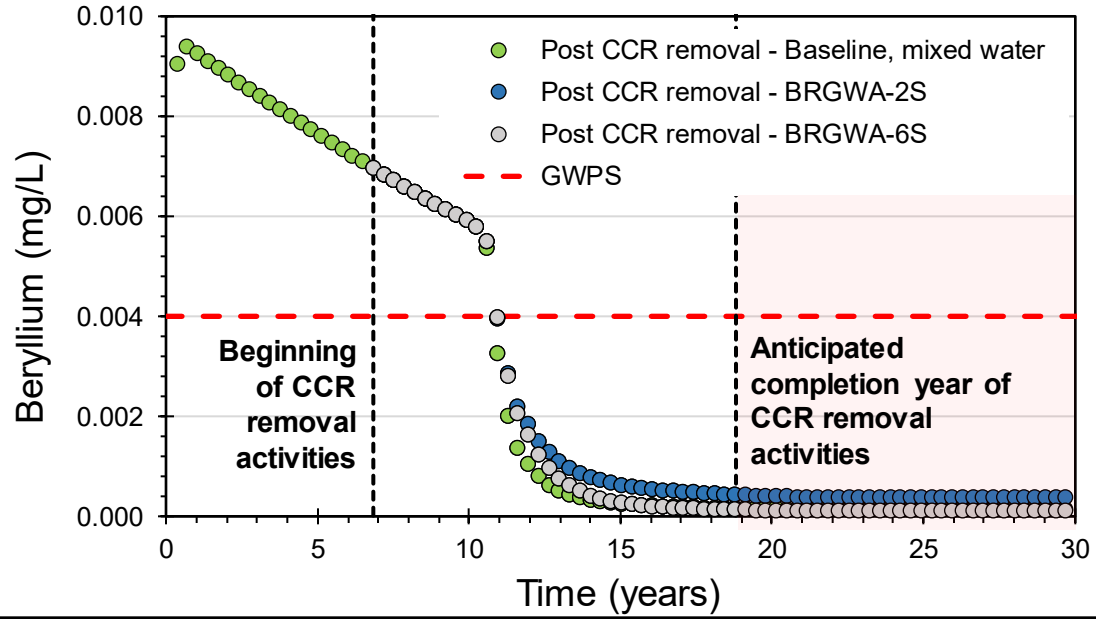
PREDICTED CONCENTRATION OF COBALT AND PH VS. TIME – GEOCHEMICAL INJECTION AND PERMEABLE REACTIVE BARRIER AT BRGWC-33S
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PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

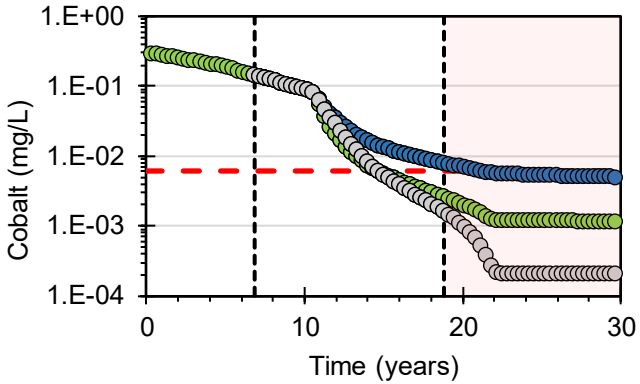
Prepared For: Georgia Power
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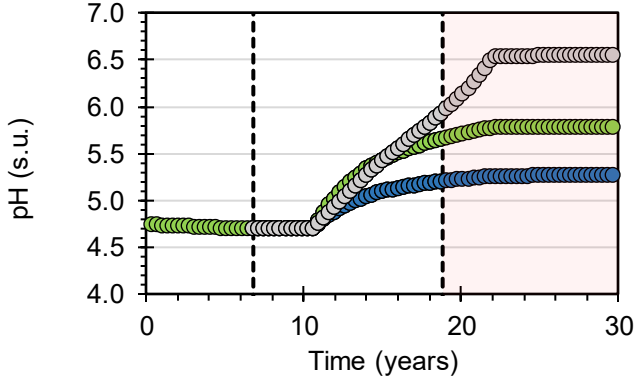
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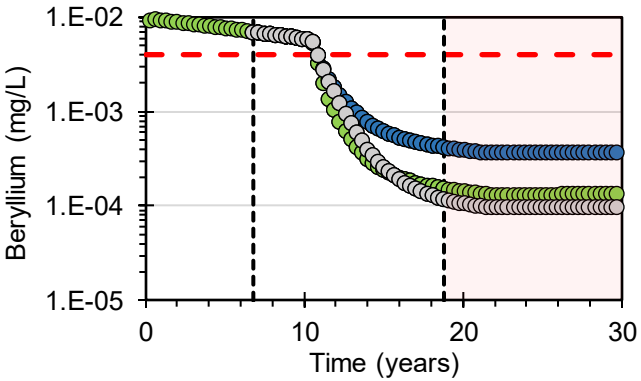
FIGURE 7











Notes:
1. GWPS indicates groundwater protection standard.
2. mg/L indicates milligrams per liter.
3. s.u. indicates standard units.

SENSITIVITY TO UPGRADIENT WATER QUALITY AT BRGWC-38S

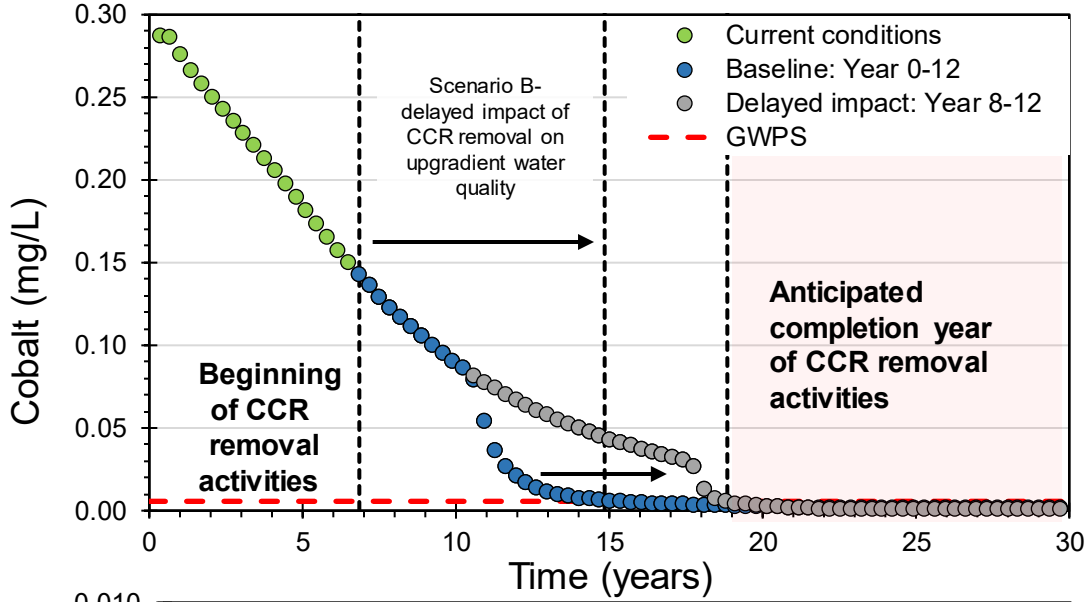
GEORGIA POWER COMPANY
PLANT BRANCH AP-E
PUTNAM COUNTY, GEORGIA

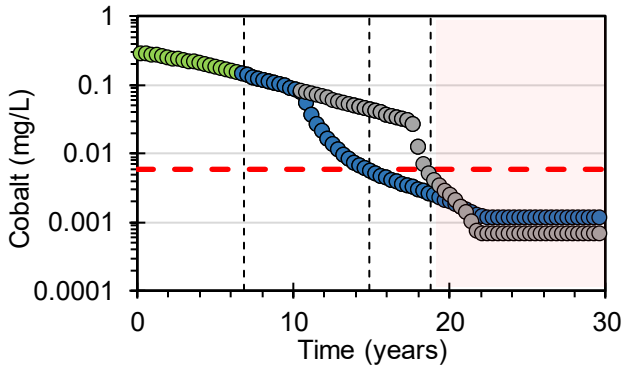
Prepared For: Georgia Power

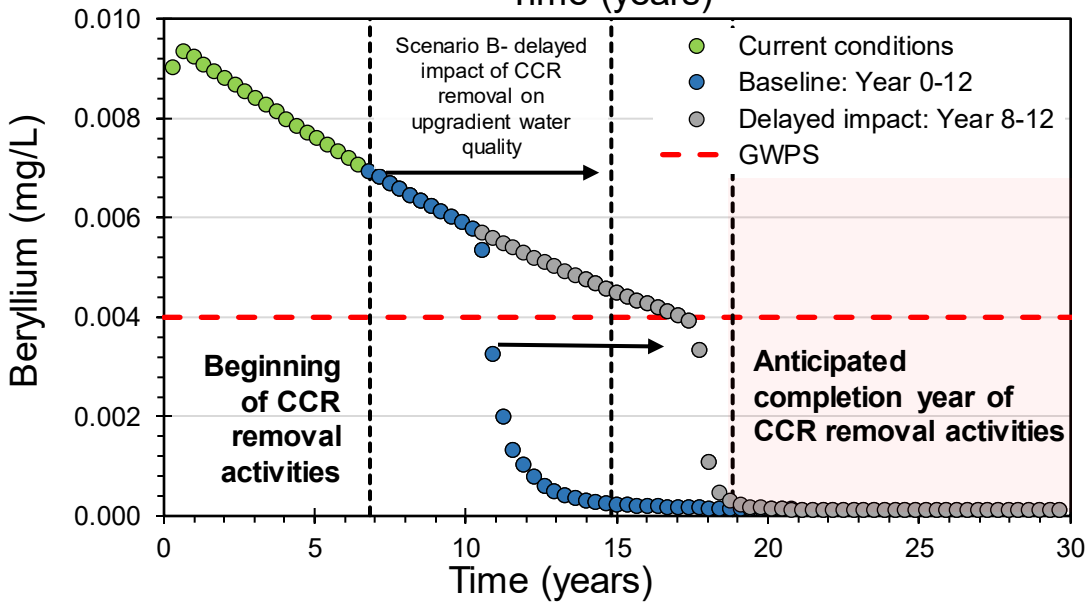
Prepared By: Geosyntec consultants

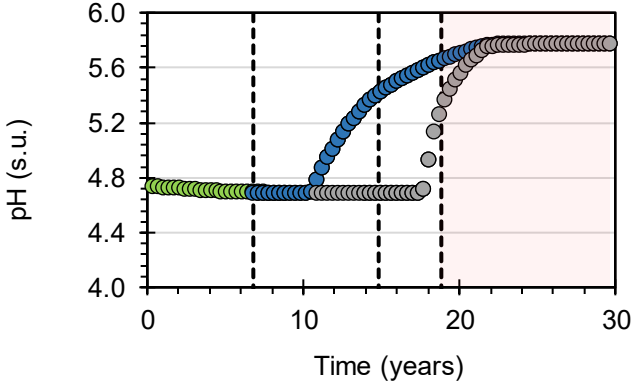
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FIGURE 8









Notes:
1. GWPS indicates groundwater protection standard.
2. mg/L indicates milligrams per liter.
3. s.u. indicates standard units.

SENSITIVITY TO TIMING OF IMPACTS FROM CLOSURE CONSTRUCTION AT BRGWC-38S

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FIGURE 9