DRAFT REMEDY SELECTION REPORT

PLANT ARKWRIGHT ASH POND 2 DRY ASH STOCKPILE MACON, GEORGIA

Prepared by



Stantec Consulting Services Inc. 10745 Westside Way, Suite 250 Alpharetta, Georgia 30009-7640

Prepared for



February 28, 2024

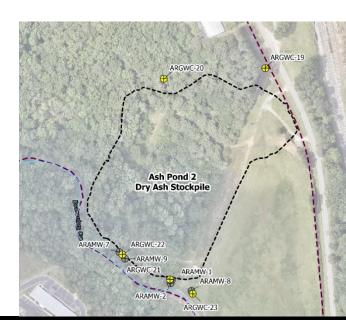
Certification

I, Jennifer L. Kolbe, 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 (CFR) 257 Subpart D] and the Georgia Environmental Protection Division Rules for Solid Waste Management 391-3-4-.10.



Jennifer L. Kolbe, PhD, P.E. (GEORGIA PE034643) Principal

Plant Arkwright Ash Pond 2 Dry Ash Stockpile: Executive Summary



Plant Arkwright is a former coal-fired electric generation facility which consisted of four 40-megawatt units located in Bibb County, Georgia, approximately six miles northwest of the city of Macon, Georgia, which was decommissioned in 2003. Coal combustion residuals (CCR), commonly referred to as "coal ash," a non-hazardous material generated from burning coal to generate electricity, were stored at the site in former Ash Ponds. 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) permits under which they were regulated. The Plant Arkwright Ash Pond 2 (AP-2) Dry Ash Stockpile (DAS) was used as a storage area for the Plant Arkwright's CCR. EPD issued a Closure Certificate for AP-2-DAS in 2010. As part of a comprehensive approach to managing CCR, Georgia Power is undertaking actions to close AP-2 DAS in accordance with federal and state regulations and completed a detailed evaluation of corrective measures to address cobalt and lithium above Groundwater Protection Standards (GWPSs) at AP-2 DAS at Plant Arkwright.

Ash Pond Closure

Georgia Power will close AP-2 DAS through the removal of approximately 304,000 cubic yards of CCR material from the CCR unit for disposal at a permitted, lined solid waste disposal facility. The closure of AP-2 DAS is regulated by the United States Environmental Protection Agency and the Georgia Environmental Protection Division (GA EPD).

Groundwater Monitoring and Assessment

Georgia Power has performed CCR groundwater monitoring at AP-2 DAS since June 2016. Over the period of Georgia Power's monitoring, concentrations of cobalt and lithium were identified at statistically significant levels



above the GWPS in one groundwater monitoring well. Groundwater and surface water monitoring indicates that cobalt and lithium above the GWPS are limited in extent and delineated.

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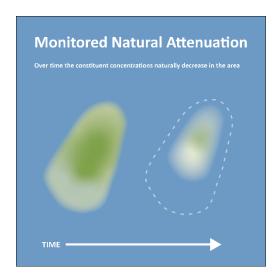
Risk Evaluation for Human Health and Environment

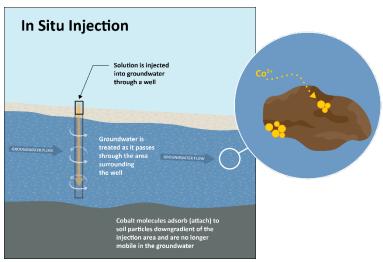
Georgia Power completed a human health and ecological risk evaluation that confirmed that cobalt and lithium identified on-site are not expected to pose a risk to human health or the environment.

Proposed Corrective Actions for Groundwater

Georgia Power initiated an assessment of corrective measures (ACM) program for AP-2 DAS in December 2020. 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 cobalt and lithium in groundwater. Using the criteria described in the CCR Rule, 40 Code of Federal Regulations (CFR) Part 257.97, the draft remedy proposed includes:

- 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 areas of highest groundwater concentrations of cobalt and lithium to immobilize these constituents. Groundwater monitoring will be performed to confirm the effectiveness of the in-situ injections.
- Monitored Natural Attenuation (MNA): Natural attenuation of cobalt and lithium 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 at the site through extensive laboratory testing and study. Groundwater monitoring will continue to document natural attenuation, which is expected to be enhanced by the geochemical in-situ injections.





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 Abbreviations and Acronyms

Abbreviation/Acronym

ACM Assessment of Corrective Measures AP-2 Arkwright Ash Pond 2 Below ground surface bgs **CAMP** Corrective Action Groundwater Monitoring Plan **CCR Coal Combustion Residuals CCR Rule** 40 Code of Federal Regulations (CFR) Part 257 CFR **Code of Federal Regulations** centimeters per second cm/s CSM Conceptual Site Model DAS Dry ash stockpile ft/day feet per day ft/ft feet per foot **GA EPD** Georgia Environmental Protection Division Georgia Power Georgia Power Company **GWPS Groundwater Protection Standard** ISI In-Situ Injection μg/L micrograms per liter MNA **Monitored Natural Attenuation** NAVD 88 North American Vertical Datum of 1988 **NPDES** National Pollutant Discharge Elimination System **0&M** Operations and Maintenance PDI Pre-Design Investigation

Definition

PRB

Permeable Reactive Barrier **PWR** Partially Weathered Rock

RCRA Resource Conservation and Recovery Act

Stantec Stantec Consulting Services, Inc. SSL Statistically Significant Level

USEPA United States Environmental Protection Agency



1. Introduction

Stantec Consulting Services Inc. (Stantec) prepared this Draft Remedy Selection Report on behalf of Georgia Power Company (Georgia Power) for Plant Arkwright Ash Pond 2 Dry Ash Stockpile (AP-2 DAS). As documented here, Georgia Power has completed a detailed evaluation of corrective measures to address cobalt and lithium in groundwater at statistically significant levels (SSLs) above the Groundwater Protection Standards (GWPSs). The evaluation was completed in accordance with the United States Environmental Protection Agency's (USEPA's) Coal Combustion Residuals (CCR) Rule, 40 Code of Federal Regulations (CFR) Part 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.

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 a proposed groundwater remedy 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 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 subject to potential modification based on adaptive management strategies, as appropriate.



2. 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* (ACM) (Wood, 2020) and *Semiannual Remedy Selection and Design Progress Reports* (Stantec 2023; Wood 2022; Wood 2021).

The remedy selected for the 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; and
 - (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 and subsequent updates to identify an appropriate groundwater remedy for the unit. Selection of an appropriate groundwater remedy is significantly influenced by CCR constituent chemistry and characteristics of Appendix IV parameters, which are inorganic trace elements—metals and metalloids that have attenuation and remediation characteristics markedly different than organic constituents. 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 (FeS₂); and precipitation as carbonates, sulfides, sulfates, and/or phosphates (USEPA, 2007; EPRI, 2018). The attenuation capacity can be evaluated through site-specific field and laboratory 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 Arkwright AP-2 DAS is located in Bibb County, Georgia, approximately six miles northwest of the city of Macon. The Plant Arkwright property is bordered by sparsely populated wooded land to the north, Beaverdam Creek to the south, the Ocmulgee River to the east, and mixed-use development (industrial, retail, and residential) to the west (**Figure 1**). The physical address of the plant is 5241 Arkwright Road, Macon, GA 31210.

When in operation, the Plant Arkwright coal-fired power plant consisted of four 40-megawatt units. In the years before retirement, the plant was used primarily to provide peaking power and operated approximately 40 to 60 days per year. Plant Arkwright was retired in 2002 and decommissioned in 2003.



Plant Arkwright AP-2 DAS, was used as a storage area for CCR beginning in the 1950s and was estimated to have been closed in-place in the late 1970s to early 1980s.

2.3 UNIT CLOSURE

AP-2 DAS was officially closed in 2010 with GA EPD approval and in accordance with the solid waste landfill regulations specified by GA EPD Rule 391-3-4.14, in effect at the time of its closure. Soil was placed over AP-2 DAS as a closure measure. A Closure Certificate was issued by GA EPD for AP-2 DAS on June 30, 2010. The Closure Certificate initiated the post-closure care period for the CCR unit, which has been performed in accordance with the GA EPD Permit No. 011-031D(LI). The CCR unit referred to as AP-2 DAS is defined as an inactive CCR landfill per GA EPD Rule 391-3-4-.10(2)(a)(3).

AP-2 DAS is exempt from the requirements in 40 CFR §257.50 (d) and (e), which state that the subpart does not apply to CCR landfills that have ceased receiving CCR material prior to October 19, 2015. This CCR unit is, however, subject to the requirements of relevant portions of GA EPD 391-3-4-.10.

Georgia Power has elected to remove the CCR material from the AP-2 DAS. The CCR material will be excavated from the AP-2 DAS and will be placed in a lined landfill.

2.4 GROUNDWATER MONITORING

The current groundwater monitoring system for the CCR unit includes the background/upgradient and downgradient monitoring wells, as summarized in **Table 1**. Compliance monitoring well locations are shown on **Figure 2**.

CCR groundwater monitoring-related activities have been performed at AP-2 DAS since June 2016 in accordance with the CCR Rule. The following Appendix IV SSL parameters, shown in **Table 2**, are the subject of this report:

Table 2. Appendix IV SSL Summary

Appendix IV SSL Constituent	Monitoring Well ID	
Cobalt	ARAMW-7	
Lithium	ARAMW-7	

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.



3. 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 parameters) 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-2 DAS. As data were gathered during the ACM process, the CSM was refined and used to eliminate potential groundwater remedial alternatives that were not compatible with the site-specific conditions and to pre-screen remedial technologies. The CSM for AP-2 DAS is summarized below.

3.1 GEOLOGIC AND HYDROGEOLOGIC SETTING

Near surface geology and hydrogeologic conditions present in the vicinity of AP-2 DAS influence the geochemical nature and extent of the inorganic constituents present in the area's groundwater. The geologic and hydrogeologic conditions at AP-2 DAS presented herein are based on information provided in the Limited Hydrogeologic Assessment Report for Inactive CCR landfill Former Plant Arkwright, AP-2 DAS Landfill (Jacobs 2018) and updated with additional AP-2 DAS area data provided in more recently published investigation reports (i.e., 2020–2023 AP-2 DAS Groundwater Corrective Action Reports and 2021–2023 AP-2 DAS Semi-Annual Remedy Selection and Design Progress Reports). A summary of the regional geologic and hydrogeologic conditions has been included (Section 3.1.1) to provide context to the AP-2 DAS area-specific conditions (Section 3.1.2).

3.1.1 Regional Framework

Plant Arkwright is located along the Ocmulgee River in the northern part of Bibb County, which is located on the southern edge of the Piedmont Province of the Appalachian Highland Physiographic District. Area topography is rolling to hilly, with the highest hills rising to about 800 feet above sea level. The topography is reflective of the deformation and subsequent long weathering of the underlying metamorphic and igneous rocks that extend across the Piedmont Province to the north of Plant Arkwright. Uppermost bedrock in the region is composed of moderate- to high-grade metamorphic rocks, consisting of biotite-granite gneiss, schist, and amphibolite, and igneous rocks like granite (LeGrand, 1962). Geologic bedrock maps indicate that bedrock at Plant Arkwright area is a biotite gneiss (See **Figure 3**).

The top of the bedrock surface in the area is described as highly weathered and, where exposed, the bedrock surface is generally soft and friable (LeGrand, 1962). In other upland areas, the crystalline bedrock is covered by a veneer of partially consolidated (saprolite) to unconsolidated (saprolitic) residuum formed by the in-place chemical weathering of the underlying rock. Residuum thicknesses of up to 100 feet have been identified in the Piedmont Province in broad draws and valleys (Miller, 1990). Major geologic structures in the region include the Ocmulgee Fault, located approximately seven miles to the northwest of Plant Arkwright which strikes mostly northeast—southwest. This fault zone was formed and subsequently fused approximately 350 million years ago (Hooper and Hatcher, 1990). The region is not considered to be seismically active, with a earthquake hazard level of very low (GFDRR, 2020).



Tributary streams in the area, having adjusted their courses to the structure of the underlying crystalline bedrock, flow generally southeastward to join the south-flowing Ocmulgee River present at an elevation of approximately 300 feet above mean sea level adjacent to Plant Arkwright. Alluvial deposits ranging from clay to sand and gravel deposits are present within incised bedrock channels formed by the tributary streams and within the broader floodplains of the larger rivers. Reported alluvial (floodplain) deposits within the greater Ocmulgee River drainage are up to 40 feet thick and extend several thousand feet from the river axis along river segments to the south of the Piedmont Province (LeGrand, 1962). These depositional conditions are not present along the Ocmulgee River adjacent to Plant Arkwright. Aerial photographs of the river show the presence of a narrow river with a restricted floodplain beyond the far bank of the river and a bedrock channel valley that has been scoured free of alluvial deposits.

There are no laterally extensive regional aquifers in the Piedmont Province (Miller, 1990). Groundwater is mainly supplied by infiltrating precipitation and is found in the residuum/partially weathered rock (PWR) and fractured portions of the upper bedrock in upland areas and in alluvial deposits within incised stream channels. Shallow groundwater flow direction locally mimics area topography but regionally moves southward towards the coastal plain (Miller, 1990). The competent crystalline rock underneath the unconsolidated deposits (overburden) has little to no primary (intergranular) porosity. Where encountered, groundwater in the competent bedrock is found in secondary porosity features such as isolated open fractures, foliation separations, igneous/metamorphic rock contacts, and potential fault zones.

3.1.2 AP-2 DAS Area

The AP-2 DAS footprint is located on a southward sloping area bounded to the north by the terminus of a ridgeline, and to the south by a constructed earthen berm just north of Beaverdam Creek. The berm wraps around the west side of the stockpile. AP-2 DAS was constructed with a soil cover and is presently heavily vegetated.

Investigation boring logs and cone penetrometer results were used to construct three geologic cross-sections along the alignments shown in **Figure 4** to characterize area geology. Cross-Sections A-A' through C-C' are provided as **Figures 4A through 4C**, respectively. The cross-sections are based on lithologic information from borings advanced in the area between 2008 and 2022.

The AP-2 DAS is composed of CCR material that varies in thickness from 1.5 feet (north end) to 30 feet (central and south end), with discontinuous layers of intermixed fill material. The CCR material is primarily a dry, black to light olive gray, sandy silt to clay-sized ash material. The soil cap and berm around the AP-2 DAS are constructed of reworked native silty to sandy clays.

The **overburden** materials present in the subsurface at AP-2 DAS from surface grade to depth are:

Native soils - These shallow overburden soils consist primarily of alluvial and saprolitic soil
deposits. Material that has developed into a soil following the complete in place chemical
weathering of its parent bedrock is here referred to as a saprolitic soil. At the AP-2 DAS, the
saprolitic soils are typically loose, range in color from dark yellow gray to red to light brown and
are composed of fine sand-sized particles containing varying percentages of clay, silt, and
medium sand. A wedge of alluvial fine- to medium-sand with interbedded soft, gray to black



- clay layers is also present and extends from Beaverdam Creek beneath the southern portion of AP-2 DAS. Native soils range in thickness from 0 to 22 feet.
- Saprolite Rock that has been chemically weathered in place, but still retains its primary rock fabric, is referred to as saprolite. Underlying the native soils is a typically grey to brownish red saprolite layer of varying thickness. The saprolite retains the streaky banding and foliations characteristic of gneiss but readily disintegrates into varying percentages of gravel, sand, silts, and clays when mechanically disturbed. Saprolite thicknesses at AP-2 DAS range from absent to 26 feet. The majority of the AP-2 DAS overburden monitoring wells are screened in saprolite.

The **bedrock** materials present beneath the overburden are:

- Partially weathered rock As weathering preferentially occurs along horizontal and vertical fractures present within the rock matrix, less altered, more resistant layers or blocks of rock that are bounded by weathered zones or fractures may be preserved above the downward advancing weathering front at the bedrock contact. These less altered layers or blocks are referred to as PWR. Borings completed to date have not found laterally extensive PWR at AP-2 DAS. Encountered PWR thicknesses range from 5 feet to approximately 20 feet.
- Biotite gneiss bedrock The top of biotite gneiss bedrock is at depths of approximately 22 to 41 feet below original grade. Bedrock contact elevations range from 263 feet North American Vertical Datum of 1988 (NAVD88) at Beaverdam Creek to 308 feet NAVD88 just north of the AP-2 DAS. The degree of fracturing at the bedrock contact varies from none noted to heavily fractured and weathered. Where present, the bedrock fractures are predominantly horizontal to slightly inclined.

The uppermost aquifer at AP-2 DAS consists of 1) water-bearing sandy overburden materials and 2) PWR and zones of shallow, highly fractured bedrock underlying the overburden or PWR. Comparison of AP-2 DAS groundwater elevation data from adjacent overburden and PWR/shallow bedrock monitoring wells shows that groundwater elevations in the overburden and shallow bedrock are similar. This, in combination with often observed weathering and discoloration in fracture zones at the bedrock contact, suggests that groundwater in the overburden and shallow bedrock fractures are hydraulically connected and groundwater flow in PWR/shallow fractured bedrock is predominantly horizontal. The base of the uppermost aquifer is unfractured competent bedrock having no significant primary porosity and no to few observed secondary porosity features.

As part of vertical delineation for target constituents exhibiting SSLs, a deeper assessment well, ARAMW-9, was installed in 2022 (**Figures 4 and 4A**). The deep bedrock assessment well ARAMW-9 has a top of screen elevation that is approximately 51 feet below the top of rock elevation of 265 feet NAVD88. The measured groundwater elevation in ARAMW-9 was 305.73 feet NAVD88, or less than a foot below ground surface at the well, and 9 feet above the elevation of the uppermost aquifer water table. These conditions show that the groundwater in the deeper bedrock monitored by ARAMW-9 is under a confined condition and not in direct hydraulic communication with the overlying unconfined uppermost aquifer at the AP-2 DAS. Groundwater in well ARAMW-9 appears to represent deep bedrock flow as supported by its hydraulic pressure and groundwater geochemistry that is distinct from the uppermost aquifer.



The January 2023 uppermost aquifer potentiometric surface contour map is shown in **Figure 5**. The uppermost aquifer at AP-2 DAS is unconfined. The water table is present in overburden at depths ranging from 6 to 26 feet below ground surface and at elevations ranging from approximately 296 to 314 feet NAVD88 (Stantec, 2023).

Groundwater in the uppermost aquifer flows southward and toward Beaverdam Creek under a measured hydraulic gradient of 0.024 to 0.026 feet per foot (ft/ft) (See **Table 1** in **Appendix C**). Observed groundwater flow at the AP-2 DAS is consistent with a southerly regional groundwater flow direction (See **Figure 5**).

The average linear groundwater flow velocity (ν) within the uppermost aquifer at AP-2 DAS can be estimated using the following equation:

 $v = Ki/n_e$

where: K = hydraulic conductivity of the saturated media

i = hydraulic gradient

n_e = effective porosity

Hydraulic conductivity (slug) testing at AP-2 DAS monitoring wells screened in the overburden and fractured bedrock (uppermost aquifer) was completed in 2021. The horizontal hydraulic conductivity at monitoring wells screened within the uppermost aquifer ranged from 8.35×10^{-5} to 7.56×10^{-4} centimeters per second (cm/s) (0.237 to 2.14 feet per day [ft/day]).

Site-specific values of effective porosity can be difficult to obtain. Accordingly, measured effective porosity values reported in the literature for saturated media having properties similar to those found at a site are commonly used to estimate average linear groundwater flow velocities. Table 10-4 of the *Interim Final RCRA Facility Investigation (RFI) Guidance* (US EPA, 1989) provides a list of effective porosity values that can be used to estimate groundwater flow velocities for differing soil and rock types. An effective porosity value of 0.20 from the *Guidance* will be used based on the predominant material types found within the uppermost aquifer at AP-2 DAS.

Assuming an effective porosity value of 0.20, the previously discussed AP-2 DAS area hydraulic gradients ranging from 0.024 to 0.026 ft/ft, and the horizontal hydraulic conductivities provided above, the calculated average linear velocity for the uppermost aquifer ranges from 0.019 to 0.557 ft/day (6.9 to 203 feet per year). These calculated values are consistent with the average groundwater velocity of 0.26 ft/day (95 feet per year) determined by calibration of the Reactive Transport Model (**Appendix C**).

3.2 GEOCHEMICAL CSM

As detailed in the *Geochemical Conceptual Site Model Report* (**Appendix A**) (Geochemical CSM Report), groundwater quality at the Arkwright Plant is affected by numerous geochemical processes, including sorption, cation exchange, precipitation, and dissolution. The effect of these geochemical processes can explain the observed behavior of cobalt and lithium in groundwater and can influence the attenuation of CCR constituents. The nature and extent of the interaction between dissolved constituents in groundwater, unconsolidated materials, saprolite, and bedrock range from limited interaction for constituents such as boron, chloride, and sulfate, to strong interaction for constituents such as cobalt. The following geochemical reactions or processes are likely mechanisms influencing the fate and transport of cobalt and lithium in groundwater:



- Sorption on the surfaces of metal oxyhydroxides
- Cation exchange with clay minerals
- Mineral precipitation or dissolution

3.3 NATURE AND EXTENT OF GROUNDWATER ABOVE THE GWPS

Based on statistical analysis of Appendix IV groundwater data, the cobalt and lithium SSLs identified in the compliance well ARAMW-7 are horizontally and vertically delineated to levels below GWPS. Due to the presence of Beaverdam Creek in the downgradient direction of ARAMW-7 and the topography in this area, installation of additional wells to horizontally characterize this area is infeasible. Based on cobalt and lithium data collected from Beaverdam Creek to date, horizontal delineation is complete. Please refer to the January-February 2023 iso-concentration maps for cobalt and lithium presented in **Figures 6 and 7**, respectively. Compliance wells with SSLs and the pertinent horizontal and vertical delineation sampling locations are also provided in **Table 3**.

Table 3. Cobalt and Lithium Delineation Summary

Detected Constituent	GWPS (mg/L)	Monitoring Well / Sampling Location ID	Concentration (mg/L)
Cobalt	0.006	ARAMW-7	0.0687
Lithium	0.04	ARAMW-7	0.0680
Vertical Delineation			
Cobalt	0.006	ARAMW-9	< 0.000300
Lithium	0.04	ARAMW-9	0.00463
Horizontal Delineation			
Cobalt	0.006	BC-0.5.7	< 0.00039
Lithium	0.04	BC-0.5.7	< 0.00073

Notes:

- 1. mg/L = milligrams per liter
- 2. "<" indicates that the constituent was below the laboratory method detection limit
- 3. Data presented are from the January-February 2023 groundwater monitoring event

4. Assessment of Corrective Measures Summary

An ACM Report was completed on December 4, 2020, in accordance with 40 CFR §257.96 and identified the following corrective measures as potentially applicable to remediate groundwater at AP-2 DAS:

- Geochemical Approaches (In-Situ Injection [ISI])
- Hydraulic Containment (Pump and Treat [P&T])
- Monitored Natural Attenuation (MNA)
- Permeable Reactive Barrier (PRB)
- Phytoremediation /TreeWell ®
- Subsurface Vertical Barrier Walls

Georgia Power also 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 site conceptual model will be updated as more data are collected; and (4) adjustments and augmentations will be made to the remedy, as warranted, to assure that site objectives are met.

Further evaluation and refinement of the groundwater corrective measures were presented in *Semiannual Remedy Selection and Design Progress Reports* submitted since the ACM Report in 2020. The corrective measures identified for the CCR unit in the ACM have been further evaluated using the criteria outlined in 40 CFR §257.96(c) and GA EPD Rule 391-3-4.10(6)(a). The screening of the corrective measures, as presented in the *Semiannual Remedy Selection and Design Progress Reports*, is summarized in **Table 4**.

The corrective measures that were not screened out and were retained for further evaluation under the 40 CFR §257.97 remedy selection criteria in this document include the following:

- Corrective Measure 1 In-Situ Injection (ISI): In-situ treatment can be accomplished through reagent injections and constitutes a remediation technology for inorganic constituents, such as cobalt. Cobalt can be precipitated or sorbed/immobilized under different combinations of pH and oxidation-reduction (redox) conditions. Lithium, because of its low reactivity and high solubility, is less amenable to precipitation and has lower sorption potential than cobalt. In-situ treatment is a potentially viable corrective measure primarily for cobalt, and to a lesser extent for lithium, in groundwater at AP-2 DAS.
- Corrective Measure 2 Pump and Treat (P&T): Hydraulic containment refers to the use of
 groundwater extraction to induce a hydraulic gradient for hydraulic capture or control of the
 migration of 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. Groundwater
 pump and treat is often slow to restore groundwater quality, but can be more effective as an



interim measure, or combined with another measure, to provide hydraulic containment to limit constituent migration toward a potential receptor.

- Corrective Measure -3- Monitored Natural Attenuation (MNA): MNA relies on natural attenuation processes to achieve site-specific remediation objectives within a similar time frame relative to more active methods. Under certain circumstances (e.g., through sorption or mineral precipitation), MNA effectively reduces the dissolved concentrations of inorganic constituents in groundwater. Attenuation mechanisms for inorganic constituents, such as cobalt and lithium, are either physical (e.g., dilution, dispersion, flushing, and related processes) or chemical (e.g., sorption or redox reactions). Physical and chemical MNA mechanisms for cobalt and lithium can be effective in reducing groundwater concentrations without the potential for additional mass of constituents migrating to downgradient groundwater. As detailed in the Geochemical CSM Report provided in Appendix A, natural attenuation of cobalt and lithium is primarily due to adsorption, co-precipitation, and cation exchange, and does not rely solely on physical means of attenuation.
- Corrective Measure 4 Permeable Reactive Barrier (PRB): PRBs typically involve the installation of a permeable subsurface wall constructed with reactive media for the removal of constituents as groundwater passes through the subsurface. PRBs can be installed in downgradient locations using conventional excavation methods, one-pass trenching method, or through injection of a solid slurry. Reactive media are emplaced within the treatment zone to create a permeable barrier that treats dissolved constituents as they passively flow through the PRB with the groundwater (ITRC, 2011). These systems can either be constructed as continuous "walls" or as "funnel-and-gate" systems where (impermeable) slurry walls create a "funnel" that directs groundwater to permeable "treatment gates" filled with reactive materials. PRBs are typically keyed into an underlying low-permeability unit such as a clay layer. Treatment of cobalt and lithium within a PRB is primarily due to adsorption, co-precipitation, and cation exchange associated with the reactive media within the barrier.
- Corrective Measure 5 Phytoremediation/TreeWell®: Phytoremediation uses trees or other plants to uptake or immobilize constituents or achieve hydraulic control without the need for an above ground water treatment system and infrastructure. However, the effectiveness of groundwater remediation using traditional phytoremediation approaches can be limited by compacted soil conditions that impede root penetration or target groundwater that is too deep for root access. Given depth of the screened interval for monitoring well ARAMW-7 which exhibits SSLs of cobalt and lithium (35 to 45 feet below ground surface [bgs]), traditional plantings of phytoremediation are not expected to be successful. However, more recently, an engineered approach to phytoremediation, the TreeWell® system (which is a proprietary system developed by Applied Natural Sciences), has been shown to overcome these constraints (e.g., Gatliff et al., 2016). By installing a cased "well" for tree planting using large diameter auger technology, extraction of deeper groundwater zones (i.e., in excess of 50 feet bgs) can be achieved since the surface of the "well" is sealed and only groundwater from a targeted zone is allowed into the cased-off borehole. This type of system mirrors a traditional mechanical extraction system using the trees as pumps. Also, the advantage of the system includes no above-ground water management needs and limited long-term operations and maintenance requirements following the establishment of the tree system.



Preliminary or conceptual remedy design drawings of the five corrective measures are shown on **Figures 8A through 8E**. Since the layouts are considered conceptual, the configuration of the implemented remedy may vary. The imagery shown on **Figures 8A through 8E** may not be fully representative of post closure conditions and actual layouts would be determined based on site conditions at the time of implementation.



5. Corrective Measures Evaluation

The purpose of this section is to evaluate and rank the five corrective measures alternatives using the required criteria described in 40 CFR §257.97(b) and the comparative criteria described in 40 CFR §257.97(c).

5.1 REQUIRED CRITERIA (§257.97(b))

As described in 40 CFR §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 40 CFR §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 40 CFR §257.98(d).

Below, the corrective measures alternatives are evaluated against the required criteria.

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

CCR material 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 has conservatively and protectively conducted a risk evaluation. A groundwater Risk Evaluation Report was prepared for AP-2 DAS and was submitted with the ACM document (Wood 2020). The Risk Evaluation Report has subsequently been updated to include groundwater and surface water monitoring data collected through August 2023 and October 2023, respectively, and is included as **Appendix B**. This evaluation is one of many lines of evidence evaluated herein and factored into the remedy selection process. The risk evaluation for the SSL-related constituents in groundwater and surface water at AP-2 DAS was conducted using methods consistent with GA EPD and USEPA guidance and included multiple conservative assumptions. Based on the evaluation, which assessed potential receptors and exposure pathways, cobalt and lithium observed in groundwater and surface water at AP-2 DAS are not expected to pose a risk to human health or the environment. The 2023 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 and the environment will be protected through implementation of any of the remedies being evaluated.



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

The proposed remedies are each predicted to attain the GWPS at the compliance boundary (waste boundary) and throughout the area of groundwater SSL exceedances. For each of the remedies retained, attainment of the GWPS is expected based on constituent transport evaluations. The groundwater flow and constituent transport evaluations, and associated input parameters, are described in detail in *Reactive Transport Model Report* included in **Appendix C.** These evaluations suggest that the GWPS can be met at the compliance boundary through monitored attenuation within approximately 36 years following closure by removal, in the absence of a more active remedy.

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

In connection with a groundwater remedy, the source of the contamination must be controlled to reduce or eliminate, to the maximum extent feasible, further releases. The following section describes how each potential remedy would, in the context of the planned unit closure, control the source of release.

Closure by removal will be completed safely, in compliance with applicable federal and state regulations, and is protective of public health and the environment. Closure by removal includes excavation of the CCR material and removal from AP-2 DAS. Physical removal of the CCR material would, over time, be supportive of concentrations of Appendix IV constituents in downgradient groundwater declining and overall groundwater concentrations attenuating.

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.

For the purpose of groundwater remedy selection, the control provided by the closure-by-removal approach ensures that the control requirement would be met for all corrective measures being evaluated. None of the remedies being evaluated will interfere with the control provided by the closure, and Appendix IV constituents beyond the waste boundary that are present within the groundwater plume will be controlled by the groundwater remedy:

- In-Situ Injection (ISI) Cobalt can be precipitated and/or immobilized under different combinations of pH and redox conditions. A variety of pH and/or redox-altering technologies are available which can incorporate biological processes, chemical oxidants and reductants, and/or mechanical processes such as air sparging. These processes chemically immobilize constituents in groundwater through precipitation and sorption, which effectively remove these constituents from groundwater, thereby controlling contaminant release/movement. Lithium, because of its lower reactivity and higher solubility, is less amenable to precipitation and has lower sorption potential than cobalt. Lithium mobility is primarily controlled by cation exchange and is less dependent on geochemical conditions such as pH and redox condition.
- Pump-and-Treat (P&T) hydraulic containment (or control) refers to the use of pumping
 (extraction) or injection to create a hydraulic gradient to capture or control the downgradient
 migration of impacted groundwater. Hydraulic containment would thereby limit potential
 contaminant release/movement to the capture zone.
- Monitored Natural Attenuation (MNA) The natural attenuation processes that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity,



mobility, volume, or concentration of constituents in groundwater. As detailed in the Geochemical CSM Report provided in **Appendix A**, the primary mechanisms governing attenuation and immobilization of cobalt and lithium at AP-2 DAS are adsorption, coprecipitation, and cation exchange. MNA of cobalt and lithium does not rely solely on physical means of attenuation. These in-situ processes, applicable to inorganic constituents found in CCR material, effectively attenuate the movement of inorganic CCR constituents in groundwater, thereby controlling contaminant release/movement.

- Permeable Reactive Barrier (PRB) A PRB is a zone of reactive material that extends below the
 water table to intercept and treat target groundwater. PRBs have proven to be effective in
 passively treating several inorganic constituents found at CCR sites, including cobalt (e.g., ITRC,
 2011). These processes can essentially immobilize and/or precipitate such inorganic
 constituents, thereby controlling contaminant release/movement. Reagents utilized in a PRB at
 AP-2 DAS would be selected to enhance geochemical processes that attenuate cobalt and
 lithium.
- Phytoremediation Phytoremediation is the use of specific plant species for their ability to
 degrade, immobilize, or contain certain constituents in soil, groundwater, surface water, and
 sediments. These processes can essentially immobilize and/or precipitate contaminates thereby
 controlling contaminant release/movement.

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

The remedial alternatives retained for further consideration in the ACM and ACM updates would be effective at removing Appendix IV constituents from groundwater, either through processes of physical removal, immobilization, or chemical attenuation in groundwater, as provided below:

The remedies considered herein remove contaminated material from the environment as follows:

- In-Situ Injection (ISI) Cobalt can be precipitated and/or immobilized under different combinations of pH and redox conditions. Lithium, because of its lower reactivity and higher solubility, is less amenable to precipitation involving manipulation of pH and redox conditions, but lithium may be attenuated by amendment materials with high cation exchange capacity. A variety of pH and/or redox-altering technologies are available which can incorporate biological processes, chemical oxidants and reductants, and/or mechanical processes such as air sparging. These processes remove contamination from the environment by reducing the presence of contaminants in groundwater through immobilization and/or precipitation.
- Pump-and-Treat (P&T) Hydraulic containment (or control) refers to the use of groundwater
 extraction to artificially induce a hydraulic gradient and capture or control the migration of
 impacted groundwater. This remedy would remove contamination from the environment by
 reducing the presence of contaminants in groundwater through withdrawal within the capture
 zone.
- Monitored Natural Attenuation (MNA) The natural attenuation processes that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. Precipitation, sorption, and cation exchange are the dominant mechanisms responsible for the reduction of



mobility, toxicity, or bioavailability of inorganic contaminants, including cobalt and lithium. These processes remove contamination from the environment by reducing the presence of contaminants in groundwater.

- Permeable Reactive Barrier (PRB) PRBs have proven to be effective in passively treating several inorganic constituents found at CCR sites, including cobalt (e.g., ITRC, 2011). Due to its lower reactivity, lithium may be more challenging to treat using PRBs. In laboratory studies, zeolites and clays such as bentonite and kaolin have been shown to exhibit lithium-sorbing characteristics. Generally, PRBs are not used for lithium remediation. A different media or a secondary technology may be needed to remediate lithium. PRBs rely on physical and chemical processes such as sorption, reduction, or oxidation. These processes remove contamination from the environment by reducing the presence of contaminants in groundwater through immobilization and/or precipitation. Cobalt can be attenuated in a PRB through use of media that provides additional sorption sites and/or adjusts geochemical conditions to favor precipitation and adsorption reactions.
- Phytoremediation Phytoremediation is the use of plants to degrade, immobilize, or contain
 constituents in soil, groundwater, surface water, and sediments. These processes remove
 contamination from the environment by reducing the presence of contaminants in groundwater
 through hydraulic control (e.g., use of plants deep root systems to provide migration control for
 groundwater plumes) and/or removal or degradation of groundwater contaminants through
 inherent transpiration mechanisms.

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

In accordance with 40 CFR §257.98(d), any waste generated during the implementation of any of the remedies under consideration would be managed in a manner that complies with any applicable requirements of the Resource Conservation and Recovery Act and the Georgia Comprehensive Solid Waste Management Act.

5.1.6 Evaluation of Required Criteria

Each of the five remedy alternatives were evaluated with respect to the required criteria. Results of this evaluation are summarized in **Table 5**.



Table 5. Summary of Required Criteria

		Co	orrective Measur	es	
REQUIRED CRITERIA	Alternative 1 In-Situ Injections (ISI)	Alternative 2 Pump and Treat (P&T)	Alternative 3 Monitored Natural Attenuation (MNA)	Alternative 4 Permeable Reactive Barrier (PRB)	Alternative 5 Phytoremediation/ TreeWell®
Be protective of human health and the environment	✓	√	✓	✓	✓
Attain the groundwater protective 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 alternatives using the comparative criteria listed in 40 CFR §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 alternatives that meet



the required criteria to support remedy selection. Consistent with 40 CFR §257.98(b), the selected and implemented remedy will be continually evaluated and, if warranted, modified consistent with adaptive management practices.

A graphic is provided within each subsection to provide a visual depiction of the favorability of each alternative, where dark green represents that the "option's performance under this criterion is *highly favorable*", 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 remedy. Long-term effectiveness and protectiveness mean that the remedy will protect human health and the environment after the remedial objectives have been met.

The short-term effectiveness of a potential remedy relates to the protectiveness of human health and the environment during construction and implementation. The degree of protection and the time period 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 and surface water sampling results, and the Risk Evaluation Report summarized in **Section 5.1.1**, Appendix IV constituents in groundwater and surface water from AP-2 DAS are not expected to pose a risk to human health or the environment. Therefore, this criterion is considered highly favorable for all remedial alternatives. In addition, each groundwater remedy 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

AP-2 DAS closure through closure by removal provides effective source control, as described in **Section 5.1.3** above. As demonstrated by the results of the *Reactive Transport Model Report* (**Appendix C**), each of the groundwater remedies retained for comparison will be effective at reducing the concentration of Appendix IV constituents in groundwater beyond the waste boundary to levels below the GWPS. Consequently, all remedies being evaluated perform similarly for purposes of this criterion and, therefore, this criterion is considered favorable for all remedies being evaluated.

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

In accordance with 40 CFR §257.97(c)(1)(iii), this sub-criterion considers the long-term management of each groundwater remedy.

Alternative 3 (MNA) is highly favorable with respect to this criterion because it requires the least amount of long-term management and involves no mechanical systems as part of the remedy. Alternative 1 (ISI) and Alternative 4 (PRB) are considered favorable because the in-situ treatment systems will require long-term monitoring and possible reapplication/replenishment of reagent or amendment, but there will not be a permanent treatment system requiring operations and maintenance



(O&M). Alternative 5 (phytoremediation) is considered favorable because it will require long term monitoring of the TreeWells® but minimal active maintenance is expected. Alternative 2 (P&T) requires ongoing O&M of the pumping and ex-situ treatment system and management of the withdrawn water; this alternative is considered less favorable under this criterion when compared to the other alternatives.

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 40 CFR §257.97(c)(1)(iv), this sub-criterion relates to the potential for threats to human health (including without limitation worker safety and the community) and the environment associated with remedy implementation.

Community impacts include general impacts to the community, such as potentially increased truck traffic on public roads during construction of the remedies, as well as increased vehicle emissions, resource consumption, and noise. Alternatives 2 and 4 (P&T and PRB) are considered less favorable since these alternatives will require construction beyond what is anticipated for the other alternatives. Alternative 2 (P&T) requires construction of a treatment system with conveyance piping, and management of treated water. For Alternative 4 (PRB), the PRB construction will likely require trenching activities, off-site disposal of excavated soils, and import of low-permeability material over local roadways.

Alternatives 1 and 5 (ISI and phytoremediation) are considered favorable. While construction activities will occur, less infrastructure is required. Alternative 1 (ISI) will require management of nominal amounts of reagent waste associated with the in-situ treatment activities, which are anticipated to include injection of reagents through a series of closely spaced injection points. Alternative 5 (phytoremediation) will require the drilling of points to allow for the planned trees to have roots deep enough to intercept the contaminated groundwater and will also require the disposal and import of material. Minimal disturbance is anticipated with Alternative 3 (MNA); therefore, this alternative is considered highly favorable with respect to this criterion.

5.2.1.5 Time until full protection is achieved

In accordance with 40 CFR §257.97(c)(1)(v), the time until the GWPS is achieved for a period of three years in accordance with 40 CFR §257.98(c)(2), for each of the remedies was evaluated based on the transport modeling results or professional judgement, depending on the remedial alternative. Remedial alternatives that require less time to meet the GWPS at the waste boundary would be considered more favorable.

As previously stated, the risk evaluation for the SSL-related constituents in groundwater and surface water at AP-2 DAS was conducted using methods consistent with GA EPD and USEPA guidance and included multiple conservative assumptions and concluded that the impacts are not expected to pose a risk to human health or the environment; therefore, receptors are protected. The timeframes to achieve GWPS at the waste boundary were evaluated using a predictive groundwater flow and transport model, and all timeframes are considered reasonable. Based upon predictive modeling of post-closure conditions following removal of CCR material, under Alternative 3 (MNA), cobalt and lithium concentrations are expected to fall below the GWPS within approximately 36 and 11 years, respectively. MNA is expected to require the longest amount of time to achieve the GWPS; therefore, this alternative is considered less favorable under this criterion.



A sensitivity analysis of groundwater modeling results indicates that the timeframe required for attenuation of cobalt and lithium is dependent on groundwater flow velocity. Alternative 2 (P&T), which includes hydraulic containment and is less reliant on groundwater flow velocity, is predicted to perform favorably, dependent on the extent of the extraction well network and the availability of cobalt and lithium in groundwater. Alternatives 1 (ISI) and 4 (PRB) leverage geochemical changes to accelerate attenuation and are also predicted to perform favorably. Predictive modeling and treatability testing indicate that increasing pH results in rapid reductions in cobalt concentrations with less than one year required for cobalt concentrations to fall below GWPS. Predictive modeling of lithium under the pH adjustment scenario indicates that the time period required for lithium attenuation remains similar to MNA conditions (11 years). Therefore, geochemical adjustment methods are considered to be favorable for cobalt, but less favorable for lithium. Pilot testing would be used to evaluate the longevity of Alternative 1 (ISI) and Alternative 4 (PRB). Alternative 5 (Phytoremediation) does not include geochemical manipulation and is expected to perform less favorably with respect to this criterion.

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 40 CFR §257.97(c)(1)(vi), this sub-criterion considers elements such as CCR material outside of the unit boundary or the handling of impacted groundwater encountered during construction and operation of the remedy.

Alternative 3 (MNA) and Alternative 1 (ISI) are considered highly favorable since potential exposure through contact with CCR-impacted material or groundwater is minimal. Alternative 2 (P&T) will require ongoing management of removed water; therefore Alternative 2 (P&T) is considered less favorable. Alternative 4 (PRB) will require excavation of soil and exposure to impacted groundwater during the placement of the PRB and is considered less favorable. Alternative 5 (phytoremediation) requires management of a relatively minimal amount of soils during installation and is considered favorable.

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 remedial alternatives (engineering controls) for purposes of comparison. Of note, the reliability of all alternatives is bolstered by the long-term reliability of the closure method and its expected positive effect on groundwater conditions.

Alternative 3 (MNA) is expected to have high long-term reliability and is considered highly favorable with respect to this criterion, as minimal long-term engineering controls are required. Alternative 2 (P&T) is considered to be a reliable, proven technology and is expected to perform favorably relative to long-term reliability. Field pilot studies to evaluate potential for groundwater recovery and bench-scale testing to evaluate ex-situ treatment technologies would be used to confirm the efficacy, and this alternative relies on mechanical systems (groundwater pumping and treatment systems) to operate and maintain. Alternatives 1 and 4 (ISI and PRB) rely on geochemical approaches which have been demonstrated to be effective by treatability testing. These methods are considered to be favorable, however, these methods have uncertainties related to potential subsurface issues such as uneven substrate distribution and preferential flow paths. Additionally, the long-term reliability of any geochemical approach would be verified through pilot testing. Alternative 5 (phytoremediation) is considered less favorable since the remedy would involve field studies to evaluate effectiveness and would rely on maintenance of the trees.



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 remedial objectives. In accordance with 40 CFR §257.98(b), adaptive site management practices will be used to modify or replace the remedy if the requirements of 40 CFR §257.97(b) are not being achieved.

Alternative 3 (MNA) is considered highly favorable, as it is the remedy with the lowest likelihood of requiring replacement because natural processes will reduce the concentration of Appendix IV constituents in groundwater over time. From the perspective of needing to replace the remedy, alternatives that rely on ex-situ treatment systems such as Alternative 2 (P&T) are considered more likely to require replacement than Alternative 3 (MNA) and are therefore considered favorable. Alternative 1 (ISI) and Alternative 4 (PRB), which rely on in-situ treatment to address lithium and cobalt, are considered favorable since the ability to treat groundwater is subject to the effectiveness and longevity of geochemical changes. In addition, Alternative 1 (ISI) and Alternative 4 (PRB) technologies may create geochemical conditions that promote the mobilization or remobilization of other CCR constituents in groundwater. Effectiveness of Alternative 5 (phytoremediation) would be dependent on groundwater flow direction, groundwater preferential pathways, and behavior of cobalt and lithium under current geo chemical conditions. Alternative 5 (phytoremediation) is considered less favorable when compared to other alternatives. During the implementation process, the selected remedies will be evaluated for effectiveness and modified if remedial objectives are not being met, in accordance with adaptive site management practices and 40 CFR §257.98(b).

5.2.1.9 Long- and short-term effectiveness summary

Each of the five remedy alternatives were evaluated with respect to the long- and short-term effectiveness. Results of this evaluation are summarized in **Table 6**.



Table 6. Category 1 - Long- and Short-Term Effectiveness, Protectiveness, and Certainty of Success Summary

	Alternative 1 In-Situ Injection (ISI)	Alternative 2 Pump and Treat (P&T)	Alternative 3 Monitored Natural Attenuation (MNA)	Alternative 4 Permeable Reactive Barrier (PRB)	Alternative 5 Phyto- remediation
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					
Summary					

Color Legend:	_
	Option performs highly favorably under this criterion
	Option performs favorably under this criterion
	Option performs <i>less favorably</i> under this criterion



5.2.2 Source Control Effectiveness

This comparative criterion takes into consideration the ability of the remedy to control further releases. Physical removal of the CCR would, over time, be supportive of declining concentrations of Appendix IV constituents in groundwater downgradient of AP-2 DAS and improve overall groundwater quality. None of the corrective measures under consideration would interfere with or diminish the anticipated benefits of the closure 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-2 DAS. Since the CCR will be removed at the time of unit closure, the closure addresses the potential for further releases from the unit. Appendix IV constituents that are present in groundwater at or currently beyond the waste boundary will be controlled by the groundwater remedy. Therefore, all groundwater remedy alternatives are considered favorable for this sub-criterion.

5.2.2.2 The extent to which treatment technologies may be used

In accordance with 40 CFR §257.97(c)(2)(ii), alternatives that include more limited treatment approaches may be considered less favorable. Alternatives that rely on more extensive treatment approaches may be considered more favorable.

CCR will be removed from AP-2 DAS during closure of the unit. Therefore, all groundwater remedy alternatives are considered favorable for this sub-criterion.

5.2.2.3 Source control effectiveness summary

Each of the five remedy alternatives were evaluated with respect to the effectiveness of source control. Results of this evaluation are summarized in **Table 7**.



Table 7. Category 2 - Source Control Effectiveness Summary

	Alternative 1 In-Situ Injection (ISI)	Alternative 2 Pump and Treat (P&T)	Alternative 3 Monitored Natural Attenuation (MNA)	Alternative 4 Permeable Reactive Barrier (PRB)	Alternative 5 Phyto- remediation
Sub-criterion i Extent to which containment practices will reduce further releases					
Sub-criterion ii Extent to which treatment technologies may be used					
Summary					

Color Legend:	_
	Option performs highly favorably under this criterion
	Option performs favorably under this criterion
	Option performs <i>less favorably</i> 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.

Alternative 3 (MNA) is considered highly favorable since the infrastructure required for implementation of a long-term monitoring program to confirm attenuation is already in place at the site. Alternative 2 (P&T) is considered less favorable since the hydraulic containment system and ex-situ treatment will involve additional treatability testing and field pilot studies. Alternative 4 (PRB) is considered less favorable due to challenges associated with wall construction in the subsurface and limited access to the relevant area. Implementation of Alternatives 1 and 5 (ISI and phytoremediation) are less challenging, however pilot studies will be used to develop designs, and these alternatives are therefore considered to be favorable.



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 40 CFR §257.97(c)(3)(ii). Typically, remedies that do not require the installation of significant infrastructure are generally more reliable and do not require significant O&M; however, more complex remedies that rely on groundwater flow or geochemical manipulation or mechanical systems would be considered less favorable.

Alternative 3 (MNA) is considered highly favorable from an operational perspective because MNA has a proven track record and only requires long-term monitoring following implementation. While Alternative 2 (P&T), is expected to be reliable, this alternative will utilize pumping of wells, associated piping, and an ex-situ treatment system with ongoing O&M. Therefore, P&T is considered less favorable with respect to this criterion. Alternative 4 (PRB) is considered favorable due to the potential for preferential flow paths to develop in the reactive barrier and/or the potential need to replace reactive materials. Alternative 1 (ISI) will include in-situ treatment and subsequent monitoring and is therefore considered favorable from a reliability standpoint. Alternative 5 (phytoremediation) will rely on a tree system requiring some maintenance and can be less favorable from a reliability standpoint.

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

Section 40 CFR §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 remedial alternative that could require several permits (for example, a P&T system) would be considered less favorable when compared to a remedial alternative that would require fewer permits (for example, MNA).

Alternative 3 (MNA) is highly favorable since the implementation does not require additional permitting. The remaining alternatives will require additional permitting and approvals for field scale pilot testing, groundwater discharge or injection, groundwater treatment, and/or management of secondary material streams. Alternative 2 (P&T) is considered less favorable since it will potentially require permitting of extraction wells and regulatory approval of discharge/management methods for the resulting treated water stream.

5.2.3.4 Availability of necessary equipment and specialists

Typically 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.

Alternative 3 (MNA) is highly favorable since specialty equipment will not be required to implement the MNA remedy. Alternative 1 (ISI) is considered to be favorable since specialists will be used to pilot test, design, and implement the in-situ treatment system for cobalt while not altering the existing and otherwise favorable subsurface geochemical conditions. Although significant quantities of reagents may be required for injections, well construction and injection techniques are common. Alternative 2 (P&T) will require equipment for drilling, recovery well installation, construction of groundwater conveyance systems, and an ex-situ treatment system and is considered less favorable. While identifying qualified contractors should not present a great challenge, supply chain issues could be a challenge and pilot testing and bench-scale testing will be involved to confirm treatment prior to full-scale implementation.



Alternative 4 (PRB) is considered less favorable because it would require specialized equipment and media for installing the PRB, and supply-chain issues could present a challenge for implementation. Alternative 5 (phytoremediation) would involve engaging a specialist for design and testing, and use of specialized equipment (TreeWells® and live trees) for the installation of the treatment system and is considered less favorable.

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

This sub criterion (40 CFR $\S257.97(c)(3)(v)$) considers disposal options for materials generated by the groundwater remedy and land area that is available for implementation of the remedy.

Alternative 3 (MNA) is considered highly favorable since no additional treatment, storage, or disposal services are anticipated. Alternative 2 (P&T) is considered less favorable since it includes ex-situ treatment and operation of a treatment system may generate materials requiring off-site management. Alternative 1 (ISI) is considered favorable since treatment will be in-situ, no additional material streams will be generated, and suitable land area is available for the injection well installations. Alternative 4 (PRB) will generate a large volume of soil during construction which would need to be managed and is less favorable with respect to this criterion. Alternative 5 (phytoremediation) is favorable, however installation of the TreeWells® will result in generation of soil that will require management.

5.2.3.6 Ease of implementation summary

Each of the five remedy alternatives were evaluated with respect to the ease of implementation. Results of this evaluation are summarized in **Table 8**.



Table 8. Category 3 - Ease of Implementation Summary

Category 3 – Sub-criterion i Degree of difficulty associated with constructing the technology	Alternative 1 In-Situ Injection (ISI)	Alternative 2 Pump and Treat (P&T)	Alternative 3 Monitored Natural Attenuation (MNA)	Alternative 4 Permeable Reactive Barrier (PRB)	Alternative 5 Phyto- remediation
Category 3 – Sub-criterion ii Expected operational reliability of the technologies					
Category 3 – Sub-criterion iii Need to coordinate with and obtain necessary approvals and permits from other agencies					
Category 3 – Sub-criterion iv Availability of necessary equipment and specialists					
Category 3 — Sub-criterion v Available capacity and location of needed treatment, storage, and disposal services					
Summary					

Color Legend:	_
	Option performs highly favorably under this criterion
	Option performs favorably under this criterion
	Option performs <i>less favorably</i> under this criterion

5.2.4 Evaluation of Comparison Criteria

The various sub-criteria were evaluated, and relative comparisons were made between the remedial alternatives to determine which remedy or remedies would be expected to be the most and least favorable regarding each of the criteria. The results of this comparison are included in **Table 9** for all the Comparison Criteria.



Table 9. Summary of Comparison Criteria

	Alternative 1 In-Situ Injection (ISI)	Alternative 2 Pump and Treat (P&T)	Alternative 3 Monitored Natural Attenuation (MNA)	Alternative 4 Permeable Reactive Barrier (PRB)	Alternative 5 Phyto- remediation
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 Legena:	<u> </u>
	Option performs highly favorably under this criterion
	Option performs favorably under this criterion
	Option performs <i>less favorably</i> under this criterion

5.3 PUBLIC MEETING AND COMMUNITY ENGAGEMENT

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



6. Proposed Remedy Selection

This section provides a summary of the selected groundwater remedy and provides a schedule for remedy implementation in accordance with 40 CFR §257.97(d). Georgia Power also 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 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 site conceptual model will be updated as more data are collected; and (4) adjustments and augmentations will be made to the corrective measure(s), as needed, to assure that performance criteria and site remedial objectives are met.

6.1 SUMMARY OF PROPOSED REMEDY SELECTION

The closure by removal of AP-2 DAS will provide effective source control such that groundwater quality downgradient of AP-2 DAS is expected to improve over time with decreasing concentrations of Appendix IV constituents. Based on the evaluation of corrective measures and the comparative criteria included in §257.97(c), the primary proposed remedy for cobalt and lithium SSLs is performing ISI to effect a geochemical shift in the aquifer, influencing the behavior of cobalt, and to a lesser extent lithium, in groundwater. Additionally, MNA processes will be incorporated to further reduce concentrations of cobalt and lithium.

In-situ treatment can be accomplished through reagent injections and constitutes a remediation technology for inorganic constituents, such as cobalt. Cobalt can be precipitated or sorbed/immobilized under different combinations of pH and oxidation-reduction (redox) conditions. Lithium, because of its lower reactivity and higher solubility, is less amenable to precipitation and has lower sorption potential than cobalt. In-situ treatment is being selected as a corrective measure primarily for cobalt in groundwater at AP-2 DAS given the long-term and short-term effectiveness and likelihood of success, as predicted by reactive transport modeling and demonstrated by treatability testing results.

MNA relies on natural attenuation processes to reduce dissolved concentrations of inorganic constituents. Attenuation of cobalt and lithium at AP-2 DAS is primarily due to adsorption, coprecipitation, and cation exchange, and does not rely solely on physical (e.g., dilution, dispersion, flushing, and related processes) means of attenuation. MNA was selected for cobalt and lithium remediation primarily due to its long-term effectiveness, as predicted by reactive transport modeling, and ease of implementation.

Prior to implementation of in-situ injections, an in-situ pilot study will be performed to confirm site-specific design criteria, such as radius of influence, reagent effectiveness, and dosage. In-situ injection will be performed either via permanent injection wells or direct push technology (temporary points) and may be include multiple rounds of injections. A conceptual layout for in-situ injection is illustrated on **Figure 8A**. The exact configuration and frequency of injection will be based on results of the pilot study and design parameters. Groundwater monitoring will be performed to evaluate the performance of the remedy and adaptive site management practices will be incorporated into the data review process.



6.2 SCHEDULE

In accordance with 40 CFR §257.97(d), the following factors were considered when developing the schedule:

- Extent and nature of contamination: The size of the relevant area in groundwater is directly related to the time required to implement remediation. The horizontal and vertical extent of cobalt and lithium present in groundwater above GWPS have been delineated, as described in Section 2 of this report, and is limited to a small area around ARAMW-7. 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: Based on results of reactive transport modeling and treatability testing, the selected remedy (in-situ treatment with MNA) is expected to achieve compliance with the GWPS within approximately 10–12 years for lithium and less than one year for cobalt. As considered in Section 5 of this report, the proposed remedy is expected to address Appendix IV constituents in groundwater. In the event that adequate progress is not made towards achieving the GWPS, Georgia Power will enlist adaptive management strategies to modify the remedial approach, in accordance with 40 CFR §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: Georgia Power has identified and pre-qualified a disposal facility with capacity
 to accept material that will be generated during implementation of the remedy. Accordingly,
 this factor has been accounted for and 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 5.1.1 of this report, the Risk Evaluation for the SSL-related constituents in groundwater and surface water at AP-2 DAS was conducted using methods consistent with GA EPD and USEPA guidance, included multiple conservative assumptions, and concluded that groundwater and surface water conditions are not expected to pose a risk to human health or the environment. These results are detailed in Appendix B. Therefore, 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 40 CFR §257.97(c)(1).
- Resource value of the aquifer: As summarized in Section 5.1.1 of this report and detailed in the Risk Evaluation (Appendix B), cobalt and lithium are not expected to pose a risk to human health and the environment. As such, considerations related to an alternative drinking water supply or interim remedial measure, as outlined in 40 CFR §257.98(a)(3), are not currently necessary or expected to become so. Further, Georgia Power will retain ownership of the Plant Arkwright Property and future development for non-industrial purposes is not currently anticipated. Because cobalt and lithium 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.



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The schedule for implementing and completing the groundwater remedial activities is described below. 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 40 CFR §257.98(b).

6.2.1 Planning and Design

Following GA EPD approval of the selected remedy, approximately 24 months will be required to design the selected remedy and develop a corrective action plan. Significant planning and design activities include:

- Pre-design Investigation: A field pre-design investigation (PDI) will be conducted to
 characterize and refine the treatment area. This investigation will provide valuable data for
 the design of geochemical injections and provide additional refinement of the plume extent.
 Samples may be collected for additional treatability testing to refine reagent dosing.
 Permanent wells may be installed for further aquifer characterization and could serve as
 pilot testing injection points or performance monitoring wells. The field component of the
 PDI will take approximately 2 to 4 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 for AP-2 DAS will be developed, submitted to GA EPD for approval, and implemented at a pilot study area near ARAMW-7. Prior to implementation of the pilot study workplan, a Pilot Test Notification form will be prepared and submitted to the GA EPD for review and approval. The form will be submitted to GA EPD a minimum of 30 days prior to initiation of the pilot test. The pilot study will evaluate injection delivery, spacing, and other criteria requiring evaluation for final design. Pilot study injections are expected to occur over a one-month period with 8 to 10 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 anticipated 8 to 10 months of performance monitoring and prior to finalizing the injection design.
- Finalize Design and Corrective Action Plan: Following completion of the pilot study, 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). While design activities will be concurrent with the previously listed activities, the final design and corrective action plan will not be finalized until successful completion of the pilot study. The CAMP will outline steps to ensure that these key objectives are met. Specifically, the plan will define how the monitoring well data, Site conditions, and statistical analysis will be routinely evaluated. Should these data call the efficacy of the selected remedy (ISI with MNA) into question, Georgia Power will reassess alternative technologies. Concurrent with the preparation of the CAMP, a full-scale UIC permit application will be submitted to GA EPD for approval.



6.2.2 Construction and Implementation

Given the small footprint of the treatment area, a relatively small number of injection points is anticipated. Following GA EPD concurrence, establishing the injection and performance monitoring well network is anticipated to take approximately 2 to 6 months, with geochemical injections occurring over the following 2 to 4 months. The injections are anticipated to reduce concentrations below GWPS and facilitate MNA. Additional performance monitoring wells may be necessary to evaluate groundwater geochemistry and whether conditions favorable for MNA will be maintained. The duration of construction and implementation may vary based on the results of the pre-design investigation and other design activities. Following injections, groundwater will be monitored to evaluate the effectiveness of the remedy.

6.2.3 Operation

While the estimated timeframe will be refined during design, it is anticipated that the geochemical injection phase of the remedy may only require 6 months to a year of operation. The need for additional injections will be evaluated as part of pilot testing, and the anticipated duration of the injection phase may be adjusted based on results.

Following the injection phase, operational requirements will be limited to groundwater performance monitoring. In total, it is estimated based on reactive transport modeling and treatability testing that less than 12 years from initiation of injections will be required to achieve GWPS for lithium and less than one year will be required for cobalt.

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 40 CFR §257.98(b), the groundwater remedy will be modified if it is determined that the site goals are not being met or will not be met.

6.3 REPORTING

In accordance with 40 CFR §257.105(h), Georgia Power will place the Final Remedy Selection Report into the AP-2 DAS operating record and post the document to Georgia Power's publicly accessible internet site. 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.



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TABLES

Table 1. Groundwater Monitoring System Summary Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

Well	Installation Date	Northing ⁽¹⁾	Easting ⁽¹⁾	Top of Casing Elevation (feet NAVD88) ⁽²⁾⁽³⁾	Ground Surface Elevation (feet NAVD88) ⁽²⁾⁽³⁾	Top of Screen Elevation (feet NAVD88) ⁽⁴⁾	Screen Bottom Elevation (feet NAVD88) ⁽⁴⁾	Screen Length (feet)	Total Well Depth on Construction Log (feet below land surface)	Groundwater Zone Screened	Hydraulic Location
	Detection Monitoring Wells										
ARGWA-19	12/16/2008	1063774.45	2439488.71	343.30	339.86	300.18	290.18	10.0	49.98	Bedrock	Upgradient
ARGWA-20	12/4/2008	1063732.73	2439088.01	331.28	327.73	303.18	293.18	10.0	34.85	Overburden	Upgradient
ARGWC-21	12/2/2008	1062941.24	2439112.52	309.15	305.97	291.70	281.70	10.0	24.57	Overburden	Downgradient
ARGWC-22	11/19/2019	1063039.36	2438925.04	309.95	307.01	292.01	282.01	10.0	25.00	Overburden	Downgradient
ARGWC-23	11/20/2019	1062884.38	2439202.38	307.70	304.29	289.29	279.29	10.0	25.00	Overburden	Downgradient
Assessment Monitoring Wells											
ARAMW-1	11/20/2019	1062938.38	2439120.01	308.51	305.07	271.07	261.07	10.0	44.00	Bedrock	Downgradient
ARAMW-2	11/20/2019	1062925.96	2439114.97	308.27	305.12	293.12	283.12	10.0	22.00	Overburden	Downgradient
ARAMW-7 ⁽⁵⁾	11/14/2020	1063049.07	2438913.27	309.81	307.13	269.43	259.43	10.0	48.00	Bedrock	Downgradient
ARAMW-8 ⁽⁵⁾	11/13/2020	1062895.98	2439197.40	307.36	304.53	267.83	257.83	10.0	47.00	Bedrock	Downgradient
ARAMW-9 ⁽⁶⁾	10/7/2022	1063022.92	2438935.47	309.28	306.31	213.91	203.91	10.0	102.90	Bedrock	Downgradient

Notes:

- 1. Horizontal locations referenced to Georgia State Plane West, North American Datum (NAD) of 1983 surveyed in June 26, 2020.
- 2. Vertical elevations are feet referenced to North American Vertical Datum of 1988 (NAVD88).
- 3. Elevations updated with revised survey certified by Donaldson & Garrett Associates on June 26, 2020.
- 4. Screen elevations calculated using Ground Surface Elevation surveyed on June 26, 2020.
- 5. ARAMW-7 and ARAMW-8 were surveyed by Donaldson & Garrett Associates and certified on December 18, 2020.
- 6. ARAMW-9 was surveyed by Metro Engineering & Surveying CO., Inc. on November 22, 2022.

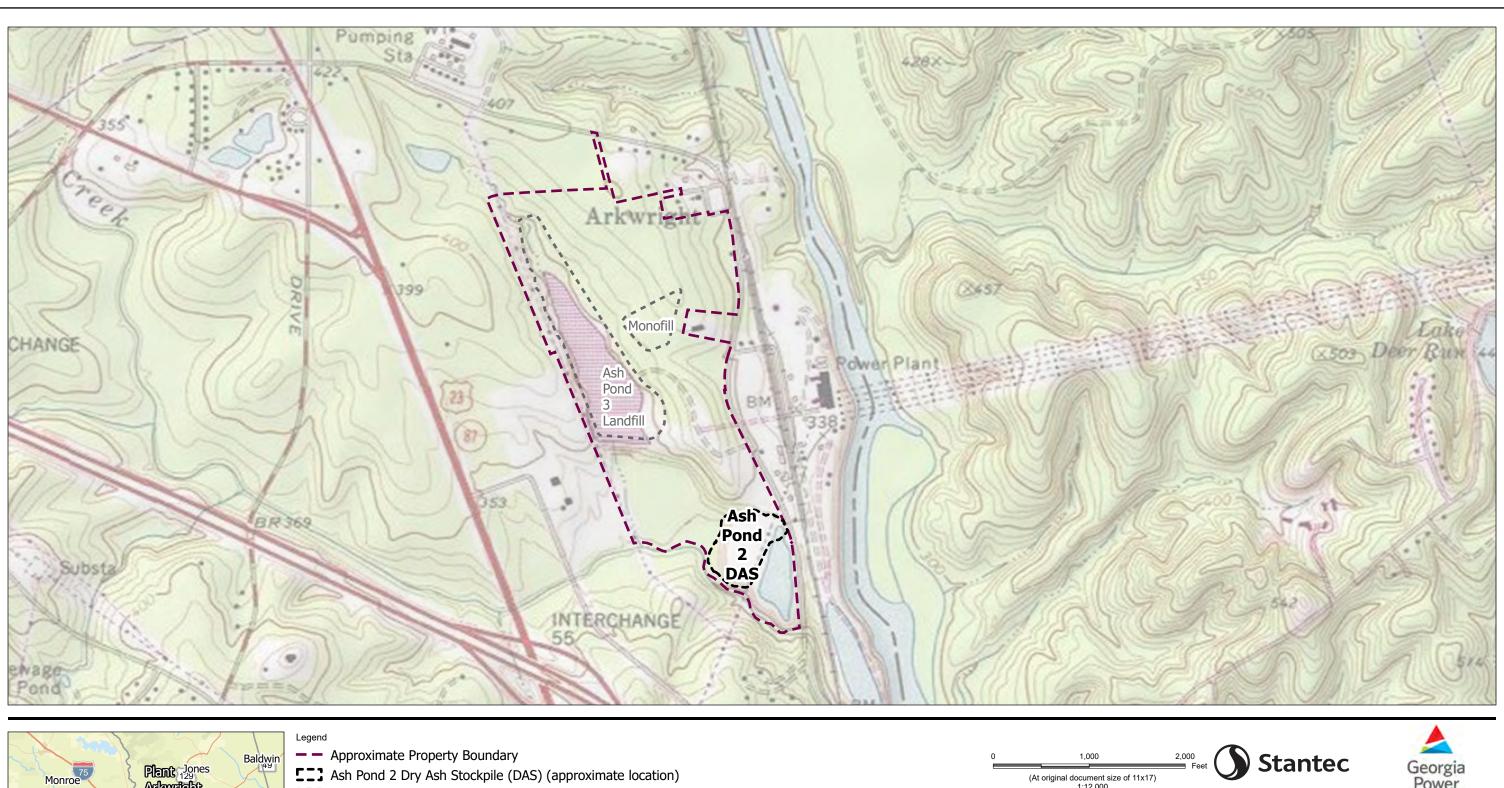
Table 4. Remedy Evaluation Summary Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, GA

Technology	Description	Retain Technology for Further Evaluation?
Geochemical Approach (In-Situ Injection)	In-Situ treatment through injection of a reagent to change geochemical conditions and precipitate or sorb/immobilize cobalt or lithium.	Yes
Hydraulic Containment (Pump and Treat [P&T])	Use of groundwater extraction wells to induce a hydraulic gradient that will capture or control the migration of impacted groundwater downgradient.	Yes
Monitored Natural Attenuation (MNA)	Reliance on natural attenuation processes to reduce concentrations in groundwater to achieve remediation objectives.	Yes
Permeable Reactive Barrier (PRB)	Installation of a permeable subsurface wall containing reactive media to remove constituents as groundwater passes through the subsurface.	Yes
Phytoremediation	Use of trees or other plants to uptake or immobilize constituents or achieve hydraulic control without need for an above-ground treatment system.	Yes
Subsurface Barrier Walls	Use of subsurface barriers to control and/or alter the flow and migration of impacted groundwater.	No. Barrier wall was removed from consideration due to the lack of space available to install a barrier wall downgradient of monitoring wells where constituents exceed GWPS.

Acronyms and Abbreviations:

GWPS = groundwater protection standard

FIGURES





Notes

1. Coordinate System: NAD 1983 StatePlane Georgia West FIPS 1002 Feet

2. Data Sources: Site Boundary and Ash Pond Boundaries provided by Southern Company Services and Wood Environment & Infrastructure Solutions

3. Background: Copyright® 2013 National Geographic Society, i-cubed, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

Ash Pond 3 Landfill and Monofill

Project Location



Macon, Georgia

Prepared by DMB on 11/1/2023 TR by JK on 11/1/2023 IR by RB on 11/1/2023

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Site Location Map





Notes
1. Coordinate System: NAD 1983 StatePlane Georgia West FIPS 1002 Feet
2. Data Sources: Ash Pond Boundaries, Surface Water Samples, Monitoring Wells, Piezometers, Property Boundary, and Beaverdam Creek locations provided by Southern Company Services and Wood Environment & Infrastructure Solutions.
3. Background: Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, Geo Technologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS.

Legend

Detection Monitoring Well

Assessment Monitoring Well

Porewater Piezometer

Surface Water Sampling Location

Stantec July 2023 Saprolite/PWR Sample Location

Wood September 2021 Overburden Sample Location

Beaverdam Creek

Approximate Property Boundary

L_3 Ash Pond 2 Dry Ash Stockpile (DAS) (approximate location)

Limit of Client Imagery (dated 7/13/2023)





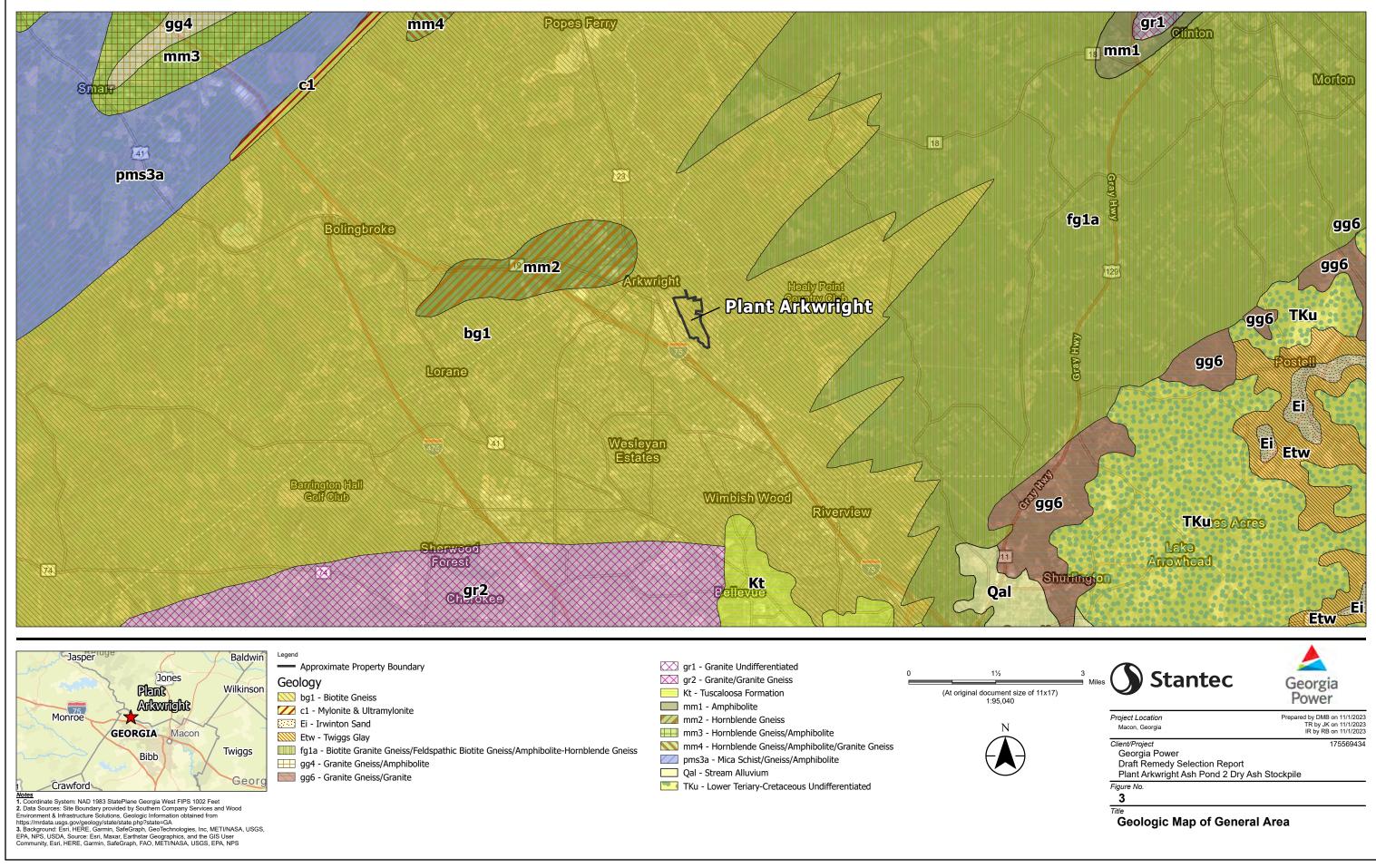


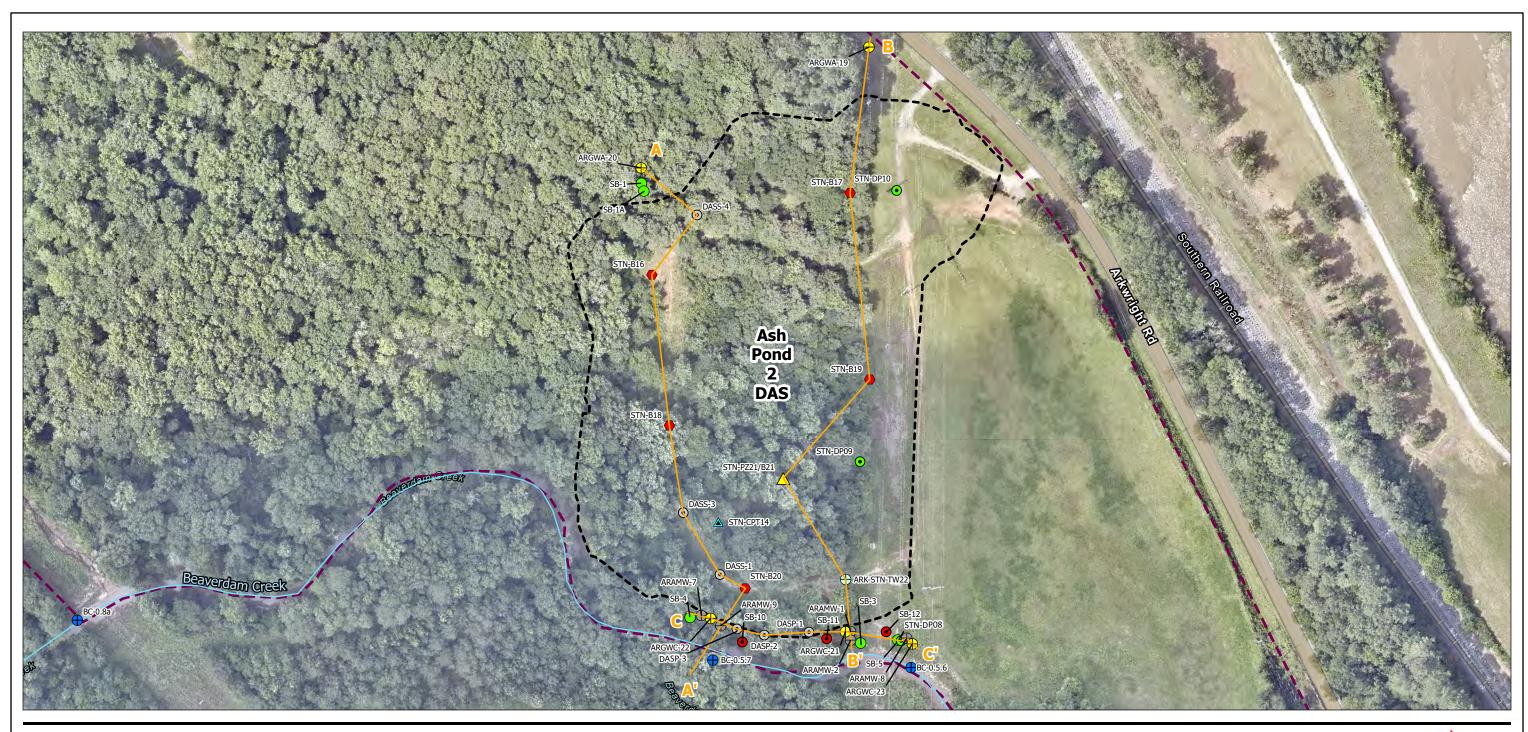
Project Location

Prepared by DMB on 11/1/2023 TR by JK on 11/1/2023 IR by RB on 11/1/2023

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Groundwater Monitoring System and **Sampling Locations Map**







Notes
1. Coordinate System: NAD 1983 StatePlane Georgia West FIPS 1002 Feet
2. Data Sources: Ash Pond Boundaries, Surface Water Samples, Monitoring Wells, Piezometers, Property Boundary, and Beaverdam Creek locations provided by Southern Company Services and Wood Environment & Infrastructure Solutions
3. Background: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS, Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, Geof Echnologies, Ico, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS. Plant imagery provided by client and is dated 7/13/2023.

Legend

- Detection Monitoring Well
- Assessment Monitoring Well
- Abandoned Piezometers
- Piezometer
- Porewater Piezometer
- ▲ CPT Sounding
- Direct Push Boring
- SPT Borings

- Surface Water Sampling Location
- Wood September 2021 Overburden Sample Location
- Stantec July 2023 Saprolite/PWR Sample Location
- Beaverdam Creek
- Cross Section Alignment
- Approximate Property Boundary
- **L_3** Ash Pond 2 Dry Ash Stockpile (DAS) (approximate location)



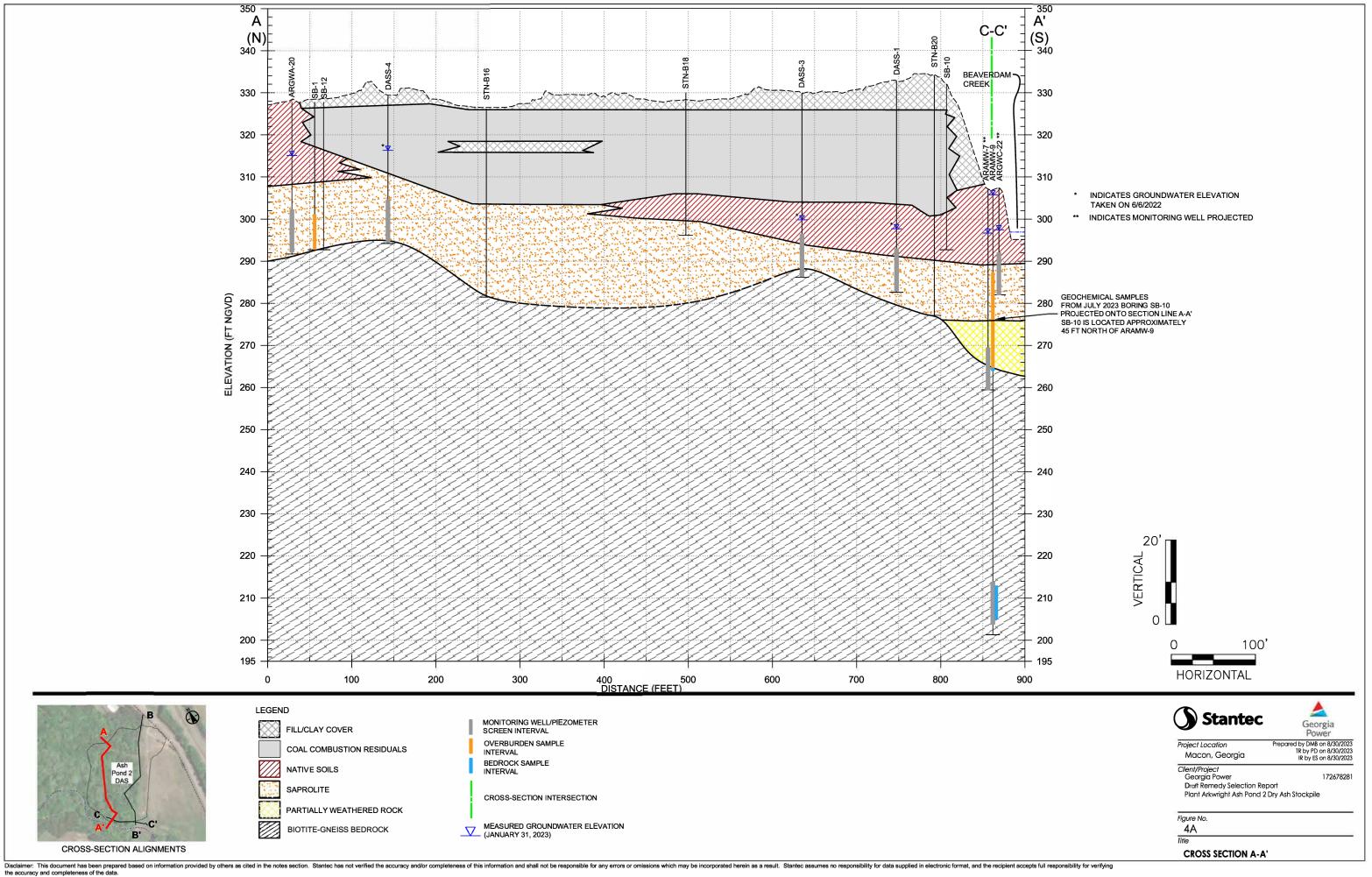


Project Location

Prepared by DMB on 2/27/2024 TR by JK on 2/27/2024 IR by RB on 2/27/2024

Client/Project Georgia Power Draft Remedy Selection Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Tritle
Cross Section Layout Map



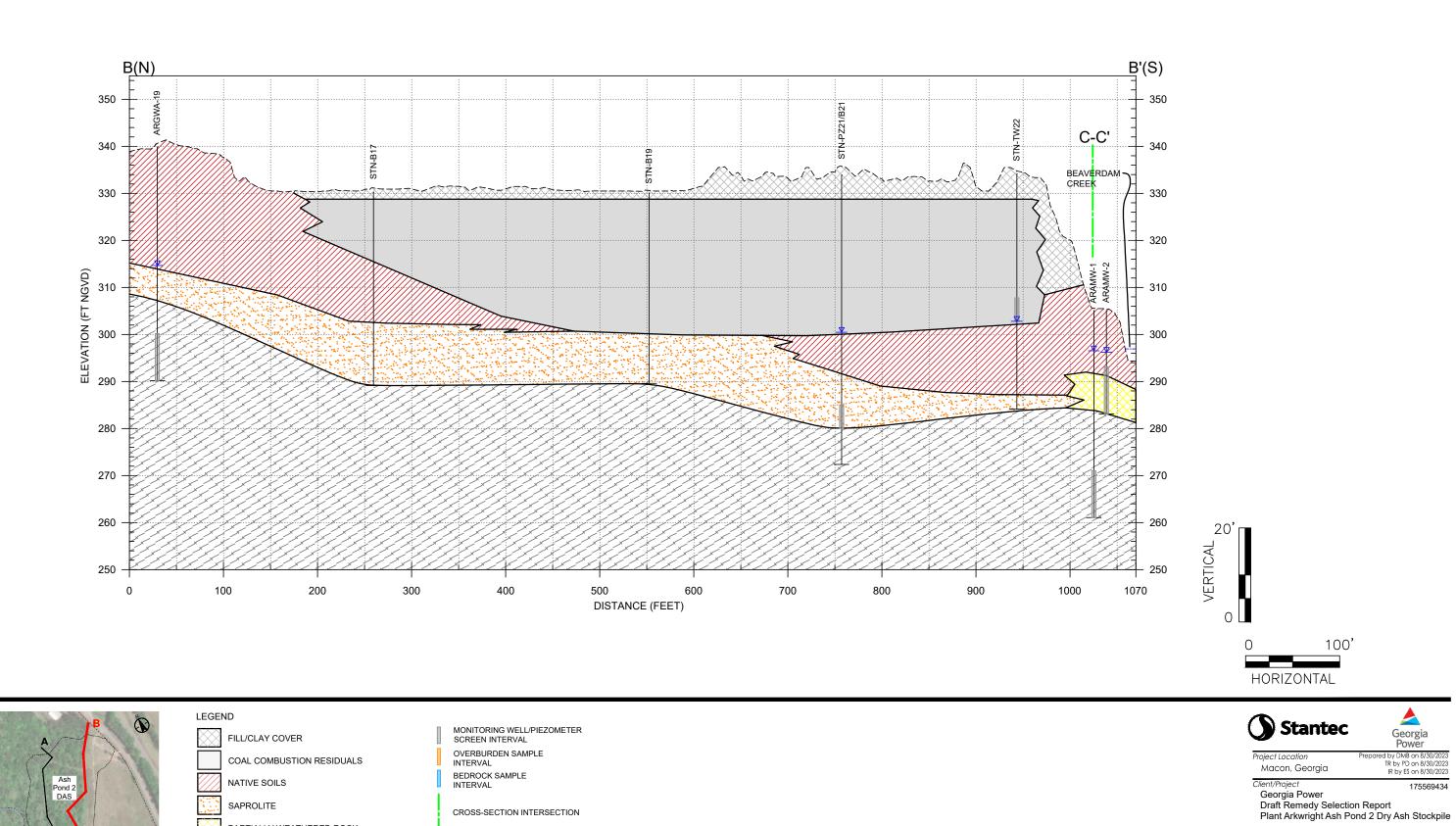


Figure No.

CROSS SECTION B-B'

CROSS-SECTION INTERSECTION

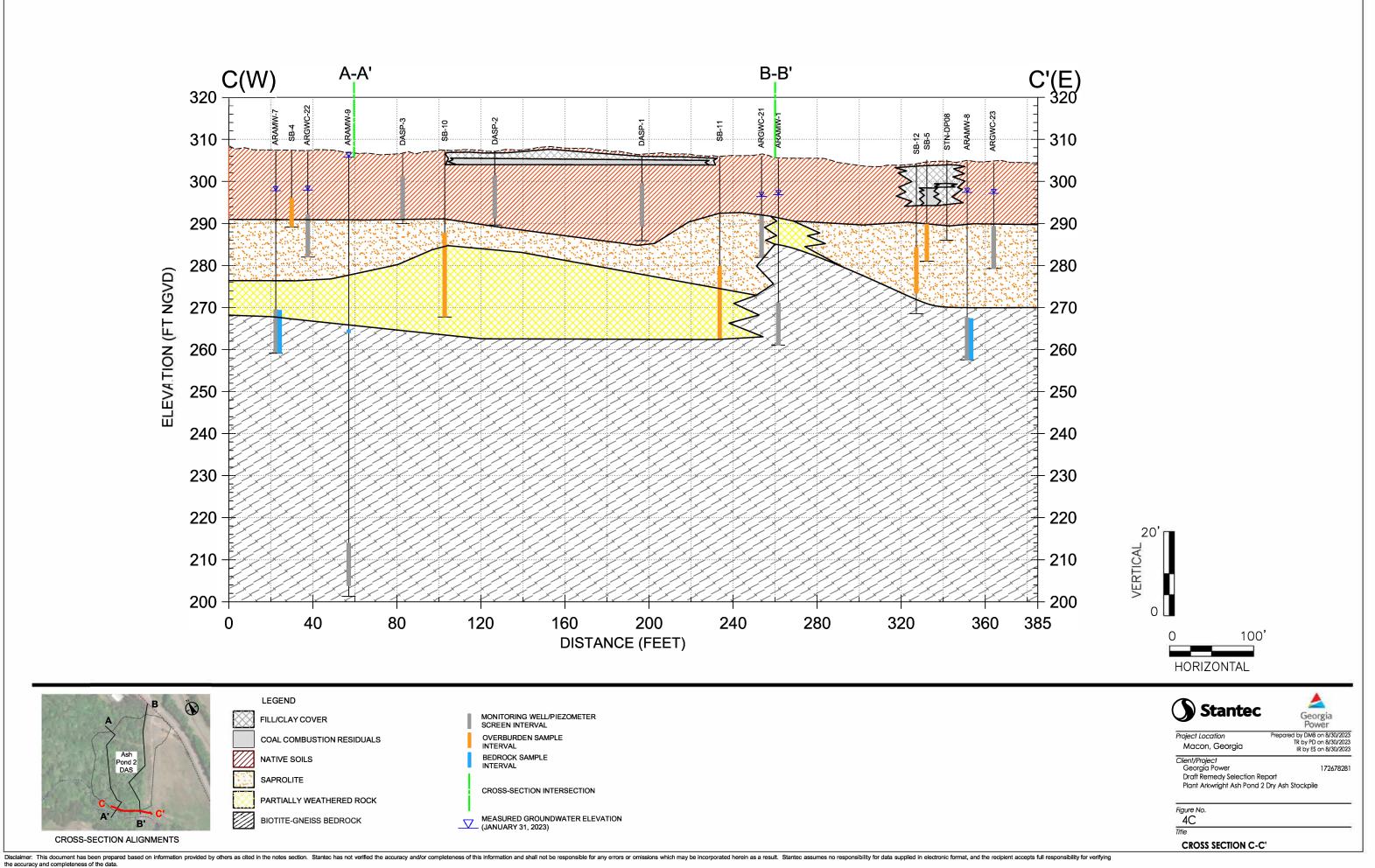
MEASURED GROUNDWATER ELEVATION (JANUARY 31, 2023)

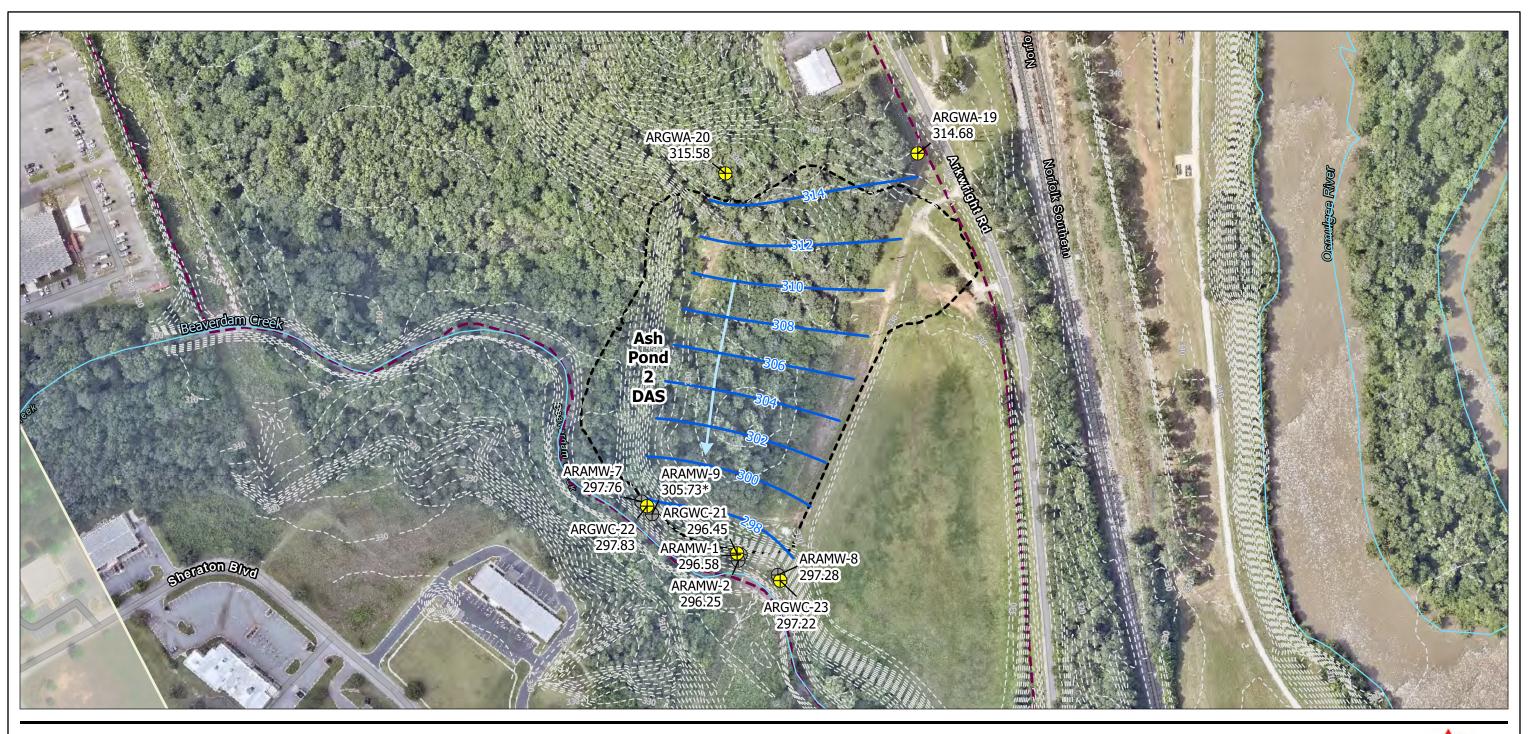
SAPROLITE

CROSS-SECTION ALIGNMENTS

PARTIALLY WEATHERED ROCK

BIOTITE-GNEISS BEDROCK







Notes
1. Coordinate System: NAD 1983 StatePlane Georgia West FIPS 1002 Feet
2. Data Sources: Ash Pond Boundaries, Monitoring Wells, Property Boundary, Topography, and Beaverdam Creek provided by Southern Company Services and Wood Environment & Infrastructure Solutions; Contours, Flow Arrow, and Ocruligee River provided by Stantec
3. Background: Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS. Plant imagery provided by client and is dated 7/1/3/2023.

.egend

Detection Monitoring Well

Assessment Monitoring Well

Potentiometric Surface Contour Jan 2023 (ft NAVD88)

Interpreted Groundwater Flow Direction

Topographic Contour 2018 (2 ft interval)

Beaverdam Creek/Ocmulgee River (Approximate)

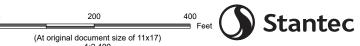
Approximate Property Boundary

Ash Pond 2 Dry Ash Stockpile (DAS) (approximate location)

Limit of Client Imagery (dated 7/13/2023)

296.58 Groundwater Elevation (ft NAVD88) *ARAMW-9 not included in contouring

SECRETARIO PROFESSIONAL





Project Location Macon, Georgia Prepared by DMB on 11/1/2023 TR by JK on 11/1/2023 IR by RB on 11/1/2023

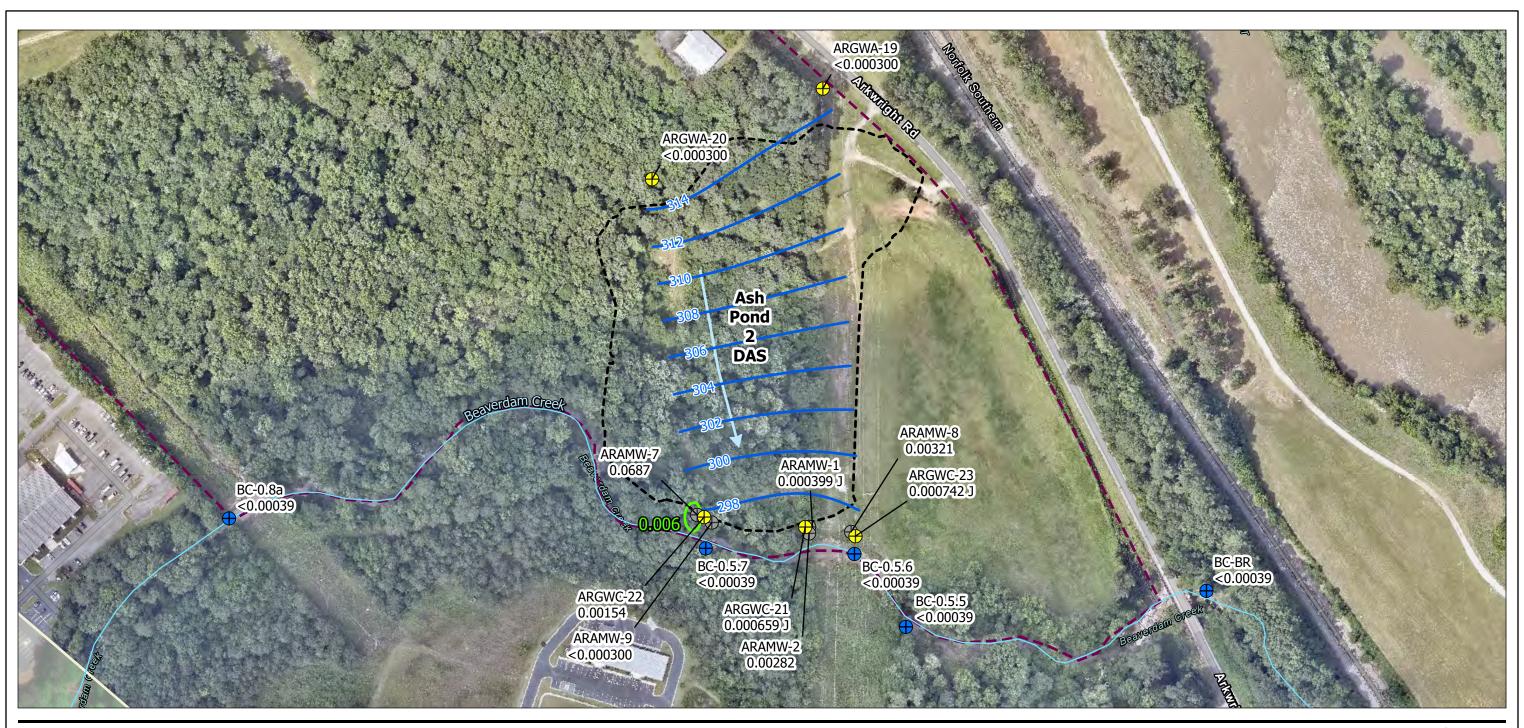
Client/Project Georgia Power

Draft Remedy Selection Report
Plant Arkwright Ash Pond 2 Dry Ash Stockpile

igure No. **5**

<u>5</u>

Potentiometric Surface Contour Map – January 30, 2023





Notes

1. Coordinate System: NAD 1983 StatePlane Georgia West FIPS 1002 Feet
2. Data Sources: Ash Pond Boundaries, Monitoring Wells, Sampling Locations, Property Boundary, Flow Arrow, Contours, and Beaverdam Creek provided by Southern Company Services and Wood Environment & Infrastructure Solutions
3. Background: Esrl Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS. Plant Increase provided by client and is dated 71/13/2023.

Detection Monitoring Well

Assessment Monitoring Well

Surface Water Sampling Location

Cobalt SSL location

Potentiometric Surface Contour Jan 2023 (ft NAVD88)

Interpreted Groundwater Flow Direction

Beaverdam Creek

- - Approximate Property Boundary

Ash Pond 2 Dry Ash Stockpile (DAS) (approximate location)

Limit of Client Imagery (dated 7/13/2023)

0.00321 Cobalt Concentration milligrams per Liter (mg/L)

Isoconcentration Notes:

Cobalt concentration data from groundwater and surface water samples collected during the January - February 2023 monitoring event.

J indicates the constituent was detected between the analytical method detection limit and the laboratory reporting limit. The value followed by J is qualified by the laboratory as estimated.

GWPS - Groundwater Protection Standard

Analyte	Units	GWPS
Cobalt	mg/L	0.006





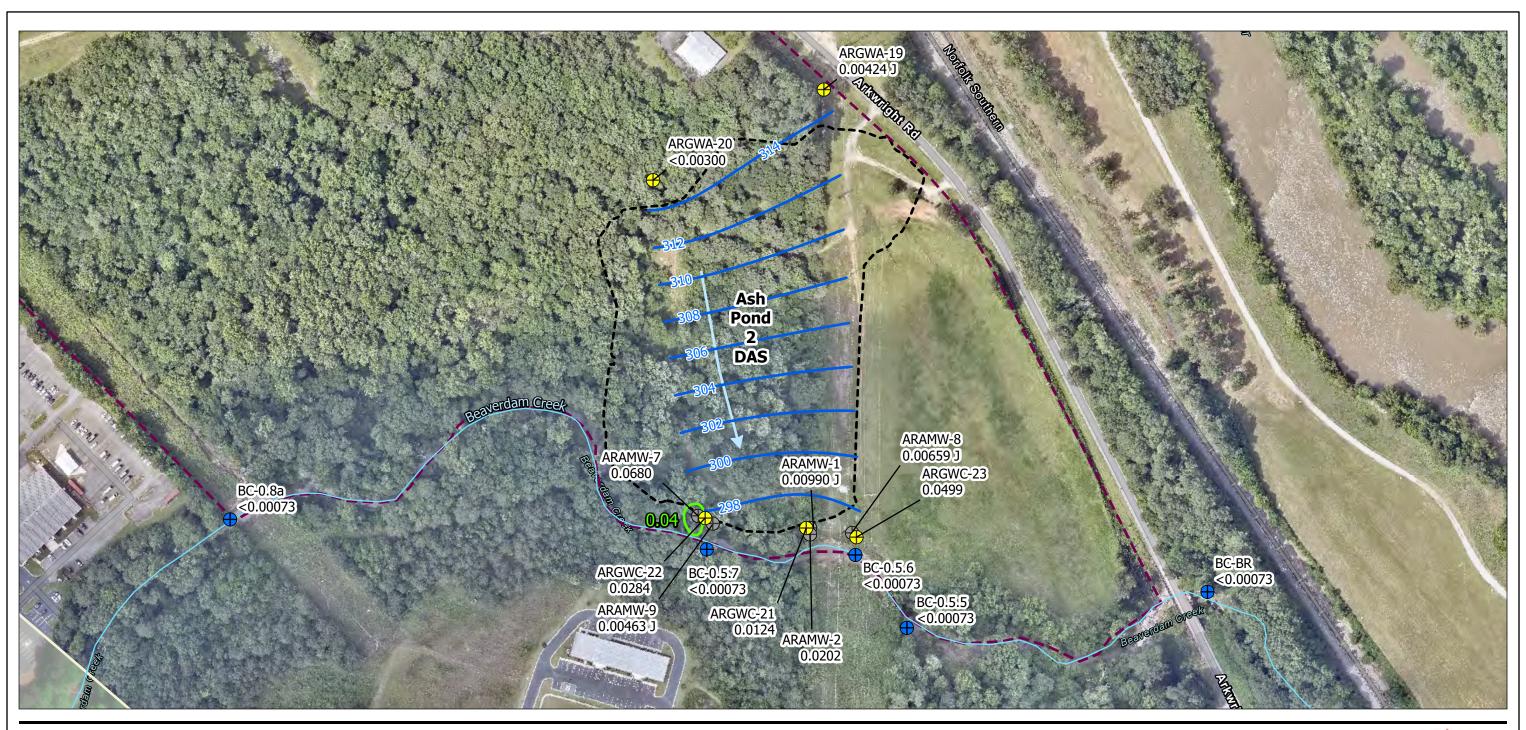
Project Location

Prepared by DMB on 11/1/2023 TR by JK on 11/1/2023 IR by RB on 11/1/2023

Client/Project Georgia Power

Draft Remedy Selection Report
Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Cobalt Concentration Map with Statistically Significant Level (SSL) Location - January -February 2023





Notes

1. Coordinate System: NAD 1983 StatePlane Georgia West FIPS 1002 Feet
2. Data Sources: Ash Pond Boundaries, Monitoring Wells, Sampling Locations, Property Boundary, Flow Arrow, Contours, and Beaverdam Creek provided by Southern Company Services and Wood Environment & Infrastructure Solutions
3. Background: Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS. Plant Increase provided by client and is dated 71/13/2023.

Detection Monitoring Well

Assessment Monitoring Well

Surface Water Sampling Location

Lithium SSL location

Potentiometric Surface Contour Jan 2023 (ft NAVD88)

Interpreted Groundwater Flow Direction

Beaverdam Creek

Approximate Property Boundary

___ Ash Pond 2 Dry Ash Stockpile (DAS) (approximate location)

Limit of Client Imagery (dated 7/13/2023) 0.00463 (J) Lithium Concentration milligrams per Liter (mg/L)

Isoconcentration Notes:

Lithium concentration data from groundwater and surface water samples collected during the January - February 2023 monitoring event.

J indicates the constituent was detected between the analytical method detection limit and the laboratory reporting limit. The value followed by J is qualified by the laboratory as estimated.

GWPS - Groundwater Protection Standard

Analyte	Units	GWPS
Lithium	mg/L	0.04

Lithium concentration exceeding the GWPS at ARGWC-23 is not an SSL





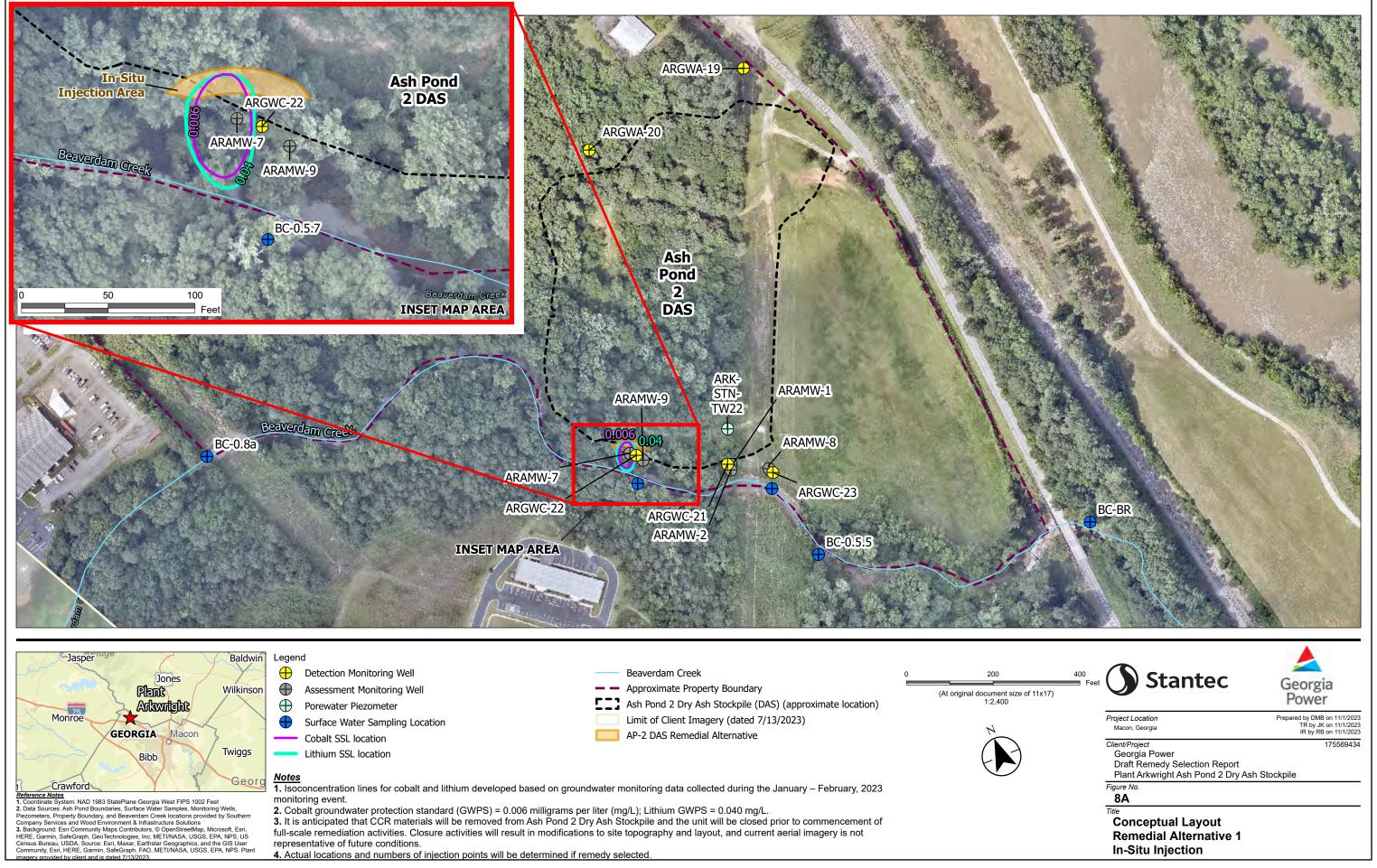
Project Location

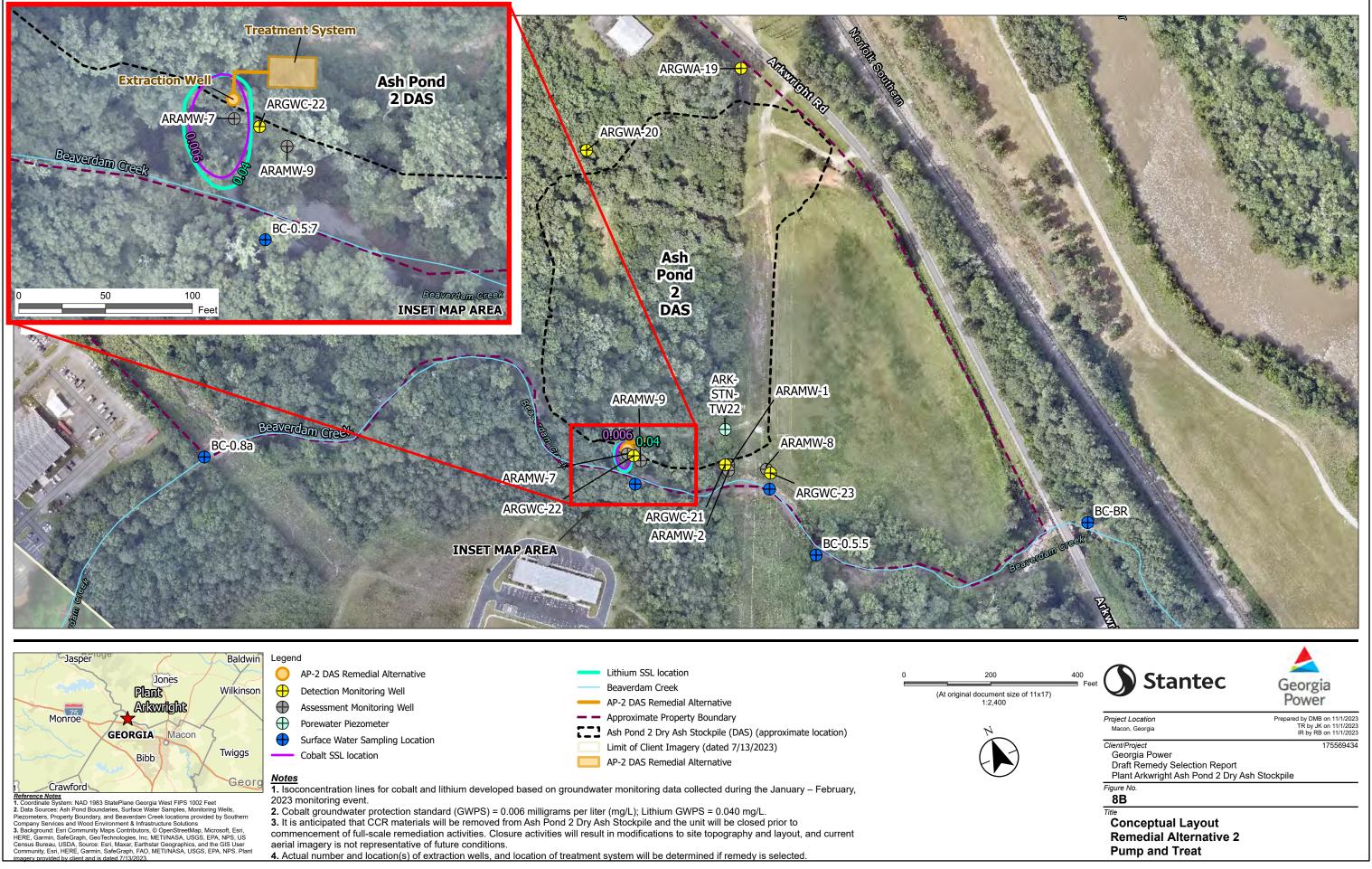
Prepared by DMB on 11/1/2023 TR by JK on 11/1/2023 IR by RB on 11/1/2023

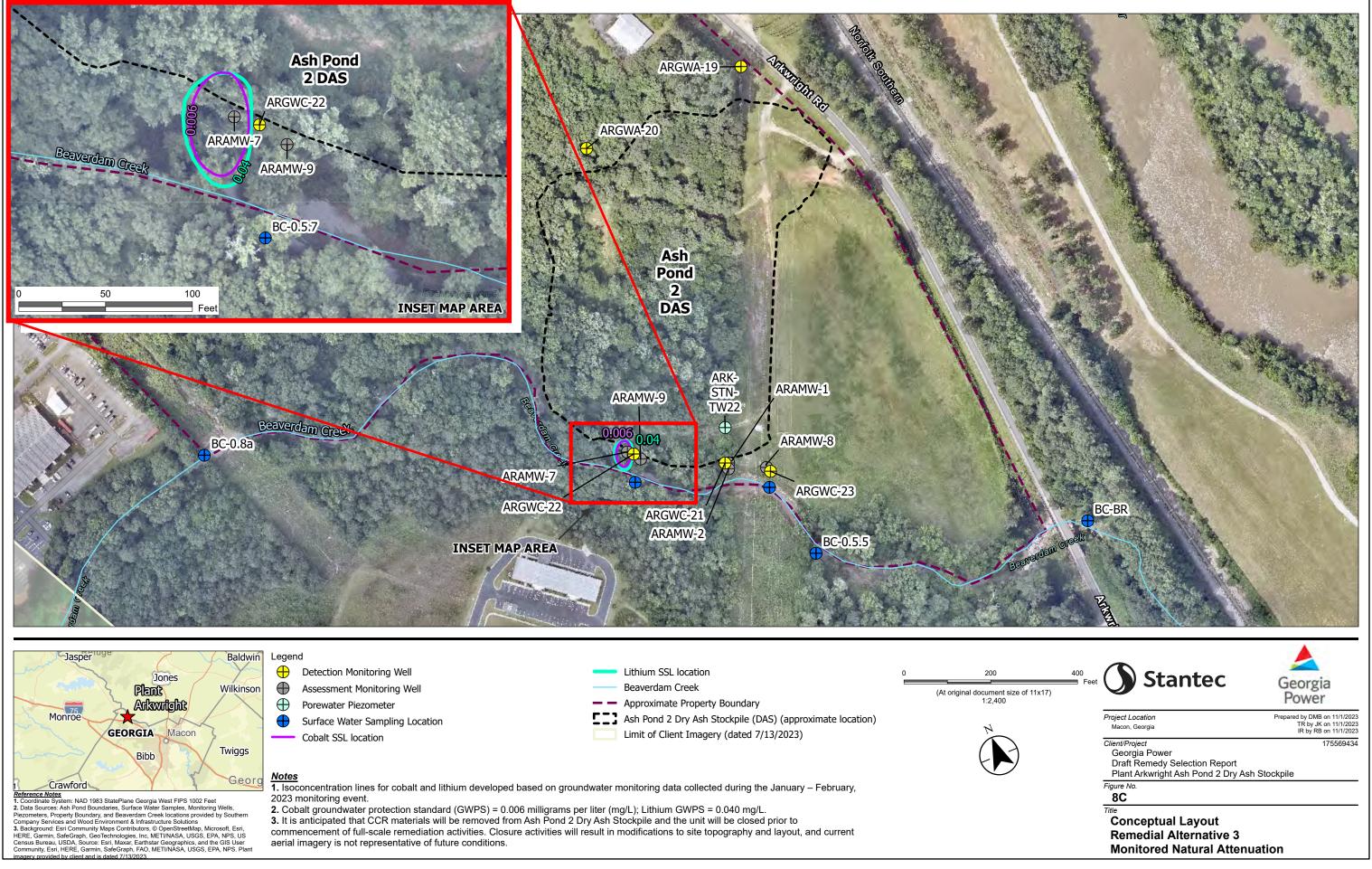
Client/Project Georgia Power

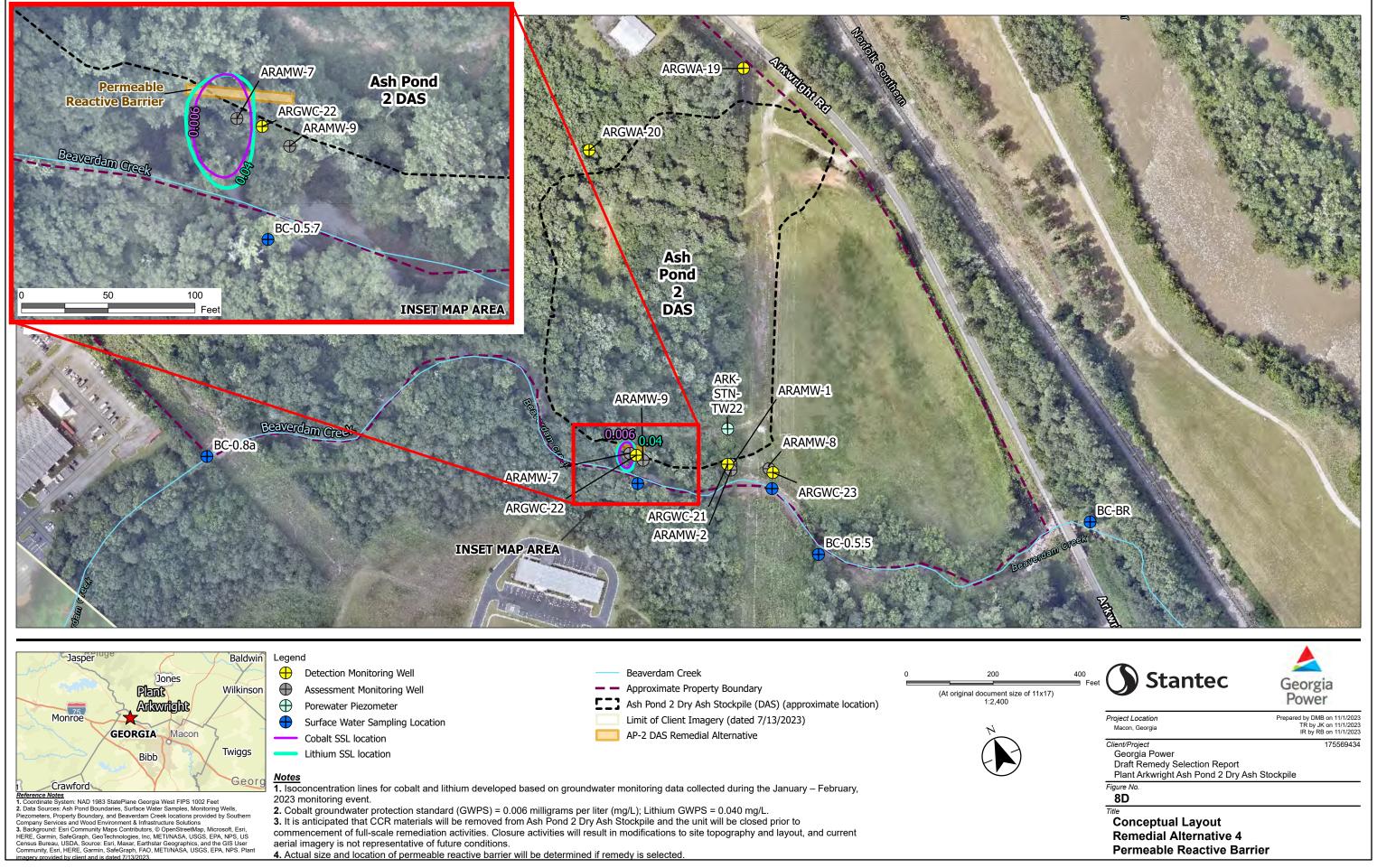
Draft Remedy Selection Report
Plant Arkwright Ash Pond 2 Dry Ash Stockpile

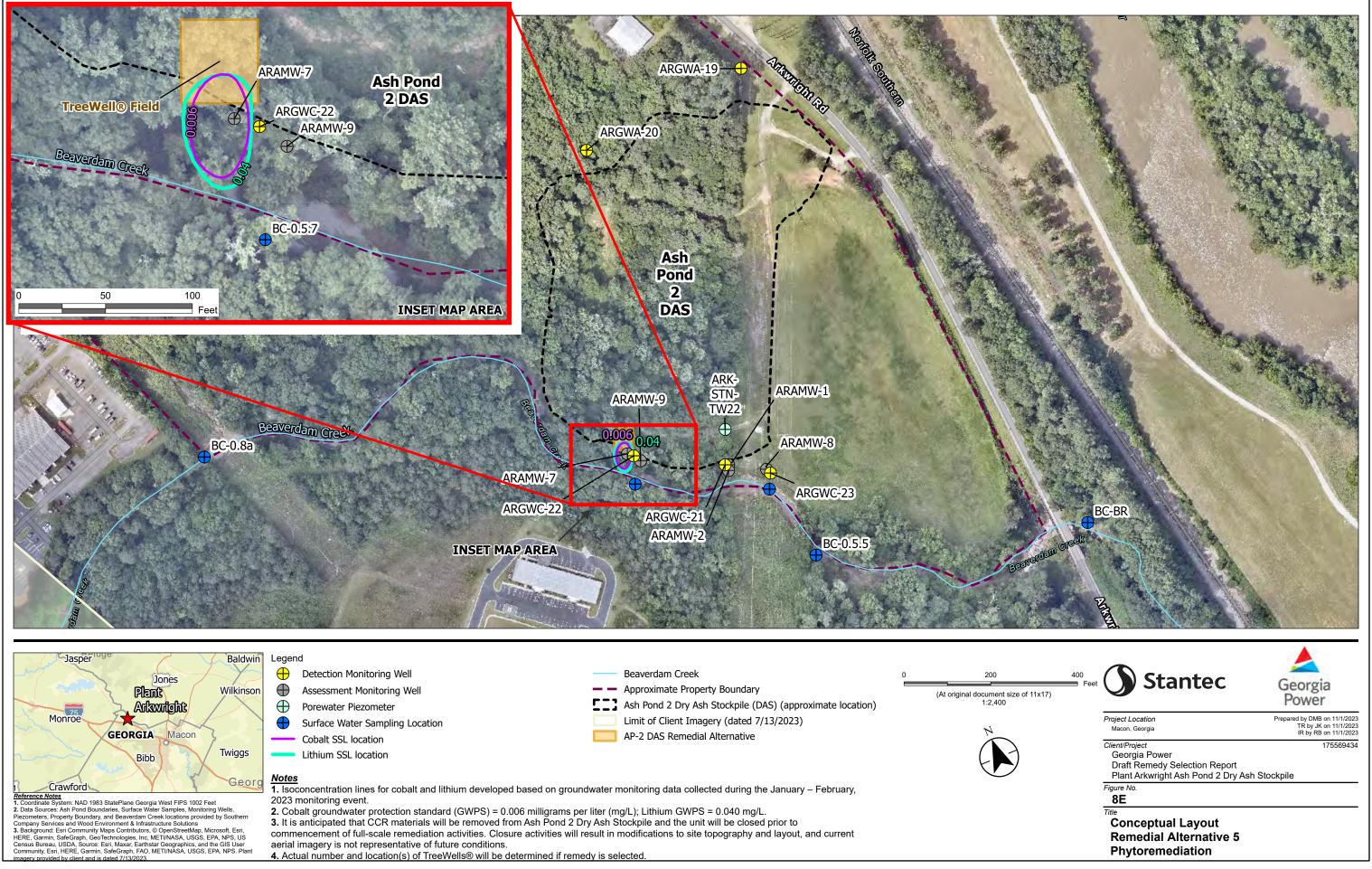
Lithium Concentration Map with Statistically Significant Level (SSL) Location - January -February 2023











APPENDIX A GEOCHEMICAL CONCEPTUAL SITE MODEL



GEOCHEMICAL CONCEPTUAL SITE MODEL REPORT

Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

February 28, 2024

Prepared for:



Prepared by: Stantec Consulting Services Inc. 10745 Westside Way, Suite 250 Alpharetta, Georgia 30009-7640

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Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

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APPENDICES

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Appendix B – Laboratory Reports
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Acronyms / Abbreviations

AP-2 DAS

Ash Pond 2 Dry Ash Stockpile

CCR

Coal Combustion Residuals

CEC

Cation Exchange Capacity

cm/s

centimeters per second

DO dissolved oxygen

DPT Direct Push Technology

EPA Environmental Protection Agency

GA EPD Georgia Environmental Protection Division

GCSM Geochemical Conceptual Site Model

Georgia Power Company

GWPS Groundwater Protection Standard meg/100g Milliequivalents per 100 grams

mg/kg milligrams per kilogram
mg/L milligrams per liter

ORP Oxidation-Reduction Potential
PWR Partially Weathered Rock
TDS Total Dissolved Solids
TOC Total Organic Carbon

SEP Sequential Extraction Procedure
SSL Statistically Significant Level

s.u. Standard Units
TSI Terra Systems, Inc.
XRD X-ray diffraction



1 Introduction

1.1 Purpose

This Geochemical Conceptual Site Model (GCSM) report has been prepared for the Georgia Power Company (Georgia Power) Plant Arkwright Ash Pond 2 Dry Ash Stockpile (AP-2 DAS) to support the remedy selection process. The purpose of this GCSM is to provide an assessment of the site-specific geochemical conditions that influence the fate and transport of cobalt and lithium in groundwater. The site-specific data and assessment of aquifer geochemistry will be the framework for constituent transport modeling and guide the selection of appropriate remedies for corrective action at AP-2 DAS.

This GCSM is prepared as an "interim" submittal that incorporates available geochemical data for AP-2 DAS. By the nature of site evaluations, GCSMs are subject to update as additional relevant data becomes available.

1.2 Background

Plant Arkwright is a former coal-fired electric generation facility located in Bibb County, Georgia approximately six miles northwest of the city of Macon. AP-2 DAS is a closed CCR unit located at Plant Arkwright. Details regarding the site location, closure of the CCR unit, and the geologic and hydrogeologic setting are provided in the Draft Remedy Selection Report.

1.3 Groundwater Quality

Statistical analysis of the January-February 2023 semi-annual assessment monitoring groundwater data reported in the 2023 Annual Groundwater Monitoring and Corrective Action Report (Stantec, 2023) identified Statistically Significant Levels (SSLs) of the Appendix IV constituents cobalt and lithium exceeding their respective groundwater protection standards (GWPS) in a single monitoring well (ARAMW-7) located downgradient of AP-2 DAS. This GCSM will focus on cobalt and lithium fate and transport mechanisms, particularly within the intersection of the shallow bedrock and partially weathered rock (PWR) material in the area coinciding with the screened interval of the ARAMW-7 well (see Figure 4C in the Draft Remedy Selection Report), and the hydraulically connected overburden material. Additional wells may have concentrations exceeding GWPS that do not qualify as SSLs (e.g. lithium at ARGWC-23); however, these constituents and locations are not the focus of this GCSM.

Time series graphs of cobalt and lithium concentrations at well ARAMW-7 and nearby monitoring wells are depicted on Figures 1 and 2, respectively. Iso-concentration maps for cobalt and lithium are included as Figures 3 and 4, respectively. The spatial distribution of cobalt and lithium is further described in section 2.1.2.



1.3.1 COBALT GEOCHEMISTRY AND FATE AND TRANSPORT PROPERTIES

Cobalt is commonly found in biotite and other ferromagnesian minerals (Smith, 1990). Cobalt occurs naturally in the Co²+ and Co³+ valence states (Adriano, 1986), with the Co²+ valence state being the predominant form under environmental conditions and the Co³+ form having very low solubility. Cobalt solubility and mobility is affected by a number of environmental factors such as pH, redox condition, and the presence of organics (e.g., humic substances). Cobalt mobility increases with decreasing oxidation-reduction potential (ORP) and pH. Reducing conditions in saturated soil release cobalt into solution through direct reduction of Co³+ to Co²+ and reductive dissolution of iron and manganese oxyhydroxides (Han and Banin, 2000). These oxyhydroxides typically control cobalt mobility under neutral pH and aerobic conditions through sorption and coprecipitation. At a pH below 6 standard units (s.u.) cobalt will tend to sorb less onto oxyhydroxides even when the redox condition is aerobic and the sorbing mineral species are stable. Complexation with dissolved organic compounds can also increase the mobility of cobalt.

Cobalt sorbs strongly to the surface of iron and manganese oxyhydroxide minerals when groundwater pH is neutral to alkaline under aerobic conditions, when these minerals are stable and sorption sites are available on the mineral surfaces. The stability of iron and manganese oxyhydroxide minerals in the soils is, influenced by the groundwater pH and the degree of oxidation or reduction (i.e., the redox condition). While oxyhydroxide minerals can dissolve under the influence of very low pH conditions, cobalt stops sorbing to iron oxyhydroxide minerals long before they dissolve under acidic conditions. Iron and manganese minerals are additionally sensitive to the redox condition of groundwater and can dissolve as conditions become increasingly reducing, which also releases sorbed constituents to groundwater, including cobalt. If reductive dissolution of manganese oxide occurs under lower pH conditions (i.e., less than 6 s.u.), cobalt mobilized by manganese oxide dissolution would not sorb to iron oxyhydroxides because the pH would be too low for cobalt sorption.

1.3.2 LITHIUM GEOCHEMISTRY AND FATE AND TRANSPORT PROPERTIES

Lithium generally occurs as the Li⁺ ion in groundwater under typical soil and groundwater redox conditions. It can be substituted for aluminum in the formation of primary oxide and silicate minerals and exchanged with cations on clay minerals. In the Coastal Plain and Piedmont areas, lithium is predominantly contained within the clay minerals (Anderson et al, 1988). Cation exchange is the main process controlling soluble lithium retention in geologic materials and is likely the main process controlling lithium attenuation (Crawley, 1977). Lithium is generally more mobile than cobalt with minimal influence from geochemical processes.

2 Summary of Site Characterization

The following section summarizes the field investigations and data evaluations completed at AP-2 DAS used to develop the current GCSM. This material is presented in part in the Assessment of Corrective Measures Report, Semiannual Remedy Selection and Design Progress Reports, and/or the Annual and Semiannual Groundwater Monitoring and Corrective Action Reports but have been compiled here to



evaluate the data from a geochemical viewpoint. Site characterization data collected for AP-2 DAS and pertinent to the GCSM includes groundwater chemistry, CCR pore water chemistry, geochemical data, and properties of solid matrix materials. This section provides a review of site groundwater, CCR pore water, and aquifer solids geochemistry with specific relation to cobalt and lithium.

2.1 Groundwater and CCR Pore Water Geochemistry

The evaluation in this section describes the general chemistry and major ion distribution observed across AP-2 DAS to provide a foundation for interpretation of the source of cobalt and lithium detected in ARAMW-7 and ultimately leading into the description of the GCSM presented in Section 4. The following sections describe the available groundwater and CCR pore water data from the AP-2 DAS area.

2.1.1 GROUNDWATER AND CCR PORE WATER ANALYSIS

Results of groundwater and CCR pore water sampling and field geochemical measurements from 2016 through 2023 are presented in Appendix A. A map depicting monitoring well and sample collection locations is presented as Figure 2 of the Draft Remedy Selection Report.

Groundwater sampling is performed semiannually for the full suites of Appendix III and Appendix IV constituents and Appendix I constituent (silver). During certain sampling events, geochemical constituents (aluminum, bicarbonate and carbonate alkalinity, iron, manganese, magnesium, potassium, and sodium) were analyzed to supplement the Appendix III and Appendix IV constituent analyses. Historical attempts to sample AP-2 DAS pore water have encountered dry boreholes indicating minimal pore water in the CCR. However, sufficient CCR pore water for analysis was collected from the CCR pore water piezometer ARK-STN-TW22 on April 26, 2023 and again on August 10, 2023. The CCR pore water samples were analyzed for the same suite of parameters as the groundwater, including geochemical constituents. Preliminary geochemical analyses were conducted using the sample result from ARK-STN-TW22, but limited recharge may have influenced geochemical conditions. Samples collected from ARK-STN-TW22 had a turbidity of approximately 50 nephelometric turbidity units, which may influence analytical results collected from that location.

The pH of groundwater at AP-2 DAS ranges from mildly acidic to neutral in the approximate range of 5.1 to 8.7 s.u. (Appendix A). The groundwater pH ranges from 7.8 to 8.1 s.u. in monitoring well ARAMW-9, which is screened in the bedrock approximately 50 feet deeper than the other wells and does not appear to be in direct hydraulic communication with the uppermost aquifer. The pH of ARAMW-8 ranges from 6.4 to 8.7 s.u., while the remaining groundwater monitoring wells range from approximately 5.1 to 6.8 s.u. This mildly acidic pH in groundwater may contribute to the geochemical control of metals/metalloids either by directly influencing sorption reactions or through solubility controls on metal oxyhydroxides (iron and manganese) that act as sorbents for metals/metalloids. The CCR pore water pH ranged from 6.4 to 6.5 s.u.

The redox condition of the groundwater ranged from oxic to anoxic (Table 1), with the most reducing condition observed in the deep bedrock well, ARAMW-9. Additionally, overburden wells ARAMW-2, ARGWC-21, and ARGWC-22 and bedrock well ARAMW-7 exhibited an anoxic condition, while the other



Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile 2 Summary of Site Characterization

groundwater wells reflect a mixed or oxic condition. Typically, concentrations of iron in groundwater are negatively correlated with the redox condition (represented by field measured ORP) of groundwater, which is consistent with the potential for precipitation of iron hydroxides in locations with oxidizing conditions. Amorphous hydroxides of iron in addition to poorly crystalline oxyhydroxides and amorphous manganese oxides are important in the sorption of metals, and will collectively be referred to herein as oxyhydroxides, except when a specific mineral phase is being discussed. Generally, AP-2 DAS groundwater well locations with more reducing (anoxic) ORP conditions exhibit higher iron concentrations, apart from the deep bedrock well ARAMW-9 which shows an anoxic condition with lesser amounts of iron. The lower iron is expected given the higher pH (8 s.u.) of the groundwater at ARAMW-9.

The relationship between manganese concentration and ORP is less direct than the relationship between iron concentration and ORP, in that once manganese is reduced and dissolved into the groundwater there are kinetic limitations that inhibit reprecipitation of manganese in response to re-oxidation. Manganese concentrations at AP-2 DAS do not exhibit a strong correlation with ORP most likely due to kinetic factors.

General cation (calcium, magnesium, potassium, and sodium) and anion (chloride, sulfate, and alkalinity) concentrations measured during the January - February 2023 groundwater monitoring event and April 2023 CCR pore water sampling event were used to create Piper and Stiff Diagrams (Figures 5 and 6). These diagrams illustrate differences or similarities in water types based on major ion chemistry to assess sources of water and chemical constituents.

- The Piper diagram (Figure 5) depicts the chemical composition of the January-February 2023 groundwater samples and the April 2023 CCR pore water sample based on the concentrations of major cations and anions. The wells are represented by different colors with each color indicating a group of collocated wells, open icons indicating wells screened in the overburden, and closed icons indicating wells screened in bedrock. The major ion chemistry of groundwater at AP-2 DAS varies by spatial location with little change between overburden and bedrock wells at a given location, the exception being the deep bedrock well ARAMW-9, which exhibits a different water type (calcium-sodium-sulfate) than the overlying adjacent wells ARAMW-7 and ARGWC-22. Downgradient wells near the southern boundary are mixed calcium-magnesium dominant with a range from mixed bicarbonate-sulfate to sulfate dominated water types. The upgradient wells are calcium-sodium-bicarbonate-type water.
- The Stiff diagram (Figure 6) shows the spatial distribution of water types across AP-2 DAS. Five distinct signatures are evident in the groundwater samples and these signatures are correlated with monitoring well location. This distribution supports the conclusion that overburden and shallow bedrock wells (screened in PWR) are hydraulically connected. The deep bedrock well ARAMW-9 exhibits a different signature supporting the hydrogeologic evaluation conclusion that it is not hydraulically connected to the adjacent shallower monitoring wells.

Geochemist's Work Bench (Bethke, 2022) was used to calculate mineral saturation indices (Table 2) and Eh pH diagrams (Figures 7 through 10) for the evaluation of cobalt, lithium, iron, and manganese mineral solubility and stability. The activities used in development of the Eh pH diagrams were the average values from ARAMW-7. Although minor differences occur based on site variability in activity, the values at



Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile 2 Summary of Site Characterization

ARAMW-7 provide for an assessment of the mineral stability system at the location of concern. Initial aqueous speciation of the groundwater at AP-2 DAS indicates that groundwater is oversaturated with iron-containing minerals, but several of these minerals (e.g., goethite, magnetite, hematite) are unlikely to form under field conditions due to kinetic factors, except for ferrihydrite/amorphous iron hydroxide. These kinetically limited minerals were suppressed during the calculation of saturation indices presented in Table 2 and the development of the Eh pH diagrams prepared for cobalt and iron to allow for the presentation of amorphous or poorly crystalline iron hydroxides such as ferrihydrite, the most likely iron mineral controlling cobalt sorption at a pH greater than 6 s.u. (see Figures 7 and 9, Table 2). Figure 7 supports predictions of soluble cobalt at site conditions of pH approximately equal to 6 and Eh generally greater than +200 millivolts, while Figure 9 reflects the geochemical conditions of upgradient wells straddling the aqueous and solid stability fields for iron and wells at the relevant area, ARAMW-7 (bedrock) and ARGWC-22 (overburden), within the dissolved iron stability field. Together, the data reflect the potential for iron minerals (ferrihydrite and/or amorphous iron hydroxide) controlling the sorption and dissolution of cobalt in the AP-2 DAS groundwater.

The Eh pH diagram for lithium presented in Figure 8 is consistent with lithium being in soluble form. The Eh pH diagram for manganese presented in Figure 10, indicates that most groundwater wells exhibit geochemical conditions where manganese would be limited to the dissolved manganese form.

2.1.2 SPATIAL DISTRIBUTION OF COBALT AND LITHIUM

SSLs for cobalt and lithium were identified at a single monitoring well, ARAMW-7. ARAMW-7 is located downgradient of AP-2 DAS and is screened at the intersection of the shallow bedrock and the PWR material which is hydraulically connected to the overburden (saprolite) material. In the groundwater monitoring network, the presence of cobalt exceeding the GWPS (0.006 mg/L) appears to be isolated to the shallow bedrock around ARAMW-7, bound below by deep well ARAMW-9 and above by ARGWC-22. Detectable cobalt concentrations are bound to the east by ARGWC-21, ARAMW-1, and ARAMW-2 and to the south by Beaverdam Creek (located downgradient of ARAMW-7), indicating that the lateral extent of the Cobalt SSL is limited to an area less than approximately 100 feet wide, as shown on Figure 3. Lower concentrations of cobalt below the GWPS were found in other groundwater monitoring wells, ARGWC-22, ARAMW-2, and ARAMW-8, which are situated in the downgradient areas of AP-2 DAS. Trace levels of cobalt were detected in other downgradient wells, whereas cobalt was not detected in groundwater samples from the upgradient bedrock monitoring well (ARGWA-19) or the upgradient overburden monitoring well (ARGWA-20) during 2023. Based on the limited lateral distribution of the cobalt SSL observed at ARAMW-7, the exceedance appears to be isolated and contained in the downgradient direction by the aerobic conditions along the perimeter of Beaverdam Creek.

Lithium, which is a much more mobile cation than cobalt, is detected across the AP-2 DAS groundwater monitoring network, with the exception of upgradient well ARGWA-20. Detections above the GWPS (0.04 mg/L) are limited to the shallow bedrock well ARAMW-7, and the overburden well ARGWC-23. Similar to cobalt, the lithium SSL at ARAMW-7 is bound below by deep bedrock well ARAMW-9, and laterally bound downgradient by Beaverdam Creek and adjacent monitoring wells. The lithium detection at ARGWC-23 is not an SSL and is delineated in the downgradient direction by Beaverdam Creek, as shown on Figure 4.



Concentrations of cobalt and lithium in the AP-2 DAS pore water piezometer ARK-STN-TW22 were reported at 0.0396 and 0.138 milligrams per liter (mg/L), respectively, in the sample collected April 2023. The location of ARK-STN-TW22 is shown on Figure 2 of the Draft Remedy Selection Report. Additional CCR pore water data was not available as there has historically been insufficient CCR pore water for sampling.

2.2 Aquifer Solids Characterization

Monitoring well ARAMW-7, which exhibits SSLs for cobalt and lithium above their GWPSs is screened at the intersection of the PWR material and the overburden (saprolite) material. To evaluate geochemical conditions in this area, aquifer solids collected included bedrock and overburden (including saprolite) samples. Sampling locations are shown on Figure 2 of the Draft Remedy Selection Report, sampling depths are summarized in Table 3, and laboratory results are included in Appendix B.

Bedrock samples were collected using sonic drilling in October 2022 from the borehole of ARAMW-9. To preserve aquifer conditions and reduce oxidation the samples were placed in sealed bags and shipped to SGS Canada Inc for analysis. A summary of the bedrock characterization completed by SGS Canada Inc. is provided in this section.

Overburden samples were collected by Wood Environment & Infrastructure Solutions, Inc. (Wood) using a direct push technology (DPT) rig in 2021 at four locations in the vicinity of AP-2 DAS and submitted for analysis. The sample depths were selected to coincide with the overburden screen sections of adjacent monitoring wells.

In August 2023, additional soil samples were collected from three locations downgradient of AP-2 DAS (as shown on Figure 2 of the Draft Remedy Selection Report) and submitted for analysis. To preserve aquifer conditions and reduce oxidation the samples were placed in bags, preserved on ice, and shipped to SGS Canada Inc for analysis. These samples were collected near the bedrock interface, targeting the saprolite region that coincides more closely with the top of the ARAMW-7 screen interval. These samples were collected to characterize the weathered bedrock zone between the overburden and the bedrock.

A compilation of the aquifer solids characterization results is presented in Tables 4 through 7B. The bedrock, saprolite, and overburden samples were characterized for baseline chemical and mineralogical composition by application of the following analytical/testing methods.

- Cation Exchange Capacity (CEC): CEC of a soil or aquifer is an important variable to understand
 when evaluating attenuation processes. Cation exchange is generally defined as the capacity of a
 soil to retain positively charged ions, such as many metals. Understanding the capacity of solids
 in the subsurface to retain positively charged solutes helps in the evaluation of attenuation
 mechanisms and capacity. The CEC was not analyzed for bedrock samples and is not expected
 to be significant in the bedrock since cation exchange is unlikely in the unweathered biotitegneiss.
- Total Organic Carbon (TOC): This analyte represents the presence of substrate for sorption and an energy source for microbially mediated metal/metalloid transformations. Organic carbon in the



subsurface can serve to sorb/retain metals, and it can also provide food to microorganisms that use certain metal/metalloids as electron acceptors and therefore change their oxidation-reduction (redox) state, which affects their mobilization/ immobilization. Organic carbon, if present, can contribute to the CEC and anion exchange capacity of a soil. TOC was not analyzed for bedrock samples as the organic content of the rock is not expected to be significant.

- Total Metals Concentration: This analysis measures the total concentrations of targeted metal/metalloids in the solid phase (digested using EPA Method 200.7 which uses nitric and hydrochloric acid to dissolve undissolved constituents). This analysis helps to understand the presence of site-specific constituents in aquifer solids as well as the presence of elements such as iron, aluminum, and manganese that form major mineral phases known to sorb/retain many metals. Although total metals concentration does not provide information regarding the mobility of the metal/metalloids, the total concentrations provide the occurrence and availability of specific metals for subsequent weathering and mobilization.
- X-Ray Diffraction (XRD): This method provides qualitative and quantitative confirmation of
 mineral phases present. XRD is limited to identifying crystalline mineral phases at a weight
 percent concentration and does not identify amorphous or poorly crystalline minerals.
 Understanding whether mineral phases important to metal/metalloid sorption are present in
 aquifer solids is essential in the evaluation of attenuation mechanisms and capacity.
- Sequential Extraction Procedure (SEP): This method of analysis provides information regarding the mineral phases targeted by a series of extraction methods and elements liberated by the extraction associated with each targeted mineral phase. The series of extractions focuses on mineral phases that tend to control metal/metalloid cation and anion retention that are typically not identifiable by XRD. Specific mineral phases are not definitively determined by SEP results due to limited ability of the extraction reagents to replicate actual conditions, modification of aquifer solids chemistry by previous reagents, and/or high detection limits masking potentially substantial constituent concentrations. Despite these limitations, SEP results remain a useful tool for assessing geochemical characteristics of aquifer solids. Methods and results of SEP analysis, including descriptions of each extraction step, are summarized in Tables 7A and 7B.

2.2.1 BEDROCK AQUIFER SOLIDS

Bedrock samples were analyzed using XRD, SEP, and total metals analysis. Significant results of these analyses are summarized below.

Most of the minerals identified from XRD are unreactive in the bedrock groundwater system and will not participate in the geochemical reactions that are relevant to this GCSM (Table 4). It is not surprising that no iron-dominant minerals were identified from bulk mineralogical XRD analysis of bedrock collected in 2022 because the iron minerals expected to form, and that control metal mobility, are poorly crystalline or amorphous minerals that do not generate a discernible XRD signature.

Total metals analysis of bedrock solids quantified considerable concentrations of iron and aluminum, the dominant metals that form highly sorptive poorly crystalline/amorphous oxyhydroxides. Iron



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concentrations range from 22,000 to 29,000 milligrams per kilogram (mg/kg), while aluminum concentrations range from 11,000 to 16,000 mg/kg (Table 4). Cobalt often has a strong association with manganese oxides and manganese is also present within the sampled bedrock (ranging from 360 to 720 mg/kg), although to a lesser degree than iron or aluminum. Iron, manganese, and aluminum-bearing minerals are the dominant minerals that participate in the sorption reactions for attenuation of dissolved metals such as cobalt in groundwater systems. The total cobalt measured in bedrock solids was 7 mg/kg at both sample depths, while lithium ranged from 17 to 22 mg/kg. These concentrations of cobalt and lithium are within the average crustal abundances of cobalt and lithium for the continental United States (Shacklette and Boerngen, 1984).

The SEP results provide an indication of the associations of various metals with various extractable phases targeted by the reagents used for extraction. Table 5 lists the SEP data for the two bedrock sample depths. There is little difference in cobalt and lithium between the relative screen interval depths of ARAMW-7 and ARAMW-9. Less than 15 percent of total cobalt and less than 35 percent of total lithium was associated with the metal hydroxide and more readily extractable phases (steps 1-4), with the remainder expected to remain immobile under groundwater conditions. Discrepancies between the sum of SEP results and the total metal concentrations commonly occur, in particular due to the small subsample sizes used for analysis and varying detection limits. With the exception of aluminum, the total metals and sum of SEP results were generally aligned.

2.2.2 SAPROLITE AQUIFER SOLIDS

Saprolite samples collected adjacent to the screened intervals of monitoring wells were analyzed for CEC, TOC, XRD, SEP, and total metals. Significant results of these analyses are summarized below.

The XRD data is presented in Table 6B and includes reactive minerals that will affect lithium and cobalt contents. In particular, there are iron oxide minerals magnetite (0.2 to 2.1 percent) and hematite (0.2 to 2 percent) and clay minerals chlorite (0.1 to 1.8 percent), illite (3 to 6.3 percent), illite-montmorillonite (non-detect to 4 percent), and montmorillonite (non-detect to 2.2 percent). Although pyrite was not sufficient to quantify, it was present in most samples. The clay minerals could contribute to attenuation of metals by the saprolite from cation exchange, CEC ranged from 4.5 to 14 milliequivalents per 100 grams of soil (meq/100g) (low CEC [Sonon et al., 2022]). The iron oxides are likely indicators of more reactive amorphous iron oxyhydroxides that are too poorly crystalline to be detected with XRD.

The SEP results are presented in Table 7B for the saprolite sampling locations and depth intervals. The total cobalt concentrations at SB-10 are lower than the bedrock samples, while those at SB-11 are similar to the bedrock samples and those at SB-12 are greater than the bedrock samples. The relative proportion of the easily weatherable cobalt phases (SEP Steps 1 - 5) is greater in SB-10, while similar in SB-11 and SB-12. The total lithium concentrations increase from west to east, and all the lithium is tied up in the least weatherable phase (SEP Step 6). Discrepancies between the sum of SEP results and the total metal concentrations commonly occur, in particular due to the small subsample sizes used for analysis and varying detection limits. With the exception of aluminum, the total metals and sum of SEP results were generally aligned.



2.2.3 OVERBURDEN AQUIFER SOLIDS

Soil samples collected adjacent to the screened intervals of monitoring wells were analyzed for CEC, TOC, XRD, SEP, and total metals. Key results of these analyses are summarized below.

The CEC of upgradient soil boring SB-1 is 54 meq/100g (moderate CEC [Sonon et al., 2022]), while the downgradient CEC ranges from 4.8 to 14 meq/100g (low CEC [Sonon et al., 2022]). TOC analysis indicated 6,800 mg/kg detected at the downgradient SB-3 location and TOC values were below detection limits of 800 to 1,200 at the other locations (Table 6A). Results indicate potential variability between upgradient saprolite and downgradient overburden soil chemistry and capacity to attenuate metal/metalloid migration in soils.

Similar to the CEC data, the XRD data indicate major differences in the screened overburden upgradient (SB-1) and that downgradient (SB-4 and SB-5) (Table 6A). In particular, the sample from SB-1 has relatively higher percent clay-size particles (15 weight percent), as determined by sieve and hydrometer analyses, however it is approximately 80 weight percent clay minerals (66.3 weight percent kaolinite). Downgradient samples have lower clay particle contents (2.9 to 9.2%), and roughly equivalent clay minerals content (5.6 to 12.9%). The difference in CEC and clay mineralogy will influence cobalt and lithium behavior in groundwater, with higher CEC contributing to increased potential for sorption (Table 6A). Total cobalt and lithium were found to be three to five times higher in SB-1 (upgradient/saprolite) than in downgradient overburden and saprolite samples (Tables 7A and 7B). Total cobalt and lithium concentrations of 64 mg/kg and 45 mg/kg, respectively, in upgradient SB-1 soil are higher than the average crustal concentrations of 9.1 mg/kg and 24 mg/kg, respectively (Shacklette and Boerngen, 1984). The SEP cobalt results support the potential presence of cobalt adsorbed to iron, manganese, and aluminum minerals within the aguifer solids matrix at SB-1, where more than half the cobalt exists in non-crystalline and oxyhydroxide phases. At the downgradient locations, SB-4 and SB-5, there was minimal cobalt associated with the metal hydroxide and more extractable phases, which is consistent with known solubility controls for metal oxyhydroxides at a mildly acidic pH. In the three samples tested, more than half of the lithium was found in recalcitrant, unreactive forms with the majority of the remainder occurring in the "organic" phase, which may be more indicative of aluminum hydroxide dissolution at the higher pH of the extracting reagent used for this phase. The SEP data indicates lower potential for adsorption/desorption and attenuation capacity for metals at the downgradient locations.

3 Treatability Testing

Treatability testing was completed by Terra Systems, Inc. (TSI) to evaluate methods of cobalt stabilization in groundwater. Although molybdenum is not the subject of this GCSM, it was addressed in the treatability testing due to previous detections. Testing was conducted with samples from aquifer solids and groundwater from two bedrock monitoring wells: ARAMW-7 (cobalt and lithium) and ARAMW-8 (molybdenum). Samples of bedrock and groundwater from ARAMW-7 and ARAMW-8 were collected during drilling in November 2020 and submitted to Terra Systems, Inc in September 2022 for treatability testing. Initial testing has included titration of groundwater with various treatment reagents:



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- Reagents tested for ARAMW-7: Sodium bicarbonate, sodium hydroxide, calcium oxide, Ceres MTS 73MF2, and Ceres MTS 73MF3.
- Reagents tested for ARAMW-8: Ferric chloride, ferrous oxide, Ceres MTS 73MF2, Ceres MTS 73MF3, zero valent iron, and calcium oxide.

The reagents selected are designed to optimize the pH for cobalt, lithium, and molybdenum sorption and in the case of the Ceres reagents, introduce soluble iron to form iron oxyhydroxides that will contribute to sorption in the saturated zone. Titrations were performed to determine influence on pH and ORP and to identify reagents and loading rates for batch testing. Vendor dosing recommendations were used for Ceres reagents.

Batch testing has been completed and the results are included in Appendix C. See Figures 11 and 12 for results of the batch testing for wells ARAMW-7 and ARAMW-8, respectively. Based on the findings of this GCSM, the mechanism of attenuation evaluated for cobalt, lithium, and molybdenum is sorption to existing iron and manganese minerals formed as a result of precipitation from treatment reagents. Favorable treatability results for cobalt and molybdenum confirm the applicability of this mechanism in site aquifer solids, although molybdenum treatment results are variable. Both cobalt and molybdenum appear to be controlled through sorption onto iron and manganese mineral phases and sorption is controlled by the stability of the mineral phase and the pH of the groundwater (as discussed in Section 4). Treatments tested did not mobilize arsenic or selenium above their respective GWPS. Sorption treatment had limited effect on lithium mobility. Most notably, the Ceres reagents increased lithium content in both ARAMW-7 and ARAMW-8.

Additional column testing was conducted and built on results of the batch tests. The final column test results indicate that for ARAMW-7, sodium bicarbonate and ferrous sulfate reagents Ceres MTS 73MF2 and Ceres MTS 73MF3 appear to be effective and have the potential to treat cobalt (Figure 13). Ceres 73MF2 treated samples appear to have levels of residual iron which would not be conducive to in situ treatment. In addition, Ceres MTS 73MF2 is a solid reagent that is more applicable to soil mixing or slurry injection, which are not appropriate for in situ injections. Column testing for two reagents for ARAMW-7, sodium bicarbonate and Ceres MTS 73MF3, appear to demonstrate that both reagents can be effective at treating cobalt if pH is controlled above 7. Ceres MTS 73MF3 was able to treat cobalt in the column for ARAMW-7 (Figure 13). The sodium bicarbonate treated column required additional bicarbonate that according to TSI, the bench scale testing contractor, could only be added to the groundwater reservoir prior to injection onto the column. The addition of sodium bicarbonate to the reservoir resulted in precipitation and decreased the influent cobalt concentration to non-detect for the bicarbonate treated column. The reaction observed in the reservoir suggests that sodium bicarbonate would be an effective treatment for cobalt in situ. Lithium remained above the GWPS for the majority of the test and appeared to increase over time (Figure 14).

For ARAMW-8, ferric chloride (buffered with sodium bicarbonate) and Ceres MTS 73MF3 were the selected reagents for column testing, as these reagents were found to be effective at reducing molybdenum without generating conditions that mobilized other metals, with the exception of lithium. Although Ceres MTS 73MF2 also had promising results, it is a solid reagent that is not conducive for dissolved reagent injections and its use would likely be limited to soil mixing or slurry injections.



The results for ARAMW-8 indicate that Ceres MTS 73MF3 is the most effective reagent for treating molybdenum, although molybdenum concentrations increased slightly during the last sampling event but remained significantly below the GWPS (Figure 15). Ferric chloride buffered with sodium bicarbonate treated molybdenum below the GWPS but progressively increased during the test between day 33 and 43 and exceeded the GWPS, suggesting that effective treatment of molybdenum with this reagent combination may be challenging to maintain under field conditions.

The TSI treatability testing final reports for batch and column studies are included in Appendix C.

4 Geochemical Conceptual Site Model

4.1 Overview of Geochemical System

This section provides a summary of the geochemical system that serves as the basis for developing a GCSM to be used in construction of geochemical models and in remedy selection.

Groundwater quality at the Arkwright Plant is affected by numerous geochemical processes, including sorption, cation exchange, precipitation, and dissolution. The effect of these geochemical processes can explain the observed behavior of cobalt and lithium in CCR pore water and groundwater and can influence the attenuation of CCR constituents. The nature and extent of the interaction between dissolved constituents in groundwater, unconsolidated materials, saprolite, and bedrock range from limited interaction for constituents such as boron, chloride, and sulfate, to strong interaction for constituents such as cobalt. The following geochemical reactions or processes are likely mechanisms influencing the fate and transport of cobalt and lithium in groundwater:

- Sorption on the surfaces of metal oxyhydroxides an interaction between dissolved
 constituents and the surface of certain metal oxyhydroxide minerals (most often iron, but also
 manganese and aluminum), whereby constituents sorb onto metal oxyhydroxides that are often
 coating soil mineral surfaces, or constituents desorb (i.e., reaction is reversible) and become
 dissolved in groundwater; this process is controlled by the pH of groundwater.
- Cation exchange with clay minerals primarily affects positively charged constituents by interacting with the clay minerals; CEC varies by clay mineral, sorption is influenced by competition among cations, and concentrations of constituents; cation exchange reactions are reversible.
- **Mineral precipitation or dissolution** a process where constituents in groundwater combine to form a soil mineral (typically iron and manganese oxyhydroxides); minerals are also subject to dissolution (i.e., reaction is reversible) under certain groundwater pH and redox condition.

Most of the geochemical processes influencing groundwater quality of the uppermost aquifer occur in the overburden. Groundwater quality at AP-2 DAS is influenced by the chemistry of source waters and subsequent interaction with the geology of the uppermost aquifer. At AP-2 DAS, there are at least two potential sources of water: the upgradient groundwater observed at ARGWA-19 and ARGWA-20; and



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CCR pore water observed at ARK-STN-TW22. Surface water from Beaverdam creek also may influence the downgradient well geochemistry.

The evidence of CCR pore water influence is observed in Figures 5 and 6. Sulfate, a common indicator of CCR material influence, is elevated in the pore water of ARK-STN-TW22 and (with the exception of ARAMW-7 which has comparable concentrations of sulfate to CCR pore water) sulfate exhibits concentrations roughly an order of magnitude greater in most wells downgradient of AP-2 DAS than in the upgradient wells. Additionally, boron, another common indicator of CCR influence, exhibits concentrations in downgradient groundwater wells ARAMW-7 and ARGWC-22 that are comparable to CCR pore water boron concentrations (Appendix A).

4.2 Cobalt Mobilization and Attenuation Processes

Based on this geochemical evaluation, the site-specific processes influencing cobalt mobilization at ARAMW-7 may be related to two potential sources that are driven by geochemical processes: (1) the influence of CCR pore water; and (2) release of naturally occurring cobalt from soil and/or bedrock materials as a result of desorption from iron oxyhydroxides and potential dissolution of manganese and/or iron oxyhydroxides. Potential influence of these sources contributing to cobalt mobilization and detection in the vicinity of ARAMW-7 is suggested by the following:

- 1. CCR pore water contained within AP-2 DAS has a cobalt concentration (0.0396 mg/L) lower than the concentration observed in ARAMW-7 (0.0687), and ARAMW-7 is downgradient of AP-2 DAS based on the primary direction of groundwater flow (Figure 5 of the Draft Remedy Selection Report), suggesting that additional cobalt in ARAMW-7 may be attributed to desorption of naturally occurring cobalt observed in aquifer solids.
- 2. Groundwater samples collected from ARAMW-7 have a similar geochemical signature (boron, sulfate, and total dissolved solids [TDS]) to the AP-2 DAS pore water (Figures 5 and 6), which indicates that groundwater at ARAMW-7 may be influenced by CCR pore water.
- 3. The downgradient wells at AP-2 DAS, including ARAMW-7, have sulfate concentrations orders of magnitude higher than detected in the upgradient wells (Figure 6). The high sulfate is atypical for the mineralogy observed at the site and is a common indicator of influence from CCR material. The cobalt in groundwater across the site appears to have a positive correlation with sulfate (Figure 16). This relationship between sulfate and cobalt indicates AP-2 DAS pore water may contribute to cobalt concentrations in downgradient groundwater.
- 4. Cobalt occurs in upgradient (114 mg/kg) and downgradient (8 to 17 mg/kg) soils at AP-2 DAS (Table 5). The saprolite beneath the soils contains total cobalt ranging from 2.4 to 19 mg/kg (Table 6B). The lower concentrations are detected near ARAMW-7 and the concentrations increase from west to east. Cobalt was also detected in bedrock (7 mg/kg) that was sampled at the screen depths of ARAMW-7 and ARAMW-9 (Table 4), indicating that cobalt occurs naturally in the soils and bedrock. The SEP data for saprolite samples (Table 7B) indicates more than half the cobalt is in the residual phase (strongest extractant) with lower amounts near ARAMW-7 and the proportion increasing to the east. This indicates variability in solid chemistry across the



downgradient zone which may reflect varying amounts of naturally occurring cobalt and varying ability of the solids to retain cobalt. The SEP data for bedrock samples (Table 5) confirms cobalt occurs predominantly in the residual phase at the screen depths of ARAMW-7 and ARAMW-9, which supports the natural occurrence of cobalt in the bedrock. Similarly, the soils downgradient have the majority of cobalt in the acid/sulfide and residual extractant phases, further confirming the natural occurrence of cobalt at the site. Additionally, the total cobalt in the soils slightly increases to the east.

- 5. The upgradient soils reflect significant weathering with the cobalt primarily in the non-crystalline and metal hydroxide extractant phases; however, the cobalt is at or below the detection limit in the groundwater (ARGWA-20). The likely reducing conditions of AP-2 DAS appears to release this lightly bound cobalt increasing the concentration in the groundwater, since these forms are not significant in the downgradient soils and bedrock. However, the saprolite samples in the vicinity of ARAMW-7 contain approximately half of the cobalt in lightly bound phases.
- 6. Groundwater pH in ARAMW-7 (5.6 s.u.) is lower than CCR pore water pH (6.5 s.u.) in AP-2 DAS, indicating a decrease in pH of CCR pore water along the flow path between AP-2 DAS and ARAMW-7 (Appendix A). This decrease in pH corresponds to a decrease in iron from 34.3 mg/L (ARK-STN-TW22) to an average of 4.8 mg/L (ARAMW-7). The lower pH as a result of iron oxidation and precipitation, could prevent sorption of cobalt from CCR pore water leaching to groundwater, but also may result in mobilization of naturally occurring cobalt sorbed to the aquifer solids. The downgradient saprolite has less iron in the SEP iron and manganese oxide phase than bedrock but more in the residual phase suggesting that the iron may be transitioning to more recalcitrant forms.
- 7. Cobalt attenuation is occurring in overburden well ARGWC-22 based on a peak and decline in cobalt concentration (Figure 1). Some other overburden and bedrock wells (ARGWC-23 and ARAMW-8) appear to show a similar trend. At ARAMW-7 a similar increase peaked and has since stabilized; however, it appears attenuation has not yet occurred at ARAMW-7 since there is no decrease in cobalt. The Eh pH diagrams of cobalt, iron, and manganese indicate that the groundwater system is consistent with cobalt, iron, and manganese in solution (Figures 7, 9, and 10). Moreover, iron and manganese are present in groundwater at ARAMW-7 providing a potential solid for cobalt sorption as iron and manganese are oxidized and precipitate, potentially resulting in additional cobalt attenuation over time.
- 8. Downgradient groundwater is also more reducing than upgradient groundwater, indicating that dissolution of manganese and/or iron oxyhydroxides may also influence dissolved cobalt concentrations in site groundwater.

4.3 Lithium Mobilization and Attenuation Processes

Based on this geochemical evaluation, the site-specific processes influencing lithium mobilization at ARAMW-7 may potentially be related to two sources: (1) the influence of CCR pore water; and (2) release



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of naturally occurring lithium. The influence of CCR pore water and geology contributing to lithium mobilization and detection in the vicinity of ARAMW-7 is evidenced by the following:

- 1. Lithium concentrations in downgradient wells ARGWC-22, ARGWC-23, and ARAMW-2 are higher than the site-specific background concentration of 0.013 mg/L. Lithium concentrations exceed the GWPS (0.040 mg/L) in a vertical delineation well ARAMW-7 with an average concentration of 0.062 mg/L.
- The lithium concentration of AP-2 DAS pore water is 0.138 mg/L, suggesting pore water is a likely source of higher lithium concentrations in downgradient bedrock wells ARAMW-2 and ARAMW-7 and overburden wells ARGWC-22 and ARGWC-23.
- 3. Groundwater samples collected from ARAMW-7 have a similar geochemical signature to the AP-2 DAS pore water (Figures 5 and 6), which indicates that groundwater at that location may be influenced by CCR pore water. The highest concentration of sulfate, a common indicator of CCR materials, in groundwater corresponds with the highest lithium and cobalt detections at ARAMW-7, indicating the potential influence of CCR porewater on groundwater geochemistry at that location.
- 4. Lithium occurs naturally at total concentrations of 14 mg/kg, in an upgradient location near overburden well ARGWA-19, to 22 mg/kg in the screened interval of bedrock well ARAMW-9. Saprolite lithium concentrations are lower than these levels near ARAMW-7 but approach these levels near ARAMW-8. These concentrations are within average crustal abundances and thus, do not reflect enriched concentrations in the aquifer solids.
- 5. Slightly elevated lithium above GWPS at well ARAMW-7 is likely derived from AP-2 DAS. However, there is significant attenuation of lithium concentrations, by dispersion and/or retention. Lithium retention in soils can be related to CEC and variable charge minerals (Crawley, 1997), and adsorption to aluminum oxides (McKenzie, 1989). The aluminum concentration in pore water is an order of magnitude greater than that of ARAMW-7, indicating possible aluminum oxide formation along the flow path from AP-2 DAS to ARAMW-7 that could be tying up the lithium.
- 6. Lithium concentrations detected in ARAMW-7 are an order of magnitude higher than lithium concentrations detected in upgradient well ARGWA-19, indicating that concentrations at ARAMW-7 may exceed naturally occurring background concentrations. Natural mobilization of lithium may also be a contributor to lithium in ARAMW-7 and ARGWC-23 potentially explaining the lower levels of lithium in the saprolite near ARAMW-7.
- 7. Lithium is consistently detected in the majority of monitoring wells across the AP-2 DAS groundwater monitoring network (Figure 4), including upgradient monitoring well ARGWA-19 which indicates a natural background lithium concentration that is approximately an order of magnitude lower than detected in ARAMW-7.
- 8. Where present, a clayey zone in the overburden may retain and slow the migration of lithium in both upgradient and downgradient locations. SEP data from the overburden indicates non detect exchangeable lithium, however the detection limits are too high to confirm that exchangeable



lithium is not present. In addition, SEP results show some lithium associated with carbonates and amorphous iron, manganese, and aluminum oxyhydroxides. Saprolite sample SEP results indicate lithium is limited to the residual phase; however, it is possible that elevated detection limits may mask concentrations of lithium in more reactive phases. The total lithium in SB-10 near ARAMW-7 is lower than that measured in overburden, bedrock, and other saprolite samples, which may indicate release of naturally occurring lithium in that area. The presence of clay minerals in the screen zone of upgradient overburden sample SB-1 likely contributes to its higher total lithium content than that found in the downgradient overburden. The CEC in the weathered bedrock is low and consistent with the overlying soils and observed mineralogy. CEC is not anticipated to reduce lithium concentration in groundwater significantly; however, the SEP amorphous oxyhydroxide fraction includes lithium in the downgradient bedrock at levels similar to the upgradient overburden. Given similar hydroxide fraction concentrations of lithium in ARAMW-7, ARAMW-9, and upgradient overburden well ARGWA-19, natural occurrence and mobilization of lithium could explain some of the downgradient concentrations.

4.4 Summary of Geochemical Conceptual Site Model

The GCSM indicates that pH and ORP are controlling the attenuation of cobalt at the bedrock and PWR interface at ARAMW-7, while attenuation of lithium at ARAMW-7 and in the overburden at ARGWC-23 is primarily controlled by CEC and sorption to amorphous oxyhydroxides. Key details for the GCSM of cobalt and lithium are discussed individually below.

4.4.1 COBALT

Groundwater and aquifer solid data from AP-2 DAS suggests two potential sources for the cobalt SSL at ARAMW-7: (1) a source of cobalt from CCR pore water; and (2) a source from the desorption of cobalt from aquifer solids. The CCR signature (Boron, Sulfate, and TDS) noted in ARAWM-7 groundwater and at its paired shallow well, ARGWC-22, would tend to suggest that CCR pore water could be a contributor to cobalt at this location. However, cobalt in ARAMW-7 can also be explained by desorption from aquifer solids due to a decrease in pH.

Along the GW flow path from AP-2 DAS to monitoring well ARAMW-7, geochemical changes are noted. A decrease in pH along the GW flow path appears to have contributed to the increased concentration of cobalt at ARAMW-7. CCR indicators boron and sulfate decreased slightly, reflecting dilution from mixing with aquifer groundwater along the flow path. As the flow path exits the AP-2 DAS dike, groundwater remains reducing with low dissolved oxygen (DO) and negative ORP values in the upper bedrock (ARAMW-7), whereas the DO increases to near 1 mg/L in overburden wells, including ARGWC-22. Being proximal to the stream boundary, the overburden wells tend to be oxic as noted in the January 2023 sampling event (Table 1).

The following provides the rationale for the two possible mechanisms for the occurrence of cobalt above GWPS at ARAMW-7.



- 1. Mechanism for cobalt potentially sourced from CCR pore water Between AP-2 DAS (as represented by pore water data from ARK-STN-TW22) and ARAMW-7, total iron decreases significantly (from an average of 36.3 mg/L to an average of 4.6 mg/L) but manganese concentrations are stable (remaining between an average of 12.4 mg/L at ARK-STN-TW22 to an average of 12.6 mg/L at ARAMW-7). There is also a decrease in pH between ARK-STN-TW22 and ARAMW-7 (average of 6.4 s.u. in ARK-STN-TW22 to an average of 5.7 s.u. in ARAMW-7). Despite the potential formation of iron oxyhydroxides from the precipitation of iron in the CCR pore water, the decrease in pH may be preventing the sorption of cobalt onto the iron oxyhydroxides resulting in cobalt exceeding the GWPS. Although ARK-STN-TW22 cobalt concentrations (average of 0.032 mg/L) indicate that AP-2 DAS pore water likely contributes some cobalt, it is approximately half the concentration seen in ARAMW-7 (average of 0.057 mg/L). Precipitation of the iron in AP-2 DAS pore water would be expected to sorb some or all of the cobalt contributed by CCR pore water, but iron precipitation has the additional effect of reducing the pH and thus limiting cobalt sorption.
- 2. **Mechanism for cobalt sourced from naturally occurring solids in the Aquifer** Between AP-2 DAS and ARAMW-7, iron contributed by CCR pore water would be expected to precipitate along the flow path (34.3 mg/L in ARK-STN-TW22 versus approximately 4 mg/L in ARAMW-7) potentially lowering the pH of groundwater and mobilizing cobalt sorbed to naturally occurring aquifer solids, resulting in the mobilization of cobalt and an exceedance of the GWPS.

It is likely that both mechanisms are contributing to the presence of cobalt in groundwater above the GWPS in ARAMW-7.

Treatability testing conducted by TSI (Appendix C) and indicates that cobalt can be treated through pH adjustment with sodium bicarbonate and buffered iron reagent addition (CERES MTS 73MF3) forming the basis for in situ attenuation of these elements in groundwater.

4.4.2 LITHIUM

Groundwater and aquifer solid data from AP-2 DAS suggest two potential sources for lithium in downgradient well ARAMW-7 at AP-2 DAS: (1) a source of lithium from CCR pore water; and (2) release of lithium from naturally occurring aquifer materials. The CCR (Boron, Sulfate, and TDS) signature noted in ARAWM-7 groundwater and at its paired shallow well, ARGWC-22, would tend to suggest that CCR pore water could be a contributor of lithium at this location. However, some lithium in ARAMW-7 can also be explained by release of naturally occurring lithium from cation exchange sites in aquifer materials, possibly as a result of displacement by cations in solution.

Lithium attenuation is generally controlled by cation exchange and sorption to iron, aluminum, and manganese oxides. Typically, lithium would be expected to be a conservative ion moving with groundwater, but lithium sorbs well to certain clay minerals. For some well pairs which appear to be hydraulically connected based on groundwater elevation and geochemical signature, lithium concentrations differ between overburden and bedrock wells. This indicates that lithium attenuation at AP-2 DAS is occurring at some locations, but the attenuation potential across the site is variable, likely based on the presence of clay minerals with higher CEC.



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The following provides the rationale for the two possible mechanisms for the occurrence of a lithium SSL at ARAMW-7.

- Mechanism for lithium potentially sourced from CCR pore water The lithium concentration of AP-2 DAS pore water in ARK-STN-TW22 is 0.138 to 0.247 mg/L, which is higher than groundwater concentrations downgradient of AP-2 DAS, including ARAMW-7, which exhibits an SSL for lithium. The highest concentration of sulfate in groundwater corresponds with the highest lithium concentration at ARAMW-7, indicating the potential influence of CCR pore water on downgradient groundwater geochemistry at the site. Additionally, the geochemical signatures as shown on Piper and Stiff diagrams (Figures 5 and 6) indicate similarities between CCR pore water and groundwater at ARAMW-7. Sorption and cation exchange are the dominant mechanisms controlling lithium mobilization and it in turn is influenced by availability of sorption and exchange sites in aquifer solids. The high TDS associated with CCR pore water will limit availability of exchange sites due to competition from other multi-valent cations in solution, resulting in lithium mobilization.
- Mechanism for lithium sourced from naturally occurring solids in the aquifer Lithium is present in upgradient monitoring wells at concentrations near the method detection limit and in most wells across the site. Groundwater in the upgradient bedrock monitoring well ARGWA-19 contains lithium concentrations as high as 0.0053 mg/L. Similar levels are found in ARAMW-8 and ARAMW-9 (0.0065 and 0.0063 mg/L, respectively) indicating a natural background of lithium below the GWPS. Additionally, lithium is detected throughout most groundwater monitoring well locations at AP-2 DAS, including the upgradient bedrock. Sorption and cation exchange are the dominant mechanisms controlling lithium mobilization and it in turn is influenced by availability of sorption and exchange sites in aquifer solids. The high TDS associated with CCR pore water will limit availability of exchange sites due to competition from other multi-valent cations in solution, resulting in lithium mobilization.

It is likely that both processes are contributing to the presence of the lithium SSL in groundwater in ARAMW-7. Continued monitoring of lithium may allow further evaluation of the contribution of each source to the groundwater.

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Redox Classification of Groundwater Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

Sample ID	Date	Dissolved Oxygen	Nitrate as Nirogen	Dissolved Manganese	Dissolved Iron	Sulfate	Iron/Sulfide	Redox Classification	Redox Process
				(mg/L)			Mass Ratio		
ARAMW-1	8/8/2023	0.06	0.007	0.144	0.167	223	3	Mixed(anoxic)	Fe(III)-SO ₄
ARAMW-2	8/8/2023	0.13	0.007	1.08	7.2	243	144	Anoxic	Fe(III)
ARAMW-7	8/8/2023	0.16	0.007	14.9	4.46	1060	89	Anoxic	Fe(III)
ARAMW-8	8/9/2023	1.65	0.007	0.277	0.511	114	10	Mixed (Oxic-Anoxic)	O ₂ -Fe(III)
ARAMW-9	8/8/2023	0.17	0.007	0.172	0.58	477	12	Anoxic	Fe(III)
ARGWA-19	8/8/2023	3.17	1.86	0.001	0.033	8.34		Oxic	O_2
ARGWA-20	8/10/2023	5.46	0.759	0.00319	0.051	18.5		Oxic	O_2
ARGWC-21	8/9/2023	0.19	0.007	0.351	0.808	214	16	Anoxic	Fe(III)
ARGWC-22	8/8/2023	0.20	0.007	13.1	3.67	719	73	Anoxic	Fe(III)
ARGWC-23	8/8/2023	0.13	1.33	0.273	0.033	69.8		Mixed (Anoxic)	NO ₃ -Mn(IV)
TW-22	8/10/2023	3.08	0.0715	10.6	16.6	1040	332	Mixed (Oxic-Anoxic)	O ₂ -Fe(III)

	Criteria fo	or inferring pro	ocess from v	vater-quality	y data		
≥0.5	_	<0.05	<0.1	_		Oxic	O_2
<0.5	<0.5	<0.05	<0.1	_		Suboxic	Suboxic
<0.5	≥0.5	< 0.05	<0.1	_		Anoxic	NO ₃
<0.5	<0.5	≥0.05	<0.1	_		Anoxic	Mn(IV)
<0.5	<0.5	_	≥0.1	≥0.5	no data	Anoxic	Fe(III)/SO ₄
<0.5	<0.5	_	≥0.1	≥0.5	>10	Anoxic	Fe(III)
<0.5	<0.5		≥0.1	≥0.5	≥0.3, ≤10	Mixed(anoxic)	Fe(III)-SO ₄
<0.5	<0.5		≥0.1	≥0.5	<0.3	Anoxic	SO ₄
<0.5	<0.5		≥0.1	<0.5		Anoxic	CH₄gen

- 1. Table was modified from McMahon and Chapelle, 2008.
- 2. Redox process: O2, oxygen reduction; NO3, nitrate reduction; Mn(IV), manganese reduction; Fe(III), iron reduction; SO4, sulfate reduction; CH4gen, methanogenesis.

mg/L	milligram per
_	criteria do not apply because the species concentration is not affected by the redox process
≤	less than or equal to
≥	greater than or equal to
<	less than
>	greater than

2023 GROUNDWATER MINERAL CALCULATED SATURATION INDICES

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

Location	Date	Classification	pН	pe	Alabandite	Co(OH) ₂	CoS	Fe(OH) ₃	Hausmannite	Rhodochrosite	Pyrite	Pyrolusite	Siderite	O2(g)	CO ₂ (g)
ARAMW-7	1/31/2023	Downgradient	5.54	2.96	-39.24	-7.41	-35.06	-3.88	-22.44	-2.23	-54.39	-17.71	-3.35	-51.14	-0.78
ARGWC-22	1/31/2023	Downgradient	5.61	4.24	-50.1	-8.90	-47.61	-2.67	-19.02	-2.08	-74.01	-14.74	-3.57	-45.60	-0.40
ARAMW-20	2/1/2023	Upgradient	5.70	5.60	-63.83	-9.31	-60.83	-1.31	-18.35	-2.81	-97.19	-12.64	-3.67	-40.07	-1.06
ARAMW-19	1/31/2023	Upgradient	5.86	5.30	-63.34	-8.97	-60.35	-2.50	-17.91	-2.82	-97.98	-12.59	-4.90	-40.21	-0.47
ARGWC-21	1/31/2023	Downgradient	6.04	4.06	-52.68	-8.34	-50.30	-1.85	-16.25	-1.83	-79.62	-13.39	-3.48	-44.17	-1.36
ARAMW-2	1/31/2023	Downgradient	6.18	4.01	-53.42	-7.44	-50.44	-1.09	-15.19	-1.67	-80.83	-12.93	-2.95	-43.85	-0.96
ARAMW-1	1/31/2023	Downgradient	6.36	2.93	-46.27	-7.92	-44.11	-2.53	-16.08	-1.50	-69.48	-14.46	-3.63	-47.63	-1.08
ARAMW-8	1/31/2023	Downgradient	6.44	4.32	-58.4	-6.84	-55.26	-0.39	-12.74	-1.46	-90.37	-11.37	-3.04	-41.67	-1.07
ARGWC-23	1/31/2023	Downgradient	6.46	4.94	-64.07	-7.42	-61.21	-0.94	-12.43	-1.79	-101.00	-10.43	-4.25	-39.16	-1.46
ARAMW-9	2/1/2023	Downgradient	7.95	1.45	-47.53	-7.35	-44.84	0.83	-8.684	-0.63	-73.33	-11.95	-1.94	-47.66	-2.99

- 1. Values listed are logarithms and are unitless.
- 2. pe is the negative of the logarithm of the aqueous activity of an electron. pe = Eh/59.2 for Eh in millivolts; Eh = ORP + 200 for ORP in millivolts.
- 3. The SI for $CO_2(q)$ and $O_2(q)$ is equal to the calculated partial pressure of each gas.
- 4. Alabandite is MnS; Co(OH)₂ is cobalt(II) hydroxide; CoS is Cobalt Sulfide; Fe(OH)₃ is Ferrihydrite; Hausmannite is Mn₂, Rhodochrosite is MnC₂; Pyrite is FeS; Pyrolusite is MnO₂; Siderite is FeCO₃; O₂(g) is oxygen gas; CO₂(g) is carbon dioxide gas.
- 5. thermo.tdat and thermo.com.V8.R6+.tdat databases were used to calculate SI in Geochemist Workbench ® (Bethke, 2022).

GROUNDWATER MONITORING WELL DETAILS AND SAMPLE COLLECTION DEPTHS

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

Well/Boring ID	Sample Collection Date	Sample Collection Depth (ft bgs)	Top of Casing Elevation (feet NAVD88) ⁽¹⁾⁽²⁾	Ground Surface Elevation (feet NAVD88) ⁽¹⁾⁽²⁾	Top of Screen Elevation (feet NAVD88) ⁽¹⁾⁽²⁾	Bottom of Screen Elevation (feet NAVD88) ⁽¹⁾⁽²⁾	Top of Screen Depth (feet bgs) ⁽³⁾	Bottom of Screen Depth (feet bgs) ⁽³⁾
			Detection	Monitoring Wells				
ARGWA-19			343.30	339.86	300.18	290.18	39.68	49.68
ARGWA-20			331.28	327.73	303.18	293.18	24.55	34.55
SB-1 ⁽⁴⁾	8/31/2021	24.6-34.6						
ARGWC-21			309.15	305.97	291.7	281.7	14.27	24.27
SB-3 ⁽⁴⁾	8/31/2021	15-25						
SB-11-25-30 ⁽⁷⁾	7/28/2023	25-30						
ARGWC-22			309.95	307.01	292.01	282.01	15	25
SB-4 ⁽⁴⁾	8/31/2021	12-22						
SB-10-20-25 ⁽⁷⁾	7/27/2023	20-25						
SB-10-25-30 ⁽⁷⁾	7/27/2023	25-30						
ARGWC-23			307.70	304.29	289.29	279.29	15	25
SB-5 ⁽⁴⁾	8/31/2021	15-25						
SB-12-20-25 ⁽⁷⁾	7/27/2023	20-25						
SB-12-25-30 ⁽⁷⁾	7/27/2023	25-30						
			Assessmer	t Monitoring Wells	•	•	•	
ARAMW-1			308.51	305.07	271.07	261.07	34	44
SB-11-30-35 ⁽⁷⁾	7/28/2023	30-35						
SB-11-35-40 ⁽⁷⁾	7/28/2023	35-40						
ARAMW-2			308.27	305.12	293.12	283.12	12	22
ARAMW-7			309.81	307.13	269.43	259.43	37.7	47.7
ARAMW-7-38-48 ⁽⁵⁾	2/13/2023	38-48						
SB-10-30-35 ⁽⁷⁾	7/27/2023	30-35						
SB-10-35-40 ⁽⁷⁾	7/27/2023	35-40						
ARAMW-9-41-41.3 ⁽⁶⁾	10/18/2022	41.0-41.3						
ARAMW-8			307.36	304.53	267.83	257.83	36.7	46.7
ARAMW-8-37-47 ⁽⁵⁾	2/13/2023	37-47						
ARAMW-9			309.28	306.31	213.91	203.91	92.4	102.4
ARAMW-9-95-100.7 ⁽⁶⁾	10/18/2022	95.0-100.7						

- 1. Horizontal locations referenced to Georgia State Plane West, North American Datum (NAD) of 1983 surveyed in June 26, 2020.
- 2. Vertical elevations are feet referenced to North American Vertical Datum of 1988 (NAVD88).
- 3. ft bgs = feet below ground surface
- 4. Soil sample collected in August 2021
- 5. Rock sample collected from archived core at Logan Martin Dam AL
- 6. Rock sample collected during monitoring well installation
- 7. Soil sample collected in July 2023

2022 AQUIFER SOLIDS (BEDROCK) MINERALOGY RESULTS

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

Sample ID	ARAMW-9-41.0/41.3-20221018	ARAMW-9-95/96.6-100.7/1002.0-20221018
Date	10/18/2022	10/18/2022
Associated Well Screen Depth	ARAMW-7	ARAMW-9
Depth (ft-bgs)	41.0-41.3	95.0-100.7
	X-Ray Diffraction, Rietveld Quantitative And	alysis (wt%)
Quartz	33.1	31.2
Microcline	13.8	13.6
Kaolinite	0.5	0.5
Muscovite	2.8	2.1
Biotite	4.0	7.2
Albite	45.8	45.3
	X-Ray Fluorescence (wt%)	
Silica as SiO2	69.3	67.5
Aluminum as Al2O3	14.8	15.5
Iron as Fe2O3	3.35	4.15
Magnesium as MgO	1.23	1.53
Calcium as CaO	2.86	2.64
Sodium as Na2O	4.04	3.99
Potassium as K2O	2.43	2.94
Titanium as TiO2	0.39	0.56
Phosphorous as P2O5	0.11	0.09
Manganese as MnO	0.05	0.10
Chromium as Cr2O3	0.03	0.04
Vanadium as V2O5	0.01	0.01
Loss On Ignition	0.96	1.14
	Total Metals (μg/g)	
Mercury	< 0.05	< 0.05
Arsenic	0.6	0.8
Aluminum	11000	16000
Boron	< 1	< 1
Barium	110	130
Beryllium	0.25	0.34
Cadmium	< 0.02	0.08
Cobalt	7	7
Chromium	220	200
Iron	22000	29000
Lithium	17	22
Manganese	360	720
Molybdenum	0.4	2.3
Lead	3.8	4.2
Antimony	< 6	< 6
Selenium	< 0.7	< 0.7
Thallium	0.23	0.40

- 1. Results are presented in feet below ground surface (ft-bgs); weight percent (wt%); micrograms per gram ($\mu g/g$).
- $2. \ Loss\ On\ Ignition\ refers\ to\ mineral\ water,\ carbonates,\ and\ hydroxides.$
- 3. < indicates the constituent was not detected above the analytical method detection limit

2022 AQUIFER SOLIDS (BEDROCK) SEQUENTIAL EXTRACTION PROCEDURE (SEP) ANALYTICAL DATA SUMMARY

Georgia Power Company - Plant Arkwright
Ash Pond 2 Dry Ash Stockpile
Macon, Georgia

						Alumin	um								
Sample Name	Associated Well Location		Step 1 uble Phase		Step 2 able Phase	SEP S Carbo	Step 3	SEP S Iron and M Oxid	langanese		Step 5 c Phase	SEP S Residua	Step 6 al Phase	Sum SEP Steps 1-6	Total Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	
ARAMW-9-41.0/41.3-20221018	ARAMW-7	63	0.1	50	0.1	580	0.9	1700	2.7	730	1.2	59000	95.0	62123	11000
ARAMW-9-9.5/96.6-100.7/1002.0-20221018	ARAMW-9	89	0.1	81	0.1	570	0.9	1800	2.8	940	1.5	61000	94.6	64480	16000
		Τ		I		Arsen	IC	OED 6		I					
Sample Name	Associated Well Location		Step 1 uble Phase		Step 2 able Phase	SEP S Carbo		SEP S Iron and M Oxid	anganese		Step 5 c Phase	SEP S Residua	Step 6 al Phase	SEP Steps 1-6	Total Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
ARAMW-9-41.0/41.3-20221018	ARAMW-7	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 3	0.6
ARAMW-9-9.5/96.6-100.7/1002.0-20221018	ARAMW-9	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 3	0.8
	_	T				Coba	lt	T		•		1			
Sample Name	Associated Well Location		Step 1 uble Phase		Step 2 able Phase	SEP S Carbo	Step 3 nates	SEP S Iron and M Oxid	anganese		Step <u>5</u> c Phase	SEP S Residua	Step 6 al Phase	Sum SEP Steps 1-6	Total Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
ARAMW-9-41.0/41.3-20221018	ARAMW-7	< 0.01		0.01	0.2	0.28	4.5	0.6	9.5	1.5	23.8	3.9	62.0	6.3	6.5
ARAMW-9-9.5/96.6-100.7/1002.0-20221018	ARAMW-9	0.02	0.3	0.04	0.5	0.46	6.1	0.6	8.0	2.8	37.2	3.6	47.9	7.5	7.1
						Iron									
Sample Name	Associated Well Location		Step 1 uble Phase		Step 2 able Phase	SEP S Carbo	Step 3 nates	SEP S Iron and M Oxid	anganese		Step 5 c Phase	SEP S Residua	Step 6 al Phase	Sum SEP Steps 1-6	Total Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
ARAMW-9-41.0/41.3-20221018	ARAMW-7	25	0.1	30	0.1	1200	5.4	3500	15.9	280	1.3	17000	77.1	22035	22000
ARAMW-9-9.5/96.6-100.7/1002.0-20221018	ARAMW-9	59	0.2	72	0.2	1100	3.7	4200	14.1	310	1.0	24000	80.7	29741	29000
						Lithiu	m								
Sample Name	Associated Well Location		Step 1 uble Phase		Step 2 able Phase	SEP S Carbo		SEP S Iron and M Oxid	anganese		Step 5 c Phase		Step 6 al Phase	Sum SEP Steps 1-6	Total Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
ARAMW-9-41.0/41.3-20221018	ARAMW-7	< 2		< 2		2	15.4	2	15.4	2	15.4	7	53.8	13	17
ARAMW-9-9.5/96.6-100.7/1002.0-20221018	ARAMW-9	< 2		< 2		< 2		3	17.6	3	17.6	11	64.7	17	22
						Mangar	ese								
Sample Name	Associated Well Location	Water Sol	Step 1 uble Phase	Exchange	Step 2 able Phase	SEP S Carbo	nates	SEP S Iron and M Oxi	langanese des		Step 5 c Phase	Residua	_	Sum SEP Steps 1-6	Total Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
ARAMW-9-41.0/41.3-20221018	ARAMW-7	0.6	0.2	6	1.6	32	8.7	56	15.2	23	6.3	250	68.0	368	360
ARAMW-9-9.5/96.6-100.7/1002.0-20221018	ARAMW-9	1.6	0.2	9.5	1.3	45	6.1	75	10.2	47	6.4	560	75.9	738	720
Sample Name	Associated Well Location		Step 1 uble Phase		Step 2 able Phase	Molybde SEP S Carbo	Step 3	SEP S Iron and M Oxid	anganese		Step 5 c Phase	SEP S Residua	Step 6 al Phase	Sum SEP Steps 1-6	Total Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
ARAMW-9-41.0/41.3-20221018	ARAMW-7	< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		0.3	100.0	0.3	0.4
ARAMW-9-9.5/96.6-100.7/1002.0-20221018	ARAMW-9	< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		2.1	100.0	2.1	2.3

- 1. Discrepancies between the sum of SEP results and the Total Metal commonly occur, in particular due to the small subsample sizes used for analysis and varying detection limits.
- 2. SEP extractions performed as described in: Tessier A., P.G.C. Campbell, and M. Bisson (1979). Sequential Extraction Procedures for the Speciation of Particulate Trace Metals. Anal. Chem. 51(7): 844-851.
- 3. Total concentrations determined by acid digestion (EPA Method 200.7)

TABLE 6A 2021 AQUIFER SOLIDS (OVERBURDEN) MINERALOGY RESULTS

Georgia Power Company - Plant Arkwright
Ash Pond 2 Dry Ash Stockpile
Macon, Georgia

Sample ID	SB-1-24.6-34.6	SB-3-15-25	SB-4-12-22	SB-5-15-25
Date	8/31/2021	8/31/2021	8/31/2021	8/31/2021
Location	SB-1	SB-3	SB-4	SB-5
Depth (ft-bgs)	24.6-34.6	15-25	12-22	15-25
Cation Exchange Capacity	54	Capacity (USEPA Method 90	9 (meq/100 gm)	5
Cation Exchange Capacity		nic Carbon (Lloyd Kahn Meth		3
Total Organic Carbon	<1200	6800	<890	<800
Total Organio Galizon		tion, Rietveld Quantitative A		
Smectite	3.3			
Kaolinite	66.3			
Illite/Mica	1.5	3.7	6.3	11.1
Mx IS clays	10.3	1.9	2.6	1.8
Quartz		46.4	52.3	39.2
K-Feldspar		7.3	1.7	
Plagioclase	7.0	35.5	31.2	47.9
Pyroxene	1.2	-		
Maghemite	6.4			
Pyrite			0.6	
Goethite	3.4			
Sepiolite				
Amphibole	0.6	5.2	5.3	
Aluminum	98,000	X-Ray Fluorescence (ppm) 75,500	73,200	96,300
Silica	146,000	75,500 294,100	307,300	287,300
Titanium	8,700	294, 100 		4,500
Iron	241,200	53,700	58,700	71,600
Manganese	3,124	1,104	929	1,150
Magnesium	41,900	60,300	66,400	66,800
Calcium	5,661	22,218	27,371	28,758
Phosphorous	661		-	
Barium	852	590	381	405
Chromium	727	574		853
Molybdenum		12	7	9
Niobium 		10	4	12
Lead				24
Strontium Tantalum	81	244	229	324
Thalium			 	99 18
Yttrium	35	29	16	24
Zinc	204	71	64	85
Zircon	77	155	95	196
		ain Size (Sieve and Hydrome		
Gravel (% Sample)	0.0	11.2	15.2	4.0
Total Sand (% Sample)	53.3	67.6	77.4	78.7
Coarse Sand	0.0	8.1	15.2	6.1
Medium Sand	20.4	29.0	35.9	29.4
Fine Sand	32.9	30.5	26.3	43.2
Silt	31.7	12.0	4.5	13.8
Clay	15.0	9.2	2.9	3.5
Morouny	<0.004	Total Metals (ppm)	~0.00 <i>4</i>	z0.004
Mercury Arsenic	<0.004 1.0	0.004 0.2	<0.004 0.5	<0.004 0.1
Aluminum	39,800	11,200	14,700	16,400
Boron	<10	<10	<10	<10
Barium	1,495	181	172	280
Beryllium	1.9	0.4	0.2	0.1
Cadmium	0.344	0.027	0.004	0.006
Cobalt	114	8	15	17
Chromium	126	194	223	236
Iron	162,000	21,700	23,500	36,300
Lithium	14	8	12	13
Manganese	2,530	359	264	397
Molybdenum	0.6	6.1	4.9	6.0
Lead	3.9	3.7 0.041	4.3	2.1
Antimony Selenium	0.059 0.093	0.041 0.063	0.036 0.031	0.024 0.007
Thallium	0.093	1.6	1.5	3.8
Notes:				

^{1.} Results are presented in feet below ground surface (ft-bgs); weight percent (wt%); parts per million (ppm);

^{2. --} is not detected; < indicates the constituent was not detected above the analytical method detection limit

^{3.} Particle size by USDA.

TABLE 6B 2023 AQUIFER SOLIDS (SAPROLITE) MINERALOGY RESULTS Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

Sample ID	SB-10-20-25	SB-10-25-30	SB-10-30-35	SB-10-35-40	SB-11-25-30	SB-11-30-35	SB-11-35-40	SB-12-20-25	SB-12-25-30
Date	7/27/2023	7/27/2023	7/27/2023	7/27/2023	7/28/2023	7/28/2023	7/28/2023	7/27/2023	7/27/2023
Location	SB-10	SB-10	SB-10	SB-10	SB-11	SB-11	SB-11	SB-12	SB-12
Depth (ft-bgs)	20-25	25-30	30-35	35-40	25-30	30-35	35-40	20-25	25-30
			inge Capacity (1	
Cation Exchange Capacity (CEC)	5.12	4.54	7.62	5.78	12.47	14.06	13.02	7.32	9.18
			nge Capacity (
Anion Exchange Capacity (AEC)	5.3	4.4	5.5 Organic Carbon	4.1	5.7	5.3	5.8	6.1	6.3
Total Organia Carban	300	200	0	0	0 (mg/kg)	100	0		
Total Organic Carbon	300		ffraction, Rietv		-		U		
Quartz	49.9	44.8	26.4	39.7	25.3	36.4	25.8	32.8	31.6
Albite	34.8	40.9	57.8	44.4	41.3	36.1	42.9	40.1	38.8
Chlorite	1.0	0.7	1.4	0.7	0.2	0.3	0.1	1.2	1.8
Diopside	0.8	0.6	0.8	1.0	2.1	1.5	0.9		
Biotite	2.3	1.8	2.9	3.2	4.6	4.6	7.0	12.3	7.7
Magnetite	0.8	1.1	0.7	1.1	0.2	0.2	0.3	0.8	2.1
Hematite	1.0	0.8	0.5	0.6	0.6	0.3	0.2	1.5	2.0
Pyrite	0.0	0.0	_	-	0.0	0.0	0.0	0.0	0.0
Actinolite	2.1	1.8	1.3	2.1	10.6	3.0	0.8		
Microcline	2.8	2.9	3.5	3.9	4.0	9.4	12.3	5.8	5.7
Illite	4.4	4.7	4.2	3.1	5.6	3.0	6.3	4.0	4.1
Montmorillonite		-	0.5	0.2	0.2	0.3	1.1		2.2
Epidote					2.4	0.7	1.9		
Laumontite		_	_		3.0	3.4	-		
Rutile		-				0.7	0.3		
Illite-Montmorillonite		-			-	-	-	1.6	4.0
			X-Ray Flu	orescence (pp	m)			•	
Aluminum as Al ₂ O ₃	98,600	109,900	147,300	114,000	146,700	133,700	154,300	156,200	162,400
Silica as SiO ₂	781,000	776,600	712,100	759,500	619,300	680,700	628,200	628,400	626,600
Titanium as TiO ₂	3,100	2,100	2,300	2,600	8,400	6,900	10,300	9,300	10,300
Iron as Fe ₂ O ₃	46,100	37,300	35,100	39,100	67,800	50,300	56,400	70,100	77,200
Manganese as MnO	500	400	800	900	1,700	900	900	1,300	1,100
Magnesium as MgO	5,000	4,000	6,800	6,700	29,500	18,800	16,100	26,400	20,800
Calcium as CaO	11,200	11,000	12,700	10,500	47,700	28,000	37,400	36,300	31,500
Phosphorous as P ₂ O ₅	500	500	600	400	1,600	1,100	4,200	2,900	1,600
Potassium as K₂O	7,200	7,700	9,600	10,000	13,600	17,800	22,400	18,600	16,300
Chromium as Cr ₂ O ₃	200	100	100	100	100	100	100	200	100
Sodium as Na ₂ O	36,000	44,300	60,400	46,800	32,400	29,600	37,500	27,800	27,100
Vanadium as V₂O₅	100	100	100	100	300	200	200	200	200
Loss on Ignition (%)	1.5	1.1	1.7	1.1	3.1	3.3	3.4	2.4	2.9
				ieve and Hydro				1	
Gravel (% Sample)	4.3	9.9	1.9	4.3	1.9	13.4	2.4	2.3	0.0
Total Sand (% Sample)	61.0	61.2	63.1	54.7	54.3	51.1	33.9	67.4	61.6
Coarse Sand	7.7	9.9	6.3	6.2	2.3	7.4	0.5	3.1	1.0
Medium Sand	24.9	25.3	24.1	18.9	17.1	16.1	3.2	21.5	17.1
Fine Sand	28.4	26.0	32.7	29.6	34.9	27.6	30.2	42.8	43.5
Silt	21.3	17.1	23.0 12.0	25.7 15.3	26.9	19.9	39.1	20.7	25.0
Clay	13.4	11.8		Metals (ppm)	16.9	15.6	24.6	9.6	13.4
Mercury	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Arsenic	0.6	0.8	0.9	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aluminum	3,000	4,100	6,000	4,900	13,000	12,000	14,000	23,000	17,000
Boron	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	30	44	68	67	110	96	82	550	280
Beryllium	0.2	0.3	0.4	0.2	0.2	0.2	0.4	0.2	0.2
Cadmium	< 0.02	< 0.02	< 0.02	< 0.02	0.040	0.040	0.030	0.020	0.020
Cobalt	2	3	4	4	10	10	12	19	17
Chromium	23	42	22	19	25	37	19	77	49
Iron	19,000	23,000	20,000	21,000	25,000	25,000	32,000	34,000	31,000
Lithium	3	4	7	6	9	9	9	17	13
Manganese	140	180	550	510	510	420	560	510	360
Molybdenum	1.2	3.4	1.2	1.6	0.4	1.6	0.5	2.1	1.2
Lead	0.6	1.1	0.9	0.4	1.6	2.0	2.7	1.7	2.0
Antimony	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Selenium	0.300	0.300	0.500	0.300	0.500	0.500	0.200	0.100	< 0.1
Thallium	< 0.02	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.3

Notes:

1. Results are presented in feet below ground surface (ft-bgs); weight percent (wt%); parts per million (ppm);

2." --" indicates the constituent was not detected; "<" indicates the constituent was not detected above the analytical method detection limit

TABLE 7A

2021 AQUIFER SOLIDS (OVERBURDEN) SEQUENTIAL EXTRACTION PROCEDURE (SEP) ANALYTICAL DATA SUMMARY Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Macon, Georgia

								Ars	senic								
Sample ID	Sample Collection Date		Step 1 able Phase	SEP S Carbona	Step 2 te Phase	SEP S Non-Cry Mineral			Step 4		Step 5 c Phase		Step 6 de Fraction		Step 7 I Fraction	Sum SEP Steps 1-7	Total Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
SB-1-24.6-34.6	8/31/2021	<0.86		< 0.64		<0.21		1.5	23	<3.1		2.6	39	2.5	38	6.6	14
SB-4-12-22	8/31/2021	< 0.62		< 0.47		<0.16		0.96	33	<2.3		1	35	0.93	32	2.9	3.5
SB-5-15-25	8/31/2021	< 0.56		< 0.42		<0.14		0.66	23	<2		1.1	38	1.1	38	2.9	3.7
								Co	balt								
Sample ID	Sample	SEP S	Step 1	SEP S	Step 2	SEP S	Step 3	SEP S	Step 4	SEP S	Step 5	SEP S	Step 6	SEP	Step 7	Sum	Total
	Collection Date	Exchange	able Phase	Carbona	te Phase		/stalline	Metal Hydro	oxide Phase	Organi	c Phase	Acid/Sulfid	de Fraction	Residua	I Fraction	SEP Steps 1-7	Concentration
		ma/ka	%	ma/ka	%	Mineral mg/kg	s Phase	ma/ka	%	ma/ka	%	ma/ka	%	ma/ka	%	ma/ka	ma/ka
SB-1-24.6-34.6	8/31/2021	<0.3		<0.31		27	42	17	27	<0.99		12	19	8	13	64	93
SB-4-12-22	8/31/2021	0.62	3.7	<0.23		1.8	11	1.4	8	<0.72		9.8	59	3.1	19	17	18
SB-5-15-25	8/31/2021	<0.19		<0.2		1.5	8.8	0.75	4	<0.64		13	77	1.7	10	17	18
								Lit	hium					•			
Sample ID	Sample	SEP S	Step 1	SEP S	Step 2	SEP S	Step 3	SEP S	Step 4	SEP S	Step 5	SEP S	Step 6	SEP :	Step 7	Sum	Total
	Collection Date	Exchange	able Phase	Carbona	te Phase	Non-Cr	/stalline	Metal Hydro	oxide Phase	Organi	c Phase	Acid/Sulfid	de Fraction	Residua	l Fraction	SEP Steps 1-7	Concentration
						Mineral	s Phase			_						-	
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
SB-1-24.6-34.6	8/31/2021	< 0.99		1.2	2.7	<0.25		2.1	4.6	8.6	19	7.3	16	26	58	45	32
SB-4-12-22	8/31/2021	<0.72		0.75	3.3	<0.18		1.7	7.4	6.5	28	10	44	3.9	17	23	11
SB-5-15-25	8/31/2021	< 0.64		<0.48		<0.16		0.84	3.9	5.3	24	12	55	3.6	17	22	15
								Molyk	denum								
Sample ID	Sample	SEP S	Step 1	SEP S	Step 2	SEP S	Step 3	SEP S	Step 4	SEP S	Step 5	SEP S	Step 6	SEP :	Step 7	Sum	Total
	Collection Date	Exchange	able Phase	Carbona	te Phase	Non-Cry	/stalline	Metal Hydro	oxide Phase	Organi	c Phase	Acid/Sulfid	de Fraction	Residua	I Fraction	SEP Steps 1-7	Concentration
		_				Mineral	s Phase	_	_				_			-	
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
SB-1-24.6-34.6	8/31/2021	<0.54		<0.41		<0.14		<0.14		<2.1		<0.16		<0.14			<0.14
SB-4-12-22	8/31/2021	< 0.39		<0.29		0.59	63	0.34	37	<1.5		<0.12		<0.098		0.93	0.8
SB-5-15-25	8/31/2021	< 0.35		< 0.26		0.34	67	0.17	33	<1.3		<0.11		<0.088		0.51	0.57

- 1. Discrepancies between the sum of SEP results and the Total Metal commonly occur, in particular due to the small subsample sizes used for analysis and varying detection limits.
- 2. SEP extractions performed as described in: Eurofins Test America Standard Operating Procedure (SOP)
- 3. Total concentrations determined by acid digestion (EPA Method 200.7)

TABLE 7B

2023 AQUIFER SOLIDS (SAPROLITE) SEQUENTIAL EXTRACTION PROCEDURE (SEP) ANALYTICAL DATA SUMMARY

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile

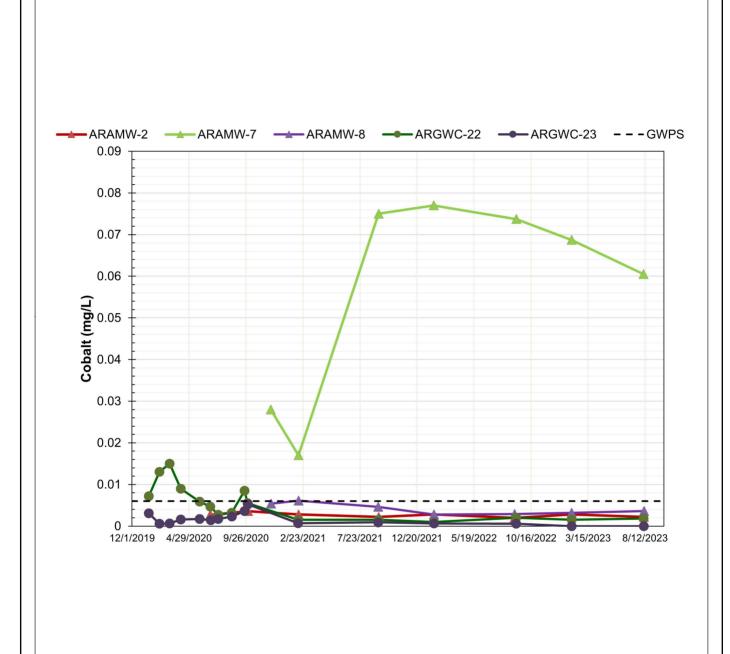
Macon, Georgia

-															
Sample ID	Sample Collection Date		Step 1 uble Phase		Step 2 able Phase		Aluminu Step 3 Ite Phase	SEP S Iron and N	Step 4 langanese des	SEP S Organic		SEP S Residual		Sum SEP Steps 1-6	Total Metals Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	
SB-10-20-25	7/27/2023	120	0.9	26	0.2	76	0.5	290	2.1	420	3.0	13000	93.3	13932	3000
SB-10-25-30	7/27/2023	120	0.9	40	0.3	61	0.5	290	2.3	360	2.8	12000	93.2	12871	4100
SB-10-30-35	7/27/2023	130	0.8	13	0.1	66	0.4	270	1.6	530	3.1	16000	94.1	17009	6000
SB-10-35-40	7/27/2023	150	0.9	20	0.1	79	0.5	520	3.2	440	2.7	15000	92.5	16209	4900
SB-11-25-30	7/28/2023	190	0.7	9	0.0	67	0.3	450	1.8	980	3.8	24000	93.4	25696	13000
SB-11-30-35	7/28/2023	190	0.7	32	0.1	110	0.4	490	1.9	1200	4.6	24000	92.2	26022	12000
SB-11-35-40	7/28/2023	240	0.9	11	0.0	110	0.4	560	2.1	1100	4.1	25000	92.5	27021	14000
SB-12-20-25 SB-12-25-30	7/27/2023 7/27/2023	120 180	0.3 0.5	32 45	0.1	90 94	0.2	310 400	0.8 1.1	680 880	1.8 2.3	36000 36000	96.7 95.7	37232 37599	23000 17000
SB-12-25-30	1/21/2023	160	0.5	45	0.1	94	Cobalt		1.1	000	2.3	36000	95.7	3/399	17000
Sample ID	Sample Collection Date	Water Soli	Step 1 uble Phase	Exchange	Step 2 able Phase	Carbona	Step 3 ite Phase	SEP S Iron and N Oxi	Step 4 langanese des	SEP S Organic	Phase	SEP S Residua	I Phase	Sum SEP Steps 1-6	Total Metals Concentration
OD 40 00 05	7/07/0000	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
SB-10-20-25 SB-10-25-30	7/27/2023 7/27/2023	0.07 0.07	1.9 2.8	0.5 < 0.1	13.4	0.48 0.39	12.8 15.7	0.58 0.51	15.5 20.5	0.21 0.12	5.6 4.8	1.9 1.4	50.8 56.2	3.7 2.5	2.4 3.1
SB-10-25-30 SB-10-30-35	7/27/2023	0.07				0.39	3.9			0.12			55.9		3.6
SB-10-30-35 SB-10-35-40	7/27/2023	0.08	1.7 1.9	< 0.1 < 0.1		0.14	14.2	1.1 1.4	30.7 33.1	0.28	7.8 3.5	2	47.3	3.6 4.2	3.7
SB-10-35-40 SB-11-25-30	7/28/2023	0.08	1.9	< 0.1		0.6	3.6	1.4	16.5	0.15	7.3	8.2	71.4	4.2 11.5	3.7 10
SB-11-30-35	7/28/2023	0.14	1.1	0.3	2.6	0.59	5.1	1.4	12.0	1.2	10.3	8	68.8	11.6	10
SB-11-35-40	7/28/2023	0.18	1.4	0.1	0.8	0.36	2.8	2.2	17.4	1.7	13.4	8.1	64.1	12.6	12
SB-12-20-25	7/27/2023	0.1	0.5	< 0.1		0.5	2.7	1.4	7.5	0.57	3.1	16	86.2	18.6	19
SB-12-25-30	7/27/2023	0.16	0.8	< 0.1		0.48	2.5	2.3	12.2	0.92	4.9	15	79.5	18.9	17
							Iron								
Sample ID	Sample Collection Date		Step 1 uble Phase		Step 2 able Phase		Step 3 ite Phase	Iron and N	Step 4 langanese des	SEP S Organic		SEP S Residua	Step 6 Il Phase	Sum SEP Steps 1-6	Total Metals Concentration
		mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg
SB-10-20-25	7/27/2023	180	0.8	280	1.3	240	1.1	1200	5.5	87	0.4	20000	91.0	21987	19000
SB-10-25-30	7/27/2023	150	0.9	42	0.2	120	0.7	920	5.3	64	0.4	16000	92.5	17296	23000
SB-10-30-35	7/27/2023	190	1.0	12	0.1	71	0.4	1100	5.7	87	0.4	18000	92.5	19460	20000
SB-10-35-40	7/27/2023	180	0.9	19	0.1	110	0.5	1600	7.6	84	0.4	19000	90.5	20993	21000
SB-11-25-30	7/28/2023	280	1.0	10 39	0.0	48 160	0.2	1200	4.2	160	0.6	27000	94.1 89.8	28698	25000
SB-11-30-35 SB-11-35-40	7/28/2023 7/28/2023	300 430	1.1 1.4	14	0.1 0.0	88	0.6 0.3	1900 1600	7.1 5.1	340 170	1.3 0.5	24000 29000	92.6	26739 31302	25000 32000
SB-12-20-25	7/27/2023	120	0.4	26	0.0	83	0.3	1000	3.3	200	0.7	29000	95.3	30429	34000
SB-12-25-30	7/27/2023	160	0.5	45	0.1	69	0.2	740	2.3	190	0.6	31000	96.3	32204	31000
05 12 20 00	112112020		0.0		0		Lithium		2.0	.00	0.0	0.000	00.0	OZZO.	0.000
Sample ID								1							
Sample ID	Sample Collection Date	Water Soli	Step 1 uble Phase	Exchange	Step 2 able Phase	Carbona	Step 3 ite Phase	SEP S Iron and N Oxi	Step 4 langanese des	SEP S Organic	Phase	SEP S Residua	I Phase	Sum SEP Steps 1-6	Total Metals Concentration
·	Collection Date	Water Solu	uble Phase	Exchange mg/kg	able Phase	Carbona mg/kg	Step 3 ite Phase	SEP S Iron and N Oxi mg/kg	langanese des %	Organic mg/kg	Phase	Residua mg/kg	I Phase	SEP Steps 1-6 mg/kg	Concentration mg/kg
SB-10-20-25	Collection Date	Water Solu mg/kg < 2	uble Phase	mg/kg	able Phase	mg/kg	Step 3 te Phase %	SEP S Iron and N Oxi mg/kg < 2	langanese des %	Organic mg/kg < 2	Phase %	Residua mg/kg 5	% 100.0	SEP Steps 1-6 mg/kg 5	Concentration mg/kg 3
SB-10-20-25 SB-10-25-30	7/27/2023 7/27/2023	Water Solu mg/kg < 2 < 2	wble Phase	mg/kg < 2 < 2	%	mg/kg < 2 < 2	Step 3_ tte Phase	SEP S Iron and M Oxi mg/kg < 2 < 2	langanese des % 	Organic mg/kg < 2 < 2	%	Residua mg/kg 5 4	% 100.0 100.0	SEP Steps 1-6 mg/kg 5	Concentration mg/kg 3 4
SB-10-20-25 SB-10-25-30 SB-10-30-35	7/27/2023 7/27/2023 7/27/2023	water Solu mg/kg < 2 < 2 < 2	%	mg/kg < 2 < 2 < 2	%	mg/kg < 2 < 2 < 2	Step 3 te Phase	SEP S Iron and N Oxi mg/kg < 2 < 2 < 2	langanese des % 	Organio mg/kg < 2 < 2 < 2	%	Residua mg/kg 5 4 9	% 100.0 100.0 100.0	SEP Steps 1-6 mg/kg 5 4 9	Concentration mg/kg 3 4 7
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SB-10-20-25 SB-10-25-30 SB-10-30-35 SB-10-30-35 SB-10-30-35 SB-11-30-35 SB-11-30-35 SB-11-30-35 SB-12-20-25 SB-12-25-30 Sample ID SB-10-20-25 SB-10-20-25 SB-10-30-35 SB-10-30-35 SB-10-30-36 SB-10-30-36 SB-10-30-36 SB-10-30-36	Collection Date 7/27/2023 7/27/2023 7/27/2023 7/27/2023 7/28/2023 7/28/2023 7/28/2023 7/27/2023 7/27/2023 7/27/2023 Sample Collection Date 7/27/2023 7/27/2023 7/27/2023 7/27/2023 7/27/2023 7/27/2023 7/27/2023 7/27/2023	Water Soli mg/kg < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 	% %	Exchange mg/kg < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 <	### Step 2 able Phase %	Carbona mg/kg < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 2 < 2 2 < 2 2 2 2	Step 3 te Phase	SEP Iron and N Oxi mg/kg < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 < 3 	langanese des	Organic mg/kg < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2 < 2	%	Residua mg/kg 5 4 9 8 12 12 12 21 18 SEP S Residua mg/kg 140 120 170 170 480	Name	SEP Steps 1-6 mg/kg 5 4 9 8 12 12 12 12 18 Sum SEP Steps 1-6 mg/kg 206 206 171 539 558 664	Concentration mg/kg 3 4 7 6 9 9 17 13 Total Metals Concentration mg/kg 140 180 550 510

- 1. Discrepancies between the sum of SEP results and the Total Metal commonly occur, in particular due to the small subsample sizes used for analysis and varying detection limits.

 2. SEP extractions performed as described in: Tessier A., P.G.C. Campbell, and M. Bisson (1979). Sequential Extraction Procedures for the Speciation of Particulate Trace Metals. Anal. Chem. 51(7): 844-851.
- Total concentrations determined by acid digestion (EPA Method 200.7)

FIGURES





<u>Notes</u>

1. mg/L - milligrams per Liter



Notes
1. Coordinate System:
2. Data Sources:
3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P. NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



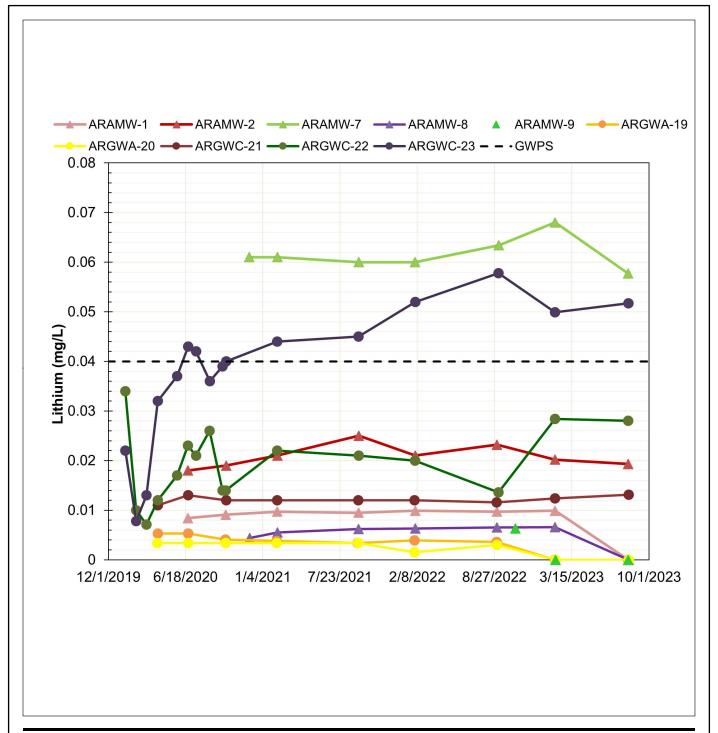


Client/Project Georgia Power

Prepared by PR on 2023-06-30 TR by BS on 2023-06-30 IR Review by RB on 2023-06-30

Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Groundwater Cobalt Time Series





<u>Notes</u>

1. mg/L - milligrams per Liter



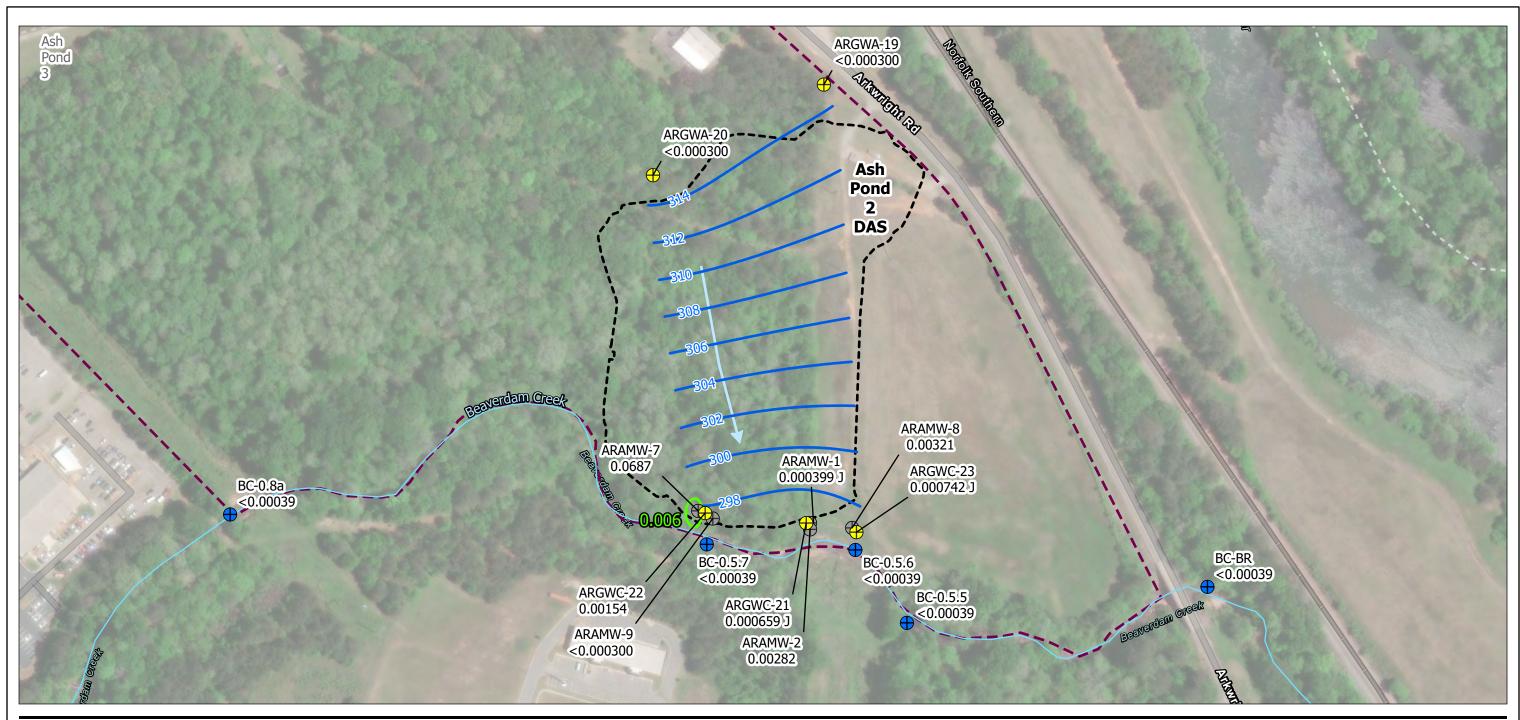


Prepared by PR on 2023-06-30 TR by BS on 2023-06-30 IR Review by RB on 2023-06-30

Client/Project Georgia Power Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Title
Groundwater Lithium Time Series

Notes
1. Coordinate System:
2. Data Sources:
3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community





Notes
1. Coordinate System: NAD 1983 StatePlane Georgia West FIPS 1002 Feet
2. Data Sources: Ash Pond Boundaries, Monitoring Wells, Sampling Locations, Property Boundary, Flow Arrow, Contours, and Beaverdam Creek provided by Southern Company Services and Wood Environment & Infrastructure Solutions
3. Background: Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

Detection Monitoring Well

Assessment Monitoring Well

Surface Water Sampling Location

Cobalt Concentration Contour Jan/Feb 2023 (mg/L)

Potentiometric Surface Contour Jan 2023 (ft NAVD88)

Interpreted Groundwater Flow Direction

Beaverdam Creek

Approximate Property Boundary

Ash Pond 2 Dry Ash Stockpile (DAS) (approximate location)

Ash Pond 3 and Ash Monofill

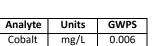
0.00321 Cobalt Concentration milligrams per Liter (mg/L)

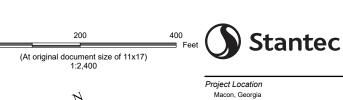
Isoconcentration Notes:

Cobalt concentration data from groundwater and surface water samples collected during the January - February 2023 monitoring event.

J indicates the constituent was detected between the analytical method detection limit and the laboratory reporting limit. The value followed by J is qualified by the laboratory as estimated.

GWPS - Groundwater Protection Standard







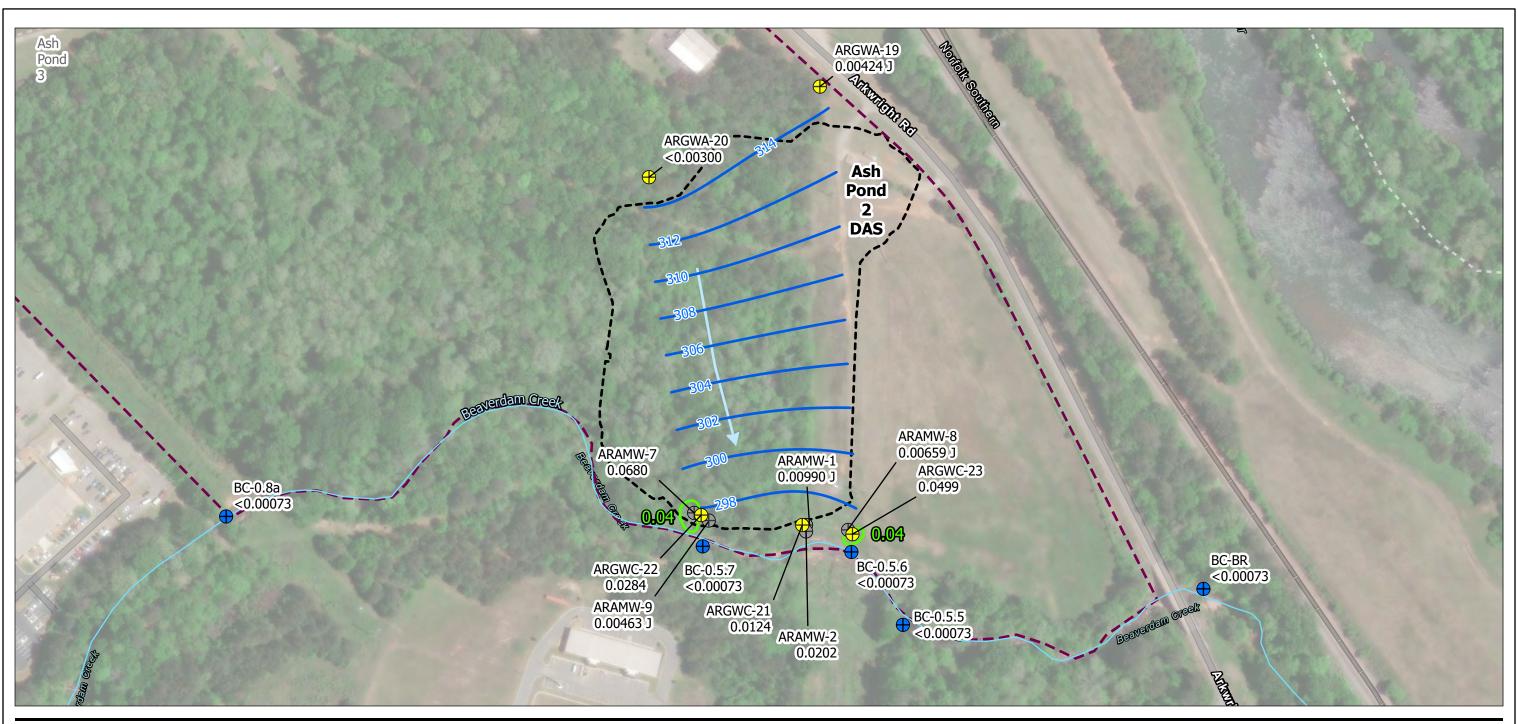
Prepared by DMB on 9/28/2023 TR by JK on 9/28/2023 IR by RB on 9/28/2023

Client/Project Georgia Power

Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

3

Isoconcentration Map for Cobalt January - February 2023





Notes
1. Coordinate System: NAD 1983 StatePlane Georgia West FIPS 1002 Feet
2. Data Sources: Ash Pond Boundaries, Monitoring Wells, Sampling Locations, Property Boundary, Flow Arrow, Contours, and Beaverdam Creek provided by Southern Company Services and Wood Environment & Infrastructure Solutions
3. Background: Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USCensus Bureau, USDA, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

 \bigoplus **Detection Monitoring Well**

Assessment Monitoring Well

Surface Water Sampling Location

Lithium Concentration Contour Jan/Feb 2023 (mg/L)

Potentiometric Surface Contour Jan 2023 (ft NAVD88)

→ Interpreted Groundwater Flow Direction

Beaverdam Creek

Approximate Property Boundary

___ Ash Pond 2 Dry Ash Stockpile (DAS) (approximate location)

Ash Pond 3 and Ash Monofill

0.00463 (J) Lithium Concentration milligrams per Liter (mg/L)

Isoconcentration Notes:

Lithium concentration data from groundwater and surface water samples collected during the January - February 2023 monitoring event.

J indicates the constituent was detected between the analytical method detection limit and the laboratory reporting limit. The value followed by J is qualified by the laboratory as estimated.

GWPS - Groundwater Protection Standard

Analyte	Units	GWPS
Lithium	mg/L	0.04





Project Location Macon, Georgia

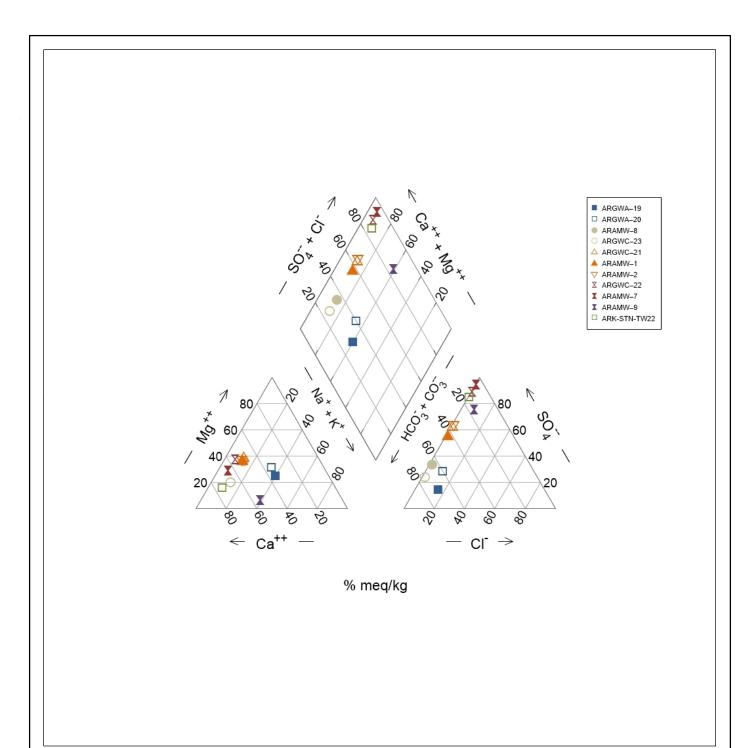
Prepared by DMB on 9/28/2023 TR by JK on 9/28/2023 IR by RB on 9/28/2023

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Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Figure No.

Isoconcentration Map for Lithium January - February 2023





<u>Notes</u> 1. Coordinate System:

1. Coordinate System:
2. Data Sources:
3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

1.% meg/kg - Percent milliequivalent per kilogram

2. Ca⁺⁺ - Calcium

3. Cl - Chloride

4. CO₃ - Carbonate **5.** HCO₃ - Bicarbonate

6. K⁺ - Potassium

7. Mg⁺⁺ - Magnesium 8. Na⁺ - Sodium 9. SO₄⁻⁻ - Sulfate

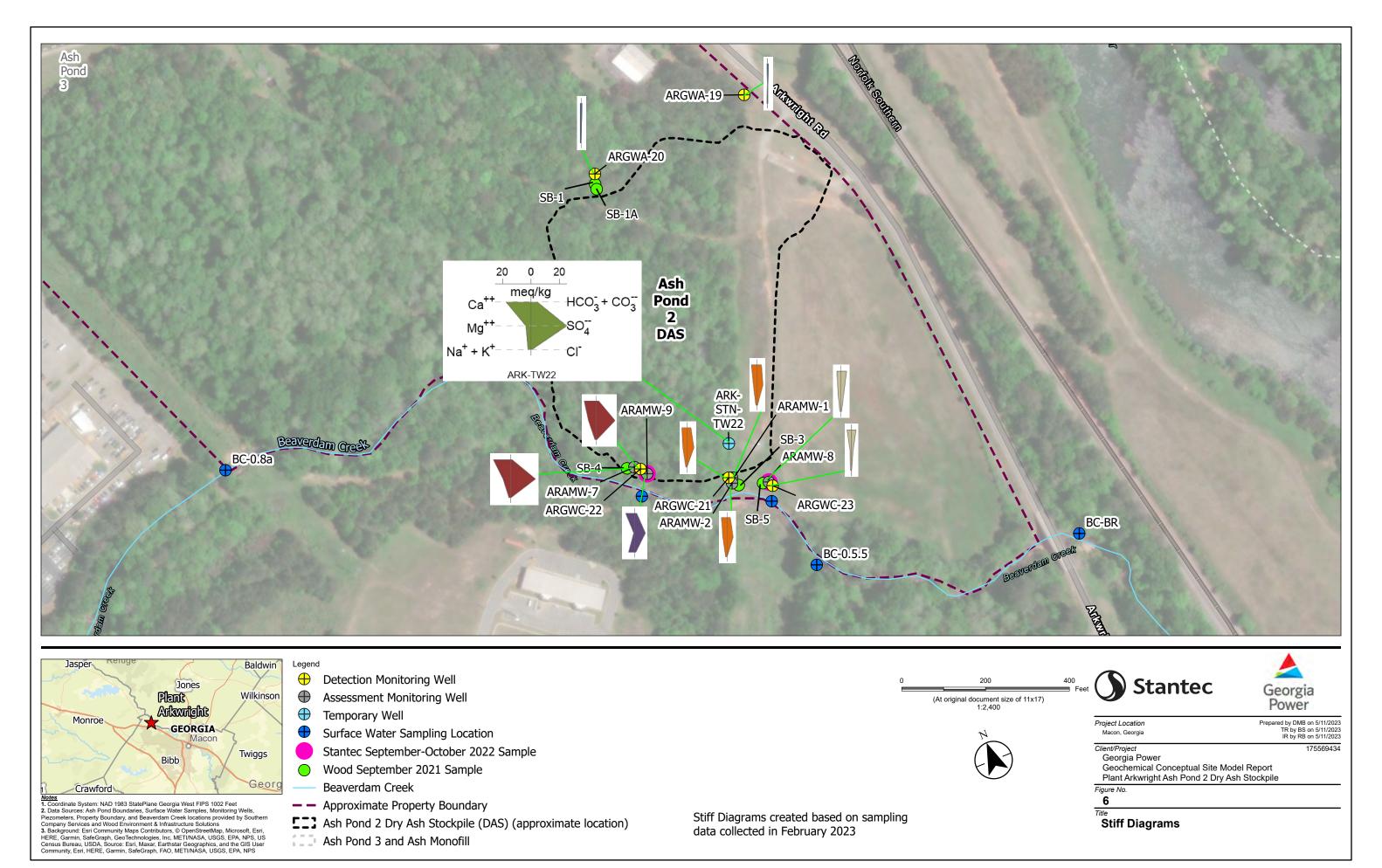


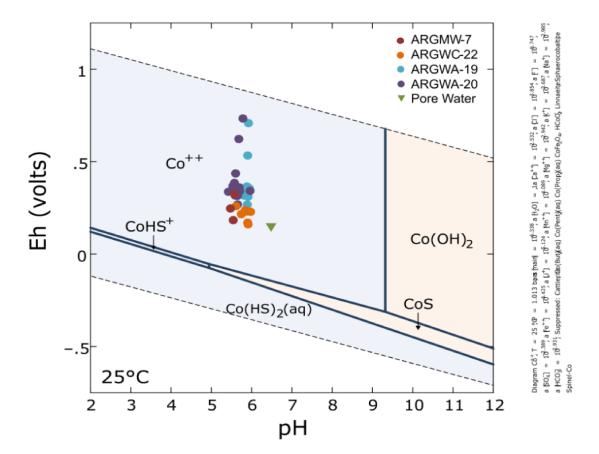


Prepared by DMB on 2023-05-16 TR by BS on 2023-05-16 IR Review by RB on 2023-05-16

Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Title
Piper Trilinear Plot







- Notes
 1. Coordinate System:
 2. Data Sources:
 3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

<u>Notes</u>

1. Eh - electrical potential

2. Eh = ORP + 200 for ORP in millivolts

3. pH - acidity

4. Co⁺⁺ - Cobalt ion

5. Co(OH)₂ - Cobalt Hydroxide
6. CoHS⁺ - Cobalt Hydrosulfide ion

7. CoS - Cobalt Sulfide

8. Co(HS)₂ - Cobalt Hydroxidesulfide





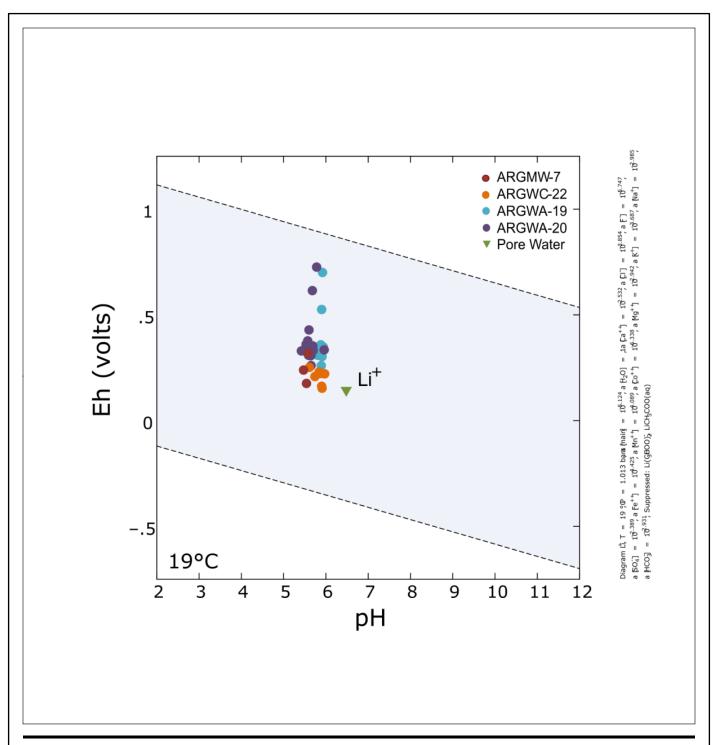
Client/Project Georgia Power

Prepared by PR on 2024-01-31 TR by BS on 2024-01-31 IR Review by RB on 2024-01-31

Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Title

Eh pH Diagram – Cobalt





Notes
1. Coordinate System:
2. Data Sources:
2. Data Sources:
3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

<u>Notes</u>

Eh - electrical potential
 Eh = ORP + 200 for ORP in millivolts.

3. pH - acidity

4. Li⁺ - Lithium



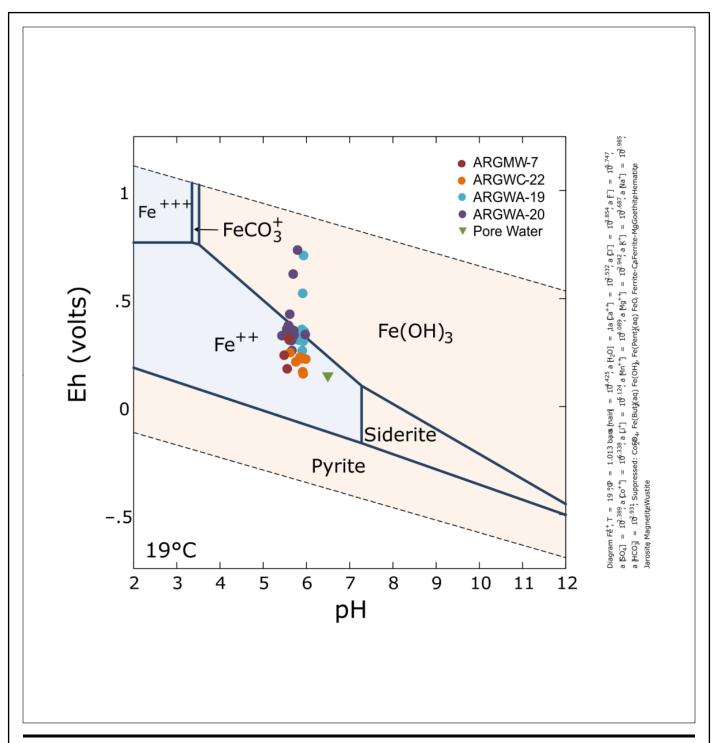


Prepared by PR on 2024-01-31 TR by BS on 2024-01-31 IR Review by RB on 2024-01-31

Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Title

Eh pH Diagram – Lithium





Notes
1. Coordinate System:
2. Data Sources:
3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Eh - electrical potential
 Eh = ORP + 200 for ORP in millivolts.

3. pH - acidity 4. Fe⁺⁺⁺ - Iron 5. Fe⁺⁺ - Iron

6. Fe(OH)₃ - Iron Hydroxide

7. FeO - Iron Monoxide



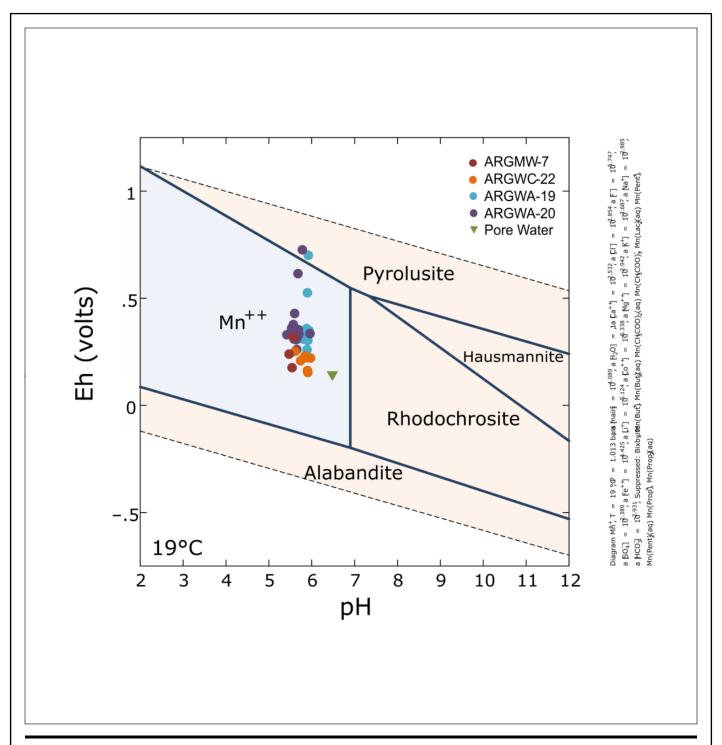


Prepared by PR on 2024-01-31 TR by BS on 2024-01-31 IR Review by RB on 2024-01-31

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Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Title Eh pH Diagram – Iron





Notes
1. Coordinate System:
2. Data Sources:
3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

<u>Notes</u>

1. Eh - electrical potential

2. Eh = ORP + 200 for ORP in millivolts.

3. pH - acidity

4. Mn⁺⁺ - Manganese

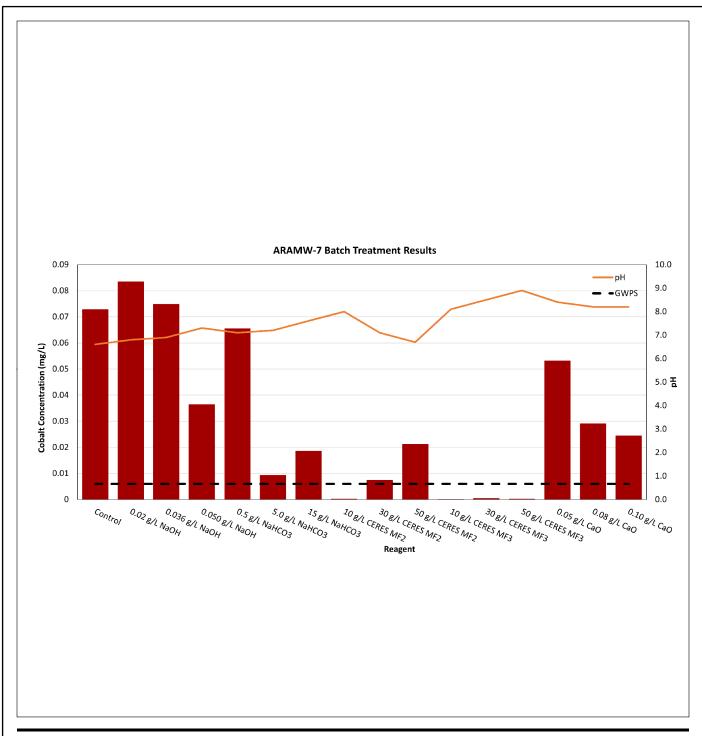




Prepared by PR on 2024-01-31 TR by BS on 2024-01-31 IR Review by RB on 2024-01-31

Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Title
Eh pH Diagram – Manganese





- Notes
 1. Coordinate System:
 2. Data Sources:
 3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

- 1. mg/L milligrams per Liter
- 2. g/L grams per Liter
- 3. NaOH Sodium Hydroxide
- 4. NaHCO₃ Sodium Bicarbonate
- 5. CERES MF2 and MF3 Metals Treatment Solutions
- 6. CaO Calcium Oxide
- 7. Source of Data: TSI Report
- 8. Test conducted under atmospheric conditions



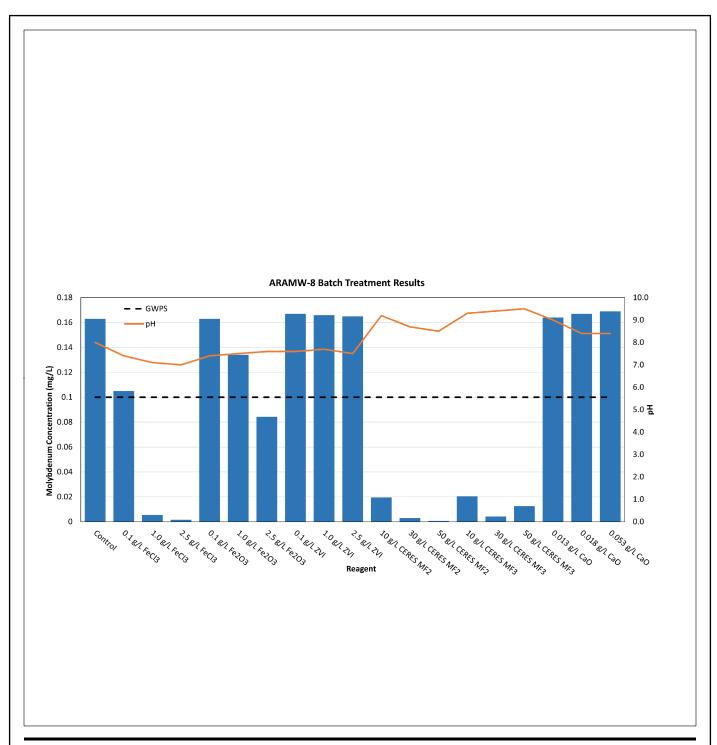


Prepared by PR on 2024-01-31 TR by BS on 2024-01-31 IR Review by RB on 2024-01-31

Client/Project Georgia Power

Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

ARAMW-7 Batch Treatment Results





- Notes
 1. Coordinate System:
 2. Data Sources:
 3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

- 1. mg/L milligrams per Liter
- 2. g/L grams per Liter
- 3. FeCl₃ Ferric Chloride
- 4. Fe₂O₃ Ferric Oxide
- 5. ZVI Zero Valent Iron
- 6. CERES MF2 and MF3 Metals Treatment Solutions
- 7. CaO Calcium Oxide
- 8. Source of Data: TSI Report
- 9. Test conducted under atmospheric conditions





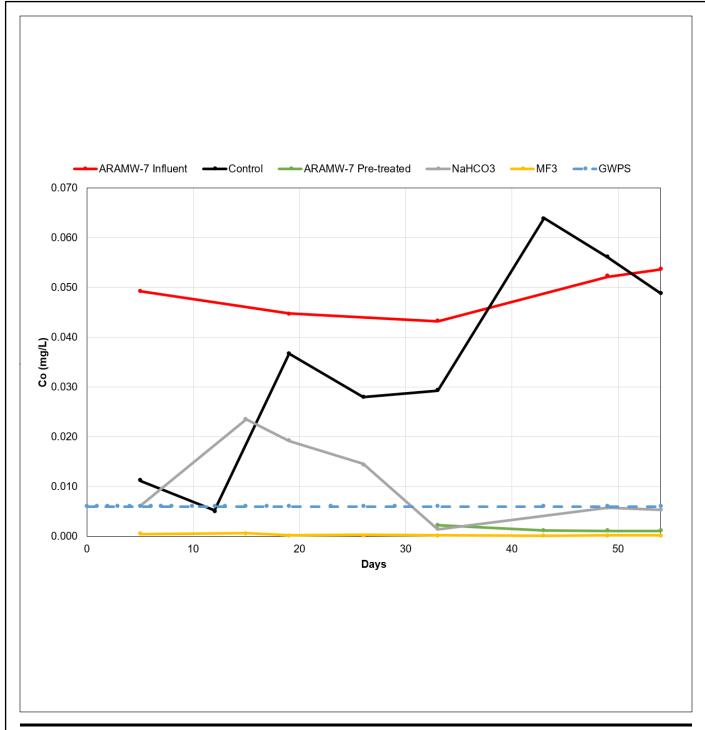
Client/Project Georgia Power

Prepared by PR on 2024-01-31 TR by BS on 2024-01-31 IR Review by RB on 2024-01-31

Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile



ARAMW-8 Batch Treatment Results





- Notes
 1. Coordinate System:
 2. Data Sources:
 2. Data Sources:
 3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

- 1. mg/L milligrams per Liter
- 2. Co Cobalt
- 3. NaHCO₃ Sodium Bicarbonate
- 4. MF3 Metals Treatment Solution
- 5. GWPS Groundwater Protection Standard
- 6. Source of Data: TSI Report
- 7. Test conducted under atmospheric conditions
- 8. ARAMW-7 groundwater (green circles) treated with sodium bicarbonate prior to application



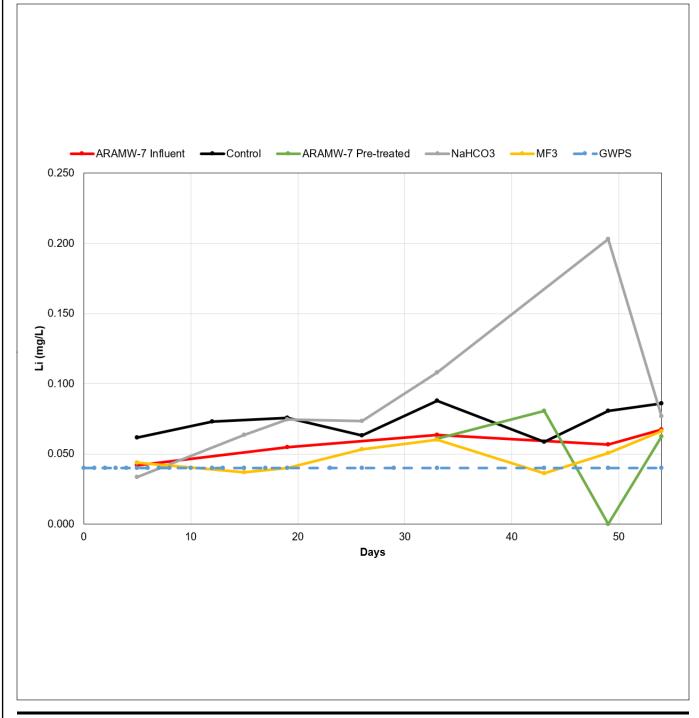


Prepared by PR on 2024-01-31 TR by BS on 2024-01-31 IR Review by RB on 2024-01-31

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Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

ARAMW-7 Column Study Cobalt Plot





- Notes
 1. Coordinate System:
 2. Data Sources:
 2. Data Sources:
 3. Background Location Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

- 1. mg/L milligrams per Liter
- 2. Co Cobalt
- 3. NaHCO₃ Sodium Bicarbonate
- 4. MF3 Metals Treatment Solution
- 5. GWPS Groundwater Protection Standard
- 6. Source of Data: TSI Report
- 7. Test conducted under atmospheric conditions
- 8. ARAMW-7 groundwater (green circles) treated with sodium bicarbonate prior to application



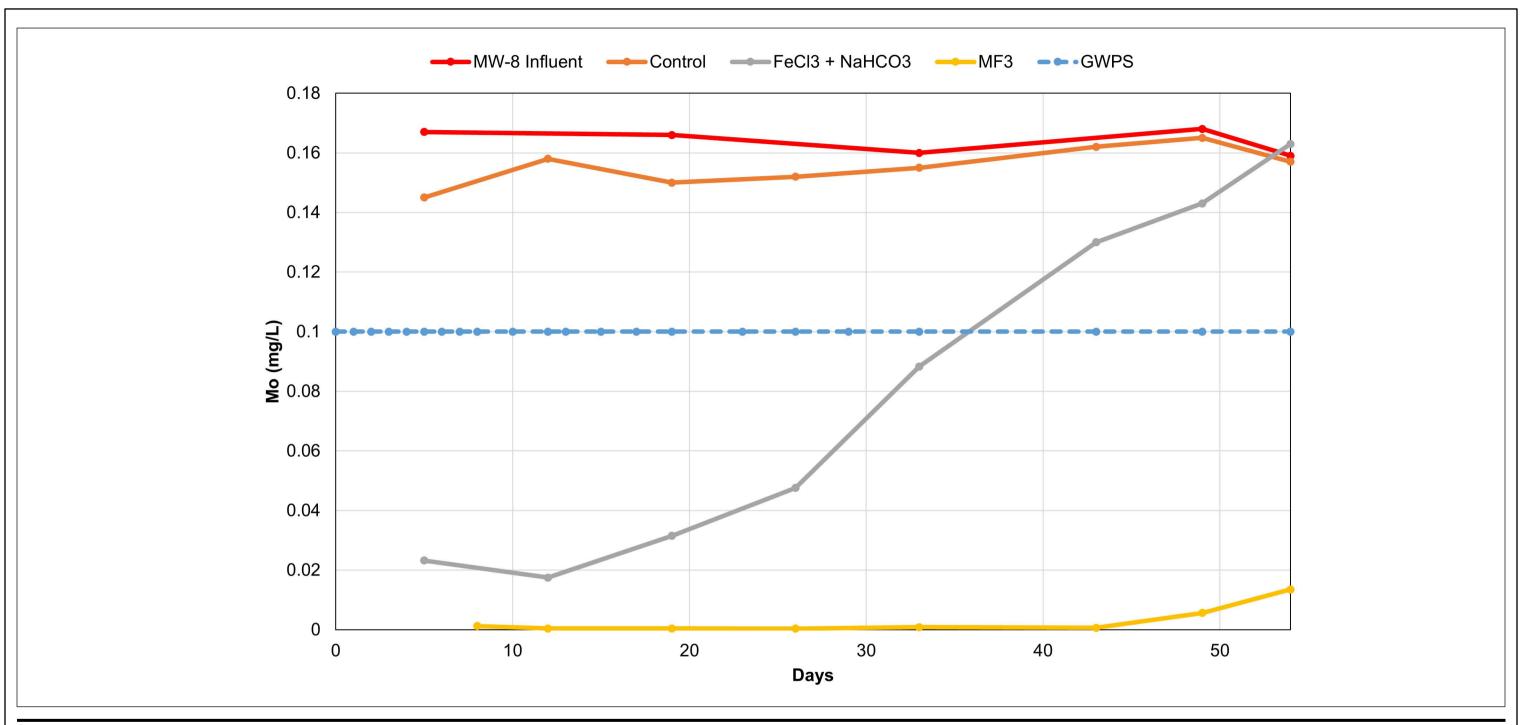


Prepared by PR on 2024-01-31 TR by BS on 2024-01-31 IR Review by RB on 2024-01-31

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Geochemical Conceptual Site Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

ARAMW-7 Column Study Lithium Plot





Notes

1. Coordinate System:

2. Data Sources:

3. Background: Esri Community Maps Contributors, @ OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

Notes

- 1. mg/L milligrams per Liter
- 2. Mo Molybdenum
- 3. NaHCO₃ Sodium Bicarbonate
- 4. FeCl₃ Ferric Chloride
- **5.** MF3 Metals Treatment Solution
- 6. GWPS Groundwater Protection Standard
- 7. Source of data: TSI Report





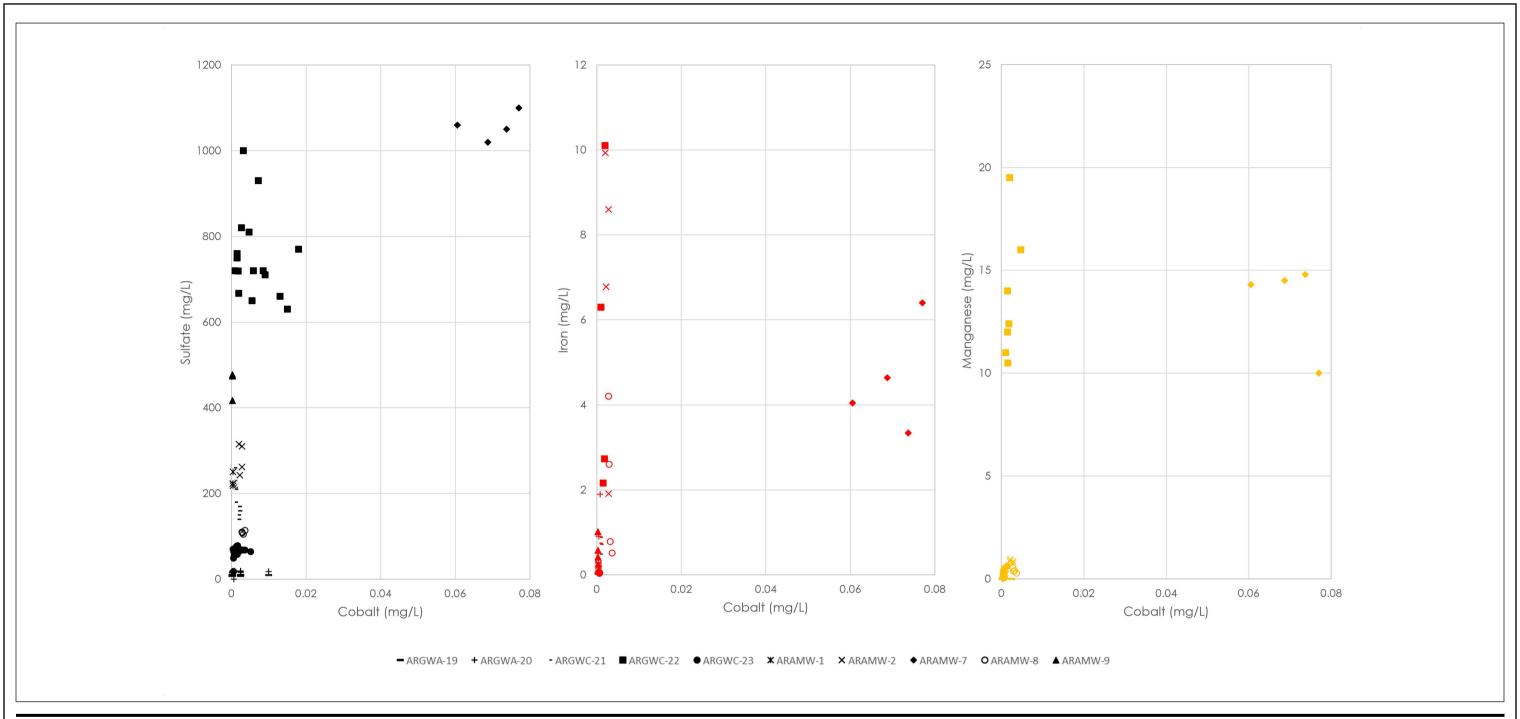
Project Location Macon, Georgia

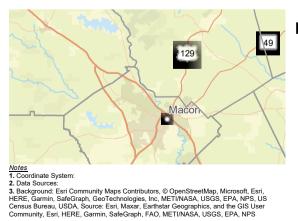
Prepared by DMB on 5/31/2023 TR by BS on 5/31/2023 IR by MD on 5/31/2023

Client/Project
Georgia Power
Geochemical Conceptual Site Model Report
Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Figure No.

ARAMW-8 Column Study Molybdenum Plot





Notes

- 1. mg/L milligrams per Liter
- 2. Data corresponding to: ARAMW-1, ARAMW-2, ARAMW-7, ARAMW-8, and ARAMW-9 (2022 and 2023); ARGWA19, ARGWA20, and ARGWC21 (from 2016 to 2023); ARGWC22 and ARGWC23 (from 2020 to 2023).





Project Location Macon, Georgia Prepared by DMB on 5/31/2023 TR by BS on 5/31/2023 IR by MD on 5/31/2023

Client/Project Georgia Power

Georgia Power
Geochemical Conceptual Site Model Report
Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Figure No.

Title

AP-2 DAS Cobalt Correlation Plots

APPENDIX A SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

							We	II ID					
	Substance	ARAMW-1	ARAMW-1	ARAMW-1	ARAMW-2	ARAMW-2							
		1/14/2020	6/24/2020	8/20/2020	9/30/2020	2/10/2021	9/9/2021	2/3/2022	9/2/2022	1/31/2023	8/8/2023	1/14/2020	6/24/2020
	Boron	1.1	0.84	NA	0.98	0.94	1	1.1	1.18	1.20	1.13	1.8	0.89
=	Calcium	NA	81	NA	100	93	93	93	80.5	87.7	83.4	NA	89
APPENDIX III	Chloride	NA	5.3	NA	5.2	5.3	4.5	5.3	3.50	4.36	3.61	NA	4.3
ĮΫ	Fluoride	NA	0.21	0.23	0.2	0.21	0.21	0.16	0.180	0.220 J	0.118	NA	0.11
PPE	Sulfate	NA	250	NA	230	260	210	250	223	218	223	NA	290
₹	TDS	NA	NA	NA	520	560	560	560	546	527	524	NA	NA
	рН	6.07	6.31	6.09	6.16	6.16	6.1	6.11	6.04	6.36	6.38	6.12	6.19
	Antimony	NA	NA	<0.002	NA	NA	<0.002	<0.00051	<0.00100	<0.00100	<0.00100	NA	NA
	Arsenic	NA	NA	<0.001	<0.001	<0.001	<0.001	<0.00028	0.00233 J	<0.00200	<0.00200	NA	NA
	Barium	NA	NA	0.055	0.052	0.046	0.051	0.046	0.0445	0.0427	0.0510	NA	NA
	Beryllium	NA	NA	<0.0025	<0.0025	<0.0025	<0.0025	<0.00027	<0.000200	<0.000200	<0.000200	NA	NA
	Cadmium	NA	NA	<0.0025	NA	<0.0025	<0.0025	<0.00022	<0.000300	<0.000300	<0.000300	NA	NA
≥	Chromium	NA	NA	<0.002	<0.002	<0.002	<0.002	<0.0015	<0.00300	<0.00300	<0.00300	NA	NA
APPENDIX IV	Cobalt	NA	0.00097 J	0.001 J	0.001 J	0.00082 J	0.00072 J	0.00045 J	0.000449 J	0.000399 J	0.000350 J	NA	0.0027
N N	Lead	NA	NA	<0.001	<0.001	<0.001	<0.001	<0.00017	<0.000500	<0.000500	<0.000500	NA	NA
γPP	Lithium	0.009	0.0084	0.0066	0.0091	0.0097	0.0095	0.0099	0.00970 J	0.00990 J	0.00909 J	0.086	0.018
`	Mercury	NA	NA	<0.0002	NA	NA	<0.0002	<0.00013	<0.0000670	<0.0000670	<0.0000670	NA	NA
	Molybdenum	NA	0.0051 J	0.0076 J	0.0054 J	0.0043 J	0.0059 J	0.0049 J	0.00785	0.00974	0.00667	NA	<0.015
	Radium	NA	NA	0.527	0.249 U	0.949	0.972	1.04	3.41	4.100	1.16 U	NA	NA
	Selenium	NA	NA	<0.005	<0.005	<0.005	<0.005	<0.00074	<0.00150	<0.00150	<0.00150	NA	NA
	Thallium	NA	NA	<0.001	NA	NA	<0.001	<0.00047	<0.000600	<0.000600	<0.000600	NA	NA
*	Silver	NA	NA	NA	<0.001	<0.001	<0.001	<0.00022	<0.000300	<0.000300	<0.000300	NA	NA
	Total Alkalinity	NA	170	NA	NA	180	190	180	187	177	184	NA	130
	Bicarbonate Alkalinity	NA	170	NA	NA	180	190	180	187	177	184	NA	130
	Carbonate Alkalinity	NA	<5	NA	NA	<5	<5	<5.0	<1.45	<1.45	<0.725	NA	<5
	Aluminum	NA	<0.0193	0.0413 J	0.0342 J	NA	NA						
SS	Iron, Dissolved	NA	NA	NA	NA	NA	NA	0.16	NA	NA	0.167	NA	NA
PARAMETERS	Iron, Total	NA	0.204	0.261	0.239	NA	NA						
Įξ	Manganese, Dissolved	NA	NA	NA	NA	NA	0.24	0.13	NA	NA	0.144	NA	NA
4R/	Manganese, Total	NA	0.41	NA	NA	0.23	0.23	NA	0.162	0.149	0.145	NA	1
L P/	Magnesium	NA	34	NA	NA	38	37	36	38.2	37.9	35.7	NA	36
	Potassium	NA	5.5	NA	NA	5.4	5.4	5.2	5.32	5.16	5.37	NA	6.9
19	Sodium	NA	21	NA	NA	22	21	21	19.5	21.9	19.3	NA	20
ADDITION/	Oxidation Reduction Potential	12.70	NA	NA	NA	NA	NA	NA	63.20	-26.43	59.72	-23.40	NA
AE.	pH, Field	6.07	6.31	6.09	6.16	6.16	6.10	6.11	6.04	6.36	6.38	6.12	6.19
	RDO Concentration	0.22	NA	NA	NA	NA	NA	NA	0.17	1.80	0.06	0.1	NA
	Specific Conductance, Field	NA	843.90	774.71	798.89	NA	NA						
	Temperature, Field	19.00	NA	NA	NA	NA	NA	NA	19.67	19.83	21.26	18.90	NA
	Turbidity, Field	0.90	NA	NA	NA	NA	NA	NA	2.12	4.09	1.38	3	NA

Notes:

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

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^{1.} Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

^{2. &}lt; indicates the constituent was not detected above the analytical method detection limit (MDL).

^{3.} J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value. Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.

^{4.} TDS indicates total dissolved solids.

^{5.} U indicates the constituent was detected below the Minimum Detection Concentration (MDC) and the precision of the laboratory instruments could not produce a reliable value. Therefore, the value followed by U is qualified by the laboratory as estimated.

^{6. * -} Georgia Appendix I constituent that is not also included in Appendix IV.

^{7.} NA indicates constituent was not analyzed

SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

							We	II ID					
	Substance	ARAMW-2	ARAMW-2	ARAMW-2	ARAMW-2	ARAMW-2	ARAMW-2	ARAMW-2	ARAMW-2	ARAMW-7	ARAMW-7	ARAMW-7	ARAMW-7
		8/20/2020	10/1/2020	2/11/2021	9/10/2021	2/3/2022	9/2/2022	1/31/2023	8/8/2023	11/30/2020	2/11/2021	9/10/2021	2/2/2022
	Boron	NA	0.95	0.98	0.85	1.0	1.08	1.16	1.07	2.1	2.4	2.6	2.3
≡	Calcium	NA	91	100	130	99	89.2	92.5	87.1	260	290	290	300
\equiv	Chloride	NA	4.2	4.4	4.2	4.1	3.54	3.40	3.35	6.3	5.9	6.5	5.7
APPENDIX	Fluoride	<0.1	0.098 J	0.12	0.13	0.095 J	0.146	0.130 J	0.0571 J	0.044 J	0.054 J	0.032 J	<0.026
ЭPЕ	Sulfate	NA	270	290	440	310	315	262	243	990	980	1100	1100
Ā	TDS	NA	530	590	870	590	664	591	548	1600	1600	1700	1700
	pH	5.99	5.96	6	6.01	6.01	6.00	6.18	6.01	6	5.67	5.7	5.58
	Antimony	<0.002	NA	NA	<0.002	<0.00051	<0.00100	<0.00100	<0.00100	NA	NA	<0.002	<0.00051
	Arsenic	0.084	0.0085	0.015	0.044	0.0092	0.0158	0.00363 J	0.0120	NA	0.00075 J	<0.001	0.00035 J,B
	Barium	0.14	0.075	0.09	0.13	0.078	0.0792	0.0670	0.0753	NA	0.037	0.029	0.029
	Beryllium	<0.0025	<0.0025	<0.0025	<0.0025	<0.00027	<0.000200	<0.000200	<0.000200	NA	<0.0025	<0.0025	<0.00027
	Cadmium	<0.0025	NA	<0.0025	<0.0025	<0.00022	<0.000300	<0.000300	<0.000300	NA	<0.0025	<0.0025	<0.00022
2	Chromium	<0.002	<0.002	<0.002	<0.002	<0.0015	<0.00300	<0.00300	<0.00300	NA	<0.002	<0.002	<0.0015
ã	Cobalt	0.0022 J	0.0036	0.0028	0.0022 J	0.0028	0.00200	0.00282	0.00223	0.028	0.017	0.075	0.077
EN	Lead	<0.001	<0.001	<0.001	<0.001	<0.00017	<0.000500	<0.000500	<0.000500	NA	0.00013 J	<0.001	<0.00017
APPENDIX	Lithium	0.036	0.019	0.021	0.025	0.021	0.0232	0.0202	0.0193	0.061	0.061	0.06	0.060
•	Mercury	<0.0002	NA	NA	<0.0002	<0.00013	<0.0000670	<0.0000670	<0.0000670	NA	NA	<0.0002	<0.00013
	Molybdenum	0.0013 J	<0.015	<0.015	<0.015	<0.00061	0.000603 J	0.000491 J	0.00110	0.0012 J	<0.015	<0.015	<0.00061
	Radium	4.13	2.86	2.09	3.4	2.69	4.18	4.30	1.86	NA	5.1	4.23	4.48
	Selenium	<0.005	<0.005	<0.005	<0.005	<0.00074	<0.00150	<0.00150	<0.00150	NA	<0.005	<0.005	<0.00074
	Thallium	<0.001	NA	NA	<0.001	<0.00047	<0.000600	<0.000600	<0.000600	NA	NA	<0.001	<0.00047
*	Silver	NA	<0.001	<0.001	<0.001	<0.00022	<0.000300	<0.000300	<0.000300	NA	<0.001	<0.001	<0.00022
	Total Alkalinity	NA	NA	150	150	160	166	151	180	120	87	64	65
	Bicarbonate Alkalinity	NA	NA	150	150	160	166	151	180	120	87	64	65
	Carbonate Alkalinity	NA	NA	<5	<5	<5.0	<1.45	<1.45	<0.725	<5	<5	<5	<5.0
	Aluminum	NA	NA	NA	NA	NA	<0.0193	<0.0193	0.0505	NA	NA	NA	NA
SS	Iron, Dissolved	NA	NA	NA	NA	8.6	NA	NA	7.20	NA	NA	NA	6.4
PARAMETERS	Iron, Total	NA	NA	NA	NA	NA	9.93	1.91	6.78	NA	NA	NA	NA
Ĭ	Manganese, Dissolved	NA	NA	NA	2.2	0.85	NA	NA	1.08	NA	NA	14	10
4R/	Manganese, Total	NA	NA	1.1	1.8	NA	0.866	0.745	0.943	11	9.5	14	NA
L P/	Magnesium	NA	NA	41	47	39	40.2	40.5	35.7	74	78	79	79
	Potassium	NA	NA	7.4	9.2	7.2	7.01	7.06	7.58	13	11	9.1	9.6
ADDITIONA	Sodium	NA	NA	20	20	20	18.9	20.5	18.8	27	30	30	29
Ī	Oxidation Reduction Potential	NA	NA	NA	NA	NA	-14.66	37.53	28.15	NA	NA	NA	NA
AE	pH, Field	5.99	5.96	6.00	6.01	6.01	6.00	6.18	6.01	6.00	5.67	5.70	5.58
	RDO Concentration	NA	NA	NA	NA	NA	0.15	1.41	0.13	NA	NA	NA	NA
	Specific Conductance, Field	NA	NA	NA	NA	NA	960.58	785.83	771.26	NA	NA	NA	NA
	Temperature, Field	NA	NA	NA	NA	NA	21.86	19.98	24.01	NA	NA	NA	NA
	Turbidity, Field	NA	NA	NA	NA	NA	4.43	4.40	4.46	NA	NA	NA	NA

Notes:

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

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^{1.} Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

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^{3.} J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value. Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.

^{4.} TDS indicates total dissolved solids.

^{5.} U indicates the constituent was detected below the Minimum Detection Concentration (MDC) and the precision of the laboratory instruments could not produce a reliable value. Therefore, the value followed by U is qualified by the laboratory as estimated.

^{6. * -} Georgia Appendix I constituent that is not also included in Appendix IV.

^{7.} NA indicates constituent was not analyzed

SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright
Ash Pond 2 Dry Ash Stockpile
Macon, Georgia

								We	II ID						
	Substance	ARAMW-7	ARAMW-7	ARAMW-7	ARAMW-8	ARAMW-8	ARAMW-8	ARAMW-8	ARAMW-8	ARAMW-8	ARAMW-8	ARAMW-9	ARAMW-9	ARAMW-9	ARAMW-9
		9/7/2022	1/31/2023	8/8/2023	12/1/2020	2/11/2021	9/9/2021	2/3/2022	9/2/2022	1/31/2023	8/9/2023	10/20/2022	12/8/2022	2/1/2023	8/8/2023
	Boron	2.33	2.56	2.25	0.4	0.53	0.53	0.60	0.558	0.637	0.770	0.0500	NA	0.0550	0.0666
=	Calcium	264	299	279	81	75	71	71	61.4	69.8	78.6	140	NA	145	146
×	Chloride	5.78	5.82	5.50	12	12	7.4	8.1	5.31	5.30	5.13	50.9	NA	37.2	36.1
Įδ	Fluoride	<0.0330	0.110 J	<0.0330	0.14	0.24	0.19	0.17	0.206	0.263 J	0.261	0.839	NA	0.938	0.837
APPENDIX III	Sulfate	1050	1020	1060	120	110	100	110	108	105	114	474	NA	417	477
₹	TDS	1610	1630	1620	420	380	260	410	385	392	436	896	NA	857	852
	рН	5.57	5.54	5.47	7.05	6.95	6.56	6.59	6.44	6.44	8.71	7.80	8.02	7.95	8.13
	Antimony	<0.00100	<0.00100	<0.00100	NA	NA	<0.002	<0.00051	<0.00100	<0.00100	0.00134 J	<0.00100	NA	<0.00100	0.00158 J
	Arsenic	<0.00200	0.00286 J	<0.00200	NA	0.00046 J	<0.001	0.00031 J	0.00206 J	<0.00200	<0.00200	0.00265 J	NA	<0.00200	<0.00200
	Barium	0.0263	0.0243	0.0244	NA	0.092	0.094	0.096	0.116	0.110	0.122	0.0305	NA	0.0158	0.0207
	Beryllium	0.000236 J	0.000296 J	0.000272 J	NA	<0.0025	<0.0025	<0.00027	<0.000200	<0.000200	<0.000200	<0.000200	NA	<0.000200	<0.000200
	Cadmium	<0.000300	<0.000300	<0.000300	NA	<0.0025	<0.0025	<0.00022	<0.000300	<0.000300	<0.000300	<0.000300	NA	<0.000300	<0.000300
≥	Chromium	<0.00300	<0.00300	<0.00300	NA	<0.002	<0.002	<0.0015	<0.00300	<0.00300	<0.00300	<0.00300	NA	<0.00300	<0.00300
APPENDIX IV	Cobalt	0.0737	0.0687	0.0605	0.0054	0.0061	0.0046	0.0028	0.00292	0.00321	0.00364	<0.000300	NA	<0.000300	<0.000300
Ē	Lead	<0.000500	<0.000500	<0.000500	NA	<0.001	<0.001	<0.00017	<0.000500	<0.000500	<0.000500	<0.000500	NA	<0.000500	<0.000500
ΑP	Lithium	0.0634	0.0680	0.0577	0.0044 J	0.0055	0.0062	0.0063	0.00654 J	0.00659 J	0.00637 J	0.00631 J	NA	0.00463 J	0.00907 J
`	Mercury	<0.0000670	<0.0000670	<0.0000670	NA	NA	<0.0002	<0.00013	<0.0000670	<0.0000670	<0.0000670	<0.0000670	NA	<0.0000670	<0.0000670
	Molybdenum	0.000379 J	<0.000200	<0.000200	0.056	0.038	0.12	0.16	0.175	0.188	0.203	0.0205	NA	0.0140	0.0109
	Radium	4.29	5.21	4.83	NA	0.285 U	0.16 U	0.510	1.89 U	3.20	0.193 U	8.42	1.41 U	0.413 U	3.92
	Selenium	<0.00150	<0.00150	<0.00150	NA	<0.005	<0.005	<0.00074	<0.00150	<0.00150	<0.00150	<0.00150	NA	<0.00150	<0.00150
	Thallium	<0.000600	<0.000600	<0.000600	NA	NA	<0.001	<0.00047	<0.000600	<0.000600	<0.000600	<0.000600	NA	<0.000600	<0.000600
*	Silver	<0.000300	<0.000300	<0.000300	NA	<0.001	<0.001	<0.00022	<0.000300	<0.000300	<0.000300	<0.000300	NA	<0.000300	<0.000300
	Total Alkalinity	60.2	56.4	55.3	220	220	210	210	214	214	245	78.2	NA	90.8	91.1
	Bicarbonate Alkalinity	60.2	56.4	55.3	220	220	210	210	214	214	245	78.2	NA	90.8	91.1
	Carbonate Alkalinity	<1.45	<1.45	<0.725	<5	<5	<5	<5.0	<1.45	<1.45	<0.725	<1.45	NA	<1.45	<0.725
	Aluminum	0.0327 J	<0.0193	0.0265 J	NA	NA	NA	NA	0.0292 J	<0.0193	<0.0193	0.143	NA	0.0860	0.0354 J
SS	Iron, Dissolved	NA	NA	4.46	NA	NA	NA	4.2	NA	NA	0.511	NA	NA	NA	0.412
PARAMETERS	Iron, Total	3.34	4.64	4.04	NA	NA	NA	NA	2.60	0.780	0.515	1.01	NA	0.417	0.580
ΙŽ	Manganese, Dissolved	NA	NA	14.9	NA	NA	0.79	0.53	NA	NA	0.277	NA	NA	NA	0.159
\ %	Manganese, Total	14.8	14.5	14.3	2.9	2	0.82	NA	0.374	0.398	0.279	0.220	NA	0.174	0.172
L P/	Magnesium	75.0	81.2	73.8	25	26	28	28	27.7	29.9	32.1	10.6	NA	9.79	10.5
1	Potassium	9.26	9.01	8.74	7	7.1	6.7	6.3	6.07	6.87	7.34	10.6	NA	8.25	7.85
2	Sodium	28.1	29.8	26.1	22	22	19	17	15.5	17.4	18.1	154	NA	115	107
ADDITION/	Oxidation Reduction Potential	117.00	-24.74	38.47	NA	NA	NA	NA	16.01	55.97	-37.6	-168.43	NA	-113.92	-117
AP	pH, Field	5.57	5.54	5.47	7.05	6.95	6.56	6.59	6.44	6.44	8.71	7.80	8.02	7.95	8.13
	RDO Concentration	0.16	0.11	0.16	NA	NA	NA	NA	0.22	0.40	1.65	3.09	NA	0.23	0.17
	Specific Conductance, Field	1789.48	1690.06	1769.61	NA	NA	NA	NA	630.88	638.28	554.68	1308.45	NA	1271.08	1195.42
	Temperature, Field	19.63	18.26	21.1	NA	NA	NA	NA	22.40	19.64	23.04	17.63	NA	17.81	19.81
	Turbidity, Field	2.66	0.98	3.31	NA	NA	NA	NA	4.28	4.84	4.19	4.76	NA	4.41	3.95

Notes:

1. Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

- 2. < indicates the constituent was not detected above the analytical method detection limit (MDL).
- 3. J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value.
- Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.
- 4. TDS indicates total dissolved solids.
- 5. U indicates the constituent was detected below the Minimum Detection Concentration (MDC) and the precision of the laboratory instruments could not produce a reliable value. Therefore, the value followed by U is qualified by the laboratory as estimated.
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- 7. NA indicates constituent was not analyzed

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SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

							Well ID					
	Substance	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19
		6/22/2016	8/29/2016	10/24/2016	1/25/2017	4/10/2017	4/10/2017	6/19/2017	10/24/2017	4/10/2018	10/16/2018	3/26/2019
	Boron	NA	0.024 J	0.0339 J	0.048 J	0.022 J	NA	<0.05	0.021 J	0.022 J	<0.05	<0.05
=	Calcium	NA	11	11.5	13	11	NA	12	12	12	14	15
APPENDIX III	Chloride	8.4	8.4	9.6	8.7	8	NA	7.6	7.2	7.2	10	12
	Fluoride	NA	<0.2	0.07 J	<0.2	<0.2	NA	<0.2	<0.2	<0.2	0.083 J	0.041 J
PPE	Sulfate	9.3	8.7	9.3	8.8	7.8	NA	8.6	9.1	7.9	8.2	6.1
₹	TDS	NA	130	108	120	130	126	86	120	120	140	170
	рН	NA	6.75 o	5.81	5.91	5.74	NA	5.54	5.82	5.92	5.94	5.85
	Antimony	NA	<0.0025	<0.003	<0.0025	<0.0025	NA	<0.0025	<0.0025	<0.0025	<0.0025	NA
	Arsenic	<0.0013	<0.0013	<0.005	<0.0013	<0.0013	NA	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
	Barium	0.039	0.04	0.0444	0.045	0.039	NA	0.041	0.041	0.044	0.047	0.056
	Beryllium	NA	<0.0025	<0.003	<0.0025	<0.0025	NA	<0.0025	<0.0025	<0.0025	<0.0025	NA
	Cadmium	<0.0025	<0.0025	<0.001	<0.0025	<0.0025	NA	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Į≥	Chromium	NA	0.0011 J	0.001 J	0.0013 J	<0.0025	NA	0.0013 J	0.0012 J	0.0015 J	0.0014 J	NA
	Cobalt	NA	<0.0025	<0.01	<0.0025	<0.0025	NA	<0.0025	<0.0025	<0.0025	<0.0025	NA
APPENDIX	Lead	<0.0013	<0.0013	<0.005	<0.0013	<0.0013	NA	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
API	Lithium	NA	0.0048 J	<0.05	0.0052	0.0034 J	NA	0.0036 J	0.0051	0.0057	0.0048 J	NA
	Mercury	NA	<0.0002	<0.0005	0.000077 J	<0.0002	NA	<0.0002	<0.0002	<0.0002	<0.0002	NA
	Molybdenum	NA	<0.015	<0.01	<0.015	<0.015	NA	<0.015	<0.015	0.00096 J	<0.015	NA
	Radium	NA	0.324 U	1.17 U	0.443 U	0.483	NA	0.478	0.764	0.3 U	0.991	NA
	Selenium	0.00025 J	0.0004 J	<0.01	<0.0013	<0.0013	NA	0.00025 J	<0.0013	0.00074 J	<0.0013	<0.0013
	Thallium	NA	<0.0005	<0.001	<0.0005	<0.0005	NA	<0.0005	<0.0005	<0.0005	<0.0005	NA
*	Silver	<0.00025	NA	<0.01	NA	<0.00025	NA	NA	<0.0013	<0.0013	<0.0013	<0.0013
	Total Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Bicarbonate Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Carbonate Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RS	Iron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Iron, Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
₽	Manganese, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PARAMETERS	Manganese, Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ž	Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ADDITIONAL	Oxidation Reduction Potential	NA	89.80	108.00	102.30	112.40	NA	146.70	110.60	499.70	147.30	124.10
₹	pH, Field	NA	6.75	5.81	5.91	5.74	NA	5.54	5.82	5.92	5.94	5.85
	RDO Concentration	NA	3.68	4.10	4.31	4.43	NA	4.43	4.05	3.76	4.50	4.27
	Specific Conductance, Field	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Temperature, Field	NA	25.74	22.00	17.99	19.87	NA	21.55	19.70	18.26	22.56	18.89
L	Turbidity, Field	NA	0.42	1.97	0.82	0.41	NA	1.28	1.56	0.16	0.18	0.38

Notes:

1. Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

- 2. < indicates the constituent was not detected above the analytical method detection limit (MDL).
- 3. J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value. Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.
- 4. TDS indicates total dissolved solids.
- 5. U indicates the constituent was detected below the Minimum Detection Concentration (MDC) and the precision of the laboratory instruments could not produce a reliable value. Therefore, the value followed by U is qualified by the laboratory as estimated.
- 6. * Georgia Appendix I constituent that is not also included in Appendix IV.
- 7. NA indicates constituent was not analyzed

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SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright
Ash Pond 2 Dry Ash Stockpile
Macon, Georgia

								Well ID						
	Substance	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-19	ARGWA-20
		8/20/2019	10/7/2019	4/7/2020	6/25/2020	8/19/2020	9/29/2020	2/9/2021	9/7/2021	2/1/2022	9/1/2022	1/31/2023	8/8/2023	6/22/2016
	Boron	NA	<0.08	0.072 J	0.091	NA	<0.08	<0.08	<0.08	0.092	0.0238	0.0234	0.0199	NA
=	Calcium	NA	14	14	14	NA	12	9.7	9.2	8.0	8.52	8.50	8.51	NA
×	Chloride	NA	11	11	11	NA	10	8.6	7.4	6.8	6.27	6.04	6.37	5.7
APPENDIX III	Fluoride	0.045 J	0.049 J	0.14	0.03 J	<0.1	0.051 J	0.059 J	0.1	0.076 J	0.148	0.108 J	<0.0330	NA
PE	Sulfate	NA	7.4	8.4	9.8	NA	8.4	10	9.9	10	8.38	7.55	8.29	18
Į₹	TDS	NA	150	120	NA	NA	110	110	110	91	81.0	95.0	62.0	NA
	pH	5.9	5.89	5.72	5.8	6.25	5.83	5.97	5.85	5.52	5.88	5.86	5.81	NA
	Antimony	<0.002	NA	NA	NA	<0.002	NA	NA	<0.002	<0.00051	<0.00100	<0.00100	<0.00100	NA
	Arsenic	0.00036 J	<0.0013	0.0006 J	NA	<0.001	<0.001	<0.001	<0.001	<0.00028	<0.00200	<0.00200	<0.00200	0.00084 J
	Barium	0.052	0.049	0.047	NA	0.044	0.04	0.032	0.03	0.031	0.0303	0.0310	0.0337	0.078
	Beryllium	<0.001	NA	NA	NA	<0.0025	<0.0025	<0.0025	<0.0025	<0.00027	<0.000200	<0.000200	<0.000200	NA
	Cadmium	<0.001	<0.001	0.00034 J	NA	<0.0025	NA	<0.0025	<0.0025	<0.00022	<0.000300	<0.000300	<0.000300	<0.0025
\$	Chromium	0.0024	<0.002	<0.002	NA	<0.002	<0.002	0.0015 J	<0.002	0.0029	<0.00300	<0.00300	<0.00300	NA
APPENDIX IV	Cobalt	0.00011 J	0.00011 J	0.00038 J	<0.0025	<0.0025	<0.0025	0.00016 J	<0.0025	<0.00026	<0.000300	<0.000300	<0.000300	NA
PEN	Lead	<0.001	0.00018 J	0.00037 J	NA	<0.001	<0.001	<0.001	<0.001	<0.00017	<0.000500	<0.000500	<0.000500	<0.0013
AP	Lithium	0.0044 J	0.013	0.0053	0.0053	0.0038 J	0.0041 J	0.0038 J	0.0034 J	0.0039 J	0.00359 J	0.00424 J	0.00382 J	NA
	Mercury	<0.0002	NA	NA	NA	<0.0002	NA	NA	<0.0002	<0.00013	<0.0000670	<0.0000670	<0.0000670	NA
	Molybdenum	<0.005	NA	NA	<0.015	<0.015	<0.015	<0.015	<0.015	0.00067 J	0.000501 J	0.000395 J	0.000421 J	NA
	Radium	0.498	0.476 U	0.651	NA	0.294 U	0.372 U	0.466 U	0.31 U	0.334 U	0.913 U	2.33	1.80	NA
	Selenium	<0.005	<0.005	<0.005	NA	<0.005	<0.005	<0.005	<0.005	<0.00074	<0.00150	<0.00150	<0.00150	0.0019
	Thallium	<0.001	NA	NA	NA	<0.001	NA	NA	<0.001	0.00057 J	<0.000600	<0.000600	<0.000600	NA
*	Silver	NA	0.00056 J	0.00018 J	NA	NA	<0.001	<0.001	<0.001	<0.00022	<0.000300	<0.000300	<0.000300	<0.00025
	Total Alkalinity	NA	NA	NA	33	NA	NA	38	38	34	37.8	38.4	37.0	NA
	Bicarbonate Alkalinity	NA	NA	NA	33	NA	NA	38	38	34	37.8	38.4	37.0	NA
	Carbonate Alkalinity	NA	NA	NA	<5	NA	NA	<5	<5	<5.0	<1.45	<1.45	<0.725	NA
	Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0193	<0.0193	<0.0193	NA
ERS	Iron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	<0.028	NA	NA	<0.0330	NA
	Iron, Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0330	<0.0330	<0.0330	NA
L PARAMETERS	Manganese, Dissolved	NA	NA	NA	NA	NA	NA	NA	<0.005	<0.0013	NA	NA	0.00100 J	NA
۱	Manganese, Total	NA	NA	NA	0.00089 J	NA	NA	<0.005	<0.005	NA	<0.00100	<0.00100	<0.00100	NA
	Magnesium	NA	NA	NA	5.5	NA	NA	3.8	3.7	3.4	3.32	3.64	3.36	NA
Ž	Potassium	NA	NA	NA	2.6	NA	NA	2.2	2	2.0	1.99	2.01	2.08	NA
۱Ĕ	Sodium	NA 201.00	NA 50.00	NA 110.10	13	NA NA	NA	11	10	10	9.76	10.0	9.51	NA
ADDITIONA	Oxidation Reduction Potential	324.80	59.20	140.12	NA 5.00	NA 0.05	NA 5.00	NA 5.07	NA 5.05	NA 5.50	157.60	113.73	148.97	NA
<	Ι', '	5.90	5.89	5.72	5.80	6.25	5.83	5.97	5.85	5.52	5.88	5.86	5.81	NA
	RDO Concentration	5.11	4.23	4.27	NA NA	NA NA	NA NA	NA	NA NA	NA NA	3.00	2.98	3.17	NA NA
	Specific Conductance, Field	NA	NA	NA 10.70	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	131.42	127.69	127.54	NA NA
	Temperature, Field	23.50	23.97	19.70	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	20.25	19.25	20.93	NA NA
Not	Turbidity, Field	0.66	0.51	1.88	NA	NA	NA	NA	NA	NA	1.79	0.25	0.69	NA

Notes:

1. Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

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- 7. NA indicates constituent was not analyzed

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SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

							Well ID					
	Substance	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20
		8/29/2016	10/24/2016	1/25/2017	4/10/2017	6/20/2017	10/24/2017	4/9/2018	10/16/2018	3/27/2019	8/20/2019	10/7/2019
	Boron	<0.05	0.0194 J	0.026 J	<0.05	0.032 J	0.054	0.06	0.036 J	0.046 J	NA	<0.08
=	Calcium	8.3	7.66	9.4	8.6	9.4	9.9	9.9	9.8	9.2	NA	8.9
PPENDIX III	Chloride	5.3	5.4	5.1	4.9	5	4.6	4.7	5.3	4.6	NA	5.2
ΔŽ	Fluoride	<0.2	0.04 J	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.042 J	0.036 J
PPE	Sulfate	18	18	19	16	18	19	18	18	15	NA	17
₹	TDS	100	91	90	110	72	110	100	110	100	NA	87
	рН	5.64	5.6	5.65	5.42	5.59	5.58	5.78	5.69	5.96	5.57	5.65
	Antimony	<0.0025	< 0.003	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	NA	<0.002	NA
	Arsenic	0.00049 J	<0.005	<0.0013	0.00056 J	0.00068 J	<0.0013	<0.0013	<0.0013	<0.0013	0.00047 J	<0.0013
	Barium	0.07	0.0738	0.084	0.073	0.078	0.081	0.081	80.0	0.082	0.079	0.076
	Beryllium	<0.0025	< 0.003	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	NA	<0.001	NA
	Cadmium	<0.0025	<0.001	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.001	<0.001
_	Chromium	0.0052	0.0053 J	0.0056	0.0047	0.0051	0.0056	0.0071	0.0071	NA	0.0078	0.0059
â	Cobalt	<0.0025	<0.01	0.00076 J	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	NA	0.00015 J	<0.0005
APPENDIX	Lead	<0.0013	< 0.005	0.00037 J	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.001	0.00014 J
API	Lithium	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	0.0021 J	0.0018 J	NA	<0.005	0.0066
`	Mercury	<0.0002	<0.0005	0.000072 J	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	NA	<0.0002	NA
	Molybdenum	<0.015	<0.01	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	NA	<0.005	NA
	Radium	0.508 U	1.46	0.377 U	0.132 U	1.17	0.704	0.539	0.354 U	NA	0.53	0.621 U
	Selenium	0.0019	0.0023 J	0.0015	0.0011 J	0.0016	0.0012 J	0.0012 J	0.0015	0.0015	0.0015 J	0.0016 J
	Thallium	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA	<0.001	NA
*	Silver	NA	<0.01	NA	<0.00025	NA	<0.0013	<0.0013	<0.0013	<0.0013	NA	0.00031 J
	Total Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Bicarbonate Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Carbonate Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RS	Iron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PARAMETERS	Iron, Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
₽	Manganese, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AR	Manganese, Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ļ	Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ž	Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
۱	Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ADDITION	Oxidation Reduction Potential	106.00	227.80	111.80	128.70	108.20	131.50	525.10	152.40	134.10	176.30	59.90
₹	pH, Field	5.64	5.60	5.65	5.42	5.59	5.58	5.78	5.69	5.96	5.57	5.65
	RDO Concentration	5.28	5.26	5.75	5.28	7.22	5.92	5.74	5.62	5.31	6.05	6.03
	Specific Conductance, Field	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Temperature, Field	19.68	20.08	18.99	18.91	18.80	18.12	17.58	18.78	17.53	18.64	17.87
	Turbidity, Field	4.46	2.90	18.00	4.25	4.65	9.69	7.85	4.73	9.60	4.44	2.06

Notes:

1. Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

- 3. J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value. Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.
- 4. TDS indicates total dissolved solids.
- 5. U indicates the constituent was detected below the Minimum Detection Concentration (MDC) and the precision of the laboratory instruments could not produce a reliable value. Therefore, the value followed by U is qualified by the laboratory as estimated.
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- 7. NA indicates constituent was not analyzed

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^{2. &}lt; indicates the constituent was not detected above the analytical method detection limit (MDL).

SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright
Ash Pond 2 Dry Ash Stockpile
Macon, Georgia

								Well ID						
	Substance	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWA-20	ARGWC-21	ARGWC-21	ARGWC-21
		4/6/2020	6/25/2020	8/19/2020	9/30/2020	2/9/2021	9/8/2021	2/1/2022	9/2/2022	2/1/2023	8/10/2023	6/23/2016	8/30/2016	10/26/2016
	Boron	0.063 J	0.081	NA	0.083	0.059 J	0.064 J	<0.060	0.0597	0.0816	0.0714	NA	0.57	0.502
=	Calcium	9.5	9.6	NA	9.9	9.2	11	8.3	9.48	10.8	11.0	NA	46.0	44.3
×	Chloride	5.2	5.1	NA	5.6	6	5.9	5.7	5.44	6.00	6.50	5.9	5.5	6
ΔN	Fluoride	0.059 J	<0.1	<0.1	0.032 J	0.048 J	0.067 J	0.028 J	0.122	0.121	<0.0330	NA	0.099 J	0.57
APPENDIX III	Sulfate	15	16	NA	15	16	16	18	18.5	19.3	18.5	150	140	160
I٩	TDS	90	NA	NA	82	100	120	100	101	90.0	105	NA	350	357
	pH	5.53	5.61	6.16	5.65	5.66	5.59	5.14	5.68	5.70	5.55	NA	6.38	6.23
	Antimony	NA	NA	<0.002	NA	NA	<0.002	<0.00051	<0.00100	<0.00100	<0.00100	NA	<0.0025	< 0.003
	Arsenic	0.00042 J	NA	<0.001	<0.001	<0.001	<0.001	<0.00028	<0.00200	<0.00200	<0.00200	0.0011 J	0.002	0.0019 J
	Barium	0.075	NA	0.085	0.08	0.078	0.085	0.079	0.0806	0.0919	0.107	0.13	0.11	0.122
	Beryllium	NA	NA	0.00022 J	0.00019 J	<0.0025	<0.0025	<0.00027	<0.000200	<0.000200	0.000275 J	NA	<0.0025	< 0.003
	Cadmium	<0.001	NA	<0.0025	NA	<0.0025	<0.0025	<0.00022	<0.000300	<0.000300	<0.000300	<0.0025	<0.0025	<0.001
≥	Chromium	0.0057	NA	0.0063	0.0057	0.0059	0.0059	0.0054	0.00578 J	0.00682 J	0.00684 J	NA	<0.0025	<0.01
â	Cobalt	0.00039 J	0.00015 J	0.00064 J	0.00031 J	0.00038 J	0.0005 J	<0.00026	<0.000300	0.000458 J	0.000814 J	NA	0.0018 J	0.0018 J
APPENDIX IV	Lead	0.00033 J	NA	0.00039 J	0.00022 J	0.00033 J	0.00024 J	<0.00017	<0.000500	<0.000500	<0.000500	<0.0013	<0.0013	<0.005
APF	Lithium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0015 J	<0.00300	<0.00300	<0.00300	NA	0.0092	0.0071 J
	Mercury	NA	NA	<0.0002	NA	NA	<0.0002	<0.00013	<0.0000670	<0.0000670	<0.0000670	NA	<0.0002	<0.0005
	Molybdenum	NA	<0.015	<0.015	<0.015	<0.015	<0.015	<0.00061	<0.000200	<0.000200	<0.000200	NA	<0.015	<0.01
	Radium	0.072 U	NA	0.94	0.679	-0.0396 U	0.44 U	0.378 U	0.783 U	2.18	1.80	NA	0.832	1.27
	Selenium	0.0017 J	NA	0.0015 J	0.0016 J	0.0016 J	<0.005	0.0015 J	<0.00150	<0.00150	<0.00150	<0.0013	<0.0013	<0.01
	Thallium	NA	NA	<0.001	NA	NA	<0.001	<0.00047	<0.000600	<0.000600	<0.000600	NA	<0.0005	<0.001
*	Silver	<0.001	NA	NA	<0.001	<0.001	<0.001	<0.00022	<0.000300	<0.000300	<0.000300	<0.00025	NA	<0.01
	Total Alkalinity	NA	39	NA	NA	40	42	38	42.6	43.4	43.8	NA	NA	NA
	Bicarbonate Alkalinity	NA	39	NA	NA	40	42	38	42.6	43.4	43.8	NA	NA	NA
	Carbonate Alkalinity	NA	<5	NA	NA	<5	<5	<5.0	<1.45	<1.45	<0.725	NA	NA	NA
	Aluminum	NA	NA	NA	NA	NA	NA	NA	0.126	0.690	1.52	NA	NA	NA
RS	Iron, Dissolved	NA	NA	NA	NA	NA	NA	0.091	NA	<0.0330	0.0509 J	NA	NA	NA
L PARAMETERS	Iron, Total	NA	NA	NA	NA	NA	NA	NA	0.204	0.903	1.90	NA	NA	NA
¥	Manganese, Dissolved	NA	NA	NA	NA	NA	0.0039 J	0.0034 J	NA	0.00254 J	0.00319 J	NA	NA	NA
AR.	Manganese, Total	NA	0.0028 J	NA	NA	0.0022 J	0.018	NA	0.00519	0.0175	0.0285	NA	NA	NA
LP	Magnesium	NA	4.9	NA	NA	4.8	5.3	4.7	4.90	5.89	6.28	NA	NA	NA
ΙŽ	Potassium	NA	1.5	NA	NA	1.5	1.6	1.3	1.33	1.60	1.86	NA	NA	NA
ADDITION/	Sodium	NA	9.7	NA	NA	11	10	10	10.0	11.3	11.5	NA	NA	NA
JOC	Oxidation Reduction Potential	159.76	NA	NA	NA	NA	NA	NA	414.26	131.60	205.29	NA	5.50	6.10
¥	pH, Field	5.53	5.61	6.16	5.65	5.66	5.59	5.14	5.68	5.70	5.55	NA	6.38	6.23
	RDO Concentration	5.60	NA	NA	NA	NA	NA	NA	5.69	5.54	5.46	NA	0.23	0.16
	Specific Conductance, Field	NA	NA	NA	NA	NA	NA	NA	149.57	157.80	156.32	NA	NA	NA
	Temperature, Field	18.21	NA	NA	NA	NA	NA	NA	19.44	17.81	20.39	NA	23.72	22.94
	Turbidity, Field	4.79	NA	NA	NA	NA	NA	NA	6.51	35.90	21.5	NA	2.85	4.94

Notes:

1. Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

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SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright
Ash Pond 2 Dry Ash Stockpile
Macon, Georgia

							Well ID					
	Substance	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21
		1/25/2017	4/10/2017	6/19/2017	10/24/2017	4/10/2018	10/16/2018	3/27/2019	8/20/2019	10/8/2019	4/7/2020	6/25/2020
	Boron	0.56	0.54	0.54	0.57	0.61	0.59	0.65	NA	0.58	0.74	0.82
=	Calcium	50	52	55	56	51	57	58	NA	60	69	80
APPENDIX III	Chloride	5.4	5.1	5.2	4.9	4.8	5.1	4.4	NA	4.5	4.2	3.7
	Fluoride	0.12 J	0.11 J	0.11 J	0.1 J	0.094 J	0.17 J	0.05 J	0.098 J	0.065 J	0.12	0.041 J
PPE	Sulfate	150	140	160	160	170	170	170	NA	170	180	210
₹	TDS	320	380	370	420	370	380	400	NA	420	460	NA
	pH	6.15	5.99	5.95	6.02	6.12	6.12	6.2	6.08	6.11	5.96	5.98
	Antimony	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	NA	<0.002	NA	NA	NA
	Arsenic	0.0017	0.002	0.0026	0.0021	0.0022	0.0021	0.0011 J	0.002	0.0012 J	0.00054 J	NA
	Barium	0.12	0.11	0.13	0.12	0.12	0.1	0.091	0.1	0.096	0.05	NA
	Beryllium	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	NA	<0.001	NA	NA	NA
	Cadmium	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.001	<0.001	<0.001	NA
≥	Chromium	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	NA	0.0017 J	<0.002	<0.002	NA
ĺĜ	Cobalt	0.0017 J	0.0016 J	0.0021 J	0.0019 J	0.0019 J	0.0019 J	NA	0.0023	0.0018	0.00087	0.00097 J
APPENDIX	Lead	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.001	0.00015 J	0.00026 J	NA
AP	Lithium	0.0087	0.0074	0.0079	0.0097	0.012	0.01	NA	0.0098	0.015	0.011	0.013
	Mercury	0.000073 J	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	NA	<0.0002	NA	NA	NA
	Molybdenum	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	NA	<0.005	NA	NA	<0.015
	Radium	0.549	0.556	0.976	0.504	0.621	0.796	NA	0.978	0.588	0.433 U	NA
	Selenium	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.005	<0.005	<0.005	NA
	Thallium	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA	<0.001	NA	NA	NA
*	Silver	NA	<0.00025	NA	<0.0013	<0.0013	<0.0013	<0.0013	NA	0.00043 J	<0.001	NA
	Total Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	140
	Bicarbonate Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	140
	Carbonate Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5
	Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ERS	Iron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PARAMETERS	Iron, Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A	Manganese, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
۱	Manganese, Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.36
	Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	37
Ž	Potassium	NA	NA	NA 	NA	NA	NA 	NA 	NA	NA 	NA 	6.1
ĮĔ	Sodium	NA	NA 00.00	NA 0.00	NA 22.22	NA 110.00	NA 22.12	NA 07.00	NA 17.00	NA 24.22	NA	19
ADDITIONAL	Oxidation Reduction Potential	29.70	33.20	8.60	20.20	412.20	-26.40	67.60	47.30	84.60	96.09	NA 5.00
⋖	pH, Field	6.15	5.99	5.95	6.02	6.12	6.12	6.20	6.08	6.11	5.96	5.98
	RDO Concentration	0.55	0.46	0.26	0.18	0.31	0.22	1.71	0.67	0.36	0.31	NA
	Specific Conductance, Field	NA 10.10	NA 10.00	NA	NA 10.05	NA 10.00	NA 20.42	NA 10.00	NA 05.00	NA 24.22	NA 10.00	NA NA
	Temperature, Field	19.13	19.90	21.34	19.25	19.02	23.18	18.39	25.39	24.08	19.32	NA
L.	Turbidity, Field	4.36	2.78	4.25	4.37	1.26	4.75	4.90	4.88	3.32	4.82	NA

Notes:

1. Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

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^{2. &}lt; indicates the constituent was not detected above the analytical method detection limit (MDL).

^{3.} J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value. Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.

^{4.} TDS indicates total dissolved solids.

^{5.} U indicates the constituent was detected below the Minimum Detection Concentration (MDC) and the precision of the laboratory instruments could not produce a reliable value. Therefore, the value followed by U is qualified by the laboratory as estimated.

^{6. * -} Georgia Appendix I constituent that is not also included in Appendix IV.

^{7.} NA indicates constituent was not analyzed

SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

							We	II ID					
	Substance	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-21	ARGWC-22	ARGWC-22	ARGWC-22	ARGWC-22
		8/21/2020	10/1/2020	2/10/2021	9/8/2021	2/1/2022	9/1/2022	1/31/2023	8/9/2023	12/16/2019	1/14/2020	2/11/2020	3/9/2020
	Boron	NA	0.9	0.81	0.79	0.85	0.921	1.06	1.12	2.7	2.7	3	2.7
I≡	Calcium	NA	79	76	81	75	71.5	79.1	82.9	200	210	180	180
IX	Chloride	NA	4.3	4.3	4	3.4	3.34	3.30	3.35	5.8	5.5	9	11
APPENDIX	Fluoride	0.084 J	0.098 J	0.14	0.16	0.11	0.161	0.175 J	0.203	0.026 J	<0.1	0.056	0.064 J
PPE	Sulfate	NA	210	220	230	230	221	260	214	770	930	660	630
Į₹	TDS	NA	500	510	560	520	537	526	520	1300	1400	1300	1200
	рН	5.89	5.99	6.01	5.94	5.65	5.97	6.04	6.6	5.74	5.91	5.9	5.97
	Antimony	<0.002	NA	NA	<0.002	<0.00051	<0.00100	<0.00100	<0.00100	<0.002	<0.002	<0.002	<0.002
	Arsenic	<0.001	<0.001	<0.001	<0.001	<0.00028	0.00207 J	<0.00200	<0.00200	0.00066 J	0.00038 J	0.0004 J	<0.005
	Barium	0.054	0.051	0.044	0.045	0.045	0.0425	0.0414	0.0474	0.076	0.071	0.046	0.039
	Beryllium	<0.0025	<0.0025	<0.0025	<0.0025	<0.00027	<0.000200	<0.000200	<0.000200	0.0005 J	0.00036 J	0.00023	0.00019
	Cadmium	<0.0025	NA	<0.0025	<0.0025	<0.00022	<0.000300	<0.000300	<0.000300	<0.001	<0.001	<0.001	<0.0025
2	Chromium	<0.002	<0.002	<0.002	<0.002	<0.0015	<0.00300	<0.00300	<0.00300	<0.002	<0.002	0.0048	<0.002
Ē	Cobalt	0.00066 J	0.00082 J	0.00063 J	0.0007 J	0.00070 J	0.000690 J	0.000659 J	0.000813 J	0.018	0.0072	0.013	0.015
Ä	Lead	<0.001	<0.001	<0.001	<0.001	<0.00017	<0.000500	<0.000500	<0.000500	<0.001	0.00022 J	<0.001	<0.001
APPENDIX IV	Lithium	0.013	0.012	0.012	0.012	0.012	0.0116	0.0124	0.0131	0.027	0.034	0.01	0.0071
`	Mercury	<0.0002	NA	NA	<0.0002	<0.00013	<0.0000670	<0.0000670	<0.0000670	<0.0002	<0.0002	<0.0002	<0.0002
	Molybdenum	<0.015	<0.015	<0.015	<0.015	<0.00061	<0.000200	<0.000200	<0.000200	0.0018 J	0.0012 J	0.00093	0.00067
	Radium	0.472	0.496 U	0.625	1.12	0.398 U	1.57 U	3.25	2.69	0.229 U	0.783	0.229 U	0.365
	Selenium	<0.005	<0.005	<0.005	<0.005	<0.00074	<0.00150	<0.00150	<0.00150	<0.005	<0.005	<0.005	<0.025
	Thallium	<0.001	NA	NA	<0.001	<0.00047	<0.000600	<0.000600	<0.000600	0.00078 J	0.00027 J	0.00034	0.00035 J
*	Silver	NA	<0.001	<0.001	<0.001	<0.00022	<0.000300	<0.000300	<0.000300	NA	NA	NA	NA
	Total Alkalinity	NA	NA	150	160	150	162	159	162	NA	NA	NA	NA
	Bicarbonate Alkalinity	NA	NA	150	160	150	162	159	162	NA	NA	NA	NA
	Carbonate Alkalinity	NA	NA	<5	<5	<5.0	<1.45	<1.45	<0.725	NA	NA	NA	NA
	Aluminum	NA	NA	NA	NA	NA	0.0241 J	0.0275 J	0.0254 J	NA	NA	NA	NA
SS	Iron, Dissolved	NA	NA	NA	NA	0.49	NA	NA	0.808	NA	NA	NA	NA
PARAMETERS	Iron, Total	NA	NA	NA	NA	NA	0.887	0.747	0.719	NA	NA	NA	NA
Į₹	Manganese, Dissolved	NA	NA	NA	NA	0.30	NA	NA	0.351	NA	NA	NA	NA
AR/	Manganese, Total	NA	NA	0.33	0.34	NA	0.326	0.301	0.348	NA	NA	NA	NA
LP,	Magnesium	NA	NA	35	37	37	36.0	38.0	41.8	NA	NA	NA	NA
	Potassium	NA	NA	5.6	5.8	5.6	5.51	5.54	6.43	NA	NA	NA	NA
₽	Sodium	NA	NA	19	19	19	18.2	19.8	21.0	NA	NA	NA	NA
ADDITIONA	Oxidation Reduction Potential	NA	NA	NA	NA	NA	69.66	40.09	56.56	7.7	-47.30	-38.30	20.50
F	pH, Field	5.89	5.99	6.01	5.94	5.65	5.97	6.04	6.6	5.74	5.91	5.90	5.97
	RDO Concentration	NA	NA	NA	NA	NA	0.21	1.59	0.19	0.10	0.20	0.10	0.19
	Specific Conductance, Field	NA	NA	NA	NA	NA	771.11	722.77	735.67	NA	NA	NA	NA
	Temperature, Field	NA	NA	NA	NA	NA	21.33	20.22	20.28	19.70	18.20	19.53	18.57
L	Turbidity, Field	NA	NA	NA	NA	NA	4.41	3.26	2.81	3.90	4.10	3.78	4.50

Notes:

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

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^{1.} Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

^{2. &}lt; indicates the constituent was not detected above the analytical method detection limit (MDL).

^{3.} J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value. Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.

^{4.} TDS indicates total dissolved solids.

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SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright
Ash Pond 2 Dry Ash Stockpile
Macon, Georgia

								Well ID						
	Substance	ARGWC-22	ARGWC-22	ARGWC-22	ARGWC-22	ARGWC-22								
		4/7/2020	5/27/2020	6/24/2020	7/15/2020	8/19/2020	9/22/2020	9/30/2020	2/10/2021	9/10/2021	2/2/2022	9/6/2022	1/31/2023	8/8/2023
	Boron	2.6	2.5	2.5	2.6	1.3	2.8	2.9	2.5	2.7	2.4	2.78	2.77	3.06
=	Calcium	190	200	180	190	220	190	200	200	200	190	162	207	196
×	Chloride	8.1	7.3	5.7	6	5.7	7.1	8	7.4	6.7	6.3	8.34	5.88	6.79
APPENDIX III	Fluoride	0.068 J	0.06 J	0.048 J	0.04 J	<0.1	0.049 J	0.045 J	0.055 J	0.035 J	0.040 J	0.0560 J	0.0979 J	<0.0660
PE	Sulfate	710	720	810	820	1000	720	650	750	760	720	667	751	719
₹	TDS	1300	1300	NA	1400	1400	1300	1200	1200	1300	1200	1180	1320	1220
	рН	5.84	5.69	5.82	5.58	6.21	5.77	5.81	5.68	5.62	5.70	5.88	5.61	5.61
	Antimony	NA	<0.002	NA	<0.002	<0.002	<0.002	NA	NA	<0.002	<0.00051	<0.00100	<0.00100	<0.00100
	Arsenic	<0.001	<0.001	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00028	<0.00200	0.00221 J	<0.00200
	Barium	0.04	0.054	NA	0.043	0.046	0.038	0.033	0.032	0.026	0.025	0.0226	0.0237	0.0255
	Beryllium	NA	0.00018 J	NA	<0.0025	<0.0025	<0.001	<0.0025	<0.0025	<0.0025	<0.00027	<0.000200	<0.000200	<0.000200
	Cadmium	<0.001	<0.0025	NA	<0.0025	<0.0025	<0.001	NA	<0.0025	<0.0025	<0.00022	<0.000300	<0.000300	<0.000300
≥	Chromium	<0.002	<0.002	NA	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0015	<0.00300	<0.00300	<0.00300
ΙĜ	Cobalt	0.009	0.0059	0.0047	0.0027	0.0032	0.0085	0.0055	0.0015 J	0.0015 J	0.0010 J	0.00198	0.00154	0.00184
APPENDIX IV	Lead	0.00014 J	<0.001	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00017	<0.000500	<0.000500	<0.000500
API	Lithium	0.012	0.017	0.023	0.021	0.026	0.014	0.014	0.022	0.021	0.020	0.0136	0.0284	0.0280
	Mercury	NA	<0.0002	NA	<0.0002	<0.0002	<0.0002	NA	NA	<0.0002	<0.00013	<0.0000670	<0.0000670	<0.0000670
	Molybdenum	NA	<0.015	<0.015	<0.015	<0.015	<0.005	<0.015	<0.015	<0.015	<0.00061	0.000203 J	0.000496 J	0.000514 J
	Radium	0.567	0.143 U	NA	0.97	0.587 U	0.884	0.602	0.233 U	0.713	0.587 U	2.58	2.20	1.22 U
	Selenium	<0.005	<0.005	NA	<0.005	<0.005	<0.005	<0.005	<0.005	0.002 J	<0.00074	<0.00150	<0.00150	<0.00150
	Thallium	NA	<0.001	NA	<0.001	<0.001	<0.001	NA	NA	<0.001	<0.00047	<0.000600	<0.000600	<0.000600
*	Silver	<0.001	NA	NA	NA	NA	NA	<0.001	<0.001	<0.001	<0.00022	<0.000300	<0.000300	<0.000300
	Total Alkalinity	NA	NA	96	NA	NA	NA	NA	120	110	120	162	90.2	117
	Bicarbonate Alkalinity	NA	NA	96	NA	NA	NA	NA	120	110	120	162	90.2	117
	Carbonate Alkalinity	NA	NA	<5	NA	NA	NA	NA	<5	<5	<5.0	<1.45	<1.45	<0.725
	Aluminum	NA	NA	<0.0193	<0.0193	0.0513								
RS.	Iron, Dissolved	NA	6.3	NA	NA	3.67								
L PARAMETERS	Iron, Total	NA	NA	10.1	2.16	2.73								
₽	Manganese, Dissolved	NA	12	11	NA	NA	13.1							
AR	Manganese, Total	NA	NA	16	NA	NA	NA	NA	14	12	NA	19.5	10.5	12.4
<u> </u>	Magnesium	NA	NA	87	NA	NA	NA	NA	80	83	79	75.0	84.5	85.0
ΙŽ	Potassium	NA	NA	4.6	NA	NA	NA	NA	4.4	4.4	4.3	3.93	4.70	5.10
ΙĔ	Sodium	NA	NA	26	NA	NA	NA	NA	26	26	26	23.9	28.7	29.2
ADDITION/	Oxidation Reduction Potential	29.12	NA	NA	22.01	51.09	60.49							
٨	pH, Field	5.84	5.69	5.82	5.58	6.21	5.77	5.81	5.68	5.62	5.70	5.88	5.61	5.61
	RDO Concentration	0.15	NA	NA	0.18	0.17	0.2							
	Specific Conductance, Field	NA	NA	1397.40	1430.31	1457.19								
	Temperature, Field	18.55	NA	NA	20.83	18.71	20.17							
	Turbidity, Field	4.54	NA	NA	4.68	1.36	2.93							

Notes:

1. Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

- 2. < indicates the constituent was not detected above the analytical method detection limit (MDL).
- 3. J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value.
- Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.
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Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

							Well ID					
	Substance	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23
		12/16/2019	1/14/2020	2/11/2020	3/9/2020	4/7/2020	5/27/2020	6/25/2020	7/15/2020	8/20/2020	9/22/2020	10/1/2020
	Boron	0.42	0.43	0.079 J	0.25	0.44	0.45	0.42	0.49	0.44	0.5	0.49
=	Calcium	69	65	10	46	65	69	72	68	69	66	73
×	Chloride	3.9	4	4.7	3.7	3.8	4	3.4	3.9	3.9	3.6	3.8
PPENDIX III	Fluoride	0.18 J	0.21	0.13	0.089 J	0.18	0.25	0.25	0.28	0.19	0.33	0.32
ЪЕ	Sulfate	66	68	18	49	58	65	77	78	69	68	64
Ā	TDS	320	340	110	210	290	320	NA	310	310	310	290
	рН	6.41	6.62	6.71	6.32	6.4	6.3	6.37	6.36	6.33	6.29	6.38
	Antimony	<0.002	<0.002	<0.002	<0.002	NA	<0.002	NA	<0.002	<0.002	<0.002	NA
	Arsenic	0.00075 J	0.00042 J	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001	<0.001
	Barium	0.096	0.075	0.046	0.14	0.16	0.18	NA	0.16	0.16	0.16	0.17
	Beryllium	0.00033 J	<0.001	<0.001	<0.0025	NA	<0.0025	NA	<0.0025	<0.0025	<0.001	<0.0025
	Cadmium	<0.001	<0.001	<0.001	<0.0025	<0.001	<0.0025	NA	<0.0025	<0.0025	<0.001	NA
≥	Chromium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	NA	<0.002	<0.002	<0.002	<0.002
â	Cobalt	0.0023	0.0031	0.00056	0.00061 J	0.0016	0.0017 J	0.0014 J	0.0017 J	0.0023 J	0.0036	0.0052
ΜŽ	Lead	<0.001	0.00018 J	0.00026 J	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001	<0.001
APPENDIX	Lithium	0.02	0.022	0.0078	0.013	0.032	0.037	0.043	0.042	0.036	0.039	0.04
	Mercury	<0.0002	<0.0002	<0.0002	<0.0002	NA	<0.0002	NA	<0.0002	<0.0002	<0.0002	<0.0002
	Molybdenum	0.025	0.032	0.021	0.013 J	NA	0.048	0.055	0.055	0.061	0.053	0.064
	Radium	0.166 U	0.869	0.0291 U	0.626	0.296 U	0.192 U	NA	0.279 U	0.242 U	0.0177 U	0.749
	Selenium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.005	<0.005	<0.005	< 0.005
	Thallium	<0.001	<0.001	0.00028 J	0.00026 J	NA	0.00026 J	NA	<0.001	<0.001	<0.001	NA
*	Silver	NA	NA	NA	NA	<0.001	NA	NA	NA	NA	NA	<0.001
	Total Alkalinity	NA	NA	NA	NA	NA	NA	160	NA	NA	NA	NA
	Bicarbonate Alkalinity	NA	NA	NA	NA	NA	NA	160	NA	NA	NA	NA
	Carbonate Alkalinity	NA	NA	NA	NA	NA	NA	<5	NA	NA	NA	NA
	Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RS.	Iron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PARAMETERS	Iron, Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
¥	Manganese, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AR	Manganese, Total	NA	NA	NA	NA	NA	NA	0.62	NA	NA	NA	NA
L P.	Magnesium	NA	NA	NA	NA	NA	NA	13	NA	NA	NA	NA
Ž	Potassium	NA	NA	NA	NA	NA	NA	2.4	NA	NA	NA	NA
₽	Sodium	NA	NA	NA	NA	NA	NA	14	NA	NA	NA	NA
ADDITION	Oxidation Reduction Potential	-59.20	8.39	70.04	112.20	81.22	NA	NA	NA	NA	NA	NA
 	pH, Field	6.41	6.62	6.71	6.32	6.40	6.30	6.37	6.36	6.33	6.29	6.38
	RDO Concentration	0.20	0.40	2.91	0.31	0.19	NA	NA	NA	NA	NA	NA
	Specific Conductance, Field	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Temperature, Field	22.30	19.40	19.81	19.88	19.88	NA	NA	NA	NA	NA	NA
	Turbidity, Field	3.10	4.90	9.78	2.43	4.66	NA	NA	NA	NA	NA	NA

Notes:

1. Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

- 2. < indicates the constituent was not detected above the analytical method detection limit (MDL).
- 3. J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value. Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.
- 4. TDS indicates total dissolved solids.
- 5. U indicates the constituent was detected below the Minimum Detection Concentration (MDC) and the precision of the laboratory instruments could not produce a reliable value. Therefore, the value followed by U is qualified by the laboratory as estimated.
- 6. * Georgia Appendix I constituent that is not also included in Appendix IV.
- 7. NA indicates constituent was not analyzed

Geochemical Conceptual Site Model Report Page 11 of 12

SUMMARY OF RELEVANT GROUNDWATER AND CCR PORE WATER ANALYTICAL AND FIELD DATA (2016-2023)

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

					W	ell ID			
	Substance	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARGWC-23	ARK-STN-TW22	ARK-STN-TW22
		2/10/2021	9/9/2021	2/3/2022	9/6/2022	1/31/2023	8/8/2023	4/26/2023	8/10/2023
	Boron	0.42	0.41	0.49	0.458	0.459	0.379	3.17	5.65
=	Calcium	67	70	71	65.2	69.9	66.6	352	374
APPENDIX III	Chloride	4.6	4.7	4.4	3.73	3.84	3.60	10.5	4.92
2	Fluoride	0.41	0.48	0.40	0.362	0.551 J	0.283	NA	0.123
PPE	Sulfate	67	72	64	65.3	55.5	69.8	1190	1040
₹	TDS	290	320	320	305	299	294	NA	NA
	рН	6.37	6.35	6.44	6.41	6.46	6.33	6.48	6.35
	Antimony	NA	<0.002	<0.00051	<0.00100	<0.00100	<0.00100	NA	NA
	Arsenic	<0.001	<0.001	0.00030 J	<0.00200	<0.00200	<0.00200	0.191	0.172
	Barium	0.13	0.12	0.10	0.0939	0.0872	0.0936	NA	NA
	Beryllium	<0.0025	<0.0025	<0.00027	<0.000200	<0.000200	<0.000200	NA	NA
	Cadmium	<0.0025	<0.0025	<0.00022	<0.000300	<0.000300	<0.000300	NA	NA
⋛	Chromium	<0.002	<0.002	<0.0015	<0.00300	<0.00300	<0.00300	NA	NA
APPENDIX IV	Cobalt	0.00072 J	0.0009 J	0.00063 J	0.000588 J	0.000742 J	0.000440 J	0.0396	0.0238
Ä	Lead	<0.001	<0.001	<0.00017	<0.000500	<0.000500	<0.000500	NA	NA
APF	Lithium	0.044	0.045	0.052	0.0578	0.0499	0.0517	0.138	0.247
•	Mercury	NA	<0.0002	<0.00013	<0.0000670	<0.0000670	<0.0000670	NA	<0.0000670
	Molybdenum	0.063	0.071	0.065	0.0670	0.0671	0.0618	0.00294	0.00367
	Radium	0.0408 U	0.498	0.612 U	2.36 U	0.859 U	0.363 U	NA	NA
	Selenium	<0.005	<0.005	<0.00074	<0.00150	<0.00150	<0.00150	NA	NA
	Thallium	NA	<0.001	<0.00047	<0.000600	<0.000600	<0.000600	NA	NA
*	Silver	<0.001	<0.001	<0.00022	<0.000300	<0.000300	<0.000300	NA	NA
	Total Alkalinity	180	190	180	180	180	175	213	170
	Bicarbonate Alkalinity	180	190	180	180	180	175	213	170
	Carbonate Alkalinity	<5	<5	<5.0	<1.45	<1.45	<0.725	<1.45	<0.725
	Aluminum	NA	NA	NA	<0.0193	0.0244 J	<0.0193	0.297	0.591
RS	Iron, Dissolved	NA	NA	<0.028	NA	NA	<0.0330	NA	16.6
	Iron, Total	NA	NA	NA	<0.0330	0.0446 J	0.0491 J	34.3	38.2
Z	Manganese, Dissolved	NA	0.5	0.080	NA	NA	0.273	NA	10.6
PARAMETERS	Manganese, Total	0.23	0.53	NA	0.417	0.0628	0.278	13.3	11.5
LP	Magnesium	12	13	12	11.6	12.3	10.5	44.3	33.5
~	Potassium	2	2	1.8	1.79	1.77	1.68	49.8	48.6
읃	Sodium	14	15	14	14.3	14.6	13.3	20.7	19.8
ADDITION/	Oxidation Reduction Potential	NA	NA	NA	134.81	92.33	60.24	-57.80	-54.64
A	pH, Field	6.37	6.35	6.44	6.41	6.46	6.33	6.48	6.35
	RDO Concentration	NA	NA	NA	0.16	2.97	0.13	7.29	6.87
	Specific Conductance, Field	NA	NA	NA	483.73	489.76	480.84	2066.80	2080.81
	Temperature, Field	NA	NA	NA	23.16	19.55	23.7	19.68	31.95
	Turbidity, Field	NA	NA	NA	1.14	1.04	2.11	50.50	47

Notes:

1. Results for constituents are reported in milligrams per liter (mg/L). Radium results are reported in picocuries per liter (pCi/L).

Temperature reported in (deg C). Specific Conductance reported in microsiemens per centimeter (uS/cm). Turbidity reported in (NTU). ORP reported in millivolts (mV).

- 2. < indicates the constituent was not detected above the analytical method detection limit (MDL).
- 3. J indicates the constituent was detected at such low levels that the precision of the laboratory instrument could not produce a reliable value.
- Therefore, the value displayed (value J) is qualified by the laboratory as an estimated number.
- 4. TDS indicates total dissolved solids.
- 5. U indicates the constituent was detected below the Minimum Detection Concentration (MDC) and the precision of the laboratory instruments could not produce a reliable value. Therefore, the value followed by U is qualified by the laboratory as estimated.
- 6. * Georgia Appendix I constituent that is not also included in Appendix IV.
- 7. NA indicates constituent was not analyzed

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APPENDIX B LABORATORY REPORTS

Analytical Report Laboratory Job ID: 180-126590-1

August 2021

Eurofins



Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, Pittsburgh 301 Alpha Drive **RIDC Park** Pittsburgh, PA 15238 Tel: (412)963-7058

Laboratory Job ID: 180-126590-1

Client Project/Site: Plant Arkwright MNA AP-2 DAS

For:

Southern Company 241 Ralph McGill Blvd SE B10185 Atlanta, Georgia 30308

Attn: Joju Abraham

Authorized for release by: 10/19/2021 6:00:23 PM

Shali Brown, Project Manager II (615)301-5031

Shali.Brown@Eurofinset.com

----- LINKS -----

Review your project results through Total Access

Have a Question?



Visit us at:

www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

PA Lab ID: 02-00416

Client: Southern Company Project/Site: Plant Arkwright MNA AP-2 DAS Laboratory Job ID: 180-126590-1

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Case Narrative

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Job ID: 180-126590-1

Laboratory: Eurofins TestAmerica, Pittsburgh

Narrative

Job Narrative 180-126590-1

Comments

No additional comments.

Receipt

The samples were received on 9/2/2021 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 4.2° C.

GC Semi VOA

Method Lloyd Kahn: Please note that the reporting limit for Lloyd Kahn TOC analysis is a nominal value and does not reflect adjustments in sample mass processed on an individual basis. SB-3-15-25 (180-126590-2) and (180-126406-B-2 MS)

Method Lloyd Kahn: Please note that the reporting limit for Lloyd Kahn TOC analysis is a nominal value and does not reflect adjustments in sample mass processed on an individual basis. SB-1-24.6-34.6 (180-126590-1), SB-4-12-22 (180-126590-3) and SB-5-15-25 (180-126590-4)

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

Metals

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

General Chemistry

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

Geotechnical

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

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Job ID: 180-126590-1

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Definitions/Glossary

Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

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** Detection Limit (DoD/DOE) DL

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)

Extincted Detection Limit (Dioxin)

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

10/19/2021

Accreditation/Certification Summary

Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Laboratory: Eurofins TestAmerica, Pittsburgh

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

Authority	Program	Identification Number	Expiration Date
Arkansas DEQ	State	19-033-0	06-27-21 *
California	State	2891	04-30-22
Connecticut	State	PH-0688	09-30-22
Florida	NELAP	E871008	09-14-21
Georgia	State	PA 02-00416	09-14-21
Illinois	NELAP	004375	09-14-21
Kansas	NELAP	E-10350	09-14-21
Kentucky (UST)	State	162013	04-30-22
Kentucky (WW)	State	KY98043	12-31-21
Louisiana	NELAP	04041	09-14-21
Maine	State	PA00164	03-06-22
Minnesota	NELAP	042-999-482	09-14-21
Nevada	State	PA00164	08-31-22
New Hampshire	NELAP	2030	04-05-22
New Jersey	NELAP	PA005	09-14-21
New York	NELAP	11182	09-14-21
North Carolina (WW/SW)	State	434	12-31-21
North Dakota	State	R-227	09-14-21
Oregon	NELAP	PA-2151	02-06-22
Pennsylvania	NELAP	02-00416	09-14-21
Rhode Island	State	LAO00362	12-31-21
South Carolina	State	89014	04-30-22
Texas	NELAP	T104704528	09-14-21
USDA	Federal	P-Soil-01	06-26-22
USDA	US Federal Programs	P330-16-00211	06-26-22
Utah	NELAP	PA001462019-8	09-14-21
Virginia	NELAP	10043	09-14-21
West Virginia DEP	State	142	09-14-21
Wisconsin	State	998027800	08-31-22

Laboratory: Eurofins TestAmerica, Burlington

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

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2336	02-25-23
Connecticut	State	PH-0751	09-30-21
DE Haz. Subst. Cleanup Act (HSCA)	State	N/A	05-17-22
Florida	NELAP	E87467	06-30-22
Minnesota	NELAP	050-999-436	12-31-21
New Hampshire	NELAP	2006	12-18-21
New Jersey	NELAP	VT972	06-30-22
New York	NELAP	10391	04-01-22
Pennsylvania	NELAP	68-00489	04-30-22
Rhode Island	State	LAO00298	12-30-21
US Fish & Wildlife	US Federal Programs	058448	07-31-22
USDA	US Federal Programs	P330-17-00272	10-30-23
Vermont	State	VT4000	02-10-22
Virginia	NELAP	460209	12-14-21
Wisconsin	State	399133350	08-31-22

Laboratory: Eurofins Xenco, Corpus Christi

Eurofins TestAmerica, Pittsburgh

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10/19/2021

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 $^{^{\}star} \ \text{Accreditation/Certification renewal pending - accreditation/certification considered valid}.$

Accreditation/Certification Summary

Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Laboratory: Eurofins Xenco, Corpus Christi (Continued)

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

Authority	Program	Identification Number	Expiration Date
Louisiana	NELAP	05094	06-30-22
Oklahoma	State	2021-016	08-31-22
Texas	NELAP	T104704210-21-28	03-31-22

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Sample Summary

Client: Southern Company Project/Site: Plant Arkwright MNA AP-2 DAS Job ID: 180-126590-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
180-126590-1	SB-1-24.6-34.6	Solid	08/31/21 17:40	09/02/21 09:30
180-126590-2	SB-3-15-25	Solid	08/30/21 18:00	09/02/21 09:30
180-126590-3	SB-4-12-22	Solid	08/31/21 12:00	09/02/21 09:30
180-126590-4	SB-5-15-25	Solid	08/31/21 13:25	09/02/21 09:30

Method Summary

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Method	Method Description	Protocol	Laboratory
9081	Cation Exchange Capacity (CEC)	SW846	XEN CC
EPA-Lloyd Kahn	Organic Carbon, Total (TOC)	EPA	TAL PIT
D422	Grain Size	ASTM	TAL BUR
9081	Cation Exchange Capacity (CEC)	SW846	XEN CC

Protocol References:

ASTM = ASTM International

EPA = US Environmental Protection Agency

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

Laboratory References:

TAL BUR = Eurofins TestAmerica, Burlington, 530 Community Drive, Suite 11, South Burlington, VT 05403, TEL (802)660-1990

TAL PIT = Eurofins TestAmerica, Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

XEN CC = Eurofins Xenco, Corpus Christi, 1733 N. Padre Island Drive, Corpus Christi, TX 78408, TEL (361)289-2471

Job ID: 180-126590-1

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Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-1-24.6-34.6

Date Collected: 08/31/21 17:40

Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-1

Matrix: Solid

Job ID: 180-126590-1

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	D422		1			171682	09/16/21 19:23	CPF	TAL BUR
	Instrumer	nt ID: D422_import								

Client Sample ID: SB-1-24.6-34.6

Date Collected: 08/31/21 17:40 Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-1

Matrix: Solid Percent Solids: 60.6

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	9081			4.050 g	100 mL	188917	09/14/21 09:45	LR	XEN CC
Total/NA	Analysis Instrumer	9081 nt ID: NOEQUIP		1			188941	09/15/21 08:46	AKM	XEN CC
Total/NA	Analysis Instrumer	EPA-Lloyd Kahn nt ID: FLASHEA		1			370561	09/07/21 17:31	DLF	TAL PIT

Client Sample ID: SB-3-15-25

Date Collected: 08/30/21 18:00

Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-2

Matrix: Solid

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	D422		1			171682	09/16/21 19:25	CPF	TAL BUR
	Instrument	ID: D422 import								

Client Sample ID: SB-3-15-25

Date Collected: 08/30/21 18:00

Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-2 **Matrix: Solid** Percent Solids: 85.5

Lab Sample ID: 180-126590-3

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	9081			4.005 g	100 mL	188917	09/14/21 09:45	LR	XEN CC
Total/NA	Analysis Instrumer	9081 nt ID: NOEQUIP		1			188941	09/15/21 08:46	AKM	XEN CC
Total/NA	Analysis Instrumer	EPA-Lloyd Kahn nt ID: FLASHEA		1			370393	09/03/21 22:53	DLF	TAL PIT

Client Sample ID: SB-4-12-22

Date Collected: 08/31/21 12:00

Date Received: 09/02/21 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D422		1			171682	09/16/21 19:28	CPF	TAL BUR
	Instrumen	t ID: D422 import								

Matrix: Solid

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-4-12-22

Lab Sample ID: 180-126590-3 Date Collected: 08/31/21 12:00 **Matrix: Solid**

Job ID: 180-126590-1

Date Received: 09/02/21 09:30 Percent Solids: 83.5

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	9081			4.250 g	100 mL	188958	09/15/21 10:15	LR	XEN CC
Total/NA	Analysis Instrumer	9081 at ID: NOEQUIP		1			188999	09/16/21 14:18	AKM	XEN CC
Total/NA	Analysis Instrumer	EPA-Lloyd Kahn at ID: FLASHEA		1			370561	09/07/21 19:51	DLF	TAL PIT

Lab Sample ID: 180-126590-4 Client Sample ID: SB-5-15-25

Date Collected: 08/31/21 13:25 **Matrix: Solid** Date Received: 09/02/21 09:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	D422		1			171682	09/16/21 19:29	CPF	TAL BUR
	Instrumer	t ID: D422_import								

Lab Sample ID: 180-126590-4 Client Sample ID: SB-5-15-25

Date Collected: 08/31/21 13:25 **Matrix: Solid**

Date Received: 09/02/21 09:30 Percent Solids: 93.2

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	9081			4.282 g	100 mL	188958	09/15/21 10:15	LR	XEN CC
Total/NA	Analysis Instrumer	9081 at ID: NOEQUIP		1			188999	09/16/21 14:18	AKM	XEN CC
Total/NA	Analysis Instrumer	EPA-Lloyd Kahn at ID: FLASHEA		1			370561	09/07/21 20:08	DLF	TAL PIT

Laboratory References:

TAL BUR = Eurofins TestAmerica, Burlington, 530 Community Drive, Suite 11, South Burlington, VT 05403, TEL (802)660-1990 TAL PIT = Eurofins TestAmerica, Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058 XEN CC = Eurofins Xenco, Corpus Christi, 1733 N. Padre Island Drive, Corpus Christi, TX 78408, TEL (361)289-2471

Analyst References:

Lab: TAL BUR

Batch Type: Analysis CPF = Fred Cota

Lab: TAL PIT

Batch Type: Analysis DLF = Donald Ferguson

Lab: XEN CC

Batch Type: Prep LR = Lucas Risner Batch Type: Analysis

AKM = Andrea Martinez

Eurofins TestAmerica, Pittsburgh

Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-1-24.6-34.6

Date Received: 09/02/21 09:30

Finer

Lab Sample ID: 180-126590-1 Date Collected: 08/31/21 17:40

Matrix: Solid

Method: D422 - Grain Size Analyte RL MDL Dil Fac Result Qualifier Unit D Prepared Analyzed Gravel 09/16/21 19:23 0.0 Sieve Size 3 inch - Percent Finer 100.0 % Passing 09/16/21 19:23 Sand 53.3 09/16/21 19:23 % Passing Sieve Size 2 inch - Percent Finer 100.0 09/16/21 19:23 09/16/21 19:23 **Coarse Sand** 0.0 % Passing Sieve Size 1.5 inch - Percent Finer 100.0 09/16/21 19:23 20.4 09/16/21 19:23 **Medium Sand** % Passing 09/16/21 19:23 Sieve Size 1 inch - Percent Finer 100.0 **Fine Sand** 32.9 09/16/21 19:23 Sieve Size 0.75 inch - Percent 100.0 % Passing 09/16/21 19:23 Finer 09/16/21 19:23 Sieve Size 0.375 inch - Percent 100.0 % Passing **Finer** Silt 31.7 09/16/21 19:23 Clay % 09/16/21 19:23 15.0 Sieve Size #4 - Percent Finer 100.0 % Passing 09/16/21 19:23 Sieve Size #10 - Percent Finer % Passing 09/16/21 19:23 100.0 Sieve Size #20 - Percent Finer 91.8 % Passing 09/16/21 19:23 Sieve Size #40 - Percent Finer 79.6 % Passing 09/16/21 19:23 Sieve Size #60 - Percent Finer 67.0 % Passing 09/16/21 19:23 Sieve Size #80 - Percent Finer 60.0 % Passing 09/16/21 19:23 Sieve Size #100 - Percent Finer % Passing 09/16/21 19:23 56.3 09/16/21 19:23 Sieve Size #200 - Percent Finer 46.7 % Passing 09/16/21 19:23 **Hydrometer Reading 1 - Percent** 39.7 % Passing **Finer** % Passing 09/16/21 19:23 **Hydrometer Reading 2 - Percent** 34.7 09/16/21 19:23 **Hydrometer Reading 3 - Percent** 26.5 % Passing **Hydrometer Reading 4 - Percent** 19.9 % Passing 09/16/21 19:23 **Hydrometer Reading 5 - Percent** 15.0 % Passing 09/16/21 19:23 09/16/21 19:23 **Hydrometer Reading 6 - Percent** 8.4 % Passing 09/16/21 19:23 **Hydrometer Reading 7 - Percent** 4.3 % Passing

Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-1-24.6-34.6 Lab Sample ID: 180-126590-1

Date Collected: 08/31/21 17:40

Matrix: Solid
Date Received: 09/02/21 09:30

Percent Solids: 60.6

General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity	54		0.082	0.082	meq/100gm	⊅	09/14/21 09:45	09/15/21 08:46	1
Total Organic Carbon - Duplicates	<1200		1600	1200	mg/Kg	₩		09/07/21 17:31	1

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Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-3-15-25

Date Collected: 08/30/21 18:00 Date Received: 09/02/21 09:30

Hydrometer Reading 7 - Percent

Finer

6.2

Lab Sample ID: 180-126590-2

Matrix: Solid

Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gravel	11.2			%			09/16/21 19:25	1
Sieve Size 3 inch - Percent Finer	100.0			% Passing			09/16/21 19:25	1
Sand	67.6			%			09/16/21 19:25	1
Sieve Size 2 inch - Percent Finer	100.0			% Passing			09/16/21 19:25	1
Coarse Sand	8.1			%			09/16/21 19:25	1
Sieve Size 1.5 inch - Percent Finer	100.0			% Passing			09/16/21 19:25	1
Medium Sand	29.0			%			09/16/21 19:25	1
Sieve Size 1 inch - Percent Finer	100.0			% Passing			09/16/21 19:25	1
Fine Sand	30.5			%			09/16/21 19:25	1
Sieve Size 0.75 inch - Percent Finer	100.0			% Passing			09/16/21 19:25	1
Sieve Size 0.375 inch - Percent Finer	94.4			% Passing			09/16/21 19:25	1
Silt	12.0			%			09/16/21 19:25	1
Clay	9.2			%			09/16/21 19:25	1
Sieve Size #4 - Percent Finer	88.8			% Passing			09/16/21 19:25	1
Sieve Size #10 - Percent Finer	80.7			% Passing			09/16/21 19:25	1
Sieve Size #20 - Percent Finer	65.4			% Passing			09/16/21 19:25	1
Sieve Size #40 - Percent Finer	51.7			% Passing			09/16/21 19:25	1
Sieve Size #60 - Percent Finer	42.5			% Passing			09/16/21 19:25	1
Sieve Size #80 - Percent Finer	36.7			% Passing			09/16/21 19:25	1
Sieve Size #100 - Percent Finer	32.8			% Passing			09/16/21 19:25	1
Sieve Size #200 - Percent Finer	21.2			% Passing			09/16/21 19:25	1
Hydrometer Reading 1 - Percent Finer	18.3			% Passing			09/16/21 19:25	1
Hydrometer Reading 2 - Percent Finer	16.0			% Passing			09/16/21 19:25	1
Hydrometer Reading 3 - Percent Finer	13.0			% Passing			09/16/21 19:25	1
Hydrometer Reading 4 - Percent Finer	11.5			% Passing			09/16/21 19:25	1
Hydrometer Reading 5 - Percent Finer	9.2			% Passing			09/16/21 19:25	1
Hydrometer Reading 6 - Percent	8.5			% Passing			09/16/21 19:25	1

% Passing

09/16/21 19:25

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Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-3-15-25 Lab Sample ID: 180-126590-2

Date Collected: 08/30/21 18:00 Matrix: Solid

Date Received: 09/02/21 09:30 Percent Solids: 85.5

General Chemistry								
Analyte	Result Qualif	fier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity	14	0.058	0.058	meq/100gm	₩	09/14/21 09:45	09/15/21 08:46	1
Total Organic Carbon - Duplicates	6800	1200	870	mg/Kg	₩		09/03/21 22:53	1

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Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-4-12-22

Date Collected: 08/31/21 12:00

Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-3

Matrix: Solid

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gravel	15.2				%			09/16/21 19:28	1
Sieve Size 3 inch - Percent Finer	100.0				% Passing			09/16/21 19:28	1
Sand	77.4				%			09/16/21 19:28	1
Sieve Size 2 inch - Percent Finer	100.0				% Passing			09/16/21 19:28	1
Coarse Sand	15.2				%			09/16/21 19:28	1
Sieve Size 1.5 inch - Percent Finer	100.0				% Passing			09/16/21 19:28	1
Medium Sand	35.9				%			09/16/21 19:28	1
Sieve Size 1 inch - Percent Finer	100.0				% Passing			09/16/21 19:28	1
Fine Sand	26.3				%			09/16/21 19:28	1
Sieve Size 0.75 inch - Percent Finer	100.0				% Passing			09/16/21 19:28	1
Sieve Size 0.375 inch - Percent Finer	92.8				% Passing			09/16/21 19:28	1
Silt	4.5				%			09/16/21 19:28	1
Clay	2.9				%			09/16/21 19:28	1
Sieve Size #4 - Percent Finer	84.8				% Passing			09/16/21 19:28	1
Sieve Size #10 - Percent Finer	69.6				% Passing			09/16/21 19:28	1
Sieve Size #20 - Percent Finer	50.1				% Passing			09/16/21 19:28	1
Sieve Size #40 - Percent Finer	33.7				% Passing			09/16/21 19:28	1
Sieve Size #60 - Percent Finer	22.5				% Passing			09/16/21 19:28	1
Sieve Size #80 - Percent Finer	16.6				% Passing			09/16/21 19:28	1
Sieve Size #100 - Percent Finer	13.7				% Passing			09/16/21 19:28	1
Sieve Size #200 - Percent Finer	7.4				% Passing			09/16/21 19:28	1
Hydrometer Reading 1 - Percent Finer	6.9				% Passing			09/16/21 19:28	1
Hydrometer Reading 2 - Percent Finer	5.2				% Passing			09/16/21 19:28	1
Hydrometer Reading 3 - Percent Finer	4.1				% Passing			09/16/21 19:28	1
Hydrometer Reading 4 - Percent Finer	3.5				% Passing			09/16/21 19:28	1
Hydrometer Reading 5 - Percent Finer	2.9				% Passing			09/16/21 19:28	1
Hydrometer Reading 6 - Percent Finer	2.4				% Passing			09/16/21 19:28	1
Hydrometer Reading 7 - Percent Finer	1.8				% Passing			09/16/21 19:28	1

10/19/2021

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Client Sample Results

Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-4-12-22 Lab Sample ID: 180-126590-3

Date Collected: 08/31/21 12:00 Matrix: Solid
Date Received: 09/02/21 09:30 Percent Solids: 83.5

General Chemistry
Applyto Popult Qualifier PI MDI Unit D Propered Applytod Dil Fac

Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac © 09/15/21 10:15 09/16/21 14:18 **Cation Exchange Capacity** 0.060 0.060 meq/100gm 8.9 Total Organic Carbon - Duplicates <890 1200 890 mg/Kg 09/07/21 19:51 ₩

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Client Sample Results

Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-5-15-25

Lab Sample ID: 180-126590-4

Date Collected: 08/31/21 13:25 **Matrix: Solid** Date Received: 09/02/21 09:30

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gravel	4.0				%			09/16/21 19:29	1
Sieve Size 3 inch - Percent Finer	100.0				% Passing			09/16/21 19:29	1
Sand	78.7				%			09/16/21 19:29	1
Sieve Size 2 inch - Percent Finer	100.0				% Passing			09/16/21 19:29	1
Coarse Sand	6.1				%			09/16/21 19:29	1
Sieve Size 1.5 inch - Percent Finer	100.0				% Passing			09/16/21 19:29	1
Medium Sand	29.4				%			09/16/21 19:29	1
Sieve Size 1 inch - Percent Finer	100.0				% Passing			09/16/21 19:29	1
Fine Sand	43.2				%			09/16/21 19:29	1
Sieve Size 0.75 inch - Percent Finer	100.0				% Passing			09/16/21 19:29	1
Sieve Size 0.375 inch - Percent Finer	100.0				% Passing			09/16/21 19:29	1
Silt	13.8				%			09/16/21 19:29	1
Clay	3.5				%			09/16/21 19:29	1
Sieve Size #4 - Percent Finer	96.0				% Passing			09/16/21 19:29	1
Sieve Size #10 - Percent Finer	89.9				% Passing			09/16/21 19:29	1
Sieve Size #20 - Percent Finer	77.5				% Passing			09/16/21 19:29	1
Sieve Size #40 - Percent Finer	60.5				% Passing			09/16/21 19:29	1
Sieve Size #60 - Percent Finer	44.6				% Passing			09/16/21 19:29	1
Sieve Size #80 - Percent Finer	35.2				% Passing			09/16/21 19:29	1
Sieve Size #100 - Percent Finer	30.1				% Passing			09/16/21 19:29	1
Sieve Size #200 - Percent Finer	17.3				% Passing			09/16/21 19:29	1
Hydrometer Reading 1 - Percent Finer	10.2				% Passing			09/16/21 19:29	1
Hydrometer Reading 2 - Percent Finer	8.0				% Passing			09/16/21 19:29	1
Hydrometer Reading 3 - Percent Finer	6.3				% Passing			09/16/21 19:29	1
Hydrometer Reading 4 - Percent Finer	4.6				% Passing			09/16/21 19:29	1
Hydrometer Reading 5 - Percent Finer	3.5				% Passing			09/16/21 19:29	1
Hydrometer Reading 6 - Percent Finer	2.9				% Passing			09/16/21 19:29	1
Hydrometer Reading 7 - Percent Finer	1.8				% Passing			09/16/21 19:29	1

Client Sample Results

Client: Southern Company Job ID: 180-126590-1

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-5-15-25 Lab Sample ID: 180-126590-4

Date Collected: 08/31/21 13:25

Matrix: Solid
Pare Respired: 09/92/21 09:20

Date Received: 09/02/21 09:30 Percent Solids: 93.2

General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity	4.8		0.054	0.054	meq/100gm	₩	09/15/21 10:15	09/16/21 14:18	1
Total Organic Carbon - Duplicates	<800		1100	800	mg/Kg	₩		09/07/21 20:08	1

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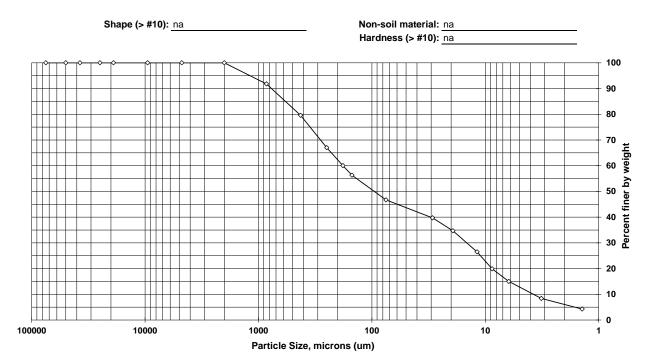
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 Sample ID:
 SB-1-24.6-34.6
 Percent Solids:
 63.6%
 Start Date:
 9/2/2021

 Lab ID:
 180-126590-A-1
 Specific Gravity:
 2.650
 End Date:
 9/22/2021

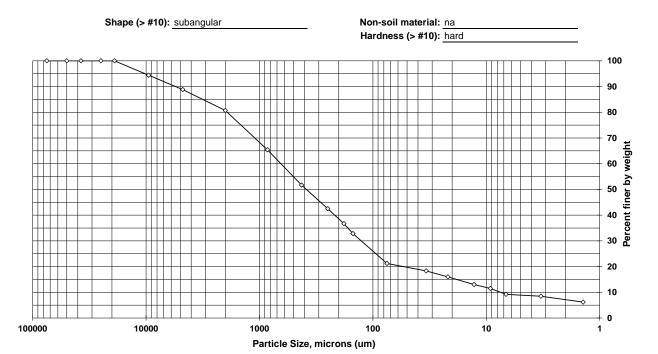


Sieve	Particle	Percent	Incremental
size	size, um	finer	percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	91.8	8.2
#40	425	79.6	12.2
#60	250	67.0	12.6
#80	180	60.0	7.0
#100	150	56.3	3.7
#200	75	46.7	9.6
Hyd1	29.2	39.7	7.0
Hyd2	19.3	34.7	5.0
Hyd3	11.8	26.5	8.2
Hyd4	8.7	19.9	6.6
Hyd5	6.2	15.0	4.9
Hyd6	3.2	8.4	6.6
Hyd7	1.4	4.3	4.1

Soil	Percent of
Classification	sample
Gravel	0.0
Sand	53.3
Coarse Sand	0.0
Medium Sand	20.4
Fine Sand	32.9
Silt	31.7
Clay	15.0

 Sample ID:
 SB-3-15-25
 Percent Solids:
 77.8%
 Start Date:
 9/2/2021

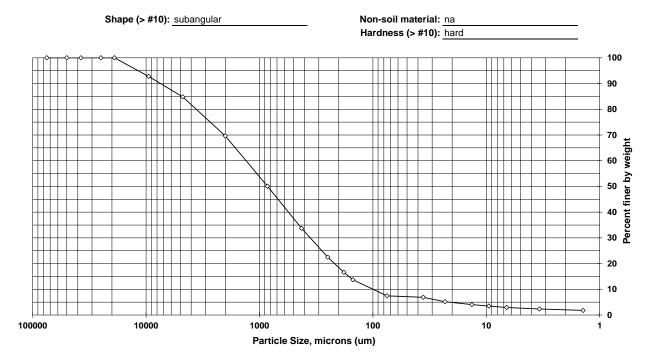
 Lab ID:
 180-126590-A-2
 Specific Gravity:
 2.650
 End Date:
 9/22/2021



Sieve	Particle	Percent	Incremental
size	size, um	finer	percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	94.4	5.6
#4	4750	88.8	5.6
#10	2000	80.7	8.1
#20	850	65.4	15.3
#40	425	51.7	13.7
#60	250	42.5	9.2
#80	180	36.7	5.8
#100	150	32.8	3.9
#200	75	21.2	11.6
Hyd1	33.9	18.3	2.9
Hyd2	21.8	16.0	2.3
Hyd3	12.8	13.0	3.0
Hyd4	9.2	11.5	1.5
Hyd5	6.7	9.2	2.3
Hyd6	3.3	8.5	0.8
Hyd7	1.4	6.2	2.3

Soil	Percent of
Classification	sample
Gravel	11.2
Sand	67.6
Coarse Sand	8.1
Medium Sand	29.0
Fine Sand	30.5
Silt	12.0
Clay	9.2
	·

				Date Received:	9/2/2021
Sample ID:	SB-4-12-22	Percent Solids:	86.0%	Start Date:	9/16/2021
Lab ID:	180-126590-A-3	Specific Gravity:	2.650	End Date:	9/22/2021

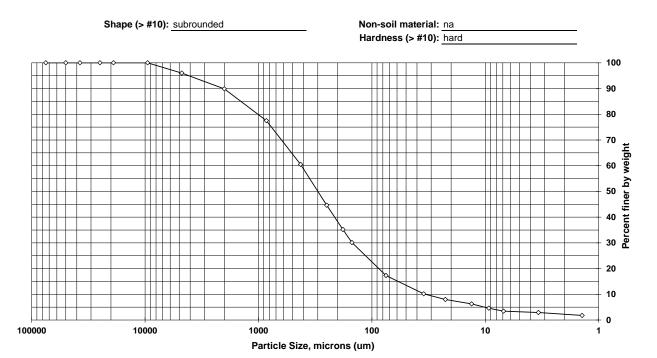


Sieve	Particle	Percent	Incremental
size	size, um	finer	percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	92.8	7.2
#4	4750	84.8	8.0
#10	2000	69.6	15.2
#20	850	50.1	19.5
#40	425	33.7	16.4
#60	250	22.5	11.2
#80	180	16.6	5.9
#100	150	13.7	2.9
#200	75	7.4	6.3
Hyd1	36	6.9	0.6
Hyd2	23.1	5.2	1.7
Hyd3	13.4	4.1	1.1
Hyd4	9.5	3.5	0.6
Hyd5	6.6	2.9	0.6
Hyd6	3.4	2.4	0.6
Hyd7	1.4	1.8	0.6
		-	

Soil	Percent of
Classification	sample
Gravel	15.2
Sand	77.4
Coarse Sand	15.2
Medium Sand	35.9
Fine Sand	26.3
Silt	4.5
Clay	2.9

 Sample ID:
 SB-5-15-25
 Percent Solids:
 92.8%
 Start Date:
 9/2/2021

 Lab ID:
 180-126590-A-4
 Specific Gravity:
 2.650
 End Date:
 9/22/2021



Sieve	Particle	Percent	Incremental
size	size, um	finer	percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	96.0	4.0
#10	2000	89.9	6.1
#20	850	77.5	12.4
#40	425	60.5	17.0
#60	250	44.6	15.9
#80	180	35.2	9.4
#100	150	30.1	5.1
#200	75	17.3	12.8
Hyd1	34.9	10.2	7.1
Hyd2	22.5	8.0	2.2
Hyd3	13.2	6.3	1.7
Hyd4	9.3	4.6	1.7
Hyd5	6.9	3.5	1.1
Hyd6	3.4	2.9	0.6
Hyd7	1.4	1.8	1.1

Soil	Percent of
Classification	sample
Gravel	4.0
Sand	78.7
Coarse Sand	6.1
Medium Sand	29.4
Fine Sand	43.2
Silt	13.8
Clay	3.5

Sediment Grain Size - D422			
Client			
Client Sample ID Lab Sample ID	SB-1-24.6-3 180-126590		
Lab Sample ID	100-120390	U-A- I	
Dry Weight Determination			
Tin Weight	1.03	3 g	
Wet Sample + Tin	22.99	J	
Dry Sample + Tin	15.00	0	
% Moisture	36.38	3 %	
Sample Weights	Tare (g)	Pan+Samp (g)	Samp (g)
Sample Weight (Wet)	44.74	4 198.04	153.3
Sample Weight (Oven Dried)			97.5
Sample Split (oven dried)	Tare (g)	Pan+Samp (g)	Samp (g)
Sample >=#10			0
Sample <#10 % Passing #10			97.5
% Passing #10			63.6
Cravel/Cand Fraction (Ciavas)			

Gravel/Sand Fraction (Sieves)

Sample Fraction	Size (um)	Pan Tare (g)	Pan+Sample (g)	Sample	% Finer	Classification	Sub Class
3 inch	75000			0.00 g	100.0	Gravel	
2 inch	50000			0.00 g	100.0	Gravel	
1.5 inch	37500			0.00 g	100.0	Gravel	
1 inch	25000			0.00 g	100.0	Gravel	
3/4 inch	19000			0.00 g	100.0	Gravel	
3/8 inch	9500			0.00 g	100.0	Gravel	
#4	4750			0.00 g	100.0	Gravel	
#10	2000			0.00 g	100.0	Sand	Coarse
#20	850	378.17	386.20	8.03 g	91.8	Sand	Medium
#40	425	366.54	378.40	11.86 g	79.6	Sand	Medium
#60	250	348.07	360.32	12.25 g	67.0	Sand	Fine
#80	180	337.47	344.32	6.85 g	60.0	Sand	Fine
#100	150	327.66	331.31	3.65 g	56.3	Sand	Fine
#200	75	312.57	321.95	9.38 g	46.7	Sand	Fine
				0.00 g	46.7		

Adjusted Hydrometer Sample Mass Hydrometer Sample Mass (g) 97.5

Silt/Clay Fraction (Hydrometer Test)

Hydrometer Test Time (min)	Actual	Spec. Gravity	Temp C	Particle Size (Micron)	% Finer	Classification	Sub Class
2	2	1.0265	20.5	29.2	39.7	Silt	
5	5	1.0235	20.5	19.3	34.7	Silt	
15	15	1.0185	20.5	11.8	26.5	Silt	
30	30	1.0145	20.5	8.7	19.9	Silt	
60	63	1.0115	20.5	6.2	15	Silt	
250	253	1.0075	20.5	3.2	8.37	Clay	
1440	1400	1.0050	20.5	1.4	4.26	Clay	

10/19/2021

Sediment Grain Size - D422			
Client			
Client Sample ID	SB-3-15-25		
Lab Sample ID	180-126590	-A-2	
Ory Weight Determination			
Tin Weight	1.02	g	
Wet Sample + Tin	17.28	g	
Dry Sample + Tin	13.67	g	
% Moisture	22.20	%	
Sample Weights	Tare (g)	Pan+Samp (g)	Samp (g)
Sample Weight (Wet)	44.10	180.46	136.36
Sample Weight (Oven Dried)			106
Sample Split (oven dried)	Tare (g)	Pan+Samp (g)	Samp (g)
Sample >=#10			20.4
Sample <#10			85.6
% Passing #10			62.8

Gravel/Sand Fraction (Sieves)

Sample Fraction	Size (um)	Pan Tare (g)	Pan+Sample (g)	Sample	% Finer	Classification	Sub Class
3 inch	75000			0.00 g	100.0	Gravel	
2 inch	50000			0.00 g	100.0	Gravel	
1.5 inch	37500			0.00 g	100.0	Gravel	
1 inch	25000			0.00 g	100.0	Gravel	
3/4 inch	19000			0.00 g	100.0	Gravel	
3/8 inch	9500	447.19	453.09	5.90 g	94.4	Gravel	
#4	4750	487.98	493.89	5.91 g	88.8	Gravel	
#10	2000	462.59	471.19	8.60 g	80.7	Sand	Coarse
#20	850	373.41	389.61	16.20 g	65.4	Sand	Medium
#40	425	361.84	376.33	14.49 g	51.7	Sand	Medium
#60	250	351.94	361.66	9.72 g	42.5	Sand	Fine
#80	180	318.93	325.12	6.19 g	36.7	Sand	Fine
#100	150	328.25	332.42	4.17 g	32.8	Sand	Fine
#200	75	313.99	326.24	12.25 g	21.2	Sand	Fine
				0.00 g	21.2		

Adjusted Hydrometer Sample Mass Hydrometer Sample Mass (g) 106

Silt/Clay Fraction (Hydrometer Test)

Hydrometer Test Time (min)	Actual	:	Spec. Gravity	Temp C	Particle Size (Micron)	% Finer	Cla	ssification	Sub Class
	2	2	1.0145	20.	33.9)	18.3 Silf	t	
	5	5	1.0130	20.	5 21.8	}	16 Silf	t	
	15	15	1.0110	20.	5 12.8	}	13 Silf	t	
	30	30	1.0100	20.	5 9.2	-	11.5 Silt	t	
	60	57	1.0085	20.	5 6.7	,	9.22 Silf	t	
	250	247	1.0080	20.	5 3.3	3	8.46 Cla	ay	
	1440	1394	1.0065	20.	5 1.4	ļ	6.19 Cla	ay	

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Sediment Grain Size - D422			
Client Sample ID	SB-4-12-22	2	
Lab Sample ID	180-126590	0-A-3	
Dry Weight Determination			
Tin Weight	1.02	U	
Wet Sample + Tin Dry Sample + Tin	23.40 20.27	U	
% Moisture	13.99	•	
Sample Weights	Tare (g)	Pan+Samp (g)	Samp (g)
Sample Weight (Wet)	47.84	4 212.91	
Sample Weight (Oven Dried)			142
Sample Split (oven dried)	Tare (g)	Pan+Samp (g)	Samp (g)
Sample >=#10			43.1
Sample <#10			98.9
% Passing #10			59.9

Gravel/Sand Fraction (Sieves)

Sample Fraction	Size (um)	Pan Tare (g)	Pan+Sample (g)	Sample	% Finer	Classification	Sub Class
3 inch	75000			0.00 g	100.0	Gravel	
2 inch	50000			0.00 g	100.0	Gravel	
1.5 inch	37500			0.00 g	100.0	Gravel	
1 inch	25000			0.00 g	100.0	Gravel	
3/4 inch	19000			0.00 g	100.0	Gravel	
3/8 inch	9500	447.19	457.36	10.17 g	92.8	Gravel	
#4	4750	487.98	499.33	11.35 g	84.8	Gravel	
#10	2000	462.59	484.14	21.55 g	69.6	Sand	Coarse
#20	850	378.17	405.83	27.66 g	50.1	Sand	Medium
#40	425	366.54	389.77	23.23 g	33.7	Sand	Medium
#60	250	348.07	363.94	15.87 g	22.5	Sand	Fine
#80	180	337.47	345.83	8.36 g	16.6	Sand	Fine
#100	150	327.66	331.73	4.07 g	13.7	Sand	Fine
#200	75	312.57	321.47	8.90 g	7.4	Sand	Fine
				0.00 g	7.4		

Adjusted Hydrometer Sample Mass Hydrometer Sample Mass (g) 142

Silt/Clay Fraction (Hydrometer Test)

Hydrometer Test Time (min)	Actual	S	pec. Gravity	Temp C	Particle Size (Micron)	% Finer	Classification	Sub Class
	2	2	1.0085	20.5	36	6.8	88 Silt	
	5	5	1.0070	20.5	23.1	5.1	8 Silt	
	15	15	1.0060	20.5	13.4	4.0	5 Silt	
	30	30	1.0055	20.5	9.5	3.4	9 Silt	
	60	63	1.0050	20.5	6.6	2.9	2 Silt	
	250	241	1.0045	20.5	3.4	2.3	6 Clay	
	1440	1388	1.0040	20.5	1.4	1.7	'9 Clay	

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Sediment Grain Size - D422			
Client Client Sample ID Lab Sample ID	SB-5-15-25 180-126590		
Dry Weight Determination Tin Weight	1.03	U	
Dry Sample + Tin % Moisture			
Sample Weights	Tare (g)	Pan+Samp (g)	Samp (g)
Sample Weight (Wet) Sample Weight (Oven Dried)	44.08		
Sample Split (oven dried) Sample >=#10 Sample <#10	Tare (g)	Pan+Samp (g)	Samp (g) 14.5 129
% Passing #10			83.8

Gravel/Sand Fraction (Sieves)

Sample Fraction	Size (um)	Pan Tare (g)	Pan+Sample (g)	Sample	% Finer	Classification	Sub Class
3 inch	75000			0.00 g	100.0	Gravel	
2 inch	50000			0.00 g	100.0	Gravel	
1.5 inch	37500			0.00 g	100.0	Gravel	
1 inch	25000			0.00 g	100.0	Gravel	
3/4 inch	19000			0.00 g	100.0	Gravel	
3/8 inch	9500			0.00 g	100.0	Gravel	
#4	4750	487.98	493.71	5.73 g	96.0	Gravel	
#10	2000	462.59	471.33	8.74 g	89.9	Sand	Coarse
#20	850	373.41	391.18	17.77 g	77.5	Sand	Medium
#40	425	361.84	386.17	24.33 g	60.5	Sand	Medium
#60	250	351.94	374.67	22.73 g	44.6	Sand	Fine
#80	180	318.93	332.40	13.47 g	35.2	Sand	Fine
#100	150	328.25	335.57	7.32 g	30.1	Sand	Fine
#200	75	313.99	332.36	18.37 g	17.3	Sand	Fine
				0.00 g	17.3		

Adjusted Hydrometer Sample Mass Hydrometer Sample Mass (g)

143

Silt/Clay Fraction (Hydrometer Test)

Hydrometer Test Time (min)	Actual	9	Spec. Gravity	Temp C	Particle Siz	ze % Finer		Classification	Sub Class
riyarometer rest rime (min)	2	2	1.0115		. ,		10.2		Sub Class
	5	5	1.0095				7.96		
	15	15	1.0080	20	5 13	.2	6.27	Silt	
	30	31	1.0065	20	5 9	.3	4.59	Silt	
	60	57	1.0055	20	5 6	.9	3.46	Silt	
	250	235	1.0050	20	5 3	.4	2.9	Clay	
	1440	1382	1.0040	20	5 1	.4	1.78	Clay	

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10

Prep Type: Total/NA

Client: Southern Company

Job ID: 180-126590-1 Project/Site: Plant Arkwright MNA AP-2 DAS

Method: 9081 - Cation Exchange Capacity (CEC)

Lab Sample ID: MB 560-188917/1-A Client Sample ID: Method Blank

Matrix: Solid

Analysis Batch: 188941

Prep Type: Total/NA **Prep Batch: 188917**

MB MB

Result Qualifier RL **MDL** Unit Analyzed Dil Fac Analyte Prepared 0.050 09/14/21 09:45 09/15/21 08:46 Cation Exchange Capacity < 0.050 0.050 meq/100gm

Lab Sample ID: MB 560-188958/1-A Client Sample ID: Method Blank

Matrix: Solid Prep Type: Total/NA **Analysis Batch: 188999 Prep Batch: 188958** MB MB

Result Qualifier RL MDL Unit Prepared Dil Fac Analyzed 0.050 09/15/21 10:15 09/16/21 14:18 Cation Exchange Capacity < 0.050 0.050 meq/100gm

Lab Sample ID: 180-126590-3 DU Client Sample ID: SB-4-12-22

Matrix: Solid

Analysis Batch: 188999

Prep Batch: 188958 Sample Sample DU DU **RPD** Result Qualifier Result Qualifier **RPD** Analyte Unit D Limit

meq/100gm Cation Exchange Capacity 8.9 9.70 9 20

Method: EPA-Lloyd Kahn - Organic Carbon, Total (TOC)

Lab Sample ID: MB 180-370393/58 Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Solid

Analysis Batch: 370393

MB MB

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Total Organic Carbon - Duplicates <750 1000 750 mg/Kg 09/03/21 20:11

Lab Sample ID: LCS 180-370393/59 **Client Sample ID: Lab Control Sample Matrix: Solid** Prep Type: Total/NA

Analysis Batch: 370393

LCS LCS Spike %Rec. Analyte Added Result Qualifier Unit %Rec Limits Total Organic Carbon -38200 33500 mg/Kg 88 75 - 125

Duplicates

Lab Sample ID: MB 180-370561/4 Client Sample ID: Method Blank **Prep Type: Total/NA**

Matrix: Solid

Analysis Batch: 370561

MB MB

RL MDL Unit **Analyte** Result Qualifier Prepared Analyzed Dil Fac 1000 Total Organic Carbon - Duplicates <750 750 mg/Kg 09/07/21 13:57

Lab Sample ID: LCS 180-370561/5 **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

Matrix: Solid

Analysis Batch: 370561

Spike LCS LCS %Rec. Added Result Qualifier Limits Analyte Unit %Rec Total Organic Carbon -38200 38200 100 75 - 125 mg/Kg

Duplicates

Eurofins TestAmerica, Pittsburgh

QC Association Summary

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

General Chemistry

Prep Batch: 188917

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Total/NA	Solid	9081	
180-126590-2	SB-3-15-25	Total/NA	Solid	9081	
MB 560-188917/1-A	Method Blank	Total/NA	Solid	9081	

Analysis Batch: 188941

Lab Sample ID 180-126590-1	Client Sample ID SB-1-24.6-34.6	Prep Type Total/NA	Matrix Solid	Method 9081	Prep Batch 188917
180-126590-2	SB-3-15-25	Total/NA	Solid	9081	188917
MB 560-188917/1-A	Method Blank	Total/NA	Solid	9081	188917

Prep Batch: 188958

Lab Sample ID 180-126590-3	Client Sample ID SB-4-12-22	Prep Type Total/NA	Matrix Solid	Method 9081	Prep Batch
180-126590-4	SB-5-15-25	Total/NA	Solid	9081	
MB 560-188958/1-A	Method Blank	Total/NA	Solid	9081	
180-126590-3 DU	SB-4-12-22	Total/NA	Solid	9081	

Analysis Batch: 188999

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-3	SB-4-12-22	Total/NA	Solid	9081	188958
180-126590-4	SB-5-15-25	Total/NA	Solid	9081	188958
MB 560-188958/1-A	Method Blank	Total/NA	Solid	9081	188958
180-126590-3 DU	SB-4-12-22	Total/NA	Solid	9081	188958

Analysis Batch: 370393

Lab Sample ID 180-126590-2	Client Sample ID SB-3-15-25	Prep Type Total/NA	Matrix Solid	Method EPA-Lloyd Kahn	Prep Batch
MB 180-370393/58	Method Blank	Total/NA	Solid	EPA-Lloyd Kahn	
LCS 180-370393/59	Lab Control Sample	Total/NA	Solid	EPA-Lloyd Kahn	

Analysis Batch: 370561

Lab Sample ID 180-126590-1	Client Sample ID SB-1-24.6-34.6	Prep Type Total/NA	Matrix Solid	Method Prep Bate EPA-Lloyd Kahn	<u>ch</u>
180-126590-3	SB-4-12-22	Total/NA	Solid	EPA-Lloyd Kahn	
180-126590-4	SB-5-15-25	Total/NA	Solid	EPA-Lloyd Kahn	
MB 180-370561/4	Method Blank	Total/NA	Solid	EPA-Lloyd Kahn	
LCS 180-370561/5	Lab Control Sample	Total/NA	Solid	EPA-Lloyd Kahn	

Geotechnical

Analysis Batch: 171682

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Total/NA	Solid	D422	
180-126590-2	SB-3-15-25	Total/NA	Solid	D422	
180-126590-3	SB-4-12-22	Total/NA	Solid	D422	
180-126590-4	SB-5-15-25	Total/NA	Solid	D422	

Eurofins TestAmerica, Pittsburgh

Job ID: 180-126590-1

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01 Alpha Drive RIDC Park Pittsburgh, PA 15238 Phone (412) 963-7058 Phone (412) 963-2468		Chain (of Cus			ord										Environment Testin
Client Information	Sampler: Shoredits, Andre	eas			PM: wn, Sh	ali										-14290.2
ient Contact:	Phone:	¥-		E-M	ail:					180-1	2650	O Cha		ustody		
nju Abraham Impany:	(770) 380-0861		PWSID:	Sha	ali.Brow	n@Eu	rofin	set.co	<u> </u>	100-	2008	Clia	111 OI C	ustody		
outhern Company			PVVSID.						Anal	vsis	Rea	ueste	d			
idress: 11 Ralph McGill Blvd SE B10185	Due Date Request	ed:					+			6						Preservation Codes:
ty: clanta	TAT Requested (d.	iys): PD				<u>@</u>			Burlington)	o ocu						A - HCL M - Hexane B - NaOH N - None
ate, Zip: A, 30308	Compliance Project		No No		-100	(Knoxville)										C - Zn Acetate
one:	PO#: 6122201429,210	19	-71						dus)			Į,				F - MeOH R - Na2S2O3 G - Amchlor S - H2SO4 H - Ascorbic Acid T - TSP Dodecahydrat
nail: .braham@southernco.com	WO #:				or No)	o LI Mo	(Knowville)	tals	meter	ty (CEC	gh)	dry weight				I - Ice U - Acetone J - DI Water V - MCAA
oject Name:	Project#:				Yes or	As Co	o (Kng	tal Me	Hydro	apaci	(Pittsburgh)	s for d			Iners	K - EDTA W - pH 4-5 L - EDA Z - other (specify)
rkwright MNA - AP-2 DAS te:	18020201 SSOW#:				ample (Yes (Yes or N	SEP .	AsCo LI Mo	ding To	Size (Sieve&Hydrometer)	ange		e/Solid			containers	Other:
Seorgia			Sample Type	Matrix	S Parie	6010D_SEP_Calc -	6010D_Total AsC	SEP on HOLD pending Total Metals	Lioyu_Raim_mod - Lioyu hann D422 - Grain Size (Sieve&Hydro	9081 - Cation Exchange Capacity (CEC)	Arsenic Speciation	Moisture - Moisture/Solids for			Number of	
ample Identification	Sample Date	Sample Time	(C=comp, G=grab)	(W=water, S=soli O=waste/oli, BT=Tissue, A=Al			-				Arsenic			4	Total	Special Instructions/Note:
3-1-24.6-34.6	8/3:121	17:40	C	tion Code: S			N X	N X	(X		1	N X			1 6	Co Li Mo for Total Metal and Pending Si
-2-24-32	0/3(12)	17:40	c	- \$	#	+ - +	×	X		<u> </u>	X	$\frac{}{\times}$				analysis [Arsenic] Co Li Mo for Total Metal and
-3-15-25	8/30/21	18:00	С	s	+	1	х	x 3	+	-		x			5	Pending SEP analysis Co Li Mo for Total Metal and Pending Si
3-4-12-22	8/31/21	12:00	С	s	†	1	х	x 3	+	+	x	x			6	analysis [Arsenic] Co Li Mo for Total Metal and Pending SEP analysis
3-5-15-25	8/31/21	13:25	С	S	$\dagger \dagger$	+	х		(x			х			5	Co Li Mo for Total Metal and Pending Si analysis
					П											
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	Poison B Unkn	own 🗆 j	Radiological			Re	tum	To Cli	ent		D	isposal				ed longer than 1 month) hive For Months
liverable Requested: I, II, III, IV, Other (specify)						ecial Ir	nstru	ctions	QC R	equire	ement					
npty Kit Relinquished by: inquished by: Andreas Shoredits	Date/Time:	Date:		Company	Time:	Receiv	ved by	r: 7	1-1	1		Me	_	Shipment: Date/Tipae	× -	Company
inquished by:	8/31/21 Date/Time:	18=5	5	Wood E&IS Company		Receiv		1				0		Date/Time	1-2	- 2 Company
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Iquisiieu by.	Date/Time:			Company		Receiv	veu by							Date/Time		Company



eurofins

Environment Testing TestAmerica

1075 BIG SHANTY ROAD N.W., SUITE 10 DRIGIN ID:LIYA (770) 421-3365 DAVID FULLTER PICKING UP PITTSBURGH PA 15238

KENNESAW, GA 30144 UNITED STATES US

SAMPLE RECEIVING ETA PITTSBURGH

301 ALPHA DR

FedEx | 1516 9332 3783

WED - 0.

) - 01 SEP 10:38A

Uncorrected temp

CF

Initials

15138334 08/31 56DJ2/56CO/FE48

PT-W1-SR-001 effective 11/8/18

321 MAN 3409



Chain of Custody Record

Eurofins TestAmerica, Pittsburgh

301 Alpha Drive RIDC Park

Pittsburgh, PA 15238 Phone: 412-963-7058 Fax: 412-963-2468

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(4) to cut and disconnected the city	Sampler			Lab PM				<u>U</u>	Carrier Tracking No(s):		COC No:		
Chent mormation (Sub Contract Lab)	ā			Brow	Brown, Snall						180-443234.1		_
Shipping/Receiving	- Luone:			E-Mail Shali	Brown	E-Mail: Shali Brown@Furofinset com	moo	<i>w</i> C	State of Origin: Georgia	-	Page: Dage 1 of 1		_
Company:					Action	Acreditations Bouried (Soc poto)	Soo potol		2000		- aga - oi -		_
TestAmerica Laboratories, Inc.						ous required	(See Hote).				Job #: 180-126590-1		
Address	Due Date Requested:										Preservation Codes:	les:	_
30 IS MIDDIEDFOOK PIKE, ,	9/16/2021						Analys	Analysis Requested	ested		3	T N	
City Knoxville	TAT Requested (days):	s):									A - nCL B - NaOH C - Zn Acetate	M - nexane N - None O - AsNaO2	
State, Zip. TN, 37921											D - Nitric Acid E - NaHSO4	P - Na2O4S Q - Na2SO3	
Phone: 865-291-3000(Tel) 865-584-4315(Fax)	PO #:				(0						F - MeOH G - Amchlor H - Ascorbic Acid	R - Na2S2O3 S - H2SO4 T - TSP Dodocohudata	
Email:	:WO#:				(0)	וסופו				S	I - Ice J - DI Water	U - Acetone V - MCAA	
Project Name. Plant Arkwright MNA AP-2 DAS	Project #: 18020201				10 29	(dow				nənist	K - EDTA L - EDA	W - pH 4-5 Z - other (specify)	
Site: Arkwright	:#MOSS				y) ası) dau -					Other:		
Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, c	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered WS/M mys/W	01_932\80108				Total Number	Specially	Special Instructions/Note:	
		X	Preservation Code:	n Code:	X					X			
SB-1-24.6-34.6 (180-126590-1)	8/31/21	17:40 Eastern		Solid		×				-	SEP pending Total results	l results	
SB-3-15-25 (180-126590-2)	8/30/21	18:00 Eastern		Solid		×				-	SEP pending Total results	results	
SB-4-12-22 (180-126590-3)	8/31/21	12:00 Eastern		Solid		×				-	SEP pending Total results	l results	
SB-5-15-25 (180-126590-4)	8/31/21	13:25 Eastern		Solid		×				-	SEP pending Total results	l results	
										7, 2,			
													T
							180-126	590 Chai	80-126590 Chain of Custody				
Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratores. This sample snipment is forwarded under cnain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/lists/fmairx being analysed the samples must be shinned back to the Eurofine TestAmerica Jahoratory or other inches and the State of Origin listed above for analysis/lists/fmairx being analysed the samples must be shinned back to the Eurofine TestAmerica Jahoratory or other inches and the State of Origin listed above for analysis/lists/fmairx being a	ca places the ownership or	of method, an	alyte & accreditat	ion complian	se upon ou	t subcontract	aboratories. 1	nis sample	snipment is torwarded ur	nder cnain-or-c	custody. If the labora	atory does not currently	
	A Delling all any zero, tille sall	an ignili saidi	simpled back to	SILIC ECITORIES	estratient.	a laboratory o	omer instruct	ons will be	most a simple back to the culture resolution of other instructions will be provided. Any changes to accreditation status should be brought to Eurofins	to accreditation	n status should be bro	ought to Eurofins	

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

Return To Client Disposal By Lab Archive For Mon TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica. Possible Hazard Identification

Primary Deliverable Rank: 2

Deliverable Requested: I, II, III, IV, Other (specify)

Unconfirmed

Months

	Empty Kit Relinquished by	Date:	Time:		Method of Shipment:	
	Relinquished by:	Date/Timed/9/11.	Mas Company	Received by:	Date/Time:	Company
10/	Relinquished by:	Date/Time: / /	Company	Received by:	Date/Time:	Company
19/2	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
2021	Custody Seals Intact: Custody Seal No.: △ Yes △ No			Cooler Temperature(s) ^o C and Other Remarks		
						Ver: 06/08/2021

Log In Number:

· EUROFINS/TESTAMERICA KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST

1. Are the shipping containers intact? 2. Were ambient air containers received intact? 3. The coolers/containers custody seal if present, is it intact? 4. Is the cooler temperature within limits? (> freezing 6. Thermometer ID: \$\infty \infty \	☐ Containers, Broken ☐ Checked in lab ☐ Yes	RECENT AT ET 03 / (704)
	☐ Checked in lab ☐ Yes	``
	□ Yes	
s cooler temperature within limits? (> freezing f water to 6 °C, VOST: 10°C) meter ID: \$\script{SCJ}\$ ion factor: \(\pm \limit{A}\limit{C}\) ion factor: \(\pm \limit{A}\limit{C}\) all of the sample containers received intact? ample container labels match COC? Dates, Times) all of the samples listed on the COC received? all of the sample collection noted? at the sampler identified on the COC? be client and project name/# identified? cetsts/parameters listed for each sample?		मंत्री
	D NA	I COURT HO XT 1689 STO9 2040 POS
2 g	Cooler Out of Temp, Client	
2; B	Contacted, Proceed/Cancel	
	☐ Cooler Out of Temp, Same Day	
£ 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Receipt	
ip b	☐ Containers, Broken	
ceived?	Containers, Improper; Client	
ceived?	Contacted; Proceed/Cancel	
ceived?	☐ COC & Samples Do Not Match	
ceived? C	□ COC Incorrect/Incomplete	
ceived?	☐ COC Not Received	
;	☐ Sample Received, Not on COC	
; (bed)	☐ Sample on COC, Not Received	
bed)	□ COC; No Date/Time; Client	
) (ben	Contacted	Labeling Verified by:
?	☐ Sampler Not Listed on COC	
(pa)	□ COC Incorrect/Incomplete	pH test strip lot number:
ated/Timed)	☐ COC No tests on COC	
``	☐ COC Incorrect/Incomplete	
	□ COC Incorrect/Incomplete	H Box
15. Were samples received within holding time?	Holding Time - Receint	Preservative:
	nll Adjusted all Included	Lot Number:
	(See box 16A)	Exp Date:
/	☐ Incorrect Preservative	Analyst:
_	☐ Headspace (VOA only)	Date:
residual chlorine, if necessary?	☐ Residual Chlorine	lime:
(e.g. 1613B, 1668) Chlorine test strin lot number:		
H<97	If no notify lab to ading	
vinfo Provided?	Designation of the company	
	□ Froject missing into	
Project #: PM Instructions:		
Sample Receiving Associate	- ()	
January Market	\\ \L	QAU26R32.doc, 062719



Environment Testing TestAmerica

570C3/169A/6F4D

SHIP DATE: 03SEP21 ACTWGT: 30.00 LB MAN CAD: 741733/CAFE3506

BILL SENDER

TESTAMERICA LABORATORIES, INC. 530 COMMUNITY DRIVE SUITE 11



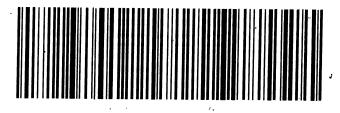
FedEx Express

TRK# 1689 5109 2050

XO BTVA

05403 BTV

10/19/2021



Company

Date/Time:

eceived by

Date/Time:

Custody Seal No.:

Custody Seals Intact: A Yes A No

Chain of Custody Record

Eurofins TestAmerica, Pittsburgh

301 Alpha Drive RIDC Park

Pittsburgh, PA 15238 Phone: 412-963-7058 Fax: 412-963-2468

Client Contact Shipping/Receiving				Brow	Brown, Shall					180-443227 1	
Shipping/Receiving	Dhono			E Mail			Chato of Origin	rivin		Dane	
	Tione			Shall	Brown@	Shali Brown@Eurofinset.com	Georgia		ĺ	Page 1 of 1	
Company					Accreditation	Accreditations Required (See note):				Job #:	
Eurofins Xenco	The state of the state of									180-126590-1	
Address: 1733 N. Padre Island Drive,	Due Date Requested: 9/16/2021	ig:				Analys	Analysis Requested		13	Preservation Codes:	
Clip. Corpus Christi State, 2p.	TAT Requested (days):	ıys):			ibscity					tate cid	0.88
Phone 361-289-2471(Tel) 361-289-2673(Fax)	#0A									F - MeOH R - Na2S2O3 G - Amchior S - H2SO4 H - Ascorbic Acid T - TSP Dodec	R - Na2S2O3 S - H2SO4 T - TSP Dodecahydrate
Email:	WO#:				(0)				s	I - Ice J - Di Water	ds.
Project Name: Plant Arkwright MNA AP-2 DAS	Project #: 18020201								nənistr	K - EDTA W - pH 4-5 L - EDA Z - other (specify)	pecify)
Site. Arkwright	SSOW#:				A) ası				oo to	Other:	
Sample Identification - Client ID (Lab ID)	Sample Date	Sample	Sample Type (C=comp, G=grab)	Matrix (wwater, S=solid, O=waste/oil, BT=Timple, A=Air)	Field Filtered Perform MS/W Perform Prep Post/9081 Prep	(cec)			Total Number	Special Instructions/Note:	s/Note:
	X	X	Preservat	Preservation Code:	X				X		
SB-1-24.6-34.6 (180-126590-1)	8/31/21	17:40 Eastern		Solid	×				-		
SB-3-15-25 (180-126590-2)	8/30/21	18:00 Eastern		Solid	×				1		
SB-4-12-22 (180-126590-3)	8/31/21	12:00 Eastern		Solid	×				-		
SB-5-15-25 (180-126590-4)	8/31/21	13:25 Eastern		Solid	×				-		

maintain accreditation in the State of Origin listed above for analysis/helsts/maintix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica. Months Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

Return To Client Disposal By Lab Archive For Mon Archive For ethod of Shipment Special Instructions/QC Requirements Time: Primary Deliverable Rank: 2 eliverable Requested: I, II, III, IV, Other (specify) Possible Hazard Identification mpty Kit Relinquished by: Inconfirmed

Cooler Temperature(s) C and Other Remarks

inquished by: Iduished by:

nquished by:

Client: Southern Company

List Source: Eurofins TestAmerica, Pittsburgh

Job Number: 180-126590-1

Login Number: 126590 List Number: 1

Creator: Watson, Debbie

Creator. Watson, Debbie		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>N/A</td> <td></td>	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Client: Southern Company Job Number: 180-126590-1

Login Number: 126590

List Number: 4 Creator: Sofio, Michael G List Source: Eurofins TestAmerica, Burlington

List Creation: 09/04/21 12:38 PM

Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey neter.</td <td>N/A</td> <td>Lab does not accept radioactive samples.</td>	N/A	Lab does not accept radioactive samples.
he cooler's custody seal, if present, is intact.	N/A	
ample custody seals, if present, are intact.	N/A	
he cooler or samples do not appear to have been compromised or ampered with.	True	
amples were received on ice.	True	
cooler Temperature is acceptable.	True	
cooler Temperature is recorded.	True	0.3°C
COC is present.	True	
OC is filled out in ink and legible.	True	
OC is filled out with all pertinent information.	True	
the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
here are no discrepancies between the containers received and the COC.	True	
amples are received within Holding Time (excluding tests with immediate ITs)	True	
ample containers have legible labels.	True	
Containers are not broken or leaking.	True	
ample collection date/times are provided.	True	
ppropriate sample containers are used.	True	
ample bottles are completely filled.	N/A	
ample Preservation Verified.	True	
here is sufficient vol. for all requested analyses, incl. any requested IS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is 6mm (1/4").	True	
fultiphasic samples are not present.	True	
amples do not require splitting or compositing.	True	
lesidual Chlorine Checked.	N/A	

Client: Southern Company Job Number: 180-126590-1

Login Number: 126590 List Source: Eurofins Xenco, Corpus Christi List Number: 3

List Creation: 09/04/21 11:16 AM

Creator: Hunter, Jeffery A

Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>N/A</td> <td></td>	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	Check done at department level as required.

Analytical Report Laboratory Job ID: 180-126590-2

August 2021

Eurofins



Environment Testing America

ANALYTICAL REPORT

Eurofins Pittsburgh 301 Alpha Drive **RIDC Park** Pittsburgh, PA 15238 Tel: (412)963-7058

Laboratory Job ID: 180-126590-2

Client Project/Site: Plant Arkwright MNA AP-2 DAS

For:

Southern Company 241 Ralph McGill Blvd SE B10185 Atlanta, Georgia 30308

Attn: Joju Abraham

Authorized for release by: 2/15/2022 12:11:20 PM

Shali Brown, Project Manager II (615)301-5031

Shali.Brown@Eurofinset.com

----- LINKS -----

Review your project results through Total Access

Have a Question?



Visit us at:

www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

PA Lab ID: 02-00416

Client: Southern Company Project/Site: Plant Arkwright MNA AP-2 DAS Laboratory Job ID: 180-126590-2

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Case Narrative

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Job ID: 180-126590-2

Laboratory: Eurofins Pittsburgh

Narrative

Job Narrative 180-126590-2

Receipt

The samples were received on 9/2/2021 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 4.2°C

Receipt Exceptions

7 Step Sequential Extraction Procedure

These soil samples were prepared and analyzed using Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0008, "7 Step Sequential Extraction Procedure". SW-846 Method 6010B as incorporated in Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0007 was used to perform the final instrument analyses.

An aliquot of each sample was sequentially extracted using the steps listed below:

- · Step 1 Exchangeable Fraction: A 5 gram aliquot of sample was extracted with 25 mL of 1M magnesium sulfate (MgSO4), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 2 Carbonate Fraction: The sample residue from step 1 was extracted with 25 mL of 1M sodium acetate/acetic acid (NaOAc/HOAc) at pH 5, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 3 Non-crystalline Materials Fraction: The sample residue from step 2 was extracted with 25 mL of 0.2M ammonium oxalate (pH 3), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- · Step 4 Metal Hydroxide Fraction: The sample residue from step 3 was extracted with 25 mL of 1M hydroxylamine hydrochloride solution in 25% v/v acetic acid, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 5 Organic-bound Fraction: The sample residue from step 4 was extracted three times with 25 mL of 5% sodium hypochlorite (NaClO) at pH 9.5, centrifuged and filtered. The resulting leachates were combined and 5 mL were digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 6 Acid/Sulfide Fraction: The sample residue from step 5 was extracted with 25 mL of a 3:1:2 v/v solution of HCI-HNO3-H2O, centrifuged and filtered. 5 mL of the resulting leachate was diluted to 50 mL with reagent water and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 7 Residual Fraction: A 1.0 g aliquot of the sample residue from step 6 was digested using HF, HNO3, HCl and H3BO3. The digestate was analyzed by ICP using method 6010B. Results are reported in mg/kg on a dry weight basis.

In addition, a 1.0 g aliquot of the original sample was digested using HF, HNO3, HCl and H3BO3. The digestate was analyzed by ICP using method 6010B. Total metal results are reported in mg/kg on a dry weight basis.

Results were calculated using the following equation:

Result, μ g/g or mg/Kg, dry weight = (C × V × V1 × D) / (W × S × V2)

Where:

C = Concentration from instrument readout, μg/mL

V = Final volume of digestate, mL

D = Instrument dilution factor

V1 = Total volume of leachate, mL

V2 = Volume of leachate digested, mL

W = Wet weight of sample, g

S = Percent solids/100

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Job ID: 180-126590-2

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Case Narrative

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Job ID: 180-126590-2 (Continued)

Laboratory: Eurofins Pittsburgh (Continued)

A method blank, laboratory control sample and laboratory control sample duplicate were prepared and analyzed with each SEP step in order to provide information about both the presence of elements of interest in the extraction solutions, and the recovery of elements of interest from the extraction solutions. Results outside of laboratory QC limits do not reflect out of control performance, but rather the effect of the extraction solution upon the analyte.

A laboratory sample duplicate was prepared and analyzed with each batch of samples in order to provide information regarding the reproducibility of the procedure.

SEP Report Notes:

The final report lists the results for each step, the result for the total digestion of the sample, and a sum of the results of steps 1 through 7 by element.

Magnesium was not reported for step 1 because the extraction solution for this step (magnesium sulfate) contains high levels of magnesium. Sodium was not reported for steps 2 and 5 since the extraction solutions for these steps contain high levels of sodium. The sum of steps 1 through 7 is much higher than the total result for sodium and magnesium due to the magnesium and sodium introduced by the extraction solutions.

The digestates for steps 1, 2 and 5 were analyzed at a dilution due to instrument problems caused by the high solids content of the digestates. The reporting limits were adjusted accordingly.

Metals

Method 6010B: The following samples were diluted due to the presence of iron which interferes with Arsenic: SB-1-24.6-34.6 (180-126590-1), SB-4-12-22 (180-126590-3) and SB-5-15-25 (180-126590-4). Elevated reporting limits (RLs) are provided.

Method 6010B: The following samples were diluted due to the presence of titanium which interferes with Cobalt: SB-1-24.6-34.6 (180-126590-1), SB-3-15-25 (180-126590-2), SB-4-12-22 (180-126590-3) and SB-5-15-25 (180-126590-4). Elevated reporting limits (RLs) are provided.

Method 6010B SEP: The following samples were diluted due to the presence of titanium which interferes with Cobalt: SB-1-24.6-34.6 (180-126590-1), SB-4-12-22 (180-126590-3) and SB-5-15-25 (180-126590-4). Elevated reporting limits (RLs) are provided.

Method 6010B SEP: The following sample was diluted due to the presence of iron which interferes with Arsenic: SB-1-24.6-34.6 (180-126590-1). Elevated reporting limits (RLs) are provided.

Method 6010B SEP: The following samples were diluted due to the presence of silicon which interferes with Arsenic: SB-1-24.6-34.6 (180-126590-1), SB-4-12-22 (180-126590-3) and SB-5-15-25 (180-126590-4). Elevated reporting limits (RLs) are provided.

Method 6010B_SEP: The following samples were diluted due to the presence of titanium which interferes with Cobalt: SB-1-24.6-34.6 (180-126590-1) and SB-5-15-25 (180-126590-4). Elevated reporting limits (RLs) are provided.

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

Subcontract Work

Method 1632 Arsenic Speciation III and IV: This method was subcontracted to Eurofins Frontier Global Sciences LLC. The subcontract laboratory certification is different from that of the facility issuing the final report.

Job ID: 180-126590-2

Definitions/Glossary

Client: Southern Company Job ID: 180-126590-2

Project/Site: Plant Arkwright MNA AP-2 DAS

Qualifiers

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IVI	eıа	15
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Qualifier **Qualifier Description**

Compound was found in the blank and sample.

J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation These commonly used abbreviations may or n	ay not be present in this report.
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¤ 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**

Detection Limit (DoD/DOE) DΙ

DL, RA, RE, IN Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample

Decision Level Concentration (Radiochemistry) DLC

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) Most Probable Number MPN 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**

Relative Error Ratio (Radiochemistry) RER

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) Toxicity Equivalent Quotient (Dioxin) **TEQ**

TNTC Too Numerous To Count

Eurofins Pittsburgh

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Accreditation/Certification Summary

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Laboratory: Eurofins Knoxville

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

Authority	Program	Identification Number	Expiration Date
	AFCEE	N/A	
ANAB	Dept. of Defense ELAP	L2311	02-13-25
ANAB	Dept. of Energy	L2311.01	02-13-25
ANAB	ISO/IEC 17025	L2311	02-13-25
Arkansas DEQ	State	88-0688	06-17-22
California	State	2423	06-30-22
Colorado	State	TN00009	02-28-22
Connecticut	State	PH-0223	09-30-23
Florida	NELAP	E87177	06-30-22
Georgia (DW)	State	906	12-11-22
Hawaii	State	NA	12-11-22
Kansas	NELAP	E-10349	10-31-22
Kentucky (DW)	State	90101	12-31-22
Louisiana	NELAP	83979	06-30-22
Louisiana (DW)	State	LA019	12-31-22
Maryland	State	277	03-31-22
Michigan	State	9933	12-11-22
Nevada	State	TN00009	07-31-22
New Hampshire	NELAP	299919	01-17-23
New Jersey	NELAP	TN001	06-30-22
New York	NELAP	10781	03-31-22
North Carolina (DW)	State	21705	07-31-22
North Carolina (WW/SW)	State	64	12-31-22
Ohio VAP	State	CL0059	06-02-23
Oklahoma	State	9415	08-31-22
Oregon	NELAP	TNI0189	12-31-22
Pennsylvania	NELAP	68-00576	12-31-22
Tennessee	State	02014	12-11-22
Texas	NELAP	T104704380-18-12	08-31-22
US Fish & Wildlife	US Federal Programs	058448	07-31-22
USDA	US Federal Programs	P330-19-00236	08-20-22
Utah	NELAP	TN00009	07-31-22
Virginia	NELAP	460176	09-14-22
Washington	State	C593	01-19-23
West Virginia (DW)	State	9955C	12-31-22
West Virginia DEP	State	345	04-30-22
Wisconsin	State	998044300	08-31-22

Job ID: 180-126590-2

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Sample Summary

Client: Southern Company Project/Site: Plant Arkwright MNA AP-2 DAS

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
180-126590-1	SB-1-24.6-34.6	Solid	08/31/21 17:40	09/02/21 09:30
180-126590-2	SB-3-15-25	Solid	08/30/21 18:00	09/02/21 09:30
180-126590-3	SB-4-12-22	Solid	08/31/21 12:00	09/02/21 09:30
180-126590-4	SB-5-15-25	Solid	08/31/21 13:25	09/02/21 09:30

Job ID: 180-126590-2

Method Summary

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

/lethod	Method Description	Protocol	Laboratory
010B	SEP Metals (ICP) - Total	SW846	TAL KNX
010B SEP	SEP Metals (ICP)	SW846	TAL KNX
Subcontract	1632 Arsenic Speciation III and IV	None	Frontier
010A	Preparation, Total Metals	SW846	TAL KNX
cid/Sulfide	Sequential Extraction Procedure, Acid/Sulfide Fraction	TAL-KNOX	TAL KNX
arbonate	Sequential Extraction Procedure, Carbonate Fraction	TAL-KNOX	TAL KNX
xchangeable	Sequential Extraction Procedure, Exchangeable Fraction	TAL-KNOX	TAL KNX
letal Hydroxide	Sequential Extraction Procedure, Metal Hydroxide Fraction	TAL-KNOX	TAL KNX
lon-Crystalline	Sequential Extraction Procedure, Non-crystalline Materials	TAL-KNOX	TAL KNX
rganic-Bound	Sequential Extraction Procedure, Organic Bound Fraction	TAL-KNOX	TAL KNX
tesidual	Sequential Extraction Procedure, Residual Fraction	TAL-KNOX	TAL KNX
otal	Preparation, Total Material	TAL-KNOX	TAL KNX

Protocol References:

None = None

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

TAL-KNOX = TestAmerica Laboratories, Knoxville, Facility Standard Operating Procedure.

Laboratory References:

Frontier = Eurofins Frontier Global Sciences LLC, 5755 8th Street E, Tacoma, WA 98424 TAL KNX = Eurofins Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

Eurofins Pittsburgh

2/15/2022

Job ID: 180-126590-2

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Lab Chronicle

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-1-24.6-34.6 Lab Sample ID: 180-126590-1

Date Collected: 08/31/21 17:40 **Matrix: Solid** Date Received: 09/02/21 09:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			58846	02/14/22 11:17	DKW	TAL KNX
	Instrumer	ATID: NOFOLIIP								

Client Sample ID: SB-1-24.6-34.6

Lab Sample ID: 180-126590-1 Date Collected: 08/31/21 17:40 **Matrix: Solid** Date Received: 09/02/21 09:30 Percent Solids: 60.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10		TAL KNX
Total/NA	Analysis Instrumen	6010B t ID: DUO		1	-		53865	09/17/21 11:09	KNC	TAL KNX
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis Instrumen	6010B t ID: DUO		5	_		53946	09/20/21 12:21	KNC	TAL KNX
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis Instrumen	6010B t ID: DUO		10			53946	09/20/21 14:28	KNC	TAL KNX
Step 1	SEP	Exchangeable			5 g	25 mL	56454	11/30/21 13:26	JMD	TAL KNX
Step 1	Prep	3010A			5 mL	50 mL	56727	12/02/21 12:30	KNC	TAL KNX
Step 1	Analysis Instrumen	6010B SEP t ID: DUO		4			58572	02/03/22 15:42	JMD	TAL KNX
Step 2	SEP	Carbonate			5 g	25 mL	56600	12/02/21 14:40	MAC	TAL KNX
Step 2	Prep	3010A			5 mL	50 mL	56635	12/03/21 11:00	MAC	TAL KNX
Step 2	Analysis Instrumen	6010B SEP t ID: DUO		3			58572	02/03/22 17:10	JMD	TAL KNX
Step 3	SEP	Non-Crystalline			5 g	25 mL	56748	12/08/21 11:40	MAC	TAL KNX
Step 3	Prep	3010A			5 mL	50 mL	56822	12/09/21 11:38	MAC	TAL KNX
Step 3	Analysis Instrumen	6010B SEP t ID: DUO		1			58572	02/03/22 18:29	JMD	TAL KNX
Step 4	SEP	Metal Hydroxide			5 g	25 mL	56873	12/09/21 10:30	MAC	TAL KNX
Step 4	Prep	3010A			5 mL	50 mL	56882	12/13/21 09:30	MAC	TAL KNX
Step 4	Analysis Instrumen	6010B SEP t ID: DUO		1			58601	02/04/22 11:48	JMD	TAL KNX
Step 5	SEP	Organic-Bound			5 g	75 mL	56924	12/10/21 14:07	MAC	TAL KNX
Step 5	Prep	3010A			5 mL	50 mL	57114	12/16/21 09:30	MAC	TAL KNX
Step 5	Analysis Instrumen	6010B SEP t ID: DUO		5			58601	02/04/22 13:06	JMD	TAL KNX
Step 6	SEP	Acid/Sulfide			5 g	250 mL	57164	12/16/21 15:44	MAC	TAL KNX
Step 6	Analysis Instrumen	6010B SEP t ID: DUO		1			58601	02/04/22 14:35	JMD	TAL KNX
Step 6	SEP	Acid/Sulfide			5 g	250 mL	57164	12/16/21 15:44	MAC	TAL KNX
Step 6	Analysis Instrumen	6010B SEP t ID: DUO		2			58657	02/07/22 15:30	KNC	TAL KNX
Step 7	Prep	Residual			1 g	50 mL	57210	12/18/21 15:37	MAC	TAL KNX
Step 7	Analysis Instrumen	6010B SEP t ID: DUO		1			58742	02/09/22 13:17	KNC	TAL KNX

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Job ID: 180-126590-2

Lab Chronicle

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Lab Sample ID: 180-126590-1

Matrix: Solid

Percent Solids: 60.6

Job ID: 180-126590-2

Client Sample ID: SB-1-24.6-34.6

Date Collected: 08/31/21 17:40 Date Received: 09/02/21 09:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1 g	50 mL	57210	12/18/21 15:37	MAC	TAL KNX
Step 7	Analysis	6010B SEP		2			58742	02/09/22 15:43	KNC	TAL KNX
	Instrumer	it ID: DUO								
Step 7	Prep	Residual			1 g	50 mL	57210	12/18/21 15:37	MAC	TAL KNX
Step 7	Analysis	6010B SEP		5			58742	02/09/22 15:48	KNC	TAL KNX
	Instrumer	it ID: DUO								

Client Sample ID: SB-3-15-25

Date Collected: 08/30/21 18:00 Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-2 **Matrix: Solid** Percent Solids: 85.5

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis	6010B		1			53865	09/17/21 11:15	KNC	TAL KNX
	Instrumer	it ID: DUO								
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis	6010B		5			53946	09/20/21 12:26	KNC	TAL KNX
	Instrumer	t ID: DUO								

Client Sample ID: SB-4-12-22

Date Collected: 08/31/21 12:00 Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-3 **Matrix: Solid**

Prep Type Sum of Steps 1-7	Batch Type Analysis	Batch Method 6010B SEP	Run	Dil Factor	Initial Amount	Final Amount	Batch Number 58846	Prepared or Analyzed 02/14/22 11:17	Analyst DKW	Lab TAL KNX
	Instrumen	t ID: NOFOLIP								

Client Sample ID: SB-4-12-22

Lab Sample ID: 180-126590-3 Date Collected: 08/31/21 12:00 **Matrix: Solid** Date Received: 09/02/21 09:30 Percent Solids: 83.5

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis	6010B		1			53865	09/17/21 11:20	KNC	TAL KNX
	Instrumer	it ID: DUO								
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis	6010B		2			53946	09/20/21 12:36	KNC	TAL KNX
	Instrumer	it ID: DUO								
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis	6010B		5			53946	09/20/21 12:41	KNC	TAL KNX
	Instrumer	it ID: DUO								
Step 1	SEP	Exchangeable			5 g	25 mL	56454	11/30/21 13:26	JMD	TAL KNX
Step 1	Prep	3010A			5 mL	50 mL	56727	12/02/21 12:30	KNC	TAL KNX
Step 1	Analysis	6010B SEP		4			58572	02/03/22 15:47	JMD	TAL KNX
	Instrumer	it ID: DUO								

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Job ID: 180-126590-2

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-4-12-22

Date Collected: 08/31/21 12:00 Date Received: 09/02/21 09:30

Client: Southern Company

Lab Sample ID: 180-126590-3

Matrix: Solid

Percent Solids: 83.5

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5 g	25 mL	56600	12/02/21 14:40	MAC	TAL KNX
Step 2	Prep	3010A			5 mL	50 mL	56635	12/03/21 11:00	MAC	TAL KNX
Step 2	Analysis Instrumen	6010B SEP t ID: DUO		3			58572	02/03/22 17:15	JMD	TAL KNX
Step 3	SEP	Non-Crystalline			5 g	25 mL	56748	12/08/21 11:40	MAC	TAL KNX
Step 3	Prep	3010A			5 mL	50 mL	56822	12/09/21 11:38	MAC	TAL KNX
Step 3	Analysis Instrumen	6010B SEP t ID: DUO		1			58572	02/03/22 18:34	JMD	TAL KNX
Step 4	SEP	Metal Hydroxide			5 g	25 mL	56873	12/09/21 10:30	MAC	TAL KNX
Step 4	Prep	3010A			5 mL	50 mL	56882	12/13/21 09:30	MAC	TAL KNX
Step 4	Analysis Instrumen	6010B SEP t ID: DUO		1			58601	02/04/22 11:53	JMD	TAL KNX
Step 5	SEP	Organic-Bound			5 g	75 mL	56924	12/10/21 14:07	MAC	TAL KNX
Step 5	Prep	3010A			5 mL	50 mL	57114	12/16/21 09:30	MAC	TAL KNX
Step 5	Analysis Instrumen	6010B SEP t ID: DUO		5			58601	02/04/22 13:11	JMD	TAL KNX
Step 6	SEP	Acid/Sulfide			5 g	250 mL	57164	12/16/21 15:44	MAC	TAL KNX
Step 6	Analysis Instrumen	6010B SEP t ID: DUO		1	Ü		58601	02/04/22 14:40	JMD	TAL KNX
Step 6	SEP	Acid/Sulfide			5 g	250 mL	57164	12/16/21 15:44	MAC	TAL KNX
Step 6	Analysis Instrumen	6010B SEP t ID: DUO		2			58657	02/07/22 15:35	KNC	TAL KNX
Step 7	Prep	Residual			1 g	50 mL	57210	12/18/21 15:37	MAC	TAL KNX
Step 7	Analysis Instrumen	6010B SEP t ID: DUO		1	Ü		58742	02/09/22 13:22	KNC	TAL KNX
Step 7	Prep	Residual			1 g	50 mL	57210	12/18/21 15:37	MAC	TAL KNX
Step 7	Analysis Instrumen	6010B SEP t ID: DUO		2	-		58742	02/09/22 15:53	KNC	TAL KNX

Client Sample ID: SB-5-15-25

Date Collected: 08/31/21 13:25

Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-4

Matrix: Solid

Batch Batch Dil Initial Final Batch Prepared **Prep Type** Туре Method Run Factor **Amount Amount** Number or Analyzed Analyst Lab Sum of Steps 1-7 6010B SEP 02/14/22 11:17 DKW TAL KNX Analysis 58846 Instrument ID: NOEQUIP

Client Sample ID: SB-5-15-25

Date Collected: 08/31/21 13:25

Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-4 **Matrix: Solid** Percent Solids: 93.2

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis	6010B		1			53865	09/17/21 11:25	KNC	TAL KNX
	Instrumen	t ID: DUO								

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Lab Chronicle

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-5-15-25

Date Collected: 08/31/21 13:25 Date Received: 09/02/21 09:30

Lab Sample ID: 180-126590-4

Matrix: Solid

Percent Solids: 93.2

Job ID: 180-126590-2

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis Instrumen	6010B nt ID: DUO		2			53946	09/20/21 12:46	KNC	TAL KNX
Total/NA	Prep	Total			1.000 g	50 mL	53804	09/16/21 08:10	KNC	TAL KNX
Total/NA	Analysis Instrumen	6010B at ID: DUO		5			53946	09/20/21 12:51	KNC	TAL KNX
Step 1	SEP	Exchangeable			5 g	25 mL	56454	11/30/21 13:26	JMD	TAL KNX
Step 1	Prep	3010A			5 mL	50 mL	56727	12/02/21 12:30	KNC	TAL KNX
Step 1	Analysis Instrumen	6010B SEP at ID: DUO		4			58572	02/03/22 16:01	JMD	TAL KNX
Step 2	SEP	Carbonate			5 g	25 mL	56600	12/02/21 14:40	MAC	TAL KNX
Step 2	Prep	3010A			5 mL	50 mL	56635	12/03/21 11:00	MAC	TAL KNX
Step 2	Analysis Instrumen	6010B SEP at ID: DUO		3			58572	02/03/22 17:20	JMD	TAL KNX
Step 3	SEP	Non-Crystalline			5 g	25 mL	56748	12/08/21 11:40	MAC	TAL KNX
Step 3	Prep	3010A			5 mL	50 mL	56822	12/09/21 11:38	MAC	TAL KNX
Step 3	Analysis Instrumen	6010B SEP at ID: DUO		1			58572	02/03/22 18:39	JMD	TAL KNX
Step 4	SEP	Metal Hydroxide			5 g	25 mL	56873	12/09/21 10:30	MAC	TAL KNX
Step 4	Prep	3010A			5 mL	50 mL	56882	12/13/21 09:30	MAC	TAL KNX
Step 4	Analysis Instrumen	6010B SEP nt ID: DUO		1			58601	02/04/22 11:58	JMD	TAL KNX
Step 5	SEP	Organic-Bound			5 g	75 mL	56924	12/10/21 14:07	MAC	TAL KNX
Step 5	Prep	3010A			5 mL	50 mL	57114	12/16/21 09:30		TAL KNX
Step 5	Analysis Instrumen	6010B SEP nt ID: DUO		5			58601	02/04/22 13:16	JMD	TAL KNX
Step 6	SEP	Acid/Sulfide			5 g	250 mL	57164	12/16/21 15:44	MAC	TAL KNX
Step 6	Analysis Instrumen	6010B SEP nt ID: DUO		1			58601	02/04/22 14:45	JMD	TAL KNX
Step 6	SEP	Acid/Sulfide			5 g	250 mL	57164	12/16/21 15:44	MAC	TAL KNX
Step 6	Analysis Instrumen	6010B SEP nt ID: DUO		2	-		58657	02/07/22 15:40	KNC	TAL KNX
Step 7	Prep	Residual			1 g	50 mL	57210	12/18/21 15:37	MAC	TAL KNX
Step 7	Analysis Instrumen	6010B SEP at ID: DUO		1			58742	02/09/22 13:27	KNC	TAL KNX
Step 7	Prep	Residual			1 g	50 mL	57210	12/18/21 15:37	MAC	TAL KNX
Step 7	Analysis Instrumen	6010B SEP at ID: DUO		2	-		58742	02/09/22 15:58	KNC	TAL KNX

Laboratory References:

Frontier = Eurofins Frontier Global Sciences LLC, 5755 8th Street E, Tacoma, WA 98424 TAL KNX = Eurofins Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

Lab Chronicle

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Job ID: 180-126590-2

Analyst References:

Lab: TAL KNX

Batch Type: SEP

JMD = Jeanette Daniels

MAC = Michael Campbell

Batch Type: Prep

KNC = Kerry Collins

MAC = Michael Campbell

Batch Type: Analysis

DKW = Donna Wilburn

JMD = Jenny Do

KNC = Kerry Collins

3

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Client: Southern Company

Molybdenum

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-1-24.6-34.6 Lab Sample ID: 180-126590-1

Date Collected: 08/31/21 17:40 Matrix: Solid Date Received: 09/02/21 09:30 Percent Solids: 60.6

Method: 6010B SEP - SEP Metals (ICP) - Step 1											
Analyte	Result Quali	lifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac			
Arsenic	<0.86	3.3	0.86	mg/Kg	<u></u>	12/02/21 12:30	02/03/22 15:42	4			
Cobalt	<0.30	16	0.30	mg/Kg	☼	12/02/21 12:30	02/03/22 15:42	4			

12/02/21 12:30 02/03/22 15:42 Lithium < 0.99 16 0.99 mg/Kg < 0.54 13 Molybdenum 0.54 mg/Kg 12/02/21 12:30 02/03/22 15:42

Method: 6010B SEP - SEP Metals (ICP) - Step 2 Analyte Result Qualifier RL **MDL** Unit D Prepared Analyzed Dil Fac <u>~</u> Arsenic < 0.64 2.5 0.64 mg/Kg 12/03/21 11:00 02/03/22 17:10 Cobalt < 0.31 0.31 mg/Kg 02/03/22 17:10 12 12/03/21 11:00

Lithium 1.2 12 0.74 mg/Kg 12/03/21 11:00 02/03/22 17:10 9.9 0.41 mg/Kg 12/03/21 11:00 02/03/22 17:10 Molybdenum < 0.41

Method: 6010B SEP - SEP Metals (ICP) - Step 3 Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac Arsenic <0.21 0.82 0.21 mg/Kg 12/09/21 11:38 02/03/22 18:29 Cobalt 27 4.1 0.074 mg/Kg 12/09/21 11:38 02/03/22 18:29 1 Lithium <0.25 4.1 12/09/21 11:38 02/03/22 18:29 0.25 mg/Kg 1

< 0.14

Method: 6010B SEP - SEP Metals (ICP) - Step 4 Result Qualifier RL Unit Analyte MDL Prepared Analyzed Dil Fac 02/04/22 11:48 0.82 0.36 mg/Kg **Arsenic** 1.5 B 12/13/21 09:30 Cobalt 4.1 0.087 mg/Kg 12/13/21 09:30 02/04/22 11:48 17 Lithium 2.1 4.1 0.25 mg/Kg 12/13/21 09:30 02/04/22 11:48 Molybdenum < 0.14 3.3 mg/Kg 12/13/21 09:30 02/04/22 11:48

3.3

0.14

mg/Kg

12/09/21 11:38

02/03/22 18:29

Method: 6010B SEP - SEP Metals (ICP) - Step 5 Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac Arsenic <3.1 12 3.1 mg/Kg 12/16/21 09:30 02/04/22 13:06 5 Cobalt <0.99 62 02/04/22 13:06 5 0.99 mg/Kg 12/16/21 09:30 62 5 Lithium 8.6 J B 3.6 mg/Kg 12/16/21 09:30 02/04/22 13:06 Molybdenum 49 2.1 mg/Kg 12/16/21 09:30 02/04/22 13:06 5

Method: 6010B SEP - SEP Metals (ICP) - Step 6 Analyte Result Qualifier RL MDL Unit D Dil Fac Prepared Analyzed 1.6 0.49 mg/Kg 12/16/21 15:44 02/07/22 15:30 **Arsenic** 2.6 2 Cobalt 12 8.2 0.15 mg/Kg 12/16/21 15:44 02/07/22 15:30 2 4.1 0.25 mg/Kg 02/04/22 14:35 Lithium 7.3 12/16/21 15:44 02/04/22 14:35 Molybdenum < 0.16 3.3 0.16 mg/Kg 12/16/21 15:44

Method: 6010B SEP - SEP Metals (ICP) - Step 7 Dil Fac **Analyte** Result Qualifier RL **MDL** Unit D Prepared Analyzed Arsenic 2.5 В 1.6 0.43 mg/Kg 12/18/21 15:37 02/09/22 15:43 2 Cobalt 8.0 J 21 0.21 mg/Kg 12/18/21 15:37 02/09/22 15:48 5 4.1 0.25 mg/Kg 12/18/21 15:37 02/09/22 13:17 Lithium 26 Molybdenum < 0.14 3.3 0.14 mg/Kg 12/18/21 15:37 02/09/22 13:17

Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7 **Analyte** Result Qualifier RL **MDL** Unit D Dil Fac Prepared Analyzed 6.6 0.50 0.13 mg/Kg 02/14/22 11:17 **Arsenic** Cobalt 64 02/14/22 11:17 2.5 0.023 mg/Kg

Eurofins Pittsburgh

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Job ID: 180-126590-2

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3

2/15/2022

Client: Southern Company Job ID: 180-126590-2

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-1-24.6-34.6

Lab Sample ID: 180-126590-1 Date Collected: 08/31/21 17:40 **Matrix: Solid** Date Received: 09/02/21 09:30

Percent Solids: 60.6

Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7 (Continued)

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Lithium	45	2.5	0.15 mg/Kg			02/14/22 11:17	1
Molybdenum	<0.082	2.0	0.082 mg/Kg			02/14/22 11:17	1

Method: 6010B - SEP N	Metals (ICP) - Total								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	14		4.1	1.1	mg/Kg	<u></u>	09/16/21 08:10	09/20/21 12:21	5
Cobalt	93		41	0.43	mg/Kg	₩	09/16/21 08:10	09/20/21 14:28	10
Lithium	32		4.1	0.25	mg/Kg	☆	09/16/21 08:10	09/17/21 11:09	1
Molybdenum	<0.14		3.3	0.14	mg/Kg	₩	09/16/21 08:10	09/17/21 11:09	1

Client: Southern Company Job ID: 180-126590-2

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-3-15-25 Lab Sample ID: 180-126590-2

 Date Collected: 08/30/21 18:00
 Matrix: Solid

 Date Received: 09/02/21 09:30
 Percent Solids: 85.5

Method: 6010B - SEP	Metals (ICP) - Total								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.0	В	0.58	0.15	mg/Kg	<u></u>	09/16/21 08:10	09/17/21 11:15	1
Cobalt	8.9	J	15	0.15	mg/Kg	₽	09/16/21 08:10	09/20/21 12:26	5
Lithium	7.9		2.9	0.18	mg/Kg	≎	09/16/21 08:10	09/17/21 11:15	1
Molybdenum	1.8	J	2.3	0.096	mg/Kg	₩	09/16/21 08:10	09/17/21 11:15	1

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Client: Southern Company

Cobalt

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-4-12-22

Lab Sample ID: 180-126590-3 Date Collected: 08/31/21 12:00 **Matrix: Solid**

Method: 6010B SEP - S	ED Motale (ICD) - 9	Stop 1							
Analyte	• •	Qualifier	RL	MDI	Unit	D	Prepared	Analyzed	Dil Fa
Arsenic	<0.62		2.4		mg/Kg	— -	12/02/21 12:30		
Cobalt	0.62	1	12		mg/Kg	☆			4
Lithium	<0.72	•	12		mg/Kg	☆		02/03/22 15:47	
Molybdenum	<0.39		9.6		mg/Kg			02/03/22 15:47	
•	ED Motolo (ICD)	ton 2			0 0				
Method: 6010B SEP - S Analyte	• •	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Arsenic	<0.47		1.8	0.47	mg/Kg	<u></u>	12/03/21 11:00	02/03/22 17:15	
Cobalt	<0.23		9.0	0.23	mg/Kg	₩	12/03/21 11:00	02/03/22 17:15	
Lithium	0.75	J	9.0	0.54	mg/Kg	₩	12/03/21 11:00	02/03/22 17:15	
Molybdenum	<0.29		7.2	0.29	mg/Kg	₩	12/03/21 11:00	02/03/22 17:15	;
Method: 6010B SEP - S	EP Metals (ICP) - S	Step 3							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Arsenic	<0.16		0.60		mg/Kg	₩	12/09/21 11:38	02/03/22 18:34	
Cobalt	1.8	J	3.0		mg/Kg	₩	12/09/21 11:38	02/03/22 18:34	
Lithium	<0.18		3.0	0.18	mg/Kg	₩	12/09/21 11:38	02/03/22 18:34	
Molybdenum	0.59	J	2.4	0.098	mg/Kg	₽	12/09/21 11:38	02/03/22 18:34	
Method: 6010B SEP - S	EP Metals (ICP) - S	Step 4							
Analyte		Qualifier	RL _	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Arsenic	0.96	В	0.60	0.26	mg/Kg	≎	12/13/21 09:30	02/04/22 11:53	
Cobalt	1.4	J	3.0	0.063	mg/Kg	≎	12/13/21 09:30	02/04/22 11:53	
Lithium	1.7	J	3.0		mg/Kg	₩	12/13/21 09:30	02/04/22 11:53	
Molybdenum	0.34	J	2.4	0.098	mg/Kg	₩	12/13/21 09:30	02/04/22 11:53	
Method: 6010B SEP - S		•							
Analyte		Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fa
Arsenic	<2.3		9.0		mg/Kg	≎	12/16/21 09:30	02/04/22 13:11	
Cobalt	<0.72		45		mg/Kg	☆	12/16/21 09:30	02/04/22 13:11	
Lithium	6.5	JB	45		mg/Kg		12/16/21 09:30	02/04/22 13:11	
Molybdenum	<1.5		36	1.5	mg/Kg	₩	12/16/21 09:30	02/04/22 13:11	
Method: 6010B SEP - S	• •	•	ъ.	MOI	1114	_	B	A l	D!! E -
Analyte		Qualifier	RL		Unit	— <u>—</u>	Prepared	Analyzed	Dil Fa
Arsenic	1.0		0.60		mg/Kg	₩.		02/04/22 14:40	
Cobalt	9.8		6.0		mg/Kg			02/07/22 15:35	
Lithium	10		3.0		mg/Kg			02/04/22 14:40	
Molybdenum	<0.12		2.4	0.12	mg/Kg	Đ.	12/16/21 15:44	02/04/22 14:40	
Method: 6010B SEP - S	• • • • • • • • • • • • • • • • • • • •	itep 7 Qualifier	DI	MDI	Unit	D	Prepared	Analyzad	Dil Fa
Analyte	0.93		RL 1.2		mg/Kg	— Ö		Analyzed 02/09/22 15:53	טוו רנ
Arsenic Cobalt	3.1	JB	3.0		mg/Kg	₩		02/09/22 13:33	
	3.1		3.0		mg/Kg	≯ ¢		02/09/22 13:22	
Lithium Molybdenum								02/09/22 13:22	
	<0.098		2.4	0.096	mg/Kg	**	12/10/21 10.3/	02/03/22 13.22	
<mark>Method: 6010B SEP - S</mark> Analyte	• •	or Step Qualifier	s 1-7 RL	MDI	Unit	D	Prepared	Analyzed	Dil Fa
Arsenic	2.9		0.50		mg/Kg	_ =	Tioparea	02/14/22 11:17	
Alacillo	2.9		0.50	0.13	mg/rtg			VZ/ 17/22 11.1/	

2.5

0.023 mg/Kg

17

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02/14/22 11:17

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Client: Southern Company Job ID: 180-126590-2

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-4-12-22 Lab Sample ID: 180-126590-3

Date Collected: 08/31/21 12:00 **Matrix: Solid**

Date Received: 09/02/21 09:30 Percent Solids: 83.5

Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7 (Continued)											
	Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
	Lithium	23		2.5	0.15	mg/Kg			02/14/22 11:17	1	
	Molybdenum	0.93	J	2.0	0.082	mg/Kg			02/14/22 11:17	1	

Method: 6010B - SEP Me	tals (ICP) - Total							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.5	1.2	0.31	mg/Kg	<u></u>	09/16/21 08:10	09/20/21 12:36	2
Cobalt	18	15	0.16	mg/Kg	₩	09/16/21 08:10	09/20/21 12:41	5
Lithium	11	3.0	0.18	mg/Kg	₽	09/16/21 08:10	09/17/21 11:20	1
Molybdenum	0.80 J	2.4	0.098	mg/Kg	₩	09/16/21 08:10	09/17/21 11:20	1

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-5-15-25

Lab Sample ID: 180-126590-4 Date Collected: 08/31/21 13:25 Matrix: Solid

Date Received: 09/02/21 0	9:30						Percent Solid	s: 93.2
_ Method: 6010B SEP - SE	P Metals (ICP) - Sten 1							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.56	2.1		mg/Kg	— <u>-</u>	12/02/21 12:30	02/03/22 16:01	4
Cobalt	<0.19	11		mg/Kg	÷	12/02/21 12:30	02/03/22 16:01	4
Lithium	<0.64	11		mg/Kg	÷		02/03/22 16:01	4
Molybdenum	<0.35	8.6		mg/Kg		12/02/21 12:30		4
Morybuorium	10.00	0.0	0.00	mg/rtg	~	12/02/21 12:00	02/00/22 10:01	
Method: 6010B SEP - SE	P Metals (ICP) - Step 2							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.42	1.6	0.42	mg/Kg	₩	12/03/21 11:00	02/03/22 17:20	3
Cobalt	<0.20	8.0	0.20	mg/Kg	☼	12/03/21 11:00	02/03/22 17:20	3
Lithium	<0.48	8.0	0.48	mg/Kg	₩	12/03/21 11:00	02/03/22 17:20	3
Molybdenum	<0.26	6.4	0.26	mg/Kg	₩	12/03/21 11:00	02/03/22 17:20	3
Method: 6010B SEP - SE	P Motols (ICP) Stop 3							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.14 Quanton —	0.54		mg/Kg	— <u>=</u>	12/09/21 11:38	02/03/22 18:39	1
Cobalt	1.5 J	2.7	0.048	0 0	☆	12/09/21 11:38	02/03/22 18:39	1
Lithium	<0.16	2.7		mg/Kg	₩	12/09/21 11:38	02/03/22 18:39	1
Molybdenum	0.34 J	2.1		mg/Kg	 ☆		02/03/22 18:39	
Morybaenam	0.34 3	2.1	0.000	mg/rtg	*	12/03/21 11.30	02/00/22 10:55	
Method: 6010B SEP - SE								
Analyte	Result Qualifier	RL _	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.66 B	0.54	0.24	0 0	₩	12/13/21 09:30	02/04/22 11:58	1
Cobalt	0.75 J	2.7	0.057	mg/Kg	₩	12/13/21 09:30	02/04/22 11:58	1
Lithium	0.84 J	2.7	0.16	mg/Kg	₩	12/13/21 09:30	02/04/22 11:58	1
Molybdenum	0.17 J	2.1	0.088	mg/Kg	☼	12/13/21 09:30	02/04/22 11:58	1
- Method: 6010B SEP - SE	P Metals (ICP) - Step 5							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<2.0	8.0	2.0	mg/Kg	— <u></u>	12/16/21 09:30	02/04/22 13:16	5
Cobalt	<0.64	40		mg/Kg	÷	12/16/21 09:30	02/04/22 13:16	5
Lithium	5.3 JB	40		mg/Kg	÷		02/04/22 13:16	5
Molybdenum	<1.3	32		mg/Kg			02/04/22 13:16	5
-				9,9				
Method: 6010B SEP - SE								
Analyte	Result Qualifier	RL _		Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.1	0.54	0.16	mg/Kg	☼	12/16/21 15:44	02/04/22 14:45	1
Cobalt	13	5.4		mg/Kg	☼	12/16/21 15:44	02/07/22 15:40	2
Lithium	12	2.7	0.16	mg/Kg	₩	12/16/21 15:44	02/04/22 14:45	1
Molybdenum	<0.11	2.1	0.11	mg/Kg	₩	12/16/21 15:44	02/04/22 14:45	1
Method: 6010B SEP - SE	P Metals (ICP) - Sten 7							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.1 B	1.1	0.28	mg/Kg	— <u></u>	12/18/21 15:37	-	2
Cobalt	1.7 J	5.4		mg/Kg			02/09/22 15:58	2
Lithium	3.6	2.7		mg/Kg			02/09/22 13:27	1
Molybdenum	<0.088	2.1		mg/Kg			02/09/22 13:27	1
Mathadi CO40D OED CE	D.Matala (IOD) - O CO:	- 4 7						
Method: 6010B SEP - SE Analyte	P Metals (ICP) - Sum of Step Result Qualifier	S 1-7 RL	MDI	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.9	0.50		mg/Kg		Tiepaieu	02/14/22 11:17	1
	2. 9 17	2.5					02/14/22 11:17	
Cobalt	17	2.5	0.023	mg/Kg			02/14/22 11:1/	1

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Job ID: 180-126590-2

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Client: Southern Company Job ID: 180-126590-2

Project/Site: Plant Arkwright MNA AP-2 DAS

Client Sample ID: SB-5-15-25

Date Collected: 08/31/21 13:25 Date Received: 09/02/21 09:30 Lab Sample ID: 180-126590-4

Matrix: Solid

Percent Solids: 93.2

Method: 6010B SEP - SEP	Metals (ICP) - Sum of Steps	1-7 (Cont	inued)				
Analyte	Result Qualifier	RL	MDL Un	nit C	Prepared	Analyzed	Dil Fac
Lithium		2.5	0.15 mg	g/Kg		02/14/22 11:17	1
Molybdenum	0.51 J	2.0	0.082 mg	g/Kg		02/14/22 11:17	1

Method: 6010B - SEP M	etals (ICP) - Total							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.7	1.1	0.28	mg/Kg	<u></u>	09/16/21 08:10	09/20/21 12:46	2
Cobalt	18	13	0.14	mg/Kg	₩	09/16/21 08:10	09/20/21 12:51	5
Lithium	15	2.7	0.16	mg/Kg	☼	09/16/21 08:10	09/17/21 11:25	1
Molybdenum	0.57 J	2.1	0.088	mg/Kg	≎	09/16/21 08:10	09/17/21 11:25	1

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Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Job ID: 180-126590-2

Method: 6010B - SEP Metals (ICP) - Total

Lab Sample ID: MB 140-53804/11-A

Matrix: Solid

Analysis Batch: 53865

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 53804

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.194	J	0.50	0.13	mg/Kg		09/16/21 08:10	09/17/21 10:54	1
Cobalt	<0.026		2.5	0.026	mg/Kg		09/16/21 08:10	09/17/21 10:54	1
Lithium	<0.15		2.5	0.15	mg/Kg		09/16/21 08:10	09/17/21 10:54	1
Molybdenum	<0.082		2.0	0.082	mg/Kg		09/16/21 08:10	09/17/21 10:54	1

MD MD

Lab Sample ID: LCS 140-53804/12-A

Matrix: Solid

Analysis Batch: 53865

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Prep Batch: 53804

LCS LCS Spike %Rec. Analyte Added Result Qualifier Unit %Rec Limits Arsenic 5.00 5.13 103 80 - 120 mg/Kg Cobalt 5.00 5.09 mg/Kg 102 80 - 125 Lithium 5.00 4.82 mg/Kg 96 80 - 120 80 - 125 Molybdenum 25.0 25.7 mg/Kg 103

Lab Sample ID: LCSD 140-53804/13-A

Matrix: Solid

Analysis Batch: 53865

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 53804

Spike LCSD LCSD %Rec. **RPD Analyte** Added Result Qualifier Unit D %Rec Limits RPD Limit 5.00 Arsenic 5.17 mg/Kg 103 80 - 120 30 mg/Kg Cobalt 5.00 102 80 - 125 30 5 12 5.00 Lithium 4.83 mg/Kg 97 80 - 120 30 Molybdenum 25.0 25.7 mg/Kg 103 80 - 125 30

Method: 6010B SEP - SEP Metals (ICP)

Lab Sample ID: MB 140-56454/6-C ^4

Matrix: Solid

Analysis Batch: 58572

Client Sample ID: Method Blank

Prep Type: Step 1

Prep Batch: 56727

мв мв **Analyte** Result Qualifier RL **MDL** Unit Prepared Analyzed Dil Fac <0.52 2.0 12/02/21 12:30 02/03/22 15:27 Arsenic 0.52 mg/Kg Cobalt <0.18 10 12/02/21 12:30 02/03/22 15:27 0.18 mg/Kg 4 <0.60 10 Lithium 0.60 mg/Kg 12/02/21 12:30 02/03/22 15:27 8.0 0.33 mg/Kg 12/02/21 12:30 02/03/22 15:27 Molybdenum < 0.33

Lab Sample ID: LCS 140-56454/4-C ^5

Matrix: Solid

Analysis Batch: 58572

Client Sample ID: Lab Control Sample

Prep Type: Step 1

Prep Batch: 56727

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	5.00	5.11		mg/Kg		102	80 - 120	
Cobalt	5.00	5.14	J	mg/Kg		103	80 - 120	
Lithium	5.00	5.05	J	mg/Kg		101	80 - 120	
Molybdenum	25.0	26.4		mg/Kg		106	80 - 120	

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Job ID: 180-126590-2

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-56454/5-B ^5

Matrix: Solid Analysis Batch: 58572

Prep Type: Step 1 Prep Batch: 56727

Spike LCSD LCSD %Rec. **RPD** Analyte Added Result Qualifier Unit D %Rec Limits RPD Limit Arsenic 5.00 4.83 mg/Kg 97 80 - 120 6 30 Cobalt 5.00 4.91 J mg/Kg 98 80 - 120 5 30 Lithium 5.00 4.69 J mg/Kg 80 - 120 94 30 Molybdenum 25.0 25.0 mg/Kg 100 80 - 120 30

Lab Sample ID: 180-126590-4 DU Client Sample ID: SB-5-15-25

Matrix: Solid

Analysis Batch: 58572

Prep Type: Step 1

Prep Batch: 56727

RPD
D Limit
C 30
C 30
C 30
C 30
1

Lab Sample ID: MB 140-56600/1-B ^3

Matrix: Solid

Analysis Batch: 58572

Client Sample ID: Method Blank Prep Type: Step 2

Prep Batch: 56635

MR MR

	1410	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.39		1.5	0.39	mg/Kg		12/03/21 11:00	02/03/22 16:45	3
Cobalt	<0.19		7.5	0.19	mg/Kg		12/03/21 11:00	02/03/22 16:45	3
Lithium	<0.45		7.5	0.45	mg/Kg		12/03/21 11:00	02/03/22 16:45	3
Molybdenum	<0.25		6.0	0.25	mg/Kg		12/03/21 11:00	02/03/22 16:45	3

Lab Sample ID: LCS 140-56600/2-B ^5 **Client Sample ID: Lab Control Sample**

Matrix: Solid

Analysis Batch: 58572

Prep Type: Step 2 Prep Batch: 56635

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	5.00	4.20		mg/Kg		84	60 - 120	
Cobalt	5.00	4.68	J	mg/Kg		94	80 - 120	
Lithium	5.00	5.01	J	mg/Kg		100	80 - 120	
Molybdenum	25.0	25.9		mg/Kg		104	70 - 120	

Lab Sample ID: LCSD 140-56600/3-B ^5 Client Sample ID: Lab Control Sample Dup **Matrix: Solid**

Analysis Batch: 58572

Prep Type: Step 2 Prep Batch: 56635

Spike LCSD LCSD **RPD** %Rec. Result Qualifier Analyte Added Unit D %Rec Limits RPD Limit Arsenic 5.00 4.88 mg/Kg 98 60 - 120 15 30 Cobalt 5.00 4.92 J 30 mg/Kg 98 80 - 120 5 Lithium 5.00 5.20 J mg/Kg 104 80 - 120 4 30 Molybdenum 25.0 24.8 mg/Kg 99 70 - 120 30

Job ID: 180-126590-2

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: 180-126590-4 DU

Matrix: Solid

Analysis Batch: 58572

Client Sample ID: SB-5-15-25

Prep Type: Step 2

Prep Batch: 56635

	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Arsenic	<0.42		<0.42		mg/Kg	— <u> </u>	NC	30
Cobalt	<0.20		<0.20		mg/Kg	₩	NC	30
Lithium	<0.48		0.714	J	mg/Kg	₩	NC	30
Molybdenum	<0.26		<0.26		mg/Kg	☼	NC	30

Lab Sample ID: MB 140-56748/1-B

Matrix: Solid

Analysis Batch: 58572

Client Sample ID: Method Blank

Prep Type: Step 3

Prep Batch: 56822

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.13		0.50	0.13	mg/Kg		12/09/21 11:38	02/03/22 18:15	1
Cobalt	<0.045		2.5	0.045	mg/Kg		12/09/21 11:38	02/03/22 18:15	1
Lithium	<0.15		2.5	0.15	mg/Kg		12/09/21 11:38	02/03/22 18:15	1
Molybdenum	<0.082		2.0	0.082	mg/Kg		12/09/21 11:38	02/03/22 18:15	1

Lab Sample ID: LCS 140-56748/2-B

Matrix: Solid

Analysis Batch: 58572

Client Sample ID: Lab Control Sample Prep Type: Step 3

Prep Batch: 56822

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	5.00	5.10		mg/Kg		102	80 - 120	 _
Cobalt	5.00	4.70		mg/Kg		94	80 - 120	
Lithium	5.00	5.03		mg/Kg		101	80 - 120	
Molybdenum	25.0	25.8		mg/Kg		103	80 - 120	

Lab Sample ID: LCSD 140-56748/3-B

Matrix: Solid

Analysis Batch: 58572

Client San	nple ID:	Lab	Control	Sample	e Dup

Prep Type: Step 3 Prep Batch: 56822

Alialysis Datcii. 30372							Fieh	altii.	00022
	Spike	LCSD	LCSD				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	5.00	5.06		mg/Kg		101	80 - 120	1	30
Cobalt	5.00	4.84		mg/Kg		97	80 - 120	3	30
Lithium	5.00	4.92		mg/Kg		98	80 - 120	2	30
Molybdenum	25.0	25.3		mg/Kg		101	80 - 120	2	30

Lab Sample ID: 180-126590-4 DU

Matrix: Solid

Analysis Batch: 58572

Prep Type: Step 3

Prep Batch: 56822

	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Arsenic	<0.14		<0.14		mg/Kg	— <u></u> — —	NC	30
Cobalt	1.5	J	1.60	J	mg/Kg	₩	6	30
Lithium	<0.16		<0.16		mg/Kg	₩	NC	30
Molybdenum	0.34	J	0.450	J	mg/Kg	₩	28	30

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Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Job ID: 180-126590-2

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: MB 140-56873/1-B

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: Method Blank

Prep Type: Step 4

Prep Batch: 56882

•	MB	MB						•	
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.410	J	0.50	0.22	mg/Kg		12/13/21 09:30	02/04/22 11:34	1
Cobalt	<0.053		2.5	0.053	mg/Kg		12/13/21 09:30	02/04/22 11:34	1
Lithium	<0.15		2.5	0.15	mg/Kg		12/13/21 09:30	02/04/22 11:34	1
Molybdenum	<0.082		2.0	0.082	mg/Kg		12/13/21 09:30	02/04/22 11:34	1

Lab Sample ID: LCS 140-56873/2-B

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: Lab Control Sample

Prep Type: Step 4

Prep Batch: 56882

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	5.00	5.20		mg/Kg		104	80 - 130	
Cobalt	5.00	4.76		mg/Kg		95	80 - 120	
Lithium	5.00	4.61		mg/Kg		92	80 - 120	
Molybdenum	25.0	24.3		mg/Kg		97	80 - 120	

Lab Sample ID: LCSD 140-56873/3-B

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: Lab Control Sample Dup

Prep Type: Step 4

Prep Batch: 56882

_	Spike	LCSD	LCSD				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	5.00	5.39		mg/Kg		108	80 - 130	4	30
Cobalt	5.00	4.98		mg/Kg		100	80 - 120	5	30
Lithium	5.00	4.80		mg/Kg		96	80 - 120	4	30
Molybdenum	25.0	25.5		mg/Kg		102	80 - 120	5	30

Lab Sample ID: 180-126590-4 DU

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: SB-5-15-25

Prep Type: Step 4

Pren Batch: 56882

Allalysis Dalcil. 3000 i							Fieh parci	1. 5	0002
	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RF	D	Limit
Arsenic	0.66	B	0.679		mg/Kg	*		3	30
Cobalt	0.75	J	0.787	J	mg/Kg	₩		5	30
Lithium	0.84	J	0.947	J	mg/Kg	₩	•	12	30
Molybdenum	0.17	j	0.204	J	mg/Kg			17	30

Lab Sample ID: MB 140-56924/1-B ^5

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: Method Blank

Prep Type: Step 5

Prep Batch: 57114

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<1.9		7.5	1.9	mg/Kg		12/16/21 09:30	02/04/22 12:51	5
Cobalt	<0.60		38	0.60	mg/Kg		12/16/21 09:30	02/04/22 12:51	5
Lithium	4.93	J	38	2.2	mg/Kg		12/16/21 09:30	02/04/22 12:51	5
Molybdenum	<1.3		30	1.3	mg/Kg		12/16/21 09:30	02/04/22 12:51	5

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Job ID: 180-126590-2

Client: Southern Company Project/Site: Plant Arkwright MNA AP-2 DAS

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCS 140-56924/2-B ^5

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: Lab Control Sample

Prep Type: Step 5 Prep Batch: 57114

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	15.0	10.6		mg/Kg		71	60 - 100	
Cobalt	15.0	3.24	J	mg/Kg		22	1 - 60	
Lithium	15.0	20.0	J	mg/Kg		133	80 - 150	
Molybdenum	75.0	48.0		ma/Ka		64	60 - 100	

Lab Sample ID: LCSD 140-56924/3-B ^5

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: Lab Control Sample Dup Prep Type: Step 5

Prep Batch: 57114

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Spike LCSD LCSD %Rec. **RPD** Analyte Added Result Qualifier Unit D %Rec Limits RPD Limit Arsenic 15.0 12.2 81 60 - 100 14 30 mg/Kg Cobalt 15.0 3.56 J 30 mg/Kg 24 1 - 60 9 Lithium 15.0 22.4 J mg/Kg 149 80 - 150 11 30 Molybdenum 75.0 57.7 mg/Kg 77 60 - 100 30 18

Lab Sample ID: 180-126590-4 DU

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: SB-5-15-25

Prep Type: Step 5

Prep Batch: 57114

	Sample	Sample	DU	DU			·	RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Arsenic	<2.0		<2.0		mg/Kg	<u></u>	NC NC	30
Cobalt	<0.64		<0.64		mg/Kg	☼	NC	30
Lithium	5.3	JB	4.44	J	mg/Kg	₩	17	30
Molybdenum	<1.3		<1.3		mg/Kg	☼	NC	30

Lab Sample ID: MB 140-57164/1-A

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: Method Blank

Prep Type: Step 6

Prep Batch: 57164

	MB MB						•		
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Arsenic	<0.15	0.50	0.15	mg/Kg		12/16/21 15:44	02/04/22 14:11	1	
Cobalt	<0.046	2.5	0.046	mg/Kg		12/16/21 15:44	02/04/22 14:11	1	
Lithium	<0.15	2.5	0.15	mg/Kg		12/16/21 15:44	02/04/22 14:11	1	
Molybdenum	<0.099	2.0	0.099	mg/Kg		12/16/21 15:44	02/04/22 14:11	1	

Lab Sample ID: LCS 140-57164/2-A

Matrix: Solid

Analysis Batch: 58601

Client Sample ID: Lab Control Sample Prep Type: Step 6

Prep Batch: 57164

_	Spike	LCS	LCS				%Rec.		
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits		
Arsenic	5.00	5.40		mg/Kg	_	108	80 - 120		-
Cobalt	5.00	5.36		mg/Kg		107	80 - 120		
Lithium	5.00	5.07		mg/Kg		101	80 - 120		
Molybdenum	25.0	26.7		mg/Kg		107	80 - 120		

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Job ID: 180-126590-2

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-57164/3-A **Matrix: Solid Prep Type: Step 6 Analysis Batch: 58601** Prep Batch: 57164

	Бріке	LC2D	FC2D				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	5.00	5.44		mg/Kg		109	80 - 120	1	30
Cobalt	5.00	5.43		mg/Kg		109	80 - 120	1	30
Lithium	5.00	5.14		mg/Kg		103	80 - 120	1	30
Molybdenum	25.0	27.1		mg/Kg		108	80 - 120	1	30

Lab Sample ID: 180-126590-4 DU Client Sample ID: SB-5-15-25

Matrix: Solid

Analysis Batch: 58601

Prep Type: Step 6 Prep Batch: 57164

	Sample	Sample	DU	DU			•	RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Arsenic	1.1		1.05		mg/Kg	₩		30
Lithium	12		11.9		mg/Kg	₩	2	30
Molybdenum	<0.11		<0.11		mg/Kg	₩	NC	30

Lab Sample ID: 180-126590-4 DU Client Sample ID: SB-5-15-25

Matrix: Solid

Analysis Batch: 58657

Prep Type: Step 6 Prep Batch: 57164

-	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Cobalt	13		12.7		mg/Kg	<u></u>	 	4	30

Lab Sample ID: MB 140-57210/1-A **Client Sample ID: Method Blank**

Matrix: Solid

Analysis Batch: 58742

Prep Type: Step 7 Prep Batch: 57210

ı		1110	1110							
	Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Arsenic	0.210	J	0.50	0.13	mg/Kg		12/18/21 15:37	02/09/22 11:30	1
	Cobalt	<0.026		2.5	0.026	mg/Kg		12/18/21 15:37	02/09/22 11:30	1
	Lithium	<0.15		2.5	0.15	mg/Kg		12/18/21 15:37	02/09/22 11:30	1
	Molybdenum	<0.082		2.0	0.082	mg/Kg		12/18/21 15:37	02/09/22 11:30	1

MR MR

Lab Sample ID: LCS 140-57210/2-A **Client Sample ID: Lab Control Sample Matrix: Solid Prep Type: Step 7 Analysis Batch: 58742** Prep Batch: 57210

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	5.00	5.27		mg/Kg		105	80 - 120	
Cobalt	5.00	5.19		mg/Kg		104	80 - 125	
Lithium	5.00	5.00		mg/Kg		100	80 - 120	
Molvbdenum	25.0	26.1		ma/Ka		104	80 - 125	

Lab Sample ID: LCSD 140-57210/3-A Client Sample ID: Lab Control Sample Dup **Matrix: Solid Prep Type: Step 7**

Analysis Batch: 58742 Prep Batch: 57210 Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Unit D %Rec Limits RPD Limit 30

Analyte Arsenic 5.00 5.40 mg/Kg 80 - 120 3 108 Cobalt 5.00 5.28 mg/Kg 80 - 125 106 2 30 Lithium 5.00 4.89 mg/Kg 80 - 120 30 98 2 25.0 26.7 mg/Kg 107 80 - 125 Molybdenum

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QC Sample Results

Job ID: 180-126590-2 Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Method: 6010B SEP - SEP Metals (ICP)

Lab Sample ID: 180-126590-4 DU Client Sample ID: SB-5-15-25 **Matrix: Solid Prep Type: Step 7 Analysis Batch: 58742** Prep Batch: 57210

	Sample	Sample	DU	J DU				RPD
Analyte	Result	Qualifier	Resul	t Qualifier	Unit	D	RPD	Limit
Lithium	3.6		3.7		mg/Kg	₩	2	30
Molybdenum	<0.088		<0.08	3	mg/Kg	₩	NC	30

Lab Sample ID: 180-126590-4 DU Client Sample ID: SB-5-15-25 **Matrix: Solid Prep Type: Step 7**

Prep Batch: 57210 Analysis Batch: 58742

Analysis Baton, our 42							i icp Batcii.	J1 = 10
	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Arsenic	1.1	В	1.09	J	mg/Kg	<u></u>	0.5	30
Cobalt	1.7	J	1.56	J	mg/Kg	₩	10	30

Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Metals

Prep Batch: 53804

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Total/NA	Solid	Total	
180-126590-2	SB-3-15-25	Total/NA	Solid	Total	
180-126590-3	SB-4-12-22	Total/NA	Solid	Total	
180-126590-4	SB-5-15-25	Total/NA	Solid	Total	
MB 140-53804/11-A	Method Blank	Total/NA	Solid	Total	
LCS 140-53804/12-A	Lab Control Sample	Total/NA	Solid	Total	
LCSD 140-53804/13-A	Lab Control Sample Dup	Total/NA	Solid	Total	

Analysis Batch: 53865

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Total/NA	Solid	6010B	53804
180-126590-2	SB-3-15-25	Total/NA	Solid	6010B	53804
180-126590-3	SB-4-12-22	Total/NA	Solid	6010B	53804
180-126590-4	SB-5-15-25	Total/NA	Solid	6010B	53804
MB 140-53804/11-A	Method Blank	Total/NA	Solid	6010B	53804
LCS 140-53804/12-A	Lab Control Sample	Total/NA	Solid	6010B	53804
LCSD 140-53804/13-A	Lab Control Sample Dup	Total/NA	Solid	6010B	53804

Analysis Batch: 53946

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Total/NA	Solid	6010B	53804
180-126590-1	SB-1-24.6-34.6	Total/NA	Solid	6010B	53804
180-126590-2	SB-3-15-25	Total/NA	Solid	6010B	53804
180-126590-3	SB-4-12-22	Total/NA	Solid	6010B	53804
180-126590-3	SB-4-12-22	Total/NA	Solid	6010B	53804
180-126590-4	SB-5-15-25	Total/NA	Solid	6010B	53804
180-126590-4	SB-5-15-25	Total/NA	Solid	6010B	53804

SEP Batch: 56454

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 1	Solid	Exchangeable	
180-126590-3	SB-4-12-22	Step 1	Solid	Exchangeable	
180-126590-4	SB-5-15-25	Step 1	Solid	Exchangeable	
MB 140-56454/6-C ^4	Method Blank	Step 1	Solid	Exchangeable	
LCS 140-56454/4-C ^5	Lab Control Sample	Step 1	Solid	Exchangeable	
LCSD 140-56454/5-B ^5	Lab Control Sample Dup	Step 1	Solid	Exchangeable	
180-126590-4 DU	SB-5-15-25	Step 1	Solid	Exchangeable	

SEP Batch: 56600

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 2	Solid	Carbonate	
180-126590-3	SB-4-12-22	Step 2	Solid	Carbonate	
180-126590-4	SB-5-15-25	Step 2	Solid	Carbonate	
MB 140-56600/1-B ^3	Method Blank	Step 2	Solid	Carbonate	
LCS 140-56600/2-B ^5	Lab Control Sample	Step 2	Solid	Carbonate	
LCSD 140-56600/3-B ^5	Lab Control Sample Dup	Step 2	Solid	Carbonate	
180-126590-4 DU	SB-5-15-25	Step 2	Solid	Carbonate	

Prep Batch: 56635

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 2	Solid	3010A	56600

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Job ID: 180-126590-2

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Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Metals (Continued)

Prep Batch: 56635 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-3	SB-4-12-22	Step 2	Solid	3010A	56600
180-126590-4	SB-5-15-25	Step 2	Solid	3010A	56600
MB 140-56600/1-B ^3	Method Blank	Step 2	Solid	3010A	56600
LCS 140-56600/2-B ^5	Lab Control Sample	Step 2	Solid	3010A	56600
LCSD 140-56600/3-B ^5	Lab Control Sample Dup	Step 2	Solid	3010A	56600
180-126590-4 DU	SB-5-15-25	Step 2	Solid	3010A	56600

Prep Batch: 56727

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 1	Solid	3010A	56454
180-126590-3	SB-4-12-22	Step 1	Solid	3010A	56454
180-126590-4	SB-5-15-25	Step 1	Solid	3010A	56454
MB 140-56454/6-C ^4	Method Blank	Step 1	Solid	3010A	56454
LCS 140-56454/4-C ^5	Lab Control Sample	Step 1	Solid	3010A	56454
LCSD 140-56454/5-B ^5	Lab Control Sample Dup	Step 1	Solid	3010A	56454
180-126590-4 DU	SB-5-15-25	Step 1	Solid	3010A	56454

SEP Batch: 56748

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 3	Solid	Non-Crystalline	
180-126590-3	SB-4-12-22	Step 3	Solid	Non-Crystalline	
180-126590-4	SB-5-15-25	Step 3	Solid	Non-Crystalline	
MB 140-56748/1-B	Method Blank	Step 3	Solid	Non-Crystalline	
LCS 140-56748/2-B	Lab Control Sample	Step 3	Solid	Non-Crystalline	
LCSD 140-56748/3-B	Lab Control Sample Dup	Step 3	Solid	Non-Crystalline	
180-126590-4 DU	SB-5-15-25	Step 3	Solid	Non-Crystalline	

Prep Batch: 56822

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 3	Solid	3010A	56748
180-126590-3	SB-4-12-22	Step 3	Solid	3010A	56748
180-126590-4	SB-5-15-25	Step 3	Solid	3010A	56748
MB 140-56748/1-B	Method Blank	Step 3	Solid	3010A	56748
LCS 140-56748/2-B	Lab Control Sample	Step 3	Solid	3010A	56748
LCSD 140-56748/3-B	Lab Control Sample Dup	Step 3	Solid	3010A	56748
180-126590-4 DU	SB-5-15-25	Step 3	Solid	3010A	56748

SEP Batch: 56873

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Prep I	Batch
180-126590-1	SB-1-24.6-34.6	Step 4	Solid	Metal Hydroxide	
180-126590-3	SB-4-12-22	Step 4	Solid	Metal Hydroxide	
180-126590-4	SB-5-15-25	Step 4	Solid	Metal Hydroxide	
MB 140-56873/1-B	Method Blank	Step 4	Solid	Metal Hydroxide	
LCS 140-56873/2-B	Lab Control Sample	Step 4	Solid	Metal Hydroxide	
LCSD 140-56873/3-B	Lab Control Sample Dup	Step 4	Solid	Metal Hydroxide	
180-126590-4 DU	SB-5-15-25	Step 4	Solid	Metal Hydroxide	

Prep Batch: 56882

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 4	Solid	3010A	56873
180-126590-3	SB-4-12-22	Step 4	Solid	3010A	56873

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Job ID: 180-126590-2

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Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Metals (Continued)

Prep Batch: 56882 (Continued)

Lab Sample ID 180-126590-4	Client Sample ID SB-5-15-25	Prep Type Step 4	Solid	Method 3010A	Prep Batch 56873
MB 140-56873/1-B	Method Blank	Step 4	Solid	3010A	56873
LCS 140-56873/2-B	Lab Control Sample	Step 4	Solid	3010A	56873
LCSD 140-56873/3-B	Lab Control Sample Dup	Step 4	Solid	3010A	56873
180-126590-4 DU	SB-5-15-25	Step 4	Solid	3010A	56873

SEP Batch: 56924

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 5	Solid	Organic-Bound	
180-126590-3	SB-4-12-22	Step 5	Solid	Organic-Bound	
180-126590-4	SB-5-15-25	Step 5	Solid	Organic-Bound	
MB 140-56924/1-B ^5	Method Blank	Step 5	Solid	Organic-Bound	
LCS 140-56924/2-B ^5	Lab Control Sample	Step 5	Solid	Organic-Bound	
LCSD 140-56924/3-B ^5	Lab Control Sample Dup	Step 5	Solid	Organic-Bound	
180-126590-4 DU	SB-5-15-25	Step 5	Solid	Organic-Bound	

Prep Batch: 57114

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 5	Solid	3010A	56924
180-126590-3	SB-4-12-22	Step 5	Solid	3010A	56924
180-126590-4	SB-5-15-25	Step 5	Solid	3010A	56924
MB 140-56924/1-B ^5	Method Blank	Step 5	Solid	3010A	56924
LCS 140-56924/2-B ^5	Lab Control Sample	Step 5	Solid	3010A	56924
LCSD 140-56924/3-B ^5	Lab Control Sample Dup	Step 5	Solid	3010A	56924
180-126590-4 DU	SB-5-15-25	Step 5	Solid	3010A	56924

SEP Batch: 57164

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 6	Solid	Acid/Sulfide	
180-126590-3	SB-4-12-22	Step 6	Solid	Acid/Sulfide	
180-126590-4	SB-5-15-25	Step 6	Solid	Acid/Sulfide	
MB 140-57164/1-A	Method Blank	Step 6	Solid	Acid/Sulfide	
LCS 140-57164/2-A	Lab Control Sample	Step 6	Solid	Acid/Sulfide	
LCSD 140-57164/3-A	Lab Control Sample Dup	Step 6	Solid	Acid/Sulfide	
180-126590-4 DU	SB-5-15-25	Step 6	Solid	Acid/Sulfide	

Prep Batch: 57210

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 7	Solid	Residual	
180-126590-3	SB-4-12-22	Step 7	Solid	Residual	
180-126590-4	SB-5-15-25	Step 7	Solid	Residual	
MB 140-57210/1-A	Method Blank	Step 7	Solid	Residual	
LCS 140-57210/2-A	Lab Control Sample	Step 7	Solid	Residual	
LCSD 140-57210/3-A	Lab Control Sample Dup	Step 7	Solid	Residual	
180-126590-4 DU	SB-5-15-25	Step 7	Solid	Residual	

Analysis Batch: 58572

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 1	Solid	6010B SEP	56727
180-126590-1	SB-1-24.6-34.6	Step 2	Solid	6010B SEP	56635
180-126590-1	SB-1-24.6-34.6	Step 3	Solid	6010B SEP	56822

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Client: Southern Company

Project/Site: Plant Arkwright MNA AP-2 DAS

Metals (Continued)

Analysis Batch: 58572 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-3	SB-4-12-22	Step 1	Solid	6010B SEP	56727
180-126590-3	SB-4-12-22	Step 2	Solid	6010B SEP	56635
180-126590-3	SB-4-12-22	Step 3	Solid	6010B SEP	56822
180-126590-4	SB-5-15-25	Step 1	Solid	6010B SEP	56727
180-126590-4	SB-5-15-25	Step 2	Solid	6010B SEP	56635
180-126590-4	SB-5-15-25	Step 3	Solid	6010B SEP	56822
MB 140-56454/6-C ^4	Method Blank	Step 1	Solid	6010B SEP	56727
MB 140-56600/1-B ^3	Method Blank	Step 2	Solid	6010B SEP	56635
MB 140-56748/1-B	Method Blank	Step 3	Solid	6010B SEP	56822
LCS 140-56454/4-C ^5	Lab Control Sample	Step 1	Solid	6010B SEP	56727
LCS 140-56600/2-B ^5	Lab Control Sample	Step 2	Solid	6010B SEP	56635
LCS 140-56748/2-B	Lab Control Sample	Step 3	Solid	6010B SEP	56822
LCSD 140-56454/5-B ^5	Lab Control Sample Dup	Step 1	Solid	6010B SEP	56727
LCSD 140-56600/3-B ^5	Lab Control Sample Dup	Step 2	Solid	6010B SEP	56635
LCSD 140-56748/3-B	Lab Control Sample Dup	Step 3	Solid	6010B SEP	56822
180-126590-4 DU	SB-5-15-25	Step 1	Solid	6010B SEP	56727
180-126590-4 DU	SB-5-15-25	Step 2	Solid	6010B SEP	56635
180-126590-4 DU	SB-5-15-25	Step 3	Solid	6010B SEP	56822

Analysis Batch: 58601

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 4	Solid	6010B SEP	56882
180-126590-1	SB-1-24.6-34.6	Step 5	Solid	6010B SEP	57114
180-126590-1	SB-1-24.6-34.6	Step 6	Solid	6010B SEP	57164
180-126590-3	SB-4-12-22	Step 4	Solid	6010B SEP	56882
180-126590-3	SB-4-12-22	Step 5	Solid	6010B SEP	57114
180-126590-3	SB-4-12-22	Step 6	Solid	6010B SEP	57164
180-126590-4	SB-5-15-25	Step 4	Solid	6010B SEP	56882
180-126590-4	SB-5-15-25	Step 5	Solid	6010B SEP	57114
180-126590-4	SB-5-15-25	Step 6	Solid	6010B SEP	57164
MB 140-56873/1-B	Method Blank	Step 4	Solid	6010B SEP	56882
MB 140-56924/1-B ^5	Method Blank	Step 5	Solid	6010B SEP	57114
MB 140-57164/1-A	Method Blank	Step 6	Solid	6010B SEP	57164
LCS 140-56873/2-B	Lab Control Sample	Step 4	Solid	6010B SEP	56882
LCS 140-56924/2-B ^5	Lab Control Sample	Step 5	Solid	6010B SEP	57114
LCS 140-57164/2-A	Lab Control Sample	Step 6	Solid	6010B SEP	57164
LCSD 140-56873/3-B	Lab Control Sample Dup	Step 4	Solid	6010B SEP	56882
LCSD 140-56924/3-B ^5	Lab Control Sample Dup	Step 5	Solid	6010B SEP	57114
LCSD 140-57164/3-A	Lab Control Sample Dup	Step 6	Solid	6010B SEP	57164
180-126590-4 DU	SB-5-15-25	Step 4	Solid	6010B SEP	56882
180-126590-4 DU	SB-5-15-25	Step 5	Solid	6010B SEP	57114
180-126590-4 DU	SB-5-15-25	Step 6	Solid	6010B SEP	57164

Analysis Batch: 58657

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 6	Solid	6010B SEP	57164
180-126590-3	SB-4-12-22	Step 6	Solid	6010B SEP	57164
180-126590-4	SB-5-15-25	Step 6	Solid	6010B SEP	57164
180-126590-4 DU	SB-5-15-25	Step 6	Solid	6010B SEP	57164

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Client: Southern Company Project/Site: Plant Arkwright MNA AP-2 DAS

Metals

Analysis Batch: 58742

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-126590-1	SB-1-24.6-34.6	Step 7	Solid	6010B SEP	57210
180-126590-1	SB-1-24.6-34.6	Step 7	Solid	6010B SEP	57210
180-126590-1	SB-1-24.6-34.6	Step 7	Solid	6010B SEP	57210
180-126590-3	SB-4-12-22	Step 7	Solid	6010B SEP	57210
180-126590-3	SB-4-12-22	Step 7	Solid	6010B SEP	57210
180-126590-4	SB-5-15-25	Step 7	Solid	6010B SEP	57210
180-126590-4	SB-5-15-25	Step 7	Solid	6010B SEP	57210
MB 140-57210/1-A	Method Blank	Step 7	Solid	6010B SEP	57210
LCS 140-57210/2-A	Lab Control Sample	Step 7	Solid	6010B SEP	57210
LCSD 140-57210/3-A	Lab Control Sample Dup	Step 7	Solid	6010B SEP	57210
180-126590-4 DU	SB-5-15-25	Step 7	Solid	6010B SEP	57210
180-126590-4 DU	SB-5-15-25	Step 7	Solid	6010B SEP	57210

Analysis Batch: 58846

Lab Sample ID 180-126590-1	Client Sample ID SB-1-24.6-34.6	Prep Type Sum of Steps 1-7	Matrix Solid	Method 6010B SEP	Prep Batch
180-126590-3	SB-4-12-22	Sum of Steps 1-7	Solid	6010B SEP	
180-126590-4	SB-5-15-25	Sum of Steps 1-7	Solid	6010B SEP	

5755 8th Street East

Tacoma, WA 98424 Phone: (253) 922-2310





25 October 2021

Shali Brown Eurofins TestAmerica - Pittsburgh 301 Alpha Drive RIDC Park Pittsburgh, PA 15238

RE: Arsenic Speciation

Enclosed are the analytical results for samples received by Eurofins Frontier Global Sciences. All quality control measurements are within established control limits and there were no analytical difficulties encountered with the exception of those listed in the case narrative section of this report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kyle Groden

Scientist



5755 8th Street East Tacoma, WA 98424 Phone: (253) 922-2310

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation 301 Alpha Drive RIDC Park Project Number: 180-126590-1 Reported: Pittsburgh PA, 15238 Project Manager: Shali Brown 25-Oct-21 11:40

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB-4-12-22 (180-126590-3)	1100043-01	Soil/Sediment	31-Aug-21 12:00	10-Sep-21 10:30

Eurofins Frontier Global Sciences, LLC

 ${\it The results in this report only apply to the samples analyzed in accordance with the}$ chain of custody document. This analytical report must be reproduced in its entirety.

Kyle Groden, Scientist

Eurofins TestAmerica - PittsburghProject: Arsenic Speciation301 Alpha Drive RIDC ParkProject Number: 180-126590-1Reported:Pittsburgh PA, 15238Project Manager: Shali Brown25-Oct-21 11:40

SAMPLE RECEIPT

Samples were received at Eurofins Frontier Global Sciences (EFGS) on 10-Sep-21 10:30. The samples were received intact, on-ice within a sealed cooler at following temperature:

<u>Cooler</u> <u>Temp C°</u> Default Cooler 1.4

SAMPLE PREPARATION AND ANALYSIS

Total solids analysis was performed in accordance with method SM2540B. Total solids are prepared at the same time as the preparation for the analyte(s) of interest in order to provide the most accurate dry mass correction which may be outside of the method recommended holding time of 7 days from sample collection.

Samples were prepared and analyzed for inorganic arsenic speciation by hydride generation cryogenic trapping gas chromatography atomic absorption spectrometry (HG-CT-GC-AAS) in accordance with EPA 1632 (EFGS SOP2987).

ANALYTICAL AND QUALITY CONTROL ISSUES

Method blanks were prepared for every preparation to assess possible blank contribution from the sample preparation procedure. The method blanks were carried through the entire analytical procedure. All blanks fell within the established acceptance criteria with the exception of any items narrated above or flagged and described in the notes and definitions section of the report.

Liquid spikes, certified reference material (CRM) or a quality control samples (QCS) were prepared for every preparation as a measure of accuracy. All liquid spikes, CRMs and/or QCS samples fell within the established acceptance criteria with the exception of any items narrated above or flagged and described in the notes and definitions section of the report.

As an additional measure of the accuracy of the methods used and to check for matrix interference, matrix spikes (MS) and matrix spike duplicates (MSD) were digested and analyzed. All of the matrix spike recoveries fell within the established acceptance criteria with the exception of any items flagged and described in the notes and definitions section of the report.

Eurofins Frontier Global Sciences, LLC

The results in this report only apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Kyle Groden, Scientist



5755 8th Street East Tacoma, WA 98424 Phone: (253) 922-2310

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation

301 Alpha Drive RIDC Park Project Number: 180-126590-1 Reported:

Pittsburgh PA, 15238 Project Manager: Shali Brown 25-Oct-21 11:40

A reasonable measure of the precision of the analytical methods is the relative percent difference (RPD) between a matrix spike recovery and a matrix spike duplicate recovery and between laboratory control sample recovery and laboratory control sample duplicate recoveries. All of the relative percent differences fell within established acceptance criteria with the exception of any items flagged and described in the notes and definitions section of the report.

Eurofins Frontier Global Sciences, LLC

The results in this report only apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Kyle Groden, Scientist

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Frontier Global Sciences

Sample Receipt Checklist

	Label Verified By: 1610 9/10/24	Other (Specify: np Blank Used/WN for Cooler(s): ature in excess of 6°C. PM notified: YM	w/ CF: , y ° C Cooler 4; ° C w/ CF: y ° C w/ CF:		1100043	
ISHADIO ALCONINI		S Arrived By: Gel Ice received withou	Cooler 2: "C Cooler 2: "C Cooler 3: "C	Sample Condition/Integrity: Sample containers intact/present: Sample labels are present and legible: Sample ID on container/bag matches COC: Correct sample containers used: Samples received within holding times:		
2 0	Client: TA- P. 43 bury Matrix: Scil Scul # of Coolers Received:	Coolant:	+	tion: ollection:	ternal COC required: No Inomalies/Non-conformances (attach additional pages if needed):	2/15/2022

Page 5 of 11

seurofins

Environment Testing

Chain of Custody Record

Eurofins TestAmerica, Pittsburgh

301 Alpha Drive RIDC Park

Pittsburgh, PA 15238 Phone: 412-963-7058 Fax: 412-963-2468

P - Na2248 Q - Na2803 R - Na28203 S - H2804 T - TSP Dodecahydrate Note: Since aboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This samples change to the relative being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention inmediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica. Special Instructions/Note: W - pH 4-5 Z - other (speclfy) N - None O - AsNaO2 U - Acetone V - MCAA Months Arsenic Speciation III and IV Sample Disposal (A fee may be assessed if samples are refained longer than 1 month)

Return To Client

Disposal By Lab

Archive For

Mon Preservation Codes G - Amchlor H - Ascorbic Acld 180-443648.1 180-126590-1 A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH Page: Page 1 of 1 Job#: 1 - Ice J - DI Water K - EDTA L - EDA Total Number of containers Carrier Tracking No(s): State of Origin: Georgia **Analysis Requested** Accreditations Required (See note); Shali. Brown@Eurofinset.com Vi bns III notision IV × SUB (Arsenic Speciation III and IV) Arsenic Lab PM: Brown, Shali Perform MS/MSD (Yes or No) Field Filtered Sample (Yes or No.) E-Mail: Matrix (Wewater, Sealld, Oewaste/oll, Preservation Code Solid (С=сошр, Sample G=grab) Type Sample Time 12:00 Eastern TAT Requested (days): Due Date Requested: 9/17/2021 Sample Date Project #: 18020201 SSOW#: 8/31/21 Phone: WO #: (Sub Contract Lab) Sample Identification - Client ID (Lab ID) Eurofins Frontier Global Sciences LLC Plant Arkwright MNA AP-2 DAS Possible Hazard Identification SB-4-12-22 (180-126590-3) Client Information Shipping/Receiving 5755 8th Street E, State, Zip: WA, 98424 Unconfirmed Arkwright Facoma



5755 8th Street East **Tacoma, WA 98424** Phone: (253) 922-2310

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation 301 Alpha Drive RIDC Park Project Number: 180-126590-1 Reported: Pittsburgh PA, 15238 Project Manager: Shali Brown 25-Oct-21 11:40

SB-4-12-22 (180-126590-3)

1100043-01

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Sequence	Analyzed	Method	Notes
Sample Preparation: [CALC]											
Arsenate (as Arsenic)	0.0683	0.0238	0.0340	mg/kg dry	30	[CALC]	14-Oct-21		18-Oct-21	EPA 1632	
Sample Preparation: EFGS SOP	2993 Speciation	Oven Di	gestion for	r Solids							
Arsenite (as Arsenic)	ND	-	0.034	mg/kg dry	30	F110474	14-Oct-21	1J18021	18-Oct-21	EPA 1632	U
Inorganic Arsenic	0.102	-	0.034	mg/kg dry	30	F110473	14-Oct-21	1J18020	15-Oct-21	EPA 1632	
Sample Preparation: EFGS SOPS	5133 Solids Ana	ılysis									
% Solids	85.4	-	0.1	% by Weight	1	F109432	01-Oct-21		04-Oct-21	SM 2540B	O-04, O-09

Eurofins Frontier Global Sciences, LLC

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Kyle Groden, Scientist

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation 301 Alpha Drive RIDC Park Project Number: 180-126590-1 Reported: Pittsburgh PA, 15238 Project Manager: Shali Brown 25-Oct-21 11:40

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F110473 - EFGS SOP2993 Spe	ciation Over	n Digestion	for Solid	s							
Blank (F110473-BLK1)					Prepared: 1	14-Oct-21 A	nalyzed: 1	5-Oct-21			
Inorganic Arsenic	ND	-	0.010	mg/kg wet							
LCS (F110473-BS1)					Prepared: 1	14-Oct-21 A	nalyzed: 1	5-Oct-21			
Inorganic Arsenic	0.075	-	0.010	mg/kg wet	0.10000		75.3	50-150			
LCS Dup (F110473-BSD1)					Prepared: 1	14-Oct-21 A	nalyzed: 1	5-Oct-21			
Inorganic Arsenic	0.076	-	0.010	mg/kg wet	0.10000		75.9	50-150	0.703	35	
Matrix Spike (F110473-MS1)		Source:	1100043-0	1RE1	Prepared: 1	14-Oct-21 A	nalyzed: 1	5-Oct-21			
Inorganic Arsenic	0.220	-	0.033	mg/kg dry	0.10838	0.102	109	50-150			
Matrix Spike Dup (F110473-MSD1)		Source:	1100043-0	1RE1	Prepared: 1	14-Oct-21 A	nalyzed: 1	5-Oct-21			
Inorganic Arsenic	0.214	-	0.034	mg/kg dry	0.11253	0.102	99.8	50-150	8.88	35	
Batch F110474 - EFGS SOP2993 Spe	ciation Ove	n Digestion	for Solid	s							
Blank (F110474-BLK1)					Prepared: 1	14-Oct-21 A	nalyzed: 1	8-Oct-21			
Arsenite (as Arsenic)	ND	-	0.010	mg/kg wet			*				Ţ
LCS (F110474-BS1)					Prepared: 1	14-Oct-21 A	analyzed: 1	8-Oct-21			
Arsenite (as Arsenic)	0.066	-	0.010	mg/kg wet	0.10000		66.4	30-170			
LCS Dup (F110474-BSD1)					Prepared: 1	14-Oct-21 A	analyzed: 1	8-Oct-21			
Arsenite (as Arsenic)	0.066	-	0.010	mg/kg wet	0.10000		66.1	30-170	0.340	35	
Matrix Spike (F110474-MS1)		Source:	1100043-0	1	Prepared: 1	14-Oct-21 A	nalyzed: 1	8-Oct-21			
Arsenite (as Arsenic)	0.118	-	0.033	mg/kg dry	0.10838	0.033	78.2	30-170			

Eurofins Frontier Global Sciences, LLC

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Kyle Groden, Scientist



5755 8th Street East **Tacoma, WA 98424**

Phone: (253) 922-2310

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation 301 Alpha Drive RIDC Park Project Number: 180-126590-1 Reported: Pittsburgh PA, 15238 Project Manager: Shali Brown 25-Oct-21 11:40

Quality Control Data

		Detection	Reporting		Spike	Source		%REC		RPD	
Analyte	Result	Limit	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

Batch F110474 - EFGS SOP2993 Speciation Oven Digestion for Solids

Matrix Spike Dup (F110474-MSD1)		Source: 1100043-01			Prepared: 14-Oct-21 Analyzed: 18-Oct-21						
Arsenite (as Arsenic)	0.099	-	0.034	mg/kg dry	0.11253	0.033	58.6	30-170	28.6	35	

Eurofins Frontier Global Sciences, LLC

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Kyle Groden, Scientist

Page 9 of 11

5755 8th Street East **Tacoma, WA 98424** Phone: (253) 922-2310

Frontier Global Sciences

Eurofins TestAmerica - Pittsburgh 301 Alpha Drive RIDC Park Pittsburgh PA, 15238

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Project: Arsenic Speciation Project Number: 180-126590-1 Project Manager: Shali Brown

Reported: 25-Oct-21 11:40

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F109432 - EFGS SOP5133	Solids Analysis										
Duplicate (F109432-DUP1)		Source:	1100084-01	l	Prepared: 0	01-Oct-21 A	nalyzed: 04	-Oct-21			
% Solids	83.8	-	0.1	% by Weight		83.4			0.478	10	O-04, O-09

Duplicate (F109432-DUP2)		Source:	1100095-0	1	Prepared: 01-Oct-21 Analyzed: 04-Oct-21			
% Solids	83.9	-	0.1	% by	83.2	0.838	10	O-04, O-09
				Weight				

Eurofins Frontier Global Sciences, LLC

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Kyle Groden, Scientist



5755 8th Street East **Tacoma, WA 98424** Phone: (253) 922-2310

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation 301 Alpha Drive RIDC Park Project Number: 180-126590-1 Reported: Pittsburgh PA, 15238 Project Manager: Shali Brown 25-Oct-21 11:40

Notes and Definitions

U	Analyte was not detected and is reported as less than the LOD or as defined by the client. The LOD has been adjusted for any dilution or concentration of the sample.
O-09	Total Solids are prepared at the same time as the preparation for the analyte(s) of interest in order to provide the most accurate dry mass correction.
O-04	This sample was analyzed outside of the recommended holding time.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the method detection limit if reported to the MDL or above the reporting limit if reported to the MRL.
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Eurofins Frontier Global Sciences, LLC

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Kyle Groden, Scientist

5755 8th Street East

Tacoma, WA 98424

Phone: (253) 922-2310



19 January 2022

Shali Brown Eurofins TestAmerica - Pittsburgh 301 Alpha Drive RIDC Park Pittsburgh, PA 15238

RE: Arsenic Speciation

Enclosed are the analytical results for samples received by Eurofins Frontier Global Sciences. All quality control measurements are within established control limits and there were no analytical difficulties encountered with the exception of those listed in the case narrative section of this report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Curtis Deer

Project Manager



5755 8th Street East **Tacoma, WA 98424**

Phone: (253) 922-2310

eurofins

Frontier Global Sciences

Eurofins TestAmerica - Pittsburgh 301 Alpha Drive RIDC Park Pittsburgh PA, 15238

Project: Arsenic Speciation

Project Number: Total As and As Speciation in Groundwater

Reported:

Project Manager: Shali Brown

19-Jan-22 16:32

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB-1-24.6-34.6 (180-126590-1)	1J00051-01	Soil/Sediment	31-Aug-21 17:40	08-Oct-21 09:45

Eurofins Frontier Global Sciences, LLC

 ${\it The results in this report only apply to the samples analyzed in accordance with the}$ chain of custody document. This analytical report must be reproduced in its entirety.

Curtis Deer, Project Manager

Page 2 of 11

5755 8th Street East Tacoma, WA 98424

Phone: (253) 922-2310



Frontier Global Sciences

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation 301 Alpha Drive RIDC Park Project Number: Total As and As Speciation in Groundwater Reported: Pittsburgh PA, 15238 Project Manager: Shali Brown 19-Jan-22 16:32

SAMPLE RECEIPT

Samples were received at Eurofins Frontier Global Sciences (EFGS) on 08-Oct-21 09:45. The samples were received intact, on-ice within a sealed cooler at the following temperature:

Cooler Temp C° Default Cooler -0.4

SAMPLE PREPARATION AND ANALYSIS

Total solids analysis was performed in accordance with method SM2540B. Total solids are prepared at the same time as the preparation for the analyte(s) of interest in order to provide the most accurate dry mass correction which may be outside of the method recommended holding time of 7 days from sample collection.

Samples were prepared and analyzed for inorganic arsenic speciation by hydride generation cryogenic trapping gas chromatography atomic absorption spectrometry (HG-CT-GC-AAS) in accordance with EPA 1632 (EFGS SOP2987).

ANALYTICAL AND QUALITY CONTROL ISSUES

Method blanks were prepared for every preparation to assess possible blank contribution from the sample preparation procedure. The method blanks were carried through the entire analytical procedure. All blanks fell within the established acceptance criteria with the exception of any items narrated above or flagged and described in the notes and definitions section of the report.

Liquid spikes, certified reference material (CRM) or a quality control samples (QCS) were prepared for every preparation as a measure of accuracy. All liquid spikes, CRMs and/or QCS samples fell within the established acceptance criteria with the exception of any items narrated above or flagged and described in the notes and definitions section of the report.

As an additional measure of the accuracy of the methods used and to check for matrix interference, matrix spikes (MS) and matrix spike duplicates (MSD) were digested and analyzed. All of the matrix spike recoveries fell within the established acceptance criteria with the exception of any items flagged and described in the notes and definitions section of the report.

Eurofins Frontier Global Sciences, LLC

The results in this report only apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

5755 8th Street East Tacoma, WA 98424

Phone: (253) 922-2310

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Frontier Global Sciences

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation

301 Alpha Drive RIDC Park Project Number: Total As and As Speciation in Groundwater Reported: Pittsburgh PA, 15238 Project Manager: Shali Brown 19-Jan-22 16:32

A reasonable measure of the precision of the analytical methods is the relative percent difference (RPD) between a matrix spike recovery and a matrix spike duplicate recovery and between laboratory control sample recovery and laboratory control sample duplicate recoveries. All of the relative percent differences fell within established acceptance criteria with the exception of any items flagged and described in the notes and definitions section of the report.

Eurofins Frontier Global Sciences, LLC

The results in this report only apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

				And in case of the last of the	-
	Label Vertex B. Date Labeled By: W. Label Vertex By: W. Label Vert	Other (Specify: Other (Specify: P Blank Used: Y/N for Cooler(s): ature in excess of 6°C. PM notified: Y/N	W/CF: - J.Y.*C Cooler 4: "C W/CF: "C W/	1100051	
Sample Receipt Checklist	P. H.S. Bury Date & Time Received: W/W 1.	d Tem	resent and intact: d: v/N/NA Comments Sample Condition/Integrity: Sample in containers in tact/present: Sample in containers in tact/present: Sample containers in tact/present: Sample containers used: Sample section containers used: Sample containers used:	remail COC required: A. Correct preservative used for requested analyses: Vename sumction and the conformances (attach additional pages if needed):	

Page 5 of 11

2/15/2022

Months

Date/Time:

Sate/Time;

Cooler Temperature(s) °C and Other Remarks

Received by:

Company Company

Date/Time:

Company +

12-C-O

telinquished by:

slinquished by: linguished by:

Sate/Time:

M - Hexane N - None O - AsNeO2 P - Na2O4S Q - Na2SO3 R - Na2SO3 S - H2SO4 T - TSP Dodeoshydrate U - Acetone U - Acetone W - PH 4-5 Z - other (specify) Note: Since laboratory accarditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accorditation in the State of Origin listed above for analysis/nests/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditations status should be brought to Eurofins FertAmerica attention in mediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica. Special Instructions/Note: 1632 Arsenic Speciation III and IV Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) Return To Client Disposal By Lab Archive For Mon Preservation Codes: A - HCL B - NaOH C - Zn Acetate D - Nitric Acid F - NachSO4 F - MeOH G - Amchlor H - Ascorbic Acid COC No: 180-446304.1 180-126590-1 Page: Page 1 of 1 Job #: 3360 I - Ice J - DI Water K - EDTA L - EDA Total Number of containers 0470 Method of Shipment Carrier Tracking No(s): 517 State of Origin: **Analysis Requested** Georgia Special Instructions/QC Requirements: E-Mail: Shall: Brown@Eurofinset.com Accreditations Required (See note): × SUB (1632 Areenic Speciation III and IV) 1632 Areenic Brown, Shali (old to say) QSMNSM mnohaq Time: Fleid Filtered Sample (Yes or No) Lab PM: Preservation Code: Matrix Solid (C=comp, G=grab) Sample Type Primary Deliverable Rank: 2 Sample Eastern Time Date: TAT Requested (days): Due Date Requested: 10/22/2021 Sample Date 8/31/21 Project #: 18020201 SSOW#: Sampler ₩O₩ Client Information (Sub Contract Lab) Deliverable Requested: I, II, III, IV, Other (specify) Sample Identification - Client ID (Lab ID) Eurofins Frontier Global Sciences LLC Plant Arkwright MNA AP-2 DAS Possible Hazard Identification SB-1-24.6-34.6 (180-126590-1) Empty Kit Relinquished by: Shipping/Receiving 5755 8th Street E, State, Zip: WA, 98424 Unconfirmed Arkwright Tacoma

Environment Testing

🛟 eurofins

Chain of Custody Record

Eurofins TestAmerica, Pittsburgh

Pittsburgh, PA 15238 Phone: 412-963-7058 Fax: 412-963-2468

301 Alpha Drive RIDC Park

Custody Seal No.:

Custody Seals Intact:



Frontier Global Sciences

5755 8th Street East **Tacoma, WA 98424**

Phone: (253) 922-2310

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation 301 Alpha Drive RIDC Park Project Number: Total As and As Speciation in Groundwater Reported: Pittsburgh PA, 15238 Project Manager: Shali Brown 19-Jan-22 16:32

SB-1-24.6-34.6 (180-126590-1) 1J00051-01

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Sequence	Analyzed	Method	Notes
Sample Preparation: [CALC]											
Arsenate (as Arsenic)	0.184	0.0328	0.0469	mg/kg dry	30	[CALC]	14-Oct-21		18-Oct-21	EPA 1632	
Sample Preparation: EFGS SOP299.	3 Speciation	Oven Di	gestion fo	r Solids							
Arsenite (as Arsenic)	ND	-	0.047	mg/kg dry	30	F110474	14-Oct-21	1J18021	18-Oct-21	EPA 1632	R-05, U
Inorganic Arsenic	0.184	-	0.047	mg/kg dry	30	F110473	14-Oct-21	1J18020	15-Oct-21	EPA 1632	
Sample Preparation: EFGS SOP513.	3 Solids Ana	ılysis									
% Solids	62.6	-	0.1	% by Weight	1	F110481	18-Oct-21		19-Oct-21	SM 2540B	O-04

Eurofins Frontier Global Sciences, LLC

 ${\it The results in this report only apply to the samples analyzed in accordance with the}$ chain of custody document. This analytical report must be reproduced in its entirety.

Curtis Deer, Project Manager

Page 7 of 11

Phone: (253) 922-2310

Frontier Global Sciences

0.118

Eurofins TestAmerica - Pittsburgh 301 Alpha Drive RIDC Park

Pittsburgh PA, 15238

eurofins

Project: Arsenic Speciation Project Number: Total As and As Speciation in Groundwater

Reported:

Project Manager: Shali Brown

19-Jan-22 16:32

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F110473 - EFGS SOP2993 Spo	eciation Ove	n Digestion	for Solid	s							
Blank (F110473-BLK1)					Prepared: 1	14-Oct-21 A	analyzed: 1	5-Oct-21			
Inorganic Arsenic	ND	-	0.010	mg/kg wet							Ţ
LCS (F110473-BS1)					Prepared: 1	14-Oct-21 A	nalyzed: 1	5-Oct-21			
Inorganic Arsenic	0.075	-	0.010	mg/kg wet	0.10000		75.3	50-150			
LCS Dup (F110473-BSD1)					Prepared: 1	14-Oct-21 A	nalyzed: 1	5-Oct-21			
Inorganic Arsenic	0.076	-	0.010	mg/kg wet	0.10000		75.9	50-150	0.703	35	
Matrix Spike (F110473-MS1)		Source:	1100043-0	1RE1	Prepared: 1	14-Oct-21 A	analyzed: 1	5-Oct-21			
Inorganic Arsenic	0.220	-	0.033	mg/kg dry	0.10838	0.102	109	50-150			
Matrix Spike Dup (F110473-MSD1)		Source:	1100043-0	1RE1	Prepared: 1	14-Oct-21 A	nalyzed: 1	5-Oct-21			
Inorganic Arsenic	0.214	-	0.034	mg/kg dry	0.11253	0.102	99.8	50-150	8.88	35	
Batch F110474 - EFGS SOP2993 Spo	eciation Ove	n Digestion	for Solid	s							
Blank (F110474-BLK1)					Prepared: 1	14-Oct-21 A	analyzed: 1	8-Oct-21			
Arsenite (as Arsenic)	ND	-	0.010	mg/kg wet							Ţ
LCS (F110474-BS1)					Prepared: 1	14-Oct-21 A	analyzed: 1	8-Oct-21			
Arsenite (as Arsenic)	0.066	-	0.010	mg/kg wet	0.10000		66.4	30-170			
LCS Dup (F110474-BSD1)					Prepared: 1	14-Oct-21 A	nalyzed: 1	8-Oct-21			
Arsenite (as Arsenic)	0.066	-	0.010	mg/kg wet	0.10000		66.1	30-170	0.340	35	
Matrix Spike (F110474-MS1)		Source:	1100043-0	1	Prepared: 1	14-Oct-21 A	nalyzed: 1	8-Oct-21			

mg/kg dry 0.10838

0.033

0.033

Eurofins Frontier Global Sciences, LLC

 ${\it The results in this report only apply to the samples analyzed in accordance with the}$ chain of custody document. This analytical report must be reproduced in its entirety.

78.2

30-170

Arsenite (as Arsenic)



Frontier Global Sciences

5755 8th Street East **Tacoma, WA 98424**

Phone: (253) 922-2310

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation

301 Alpha Drive RIDC Park Project Number: Total As and As Speciation in Groundwater Pittsburgh PA, 15238 Project Manager: Shali Brown

Reported:

Quality Control Data

19-Jan-22 16:32

		Detection	Reporting		Spike	Source		%REC		RPD	
Analyte	Result	Limit	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

Batch F110474 - EFGS SOP2993 Speciation Oven Digestion for Solids

Matrix Spike Dup (F110474-MSD1)		Source:	1100043-0	01	Prepared: 1	4-Oct-21 A	nalyzed: 1	8-Oct-21			
Arsenite (as Arsenic)	0.099	-	0.034	mg/kg dry	0.11253	0.033	58.6	30-170	28.6	35	

Eurofins Frontier Global Sciences, LLC

 ${\it The results in this report only apply to the samples analyzed in accordance with the}$ chain of custody document. This analytical report must be reproduced in its entirety.

Curtis Deer, Project Manager

Page 9 of 11

5755 8th Street East **Tacoma, WA 98424**

Phone: (253) 922-2310

Reported:

19-Jan-22 16:32

eurofins

Pittsburgh PA, 15238

Frontier Global Sciences

Eurofins TestAmerica - Pittsburgh Project: Arsenic Speciation 301 Alpha Drive RIDC Park Project Number: Total As and As Speciation in Groundwater

Project Manager: Shali Brown

Quality Control Data

l	7 . 1.	Detection	Reporting		Spike	Source		%REC		RPD	
Analyte	Result	Limit	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes
Batch F110481 - EFGS SOP5133	Solids Analysis										
Duplicate (F110481-DUP1)		Source:	1J00051-01	1	Prepared:	18-Oct-21 A	Analyzed: 19	9-Oct-21			
% Solids	62.4	-	0.1	% by Weight		62.6			0.320	10	
Duplicate (F110481-DUP2)		Source:	1J00064-01	l	Prepared:	18-Oct-21 A	Analyzed: 19	9-Oct-21			
% Solids	57.5	-	0.1	% by		58.0			0.866	10	
				Weight							

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Frontier Global Sciences

Eurofins TestAmerica - PittsburghProject: Arsenic Speciation301 Alpha Drive RIDC ParkProject Number: Total As and As Speciation in GroundwaterReported:Pittsburgh PA, 15238Project Manager: Shali Brown19-Jan-22 16:32

Notes and Definitions

U	Analyte was not detected and is reported as less than the LOD or as defined by the client. The LOD has been adjusted for any dilution or concentration of the sample.
R-05	The sample was diluted due to the presence of high levels of non-target analytes or particulates resulting in elevated reporting limits.
O-04	This sample was analyzed outside of the recommended holding time.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the method detection limit if reported to the MDL or above the reporting limit if reported to the MRL.
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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01 Alpha Drive RIDC Park ittsburgh, PA 15238 hone (412) 963-7058 Phone (412) 963-2468		Chain (of Cus			ord										Environment Testing America
lient Information	Sampler: Shoredits, Andre	eas			PM: wn, Sh	ali										-14290.2
ient Contact	Phone:	¥.		E-N	ail:					 180-1	2650	0 Chai				
onpany:	(770) 380-0861		PWSID:	Sh	ali.Brow	n@Eu	rofin	set.cor	<u> </u>	100-1	2009	O Chai	n or C	ustody		
outhern Company			PVVSID.						Analy	vsis	Rea	ueste	d			
idress: 11 Ralph McGill Blvd SE B10185	Due Date Request	ed:					4			6						Preservation Codes:
y: lanta	TAT Requested (days)	rys):			1	<u> </u>			Burlington)	anco C						A - HCL M - Hexane B - NaOH N - None
ate, Zip: A, 30308	Compliance Project		A No		400	(Knoxville)				(sub Xenco						C - Zn Acetate O - AsNaO2 D - Nitric Acid P - Na2O4S E - NaHSO4 Q - Na2SO3
one:	PO#:		. 110	-	-	Ŗ			qne)			=				F - MeOH R - Na2S2O3 G - Amchlor S - H2SO4
ail:	6122201429.210 WO#:	09			9	LI Mo	€		ter)	EG		weight				H - Ascorbic Acid T - TSP Dodecahydrate U - Acetone
Abraham@southernco.com					s or N	ို	(Knowville)	Metals	frome	city ((Pittsburgh)	후			, p	J - DI Water V - MCAA
oject Name: kwright MNA - AP-2 DAS	Project #: 18020201				(Yes	Ä	9	Total	& Hyc	Capa	Pittst	ds fo			containers	L - EDA Z - other (specify)
te: eorgia	SSOW#:				ample (Yes (Yes or N	- SEP	Asco LI Mo	gnibr	Size (Sieve&Hydrometer)	hange		re/Sol				
ample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (w=water, S=sol 0=waste/oll, BT=TIssue, A=Al	Field Filterred S	6010D_SEP_Calc	6010D_Total As	SEP on HOLD pending Total Metals	D422 - Grain Size	9081 - Cation Exchange Capacity (CEC)	Arsenic Speciation	Moisture - Moisture/Solids for			Total Number of	
		><		tion Code:	IXIX	N	N	NI			1	N				C. Little (v. Taral Mark) and B. and an SE
-1-24.6-34.6	8/31/21	17:40	С	S		X	X	x >	X	. X		X			5	Co Li Mo for Total Metal and Pending SE analysis
-2-24-32			С	S	$\pm \pm$	×	×	× /	×	×	X	X				[Arsenic] Co Li Mo for Total Metal and Pending SEP analysis
-3-15-25	8/30/21	18:00	С	s		х	х	X X	X	х		х			5	Co Li Mo for Total Metal and Pending SE analysis
3-4-12-22	8/31/21	12:00	С	S		X	х	хх	х	X	х	х			6	[Arsenic] Co Li Mo for Total Metal and Pending SEP analysis
3-5-15-25	8/31/21	13:25	С	s	\prod	х	х	x x	X	x		х			5	Co Li Mo for Total Metal and Pending SE analysis
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ssible Hazard Identification Non-Hazard Flammable Skin Irritant liverable Requested: I, II, III, IV, Other (specify)	Poison B Unkn	own 🗆 j	Radiological			Re	tum	osal(. To Clie ctions/	nt		Di	sposal .				ed longer than 1 month) hive For Months
ppty Kit Relinquished by:		Date:			Time:	-	_	-				Met	hod of S	nipment:		-
inquished by: Andreas Shoredits	Date/Time: 8/31/21	18-5	_	Company Wood E&IS		Receiv	ed by	: /	10	10	d	or	7	Date/Time	-1	-2/ Company
inquished by:	Date/Time:	10-3	3	Company		Receiv	red by	1					-	Date/Time		930 Company
				Company		Receiv								Date/Time		Company





Environment Testing TestAmerica

1075 BIG SHANTY ROAD N.W., SUITE 10 DRIGIN ID:LIYA (770) 421-3365 DAVID FULLTER PICKING UP SAMPLE RECEIVING ETA PITTSBURGH



FedEx | 1516 9332 3783

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) - 01 SEP 10:38A ORITY OVERNIGE



15138334 08/31 56DJ2/56CO/FE48

PT-W1-SR-001 effective 11/8/18 Uncorrected temp

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Initials





















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Login Sample Receipt Checklist

Client: Southern Company Job Number: 180-126590-2

Login Number: 126590 List Source: Eurofins Pittsburgh

List Number: 1

Creator: Watson, Debbie

Creator. Watson, Debbie		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>N/A</td> <td></td>	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Quantitative XRD Analysis

October 2021

Ellington Geological Services, LLC



Quantitative XRD Analysis

Bulk and Clay

8 Samples

Yingqian (Chan) Xiong

18 October 2021

Ellington Geological Services, LLC

1414 Lumpkin Road Houston, TX 77040 USA T: +1 281-888-9154

www.ellingtongeo.com

1. Samples

Well/Sample ID	Depth (m/ft)	Number of Samples	Study
SB-1,SB-3 – SB-9	N/A	8	XRD

2. Methods

X-Ray Diffraction (XRD)

X-ray diffraction (XRD) analysis was utilized to identify minerals and quantify weight percentage. In XRD analysis, a focused X-ray beam interacts with the electrons in minerals' atomic crystal structure, recording regular and diagnostic patterns indicative of mineral crystal dimensions. Characteristic diffraction peaks were used by the interpreters to identify individual mineral phases. Our software allows for the careful selection of experimental parameters in modeling the experimental patterns to determine mineral weight percentages.

Instrument

Bruker D2

Sample Preparation

These bulk samples were disaggregated with a mortar and pestle and then micronized. The samples were spray dried and fine powder of each sample was carefully top loaded into an XRD sample holder for maximize random grain orientation and an even surface. Then each sample was run at 0.020 degree/step. The clay fractions were separated after dispersed in distilled water with dispersant (Sodium Hexametaphosphate). Clay suspensions were then deposited to glass slides. Each clay sample was dried at low temperature (60 degree Celcius) prior to XRD analysis and then saturated overnight by ethylene glycol for subsequent analysis. Occasionally, a heat treatment is necessary, in which case the slides are heated for 1 hour at 550°C prior to further XRD analysis.

Data Processing

Mineral identification was performed with JADE version 9.5 software. This version is equipped with the International Centre for Diffraction Data's (ICDD) PDF-2 Minerals Database, containing over 298,000 reference-XRD patterns. Quantitative analysis of

minerals was performed by the Rietveld method with no accounting for any amorphous phases. The results are normalized to 100% based on the assumption that the complete mineral content of the sample is accounted for in the XRD patterns.

3. Summary of Results

- There are no carbonates in this set of samples.
- Maghemite and goethite present in the first sample SB-1, in which kaolinite is the major mineral.
- Quartz and plagioclase are the major minerals in all other samples SB-3 to SB-9. Smectite presents in sample SB-6 and SB-9.

4. Data File

The data are in .xlsx format with file name "2021-1124_Wood_Arkwright AP2 DAS & AP3_XRD B+C_XRF_ICP Results" Tab "XRD".



1414 Lumpkin Rd. Houston, TX 77043 https://www.ellingtongeo.com

Client: Client: Client Project Name: Client Project Number: Depth Interval: Sample Type: Client Project Number: Depth Interval: Sample Type: Client Project Number: Depth Interval: Sample Type: Client Project Number: Client Number: Cli

Result T VDE A

EA Project #: 2021-1124
Report Date: 18 October 2021
Sample Number: 8

XRF

Data Type(s). A	3	19 OI VIVI	Anaiysis	Data Type(s):)
	Data Type(S).	LO UL AINI	Aliaivaia	Data Typa(a): 1

Displayed as Elements Only																							
Project	Sample	Al (ppm)	Si (ppm)	Ti (ppm)	Fe (ppm)	Mn (ppm)	Mg (ppm)	Ca (ppm)	K (ppm)	P (ppm)	Na (ppm)	S (ppm)	As (ppm)	Ba (ppm)	Bi (ppm)	Cd (ppm)	Co (ppm)	CI (%)	Cr (ppm)	Cu (ppm)	Hg (ppm)	La (ppm)	Mo (ppm)
GPC Arkwright AP2 DAS and AP3	SB-1-24.6-34.6	98,000	146,000	8,700	241,200	3,124	41,900	5,661	ND	661	ND	ND	ND	852	ND	ND	ND	ND	727	ND	ND	ND	ND
GPC Arkwright AP2 DAS and AP3	SB-3-15-25	75,500	294,100	ND	53,700	1,104	60,300	22,218	ND	ND	ND	ND	ND	590	ND	ND	ND	ND	574	ND	ND	ND	12
GPC Arkwright AP2 DAS and AP3	SB-4-12-22	73,200	307,300	ND	58,700	929	66,400	27,371	ND	ND	ND	ND	ND	381	ND	ND	ND	ND	ND	ND	ND	ND	7
GPC Arkwright AP2 DAS and AP3	SB-5-15-25	96,300	287,300	4,500	71,600	1,150	66,800	28,758	ND	ND	ND	ND	ND	405	ND	ND	ND	ND	853	ND	ND	ND	9
GPC Arkwright AP2 DAS and AP3	SB-6-17-25	124,100	201,600	5,700	150,400	2,891	68,100	36,546	ND	ND	ND	ND	ND	221	ND	ND	ND	ND	898	ND	ND	ND	ND
GPC Arkwright AP2 DAS and AP3	SB-7-20-30	80,700	259,000	4,000	81,600	2,130	61,700	36,547	ND	ND	ND	ND	ND	182	ND	ND	ND	ND	766	ND	ND	ND	15
GPC Arkwright AP2 DAS and AP3	SB-8-20.6-30.6	112,300	222,800	4,300	107,200	2,225	63,900	27,048	ND	ND	ND	ND	ND	301	ND	ND	ND	ND	597	ND	ND	ND	5
GPC Arkwright AP2 DAS and AP3	SB-9-29.6-39.6	85,800	277,200	ND	72,300	1,459	59,800	30,903	ND	ND	ND	ND	ND	197	ND	ND	ND	ND	670	ND	ND	ND	8
Displayed with Major Oxides																							
Project	Sample	Al2O3 (%)	SiO2 (%)	TiO2 (%)	Fe2O3 (%)	MnO (%)	MgO (%)	CaO (%)	K2O (%)	P2O5 (%)	Na2O (%)	S (ppm)	As (ppm)	Ba (ppm)	Bi (ppm)	Cd (ppm)	Co (ppm)	CI (%)	Cr (ppm)	Cu (ppm)	Hg (ppm)	La (ppm)	Mo (ppm)
GPC Arkwright AP2 DAS and AP3	SB-1-24.6-34.6	18.5	31.2	1.5	34.5	0.4	6.9	0.8	ND	0.2	ND	ND	ND	852	ND	ND	ND	ND	727	ND	ND	ND	ND
GPC Arkwright AP2 DAS and AP3	SB-3-15-25	14.3	62.9	ND	7.7	0.1	10.0	3.1	ND	ND	ND	ND	ND	590	ND	ND	ND	ND	574	ND	ND	ND	12
GPC Arkwright AP2 DAS and AP3	SB-4-12-22	13.8	65.7	ND	8.4	0.1	11.0	3.8	ND	ND	ND	ND	ND	381	ND	ND	ND	ND	ND	ND	ND	ND	7
GPC Arkwright AP2 DAS and AP3	SB-5-15-25	10.3	C1 F	0.0	10.2	0.1	11.1	4.0	ND	ND	ND	ND	ND	405	ND	ND	ND	ND	853	ND	ND	NID	
	30-3-13-23	18.2	61.5	0.8	10.2	0.1	11.1	4.0	ND	IND	IND	IND	110	703	110	110	IND	ND	633	ND	ND	ND	9
=	SB-6-17-25	23.4	43.1	1.0	21.5	0.1	11.3	5.1	ND	ND	ND	ND	ND	221	ND	ND	ND	ND	898	ND	ND ND	ND ND	9 ND
GPC Arkwright AP2 DAS and AP3								5.1 5.1															9 ND 15
GPC Arkwright AP2 DAS and AP3 GPC Arkwright AP2 DAS and AP3 GPC Arkwright AP2 DAS and AP3	SB-6-17-25	23.4	43.1	1.0	21.5	0.4	11.3	5.1 5.1 3.8	ND	ND	ND	ND	ND	221	ND	ND	ND	ND	898	ND	ND	ND	



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Depth Interval: N/A
Sample Type: Soil

GPC Arkwright AP2 DAS and AP3

GPC Arkwright AP2 DAS and AP3 SB-9-29.6-39.6

SB-8-20.6-30.6

Client: Wood Environment and Infrastructure Solutions Client Project Name: GPC Arkwright AP2 DAS and AP3 Client Project Number: 6122201429 Phase 2109

ND

ND

ND

Results of XRF Analysis

EA Project #: 2021-1124 Report Date: 18 October 2021

Sample Number: 8 Data Type(s): XRF

Displayed as Elements Only															
Project	Sample	Nb (ppm)	Ni (ppm)	Pb (ppm)	Se (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Th (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
GPC Arkwright AP2 DAS and AP3	SB-1-24.6-34.6	ND	ND	ND	ND	ND	81	ND	ND	ND	ND	ND	35	204	77
GPC Arkwright AP2 DAS and AP3	SB-3-15-25	10	ND	ND	ND	ND	244	ND	ND	ND	ND	ND	29	71	155
GPC Arkwright AP2 DAS and AP3	SB-4-12-22	4	ND	ND	ND	ND	229	ND	ND	ND	ND	ND	16	64	95
GPC Arkwright AP2 DAS and AP3	SB-5-15-25	12	ND	24	ND	ND	324	99	18	ND	ND	ND	24	85	196
GPC Arkwright AP2 DAS and AP3	SB-6-17-25	7	ND	ND	ND	ND	85	ND	ND	ND	ND	ND	55	172	95
GPC Arkwright AP2 DAS and AP3	SB-7-20-30	7	ND	ND	ND	ND	195	ND	ND	ND	ND	ND	41	122	122
GPC Arkwright AP2 DAS and AP3	SB-8-20.6-30.6	9	ND	ND	ND	ND	149	ND	ND	ND	ND	ND	62	143	94
GPC Arkwright AP2 DAS and AP3	SB-9-29.6-39.6	4	ND	ND	ND	ND	284	ND	ND	ND	ND	ND	34	116	87
	_														
Displayed with Major Oxides															
Project	Sample	Nb (ppm)	Ni (ppm)	Pb (ppm)	Se (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Th (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
GPC Arkwright AP2 DAS and AP3	SB-1-24.6-34.6	ND	ND	ND	ND	ND	81	ND	ND	ND	ND	ND	35	204	77
GPC Arkwright AP2 DAS and AP3	SB-3-15-25	10	ND	ND	ND	ND	244	ND	ND	ND	ND	ND	29	71	155
GPC Arkwright AP2 DAS and AP3	SB-4-12-22	4	ND	ND	ND	ND	229	ND	ND	ND	ND	ND	16	64	95
GPC Arkwright AP2 DAS and AP3	SB-5-15-25	12	ND	24	ND	ND	324	99	18	ND	ND	ND	24	85	196
GPC Arkwright AP2 DAS and AP3	SB-6-17-25	7	ND	ND	ND	ND	85	ND	ND	ND	ND	ND	55	172	95
GPC Arkwright AP2 DAS and AP3	SB-7-20-30	7	ND	ND	ND	ND	195	ND	ND	ND	ND	ND	41	122	122

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Results of X-Ray Diffraction (XRD) Analysis

EA Project #: 2021-1124 Report Date: 18 October 2021
Sample Number: 8

Data Type(s): **XRD**

		wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	Wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	Wt%	Wt%
				CLAYS				CARBONATI	ES					OTHER	MINERALS							_TOTALS_	
Project	Sample	Smectite	Chlorite	Kaolinite	Illite/Mica	Mx IS	Calcite	Dolomite	Siderite	Quartz	K-Feldspar	Plagioclase	Pyroxene	Maghemite	Hematite	Pyrite	Goethite	Sepiolite	Apatite	Amphibole	Clays	Carbonates	Other
GPC Arkwright AP2 DAS and AP3	SB-1-24.6-34.6	3.3	-	66.3	1.5	10.3	-	-	-	-	-	7.0	1.2	6.4	-	-	3.4	-	-	0.6	81.4	-	18.6
GPC Arkwright AP2 DAS and AP3	SB-3-15-25	-	-	-	3.7	1.9	-	-	-	46.4	7.3	35.5	-	-	-	-	-	-	-	5.2	5.6	-	94.4
GPC Arkwright AP2 DAS and AP3	SB-4-12-22	-	-	-	6.3	2.6	-	-	-	52.3	1.7	31.2	-	-	-	0.6	-	-	-	5.3	8.9	-	91.1
GPC Arkwright AP2 DAS and AP3	SB-5-15-25	-	-	-	11.1	1.8	-	-	-	39.2	-	47.9	-	-	-	-	-	-	-	-	12.9	-	87.1
GPC Arkwright AP2 DAS and AP3	SB-6-17-25	2.4	-	12.5	0.4	4.3	-	-	-	22.7	2.4	13.1	-	-	-	-	-	1.8	-	40.4	19.6	-	80.4
GPC Arkwright AP2 DAS and AP3	SB-7-20-30	-	-	-	3.5	2.1	-	-	-	32.1	1.6	41.4	2.4	-	-	-	-	-	-	16.9	5.6	-	94.4
GPC Arkwright AP2 DAS and AP3	SB-8-20.6-30.6	-	-	8.9	18.9	1.3	-	-	-	16.9	-	40.8	1.7	-	-	-	-	-	-	11.5	29.1	-	70.9
GPC Arkwright AP2 DAS and AP3	SB-9-29.6-39.6	0.9	-	2.0	1.4	2.7	-	-	-	48.6	-	32.8	1.0	-	-	-	-	-	-	10.6	7.0	-	93.0
																						_	

Due to detection limits for minerals quantified at less than 1%, the level of uncertainty dictates that presence is not necessarily definitive.



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Client: Wood Environment and Infrastructure Solutions
Client Project Name:
Client Project Number:
Depth Interval:
Sample Type:
Client: Wood Environment and Infrastructure Solutions
GPC Arkwright AP2 DAS and AP3
6122201429 Phase 2109
N/A
Soil

Results of ICP Analysis

EA Project #: 2021-1124
Report Date: 18 October 2021
Sample Number: 8
Data Type(s): ICP (ME-MS41L)

		Au	Ag	Al	As	В	Ва	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	Ge	Hf	Hg	In	K
Project	Sample	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%
GPC Arkwright AP2 DAS and AP3	SB-1-24.6-34.6	(0	0	4.0	1 <10	1,49	5	2	0	0.5	0	27	114	126	4	141	16.2	15	0	1 < 0.004	0	0.1
GPC Arkwright AP2 DAS and AP3	SB-3-15-25	(0	0	1.1	0 <10	18	1	0	0	0.3	0	15	8	194	2	38	2.2	5	0	0 0	0	0.4
GPC Arkwright AP2 DAS and AP3	SB-4-12-22	(0	0	1.5	1 <10	17	2	0	0	0.3	0	12	15	223	2	31	2.4	5	0	0 < 0.004	0	0.7
GPC Arkwright AP2 DAS and AP3	SB-5-15-25	(0	0	1.6	0 <10	28	0	0	0	0.2	0	22	17	236	2	53	3.6	8	0	0 < 0.004	0	0.9
GPC Arkwright AP2 DAS and AP3	SB-6-17-25	(0	0	3.0	0 <10	28	4	2	0	0.4	0	24	82	202	3	115	5.0	11	0	0 <0.004	0	0.4
GPC Arkwright AP2 DAS and AP3	SB-7-20-30	<0.0002		0	1.6	0 <10	14	7	0	0	8.0	0	21	16	317	2	53	3.4	6	0	0 < 0.004	0	0.5
GPC Arkwright AP2 DAS and AP3	SB-8-20.6-30.6	(0	0	2.5	0 <10	29	4	1	0	0.4	0	21	30	161	3	42	4.5	10	0	0 <0.004	0	1.0
GPC Arkwright AP2 DAS and AP3	SB-9-29.6-39.6	(0	0	1.4	0 <10	15	7	1	0	0.3	0	20	11	191	1	61	2.1	5	0	0 < 0.004	0	0.4



1414 Lumpkin Rd. Houston, TX 77043 https://www.ellingtongeo.com

Client: Wood Environment and Infrastructure Solutions
Client Project Name:
Client Project Number:
Depth Interval:
Sample Type:
Client: Wood Environment and Infrastructure Solutions
GPC Arkwright AP2 DAS and AP3
6122201429 Phase 2109
N/A
Soil

Results of ICP Analysis

EA Project #: 2021-1124
Report Date: 18 October 2021
Sample Number: 8
Data Type(s): ICP (ME-MS41L)

		La	Li	Mg	, N	ln Mo	Na	Nb	Ni	Р	Pb	Pd	Pt	Rb	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te
Project	Sample	ppm	ppm	%	p	pm ppm	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
GPC Arkwright AP2 DAS and AP3	SB-1-24.6-34.6		10	14	1.3	2,530	1	0.0	0	95	0.1	4	0 < 0.002		7	0	0.0	0	34	0	2	62 < 0.00	0 0
GPC Arkwright AP2 DAS and AP3	SB-3-15-25		8	8	0.5	359	6	0.0	0	26	0.0	4 < 0.001	<0.002		28	0	0.0	0	6	0	2	14 < 0.00	0.003
GPC Arkwright AP2 DAS and AP3	SB-4-12-22		5	12	0.9	264	5	0.0	0	38	0.0	4	0 < 0.002		53	0	0.0	0	5	0	3	20 < 0.00	5 0
GPC Arkwright AP2 DAS and AP3	SB-5-15-25		11	13	1.0	397	6	0.0	0	40	0.0	2 < 0.001	<0.002		59	0 < 0.01	L	0	13	0	1	30 < 0.00	5 0
GPC Arkwright AP2 DAS and AP3	SB-6-17-25		17	18	1.1	1,040	2	0.1	0	50	0.0	10 < 0.001	<0.002		38	0	0.0	0	22	0	1	8 < 0.00	0 0
GPC Arkwright AP2 DAS and AP3	SB-7-20-30		8	6	0.8	898	10	0.1	0	38	0.1	3 < 0.001	<0.002		23	0 < 0.01	L	0	13	0	1	14 < 0.00	5 0
GPC Arkwright AP2 DAS and AP3	SB-8-20.6-30.6		9	8	1.0	1,310	5	0.1	0	23	0.0	4	0 < 0.002		70	0	0.0	0	18	0	1	9 < 0.00	0.003
GPC Arkwright AP2 DAS and AP3	SB-9-29.6-39.6		11	5	0.6	519	4	0.0	0	34	0.0	4 < 0.001	<0.002		24	0 < 0.01	L	0	9	0	1	16 < 0.00	5 0



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Client: Wood Environment and Infrastructure Solutions
Client Project Name:
Client Project Number:
Depth Interval:
Sample Type:
Client: Wood Environment and Infrastructure Solutions
GPC Arkwright AP2 DAS and AP3
6122201429 Phase 2109
N/A
Soil

Results of ICP Analysis

EA Project #: 2021-1124
Report Date: 18 October 2021
Sample Number: 8
Data Type(s): ICP (ME-MS41L)

		Th	Ti	TI	U	V	W	Υ	Zn	Zr	
Project	Sample	ppm	%	ppm	ppm	ppr	n ppm	ppm	ppm	ppm	
GPC Arkwright AP2 DAS and AP3	SB-1-24.6-34.6		0	1.1	0	1	493	0	44	198	38
GPC Arkwright AP2 DAS and AP3	SB-3-15-25		2	0.2	0	1	56	0	11	49	2
GPC Arkwright AP2 DAS and AP3	SB-4-12-22		2	0.2	0	1	72	0	5	42	1
GPC Arkwright AP2 DAS and AP3	SB-5-15-25		4	0.2	0	0	93	0	6	64	0
GPC Arkwright AP2 DAS and AP3	SB-6-17-25		3	0.4	0	2	182	0	31	90	5
GPC Arkwright AP2 DAS and AP3	SB-7-20-30		2	0.3	0	1	93	0	18	65	2
GPC Arkwright AP2 DAS and AP3	SB-8-20.6-30.6		2	0.3	0	1	156	0	29	82	2
GPC Arkwright AP2 DAS and AP3	SB-9-29.6-39.6		3	0.2	0	1	50	0	15	59	1

Quantitative X-Ray Diffraction by Rietveld Refinement

October 2022

SGS



Quantitative X-Ray Diffraction by Rietveld Refinement

Report Prepared for: Environmental Services

Project Number/ LIMS No. Custom XRD/MI4507-NOV22

Sample Receipt: November 3, 2022

Sample Analysis: November 10, 2022

Reporting Date: December 8, 2022

BRUKER AXS D8 Advance Diffractometer Instrument:

Co radiation, 35 kV, 40 mA; Detector: LYNXEYE Test Conditions:

Regular Scanning: Step: 0.02°, Step time: 0.75s, 2θ range: 6-80°

PDF2/PDF4 powder diffraction databases issued by the International Center Interpretations:

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

Hayun to

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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WARNING: The sample(s) to which the findings recorded herein (the "Findings") relate was(were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted.



Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

M: 1/0	ARAMW-9-41.0/41.3-20221018	ARAMW-9-9.5/96.6-100.7/1002.0-20221018
Mineral/Compound	NOV4507-01	NOV4507-02
	(wt %)	(wt %)
Quartz	33.1	31.2
Microcline	13.8	13.6
Kaolinite	0.5	0.5
Muscovite	2.8	2.1
Biotite	4.0	7.2
Albite	45.8	45.3
TOTAL	100	100

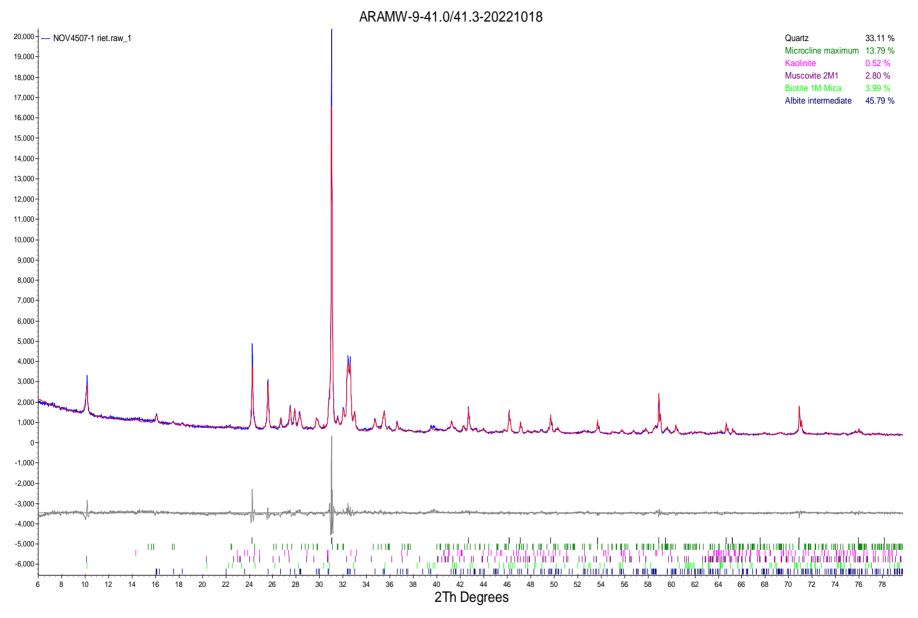
Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.

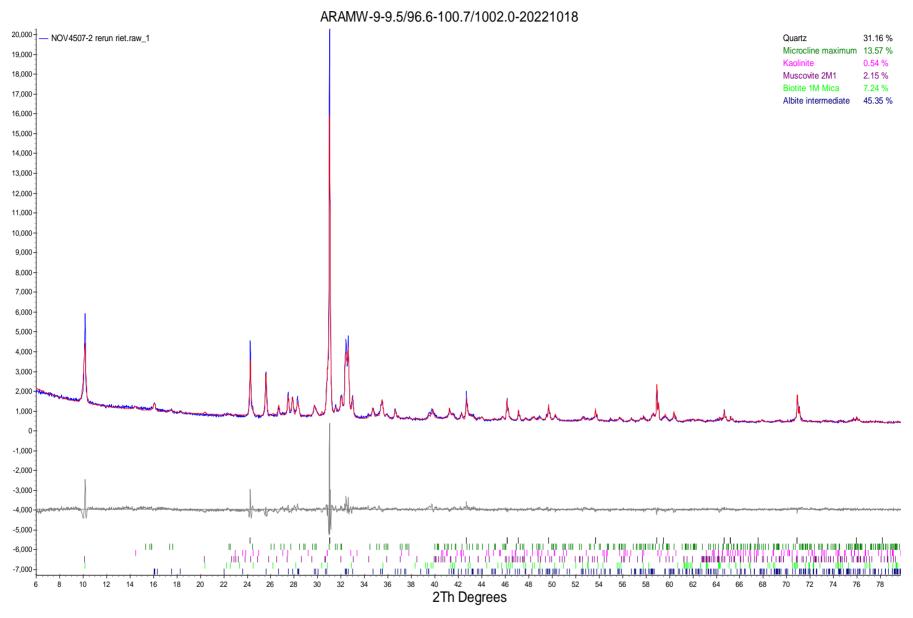
Mineral/Compound	Formula
Quartz	SiO ₂
Microcline	KAISi₃O ₈
Kaolinite	$Al_2Si_2O_5(OH)_4$
Muscovite	$KAI_2(AISi_3O_{10})(OH)_2$
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$
Albite	NaAlSi ₃ O ₈

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









Analytical Report Laboratory Job ID: CA19331-OCT22

October 2022 SGS



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Stantec Consulting Ltd.

Attn: Shannon Zahuranec

3052 Beaumont Centre Circle Lexington, Kentucky 40513, USA

Phone: 859-422-3122

Fax:

29-November-2022

Date Rec.: 27 October 2022 LR Report: CA19331-OCT22

Reference: Arkwright Plant/175569434

Copy: #1

CERTIFICATE OF ANALYSIS Final Report

Analysis	1:	2:	3:	4:	5:	6:
	Analysis Start Ana		Analysis		AMW-9-41.0/41.3- AI	
	Date	Time C	ompleted DateCo	mpleted Time	2022101800.	7/1002.0-20221018
Sample Date & Time					18-Oct-22 16:00	18-Oct-22 16:16
Prep-Env AR [Prep]	09-Nov-22	10:43	21-Nov-22	10:04	1	1
Hg MS [ug/g]	16-Nov-22	17:05	21-Nov-22	10:04	< 0.05	< 0.05
As [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	0.6	0.8
Al [μg/g]	16-Nov-22	17:05	21-Nov-22	10:04	11000	16000
B [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	< 1	< 1
Ba [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	110	130
Be [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	0.25	0.34
Cd [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	< 0.02	0.08
Co [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	6.5	7.1
Cr [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	220	200
Fe [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	22000	29000
Li [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	17	22
Mn [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	360	720
Mo [μg/g]	16-Nov-22	17:05	21-Nov-22	10:04	0.4	2.3
Pb [μg/g]	16-Nov-22	17:05	21-Nov-22	10:04	3.8	4.2
Sb [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	< 6	< 6
Se [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	< 0.7	< 0.7
TI [µg/g]	16-Nov-22	17:05	21-Nov-22	10:04	0.23	0.40

Catharine Arnold, B.Sc., C.Chem Project Specialist,

Environment, Health & Safety

Analytical Report Laboratory Job ID: CA19332-OCT22

October 2022 SGS



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Stantec Consulting Ltd.

Attn: Shannon Zahuranec

3052 Beaumont Centre Circle Lexington, Kentucky

40513, USA

Phone: 859-422-3122

Fax:

29-November-2022

Date Rec.: 27 October 2022 LR Report: CA19332-OCT22

Reference: Arkwright Plant/175569434

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CERTIFICATE OF ANALYSIS Final Report

Analysis	1: Analysis Start Date	•	3: Analysis Completed Date (•		6: ARAMW-9-9.5/96.6- 100.7/1002.0-20221 018
Sample Date & Time					18-Oct-22 16:00	18-Oct-22 16:16
SiO2 [%]	07-Nov-22	13:18	08-Nov-22	13:18	69.3	67.5
Al2O3 [%]	07-Nov-22	13:18	08-Nov-22	13:18	14.8	15.5
Fe2O3 [%]	07-Nov-22	13:18	08-Nov-22	13:18	3.35	4.15
MgO [%]	07-Nov-22	13:18	08-Nov-22	13:18	1.23	1.53
CaO [%]	07-Nov-22	13:18	08-Nov-22	13:18	2.86	2.64
Na2O [%]	07-Nov-22	13:18	08-Nov-22	13:18	4.04	3.99
K2O [%]	07-Nov-22	13:18	08-Nov-22	13:18	2.43	2.94
TiO2 [%]	07-Nov-22	13:18	08-Nov-22	13:18	0.39	0.56
P2O5 [%]	07-Nov-22	13:18	08-Nov-22	13:18	0.11	0.09
MnO [%]	07-Nov-22	13:18	08-Nov-22	13:18	0.05	0.10
Cr2O3 [%]	07-Nov-22	13:18	08-Nov-22	13:18	0.03	0.04
V2O5 [%]	07-Nov-22	13:18	08-Nov-22	13:18	0.01	0.01
LOI [%]	07-Nov-22	13:18	08-Nov-22	13:18	0.96	1.14
Sum [%]	07-Nov-22	13:18	08-Nov-22	13:18	99.5	100.2

Catharine Arnold, B.Sc., C.Chem Project Specialist,

Environment, Health & Safety

Analytical Report Laboratory Job ID: CA19337-NOV22

November 2022 SGS



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Stantec Consulting Ltd.

Attn: Shannon Zahuranec

3052 Beaumont Centre Circle Lexington, Kentucky

40513, USA

40313, 037

Phone: 859-422-3122

Fax:

21-February-2023

Date Rec.: 29 November 2022 LR Report: CA19337-NOV22 Reference: Tessier Leach

Copy: #2

CERTIFICATE OF ANALYSIS Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed	_	5: ARK-SO-GWC-17S B-A/E-20.0/30.0-2023	
			Date	Time	20913	21018
Sample Date & Time					13-Sep-22 15:30	18-Oct-22 13:45
Al [μg/g]	19-Jan-23	23:42	31-Jan-23	10:02	11	8
As [μg/g]	19-Jan-23	23:42	13-Feb-23	16:26	< 0.5	< 0.5
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	10:02	0.09	0.01
Fe [µg/g]	19-Jan-23	23:42	31-Jan-23	10:02	21	16
Li [µg/g]	19-Jan-23	23:42	31-Jan-23	10:02	< 2	< 2
Mn [µg/g]	19-Jan-23	23:42	31-Jan-23	10:02	2.4	1.0
Mo [μg/g]	19-Jan-23	23:42	21-Feb-23	15:08	< 0.1	< 0.1

Analysis	7: ARAMW-9-41.0/41. 3-20221018	8: ARAMW-9-9.5/96.6 -100.7/1002.0-2022 1018
Sample Date & Time	18-Oct-22 16:00	18-Oct-22 16:16
Al [μg/g]	63	89
As [µg/g]	< 0.5	< 0.5
Co [µg/g]	< 0.01	0.02
Fe [µg/g]	25	59
Li [μg/g]	< 2	< 2
Mn [μg/g]	0.6	1.6
Mo [μg/g]	< 0.1	< 0.1

Water Soluble Fraction

Revised with As and Mo added.



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

LR Report: CA19337-NOV22

Catharine Arnold, B.Sc., C.Chem

Project Specialist,

Environment, Health & Safety



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Stantec Consulting Ltd.

Attn: Shannon Zahuranec

3052 Beaumont Centre Circle Lexington, Kentucky

40513, USA

Phone: 859-422-3122

Fax:

21-February-2023

Date Rec.: 29 November 2022 LR Report: CA19338-NOV22 Reference: Tessier Leach

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CERTIFICATE OF ANALYSIS Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date			6: ARK-SO-GWC-12 4SB-A-15.0/23.9-2 0221018
Sample Date & Time					13-09-22 15:30	18-10-22 13:45
Al [μg/g]	19-Jan-23	23:42	31-Jan-23	10:02	15	13
As [μg/g]	19-Jan-23	23:42	13-Feb-23	16:27	< 0.5	< 0.5
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	10:02	0.43	0.06
Fe [µg/g]	19-Jan-23	23:42	31-Jan-23	10:02	27	26
Li [μg/g]	19-Jan-23	23:42	31-Jan-23	10:02	< 2	< 2
Mn [μg/g]	19-Jan-23	23:42	31-Jan-23	10:02	13	8.7
Mo [μg/g]	19-Jan-23	23:42	21-Feb-23	15:08	< 0.1	< 0.1

Analysis	7:	8:
	ARAMW-9-41.0/41.	ARAMW-9-9.5/96.
	3-20221018	6-100.7/1002.0-20
		221018
Sample Date & Time	18-10-22 16:00	18-10-22 16:16
Al [μg/g]	50	81
As [µg/g]	< 0.5	< 0.5
Co [µg/g]	0.01	0.04
Fe [µg/g]	30	72
Li [µg/g]	< 2	< 2
Mn [µg/g]	6.0	9.5
Mo [μg/g]	< 0.1	< 0.1

Fraction 2 Exchangeable Metals

Revised with As and Mo added.



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Tessier Leach Fraction 2 - Exchangeable Metals

LR Report: CA19338-NOV22

Catharine Arnold, B.Sc., C.Chem

Project Specialist, Environment, Health & Safety



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Stantec Consulting Ltd.

Attn : Shannon Zahuranec

3052 Beaumont Centre Circle Lexington, Kentucky 40513, USA

Phone: 859-422-3122

Fax:

22-February-2023

Date Rec.: 29 November 2022 LR Report: CA19339-NOV22

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CERTIFICATE OF ANALYSIS Final Report - Revised

Analysis	1: Analysis Start Analy	2:	3: Analysis	4: Analysis AF	5: 2K-SO-GWC-17S A	6: ARK-SO-GWC-1244	7: ARAMW-9-41.0/41. <i>A</i>	8: RAMW-9-9 5/96 6
	Date		•	•	A/E-20.0/30.0-20S 220913			100.7/1002.0-2022 1018
Sample Date & Time					13-09-22 15:30	18-10-22 13:45	18-10-22 16:00	18-10-22 16:16
Al [μg/g]	19-Jan-23	23:42	31-Jan-23	10:03	35	31	580	570
As [µg/g]	19-Jan-23	23:42	13-Feb-23	16:27	< 0.5	< 0.5	< 0.5	< 0.5
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	10:03	0.13	0.05	0.28	0.46
Fe [µg/g]	19-Jan-23	23:42	31-Jan-23	10:03	24	46	1200	1100
Li [μg/g]	19-Jan-23	23:42	31-Jan-23	10:03	< 2	< 2	2	< 2
Mn [µg/g]	19-Jan-23	23:42	31-Jan-23	10:03	5.1	5.3	32	45
Mo [μg/g]	19-Jan-23	23:42	21-Feb-23	15:09	< 0.1	< 0.1	< 0.1	< 0.1

Fraction 3 Metals Bound to Carbonates

Revised with As and Mo added.

Catharine Arnold, B.Sc., C.Chem Project Specialist,



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Stantec Consulting Ltd.

Attn: Shannon Zahuranec

3052 Beaumont Centre Circle Lexington, Kentucky

40513, USA

Phone: 859-422-3122

Fax:

22-February-2023

Date Rec. : 29 November 2022 LR Report: CA19340-NOV22 Reference: Tessier Leach

Copy: #3

CERTIFICATE OF ANALYSIS Final Report - Revised

Analysis	3: Analysis Completed DateCon		A/E-20.0/30.0-20 S			00.7/1002.0-2022
			220913	21018		1018
Sample Date & Time			13-09-22 15:30	18-10-22 13:45	18-10-22 16:00	18-10-22 16:16
Al [μg/g]	31-Jan-23	10:03	410	220	1700	1800
As [μg/g]	13-Feb-23	16:28	< 0.5	< 0.5	< 0.5	< 0.5
Co [µg/g]	31-Jan-23	10:03	30	5.8	0.60	0.60
Fe [µg/g]	31-Jan-23	10:03	2700	2300	3500	4200
Li [µg/g]	31-Jan-23	10:03	< 2	< 2	2	3
Mn [μg/g]	31-Jan-23	10:03	950	340	56	75
Mo [μg/g]	21-Feb-23	15:09	< 0.1	< 0.1	< 0.1	< 0.1

Fraction 4 Metals Bound to Fe and Mn Oxides Revised with As added.

Catharine Arnold, B.Sc., C.Chem Project Specialist,



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Stantec Consulting Ltd.

Attn: Shannon Zahuranec

3052 Beaumont Centre Circle Lexington, Kentucky

40513, USA

Phone: 859-422-3122

Fax:

22-February-2023

Date Rec.: 29 November 2022 LR Report: CA19341-NOV22 Reference: Tessier Leach

Copy: #3

CERTIFICATE OF ANALYSIS Final Report - Revised

Analysis	3: Analysis Completed DateCom	Analysis Analysis ARK-SO-GWC-17S ARK eted DateCompleted Time B-A/E-20.0/30.0-20 SB-A		B-A-15.0/23.9-202		-100.7/1002.0-2022	
			220913	21018		1018	
Sample Date & Time			13-09-22 15:30	18-10-22 13:45	18-10-22 16:00	18-10-22 16:16	
Al [μg/g]	31-Jan-23	10:03	510	540	730	940	
As [µg/g]	13-Feb-23	16:28	< 0.5	< 0.5	< 0.5	< 0.5	
Co [µg/g]	31-Jan-23	10:03	3.2	1.9	1.5	2.8	
Fe [µg/g]	31-Jan-23	10:03	130	160	280	310	
Li [µg/g]	31-Jan-23	10:03	< 2	< 2	2	3	
Mn [μg/g]	31-Jan-23	10:03	88	91	23	47	
Mo [μg/g]	21-Feb-23	15:09	0.3	0.1	< 0.1	< 0.1	

Fraction 5 Bound to Organic Material Revised with As and Mo added.

Catharine Arnold, B.Sc., C.Chem Project Specialist,



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Stantec Consulting Ltd.

Attn: Shannon Zahuranec

3052 Beaumont Centre Circle Lexington, Kentucky

40513, USA

Phone: 859-422-3122

Fax:

22-February-2023

Date Rec.: 29 November 2022 LR Report: CA19342-NOV22 Reference: Tessier Leach

Copy: #3

CERTIFICATE OF ANALYSIS Final Report - Revised

Analysis	3: Analysis Completed DateCon	•			7: ARAMW-9-41.0/41. <i>J</i> 3-20221018 -	8: ARAMW-9-9.5/96.6 100.7/1002.0-2022 1018
Sample Date & Time			13-09-22 15:30	18-10-22 13:45	18-10-22 16:00	18-10-22 16:16
Al [μg/g]	31-Jan-23	10:04	84000	58000	59000	61000
As [μg/g]	13-Feb-23	16:28	< 0.5	1.1	< 0.5	< 0.5
Co [µg/g]	31-Jan-23	10:04	15	12	3.9	3.6
Fe [µg/g]	31-Jan-23	10:04	69000	55000	17000	24000
Li [µg/g]	31-Jan-23	10:04	9	8	7	11
Mn [µg/g]	31-Jan-23	10:04	600	570	250	560
Mo [μg/g]	21-Feb-23	15:09	0.4	0.7	0.3	2.1

Fraction 6 Residual metals

Revised with As and Mo added.

Catharine Arnold, B.Sc., C.Chem Project Specialist,

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Invoice/Receipt to {3}:	Attention	Shannon Zahuranec			☐ YES		NO							
/Rec (3):	A dd dans	3052 Beaumont Centre Circle												A SO
oice	Address:	Lexington, KY 40513		100				und Time	9	_				
ž	Fmail	shannon.zahuranec@stantec.c	nm				Specify	h Turnaro	una iim	e Kequir	ear		☐ YES	× 1
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	Company Name:	Stantec					Phone	Numbe	r:		859-422-	3122		
	tact Name:			*										
		Shannon Zahuranec			4		Fax N	umber:						
	Address:	3052 Beaumont Centre Circle, I	exington, KY 40513				E-mail	:			shannor	.zahurane	ec@stante	c.com
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		Sample Identifier		Sampled	Time Sampled	# of Bottles		IS – 3,Ba,Be, 5o,F,Fe,Pb,Li ,Mg,Na,Se,T	. ₹	5.				
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ARK-	-SO-GWC-17SB-	A/E-20.0/30.0-20220913	pulpisoil	09/13/22	15:30	2		Х	Х					1
"ARK-	-SO-GWC-124SE	3-A-15.0/23.9-20221018	pulp/soil	10/18/22	13:45	1	Х	Х	Х	Х				-
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Total N	Metals – Sb,Al,As,B	,Ba,Be,Ca,Cd,Cr,Co,F,Fe,Pb,Li,I	Hg,Mn,Mo,Mg,Na,Se,TI									- 192		
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SEP m	netal analyses													
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	Sampled By {1}:	David Schroder		(Signafure)	David "	Selrush			Date:	10	0 18 22			dd/yy)
Re	elinquished by {2):	David Schroder		(Signature)	t. ()	X.V.			Date:	10	19	22	(mm/	dd/vv)

Note: {1} Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. (2) Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. {4} Completion of work may require the subcontracting of samples between the London and Lakefield laboratories.

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12:30 FedEX BF

Analytical Report Laboratory Job ID: CA19106-AUG23

July 2023

SGS





P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

11-September-2023

Project: PO#175569434

Date Rec.: 10 August 2023 LR Report: CA19106-AUG23

Reference: Plant Arkwright AP-2/175569434 -PO#175569434

Copy: #1

Stantec Consulting Services Inc.

Attn: Edgar Smith

10745 Westside Way, Suite 250 Alpharetta, GA 30009, USA

Phone: 770-656-2676

Fax:

CERTIFICATE OF ANALYSIS **Final Report**

Analysis	1:	2:	3:	4:	5:	6:	7:
	Analysis Start An Date		Analysis empleted DateCor	Analysis npleted Time	SB-10-20-25	SB-10-25-30	SB-10-30-35
Sample Date & Time					07/27/2023 17:25	07/27/2023 17:30	07/27/2023 17:35
Hg MS [ug/g]	23-Aug-23	17:59	28-Aug-23	12:07	< 0.05	< 0.05	< 0.05
Ag [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	< 0.5	< 0.5	< 0.5
As [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	0.6	0.8	0.9
Al [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	3000	4100	6000
B [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	< 1	< 1	< 1
Ba [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	30	44	68
Be [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	0.21	0.26	0.37
Bi [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	< 0.09	< 0.09	< 0.09
Ca [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	530	790	940
Cd [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	< 0.02	< 0.02	< 0.02
Co [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	2.4	3.1	3.6
Cr [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	23	42	22
Cu [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	3.2	14	3.5
Fe [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	19000	23000	20000
K [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	1000	1400	1900
Li [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	3	4	7
Mg [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	1600	1800	3600
Mn [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	140	180	550
Mo [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	1.2	3.4	1.2
Ni [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	3.4	5.2	5.1
Pb [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	0.58	1.1	0.86
Sb [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	< 6	< 6	< 6
Se [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	0.3	0.3	0.5
Sn [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	2	5	5
Sr [µg/g]	23-Aug-23	17:59	28-Aug-23	12:07	4.0	5.0	6.8
Ti [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	330	490	650
TI [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	< 0.02	0.03	0.02
U [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	0.40	0.59	1.0
V [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	12	16	24
Υ [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	17	25	52
Zn [μg/g]	23-Aug-23	17:59	28-Aug-23	12:07	22	28	57



P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Project: PO#175569434

LR Report: CA19106-AUG23

Analysis	8: SB-10-35-40	9: SB-11-25-30	10: SB-11-30-35	11: SB-11-35-40	12: SB-12-20-25	13: SB-12-25-30
Sample Date & Time	07/27/2023 17:40	07/28/2023 10:15	07/28/2023 10:20	07/28/2023 10:25	07/27/2023 13:05	07/27/2023 13:10
Hg MS [ug/g]	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ag [μg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
As [μg/g]	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Al [μg/g]	4900	13000	12000	14000	23000	17000
B [μg/g]	< 1	< 1	< 1	< 1	< 1	< 1
Ba [µg/g]	67	110	96	82	550	280
Be [µg/g]	0.24	0.21	0.19	0.37	0.19	0.19
Bi [μg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	780	4900	3300	6300	4400	2600
Cd [µg/g]	< 0.02	0.04	0.04	0.03	0.02	0.02
Co [µg/g]	3.7	10	10	12	19	17
Cr [µg/g]	19	25	37	19	77	49
Cu [µg/g]	4.8	20	35	41	0.4	1.1
Fe [µg/g]	21000	25000	25000	32000	34000	31000
K [µg/g]	1800	3800	2400	5300	13000	9000
Li [μg/g]	6	9	9	9	17	13
Mg [µg/g]	3000	8100	7900	7900	15000	11000
Mn [μg/g]	510	510	420	560	510	360
Mo [μg/g]	1.6	0.4	1.6	0.5	2.1	1.2
Ni [μg/g]	4.8	12	11	11	48	33
Pb [µg/g]	0.36	1.6	2.0	2.7	1.7	2.0
Sb [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6
Se [µg/g]	0.3	0.5	0.5	0.2	0.1	< 0.1
Sn [µg/g]	5	< 2	< 2	< 2	< 2	< 2
Sr [µg/g]	4.9	14	19	22	140	58
Ti [μg/g]	600	1700	1200	2000	2500	1600
TI [μg/g]	0.02	0.13	0.12	0.15	0.39	0.28
U [μg/g]	0.32	0.35	1.0	0.39	0.68	0.22
V [µg/g]	16	53	50	63	81	66
Υ [μg/g]	25	7.0	6.6	4.7	8.4	3.8
Zn [µg/g]	46	54	55	74	76	61

Method Descriptions

Units	Description	SGS Method Code
μg/g	Al by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Sb by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	As by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Ba by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Be by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Bi by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	B by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Cd by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Ca by ICP-MS & aqua regia digestion	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Cr by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Co by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Cu by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Fe by ICP-MS & aqua regia digestion	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Pb by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Li by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Mg by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Mn by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
ug/g	Hg pulp by ICP-MS	ME-CA-[ENV]SPE-LAK-AN-004





P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Project: PO#175569434

LR Report: CA19106-AUG23

Units	Description	SGS Method Code
μg/g	Mo by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Ni by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	K by ICP-OES & aqua regia digestion	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Se by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Ag by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Sr by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	TI by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Sn by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Ti by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	U by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	V by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Y by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005
μg/g	Zn by ICP-MS & aqua regia digest	ME-CA-[ENV]SPE-LAK-AN-005

Catharine Arnold, B.Sc., C.Chem

Project Specialist,



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

Trace Metals - Aqua Regia Digest, ICP-MS

Project : PO#175569434

LR Report : CA19106-AUG23

Quality Control Report

				Inc	rganic Analys	is							
Parameter	Reporting	Unit	Method		Dupl	icate		LC	S / Spike Blan	k	Matrix Spik	e / Reference	Material
	Limit		Blank	Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery I	Limits (%)	Spike Recovery (%)	Recovery L	imits (%)
							%		Low	High		Low	High
Mercury by CVAAS - QCBatchID: EMS0147-AU	G23												
Mercury	0.05	ug/g	<0.05			ND	20	97	80	120	108	70	130
Metals in Soil - Aqua-regia/ICP-MS - QCBatchID													
Aluminum	3	μg/g	<3			1	20	101	70	130	NV	70	130
Antimony	6	μg/g	<0.8			6	20	96	70	130	NV	70	130
Arsenic	0.5	μg/g	<0.5			2	20	100	70	130	101	70	130
Barium	0.01	μg/g	<0.01			1	20	97	70	130	89	70	130
Beryllium	0.02	μg/g	<0.02			ND	20	93	70	130	NV	70	130
Bismuth	0.09	μg/g	<0.09			ND	20	101	70	130	NV	70	130
Boron	1	μg/g	<1			1	20	92	70	130	NV	70	130
Cadmium	0.02	μg/g	<0.02			ND	20	104	70	130	NV	70	130
Calcium	3	μg/g	<3			1	20	95	70	130	NV	70	130
Chromium	0.5	μg/g	<0.5			2	20	99	70	130	77	70	130
Cobalt	0.01	μg/g	<0.01			0	20	98	70	130	90	70	130
Copper	0.1	μg/g	<0.1			2	20	101	70	130	86	70	130
Iron	3	μg/g	9.6			1	20	98	70	130	98	70	130
Lead	0.05	μg/g	< 0.05			5	20	100	70	130	102	70	130
Lithium	2	μg/g	<2			ND	20	95	70	130	NV	70	130
Magnesium	3	μg/g	<3			2	20	101	70	130	NV	70	130
Manganese	0.1	μg/g	<0.1			1	20	103	70	130	113	70	130
Molybdenum	0.1	μg/g	<0.1			ND	20	97	70	130	NV	70	130
Nickel	0.1	μg/g	<0.1			1	20	103	70	130	90	70	130
Potassium	3	μg/g	<3			9	20	96	70	130	NV	70	130
Selenium	0.1	μg/g	<0.1			ND	20	106	70	130	NV	70	130
Silver	0.5	μg/g	<0.01			ND	20	101	70	130	123	70	130
Strontium	0.02	μg/g	<0.02			4	20	98	70	130	NV	70	130
Thallium	0.02	μg/g	<0.02			ND	20	NV	70	130	NV	70	130
Tin	2	μg/g	<2			ND	20	102	70	130	NV	70	130
Titanium	0.1	μg/g	<0.1			ND	20	95	70	130	NV	70	130
Uranium	0.002	μg/g	<0.002			1	20	95	70	130	NV	70	130
Vanadium	1	μg/g	<1			ND	20	99	70	130	93	70	130
Yttrium	0.004	μg/g	<0.004			3	20	98	70	130	NV	70	130
Zinc	0.7	μg/g	<0.7			4	20	104	70	130	86	70	130

Analytical Report Laboratory Job ID: CA19110-AUG23

July 2023

SGS



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

Stantec Consulting Services Inc.

Attn: Edgar Smith

10745 Westside Way, Suite 250 Alpharetta, GA 30009, USA

Phone: 770-656-2676

Fax:

Tessier Leach Fraction 1 - Water Soluble

Project: PO#175569434

20-September-2023

Date Rec.: 10 August 2023 LR Report: CA19110-AUG23

Reference: Plant Arkwright AP-2/175569434 -

PO#175569434

Copy: #1

CERTIFICATE OF ANALYSIS Final Report

Analysis	1: Analysis Start Anal Date		3: Analysis ompleted DateCo	4: Analysis mpleted Time	5: SB-10-20-25	6: SB-10-25-30	7: SB-10-30-35	8: SB-10-35-40	9: SB-11-25-30	10: SB-11-30-35
Sample Date & Time					07/27/2023 17:25	07/27/2023 17:30	07/27/2023 17:35	07/27/2023 17:40	07/28/2023 10:15	07/28/2023 10:20
Ag [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Al [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	120	120	130	150	190	190
As [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	1.5	1.2	1.7	1.9	2.3	1.9
Be [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
B [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 1	< 1	< 1	< 1	< 1	< 1
Bi [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	81	42	27	28	65	48
Cd [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	0.07	0.07	0.06	0.08	0.14	0.13
Cr [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	0.2	< 0.1	< 0.1	< 0.1	0.3	0.7
Fe [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	180	150	190	180	280	300
K [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	39	29	23	29	44	44
Li [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 2	< 2	< 2	< 2	< 2	< 2
Mg [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	44	36	41	44	83	79
Mn [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	3.7	3.4	10	11	8.2	6.3
Mo [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1



Project: PO#175569434

LR Report : CA19110-AUG23

SGS Canada Inc. P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

Analysis	1: Analysis Start Ana	2:	3: Analysis	4:	5: SB-10-20-25	6: SB-10-25-30	7: SB-10-30-35	8: SB-10-35-40	9: SB-11-25-30	10: SB-11-30-35
	Date		empleted DateCor	Analysis mpleted Time	3B-10-20-23	3B-10-23-30	36-10-30-33	3D-10-33-40	3D-11-23-30	36-11-30-33
Na [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	91	98	92	110	49	44
Ni [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
P [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	4	3	4	< 3	3	< 3
Pb [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Si [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	270	270	350	350	410	400
Sb [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sr [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	0.3	0.3	0.2	0.2	0.4	0.3
Sn [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ti [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	7.0	5.9	9.7	8.6	20	18
TI [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	0.014	0.010	0.015	0.006	0.004	0.013
V [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 3	< 3	< 3	< 3	< 3	< 3
Υ [μg/g]	19-Sep-23	17:23	20-Sep-23	14:32	0.70	0.65	0.73	0.48	0.10	0.11
Zn [µg/g]	19-Sep-23	17:23	20-Sep-23	14:32	< 0.7	< 0.7	0.7	0.8	< 0.7	< 0.7

Analysis	11: SB-11-35-40	12: SB-12-20-25	13: SB-12-25-30
	35-11-33-40	36-12-20-23	36-12-23-30
Sample Date & Time	07/28/2023 10:25	07/27/2023 13:05	07/27/2023 13:10
Ag [μg/g]	< 0.05	< 0.05	< 0.05
Al [μg/g]	240	120	180
As [μg/g]	< 0.5	< 0.5	< 0.5
Ba [µg/g]	2.4	3.8	3.5
Be [µg/g]	< 0.02	< 0.02	< 0.02
B [μg/g]	< 1	< 1	< 1
Bi [μg/g]	< 0.09	< 0.09	< 0.09
Ca [µg/g]	72	49	48
Cd [µg/g]	< 0.05	< 0.05	< 0.05
Co [µg/g]	0.18	0.10	0.16
Cr [µg/g]	< 0.5	< 0.5	< 0.5
Cu [µg/g]	0.6	< 0.1	< 0.1
Fe [µg/g]	430	120	160
K [μg/g]	68	43	63
Li [µg/g]	< 2	< 2	< 2



Project: PO#175569434

LR Report : CA19110-AUG23

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Analysis	11:	12:	13:
	SB-11-35-40	SB-12-20-25	SB-12-25-30
Mg [μg/g]	110	50	75
Mn [μg/g]	10	3.5	3.6
Mo [μg/g]	< 0.1	0.2	0.2
Na [µg/g]	55	24	34
Ni [μg/g]	< 0.5	< 0.5	< 0.5
P [μg/g]	3	< 3	< 3
Pb [µg/g]	< 0.1	< 0.1	< 0.1
Si [µg/g]	520	220	310
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.1	< 0.1	< 0.1
Sr [µg/g]	0.6	0.9	0.8
Sn [µg/g]	< 0.5	< 0.5	< 0.5
Ti [μg/g]	25	8.7	11
TI [μg/g]	< 0.02	< 0.02	< 0.02
U [μg/g]	0.006	0.007	< 0.002
V [μg/g]	< 3	< 3	< 3
Υ [μg/g]	0.059	0.048	0.030
Zn [µg/g]	1.1	< 0.7	< 0.7

Water Soluble Fraction

Catharine aurold Catharine Arnold, B.Sc., C.Chem Project Specialist,

Analytical Report Laboratory Job ID: CA19111-AUG23

July 2023

SGS



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

Stantec Consulting Services Inc.

Attn: Edgar Smith

10745 Westside Way, Suite 250 Alpharetta, GA 30009, USA

Phone: 770-656-2676

Fax:

Tessier Leach Fraction 2 - Exchangeable Metals

Project: PO#175569434

20-September-2023

Date Rec.: 10 August 2023 **CA19111-AUG23**

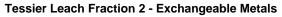
Reference: Plant Arkwright AP-2/175569434 -

PO#175569434

Copy: #1

CERTIFICATE OF ANALYSIS Final Report

Analysis	1:	2:	3:	4:	5:	6:	7:	8:	9:	10:
	Analysis Start Anal				SB-10-20-25	SB-10-25-30	SB-10-30-35	SB-10-35-40	SB-11-25-30	SB-11-30-35
	Date	TilleCC	ompleted DateCompleted Time							
Sample Date & Time					07/27/2023 17:25	07/27/2023 17:30	07/27/2023 17:35	07/27/2023 17:40	07/28/2023 10:15	07/28/2023 10:20
Ag [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Al [μg/g]	19-Sep-23	17:23	20-Sep-23	14:34	26	40	13	20	9	32
As [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	5.1	3.2	4.4	3.2	22	19
Be [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
B [μg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 1	< 1	< 1	< 1	< 1	< 1
Bi [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	470	390	760	500	1400	1500
Cd [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	0.04	0.03	0.01	0.04	0.05	0.05
Cr [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	2.9	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	0.5	< 0.1	< 0.1	< 0.1	< 0.1	0.3
Fe [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	280	42	12	19	10	39
K [μg/g]	19-Sep-23	17:23	20-Sep-23	14:34	47	32	37	39	67	110
Li [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 2	< 2	< 2	< 2	< 2	< 2
Mg [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
Mn [μg/g]	19-Sep-23	17:23	20-Sep-23	14:34	7.5	4.4	8.4	10	11	12
Mo [μg/g]	19-Sep-23	17:23	20-Sep-23	14:34	0.6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1



Project: PO#175569434

LR Report : CA19111-AUG23

SGS Canada Inc. P.O. Box 4300 - 185 Concession St.

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

Analysis	1:	2:	3:	4:	5:	6:	7:	8:	9:	10:
	Analysis Start Ana Date		Analysis empleted DateCor	Analysis npleted Time	SB-10-20-25	SB-10-25-30	SB-10-30-35	SB-10-35-40	SB-11-25-30	SB-11-30-35
Na [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	9.6	21	51	64	24	17
Ni [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Pb [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
P [μg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 3	4	< 3	< 3	< 3	3
Sb [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sn [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
TI [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	0.002	0.003	< 0.002	< 0.002	< 0.002	0.002
V [μg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 3	< 3	< 3	< 3	< 3	< 3
W [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Υ [μg/g]	19-Sep-23	17:23	20-Sep-23	14:34	0.068	0.18	0.100	0.090	0.009	0.026
Zn [µg/g]	19-Sep-23	17:23	20-Sep-23	14:34	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7

Analysis	11: SB-11-35-40	12: SB-12-20-25	13: SB-12-25-30
Sample Date & Time	07/28/2023 10:25	07/27/2023 13:05	07/27/2023 13:10
Ag [μg/g]	< 0.05	< 0.05	< 0.05
Al [μg/g]	11	32	45
As [μg/g]	< 0.5	< 0.5	< 0.5
Ba [µg/g]	10	31	24
Be [µg/g]	< 0.02	< 0.02	< 0.02
B [μg/g]	< 1	< 1	< 1
Bi [μg/g]	< 0.09	< 0.09	< 0.09
Ca [µg/g]	1300	940	1100
Cd [µg/g]	< 0.05	< 0.05	< 0.05
Co [µg/g]	0.04	0.04	0.06
Cr [µg/g]	< 0.5	< 0.5	< 0.5
Cu [µg/g]	0.1	< 0.1	< 0.1
Fe [µg/g]	14	26	45
K [μg/g]	70	76	78
Li [µg/g]	< 2	< 2	< 2
Mg [µg/g]	< 5000	< 5000	< 5000
Mn [µg/g]	22	4.6	4.9



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Tessier Leach Fraction 2 - Exchangeable Metals

Project: PO#175569434

LR Report : CA19111-AUG23

Analysis	11: SB-11-35-40	12: SB-12-20-25	13: SB-12-25-30
Mo [μg/g]	< 0.1	< 0.1	0.1
Na [μg/g]	19	3.1	5.5
Ni [µg/g]	< 0.5	< 0.5	< 0.5
Pb [µg/g]	< 0.1	< 0.1	< 0.1
P [μg/g]	4	3	3
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.1	< 0.1	< 0.1
Sn [µg/g]	< 0.5	< 0.5	< 0.5
TI [μg/g]	< 0.02	< 0.02	< 0.02
U [μg/g]	< 0.002	< 0.002	< 0.002
V [µg/g]	< 3	< 3	< 3
W [μg/g]	< 0.04	< 0.04	< 0.04
Υ [μg/g]	< 0.004	0.015	0.008
Zn [µg/g]	< 0.7	< 0.7	< 0.7

Fraction 2 Exchangeable Metals

Catharine Arnold, B.Sc., C.Chem Project Specialist,

Analytical Report Laboratory Job ID: CA19112-AUG23

July 2023

SGS



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

Stantec Consulting Services Inc.

Attn: Edgar Smith

10745 Westside Way, Suite 250 Alpharetta, GA 30009, USA

Phone: 770-656-2676

Fax:

Tessier Leach Fraction 3 - Metals Bound to Carbonates

Project : PO#175569434

20-September-2023

Date Rec.: 10 August 2023 LR Report: CA19112-AUG23

Reference: Plant Arkwright AP-2/175569434 -

PO#175569434

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CERTIFICATE OF ANALYSIS Final Report

Analysis	1: Analysis Start Anal Date		3: Analysis ompleted DateCo	4: Analysis mpleted Time	5: SB-10-20-25	6: SB-10-25-30	7: SB-10-30-35	8: SB-10-35-40	9: SB-11-25-30	10: SB-11-30-35
Sample Date & Time					07/27/2023 17:25	07/27/2023 17:30	07/27/2023 17:35	07/27/2023 17:40	07/28/2023 10:15	07/28/2023 10:20
Ag [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Al [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	76	61	66	79	67	110
As [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	10	6.4	9.4	11	26	26
Be [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
B [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 1	< 1	< 1	< 1	< 1	< 1
Bi [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	82	60	75	80	130	160
Cd [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	0.48	0.39	0.14	0.60	0.41	0.59
Cr [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	6.4	3.5	1.3	0.8	< 0.5	0.7
Cu [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	0.3	0.2	0.1	0.2	0.8	1.8
Fe [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	240	120	71	110	48	160
K [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	100	55	68	110	110	220
Li [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 2	< 2	< 2	< 2	< 2	< 2
Mg [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	1600	1500	2100	1500	3000	3100
Mn [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	21	18	48	68	25	35
Mo [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

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Project : PO#175569434 LR Report : CA19112-AUG23

Analysis	1:	2:	3:	4:	5:	6:	7:	8:	9:	10:
	Analysis Start Ana Date		Analysis empleted DateCor	Analysis npleted Time	SB-10-20-25	SB-10-25-30	SB-10-30-35	SB-10-35-40	SB-11-25-30	SB-11-30-35
Na [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 1	3800	710	3400	390	3300
Ni [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Pb [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
P [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	4	5	5	4	5	5
Sb [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sn [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
TI [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	0.036	0.019	0.033	0.013	0.012	0.056
V [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 3	< 3	< 3	< 3	< 3	< 3
W [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Υ [μg/g]	19-Sep-23	17:23	20-Sep-23	14:35	1.1	0.74	1.5	1.1	0.45	0.47
Zn [µg/g]	19-Sep-23	17:23	20-Sep-23	14:35	0.8	< 0.7	0.7	0.9	< 0.7	0.7

Analysis	11: SB-11-35-40	12: SB-12-20-25	13: SB-12-25-30
	36-11-33-40	36-12-20-23	36-12-23-30
Sample Date & Time	07/28/2023 10:25	07/27/2023 13:05	07/27/2023 13:10
Ag [μg/g]	< 0.05	< 0.05	< 0.05
Al [μg/g]	110	90	94
As [μg/g]	< 0.5	< 0.5	< 0.5
Ba [µg/g]	20	40	29
Be [µg/g]	< 0.02	< 0.02	< 0.02
B [μg/g]	< 1	< 1	2
Bi [μg/g]	< 0.09	< 0.09	< 0.09
Ca [µg/g]	200	230	170
Cd [µg/g]	< 0.05	< 0.05	< 0.05
Co [µg/g]	0.36	0.50	0.48
Cr [µg/g]	< 0.5	0.9	0.6
Cu [µg/g]	1.2	< 0.1	< 0.1
Fe [µg/g]	88	83	69
K [μg/g]	99	140	90
Li [μg/g]	< 2	< 2	< 2
Mg [µg/g]	3900	2400	2200
Mn [µg/g]	57	28	24



Project : PO#175569434 LR Report : CA19112-AUG23

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SGS Canada Inc

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

Analysis	11: SB-11-35-40	12: SB-12-20-25	13: SB-12-25-30
Mo [μg/g]	< 0.1	< 0.1	< 0.1
Na [µg/g]	520	3200	1700
Ni [μg/g]	< 0.5	< 0.5	< 0.5
Pb [μg/g]	< 0.1	< 0.1	< 0.1
P [μg/g]	5	4	5
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.1	< 0.1	< 0.1
Sn [µg/g]	< 0.5	< 0.5	< 0.5
TI [μg/g]	< 0.02	< 0.02	< 0.02
U [μg/g]	0.018	0.029	0.008
V [μg/g]	< 3	< 3	< 3
W [µg/g]	< 0.04	< 0.04	< 0.04
Υ [μg/g]	0.20	0.27	0.19
Zn [µg/g]	< 0.7	< 0.7	< 0.7

Fraction 3 Metals Bound to Carbonates

Catharine Arnold (Catharine ARNOLD & CHEMIST)

Project Specialist,

Analytical Report Laboratory Job ID: CA19113-AUG23

July 2023

SGS



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

Stantec Consulting Services Inc.

Attn: Edgar Smith

10745 Westside Way, Suite 250 Alpharetta, GA 30009, USA

Phone: 770-656-2676

Fax:

Tessier Leach Fraction 4- Metals Bound to Fe and Mn

Oxides Project: PO#175569434

20-September-2023

Date Rec.: 10 August 2023 LR Report: CA19113-AUG23

Reference: Plant Arkwright AP-2/175569434 -

PO#175569434

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CERTIFICATE OF ANALYSIS Final Report

Analysis	3: Analysis Completed DateCor	4: Analysis npleted Time	5: SB-10-20-25	6: SB-10-25-30	7: SB-10-30-35	8: SB-10-35-40	9: SB-11-25-30	10: SB-11-30-35	11: SB-11-35-40
Sample Date & Time			07/27/2023 17:25	07/27/2023 17:30	07/27/2023 17:35	07/27/2023 17:40	07/28/2023 10:15	07/28/2023 10:20	07/28/2023 10:25
Ag [μg/g]	20-Sep-23	14:36	< 0.01	< 0.01	< 0.01	< 0.01	0.08	0.08	0.10
Al [μg/g]	20-Sep-23	14:36	290	290	270	520	450	490	560
As [μg/g]	20-Sep-23	14:36	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	20-Sep-23	14:36	4.7	3.9	16	23	17	12	15
Be [µg/g]	20-Sep-23	14:36	0.07	0.05	0.08	0.07	0.05	0.05	0.07
B [μg/g]	20-Sep-23	14:36	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bi [μg/g]	20-Sep-23	14:36	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	20-Sep-23	14:36	61	55	70	100	340	220	330
Cd [µg/g]	20-Sep-23	14:36	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	20-Sep-23	14:36	0.58	0.51	1.1	1.4	1.9	1.4	2.2
Cr [µg/g]	20-Sep-23	14:36	19	9.4	10	10	3.5	12	3.6
Cu [µg/g]	20-Sep-23	14:36	1.2	0.5	0.5	0.9	2.9	4.5	4.0
Fe [µg/g]	20-Sep-23	14:36	1200	920	1100	1600	1200	1900	1600
K [μg/g]	20-Sep-23	14:36	44	45	40	75	96	140	98
Li [μg/g]	20-Sep-23	14:36	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Mg [µg/g]	20-Sep-23	14:36	170	150	250	260	480	520	570
Mn [µg/g]	20-Sep-23	14:36	27	20	250	280	100	64	180
Mo [μg/g]	20-Sep-23	14:36	0.3	0.1	< 0.1	0.3	< 0.1	0.2	< 0.1



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Tessier Leach Fraction 4- Metals Bound to Fe and Mn

Oxides PO#175569434

LR Report: CA19113-AUG23

Analysis	3:	4:	5:	6:	7:	8:	9:	10:	11: SB-11-35-40
	Analysis Completed DateCon	Analysis npleted Time	SB-10-20-25	SB-10-25-30	SB-10-30-35	SB-10-35-40	SB-11-25-30	SB-11-30-35	36-11-33-40
Na [μg/g]	20-Sep-23	14:36	2800	1600	1900	1800	3100	3700	3100
Ni [μg/g]	20-Sep-23	14:36	1.1	0.5	1.1	1.3	0.7	1.1	1.0
Pb [µg/g]	20-Sep-23	14:36	0.2	0.1	0.1	0.1	0.2	0.3	0.3
P [µg/g]	20-Sep-23	14:36	6	6	6	6	27	15	29
Sb [µg/g]	20-Sep-23	14:36	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	20-Sep-23	14:36	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sn [µg/g]	20-Sep-23	14:36	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
TI [μg/g]	20-Sep-23	14:36	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [μg/g]	20-Sep-23	14:36	0.050	0.037	0.087	0.039	0.036	0.11	0.040
V [µg/g]	20-Sep-23	14:36	< 3	< 3	< 3	< 3	5	5	6
W [µg/g]	20-Sep-23	14:36	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Υ [μg/g]	20-Sep-23	14:36	0.88	0.73	1.0	1.7	0.30	0.34	0.20
Zn [µg/g]	20-Sep-23	14:36	1.8	1.7	4.0	4.9	2.9	3.8	4.6

Analysis	12: SB-12-20-25	13 SB-12-25-30	
	02 .2 20 20	52 .2 20 00	
Sample Date & Time	07/27/2023 13:05	07/27/2023 13:10	
Ag [μg/g]	0.09	0.10	
Al [μg/g]	310	400	
As [μg/g]	< 0.5	< 0.5	
Ba [µg/g]	18	19	
Be [µg/g]	0.03	0.04	
B [μg/g]	< 1	1	
Bi [μg/g]	< 0.09	< 0.09	
Ca [µg/g]	220	200	
Cd [µg/g]	< 0.05	< 0.05	
Co [µg/g]	1.4	2.3	
Cr [µg/g]	13	4.9	
Cu [µg/g]	0.2	0.3	
Fe [µg/g]	1000	740	
K [μg/g]	130	160	
Li [μg/g]	< 2	< 2	
Mg [µg/g]	330	410	
Mn [µg/g]	84	110	



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Tessier Leach Fraction 4- Metals Bound to Fe and Mn

Project: PO#175569434

LR Report : CA19113-AUG23

Analysis	12: SB-12-20-25	13: SB-12-25-30
Mo [μg/g]	0.3	0.1
Na [µg/g]	2700	3000
Ni [μg/g]	1.4	1.5
Pb [µg/g]	0.2	0.4
P [μg/g]	37	29
Sb [µg/g]	< 0.8	< 0.8
Se [µg/g]	< 0.1	< 0.1
Sn [µg/g]	< 0.5	< 0.5
TI [μg/g]	< 0.02	< 0.02
U [μg/g]	0.055	0.016
V [µg/g]	5	4
W [μg/g]	< 0.04	< 0.04
Υ [μg/g]	0.20	0.18
Zn [µg/g]	1.8	2.1

Fraction 4 Metals Bound to Fe and Mn Oxides

Catharine Arnold, B.Sc., C.Chem

Project Specialist,

Analytical Report Laboratory Job ID: CA19114-AUG23

July 2023

SGS



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

Stantec Consulting Services Inc.

Attn: Edgar Smith

10745 Westside Way, Suite 250 Alpharetta, GA 30009, USA

Phone: 770-656-2676

Fax:

Tessier Leach Fraction 5 - Bound to Organic Material

Project: PO#175569434

20-September-2023

Date Rec.: 10 August 2023 **CA19114-AUG23**

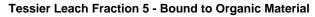
Reference: Plant Arkwright AP-2/175569434 -

PO#175569434

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CERTIFICATE OF ANALYSIS Final Report

Analysis	3: Analysis Completed DateCo	4: Analysis npleted Time	5: SB-10-20-25	6: SB-10-25-30	7: SB-10-30-35	8: SB-10-35-40	9: SB-11-25-30	10: SB-11-30-35	11: SB-11-35-40
Sample Date & Time			07/27/2023 17:25	07/27/2023 17:30	07/27/2023 17:35	07/27/2023 17:40	07/28/2023 10:15	07/28/2023 10:20	07/28/2023 10:25
Ag [μg/g]	20-Sep-23	14:37	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Al [μg/g]	20-Sep-23	14:37	420	360	530	440	980	1200	1100
As [µg/g]	20-Sep-23	14:37	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	20-Sep-23	14:37	3.5	3.1	10	7.0	15	12	17
Be [µg/g]	20-Sep-23	14:37	0.03	0.02	0.04	0.02	0.02	0.02	0.04
B [μg/g]	20-Sep-23	14:37	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bi [µg/g]	20-Sep-23	14:37	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	20-Sep-23	14:37	79	51	86	110	1000	660	1600
Cd [µg/g]	20-Sep-23	14:37	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	20-Sep-23	14:37	0.21	0.12	0.28	0.15	0.84	1.2	1.7
Cr [µg/g]	20-Sep-23	14:37	4.3	2.5	2.1	1.1	0.9	1.8	0.8
Cu [µg/g]	20-Sep-23	14:37	1.0	< 0.1	< 0.1	0.3	0.3	9.7	8.2
Fe [µg/g]	20-Sep-23	14:37	87	64	87	84	160	340	170
K [μg/g]	20-Sep-23	14:37	49	52	69	98	130	130	140
Li [μg/g]	20-Sep-23	14:37	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Mg [µg/g]	20-Sep-23	14:37	60	50	100	76	230	340	250
Mn [μg/g]	20-Sep-23	14:37	7.1	5.2	53	19	40	36	66
Mo [μg/g]	20-Sep-23	14:37	1.8	0.6	0.5	0.8	0.2	< 0.1	< 0.1



Project: PO#175569434

LR Report: CA19114-AUG23

SGS Canada Inc.

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Analysis	3:	4:	5:	6:	7:	8:	9:	10:	11:
Analysis Completed DateComp		Analysis mpleted Time	SB-10-20-25	SB-10-25-30	SB-10-30-35	SB-10-35-40	SB-11-25-30	SB-11-30-35	SB-11-35-40
Na [µg/g]	20-Sep-23	14:37	90	76	95	87	99	170	200
Ni [µg/g]	20-Sep-23	14:37	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.8	0.6
Pb [μg/g]	20-Sep-23	14:37	0.2	< 0.1	0.1	< 0.1	0.2	0.3	0.4
P [μg/g]	20-Sep-23	14:37	7	4	5	9	210	110	470
Sb [µg/g]	20-Sep-23	14:37	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	20-Sep-23	14:37	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.3	< 0.1
Sn [µg/g]	20-Sep-23	14:37	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
TI [μg/g]	20-Sep-23	14:37	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [μg/g]	20-Sep-23	14:37	0.052	0.043	0.11	0.038	0.039	0.085	0.039
V [µg/g]	20-Sep-23	14:37	< 3	< 3	< 3	< 3	5	< 3	4
W [µg/g]	20-Sep-23	14:37	0.89	1.6	0.43	7.7	0.30	< 0.04	< 0.04
Y [μg/g]	20-Sep-23	14:37	1.9	1.7	3.8	2.6	1.8	1.2	1.2
Zn [µg/g]	20-Sep-23	14:37	1.3	0.9	2.2	1.8	1.9	4.0	2.9

Analysis	12: SB-12-20-25	13 SB-12-25-30	
	3B-12-20-23	3D-12-23-30	
Sample Date & Time	07/27/2023 13:05	07/27/2023 13:10	
Ag [μg/g]	< 0.05	< 0.05	
Al [μg/g]	680	880	
As [μg/g]	< 0.5	< 0.5	
Ba [µg/g]	69	34	
Be [µg/g]	< 0.02	0.02	
B [μg/g]	< 1	1	
Bi [µg/g]	< 0.09	< 0.09	
Ca [µg/g]	1000	590	
Cd [µg/g]	< 0.05	< 0.05	
Co [µg/g]	0.57	0.92	
Cr [µg/g]	1.1	0.9	
Cu [µg/g]	< 0.1	< 0.1	
Fe [µg/g]	200	190	
K [μg/g]	270	220	
Li [µg/g]	< 2	< 2	
Mg [µg/g]	230	240	
Mn [μg/g]	27	35	



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

Tessier Leach Fraction 5 - Bound to Organic Material

Project : PO#175569434 LR Report : CA19114-AUG23

Analysis	12: SB-12-20-25	13: SB-12-25-30
Mo [μg/g]	0.8	0.5
Na [µg/g]	110	100
Ni [μg/g]	0.7	0.8
Pb [µg/g]	0.3	0.4
P [μg/g]	340	150
Sb [µg/g]	< 0.8	< 0.8
Se [µg/g]	< 0.1	< 0.1
Sn [µg/g]	< 0.5	< 0.5
TI [μg/g]	< 0.02	< 0.02
U [μg/g]	0.034	0.014
V [μg/g]	3	< 3
W [µg/g]	0.20	0.47
Υ [μg/g]	2.0	1.1
Zn [µg/g]	2.1	1.8

Fraction 5 Bound to Organic Material

Catharine Arnold, B.Sc., C.Chem Project Specialist,

Analytical Report Laboratory Job ID: CA19115-AUG23

July 2023

SGS



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

Stantec Consulting Services Inc.

Attn: Edgar Smith

10745 Westside Way, Suite 250 Alpharetta, GA 30009, USA

Phone: 770-656-2676

Fax:

Tessier Leach Fraction 6 - Residual metals

Project: PO#175569434

20-September-2023

Date Rec.: 10 August 2023 **CA19115-AUG23**

Reference: Plant Arkwright AP-2/175569434 -

PO#175569434

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CERTIFICATE OF ANALYSIS Final Report

Analysis	3: Analysis	4: Analysis	5: SB-10-20-25	6: SB-10-25-30	7: SB-10-30-35	8: SB-10-35-40	9: SB-11-25-30	10: SB-11-30-35	11: SB-11-35-40
	Completed DateCor	npietea i ime							
Sample Date & Time			07/27/2023 17:25	07/27/2023 17:30	07/27/2023 17:35	07/27/2023 17:40	07/28/2023 10:15	07/28/2023 10:20	07/28/2023 10:25
Ag [μg/g]	20-Sep-23	14:38	< 0.05	< 0.05	< 0.05	< 0.05	0.07	0.07	0.07
Al [μg/g]	20-Sep-23	14:38	13000	12000	16000	15000	24000	24000	25000
As [μg/g]	20-Sep-23	14:38	1.3	1.0	1.6	1.0	< 0.5	< 0.5	0.6
Ba [µg/g]	20-Sep-23	14:38	87	92	110	120	89	91	130
Be [µg/g]	20-Sep-23	14:38	0.40	0.42	0.74	0.56	0.35	0.36	0.56
B [μg/g]	20-Sep-23	14:38	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bi [μg/g]	20-Sep-23	14:38	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	20-Sep-23	14:38	1100	930	1000	1200	6300	3500	5400
Cd [µg/g]	20-Sep-23	14:38	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	20-Sep-23	14:38	1.9	1.4	2.0	2.0	8.2	8.0	8.1
Cr [µg/g]	20-Sep-23	14:38	15	11	10	9.9	30	30	16
Cu [µg/g]	20-Sep-23	14:38	9.9	2.4	2.7	3.8	15	20	23
Fe [µg/g]	20-Sep-23	14:38	20000	16000	18000	19000	27000	24000	29000
K [μg/g]	20-Sep-23	14:38	1900	1800	2700	3000	4200	3300	6200
Li [µg/g]	20-Sep-23	14:38	5	4	9	8	12	12	12
Mg [µg/g]	20-Sep-23	14:38	1700	1500	3000	2900	8800	7700	6800
Mn [µg/g]	20-Sep-23	14:38	140	120	170	170	480	330	260
Mo [μg/g]	20-Sep-23	14:38	1.1	0.4	0.5	0.7	0.2	1.4	0.4



Project: PO#175569434

LR Report: CA19115-AUG23

SGS Canada Inc.

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

Analysis	3:	4:	5:	6:	7:	8:	9:	10:	11:
	Analysis Completed DateCor	Analysis npleted Time	SB-10-20-25	SB-10-25-30	SB-10-30-35	SB-10-35-40	SB-11-25-30	SB-11-30-35	SB-11-35-40
Na [μg/g]	20-Sep-23	14:38	3400	3700	4700	5500	2800	2900	3300
Ni [μg/g]	20-Sep-23	14:38	3.8	3.1	3.8	3.8	14	10	9.0
Pb [μg/g]	20-Sep-23	14:38	1.3	0.8	1.0	0.6	2.0	2.9	3.3
P [μg/g]	20-Sep-23	14:38	150	100	160	110	430	330	1100
Sb [µg/g]	20-Sep-23	14:38	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	20-Sep-23	14:38	0.3	0.2	0.4	0.3	0.2	0.2	0.1
Sn [µg/g]	20-Sep-23	14:38	4.7	3.0	5.3	5.7	1.0	1.1	1.0
TI [μg/g]	20-Sep-23	14:38	0.05	0.03	0.04	0.04	0.16	0.16	0.20
U [μg/g]	20-Sep-23	14:38	0.56	0.41	0.96	0.37	0.39	1.2	0.49
V [μg/g]	20-Sep-23	14:38	14	11	20	15	63	62	65
W [µg/g]	20-Sep-23	14:38	1.4	0.54	0.98	7.5	0.26	1.2	0.44
Υ [μg/g]	20-Sep-23	14:38	20	15	44	22	7.4	6.5	4.6
Zn [µg/g]	20-Sep-23	14:38	25	20	49	42	56	52	65

Analysis	12: SB-12-20-25	13: SB-12-25-30
	36-12-20-23	36-12-23-30
	07/07/0000 40 07	07/07/0000 40 40
Sample Date & Time	07/27/2023 13:05	07/27/2023 13:10
Ag [μg/g]	< 0.05	< 0.05
Al [μg/g]	36000	36000
As [μg/g]	< 0.5	< 0.5
Ba [µg/g]	500	250
Be [µg/g]	0.43	0.45
B [μg/g]	< 1	2
Bi [μg/g]	< 0.09	< 0.09
Ca [µg/g]	5300	4600
Cd [µg/g]	< 0.05	< 0.05
Co [µg/g]	16	15
Cr [µg/g]	63	49
Cu [µg/g]	0.3	1.0
Fe [µg/g]	29000	31000
K [μg/g]	12000	9300
Li [μg/g]	21	18
Mg [µg/g]	14000	10000
Mn [μg/g]	350	260



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

Tessier Leach Fraction 6 - Residual metals

Project: PO#175569434 LR Report: CA19115-AUG23

Analysis	12: SB-12-20-25	13: SB-12-25-30
 Μο [μg/g]	0.6	0.4
Na [µg/g]	3500	4000
Ni [μg/g]	42	31
Pb [µg/g]	3.1	3.6
P [μg/g]	710	430
Sb [µg/g]	< 0.8	< 0.8
Se [µg/g]	< 0.1	< 0.1
Sn [µg/g]	1.5	1.3
TI [μg/g]	0.43	0.33
U [μg/g]	0.61	0.22
V [µg/g]	74	68
W [µg/g]	0.86	0.55
Υ [μg/g]	5.4	2.6
Zn [µg/g]	69	61

Fraction 6 Residual metals

Catharine Arnold, B.Sc., C.Chem Project Specialist,



ANALYSIS REPORT BBM23-32044

F400101 SGS CANADA INC LISA THOMPSON 185 Concession Street Lakefield K0L 2H0 ON

CANADA

Order Number Submission Number	PO# CA19107-AUG23 / 9 SOIL	Date Received Date Analysed	13-Sep-2023 21-Sep-2023 - 04-Oct-2023
Number of Samples	9	Date Completed	06-Oct-2023
		SGS Order Number	BBM23-32044

Methods Summary						
Number of Sample	Method Code	<u>Description</u>				
9	G_WGH_KG	Weight of samples received				
9	G_PHY01V	Loss on ignition (LOI), Furnace, variable wt, variable temp				
9	GO_XRF72	Borate Fusion, XRF, Ore Grade				

Comments

Preparation of samples was performed at the SGS Lakefield

Analysis of samples was performed at the SGS Burnaby site.

Authorised Signatory

John Chiang

Laboratory Operations Manager



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WARNING: The sample(s) to which the findings recorded herein (the "Findings") relate was(were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted. The findings report on the samples provided by the client and are not intended for commercial or contractual settlement purposes.

> - not analysed -- element not determined | I.S. insufficient sample | L.N.R. listed not received

11-Oct-2023 8:23PM BBM_U0048434429 Page 1 of 3 MIN-M_COA_ROW-Last Modified Date: 05-Nov-2019

SGS Canada Inc. NAMMnerals Geochemistry 3260 Production Way Burnaby BC. V5A 4W4 CANADA t +1 (604) 638 2349 f +1 (604) 444 5486

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Order Number Submission Number Number of Samples

PO# CA19107-AUG23 / 9 SOIL

ANALYSIS REPORT BBM23-32044

Element	WTKG	LOI	@Al2O3	@CaO	@Cr2O3	@Fe2O3
Method	G_WGH_KG	G_PHY01V	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	0.01	-10	0.01	0.01	0.01	0.01
Upper Limit		100	100	60	5	100
Unit	kg	%	%	%	%	%
SB-10-20-25	0.11	1.53954	9.86	1.12	0.02	4.61
SB-10-25-30	0.12	1.13000	10.99	1.10	0.01	3.73
SB-10-30-35	0.12	1.69949	14.73	1.27	<0.01	3.51
SB-10-35-40	0.12	1.11000	11.40	1.05	<0.01	3.91
SB-11-25-30	0.11	3.10907	14.67	4.77	<0.01	6.78
SB-11-30-35	0.12	3.26130	13.37	2.80	0.01	5.03
SB-11-35-40	0.19	3.41068	15.43	3.74	<0.01	5.64
SB-12-20-25	0.12	2.44049	15.62	3.63	0.02	7.01
SB-12-25-30	0.13	2.89971	16.24	3.15	<0.01	7.72
*Std OREAS 70b	-	6.64133	-	-	-	-
*Rep SB-10-35-40	-	1.04000	-	-	-	-
*Std OREAS 70b	-	-	7.17	4.28	0.18	7.99
*Rep SB-10-35-40	-	-	11.45	1.04	<0.01	3.84
*Blk BLANK	-	-	<0.01	<0.01	<0.01	<0.01
*Std OREAS 751	_	-	15.79	1.04	<0.01	2.39

Element	@K2O	@MgO	Mn3O4	@Na2O	@P2O5	@SiO2
Method	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	0.01	0.01	0.01	0.01	0.01	0.01
Upper Limit	70	100	100	60	55	100
Unit	%	%	%	%	%	%
SB-10-20-25	0.72	0.50	0.05	3.60	0.05	78.10
SB-10-25-30	0.77	0.40	0.04	4.43	0.05	77.66
SB-10-30-35	0.96	0.68	0.08	6.04	0.06	71.21
SB-10-35-40	1.00	0.67	0.09	4.68	0.04	75.95
SB-11-25-30	1.36	2.95	0.17	3.24	0.16	61.93
SB-11-30-35	1.78	1.88	0.09	2.96	0.11	68.07
SB-11-35-40	2.24	1.61	0.09	3.75	0.42	62.82
SB-12-20-25	1.86	2.64	0.13	2.78	0.29	62.84
SB-12-25-30	1.63	2.08	0.11	2.71	0.16	62.66

- not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

11-Oct-2023 8:23PM BBM_U0048434429 Page 2 of 3 MIN-M_COA_ROW-Last Modified Date: 05-Nov-2019

SGS Canada Inc. NAMMinerals Geochemistry 3260 Production Way Burnaby BC. V5A 4W4 CANADA **t** +1 (604) 638 2349 **f** +1 (604) 444 5486

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Order Number Submission Number **Number of Samples**

PO# CA19107-AUG23 / 9 SOIL

ANALYSIS REPORT BBM23-32044

Element	@K2O	@MgO	Mn3O4	@Na2O	@P2O5	@SiO2
Method	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	0.01	0.01	0.01	0.01	0.01	0.01
Upper Limit	70	100	100	60	55	100
Unit	%	%	%	%	%	%
*Std OREAS 70b	0.70	22.47	0.17	1.04	0.05	48.54
*Rep SB-10-35-40	1.01	0.68	0.10	4.68	0.04	76.57
*BIk BLANK	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
*Std OREAS 751	2.88	0.51	0.10	3.38	0.27	71.15

Element Method Lower Limit Upper Limit Unit	@TiO2 GO_XRF72 0.01 100 %	@V2O5 GO_XRF72 0.01 10 %	Sum GO_XRF72 0.01 100 %
SB-10-20-25	0.31	<0.01	99.00
SB-10-25-30	0.21	<0.01	99.45
SB-10-30-35	0.23	<0.01	98.82
SB-10-35-40	0.26	<0.01	99.11
SB-11-25-30	0.84	0.03	96.98
SB-11-30-35	0.69	0.02	97.01
SB-11-35-40	1.03	0.02	97.05
SB-12-20-25	0.93	0.02	97.87
SB-12-25-30	1.03	0.02	97.59
*Std OREAS 70b	0.30	<0.01	93.63
*Rep SB-10-35-40	0.25	<0.01	99.74
*BIk BLANK	<0.01	<0.01	0.02
*Std OREAS 751	0.24	<0.01	97.97

SGS Canada Minerals Burnaby conforms to the requirements of ISO/IEC17025 for specific tests as listed on their scope of accreditation found at https://www.scc.ca/en/search/laboratories/sgs Tests and Elements marked with an "@" symbol in the report denote ISO/IEC17025 accreditation.

- not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

11-Oct-2023 8:23PM BBM_U0048434429 Page 3 of 3 MIN-M_COA_ROW-Last Modified Date: 05-Nov-2019

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Analytical Report Grain Size Analysis

August 2023

Stantec Consulting Services Inc.



Specific Gravity of Soils

ASTM D 854

Project Name Plant Arkwright AP-2 Project Number 175569434

														Water	Flask &	Oven	Specific		
								Flask	Flask, Soil		Flask	Flask		Density	Water	Dry	Gravity		Specific
		Max.			Oven Dry		Flask	& Soil	& Water		Calibration	Calibration	Test	@ Test	Weight	Soil	@ Test	Temp.	Gravity
Lab	Assoc.	Particle		Test	Soil &	Flask	Weight	Weight	Weight	Temp.	Weight	Volume	Temp.	Temp.	@Test	Weight	Temp.	Coeff.,	@ 20 °C
ID	Test	Size	Method	Date	Tare (g)	ID	(g)	(g)	(g)	(°C)	(g)	(ml)	(°C)	(g/ml)	Temp. (g)	(g)	(g//ml)	K	(g//ml)
1	PSA	No. 10	Dry	08/17/2023		LX-56	88.29	117.44	355.5	20.7	88.3	249.41648	20.7	0.99806	337.22	29.15	2.68	0.99985	2.68
2	PSA	No. 10	Dry	08/17/2023		LX-59	90.28	119.37	357.45	20.7	90.3	249.52167	20.7	0.99806	339.32	29.09	2.65	0.99985	2.65
3	PSA	No. 10	Dry	08/17/2023		LX-62	88.87	117.85	355.81	20.7	88.88	249.4866	20.7	0.99806	337.87	28.98	2.62	0.99985	2.62
4	PSA	No. 10	Dry	08/17/2023		LX-57	89.1	118.71	356.67	20.7	89.11	249.44653	20.7	0.99806	338.06	29.61	2.69	0.99985	2.69
5	PSA	No. 10	Dry	08/17/2023		LX-52	92.23	121.43	359.9	20.4	92.26	249.3864	20.4	0.99812	341.15	29.2	2.79	0.99992	2.79
6	PSA	No. 10	Dry	08/17/2023		LX-55	88.91	118.05	356.41	20.4		249.37641	20.4	0.99812	337.82	29.14	2.76	0.99992	2.76
7	PSA	No. 10	Dry	08/17/2023		LX-49	113.39	137.29	377.8	20.4		249.75205	20.4	0.99812	362.67	23.9	2.72	0.99992	2.72
8	PSA	No. 10	Dry	08/16/2023		LX-53	93.35	123.07	361.38	20.7	93.38	249.79212	20.7	0.99806	342.66	29.72	2.70	0.99985	2.70
9	PSA	No. 10	Dry	08/16/2023		LX-1	94.27	122.85	361.69	20.7	94.3	249.78211	20.7	0.99806	343.57	28.58	2.73	0.99985	2.73

Comments	<u></u>		
	Reviewed By	K1	
	<u> </u>		



 Project Name
 Plant Arkwright AP-2
 Project Number
 175569434

 Source
 SB-10-20-25, 20.0'-25.0'
 Lab ID
 1

Sieve Analysis for the Portion Coarser than the No. 10 Sieve

Test Method ASTM D 422
Prepared Using ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By KB
Test Date 08-14-2023
Date Received 08-09-2023

Maximum Particle Size: 3/4" Sieve

	%
Sieve Size	Passing
3/4"	100.0
3/8"	97.9
No. 4	95.7
No. 10	88.0

Analysis for the Portion Finer than the No. 10 Sieve

Analysis Based on -3 inch Fraction Only

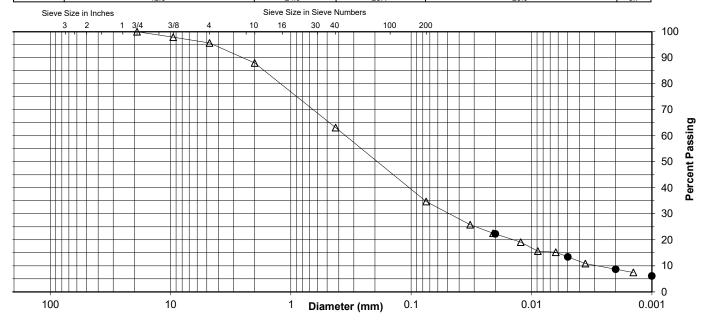
Specific Gravity 2.68

Dispersed Using Apparatus A - Mechanical, for 1 Minute

No. 40	63.1
No. 200	34.7
0.02 mm	22.3
0.005 mm	13.4
0.002 mm	8.7
0.001 mm	6.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay	/
ASTIVI	0.0	4.3	7.7	24.9	28.4	21.3	13.4	ļ.
AASHTO		Gravel		Coarse Sand	Fine Sand	Silt		Clav
AASHIU		12.0		24.9	28.4	26.0		8.7



Comments

Reviewed By

KHIS

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Project Name Plant Arkwright AP-2 Project Number _ 175569434 Lab ID SB-10-25-30, 25.0'-30.0' Source

Sieve Analysis for the Portion Coarser than the No. 10 Sieve

ASTM D 422 Test Method ASTM D 421 Prepared Using

Particle Shape: Angular Particle Hardness: Hard and Durable

Tested By KB
Test Date 08-14-2023 Date Received 08-09-2023

Maximum Particle Size: 3/4" Sieve

	%
Sieve Size	Passing
3/4"	100.0
3/8"	96.2
No. 4	90.1
No. 10	80.2

Analysis for the Portion Finer than the No. 10 Sieve

Analysis Based on -3 inch Fraction Only

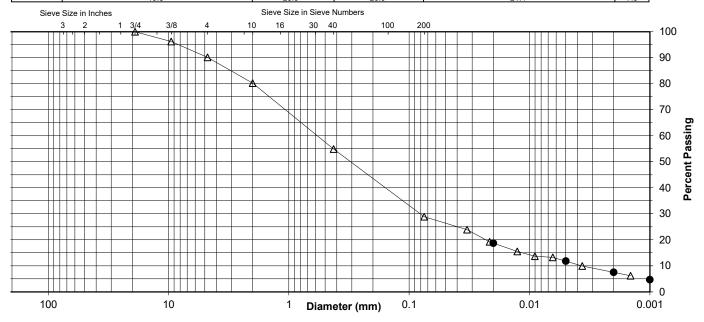
Specific Gravity _____2.65

Dispersed Using Apparatus A - Mechanical, for 1 Minute

No. 40	54.9
No. 200	28.9
0.02 mm	18.7
0.005 mm	11.8
0.002 mm	7.5
0.001 mm	4.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTIVI	0.0	9.9	9.9	25.3	26.0	17.1	11.8
AASHTO		Gravel		Coarse Sand	Fine Sand	Silt	Clav
AASHIU		19.8		25.3	26.0	21.4	7.5



Comments

Reviewed By

Template: tmp_sum_input.xlsm Version: 20170217 Approved By: RJ

Stantec Consulting Services Inc. Lexington, Kentucky

Reported By: RHB Report Date: 08/23/2023





 Project Name
 Plant Arkwright AP-2
 Project Number
 175569434

 Source
 SB-10-30-35, 30.0'-35.0'
 Lab ID
 3

Sieve Analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422	
Prepared Using	ASTM D 421	

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By KB
Test Date 08-14-2023
Date Received 08-09-2023

Maximum Particle Size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	98.1
No. 10	91.8

Analysis for the Portion Finer than the No. 10 Sieve

Analysis Based on -3 inch Fraction Only

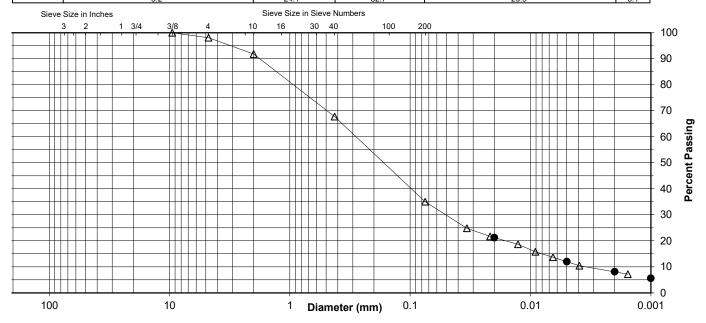
Specific Gravity ____2.62___

Dispersed Using Apparatus A - Mechanical, for 1 Minute

	No. 40	67.7
	No. 200	35.0
I	0.02 mm	21.2
I	0.005 mm	12.0
I	0.002 mm	8.1
ſ	0.001 mm	5.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay	1
ASTIVI	0.0	1.9	6.3	24.1	32.7	23.0	12.0	1
AAGUTO		Gravel		Coarse Sand	Fine Sand	Silt		Clav
AASHTO		8.2		24 1	32.7	26.9		8 1



Comments

Reviewed By _______

KHD



Project Name	Plant Arkwright AP-2	Project Number	175569434
Source	SB-10-35-40, 35.0'-40.0'	Lab ID _	4

Sieve Analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422	
Prepared Using	ASTM D 421	

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By KB
Test Date 08-14-2023
Date Received 08-09-2023

Maximum Particle Size: 3/8" Sieve

% Passing
100.0
95.7
89.5

Analysis for the Portion Finer than the No. 10 Sieve

Analysis Based on -3 inch Fraction Only

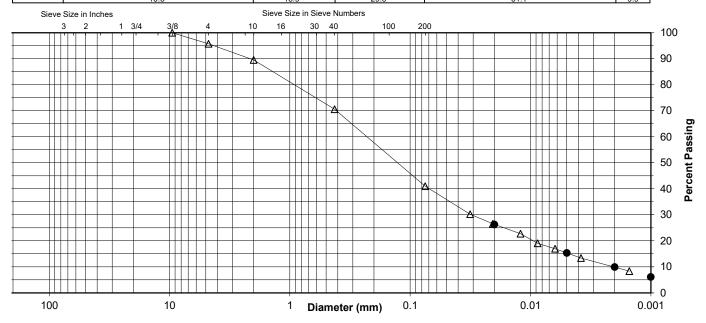
Specific Gravity ____2.69___

Dispersed Using Apparatus A - Mechanical, for 1 Minute

No. 40	70.6
No. 200	41.0
0.02 mm	26.3
0.005 mm	15.3
0.002 mm	9.9
0.001 mm	6.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay	
ASTIVI	0.0	4.3	6.2	18.9	29.6	25.7	15.3	
AASHTO		Gravel		Coarse Sand	Fine Sand	Silt		Clav
		10.5		18.9	29.6	31.1		9.9



Comments

Reviewed By RH

Reported By: RHB Report Date: 08/23/2023



ASTM D 422

Project Name	Plant Arkwright AP-2	Project Number	175569434
Source	SB-11-25-30, 25.0'-30.0'	Lab ID	5

Sieve Analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared Using	ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By KB
Test Date 08-14-2023
Date Received 08-09-2023

Maximum Particle Size: 3/8" Sieve

0: 0:	%
Sieve Size	Passing
3/8"	100.0
No. 4	98.1
No. 10	95.8

Analysis for the Portion Finer than the No. 10 Sieve

Analysis Based on -3 inch Fraction Only

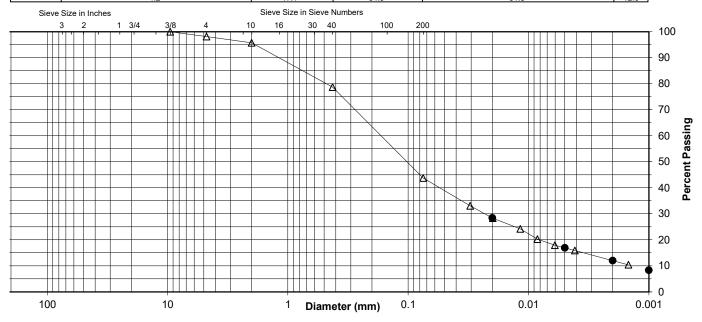
Specific Gravity 2.79

Dispersed Using Apparatus A - Mechanical, for 1 Minute

No. 40	78.7
No. 200	43.8
0.02 mm	28.4
0.005 mm	16.9
0.002 mm	12.0
0.001 mm	8.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay		
ASTW	0.0	1.9	2.3	17.1	34.9	26.9	16.9	16.9	
AASHTO		Gravel		Coarse Sand	Fine Sand	Silt		Clav	
AASHIU		4.2		17.1	34.9	31.8		12.0	



Comments

Reviewed By

KHD



Project Name	Plant Arkwright AP-2	Project Number	175569434
Source	SB-11-30-35, 30.0'-35.0'	Lab ID _	6

Sieve Analysis for the Portion Coarser than the No. 10 Sieve

Test Method ASTM D 422
Prepared Using ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By KB
Test Date 08-14-2023
Date Received 08-09-2023

Maximum Particle Size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	97.6
3/8"	93.6
No. 4	86.6
No. 10	79.2

Analysis for the Portion Finer than the No. 10 Sieve

Analysis Based on -3 inch Fraction Only

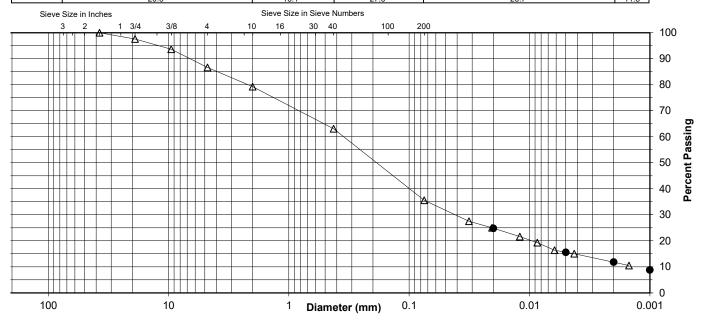
Specific Gravity ____2.76___

Dispersed Using Apparatus A - Mechanical, for 1 Minute

No. 40	63.1
No. 200	35.5
0.02 mm	24.8
0.005 mm	15.6
0.002 mm	11.8
0.001 mm	8.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay	
ASTIVI	2.4	11.0	7.4	16.1	27.6	19.9	15.6	
AACUTO		Gravel		Coarse Sand	Fine Sand	Silt		Clav
AASHTO		20.8		16.1	27.6	23.7		11.8



Comments

Reviewed By

KHIS



 Project Name
 Plant Arkwright AP-2
 Project Number
 175569434

 Source
 SB-11-35-40, 35.0'-40.0'
 Lab ID
 7

Sieve Analysis for the Portion Coarser than the No. 10 Sieve

Test Method ASTM D 422
Prepared Using ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By KB
Test Date 08-15-2023
Date Received 08-09-2023

Maximum Particle Size: 3/4" Sieve

0: 0:	
Sieve Size	Passing
3/4"	100.0
3/8"	97.6
No. 4	97.6
No. 10	97.1

Analysis for the Portion Finer than the No. 10 Sieve

Analysis Based on -3 inch Fraction Only

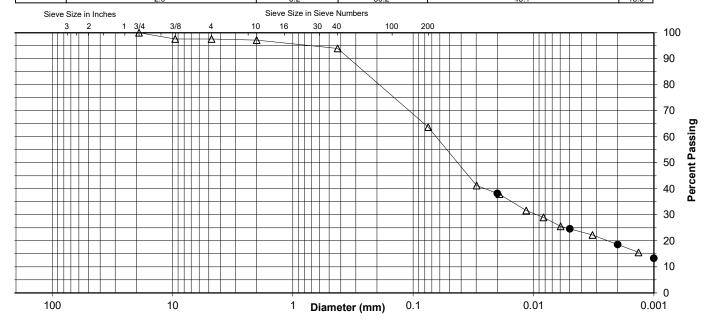
Specific Gravity 2.72

Dispersed Using Apparatus A - Mechanical, for 1 Minute

	No. 40	93.9
ĺ	No. 200	63.7
ĺ	0.02 mm	38.2
ĺ	0.005 mm	24.6
	0.002 mm	18.6
ĺ	0.001 mm	13.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay	
ASTIVI	0.0	2.4	0.5	3.2	30.2	39.1	24.6	
AACUTO		Gravel		Coarse Sand	Fine Sand	Silt		Clav
AASHTO		29		3.2	30.2	45 1		18.6



Comments

Reviewed By RHI





Project Name	Plant Arkwright AP-2	Project Number	175569434
Source	SB-12-20-25, 20.0'-25.0'	Lab ID	8

Sieve Analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422	
Prepared Using	ASTM D 421	

Particle Shape: Angular Particle Hardness: Hard and Durable

Tested By KB
Test Date 08-14-2023 Date Received 08-09-2023

Maximum Particle Size: 1 1/2" Sieve

Sieve Size	% Passing
0.070 0.20	i doomig
1 1/2"	100.0
3/4"	98.8
3/8"	98.8
No. 4	97.7
No. 10	94.6

Analysis for the Portion Finer than the No. 10 Sieve

Analysis Based on -3 inch Fraction Only

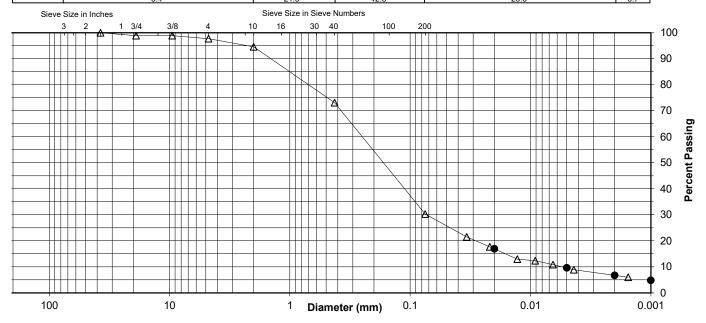
Specific Gravity 2.7

Dispersed Using Apparatus A - Mechanical, for 1 Minute

No. 40	73.1
No. 200	30.3
0.02 mm	16.9
0.005 mm	9.6
0.002 mm	6.7
0.001 mm	4.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTIVI	1.2	1.1	3.1	21.5	42.8	20.7	9.6
AACUTO		Gravel		Coarse Sand	Fine Sand	Silt	Cla
AASHTO		5.4		21.5	42.8	23.6	6



Comments

Reviewed By

Reported By: RHB Report Date: 08/23/2023



ASTM D 422

Project Name	Plant Arkwright AP-2	Project Number	175569434
Source	SB-12-25-30, 25.0'-30.0'	Lab ID	9

Sieve Analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared Using	ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By KB
Test Date 08-14-2023
Date Received 08-09-2023

Maximum Particle Size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.0

Analysis for the Portion Finer than the No. 10 Sieve

Analysis Based on -3 inch Fraction Only

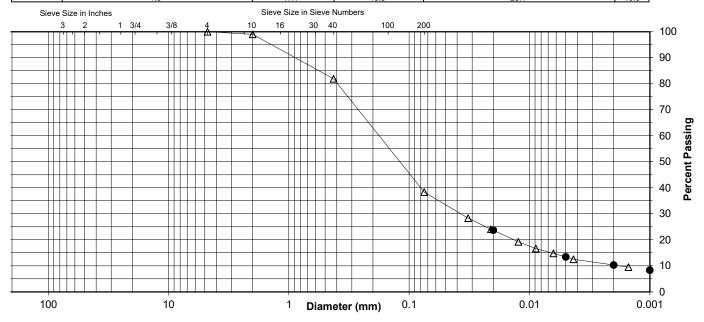
Specific Gravity 2.73

Dispersed Using Apparatus A - Mechanical, for 1 Minute

No. 40	81.9
No. 200	38.4
0.02 mm	23.7
0.005 mm	13.4
0.002 mm	10.3
0.001 mm	8.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay	,
ASTIVI	0.0	0.0	1.0	17.1	43.5	25.0	13.4	
AASHTO		Gravel		Coarse Sand	Fine Sand	Silt		Clav
AASHIU		1.0		17.1	43.5	28.1		10.3



Comments

Reviewed By KH

KHU

Analytical Report

Laboratory Job ID: 2308063

August 2023

Specialty Analytical



Specialty Analytical

9011 SE Jannsen Rd Clackamas, OR 97015 TEL: (503) 607-1331

Website: www.specialtyanalytical.com

August 22, 2023

Edgar Smith Stantec Consulting Services, Inc 10745 Westside Way, Suite 250

Alpharetta, GA 30009 TEL: (770) 656-2676

FAX:

RE: Plant Arkwright AP-2/ 175569434 Order No.: 2308063

Dear Edgar Smith:

There were no problems with the analysis and all data for associated QC met EPA or laboratory specifications, except where noted in the Case Narrative, or as qualified with flags. Results apply only to the samples analyzed. Without approval of the laboratory, the reproduction of this report is only permitted in its entirety.

If you have any questions regarding these tests, please feel free to call.

Sincerely,

Marty French Lab Director

Specialty Analytical

WO#:

2308063

Date Reported:

8/22/2023

CLIENT: Stantec Consulting Services, Inc Project: Plant Arkwright AP-2/ 175569434

Lab ID: 2308063-001 **Matrix:** SOIL

Client Sample ID SB-10-20-25 **Collection Date:** 7/27/2023 5:25:00 PM

Analyses Result RL Qual Units DF Date Analyzed

ANION EXCHANGE CAPACITY SW9081 Analyst: NK

Anion Exchange Capacity 5.31 0.000200 meq/100g 1 8/10/2023 11:02:09 AM

Lab ID: 2308063-002 **Matrix:** SOIL

Client Sample ID SB-10-25-30 **Collection Date:** 7/27/2023 5:30:00 PM

Analyses Result RL Qual Units DF Date Analyzed

 ANION EXCHANGE CAPACITY
 SW9081
 Analyst: NK

 Anion Exchange Capacity
 4.38
 0.000200
 meq/100g
 1
 8/10/2023 11:03:09 AM

Lab ID: 2308063-003 **Matrix:** SOIL

Client Sample ID SB-10-30-35 **Collection Date:** 7/27/2023 5:35:00 PM

Analyses Result RL Qual Units DF Date Analyzed

 ANION EXCHANGE CAPACITY
 SW9081
 Analyst: NK

 Anion Exchange Capacity
 5.50
 0.000200
 meq/100g
 1
 8/10/2023 11:04:09 AM

Lab ID: 2308063-004 **Matrix:** SOIL

Client Sample ID SB-10-35-40 **Collection Date:** 7/27/2023 5:40:00 PM

Analyses Result RL Qual Units DF Date Analyzed

 ANION EXCHANGE CAPACITY
 SW9081
 Analyst: NK

 Anion Exchange Capacity
 4.14
 0.000200
 meq/100g
 1
 8/10/2023 11:06:09 AM

Lab ID: 2308063-005 **Matrix:** SOIL

Client Sample ID SB-11-25-30 Collection Date: 7/28/2023 10:15:00 AM

Analyses Result RL Qual Units DF Date Analyzed

ANION EXCHANGE CAPACITY SW9081 Analyst: NK

Anion Exchange Capacity 5.65 0.000200 meq/100g 1 8/10/2023 11:07:09 AM

Specialty Analytical

Analyses

Analyses

WO#:

DF

DF

2308063

Date Reported:

Date Analyzed

Date Analyzed

8/22/2023

CLIENT: Stantec Consulting Services, Inc Project: Plant Arkwright AP-2/ 175569434

Lab ID: 2308063-006 **Matrix:** SOIL

Result

Client Sample ID SB-11-30-35 Collection Date: 7/28/2023 10:20:00 AM

ANION EXCHANGE CAPACITY

Anion Exchange Capacity

5.28

0.000200

meq/100g

1

8/10/2023 11:08:09 AM

RL Oual Units

RL Qual Units

Lab ID: 2308063-007 **Matrix:** SOIL

Client Sample ID SB-11-35-40 Collection Date: 7/28/2023 10:25:00 AM

Analyses Result RL Qual Units DF Date Analyzed

 ANION EXCHANGE CAPACITY
 SW9081
 Analyst: NK

 Anion Exchange Capacity
 5.79
 0.000200
 meq/100g
 1
 8/10/2023 11:09:09 AM

Lab ID: 2308063-008 **Matrix:** SOIL

Result

Client Sample ID SB-12-20-25 Collection Date: 7/27/2023 1:05:00 PM

ANION EXCHANGE CAPACITY SW9081 Analyst: NK

Anion Exchange Capacity 6.08 0.000200 meq/100g 1 8/10/2023 11:10:09 AM

Lab ID: 2308063-009 **Matrix:** SOIL

Client Sample ID SB-12-25-30 **Collection Date:** 7/27/2023 1:10:00 PM

Analyses Result RL Qual Units DF Date Analyzed

 ANION EXCHANGE CAPACITY
 SW9081
 Analyst: NK

 Anion Exchange Capacity
 6.28
 0.000200
 meq/100g
 1
 8/10/2023 11:11:09 AM

QC SUMMARY REPORT

WO#:

2308063

8/22/2023

Client: Stantec Consulting Services, Inc

Specialty Analytical

Project: Plant Arkwright AP-2/175569434 TestCode: AEC_S

Sample ID: 2308063-003ADUP SampType: **DUP** TestCode: AEC_S Units: meq/100g Prep Date: RunNo: 50394 Client ID: SB-10-30-35 Batch ID: **R50394** TestNo: SW9081 Analysis Date: 8/10/2023 SeqNo: 648628 Analyte PQL SPK value SPK Ref Val LowLimit HighLimit RPD Ref Val **RPDLimit** Qual Result %REC %RPD

Anion Exchange Capacity 3.09 0.000200 5.501 56.3 20 RMI



Client Name STANTEC

Specialty Analytical 9011 SE Jannsen Rd Clackamas, Oregon 97015 TEL: 503-607-1331 FAX: 503-607-1336

Website: www.specialtyanalytical.com

Sample Receipt Checklist

Work Order Number 2308063

RcptNo: 1 Date and Time Receive 8/7/2023 10:17:52 AM Received by: Mandy Wehe Completed by Reviewed by: Completed Date: 8/7/2023 Reviewed Date: 8/7/2023 2:10:47 PM Carrier name: FedEx **V** No \square Chain of custody present? Vac Chain of custody signed when relinquished and received? Yes **✓** No \square **✓** No \square Not Present Chain of custody agrees with sample labels? Yes **✓** No 🗌 Are matrices correctly identified on Chain of custody? **✓** No 🗌 Is it clear what analyses were requested? Not Present 🗸 Yes No \square Custody seals intact on sample bottles? No 🗌 **✓** Samples in proper container/bottle? Yes Were correct preservatives used and noted? Yes No 🗀 NA **✓** No 🗌 Sample containers intact? No 🗌 **✓** Sufficient sample volume for indicated test? **V** Were container lables complete (ID, Pres, Date)? Yes No \square No 🗌 All samples received within holding time? Yes **✓** No 🗹 Was an attempt made to cool the samples? Yes NA No 🗸 All samples received at a temp. of > 0° C to 6.0° C? Yes NA Response when temperature is outside of range: Preservative added to bottles: **✓** No 🗌 Yes 24 °C Sample Temp. taken and recorded upon receipt? To **✓** No \square No Vials Water - Were bubbles absent in VOC vials? **✓** No 🗌 Water - Was there Chlorine Present? NA No 🗆 **✓** NA Water - pH acceptable upon receipt? **✓** No \square Are Samples considered acceptable? Yes **✓** No 🗌 Custody Seals present? Yes No 🗸 Traffic Report or Packing Lists present? Yes Air Bill Sticker Not Present Airbill or Sticker? Airbill No: No 🗸 Sample Tags Present? Yes No 🗸 Sample Tags Listed on COC? Tag Numbers: Intact 🗹 Broken Leaking \square Sample Condition? Case Number: SDG: SAS: Cooler Information **Equipment Information** Adjusted? Checked by Any No and/or NA (not applicable) response must be detailed in the comments section be



Specialty Analytical 9011 SE Jannsen Rd Clackamas, Oregon 97015 TEL: 503-607-1331 FAX: 503-607-1336 Website: www.specialtyanalytical.com

Sample Receipt Checklist

Client Name STANTEC		Work Order Number	2308063
Client Contacted? ☐ Yes ✓ No	☐ NA Person Contacted:	Comments:	
Contact Mode: Phone:	Fax: Email:	☐ In Person:	
Client Instructions:			
Date Contacted:	Contacted By:		
Regarding:			
CorrectiveAction:			

Sample Details

SampID	ClientSampID	ContainerID	Type	Org pH	Temp.	RcptNo	Cooler No	Comments
2308063-001A	SB-10-20-25	Container-01 of 01	Bottle					
2308063-002A	SB-10-25-30	Container-01 of 01	Bottle					
2308063-003A	SB-10-30-35	Container-01 of 01	Bottle					
2308063-004A	SB-10-35-40	Container-01 of 01	Bottle					
2308063-005A	SB-11-25-30	Container-01 of 01	Bottle					
2308063-006A	SB-11-30-35	Container-01 of 01	Bottle					
2308063-007A	SB-11-35-40	Container-01 of 01	Bottle					
2308063-008A	SB-12-20-25	Container-01 of 01	Bottle					
2308063-009A	SB-12-25-30	Container-01 of 01	Bottle					

www.specialtyanalytical.com

9011 SE Jannsen Rd					Chain of Custody Record																			
Specialty Analytical	Clackan	Da	te: 7/	4/20	23			Pa	ge: 1	C	of: 1		L	Laboratory Project No (internal): 230%のしろ										
Analytical	Phone Fax	Project Name: Plant Arkwright AP-2										Temperature on Receipt: ZY.O °C												
Gient: Stantec Consulting				Pro	oject N	_{vo:} 1	755	69	434		PO No	o: 17	5569	9434	. (Cooling): V	10			Shipped	Via:	Fed	EX
Address: 10745 Westside V	***********************		***************************************)ylar				***************************************	***************************************		***************************************		Custod	y Sea	ıl:(Y)	V N	ntact	/ Broke	en (600Jey	/ Bottle
Oty, State, Zip: Alpharetta, GA		***************************************					; OF] wa	7	THEF	G/	······································			MDL			TI	IER IV			ĒDD [√
Telephone: 770-656-2676		***************************************	***************************************				Ed	,			/// 161	``		·**	s	ample D	sposal:	 □₽ŧ	eturn t	to dient	Dispo	sal by	lab (after	r 60 days)
AP Email: APInvoices@star	itec.com		ikaden erdadada askarı)stan	tec c	com	ana	us.m	ncara	ath@	star	ntec	.co	m	:			
AP Email: 11 11 11 11 11 11 11 11 11 11 11 11 11					⊏ma 	II: 00;				queste			<u> </u>		3			-						
Sample Name	Sample Date	Sample Time	Sample Matrix*	# of Containers	AEC				AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA										······································	Cor	nments			
¹ SB-10-20-25	7/27/2023	17:25	S	1	✓																			
² SB-10-25-30	7/27/2023	17:30	S	1	1					***************************************											-		***************************************	***************************************
³ SB-10-30-35	7/27/2023	17:35	S	1	1															······································				
⁴ SB-10-35-40	7/27/2023	17:40	S	1	1								†		 					···				
⁵ SB-11-25-30	7/28/2023	10:15	S	1	/			•	1	1	<u> </u>		Ī							***************************************				
⁶ SB-11-30-35	7/28/2023	10:20	S	1	1		<u></u>		1	***************************************	***************************************			Ī		***************************************						***************************************		
⁷ SB-11-35-40	7/28/2023	10:25	S	1	1		1																	
⁸ SB-12-20-25	7/27/2023	13:05	S	1	√			Ī	Ī		Ī				I									
⁹ SB-12-25-30	7/27/2023	13:10	S	1	1	•																		
10					Ī				Ī		Ī				Ī				***************************************	***************************************		***************************************	***************************************	-
*Matrix: A=Air, AQ=Aqueous, L=Liquid,	O=Oil, P=F	roduct, S=S	3oil, SD=S	èdimer	nt, SL=	Solid, V	N = Wat	er, D	W = Drir	nking Wa	ter, GV	√= Grou	ınd Wat	er, SW	= Storm	Water,	ww=	Waste	Wate	r, M=	Miscellane	ous		
Turn-around Time:	Standard (5-7 Busin	ess):	✓	(3 Day	·: [2	Day:		Exp		Next [ed turr	•	und re	ques	ts sh		me Da	ay: oordina] ted i	n adva	ance
Relinquished x Dylan Quintal Sym Sumth Date/Time 08/04							11:	30		Rece x	ved		LA	l			Date/Ti	me			, S			
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Relinquished x	Date/T	ime			·					Rece x	ived				***************************************	[Date/Tir	me				P	age 7	of 10



Specialty Analytical 9011 SE Jannsen Ra Clackamas, Oregon 97015 TEL: 503-607-1331 FAX: 503-607-1336 Website: www.specialtyanalytical.com

Definition Only

WO#: **2308063**Date: **8/22/2023**

Definitions:

KEY TO FLAGS

A: This sample contains a Gasoline Range Organic not identified as a specific hydrocarbon product. The result was qualified against gasoline calibration standards.

A1: This sample contains a Diesel Range Organic not identified as a specific hydrocarbon product. The result was qualified against diesel calibration standards.

A2: This sample contains a Lube Oil Range Organic not identified as a specific hydrocarbon product. The result was qualified against lube oil calibration standards.

A3: The results was determined to be Non-Detect based on hydrocarbon pattern recognition. The product was carry-over from another hydrocarbon type.

A4: The product appears to be aged or degraded.

B: The blank exhibited a positive result greater than the reporting limit for this compound.

CN: See Case Narrative.

E: Result exceeds the calibration range for this compound. The result should be considered an estimate.

F: The positive result for this hydrocarbon is due to single component contamination. The product does not match any hydrocarbon in the fuels library.

FS: Follow-up testing is suggested.

G: Result may be biased high due to biogenic interferences. Clean up is recommended.

H: Sample was analyzed outside recommended holding time.

HT:

At client's request, samples was analyzed outside of recommended holding time.

HP: Sample was analyzed outside recommended holding time due to VOA having pH >2.

J: The results for this analyte is between the MDL and the PQL and should be considered an



Specialty Analytical 9011 SE Jannsen Ra Clackamas, Oregon 97015 TEL: 503-607-1331 FAX: 503-607-1336 Website: www.specialtyanalytical.com

Definition Only

WO#: **2308063**Date: **8/22/2023**

Definitions:

estimated concentration.

K: Diesel result is biased high due to amount of Oil contained in the sample.

L: Diesel result is biased high due to amount of Gasoline contained in the sample.

M: Oil result is biased high due to amount of Diesel contained in the sample.

N: Gasoline result is biased high due to amount of Diesel contained in the sample.

MC: Sample concentration is greater than 4x the spiked value, the spiked value is considered insignificant.

MI: Result is outside control limits due to matrix interference.

NH: Sample matrix is non-homogeneous

MSA: Value determined by Method of Standard Addition.

O: Laboratory Control Standard (LCS) exceeded laboratory control limits but meets CCV criteria. Data meets EPA requirements.

Q: Detection levels elevated due to sample matrix.

R: RPD control limits were exceeded

RF: Duplicate failed due to result being at or near the method-reporting limit.

RP: Matrix spike values exceed established QC limits; post digestion spike is in control.

S: Recovery is outside control limits.

SC: CCV or LCS exceeded high recovery control limits, but associated samples are non-detect. Data meets EPA requirements.

SL: LCS exceeded recovery control limits, but associated MS/MSD passing. Data meets EPA requirements.



Specialty Analytical 9011 SE Jannsen Ra Clackamas, Oregon 97015 TEL: 503-607-1331 FAX: 503-607-1336 Website: www.specialtyanalytical.com

Definition Only

WO#: **2308063**Date: **8/22/2023**

Definitions:

SV: CCV exceded low recovery control limits. ND as reported evaluated using EPA method 8260D section 11.4.3.2

TA: Sample treated with ascorbic acid for the removal of thiocyanates.

Analytical Report

Laboratory Job ID: Custom XRD/MI4549

August 2023

SGS



Quantitative X-Ray Diffraction by Rietveld Refinement

Report Prepared for: **Environmental Services**

Project Number/ LIMS No. Custom XRD/MI4549-AUG23

Sample Receipt: August 17, 2023

Sample Analysis: August 31, 2023

Reporting Date: September 20, 2023

BRUKER AXS D8 Advance Diffractometer Instrument:

Co radiation, 35 kV, 40 mA; Detector: LYNXEYE Test Conditions:

Regular Scanning: Step: 0.02°, Step time: 0.75s, 2θ range: 6-80°

PDF2/PDF4 powder diffraction databases issued by the International Center Interpretations:

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

Sayun Z

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.

DISCLAIMER: This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

WARNING: The sample(s) to which the findings recorded herein (the "Findings") relate was(were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted



Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

	SB-10-20-25	SB-10-25-30	SB-10-30-35	SB-10-35-40	SB-11-25-30	SB-11-30-35	SB-11-35-40	SB-12-20-25	SB-12-25-30
Mineral/Compound	AUG4549-1	AUG4549-2	AUG4549-3	AUG4549-4	AUG4549-5	AUG4549-6	AUG4549-7	AUG4549-8	AUG4549-9
	(wt %)								
Quartz	49.9	44.8	26.4	39.7	25.3	36.4	25.8	32.8	31.6
Albite	34.8	40.9	57.8	44.4	41.3	36.1	42.9	40.1	38.8
Chlorite	1.0	0.7	1.4	0.7	0.2	0.3	0.1	1.2	1.8
Diopside	0.8	0.6	0.8	1.0	2.1	1.5	0.9	-	-
Biotite	2.3	1.8	2.9	3.2	4.6	4.6	7.0	12.3	7.7
Magnetite	0.8	1.1	0.7	1.1	0.2	0.2	0.3	0.8	2.1
Hematite	1.0	0.8	0.5	0.6	0.6	0.3	0.2	1.5	2.0
Pyrite	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0
Actinolite	2.1	1.8	1.3	2.1	10.6	3.0	0.8	-	-
Microcline	2.8	2.9	3.5	3.9	4.0	9.4	12.3	5.8	5.7
Illite	4.4	4.7	4.2	3.1	5.6	3.0	6.3	4.0	4.1
Montmorillonite	-	-	0.5	0.2	0.2	0.3	1.1	-	2.2
Epidote	-	-	-	-	2.4	0.7	1.9	-	-
Laumontite	-	-	-	-	3.0	3.4	-	-	-
Rutile	-	-	-	-	-	0.7	0.3	-	-
Illite-Montmorillonite	-	-	-	-	-	-	-	1.6	4.0
TOTAL	100	100	100	100	100	100	100	100	100

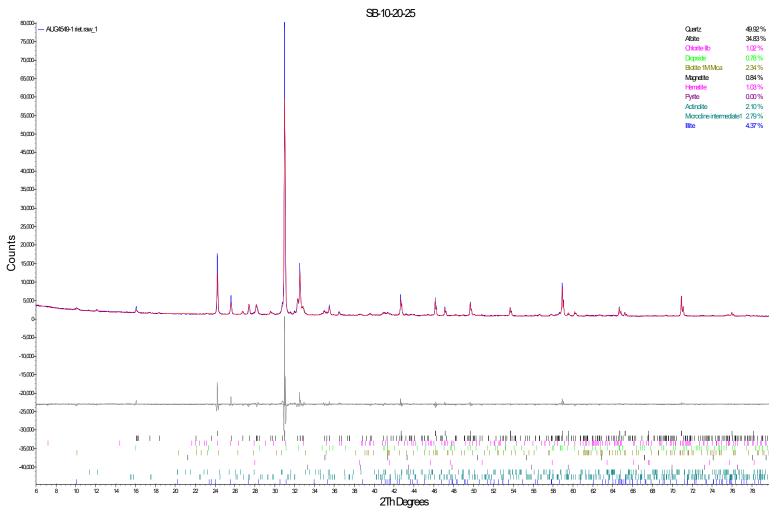
Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

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

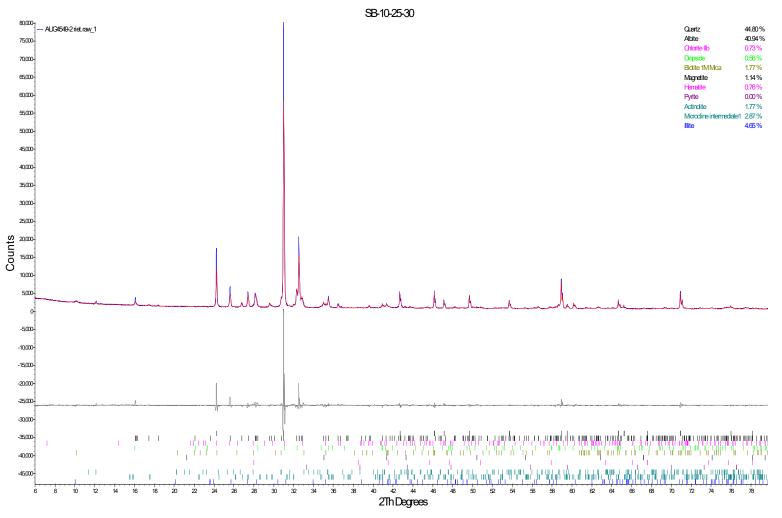
The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.

Mineral/Compound	Formula
Quartz	SiO ₂
Albite	NaAlSi₃O ₈
Chlorite	(Fe,(Mg,Mn) ₅ ,Al)(Si ₃ Al)O ₁₀ (OH) ₈
Diopside	CaMgSi ₂ O ₆
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$
Magnetite	Fe ₃ O ₄
Hematite	Fe_2O_3
Pyrite	FeS ₂
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$
Microcline	KAISi ₃ O ₈
Illite	$(K,H_3O)(AI,Mg,Fe)_2(Si,AI)_4O_{10}[(OH)_2,(H_2O)]$
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2\cdot 10H_2O$
Epidote	$Ca_2(AI,Fe)AI_2O(SiO_4)(Si_2O_7)(OH)$
Laumontite	$Ca(Al_2Si_4O_{12})\cdot 4H_2O$
Rutile	TiO ₂
Illite-Montmorillonite	$KAI_4(Si,AI)_8O_{20}(OH)_4 \cdot 8H_2O$

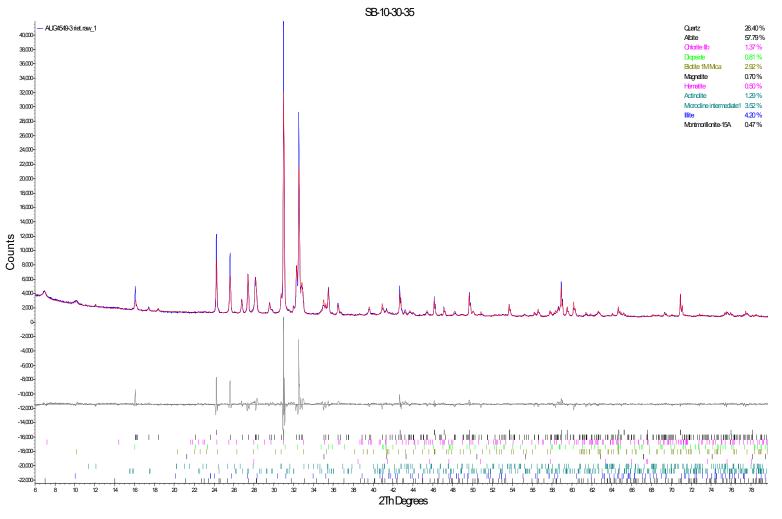




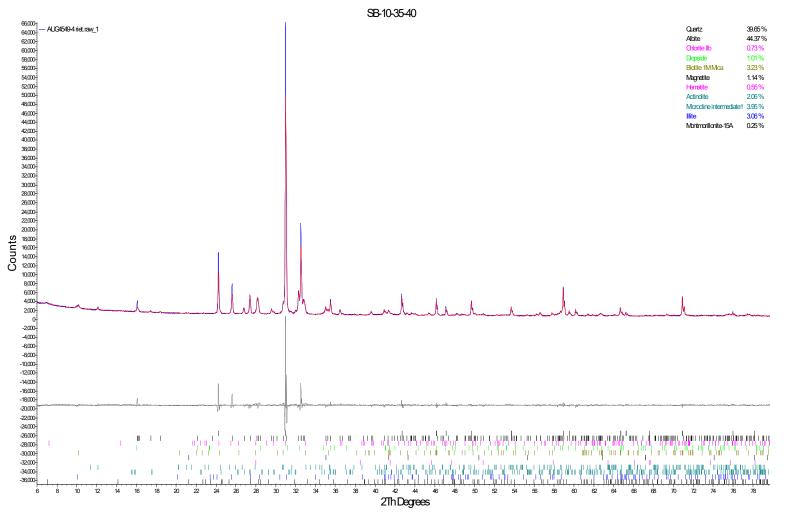




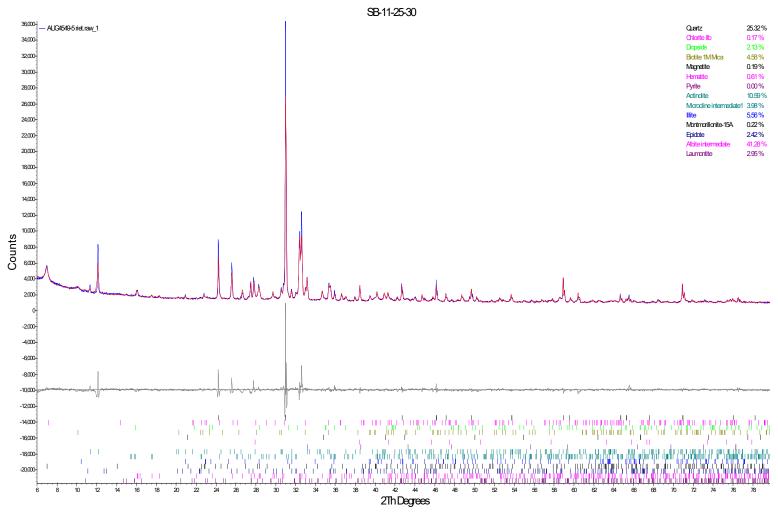




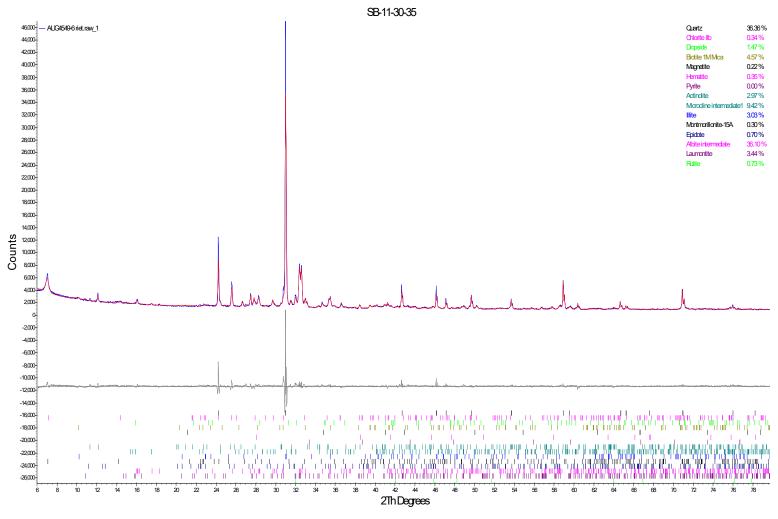




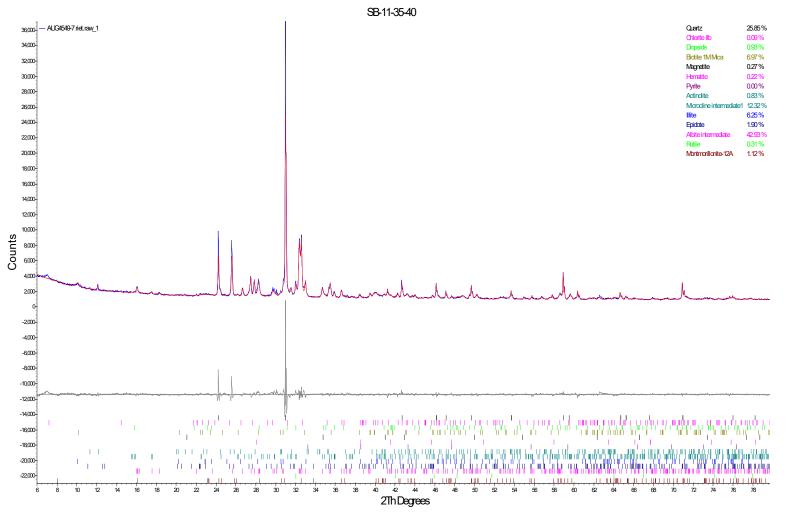




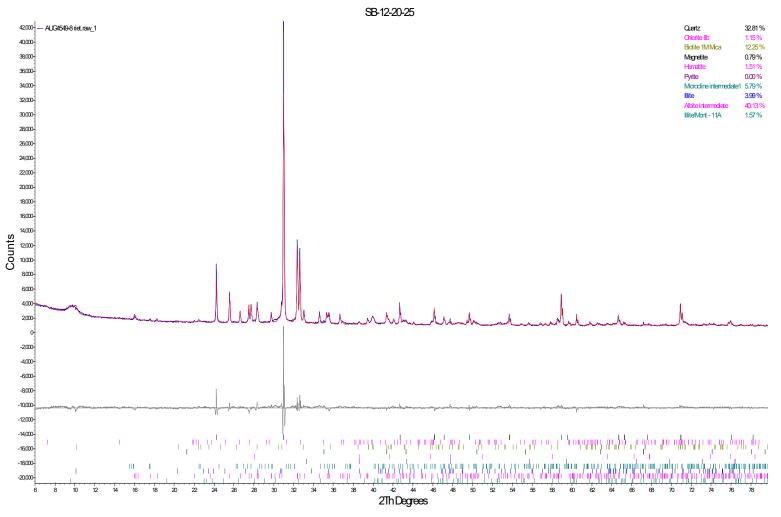




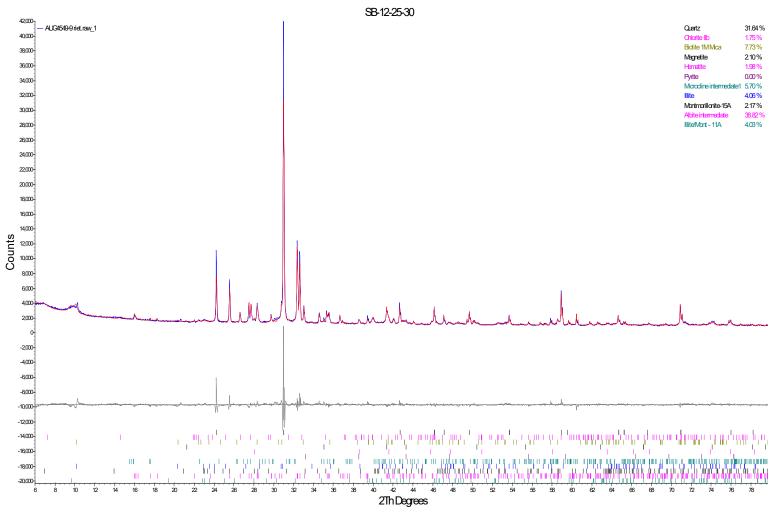












Analytical Report

Laboratory Job ID: CA19109

November 2023

SGS



Analysis Report

GS23-05053

F402001 SGS LAKEFIELD RESEARCH PO BOX 4300 185 CONCESSION STREET LAKEFIELD, ONTARIO ON KOL 2HO CANADA
 Received :
 09-Nov-2023

 Completed :
 24-Nov-2023

 Order Reference :
 CA19109-Aug23

Laboratory ID: Client Sample #: Description:	GS23-05053.001 SB-10-20-25	GS23-05053.002 SB-10-25-30	GS23-05053.003 SB-10-30-35	GS23-05053.004 SB-10-35-40
CEC Actual (meq/100g)	5.12	4.54	7.62	5.78

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: 0000293168

Page 1 of 3

Signed and dated in Guelph, ON

On 24-Nov-2023

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.

Health & Nutrition

Suite 1 - 503 Imperial Road N Guelph ON N1H 6T9 t+1(519) 837-1600 f+1(519) 837-1242 www.sgs.com/agriculture



Analysis Report

GS23-05053

F402001 SGS LAKEFIELD RESEARCH PO BOX 4300 185 CONCESSION STREET LAKEFIELD, ONTARIO ON KOL 2HO CANADA Received: 09-Nov-2023

Completed: 24-Nov-2023

Order Reference: CA19109-Aug23

Order Reference : CA19109-Aug23

Laboratory ID: Client Sample #: Description:	GS23-05053.005 SB-11-25-30	GS23-05053.006 SB-11-30-35	GS23-05053.007 SB-11-35-40	GS23-05053.008 SB-12-20-25
CEC Actual (meq/100g)	12.47	14.06	13.02	7.32

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: 0000293168

Page 2 of 3

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Analysis Report

GS23-05053

F402001 SGS LAKEFIELD RESEARCH PO BOX 4300 185 CONCESSION STREET LAKEFIELD, ONTARIO ON KOL 2H0 CANADA
 Received :
 09-Nov-2023

 Completed :
 24-Nov-2023

 Order Reference :
 CA19109-Aug23

Laboratory ID: Client Sample #: Description: GS23-05053.009 SB-12-25-30

CEC Actual (meq/100g)

9.18

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: 0000293168

Page 3 of 3

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Analytical Report

Laboratory Job ID: CA19105

September 2023

SGS



SGS Canada Inc.

P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO

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

25-September-2023

Project: PO#175569434

Date Rec.: 10 August 2023 LR Report: CA19105-AUG23 Reference: Plant Arkwright

AP-2/175569434 -PO#175569434

Copy: #1

Stantec Consulting Services Inc.

Attn: Edgar Smith

10745 Westside Way, Suite 250 Alpharetta, GA 30009, USA

Phone: 770-656-2676

Fax:

CERTIFICATE OF ANALYSIS **Final Report**

Sample ID	Sample Date &	С	TOC	CO3 (HCI) as
	Time	%	%	%CO3 %
1: Analysis Start Date		21-Sep-23	22-Sep-23	22-Sep-23
2: Analysis Start Time		13:36	12:08	12:09
3: Analysis Completed Date		21-Sep-23	22-Sep-23	22-Sep-23
4: Analysis Completed Time		18:08	13:01	13:01
5: SB-10-20-25	27-Jul-23 17:25	0.073	0.030	0.20
6: SB-10-25-30	27-Jul-23 17:30	0.031	0.020	< 0.04
7: SB-10-30-35	27-Jul-23 17:35	0.009	0.000	< 0.04
8: SB-10-35-40	27-Jul-23 17:40	0.019	0.000	< 0.04
9: SB-11-25-30	28-Jul-23 10:15	0.006	0.000	< 0.04
10: SB-11-30-35	28-Jul-23 10:20	0.013	0.010	< 0.04
11: SB-11-35-40	28-Jul-23 10:25	0.005	0.000	< 0.04
12: SB-12-20-25	27-Jul-23 13:05	0.010	< 0.025	< 0.04
13: SB-12-25-30	27-Jul-23 13:10	0.011	-0.010	< 0.04

Catharine Arnold, B.Sc., C.Chem

Project Specialist,

Catharine awold

Environment, Health & Safety

APPENDIX C TREATABILITY TESTING REPORTS



September 27, 2023

Angus McGrath PhD Senior Principal

Direct: 925 296-2134 Mobile: 510 385-4497

Angus.McGrath@stantec.com

Stantec

1340 Treat Boulevard Suite 300 Walnut Creek CA 94597-7966



TERRA SYSTEMS, INC. FINAL REPORT TO STANTEC FOR COAL ASH RESIDUE BATCH TREATABILITY STUDIES FOR PLANT ARKWRIGHT AP2

1.0 INTRODUCTION

Coal ash residue (CCR) landfill may generate acidic conditions which allow metals such as cobalt, arsenic, iron, lithium, molybdenum, and selenium to accumulate to levels above regulatory limits. This bench-scale treatability evaluated neutralization/precipitation with several reagents to be chosen by Stantec to treat arsenic, cobalt, lithium, molybdenum, and selenium. Wells ARAMW-7 and ARAMW8- at Plant Arkwright AP2 are screened in the fractured bedrock. The Georgia groundwater protection standards (GWPS) for the metals of concern are:

- arsenic 0.010 mg/L
- cobalt 0.006 mg/L
- lithium 0.04 mg/L
- molybdenum 0.1 mg/L
- selenium 0.05 mg/L.

2.0 BENCH-SCALE STUDY SCOPE

The following phases were conducted for the treatability study:

Initial Characterization

The groundwater was analyzed for

- Field parameters pH, ORP, specific conductivity (SC), Hach ferrous iron, Hach sulfide, Hach alkalinity, and Hach hardness,
- Anions (chloride, fluoride, and sulfate)
- Major dissolved cations (calcium, iron, magnesium, manganese, potassium, silicon, and sodium)
- Trace dissolved metals of concern (arsenic, cobalt, molybdenum, and selenium)



- Dissolved lithium
- Dissolved organic carbon (DOC)
- Total dissolved solids (TDS)

Batch Tests

- Two locations with site bedrock and ARAMW-7 and ARAMW-8 groundwaters
- Evaluate five reagents at three dosages for ARAMW-7
- Evaluate six reagents at three dosages for ARAMW-8
- Titrations with each reagent (with and without soil to evaluate buffer capacity)
- Include control samples
 - o Groundwater, no reagent, no soil
 - o Groundwater and soil, no reagent
- Measure six select dissolved metals (ICP-MS) and general chemistry (pH, ORP, SC) in treated samples and control samples
- 7 day reaction time
- Bedrock/water ratio is 10% soil to 90% water, reagent ratio to be determined

2.1 Bench-scale Groundwater and Soil Collection

Groundwater samples from ARAMW-7 were collected on December 13, 2022 between 9:25 and 13:20. Groundwater samples from ARAMW-8 were collected on December 13, 2022 between 9:10 and 14:50. Bedrock samples from ARAMW-7 were collected by a rotary sonic drilling rig from 38-48 feet on February 15, 2023 and from ARAMW-8 from 37-47 feet on February 15, 2023. Copies of the chain-of-custody forms are attached in Appendix I.

2.3 Baseline Characterization

At the beginning of the bench-scale treatability test, baseline characterization was performed to verify contaminant concentrations in the samples. Homogenized groundwater samples were analyzed for total cations: calcium, magnesium, potassium, silicon, and sodium; dissolved organic carbon (DOC); total dissolved solids; and anions: chloride, fluoride, and sulfate by the Eurofins Lancaster Laboratories. Each groundwater was analyzed for dissolved lithium and dissolved metals of concern: arsenic, cobalt, iron, , manganese, molybdenum, and selenium. The volume of samples for each analysis in the initial characterization are shown in Table 2. The analytical methods and detection limits by Eurofins Lancaster Laboratory are shown in Table 3. TSI measured pH in the soil and groundwater, oxidation-reduction potential (ORP), dissolved oxygen (DO), total suspended solids, specific conductivity, total and bicarbonate alkalinity, total hardness, ferrous iron, and sulfide in the aqueous phase using calibrated meters and Hach procedures.



Table 1. Analyses and Volumes for Initial Characterization

Analyses	GW Volume
	L
Cations in GW Total Ca, K, Mg, Si, and Na	0.25
GW Dissolved As, Co, Fe, Mo, Mn, Se	0.25
GW Dissolved Li	0.25
DOC	0.05
Sulfate, Chloride, and Fluoride	0.05
Total Dissolved Solids	0.5
Field Parameters	0.05
Total	1.4

Table 2. Analytes, Methods, and Detection Limits*

Analyte	Method	Detection
		Limit
		mg/L
Arsenic	6020B ICP/MS	0.00070
Calcium	6010D ICP	0.096
Chloride	EPA 300.0 R2.1	3.0
Cobalt	6020B ICP/MS	0.000161
Fluoride	EPA 300.0 R2.1	0.45
Iron	6020B ICP/MS	0.0206
Lithium	6010D ICP	0.0113
Magnesium	6020B ICP/MS	0.040
Manganese	6020B ICP/MS	0.00979
Molybdenum	6020B ICP/MS	0.000134
Potassium	6020B ICP/MS	0.000204
Selenium	6020B ICP/MS	0.000286
Sodium	6020B ICP/MS	0.239
Sulfate	EPA 300.0 R2.1	2.5
TDS	2540C	12
DOC	EPA 415.1	0.5



2.4 Initial Characterization Results

As shown in Table 3, the MW-7 groundwater was sampled for sulfate (1,010 mg/L), fluoride (<0.45 mg/L), chloride (5.0 mg/L), dissolved organic carbon (0.895 mg/L), calcium (152 mg/L), magnesium (8.94 mg/L), potassium (46 mg/L), silicon (9.46 mg/L), sodium (64.3 mg/L) and total dissolved solids (794 mg/L). Groundwater samples were analyzed for dissolved arsenic, cobalt, iron, manganese, molybdenum, and selenium plus dissolved lithium. Lithium was 0.0689 mg/L and molybdenum was 0.000138 mg/L. There was a moderate level of dissolved arsenic (0.0325 mg/L), above the GA GWPS of 0.010 mg/L. Dissolved cobalt was 0.0521 mg/L which exceeded the GA GWPS of 0.0060 mg/L. Dissolved selenium was not detected. Dissolved iron was 4.82 mg/L. Dissolved manganese was 12.6 mg/L. The pH of MW-7 was 6.0 SU, ORP (132 mV), DO (7.1 mg/L), and specific conductivity (410 μS/cm). The composite groundwater had a bicarbonate alkalinity of 80 mg/L as CaCO3, hardness of 260 mg/L as CaCO3, with 5.42 mg/L ferrous iron and 0.08 mg/L sulfide; Hach procedures were used for these analyses.

The MW-8 groundwaters were sampled for sulfate (108 mg/L), fluoride (<0.45 mg/L), chloride (5.51 mg/L), dissolved organic carbon (1.22 mg/L), calcium (325 mg/L), magnesium (83.6 mg/L), potassium (10.4 mg/L), silicon (34.3 mg/L), sodium (30.7 mg/L) and total dissolved solids (383 mg/L). Lithium was 0.0116 mg/L and molybdenum was 0.160 mg/L. There was little dissolved arsenic (0.0033 mg/L). Dissolved cobalt was 0.00639 mg/L which exceeded the GA GWPS of 0.0060 mg/L. Dissolved selenium was not detected. Dissolved iron was 0.488 mg/L. Dissolved manganese was 0.532 mg/L. The pH of MW-8 was 7.2 SU, ORP (136 mV), DO (10.7 mg/L), and specific conductivity (699 μ S/cm). The composite groundwater had a bicarbonate alkalinity of 260 mg/L as CaCO3, hardness of 300 mg/L as CaCO3, with 0.22 mg/L ferrous iron and 0.02 mg/L sulfide; Hach procedures were used for these analyses.

2.5 MW-7 Titration Tests

Titrations (Table 4) were performed with the following for MW-7:

- 100 g of composite groundwater titrated with 25% sodium hydroxide
- 10 g rock plus 90 mL groundwater titrated with 25% sodium hydroxide
- 100 g of composite groundwater titrated with sodium bicarbonate
- 10 g rock plus 90 mL groundwater titrated with sodium bicarbonate
- 100 g of composite groundwater titrated with CERES MTS 73MF2
- 10 g rock plus 90 mL groundwater titrated with CERES MTS 73MF2
- 100 g of composite groundwater titrated with CERES MTS 73MF3
- 10 g rock plus 90 mL groundwater titrated with CERES MTS 73MF3
- 100 g of composite groundwater titrated with calcium oxide
- 10 g rock plus 90 mL groundwater titrated with calcium oxide



Table 3. Initial Groundwater Characterization Results

Field Parameters						
		GA				
		GWPS				
Well		Freshwater	MW-7	MW-7	MW-8	MW-8
			Dissolved	Total	Dissolved	Total
Time Collected			12:45		10:25	
GW pH	SU		6.0		7.2	
GW ORP	mV		132		136	
GW DO	mg/L		7.1		10.7	
Specific Conductivity	uS/cm		410		699	
GW TSS	mg/L					
GW Bicarbonate Alkalinity	mg/L		80		260	
GW Hardness as CaCO3	mg/L		260		300	
GW Ferrous Iron	mg/L		5.42		0.22	
GW Sulfide	mg/L		0.08		0.02	
GW TDS	mg/L					
Sulfate	mg/L			1010		108
Fluoride	mg/L	4.0		< 0.45		< 0.45
Chloride	mg/L			5.02		5.51
Dissolved Organic Carbon	mg/L		0.895		1.22	
Arsenic	mg/L	0.010	0.0325		0.0033	
Cobalt	mg/L	0.006	0.0521		0.00639	
Iron	mg/L		4.82		0.488	
Lithium	mg/L	0.040	0.0689		0.0116	
Manganese	mg/L		12.6		0.532	
Molybdenum	mg/L	0.10	0.000138		0.160	
Selenium	mg/L	0.050	< 0.000286		< 0.000286	
Calcium	mg/L			152		325
Magnesium	mg/L			8.94		83.6
Potassium	mg/L			46		10.4
Silicon	mg/L			9.46		34.3
Sodium	mg/L			64.3	İ	30.7
Dissolved Solids	mg/L		794		383	

GWPS = Georgia Groundwater Protection Standard

123 Compound above GWPS

J Value, compound detected above method detection limit by below method calibration

Compound detected in laboratory blank associated with these samples



Table 4. MW-7 Titration Results

MW-7		25% NaOH								
GW	g	100	İ		1					
Reagent	g	0	0	0.02	0.03	0.04	0.05			
pН	SU	6.2	6.3	6.9	7.9	9.0	9.4			
ORP	mV	88	16	83	56	61	75			
Loading	g/L	0	0	0.05	0.075	0.1	0.125			
MW-7 + Ro		25% NaOH	Ů	0.03	0.075	0.1	0.123			
GW -/ - RC	g	90								
Rock	g	10								
Reagent	g	0	0.02	0.025	0.03	0.035				
рН	SU	6.2	7.2	7.8	8.4	8.9				
ORP	mV	209	229	225	214	178				
Loading	g/L	0	0.056	0.069	0.083	0.097				
MW-7	8.2	NaHCO3	0.020	0.007	0.002	0.057				
GW	σ	100								
Reagent	g	0	0.1	0.2	0.5	0.8	1.1	1.5		
pH	SU	6.5	7.1	7.4	7.8	7.9	7.8	7.8		
ORP	mV	88	-12	-30	-16	12	56	60		
Loading	g/L	0	1	2	5	8	11	15	1	
MW-7 + Ro			1		,	0	11	13		
GW		NaHCO3 90								
Rock	g	10						After 1 hr		
Reagent	g	0	0.1	0.25	0.5	0.75	1	1	1.25	1.5
pH	g SU	6.8	0.1 6.9		0.5	7.7	7.7	7.3	7.4	7.5
ORP	mV	136	14	7.2	7.6	60	92	118	7.4	7.3
Loading	g/L	0	1.1	2.8	5.6	8.3	11.1	11.1	13.9	16.7
Loading	g/L		1.1	2.0	3.0	0.3	11.1	11.1	13.9	10.7
MW-7		CERES MTS 73MF2								
GW	g	100								
Reagent	g	0	0.01	0.1	1	3	5			
рН	SU	6.3	6.4	6.7	8.5	8.4	8.3			
ORP	mV	36	19	-34	-361	-358	-375			
Loading	g/L	0	0.1	1	10	30	50			
		CERES MTS								
MW-7		73MF3								
GW	g	100								
Reagent	g	0	0.01	0.1	1	3	5	5 after 1 hr		
pН	SU	6.4	6.3	6.3	6.9	5.6	5.3	8.6		
ORP	mV	28	20	5	34	82	-302	-106		
Loading	g/L	0	0.1	1	10	30	50	50		
MW-7		CaO								
GW	g	100								
Reagent	g	0	0	0.0025	0.005	0.01	0.02			
рН	SU	6.8	7.1	6.9	6.8	7.3	9.2			
ORP	mV	-45	-43	-20	-24	8	15			
Loading	g/L	0	0	0.025	0.05	0.1	0.2			
MW-7 + Ro	-	CaO								
GW	g	90								
Rock	g	10								
Reagent	g	0	0.0025	0.005	0.0075	0.010			1	
рН	SU	7.1	6.9	6.9	7.7	8.9				
ORP	mV	170	135	124	164	118			1	
Loading	g/L	0	0.028	0.056	0.083	0.111				



The MW-7 groundwater had a pH of 6.2-6.3 SU. Adding 0.02 mL of 25% sodium hydroxide (0.050 g/L) increased the pH to 6.9 SU, 0.075 g/L increased the pH to 7.9 SU, 0.1 g/L to 9.0, and 0.125 g/L increased the pH to 9.4 SU. With 10% rock and groundwater (GW), the initial pH was 6.2 SU. Additions of 0.056 g/L NaOH increased the pH to 7.2 SU, 0.069 g/L to 7.8, 0.083 g/L to 8.4, and 0.097 g/L to 8.9. The sodium hydroxide decreased the ORP slightly.

For the sodium bicarbonate titrations, 0, 1, 2, 5, 8, 11, and 15 g/L sodium bicarbonate were added to the groundwater and 1.1, 2.8, 5.6, 8.3, 11.1, 13.9, and 16.7 g/L to the rock and groundwater. With the groundwater only, the pH was 6.5 SU, 1 g/L increased the pH to 7.1 SU, 2 g/L increased the pH to 7.4 SU, 5 g/L to 7.8 SU, 8 g/L to 7.9 SU, 11 g/L to 7.8 SU, and 15 g/L to 7.8 SU. The ORPs decreased from 88 mV to as low as -30 mV but then increased to 60 mV with exposure to the atmosphere. With the rock and groundwater, the pH was 6.8 SU, 1.1 g/L increased the pH to 6.9 SU, 2.8 g/L to 7.2 SU, 5.6 g/L to 7.6 SU, 8.3 g/L to 7.7 SU, and 11.1 g/L to 7.7 SU but the pH drifted down to 7.3 SU after 1 hour. With 13.9 and 16.7 g/L sodium bicarbonate, the pH of the groundwater and rock only increased to 7.5 SU. The ORPs decreased from 136 mV to as low as -24 mV but then increased to 118 mV with exposure to the atmosphere.

The CERES MTS 73MF2 reagent was added at loadings of 0, 0.1, 1, 10, 30, and 50 g/L to the groundwater. The pH increased from 6.4 SU to as high as 8.5 SU and the ORP decreased to -375 mV.

The CERES MTS 73MF3 reagent was added at loadings of 0, 0.1, 1, 10, 30, and 50 g/L to the groundwater. The pH increased from 6.4 SU to as high as 6.9 SU at 10 g/L but then fell to 5.3 SU at the 50 g/L loading. The ORP decreased to as low as -302 mV. After one hour at the 50 g/L loading, the pH increased to 8.6 SU and the ORP increased to -106 mV.

For the calcium oxide titrations, 0, 0.025, 0.05, 0.1, and 0.2 g/L calcium oxide were added to the groundwater and 0.028, 0.056, 0.083, and 0.111 g/L to the rock and groundwater. With the groundwater only, the pH was 6.8 to 7.1 SU, at 0.025 g/L the pH was 6.9 SU, at 0.05 g/L the pH was 6.8 SU, 0.1 g/L increased the pH to 7.3 SU, and 0.2 g/L increased the pH to 9.2 SU. The ORPs increased from -45 mV to 15 mV. With the rock and groundwater, the pH was 7.1 SU, 0.028 g/L loading had a pH of 6.9 SU, 0.083 g/L was 7.7 SU, and the 0.111 g/L loading was pH 8.9 SU. Relatively small additions of calcium oxide increased the pH greatly. The ORPs with the rock and groundwater were relatively stable.

These titrations were used in the batch tests to determine the loadings of sodium hydroxide, sodium bicarbonate, CERES MTS 73MF2, CERES MTS 73MF3, and calcium oxide.

2.6 MW-8 Titration Tests

Titrations (Table 5) were performed with the following for MW-8:

- 100 g of composite groundwater titrated with Ferric Chloride (FeCl₃) as a powder
- 100 g of composite groundwater titrated with ferric oxide (Fe₂O₃)
- 100 g of composite groundwater titrated with zero valent iron (ZVI)
- 100 g of composite groundwater titrated with CERES MTS 73MF2
- 100 g of composite groundwater titrated with CERES MTS 73MF3
- 100 g of composite groundwater titrated with calcium oxide



• 10 g rock plus 90 mL groundwater and calcium oxide

Table 5. MW-8 Titration Results

MW-8	FeCl ₃	Tation Resu					1
GW	g	100					
Reagent	g	0	0.01	0.11	1		
pH	SU	7.6	7.0	2.9	2.1		
ORP	mV	117	151	577	663		
Loading	g/L	0	0.1	1.1	10		
		0	0.1	1.1	10		
MW-8	Fe ₂ O ₃						
GW	g	100			1		
Reagent	g	0	0.01	0.1	1		
рН	SU	8.0	7.9	7.8	7.6		
ORP	mV	289	279	235	275		
Loading	g/L	0	0.1	1	10		
MW-8	ZVI						
GW	g	100					
Reagent	g	0	0.01	0.1	1		
pН	SU	7.4	7.6	7.7	7.6		
ORP	mV	163	148	148	159		
Loading	g/L	0	0.1	1	10		
		CERES MTS					
MW-8		73MF2					
GW	g	100					
Reagent	g	0	0.01	0.1	1	3	5
рН	SU	7.6	6.9	6.9	7.1	7.0	6.8
ORP	mV	275	227	-83	-423	-438	-430
Loading	g/L	0	0.1	1	10	30	50
0	8	CERES MTS					
MW-8		73MF3					
GW	g	100					
Reagent	g	0	0.01	0.1	1	3	5
рН	SU	7.8	8.1	8.2	8.8	8.2	9.9
ORP	mV	140	129	123	136	147	142
Loading	g/L	0	0.1	1	10	30	50
MW-8	g <u>E</u>	CaO	0.1	-	10	30	20
GW	g	100					
Reagent	g	0	0.005	0.010	0.015		
pH	SU	7.7	8.3	9.0	9.3		+
ORP	mV	50	15	12	12		1
Loading	g/L	0	0.05	0.1	0.15		
MW-8 + Ro	U	<u> </u>	0.03	0.1	0.13		
GW -8 + Ro		CaO 90					1
Rock	g	10			1		
Reagent	g	0	0.0025	0.005	0.0075		
	g	· ·					
pH	SU	7.3	7.9	8.5	8.9		
ORP	mV	221	206	174	160		
Loading	g/L	0	0.028	0.056	0.083		

The MW-8 groundwater had a pH of 7.6 SU. Adding 0.1 g/L FeCl₃ decreased the pH to 7.0 SU, 1.1 g/L decreased the pH to 2.9 SU, and 10 g/L decreased the pH to 2.1 SU (a 1 g/LFeCl₃ solution has a pH of 2.8 SU). The ferric chloride increased the ORP from 117 to 663 mV. Ferric chloride will require alkaline buffering to maintain the pH.

Adding 0.1 to 10 g/L Fe_2O_3 had minimal impact on the pH (7.6 to 7.9 SU) or ORP (235 to 279mV).

Adding 0.1 to 10 g/L ZVI had minimal impact on the pH (7.6 to 7.7 SU) or ORP (148 To 159 mV).



The CERES MTS 73MF2 reagent was added at loadings of 0, 0.1, 1, 10, 30, and 50 g/L to the groundwater. The pH decreased from 7.6 to as low as 6.8 SU and the ORP decreased to -430 mV.

The CERES MTS 73MF3 reagent was added at loadings of 0, 0.1, 1, 10, 30, and 50 g/L to the groundwater. The pH increased from 7.8 to as high as 9.9 SU at 50 g/L. The ORP remained stable (from 123 to 147 mV).

For the calcium oxide titrations, 0, 0.05, 0.1, and 0.15 g/L calcium oxide were added to the groundwater and 0.028, 0.056, and 0.083 were added to the rock and groundwater. With the groundwater only, the pH was 7.7 SU at 0.05 g/L the pH was 8.3 SU, 0.1 g/L increased the pH to 9.0 SU, and 0.15 g/L increased the pH to 9.3 SU. The ORPs decreased from 50 mV to 12 mV. With the rock and groundwater, the pH was 7.3 SU, 0.028 g/L loading had a pH of 7.9 SU, 0.056 g/L had a pH of 8.5 SU, and 0.083 g/L had a pH of 8.9 SU. Relatively small additions of calcium oxide increased the pH greatly. The ORPs with the rock and groundwater decreased from 221 to 160 mV.

3.0 BATCH TESTS

3.1 MW-7 Batch Reagent Selection

The bench-scale treatability study assumes that one of the following technologies can be used for in-situ remediation of the metals:

- elevated pH precipitation/sorption with sodium hydroxide
- elevated pH precipitation sorption with sodium sodium bicarbonate
- elevated pH precipitation/sorption with calcium oxide
- treatment with alkaline buffered ferrous sulfate (two formulations, low and high pH buffer) precipitation/sorption

All reagents used for the bench-scale test were commercially available products. The reagent usages and their dosages were adjusted according to the results of the activities and observations during the execution of the bench-scale treatability study. The following provides more detail on each of the reagents proposed for the bench-scale treatability testing:

- Sodium Hydroxide. Sodium hydroxide can increase the pH up to 14 SU. Three loadings of 0.022, 0.040, and 0.050 g/L sodium hydroxide were evaluated in the tests to determine the precipitation of the metals of concern in the groundwater and rock.
- Sodium Bicarbonate: Sodium bicarbonate can increase the pH up to about 8.3 SU. Three loadings of 0.5, 5.0, and 15 g/L sodium bicarbonate were evaluated in the tests to determine the precipitation of the metals of concern in the groundwater and rock.
- CERES MTS 73MF2 alkaline buffered ferrous sulfate. May include zeolite ion exchange, calcium carbonate, magnesium oxide, magnesium hydroxide, ferrous sulfate, iron powder, activated carbon, sulfide complex, and phosphate complex. Three loadings of 10, 30.0, and 50 g/L CERES MTS 73MF2 were evaluated in the tests to determine the precipitation of the metals of concern in the groundwater and rock. This is a solid reagent with more limited solubility.
- CERES MTS 73MF3 alkaline buffered ferrous sulfate. May include zeolite ion exchange, calcium carbonate, magnesium oxide, magnesium hydroxide, ferrous sulfate, iron powder,



- activated carbon, sulfide complex, and phosphate complex. Three loadings of 10, 30.0, and 50 g/L CERES MTS 73MF3 were evaluated in the tests to determine the precipitation of the metals of concern in the groundwater and rock.
- Calcium Oxide: Calcium oxide can increase the pH up to about 12.5 SU. Three loadings of 0.05, 0.08, and 0.11 g/L calcium oxide were evaluated in the tests to determine the precipitation of the metals of concern in the groundwater and rock.

The batch studies used 50 g soil per bottle. The groundwater solutions were prepared with 0.55 L of composited groundwater and the reagents at the chosen dosages. The bottles were filled with the solutions. The volumes of solution needed to fill the bottles were recorded. The pH and ORP of the remaining solutions were recorded. All containers were mixed and turned daily for seven days.

Groundwater samples (the supernatants in the reactors) were analyzed for:

- dissolved arsenic, calcium, cobalt, iron, magnesium, manganese, molybdenum, potassium, selenium, silicon, and sodium by EPA Method 6010D inductively coupled plasma mass spectrometry (ICP/MS)
- dissolved lithium by EPA Method 6010D ICP

Eurofins Lancaster Laboratories (ELLE) conducted the metals analyses. The pH, ORP, DO, bicarbonate alkalinity, total hardness, ferrous iron, total suspended solids, total dissolved solids, specific conductivity, and sulfide were conducted by TSI using calibrated meters and Hach procedures. The volumes were adjusted to account for required dilutions and volumes of water available.

3.2 MW-7 Batch Results

Table 6 presents the results of the MW-7 batch testing. The initial characterization sample had a pH of 6.0 SU, ORP of 132 mV, DO of 7.1 mg/L, specific conductivity of 410 $\mu S/cm$, 80 mg/L alkalinity, 260 mg/L hardness, 5.42 mg/L ferrous iron, and 0.08 mg/L sulfide. Dissolved arsenic was 0.0325 mg/L, dissolved cobalt 0.0521 mg/L, and dissolved lithium of 0.0689 mg/L. Molybdenum was 0.000138 mg/L and selenium was not detected. The control solution on Day 0 had a pH of 6.4 SU and ORP of 105 mV. After the addition of the 8.8% rock, the pH increased to 6.7 SU and the ORP decreased to 35 mV. By Day 7, the pH was 6.6 SU, the ORP was 204 mV, DO 9.4 mg/L, specific conductivity was 1,560 $\mu S/cm$, alkalinity was 80 mg/L, hardness of 180 mg/L, and ferrous iron and sulfide were not detected. Arsenic had decreased to 0.00383 mg/L (below the GA GWPS) likely due to the aerobic incubation conditions. Elevated levels of dissolved cobalt (0.0729 mg/L) and lithium (0.0696 mg/L) remained above the GA GWPS. Calcium, magnesium, silicon increased from the initial characterization samples. Dissolved iron, potassium, and sodium were lower with manganese showing little change.

With the sodium hydroxide treatments, solution loadings ranged from 0.02 to 0.05 g/L or 0.22 to 0.55 g/kg rock. The solution pHs on Day 0 increased from 6.4 to 8.8 SU with ORPs of 74 to 97 mV. The Day 0 pH with the rock and groundwater increased from 6.8 to 8.3 SU. The Day 0 ORPs with the rock and groundwater were mildly oxidizing (23 to 78 mV). By Day 7, the pHs had fallen to between 6.8 and 7.3 SU. Mildly oxidizing conditions were found (168 to 195 mV). The DO ranged from 8.5 to 9.5 mg/L. Specific conductivity increased slightly to between 1,601 to 1,626



μS/cm due to the sodium ions. Bicarbonate alkalinity ranged from 120 to 180 mg/L as CaCO₃. Hardness ranged from 80 and 220 mg/L as CaCO₃. Ferrous iron ranged from <0.05 to 0.9 mg/L. No sulfide was detected. Dissolved arsenic decreased from 0.00383 mg/L in Control Day 7 to between 0.00157 to 0.0027 mg/L, below the GA GWPS in all sodium hydroxide loadings. Cobalt ranged from 0.0365 to 0.0835 mg/L, above the GW GWPS. Lithium (0.0689 to 0.0791 mg/L) was not impacted by the sodium hydroxide and remained above the GA GWPS. Little dissolved molybdenum was detected. Selenium was not detected in the sodium hydroxide treatments. Little dissolved iron was detected. Calcium, magnesium, manganese, potassium, and silicon were unchanged but sodium increased slightly.

With the sodium bicarbonate, solution loadings ranged from 0.5 to 15 g/L or 5.5 to 165 g/kg rock. The solution pHs on Day 0 increased from 6.9 to 8.1 SU with ORPs of 35 to 84 mV. The Day 0 pH with the rock and groundwater increased from 7.0 to 7.6 SU. The Day 0 ORPs with the rock and groundwater were mildly reducing (-28 to 6 mV). By Day 7, the pHs had fallen to between 7.1 and 7.6 SU. Mildly oxidizing conditions were found (194 to 220 mV). The DO ranged from 7.1 to 9.6 mg/L. Specific conductivity increased to between 1,826 to 11,800 µS/cm due to the sodium and bicarbonate ions. Bicarbonate alkalinity ranged from 400 to 10,800 mg/L as CaCO₃. Hardness was elevated at between 180 and 420 mg/L as CaCO₃. Ferrous iron and sulfide were not detected. Dissolved arsenic decreased from 0.00383 mg/L in Control Day 7 to between 0.00242 to 0.00515 mg/L, below the GA GWPS in all sodium bicarbonate loadings. Cobalt ranged from 0.00965 to 0.0655 mg/L, still above the GW GWPS. Lithium (0.0532 to 0.0705 mg/L) was not impacted by the sodium bicarbonate and remained above the GA GWPS. Little dissolved molybdenum was detected. Selenium was not detected in the NaHCO3 treatments. Little dissolved iron was detected. Dissolved manganese decreased from 11.0 mg/L in Control Day 7 to between 12.0 and 0.148 mg/L as the sodium bicarbonate loadings increased. Dissolved calcium decreased from 300 to 53.5 mg/L. Dissolved magnesium, potassium, and silicon were largely unchanged but sodium increased to as high as 3,870 mg/L.

With the CERES MTS 73MF2 reagent incubated for seven days, the loadings ranged from 10.0 to 50 g/L or 110 to 550 g/kg rock. The solution pH increased from 7.6 to 8.6 SU with negative -304 to -205 mV ORPs. The Day 0 pH with the rock and groundwater ranged from 8.7 to 8.9 SU. The Day 0 ORPs were reducing (-223 to -181 mV). By Day 7, the pHs ranged between 6.7 and 8.0 SU. Reducing conditions were found (-171 to -93 mV). The DO ranged from 1.3 to 2.7 mg/L. Specific conductivity increased to between 3,240 to 6,140 µS/cm due to the reagent. Bicarbonate alkalinity was low; 80 to 480 mg/L as CaCO₃. Hardness increased from 1,920 to 7,200 mg/L as CaCO₃. Ferrous iron increased from 0.8 to 41 mg/L. No sulfide was detected. Dissolved arsenic decreased from 0.00996 at the 10 g/L loading to 0.000803 mg/L at the 50 g/L loading. All CERES MTS 73MF2 treatments had dissolved arsenic below the GA GWPS. Cobalt ranged from 0.000248 (below the GA GWPS) at the 10 g/L loading to 0.00751 mg/L at the 30 g/L loading to 0.0213 mg/Lat the 50 g/L loading, both above the GA GWPS. Lithium increased from 0.0805 to 0.166 mg/L (higher than the Control Day 7) and remained above the GA GWPS. Dissolved molybdenum ranged from 0.000274 mg/L to 0.000425 mg/L (below the GA GWPS). Selenium was not detected. Dissolved manganese increased from 1.9 mg/L to 10.6 mg/L. Dissolved iron increased from 0.0871 mg/L to 248 mg/L as the CERES MTS 73MF2 loading increased. Calcium, magnesium, and sodium increased with the CERES MTS 73MF2 loadings. Potassium showed little change but



silicon was much lower (0.541 to 0.901 mg/L) the Control Day 7. Sodium increased from 44.7 to 92.1 mg/L.

With the CERES MTS 73MF3 reagent incubated for seven days, the loadings ranged from 10 to 50 g/L or 110 to 550 g/kg rock. The solution pH increased from 6.2 to 10.1 SU with positive ORPs of 110 to 350 mV. The Day 0 pH with the rock and groundwater ranged from 6.9 to 7.3 SU. The Day 0 ORPs were mildly oxidizing (212 to 235 mV). By Day 7, the pHs had ranged between 8.1 and 8.9 SU. Mildly oxidizing conditions were found (102 to 143 mV). The DO ranged from 3.4 to 6.1 mg/L. Specific conductivity increased to between 1,920 to 4,800 µS/cm due to the reagent. Bicarbonate alkalinity was low; 120 to 240 mg/L as CaCO₃. Hardness increased from 1,920 to 4,800 mg/L as CaCO₃. Ferrous iron was 2.35 to 6.0 mg/L. Only a trace level of sulfide (0.01 mg/L) was detected at the 50 g/L loading. Dissolved arsenic ranged from 0.00195 mg/L to 0.00351 mg/L; all below the GA GWPS. Cobalt ranged from 0.00018 to 0.000487 mg/L, well below the GA GWPS. Lithium increased from 0.0838 to 0162 mg/L (above the Control Day 7) and all were above the GA GWPS. Dissolved molybdenum ranged from <0.000134 mg/L to 0.00512 mg/L (below the GA GWPS). Selenium was not detected. Dissolved manganese decreased to <0.00979 to 0.00755 mg/L. Little dissolved iron was detected. Calcium and magnesium increased with the CERES MTS 73MF3 loadings. Potassium and sodium showed little change but silicon was much lower (<0.117 to 3.23 mg/L) the Control Day 7.

With the calcium oxide, solution loadings ranged from 0.05 to 0.11 g/L or 0.55 to 1.1 g/kg rock. The solution pHs on Day 0 increased from 7.8 to 8.4 SU with ORPs of 167 to 229 mV. The Day 0 pH with the rock and groundwater increased from 7.4 to 8.7 SU. The Day 0 ORPs with the rock and groundwater were mildly oxidizing (140 to 215 mV). By Day 7, the pHs had fallen to between 8.2 and 8.4 SU. Mildly oxidizing conditions were found (107 to 110 mV). The DO ranged from 6.1 to 8.2 mg/L. Specific conductivity increased slightly to between 1,016 to 1,084 μS/cm due to the calcium ions. Bicarbonate alkalinity ranged from 120 to 160 mg/L as CaCO₃. Hardness ranged from 80 and 160 mg/L as CaCO₃. Ferrous iron ranged from 0.15 to 1.3 mg/L. Only trace sulfide was detected. Dissolved arsenic decreased from 0.00383 mg/L in the Control Day 7 to between 0.000886 to 0.00247 mg/L, below the GA GWPS in all calcium oxide loadings. Cobalt ranged from 0.0245 to 0.0532 mg/L, above the GW GWPS. Lithium (0.0670 to 0.0682 mg/L) was not impacted by the calcium oxide and remained above the GA GWPS. Little dissolved molybdenum was detected. Selenium was not detected in the sodium hydroxide treatments. Little dissolved iron was detected. Dissolved manganese decreased slightly at the higher calcium oxide loadings. Calcium, magnesium, potassium, and silicon were higher.

Table 7 summarizes the percent removal from Control Day 7. Negative numbers mean increases from Control Day 7. > means the compound was not detected on Day 7 in the treatment; the detection limit was used in calculation. Results in green were reduced to below the GA GWPS. Results in yellow are reduced by 50% or more from the Control Day 7. All treatments reduced arsenic to below the GA GWPS. Only the 10 g/L CERES MTS 73MF2, and 10-50 g/L CERES MTS 73MF3 reagents reduced cobalt to below the GA GWPS. No treatments reached the GA GWPS for lithium with increased lithium over the Control Day 7with the CERES MTS 73MF2 and CERES MTS 73MF3 reagents. Molybdenum and selenium were below the GA GWPS in the initial characterization and all treatment samples. No treatments reduced all CCR metals of concern in MW-7 to below the GA GWPS.



Table 8 summarizes the analyses of the sodium hydroxide and sodium bicarbonate reagents for total metals. The 10 g/L sodium bicarbonate and 0.5 g/L sodium hydroxide did not have any metals above the GA GWPS, in contrast there was detectable iron, manganese, molybdenum and cobalt in the 10 g/L NaHCO3 treatment. The calcium oxide, CERES MTS 73MF2, and CERES MF3 reagents were not analyzed for total metals.



Table 6. MW-7 Batch Treatments Results

		GA GWPS	IC	Control	0.02 g/L NaOH	0.036 g/L NaOH	0.050 g/L NaOH	0.5 g/L NaHCO3	5.0 g/L NaHCO3	15 g/L NaHCO3	10 g/L CERES MTS 73MF2	30 g/L CERES MTS 73MF2	50 g/L CERES MTS 73MF2
Rock	g			50	50	50	50	50	50	50	50	50	50
Groundwater for Solution	g			550	550	550	550	550	550	550	550	550	550
Reagent	g			0	0.044	0.080	0.11	0.275	2.8	8.25	5.5	16.5	27.5
Solution pH	SU			6.4	6.4	7.8	8.8	6.9	7.8	8.1	7.8	7.7	8.6
Solution ORP	mV			105	97	95	74	54	35	84	-250	-205	-304
Volume Solution	g			513.6	512.5	512.2	508.0	512.4	514.2	518.8	514.7	526.3	526.0
Reagent Concentration	g/kg			0	0.220	0.400	0.550	5.50	55.00	165.00	110.00	330.00	550.00
Reagent Concentration	g/L			0	0.020	0.036	0.050	0.50	5.00	15.00	10.00	30.00	50.00
% Rock	%			8.9	8.9	8.9	9.0	8.9	8.9	8.8	8.9	8.7	8.7
Rock + Solution pH	SU			6.7	6.8	7.5	8.3	7.0	7.6	7.4	7.3	6.8	7.1
Rock + Solution ORP	mV			35	23	78	57	-28	-13	6	-223	-181	-190
Day				7	7	7	7	7	7	7	7	7	7
pН	SU		6.0	6.6	6.8	6.9	7.3	7.1	7.2	7.6	8.0	7.1	6.7
ORP	mV		132	204	195	188	168	194	220	216	-93	-171	-158
DO	mg/L		7.1	9.4	8.5	9.5	9.5	9.6	8.9	7.1	2.7	1.7	1.3
Specific Conductivity	uS/cm		410	1560	1615	1626	1601	1826	5210	1180	3240	4790	6140
Bicarbonate Alkalinity as													
CaCO3	mg/L		80	80	120	140	180	400	1920	10800	240	480	80
Hardness as CaCO3	mg/L		260	180	80	100	220	180	420	360	1920	4200	7200
Ferrous Iron	mg/L		5.42	< 0.05	0.20	< 0.05	0.9	< 0.05	< 0.05	< 0.05	0.80	15.4	41
Sulfide	mg/L		0.08	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
ELLE Results													
Dissolved Arsenic	mg/L	0.010	0.0325	0.00383	0.00227	0.00219	0.00157	0.00261	0.00242	0.00515	0.000996	0.000959	0.000803
Dissolved Cobalt	mg/L	0.0060	0.0521	0.0729	0.0835	0.0749	0.0365	0.0655	0.00935	0.0186	0.000248	0.00751	0.0213
Dissolved Iron	mg/L		4.820	0.215	0.0563	0.0444	0.0443	0.0587	0.0282	0.214	0.0871	78.3	248
Dissolved Lithium	mg/L	0.04	0.0689	0.0696	0.0791	0.0791	0.0689	0.0705	0.0692	0.0532	0.0805	0.130	0.166
Dissolved Manganese	mg/L		12.60	11	12.8	12	10.6	12.7	0.103	0.148	1.9	5.08	10.6
Dissolved Molybdenum	mg/L	0.100	0.000138	0.000420	0.000487	0.00031	0.000433	0.000266	0.000442	0.000956	0.000425	0.000342	0.000274
Dissolved Selenium	mg/L	0.05	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286
Dissolved Calcium	mg/L		152	297	297	302	294	300	90.3	53.5	235	354	422
Dissolved Magnesium	mg/L		8.94	77.5	77.2	76.5	77.7	76.4	73.3	73.8	338	617	992
Dissolved Potassium	mg/L		46	17.1	17.6	11.4	11.1	12.8	15.7	32.4	11.4	13	14.9
Dissolved Silicon	mg/L		9.46	69.8	66.8	68.5	62.7	71	69.6	65.5	0.541	0.901	0.685
Dissolved Sodium	mg/L		64.3	29.1	54.4	57.1	77.8	163	1390	3870	44.7	68.7	92.1

GA GWPS = Georgia Groundwater Performance Standard

0.022 Exceeds GA GPWS

0.039 J value. Compound detected above method detection limit but below method calibration limit.

0.0729 Compound detected in blank



Table 6. MW-7 Batch Treatments Results

		GA			10 g/L CERES MTS	30 g/L CERES MTS	50 g/L CERES MTS	0.05 g/L	0.08 g/L	0.11 g/L
p. 1		GWPS	IC	Control	73MF3	73MF3	73MF3	CaO	CaO	CaO
Rock	g			50	50	50	50	50	50	50
Groundwater for Solution	g			550	550	550	550	550	550	550
Reagent	g			0	5.5	16.5	27.5	0.0275	0.044	0.055
Solution pH	SU			6.4	6.2	9.4	10.1	7.8	8.3	8.4
Solution ORP	mV			105	153	110	350	229	190	167
Volume Solution	g			513.6	517.3	517.3	529.0	516	514.4	514.6
Reagent Concentration	g/kg			0	110.00	330.00	550.00	0.55	0.88	1.1
Reagent Concentration	g/L			0	10.00	30.00	50.00	0.05	0.080	0.11
% Rock	%			8.9	8.8	8.8	8.6	8.8	8.9	8.9
Rock + Solution pH	SU			6.7	7.3	7.0	6.9	7.4	8.1	8.7
Rock + Solution ORP	mV			35	235	233	212	215	194	140
Day				7	7	7	7	7	7	7
pН	SU		6.0	6.6	8.1	8.5	8.9	8.4	8.2	8.2
ORP	mV		132	204	143	120	102	107	109	110
DO	mg/L		7.1	9.4	6.1	5.1	3.4	8.2	8.2	6.1
Specific Conductivity	uS/cm		410	1560	1757	4160	5370	1016	1084	1083
Bicarbonate Alkalinity as CaCO3	mg/L		80	80	240	120	240	160	160	120
Hardness as CaCO3	mg/L		260	180	1920	3600	4800	80	160	120
Ferrous Iron	mg/L		5.42	< 0.05	2.35	2.7	6.0	0.55	1.3	0.15
Sulfide	mg/L		0.08	< 0.01	< 0.01	< 0.01	0.01	< 0.01	0.02	< 0.01
ELLE Results										
Dissolved Arsenic	mg/L	0.010	0.0325	0.00383	0.00200	0.00195	0.00351	0.00141	0.00247	0.000886
Dissolved Cobalt	mg/L	0.0060	0.0521	0.0729	0.00018	0.000487	0.000201	0.0532	0.0291	0.0245
Dissolved Iron	mg/L		4.820	0.215	0.0512	0.095	0.115	0.0677	0.0736	0.0786
Dissolved Lithium	mg/L	0.04	0.0689	0.0696	0.0838	0.12	0.162	0.0670	0.0671	0.0682
Dissolved Manganese	mg/L		12.60	11	0.00755	< 0.00979	0.00538	11.6	7.97	6.27
Dissolved Molybdenum	mg/L	0.100	0.000138	0.000420	< 0.000134	0.000512	0.000168	0.00042	0.000452	0.000515
Dissolved Selenium	mg/L	0.05	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286
Dissolved Calcium	mg/L		152	297	270	336	409	317	325	318
Dissolved Magnesium	mg/L		8.94	77.5	354	585	826	76.0	77.2	69.2
Dissolved Potassium	mg/L		46	17.1	11.9	12.3	13.8	15.6	13.8	14.9
Dissolved Silicon	mg/L		9.46	69.8	3.23	0.644	< 0.117	63.3	60.3	58.0
Dissolved Sodium	mg/L		64.3	29.1	34.2	34.2	37.2	29.4	28.8	28.3

GA GWPS = Georgia Groundwater Performance Standard

0.022 Exceeds GA GPWS

0.039 J value. Compound detected above method detection limit but below method calibration limit.

0.0729 Compound detected in blank



Table 7. Percent Removals of Dissolved Metals from Day 7 Controls

							10 g/L	30 g/L	50 g/L	10 g/L	30 g/L	50 g/L			
							CERES	CERES	CERES	CERES	CERES	CERES	0.05	0.08	0.11
	0.02 g/L	0.036 g/L	0.050 g/L	0.5 g/L	5.0 g/L	15 g/L	MTS	MTS	MTS	MTS	MTS	MTS	g/L	g/L	g/L
ELLE Results	NaOH	NaOH	NaOH	NaHCO3	NaHCO3	NaHCO3	73MF2	73MF2	73MF2	73MF3	73MF3	73MF3	CaO	CaO	CaO
Dissolved Arsenic	40.7	42.8	59.0	31.9	36.8	-34.5	74.0	75.0	79.0	47.8	49.1	8.4	63.2	35.5	76.9
Dissolved Cobalt	-14.5	-2.7	49.9	10.2	87.2	74.5	99.7	89.7	70.8	99.8	99.3	99.7	27.0	60.1	66.4
Dissolved Lithium	-13.6	-13.6	1.0	-1.3	0.6	23.6	-15.7	-86.8	-138.5	-20.4	-72.4	-132.8	3.7	3.6	2.0
Dissolved Molybdenum	-16.0	26.2	-3.1	36.7	-5.2	-127.6	-1.2	18.6	34.8	>68.1	-21.9	60.0	0.0	-7.6	-22.6
Dissolved Selenium															

Table 8. Reagent Total Metals

			0.5 g/L	10 g/L
Reagent		GA GWPS	NaOH	NaHCO3
Total Arsenic	mg/L	0.010	< 0.00068	< 0.00068
Total Cobalt	mg/L	0.032	< 0.000156	0.000259
Total Iron	mg/L		0.433	0.367
Total Lithium	mg/L	0.040	< 0.011	< 0.011
Total Manganese	mg/L		0.0143	0.00948
Total Molybdenum	mg/L	0.10	0.000149	0.000584



3.3 MW-8 Batch Reagent Selection

The bench-scale treatability study assumes that one of the following technologies can be used for in-situ remediation of the elevated cobalt and molybdenum found in the MW-8 groundwater:

- precipitation with ferric chloride (FeCl₃)
- adsorption with ferric oxide (Fe₂O₃)
- adsorption with zero valent iron (ZVI)
- elevated pH precipitation with calcium oxide
- treatment with alkaline buffered ferrous sulfate (two formulations)

All reagents used for the bench-scale test were commercially available products. The reagent usages and their dosages were adjusted according to the results of the activities and observations during the execution of the bench-scale treatability study. The following provides more detail on each of the reagents proposed for the bench-scale treatability testing:

- Ferric Chloride (FeCl₃). Alfar Aesar crystalline anhydrous ferric chloride was added to promote the precipitation of the metals. Three loadings of 0.1, 1.0, and 2.5 g/L ferric chloride were evaluated in the tests to determine the precipitation of the metals of concern in the groundwater and rock. Ferric chloride is acidic so the pH was adjusted to neutral with 25% sodium hydroxide and 5% hydrochloric acid.
- Ferric Oxide (Fe₂O₃): Sigma Aldrich ferric oxide (Fe₂³⁺O₂) can adsorb the metals. Three loadings of 0.1, 1.0, and 2.5 g/L ferric oxide were evaluated in the tests to determine the adsorption of the metals of concern in the groundwater and rock.
- Zero valent iron (ZVI): CERES 4 µm ultrafine powder ZVI can adsorb the metals. Three loadings of 0.1, 1.0, and 2.5 g/L ZVI were evaluated in the tests to determine the adsorption of the metals of concern in the groundwater and rock.
- CERES MTS 73MF2 alkaline buffered ferrous sulfate. May include zeolite ion exchange, calcium carbonate, magnesium oxide, magnesium hydroxide, ferrous sulfate, iron powder, activated carbon, sulfide complex, and phosphate complex. Three loadings of 10, 30.0, and 50 g/L CERES MTS 73MF2 were evaluated in the tests to determine the precipitation of the metals of concern in the groundwater and rock.
- CERES MTS 73MF3 alkaline buffered ferrous sulfate. May include zeolite ion exchange, calcium carbonate, magnesium oxide, magnesium hydroxide, ferrous sulfate, iron powder, activated carbon, sulfide complex, and phosphate complex. Three loadings of 10, 30.0, and 50 g/L CERES MTS 73MF3 were evaluated in the tests to determine the precipitation of the metals of concern in the groundwater and rock.
- Calcium Oxide: Calcium oxide can increase the pH up to about 12.5 SU. Three loadings of 0.013, 0.018, and 0.053 g/L calcium oxide were evaluated in the tests to determine the precipitation of the metals of concern in the groundwater and rock.

The batch studies used 50 g soil per bottle. The groundwater solutions were prepared with 0.55 L of composited groundwater and the reagents at the chosen dosages. The bottles were filled with the solutions. The volumes of solution needed to fill the bottles were recorded. The pH and ORP of the remaining solutions were recorded. All containers were mixed and turned daily for seven days.



Groundwater samples (the supernatants in the reactors) were analyzed for:

- dissolved arsenic, calcium, cobalt, iron, magnesium, manganese, molybdenum, potassium, selenium, silicon, and sodium
- dissolved lithium

Eurofins Lancaster Laboratories (ELLE) conducted metals analyses. The pH, ORP, dissolved oxygen (DO), bicarbonate alkalinity, total hardness, ferrous iron, total suspended solids, total dissolved solids, specific conductivity, and sulfide were conducted by TSI using calibrated meters and Hach procedures.

3.3 MW-8 Batch Results

Table 9 presents the results of the MW-8 batch testing. The initial characterization sample had a pH of 7.2 SU, ORP of 136 mV, dissolved oxygen of 10.7 mg/L, specific conductivity of 699 μ S/cm, 260 mg/L alkalinity, 300 mg/L hardness, 0.22 mg/L ferrous iron, and 0.02 mg/L sulfide. Dissolved arsenic was 0.0033 mg/L, dissolved cobalt 0.00639 mg/L, and dissolved molybdenum of 0.16 mg/L (cobalt and molybdenum above the GA GWPS). Dissolved lithium was 0.0116 mg/L. Selenium was not detected. The control solution on Day 0 had a pH of 7.8 SU and ORP of 165 mV. After the addition of the 8.9% rock, the pH increased to 7.8 SU and the ORP increased to 223 mV. By Day 7, the pH was 8.0 SU, the ORP was 129 mV, dissolved oxygen was 9.0 mg/L, specific conductivity was 659 μ S/cm, alkalinity was 240 mg/L, hardness was 280 mg/L, ferrous iron was 0.3 mg/L and sulfide was 0.01 mg/L. Arsenic had fallen to 0.000873 mg/L likely due to the aerobic incubation conditions. Dissolved cobalt fell to 0.00242 mg/L (below the GA GWPS) and lithium was non-detect. Molybdenum remained elevated at 0.163 mg/L above the GA GWPS. Calcium, iron, magnesium, and sodium decreased from the initial characterization samples. Dissolved manganese, potassium, and silicon showed little change.

With the powdered ferric chloride treatments, the loadings in the solutions ranged from 0.1 to 2.5 g/L or 1.1 to 27.5 g/kg rock. The solution pHs on Day 0 was 7.4 SU at the 0.1 g/L loading, 3.0 SU at the 1 g/L loading, and 2.4 g/L with the 2.5 g/L loading. The pH of the 1.0 g/L FeCl₃ solution was neutralized with 1.3 mL of 25% sodium hydroxide (0.59 g/L sodium hydroxide) and 5 mL of 5% hydrochloric acid (0.55 g/L hydrochloric acid); the pH was 7.9 SU. The pH of the 2.5 g/L FeCl₃ solution was neutralized with 3.5 mL of 25% sodium hydroxide (1.59 g/L) and 10 mL of 5% hydrochloric acid (1.0 g/L hydrochloric acid); the pH was 7.0 SU. ORPs of the solution were 203 to 227 mV. By Day 7, the pHs had fallen to between 7.0 and 7.4 SU. Mildly oxidizing conditions were found (118 to 121 mV). The DO ranged from 8.7 to 9.5 mg/L. Specific conductivity increased to between 648 to 4,560 µS/cm due to the sodium, ferric, and chloride ions. Bicarbonate alkalinity ranged from 180 to 240 mg/L as CaCO₃. Hardness ranged from 300 and 360 mg/L as CaCO₃. Ferrous iron ranged from <0.1 to 0.4 mg/L. Little sulfide was detected. Dissolved arsenic ranged from 0.0012 and 0.00132 mg/L, below the GA GWPS. Cobalt ranged from 0.00246 to 0.00405 mg/L, below the GW GWPS. Lithium was detected only at low concentrations. Molybdenum was 0.00152 to 0.00537 mg/L; below the GA GWPS, in the 1.0 and 2.5 g/L FeCl₃ treatments but was only reduced slightly to 0.105 mg/L with the 0.1 g/L loading – above the GA GWSP. Selenium was not detected in the ferric chloride treatments. Little dissolved



iron was detected. Calcium, magnesium, manganese, and potassium were unchanged but silicon decreased to as low as 3.15 mg/L and sodium increased (due to sodium hydroxide).

With the ferric oxide, solution loadings ranged from 0.1 to 2.5 g/L or 1.1 to 27.5 g/kg rock. The solution pHs on Day 0 increased from 7.2 to 7.5 SU with ORPs of 133 to 146 mV. The Day 0 pH with the rock and groundwater was 7.4 SU. The Day 0 ORPs with the rock and groundwater were mildly oxidizing (198 to 212 mV). By Day 7, the pHs were between 7.1 and 7.6 SU. Mildly oxidizing conditions were found (198 to 212 mV). The DO ranged from 9.0 to 9.4 mg/L. Specific conductivity ranged between 601 and 714 μS/cm. Bicarbonate alkalinity was 280-300 mg/L as CaCO₃. Hardness was between 300 and 360 mg/L as CaCO₃. Ferrous iron and sulfide were low. Dissolved arsenic decreased from 0.000873 mg/L in Control Day 7 to between <0.00070 to 0.000815 mg/L, below the GA GWPS. Cobalt ranged from 0.000743 to 0.00219 mg/L, below the GW GWPS. Lithium was below the GA GWPS. Dissolved molybdenum was below the GA GWPS only in the 2.5 g/L Fe₂O₃ loading (0.0843 mg/L). Selenium was not detected or very low in the ferric oxide treatments treatments. Little dissolved iron was detected. Dissolved calcium, manganese, magnesium, potassium, silicon, and sodium were largely unchanged.

With the ZVI, solution loadings ranged from 0.1 to 2.5 g/L or 1.1 to 27.5 g/kg rock. The solution pHs on Day 0 ranged from 7.6 to 7.7 SU with ORPs of 133 to 136 mV. The Day 0 pH with the rock and groundwater was 7.4 SU. The Day 0 ORPs with the rock and groundwater were mildly oxidizing (184 to 190 mV). By Day 7, the pHs ranged between 7.5 and 7.7 SU. Mildly oxidizing conditions were found (105 to 109 mV). The DO ranged from 8.4 to 9.5 mg/L. Specific conductivity ranged between 616 and 634 μS/cm. Bicarbonate alkalinity was 300 mg/L as CaCO₃. Hardness was between 300 and 360 mg/L as CaCO₃. Ferrous iron and sulfide were low. Dissolved arsenic decreased from 0.000873 mg/L in the Control Day 7 to between <0.00070 to 0.000831 mg/L, below the GA GWPS. Cobalt ranged from 0.00237 to 0.00275 mg/L, below the GW GWPS. Lithium was below the GA GWPS. Dissolved molybdenum remained above the GA GWPS in all ZVI loadings. Selenium was not detected or very low in the ZVI treatments treatments. Little dissolved iron was detected. Dissolved calcium, manganese, magnesium, potassium, silicon, and sodium were largely unchanged.

With the CERES MTS 73MF2 reagent incubated for seven days, the loadings ranged from 10.0 to 50 g/L or 110 to 550 g/kg rock. The solution pH increased from 7.5 to 8.3 SU with negative -295 to -168 mV ORPs. The Day 0 pH with the rock and groundwater ranged from 8.5 to 9.2 SU. The Day 0 ORPs were reducing (-194 to -137 mV). By Day 7, the pHs ranged between 8.5 and 9.2 SU. Reducing conditions were found (-119 to -53 mV). The DO ranged from 1.4 to 2.5 mg/L. Specific conductivity increased to between 1,628 to 5,540 μS/cm due to the reagent. Bicarbonate alkalinity was low; 60 to 120 mg/L as CaCO₃. Hardness increased from 1,200 to 4,800 mg/L as CaCO₃. Ferrous iron increased from 0.3 to 4.5 mg/L. Little sulfide was detected. Dissolved arsenic decreased to non-detect. Cobalt ranged from <0.000161 to 0.000346 mg/L (below the GA GWPS). Lithium increased from 0.0286 at the 10 g/L 73MF2 loading (below the GA GWPS) to 0.118 mg/L (higher than the Control Day 7) and were above the GA GWPS at the 30 and 50 g/L CERES MTS 73MF2 loadings. Dissolved molybdenum ranged from 0.000651 mg/L to 0.0195 mg/L (below the GA GWPS). Selenium was not detected. Dissolved manganese increased from 0.307 mg/L to 2.27



mg/L. Dissolved iron increased from 0.0889 mg/L to 2.34 mg/L. Calcium, magnesium, and sodium increased with the CERES MTS 73MF2 loadings. Potassium showed little change but silicon was much lower (<0.117 to 0.627 mg/L) than the Control Day 7. Sodium increased from 31.4 to 82.1 mg/L.

With the CERES MTS 73MF3 reagent incubated for seven days, the loadings ranged from 10 to 50 g/L or 110 to 550 g/kg rock. The solution pH ranged from 6.8 to 9.4 SU with ORPs of -92 to 432 mV. The Day 0 pH with the rock and groundwater ranged from 6.4 to 7.3 SU. The Day 0 ORPs were mildly reducing (-63 to -17 mV). By Day 7, the pHs ranged between 9.3 and 9.5 SU. Mildly reducing conditions were found (-40 to -8 mV). The DO ranged from 5.6 to 8.2 mg/L. Specific conductivity increased to between 1,131 to 3,890 µS/cm due to the reagent. Bicarbonate alkalinity was low; 120 mg/L as CaCO₃. Hardness increased from 960 to 2,400 mg/L as CaCO₃. Ferrous iron was <0.05 to 0.50 mg/L. Only a trace level of sulfide (0.03 mg/L or less) was detected. Dissolved arsenic ranged from 0.000705 mg/L to 0.000721 mg/L; all below the GA GWPS. Cobalt was <0.000161 mg/L, well below the GA GWPS. Lithium increased from 0.0208 mg/L at the 10 g/L CERES MTS 73MF3 loading to 0.0685 mg/L (above the Control Day 7); the 30 and 50 g/L CERES MTS 73MF3 treatments were above the GA GWPS and elevated over the Control Day 7. Dissolved molybdenum ranged from 0.000426 mg/L to 0.0204 mg/L (below the GA GWPS). Selenium was not detected. Dissolved manganese decreased to between 0.00305 to 0.00563 mg/L. Little dissolved iron was detected. Calcium and magnesium increased with the CERES MTS 73MF3 loadings. Potassium and sodium showed little change but silicon was much lower (<0.117 to 3.23 mg/L) than the Control Day 7.

With the calcium oxide, solution loadings ranged from 0.013 to 0.053 g/L or 0.14 to 0.55 g/kg rock. The solution pHs on Day 0 increased from 7.8 to 9.0 SU with ORPs of 188 to 208 mV. The Day 0 pH with the rock and groundwater ranged from 7.7 to 7.9 SU. The Day 0 ORPs with the rock and groundwater were mildly reducing to oxidizing (-25 to 170 mV). By Day 7, the pHs had increased to between 8.4 and 9.0 SU. Mildly oxidizing conditions were found (10 to 38 mV). The DO ranged from 7.5 to 9.2 mg/L. Specific conductivity ranged between 534 to 597 μ S/cm. Bicarbonate alkalinity was 300 mg/L as CaCO3. Hardness ranged from 240 and 400 mg/L as CaCO3. Ferrous iron ranged from <0.05 to 0.35 mg/L. Only trace sulfide was detected. Dissolved arsenic decreased from 0.000873 mg/L in Control Day 7 to between <0.00070 to 0.000991 mg/L, below the GA GWPS in all calcium oxide loadings. Cobalt ranged from 0.00127 to 0.00297 mg/L, below the GW GWPS. Lithium was not detected in the calcium oxide treatments. Molybdenum ranged from 0.164 to 0.169 mg/L; above the GA GWPS. Selenium was not detected in the calcium oxide treatments. Little dissolved iron was detected. Dissolved manganese increased slightly at the higher calcium oxide loadings. Calcium, magnesium, potassium, silicon, and sodium were unchanged.

Table 10 summarizes the percent removal from the Control Day 7 for MW-8. Negative numbers mean increases from Control Day 7. > means the compound was not detected on Day 7 in the treatment; the detection limit was used in calculation. Results in green were reduced to below the GA GWPS. Results in yellow are reduced by 50% or more from the Control Day 7. All treatments reduced arsenic to below the GA GWPS. The groundwater and all treatments had arsenic levels



below the GA GWPS. All treatments reduced cobalt to below the GA GWPS. The groundwater was below the GA GWPS for lithium however increased lithium over the Control Day 7 with the 30 and 50 g/L CERES MTS 73MF2 and 30 and 50 g/L CERES MTS 73MF3 reagents. The following treatments reduced molybdenum were the 1-2.5 g/L ferric chloride, 2.5 g/L ferric oxide, 10-50 g/L CERES MTS 73MF2, and 10-50 g/L CERES MTS 73MF3. Selenium was low in all treatments. The following treatments reduced the CCR metals of concern in MW-8 to below the GA GWPS: 1-2.5 g/L ferric chloride, 2.5 g/L ferric oxide, and 10 g/L CERES MTS 73MF3.

Sincerely,

TERRA SYSTEMS, INC.

Michael D. Lee, Ph.D.

Vice-President Research and Development

michael I lee, PRI.



Table 9. MW-8 Batch Results

		GA GWPS	IC	Control	0.1 g/L FeCl3	1.0 g/L FeCl3	2.5 g/L FeCl3	0.1 g/L Fe2O3	1.0 g/L Fe2O3	2.5 g/L Fe2O3	0.1 g/L ZVI	1.0 g/L ZVI	2.5 g/L ZVI
Rock	g			50	50	50	50	50	50	50	50	50	50
Groundwater for Solution	g			550	550	550	550	550	550	550	550	550	550
Reagent	g			0	0.055	0.55	1.375	0.055	0.55	1.375	0.055	0.55	1.375
Solution pH	SU			7.8	7.4	3.0	2.4	7.2	7.5	7.5	7.6	7.6	7.7
Solution ORP	mV			165	152			146	134	133	133	135	136
Volume Solution	g			513	514.2	514.4	511.9	513.0	515.4	515.9	513.2	515.1	518.8
Reagent Concentration	g/kg			0	1.10	11.00	27.50	1.10	11.00	27.50	1.10	11.00	27.50
Reagent Concentration	g/L			0	0.10	1.00	2.50	0.10	1.00	2.50	0.10	1.00	2.50
25% NaOH	mL					1.3	3.5						
5% HCl	mL					5	10						
% Rock	%			8.9	8.9	8.9	8.9	8.9	8.8	8.8	8.9	8.8	8.8
Rock + Solution pH	SU			7.8	6.8	7.9	7.0	7.4	7.4	7.4	7.4	7.4	7.4
Rock + Solution ORP	mV			223	227		203	212	201	198	190	190	184
Day				7	7	7	7	7	7	7	7	7	7
pН	SU		7.2	8.0	7.4	7.1	7.0	7.4	7.5	7.6	7.6	7.7	7.5
ORP	mV		136	129	121	121	118	91	99	105	105	107	109
DO	mg/L		10.7	9.0	9.5	8.7	8.7	9.0	9.2	9.4	9.5	8.7	8.4
Specific Conductivity	uS/cm		699	659	648	1992	4560	714	601	609	616	619	634
Bicarbonate Alkalinity as CaCO3	mg/L		260	240	240	180	180	280	300	300	300	300	300
Hardness as CaCO3	mg/L		300	280	320	360	300	300	300	360	360	300	360
Ferrous Iron	mg/L		0.22	0.3	< 0.1	0.4	< 0.1	0.1	< 0.1	< 0.1	< 0.05	0.1	< 0.1
Sulfide	mg/L		0.02	0.01	0.02	< 0.01	< 0.01	0.02	< 0.01	0.01	0.08	0.07	0.01
ELLE Results													
Dissolved Arsenic	mg/L	0.010	0.0033	0.000873	0.00128	0.00120	0.00132	< 0.00070	0.000815	< 0.00070	0.000831	< 0.00070	0.000792
Dissolved Cobalt	mg/L	0.0060	0.00639	0.00242	0.00405	0.00246	0.00265	0.00219	0.00153	0.000743	0.00275	0.00241	0.00237
Dissolved Iron	mg/L		0.488	0.0892	0.0662	0.506	0.0293	0.0242	0.0326	< 0.0206	< 0.0206	0.0245	0.0709
Dissolved Lithium	mg/L	0.04	0.0116	< 0.0113	< 0.0113	< 0.0113	0.0162	< 0.0113	0.0113	< 0.0113	0.0150	< 0.0113	0.0115
Dissolved Manganese	mg/L		0.53	0.387	0.489	0.531	0.574	0.377	0.338	0.256	0.525	1.45	2.8
Dissolved Molybdenum	mg/L	0.100	0.16	0.163	0.105	0.00537	0.00152	0.163	0.134	0.0843	0.167	0.166	0.165
Dissolved Selenium	mg/L	0.05	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	0.000512	< 0.000286	< 0.000286	< 0.000286
Dissolved Calcium	mg/L		325	81.7	82.1	78.5	74.5	79.2	79.0	80.9	80.4	80.4	80.9
Dissolved Magnesium	mg/L		83.6	28.7	29.4	30.7	29	28.6	29.7	27.7	27.8	27.9	28.1
Dissolved Potassium	mg/L		10.4	9.77	8.35	9.26	11	8.5	8.7	8.26	8.3	8.7	8.02
Dissolved Silicon	mg/L		34.3	28	23.1	7.43	3.15	27.8	28.0	27.0	28.0	27.2	27.4
Dissolved Sodium	mg/L		30.7	18.4	18.2	332	869	18.3	18.7	17.9	17.3	18.1	18

GA GWPS = Georgia Groundwater Performance Standard

0.022 Exceeds GA GPWS
0.039

J value. Compound detected above method detection limit but below method calibration limit.

Table 9. MW-8 Batch Results



	Market British												
		GA GWPS	IC	Control	10 g/L CERES MTS 73MF2	30 g/L CERES MTS 73MF2	50 g/L CERES MTS 73MF2	10 g/L CERES MTS 73MF3	30 g/L CERES MTS 73MF3	50 g/L CERES MTS 73MF3	0.013 g/L CaO	0.018 g/L CaO	0.053 g/L CaO
Rock	g			50	50	50	50	50	50	50	50	50	50
Groundwater for Solution	g			550	550	550	550	550	550	550	550	550	550
Reagent	g			0	5.5	16.5	27.5	5.5	16.5	27.5	0.007	0.010	0.0275
Solution pH	SU			7.8	7.5	8.3	8.0	7.5	6.8	9.4	7.8	8.3	9.0
Solution ORP	mV			165	-168	-232	-295	-91	-92	432	188	190	208
Volume Solution	g			513	516.0	520.9	527.3	519.5	526.1	523.0	511.5	511.5	514.6
Reagent Concentration	g/kg			0	110.00	330.00	550.00	110.00	330.00	550.00	0.14	0.20	0.55
Reagent Concentration	g/L			0	10.00	30.00	50.00	10.00	30.00	50.00	0.013	0.018	0.053
25% NaOH	mL												
5% HCl	mL												
% Rock	%			8.9	8.8	8.8	8.7	8.8	8.7	8.7	8.9	8.9	8.9
Rock + Solution pH	SU			7.8	7.2	6.5	6.3	7.0	6.4	7.3	7.7	7.9	7.9
Rock + Solution ORP	mV			223	-194	-148	-137	-63	-20	-17	170	-13	-25
Day				7	7	7	7	7	7	7	7	7	7
pН	SU		7.2	8.0	9.2	8.7	8.5	9.3	9.4	9.5	9.0	8.4	8.4
ORP	mV		136	129	-53	-114	-119	-40	-17	-8	10	38	38
DO	mg/L		10.7	9.0	2.5	1.7	1.4	8.2	5.6	5.8	8.4	7.5	9.2
Specific Conductivity	uS/cm		699	659	1628	3920	5540	1131	2950	3890	597	550	534
Bicarbonate Alkalinity as													
CaCO3	mg/L		260	240	120	60	120	120	120	120	300	300	300
Hardness as CaCO3	mg/L		300	280	1200	3000	4800	960	2400	2400	400	240	320
Ferrous Iron	mg/L		0.22	0.3	0.40	0.3	4.5	< 0.05	0.5	0.45	0.35	< 0.05	< 0.05
Sulfide	mg/L		0.02	0.01	< 0.01	0.05	< 0.01	0.01	0.03	0.02	< 0.01	0.01	0.02
ELLE Results													
Dissolved Arsenic	mg/L	0.010	0.0033	0.000873	< 0.00070	< 0.00070	< 0.00070	0.000705	0.00071	0.000721	0.000731	0.000901	< 0.00070
Dissolved Cobalt	mg/L	0.0060	0.00639	0.00242	< 0.000161	0.000346	0.000332	< 0.000161	< 0.000161	< 0.000161	0.00127	0.00185	0.00297
Dissolved Iron	mg/L		0.488	0.0892	0.0889	2.34	0.912	0.0349	0.021	0.129	0.0286	0.0574	0.0448
Dissolved Lithium	mg/L	0.04	0.0116	< 0.0113	0.0286	0.0718	0.118	0.0208	0.0606	0.0685	< 0.0113	< 0.0113	< 0.0113
Dissolved Manganese	mg/L		0.53	0.387	0.307	1.72	2.27	0.00358	0.00305	0.00563	0.111	0.318	0.416
Dissolved Molybdenum	mg/L	0.100	0.16	0.163	0.0195	0.00292	0.000651	0.0204	0.00426	0.0125	0.164	0.167	0.169
Dissolved Selenium	mg/L	0.05	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286	< 0.000286
Dissolved Calcium	mg/L		325	81.7	53.2	178	252	20.6	117	128	68.2	82.6	80.9
Dissolved Magnesium	mg/L		83.6	28.7	231	625	1040	165	424	715	28.6	28.6	28.9
Dissolved Potassium	mg/L		10.4	9.77	9.35	10.9	12.2	8.75	10.2	10.9	8.91	8.83	8.36
Dissolved Silicon	mg/L		34.3	28	0.627	< 0.117	0.526	0.927	0.612	< 0.117	26.3	26.5	27.4
Dissolved Sodium	mg/L		30.7	18.4	31.4	57.8	82.1	19.9	23.6	22.9	18.1	18.2	17.9

GA GWPS = Georgia Groundwater Performance Standard

0.022 Exceeds GA GPWS

0.039 J value. Compound detected above method detection limit but below method calibration limit.



Table 10. MW-8 Batch Tests %Removal from Control Day 7

ELLE Results	0.1 g/L FeCl3	1.0 g/L FeCl3	2.5 g/L FeCl3	0.1 g/L Fe2O3	1.0 g/L Fe2O3	2.5 g/L Fe2O3	0.1 g/L ZVI	1.0 g/L ZVI	2.5 g/L ZVI	10 g/L CERES MTS 73MF2	30 g/L CERES MTS 73MF2	50 g/L CERES MTS 73MF2	10 g/L CERES MTS 73MF3	30 g/L CERES MTS 73MF3	50 g/L CERES MTS 73MF3	0.013 g/L CaO	0.018 g/L CaO	0.053 g/L CaO
Dissolved Arsenic	-46.6	-37.5	-51.2	>19.8	6.6	>19.8	4.8	>19.8	9.3	>19.8	>19.8	>19.8	19.2	18.7	17.4	16.3	-3.2	>19.8
Dissolved Cobalt	-67.4	-1.7	-9.5	9.5	36.8	69.3	-13.6	0.4	2.1	>33.5	85.7	86.3	>33.5	>33.5	>33.5	47.5	23.6	-22.7
Dissolved Lithium			>-43.3		0.0		>32.7		>-1.8	>-153.1	>-535.4	>-944.2	>-84.1	>-436.3	>-506.2			
Dissolved Molybdenum	35.6	96.7	99.1	0.0	17.8	48.3	-2.5	-1.8	-1.2	88.0	98.2	99.6	87.5	97.4	92.3	-0.6	-2.5	-3.7
Dissolved Selenium						>-79.0												



ATTACHMENT 1 ANALYTICAL REPORTS

ANALYTICAL REPORT

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

Generated 1/24/2023 5:42:51 PM

JOB DESCRIPTION

Stantec CCR TS II

JOB NUMBER

410-110077-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike Lancaster PA 17601

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

Marrissa Williams

Generated 1/24/2023 5:42:51 PM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246 3

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Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

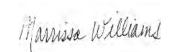
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

This report shall not be reproduced except in full, without the written approval of the laboratory.

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Client: Terra Systems Inc

Laboratory Job ID: 410-110077-1

Project/Site: Stantec CCR TS II

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-110077-1

Project/Site: Stantec CCR TS II

Qualifiers

HPLC/IC	
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.

Metals

Qualifier Qualifier Description

^2 Calibration Blank (ICB and/or CCB) is outside acceptance limits.

B Compound was found in the blank and sample.

J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation These commonly used abbreviations may or may not be present in this report.

z 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

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Case Narrative

Client: Terra Systems Inc

Job ID: 410-110077-1

Project/Site: Stantec CCR TS II

Job ID: 410-110077-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-110077-1

Receipt

The samples were received on 12/21/2022 3:16 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 1.8°C

HPLC/IC

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

Metals

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

General Chemistry

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

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Detection Summary

Client: Terra Systems Inc Job ID: 410-110077-1 Project/Site: Stantec CCR TS II

Client Sample ID: MW-7

Lab Sample ID: 410-110077-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D Method		Prep Type
Sulfate	1010		150	50.0	mg/L	100	EPA 300.0	R2.1	Total/NA
Chloride	5.02	J	7.50	3.00	mg/L	5	EPA 300.0	R2.1	Total/NA
Calcium	152000		500	96.0	ug/L	1	6010D		Total
									Recoverable
Magnesium	8940		100	40.0	ug/L	1	6010D		Total
									Recoverable
Potassium	46000		500	204	ug/L	1	6010D		Total
									Recoverable
Sodium	64300		1000	239	ug/L	1	6010D		Total
Silicon	9460		500	200	ug/L		6010D		Recoverable Total
Silicon	9400		300	200	ug/L	'	00100		Recoverable
Lithium	0.0689		0.0515	0.0113	mg/L	1	6010D		Dissolved
Arsenic	32.5		2.06	0.700	ug/L	1	6020B		Dissolved
Cobalt	52.1	B ^2	0.515	0.161	ug/L	1	6020B		Dissolved
Iron	4820	В	51.5	20.6	ug/L	1	6020B		Dissolved
Manganese	12600		20.6	9.79	ug/L	10	6020B		Dissolved
Molybdenum	0.138	J	0.515	0.134	ug/L	1	6020B		Dissolved
Total Dissolved Solids	794		120	48.0	mg/L	1	2540C - 2	015	Total/NA
Dissolved Organic Carbon	0.895	J	1.00	0.500	mg/L	1	415.1		Dissolved

Client Sample ID: MW-8

Lab Sample ID: 410-110077-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Sulfate	108		15.0	5.00	mg/L	10	EPA 300.0 R2.1	Total/NA
Chloride	5.51	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Calcium	325000		500	96.0	ug/L	1	6010D	Total Recoverable
Magnesium	83600		100	40.0	ug/L	1	6010D	Total Recoverable
Potassium	10400		500	204	ug/L	1	6010D	Total Recoverable
Sodium	30700		1000	239	ug/L	1	6010D	Total Recoverable
Silicon	34300		500	200	ug/L	1	6010D	Total Recoverable
Lithium	0.0116	J	0.0515	0.0113	mg/L	1	6010D	Dissolved
Arsenic	3.30		2.06	0.700	ug/L	1	6020B	Dissolved
Cobalt	6.39	B ^2	0.515	0.161	ug/L	1	6020B	Dissolved
Iron	488	B ^2	51.5	20.6	ug/L	1	6020B	Dissolved
Manganese	532		2.06	0.979	ug/L	1	6020B	Dissolved
Molybdenum	160		0.515	0.134	ug/L	1	6020B	Dissolved
Total Dissolved Solids	383		60.0	24.0	mg/L	1	2540C - 2015	Total/NA
Dissolved Organic Carbon	1.22		1.00	0.500	mg/L	1	415.1	Dissolved

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Terra Systems Inc Job ID: 410-110077-1

Project/Site: Stantec CCR TS II

Lab Sample ID: 410-110077-1 **Client Sample ID: MW-7**

Date Collected: 12/21/22 10:20 Matrix: Water Date Received: 12/21/22 15:16

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			01/03/23 22:03	
Sulfate	1010		150	50.0	mg/L			01/05/23 15:39	100
Chloride	5.02	J	7.50	3.00	mg/L			01/03/23 22:03	5
Method: SW846 6010D - Metals (ICF) - Total Re	coverable							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	152000		500	96.0	ug/L		01/04/23 10:37	01/10/23 21:14	1
Magnesium	8940		100	40.0	ug/L		01/04/23 10:37	01/10/23 21:14	1
Potassium	46000		500	204	ug/L		01/04/23 10:37	01/10/23 21:14	1
Sodium	64300		1000	239	ug/L		01/04/23 10:37	01/10/23 21:14	1
Silicon	9460		500	200	ug/L		01/04/23 10:37	01/10/23 21:14	1
Method: SW846 6010D - Metals (ICF) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0689		0.0515	0.0113	mg/L		01/10/23 09:29	01/16/23 17:13	1
Method: SW846 6020B - Metals (ICF	P/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	32.5		2.06	0.700	ug/L		01/10/23 09:29	01/16/23 15:52	1
Cobalt	52.1	B ^2	0.515	0.161	ug/L		01/10/23 09:29	01/16/23 15:52	1
Iron	4820	В	51.5	20.6	ug/L		01/10/23 09:29	01/16/23 15:52	1
Manganese	12600		20.6	9.79	ug/L		01/10/23 09:29	01/24/23 12:14	10
Molybdenum	0.138	J	0.515	0.134	ug/L		01/10/23 09:29	01/16/23 15:52	1
Selenium	<0.286		1.03	0.286	ug/L		01/10/23 09:29	01/16/23 15:52	1
General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	794		120	48.0	mg/L			12/23/22 10:00	1

Client Sample ID: MW-8 Lab Sample ID: 410-110077-2

RL

1.00

MDL Unit

0.500 mg/L

Date Collected: 12/21/22 10:40 **Matrix: Water** Date Received: 12/21/22 15:16

Result Qualifier

0.895 J

Method: EPA 300.0	R2.1 -	- Anions.	lon (Chromatography

Dissolved Organic Carbon

(MCAWW 415.1)

Method: EPA 300.0 R2.1 - Anions, I	on Chromato	ograpny							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			01/03/23 22:25	5
Sulfate	108		15.0	5.00	mg/L			01/03/23 22:36	10
Chloride	5.51	J	7.50	3.00	mg/L			01/03/23 22:25	5

Method: SW846 6010D - Metals	(ICP) - Total Recoverable
Analyte	Result Qualifier

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	325000		500	96.0	ug/L		01/04/23 10:37	01/10/23 21:18	1
Magnesium	83600		100	40.0	ug/L		01/04/23 10:37	01/10/23 21:18	1
Potassium	10400		500	204	ug/L		01/04/23 10:37	01/10/23 21:18	1
Sodium	30700		1000	239	ug/L		01/04/23 10:37	01/10/23 21:18	1
Silicon	34300		500	200	ug/L		01/04/23 10:37	01/10/23 21:18	1

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Prepared

Analyzed

01/04/23 21:43

Dil Fac

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-110077-1

Project/Site: Stantec CCR TS II

Client Sample ID: MW-8 Lab Sample ID: 410-110077-2

Date Collected: 12/21/22 10:40 Matrix: Water
Date Received: 12/21/22 15:16

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0116	J	0.0515	0.0113	mg/L		01/10/23 09:29	01/16/23 17:16	1
Method: SW846 6020B - Metals (ICI	P/MS) - Disse	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.30		2.06	0.700	ug/L		01/10/23 09:29	01/16/23 16:00	1
Cobalt	6.39	B ^2	0.515	0.161	ug/L		01/10/23 09:29	01/16/23 16:00	1
Iron	488	B ^2	51.5	20.6	ug/L		01/23/23 13:46	01/24/23 12:04	1
Manganese	532		2.06	0.979	ug/L		01/23/23 13:46	01/24/23 12:04	1
Molybdenum	160		0.515	0.134	ug/L		01/10/23 09:29	01/16/23 16:00	1
Selenium	<0.286		1.03	0.286	ug/L		01/10/23 09:29	01/16/23 16:00	1
General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C - 2015)	383		60.0	24.0	mg/L			12/23/22 10:00	1
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon (MCAWW 415.1)	1.22		1.00	0.500	mg/L			01/04/23 21:58	1

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077-1

Client: Terra Systems Inc Project/Site: Stantec CCR TS II Job ID: 410-110077-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-332269/5

Matrix: Water

Analysis Batch: 332269

Client Sample ID: Method Blank

Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample Dup

Client Sample ID: Method Blank

Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

мв мв Result Qualifier Dil Fac Analyte RL MDL Unit D Prepared Analyzed Fluoride <0.0900 0.200 0.0900 mg/L 01/03/23 20:57 Sulfate <0.500 1.50 0.500 mg/L 01/03/23 20:57 Chloride < 0.600 0.600 mg/L 01/03/23 20:57 1.50

Lab Sample ID: LCS 410-332269/3

Matrix: Water

Analysis Batch: 332269

Spike LCS LCS %Rec Added Analyte Result Qualifier %Rec Limits Unit D Fluoride 0.750 0.7594 mg/L 101 90 - 110 Sulfate 7.50 7.404 mg/L 99 90 - 110 Chloride 3.00 2.906 mg/L 97 90 - 110

Lab Sample ID: LCSD 410-332269/4

Matrix: Water

Analysis Batch: 332269

LCSD LCSD RPD Spike %Rec Analyte Added Result Qualifier Unit D %Rec Limits RPD Limit Fluoride 0.750 0.7572 mg/L 101 90 - 110 0 20 Sulfate 7.50 7.406 99 90 - 110 20 mg/L 0 Chloride 3.00 2.905 mg/L 97 90 - 110 0 20

Lab Sample ID: MB 410-333051/5

Matrix: Water

Analysis Batch: 333051

MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			01/05/23 13:30	1
Sulfate	<0.500		1.50	0.500	mg/L			01/05/23 13:30	1
Chloride	< 0.600		1.50	0.600	mg/L			01/05/23 13:30	1

Lab Sample ID: LCS 410-333051/3

Matrix: Water

Analysis Batch: 333051

LCS LCS Spike %Rec Analyte Added Result Qualifier Unit %Rec Limits Sulfate 7.50 7.293 97 90 - 110 mg/L 3.00 2.869 Chloride mg/L 96 90 - 110

Lab Sample ID: LCSD 410-333051/4

Matrix: Water

Analysis Batch: 333051

Analysis Buton: 666661										
	Spike	LCSD	LCSD				%Rec		RPD	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
Sulfate	7.50	7.328		mg/L		98	90 - 110	0	20	
Chloride	3.00	2.877		mg/L		96	90 - 110	0	20	

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Job ID: 410-110077-1

Prep Type: Total/NA

Prep Batch: 334000

Prep Batch: 334000

Client: Terra Systems Inc

Project/Site: Stantec CCR TS II

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-334000/1-A Client Sample ID: Method Blank

Matrix: Water

Analysis Batch: 336002

мв мв

Analyte Result Qualifier RLMDL Unit D Prepared Analyzed Dil Fac Lithium <0.0113 0.0515 0.0113 mg/L 01/10/23 09:29 01/16/23 16:28

Lab Sample ID: LCS 410-334000/2-A Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 336002

Spike LCS LCS %Rec Added Analyte Result Qualifier Unit D %Rec Limits Lithium 0.500 0.4979 mg/L 100 80 - 120

Lab Sample ID: MB 410-332457/1-A Client Sample ID: Method Blank **Matrix: Water Prep Type: Total Recoverable** Analysis Batch: 334183 Prep Batch: 332457

мв мв Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac <96.0 500 96.0 ug/L 01/04/23 10:37 01/10/23 20:27 <40.0 100 01/04/23 10:37 01/10/23 20:27 40.0 ug/L

Magnesium 500 Potassium <204 204 ug/L 01/04/23 10:37 01/10/23 20:27 Sodium <239 1000 239 ug/L 01/04/23 10:37 01/10/23 20:27 Silicon <200 500 200 ug/L 01/04/23 10:37 01/10/23 20:27

Lab Sample ID: LCS 410-332457/2-A Client Sample ID: Lab Control Sample **Matrix: Water Prep Type: Total Recoverable**

Analyte

Calcium

Analysis Batch: 334183

Prep Batch: 332457 Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits 5000 ug/L Calcium 5435 109 80 - 120 Magnesium 5000 5317 80 - 120 ug/L 106 Potassium 5000 5321 ug/L 106 80 - 120 Sodium 5000 5275 ug/L 105 80 - 120 Silicon 5000 5204 104 ug/L 80 - 120

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: LCS 410-334000/2-A **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

Matrix: Water

Analysis Batch: 336040							Prep Bat	tch: 334000
	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	500	470.8		ug/L		94	85 - 120	
Cobalt	500	492.0		ug/L		98	90 - 113	
Iron	5000	5037		ug/L		101	88 - 119	
Manganese	500	495.5		ug/L		99	89 - 120	
Molybdenum	50.0	47.51		ug/L		95	85 - 115	
Selenium	100	98.27		ug/L		98	80 - 120	

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Client: Terra Systems Inc Job ID: 410-110077-1 Project/Site: Stantec CCR TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 410-337885/1-A

Matrix: Water

Analysis Batch: 338236

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 337885

мв мв

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	29.27	J	51.5	20.6	ug/L		01/23/23 13:46	01/24/23 11:58	1
Manganese	<0.979		2.06	0.979	ug/L		01/23/23 13:46	01/24/23 11:58	1

Lab Sample ID: LCS 410-337885/2-A **Client Sample ID: Lab Control Sample**

Matrix: Water

Analysis Batch: 338236

Prep Type: Total/NA

Prep Batch: 337885

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Iron	5000	5011		ug/L	_	100	88 - 119	
Manganese	500	502.4		ug/L		100	89 - 120	

Lab Sample ID: LCSD 410-337885/3-A Client Sample ID: Lab Control Sample Dup

Matrix: Water

Analysis Batch: 338236

Prep Type: Total/NA

Prep Batch: 337885

		Spike	LCSD	LCSD				%Rec		RPD
Analyte		Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Iron		5000	4830		ug/L		97	88 - 119	4	20
Manganese		500	479.8		ug/L		96	89 - 120	5	20

Lab Sample ID: 410-110077-2 MS Client Sample ID: MW-8 **Matrix: Water Prep Type: Dissolved Prep Batch: 337885**

Analysis Batch: 338236

	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Iron	488	B ^2	5000	5625		ug/L		103	75 - 125	
Manganese	532		500	1054		ug/L		105	75 - 125	

Lab Sample ID: 410-110077-2 DU Client Sample ID: MW-8

Matrix: Water

Analysis Batch: 338236

Prep Type: Dissolved

Prep Batch: 337885

	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Iron	488	B ^2	508.3		ug/L			4	20
Manganese	532		536.1		ug/L			0.8	20

Method: 2540C - 2015 - Total Dissolved Solids (Dried at 180 °C)

Lab Sample ID: MB 410-329823/1 Client Sample ID: Method Blank

Matrix: Water

Analysis Batch: 329823

Prep Type: Total/NA

мв мв

Dil Fac Analyte Result Qualifier RL MDL Unit Prepared Analyzed Total Dissolved Solids 30.0 <12.0 12.0 mg/L 12/23/22 10:00

Lab Sample ID: LCS 410-329823/2 Client Sample ID: Lab Control Sample Prep Type: Total/NA

Matrix: Water

Analysis Batch: 329823

Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits **Total Dissolved Solids** 200 182.0 72 - 127 mg/L

Eurofins Lancaster Laboratories Environment Testing, LLC

QC Sample Results

Client: Terra Systems Inc Job ID: 410-110077-1

Project/Site: Stantec CCR TS II

Method: 415.1 - DOC

Lab Sample ID: MB 410-332727/6 Client Sample ID: Method Blank **Prep Type: Dissolved**

Matrix: Water

Analysis Batch: 332727

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon	<0.500		1.00	0.500	mg/L			01/04/23 16:07	1

Lab Sample ID: LCS 410-332727/5 **Client Sample ID: Lab Control Sample Matrix: Water Prep Type: Dissolved**

Analysis Batch: 332727

Spike LCS LCS Added Result Qualifier Unit D %Rec

MD MD

Dissolved Organic Carbon 25.0 23.75 mg/L 95 86 - 114

%Rec

Limits

QC Association Summary

Client: Terra Systems Inc Job ID: 410-110077-1 Project/Site: Stantec CCR TS II

HPLC/IC

Analysis Batch: 332269

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-110077-1	MW-7	Total/NA	Water	EPA 300.0 R2.1	
410-110077-2	MW-8	Total/NA	Water	EPA 300.0 R2.1	
410-110077-2	MW-8	Total/NA	Water	EPA 300.0 R2.1	
MB 410-332269/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-332269/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-332269/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 333051

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-110077-1	MW-7	Total/NA	Water	EPA 300.0 R2.1	
MB 410-333051/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-333051/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-333051/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Metals

Prep Batch: 332457

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-110077-1	MW-7	Total Recoverable	Water	3005A	
410-110077-2	MW-8	Total Recoverable	Water	3005A	
MB 410-332457/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 410-332457/2-A	Lab Control Sample	Total Recoverable	Water	3005A	

Prep Batch: 334000

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Prep Batch
410-110077-1	MW-7	Dissolved	Water	Non-Digest Prep
410-110077-2	MW-8	Dissolved	Water	Non-Digest Prep
MB 410-334000/1-A	Method Blank	Total/NA	Water	Non-Digest Prep
LCS 410-334000/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep

Analysis Batch: 334183

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-110077-1	MW-7	Total Recoverable	Water	6010D	332457
410-110077-2	MW-8	Total Recoverable	Water	6010D	332457
MB 410-332457/1-A	Method Blank	Total Recoverable	Water	6010D	332457
LCS 410-332457/2-A	Lab Control Sample	Total Recoverable	Water	6010D	332457

Analysis Batch: 336002

	Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
	410-110077-1	MW-7	Dissolved	Water	6010D	334000
	410-110077-2	MW-8	Dissolved	Water	6010D	334000
	MB 410-334000/1-A	Method Blank	Total/NA	Water	6010D	334000
Ĺ	LCS 410-334000/2-A	Lab Control Sample	Total/NA	Water	6010D	334000

Analysis Batch: 336040

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-110077-1	MW-7	Dissolved	Water	6020B	334000
410-110077-2	MW-8	Dissolved	Water	6020B	334000
LCS 410-334000/2-A	Lab Control Sample	Total/NA	Water	6020B	334000

Eurofins Lancaster Laboratories Environment Testing, LLC

1/24/2023

QC Association Summary

Client: Terra Systems Inc Job ID: 410-110077-1 Project/Site: Stantec CCR TS II

Metals

Prep Batch: 337885

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-110077-2	MW-8	Dissolved	Water	Non-Digest Prep	
MB 410-337885/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-337885/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	
LCSD 410-337885/3-A	Lab Control Sample Dup	Total/NA	Water	Non-Digest Prep	
410-110077-2 MS	MW-8	Dissolved	Water	Non-Digest Prep	
410-110077-2 DU	MW-8	Dissolved	Water	Non-Digest Prep	

Analysis Batch: 338236

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-110077-1	MW-7	Dissolved	Water	6020B	334000
410-110077-2	MW-8	Dissolved	Water	6020B	337885
MB 410-337885/1-A	Method Blank	Total/NA	Water	6020B	337885
LCS 410-337885/2-A	Lab Control Sample	Total/NA	Water	6020B	337885
LCSD 410-337885/3-A	Lab Control Sample Dup	Total/NA	Water	6020B	337885
410-110077-2 MS	MW-8	Dissolved	Water	6020B	337885
410-110077-2 DU	MW-8	Dissolved	Water	6020B	337885

General Chemistry

Analysis Batch: 329823

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method P	rep Batch
410-110077-1	MW-7	Total/NA	Water	2540C - 2015	
410-110077-2	MW-8	Total/NA	Water	2540C - 2015	
MB 410-329823/1	Method Blank	Total/NA	Water	2540C - 2015	
LCS 410-329823/2	Lab Control Sample	Total/NA	Water	2540C - 2015	

Analysis Batch: 332727

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-110077-1	MW-7	Dissolved	Water	415.1	
410-110077-2	MW-8	Dissolved	Water	415.1	
MB 410-332727/6	Method Blank	Dissolved	Water	415.1	
LCS 410-332727/5	Lab Control Sample	Dissolved	Water	415.1	

Client: Terra Systems Inc Project/Site: Stantec CCR TS II

Client Sample ID: MW-7

Lab Sample ID: 410-110077-1

Matrix: Water

Date Collected: 12/21/22 10:20 Date Received: 12/21/22 15:16

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		100	333051	L4QM	ELLE	01/05/23 15:39
Total/NA	Analysis	EPA 300.0 R2.1		5	332269	L4QM	ELLE	01/03/23 22:03
Dissolved	Prep	Non-Digest Prep			334000	HUH3	ELLE	01/10/23 09:29
Dissolved	Analysis	6010D		1	336002	T8CQ	ELLE	01/16/23 17:13
Total Recoverable	Prep	3005A			332457	HUH3	ELLE	01/04/23 10:37
Total Recoverable	Analysis	6010D		1	334183	S4PD	ELLE	01/10/23 21:14
Dissolved	Prep	Non-Digest Prep			334000	HUH3	ELLE	01/10/23 09:29
Dissolved	Analysis	6020B		1	336040	F7JF	ELLE	01/16/23 15:52
Dissolved	Prep	Non-Digest Prep			334000	HUH3	ELLE	01/10/23 09:29
Dissolved	Analysis	6020B		10	338236	F7JF	ELLE	01/24/23 12:14
Total/NA	Analysis	2540C - 2015		1	329823	M98K	ELLE	12/23/22 10:00 - 12/28/22 06:30
Dissolved	Analysis	415.1		1	332727	P684	ELLE	01/04/23 21:43

Client Sample ID: MW-8 Lab Sample ID: 410-110077-2

Matrix: Water

Date Collected: 12/21/22 10:40 Date Received: 12/21/22 15:16

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	332269	L4QM	ELLE	01/03/23 22:25
Total/NA	Analysis	EPA 300.0 R2.1		10	332269	L4QM	ELLE	01/03/23 22:36
Dissolved	Prep	Non-Digest Prep			334000	HUH3	ELLE	01/10/23 09:29
Dissolved	Analysis	6010D		1	336002	T8CQ	ELLE	01/16/23 17:16
Total Recoverable	Prep	3005A			332457	HUH3	ELLE	01/04/23 10:37
Total Recoverable	Analysis	6010D		1	334183	S4PD	ELLE	01/10/23 21:18
Dissolved	Prep	Non-Digest Prep			334000	HUH3	ELLE	01/10/23 09:29
Dissolved	Analysis	6020B		1	336040	F7JF	ELLE	01/16/23 16:00
Dissolved	Prep	Non-Digest Prep			337885	HUH3	ELLE	01/23/23 13:46
Dissolved	Analysis	6020B		1	338236	F7JF	ELLE	01/24/23 12:04
Total/NA	Analysis	2540C - 2015		1	329823	M98K	ELLE	12/23/22 10:00 - 12/28/22 06:30
Dissolved	Analysis	415.1		1	332727	P684	ELLE	01/04/23 21:58

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Job ID: 410-110077-1

Client: Terra Systems Inc Project/Site: Stantec CCR TS II

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alaska	State	PA00009	06-30-23
Alaska (UST)	State	17-027	02-28-23
Arizona	State	AZ0780	03-12-23
Arkansas DEQ	State	88-00660	08-09-23
California	State	2792	11-30-22 *
Colorado	State	PA00009	06-30-23
Connecticut	State	PH-0746	06-30-23
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-23
Delaware (DW)	State	N/A	01-31-23
Florida	NELAP	E87997	07-02-23
Georgia (DW)	State	C048	01-31-23
Hawaii	State	N/A	01-31-23
Illinois	NELAP	200027	01-31-23
lowa	State	361	03-01-24
Kansas	NELAP	E-10151	10-31-23
Kentucky (DW)	State	KY90088	12-31-22 *
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	12-31-23
Louisiana (All)	NELAP	02055	06-30-23
Maine	State	2019012	03-12-23
Maryland	State	100	06-30-23
Massachusetts	State	M-PA009	06-30-23
Michigan	State	9930	01-31-23
Minnesota	NELAP	042-999-487	12-31-23
Mississippi	State	022	01-31-23
Missouri	State	450	01-31-25
Montana (DW)	State	0098	01-01-24
• •	State	<cert no.=""></cert>	02-01-23
Montana (UST) Nebraska	State	NE-OS-32-17	01-31-23
	NELAP	NE-03-32-17 2730	01-31-23
New Hampshire			
New Jersey	NELAP	PA011	06-30-23
New York	NELAP	10670	04-01-23
North Carolina (DW)	State	42705	07-31-23
North Carolina (WW/SW)	State	521	12-31-23
North Dakota	State	R-205	01-31-23
Oklahoma	NELAP	R-205	08-31-23
Oregon	NELAP	PA200001	09-11-23
PALA	Canada	1978	09-16-24
Pennsylvania 	NELAP	36-00037	01-31-24
Rhode Island	State	LAO00338	12-30-22 *
South Carolina	State	89002	01-31-23
Tennessee	State	02838	01-31-23
Texas	NELAP	T104704194-22-45	08-31-23
USDA	US Federal Programs	525-22-298-19481	10-25-25
Vermont	State	VT - 36037	10-28-23
Virginia	NELAP	460182	06-14-23
Washington	State	C457	04-11-23
West Virginia (DW)	State	9906 C	12-31-23

 $^{^{\}star} \ \text{Accreditation/Certification renewal pending - accreditation/certification considered valid}.$

Eurofins Lancaster Laboratories Environment Testing, LLC

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Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-110077-1

Project/Site: Stantec CCR TS II

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-23
Wyoming	State	8TMS-L	01-31-23
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc Project/Site: Stantec CCR TS II Job ID: 410-110077-1

Method	Method Description	Protocol	Laboratory
EPA 300.0 R2.1	Anions, Ion Chromatography	EPA	ELLE
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
2540C - 2015	Total Dissolved Solids (Dried at 180 °C)	SM	ELLE
415.1	DOC	MCAWW	ELLE
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM = "Standard Methods For The Examination Of Water And Wastewater"

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Sample Summary

Client: Terra Systems Inc Project/Site: Stantec CCR TS II Job ID: 410-110077-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-110077-1	MW-7	Water	12/21/22 10:20	12/21/22 15:16
410-110077-2	MW-8	Water	12/21/22 10:40	12/21/22 15:16

-110077-1

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Environn

quest/Chain of Custody

eurofins |

Lancaster Laboratories Environmental		Acc	:t.#	410	-1100	77 Chain	of Cu	stody			- 1	pie#_								
Client: Terra Systems, Inc.						Matrix					A	naly	ses	Requ	ıeste	ed			For Lab Us	e Only
Project Name/#: Stantec CCR TS II	Site ID #:	Macon, GA				V						Prese	ervat	ion (Code	s			SF #:	
Project Manager: Michael D. Lee	P.O. #:	222566-12-2	21-22		Tissue	D es			N	-	4	N	Р	8	×	X			SCR #:	
Sampler: Michael D. Lee	PWSID #:				i≟	Ground		S	Se			iS p		(pau					Preservat	ion Codes
Phone #: 302-798-9553	Quote #:	4101181	18		닡			iner	in, Mo,			a, and		id filter					H = HCI	T = Thiosulfate
State where samples were collected: GA For	Compliance:	Yes 🗌	No	1	Sediment	ple ES		Containers	. Fe, Mn.		Ē	g. N		g) sp:					N = HNO ₃	B = NaOH
	Collec	tion		Composite		Potable NPDES	2	0	Dis (field fil) As, Co.	F, S04	(field fil)	Ca, K, Mg, Na,	0	Dissolved Solids (field filtered)					S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄
Sample Identification	Date	Time	Grab	Con	Soll	Water	Other:	Total #	Dis (fie	C, E	Dis	Total	DOC	Total D					Rem	arks
MW-7	12/21/2022	10:20		Х		Х		1	Х	Х	Х	Х	Х	Х						
MVV-8	12/21/2022	10:40		Х		Х		1	Х	Х	Х	Х	Х	Х						
												_								
			\vdash						_							_				
							-	_						_		_				
			\vdash					-												
Towns of Time Boundary (TAT)					Reli	nquished	hv.			D	ate	Ti	me	Rec	eived	hv.			Date	Time
Turnaround Time Requested (TAT) (please che (Rush TAT is subject to laboratory a	•		Rus	h 🗌		Note		111	1	1		1		B		1/1	9		12/21/22	
Date results are needed: 1/4/23		903./			Reli	nquished	by:	W C	A		الا ate		<i>OU</i> me		eived			_	Date	Time
	nail ☑	Phon				4-12		0		12/	71/2	215	11			-				
E-mail Address: mlee@terrasystems.net	nan 🖭	1 11011	כ נ	_		nquished	by:				ate_		me	Rec	eived	by:			Date	Time
Phone: 302-798-9553																				
Data Package Options (please check if required	1)				Reli	nquished	by:			D	ate	Ti	me	Rec	eived	by:	/		Date	Time
Type I (Validation/non-CLP)																				
Type III (Reduced non-CLP) CT RCP					Reli	nquished	by:	/		Di	ate	Ti	me	Rec	eived	by:			Date	Time
Type VI (Raw Data Only)	P-13												-		4	st	1		12-21-22	1516
NJ DKQP NYSDEC	Category	☐ A or		В	Reli	nquished	by C	omme	ercial	Carrie	er:								AD	
EDD Required? Yes No V If ye	es, format:				UPS		FedE	Ξx		Other				Tem	perat	ure u	pon re	ceipt	0.8	°C

Eurofins Lancaster Laboratories Environmental, LLC • 2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300



Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-110077-1

Login Number: 110077 List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Number: 1

Creator: Jeremiah, Cory T

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	True	

1/24/2023

Eurofins Lancaster Laboratories Environment Testing, LLC

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PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703 Generated 4/15/2023 7:07:58 AM

JOB DESCRIPTION

Stantec CCR AP2 TS II

JOB NUMBER

410-120639-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike Lancaster PA 17601

EOL EOL

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 4/15/2023 7:07:58 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

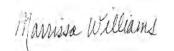
Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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4/15/2023

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 TS II Laboratory Job ID: 410-120639-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Qualifiers

M	eta	Is

Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.
В	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary	
Abbreviation	These commonly used abbreviations may or may not be present in this report.
n	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

MPN MQL

Method Quantitation Limit NC Not Calculated Not Detected at the reporting limit (or MDL or EDL if shown) ND

NEG Negative / Absent POS Positive / Present

PQL Practical Quantitation Limit

PRES Presumptive **Quality Control** QC

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

Page 5 of 27 4/15/2023

Case Narrative

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Job ID: 410-120639-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-120639-1

Receipt

The samples were received on 3/29/2023 3:39 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 0.7°C

Metals

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

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Job ID: 410-120639-1

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 TS II

Client Sample ID: MW-7 Control Lab Sample ID: 410-120639-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0696		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	297		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	69.8		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00383		0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0729	В	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.215	J	0.515	0.206	mg/L	10		6020B	Dissolved
Magnesium	77.5	^2	0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	11.0	^2	0.0206	0.00979	mg/L	10		6020B	Dissolved
Molybdenum	0.000420	JB	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	17.1		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	29.1	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7 Low NaOH

Lab Sample ID: 410-120639-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0791		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	297		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	66.8		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00227		0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0835		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0563		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	77.2		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	12.8		0.206	0.0979	mg/L	100		6020B	Dissolved
Molybdenum	0.000487	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	17.6		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	54.4	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7 Mod NaOH

Lab Sample ID: 410-120639-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0642		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	302		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	68.5		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00219		0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0749		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0444	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	76.5		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	12.0		0.0206	0.00979	mg/L	10		6020B	Dissolved
Molybdenum	0.000310	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	11.4		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	57.1	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7 High NaOH

Lab Sample ID: 410-120639-4

4/15/2023

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0689		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	294		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	62.7		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00157	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0365		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0443	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	77.7		0.0515	0.0165	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 TS II

Job ID: 410-120639-1

Client Sample ID: MW-7 High NaOH (Continued)

Lab Sample ID: 410-120639-4	Lab	Samp	le ID:	410-	120639-4
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Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Manganese	10.6		0.206	0.0979	mg/L	100	_	6020B	Dissolved
Molybdenum	0.000433	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	11.1		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	77.8	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7 Low NaHCO3

Lab Sample ID: 410-120639-5

Analyte	Result C	Qualifier RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0705	0.0515	0.0113	mg/L		_	6010D	Dissolved
Calcium	300	0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	71.0	1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00261	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0655	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0587	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	76.4	0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	12.7	0.206	0.0979	mg/L	100		6020B	Dissolved
Molybdenum	0.000266 J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	12.8	0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	163	20.6	9.27	mg/L	100		6020B	Dissolved

Client Sample ID: MW-7 Mod NaHCO3

Lab Sample ID: 410-120639-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0692		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	90.3		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	69.6		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00242		0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00935		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0282	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	73.3		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.103	^2	0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000442	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	15.7		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	1390		20.6	9.27	mg/L	100		6020B	Dissolved

Client Sample ID: MW-7 High NaHCO3

Lab Sample ID: 410-120639-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0532		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	53.5		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	65.5		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00515		0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0186		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.214		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	73.8		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.148		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000956		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	32.4		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	3870	B ^2	20.6	9.27	mg/L	100		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 TS II

Job ID: 410-120639-1

Client Sample ID: MW-7 10 g/L CERES MF2

Lab Sample ID: 410-120639-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0805		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	235		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	0.541	J	1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000996	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.000248	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0871		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	338	^2	5.15	1.65	mg/L	100		6020B	Dissolved
Manganese	1.90	^2	0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000425	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	11.4		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	44.7	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7 30 g/L CERES MF2

Lab Sample ID: 410-120639-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Lithium	0.130		0.0515	0.0113	mg/L		6010D	Dissolved
Calcium	354		0.515	0.0989	mg/L	1	6010D	Dissolved
SiO2, Silica	0.901	J	1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.000959	J	0.00206	0.000700	mg/L	1	6020B	Dissolved
Cobalt	0.00751		0.000515	0.000161	mg/L	1	6020B	Dissolved
Iron	78.3		0.0515	0.0206	mg/L	1	6020B	Dissolved
Magnesium	617	^2	0.515	0.165	mg/L	10	6020B	Dissolved
Manganese	5.08		0.0206	0.00979	mg/L	10	6020B	Dissolved
Molybdenum	0.000342	J	0.000515	0.000134	mg/L	1	6020B	Dissolved
Potassium	13.0		0.206	0.0670	mg/L	1	6020B	Dissolved
Sodium	68.7	^2	0.206	0.0927	mg/L	1	6020B	Dissolved

Client Sample ID: MW-7 50 g/L CERES MF2

Lab Sample ID: 410-120639-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.166		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	422		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	0.685	J	1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000803	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0213		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	248		5.15	2.06	mg/L	100		6020B	Dissolved
Magnesium	992	^2	5.15	1.65	mg/L	100		6020B	Dissolved
Manganese	10.6		0.206	0.0979	mg/L	100		6020B	Dissolved
Molybdenum	0.000274	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	14.9		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	92.1	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Client Sample ID: MW-7 Control

Lab Sample ID: 410-120639-1

Matrix: Water

Date Collected: 03/28/23 08:15 Date Received: 03/29/23 15:39

Client: Terra Systems Inc

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0696		0.0515	0.0113	mg/L		04/05/23 10:35	04/05/23 22:39	1
Calcium	297		0.515	0.0989	mg/L		04/05/23 10:35	04/05/23 22:39	1
SiO2, Silica	69.8		1.10	0.117	mg/L		04/05/23 10:35	04/05/23 22:39	1
- Method: SW846 6020B - I	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00383		0.00206	0.000700	mg/L		04/05/23 10:35	04/06/23 08:34	1
Cobalt	0.0729	В	0.000515	0.000161	mg/L		04/05/23 10:35	04/06/23 08:34	1
Iron	0.215	J	0.515	0.206	mg/L		04/05/23 10:35	04/10/23 10:07	10
Magnesium	77.5	^2	0.0515	0.0165	mg/L		04/05/23 10:35	04/06/23 08:34	1
Manganese	11.0	^2	0.0206	0.00979	mg/L		04/05/23 10:35	04/10/23 10:07	10
Molybdenum	0.000420	JB	0.000515	0.000134	mg/L		04/05/23 10:35	04/06/23 08:34	1
Potassium	17.1		0.206	0.0670	mg/L		04/05/23 10:35	04/06/23 08:34	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 10:35	04/06/23 08:34	1
Sodium	29.1	^2	0.206	0.0927	mg/L		04/05/23 10:35	04/06/23 08:34	1

Client Sample ID: MW-7 Low NaOH

Lab Sample ID: 410-120639-2 Date Collected: 03/28/23 08:30

Matrix: Water

Date Received: 03/29/23 15:39

791	0.0515						
· 	0.0515	0.0113	mg/L		04/05/23 09:29	04/07/23 08:38	1
297	0.515	0.0989	mg/L		04/05/23 09:29	04/07/23 08:38	1
6.8	1.10	0.117	mg/L		04/05/23 09:29	04/07/23 08:38	1
6	297 66.8 Dissolved	66.8 1.10	66.8 1.10 0.117	66.8 1.10 0.117 mg/L	66.8 1.10 0.117 mg/L	66.8 1.10 0.117 mg/L 04/05/23 09:29	66.8 1.10 0.117 mg/L 04/05/23 09:29 04/07/23 08:38

Method: SW846 6020B - Me	tals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00227		0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 10:07	1
Cobalt	0.0835		0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 10:07	1
Iron	0.0563		0.0515	0.0206	mg/L		04/05/23 09:29	04/12/23 10:07	1
Magnesium	77.2		0.0515	0.0165	mg/L		04/05/23 09:29	04/12/23 10:07	1
Manganese	12.8		0.206	0.0979	mg/L		04/05/23 09:29	04/13/23 10:15	100
Molybdenum	0.000487	J	0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 10:07	1
Potassium	17.6		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 10:07	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 10:07	1
Sodium	54.4	^2	0.206	0.0927	mg/L		04/05/23 09:29	04/12/23 10:07	1

Client Sample ID: MW-7 Mod NaOH

Lab Sample ID: 410-120639-3

Date Collected: 03/28/23 08:45 Date Received: 03/29/23 15:39

Matrix: Water

Method: SW846 6010D - N	netals (ICP) - Dissolve	a							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0642		0.0515	0.0113	mg/L		04/05/23 09:29	04/07/23 09:00	1
Calcium	302		0.515	0.0989	mg/L		04/05/23 09:29	04/07/23 09:00	1
SiO2, Silica	68.5		1.10	0.117	mg/L		04/05/23 09:29	04/07/23 09:00	1

Method: SW846 6020B - Metals (IC	P/MS) - Dissolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00219	0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 10:16	1

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Client Sample ID: MW-7 Mod NaOH

Lab Sample ID: 410-120639-3 Date Collected: 03/28/23 08:45 Matrix: Water

Date Received: 03/29/23 15:39

Method: SW846 6020B - Me	tals (ICP/MS) - Diss	olved (Cont	tinued)						
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	0.0749		0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 10:16	1
Iron	0.0444	J	0.0515	0.0206	mg/L		04/05/23 09:29	04/12/23 10:16	1
Magnesium	76.5		0.0515	0.0165	mg/L		04/05/23 09:29	04/12/23 10:16	1
Manganese	12.0		0.0206	0.00979	mg/L		04/05/23 09:29	04/13/23 09:57	10
Molybdenum	0.000310	J	0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 10:16	1
Potassium	11.4		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 10:16	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 10:16	1
Sodium	57.1	^2	0.206	0.0927	mg/L		04/05/23 09:29	04/12/23 10:16	1

Client Sample ID: MW-7 High NaOH

Lab Sample ID: 410-120639-4 Date Collected: 03/28/23 09:00

Matrix: Water Date Received: 03/29/23 15:39

Method: SW846 6010D - Metals (ICF	P) - Dissolved								
Analyte	Result (Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0689		0.0515	0.0113	mg/L		04/05/23 09:29	04/07/23 08:35	1
Calcium	294		0.515	0.0989	mg/L		04/05/23 09:29	04/07/23 08:35	1
SiO2, Silica	62.7		1.10	0.117	mg/L		04/05/23 09:29	04/07/23 08:35	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00157	J	0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 10:05	1
Cobalt	0.0365		0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 10:05	1
Iron	0.0443	J	0.0515	0.0206	mg/L		04/05/23 09:29	04/12/23 10:05	1
Magnesium	77.7		0.0515	0.0165	mg/L		04/05/23 09:29	04/12/23 10:05	1
Manganese	10.6		0.206	0.0979	mg/L		04/05/23 09:29	04/13/23 09:47	100
Molybdenum	0.000433	J	0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 10:05	1
Potassium	11.1		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 10:05	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 10:05	1
Sodium	77.8	^2	0.206	0.0927	mg/L		04/05/23 09:29	04/12/23 10:05	1

Client Sample ID: MW-7 Low NaHCO3 Lab Sample ID: 410-120639-5

Date Collected: 03/28/23 09:15 **Matrix: Water** Date Received: 03/29/23 15:39

Method: SW846 6010D - I	Metals (ICP) - Dissolved							
Analyte	Result Qu	ualifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0705	0.0515	0.0113	mg/L		04/05/23 09:29	04/07/23 08:44	1
Calcium	300	0.515	0.0989	mg/L		04/05/23 09:29	04/07/23 08:44	1
SiO2. Silica	71.0	1.10	0.117	mg/L		04/05/23 09:29	04/07/23 08:44	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00261		0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 10:12	1
Cobalt	0.0655		0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 10:12	1
Iron	0.0587		0.0515	0.0206	mg/L		04/05/23 09:29	04/12/23 10:12	1
Magnesium	76.4		0.0515	0.0165	mg/L		04/05/23 09:29	04/12/23 10:12	1
Manganese	12.7		0.206	0.0979	mg/L		04/05/23 09:29	04/13/23 10:17	100
Molybdenum	0.000266	J	0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 10:12	1
Potassium	12.8		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 10:12	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 10:12	1

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Client Sample ID: MW-7 Low NaHCO3

Lab Sample ID: 410-120639-5 Date Collected: 03/28/23 09:15

Matrix: Water

Date Received: 03/29/23 15:39

Method: SW846 6020B - Metals (ICP/MS) - Dissolved (Continued) Result Qualifier RLMDL Unit Prepared Analyzed Dil Fac 20.6 04/05/23 09:29 04/13/23 10:17 Sodium 163 9.27 mg/L 100

Client Sample ID: MW-7 Mod NaHCO3

Lab Sample ID: 410-120639-6 Date Collected: 03/28/23 09:30 **Matrix: Water**

Date Received: 03/29/23 15:39

Method: SW846 6010D - Metals (ICF	P) - Dissolved							
Analyte	Result (Qualifier R	L MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0692	0.051	5 0.0113	mg/L		04/05/23 09:29	04/07/23 09:04	1
Calcium	90.3	0.51	5 0.0989	mg/L		04/05/23 09:29	04/07/23 09:04	1
SiO2, Silica	69.6	1.1	0 0.117	mg/L		04/05/23 09:29	04/07/23 09:04	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00242		0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 10:18	1
Cobalt	0.00935		0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 10:18	1
Iron	0.0282	J	0.0515	0.0206	mg/L		04/05/23 09:29	04/12/23 10:18	1
Magnesium	73.3		0.0515	0.0165	mg/L		04/05/23 09:29	04/12/23 10:18	1
Manganese	0.103	^2	0.00206	0.000979	mg/L		04/05/23 09:29	04/12/23 10:18	1
Molybdenum	0.000442	J	0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 10:18	1
Potassium	15.7		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 10:18	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 10:18	1
Sodium	1390		20.6	9.27	mg/L		04/05/23 09:29	04/13/23 20:20	100

Client Sample ID: MW-7 High NaHCO3

Lab Sample ID: 410-120639-7 Date Collected: 03/28/23 09:45 **Matrix: Water**

Date Received: 03/29/23 15:39

Method: SW846 6010D - Me	etals (ICP) - Dissolved								
Analyte	Result C	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0532		0.0515	0.0113	mg/L		04/07/23 07:36	04/07/23 14:07	1
Calcium	53.5		0.515	0.0989	mg/L		04/07/23 07:36	04/07/23 14:07	1
SiO2, Silica	65.5		1.10	0.117	mg/L		04/07/23 07:36	04/07/23 14:07	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00515		0.00206	0.000700	mg/L		04/07/23 07:36	04/10/23 18:16	1
Cobalt	0.0186		0.000515	0.000161	mg/L		04/07/23 07:36	04/10/23 18:16	1
Iron	0.214		0.0515	0.0206	mg/L		04/07/23 07:36	04/10/23 18:16	1
Magnesium	73.8		0.0515	0.0165	mg/L		04/07/23 07:36	04/10/23 18:16	1
Manganese	0.148		0.00206	0.000979	mg/L		04/07/23 07:36	04/10/23 18:16	1
Molybdenum	0.000956		0.000515	0.000134	mg/L		04/07/23 07:36	04/10/23 18:16	1
Potassium	32.4		0.206	0.0670	mg/L		04/07/23 07:36	04/10/23 18:16	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/07/23 07:36	04/10/23 18:16	1
Sodium	3870	B ^2	20.6	9.27	mg/L		04/07/23 07:36	04/10/23 18:59	100

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Job ID: 410-120639-1

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 TS II

Client Sample ID: MW-7 10 g/L CERES MF2

Date Collected: 03/28/23 10:00 Date Received: 03/29/23 15:39

Lab Sample ID: 410-120639-8

Matrix: Water

D Prepared Analyzed Dil Fac

Method: SW846 6010D - Metals (ICP) - Dissolved Analyte Result Qualifier RL MDL Unit Lithium 0.0805 0.0515 0.0113 mg/L 04/05/23 09:29 04/07/23 08:41 Calcium 235 0.515 0.0989 mg/L 04/05/23 09:29 04/07/23 08:41 SiO2, Silica 0.541 J 1.10 0.117 mg/L 04/05/23 09:29 04/07/23 08:41

Method: SW846 6020B - Metals (ICP/MS) - Dissolved RL D Analyte Result Qualifier MDL Unit Prepared Dil Fac Analyzed **Arsenic** 0.000996 0.00206 0.000700 mg/L 04/05/23 09:29 04/12/23 10:09 Cobalt 0.000248 J 0.000515 0.000161 mg/L 04/05/23 09:29 04/12/23 10:09 Iron 0.0871 0.0515 0.0206 mg/L 04/05/23 09:29 04/12/23 10:09 1.65 mg/L ^2 5.15 04/05/23 09:29 04/13/23 09:51 100 Magnesium 338 Manganese 1.90 ^2 0.00206 0.000979 mg/L 04/05/23 09:29 04/12/23 10:09 0.000515 Molybdenum 0.000134 mg/L 04/05/23 09:29 04/12/23 10:09 0.000425 J 0.206 0.0670 mg/L 04/05/23 09:29 04/12/23 10:09 **Potassium** 11.4 Selenium <0.000286 0.00103 0.000286 mg/L 04/05/23 09:29 04/12/23 10:09 04/05/23 09:29 **Sodium** 0.206 0.0927 mg/L 04/12/23 10:09 44.7 ^2

Client Sample ID: MW-7 30 g/L CERES MF2

Date Collected: 03/28/23 10:15 Date Received: 03/29/23 15:39

Lab Sample ID: 410-120639-9

Matrix: Water

Method: SW846 6010D - Metals (ICI	P) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.130		0.0515	0.0113	mg/L		04/05/23 09:29	04/07/23 08:48	1
Calcium	354		0.515	0.0989	mg/L		04/05/23 09:29	04/07/23 08:48	1
SiO2, Silica	0.901	J	1.10	0.117	mg/L		04/05/23 09:29	04/07/23 08:48	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000959	J	0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 10:14	1
Cobalt	0.00751		0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 10:14	1
Iron	78.3		0.0515	0.0206	mg/L		04/05/23 09:29	04/12/23 10:14	1
Magnesium	617	^2	0.515	0.165	mg/L		04/05/23 09:29	04/13/23 09:55	10
Manganese	5.08		0.0206	0.00979	mg/L		04/05/23 09:29	04/13/23 09:55	10
Molybdenum	0.000342	J	0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 10:14	1
Potassium	13.0		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 10:14	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 10:14	1
Sodium	68.7	^2	0.206	0.0927	mg/L		04/05/23 09:29	04/12/23 10:14	1

Client Sample ID: MW-7 50 g/L CERES MF2

Date Collected: 03/28/23 10:30 Date Received: 03/29/23 15:39

Lab Sample ID: 410-120639-10

Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.166		0.0515	0.0113	mg/L		04/05/23 09:29	04/07/23 09:07	1
Calcium	422		0.515	0.0989	mg/L		04/05/23 09:29	04/07/23 09:07	1
SiO2, Silica	0.685	J	1.10	0.117	mg/L		04/05/23 09:29	04/07/23 09:07	1

Method: SW846 6020B - Metals (ICP/MS) - Dissolved									
	Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Arsenic	0.000803 J	0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 10:26	1

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Date Received: 03/29/23 15:39

Client Sample ID: MW-7 50 g/L CERES MF2

Lab Sample ID: 410-120639-10 Date Collected: 03/28/23 10:30

Matrix: Water

Method: SW846 6020B -	Metals (ICP/MS) - Diss	olved (Cont	inued)						
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	0.0213		0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 10:26	1
Iron	248		5.15	2.06	mg/L		04/05/23 09:29	04/13/23 10:01	100
Magnesium	992	^2	5.15	1.65	mg/L		04/05/23 09:29	04/13/23 10:01	100
Manganese	10.6		0.206	0.0979	mg/L		04/05/23 09:29	04/13/23 10:01	100
Molybdenum	0.000274	J	0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 10:26	1
Potassium	14.9		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 10:26	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 10:26	1
Sodium	92.1	^2	0.206	0.0927	mg/L		04/05/23 09:29	04/12/23 10:26	1

Job ID: 410-120639-1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-361078/1-A

Matrix: Water

Analysis Batch: 362042

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361078

мв мв

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		04/05/23 09:29	04/07/23 07:56	1
Calcium	<0.0989		0.515	0.0989	mg/L		04/05/23 09:29	04/07/23 07:56	1
SiO2, Silica	<0.117		1.10	0.117	mg/L		04/05/23 09:29	04/07/23 07:56	1

Lab Sample ID: LCS 410-361078/2-A

Matrix: Water

Analysis Batch: 362042

Client Sample ID: Lab Control Sample

Prep Type: Total/NA **Prep Batch: 361078**

%Rec

Spike LCS LCS Added Analyte Result Qualifier %Rec Limits Unit D Lithium 0.500 0.4924 mg/L 98 80 - 120 Calcium 5.00 4.911 mg/L 98 80 - 120

Lab Sample ID: MB 410-361129/1-A

Matrix: Water

Analysis Batch: 361396

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 361129

MB MB

Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac 04/05/23 21:41 Lithium < 0.0113 0.0515 0.0113 mg/L 04/05/23 10:35 Calcium <0.0989 0.515 0.0989 mg/L 04/05/23 10:35 04/05/23 21:41 SiO2, Silica <0.117 04/05/23 10:35 04/05/23 21:41 1.10 0.117 mg/L

Lab Sample ID: LCS 410-361129/2-A

Matrix: Water

Analysis Batch: 361396

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 361129

Spike LCS LCS Analyte Added Result Qualifier Unit %Rec Limits Lithium 0.500 0.5071 101 80 - 120 mg/L Calcium 5.00 4.979 mg/L 100 80 - 120

Lab Sample ID: MB 410-361916/1-A

Matrix: Water

Analysis Batch: 362413

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361916

MR MR

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		04/07/23 07:36	04/07/23 13:33	1
Calcium	<0.0989		0.515	0.0989	mg/L		04/07/23 07:36	04/07/23 13:33	1
SiO2, Silica	< 0.117		1.10	0.117	mg/L		04/07/23 07:36	04/07/23 13:33	1

Lab Sample ID: LCS 410-361916/2-A

Matrix: Water

Analysis Batch: 362413

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 361916

	Sį	pike	LCS	LCS					%Rec	
Analyte	Ad	ded	Result	Qualifier	Unit	D	%R	ec	Limits	
Lithium	0.	500	0.5634		mg/L		1	13	80 - 120	
Calcium	ŧ	5.00	5.553		mg/L		1	111	80 - 120	

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Job ID: 410-120639-1

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 TS II

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-361078/1-A

Matrix: Water

Analysis Batch: 363605

Client Sample ID: Method Blank **Prep Type: Total/NA**

Prep Batch: 361078

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 09:40	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 09:40	1
Iron	<0.0206		0.0515	0.0206	mg/L		04/05/23 09:29	04/12/23 09:40	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		04/05/23 09:29	04/12/23 09:40	1
Manganese	<0.000979		0.00206	0.000979	mg/L		04/05/23 09:29	04/12/23 09:40	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 09:40	1
Potassium	<0.0670		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 09:40	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 09:40	1
Sodium	<0.0927		0.206	0.0927	mg/L		04/05/23 09:29	04/12/23 09:40	1

Client Sample ID: Lab Control Sample

Matrix: Water

Analysis Batch: 363605

Lab Sample ID: LCS 410-361078/2-A

Prep Type: Total/NA

Prep Batch: 361078

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.5005		mg/L		100	85 - 120	
Cobalt	0.500	0.5105		mg/L		102	90 - 113	
Iron	5.00	5.066		mg/L		101	88 - 119	
Magnesium	5.00	4.966		mg/L		99	90 - 112	
Manganese	0.500	0.5112		mg/L		102	89 - 120	
Molybdenum	0.0500	0.05054		mg/L		101	85 - 115	
Potassium	5.00	5.148		mg/L		103	90 - 112	
Selenium	0.100	0.09961		mg/L		100	80 - 120	
Sodium	5.00	5.134		mg/L		103	89 - 112	

Lab Sample ID: MB 410-361129/1-A **Client Sample ID: Method Blank**

Matrix: Water

Analysis Batch: 361614

Prep Type: Total/NA

Prep Batch: 361129

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/05/23 10:35	04/06/23 07:57	1
Cobalt	0.0002215	J	0.000515	0.000161	mg/L		04/05/23 10:35	04/06/23 07:57	1
Iron	<0.0206		0.0515	0.0206	mg/L		04/05/23 10:35	04/06/23 07:57	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		04/05/23 10:35	04/06/23 07:57	1
Manganese	<0.000979		0.00206	0.000979	mg/L		04/05/23 10:35	04/06/23 07:57	1
Molybdenum	0.0001566	J	0.000515	0.000134	mg/L		04/05/23 10:35	04/06/23 07:57	1
Potassium	<0.0670		0.206	0.0670	mg/L		04/05/23 10:35	04/06/23 07:57	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 10:35	04/06/23 07:57	1
Sodium	<0.0927		0.206	0.0927	mg/L		04/05/23 10:35	04/06/23 07:57	1
									

Lab Sample ID: LCS 410-361129/2-A **Client Sample ID: Lab Control Sample**

Matrix: Water

Analysis Batch: 361614

Prep Type: Total/NA

Prep Batch: 361129

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.5010		mg/L		100	85 _ 120	
Cobalt	0.500	0.4743		mg/L		95	90 - 113	
Iron	5.00	4.860		mg/L		97	88 - 119	
Magnesium	5.00	4.860		mg/L		97	90 - 112	

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QC Sample Results

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Matrix: Water

Analysis Batch: 361614

Lab Sample ID: LCS 410-361129/2-A **Client Sample ID: Lab Control Sample** Prep Type: Total/NA **Prep Batch: 361129**

	Бріке	LUS	LUS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Manganese	0.500	0.4887		mg/L		98	89 - 120	
Molybdenum	0.0500	0.04906		mg/L		98	85 - 115	
Potassium	5.00	4.866		mg/L		97	90 - 112	
Selenium	0.100	0.1006		mg/L		101	80 - 120	
Sodium	5.00	4.743		mg/L		95	89 - 112	

Lab Sample ID: MB 410-361916/1-A

Matrix: Water

Analysis Batch: 362821

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361916

B MB							
t Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
)	0.00206	0.000700	mg/L		04/07/23 07:36	04/10/23 17:45	1
	0.000515	0.000161	mg/L		04/07/23 07:36	04/10/23 17:45	1
6	0.0515	0.0206	mg/L		04/07/23 07:36	04/10/23 17:45	1
5	0.0515	0.0165	mg/L		04/07/23 07:36	04/10/23 17:45	1
)	0.00206	0.000979	mg/L		04/07/23 07:36	04/10/23 17:45	1
ļ.	0.000515	0.000134	mg/L		04/07/23 07:36	04/10/23 17:45	1
)	0.206	0.0670	mg/L		04/07/23 07:36	04/10/23 17:45	1
6	0.00103	0.000286	mg/L		04/07/23 07:36	04/10/23 17:45	1
,	0.206	0.0927	mg/L		04/07/23 07:36	04/10/23 17:45	1
1	MB Qualifier 1 6 6 7	t Qualifier RL 0 0.00206 1 0.000515 5 0.0515 9 0.00206 4 0.000515 0 0.206 0 0.206 0 0.00103	t Qualifier RL MDL 0 0.00206 0.000700 1 0.000515 0.000161 3 0.0515 0.0165 4 0.00206 0.000979 4 0.000515 0.000134 0 0.206 0.0670 0 0.00103 0.000286	t Qualifier RL MDL Unit 0 0.00206 0.000700 mg/L 1 0.000515 0.000161 mg/L 5 0.0515 0.0165 mg/L 9 0.00206 0.000979 mg/L 4 0.000515 0.000134 mg/L 0 0.206 0.0670 mg/L 0 0.00103 0.000286 mg/L	t Qualifier RL MDL Unit D 0 0.00206 0.000700 mg/L mg/L 1 0.000515 0.000161 mg/L mg/L 2 0.0515 0.0165 mg/L 3 0.00206 0.000979 mg/L 4 0.000515 0.000134 mg/L 3 0.206 0.0670 mg/L 4 0.00103 0.000286 mg/L	t Qualifier RL MDL Unit D Prepared 0 0.00206 0.000700 mg/L 04/07/23 07:36 1 0.000515 0.000161 mg/L 04/07/23 07:36 3 0.0515 0.0206 mg/L 04/07/23 07:36 4 0.00206 0.000979 mg/L 04/07/23 07:36 4 0.000515 0.000134 mg/L 04/07/23 07:36 5 0.206 0.0670 mg/L 04/07/23 07:36 6 0.00103 0.000286 mg/L 04/07/23 07:36	t Qualifier RL MDL DIMENTAL D DIMENTAL Prepared DIMENTAL Analyzed DIMENTAL 0 0.00206 0.000700 mg/L 0.4/07/23 07:36 0.4/10/23 17:45 1 0.000515 0.000161 mg/L 0.4/07/23 07:36 0.4/10/23 17:45 2 0.0515 0.0206 mg/L 0.4/07/23 07:36 0.4/10/23 17:45 3 0.00206 0.000979 mg/L 0.4/07/23 07:36 0.4/10/23 17:45 4 0.000515 0.000134 mg/L 0.4/07/23 07:36 0.4/10/23 17:45 4 0.000515 0.000134 mg/L 0.4/07/23 07:36 0.4/10/23 17:45 5 0.206 0.0070 mg/L 0.4/07/23 07:36 0.4/10/23 17:45 6 0.00103 0.000286 mg/L 0.4/07/23 07:36 0.4/10/23 17:45

Lab Sample ID: LCS 410-361916/2-A

Matrix: Water

Analysis Batch: 362821

Client Sample ID: Lab Control Sample

Prep Type: Total/NA **Prep Batch: 361916**

Spike LCS LCS %Rec Analyte Added Result Qualifier Limits Unit %Rec Arsenic 0.500 0.5283 106 85 - 120 mg/L Cobalt 0.500 0.5496 mg/L 110 90 - 113 5.00 5.320 106 Iron mg/L 88 - 119 Magnesium 5.00 5.264 mg/L 105 90 - 112 0.500 0.5322 106 89 - 120 Manganese mg/L Molybdenum 0.0500 0.05420 mg/L 108 85 - 115 Potassium 5.00 5.220 mg/L 104 90 - 112 Selenium 0.100 0.1054 105 80 - 120 mg/L Sodium 5.00 5.621 89 - 112 mg/L 112

QC Association Summary

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Metals

Pre	рΒ	atc	h:	361	078
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Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Pre	p Batch
410-120639-2	MW-7 Low NaOH	Dissolved	Water	Non-Digest Prep	
410-120639-3	MW-7 Mod NaOH	Dissolved	Water	Non-Digest Prep	
410-120639-4	MW-7 High NaOH	Dissolved	Water	Non-Digest Prep	
410-120639-5	MW-7 Low NaHCO3	Dissolved	Water	Non-Digest Prep	
410-120639-6	MW-7 Mod NaHCO3	Dissolved	Water	Non-Digest Prep	
410-120639-8	MW-7 10 g/L CERES MF2	Dissolved	Water	Non-Digest Prep	
410-120639-9	MW-7 30 g/L CERES MF2	Dissolved	Water	Non-Digest Prep	
410-120639-10	MW-7 50 g/L CERES MF2	Dissolved	Water	Non-Digest Prep	
MB 410-361078/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361078/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Prep Batch: 361129

Lab Sample ID 410-120639-1	Client Sample ID MW-7 Control	Prep Type Dissolved	Matrix Water	Method Non-Digest Prep	Prep Batch
MB 410-361129/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361129/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 361396

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120639-1	MW-7 Control	Dissolved	Water	6010D	361129
MB 410-361129/1-A	Method Blank	Total/NA	Water	6010D	361129
LCS 410-361129/2-A	Lab Control Sample	Total/NA	Water	6010D	361129

Analysis Batch: 361614

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120639-1	MW-7 Control	Dissolved	Water	6020B	361129
MB 410-361129/1-A	Method Blank	Total/NA	Water	6020B	361129
LCS 410-361129/2-A	Lab Control Sample	Total/NA	Water	6020B	361129

Prep Batch: 361916

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120639-7	MW-7 High NaHCO3	Dissolved	Water	Non-Digest Prep	
MB 410-361916/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361916/2-A	A Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 362042

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120639-2	MW-7 Low NaOH	Dissolved	Water	6010D	361078
410-120639-3	MW-7 Mod NaOH	Dissolved	Water	6010D	361078
410-120639-4	MW-7 High NaOH	Dissolved	Water	6010D	361078
410-120639-5	MW-7 Low NaHCO3	Dissolved	Water	6010D	361078
410-120639-6	MW-7 Mod NaHCO3	Dissolved	Water	6010D	361078
410-120639-8	MW-7 10 g/L CERES MF2	Dissolved	Water	6010D	361078
410-120639-9	MW-7 30 g/L CERES MF2	Dissolved	Water	6010D	361078
410-120639-10	MW-7 50 g/L CERES MF2	Dissolved	Water	6010D	361078
MB 410-361078/1-A	Method Blank	Total/NA	Water	6010D	361078
LCS 410-361078/2-A	Lab Control Sample	Total/NA	Water	6010D	361078

Analysis Batch: 362413

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120639-7	MW-7 High NaHCO3	Dissolved	Water	6010D	361916

Eurofins Lancaster Laboratories Environment Testing, LLC

QC Association Summary

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Metals (Continued
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Analysis Batch: 362413	(Continued)
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Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 410-361916/1-A	Method Blank	Total/NA	Water	6010D	361916
LCS 410-361916/2-A	Lab Control Sample	Total/NA	Water	6010D	361916

Analysis Batch: 362611

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120639-1	MW-7 Control	Dissolved	Water	6020B	361129

Analysis Batch: 362821

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120639-7	MW-7 High NaHCO3	Dissolved	Water	6020B	361916
410-120639-7	MW-7 High NaHCO3	Dissolved	Water	6020B	361916
MB 410-361916/1-A	Method Blank	Total/NA	Water	6020B	361916
LCS 410-361916/2-A	Lab Control Sample	Total/NA	Water	6020B	361916

Analysis Batch: 363605

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120639-2	MW-7 Low NaOH	Dissolved	Water	6020B	361078
410-120639-3	MW-7 Mod NaOH	Dissolved	Water	6020B	361078
410-120639-4	MW-7 High NaOH	Dissolved	Water	6020B	361078
410-120639-5	MW-7 Low NaHCO3	Dissolved	Water	6020B	361078
410-120639-6	MW-7 Mod NaHCO3	Dissolved	Water	6020B	361078
410-120639-8	MW-7 10 g/L CERES MF2	Dissolved	Water	6020B	361078
410-120639-9	MW-7 30 g/L CERES MF2	Dissolved	Water	6020B	361078
410-120639-10	MW-7 50 g/L CERES MF2	Dissolved	Water	6020B	361078
MB 410-361078/1-A	Method Blank	Total/NA	Water	6020B	361078
LCS 410-361078/2-A	Lab Control Sample	Total/NA	Water	6020B	361078

Analysis Batch: 364058

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120639-2	MW-7 Low NaOH	Dissolved	Water	6020B	361078
410-120639-3	MW-7 Mod NaOH	Dissolved	Water	6020B	361078
410-120639-4	MW-7 High NaOH	Dissolved	Water	6020B	361078
410-120639-5	MW-7 Low NaHCO3	Dissolved	Water	6020B	361078
410-120639-8	MW-7 10 g/L CERES MF2	Dissolved	Water	6020B	361078
410-120639-9	MW-7 30 g/L CERES MF2	Dissolved	Water	6020B	361078
410-120639-10	MW-7 50 g/L CERES MF2	Dissolved	Water	6020B	361078

Analysis Batch: 364243

Lab Sample ID		Prep Type	Matrix	Method	Prep Batch
410-120639-6	MW-7 Mod NaHCO3	Dissolved	Water	6020B	361078

Project/Site: Stantec CCR AP2 TS II

Client: Terra Systems Inc

Client Sample ID: MW-7 Control

Date Collected: 03/28/23 08:15 Date Received: 03/29/23 15:39 Lab Sample ID: 410-120639-1

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6010D		1	361396	T8CQ	ELLE	04/05/23 22:39
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	361614	F7JF	ELLE	04/06/23 08:34
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		10	362611	F7JF	ELLE	04/10/23 10:07

Client Sample ID: MW-7 Low NaOH

Date Collected: 03/28/23 08:30 Date Received: 03/29/23 15:39 Lab Sample ID: 410-120639-2

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 08:38
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		100	364058	F7JF	ELLE	04/13/23 10:15
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		1	363605	F7JF	ELLE	04/12/23 10:07

Client Sample ID: MW-7 Mod NaOH

Date Collected: 03/28/23 08:45 Date Received: 03/29/23 15:39

Lab Sample ID: 410-120639-3 **Matrix: Water**

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 09:00
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		10	364058	F7JF	ELLE	04/13/23 09:57
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		1	363605	F7JF	ELLE	04/12/23 10:16

Date Received: 03/29/23 15:39

Lab Sample ID: 410-120639-4 Client Sample ID: MW-7 High NaOH Date Collected: 03/28/23 09:00 **Matrix: Water**

_	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 08:35
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		100	364058	F7JF	ELLE	04/13/23 09:47
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		1	363605	F7JF	ELLE	04/12/23 10:05

Eurofins Lancaster Laboratories Environment Testing, LLC

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 TS II

Client Sample ID: MW-7 Low NaHCO3

Date Collected: 03/28/23 09:15 Date Received: 03/29/23 15:39 Lab Sample ID: 410-120639-5

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 08:44
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		100	364058	F7JF	ELLE	04/13/23 10:17
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		1	363605	F7JF	ELLE	04/12/23 10:12

Client Sample ID: MW-7 Mod NaHCO3

Date Collected: 03/28/23 09:30 Date Received: 03/29/23 15:39

Lab Sample ID: 410-120639-6

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 09:04
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		1	363605	F7JF	ELLE	04/12/23 10:18
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		100	364243	UCIG	ELLE	04/13/23 20:20

Client Sample ID: MW-7 High NaHCO3

Date Collected: 03/28/23 09:45

Date Received: 03/29/23 15:39

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361916	HUH3	ELLE	04/07/23 07:36
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 14:07
Dissolved	Prep	Non-Digest Prep			361916	HUH3	ELLE	04/07/23 07:36
Dissolved	Analysis	6020B		1	362821	UCIG	ELLE	04/10/23 18:16
Dissolved	Prep	Non-Digest Prep			361916	HUH3	ELLE	04/07/23 07:36
Dissolved	Analysis	6020B		100	362821	UCIG	ELLE	04/10/23 18:59

Client Sample ID: MW-7 10 g/L CERES MF2

Date Collected: 03/28/23 10:00

Date Received: 03/29/23 15:39

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 08:41
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		100	364058	F7JF	ELLE	04/13/23 09:51
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		1	363605	F7JF	ELLE	04/12/23 10:09

Lab Chronicle

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Date Received: 03/29/23 15:39

Client Sample ID: MW-7 30 g/L CERES MF2

Lab Sample ID: 410-120639-9 Date Collected: 03/28/23 10:15 **Matrix: Water**

Batch Batch Dilution Batch Prepared Prep Type Туре Method Run Factor **Number Analyst** Lab or Analyzed 04/05/23 09:29 Dissolved Prep Non-Digest Prep 361078 HUH3 ELLE Dissolved Analysis 6010D 1 362042 MT26 **ELLE** 04/07/23 08:48 Dissolved Prep Non-Digest Prep 361078 HUH3 ELLE 04/05/23 09:29 Dissolved Analysis 6020B 10 364058 F7JF **ELLE** 04/13/23 09:55 ELLE 04/05/23 09:29 Dissolved Prep Non-Digest Prep 361078 HUH3 Dissolved Analysis 6020B 1 363605 F7JF **ELLE** 04/12/23 10:14

Client Sample ID: MW-7 50 g/L CERES MF2 Lab Sample ID: 410-120639-10

Date Collected: 03/28/23 10:30 **Matrix: Water**

Date Received: 03/29/23 15:39

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 09:07
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		100	364058	F7JF	ELLE	04/13/23 10:01
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		1	363605	F7JF	ELLE	04/12/23 10:26

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-120639-1

Project/Site: Stantec CCR AP2 TS II

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alaska	State	PA00009	06-30-23
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-23
California	State	2792	04-17-23
Colorado	State	PA00009	06-30-23
Connecticut	State	PH-0746	04-17-23
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	04-17-23
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Illinois	NELAP	200027	04-17-23
lowa	State	361	04-17-23
Kansas	NELAP	E-10151	04-17-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	04-17-23
Louisiana (All)	NELAP	02055	04-17-23
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-23
Massachusetts	State	M-PA009	04-17-23
Michigan	State	9930	01-31-24
Minnesota	NELAP	042-999-487	12-31-23
Mississippi	State	023	01-31-24
Missouri	State	450	01-31-24
	State	0098	
Montana (DW) Nebraska	State	NE-OS-32-17	01-01-24 01-31-24
New Hampshire	NELAP	2730	04-17-23
New Jersey	NELAP	PA011	04-17-23
New York	NELAP	10670	04-17-23
North Carolina (DW)	State	42705	07-31-23
North Carolina (WW/SW)	State	521 B. 005	04-17-23
North Dakota	State	R-205	04-17-23
Oklahoma	NELAP	R-205	04-17-23
Oregon	NELAP	PA200001	04-17-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	04-17-23
Rhode Island	State	LAO00338	04-17-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Texas	NELAP	T104704194-22-45	04-17-23
USDA	US Federal Programs	525-22-298-19481	10-25-25
Vermont	State	VT - 36037	10-28-23
Virginia	NELAP	460182	04-17-23
West Virginia (DW)	State	9906 C	12-31-23
West Virginia DEP	State	055	07-31-23
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

Eurofins Lancaster Laboratories Environment Testing, LLC

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Method Summary

Client: Terra Systems Inc

Job ID: 410-120639-1 Project/Site: Stantec CCR AP2 TS II

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Sample Summary

Client: Terra Systems Inc

Job ID: 410-120639-1 Project/Site: Stantec CCR AP2 TS II

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-120639-1	MW-7 Control	Water	03/28/23 08:15	03/29/23 15:39
410-120639-2	MW-7 Low NaOH	Water	03/28/23 08:30	03/29/23 15:39
410-120639-3	MW-7 Mod NaOH	Water	03/28/23 08:45	03/29/23 15:39
410-120639-4	MW-7 High NaOH	Water	03/28/23 09:00	03/29/23 15:39
410-120639-5	MW-7 Low NaHCO3	Water	03/28/23 09:15	03/29/23 15:39
410-120639-6	MW-7 Mod NaHCO3	Water	03/28/23 09:30	03/29/23 15:39
410-120639-7	MW-7 High NaHCO3	Water	03/28/23 09:45	03/29/23 15:39
410-120639-8	MW-7 10 g/L CERES MF2	Water	03/28/23 10:00	03/29/23 15:39
410-120639-9	MW-7 30 g/L CERES MF2	Water	03/28/23 10:15	03/29/23 15:39
410-120639-10	MW-7 50 g/L CERES MF2	Water	03/28/23 10:30	03/29/23 15:39

Environmental

Macon, GA

Yes

Collection

222566-3-28-23

41011818

Time

8:15

8:30

8:45

9:00

9:15

9:30

9:45

10:00

10:15

10:30

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Project Name/#:

Project Manager:

Sampler: Michael D. Lee

Sample Identification

MW-7 Control

MW-7 Low NaOH

MW-7 Mod NaOH

MW-7 High NaOH

MW-7 Low NaHCO3

MW-7 Mod NaHCO3

MW-7 High NaHCO3

MW-7 10 g/L CERES MF2

MW-7 30 g/L CERES MF2

MW-7 50 g/L CERES MF2

Client:

Phone #:

Lancaster Laboratories **Environmental**

Stantec CCR AP2 TS II

Michael D. Lee

Site ID #:

PWSID#:

Quote #:

Date

3/28/2023

3/28/2023

3/28/2023

3/28/2023

3/28/2023

3/28/2023

3/28/2023

3/28/2023

3/28/2023

3/28/2023

GA For Compliance:

P.O. #:

Terra Systems, Inc.

302-798-9553

State where samples were collected:

Acct. #

Matrix

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Potable

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Tissue Ground

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								SCR #:		
								Preservat	on Codes	
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								N = HNO ₃	B = NaOH	
								S = H ₂ SO ₄	P = H ₃ PO ₄	
								O = Other		
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Turnaround Time Requested (Rush TAT is sub	(TAT) (please check): pject to laboratory appro	Standard		Rush 🗌	Mukael VCLL	3/29/23		BALL BALL	3/29/23	11me
Date results are needed	4/12/23				Relinquished by:	Date		Received by:	Date	Time
Rush results requested by (please	check): E-Mail	V	Phone		BORNE	3/29/23	1539			
E-mail Address: mlee@terra	asystemnet				Relinquished by:	Date	Time	Received by:	Date	Time
Phone: 302-798-	9553									
Data Package Options (please	check if required)				Relinquished by:	Date	Time	Received by:	Date	Time
Type I (Validation/non-CLP)	MA MCP									
Type III (Reduced non-CLP)	CT RCP				Relinquished by:	Date	Time	Received by:	Date	Time
Type VI (Raw Data Only)	TX TRRP-10	3 🗌						Ele a	7/29/23	15:59
NJ DKQP	NYSDEC Ca	ategory [A or	□В	Relinquished by Commercial	Carrier:			17	
EDD Required? Yes N	o 🔽 If yes,	format:			UPSFedEx	Other		Temperature upon receipt	t	_°C

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7045 0216



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4/15/2023

Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-120639-1

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC Login Number: 120639

List Number: 1

Creator: Jeremiah, Cory T

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	Not present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
s the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

Generated 4/17/2023 6:27:52 AM

JOB DESCRIPTION

Stantec CCR AP2 MW-7 TS II

JOB NUMBER

410-120641-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 4/17/2023 6:27:52 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Marrissa Williams

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-120641-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Qualifiers

NEG

POS

PQL

QC

RL RPD

TEF

TEQ

TNTC

RER

PRES

Negative / Absent

Positive / Present

Presumptive Quality Control

Practical Quantitation Limit

Relative Error Ratio (Radiochemistry)

Toxicity Equivalent Factor (Dioxin)

Too Numerous To Count

Toxicity Equivalent Quotient (Dioxin)

Reporting Limit or Requested Limit (Radiochemistry)

Relative Percent Difference, a measure of the relative difference between two points

Metals	
Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
В	Compound was found in the blank and sample.
F3	Duplicate RPD exceeds the control limit
F5	Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL, and the absolute difference between results is < the upper reporting limits for both.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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)

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Case Narrative

Client: Terra Systems Inc

Job ID: 410-120641-1 Project/Site: Stantec CCR AP2 MW-7 TS II

Job ID: 410-120641-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-120641-1

Receipt

The samples were received on 3/29/2023 3:39 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 2.4°C

Receipt Exceptions

The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): MW-7 50 g/L CERES MF3 (410-120641-3). The COC lists a collection time of 08:30. The sample container labels list a collection time of 08:45.

Metals

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

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Job ID: 410-120641-1

Client Sample ID: MW-7 10 g/L CERES MF3

Lab Sample ID: 410-120641-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0838		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	270		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	3.23		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00200	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.000180	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0512	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	354	^2	5.15	1.65	mg/L	100		6020B	Dissolved
Manganese	0.00755		0.00206	0.000979	mg/L	1		6020B	Dissolved
Potassium	11.9		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	32.1	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7 30 g/L CERES MF3

Lab Sample ID: 410-120641-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.120		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	336		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	0.644	J	1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00195	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.000487	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0950	В	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	585		0.515	0.165	mg/L	10		6020B	Dissolved
Molybdenum	0.000512	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	12.3		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	34.2		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7 50 g/L CERES MF3

Lab Sample ID: 410-120641-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.162		0.0515	0.0113	mg/L	1		6010D	Dissolved
Calcium	409		0.515	0.0989	mg/L	1		6010D	Dissolved
Arsenic	0.00351		0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.000201	JB	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.115		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	826	^2	0.515	0.165	mg/L	10		6020B	Dissolved
Manganese	0.00538		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000168	JB	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	13.8		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	37.2	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7 Low CaO

Lab Sample ID: 410-120641-4

4/17/2023

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0670		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	317		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	63.3		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00141	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0532	В	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0677		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	76.0	^2	0.515	0.165	mg/L	10		6020B	Dissolved
Manganese	11.6	^2	0.0206	0.00979	mg/L	10		6020B	Dissolved
Molybdenum	0.000420	JB	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	15.6		0.206	0.0670	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Detection Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Job ID: 410-120641-1

Client Sample ID: MW-7 Low CaO (Continued)

Lab Sample ID: 410-120641-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D Metho	od Prep Type	
Sodium	29.4	^2	0.206	0.0927	mg/L	1	6020B	B Dissolved	

Client Sample ID: MW-7 Mod CaO

Lab Sample ID: 410-120641-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0671		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	325		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	60.3		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00247		0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0291	В	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0736		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	77.2	^2	0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	7.97	^2	0.0206	0.00979	mg/L	10		6020B	Dissolved
Molybdenum	0.000452	JB	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	13.8		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	28.8	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7 High CaO

Lab Sample ID: 410-120641-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0682		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	318		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	58.0		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000886	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.0245	В	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0786		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	69.2	^2	0.515	0.165	mg/L	10		6020B	Dissolved
Manganese	6.27	^2	0.0206	0.00979	mg/L	10		6020B	Dissolved
Molybdenum	0.000515	В	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	14.9		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	28.3	^2	0.206	0.0927	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

4/17/2023

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Project/Site: Stantec CCR AP2 MW-7 TS II

Client: Terra Systems Inc

Client Sample ID: MW-7 10 g/L CERES MF3

Lab Sample ID: 410-120641-1 Date Collected: 03/29/23 08:00 **Matrix: Water**

Date Received: 03/29/23 15:39

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0838		0.0515	0.0113	mg/L		04/05/23 09:29	04/07/23 09:10	1
Calcium	270		0.515	0.0989	mg/L		04/05/23 09:29	04/07/23 09:10	1
SiO2, Silica	3.23		1.10	0.117	mg/L		04/05/23 09:29	04/07/23 09:10	1
- Method: SW846 6020B - N	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00200	J	0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 10:32	1
Cobalt	0.000180	J	0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 10:32	1
Iron	0.0512	J	0.0515	0.0206	mg/L		04/05/23 09:29	04/12/23 10:32	1
Magnesium	354	^2	5.15	1.65	mg/L		04/05/23 09:29	04/13/23 10:05	100
Manganese	0.00755		0.00206	0.000979	mg/L		04/05/23 09:29	04/13/23 10:03	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 10:32	1
Potassium	11.9		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 10:32	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 10:32	1
Sodium	32.1	^2	0.206	0.0927	ma/L		04/05/23 09:29	04/12/23 10:32	1

Client Sample ID: MW-7 30 g/L CERES MF3

Lab Sample ID: 410-120641-2 Date Collected: 03/29/23 08:15 **Matrix: Water**

Date Received: 03/29/23 15:39

Method: SW846 6010D - Metals (ICP) - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.120		0.0515	0.0113	mg/L		04/05/23 09:39	04/06/23 15:34	1
Calcium	336		0.515	0.0989	mg/L		04/05/23 09:39	04/06/23 15:34	1
SiO2, Silica	0.644	J	1.10	0.117	mg/L		04/05/23 09:39	04/06/23 15:34	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00195	J	0.00206	0.000700	mg/L		04/05/23 09:39	04/06/23 21:09	1
Cobalt	0.000487	J	0.000515	0.000161	mg/L		04/05/23 09:39	04/06/23 21:09	1
Iron	0.0950	В	0.0515	0.0206	mg/L		04/05/23 09:39	04/06/23 21:09	1
Magnesium	585		0.515	0.165	mg/L		04/05/23 09:39	04/06/23 21:34	10
Manganese	<0.00979		0.0206	0.00979	mg/L		04/05/23 09:39	04/06/23 21:34	10
Molybdenum	0.000512	J	0.000515	0.000134	mg/L		04/05/23 09:39	04/06/23 21:09	1
Potassium	12.3		0.206	0.0670	mg/L		04/05/23 09:39	04/06/23 21:09	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 09:39	04/06/23 21:09	1
Sodium	34.2		0.206	0.0927	mg/L		04/05/23 09:39	04/06/23 21:09	1

Client Sample ID: MW-7 50 g/L CERES MF3

Lab Sample ID: 410-120641-3 Date Collected: 03/29/23 08:30 **Matrix: Water**

Date Received: 03/29/23 15:39

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.162		0.0515	0.0113	mg/L		04/05/23 10:35	04/05/23 22:07	1
Calcium	409		0.515	0.0989	mg/L		04/05/23 10:35	04/05/23 22:07	1
SiO2, Silica	<0.117		1.10	0.117	mg/L		04/05/23 10:35	04/05/23 22:07	1
Method: SW846 6020B -	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00351		0.00206	0.000700	ma/L		04/05/23 10:35	04/06/23 08:20	

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Client Sample ID: MW-7 50 g/L CERES MF3

Lab Sample ID: 410-120641-3 Date Collected: 03/29/23 08:30 **Matrix: Water**

Date Received: 03/29/23 15:39

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	0.000201	J B	0.000515	0.000161	mg/L		04/05/23 10:35	04/06/23 08:20	1
Iron	0.115		0.0515	0.0206	mg/L		04/05/23 10:35	04/10/23 09:20	1
Magnesium	826	^2	0.515	0.165	mg/L		04/05/23 10:35	04/10/23 09:47	10
Manganese	0.00538		0.00206	0.000979	mg/L		04/05/23 10:35	04/10/23 17:14	1
Molybdenum	0.000168	JB	0.000515	0.000134	mg/L		04/05/23 10:35	04/06/23 08:20	1
Potassium	13.8		0.206	0.0670	mg/L		04/05/23 10:35	04/06/23 08:20	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 10:35	04/06/23 08:20	1
Sodium	37.2	^2	0.206	0.0927	mg/L		04/05/23 10:35	04/06/23 08:20	1

Client Sample ID: MW-7 Low CaO

Lab Sample ID: 410-120641-4 Date Collected: 03/29/23 09:00 Matrix: Water

Date Received: 03/29/23 15:39

Method: SW846 6010D - Metals (ICP) - Dissolved Analyte Result Qualifier Dil Fac RLMDL Unit Prepared Analyzed Lithium 0.0670 0.0515 0.0113 mg/L 04/05/23 10:35 04/05/23 22:13 Calcium 0.515 0.0989 mg/L 04/05/23 10:35 04/05/23 22:13 317 SiO2, Silica 63.3 1.10 0.117 mg/L 04/05/23 10:35 04/05/23 22:13

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00141	J	0.00206	0.000700	mg/L		04/05/23 10:35	04/06/23 08:24	1
Cobalt	0.0532	В	0.000515	0.000161	mg/L		04/05/23 10:35	04/06/23 08:24	1
Iron	0.0677		0.0515	0.0206	mg/L		04/05/23 10:35	04/10/23 09:22	1
Magnesium	76.0	^2	0.515	0.165	mg/L		04/05/23 10:35	04/10/23 09:57	10
Manganese	11.6	^2	0.0206	0.00979	mg/L		04/05/23 10:35	04/10/23 09:57	10
Molybdenum	0.000420	J B	0.000515	0.000134	mg/L		04/05/23 10:35	04/06/23 08:24	1
Potassium	15.6		0.206	0.0670	mg/L		04/05/23 10:35	04/06/23 08:24	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 10:35	04/06/23 08:24	1
Sodium	29.4	^2	0.206	0.0927	mg/L		04/05/23 10:35	04/06/23 08:24	1

Client Sample ID: MW-7 Mod CaO

Lab Sample ID: 410-120641-5 Date Collected: 03/29/23 09:15 **Matrix: Water**

Date Received: 03/29/23 15:39

04/05/23 22:32
2

Method: SW846 6020B - Me	etals (ICP/MS) - Disse	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00247		0.00206	0.000700	mg/L		04/05/23 10:35	04/06/23 08:30	1
Cobalt	0.0291	В	0.000515	0.000161	mg/L		04/05/23 10:35	04/06/23 08:30	1
Iron	0.0736		0.0515	0.0206	mg/L		04/05/23 10:35	04/10/23 09:26	1
Magnesium	77.2	^2	0.0515	0.0165	mg/L		04/05/23 10:35	04/06/23 08:30	1
Manganese	7.97	^2	0.0206	0.00979	mg/L		04/05/23 10:35	04/10/23 10:03	10
Molybdenum	0.000452	JB	0.000515	0.000134	mg/L		04/05/23 10:35	04/06/23 08:30	1
Potassium	13.8		0.206	0.0670	mg/L		04/05/23 10:35	04/06/23 08:30	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 10:35	04/06/23 08:30	1

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-120641-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-7 Mod CaO

Lab Sample ID: 410-120641-5 Date Collected: 03/29/23 09:15

Matrix: Water

Date Received: 03/29/23 15:39

Method: SW846 6020B - Metals (ICP/MS) - Dissolved (Continued) Result Qualifier Analyte RLMDL Unit Prepared Analyzed Dil Fac Sodium 28.8 ^2 0.206 0.0927 mg/L 04/05/23 10:35 04/06/23 08:30

Client Sample ID: MW-7 High CaO Lab Sample ID: 410-120641-6

Date Collected: 03/29/23 09:30 **Matrix: Water**

Date Received: 03/29/23 15:39

Method: SW846 6010D - Metals (IC	P) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0682		0.0515	0.0113	mg/L		04/05/23 10:35	04/05/23 22:16	1
Calcium	318		0.515	0.0989	mg/L		04/05/23 10:35	04/05/23 22:16	1
SiO2, Silica	58.0		1.10	0.117	mg/L		04/05/23 10:35	04/05/23 22:16	1
Method: SW846 6020B - Metals (IC	P/MS) - Disso	olved							

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000886	J	0.00206	0.000700	mg/L		04/05/23 10:35	04/06/23 08:26	1
Cobalt	0.0245	В	0.000515	0.000161	mg/L		04/05/23 10:35	04/06/23 08:26	1
Iron	0.0786		0.0515	0.0206	mg/L		04/05/23 10:35	04/10/23 09:24	1
Magnesium	69.2	^2	0.515	0.165	mg/L		04/05/23 10:35	04/10/23 09:59	10
Manganese	6.27	^2	0.0206	0.00979	mg/L		04/05/23 10:35	04/10/23 09:59	10
Molybdenum	0.000515	В	0.000515	0.000134	mg/L		04/05/23 10:35	04/06/23 08:26	1
Potassium	14.9		0.206	0.0670	mg/L		04/05/23 10:35	04/06/23 08:26	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/05/23 10:35	04/06/23 08:26	1
Sodium	28.3	^2	0.206	0.0927	mg/L		04/05/23 10:35	04/06/23 08:26	1

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Job ID: 410-120641-1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-361078/1-A

Matrix: Water

Analysis Batch: 362042

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361078

MB MB

MB MB

< 0.0113

<0.0989

< 0.117

Result Qualifier

	Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Lithium	<0.0113		0.0515	0.0113	mg/L		04/05/23 09:29	04/07/23 07:56	1
	Calcium	<0.0989		0.515	0.0989	mg/L		04/05/23 09:29	04/07/23 07:56	1
l	SiO2, Silica	<0.117		1.10	0.117	mg/L		04/05/23 09:29	04/07/23 07:56	1

Lab Sample ID: LCS 410-361078/2-A

Matrix: Water

Analysis Batch: 362042

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 361078

	Spike	LCS	LCS			%Rec	
Analyte	Added	Result	Qualifier Unit	D	%Rec	Limits	
Lithium	0.500	0.4924	mg/L		98	80 - 120	
Calcium	5.00	4.911	mg/L		98	80 - 120	

Lab Sample ID: MB 410-361085/1-A

Matrix: Water

Analyte

Lithium

Calcium

SiO2, Silica

Analysis Batch: 361899

Client Sample ID: Method Blank Prep Type: Total/NA

Analyzed

04/06/23 14:16

04/06/23 14:16

04/06/23 14:16

Prep Batch: 361085

Dil Fac

Lab Sample ID: LCS 410-361085/2-A

Matrix: Water

Analysis Batch: 361899

Client Sample ID: Lab Control Sample

Prepared

04/05/23 09:39

04/05/23 09:39

04/05/23 09:39

Prep Type: Total/NA

Prep Batch: 361085

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Lithium	 0.500	0.5373		mg/L		107	80 - 120	
Calcium	5.00	5.239		ma/L		105	80 - 120	

RL

0.0515

0.515

1.10

MDL Unit

0.0113 mg/L

0.0989 mg/L

0.117 mg/L

Lab Sample ID: MB 410-361129/1-A

Matrix: Water

Analysis Batch: 361396

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361129

мв мв

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113	0.0	0515	0.0113	mg/L		04/05/23 10:35	04/05/23 21:41	1
Calcium	<0.0989	0).515	0.0989	mg/L		04/05/23 10:35	04/05/23 21:41	1
SiO2, Silica	<0.117		1.10	0.117	mg/L		04/05/23 10:35	04/05/23 21:41	1

Lab Sample ID: LCS 410-361129/2-A

Matrix: Water

Analysis Batch: 361396

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 361129

	Spike	LCS	LCS			%Rec	
Analyte	Added	Result	Qualifier Unit	D	%Rec	Limits	
Lithium	0.500	0.5071	mg/L		101	80 - 120	
Calcium	5.00	4.979	mg/L		100	80 - 120	

Project/Site: Stantec CCR AP2 MW-7 TS II

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: 410-120641-2 MS

Matrix: Water

Analysis Batch: 361899

Client: Terra Systems Inc

Client Sample ID: MW-7 30 g/L CERES MF3

Prep Type: Dissolved

Prep Batch: 361085

	Sample	Sample	Spike	IVIS	IVIS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Lithium	0.120		0.500	0.6667		mg/L		109	75 - 125	
Calcium	336		5.00	344.1	4	mg/L		152	75 - 125	

Lab Sample ID: 410-120641-2 MSD

Matrix: Water

Analysis Batch: 361899

Client Sample ID: MW-7 30 g/L CERES MF3

Prep Type: Dissolved Prep Batch: 361085

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	Sample	Sample	Spike	MSD	MSD				%Rec		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Lithium	0.120		0.500	0.6653		mg/L		109	75 - 125	0	20
Calcium	336		5.00	344.1	4	mg/L		153	75 - 125	0	20

Lab Sample ID: 410-120641-2 DU

Matrix: Water

Analysis Batch: 361899

Client Sample ID: MW-7 30 g/L CERES MF3

Prep Type: Dissolved

Prep Batch: 361085

DU DU RPD Sample Sample Result Qualifier Result Qualifier RPD Limit Analyte Unit Lithium 0.120 0.1277 6 20 mg/L Calcium 336 338.3 mg/L 0.5 20 SiO2, Silica 0.644 J 0.6429 J mg/L 0.2

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-361078/1-A

Matrix: Water

Analysis Batch: 363605

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361078

MB	MB							
Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
<0.000700		0.00206	0.000700	mg/L		04/05/23 09:29	04/12/23 09:40	1
<0.000161		0.000515	0.000161	mg/L		04/05/23 09:29	04/12/23 09:40	1
<0.0206		0.0515	0.0206	mg/L		04/05/23 09:29	04/12/23 09:40	1
<0.0165		0.0515	0.0165	mg/L		04/05/23 09:29	04/12/23 09:40	1
<0.000979		0.00206	0.000979	mg/L		04/05/23 09:29	04/12/23 09:40	1
<0.000134		0.000515	0.000134	mg/L		04/05/23 09:29	04/12/23 09:40	1
<0.0670		0.206	0.0670	mg/L		04/05/23 09:29	04/12/23 09:40	1
<0.000286		0.00103	0.000286	mg/L		04/05/23 09:29	04/12/23 09:40	1
<0.0927		0.206	0.0927	mg/L		04/05/23 09:29	04/12/23 09:40	1
	Result <0.000700 <0.000161 <0.0206 <0.0165 <0.000979 <0.000134 <0.0670 <0.000286	<0.000161 <0.0206 <0.0165 <0.000979 <0.000134 <0.0670 <0.000286	Result Qualifier RL <0.000700	Result Qualifier RL MDL <0.000700	Result Qualifier RL MDL Unit <0.000700	Result Qualifier RL MDL Unit D <0.000700	Result Qualifier RL MDL Unit D Prepared <0.000700	Result Qualifier RL MDL Unit D Prepared Analyzed <0.000700

Lab Sample ID: LCS 410-361078/2-A

Matrix: Water

Analysis Batch: 363605

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 361078

	Spike	LCS	LCS			%Rec
Analyte	Added	Result	Qualifier l	Unit D	%Rec	Limits
Arsenic	0.500	0.5005	r	mg/L	100	85 - 120
Cobalt	0.500	0.5105	r	mg/L	102	90 - 113
Iron	5.00	5.066	r	mg/L	101	88 - 119
Magnesium	5.00	4.966	r	mg/L	99	90 - 112
Manganese	0.500	0.5112	r	mg/L	102	89 - 120
Molybdenum	0.0500	0.05054	r	mg/L	101	85 - 115
Potassium	5.00	5.148	r	mg/L	103	90 - 112
Selenium	0.100	0.09961	r	mg/L	100	80 - 120

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Project/Site: Stantec CCR AP2 MW-7 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 410-361078/2-A

Client: Terra Systems Inc

Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA Analysis Batch: 363605 **Prep Batch: 361078**

Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits D Sodium 5.00 5.134 103 89 - 112 mg/L

MB MB

Lab Sample ID: MB 410-361085/1-A Client Sample ID: Method Blank

Matrix: Water

Analysis Batch: 361867

Prep Type: Total/NA

Prep Batch: 361085

RL D Prepared Dil Fac Analyte Result Qualifier MDL Unit Analyzed Arsenic < 0.000700 0.00206 0.000700 mg/L 04/05/23 09:39 04/06/23 20:35 Cobalt < 0.000161 0.000515 0.000161 mg/L 04/05/23 09:39 04/06/23 20:35 04/05/23 09:39 04/06/23 20:35 Iron 0.02485 J 0.0515 0.0206 mg/L Magnesium <0.0165 0.0515 0.0165 mg/L 04/05/23 09:39 04/06/23 20:35 Manganese < 0.000979 0.00206 0.000979 mg/L 04/05/23 09:39 04/06/23 20:35 Molybdenum <0.000134 0.000515 0.000134 mg/L 04/05/23 09:39 04/06/23 20:35 Potassium 04/05/23 09:39 04/06/23 20:35 < 0.0670 0.206 0.0670 mg/L Selenium <0.000286 0.00103 0.000286 mg/L 04/05/23 09:39 04/06/23 20:35 0.206 04/05/23 09:39 04/06/23 20:35 Sodium <0.0927 0.0927 mg/L

Lab Sample ID: LCS 410-361085/2-A

Matrix: Water

Analysis Batch: 361867

Client Sample ID: Lab Control Sample

Prep Type: Total/NA **Prep Batch: 361085**

LCS LCS Spike %Rec Added Result Qualifier Analyte Unit %Rec Limits Arsenic 0.500 0.4947 99 85 - 120 mg/L Cobalt 0.500 0.4838 97 90 - 113 mg/L Iron 5.00 4.942 mg/L 99 88 - 119 5.00 4.797 90 - 112 Magnesium mg/L 96 0.500 0.4978 100 89 - 120 Manganese mg/L Molybdenum 0.0500 0.04851 mg/L 97 85 - 115 mg/L 90 - 112 Potassium 5.00 4.882 98 Selenium 0.100 0.1012 mg/L 101 80 - 120 Sodium 5.00 4.792 96 89 - 112 mg/L

Lab Sample ID: MB 410-361129/1-A

Matrix: Water

Analysis Batch: 361614

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361129

MB	MB							
Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
<0.000700		0.00206	0.000700	mg/L		04/05/23 10:35	04/06/23 07:57	1
0.0002215	J	0.000515	0.000161	mg/L		04/05/23 10:35	04/06/23 07:57	1
<0.0206		0.0515	0.0206	mg/L		04/05/23 10:35	04/06/23 07:57	1
<0.0165		0.0515	0.0165	mg/L		04/05/23 10:35	04/06/23 07:57	1
<0.000979		0.00206	0.000979	mg/L		04/05/23 10:35	04/06/23 07:57	1
0.0001566	J	0.000515	0.000134	mg/L		04/05/23 10:35	04/06/23 07:57	1
<0.0670		0.206	0.0670	mg/L		04/05/23 10:35	04/06/23 07:57	1
<0.000286		0.00103	0.000286	mg/L		04/05/23 10:35	04/06/23 07:57	1
<0.0927		0.206	0.0927	mg/L		04/05/23 10:35	04/06/23 07:57	1
	Result <0.000700 0.0002215 <0.0206 <0.0165 <0.000979 0.0001566 <0.0670 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <0.000286 <	0.0002215 J <0.0206 <0.0165 <0.000979 0.0001566 J <0.0670 <0.000286	Result Qualifier RL <0.000700	Result Qualifier RL MDL <0.000700	Result Qualifier RL MDL Unit <0.000700	Result Qualifier RL MDL Unit D <0.000700	Result Qualifier RL MDL Unit D Prepared <0.000700	Result Qualifier RL MDL Unit D Prepared Analyzed <0.000700

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Prep Batch: 361085

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 MW-7 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 410-361129/2-A			Client Sample ID: Lab Control Sample
Matrix: Water			Prep Type: Total/NA
Analysis Batch: 361614			Prep Batch: 361129
	Snike	LCS LCS	%Rec

	э ріке	LUS	LUS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.5010		mg/L		100	85 - 120	
Cobalt	0.500	0.4743		mg/L		95	90 - 113	
Iron	5.00	4.860		mg/L		97	88 - 119	
Magnesium	5.00	4.860		mg/L		97	90 - 112	
Manganese	0.500	0.4887		mg/L		98	89 - 120	
Molybdenum	0.0500	0.04906		mg/L		98	85 - 115	
Potassium	5.00	4.866		mg/L		97	90 - 112	
Selenium	0.100	0.1006		mg/L		101	80 - 120	
Sodium	5.00	4.743		mg/L		95	89 - 112	

Lab Sample ID: 410-120641-2 MS Client Sample ID: MW-7 30 g/L CERES MF3 **Matrix: Water Prep Type: Dissolved**

Analysis Batch: 361867

<0.00979

•									•	
	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.00195	J	0.500	0.5239		mg/L		104	75 - 125	
Cobalt	0.000487	J	0.500	0.4618		mg/L		92	80 - 125	
Iron	0.0950	В	5.00	4.809		mg/L		94	75 - 125	
Molybdenum	0.000512	J	0.0500	0.04940		mg/L		98	81 - 125	
Potassium	12.3		5.00	16.93		mg/L		92	75 - 125	
Selenium	<0.000286		0.100	0.1055		mg/L		106	75 - 125	
Sodium	34.2		5.00	38.64	4	mg/L		89	75 - 125	

Lab Sample ID: 410-120641-2 MS Client Sample ID: MW-7 30 g/L CERES MF3 **Matrix: Water Prep Type: Dissolved**

Analysis Batch: 361867

Prep Batch: 361085 MS MS Sample Sample Spike %Rec Analyte Result Qualifier Added Result Qualifier Unit Limits %Rec 5.00 642.9 4 Magnesium 585 1152 75 - 125 mg/L

0.500

Lab Sample ID: 410-120641-2 MSD Client Sample ID: MW-7 30 g/L CERES MF3

0.5024

mg/L

Matrix: Water

Manganese

Analysis Batch: 361867 **Prep Batch: 361085**

	Sample	Sample	Spike	MSD	MSD				%Rec		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	0.00195	J	0.500	0.5226		mg/L		104	75 - 125	NC	20
Cobalt	0.000487	J	0.500	0.4687		mg/L		94	80 - 125	NC	20
Iron	0.0950	В	5.00	4.941		mg/L		97	75 - 125	NC	20
Molybdenum	0.000512	J	0.0500	0.05007		mg/L		99	81 - 125	NC	20
Potassium	12.3		5.00	16.86		mg/L		91	75 - 125	NC	20
Selenium	<0.000286		0.100	0.1071		mg/L		107	75 - 125	NC	20
Sodium	34.2		5.00	38.83		mg/L		93	75 - 125	NC	20

Eurofins Lancaster Laboratories Environment Testing, LLC

100

75 - 125

Prep Type: Dissolved

QC Sample Results

Client: Terra Systems Inc Job ID: 410-120641-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 410-120641-2 MSD Mat

Ana

b Sample ID: 410-120641-2 MSD	Sample ID: 410-120641-2 MSD						Client Sample ID: MW-7 30 g/L CERES MF3					
atrix: Water										Prep Ty	pe: Diss	olved
nalysis Batch: 361867										Prep	Batch: 3	61085
	Sample	Sample	Spike	MSD	MSD					%Rec		RPD
alvte	Result	Qualifier	Added	Result	Qualifier	Unit		D	%Rec	Limits	RPD	Limit

Analyte Magnesium 585 5.00 612.0 4 mg/L 534 75 - 125 5 20 Manganese <0.00979 0.500 0.4824 mg/L 96 75 - 125 20

Lab Sample ID: 410-120641-2 DU

Matrix: Water Analysis Batch: 361867							Prep Type: Diss Prep Batch: 3	
	Sample	nple Sample DU DU				R		
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Arsenic	0.00195	J	0.001283	J F5	mg/L		41	20
Cobalt	0.000487	J	<0.000161		mg/L		NC	20
Iron	0.0950	В	0.02912	JF3	mg/L		106	20
Molybdenum	0.000512	J	<0.000134		mg/L		NC	20
Potassium	12.3		12.24		mg/L		0.5	20
Selenium	<0.000286		<0.000286		mg/L		NC	20
Sodium	34.2		34.76		mg/L		2	20

Lab Sample ID: 410-120641-2 DU

Matrix: Water	latrix: Water							Prep Type: Dissolved		
Analysis Batch: 361867							Prep Batch: 361085			
	Sample	Sample		DU	DU				RPD	
Analyte	Result	Qualifier		Result	Qualifier	Unit	D	RPD	Limit	
Magnesium	585			601.8		mg/L			20	
Manganese	< 0.00979			< 0.00979		mg/L		NC	20	

Client Sample ID: MW-7 30 g/L CERES MF3

Client Sample ID: MW-7 30 g/L CERES MF3

Eurofins Lancaster Laboratories Environment Testing, LLC

QC Association Summary

Client: Terra Systems Inc Job ID: 410-120641-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Metals

Pre	рΒ	atc	h:	361	078
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Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-1	MW-7 10 g/L CERES MF3	Dissolved	Water	Non-Digest Prep	
MB 410-361078/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361078/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Prep Batch: 361085

Lab Sample ID 410-120641-2	Client Sample ID MW-7 30 g/L CERES MF3	Prep Type Dissolved	Matrix Water	Method Prep Batcl Non-Digest Prep
MB 410-361085/1-A	Method Blank	Total/NA	Water	Non-Digest Prep
LCS 410-361085/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep
410-120641-2 MS	MW-7 30 g/L CERES MF3	Dissolved	Water	Non-Digest Prep
410-120641-2 MSD	MW-7 30 g/L CERES MF3	Dissolved	Water	Non-Digest Prep
410-120641-2 DU	MW-7 30 g/L CERES MF3	Dissolved	Water	Non-Digest Prep

Prep Batch: 361129

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-3	MW-7 50 g/L CERES MF3	Dissolved	Water	Non-Digest Prep	
410-120641-4	MW-7 Low CaO	Dissolved	Water	Non-Digest Prep	
410-120641-5	MW-7 Mod CaO	Dissolved	Water	Non-Digest Prep	
410-120641-6	MW-7 High CaO	Dissolved	Water	Non-Digest Prep	
MB 410-361129/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361129/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 361396

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-3	MW-7 50 g/L CERES MF3	Dissolved	Water	6010D	361129
410-120641-4	MW-7 Low CaO	Dissolved	Water	6010D	361129
410-120641-5	MW-7 Mod CaO	Dissolved	Water	6010D	361129
410-120641-6	MW-7 High CaO	Dissolved	Water	6010D	361129
MB 410-361129/1-A	Method Blank	Total/NA	Water	6010D	361129
LCS 410-361129/2-A	Lab Control Sample	Total/NA	Water	6010D	361129

Analysis Batch: 361614

Γ	A11				
Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-3	MW-7 50 g/L CERES MF3	Dissolved	Water	6020B	361129
410-120641-4	MW-7 Low CaO	Dissolved	Water	6020B	361129
410-120641-5	MW-7 Mod CaO	Dissolved	Water	6020B	361129
410-120641-6	MW-7 High CaO	Dissolved	Water	6020B	361129
MB 410-361129/1-A	Method Blank	Total/NA	Water	6020B	361129
LCS 410-361129/2-A	Lab Control Sample	Total/NA	Water	6020B	361129

Analysis Batch: 361867

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-2	MW-7 30 g/L CERES MF3	Dissolved	Water	6020B	361085
410-120641-2	MW-7 30 g/L CERES MF3	Dissolved	Water	6020B	361085
MB 410-361085/1-A	Method Blank	Total/NA	Water	6020B	361085
LCS 410-361085/2-A	Lab Control Sample	Total/NA	Water	6020B	361085
410-120641-2 MS	MW-7 30 g/L CERES MF3	Dissolved	Water	6020B	361085
410-120641-2 MS	MW-7 30 g/L CERES MF3	Dissolved	Water	6020B	361085
410-120641-2 MSD	MW-7 30 g/L CERES MF3	Dissolved	Water	6020B	361085
410-120641-2 MSD	MW-7 30 g/L CERES MF3	Dissolved	Water	6020B	361085
410-120641-2 DU	MW-7 30 g/L CERES MF3	Dissolved	Water	6020B	361085

QC Association Summary

Client: Terra Systems Inc Job ID: 410-120641-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Metals (Continued)

Analy	/sis	Batch:	361867	(Continued)
Allul	1313	Dateii.	001001	Continuou

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-2 DU	MW-7 30 g/L CERES MF3	Dissolved	Water	6020B	361085

Analysis Batch: 361899

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-2	MW-7 30 g/L CERES MF3	Dissolved	Water	6010D	361085
MB 410-361085/1-A	Method Blank	Total/NA	Water	6010D	361085
LCS 410-361085/2-A	Lab Control Sample	Total/NA	Water	6010D	361085
410-120641-2 MS	MW-7 30 g/L CERES MF3	Dissolved	Water	6010D	361085
410-120641-2 MSD	MW-7 30 g/L CERES MF3	Dissolved	Water	6010D	361085
410-120641-2 DU	MW-7 30 g/L CERES MF3	Dissolved	Water	6010D	361085

Analysis Batch: 362042

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-1	MW-7 10 g/L CERES MF3	Dissolved	Water	6010D	361078
MB 410-361078/1-A	Method Blank	Total/NA	Water	6010D	361078
LCS 410-361078/2-A	Lab Control Sample	Total/NA	Water	6010D	361078

Analysis Batch: 362611

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-3	MW-7 50 g/L CERES MF3	Dissolved	Water	6020B	361129
410-120641-3	MW-7 50 g/L CERES MF3	Dissolved	Water	6020B	361129
410-120641-4	MW-7 Low CaO	Dissolved	Water	6020B	361129
410-120641-4	MW-7 Low CaO	Dissolved	Water	6020B	361129
410-120641-5	MW-7 Mod CaO	Dissolved	Water	6020B	361129
410-120641-5	MW-7 Mod CaO	Dissolved	Water	6020B	361129
410-120641-6	MW-7 High CaO	Dissolved	Water	6020B	361129
410-120641-6	MW-7 High CaO	Dissolved	Water	6020B	361129

Analysis Batch: 362819

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-3	MW-7 50 a/L CERES MF3	Dissolved	Water	6020B	361129

Analysis Batch: 363605

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-1	MW-7 10 g/L CERES MF3	Dissolved	Water	6020B	361078
MB 410-361078/1-A	Method Blank	Total/NA	Water	6020B	361078
LCS 410-361078/2-A	Lab Control Sample	Total/NA	Water	6020B	361078

Analysis Batch: 364058

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-120641-1	MW-7 10 g/L CERES MF3	Dissolved	Water	6020B	361078
410-120641-1	MW-7 10 g/L CERES MF3	Dissolved	Water	6020B	361078

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-7 10 g/L CERES MF3

Date Collected: 03/29/23 08:00 Date Received: 03/29/23 15:39

Lab Sample ID: 410-120641-1

	Matrix:	Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 09:10
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		1	364058	F7JF	ELLE	04/13/23 10:03
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		100	364058	F7JF	ELLE	04/13/23 10:05
Dissolved	Prep	Non-Digest Prep			361078	HUH3	ELLE	04/05/23 09:29
Dissolved	Analysis	6020B		1	363605	F7JF	ELLE	04/12/23 10:32

Client Sample ID: MW-7 30 g/L CERES MF3

Date Collected: 03/29/23 08:15

Date Received: 03/29/23 15:39

ab	Sam	ple	ID:	410-1	120641-2
-0.0					

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361085	HUH3	ELLE	04/05/23 09:39
Dissolved	Analysis	6010D		1	361899	MT26	ELLE	04/06/23 15:34
Dissolved	Prep	Non-Digest Prep			361085	HUH3	ELLE	04/05/23 09:39
Dissolved	Analysis	6020B		1	361867	UCIG	ELLE	04/06/23 21:09
Dissolved	Prep	Non-Digest Prep			361085	HUH3	ELLE	04/05/23 09:39
Dissolved	Analysis	6020B		10	361867	UCIG	ELLE	04/06/23 21:34

Client Sample ID: MW-7 50 g/L CERES MF3

Date Collected: 03/29/23 08:30 Date Received: 03/29/23 15:39 Lab Sample ID: 410-120641-3

Matrix: Water

_	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6010D		1	361396	T8CQ	ELLE	04/05/23 22:07
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	362819	UCIG	ELLE	04/10/23 17:14
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	361614	F7JF	ELLE	04/06/23 08:20
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	362611	F7JF	ELLE	04/10/23 09:20
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		10	362611	F7JF	ELLE	04/10/23 09:47

Client Sample ID: MW-7 Low CaO

Date Collected: 03/29/23 09:00 Date Received: 03/29/23 15:39

Lab Sam	ple ID: 410-	120641-4
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Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6010D		1	361396	T8CQ	ELLE	04/05/23 22:13

Eurofins Lancaster Laboratories Environment Testing, LLC

Lab Chronicle

Client: Terra Systems Inc Job ID: 410-120641-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-7 Low CaO

Date Received: 03/29/23 15:39

Lab Sample ID: 410-120641-4 Date Collected: 03/29/23 09:00

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	361614	F7JF	ELLE	04/06/23 08:24
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	362611	F7JF	ELLE	04/10/23 09:22
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		10	362611	F7JF	ELLE	04/10/23 09:57

Client Sample ID: MW-7 Mod CaO

Lab Sample ID: 410-120641-5 Date Collected: 03/29/23 09:15

Matrix: Water

Date Received: 03/29/23 15:39

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6010D		1	361396	T8CQ	ELLE	04/05/23 22:32
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	361614	F7JF	ELLE	04/06/23 08:30
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	362611	F7JF	ELLE	04/10/23 09:26
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		10	362611	F7JF	ELLE	04/10/23 10:03

Client Sample ID: MW-7 High CaO

Lab Sample ID: 410-120641-6 Date Collected: 03/29/23 09:30 **Matrix: Water**

Date Received: 03/29/23 15:39

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6010D		1	361396	T8CQ	ELLE	04/05/23 22:16
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	361614	F7JF	ELLE	04/06/23 08:26
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		1	362611	F7JF	ELLE	04/10/23 09:24
Dissolved	Prep	Non-Digest Prep			361129	HUH3	ELLE	04/05/23 10:35
Dissolved	Analysis	6020B		10	362611	F7JF	ELLE	04/10/23 09:59

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-120641-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alaska	State	PA00009	06-30-23
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-23
California	State	2792	04-17-23
Colorado	State	PA00009	06-30-23
Connecticut	State	PH-0746	04-17-23
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	04-17-23
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Illinois	NELAP	200027	04-17-23
lowa	State	361	04-17-23
Kansas	NELAP	E-10151	04-17-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	04-17-23
Louisiana (All)	NELAP	02055	04-17-23
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-23
Massachusetts	State	M-PA009	04-17-23
Michigan	State	9930	01-31-24
Minnesota	NELAP	042-999-487	12-31-23
Mississippi	State	023	01-31-24
Missouri	State	450	01-31-25
Montana (DW)	State	0098	01-01-24
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	04-17-23
New Jersey	NELAP	PA011	04-17-23
New York	NELAP	10670	04-17-23
North Carolina (DW)	State	42705	07-31-23
North Carolina (WW/SW)	State	521	04-17-23
North Dakota	State	R-205	04-17-23
Oklahoma	NELAP	R-205	04-17-23
Oregon	NELAP	PA200001	04-17-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	04-17-23
Rhode Island	State	LAO00338	04-17-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Texas	NELAP	T104704194-22-45	04-17-23
usda Usda		525-22-298-19481	10-25-25
	US Federal Programs	525-22-296-19461 VT - 36037	10-25-25
Virginia	State		
Virginia	NELAP State	460182	04-17-23
West Virginia (DW)	State	9906 C	12-31-23
West Virginia DEP	State	055	07-31-23
Wyoming Wyoming (UST)	State A2LA	8TMS-L 0001.01	01-31-24 11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Job ID: 410-120641-1

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Sample Summary

Client: Terra Systems Inc Job ID: 410-120641-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-120641-1	MW-7 10 g/L CERES MF3	Water	03/29/23 08:00	03/29/23 15:39
410-120641-2	MW-7 30 g/L CERES MF3	Water	03/29/23 08:15	03/29/23 15:39
410-120641-3	MW-7 50 g/L CERES MF3	Water	03/29/23 08:30	03/29/23 15:39
410-120641-4	MW-7 Low CaO	Water	03/29/23 09:00	03/29/23 15:39
410-120641-5	MW-7 Mod CaO	Water	03/29/23 09:15	03/29/23 15:39
410-120641-6	MW-7 High CaO	Water	03/29/23 09:30	03/29/23 15:39

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Environmental

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Chain of Custody

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Lancaster Laboratories
Environmental

410-120641 Chain of Custody

Client: Terra Systems, Inc.						Matrix						nalyse	c Por	west	od			For Lab Us	e Only
	II Site ID #:	Macon, GA										reserv						SF#:	e Only
						1 1						reserv	ation	T	es				
Project Manager: Michael D. Lee	P.O. #:	222566-3-29	3-23		Tissue	Ground			N	N	N	\vdash	-		+			SCR #:	
Sampler: Michael D. Lee	PWSID #:				1	11		5	. Mg	Se, Si						'		Preservat	ion Codes
Phone #: 302-798-9553	Quote #:	4101181	18		Sediment			aine	Co, Fe, K, Mg	N. Sa								H = HCI	T = Thiosulfate
State where samples were collected: GA Fo	r Compliance:	Yes	No	~	Ę	Potable		ont	S	Mo	% Li							N = HNO ₃	B = NaOH
	Collec	ction		Composite		1 1	er:	il # of Containers	Dis (field fil) As,	Dis (field fil) Mn, Mo, Na,	Dis (field fil) Ca							S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄
Sample Identification	Date	Time	Grab	Con	Soil	Water	Other:	Total #	Dis (f	Dis (f	Dis (f							Rem	arks
MW-7 10 g/L CERES MF3	3/29/2023	8:00		X		х		2	Х	Х	Х								
MW-7 30 g/L CERES MF3	3/29/2023	8:15		Х		х		2	Х	Х	Х								
MW-7 50 g/L CERES MF3	3/29/2023	8:30		X		Х		2	Х	X	Х								
MW-7 Low CaO	3/29/2023	9:00		Х	L	х		2	Х	Х	Х								
MW-7 Mod CaO	3/29/2023	9:15		Х		Х		2	Х	Х	Х								
MW-7 High CaO	3/29/2023	9:30		Х		х		2	Х	Х	Х								
			$oldsymbol{oldsymbol{\perp}}$	_	lacksquare			<u> </u>	$oxed{oxed}$			\sqcup		\perp	_				
			-	-	⊢			-	├				+	+	-				
			\vdash	\vdash	⊢			\vdash	\vdash				-	+	-				
Turnaround Time Requested (TAT) (please ch	eck): Standa	ard 🗸	Pus	h 🗌	Reli	inquished	by:			Di	ate	Time	Re	ceived	d by:			Date	Time
(Rush TAT is subject to laboratory			ivusi	"	9	4 chast	1.0	(00	2	13/2	9/23	11:20		Bos	2 K	resa		3/29/23	1120
Date results are needed: 4/12/23						inquished		<u>ue</u>		_	ate	Time		ceive				Date	Time
	Mail 🗸	Phone	e [$\overline{}$	E	30-1	1	1) -	3/2	2/23	1539	}						
E-mail Address: mlee@terrasystems.net		1 110111		_		inquished	by:				ate	Time	Re	ceive	d by:			Date	Time
Phone: 302-798-9553																			
Data Package Options (please check if require	ed)				Reli	inquished	by:			Di	ate	Time	Re	ceive	d by:			Date	Time
Type I (Validation/non-CLP)																			
Type III (Reduced non-CLP) CT RC	P \square				Reli	inquished	бу:			Di	ate	Time	Re	ceive	d by:		-	Date	Time
Type VI (Raw Data Only) TX TRI	RP-13												7	9	C	50	-	3/29/23	15:39
	EC Category	☐ A or		В	Reli	inquished	by C	omme	ercial	Carrie	er:							21	
	yes, format:				UPS	3	FedE	Ξx		Other			Te	mpera	iture u	pon re	eceipt	1.4	°C

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7045 0216



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Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-120641-1

Login Number: 120641 List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Number: 1

Creator: Jeremiah, Cory T

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	Not present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

Eurofins Lancaster Laboratories Environment Testing, LLC

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PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

JOB DESCRIPTION

Generated 4/17/2023 6:32:51 AM

Stantec CCR AP2 MW-8 TS II

JOB NUMBER

410-121030-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike Lancaster PA 17601

EOL

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 4/17/2023 6:32:51 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

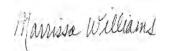
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Client: Terra Systems Inc Project/Site: Stantec CCR AP2 MW-8 TS II Laboratory Job ID: 410-121030-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Qualifiers

MPN

MQL

NC

ND

NEG

POS

PQL

QC

RL

RER

RPD

TEF

TEQ TNTC

PRES

Most Probable Number

Not Calculated

Negative / Absent

Positive / Present

Presumptive

Quality Control

Method Quantitation Limit

Practical Quantitation Limit

Relative Error Ratio (Radiochemistry)

Toxicity Equivalent Factor (Dioxin)
Toxicity Equivalent Quotient (Dioxin)

Too Numerous To Count

Reporting Limit or Requested Limit (Radiochemistry)

Relative Percent Difference, a measure of the relative difference between two points

Not Detected at the reporting limit (or MDL or EDL if shown)

Metals Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
F5	Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL, and the absolute difference between results is < the upper reporting limits for both.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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)

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Case Narrative

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Job ID: 410-121030-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-121030-1

Receipt

The samples were received on 3/31/2023 4:05 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 0.3°C

Metals

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

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Client: Terra Systems Inc

Client Sample ID: MW-8 Control

Project/Site: Stantec CCR AP2 MW-8 TS II

Lab Sample ID: 410-121030-1

Job ID: 410-121030-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	81.7		0.515	0.0989	mg/L	1	_	6010D	Dissolved
SiO2, Silica	28.0		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000873	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00242		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0892		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	28.7		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.387		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.163		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	9.77		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	18.4		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 Low FeCl3

Lab Sample ID: 410-121030-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	82.1		0.515	0.0989	mg/L	1	_	6010D	Dissolved
SiO2, Silica	23.1		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00128	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00405		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0662		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	29.4		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.489		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.105		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.35		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	18.2		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 Mod FeCl3

Lab Sample ID: 410-121030-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	78.5		0.515	0.0989	mg/L	1	_	6010D	Dissolved
SiO2, Silica	7.43		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00120	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00246		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.506		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	30.7		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.531		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.00537		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	9.26		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	332		1.03	0.464	mg/L	5		6020B	Dissolved

Client Sample ID: MW-8 High FeCl3

Lab Sample ID: 410-121030-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0162	J	0.0515	0.0113	mg/L		_	6010D	Dissolved
Calcium	74.5		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	3.15		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00132	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00265		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0293	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	29.0		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.574		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.00152		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	11.0		0.206	0.0670	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-8 TS II

Client Sample ID: MW-8 High FeCl3 (Continued)

Lab Sample ID: 410-121030-4

Job ID: 410-121030-1

Analyte	Result Qualifier	RL	MDL Unit	Dil Fac D	Method	Prep Type
Sodium	869	2.06	0.927 mg/L		6020B	Dissolved

Client Sample ID: MW-8 Low Fe2O3 Lab Sample ID: 410-121030-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	79.2		0.515	0.0989	mg/L	1	_	6010D	Dissolved
SiO2, Silica	27.8		1.10	0.117	mg/L	1		6010D	Dissolved
Cobalt	0.00219		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0242	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	28.6		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.377		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.163		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.50		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	18.3		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 Mod Fe2O3

Lab Sample ID: 410-121030-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0113	J	0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	79.0		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	28.0		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000815	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00153		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0326	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	29.7		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.338		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.134		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.70		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	18.7		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 High Fe2O3

Lab Sample ID: 410-121030-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	80.9		0.515	0.0989	mg/L	1	_	6010D	Dissolved
SiO2, Silica	27.0		1.10	0.117	mg/L	1		6010D	Dissolved
Cobalt	0.000743		0.000515	0.000161	mg/L	1		6020B	Dissolved
Magnesium	27.7	^2	0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.256		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.0843		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.26		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000512	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	17.9		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 Low ZVI

Lab Sample ID: 410-121030-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0150	J	0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	80.4		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	28.0		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000831	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00275		0.000515	0.000161	mg/L	1		6020B	Dissolved
Magnesium	27.8	^2	0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.525		0.00206	0.000979	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Detection Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-8 TS II

Client Sample ID: MW-8 Low ZVI (Continued) Lab Sample ID: 410-121030-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep	Туре
Molybdenum	0.167	0.0	000515	0.000134	mg/L	1	_	6020B	Diss	olved
Potassium	8.30		0.206	0.0670	mg/L	1		6020B	Diss	olved
Sodium	17.3		0.206	0.0927	mg/L	1		6020B	Diss	olved

Client Sample ID: MW-8 Mod ZVI

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D I	Method	Prep Type
Calcium	80.4		0.515	0.0989	mg/L	1	_	6010D	Dissolved
SiO2, Silica	27.2		1.10	0.117	mg/L	1	(6010D	Dissolved
Cobalt	0.00241		0.000515	0.000161	mg/L	1	(6020B	Dissolved
Iron	0.0245	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	27.9	^2	0.0515	0.0165	mg/L	1	(6020B	Dissolved
Manganese	1.45		0.00206	0.000979	mg/L	1	(6020B	Dissolved
Molybdenum	0.166		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.70		0.206	0.0670	mg/L	1	(6020B	Dissolved
Sodium	18.1		0.206	0.0927	mg/L	1	(6020B	Dissolved

Client Sample ID: MW-8 High ZVI

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0115	J	0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	80.9		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	27.4		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000792	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00237		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0709		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	28.1	^2	0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	2.80		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.165		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.02		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	18.0		0.206	0.0927	ma/L	1		6020B	Dissolved

Job ID: 410-121030-1

Lab Sample ID: 410-121030-9

Lab Sample ID: 410-121030-10

Project/Site: Stantec CCR AP2 MW-8 TS II

Client Sample ID: MW-8 Control

Date Collected: 03/31/23 10:30 Date Received: 03/31/23 16:05

Client: Terra Systems Inc

Lab Sample ID: 410-121030-1

Matrix: Water

Method: SW846 6010D - Metals (IC	P) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		04/06/23 11:03	04/07/23 22:00	1
Calcium	81.7		0.515	0.0989	mg/L		04/06/23 11:03	04/07/23 22:00	1
SiO2, Silica	28.0		1.10	0.117	mg/L		04/06/23 11:03	04/07/23 22:00	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000873	J	0.00206	0.000700	mg/L		04/06/23 11:03	04/11/23 19:04	1
Cobalt	0.00242		0.000515	0.000161	mg/L		04/06/23 11:03	04/11/23 19:04	1
Iron	0.0892		0.0515	0.0206	mg/L		04/06/23 11:03	04/11/23 19:04	1
Magnesium	28.7		0.0515	0.0165	mg/L		04/06/23 11:03	04/11/23 19:04	1
Manganese	0.387		0.00206	0.000979	mg/L		04/06/23 11:03	04/11/23 19:04	1
Molybdenum	0.163		0.000515	0.000134	mg/L		04/06/23 11:03	04/11/23 19:04	1
Potassium	9.77		0.206	0.0670	mg/L		04/06/23 11:03	04/11/23 19:04	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:03	04/11/23 19:04	1
Sodium	18.4		0.206	0.0927	mg/L		04/06/23 11:03	04/11/23 19:04	1

Client Sample ID: MW-8 Low FeCl3

Date Collected: 03/31/23 10:45

Date Received: 03/31/23 16:05

Lab Sample ID: 410-121030-2

Matrix: Water

Method: SW846 6010D - Metals (ICP) - Dissolved Analyte MDL Unit Result Qualifier Analyzed Dil Fac RL Prepared Lithium < 0.0113 0.0515 0.0113 mg/L 04/06/23 11:03 04/07/23 21:44 0.515 04/06/23 11:03 04/07/23 21:44 **Calcium** 82.1 0.0989 mg/L SiO2, Silica 23.1 1.10 0.117 mg/L 04/06/23 11:03 04/07/23 21:44

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00128	J	0.00206	0.000700	mg/L		04/06/23 11:03	04/11/23 18:48	1
Cobalt	0.00405		0.000515	0.000161	mg/L		04/06/23 11:03	04/11/23 18:48	1
Iron	0.0662		0.0515	0.0206	mg/L		04/06/23 11:03	04/11/23 18:48	1
Magnesium	29.4		0.0515	0.0165	mg/L		04/06/23 11:03	04/11/23 18:48	1
Manganese	0.489		0.00206	0.000979	mg/L		04/06/23 11:03	04/11/23 18:48	1
Molybdenum	0.105		0.000515	0.000134	mg/L		04/06/23 11:03	04/11/23 18:48	1
Potassium	8.35		0.206	0.0670	mg/L		04/06/23 11:03	04/11/23 18:48	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:03	04/11/23 18:48	1
Sodium	18.2		0.206	0.0927	mg/L		04/06/23 11:03	04/11/23 18:48	1

Client Sample ID: MW-8 Mod FeCI3

Date Collected: 03/31/23 11:00

Date Received: 03/31/23 16:05

Lab Sample ID: 410-121030-3

Matrix: Water

Analyte	Result Quali	ifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113	0.0515	0.0113	mg/L		04/06/23 11:03	04/07/23 21:57	1
Calcium	78.5	0.515	0.0989	mg/L		04/06/23 11:03	04/07/23 21:57	1
SiO2, Silica	7.43	1.10	0.117	mg/L		04/06/23 11:03	04/07/23 21:57	1

Wethod: SW846 6020B - Wetals (IC	P/MS) - Dissolved					
Analyte	Result Qualifier	RL	MDL Unit	D Prepar	ed Analyzed	Dil Fac
Arsenic	0.00120 J	0.00206	0.000700 mg/L	04/06/23	11:03 04/11/23 19:02	1

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Project/Site: Stantec CCR AP2 MW-8 TS II

Client: Terra Systems Inc

Client Sample ID: MW-8 Mod FeCl3

Lab Sample ID: 410-121030-3 Date Collected: 03/31/23 11:00 Matrix: Water

Date Received: 03/31/23 16:05

Method: SW846 6020B - Metals (ICP/MS) - Dissolved (Continued)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	0.00246		0.000515	0.000161	mg/L		04/06/23 11:03	04/11/23 19:02	1
Iron	0.506		0.0515	0.0206	mg/L		04/06/23 11:03	04/11/23 19:02	1
Magnesium	30.7		0.0515	0.0165	mg/L		04/06/23 11:03	04/11/23 19:02	1
Manganese	0.531		0.00206	0.000979	mg/L		04/06/23 11:03	04/11/23 19:02	1
Molybdenum	0.00537		0.000515	0.000134	mg/L		04/06/23 11:03	04/11/23 19:02	1
Potassium	9.26		0.206	0.0670	mg/L		04/06/23 11:03	04/11/23 19:02	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:03	04/11/23 19:02	1
Sodium	332		1.03	0.464	mg/L		04/06/23 11:03	04/11/23 19:20	5

Client Sample ID: MW-8 High FeCl3

Lab Sample ID: 410-121030-4 Date Collected: 03/31/23 11:15 Matrix: Water

Date Received: 03/31/23 16:05

Method	SW846 6010D - Metals (IC	P) - Dissolve	d							
Analyte		Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium		0.0162	J	0.0515	0.0113	mg/L		04/06/23 11:03	04/07/23 21:28	1
Calcium		74.5		0.515	0.0989	mg/L		04/06/23 11:03	04/07/23 21:28	1
SiO2, Sili	ca	3.15		1.10	0.117	mg/L		04/06/23 11:03	04/07/23 21:28	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00132	J	0.00206	0.000700	mg/L		04/06/23 11:03	04/11/23 18:44	1
Cobalt	0.00265		0.000515	0.000161	mg/L		04/06/23 11:03	04/11/23 18:44	1
Iron	0.0293	J	0.0515	0.0206	mg/L		04/06/23 11:03	04/11/23 18:44	1
Magnesium	29.0		0.0515	0.0165	mg/L		04/06/23 11:03	04/11/23 18:44	1
Manganese	0.574		0.00206	0.000979	mg/L		04/06/23 11:03	04/11/23 18:44	1
Molybdenum	0.00152		0.000515	0.000134	mg/L		04/06/23 11:03	04/11/23 18:44	1
Potassium	11.0		0.206	0.0670	mg/L		04/06/23 11:03	04/11/23 18:44	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:03	04/11/23 18:44	1
Sodium	869		2.06	0.927	mg/L		04/06/23 11:03	04/11/23 19:18	10

Client Sample ID: MW-8 Low Fe2O3 Lab Sample ID: 410-121030-5

Date Collected: 03/31/23 11:30 **Matrix: Water** Date Received: 03/31/23 16:05

Method: SW846 6010D -	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		04/06/23 11:03	04/07/23 21:25	1
Calcium	79.2		0.515	0.0989	mg/L		04/06/23 11:03	04/07/23 21:25	1
SiO2. Silica	27 8		1.10	0.117	ma/L		04/06/23 11:03	04/07/23 21:25	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 11:03	04/11/23 18:42	1
Cobalt	0.00219		0.000515	0.000161	mg/L		04/06/23 11:03	04/11/23 18:42	1
Iron	0.0242	J	0.0515	0.0206	mg/L		04/06/23 11:03	04/11/23 18:42	1
Magnesium	28.6		0.0515	0.0165	mg/L		04/06/23 11:03	04/11/23 18:42	1
Manganese	0.377		0.00206	0.000979	mg/L		04/06/23 11:03	04/11/23 18:42	1
Molybdenum	0.163		0.000515	0.000134	mg/L		04/06/23 11:03	04/11/23 18:42	1
Potassium	8.50		0.206	0.0670	mg/L		04/06/23 11:03	04/11/23 18:42	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:03	04/11/23 18:42	1

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Client Sample Results

Job ID: 410-121030-1 Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-8 TS II

Client Sample ID: MW-8 Low Fe2O3

Lab Sample ID: 410-121030-5 Date Collected: 03/31/23 11:30

Matrix: Water

Date Received: 03/31/23 16:05

Method: SW846 6020B - Metals (ICP/MS) - Dissolved (Continued) Analyte Result Qualifier RL **MDL** Unit

D Prepared Analyzed Dil Fac Sodium 18.3 0.206 0.0927 mg/L 04/06/23 11:03 04/11/23 18:42

Client Sample ID: MW-8 Mod Fe2O3

Lab Sample ID: 410-121030-6 Date Collected: 03/31/23 11:45 **Matrix: Water**

Date Received: 03/31/23 16:05

Method: SW846 6010D - Metals (ICP) - Dissolved Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac 0.0515 Lithium 0.0113 0.0113 mg/L 04/06/23 10:59 04/07/23 10:03 0.0989 Calcium 79.0 0.515 mg/L 04/06/23 10:59 04/07/23 10:03 SiO2, Silica 0.117 mg/L 04/06/23 10:59 04/07/23 10:03 28.0 1.10

Method: SW846 6020B - Metals (ICP/MS) - Dissolved Analyte Result Qualifier MDL Unit D Prepared Dil Fac RL Analyzed 0.000815 0.00206 0.000700 mg/L 04/06/23 10:59 04/11/23 08:28 Arsenic 0.000161 Cobalt 0.00153 0.000515 mg/L 04/06/23 10:59 04/11/23 08:28 Iron 0.0326 0.0515 0.0206 mg/L 04/06/23 10:59 04/11/23 08:28 Magnesium 29.7 0.0515 0.0165 mg/L 04/06/23 10:59 04/11/23 08:28 Manganese 0.338 0.00206 0.000979 mg/L 04/06/23 10:59 04/11/23 08:28 0.000515 0.000134 04/06/23 10:59 04/11/23 08:28 Molybdenum 0.134 mg/L 8.70 0.206 0.0670 mg/L 04/06/23 10:59 04/11/23 08:28 **Potassium** Selenium < 0.000286 0.00103 0.000286 mg/L 04/06/23 10:59 04/11/23 08:28 0.206 0.0927 mg/L 04/06/23 10:59 04/11/23 08:28 **Sodium** 18.7

Client Sample ID: MW-8 High Fe2O3

Lab Sample ID: 410-121030-7 Date Collected: 03/31/23 12:00 **Matrix: Water**

Date Received: 03/31/23 16:05

Method: SW846 6010D - Metals (ICP) - Dissolved Analyte Result Qualifier RL **MDL** Unit D Prepared Analyzed Dil Fac mg/L Lithium <0.0113 0.0515 0.0113 04/06/23 11:08 04/07/23 12:27 Calcium 80.9 0.515 0.0989 mg/L 04/06/23 11:08 04/07/23 12:27 04/06/23 11:08 04/07/23 12:27 SiO2, Silica 1 10 0.117 mg/L 27.0

Method: SW846 6020B - Metals (ICP/MS) - Dissolved Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac Arsenic <0.000700 0.00206 0.000700 mg/L 04/06/23 11:08 04/12/23 16:57 0.000515 0.000161 mg/L 04/06/23 11:08 04/12/23 16:57 Cobalt 0.000743 04/12/23 16:57 Iron <0.0206 0.0515 0.0206 mg/L 04/06/23 11:08 0.0515 0.0165 04/06/23 11:08 04/12/23 16:57 ma/L Magnesium 27.7 ^2 0.00206 0.000979 04/06/23 11:08 04/12/23 16:57 Manganese 0.256 Molybdenum 0.0843 0.000515 0.000134 mg/L 04/06/23 11:08 04/12/23 16:57 Potassium 8.26 0.206 0.0670 mg/L 04/06/23 11:08 04/12/23 16:57 Selenium 0.000512 J 0.00103 0.000286 mg/L 04/06/23 11:08 04/12/23 16:57 Sodium 0.206 0.0927 mg/L 04/06/23 11:08 04/12/23 16:57 17.9

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-8 TS II

Client Sample ID: MW-8 Low ZVI

Date Collected: 03/31/23 12:45 Date Received: 03/31/23 16:05 Lab Sample ID: 410-121030-8

Matrix: Water

Job ID: 410-121030-1

Method: SW846 6010D - Metals (IC	CP) - Dissolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0150 J	0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 12:31	1
Calcium	80.4	0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 12:31	1
SiO2, Silica	28.0	1.10	0.117	mg/L		04/06/23 11:08	04/07/23 12:31	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000831	J	0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 16:59	1
Cobalt	0.00275		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:59	1
Iron	<0.0206		0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:59	1
Magnesium	27.8	^2	0.0515	0.0165	mg/L		04/06/23 11:08	04/12/23 16:59	1
Manganese	0.525		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:59	1
Molybdenum	0.167		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:59	1
Potassium	8.30		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:59	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:59	1
Sodium	17.3		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:59	1

Client Sample ID: MW-8 Mod ZVI

Date Collected: 03/31/23 13:00

Date Received: 03/31/23 16:05

Lab Sample ID: 410-121030-9

Matrix: Water

Method: SW846 6010D - M	etals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 12:11	1
Calcium	80.4		0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 12:11	1
SiO2, Silica	27.2		1.10	0.117	mg/L		04/06/23 11:08	04/07/23 12:11	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 16:53	1
Cobalt	0.00241		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:53	1
Iron	0.0245	J	0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:53	1
Magnesium	27.9	^2	0.0515	0.0165	mg/L		04/06/23 11:08	04/12/23 16:53	1
Manganese	1.45		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:53	1
Molybdenum	0.166		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:53	1
Potassium	8.70		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:53	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:53	1
Sodium	18.1		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:53	1

Client Sample ID: MW-8 High ZVI

Date Collected: 03/31/23 13:15

Date Received: 03/31/23 16:05

Lab	Samp	le ID	: 410-	-1210	30-10
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Matrix: Water

Analyte	Result Qualifi	ier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0115 J	0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 12:14	1
Calcium	80.9	0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 12:14	1
SiO2, Silica	27.4	1.10	0.117	mg/L		04/06/23 11:08	04/07/23 12:14	1

Method: SW846 6020B - Metals (IC	P/MS) - Dissolv	ved						
Analyte	Result Qu	tualifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000792 J	0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 16:55	1

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Client Sample ID: MW-8 High ZVI

Lab Sample ID: 410-121030-10 Date Collected: 03/31/23 13:15

Matrix: Water

Date Received: 03/31/23 16:05

Method: SW846 6020B -	Metals (ICP/MS) - Diss	olved (Cont	inued)						
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	0.00237		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:55	1
Iron	0.0709		0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:55	1
Magnesium	28.1	^2	0.0515	0.0165	mg/L		04/06/23 11:08	04/12/23 16:55	1
Manganese	2.80		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:55	1
Molybdenum	0.165		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:55	1
Potassium	8.02		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:55	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:55	1
Sodium	18.0		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:55	1

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-361600/1-A

Analysis Batch: 362042

Matrix: Water

Client Sample ID: Method Blank

Client Sample ID: Lab Control Sample

Client Sample ID: Method Blank

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 361600

Prep Type: Total/NA

Prep Batch: 361600

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		04/06/23 10:59	04/07/23 09:23	1
Calcium	<0.0989		0.515	0.0989	mg/L		04/06/23 10:59	04/07/23 09:23	1
SiO2, Silica	<0.117		1.10	0.117	mg/L		04/06/23 10:59	04/07/23 09:23	1

Lab Sample ID: LCS 410-361600/2-A

Matrix: Water

Analysis Batch: 362042

	Spike	LCS	LCS			%Rec	
Analyte	Added	Result	Qualifier U	nit D	%Rec	Limits	
Lithium	0.500	0.5027	m	g/L	101	80 - 120	
Calcium	5.00	4.999	m	g/L	100	80 - 120	

Lab Sample ID: MB 410-361602/1-A

Matrix: Water

Analysis Batch: 362412

Prep Type: Total/NA **Prep Batch: 361602** MB MB

Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac Lithium < 0.0113 0.0515 0.0113 mg/L 04/06/23 11:03 04/07/23 20:51 Calcium <0.0989 0.515 0.0989 mg/L 04/06/23 11:03 04/07/23 20:51 SiO2, Silica < 0.117 1.10 0.117 mg/L 04/06/23 11:03 04/07/23 20:51

Lab Sample ID: LCS 410-361602/2-A

Matrix: Water Prep Type: Total/NA Analysis Batch: 362412 **Prep Batch: 361602**

	Бріке	LCS	LCS				%Rec
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits
Lithium	0.500	0.5020	-	mg/L		100	80 - 120
Calcium	5.00	5.103		mg/L		102	80 - 120

Lab Sample ID: MB 410-361604/1-A

Matrix: Water

Analysis Batch: 362413

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 361604

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Lithium <0.0113 0.0515 0.0113 mg/L 04/06/23 11:08 04/07/23 10:57 Calcium <0.0989 0.515 0.0989 mg/L 04/06/23 11:08 04/07/23 10:57 SiO2, Silica < 0.117 1.10 0.117 mg/L 04/06/23 11:08 04/07/23 10:57

Lab Sample ID: LCS 410-361604/2-A **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 362413

Prep Batch: 361604

MR MR

	Spike	LCS	LCS			%Rec	
Analyte	Added	Result	Qualifier	Unit D	%Rec	Limits	
Lithium	0.500	0.5257		mg/L	105	80 - 120	
Calcium	5.00	5.165		mg/L	103	80 - 120	

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Project/Site: Stantec CCR AP2 MW-8 TS II

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: 410-121030-6 MS

Matrix: Water

Analysis Batch: 362042

Client: Terra Systems Inc

Client Sample ID: MW-8 Mod Fe2O3

Prep Type: Dissolved Prep Batch: 361600

	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Lithium	0.0113	J	0.500	0.5037		mg/L		98	75 - 125	
Calcium	79.0		5.00	83.64	4	mg/L		92	75 - 125	

Lab Sample ID: 410-121030-6 MSD

Matrix: Water

Analysis Batch: 362042

Client Sample ID: MW-8 Mod Fe2O3 **Prep Type: Dissolved**

Prep Batch: 361600

•	Sample	Sample	Spike	MSD	MSD				%Rec		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Lithium	0.0113	J	0.500	0.5326		mg/L		104	75 - 125	6	20
Calcium	79.0		5.00	85.83	4	mg/L		136	75 - 125	3	20

Lab Sample ID: 410-121030-6 DU

Matrix: Water

Analysis Batch: 362042

Client Sample ID: MW-8 Mod Fe2O3

Prep Type: Dissolved

Prep Batch: 361600

Sam	le Sample	DU	DU				RPD
Analyte Res	lt Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Lithium 0.01	3 J	<0.0113		mg/L		 NC	20
Calcium 79	.0	79.51		mg/L		0.6	20
SiO2, Silica	.0	28.29		mg/L		0.9	

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-361600/1-A

Matrix: Water

Analysis Batch: 363081

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361600

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 10:59	04/11/23 07:25	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		04/06/23 10:59	04/11/23 07:25	1
Iron	<0.0206		0.0515	0.0206	mg/L		04/06/23 10:59	04/11/23 07:25	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		04/06/23 10:59	04/11/23 07:25	1
Manganese	<0.000979		0.00206	0.000979	mg/L		04/06/23 10:59	04/11/23 07:25	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		04/06/23 10:59	04/11/23 07:25	1
Potassium	<0.0670		0.206	0.0670	mg/L		04/06/23 10:59	04/11/23 07:25	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 10:59	04/11/23 07:25	1
Sodium	<0.0927		0.206	0.0927	mg/L		04/06/23 10:59	04/11/23 07:25	1
Sodium	<0.0927		0.206	0.0927	mg/L		04/06/23 10:59	04/11/23 07:25	1

Lab Sample ID: LCS 410-361600/2-A

Matrix: Water

Analysis Batch: 363081

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 361600

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.5079		mg/L		102	85 - 120	
Cobalt	0.500	0.5077		mg/L		102	90 - 113	
Iron	5.00	5.018		mg/L		100	88 - 119	
Magnesium	5.00	4.983		mg/L		100	90 - 112	
Manganese	0.500	0.5010		mg/L		100	89 _ 120	
Molybdenum	0.0500	0.05112		mg/L		102	85 _ 115	
Potassium	5.00	5.017		mg/L		100	90 - 112	
Selenium	0.100	0.09662		mg/L		97	80 - 120	

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Project/Site: Stantec CCR AP2 MW-8 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 410-361600/2-A

Matrix: Water

Analysis Batch: 363081

Client: Terra Systems Inc

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Prep Batch: 361600

Spike LCS LCS Analyte Added Result Qualifier Unit %Rec Limits Sodium 5.00 5.074 101 89 - 112 mg/L

Lab Sample ID: MB 410-361602/1-A Client Sample ID: Method Blank

Matrix: Water

Analysis Batch: 363346 MR MR

Prep Type: Total/NA

Prep Batch: 361602

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 11:03	04/11/23 17:29	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		04/06/23 11:03	04/11/23 17:29	1
Iron	<0.0206		0.0515	0.0206	mg/L		04/06/23 11:03	04/11/23 17:29	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		04/06/23 11:03	04/11/23 17:29	1
Manganese	<0.000979		0.00206	0.000979	mg/L		04/06/23 11:03	04/11/23 17:29	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		04/06/23 11:03	04/11/23 17:29	1
Potassium	<0.0670		0.206	0.0670	mg/L		04/06/23 11:03	04/11/23 17:29	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:03	04/11/23 17:29	1
Sodium	<0.0927		0.206	0.0927	ma/L		04/06/23 11:03	04/11/23 17:29	1

Lab Sample ID: LCS 410-361602/2-A

Matrix: Water

Analysis Batch: 363346

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 361602

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.4962		mg/L		99	85 - 120	
Cobalt	0.500	0.5006		mg/L		100	90 - 113	
Iron	5.00	5.034		mg/L		101	88 - 119	
Magnesium	5.00	4.997		mg/L		100	90 - 112	
Manganese	0.500	0.5032		mg/L		101	89 - 120	
Molybdenum	0.0500	0.04894		mg/L		98	85 - 115	
Potassium	5.00	5.086		mg/L		102	90 - 112	
Selenium	0.100	0.1001		mg/L		100	80 - 120	
Sodium	5.00	5.139		mg/L		103	89 - 112	

Lab Sample ID: MB 410-361604/1-A

Matrix: Water

Analysis Batch: 363809

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 361604

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 15:58	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 15:58	1
Iron	<0.0206		0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 15:58	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		04/06/23 11:08	04/12/23 15:58	1
Manganese	<0.000979		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 15:58	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 15:58	1
Potassium	<0.0670		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 15:58	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 15:58	1
Sodium	<0.0927		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 15:58	1

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 MW-8 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 410-361604/2-A **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA Analysis Batch: 363809 **Prep Batch: 361604**

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.4926		mg/L		99	85 - 120	
Cobalt	0.500	0.4971		mg/L		99	90 _ 113	
Iron	5.00	5.026		mg/L		101	88 - 119	
Magnesium	5.00	4.866		mg/L		97	90 - 112	
Manganese	0.500	0.5060		mg/L		101	89 _ 120	
Molybdenum	0.0500	0.04979		mg/L		100	85 - 115	
Potassium	5.00	5.125		mg/L		102	90 - 112	
Selenium	0.100	0.09782		mg/L		98	80 - 120	
Sodium	5.00	5.043		mg/L		101	89 _ 112	

Lab Sample ID: 410-121030-6 MS Client Sample ID: MW-8 Mod Fe2O3 **Matrix: Water Prep Type: Dissolved**

Prep Batch: 361600 Analysis Batch: 363081

	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.000815	J	0.500	0.5115		mg/L		102	75 - 125	
Cobalt	0.00153		0.500	0.5050		mg/L		101	80 - 125	
Iron	0.0326	J	5.00	5.113		mg/L		102	75 - 125	
Magnesium	29.7		5.00	33.85	4	mg/L		83	75 - 125	
Manganese	0.338		0.500	0.8332		mg/L		99	75 - 125	
Molybdenum	0.134		0.0500	0.1850		mg/L		102	81 - 125	
Potassium	8.70		5.00	13.43		mg/L		95	75 - 125	
Selenium	<0.000286		0.100	0.09967		mg/L		100	75 - 125	
Sodium	18.7		5.00	22.93		mg/L		85	75 - 125	

Lab Sample ID: 410-121030-6 MSD Client Sample ID: MW-8 Mod Fe2O3 **Matrix: Water Prep Type: Dissolved**

Analysis Batch: 363081

Prep Batch: 361600 MSD MSD RPD Sample Sample Spike %Rec Result Qualifier Added Limit Analyte Result Qualifier Unit %Rec Limits **RPD** Arsenic 0.000815 0.500 0.5152 103 75 - 125 20 mg/L mg/L Cobalt 0.00153 0.500 0.5166 103 80 - 125 20 Iron 0.0326 J 5.00 5.145 mg/L 102 75 - 125 20 Magnesium 29.7 5.00 33.60 4 mg/L 78 75 - 125 20 0.338 0.500 0.8360 100 75 - 125 20 Manganese mg/L Molybdenum 0.134 0.0500 0.1854 mg/L 103 81 - 125 20 8.70 5.00 13.46 95 20 Potassium mg/L 75 - 125 0 0.09755 Selenium < 0.000286 0.100 mg/L 98 75 - 125 2 20 Sodium 18.7 5.00 22.90 mg/L 75 - 125

Lab Sample ID: 410-121030-6 DU Client Sample ID: MW-8 Mod Fe2O3

Matrix: Water

Analysis Batch: 363081							Prep	Batch: 3	61600
	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Arsenic	0.000815	J	0.0008086	J	mg/L			0.8	20
Cobalt	0.00153		0.001461		mg/L			5	20
Iron	0.0326	J	0.02588	JF5	mg/L			23	20
Magnesium	29.7		29.28		mg/L			1	20

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Prep Type: Dissolved

QC Sample Results

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 410-121030-6 DU	Client Sample ID: MW-8 Mod Fe2O3
Matrix: Water	Prep Type: Dissolved
Analysis Batch: 363081	Prep Batch: 361600

Prep Batch: 361600

	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Manganese	0.338		0.3329		mg/L		2	20
Molybdenum	0.134		0.1338		mg/L		0	20
Potassium	8.70		8.555		mg/L		2	20
Selenium	<0.000286		<0.000286		mg/L		NC	20
Sodium	18.7		18.43		mg/L		1	20

QC Association Summary

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Metals

Prep Batch: 361600

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121030-6	MW-8 Mod Fe2O3	Dissolved	Water	Non-Digest Prep	
MB 410-361600/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361600/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	
410-121030-6 MS	MW-8 Mod Fe2O3	Dissolved	Water	Non-Digest Prep	
410-121030-6 MSD	MW-8 Mod Fe2O3	Dissolved	Water	Non-Digest Prep	
410-121030-6 DU	MW-8 Mod Fe2O3	Dissolved	Water	Non-Digest Prep	

Prep Batch: 361602

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121030-1	MW-8 Control	Dissolved	Water	Non-Digest Prep	
410-121030-2	MW-8 Low FeCl3	Dissolved	Water	Non-Digest Prep	
410-121030-3	MW-8 Mod FeCl3	Dissolved	Water	Non-Digest Prep	
410-121030-4	MW-8 High FeCl3	Dissolved	Water	Non-Digest Prep	
410-121030-5	MW-8 Low Fe2O3	Dissolved	Water	Non-Digest Prep	
MB 410-361602/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361602/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Prep Batch: 361604

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121030-7	MW-8 High Fe2O3	Dissolved	Water	Non-Digest Prep	r rep Daton
410-121030-8	MW-8 Low ZVI	Dissolved	Water	Non-Digest Prep	
410-121030-9	MW-8 Mod ZVI	Dissolved	Water	Non-Digest Prep	
410-121030-10	MW-8 High ZVI	Dissolved	Water	Non-Digest Prep	
MB 410-361604/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361604/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 362042

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121030-6	MW-8 Mod Fe2O3	Dissolved	Water	6010D	361600
MB 410-361600/1-A	Method Blank	Total/NA	Water	6010D	361600
LCS 410-361600/2-A	Lab Control Sample	Total/NA	Water	6010D	361600
410-121030-6 MS	MW-8 Mod Fe2O3	Dissolved	Water	6010D	361600
410-121030-6 MSD	MW-8 Mod Fe2O3	Dissolved	Water	6010D	361600
410-121030-6 DU	MW-8 Mod Fe2O3	Dissolved	Water	6010D	361600

Analysis Batch: 362412

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121030-1	MW-8 Control	Dissolved	Water	6010D	361602
410-121030-2	MW-8 Low FeCl3	Dissolved	Water	6010D	361602
410-121030-3	MW-8 Mod FeCl3	Dissolved	Water	6010D	361602
410-121030-4	MW-8 High FeCl3	Dissolved	Water	6010D	361602
410-121030-5	MW-8 Low Fe2O3	Dissolved	Water	6010D	361602
MB 410-361602/1-A	Method Blank	Total/NA	Water	6010D	361602
LCS 410-361602/2-A	Lab Control Sample	Total/NA	Water	6010D	361602

Analysis Batch: 362413

Lab Sample ID 410-121030-7	Client Sample ID MW-8 High Fe2O3	Prep Type Dissolved	Matrix Water	Method 6010D	Prep Batch 361604
410-121030-8	MW-8 Low ZVI	Dissolved	Water	6010D	361604
410-121030-9	MW-8 Mod ZVI	Dissolved	Water	6010D	361604
410-121030-10	MW-8 High ZVI	Dissolved	Water	6010D	361604

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QC Association Summary

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Metals (Continued)

Analysis	Batch: 362413	(Continued)
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Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 410-361604/1-A	Method Blank	Total/NA	Water	6010D	361604
LCS 410-361604/2-A	Lab Control Sample	Total/NA	Water	6010D	361604

Analysis Batch: 363081

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121030-6	MW-8 Mod Fe2O3	Dissolved	Water	6020B	361600
MB 410-361600/1-A	Method Blank	Total/NA	Water	6020B	361600
LCS 410-361600/2-A	Lab Control Sample	Total/NA	Water	6020B	361600
410-121030-6 MS	MW-8 Mod Fe2O3	Dissolved	Water	6020B	361600
410-121030-6 MSD	MW-8 Mod Fe2O3	Dissolved	Water	6020B	361600
410-121030-6 DU	MW-8 Mod Fe2O3	Dissolved	Water	6020B	361600

Analysis Batch: 363346

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121030-1	MW-8 Control	Dissolved	Water	6020B	361602
410-121030-2	MW-8 Low FeCl3	Dissolved	Water	6020B	361602
410-121030-3	MW-8 Mod FeCl3	Dissolved	Water	6020B	361602
410-121030-3	MW-8 Mod FeCl3	Dissolved	Water	6020B	361602
410-121030-4	MW-8 High FeCl3	Dissolved	Water	6020B	361602
410-121030-4	MW-8 High FeCl3	Dissolved	Water	6020B	361602
410-121030-5	MW-8 Low Fe2O3	Dissolved	Water	6020B	361602
MB 410-361602/1-A	Method Blank	Total/NA	Water	6020B	361602
LCS 410-361602/2-A	Lab Control Sample	Total/NA	Water	6020B	361602

Analysis Batch: 363809

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121030-7	MW-8 High Fe2O3	Dissolved	Water	6020B	361604
410-121030-8	MW-8 Low ZVI	Dissolved	Water	6020B	361604
410-121030-9	MW-8 Mod ZVI	Dissolved	Water	6020B	361604
410-121030-10	MW-8 High ZVI	Dissolved	Water	6020B	361604
MB 410-361604/1-A	Method Blank	Total/NA	Water	6020B	361604
LCS 410-361604/2-A	Lab Control Sample	Total/NA	Water	6020B	361604

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-8 TS II

Client Sample ID: MW-8 Control

Date Collected: 03/31/23 10:30 Date Received: 03/31/23 16:05 Lab Sample ID: 410-121030-1

Matrix: Water

Job ID: 410-121030-1

Batch Batch Dilution Batch Prepared Prep Type Туре Method Run Factor **Number Analyst** Lab or Analyzed 04/06/23 11:03 Dissolved Prep Non-Digest Prep 361602 HUH3 ELLE Dissolved Analysis 6010D 1 362412 MT26 **ELLE** 04/07/23 22:00 Dissolved Prep Non-Digest Prep 361602 HUH3 **ELLE** 04/06/23 11:03 Dissolved 04/11/23 19:04 Analysis 6020B 1 363346 UCIG **ELLE**

Client Sample ID: MW-8 Low FeCI3

Date Collected: 03/31/23 10:45 Date Received: 03/31/23 16:05

Lab Sample ID: 410-121030-2

Matrix: Water

Batch Batch Dilution Batch Prepared or Analyzed **Prep Type** Туре Method Run Factor Number Analyst Lab Dissolved Non-Digest Prep 361602 HUH3 ELLE 04/06/23 11:03 Prep Dissolved 6010D Analysis 362412 MT26 **ELLE** 04/07/23 21:44 1 Dissolved Prep Non-Digest Prep 361602 HUH3 ELLE 04/06/23 11:03 Dissolved 6020B 363346 UCIG ELLE 04/11/23 18:48 Analysis 1

Client Sample ID: MW-8 Mod FeCI3

Date Collected: 03/31/23 11:00

Lab Sample ID: 410-121030-3

Matrix: Water

Date Received: 03/31/23 16:05

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361602	HUH3	ELLE	04/06/23 11:03
Dissolved	Analysis	6010D		1	362412	MT26	ELLE	04/07/23 21:57
Dissolved	Prep	Non-Digest Prep			361602	HUH3	ELLE	04/06/23 11:03
Dissolved	Analysis	6020B		1	363346	UCIG	ELLE	04/11/23 19:02
Dissolved	Prep	Non-Digest Prep			361602	HUH3	ELLE	04/06/23 11:03
Dissolved	Analysis	6020B		5	363346	UCIG	ELLE	04/11/23 19:20

Client Sample ID: MW-8 High FeCl3

Date Collected: 03/31/23 11:15

Date Received: 03/31/23 16:05

_ab	Sampl	le ID:	410-1	21030	-4

Lab Sample ID: 410-121030-5

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361602	HUH3	ELLE	04/06/23 11:03
Dissolved	Analysis	6010D		1	362412	MT26	ELLE	04/07/23 21:28
Dissolved	Prep	Non-Digest Prep			361602	HUH3	ELLE	04/06/23 11:03
Dissolved	Analysis	6020B		1	363346	UCIG	ELLE	04/11/23 18:44
Dissolved	Prep	Non-Digest Prep			361602	HUH3	ELLE	04/06/23 11:03
Dissolved	Analysis	6020B		10	363346	UCIG	ELLE	04/11/23 19:18

Client Sample ID: MW-8 Low Fe2O3

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ate Collected: 03/31	1/23 11:30			Matrix: Water
ate Received: 03/31	/23 16:05			
-		 	 _	

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361602	HUH3	ELLE	04/06/23 11:03
Dissolved	Analysis	6010D		1	362412	MT26	ELLE	04/07/23 21:25

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-8 TS II Client Sample ID: MW-8 Low Fe2O3

Lab Sample ID: 410-121030-5

Matrix: Water

Date Collected: 03/31/23 11:30 Date Received: 03/31/23 16:05

Matrix: Water

Batch Batch Dilution Batch Prepared Prep Type Туре Method Run Factor Number Analyst Lab or Analyzed 04/06/23 11:03 Dissolved Prep Non-Digest Prep 361602 HUH3 ELLE 04/11/23 18:42 6020B ELLE Dissolved Analysis 1 363346 UCIG

Client Sample ID: MW-8 Mod Fe2O3 Lab Sample ID: 410-121030-6

Date Collected: 03/31/23 11:45 **Matrix: Water**

Date Received: 03/31/23 16:05

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361600	HUH3	ELLE	04/06/23 10:59
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 10:03
Dissolved	Prep	Non-Digest Prep			361600	HUH3	ELLE	04/06/23 10:59
Dissolved	Analysis	6020B		1	363081	F7JF	ELLE	04/11/23 08:28

Client Sample ID: MW-8 High Fe2O3 Lab Sample ID: 410-121030-7

Date Collected: 03/31/23 12:00

Date Received: 03/31/23 16:05

Date Received: 03/31/23 16:05

_	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 12:27
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:57

Client Sample ID: MW-8 Low ZVI Lab Sample ID: 410-121030-8

Date Collected: 03/31/23 12:45 **Matrix: Water**

Batch Batch Dilution Batch Prepared Prep Type Method or Analyzed Type Run Factor Number Analyst Lab 04/06/23 11:08 Dissolved Prep Non-Digest Prep 361604 HUH3 **ELLE** Dissolved Analysis 6010D 362413 MT26 ELLE 04/07/23 12:31 1 Dissolved Prep Non-Digest Prep 361604 HUH3 ELLE 04/06/23 11:08 Dissolved Analysis 6020B 363809 UCIG ELLE 04/12/23 16:59

1 Lab Sample ID: 410-121030-9 Client Sample ID: MW-8 Mod ZVI

Date Collected: 03/31/23 13:00 **Matrix: Water** Date Received: 03/31/23 16:05

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 12:11
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:53

Lab Chronicle

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Client Sample ID: MW-8 High ZVI

Lab Sample ID: 410-121030-10 Date Collected: 03/31/23 13:15

Matrix: Water

Date Received: 03/31/23 16:05

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 12:14
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:55

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alaska	State	PA00009	06-30-23
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-23
California	State	2792	04-17-23
Colorado	State	PA00009	06-30-23
Connecticut	State	PH-0746	04-17-23
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	04-17-23
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Illinois	NELAP	200027	04-17-23
lowa	State	361	04-17-23
Kansas	NELAP	E-10151	04-17-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	04-17-23
Louisiana (All)	NELAP	02055	04-17-23
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-23
Massachusetts	State	M-PA009	04-17-23
Michigan	State	9930	01-31-24
Minnesota	NELAP	042-999-487	12-31-23
	State	023	01-31-24
Mississippi Missouri	State	450	
Missouri			01-31-25
Montana (DW)	State	0098 NE 00 33 47	01-01-24
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	04-17-23
New Jersey	NELAP	PA011	04-17-23
New York	NELAP	10670	04-17-23
North Carolina (DW)	State	42705	07-31-23
North Carolina (WW/SW)	State	521	04-17-23
North Dakota	State	R-205	04-17-23
Oklahoma	NELAP	R-205	04-17-23
Oregon	NELAP	PA200001	04-17-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	04-17-23
Rhode Island	State	LAO00338	04-17-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Texas	NELAP	T104704194-22-45	04-17-23
USDA	US Federal Programs	525-22-298-19481	10-25-25
Vermont	State	VT - 36037	10-28-23
Virginia	NELAP	460182	04-17-23
West Virginia (DW)	State	9906 C	12-31-23
West Virginia DEP	State	055	07-31-23
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Sample Summary

Client: Terra Systems Inc Job ID: 410-121030-1

Project/Site: Stantec CCR AP2 MW-8 TS II

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-121030-1	MW-8 Control	Water	03/31/23 10:30	03/31/23 16:05
410-121030-2	MW-8 Low FeCl3	Water	03/31/23 10:45	03/31/23 16:05
410-121030-3	MW-8 Mod FeCl3	Water	03/31/23 11:00	03/31/23 16:05
410-121030-4	MW-8 High FeCl3	Water	03/31/23 11:15	03/31/23 16:05
410-121030-5	MW-8 Low Fe2O3	Water	03/31/23 11:30	03/31/23 16:05
410-121030-6	MW-8 Mod Fe2O3	Water	03/31/23 11:45	03/31/23 16:05
410-121030-7	MW-8 High Fe2O3	Water	03/31/23 12:00	03/31/23 16:05
410-121030-8	MW-8 Low ZVI	Water	03/31/23 12:45	03/31/23 16:05
410-121030-9	MW-8 Mod ZVI	Water	03/31/23 13:00	03/31/23 16:05
410-121030-10	MW-8 High ZVI	Water	03/31/23 13:15	03/31/23 16:05

Environmental

Macon, GA

222566-3-29-23

41011818

Time

10:30

10:45

11:00

11:15

11:30

11:45

12:00

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13:00

13:15

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Rush

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'Chain of Custody

eurofins :

Project Name/#:

Project Manager:

Sampler: Michael D. Lee

Sample Identification

MW-8 Control

MW-8 Low FeCI3

MW-8 Mod FeCl3

MW-8 High FeCl3

MW-8 Low Fe2O3

MW-8 Mod Fe2O3

MW-8 High Fe2O3

MW-8 Low ZVI

MW-8 Mod ZVI

MW-8 High ZVI

E-mail Address:

Phone:

NJ DKQP

EDD Required?

Date results are needed:

Type I (Validation/non-CLP)

Type III (Reduced non-CLP)

Type VI (Raw Data Only)

Rush results requested by (please check):

Client:

Phone #:

Lancaster Laboratories **Environmental**

Michael D. Lee

Turnaround Time Requested (TAT) (please check):

Data Package Options (please check if required)

Yes

Stantec CCR AP2 MW-8 TS II | Site ID #:

P.O. #:

PWSID #:

Quote #:

Date

3/29/2023

3/29/2023

3/29/2023

3/29/2023

3/29/2023

3/29/2023

3/29/2023

3/29/2023

3/29/2023

3/29/2023

(Rush TAT is subject to laboratory approval and surcharges.)

MA MCP

CT RCP

TX TRRP-13

NYSDEC Category

If yes, format

E-Mail

4/14/23

mlee@terrasystems.net 302-798-9553

No

Standard

Collection

GA For Compliance:

Terra Systems, Inc.

302-798-9553

State where samples were collected:

Acct. #

Matrix

Surface

1

Ground

Potable NPDES

Water

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X

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Relinquished by

Relinquished by:

Relinquished by:

Relinquished by:

Relinquished by:

Relinquished by Commercial Carrier:

Other:

440.40	4000.01		

110-121030 Chain of Custody For Lab Use Only **Analyses Requested Preservation Codes** SF #: ____ Ν SCR #: Ν Š Preservation Codes Total # of Containers Se, Na T = Thiosulfate Mo, S, Dis (field fil) Ca & Li N = HNO₃ B = NaOH Dis (field fil) Mn, Dis (field fil) As, S = H2SO4 P = H.PO. O = Other Remarks Х Х Х Х Х 2 X Х Х Х Х Х Х Х Х Х 2 Х Х Х 2 X Х X 2 Х Х Х Х Х Date Time Received by: Date Time Bot 1 131/23 11.20 1100 3/3/123 Time Time Received by: Date 13/23 1605 Time Received by: Date Time Time Received by: Date Date Time Time Date Received by: Date 1605

Temperature upon receipt

Eurofins Lancaster Laboratories Environmental, LLC • 2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300



°C

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Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-121030-1

Login Number: 121030 List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Number: 1

Creator: Jeremiah, Cory T

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

4/17/2023

Eurofins Lancaster Laboratories Environment Testing, LLC

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PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

Generated 4/17/2023 6:32:51 AM

JOB DESCRIPTION

Stantec CCR AP2 MW-7 TS II

JOB NUMBER

410-121021-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

Harrissa Williams

Generated 4/17/2023 6:32:51 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Page 2 of 34

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

This report shall not be reproduced except in full, without the written approval of the laboratory.

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Marrissa Williams

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Qualifiers

Wetais	
Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
F5	Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL, and the absolute difference between results is < the upper reporting limits for both.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

ML

MPN

MQL NC

ND

NEG

POS

PQL

QC

RL

RER

RPD

TEF

TEQ TNTC

PRES

Minimum Level (Dioxin)

Most Probable Number Method Quantitation Limit

Not Detected at the reporting limit (or MDL or EDL if shown)

Not Calculated

Negative / Absent

Positive / Present

Presumptive

Quality Control

Practical Quantitation Limit

Relative Error Ratio (Radiochemistry)

Toxicity Equivalent Factor (Dioxin) Toxicity Equivalent Quotient (Dioxin)

Too Numerous To Count

Reporting Limit or Requested Limit (Radiochemistry)

Relative Percent Difference, a measure of the relative difference between two points

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

Case Narrative

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Job ID: 410-121021-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-121021-1

Receipt

The samples were received on 3/31/2023 4:05 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 2.2°C

Receipt Exceptions

The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): MW-8 Low CaO (410-121021-7). The container labels list 08:45, while the COC lists 09:00. Entered per the client COC, labeled per the client ID.

The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): MW-8 Mod CaO (410-121021-8). The container labels list 09:00, while the COC lists 09:15. Entered per the client COC, labeled per the client ID.

The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): MW-8 High CaO (410-121021-9). The container labels list 09:15, while the COC lists 09:30. Entered per the client COC, labeled per the client ID.

Metals

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

Job ID: 410-121021-1

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 10 g/L CERES MF2

Lab Sample ID: 410-121021-1

Job ID: 410-121021-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0296	J	0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	53.2		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	0.627	J	1.10	0.117	mg/L	1		6010D	Dissolved
Iron	0.0889		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	231		0.258	0.0824	mg/L	5		6020B	Dissolved
Manganese	0.307		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.0195		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	9.35		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	31.4		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 30 g/L CERES MF2

Lab Sample ID: 410-121021-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0718		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	178		0.515	0.0989	mg/L	1		6010D	Dissolved
Cobalt	0.000346	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	2.34		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	625		0.515	0.165	mg/L	10		6020B	Dissolved
Manganese	1.72		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.00292		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	10.9		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	57.8		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 50 g/L CERES MF2

Lab Sample ID: 410-121021-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.118		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	252		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	0.526	J	1.10	0.117	mg/L	1		6010D	Dissolved
Cobalt	0.000332	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.912		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	1040		2.58	0.824	mg/L	50		6020B	Dissolved
Manganese	2.27		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000651		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	12.2		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	82.1		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 10 g/L CERES MF3

Lab Sample ID: 410-121021-4

4/17/2023

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0208	J	0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	20.6		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	0.927	J	1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000705	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Iron	0.0349	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	165		0.258	0.0824	mg/L	5		6020B	Dissolved
Manganese	0.00358		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.0204		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.75		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	19.9		0.206	0.0927	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 30 g/L CERES MF3

Lab Sample ID: 410-121021-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0606		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	117		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	0.612	J	1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000710	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Iron	0.0210	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	424		0.515	0.165	mg/L	10		6020B	Dissolved
Manganese	0.00305		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.00426		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	10.2		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	23.6		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 50 g/L CERES MF3

Lab Sample ID: 410-121021-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0685		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	128		0.515	0.0989	mg/L	1		6010D	Dissolved
Arsenic	0.000721	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Iron	0.129		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	715		0.515	0.165	mg/L	10		6020B	Dissolved
Manganese	0.00563		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.0125		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	10.9		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	22.9		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 Low CaO

Lab Sample ID: 410-121021-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	68.2		0.515	0.0989	mg/L	1	_	6010D	Dissolved
SiO2, Silica	26.3		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000731	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00127		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0286	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	28.6	^2	0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.111		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.164		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.91		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	18.1		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 Mod CaO

Lab Sample ID: 410-121021-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	82.6		0.515	0.0989	mg/L	1	_	6010D	Dissolved
SiO2, Silica	26.5		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000901	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Cobalt	0.00185		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0574		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	28.6	^2	0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.318		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.167		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.83		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	18.2		0.206	0.0927	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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: 410-121021-

Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Client: Terra Systems Inc

Client Sample ID: MW-8 High CaO

Lab Sample ID: 410-121021-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	80.9		0.515	0.0989	mg/L	1	_	6010D	Dissolved
SiO2, Silica	27.4		1.10	0.117	mg/L	1		6010D	Dissolved
Cobalt	0.00297		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0448	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	28.9	^2	0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.416		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.169		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.36		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	17.9		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 10 g/L CERES 1135 MF2

Lab Sample ID: 410-121021-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0157	J	0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	98.0		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	1.89		1.10	0.117	mg/L	1		6010D	Dissolved
Cobalt	0.00438		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	48.1		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	370		0.258	0.0824	mg/L	5		6020B	Dissolved
Manganese	2.91		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.00739		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	9.34		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	38.5		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 30 g/L CERES 1135 MF2

Lab Sample ID: 410-121021-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0383	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
Calcium	162		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	0.599	J	1.10	0.117	mg/L	1		6010D	Dissolved
Cobalt	0.0272		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	439		0.515	0.206	mg/L	10		6020B	Dissolved
Magnesium	1030		2.58	0.824	mg/L	50		6020B	Dissolved
Manganese	11.5		0.0206	0.00979	mg/L	10		6020B	Dissolved
Molybdenum	0.00145		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	10.6		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	75.7		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Lab Sample ID: 410-121021-12

4/17/2023

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0531		0.0515	0.0113	mg/L	1	_	6010D	Dissolved
Calcium	197		0.515	0.0989	mg/L	1		6010D	Dissolved
SiO2, Silica	0.561	J	1.10	0.117	mg/L	1		6010D	Dissolved
Cobalt	0.0378	^2	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	673		2.58	1.03	mg/L	50		6020B	Dissolved
Magnesium	1560		2.58	0.824	mg/L	50		6020B	Dissolved
Manganese	18.6		0.103	0.0489	mg/L	50		6020B	Dissolved
Molybdenum	0.000972		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	10.6		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	121		10.3	4.64	mg/L	50		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 10 g/L CERES MF2

Lab Sample ID: 410-121021-1

Date Collected: 03/30/23 08:00 Matrix: Water

Date Received: 03/31/23 16:05

Client: Terra Systems Inc

	Method: SW846 6010D - Metals (ICF) - Dissolve	d							
	Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
l	Lithium	0.0296	J	0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 12:05	1
	Calcium	53.2		0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 12:05	1
	SiO2, Silica	0.627	J	1.10	0.117	mg/L		04/06/23 11:08	04/07/23 12:05	1
_										

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 16:43	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:43	1
Iron	0.0889		0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:43	1
Magnesium	231		0.258	0.0824	mg/L		04/06/23 11:08	04/12/23 17:42	5
Manganese	0.307		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:43	1
Molybdenum	0.0195		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:43	1
Potassium	9.35		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:43	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:43	1
Sodium	31.4		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:43	1

Client Sample ID: MW-8 30 g/L CERES MF2

Lab Sample ID: 410-121021-2 Date Collected: 03/30/23 08:15 Matrix: Water

Date Received: 03/31/23 16:05

Method: SW846 6010D -	Metals (ICP) - Dissolved								
Analyte	Result C	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0718		0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 12:02	1
Calcium	178		0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 12:02	1
SiO2, Silica	<0.117		1.10	0.117	mg/L		04/06/23 11:08	04/07/23 12:02	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 16:41	1
Cobalt	0.000346	J	0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:41	1
Iron	2.34		0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:41	1
Magnesium	625		0.515	0.165	mg/L		04/06/23 11:08	04/12/23 17:40	10
Manganese	1.72		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:41	1
Molybdenum	0.00292		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:41	1
Potassium	10.9		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:41	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:41	1
Sodium	57.8		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:41	1

Client Sample ID: MW-8 50 g/L CERES MF2

Lab Sample ID: 410-121021-3 Date Collected: 03/30/23 08:30 **Matrix: Water**

Date Received: 03/31/23 16:05

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Lithium	0.118		0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 11:22	
Calcium	252		0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 11:22	
SiO2, Silica	0.526	J	1.10	0.117	mg/L		04/06/23 11:08	04/07/23 11:22	
Method: SW846 6020B - N	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil F
Arsenic	<0.000700		0.00206	0.000700	ma/L		04/06/23 11:08	04/12/23 16:20	

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Lab Sample ID: 410-121021-3

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 50 g/L CERES MF2

Date Collected: 03/30/23 08:30 Matrix: Water

Date Received: 03/31/23 16:05

Client: Terra Systems Inc

Method: SW846 6020B - M	lethod: SW846 6020B - Metals (ICP/MS) - Dissolved (Continued)										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac		
Cobalt	0.000332	J	0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:20	1		
Iron	0.912		0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:20	1		
Magnesium	1040		2.58	0.824	mg/L		04/06/23 11:08	04/12/23 17:29	50		
Manganese	2.27		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:20	1		
Molybdenum	0.000651		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:20	1		
Potassium	12.2		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:20	1		
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:20	1		
Sodium	82.1		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:20	1		

Client Sample ID: MW-8 10 g/L CERES MF3

Date Collected: 03/30/23 10:15 Matrix: Water

Date Received: 03/31/23 16:05

Method: SW846 6010D - Metals	(ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0208	J	0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 12:08	1
Calcium	20.6		0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 12:08	1
SiO2, Silica	0.927	J	1.10	0.117	mg/L		04/06/23 11:08	04/07/23 12:08	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000705	J	0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 16:45	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:45	1
Iron	0.0349	J	0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:45	1
Magnesium	165		0.258	0.0824	mg/L		04/06/23 11:08	04/12/23 17:44	5
Manganese	0.00358		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:45	1
Molybdenum	0.0204		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:45	1
Potassium	8.75		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:45	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:45	1
Sodium	19.9		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:45	1

Client Sample ID: MW-8 30 g/L CERES MF3

Lab Sample ID: 410-121021-5 Date Collected: 03/30/23 10:30 **Matrix: Water**

Date Received: 03/31/23 16:05

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Lithium	0.0606		0.0515	0.0113	mg/L		04/06/23 10:59	04/07/23 09:38	
Calcium	117		0.515	0.0989	mg/L		04/06/23 10:59	04/07/23 09:38	
SiO2, Silica	0.612	J	1.10	0.117	mg/L		04/06/23 10:59	04/07/23 09:38	
- Method: SW846 6020B -	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000710	J	0.00206	0.000700	mg/L		04/06/23 10:59	04/11/23 07:29	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		04/06/23 10:59	04/11/23 07:29	1
Iron	0.0210	J	0.0515	0.0206	mg/L		04/06/23 10:59	04/11/23 07:29	1
Magnesium	424		0.515	0.165	mg/L		04/06/23 10:59	04/11/23 19:05	10
Manganese	0.00305		0.00206	0.000979	mg/L		04/06/23 10:59	04/11/23 07:29	1
Molybdenum	0.00426		0.000515	0.000134	mg/L		04/06/23 10:59	04/11/23 07:29	1
Potassium	10.2		0.206	0.0670	mg/L		04/06/23 10:59	04/11/23 07:29	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 10:59	04/11/23 07:29	1

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Lab Sample ID: 410-121021-4

Client Sample Results

Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 30 g/L CERES MF3

Lab Sample ID: 410-121021-5

Date Collected: 03/30/23 10:30 **Matrix: Water** Date Received: 03/31/23 16:05

Method: SW846 6020B - Metals (ICP/MS) - Dissolved (Continued)

Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac Sodium 0.206 0.0927 mg/L 04/06/23 10:59 04/11/23 07:29 23.6

Client Sample ID: MW-8 50 g/L CERES MF3

Lab Sample ID: 410-121021-6 Date Collected: 03/30/23 10:45 **Matrix: Water**

Date Received: 03/31/23 16:05

Method: SW846 6010D - Metals (ICP) - Dissolved Analyte Result Qualifier RL MDL Unit D Dil Fac Prepared Analyzed 0.0515 Lithium 0.0685 0.0113 mg/L 04/06/23 11:08 04/07/23 11:49 0.0989 mg/L Calcium 0.515 04/06/23 11:08 04/07/23 11:49 128 SiO2, Silica <0.117 0.117 mg/L 04/06/23 11:08 04/07/23 11:49 1.10

Method: SW846 6020B - Metals (ICP/MS) - Dissolved Analyte Result Qualifier RL MDL Unit Prepared Dil Fac Analyzed 0.000700 Arsenic 0.000721 0.00206 04/06/23 11:08 04/12/23 16:35 mg/L < 0.000161 0.000161 Cobalt 0.000515 mg/L 04/06/23 11:08 04/12/23 16:35 Iron 0.129 0.0515 0.0206 mg/L 04/06/23 11:08 04/12/23 16:35 04/12/23 17:38 Magnesium 715 0.515 0.165 mg/L 04/06/23 11:08 10 Manganese 0.00563 0.00206 0.000979 mg/L 04/06/23 11:08 04/12/23 16:35 0.000515 0.000134 mg/L 04/06/23 11:08 04/12/23 16:35 Molybdenum 0.0125 04/12/23 16:35 0.206 0.0670 mg/L 04/06/23 11:08 **Potassium** 10.9 Selenium < 0.000286 0.00103 0.000286 mg/L 04/06/23 11:08 04/12/23 16:35 **Sodium** 0.206 0.0927 mg/L 04/06/23 11:08 04/12/23 16:35 22.9

Client Sample ID: MW-8 Low CaO

Lab Sample ID: 410-121021-7 Date Collected: 03/30/23 09:00 **Matrix: Water**

Date Received: 03/31/23 16:05

Method: SW846 6010D - Metals (ICP) - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 11:29	1
Calcium	68.2		0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 11:29	1
SiO2, Silica	26.3		1.10	0.117	mg/L		04/06/23 11:08	04/07/23 11:29	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000731	J	0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 16:31	1
Cobalt	0.00127		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:31	1
Iron	0.0286	J	0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:31	1
Magnesium	28.6	^2	0.0515	0.0165	mg/L		04/06/23 11:08	04/12/23 16:31	1
Manganese	0.111		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:31	1
Molybdenum	0.164		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:31	1
Potassium	8.91		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:31	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:31	1
Sodium	18.1		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:31	1

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Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 Mod CaO

Lab Sample ID: 410-121021-8 Date Collected: 03/30/23 09:15

Matrix: Water

Date Received: 03/31/23 16:05

Client: Terra Systems Inc

Analyte	Result Qualit	fier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113	0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 11:55	1
Calcium	82.6	0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 11:55	1
SiO2, Silica	26.5	1.10	0.117	mg/L		04/06/23 11:08	04/07/23 11:55	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000901	J	0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 16:37	1
Cobalt	0.00185		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:37	1
Iron	0.0574		0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:37	1
Magnesium	28.6	^2	0.0515	0.0165	mg/L		04/06/23 11:08	04/12/23 16:37	1
Manganese	0.318		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:37	1
Molybdenum	0.167		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:37	1
Potassium	8.83		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:37	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:37	1
Sodium	18.2		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:37	1

Client Sample ID: MW-8 High CaO

Lab Sample ID: 410-121021-9 Date Collected: 03/30/23 09:30 Matrix: Water

Date Received: 03/31/23 16:05

Method: SW846 6010D - Metals (ICP) - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 11:58	1
Calcium	80.9		0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 11:58	1
SiO2, Silica	27.4		1.10	0.117	mg/L		04/06/23 11:08	04/07/23 11:58	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 16:39	1
Cobalt	0.00297		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:39	1
Iron	0.0448	J	0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:39	1
Magnesium	28.9	^2	0.0515	0.0165	mg/L		04/06/23 11:08	04/12/23 16:39	1
Manganese	0.416		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:39	1
Molybdenum	0.169		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:39	1
Potassium	8.36		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:39	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:39	1
Sodium	17.9		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:39	1

Client Sample ID: MW-8 10 g/L CERES 1135 MF2

Lab Sample ID: 410-121021-10 Date Collected: 03/30/23 09:30 **Matrix: Water**

Date Received: 03/31/23 16:05

				D	Prepared	Analyzed	Dil Fa
0.0157 J	0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 11:26	
98.0	0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 11:26	
1.89	1.10	0.117	mg/L		04/06/23 11:08	04/07/23 11:26	
	98.0	98.0 0.515	98.0 0.515 0.0989	98.0 0.515 0.0989 mg/L	98.0 0.515 0.0989 mg/L	98.0 0.515 0.0989 mg/L 04/06/23 11:08	98.0 0.515 0.0989 mg/L 04/06/23 11:08 04/07/23 11:26

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 10 g/L CERES 1135 MF2

Lab Sample ID: 410-121021-10

Matrix: Water

Date Collected: 03/30/23 09:30 Date Received: 03/31/23 16:05

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	0.00438		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 16:22	1
Iron	48.1		0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 16:22	1
Magnesium	370		0.258	0.0824	mg/L		04/06/23 11:08	04/12/23 17:32	5
Manganese	2.91		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 16:22	1
Molybdenum	0.00739		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 16:22	1
Potassium	9.34		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 16:22	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 16:22	1
Sodium	38.5		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 16:22	1

Client Sample ID: MW-8 30 g/L CERES 1135 MF2

Lab Sample ID: 410-121021-11

Analyzed

04/12/23 16:33

04/12/23 16:33

Date Collected: 03/30/23 09:45 Date Received: 03/31/23 16:05 **Matrix: Water**

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0383	J	0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 11:32	1
Calcium	162		0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 11:32	1
SiO2, Silica	0.599	J	1.10	0.117	mg/L		04/06/23 11:08	04/07/23 11:32	1

Method: SW846 6020B - Me	ethod: SW846 6020B - Metals (ICP/MS) - Dissolved								
Analyte	Result	Qualifier	RL	MDL	Unit				
Arsenic	<0.000700		0.00206	0.000700	mg/L				
Cobalt	0.0272		0.000515	0.000161	mg/L				
Iron	439		0.515	0.206	mg/L				

1030

11.5

10.6

75.7

0.00145

<0.000286

0.00206	0.000700	mg/L	04/06/23 11:08	04/12/23	16:33	1
0.000515	0.000161	mg/L	04/06/23 11:08	04/12/23	16:33	1
0.515	0.206	mg/L	04/06/23 11:08	04/12/23	17:34	10
2.58	0.824	mg/L	04/06/23 11:08	04/12/23	17:36	50
0.0206	0.00979	mg/L	04/06/23 11:08	04/12/23	17:34	10
0.000515	0.000134	mg/L	04/06/23 11:08	04/12/23	16:33	1
0.206	0.0670	ma/l	04/06/23 11:08	04/12/23	16.33	1

Prepared

04/06/23 11:08

04/06/23 11:08

D

Client Sample ID: MW-8 50 g/L CERES 1135 MF2 Lab Sample ID: 410-121021-12 Date Collected: 03/30/23 10:00 **Matrix: Water**

0.000286 mg/L

0.0927 mg/L

0.00103

0.206

Date Received: 03/31/23 16:05

Magnesium

Manganese

Potassium

Selenium

Sodium

Molybdenum

Method: SW846 6010D - Metals (ICP) - Dissolved									
Analyte	Result (Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0531		0.0515	0.0113	mg/L		04/06/23 11:51	04/07/23 23:29	1
Calcium	197		0.515	0.0989	mg/L		04/06/23 11:51	04/07/23 23:29	1
SiO2. Silica	0.561	J	1.10	0.117	mg/L		04/06/23 11:51	04/07/23 23:29	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 11:51	04/11/23 19:36	1
Cobalt	0.0378	^2	0.000515	0.000161	mg/L		04/06/23 11:51	04/11/23 19:36	1
Iron	673		2.58	1.03	mg/L		04/06/23 11:51	04/11/23 20:28	50
Magnesium	1560		2.58	0.824	mg/L		04/06/23 11:51	04/11/23 20:28	50
Manganese	18.6		0.103	0.0489	mg/L		04/06/23 11:51	04/11/23 20:28	50
Molybdenum	0.000972		0.000515	0.000134	mg/L		04/06/23 11:51	04/11/23 19:36	1
Potassium	10.6		0.206	0.0670	mg/L		04/06/23 11:51	04/11/23 19:36	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:51	04/11/23 19:36	1

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Dil Fac

Client Sample Results

Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Lab Sample ID: 410-121021-12

Matrix: Water

Date Collected: 03/30/23 10:00 Date Received: 03/31/23 16:05

Method: SW846 6020B - Metals (ICP/MS) - Dissolved (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	121		10.3	4.64	ma/L		04/06/23 11:51	04/11/23 20:28	50

2

4

5

6

8

11

13

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Job ID: 410-121021-1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-361600/1-A

Matrix: Water

Analysis Batch: 362042

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361600

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		04/06/23 10:59	04/07/23 09:23	1
Calcium	<0.0989		0.515	0.0989	mg/L		04/06/23 10:59	04/07/23 09:23	1
SiO2, Silica	<0.117		1.10	0.117	mg/L		04/06/23 10:59	04/07/23 09:23	1

MB MB

MB MB

Lab Sample ID: LCS 410-361600/2-A

Matrix: Water

Analysis Batch: 362042

Client Sample ID: Lab Control Sample

Prep Type: Total/NA **Prep Batch: 361600**

	Spike	LCS	LCS			%Rec	
Analyte	Added	Result	Qualifier Un	it D	%Rec	Limits	
Lithium	0.500	0.5027	mg	/L	101	80 - 120	
Calcium	5.00	4.999	mg	/L	100	80 - 120	

Lab Sample ID: MB 410-361604/1-A

Matrix: Water

Analysis Batch: 362413

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 361604

Analyte	Result	Qualifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113	0.0515	0.0113	mg/L		04/06/23 11:08	04/07/23 10:57	1
Calcium	<0.0989	0.515	0.0989	mg/L		04/06/23 11:08	04/07/23 10:57	1
SiO2, Silica	<0.117	1.10	0.117	mg/L		04/06/23 11:08	04/07/23 10:57	1

Lab Sample ID: LCS 410-361604/2-A

Matrix: Water

Analysis Batch: 362413

Client Sample ID: Lab Control Sample

Prep Type: Total/NA **Prep Batch: 361604**

LCS LCS Spike Analyte Added Result Qualifier Unit %Rec Limits Lithium 0.500 80 - 120 0.5257 mg/L 105 Calcium 80 - 120 5.00 5.165 mg/L 103

Lab Sample ID: MB 410-361628/1-A

Matrix: Water

Analysis Batch: 362412

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 361628

мв мв Result Qualifier RL MDL Unit D Prepared Analyzed

Analyte Dil Fac Lithium <0.0113 0.0515 0.0113 mg/L 04/06/23 11:51 04/07/23 23:23 Calcium <0.0989 0.515 0.0989 mg/L 04/06/23 11:51 04/07/23 23:23 SiO2, Silica < 0.117 1.10 0.117 mg/L 04/06/23 11:51 04/07/23 23:23

Lab Sample ID: LCS 410-361628/2-A

Matrix: Water Analysis Batch: 362412 **Client Sample ID: Lab Control Sample**

Prep Type: Total/NA

Prep Batch: 361628

LCS LCS Spike %Rec Limits Analyte Added Result Qualifier Unit %Rec Lithium 0.500 0.4960 99 80 - 120 mg/L Calcium 5.00 5.021 mg/L 100 80 - 120

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Job ID: 410-121021-1

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: 410-121021-5 MS

Matrix: Water

Analysis Batch: 362042

Client Samp	le ID:	MW-8	30	g/L	CERES	MF3
		D.		T	a. Diag.	

Client Sample ID: MW-8 30 g/L CERES MF3

Prep Type: Dissolved Prep Batch: 361600

-	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Lithium	0.0606		0.500	0.5777		mg/L		103	75 - 125	
Calcium	117		5.00	124.0	4	mg/L		130	75 - 125	

Lab Sample ID: 410-121021-5 MSD

Matrix: Water									Prep T	ype: Diss	solved
Analysis Batch: 362042									Prep	Batch: 3	61600
	Sample	Sample	Spike	MSD	MSD				%Rec		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Lithium	0.0606		0.500	0.5814		mg/L		104	75 - 125	1	20

5.00

117

0.0531

197

Lab Sample ID: 410-121021-5 DU

Matrix: Water

Calcium

Analysis Batch: 362042

Client Sample ID: MW-8 30 g/	L CERES MF3
------------------------------	-------------

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

75 - 125

144

Prep Type: Dissolved

Prep Batch: 361600

Prep Type: Dissolved

	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Lithium	0.0606		0.06163		mg/L		2	20
Calcium	117		119.3		mg/L		2	20
SiO2, Silica	0.612	J	0.5958	J	mg/L		3	

124.7 4

mg/L

mg/L

mg/L

Lab Sample ID: 410-121021-12 MS

Matrix: Water

Analysis Batch: 362412									Prep	Batch: 361628
	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Lithium	0.0531		0.500	0.5847		mg/L		106	75 - 125	
Calcium	197		5 00	206.3	4	ma/l		187	75 - 125	

0.500

5.00

Lab Sample ID: 410-121021-12 MSD

Matrix: Water

Analyte Lithium

Calcium

Analysis Bat

er									Prep T	ype: Diss	olved			
tch: 362412									Prep Batch: 3616					
	Sample	Sample	Spike	MSD	MSD				%Rec		RPD			
	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit			

0.5884

206.6 4

Lab Sample ID: 410-121021-12 DU

Matrix: Water

Analysis Batch: 362412

Client Sample	ID: MW-8	50 g/L	CERES	1135 MF2

75 - 125

75 - 125

107

194

Prep Type: Dissolved

Prep Batch: 361628

20

20

	Sample	Sample	DU	DU					RPD	
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit	
Lithium	0.0531		0.05832		mg/L		 	9	20	
Calcium	197		204.5		mg/L			4	20	
SiO2, Silica	0.561	J	0.4821	J	mg/L			15		

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Client: Terra Systems Inc Project/Site: Stantec CCR AP2 MW-7 TS II

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-361600/1-A

Analysis Batch: 363081

Matrix: Water

Client Sample ID: Method Blank **Prep Type: Total/NA**

Prep Batch: 361600

мв мв

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 10:59	04/11/23 07:25	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		04/06/23 10:59	04/11/23 07:25	1
Iron	<0.0206		0.0515	0.0206	mg/L		04/06/23 10:59	04/11/23 07:25	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		04/06/23 10:59	04/11/23 07:25	1
Manganese	<0.000979		0.00206	0.000979	mg/L		04/06/23 10:59	04/11/23 07:25	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		04/06/23 10:59	04/11/23 07:25	1
Potassium	<0.0670		0.206	0.0670	mg/L		04/06/23 10:59	04/11/23 07:25	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 10:59	04/11/23 07:25	1
Sodium	< 0.0927		0.206	0.0927	mg/L		04/06/23 10:59	04/11/23 07:25	1
_									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 410-361600/2-A **Matrix: Water**

Analysis Batch: 363081

Prep Type: Total/NA **Prep Batch: 361600**

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.5079	-	mg/L		102	85 - 120	
Cobalt	0.500	0.5077		mg/L		102	90 - 113	
Iron	5.00	5.018		mg/L		100	88 - 119	
Magnesium	5.00	4.983		mg/L		100	90 - 112	
Manganese	0.500	0.5010		mg/L		100	89 - 120	
Molybdenum	0.0500	0.05112		mg/L		102	85 - 115	
Potassium	5.00	5.017		mg/L		100	90 - 112	
Selenium	0.100	0.09662		mg/L		97	80 - 120	
Sodium	5.00	5.074		mg/L		101	89 - 112	

Lab Sample ID: MB 410-361604/1-A Client Sample ID: Method Blank

Matrix: Water

Analysis Batch: 363809

Prep Type: Total/NA **Prep Batch: 361604** мв мв

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		04/06/23 11:08	04/12/23 15:58	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		04/06/23 11:08	04/12/23 15:58	1
Iron	<0.0206		0.0515	0.0206	mg/L		04/06/23 11:08	04/12/23 15:58	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		04/06/23 11:08	04/12/23 15:58	1
Manganese	<0.000979		0.00206	0.000979	mg/L		04/06/23 11:08	04/12/23 15:58	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		04/06/23 11:08	04/12/23 15:58	1
Potassium	<0.0670		0.206	0.0670	mg/L		04/06/23 11:08	04/12/23 15:58	1
Selenium	<0.000286		0.00103	0.000286	mg/L		04/06/23 11:08	04/12/23 15:58	1
Sodium	<0.0927		0.206	0.0927	mg/L		04/06/23 11:08	04/12/23 15:58	1

Lab Sample ID: LCS 410-361604/2-A **Client Sample ID: Lab Control Sample**

Matrix: Water Prep Type: Total/NA Analysis Batch: 363809 **Prep Batch: 361604** LCS LCS Spike %Rec

	•						
Analyte	Added	Result	Qualifier Unit	D	%Rec	Limits	
Arsenic	0.500	0.4926	mg/L		99	85 - 120	
Cobalt	0.500	0.4971	mg/L		99	90 - 113	
Iron	5.00	5.026	mg/L		101	88 - 119	
Magnesium	5.00	4.866	mg/L		97	90 - 112	

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Client: Terra Systems Inc Project/Site: Stantec CCR AP2 MW-7 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 410-361604/2-A

Matrix: Water

Analysis Batch: 363809

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Prep Batch: 361604

Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits 0.500 0.5060 mg/L 89 - 120 Manganese 101 Molybdenum 0.0500 0.04979 mg/L 100 85 - 115 Potassium 5.00 5.125 mg/L 102 90 - 112 Selenium 0.100 0.09782 mg/L 98 80 - 120 5.00 5.043 89 - 112 Sodium mg/L 101

Lab Sample ID: MB 410-361628/1-A Client Sample ID: Method Blank

Matrix: Water

Analysis Batch: 363346

Prep Type: Total/NA

Prep Batch: 361628

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac 0.00206 Arsenic < 0.000700 0.000700 mg/L 04/06/23 11:51 04/11/23 19:26 Cobalt <0.000161 0.000515 0.000161 mg/L 04/06/23 11:51 04/11/23 19:26 <0.0206 0.0515 04/06/23 11:51 04/11/23 19:26 Iron 0.0206 mg/L Magnesium <0.0165 0.0515 0.0165 mg/L 04/06/23 11:51 04/11/23 19:26 0.00206 < 0.000979 0.000979 mg/L 04/06/23 11:51 04/11/23 19:26 Manganese Molybdenum < 0.000134 0.000515 0.000134 mg/L 04/06/23 11:51 04/11/23 19:26 Potassium < 0.0670 0.206 0.0670 mg/L 04/06/23 11:51 04/11/23 19:26

0.00103

0.206

0.000286 mg/L

0.0927 mg/L

MB MB

< 0.000286

<0.0927

Lab Sample ID: LCS 410-361628/2-A

Matrix: Water

Selenium

Sodium

Analysis Batch: 363346

Client Sample ID: Lab Control Sample

04/11/23 19:26

04/11/23 19:26

04/06/23 11:51

04/06/23 11:51

Prep Type: Total/NA

Prep Batch: 361628

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.4920		mg/L		98	85 - 120	
Cobalt	0.500	0.4944		mg/L		99	90 - 113	
Iron	5.00	4.968		mg/L		99	88 - 119	
Magnesium	5.00	4.957		mg/L		99	90 - 112	
Manganese	0.500	0.5030		mg/L		101	89 - 120	
Molybdenum	0.0500	0.04878		mg/L		98	85 - 115	
Potassium	5.00	5.053		mg/L		101	90 - 112	
Selenium	0.100	0.1007		mg/L		101	80 - 120	
Sodium	5.00	5.084		mg/L		102	89 - 112	

Lab Sample ID: 410-121021-5 MS

Matrix: Water

Analysis Batch: 363081

Client Sample ID: MW-8 30 g/L CERES MF3

Prep Type: Dissolved

Prep Batch: 361600

	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.000710	J	0.500	0.5382		mg/L		107	75 - 125	
Cobalt	<0.000161		0.500	0.5049		mg/L		101	80 - 125	
Iron	0.0210	J	5.00	5.036		mg/L		100	75 - 125	
Manganese	0.00305		0.500	0.4986		mg/L		99	75 - 125	
Molybdenum	0.00426		0.0500	0.05592		mg/L		103	81 - 125	
Potassium	10.2		5.00	14.77		mg/L		92	75 - 125	
Selenium	<0.000286		0.100	0.1032		mg/L		103	75 - 125	
Sodium	23.6		5.00	28.19	4	mg/L		92	75 - 125	

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4/17/2023

Client: Terra Systems Inc

Potassium

Selenium

Sodium

Project/Site: Stantec CCR AP2 MW-7 TS II

Job ID: 410-121021-1

Method: 6020B - Metals (ICP/MS) (Continued)

10.2

23.6

< 0.000286

Lab Sample ID: 410-121021-5 MS	Client Sample ID: MW-8 30 g/L CERES MF3
Matrix: Water	Prep Type: Dissolved
Analysis Batch: 363324	Prep Batch: 361600

	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Magnesium	424		5.00	443.3	4	mg/L		385	75 - 125	

Lab Sample ID: 410-121021-5 MSD Client Sample ID: MW-8 30 g/L CERES MF3 **Matrix: Water Prep Type: Dissolved** Analysis Batch: 363081 **Prep Batch: 361600** Sample Sample Spike MSD MSD %Rec RPD Result Qualifier Result Qualifier RPD Limit Analyte Added Unit D %Rec Limits Arsenic 0.000710 0.500 0.5538 mg/L 111 75 - 125 3 20 Cobalt <0.000161 0.500 0.5135 103 80 - 125 20 mg/L 2 0.0210 5.00 5.065 mg/L 101 75 - 125 20 0.00305 0.500 100 75 - 125 20 0.5022 mg/L Manganese Molybdenum 0.00426 0.0500 0.05385 mg/L 99 81 - 125 20

15.01

0.1027

28.11 4

mg/L

mg/L

mg/L

97

103

75 - 125

75 - 125

75 - 125

5.00

0.100

5.00

Lab Sample ID: 410-121021-5 MSD Client Sample ID: MW-8 30 g/L CERES MF3 **Matrix: Water Prep Type: Dissolved** Analysis Batch: 363324 **Prep Batch: 361600** MSD MSD RPD Spike %Rec Sample Sample Result Qualifier Added Qualifier Analyte Result Unit %Rec Limits **RPD** Limit 424 4 6

5.00 417.1 -139 75 - 125 20 Magnesium mg/L Lab Sample ID: 410-121021-5 DU Client Sample ID: MW-8 30 g/L CERES MF3 **Matrix: Water Prep Type: Dissolved** Analysis Batch: 363081 **Prep Batch: 361600**

Analysis Batom 60000							i rop Baton. o	0.000
	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Arsenic	0.000710	J	<0.000700		mg/L		NC	20
Cobalt	<0.000161		<0.000161		mg/L		NC	20
Iron	0.0210	J	0.02664	J F5	mg/L		23	20
Manganese	0.00305		0.003125		mg/L		2	20
Molybdenum	0.00426		0.004141		mg/L		3	20
Potassium	10.2		10.14		mg/L		0.3	20
Selenium	<0.000286		<0.000286		mg/L		NC	20
Sodium	23.6		23.65		mg/L		0.3	20

Lab Sample ID: 410-121021-5 DU	Client Sample ID: I	/IW-8 30 g/L CERES MF3
Matrix: Water		Prep Type: Dissolved
Analysis Batch: 363324		Prep Batch: 361600
Sample Sample	DU DU	RPD

	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Magnesium	424		427.3		mg/L			0.8	20

Lab Sample ID: 410-121021-12			Client S	ample ID): MW-8	8 50 g/L CERES 1135 MF2 Prep Type: Dissolved Prep Batch: 361628 **Rec				
Matrix: Water									Prep Ty	pe: Dissolved
Analysis Batch: 363346									Prep I	Batch: 361628
	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	<0.000700		0.500	0.5257		mg/L		105	75 - 125	

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Project/Site: Stantec CCR AP2 MW-7 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 410-121021-12 MS

Matrix: Water

Analysis Batch: 363346

Client: Terra Systems Inc

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Prep Type: Dissolved

Prep Batch: 361628

	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Cobalt	0.0378	^2	0.500	0.5428		mg/L		101	80 - 125	
Molybdenum	0.000972		0.0500	0.04953		mg/L		97	81 - 125	
Potassium	10.6		5.00	15.27		mg/L		93	75 - 125	
Selenium	<0.000286		0.100	0.1078		mg/L		108	75 - 125	

Lab Sample ID: 410-121021-12 MS

Matrix: Water

Analysis Batch: 363346

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Prep Type: Dissolved

Prep Batch: 361628

Sam	ole Sample	Spike	MS	MS				%Rec	
Analyte Res	ult Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Iron 6	73	5.00	681.6	4	mg/L		174	75 - 125	
Magnesium 15	60	5.00	1571	4	mg/L		311	75 - 125	
Manganese 1	3.6	0.500	19.39	4	mg/L		166	75 - 125	
Sodium	21	5.00	111.3	4	mg/L		-186	75 - 125	

Lab Sample ID: 410-121021-12 MSD

Matrix: Water

Analysis Batch: 363346

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Prep Type: Dissolved

Prep Batch: 361628

Sample Sample Spike MSD MSD %Rec RPD Qualifier Added Result Qualifier RPD Limit Analyte Result %Rec Limits Unit < 0.000700 0.500 0.5357 107 75 - 125 20 Arsenic mg/L 2 0.500 Cobalt 0.0378 0.5477 mg/L 102 80 - 125 20 0.0500 Molybdenum 0.000972 0.05135 mg/L 101 81 - 125 20 Potassium 5.00 15.17 75 - 125 20 10.6 mg/L 75 - 125 Selenium <0.000286 0.100 0.1087 mg/L 109 20

Lab Sample ID: 410-121021-12 MSD

Matrix: Water

Analysis Batch: 363346

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Prep Type: Dissolved

Prep Batch: 361628

Sample Sample Spike MSD MSD %Rec RPD Qualifier Added Result Qualifier RPD Limit Result %Rec Limits Analyte Unit 673 5.00 668.4 4 20 Iron mg/L -90 75 - 125 2 1560 5.00 1559 4 Magnesium mg/L 71 75 - 125 20 18.6 0.500 18.72 4 Manganese mg/L 33 75 - 125 3 20 Sodium 121 5.00 109.0 20 mg/L -234 75 - 125

Lab Sample ID: 410-121021-12 DU

Matrix: Water

Analysis Batch: 363346

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Prep Type: Dissolved

Prep Batch: 361628

, =								
	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Arsenic	<0.000700		<0.000700		mg/L		NC NC	20
Cobalt	0.0378	^2	0.03748		mg/L		0.8	20
Molybdenum	0.000972		0.0008683		mg/L		11	20
Potassium	10.6		10.35		mg/L		3	20
Selenium	<0.000286		<0.000286		mg/L		NC	20

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QC Sample Results

Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 410-121021-12 DU

Matrix: Water

Prep Type: Dissolved
Analysis Batch: 363346

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Prep Type: Dissolved
Prep Batch: 361628

	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	I	RPD	Limit
Iron	673		681.4		mg/L			1 -	20
Magnesium	1560		1587		mg/L			2	20
Manganese	18.6		19.14		mg/L			3	20
Sodium	121		106.5		mg/L			12	20

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QC Association Summary

Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Metals

Prep Batch: 361600

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-5	MW-8 30 g/L CERES MF3	Dissolved	Water	Non-Digest Prep	
MB 410-361600/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361600/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	
410-121021-5 MS	MW-8 30 g/L CERES MF3	Dissolved	Water	Non-Digest Prep	
410-121021-5 MSD	MW-8 30 g/L CERES MF3	Dissolved	Water	Non-Digest Prep	
410-121021-5 DU	MW-8 30 g/L CERES MF3	Dissolved	Water	Non-Digest Prep	

Prep Batch: 361604

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-1	MW-8 10 g/L CERES MF2	Dissolved	Water	Non-Digest Prep	-
410-121021-2	MW-8 30 g/L CERES MF2	Dissolved	Water	Non-Digest Prep	
410-121021-3	MW-8 50 g/L CERES MF2	Dissolved	Water	Non-Digest Prep	
410-121021-4	MW-8 10 g/L CERES MF3	Dissolved	Water	Non-Digest Prep	
410-121021-6	MW-8 50 g/L CERES MF3	Dissolved	Water	Non-Digest Prep	
410-121021-7	MW-8 Low CaO	Dissolved	Water	Non-Digest Prep	
410-121021-8	MW-8 Mod CaO	Dissolved	Water	Non-Digest Prep	
410-121021-9	MW-8 High CaO	Dissolved	Water	Non-Digest Prep	
410-121021-10	MW-8 10 g/L CERES 1135 MF2	Dissolved	Water	Non-Digest Prep	
410-121021-11	MW-8 30 g/L CERES 1135 MF2	Dissolved	Water	Non-Digest Prep	
MB 410-361604/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361604/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Prep Batch: 361628

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-12	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	Non-Digest Prep	
MB 410-361628/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-361628/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	
410-121021-12 MS	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	Non-Digest Prep	
410-121021-12 MSD	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	Non-Digest Prep	
410-121021-12 DU	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	Non-Digest Prep	

Analysis Batch: 362042

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-5	MW-8 30 g/L CERES MF3	Dissolved	Water	6010D	361600
MB 410-361600/1-A	Method Blank	Total/NA	Water	6010D	361600
LCS 410-361600/2-A	Lab Control Sample	Total/NA	Water	6010D	361600
410-121021-5 MS	MW-8 30 g/L CERES MF3	Dissolved	Water	6010D	361600
410-121021-5 MSD	MW-8 30 g/L CERES MF3	Dissolved	Water	6010D	361600
410-121021-5 DU	MW-8 30 g/L CERES MF3	Dissolved	Water	6010D	361600

Analysis Batch: 362412

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-12	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6010D	361628
MB 410-361628/1-A	Method Blank	Total/NA	Water	6010D	361628
LCS 410-361628/2-A	Lab Control Sample	Total/NA	Water	6010D	361628
410-121021-12 MS	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6010D	361628
410-121021-12 MSD	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6010D	361628
410-121021-12 DU	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6010D	361628

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QC Association Summary

Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Metals

Analysis Batch: 362413

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-1	MW-8 10 g/L CERES MF2	Dissolved	Water	6010D	361604
410-121021-2	MW-8 30 g/L CERES MF2	Dissolved	Water	6010D	361604
410-121021-3	MW-8 50 g/L CERES MF2	Dissolved	Water	6010D	361604
410-121021-4	MW-8 10 g/L CERES MF3	Dissolved	Water	6010D	361604
410-121021-6	MW-8 50 g/L CERES MF3	Dissolved	Water	6010D	361604
410-121021-7	MW-8 Low CaO	Dissolved	Water	6010D	361604
410-121021-8	MW-8 Mod CaO	Dissolved	Water	6010D	361604
410-121021-9	MW-8 High CaO	Dissolved	Water	6010D	361604
410-121021-10	MW-8 10 g/L CERES 1135 MF2	Dissolved	Water	6010D	361604
410-121021-11	MW-8 30 g/L CERES 1135 MF2	Dissolved	Water	6010D	361604
MB 410-361604/1-A	Method Blank	Total/NA	Water	6010D	361604
LCS 410-361604/2-A	Lab Control Sample	Total/NA	Water	6010D	361604

Analysis Batch: 363081

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-5	MW-8 30 g/L CERES MF3	Dissolved	Water	6020B	361600
MB 410-361600/1-A	Method Blank	Total/NA	Water	6020B	361600
LCS 410-361600/2-A	Lab Control Sample	Total/NA	Water	6020B	361600
410-121021-5 MS	MW-8 30 g/L CERES MF3	Dissolved	Water	6020B	361600
410-121021-5 MSD	MW-8 30 g/L CERES MF3	Dissolved	Water	6020B	361600
410-121021-5 DU	MW-8 30 g/L CERES MF3	Dissolved	Water	6020B	361600

Analysis Batch: 363324

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-5	MW-8 30 g/L CERES MF3	Dissolved	Water	6020B	361600
410-121021-5 MS	MW-8 30 g/L CERES MF3	Dissolved	Water	6020B	361600
410-121021-5 MSD	MW-8 30 g/L CERES MF3	Dissolved	Water	6020B	361600
410-121021-5 DU	MW-8 30 g/L CERES MF3	Dissolved	Water	6020B	361600

Analysis Batch: 363346

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-12	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6020B	361628
410-121021-12	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6020B	361628
MB 410-361628/1-A	Method Blank	Total/NA	Water	6020B	361628
LCS 410-361628/2-A	Lab Control Sample	Total/NA	Water	6020B	361628
410-121021-12 MS	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6020B	361628
410-121021-12 MS	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6020B	361628
410-121021-12 MSD	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6020B	361628
410-121021-12 MSD	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6020B	361628
410-121021-12 DU	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6020B	361628
410-121021-12 DU	MW-8 50 g/L CERES 1135 MF2	Dissolved	Water	6020B	361628

Analysis Batch: 363809

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-1	MW-8 10 g/L CERES MF2	Dissolved	Water	6020B	361604
410-121021-1	MW-8 10 g/L CERES MF2	Dissolved	Water	6020B	361604
410-121021-2	MW-8 30 g/L CERES MF2	Dissolved	Water	6020B	361604
410-121021-2	MW-8 30 g/L CERES MF2	Dissolved	Water	6020B	361604
410-121021-3	MW-8 50 g/L CERES MF2	Dissolved	Water	6020B	361604
410-121021-3	MW-8 50 g/L CERES MF2	Dissolved	Water	6020B	361604
410-121021-4	MW-8 10 g/L CERES MF3	Dissolved	Water	6020B	361604

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QC Association Summary

Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Metals (Continued)

Analysis Batch: 363809 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-121021-4	MW-8 10 g/L CERES MF3	Dissolved	Water	6020B	361604
410-121021-6	MW-8 50 g/L CERES MF3	Dissolved	Water	6020B	361604
410-121021-6	MW-8 50 g/L CERES MF3	Dissolved	Water	6020B	361604
410-121021-7	MW-8 Low CaO	Dissolved	Water	6020B	361604
410-121021-8	MW-8 Mod CaO	Dissolved	Water	6020B	361604
410-121021-9	MW-8 High CaO	Dissolved	Water	6020B	361604
410-121021-10	MW-8 10 g/L CERES 1135 MF2	Dissolved	Water	6020B	361604
410-121021-10	MW-8 10 g/L CERES 1135 MF2	Dissolved	Water	6020B	361604
410-121021-11	MW-8 30 g/L CERES 1135 MF2	Dissolved	Water	6020B	361604
410-121021-11	MW-8 30 g/L CERES 1135 MF2	Dissolved	Water	6020B	361604
410-121021-11	MW-8 30 g/L CERES 1135 MF2	Dissolved	Water	6020B	361604
MB 410-361604/1-A	Method Blank	Total/NA	Water	6020B	361604
LCS 410-361604/2-A	Lab Control Sample	Total/NA	Water	6020B	361604

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Client: Terra Systems Inc

Date Received: 03/31/23 16:05

Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 10 g/L CERES MF2

Date Collected: 03/30/23 08:00

Lab Sample ID: 410-121021-1

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 12:05
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:43
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		5	363809	UCIG	ELLE	04/12/23 17:42

Client Sample ID: MW-8 30 g/L CERES MF2

Date Collected: 03/30/23 08:15 Date Received: 03/31/23 16:05 Lab Sample ID: 410-121021-2

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 12:02
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:41
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		10	363809	UCIG	ELLE	04/12/23 17:40

Client Sample ID: MW-8 50 g/L CERES MF2

Date Collected: 03/30/23 08:30

Date Received: 03/31/23 16:05

Lab Sample	ID: 410-121021-3
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Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 11:22
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:20
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		50	363809	UCIG	ELLE	04/12/23 17:29

Client Sample ID: MW-8 10 g/L CERES MF3

Date Collected: 03/30/23 10:15

Date Received: 03/31/23 16:05

Lab Sample ID: 410-1	21021-4
Matr	ix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 12:08
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:45
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		5	363809	UCIG	ELLE	04/12/23 17:44

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Project/Site: Stantec CCR AP2 MW-7 TS II

Client: Terra Systems Inc

Client Sample ID: MW-8 30 g/L CERES MF3

Date Collected: 03/30/23 10:30

Date Received: 03/31/23 16:05

Lab Sample ID: 410-121021-5

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361600	HUH3	ELLE	04/06/23 10:59
Dissolved	Analysis	6010D		1	362042	MT26	ELLE	04/07/23 09:38
Dissolved	Prep	Non-Digest Prep			361600	HUH3	ELLE	04/06/23 10:59
Dissolved	Analysis	6020B		10	363324	UCIG	ELLE	04/11/23 19:05
Dissolved	Prep	Non-Digest Prep			361600	HUH3	ELLE	04/06/23 10:59
Dissolved	Analysis	6020B		1	363081	F7JF	ELLE	04/11/23 07:29

Client Sample ID: MW-8 50 g/L CERES MF3

Date Collected: 03/30/23 10:45 Date Received: 03/31/23 16:05 Lab Sample ID: 410-121021-6

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 11:49
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:35
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		10	363809	UCIG	ELLE	04/12/23 17:38

Client Sample ID: MW-8 Low CaO

Date Collected: 03/30/23 09:00 Date Received: 03/31/23 16:05 Lab Sample ID: 410-121021-7

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 11:29
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:31

Client Sample ID: MW-8 Mod CaO

Date Collected: 03/30/23 09:15

Date Received: 03/31/23 16:05

Lab Sam _l	ple ID: ،	410-121	021-8
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Matrix: Water

<u> </u>	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 11:55
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:37

Client Sample ID: MW-8 High CaO

Date Collected: 03/30/23 09:30

Date Received: 03/31/23 16:05

Lab Sample ID: 410-121021-9

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 11:58

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Client: Terra Systems Inc Project/Site: Stantec CCR AP2 MW-7 TS II

Client Sample ID: MW-8 High CaO

Date Collected: 03/30/23 09:30 Date Received: 03/31/23 16:05 Lab Sample ID: 410-121021-9

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:39

Client Sample ID: MW-8 10 g/L CERES 1135 MF2

Date Collected: 03/30/23 09:30 Date Received: 03/31/23 16:05 Lab Sample ID: 410-121021-10

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 11:26
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:22
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		5	363809	UCIG	ELLE	04/12/23 17:32

Client Sample ID: MW-8 30 g/L CERES 1135 MF2

Date Collected: 03/30/23 09:45 Date Received: 03/31/23 16:05

Lab Sample ID: 410-121021-11

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6010D		1	362413	MT26	ELLE	04/07/23 11:32
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		1	363809	UCIG	ELLE	04/12/23 16:33
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		10	363809	UCIG	ELLE	04/12/23 17:34
Dissolved	Prep	Non-Digest Prep			361604	HUH3	ELLE	04/06/23 11:08
Dissolved	Analysis	6020B		50	363809	UCIG	ELLE	04/12/23 17:36

Client Sample ID: MW-8 50 g/L CERES 1135 MF2

Date Collected: 03/30/23 10:00

Date Received: 03/31/23 16:05

Lab Sample ID: 410-121021-12
Matrix: Water

_	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			361628	HUH3	ELLE	04/06/23 11:51
Dissolved	Analysis	6010D		1	362412	MT26	ELLE	04/07/23 23:29
Dissolved	Prep	Non-Digest Prep			361628	HUH3	ELLE	04/06/23 11:51
Dissolved	Analysis	6020B		1	363346	UCIG	ELLE	04/11/23 19:36
Dissolved	Prep	Non-Digest Prep			361628	HUH3	ELLE	04/06/23 11:51
Dissolved	Analysis	6020B		50	363346	UCIG	ELLE	04/11/23 20:28

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date			
A2LA	Dept. of Defense ELAP	0001.01	11-30-24			
A2LA	ISO/IEC 17025	0001.01	11-30-24			
Alaska	State	PA00009	06-30-23			
Arizona	State	AZ0780	03-12-24			
Arkansas DEQ	State	88-00660	08-09-23			
California	State	2792	04-17-23			
Colorado	State	PA00009	06-30-23			
Connecticut	State	PH-0746	04-17-23			
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24			
Delaware (DW)	State	N/A	01-31-24			
Florida	NELAP	E87997	04-17-23			
Georgia (DW)	State	C048	01-31-24			
Hawaii	State	N/A	01-31-24			
Illinois	NELAP	200027	04-17-23			
lowa	State	361	04-17-23			
Kansas	NELAP	E-10151	04-17-23			
Kentucky (DW)	State	KY90088	12-31-23			
Kentucky (UST)	State	0001.01	11-30-24			
Kentucky (WW)	State	KY90088	04-17-23			
Louisiana (All)	NELAP	02055	04-17-23			
Maine	State	2019012	03-12-25			
Maryland	State	100	06-30-23			
Massachusetts	State	M-PA009	04-17-23			
Michigan	State	9930	01-31-24			
Minnesota	NELAP	042-999-487	12-31-23			
Mississippi	State	023	01-31-24			
Missouri	State	450	01-31-24			
	State	0098				
Montana (DW) Nebraska	State	NE-OS-32-17	01-01-24 01-31-24			
New Hampshire	NELAP	2730	04-17-23			
New Jersey	NELAP	PA011	04-17-23			
New York	NELAP	10670	04-17-23			
North Carolina (DW)	State	42705	07-31-23			
North Carolina (WW/SW)	State	521 B. 005	04-17-23			
North Dakota	State	R-205	04-17-23			
Oklahoma	NELAP	R-205	04-17-23			
Oregon	NELAP	PA200001	04-17-23			
PALA	Canada	1978	09-16-24			
Pennsylvania	NELAP	36-00037	04-17-23			
Rhode Island	State	LAO00338	04-17-23			
South Carolina	State	89002	01-31-24			
Tennessee	State	02838	01-31-24			
Texas	NELAP	T104704194-22-45	04-17-23			
USDA	US Federal Programs	525-22-298-19481	10-25-25			
Vermont	State	VT - 36037	10-28-23			
Virginia	NELAP	460182	04-17-23			
West Virginia (DW)	State	9906 C	12-31-23			
West Virginia DEP	State	055	07-31-23			
Wyoming	State	8TMS-L	01-31-24			
Wyoming (UST)	A2LA	0001.01	11-30-24			

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 MW-7 TS II

Protocol Laboratory

Job ID: 410-121021-1

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Sample Summary

Client: Terra Systems Inc Job ID: 410-121021-1

Project/Site: Stantec CCR AP2 MW-7 TS II

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-121021-1	MW-8 10 g/L CERES MF2	Water	03/30/23 08:00	03/31/23 16:05
410-121021-2	MW-8 30 g/L CERES MF2	Water	03/30/23 08:15	03/31/23 16:05
410-121021-3	MW-8 50 g/L CERES MF2	Water	03/30/23 08:30	03/31/23 16:05
410-121021-4	MW-8 10 g/L CERES MF3	Water	03/30/23 10:15	03/31/23 16:05
410-121021-5	MW-8 30 g/L CERES MF3	Water	03/30/23 10:30	03/31/23 16:05
410-121021-6	MW-8 50 g/L CERES MF3	Water	03/30/23 10:45	03/31/23 16:05
410-121021-7	MW-8 Low CaO	Water	03/30/23 09:00	03/31/23 16:05
410-121021-8	MW-8 Mod CaO	Water	03/30/23 09:15	03/31/23 16:05
410-121021-9	MW-8 High CaO	Water	03/30/23 09:30	03/31/23 16:05
410-121021-10	MW-8 10 g/L CERES 1135 MF2	Water	03/30/23 09:30	03/31/23 16:05
410-121021-11	MW-8 30 g/L CERES 1135 MF2	Water	03/30/23 09:45	03/31/23 16:05
410-121021-12	MW-8 50 g/L CERES 1135 MF2	Water	03/30/23 10:00	03/31/23 16:05

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Chain of Custody

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Lancaster Laboratories Environmental

Client: Terra Systems, Inc.						Matrix					Α	nalyse	Requ	ueste	ed			For Lab Us	e Only
Project Name/#: Stantec CCR AP2 MW-7 TS II	Site ID #:	Macon, GA				I					F	reserv	ation (Code	s			SF #:	
Project Manager: Michael D. Lee	P.O. #:	222566-3-30	0-23		Tissue	ace and			N	N	N							SCR #:	
Sampler: Michael D. Lee	PWSID#:				ĭĔ	Ground Surface			βy	i, Si								Preservati	Ion Codes
Phone #: 302-798-9553	Quote #:	4101181	18					Containers	Fe, K, Mg	Na, Se.								H = HCI	T = Thiosulfate
State where samples were collected: GA For C	Compliance:	Yes 🗌	No	7	in e	ble		onta	Co, Fe	Mo, h	& Li							N = HNO ₃	B = NaOH
	Collec	tion	٩	Composite	☐ Sediment	Polable NPDES	:-	# of	Dis (field fil) As, (Dis (field fil) Mn, Mo,	(field fil) Ca 8							S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄
Sample Identification	Date	Time	Grab	Con	Soil	Water	Other:	Total	Dis (f	Dis (fi	Dis (fi		ļ					Rem	arks
MW-8 10 g/L CERES MF2	3/30/2023	8:00		Х		Х		2	Х	Х	Х								
MW-8 30 g/L CERES MF2	3/30/2023	8:15		Х		Х		2	Х	Х	Х								
MW-8 50 g/L CERES MF2	3/30/2023	8:30		Х		Х		2	Х	Х	Х								
MW-8 10 g/L CERES MF3	3/30/2023	10:15		Х		Х		2	Х	Х	Х								
MW-8 30 g/L CERES MF3	3/30/2023	10:30		Х		Х		2	Х	Х	Х								
MW-8 50 g/L CERES MF3	3/30/2023	10:45		Х		Х		2	Х	Х	Х								
MW-8 Low CaO	3/30/2023	9:00		Х		Х		2	Х	Х	Х								
MW-8 Mod CaO	3/30/2023	9:15		Х		х		2	Х	Х	Х								
MW-8 High CaO	3/30/2023	9:30		Х		X		2	Х	Х	Х								
Turnaround Time Requested (TAT) (please check (Rush TAT is subject to laboratory ap			Rusl	n 🗆	91	KAR	ell	10	el	3/3	ate / 23	Time	1		- 12	!! (2	Date 3/31/23	Time //20
Date results are needed: 4/14/23					Reli	nquished	by:	Ω			ate	Time	1	eived	by:			Date	Time
Rush results requested by (please check): E-M	ail 🔽	Phone	е [1	Ser L		<u>x</u>		3/3/	73	1605							
E-mail Address: <u>mlee@terrasystems.net</u>					Reli	nquished	by:			Da	te	Time	Rec	eived	by:		\	Date	Time
Phone: 302-798-9553																			
Data Package Options (please check if required)					Reli	nquished	by.	\		Da	ate	Time	Rec	eived	by:			Date	Time
Type I (Validation/non-CLP)																			`.
Type III (Reduced non-CLP) CT RCP					Reli	nquished	by:			Q	ate	Time	Rec	eived	by:			Date	Time
Type VI (Raw Data Only) TX TRRP	-13												X	in	-1	M		3/3/123	1605
NJ DKQP NYSDEC	Category	☐ A or		В	Relinquished by Commercial Carrier:				4					22					
EDD Required? Yes No If ye	s, format:				UPS		FedE	Ex		Other			Tem	perat	ure up	on re	eceipt	1.6	_ °C

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4/17/2023



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Environmental Analysis Request/Chain of Custody

	Environmental Analy	313 Mcquest Of
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	Environmental		Acct	t. #			Group #					Samı	ole #							
Client: Terra	Systems, Inc.						Matrix					A	nalyses	Requ	este	ed			For Lab U	se Only
Project Name/#:	CERES CCR AP2 MW-7 TS	Site ID #:	Macon, GA									F	reserva	ion (Code	s			SF #:	
Project Manager:	Michael D. Lee	P.O. #:	232590-3-30)-23		Tissue	ace			N	N	N							SCR #:	
Sampler: Michael	D. Lee	PWSID #:				Ĭ <u>≝</u>	Ground Surface		y y	Mg	iS.								Preserva	tion Codes
Phone #: 302-	798-9553	Quote #:	4101181	18					iner	Fe. K.	Na, Se,								H = HCI	T = Thiosulfate
State where samp	les were collected: GA For 0	Compliance:	Yes	No	1	Sediment	ble		Containers	S, F	Mo, h	17.0							N = HNO ₃	B = NeOH
		Collec	tion		Composite		Potable NPDES		# of	fil) As,	Dis (field fil) Mn.	fil) Ca							S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄
Sample Identific	cation	Date	Time	Grab	Соп	Soil	Water	Other:	Total	Dis (field	Dis (fi	Dis (field							Ren	narks
MW-8 10 g/L CER	ES 1135 MF2	3/30/2023	9:30		Х		Х		2	Х	Х	Х								
MW-8 30 g/L CER	ES 1135 MF2	3/30/2023	9:45		Х		Х		2	Х	Х	Х								
MW-8 50 g/L CER	ES 1135 MF2	3/30/2023	10:00		X		Х		2	Х	Х	Х								
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				\vdash	-	\vdash			-									=		
Turnaraund Tin	ne Requested (TAT) (please chec	l k): Standa	rd 🗸	Rusi		Reli	nguished	bv:	l		Di	late	Time	Rece	l	bv:			Date	Time
Turnaround in	(Rush TAT is subject to laboratory ap	•		Rus	11	911	10/10		Ke	V	7/2	1/23	11.00	1		14	0		3/31/23	1100
Date results are no			<u></u>			Řeli	nquished		1			ate	Time	Rece					Date	Time
		ail 🗸	Phone	е Г		E	se-1-	_	W		3/3	23	1605							
E-mail Address:	mlee@terrasystems.net				_	Reli	nquished	by:			_	ate	Time	Rece	eived	by:			Date	Time
Phone:	302-798-9553						1													
Data Package C	Options (please check if required))				Reli	nquished	by:		$\overline{}$	D	ate	Time	Rec	eived	by:			Date	Time
Type I (Validation/	non-CLP) MA MCP																			
Type III (Reduced	non-CLP) CT RCP					Reli	nquished	by:			D	ate	Time	Rec	eived	by:	0		Date	Time
Type VI (Raw Dat	a Only) TX TRRP	P-13 🔲												18		1	The	=	3/31/23	1605
NJ DKQP	NYSDEC	Category	☐ A or		В	Reli	nquished	by C	omme	ercial	Carri	er:	(1					22	
EDD Required?	Yes No If ye	s, format:				UPS		FedE	Ex		Other			Tem	perat	ure up	on re	ceipt	<u> </u>	°C

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Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-121021-1

Login Number: 121021 List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Number: 1

Creator: Jeremiah, Cory T

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
VV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
W: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
here are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
here is sufficient vol. for all requested analyses.	True	
s the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
/OA sample vials do not have headspace >6mm in diameter (none, if from NV)?	N/A	

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September 27, 2023

Angus McGrath, James Witty, and Jennifer Kolbe Stantec 1340 Treat Boulevard Suite 300 Walnut Creek CA 94597-7966



TERRA SYSTEMS, INC. FINAL REPORT TO STANTEC FOR COAL ASH RESIDUE COLUMN TREATABILITY STUDIES FOR PLANT ARKWRIGHT AP2

1.0 INTRODUCTION

Coal ash residue (CCR) landfill may generate conditions which allow metals such as cobalt, arsenic, iron, lithium, molybdenum, and selenium to be mobilized at levels above regulatory limits. This bench-scale treatability evaluated neutralization/precipitation with several reagents to be chosen by Stantec to treat arsenic, cobalt, lithium, molybdenum, and selenium. Wells ARAMW-7 and ARAMW-8 at Plant Arkwright AP2 are screened in the fractured bedrock. The Georgia groundwater protection standard (GWPS) for the metals of concern are:

- arsenic 0.010 mg/L
- cobalt 0.006 mg/L
- lithium 0.04 mg/L
- molybdenum 0.1 mg/L
- selenium 0.05 mg/L.

2.0 BENCH-SCALE STUDY SCOPE

2.1 Column Study

- Objectives:
 - Evaluate pore volume treatment and evolution under transient flow conditions like field flow rate (increase by no more than 10x to obtain sample volume)
 - o Evaluate influence on permeability / flow through column
- Field flow rate: 0.27 feet per day
- Two locations with two reagents and one control each (6 total). The column matrix was bedrock/native geologic material
- Analyze complete chemistry on aqueous sample (pH, ORP, SC, alkalinity, anions [SO4 Cl F], major ions [Mg, Na, K, Ca], trace metals [As, Co, Li, Fe, Mo, Mn, Se,], sulfide, ferrous iron)
- Record observations related to flow, leakage, precipitation, photograph periodically
- Collect residue for characterization (either bedrock/native geologic material or non-reactive matrix media; no analysis included in scope)



2.1 Bench-scale Groundwater and Soil Collection

On December 16, 90 kg of the ARAMW-7 and 90 kg of the ARAMW-8 groundwater were received at Terra Systems, Inc. On February 20, 2023, 7.7 kg of rock from ARAMW-7 at 38-48 feet and 7.3 kg of rock from ARAMW-8 at 37-47 feet were received. These weights include the cubicontainers or Ziploc bags.

2.2 Baseline Characterization

At the beginning of the bench-scale treatability test, baseline characterization was performed to verify contaminant concentrations in the samples. Homogenized groundwater samples were analyzed for dissolved cations calcium, magnesium, potassium, and sodium; dissolved organic carbon (DOC), total dissolved solids; and sulfate by the Eurofins Lancaster Laboratories. Each cubicontainer was analyzed for dissolved lithium, major cations (calcium, iron, magnesium, manganese, and potassium) and dissolved trace elements of concern: arsenic, cobalt, molybdenum, and selenium. The volume of samples for each analysis in the initial characterization are shown in Table 1. The analytical methods and detection limits provided by Eurofins Lancaster Laboratory are shown in Table 2. TSI measured pH in the soil and groundwater, oxidation-reduction potential (ORP), dissolved oxygen (DO), total suspended solids, specific conductivity, total and bicarbonate alkalinity, total hardness, ferrous iron, and sulfide in the aqueous phase using calibrated meters and Hach procedures.

Table 1. Analyses and Volumes for Initial Characterization

Analyses	GW Volume
	L
Cations in GW Total Fe, Mg, Mn, Na, K, Ca	0.25
GW Dissolved As, Co, Mo, Se	0.25
GW Dissolved Li	0.25
DOC	0.05
Sulfate, Chloride, and Fluoride	0.05
Total Dissolved Solids	0.5
Field Parameters	0.05
Soil Total As, Co, Fe, Mo, Mn, Se, % Moisture	
Total	1.75

Table 2. Analytes, Methods, and Detection Limits

Analyte	Method	Detection
		Limit
		mg/L
Arsenic	6020B ICP/MS	0.00070
Calcium	6010D ICP	0.0989
Chloride	EPA 300.0 R2.1	3.0
Cobalt	6020B ICP/MS	0.000161
Fluoride	EPA 300.0 R2.1	0.45
Iron	6020B ICP/MS	0.0206
Lithium	6010D ICP	0.0113
Magnesium	6020B ICP/MS	0.0165
Manganese	6020B ICP/MS	0.000979
Molybdenum	6020B ICP/MS	0.000134
Potassium	6020B ICP/MS	0.0670
Selenium	6020B ICP/MS	0.000285
Sodium	6020B ICP/MS	0.0927
Sulfate	EPA 300.0 R2.1	0.50
TDS	2540C	13.3

2.3 Initial Characterization Results



As shown in Table 3, the MW-7 groundwater was sampled for sulfate (1,010 mg/L), fluoride (<0.45 mg/L), chloride (5.0 mg/L), dissolved organic carbon (0.895 mg/L), calcium (152 mg/L), magnesium (8.94 mg/L), potassium (46 mg/L), silicon (9.46 mg/L), sodium (64.3 mg/L) and total dissolved solids (794 mg/L). Groundwater samples were analyzed for dissolved arsenic, cobalt, iron, manganese, molybdenum, and selenium plus dissolved lithium. Lithium was 0.0689 mg/L and molybdenum was 0.000138 mg/L. There was a moderate level of dissolved arsenic (0.0325 mg/L), above the GA GWPS of 0.010 mg/L. Dissolved cobalt was 0.0521 mg/L which exceeded the GA GWPS of 0.0060 mg/L. Dissolved selenium was not detected. Dissolved iron was 4.82 mg/L. Dissolved manganese was 12.6 mg/L. The pH of MW-7 was 6.0 SU with an ORP (132 mV), dissolved oxygen (7.1 mg/L), and specific conductivity (410 μS/cm). The composite groundwater had a bicarbonate alkalinity of 80 mg/L as CaCO3, hardness of 260 mg/L as CaCO3, with 5.42 mg/L ferrous iron and 0.08 mg/L sulfide; Hach procedures were used for these analyses.

The MW-8 groundwaters were sampled for sulfate (108 mg/L), fluoride (<0.45 mg/L), chloride (5.51 mg/L), dissolved organic carbon (1.22 mg/L), calcium (325 mg/L), magnesium (83.6 mg/L), potassium (10.4 mg/L), silicon (34.3 mg/L), sodium (30.7 mg/L) and total dissolved solids (383 mg/L). Lithium was 0.0116 mg/L and molybdenum was 0.160 mg/L. There was little dissolved arsenic (0.0033 mg/L). Dissolved cobalt was 0.00639 mg/L which exceeded the GA GWPS of 0.0060 mg/L. Dissolved selenium was not detected. Dissolved iron was 0.488 mg/L. Dissolved manganese was 0.532 mg/L. The pH of MW-8 was 7.2 SU, ORP (136 mV), dissolved oxygen (10.7 mg/L), and specific conductivity (699 μ S/cm). The composite groundwater had a bicarbonate alkalinity of 260 mg/L as CaCO3, hardness of 300 mg/L as CaCO3, with 0.22 mg/L ferrous iron and 0.02 mg/L sulfide; Hach procedures were used for these analyses.



Table 3. Initial Groundwater Characterization Results

Well		GA GWPS Freshwater	MW-7	MW-7	MW-8	MW-8
			Dissolved	Total	Dissolved	Total
Time Collected			12:45		10:25	
GW pH	SU		6.0		7.2	
GW ORP	mV		132		136	
GW DO	mg/L		7.1		10.7	
Specific Conductivity	μS/cm		410		699	
GW TSS	mg/L					
GW Bicarbonate Alkalinity	mg/L		80		260	
GW Hardness as CaCO3	mg/L		260		300	•
GW Ferrous Iron	mg/L		5.42		0.22	
GW Sulfide	mg/L		0.08		0.02	
GW TDS	mg/L					
Sulfate	mg/L			1010		108
Fluoride	mg/L	4.0		< 0.45		< 0.45
Chloride	mg/L			5.02		5.51
Dissolved Organic Carbon	mg/L		0.895		1.22	
Arsenic	mg/L	0.010	0.0325		0.0033	
Cobalt	mg/L	0.006	0.0521		0.00639	
Iron	mg/L		4.82		0.488	
Lithium	mg/L	0.040	0.0689		0.0116	
Manganese	mg/L		12.6		0.532	
Molybdenum	mg/L	0.10	0.000138		0.160	
Selenium	mg/L	0.050	< 0.000286		< 0.000286	
Calcium	mg/L			152		325
Magnesium	mg/L			8.94		83.6
Potassium	mg/L			46		10.4
Silicon	mg/L			9.46		34.3
Sodium	mg/L			64.3		30.7
Dissolved Solids	mg/L		794		383	

GWPS = Georgia Groundwater Protection Standard

123 Compound above GWPS

J Value, compound detected above method detection limit by below method calibration

Compound detected in laboratory blank associated with these samples



3.0 ARAMW-7 COLUMN TESTS

3.1 MW-7 Column Reagent Selection

Based upon the batch tests described previously, the following reagents were chosen for the ARAMW-7 column tests:

- Control Column
- Sodium Bicarbonate: Sodium bicarbonate can increase the pH up to about 8.3 SU.
- CERES MTS 73MF3 alkaline buffered magnesium hydroxide, ferrous sulfate, and ferric sulfate.

The columns were prepared by installing a 3/8" plastic bushing to small luer outlets onto both endcaps. The weight of the empty column and endcaps was recorded. The bottom endcap had a geotextile membrane layer at the bottom and the endcap was glued onto the column. A layer of sand was added to the bottom of the column. The bedrock was broken into fragments generally less than 0.95 cm (0.37 in). The bedrock fragments were weighed and then added to the column while maintaining the groundwater level (to prevent trapping air bubbles). The columns were filled with bedrock fragments and groundwater and periodically tapped. Once each column was filled, a sand layer was added to the top and a geotextile covering was placed over the sand and the top endcap was glued onto the column.

The 7A Control column was prepared with 1.07 kg rock, 0.25 kg sand, 0.26 kg groundwater, and had a pore volume of 327 mL.

The sodium bicarbonate 7B column was prepared with 0.96 kg rock, 0.28 kg sand, 0.28 kg groundwater, and had a pore volume of 404 mL. A solution of 84.7 g of sodium bicarbonate was added to 200 mL of groundwater and pumped onto the column. This loading was equivalent to 217 g/L of groundwater in the column. The sodium bicarbonate represents 5.65% of the rock, sand, and groundwater. On Day 26, 110 g of sodium bicarbonate was added to 11.0 kg of groundwater (10 g/L) in a new cubicontainer of the MW-7 groundwater (which resulted in minor but observable precipitate formation as seen in Figure 1.



Figure 1. Precipitate in MW-7 Feed with 10 g/L Sodium Bicarbonate



The CERES MTS MF3 7C column was prepared with 0.96 kg rock, 0.28 kg sand, 0.29 kg groundwater, and had a pore volume of 332 mL A solution of 42.3 g of CERES MTS 73MF3 reagent was added to 251 mL of groundwater and pumped onto the column. The CERES MTS 73MF3 represents 2.8% of the rock, sand, and groundwater.

The ARAMW-7 groundwater was pumped from the bottom of the columns with an eight-channel Longer Pump BT-100-1L peristaltic pump, a 6-channel Cole Parmer Masterflex 7553-80 peristaltic pump, or a two channel Cole Parmer Masterflex 7553-80 peristaltic pump. The volume of flow and the time for collection of the groundwater was recorded and the flowrates calculated.

The columns were run for 54 days (8 weeks). The influent was in the cubicontainers the groundwater was shipped in and was open to the atmosphere. The effluent samples were collected in Tedlar bags closed to the atmosphere. Influent samples were analyzed for anions and metals every two weeks (see Table 4) for a total of 5 sampling events. Effluent samples from the columns were submitted to Eurofins Lancaster Laboratories to be analyzed for anions and metals on a weekly basis for 8 samples per column. The DO, pH, ORP, and SC were monitored one to two times per week using laboratory meters and probes. The alkalinity, total hardness, ferrous iron, and sulfide were monitored weekly using Hach methods. A photograph of the columns is shown in Figure 2.



Figure 2. Columns June 2023



Table 4. Column Sampling Schedule

Column		Frequency days	Number
GW Influent	Dissolved Metals As, Ca, Co, Fe, K, Li, Mg, Mn, Mo, Na, Se, SIiO2	5, 19, 33, 49, and 54	5
	Anions Cl, F, SO4	5, 19, 33, 49, and 54	5
7B Influent	Dissolved Metals As, Ca, Co, Fe, K, Li, Mg, Mn, Mo, Na, Se, SIiO2	33, 43, 49, 54	4
	Anions Cl, F, SO4	33, 43, 49, 54	4
		5, 12, 19, 26, 33, 43, 49,	
GW Effluent	Dissolved Metals As, Ca, Co, Fe, K, Li, Mg, Mn, Mo, Na, Se, SIiO2	and 54	8
		5, 12, 19, 26, 33, 43, 49,	
Per Column	Anions Cl, F, SO4	and 54	8

3.3 MW-7 Column Operation

3.3.1 MW-7 Column Flow

Table 5 presents the flowrates for the three MW-7 columns. The flow rate for the 7A Control column ranged from 0 to 0.203 mL/min with an average of 0.086 mL/min and a total flow of 5.94 L or about 18.2 pore volumes. Little flow was observed from days 0-4, 8-12, and 15-17. The flowrate was equivalent to 0.34 pore volumes/day or a groundwater flowrate of 0.34 ft/day.



The flow rate for the Sodium Bicarbonate column 7B ranged from 0 to 0.363 mL/min with an average of 0.097 mL/min and a total flow of 5.8 L or about 14.4 pore volumes. Little flow was observed from days 0-2 and 6-12. The flowrate was equivalent to 0.27 pore volumes/day or a groundwater flowrate of 0.27 ft/day.

The flow rate for the 7C CERES MTS 73MF3 column 3 ranged from 0 to 0.269 mL/min with an average of 0.050 mL/min and a total flow of 4.1 L or about 12.3 pore volumes. The flow was low from days 1-3, 5-12, and 15-17. The flowrate was equivalent to 0.23 pore volumes/day or a groundwater flowrate of 0.23 ft/day.

3.3.2 Column Field Parameters

Table 6 presents the field parameters for the MW-7 columns.

Influent. The pH in the MW-7 influent ranged from 6.9 to 7.8 SU. The ORP was slightly oxidizing ranging from 108 to 276 mV. The influent was aerobic with DO levels between 8.3 and 9.3 mg/L. Specific conductivity ranged from 1,066 to 1,516 μS/cm. There was only a moderate alkalinity (80 mg/L as CaCO₃) but elevated hardness (1,200 to 1,920 mg/L as CaCO₃). Ferrous iron ranged from 0.14 to 0.39 mg/L. Only trace levels of sulfide (maximum 0.03 mg/L) were detected.

Control Column 7A. The pH in the effluent from Column 7A ranged from 6.9 to 7.6 SU. The ORP was slightly oxidizing ranging from 168 to 283 mV. The effluent was aerobic with DO levels between 6.7 and 8.2 mg/L. Specific conductivity ranged from 425 (appears to be an erroneous measurement) to 1,586 μ S/cm with a slight decrease over time. There was only a moderate alkalinity (60 to 200 mg/L as CaCO₃) and elevated hardness (1,320 to 1,680 mg/L as CaCO₃). Ferrous iron was low (0.16 to 0.5 mg/L). Only trace levels of sulfide (maximum 0.03 mg/L) were detected.

Sodium Bicarbonate Column 7B Influent. On Day 26, 110 g of sodium bicarbonate was added to a fresh cubicontainer of 11 L of the MW-7 groundwater and this served as the influent for the 7B column thereafter. The pH of this solution was 8.0 SU with an ORP of 282 mV, DO of 11.5 mg/L, and specific conductivity of 9,720 μ S/cm. The pH in the 7B influent ranged from 6.7 SU (Day 29) to 8.4 SU on Day 54. The ORP was slightly oxidizing ranging from 209 to 285 mV. The influent was aerobic with DO levels between 8.2 and 11.5 mg/L. Specific conductivity ranged from 8,530 to 9,720 μ S/cm due to the sodium bicarbonate. There were elevated alkalinity (6,000 to 8,400 mg/L as CaCO₃) and moderate hardness (480 to 960 mg/L as CaCO₃). Ferrous iron ranged from 0.11 to 0.7 mg/L. Only trace levels of sulfide (maximum 0.05 mg/L) were detected.

Sodium Bicarbonate Column 7B Effluent. The pH in the effluent from Column 7B ranged from 6.6 (Day 29) to 8.5 SU (Day -1). The pH was above 8.0 SU from days 43 to 54 after the higher sodium bicarbonate was added to the 7B influent. The ORP was slightly oxidizing ranging from 69 to 283 mV. The effluent was aerobic with DO levels between 3.0 and 8.1 mg/L. Specific conductivity ranged from 1,338 to 35,000 μS/cm. Specific conductivity was highest at



Day -1 and fell to background levels by Day 15 but became elevated again after the sodium bicarbonate was introduced into the influent. There was elevated alkalinity on Day 5 and Days 33 to 54 (3,600 to 8,400 mg/L as CaCO₃). Hardness ranged from 360 to 1,680 mg/L as CaCO₃. Ferrous iron was moderate (0.01 to 0.8 mg/L). Only trace levels of sulfide were detected.

CERES MTS 73MF3 Column 7C. The pH ranged from a low of 6.9 SU on Day 29 to 9.4 on Day -1. The pH of the effluent was above 7.5 to 8.2 SU except for Day 29. The ORP weas slightly oxidizing ranging from 78 to 285 mV. The effluent was aerobic with DO levels between 2.5 and 8.0 mg/L. Specific conductivity ranged from 411 to 9,280 μ S/cm. Specific conductivity was highest at Day -1 (56,6000 μ S/cm) and had fallen to background levels by Day 19. There was low alkalinity ranging from 20 to 40 mg/L as CaCO₃. Hardness ranged from 1,440 to 2,640 mg/L (Day 5). Ferrous iron was low (0.08 to 0.24 mg/L). Only trace levels of sulfide were detected.



Table 5. ARAMW-7 Groundwater Flow Rates and Cumulative Pore Volumes

Column	Treatment					Column	Treatment				Column	Treatment			
												CERES			
7A	Control					7B	NaHCO3				7C	MTS 73MF3			
Day	Flow	Flowrate	PV	Cum PV		Day	Flow	Flowrate	PV	Cum PV	Day	Flow	Flowrate	PV	Cum PV
	mL	mL/min					mL	mL/min				mL	mL/min		
0	0					0	0				0	72.9	0.060	0.22	0.22
1	0					1	0				1	9.6	0.005	0.03	0.25
2	0					2	0				2	0.9	0.001	0.00	0.25
3	0					3	36.2	0.180	0.09	0.09	3	4	0.020	0.01	0.26
4	0					4	115.5	0.363	0.29	0.38	4	85.5	0.269	0.26	0.52
5	270.1	0.180	0.83	0.83		5	219.7	0.146	0.54	0.92	5	10.2	0.007	0.03	0.55
6	128.7	0.089	0.39	1.22		6	0	0.000	0.00	0.92	6	0	0.000	0.00	0.55
7	170.1	0.112	0.52	1.74		7	0	0.000	0.00	0.92	7	1.6	0.001	0.00	0.56
8	0	0.000	0.00	1.74		8	0.2	0.000	0.00	0.92	8	1.1	0.001	0.00	0.56
10	0	0.000	0.00	1.74		10	0	0.000	0.00	0.92	10	0	0.000	0.00	0.56
12	0	0.000	0.00	1.74		12	0	0.000	0.00	0.92	12	0	0.000	0.00	0.56
13	293.8	0.203	0.90	2.64		13	269.2	0.186	0.67	1.59	13	123.4	0.085	0.37	0.93
15	0.0	0.000	0.00	2.64		15	96.2	0.035	0.24	1.82	15	2.4	0.001	0.01	0.94
17	0	0.000	0.00	2.64		17	37	0.012	0.09	1.92	17	0	0.000	0.00	0.94
19	505.2	0.200	1.54	4.18		19	457.5	0.181	1.13	3.05	19	423.8	0.168	1.28	2.22
23	615.2	0.103	1.88	6.06		23	453.4	0.076	1.12	4.17	23	112.6	0.019	0.34	2.55
26	444.5	0.117	1.36	7.42		26	406.6	0.107	1.01	5.18	26	288.4	0.076	0.87	3.42
29	423.8	0.103	1.30	8.72		29	422.7	0.103	1.05	6.22	29	288.5	0.070	0.87	4.29
33	400	0.074	1.22	9.94		33	255.4	0.047	0.63	6.86	33	288	0.053	0.87	5.16
43	1062.9	0.074	3.25	13.19		43	20.2	0.001	0.050	6.91	43	901.7	0.063	2.716	7.88
49	894.6	0.105	2.736	15.93		49	1691.1	0.198	4.186	11.09	49	828.5	0.097	2.495	10.37
54	733	0.110	2.242	18.17		54	1318.6	0.199	3.264	14.36	54	643.1	0.097	1.937	12.31
					_					Avg Pore					Avg Pore
		Avg		Avg Pore				Avg		Volumes/					Volumes/D
	Cum Flow	Flowrate		Volumes/Day			Cum Flow	Flowrate		Day		Cum Flow	Avg Flowrate		ay
	5942	0.086		0.34			5800	0.097		0.266		4086	0.050		0.228



Table 6. MW-7 Field Parameters

Influent										7A	Control						
Day	pН	ORP	DO	SC	Alk	Hard	Fe2+	S	Day	pН	ORP	DO	SC	Alk	Hard	Fe2+	S
	SU	mV	mg/L	mS/cm	mg/L CaCO3	mg/L CaCO3	mg/L	mg/L		SU	mV	mg/L	mS/cm	mg/L CaCO3	mg/L CaCO3	mg/L	mg/L
-1	7.8	108		1311					-1								
1	7.3	178	9.3	1426					1								
5	6.9	214	8.6	1516	80	1680	0.34	0	5	7.0	173	7.3	1481	80	1440	0.5	0
8									8	7.1	168	7.1	1418	80	1320	0.16	0
15									15	7.5	206	8.1	1493				
19	7.0	267	8.4	1423	80	1200	0.16	0.01	19	7.0	281	6.7	1347				
23									23	7.5	234	7.1	1566				
26									26	7.6	245	7.1	1444	80	1440	0.32	0
29									29	6.9	221	7.6	1538				
33	7.7	257	8.3	1510	80	1920	0.39	0.02	33	7.5	267	7.2	1513	60	1440	0.23	
43									43	7.1	283	8.2	425	80	1440	0.17	0
49	7.3	276	8.4	1066	80	1440	0.14	0.03	49	7.3	277	7.7	1087	80	1440	0.21	0.03
54	7.5	260	8.5	1340	80	1440	0.20	0.03	54	7.4	267	7.6	1297	200	1680	0.23	0

7B Influent	NaHCO3									7B	NaHCO3		3R	MF2			
Day	pН	ORP	DO	SC	Alk	Hard	Fe2+	S	Day	pН	ORP	DO	SC	Alk	Hard	Fe2+	S
					mg/L	mg/L								mg/L	mg/L		
	SU	mV	mg/L	mS/cm	CaCO3	CaCO3	mg/L	mg/L		SU	mV	mg/L	mS/cm	CaCO3	CaCO3	mg/L	mg/L
-1									-1	8.5	69		35000				
4									4	8.0	155		1480				
5									5	7.4	163	6.0	2770	2160	960	0.18	0.01
15									15	7.5	206	8.1	1493	240	1440	0.36	0.01
19									19	7.2	278	3.0	1338	240	1440	0.24	0.02
23									23	7.4	238	5.9	1465				
26	8.0	282	11.5	9720					26	7.4	248	5.3	1369	120	1680	0.59	0
29	6.7	285	9.3	8830					29	6.6	227	4.7	5350				
33	7.8	279	8.3	8760	8400	720	0.32	0.03	33	7.8	283	5.3	8720	3600	720	0.14	0.02
43	8.1	242	8.3	8770	6600	960	0.7	0.04	43	8.5	222	5.8	8830	8400	480	0.8	0.06
49	8.2	248	8.2	8530	6000	480	0.11	0.05	49	8.1	252	3.3	8730	8400	360	0.05	0.02
54	8.4	209	8.3	8550	7200	720	0.70	0	54	8.4	220	4.3	8530	7200	480	0.01	0



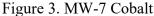
Table 6. MW-7 Field Parameters

aramen								
	CERES							
	MTS							
7C	73MF3							
Day	pН	ORP	DO	SC	Alk	Hard	Fe2+	S
	SU	mV	mg/L	μS/cm	mg/L CaCO3	mg/L CaCO3	mg/L	mg/L
-1	9.4	78		56600				
0	7.6	133	6.7	4020				
4	7.8	195		2670				
5	7.5	161	8.0	8090	40	2640	0.24	0
15	7.8	210	3.4	1599				
19	7.4	264	2.5	1275	20	1920	0.2	0.02
23	7.5	234	5.4	1404				
26	7.7	238	3.8	1347	40	1440	0.24	0
29	6.9	264	5.1	1542				
33	7.7	285	5.2	1711	40	1440	0.09	0.01
43	8.0	250	5.8	992	20	1440	0.16	0.02
49	7.9	259	5.0	1403	20	1440	0.08	0.01
54	8.2	221	5.5	1474	40	1440	0.14	0.08



3.3.3 ARAMW-7 Column Metals and Anions

Table 7 presents the metals and anions data for each ARAMW-7 influent and column effluent. Figure 3 shows the cobalt levels in the influent, 7B influent, and effluents from the 7A Control, 7B sodium bicarbonate, and 7C CERES73MF2 columns. Figure 4 shows the lithium levels in the influent, 7B influent, and effluents from the 7A Control, 7B sodium bicarbonate, and 7C CERES73MF2 columns.



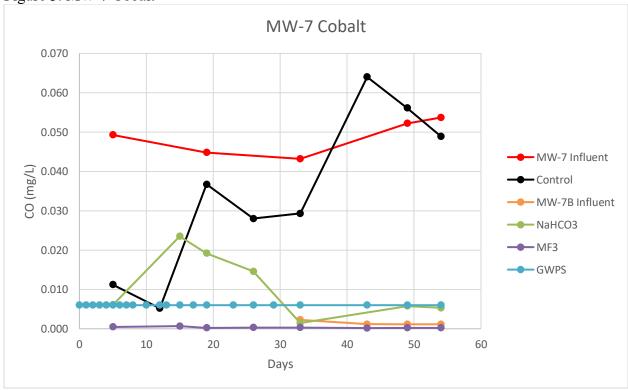
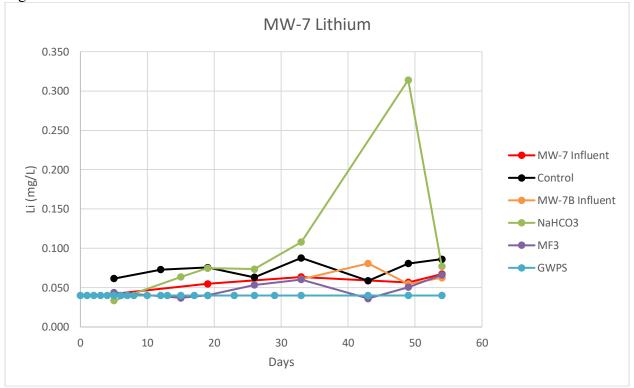




Figure 4. MW-7 Lithium



Influent. Arsenic ranged from <0.00070 to 0.00141 mg/L in the influent. Arsenic never exceeded the GA GWPS of 0.010 mg/L in the influent. Cobalt ranged from 0.0432 to 0.0537 mg/L in the influent and remained above the GA GWPS of 0.0060 mg/L. Dissolved iron ranged from <0.0206 to 0.0959 mg/L. Dissolved manganese ranged from 11.4 to 13.3 mg/L. Molybdenum ranged from <0.000134 to 0.00731 mg/L; molybdenum was never detected above the GA GWPS of 0.10 mg/L. Only low levels of selenium (<0.000286 to 0.000666 mg/L) were detected. Lithium ranged from 0.0421 mg/L to 0.0672 mg/L; lithium exceeded the GA GWPS of 0.040 mg/L in all influent samples. Calcium, magnesium, silica dioxide, sodium, and potassium showed little variability, with calcium ranging from 269 to 298 mg/L, magnesium from 71.7 to 78.5 mg/L, sodium from 26.5 to 28.6 mg/L, potassium from 8.9 to 9.62 mg/L, and silica dioxide from 67 to 71.9 mg/L. Only trace levels of chloride were detected of 5.54 to 6.94 mg/L. Fluoride was not detected. Sulfate varied between 991 and 1,060 mg/L.

Control Column 7A Effluent. Arsenic ranged from 0.00123 to 0.00299 mg/L in the Control Column 7A effluent; arsenic never exceeded the GA GWPS. Cobalt ranged from 0.00521 to 0.064 mg/L in the effluent and remained above the GA GWPS of 0.0060 mg/L except at Day 12. Dissolved iron ranged from <0.0206 to 0.23 mg/L. Dissolved manganese ranged from 10.2 to 12.8 mg/L. Molybdenum was present at low concentrations of 0.00034 to 0.00166 mg/L. Only low levels of selenium (<0.000286 to 0.000642 mg/L) were detected. Lithium was detected at concentrations of 0.0587 to 0.0878, exceeding the GA GWPS in all samples. Calcium, magnesium, sodium, and potassium showed little



variability, with calcium ranging from 250 to 304 mg/L, magnesium from 71.2 to 79.8 mg/L, sodium from 25.8 to 35.0 mg/L, potassium from 23.5 to 33.3 mg/L, and silica dioxide from 57.1 to 67.0 mg/L. Only trace levels of chloride were detected. Fluoride was not detected. Sulfate varied between 995 and 3,350 mg/L (Day 5). The sulfate on Day 5 appears erroneous as the groundwater only contained 1,010 mg/L.

7B NaHCO3 Influent. Samples were collected from the new MW-7B influent from Days 33 to 54. Arsenic ranged from 0.000911 to 0.00129 mg/L in the 7B influent, below the GA GWPS. The addition of the 10 g/L sodium bicarbonate to the influent resulted in precipitation of the cobalt in the influent to between 0.00114 to 0.00226 mg/L, which is below the GA GWPS. Dissolved iron ranged from 0.0373 to 0.0801 mg/L. Dissolved manganese ranged from 0.0455 to 0.0798 mg/L. Molybdenum ranged from 0.000746 to 0.000965 mg/L; molybdenum was never detected above the GA GWPS. Selenium was not detected. Lithium ranged from 0.0546 mg/L to 0.0808 mg/L; lithium exceeded the GA GWPS of 0.040 mg/L in all 7B influent samples. Calcium, magnesium, silica dioxide, sodium, and potassium showed little variability, with calcium ranging from 7.86 to 35 mg/L, magnesium from 69.1 to 73.5 mg/L, sodium from 2,600 to 3,460 mg/L, potassium from 8.85 to 9.28 mg/L, and silica dioxide from 66.8 to 68.5 mg/L. Only trace to low levels of chloride were detected of 6.37 to 22.9 mg/L. Fluoride was not detected. Sulfate varied between 998 and 1,120 mg/L.

Sodium Bicarbonate Column 7B Effluent. Arsenic ranged from 0.000955 to 0.00496 mg/L in the Sodium Bicarbonate Column 7B effluent. Arsenic never exceeded the GA GWPS. Cobalt ranged from 0.000146 to 0.0235 mg/L in the effluent and remained below the GA GWPS of 0.0060 mg/L from Days 33 to 54 after the second bicarbonate addition. Precipitation occurred in the influent. Cobalt levels in the 7B column effluent were higher than the influent likely as precipitate cobalt in the column from Days 5 to 26 continued to be released. The sodium bicarbonate remained in the influent from Days 26 to 54. Dissolved iron ranged from <0.0206 to 0.0762 mg/L. Dissolved manganese ranged from 0.178 to 9.6 mg/L which was 93.7 to 98.7% lower than the MW-7 influent. Molybdenum was present at low concentrations of 0.000396 to 0.00184 mg/L. Lithium ranged from 0.00335 mg/L on Day 5 but then exceeded the GA GWPS from Day 15 to 54 with concentrations up to 0.314 mg/L. Only low levels of selenium (0.000298 to 0.00214 mg/L) were detected. Calcium ranged from 5.92 to 311 (day 19) mg/L, magnesium from 61.9 to 81.1 mg/L, sodium from 29.5 to 2,740 mg/L, potassium from 23.7 to 54.5 mg/L, and silica dioxide from 48.8 to 63.8 mg/L. The maximum sodium of 2,740 mg/L was detected on Day 49 and decreased slightly to 2,670 mg/L on Day 54. Only low levels of chloride were detected. Fluoride was not detected. Sulfate varied between 1,020 and 1,100 mg/L.

CERES MTS 73MF3 Column 7C. Arsenic ranged from <0.00070 to 0.0027 mg/L in the Column 7C CERES MTS 73MF3 effluent Cobalt ranged from 0.000181 to 0.000679 mg/L in the effluent and remained below the GA GWPS. Dissolved iron ranged from <0.0206 to 0.342 mg/L. Dissolved manganese ranged from 0.0156 to 0.0.0758 mg/L which was 98.9 to 99.9% lower than the influent. Molybdenum was present at low concentrations of 0.000165 to 0.00166 mg/L. Lithium was detected below the GA GWPS at 0.037 mg/L on



Day 15 and 0.0362 mg/L on Day 43; the remaining timepoints exceeded the GA GWPS. Only low levels of selenium (0.000428 to 0.00187 mg/L) were detected. Calcium ranged from 212 to 349 mg/L, magnesium from 91.6 to 223 mg/L, sodium from 29.9 to 43.5 mg/L, potassium from 11.5 to 22 mg/L, and silica dioxide from 0.563 to 0.149 mg/L. The maximum calcium and magnesium levels were detected on Day 5 and decreased to below background levels by Day 26. The CERES MTS 73MF3 reagent contains calcium and magnesium. While it also contains ferrous sulfate and ferric sulfate, little ferrous iron or dissolved iron was detected in the effluent. Only moderate levels of chloride (5.56 to 9.48 mg/L) were detected. Sulfate decreased from 2,750 mg/L on Day 5 to 1,080 mg/L on Day 54 which is similar to the influent.



Table 7. Metals and Anions in MW-7 Columns

Day	Dis As	Dis Co	Dis Fe	Dis Mn	Dis Mo	Dis Se	Dis Li	Dis Ca	Dis Mg	Dis Na	Dis K	Dis SiO2	Chloride	Fluoride	Sulfate
Day	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GA GWPS	0.010	0.0060	IIIg/L	IIIg/L	0.10	0.050	0.040	mg/L	mg/L	IIIg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Influent	0.010	0.0000			0.10	0.050	0.0.10								
5	< 0.00070	0.0493	0.0327	11.6	< 0.000134	0.000666	0.0421	298	76.5	28.0	9.26	67	5.85	< 0.45	991
19	0.000756	0.0448	0.0959	12.7	0.000341	< 0.000286	0.0549	293	78.1	28.5	9.31	70.2	5.54	< 0.45	998
33	< 0.00070	0.0432	< 0.0206	11.4	0.000213	< 0.000286	0.0637	278	77.5	28.6	9.62	70.4	6.94	< 0.45	1030
49	0.000114	0.0522	0.0604	13.3	< 0.000134	< 0.000286	0.0566	283	71.7	26.5	8.9	71.9	5.83	< 0.90	1020
54	0.00141	0.0537	0.0259	13.3	0.00731	< 0.000286	0.0672	269	78.5	27.9	8.99	71.3	6.12	< 0.45	1060
Column	7A	Control													
5	0.00187	0.0112	0.23	11.2	0.00166	0.000436	0.0615	304	74.7	27.9	23.7	57.4	7.31	< 0.45	3350
12	0.0020	0.00521	0.0405	10.6	0.00146	< 0.000286	0.0729	262	75	29.2	23.5	58	5.69	< 0.45	1050
19	0.00299	0.0367	0.0985	12.4	0.00152	< 0.000286	0.0756	289	79.8	35	33.3	57.1	5.63	< 0.45	995
26	0.00139	0.028	0.0268	10.2	0.000695	< 0.000286	0.0632	261	77.0	25.8	28.8	59.3	6.51	< 0.45	1070
33	0.00138	0.0293	0.0233	10.3	0.00109	0.000316	0.0878	266	77.8	29.1	29.3	60.3	6.43	< 0.45	1010
43	0.00153	0.0640	<0.0206	12.4	0.000846	0.000534	0.0587	256	78.5	28.9	33.3	61.4	6.17	<0.45	1030
49	0.00123	0.0561	0.0410	11.3	0.000336	0.000642	0.0807	250	71.2	26.5	29.6	66.8	5.57	< 0.90	1030
54	0.00142	0.0489	0.0533	12.8	0.00105	0.000408	0.0861	286	76.9	27.8	27.0	67.0	6.25	< 0.45	1040
	7B														
Column	Influent	NaHCO3													
33	0.000911	0.00226	0.0373	0.0798	0.000765	< 0.000286	0.0608	35.0	69.1	2600	8.85	66.8	7.07	< 0.9	1120
43	0.00102	0.001180	0.0383	0.0455	0.000965	< 0.000286	0.0808	21.5	73.5	3460	8.98	68.3	22.90	<0.9	1040
49	0.00112	0.00114	0.0709	0.0666	0.000770	< 0.000286	0.0546	13.4	70.9	2830	9.19	67.4	6.77	<0.9	1100
54	0.00129	0.00114	0.0801	0.0472	0.000746	< 0.000286	0.0626	7.86	71.9	2670	9.28	68.5	6.37	< 0.9	998
Column	7B	NaHCO3													
5	0.00238	0.0061	0.0457	1.92	0.00184	0.00214	0.0335	77.6	61.9	1270	28.6	48.8	6.21	< 0.45	1030
15	0.00196	0.0235	0.0228	7.58	0.000638	< 0.000286	0.0635	229	79.2	42.6	23.7	51.1	5.73	< 0.45	1020
19	0.00131	0.0192	0.0309	9.23	0.000757	< 0.000286	0.0747	311	81.1	37.3	28.9	52.0	5.7	< 0.45	1100
26	0.000955	0.0146	< 0.0206	9.6	0.000396	< 0.000286	0.0735	289	74.3	29.5	24.3	59.5	6.08	< 0.45	1090
33	0.00453	0.00146	0.0575	0.714	0.00117	0.000638	0.108	23.4	73.3	2600	54.5	60.6	7.01	< 0.45	1100
49	0.00496	0.00575	0.0762	0.429	0.00114	0.000391	0.314	10.2	68.0	2740	41.0	59.2	7.01	<0.9	1060
54	0.00283	0.00532	0.0506	0.178	0.000776	0.000298	0.0770	5.92	72.7	2670	32.7	63.8	6.27	< 0.9	1050
1		CEDEC													
1		CERES MTS													
Column	7C	73MF3													
5	0.000886	0.000458	0.0312	0.062	0.000262	0.00187	0.0438	349	223	41	1.21	18.8	9.48	< 0.45	2750
15	0.0027	0.000679	0.342	0.0546	0.000209	0.00109	0.037	323	96.5	43.5	1.49	22		****	
19	< 0.00070	0.000246	0.0361	0.0707	< 0.000134	0.00101	0.0402	294	94.0	35.6	0.847	14.9	5.96	< 0.45	1140
26	0.000793	0.000312	0.0208	0.0758	0.000165	0.000868	0.0534	243	97.1	33.8	0.892	13.2	6.38	< 0.45	1120
33	< 0.00070	0.000293	< 0.0206	0.0576	0.000416	0.000610	0.0603	230	91.6	31.7	0.852	12.9	6.49	< 0.45	1200
43	< 0.00070	0.000181	0.0229	0.0156	0.000311	0.000755	0.0362	212	103	29.9	0.569	11.5	6.20	< 0.45	1050
49	< 0.00070	0.000231	0.0255	0.0237	0.000427	0.000688	0.0505	216	99.5	31.2	0.563	11.5	5.56	< 0.45	1020
54	0.00120	0.000248	0.0280	0.0194	0.00166	0.000428	0.0662	231	108	33.0	0.683	11.5	6.15	< 0.45	1080

0.000732 J value, compound detected above method detection limit but below method calibration limit 0.0524 Compound exceeds GA GWPS



3.4 MW-7 COLUMN CONCLUSIONS

The following conclusions can be reached from the MW-7 column study:

- 1. Arsenic levels were above the GA GWPS in the MW-7 groundwater. Aerobic conditions and potentially adsorption to iron oxides appeared to reduce arsenic in the influent and effluents of the three columns to below the GA GWPS.
- 2. The second addition and maintenance of 10 g/L sodium bicarbonate were effective in reducing the cobalt to below the GA GWPS over 8.1 pore volumes while the sodium and alkalinity remained above background levels.
- 3. The 14.4 g/L CERE 73MF3 reagent was effective in treating cobalt for more than 12 pore volumes.
- 4. Lithium remained slightly below to well above the GA GWPS in the influent and effluent of the three columns. None of the treatments were successful for lithium.

4.0 ARAMW-8 COLUMNS

4.1 MW-8 Column Reagent Selection

Based upon the batch tests described previously, the following reagents were chosen for the ARAMW-8 column tests:

- 8A Control Column
- 8B Ferric Chloride and Sodium Bicarbonate Column: A mixture of ferric chloride and sodium bicarbonate to increase the pH was prepared.
- 8C CERES MTS 73MF3 Column alkaline buffered magnesium hydroxide, ferrous sulfate, and ferric sulfate.

The MW-8A Control column was prepared with 0.89 kg rock, 0.21 kg sand, 0.36 kg groundwater, and a pore volume of 351 mL.

The ferric chloride-sodium bicarbonate 8B column was prepared with 0.88 kg rock, 0.32 kg sand, 0.31 kg groundwater, and a pore volume of 374 mL. A solution of 4.2 g ferric chloride and 14.8 g of sodium bicarbonate was added to 200 mL of groundwater and pumped onto the column. This loading was equivalent to 11.2 g/L of ferric chloride and 39.6 g/L sodium bicarbonate in the groundwater in the column. The ferric chloride represents 0.3% of the rock, sand, and groundwater and the sodium bicarbonate 1.0% of the rock, sand, and groundwater .

The CERES MTS 73MF3 column was prepared with 1.02 kg rock, 0.21kg sand, 0.31 kg groundwater, and a pore volume of 298 mL A solution of 42.3 g of MTS 73MF3 reagent was added to 213 mL of groundwater and pumped onto the column. The CERES MTS 73MF3 represents 2.7% of the rock, sand, and groundwater.

The ARAMW-8 groundwater was pumped from the bottom of the columns with an eight-channel Longer Pump BT-100-1L peristaltic pump, a 6-channel Cole Parmer Masterflex 7553-80



peristaltic pump, a two channel Cole Parmer Masterflex 7553-80 peristaltic pump. The volume of flow and the time for collection of the groundwater was recorded and the flowrates calculated.

4.2 MW-8 Column Operation

4.2.1 MW-8 Column Flow

Table 8 presents the flowrates for the three columns. The flow rate for the 8A Control column ranged from 0 to 0.418 mL/min with an average of 0.093 mL/min and a total flow of 5.89 L or about 16.8 pore volumes. Little flow was observed from days 0-2, 6-10, and 13-17. The flowrate was equivalent to 0.31 pore volumes/day or a groundwater flowrate of 0.31 ft/day.

The flow rate for the Ferric Chloride-Sodium Bicarbonate column 8B ranged from 0 to 0.316 mL/min with an average of 0.109 mL/min and a total flow of 7.06 L or about 18.9 pore volumes. Little flow was observed from days 0-4, 6-7, and 15-17. The flowrate was equivalent to 0.35 pore volumes/day or a groundwater flowrate of 0.35 ft/day.

The flow rate for the 8C CERES MTS 73MF3 column 3 ranged from 0 to 0.377 mL/min with an average of 0.096 mL/min and a total flow of 6.7 L or about 22.5 pore volumes. The flow was low from days 0-5, 8-10, and 15-19. The flowrate was equivalent to 0.42 pore volumes/day or a groundwater flowrate of 0.42 ft/day.

4.2.2 Column Field Parameters

Table 9 presents the field parameters for the MW-8 columns.

Influent. The pH in the MW-8 influent ranged from 7.8 to 8.3 SU. The ORP was slightly oxidizing ranging from 107 to 273 mV. The influent was aerobic with DO levels between 8.2 and 9.3 mg/L. Specific conductivity ranged from 466 to 632 μ S/cm. There was moderate alkalinity (240-300 mg/L as CaCO₃) and moderate hardness (360 to 480 mg/L as CaCO₃). Ferrous iron ranged from 0.08 to 0.6 mg/L. Only trace levels of sulfide (maximum 0.04 mg/L) were detected.

Control Column 8A. The pH in the effluent from Column 8A ranged from 6.9 to 8.2 SU. The ORP was slightly oxidizing ranging from 149 to 276 mV. The effluent was aerobic with DO levels between 5.0 and 6.9 mg/L. Specific conductivity ranged from 383 to 788 μ S/cm with a slight decrease over time. There was moderate alkalinity (240 to 300 mg/L as CaCO₃) and moderate hardness (360 to 480 mg/L as CaCO₃). Ferrous iron was low (0.02 to 0.42 mg/L). Only trace levels of sulfide (maximum 0.04 mg/L) were detected.

Ferric Chloride-Sodium Bicarbonate Column Sodium Bicarbonate Column 8B Effluent. The mixture of ferric chloride and sodium bicarbonate had a pH of 7.1 SU, ORP of 190 mV, and a specific conductivity of 79,200 μS/cm. The pH in the effluent from Column 8B ranged from 6.8 (Day 29) to 8.1 SU (Day 5). The ORP was slightly oxidizing ranging from 140 to 281 mV. The effluent was aerobic with DO levels between 4.3 and 6.3 mg/L. Specific conductivity ranged from 404 to 79,200 μS/cm. Specific conductivity was highest at Day -1 and fell to background



levels by Day 19. There was elevated alkalinity on Days 5 to 12. Hardness ranged from 120 to 480 mg/L as CaCO₃. Ferrous iron was moderate (0.11 to 1.7 mg/L on Day 5). Only trace levels of sulfide were detected.

CERES MTS 73MF3 Column 8C. The pH ranged from a low of 7.0 SU on Day 29 to 9.4 on Day -1. The pH of the effluent was above 7.5 SU except for Days 12, 23, and 29. The ORP weas slightly oxidizing ranging from 78 to 276 mV. The effluent was aerobic with DO levels between 5.9 and 7.7 mg/L. Specific conductivity ranged from 384 to 56,600 μ S/cm. Specific conductivity was highest at Day -1 (56,6000 μ S/cm) and had fallen to background levels by Day 19. There was low alkalinity ranging from 40 to 120 mg/L as CaCO₃. Hardness ranged from 60 to 480 mg/L (Day 8). Ferrous iron was low (0 to 1.15 mg/L). Only trace levels of sulfide were detected.



Table 8. ARAMW-8 Groundwater Flow Rates and Cumulative Pore Volumes

Column	Treatment				Column	Treatment					Column	Treatment			
						FeCl3-						CERES			
8A	Control				8B	NaHCO3					8C	MTS 73MF3			
Day	Flow	Flowrate	PV	Cum PV	Day	Flow	Flowrate	PV	Cum PV		Day	Flow	Flowrate	PV	Cum PV
	mL	mL/min				mL	mL/min					mL	mL/min		-
0	0				0	0					0	0			
1	0				1	0					1	1.2	0.001		
2	0				2	0					2	0			
3	38.2	0.190	0.11	0.11	3	0.5					3	0			
4	132.9	0.418	0.38	0.49	4	0					4	0			
5	210.5	0.140	0.60	1.09	5	399.8	0.267	1.07	1.07		5	11	0.007	0.037	0.04
6	0.0	0.000	0.00	1.09	6	0	0.000	0.00	1.07		6	544.8	0.377	1.828	1.87
7	0	0.000	0.00	1.09	7	0	0.000	0.00	1.07		7	158.6	0.105	0.532	2.40
8	2.2	0.002	0.01	1.09	8	89.8	0.096	0.24	1.31		8	0	0.000	0.000	2.40
10	0	0.000	0.00	1.09	10	441.7	0.144	1.18	2.49		10	2.6	0.001	0.009	2.41
12	366.1	0.162	1.04	2.14	12	713.1	0.316	1.91	4.40		12	507.2	0.225	1.702	4.11
13	0.1	0.000	0.00	2.14	13	250.1	0.173	0.67	5.07		13	246	0.170	0.826	4.93
15	0	0.000	0.00	2.14	15	0	0.000	0.00	5.07		15	1.3	0.000	0.004	4.94
17	0	0.000	0.00	2.14	17	0	0.000	0.00	5.07		17	0.4	0.000	0.001	4.94
19	455.9	0.180	1.30	3.44	19	473.9	0.187	1.27	6.33		19	0	0.000	0.000	4.94
23	459.2	0.077	1.31	4.74	23	413.6	0.069	1.11	7.44		23	354.2	0.119	1.189	6.13
26	436.3	0.114	1.24	5.99	26	350.6	0.092	0.94	8.38		26	457.3	0.120	1.535	7.66
29	423.6	0.103	1.21	7.19	29	408.3	0.100	1.09	9.47		29	524.2	0.128	1.759	9.42
33	577.4	0.107	1.65	8.84	33	563.4	0.104	1.51	10.97		33	344.9	0.064	1.157	10.58
43	1497	0.104	4.26	13.10	43	1449.8	0.101	3.88	14.85		43	807.1	0.056	2.708	13.29
49	570	0.067	1.624	14.73	49	811.9	0.095	2.17	17.02		49	1432.2	0.168	4.806	18.09
54	722.9	0.109	2.060	16.79	54	695	0.105	1.86	18.88		54	1303.4	0.196	4.374	22.47
									Avg Pore						Avg Pore
		Avg		Avg Pore			Avg		Volumes/						Volumes/
	Cum Flow	Flowrate		Volumes/Day		Cum Flow	Flowrate		Day	_		Cum Flow	Avg Flowrate		Day
	5892.3	0.093		0.31		7061.5	0.109		0.35			6696.4	0.096		0.42



Table 9. MW-8 Field Parameters

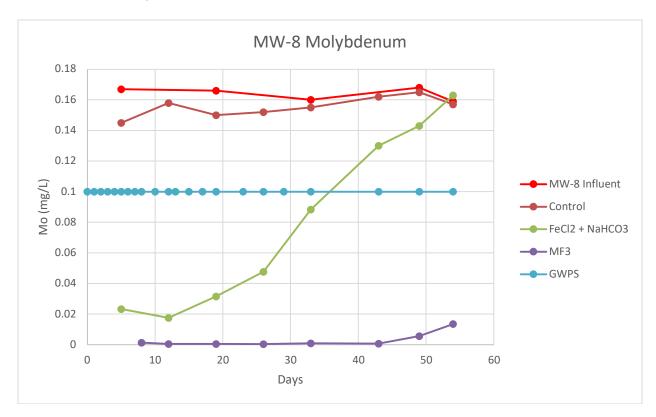
Influent										8A	Control						
Day	pН	ORP	DO	SC	Alk	Hard	Fe2+	S	Dayu	pН	ORP	DO	SC	Alk	Hard	Fe2+	S
					mg/L	mg/L								mg/L	mg/L		
	SU	mV	mg/L	mS/cm	CaCO3	CaCO3	mg/L	mg/L		SU	mV	mg/L	mS/cm	CaCO3	CaCO3	mg/L	mg/L
-1	8.1	107		545					4	7.7	200		788				0.02
0	7.9	140	9.3	598					5	7.7	149	5.1	565	300	480	0.42	0
5	7.8	142	8.3	600	280	480	0.6	0.03	12	7.9	207	6.9	616	300	360	0.18	0.04
19	7.8	236	8.3	477	300	360	0.14	0.03	19	7.7	245	5.0	484	300	360	0.3	
33	7.9	273	8.3	466	240	360	0.22	0.04	23	7.6	231	6.5	509				0
49	8.0	259	8.2	506	300	360	0.08	0.02	26	7.9	234	6.1	491	300	360	0.16	
54	8.3	214	8.9	632	300	360	0.22	0	29	6.9	258	5.6	510				0.03
									33	7.8	276	5.3	452	240	360	0.12	0.02
									43	8.0	240	5.8	383	240	360	0.14	0.01
									49	8.0	205	5.2	477	300	360	0.11	0
									54	8.2	216	5.2	490	240	360	0.02	0.02

8B	FeCl ₃ NaHCO3									8C	CERES MTS 73MF3		3R	MF2			
Day	pН	ORP	DO	SC	Alk	Hard	Fe2+	S	Day	pН	ORP	DO	SC	Alk	Hard	Fe2+	S
	SU	mV	mg/L	mS/cm	mg/L CaCO3	mg/L CaCO3	mg/L	mg/L		SU	mV	mg/L	mS/cm	mg/L CaCO3	mg/L CaCO3	mg/L	mg/L
-1	7.1	190		79200					-1	9.4	78		56600				
5	8.1	150	5.9	1742	1200	120	1.7	0.02	5	7.9	143	7.4	4720			1.15	
8	7.9	140	5.6	1091					8	8.2	182	6.6	830	40	480	0.64	0.02
12	7.4	193	5.2	652	720	200	0.5	0	12	7.3	193	6.8	606	40	480	0.95	0
19	7.6	253	4.3	526	480	360	0.26	0.04	19	7.8	248	7.7	503	120	360	0.4	0
23	7.6	239	5.9	546					23	7.2	237	7.6	555				
26	7.6	241	5.7	543	360	480	0.27	0	26	7.9	234	6.0	517	40	360	0.13	0
29	6.8	267	5.6	573					29	7.0	253	6.6	532				
33	7.8	281	6.2	525	360	420	0.15	0	33	8.0	276	5.9	505	40	360	0.14	0.03
43	7.7	278	6.2	404	360	360	0.13	0.01	43	7.9	272	7.0	384	40	360	0.17	0
49	7.9	263	6.3	579	360	360	0.12	0.03	49	8.3	251	6.1	516	80	360	0.11	0.03
54	8.0	226	6.3	518	360	360	0.11	0	54	8.8	205	6.8	475	100	60	0	0



4.2.3 MW-8 Column Metals and Anions

Table 10 presents the metals and anions data for each MW-8 influent and column effluent. Figure 4 shows the molybdenum concentrations in the MW-8 influent and 8A Control, 8B FeCl₃ and NaHCO₃, and 8C CERES 73MF2 column effluents.



Influent. Arsenic ranged from <0.00070 to 0.000818 mg/L in the influent. Arsenic never exceeded the GA GWPS of 0.010 mg/L in the MW-8 influent. Cobalt ranged from 0.00164 to 0.00483 mg/L in the influent and remained below the GA GWPS of 0.0060 mg/L. Dissolved iron ranged from <0.0206 to 0.0388 mg/L. Dissolved manganese ranged from 0.0388 to 0.383 mg/L. Molybdenum ranged from 0.159 to 0.168 mg/L; molybdenum was was always above the GA GWPS of 0.10 mg/L. Only low levels of selenium (<0.000286 to 0.000422 mg/L) were detected. Lithium was not detected (<0.0113 mg/L). Calcium, magnesium, silica dioxide, sodium, and potassium showed little variability, with calcium ranging from 57.9 to 75.7 mg/L, magnesium from 29.3 to 30.1 mg/L, sodium from 16.5 to 17.6 mg/L, potassium from 5.94 to 6.10 mg/L, and silica dioxide from 27.6 to 30.2 mg/L. Only trace levels of chloride were detected of 5.39 to 6.63 mg/L. Fluoride was not detected. Sulfate varied between 105 and 122 mg/L.

Control Column 8A Effluent. Arsenic ranged from 0.00114 to 0.00399 mg/L in the Control Column 7A effluent; below the GA GWPS. Cobalt ranged from <0.000161 to 0.00406 mg/L in the effluent and remained below the GA GWPS of 0.0060 mg/L. Dissolved iron ranged from <0.0206 to 0.108 mg/L. Dissolved manganese ranged from 0.00555 to 0.102 mg/L. Molybdenum was present at elevated concentrations above the GA



GWPS of 0.145 to 0.165 mg/L at all sampling points. Only low levels of selenium (0.00032 to 0.000358 mg/L) were detected. Lithium was not detected at concentrations (<0.0113 mg/L). Calcium, magnesium, sodium, and potassium showed little variability, with calcium ranging from 48.2 to 83.7 mg/L, magnesium from 29.8 to 38.0 mg/L, sodium from 16.6 to 21.7 mg/L, potassium from 6.54 to 11.1 mg/L, and silica dioxide from 18.9 to 23.8 mg/L. Only trace levels of chloride were detected. Fluoride was detected at low levels below 0.5 mg/L. Sulfate varied between 107 and 136 mg/L.

Ferric Chloride and Sodium Bicarbonate Column 8B Effluent. Arsenic ranged from <0.00070 to 0.00271 mg/L in the Ferric Chloride and Sodium Bicarbonate Column 8B. Arsenic never exceeded the GA GWPS. Cobalt ranged from <0.000161 to 0.000312 mg/L in the effluent and remained below the GA GWPS of 0.0060 mg/L. Dissolved iron ranged from <0.0206 to 0.0605 mg/L. Dissolved manganese ranged from 0.0199 to 0.0556 mg/L which was 73.6 to 93.4% lower than the influent except at Day 33 when the influent manganese was only 0.0388 mg/L. Molybdenum was reduced to 0.01775 to 0.0883 mg/L from Days 5 to 33. From Days 43 to 54, the molybdenum ranged from 0.130 to 0.163 mg/L; above the GA GWPS. The adsorption/precipitation capacity from the ferric chloride and sodium bicarbonate was exhausted. Lithium ranged from <0.00113 to 0.0162 mg/L and did not exceed the GA GWPS. Only low levels of selenium (<0.000286 to 0.00148 mg/L) were detected. Calcium ranged from 10.7 to 68 mg/L, magnesium from 5.88 to 31.5 mg/L, sodium from 16.4 to 484 mg/L (dropped to baseline by day 19), potassium from 7.37 to 12.5 mg/L, and silica dioxide from 4.79 to 15.2 mg/L. Only low levels of chloride were detected after Day 5. Fluoride was only detected at 1.21 mg/L on Day 5. Sulfate varied between 107 and 120 mg/L.

CERES MTS 73MF3 Column 8C. Arsenic ranged from <0.00070 to 0.000283 mg/L in the Column 8C CERES MTS 73MF3 effluent. Cobalt ranged from <0.000161 to 0.000349 mg/L in the effluent and remained below the GA GWPS. Dissolved iron ranged from <0.0206 to 0.0429 mg/L. Dissolved manganese ranged from 0.00176 to 0.0468 mg/L which was 77.8 to 99.3% lower than the influent. Molybdenum was present at low concentrations of 0.000364 to 0.0135 mg/L; it was always below the GA GWSP. Lithium was not detected below the GA GWPS <0.00113 to 0.0182 mg/L. Only low levels of selenium (<0.000286 to 0.000799 mg/L) were detected. Calcium ranged from 6.75 to 73.4 mg/L, magnesium from 43.7 to 69.5 mg/L, sodium from 17.1 to 19.3 mg/L, potassium from 6.22 to 8.3 mg/L, and silica dioxide from 2.33 to 2.65 mg/L. The maximum calcium was detected on Day 8 and decreased to below background levels by Day 12 and to as low as 6.75 mg/L on Day 54. The maximum magnesium was detected on Day 8 and remained above background levels through Day 54. The CERES MTS 73MF3 reagent contains calcium and magnesium. While it also contains ferrous sulfate and ferric sulfate, little ferrous iron or dissolved iron was detected in the effluent. Only moderate levels of chloride (5.76 to 7.41 mg/L) were detected. Sulfate decreased from 500 mg/L on Day 8 to 189 mg/L on Day 54 which is higher than the influent.



Table 10. Metals and Anions in MW-8 Columns

Day	Dis As	Dis Co	Dis Fe	Dis Mn	Dis Mo	Dis Se	Dis Li	Dis Ca	Dis Mg	Dis Na	Dis K	Dis SiO2	Chloride	Fluoride	Sulfate
Day	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GA GWPS	0.010	0.0060	mg/L	mg/L	0.10	0.050	0.040	IIIg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Influent	0.010	0.0060			0.10	0.030	0.040								
5	< 0.00070	0.00483	0.0388	0.302	0.167	0.000442	< 0.0113	75.7	20.8	17.3	6.1	29.5	5.88	<0.15	114
19	<0.00070	0.00483	< 0.0388	0.302	0.167	0.000442 <0.000286	<0.0113	74.0	29.8 30.1	17.6	6.1 5.95	29.3	5.88	<0.45 <0.45	114
33	0.00070	0.0045	<0.0206	0.383	0.166 0.160	<0.000286	<0.0113	57.9	29.3	17.4	6.06	29.7		<0.45	122
49													6.63	<0.45	
54	0.000736	0.00372	<0.0206	0.249	0.168	<0.000286	<0.0113	68.1	29.3 29.7	16.5	5.96 5.94	27.6	5.39	<0.45	105
54	0.000818	0.00320	< 0.0206	0.242	0.159	<0.000286	< 0.0113	65.8	29.7	17.0	5.94	30.2	6.02	<0.45	115
Column	8A	Ct1													
5	0.00339	0.000406	0.0971	0.102	0.145	0.00358	< 0.0113	83.7	33	21.7	11.1	20.5	7.74	0.465	136
12	0.00339	0.000406	0.0971	0.102	0.145	0.00358	<0.0113	62.9	29.8	17.3	8.89	18.9	5.88	<0.45	118
	0.0026	0.000195		0.101		0.000937	<0.0113					19.6		<0.45	110
19 26	0.00183	< 0.000246	0.0303 <0.0206	0.0673	0.150	0.000427	<0.0113	65.2 54.7	32.7 29.8	18.1 16.7	8.99 7.71	19.6	5.76 7.32	0.495	110
33	0.00131	< 0.000161	<0.0206	0.0156	0.152 0.155	0.000437	<0.0113	51.1	33.4	17.3	7.54	21.0	6.27	< 0.495	120
43	0.00163	< 0.000161	<0.0206	0.00555			<0.0113	51.1	38.0	18.2	7.46	21.0		<0.45	110
					0.162	0.000346							8.31		
49	0.00114	0.000188	<0.0206	0.0138	0.165	0.000320	<0.0113	49.7	37.1	17.1	7.03	21.8	5.76	< 0.45	107
54	0.00128	0.000203	0.0317	0.00770	0.157	0.000332	< 0.0113	48.2	36.3	16.6	6.54	23.8	5.47	< 0.45	117
		E 012											-		
C. I	8B	FeCl3-													
Column		NaHCO3	0.0212	0.0100	0.0222	0.00140	-0.0112	10.7	5.00	40.4	7.27	4.70	1.67	1.21	110
5	0.00271	0.00031	0.0312	0.0199	0.0232	0.00148	< 0.0113	10.7	5.88	484	7.37	4.79	167	1.21	110
12	0.00203	0.000312	0.0605	0.0517	0.0175	0.000299	0.0162	29.1	14.8	112	8.91	5.2	10.2	< 0.45	111
19	0.00093	0.000171	0.0315	0.0555	0.0315	<0.000286	0.0147	62.2	31.5	37.1	12.5	7.6	6.06	< 0.45	111
26	0.000735	< 0.000161	<0.0206	0.0556	0.0476	<0.000286	< 0.0113	65.5	30.6	20.1	10.3	8.28	6.68	<0.45	111
33	<0.00070	0.000179	< 0.0206	0.0494	0.0883	<0.000286	<0.0113	68.0	30.8	18.2	9.61	9.52	6.53	<0.45	120
43	0.000932	< 0.000161	< 0.0206	0.0319	0.130	<0.000286	< 0.0113	66.9	31.5	18.1	8.95	11.0	6.96	<0.45	109
49	0.000853	0.000164	< 0.0206	0.0205	0.143	< 0.000286	< 0.0113	66.1	28.4	16.4	8.4	13.7	5.61	< 0.45	107
54	< 0.00070	0.000219	0.0238	0.0406	0.163	< 0.000286	< 0.0113	66.5	30.1	17.1	8.03	15.2	5.59	< 0.45	115
		opp.p.o													
		CERES											1		
Column	8C	MTS 73MF3													
Column 8	0.00283	0.000349	< 0.0206	0.0277	0.00124	0.000799	0.0159	73.4	69.5	19.3	8.3	2.63	6.64	<0.45	500
12	0.00283	< 0.000349	<0.0206	0.0277	0.00124	<0.000799	0.0159	47.3	43.7	17.6	6.95	2.63	5.76	<0.45	336
19	0.00133		0.0429	0.0136	0.000437	<0.000286	0.0182				6.95	2.59	6.06	<0.45	340
26	0.00106	0.00018	< 0.0206		0.000444			42.8	43.8 45.3	17.8 18.3	6.71	2.59	7.41	<0.45	287
		<0.000161		0.0468		<0.000286	<0.00113	33.7	45.3	18.3	6.44	2.42		<0.45	
33	<0.00070	<0.000161	<0.0206	0.00779	0.000873	<0.000286	<0.00113	23.5	_				7.18		280
43	0.00109	<0.000161	<0.0206	0.00848	0.000654	0.00031	<0.00113	20.3	48.8	19.0	6.36	2.65	6.41	< 0.45	256
49	0.00133	< 0.000161	<0.0206	0.00521	0.00561	<0.000286	<0.00113	10.3	51.8	17.1	6.22	2.42	5.79	< 0.45	231
54	0.00139	< 0.000161	0.0220	0.00176	0.0135	0.000415	< 0.00113	6.75	64.0	18.7	6.65	2.38	6.39	< 0.45	189

0.000732 J value, compound detected above method detection limit but below method calibration limit 0.0524 Compound exceeds GA GWPS



4.3 ARAMW-8 COLUMN CONCLUSIONS

The following conclusions can be reached from the MW-8 column study:

- 1. Arsenic, lithium, and selenium levels were below the GA GWPS in the MW-8 groundwater.
- 2. Cobalt was slightly above the GA GWPS of 0.0060 mg/L in the initial characterization groundwater but was below the GA GWPS in the influent and all three column effluents The 10 g/L sodium bicarbonate additions to the MW-7 feed resulted in reductions in cobalt below the GA GWPS. This precipitation reaction would also occur in the MW-7B column.
- 3. The application of ferric chloride and sodium bicarbonate was effective in reducing the molybdenum to below the GA GWPS over 11 pore volumes while the sodium and alkalinity remained above background levels. Molybdenum was above the GA GWPS from Days 43 to 54 and pore volumes 14.8 to 18.9.
- 4. The 142 g/L CERE CERES MTS 73MF3 reagent was effective in treating molybdenum to below the GA GWPS for more than 22.5 pore volumes.

Please let me know if you have any questions about this draft report.

Sincerely,

TERRA SYSTEMS, INC.

Michael D. Lee, Ph.D.

Vice-President Research and Development

michael I lee, PRI.



ATTACHMENT 1 CHAIN-OF-CUSTODY FORMS



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Location: N	Macon, Ga	es.	Phone:	770-656-26	770-656-2676 / 859-619-6086	9-6086										
Sampler:	Jackson Bankston	3ankston .							nber o	bility						
Date	Time		Sample Identification	Sample Technique	Matrix		Preser- vative	Container Type		stseta						Remarks
9/6/2022	14:00	14:00 GWC17-09062022-01	322-01	Low Flow WG	w w	<u>s</u>	/None	ce/None 2.5 G Cubitainer	-	×					Tim	Time: 1400-1425
9/6/2022	1	14:30 GWC17-09062022-02	322-02	Low Flow WG	w W	8	/None	ce/None 2.5 G Cubitainer	_	×					Ţ	Time: 1430-1457
9/6/2022	15:05	15:05 GWC17-09062022-03	322-03	Low Flow	we v	93 	ce/None 2	2.5 G Cubitainer	-	×					Ë	Time: 1505-1532
9/7/2022	8:00	8:00 GWC17-09062022-04	022-04	Low Flow WG	9 ^	<u>8</u>	None 2	ce/None 2.5 G Cubitainer	_	×					Tim	Time: 0800-0835
9/7/2022	8:40	8:40 GWC17-09062022-05	022-05	Low Flow	wG v	<u>8</u>	ce/None	2.5 G Cubitainer	-	×				(Tim	Time: 0840-0910
9/7/2022	9:15	9:15 GWC17-09062022-06	022-06	Low Flow WG	» WG	8	ce/None	2.5 G Cubitainer	_	×					Tim	Time: 0915-0945
9/7/2022	9:50	9:50 GWC17-09062022-07	022-07	Low Flow WG	wG v	8	None ,	ce/None 2.5 G Cubitainer	-	×					Tim	Time: 950-1030
9/7/2022	10:35	10:35 GWC17-09062022-08	022-08	Low Flow	w WG	<u>8</u>	√None ;	ce/None 2.5 G Cubitainer	-	×					E I	Time: 1035-1100
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10/4/2022	13:24	13:24 ARAMW-9 41.0-43.0	Rotary Sonic	ROCK	Ice/None	2 Gal Ziploc	-	×							
10/4/2022	17:00	17:00 ARAMW-9 95.0-96.5	Rotary Sonic	ROCK	Ice/None	2 Gal Ziploc	-	×							
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ATTACHMENT 2 ANALYTICAL REPORTS

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PREPARED FOR

Attn: Dr. Michael D Lee

Terra Systems Inc 130 Hickman Road

Suite 1

ANALYTICAL REPORT

Stantec CCR AP2 Columns

JOB NUMBER

410-132044-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

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Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

7/5/2023

Eurofins Lancaster Laboratories Environment Testing, LLC

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Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

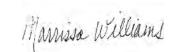
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns Laboratory Job ID: 410-132044-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Qualifiers

HPLC/IC	
Qualifier	

ı	Docult is loss than the DI	but greater than or equal to the	MDI and the concentration is an	annrovimete velue

Metals

Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
В	Compound was found in the blank and sample.
F5	Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL, and the absolute difference between results is < the upper reporting limits for both.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

LOD

MQL

C.CCCu. y	
Abbreviation	These commonly used abbreviations may or may not be present in this report.
n	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)

Limit of Quantitation (DoD/DOE) LOQ MCL EPA recommended "Maximum Contaminant Level" Minimum Detectable Activity (Radiochemistry) MDA

Limit of Detection (DoD/DOE)

MDC Minimum Detectable Concentration (Radiochemistry) MDL Method Detection Limit ML Minimum Level (Dioxin) MPN Most Probable Number

Method Quantitation Limit

Qualifier Description

Not Calculated NC

Not Detected at the reporting limit (or MDL or EDL if shown) ND

NEG Negative / Absent Positive / Present POS PQL Practical Quantitation Limit

PRES Presumptive QC **Quality Control**

RER Relative Error Ratio (Radiochemistry)

Reporting Limit or Requested Limit (Radiochemistry) RL

Relative Percent Difference, a measure of the relative difference between two points **RPD**

TEF Toxicity Equivalent Factor (Dioxin) TEQ Toxicity Equivalent Quotient (Dioxin)

TNTC Too Numerous To Count

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Case Narrative

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132044-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-132044-1

Receipt

The samples were received on 6/23/2023 5:00 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 0.3°C

HPLC/IC

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

Metals

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

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132044-1

Client Sample ID: MW-7I Influent Week 1

Lab Sample ID: 410-132044-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	991		375	125	mg/L	250	_	EPA 300.0 R2.1	Total/NA
Chloride	5.85	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0421	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	67.0		1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	298		0.515	0.237	mg/L	1		6010D	Dissolved
Cobalt	49.3		0.515	0.161	ug/L	1		6020B	Dissolved
Iron	32.7	J	51.5	20.6	ug/L	1		6020B	Dissolved
Manganese	11600		20.6	9.79	ug/L	10		6020B	Dissolved
Selenium	0.666	J	1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	28000	^2	206	92.7	ug/L	1		6020B	Dissolved
Potassium	9260		206	67.0	ug/L	1		6020B	Dissolved
Magnesium	76500		51.5	16.5	ug/L	1		6020B	Dissolved

Client Sample ID: MW-7A Control Day 8 Week 1

Lab Sample ID: 410-132044-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	3350		375	125	mg/L	250	_	EPA 300.0 R2.1	Total/NA
Chloride	7.31	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0615		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	57.4		1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	304		0.515	0.237	mg/L	1		6010D	Dissolved
Arsenic	1.87	J	2.06	0.700	ug/L	1		6020B	Dissolved
Cobalt	11.2		0.515	0.161	ug/L	1		6020B	Dissolved
Iron	230		51.5	20.6	ug/L	1		6020B	Dissolved
Manganese	11200		103	48.9	ug/L	50		6020B	Dissolved
Molybdenum	1.66		0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	0.436	J	1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	27900		206	92.7	ug/L	1		6020B	Dissolved
Potassium	23700		206	67.0	ug/L	1		6020B	Dissolved
Magnesium	74700		51.5	16.5	ug/L	1		6020B	Dissolved

Client Sample ID: MW-7B NaHCO3 Week 1

Lab Sample ID: 410-132044-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1030		375	125	mg/L	250	_	EPA 300.0 R2.1	Total/NA
Chloride	6.21	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0335	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	48.8		1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	77.6		0.515	0.237	mg/L	1		6010D	Dissolved
Arsenic	2.38		2.06	0.700	ug/L	1		6020B	Dissolved
Cobalt	6.10		0.515	0.161	ug/L	1		6020B	Dissolved
Iron	45.7	J	51.5	20.6	ug/L	1		6020B	Dissolved
Manganese	1920		2.06	0.979	ug/L	1		6020B	Dissolved
Molybdenum	1.84		0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	2.14		1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	1270000		10300	4640	ug/L	50		6020B	Dissolved
Potassium	28600		206	67.0	ug/L	1		6020B	Dissolved
Magnesium	61900		51.5	16.5	ug/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132044-1

Client Sample ID: MW-7C MF3 Week 1

Lab Sample ID: 410-132044-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	2750		750	250	mg/L	500	_	EPA 300.0 R2.1	Total/NA
Chloride	9.48		7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0438	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	1.21		1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	349		0.515	0.237	mg/L	1		6010D	Dissolved
Arsenic	0.886	J	2.06	0.700	ug/L	1		6020B	Dissolved
Cobalt	0.458	JВ	0.515	0.161	ug/L	1		6020B	Dissolved
Iron	31.2	J	51.5	20.6	ug/L	1		6020B	Dissolved
Manganese	62.0		2.06	0.979	ug/L	1		6020B	Dissolved
Molybdenum	0.262	J	0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	1.87		1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	41000		206	92.7	ug/L	1		6020B	Dissolved
Potassium	18800		206	67.0	ug/L	1		6020B	Dissolved
Magnesium	223000		258	82.4	ug/L	5		6020B	Dissolved

Client Sample ID: MW-8I Influent Week 1

Lab Sample ID: 410-132044-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	114		15.0	5.00	mg/L	10	_	EPA 300.0 R2.1	Total/NA
Chloride	5.88	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	29.5		1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	75.7		0.515	0.237	mg/L	1		6010D	Dissolved
Cobalt	4.83		0.515	0.161	ug/L	1		6020B	Dissolved
Iron	38.8	J	51.5	20.6	ug/L	1		6020B	Dissolved
Manganese	302		2.06	0.979	ug/L	1		6020B	Dissolved
Molybdenum	167		0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	0.442	J	1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	17300	^2	206	92.7	ug/L	1		6020B	Dissolved
Potassium	6100		206	67.0	ug/L	1		6020B	Dissolved
Magnesium	29800		51.5	16.5	ug/L	1		6020B	Dissolved

Client Sample ID: MW-8A Control Week 1

Lab Sample ID: 410-132044-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Fluoride	0.465	J	1.00	0.450	mg/L	5		EPA 300.0 R2.1	Total/NA
Sulfate	136		15.0	5.00	mg/L	10		EPA 300.0 R2.1	Total/NA
Chloride	7.74		7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	20.5		1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	83.7		0.515	0.237	mg/L	1		6010D	Dissolved
Arsenic	3.39		2.06	0.700	ug/L	1		6020B	Dissolved
Cobalt	0.406	J	0.515	0.161	ug/L	1		6020B	Dissolved
Iron	97.1		51.5	20.6	ug/L	1		6020B	Dissolved
Manganese	102		2.06	0.979	ug/L	1		6020B	Dissolved
Molybdenum	145		0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	3.58		1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	21700	^2	206	92.7	ug/L	1		6020B	Dissolved
Potassium	11100		206	67.0	ug/L	1		6020B	Dissolved
Magnesium	33000		51.5	16.5	ug/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Detection Summary

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 1

Lab Sample ID: 410-132044-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Fluoride	1.21		1.00	0.450	mg/L		EPA 300.0 R2.1	Total/NA
Sulfate	110		15.0	5.00	mg/L	10	EPA 300.0 R2.1	Total/NA
Chloride	167		75.0	30.0	mg/L	50	EPA 300.0 R2.1	Total/NA
SiO2	4.79		1.10	0.117	mg/L	1	6010D	Dissolved
Calcium	10.7		0.515	0.237	mg/L	1	6010D	Dissolved
Arsenic	2.71		2.06	0.700	ug/L	1	6020B	Dissolved
Cobalt	0.310	J	0.515	0.161	ug/L	1	6020B	Dissolved
Iron	31.2	J	51.5	20.6	ug/L	1	6020B	Dissolved
Manganese	19.9		2.06	0.979	ug/L	1	6020B	Dissolved
Molybdenum	23.2		0.515	0.134	ug/L	1	6020B	Dissolved
Selenium	1.48		1.03	0.286	ug/L	1	6020B	Dissolved
Sodium	484000		2060	927	ug/L	10	6020B	Dissolved
Potassium	7370		206	67.0	ug/L	1	6020B	Dissolved
Magnesium	5880		51.5	16.5	ug/L	1	6020B	Dissolved

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Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7I Influent Week 1

Lab Sample ID: 410-132044-1 Date Collected: 06/23/23 09:00 Matrix: Water

Date Received: 06/23/23 17:00

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			06/28/23 21:49	5
Sulfate	991		375	125	mg/L			06/29/23 22:27	250
Chloride	5.85	J	7.50	3.00	mg/L			06/28/23 21:49	5
Method: SW846 6010D - Me	etals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0421	J	0.0515	0.0113	mg/L		06/26/23 21:41	06/27/23 18:42	1
SiO2	67.0		1.10	0.117	mg/L		06/26/23 21:41	06/27/23 18:42	1
Calcium	298		0.515	0.237	mg/L		06/26/23 21:41	06/27/23 18:42	1
: Method: SW846 6020B - Me	etals (ICP/MS) - Diss	olved Qualifier	0.515	0.237	J	D	06/26/23 21:41 Prepared	06/27/23 18:42 Analyzed	Dil Fac
Method: SW846 6020B - Me Analyte	etals (ICP/MS) - Diss				J	<u>D</u>			1 Dil Fac
Method: SW846 6020B - Me Analyte Arsenic	etals (ICP/MS) - Diss Result		RL	MDL	Unit	<u>D</u>	Prepared	Analyzed	1 Dil Fac
Method: SW846 6020B - Me Analyte Arsenic Cobalt	etals (ICP/MS) - Diss Result <0.700	Qualifier		MDL 0.700	Unit ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41	Analyzed 06/27/23 16:59	1 Dil Fac
Method: SW846 6020B - Me Analyte Arsenic Cobalt Iron	etals (ICP/MS) - Diss Result <0.700 49.3	Qualifier		MDL 0.700 0.161	Unit ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 16:59 06/27/23 16:59	Dil Fac 1 1 1 10
Method: SW846 6020B - Me Analyte Arsenic Cobalt Iron Manganese	etals (ICP/MS) - Diss Result <0.700 49.3 32.7	Qualifier	RL 2.06 0.515 51.5	MDL 0.700 0.161 20.6	Unit ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 16:59 06/27/23 16:59 06/27/23 16:59	1 1
Method: SW846 6020B - Me Analyte Arsenic Cobalt Iron Manganese Molybdenum	etals (ICP/MS) - Diss Result <0.700 49.3 32.7 11600	Qualifier	2.06 0.515 51.5 20.6	MDL 0.700 0.161 20.6 9.79	Unit ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 16:59 06/27/23 16:59 06/27/23 16:59 06/27/23 17:32	1 1
Calcium Method: SW846 6020B - Me Analyte Arsenic Cobalt Iron Manganese Molybdenum Selenium Sodium	etals (ICP/MS) - Diss Result <0.700 49.3 32.7 11600 <0.134	Qualifier J	2.06 0.515 51.5 20.6 0.515	MDL 0.700 0.161 20.6 9.79 0.134	Unit ug/L ug/L ug/L ug/L ug/L	D	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 16:59 06/27/23 16:59 06/27/23 16:59 06/27/23 17:32 06/27/23 16:59	1 1
Method: SW846 6020B - Me Analyte Arsenic Cobalt Iron Manganese Molybdenum Selenium	etals (ICP/MS) - Diss Result <0.700 49.3 32.7 11600 <0.134 0.666	Qualifier J	2.06 0.515 51.5 20.6 0.515 1.03	MDL 0.700 0.161 20.6 9.79 0.134 0.286	Unit ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 16:59 06/27/23 16:59 06/27/23 16:59 06/27/23 16:59 06/27/23 16:59	1 1

Client Sample ID: MW-7A Control Day 8 Week 1

Date Collected: 06/23/23 09:15

Date Received: 06/23/23 17:00

Method: EPA 300.0 R2.1 - Anions,	Ion Chromato	ography							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1 00	0.450	ma/L			06/28/23 22:12	5

375 06/29/23 22:39 250 Sulfate 3350 125 mg/L Chloride 7.31 J 7.50 3.00 mg/L 06/28/23 22:12

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0615		0.0515	0.0113	mg/L		06/26/23 21:41	06/27/23 19:14	1
SiO2	57.4		1.10	0.117	mg/L		06/26/23 21:41	06/27/23 19:14	1
Calcium	304		0.515	0.237	mg/L		06/26/23 21:41	06/27/23 19:14	1

Method: SW8	46 6020B - Metal	s (ICP/MS)	- Dissolved

(ICP/IVIO) - DISSU	Jiveu							
Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1.87	J	2.06	0.700	ug/L		06/26/23 21:41	06/27/23 17:17	1
11.2		0.515	0.161	ug/L		06/26/23 21:41	06/27/23 17:17	1
230		51.5	20.6	ug/L		06/26/23 21:41	06/27/23 17:17	1
11200		103	48.9	ug/L		06/26/23 21:41	06/27/23 17:38	50
1.66		0.515	0.134	ug/L		06/26/23 21:41	06/27/23 17:17	1
0.436	J	1.03	0.286	ug/L		06/26/23 21:41	06/27/23 17:17	1
27900		206	92.7	ug/L		06/26/23 21:41	06/27/23 17:17	1
23700		206	67.0	ug/L		06/26/23 21:41	06/27/23 17:17	1
74700		51.5	16.5	ug/L		06/26/23 21:41	06/27/23 17:17	1
	Result 1.87 11.2 230 11200 1.66 0.436 27900 23700	230 11200 1.66 0.436 J 27900 23700	Result Qualifier RL 1.87 J 2.06 11.2 0.515 230 51.5 11200 103 1.66 0.515 0.436 J 1.03 27900 206 23700 206	Result Qualifier RL MDL 1.87 J 2.06 0.700 11.2 0.515 0.161 230 51.5 20.6 11200 103 48.9 1.66 0.515 0.134 0.436 J 1.03 0.286 27900 206 92.7 23700 206 67.0	Result Qualifier RL MDL Unit 1.87 J 2.06 0.700 ug/L 11.2 0.515 0.161 ug/L 230 51.5 20.6 ug/L 11200 103 48.9 ug/L 1.66 0.515 0.134 ug/L 0.436 J 1.03 0.286 ug/L 27900 206 92.7 ug/L 23700 206 67.0 ug/L	Result Qualifier RL MDL Unit D 1.87 J 2.06 0.700 ug/L 11.2 0.515 0.161 ug/L 230 51.5 20.6 ug/L 11200 103 48.9 ug/L 1.66 0.515 0.134 ug/L 0.436 J 1.03 0.286 ug/L 27900 206 92.7 ug/L 23700 206 67.0 ug/L	Result Qualifier RL MDL Unit D Prepared 1.87 J 2.06 0.700 ug/L 06/26/23 21:41 11.2 0.515 0.161 ug/L 06/26/23 21:41 230 51.5 20.6 ug/L 06/26/23 21:41 11200 103 48.9 ug/L 06/26/23 21:41 1.66 0.515 0.134 ug/L 06/26/23 21:41 0.436 J 1.03 0.286 ug/L 06/26/23 21:41 27900 206 92.7 ug/L 06/26/23 21:41 23700 206 67.0 ug/L 06/26/23 21:41	Result Qualifier RL MDL Unit D Prepared Analyzed 1.87 J 2.06 0.700 ug/L 06/26/23 21:41 06/27/23 17:17 11.2 0.515 0.161 ug/L 06/26/23 21:41 06/27/23 17:17 230 51.5 20.6 ug/L 06/26/23 21:41 06/27/23 17:17 11200 103 48.9 ug/L 06/26/23 21:41 06/27/23 17:38 1.66 0.515 0.134 ug/L 06/26/23 21:41 06/27/23 17:17 0.436 J 1.03 0.286 ug/L 06/26/23 21:41 06/27/23 17:17 27900 206 92.7 ug/L 06/26/23 21:41 06/27/23 17:17 23700 206 67.0 ug/L 06/26/23 21:41 06/27/23 17:17

Eurofins Lancaster Laboratories Environment Testing, LLC

Lab Sample ID: 410-132044-2

Matrix: Water

7/5/2023

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7B NaHCO3 Week 1

Lab Sample ID: 410-132044-3 Date Collected: 06/23/23 09:30 Matrix: Water

Date Received: 06/23/23 17:00

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			06/29/23 21:30	5
Sulfate	1030		375	125	mg/L			06/29/23 21:42	250
Chloride	6.21	J	7.50	3.00	mg/L			06/29/23 21:30	5
Method: SW846 6010D - N	Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0335	J	0.0515	0.0113	mg/L		06/26/23 21:41	06/27/23 18:55	1
SiO2	48.8		1.10	0.117	mg/L		06/26/23 21:41	06/27/23 18:55	1
			0.545	0.007	ma er /1		00/00/00 04 44	00/07/00 40-55	
	77.6 Netals (ICP/MS) - Diss	olved	0.515	0.237	mg/L		06/26/23 21:41	06/27/23 18:55	1
Calcium Method: SW846 6020B - N		olved	0.515	0.237	mg/L		06/26/23 21:41	06/27/23 18:55	1
Method: SW846 6020B - N Analyte	Metals (ICP/MS) - Disse Result	olved Qualifier	RL	MDL	Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - N Analyte Arsenic	Metals (ICP/MS) - Diss Result 2.38		RL 2.06	MDL 0.700	Unit ug/L	<u>D</u>	Prepared 06/26/23 21:41	Analyzed 06/27/23 17:13	·
Method: SW846 6020B - N Analyte Arsenic	Metals (ICP/MS) - Disse Result		RL 2.06 0.515	MDL	Unit ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:13 06/27/23 17:13	·
	Metals (ICP/MS) - Diss Result 2.38	Qualifier	RL 2.06	MDL 0.700	Unit ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41	Analyzed 06/27/23 17:13	·
Method: SW846 6020B - N Analyte Arsenic Cobalt	Netals (ICP/MS) - Diss Result 2.38 6.10	Qualifier	RL 2.06 0.515	MDL 0.700 0.161 20.6	Unit ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:13 06/27/23 17:13	Dil Fac
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron Manganese	Netals (ICP/MS) - Diss Result 2.38 6.10 45.7	Qualifier	RL 2.06 0.515 51.5	MDL 0.700 0.161 20.6	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:13 06/27/23 17:13 06/27/23 17:13	Dil Fac 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron Manganese Molybdenum	Netals (ICP/MS) - Dissa Result 2.38 6.10 45.7 1920	Qualifier	2.06 0.515 51.5 2.06	MDL 0.700 0.161 20.6 0.979	Unit ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:13 06/27/23 17:13 06/27/23 17:13 06/27/23 17:13	Dil Fac 1 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron Manganese Molybdenum Selenium	Metals (ICP/MS) - Dissa Result 2.38 6.10 45.7 1920 1.84	Qualifier	2.06 0.515 51.5 2.06 0.515	MDL 0.700 0.161 20.6 0.979 0.134	Unit ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:13 06/27/23 17:13 06/27/23 17:13 06/27/23 17:13	Dil Fac 1 1 1 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron	Metals (ICP/MS) - Diss Result 2.38 6.10 45.7 1920 1.84 2.14	Qualifier	2.06 0.515 51.5 2.06 0.515 1.03	MDL 0.700 0.161 20.6 0.979 0.134 0.286	Unit ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:13 06/27/23 17:13 06/27/23 17:13 06/27/23 17:13 06/27/23 17:13	Dil Fac 1 1 1 1 1 1 1 1

Client Sample ID: MW-7C MF3 Week 1

Date Collected: 06/23/23 09:45 **Matrix: Water**

Date Received: 06/23/23 17:00

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			06/28/23 22:34	5
Sulfate	2750		750	250	mg/L			06/29/23 22:16	500
Chloride	9.48		7.50	3.00	mg/L			06/28/23 22:34	5
Method: SW846 6010D - N	letals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0438	J	0.0515	0.0113	mg/L		06/26/23 21:26	06/27/23 20:47	1
SiO2	1.21		1.10	0.117	mg/L		06/26/23 21:26	06/27/23 20:47	1
Calcium	349		0.515	0.237	mg/L		06/26/23 21:26	06/27/23 20:47	1
·									
•		olved							
Method: SW846 6020B - N Analyte	letals (ICP/MS) - Diss	olved Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - N	letals (ICP/MS) - Diss	Qualifier		MDL 0.700	Unit ug/L	<u>D</u>	Prepared 06/26/23 21:26	Analyzed 06/27/23 16:53	Dil Fac
Method: SW846 6020B - N Analyte	letals (ICP/MS) - Diss Result	Qualifier J			ug/L	<u>D</u>	<u>.</u>		Dil Fac
Method: SW846 6020B - N Analyte Arsenic	letals (ICP/MS) - Diss Result 0.886	Qualifier J J B	2.06	0.700 0.161	ug/L	<u>D</u>	06/26/23 21:26	06/27/23 16:53	Dil Fac 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt		Qualifier J J B	2.06 0.515	0.700 0.161	ug/L ug/L ug/L	<u>D</u>	06/26/23 21:26 06/26/23 21:26	06/27/23 16:53 06/28/23 07:45	Dil Fac
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron	Name	Qualifier J J B J	2.06 0.515 51.5	0.700 0.161 20.6	ug/L ug/L ug/L ug/L	<u>D</u>	06/26/23 21:26 06/26/23 21:26 06/26/23 21:26	06/27/23 16:53 06/28/23 07:45 06/27/23 16:53	Dil Fac 1 1 1 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron Manganese	New Text	Qualifier J J B J	2.06 0.515 51.5 2.06	0.700 0.161 20.6 0.979	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	06/26/23 21:26 06/26/23 21:26 06/26/23 21:26 06/26/23 21:26	06/27/23 16:53 06/28/23 07:45 06/27/23 16:53 06/27/23 16:53	Dil Fac 1 1 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron Manganese Molybdenum	Name	Qualifier J J B J	2.06 0.515 51.5 2.06 0.515	0.700 0.161 20.6 0.979 0.134	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	06/26/23 21:26 06/26/23 21:26 06/26/23 21:26 06/26/23 21:26 06/26/23 21:26	06/27/23 16:53 06/28/23 07:45 06/27/23 16:53 06/27/23 16:53 06/27/23 16:53	Dil Fac 1 1 1 1 1 1 1 1 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron Manganese Molybdenum Selenium	New York	Qualifier J J B J	2.06 0.515 51.5 2.06 0.515 1.03	0.700 0.161 20.6 0.979 0.134 0.286 92.7	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	06/26/23 21:26 06/26/23 21:26 06/26/23 21:26 06/26/23 21:26 06/26/23 21:26 06/26/23 21:26	06/27/23 16:53 06/28/23 07:45 06/27/23 16:53 06/27/23 16:53 06/27/23 16:53	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Eurofins Lancaster Laboratories Environment Testing, LLC

Lab Sample ID: 410-132044-4

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8I Influent Week 1

Lab Sample ID: 410-132044-5 Date Collected: 06/23/23 10:00

Matrix: Water Date Received: 06/23/23 17:00

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			06/28/23 22:57	5
Sulfate	114		15.0	5.00	mg/L			06/28/23 23:32	10
Chloride	5.88	J	7.50	3.00	mg/L			06/28/23 22:57	5
Method: SW846 6010D -	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		06/26/23 21:41	06/27/23 18:46	1
SiO2	29.5		1.10	0.117	mg/L		06/26/23 21:41	06/27/23 18:46	1
	75.7		0.515	0 237	mg/L		06/26/23 21:41	06/27/23 18:46	1
Calcium	75.7		0.515	0.201	9/ =		00/20/20 21.41	00/21/20 10:10	
Calcium - Method: SW846 6020B - Analyte	Metals (ICP/MS) - Diss	olved Qualifier	RL		Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - Analyte	Metals (ICP/MS) - Diss				Unit	<u>D</u>			
Method: SW846 6020B - Analyte	Metals (ICP/MS) - Diss		RL	MDL	Unit ug/L	<u>D</u>	Prepared	Analyzed	
Method: SW846 6020B - Analyte Arsenic Cobalt	Metals (ICP/MS) - Diss Result <0.700	Qualifier	RL 2.06	MDL 0.700 0.161	Unit ug/L	<u>D</u>	Prepared 06/26/23 21:41	Analyzed 06/27/23 17:01	Dil Fac
Method: SW846 6020B - Analyte Arsenic Cobalt Iron	Metals (ICP/MS) - Diss Result <0.700 4.83	Qualifier	RL 2.06 0.515	MDL 0.700 0.161	Unit ug/L ug/L ug/L	<u> </u>	Prepared 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:01 06/27/23 17:01	Dil Fac
Method: SW846 6020B - Analyte Arsenic	Metals (ICP/MS) - Diss Result <0.700 4.83 38.8	Qualifier	RL 2.06 0.515 51.5	MDL 0.700 0.161 20.6	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:01 06/27/23 17:01 06/27/23 17:01	Dil Fac 1 1 1
Method: SW846 6020B - Analyte Arsenic Cobalt Iron Manganese Molybdenum	Metals (ICP/MS) - Diss Result <0.700 4.83 38.8 302	Qualifier	2.06 0.515 51.5 2.06	MDL 0.700 0.161 20.6 0.979	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:01 06/27/23 17:01 06/27/23 17:01 06/27/23 17:01	Dil Fac 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Cobalt Iron Manganese Molybdenum Selenium	Metals (ICP/MS) - Diss Result <0.700 4.83 38.8 302 167	Qualifier J	2.06 0.515 51.5 2.06 0.515	MDL 0.700 0.161 20.6 0.979 0.134	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:01 06/27/23 17:01 06/27/23 17:01 06/27/23 17:01 06/27/23 17:01	Dil Fac 1 1 1 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Cobalt Iron Manganese	Metals (ICP/MS) - Diss Result <0.700 4.83 38.8 302 167 0.442	Qualifier J	2.06 0.515 51.5 2.06 0.515 1.03	MDL 0.700 0.161 20.6 0.979 0.134 0.286 92.7	ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	Analyzed 06/27/23 17:01 06/27/23 17:01 06/27/23 17:01 06/27/23 17:01 06/27/23 17:01	Dil Fac 1 1 1 1 1 1 1 1

Client Sample ID: MW-8A Control Week 1

Lab Sample ID: 410-132044-6 Date Collected: 06/23/23 10:15 **Matrix: Water**

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- Jale Neceiveu. 00/25/25 T	7.00								
Method: EPA 300.0 R2.1	- Anions, Ion Chromato	ography							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Fluoride	0.465	J	1.00	0.450	mg/L			06/28/23 23:43	
Sulfate	136		15.0	5.00	mg/L			06/28/23 23:55	1
Chloride	7.74		7.50	3.00	mg/L			06/28/23 23:43	
- Method: SW846 6010D -	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Lithium	<0.0113		0.0515	0.0113	mg/L		06/26/23 21:41	06/27/23 18:49	
SiO2	20.5		1.10	0.117	mg/L		06/26/23 21:41	06/27/23 18:49	

Calcium	83.7	83.7 0.515			mg/L		06/26/23 21:41	06/27/23 18:49	1
Method: SW846 6020B - Metals ((ICP/MS) - Disso	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.39		2.06	0.700	ug/L		06/26/23 21:41	06/27/23 17:03	1
Cobalt	0.406	J	0.515	0.161	ug/L		06/26/23 21:41	06/27/23 17:03	1
Iron	97.1		51.5	20.6	ug/L		06/26/23 21:41	06/27/23 17:03	1
Manganese	102		2.06	0.979	ug/L		06/26/23 21:41	06/27/23 17:03	1
Molybdenum	145		0.515	0.134	ug/L		06/26/23 21:41	06/27/23 17:03	1
Selenium	3.58		1.03	0.286	ug/L		06/26/23 21:41	06/27/23 17:03	1
Sodium	21700	^2	206	92.7	ug/L		06/26/23 21:41	06/27/23 17:03	1
Potassium	11100		206	67.0	ug/L		06/26/23 21:41	06/27/23 17:03	1
Magnesium	33000		51.5	16.5	ug/L		06/26/23 21:41	06/27/23 17:03	1

Eurofins Lancaster Laboratories Environment Testing, LLC

7/5/2023

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 1

Lab Sample ID: 410-132044-7 Date Collected: 06/23/23 10:30 Matrix: Water

Date Received: 06/23/23 17:00

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	1.21		1.00	0.450	mg/L			06/29/23 00:06	5
Sulfate	110		15.0	5.00	mg/L			06/29/23 00:18	10
Chloride	167		75.0	30.0	mg/L			06/30/23 15:53	50
Method: SW846 6010D - N	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		06/26/23 21:41	06/27/23 18:52	1
SiO2	4.79		1.10	0.117	mg/L		06/26/23 21:41	06/27/23 18:52	1
Calcium	10.7		0.515	0.237	mg/L		06/26/23 21:41	06/27/23 18:52	1
					· ·				
Method: SW846 6020B - N Analyte	Metals (ICP/MS) - Diss	olved Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - N Analyte	Metals (ICP/MS) - Diss			MDL 0.700		<u>D</u>	Prepared 06/26/23 21:41	Analyzed 06/27/23 17:11	Dil Fac
Method: SW846 6020B - N Analyte Arsenic	Metals (ICP/MS) - Disse Result	Qualifier	RL		ug/L	<u>D</u>	<u>·</u>		Dil Fac
Method: SW846 6020B - N Analyte Arsenic Cobalt	Metals (ICP/MS) - Disservation Result 2.71	Qualifier J	RL 2.06	0.700 0.161	ug/L	<u>D</u>	06/26/23 21:41	06/27/23 17:11	Dil Fac 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron	Netals (ICP/MS) - Diss Result 2.71 0.310	Qualifier J	RL 2.06 0.515	0.700 0.161	ug/L ug/L ug/L	<u>D</u>	06/26/23 21:41 06/26/23 21:41	06/27/23 17:11 06/27/23 17:11	Dil Fac 1 1 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron Manganese	Metals (ICP/MS) - Disso Result 2.71 0.310 31.2	Qualifier J	2.06 0.515 51.5	0.700 0.161 20.6	ug/L ug/L ug/L ug/L	<u>D</u>	06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	06/27/23 17:11 06/27/23 17:11 06/27/23 17:11	Dil Fac 1 1 1 1 1 1
Method: SW846 6020B - N Analyte Arsenic Cobalt Iron Manganese Molybdenum	Metals (ICP/MS) - Dissa Result 2.71 0.310 31.2 19.9	Qualifier J	2.06 0.515 51.5 2.06	0.700 0.161 20.6 0.979	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	06/27/23 17:11 06/27/23 17:11 06/27/23 17:11 06/27/23 17:11	Dil Fac 1 1 1 1 1 1
Method: SW846 6020B - M Analyte Arsenic Cobalt Iron Manganese Molybdenum Selenium	Metals (ICP/MS) - Dissa Result 2.71 0.310 31.2 19.9 23.2	Qualifier J	2.06 0.515 51.5 2.06 0.515	0.700 0.161 20.6 0.979 0.134 0.286	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	06/27/23 17:11 06/27/23 17:11 06/27/23 17:11 06/27/23 17:11 06/27/23 17:11	Dil Fac 1 1 1 1 1 1 1 1 1 1 10
Method: SW846 6020B - N	Metals (ICP/MS) - Dissa Result 2.71 0.310 31.2 19.9 23.2 1.48	Qualifier J	2.06 0.515 51.5 2.06 0.515 1.03	0.700 0.161 20.6 0.979 0.134 0.286	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41 06/26/23 21:41	06/27/23 17:11 06/27/23 17:11 06/27/23 17:11 06/27/23 17:11 06/27/23 17:11 06/27/23 17:11	1 1 1 1 1 1

Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-391975/5

Analysis Batch: 391975

Matrix: Water

Client: Terra Systems Inc

Client Sample ID: Method Blank

Prep Type: Total/NA

мв мв Dil Fac Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Fluoride <0.0900 0.200 0.0900 mg/L 06/28/23 20:40 Sulfate <0.500 1.50 0.500 mg/L 06/28/23 20:40 Chloride <0.600 0.600 mg/L 06/28/23 20:40 1.50

Lab Sample ID: LCS 410-391975/3 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 391975

Spike LCS LCS %Rec Added Analyte Result Qualifier %Rec Limits Unit D Fluoride 0.750 0.7171 mg/L 96 90 - 110 Sulfate 7.50 7.342 mg/L 98 90 - 110 Chloride 3.00 3.010 mg/L 100 90 - 110

Lab Sample ID: LCSD 410-391975/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 391975

LCSD LCSD RPD Spike %Rec Analyte Added Result Qualifier Unit D %Rec Limits RPD Limit Fluoride 0.750 0.7181 mg/L 96 90 - 110 0 20 Sulfate 7.50 7.355 98 90 - 110 20 mg/L 0 Chloride 3.00 3.002 mg/L 100 90 - 110 0 20

Lab Sample ID: MB 410-392396/5 Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Water

Analysis Batch: 392396

MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			06/29/23 18:51	1
Sulfate	<0.500		1.50	0.500	mg/L			06/29/23 18:51	1
Chloride	<0.600		1.50	0.600	mg/L			06/29/23 18:51	1

Lab Sample ID: LCS 410-392396/3 Client Sample ID: Lab Control Sample Prep Type: Total/NA

Matrix: Water

Analysis Batch: 392396

	Spike	LCS	LCS				%Rec
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits
Fluoride	 0.750	0.7061		mg/L		94	90 - 110
Sulfate	7.50	7.452		mg/L		99	90 - 110
Chloride	3.00	2.987		mg/L		100	90 - 110

Lab Sample ID: LCSD 410-392396/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 392396

-	Spike	LCSD	LCSD			%Rec		RPD	
Analyte	Added	Result	Qualifier	Unit	D %Re	c Limits	RPD	Limit	
Fluoride	0.750	0.7124		mg/L	9	5 90 - 110	1	20	
Sulfate	7.50	7.432		mg/L	9	9 90 - 110	0	20	
Chloride	3.00	2.973		mg/L	9	9 90 - 110	0	20	

Eurofins Lancaster Laboratories Environment Testing, LLC

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Job ID: 410-132044-1

Dil Fac

Client Sample ID: Method Blank

Analyzed

06/30/23 10:29

Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample Dup

Client Sample ID: Method Blank

Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Batch: 391003

Prep Type: Total/NA

Prep Batch: 391003

Project/Site: Stantec CCR AP2 Columns

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography (Continued)

Lab Sample ID: MB 410-392446/5

Matrix: Water Analysis Batch: 392446

Client: Terra Systems Inc

MB MB

Analyte Result Qualifier RLMDL Unit D Prepared Chloride <0.600 1.50 0.600 mg/L

Lab Sample ID: LCS 410-392446/3

Matrix: Water

Analysis Batch: 392446

Spike LCS LCS %Rec Added Analyte Result Qualifier Unit D %Rec Limits Chloride 3.00 3.061 mg/L 102 90 - 110

Lab Sample ID: LCSD 410-392446/4

Matrix: Water

Analysis Batch: 392446

Spike LCSD LCSD %Rec RPD Analyte Added Result Qualifier Unit %Rec Limits RPD Limit Chloride 3.00 3.054 mg/L 102 90 - 110 20

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-391003/1-A

Matrix: Water

Analysis Batch: 391512

мв мв

Analyte Qualifier MDL Unit Prepared Analyzed Dil Fac Result RL Lithium 0.0515 06/26/23 21:26 < 0.0113 0.0113 mg/L 06/27/23 19:52 SiO2 06/26/23 21:26 1.10 < 0.117 0.117 mg/L 06/27/23 19:52 Calcium <0.237 0.515 0.237 mg/L 06/26/23 21:26 06/27/23 19:52

Lab Sample ID: LCS 410-391003/2-A

Matrix: Water

Analysis Batch: 391512

LCS LCS Spike %Rec Analyte Added Result Qualifier Unit %Rec Limits Lithium 0.500 0.5080 mg/L 102 80 - 120 Calcium 5.00 5.188 mg/L 104 80 - 120

Lab Sample ID: MB 410-391006/1-A

Matrix: Water

Analysis Batch: 391512

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 391006

Prep Type: Total/NA

MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		06/26/23 21:41	06/27/23 18:36	1
SiO2	<0.117		1.10	0.117	mg/L		06/26/23 21:41	06/27/23 18:36	1
Calcium	<0.237		0.515	0.237	mg/L		06/26/23 21:41	06/27/23 18:36	1

Lab Sample ID: LCS 410-391006/2-A

Matrix: Water

Analysis Batch: 391512

Prep Batch: 391006 Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits Lithium 0.500 0.5098 102 80 - 120 mg/L

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Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Client: Terra Systems Inc

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: LCS 410-391006/2-A Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA Analysis Batch: 391512 **Prep Batch: 391006**

Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits D 5.00 Calcium 5 252 105 80 - 120 mg/L

Lab Sample ID: 410-132044-4 MS Client Sample ID: MW-7C MF3 Week 1

Matrix: Water Prep Type: Dissolved

Analysis Batch: 391512 **Prep Batch: 391003**

Sample Sample Spike MS MS %Rec Result Qualifier Added Analyte Result Qualifier Unit %Rec Limits D 0.500 Lithium 0.0438 J 0.5750 mg/L 106 75 - 125 5.00 Calcium 349 357.9 4 mg/L 184 75 - 125

Lab Sample ID: 410-132044-4 MSD Client Sample ID: MW-7C MF3 Week 1

Matrix: Water Prep Type: Dissolved

Analysis Batch: 391512 Prep Batch: 391003 MSD MSD Sample Sample RPD Spike %Rec Qualifier Limit Result Qualifier Added Result RPD Analyte Unit %Rec Limits

Lithium 0.0438 0.500 0.5488 101 75 - 125 20 mg/L 5 Calcium 349 5.00 352.4 4 mg/L 75 75 - 125 2 20

Lab Sample ID: 410-132044-4 DU Client Sample ID: MW-7C MF3 Week 1

Matrix: Water

Prep Type: Dissolved Analysis Batch: 391512 Prep Batch: 391003

DU DU Sample Sample RPD Result Qualifier Limit Analyte Result Qualifier Unit RPD Lithium 0.0438 J 0.04448 2 20 mg/L

SiO2 1.21 1.189 2 mg/L Calcium 349 346.6 mg/L 0.6 20

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-391003/1-A Client Sample ID: Method Blank

Matrix: Water Prep Type: Total/NA **Analysis Batch: 391487** Prep Batch: 391003

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.700		2.06	0.700	ug/L		06/26/23 21:26	06/27/23 14:58	1
Iron	<20.6		51.5	20.6	ug/L		06/26/23 21:26	06/27/23 14:58	1
Manganese	<0.979		2.06	0.979	ug/L		06/26/23 21:26	06/27/23 14:58	1
Molybdenum	<0.134		0.515	0.134	ug/L		06/26/23 21:26	06/27/23 14:58	1
Selenium	<0.286		1.03	0.286	ug/L		06/26/23 21:26	06/27/23 14:58	1
Sodium	<92.7		206	92.7	ug/L		06/26/23 21:26	06/27/23 14:58	1
Potassium	<67.0		206	67.0	ug/L		06/26/23 21:26	06/27/23 14:58	1
Magnesium	<16.5		51.5	16.5	ug/L		06/26/23 21:26	06/27/23 14:58	1

Lab Sample ID: MB 410-391003/1-A Client Sample ID: Method Blank

Matrix: Water Prep Type: Total/NA Analysis Batch: 391998 Prep Batch: 391003

MR MR

Analyte Result Qualifier RL **MDL** Unit Prepared Analyzed Cobalt <0.161 0.515 0.161 ug/L 06/26/23 21:26 06/28/23 19:16

7/5/2023

Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 410-391003/2-A

Matrix: Water

Analysis Batch: 391487

Client: Terra Systems Inc

Prep Type: Total/NA

Prep Batch: 391003

Spike	LCS	LCS				%Rec	
Added	Result	Qualifier	Unit	D	%Rec	Limits	
500	498.1		ug/L		100	85 - 120	
500	500.0		ug/L		100	90 - 113	
5000	5003		ug/L		100	88 - 119	
500	495.1		ug/L		99	89 - 120	
50.0	51.14		ug/L		102	85 - 115	
100	101.8		ug/L		102	80 - 120	
5000	5042		ug/L		101	89 - 112	
5000	5056		ug/L		101	90 - 112	
5000	5052		ug/L		101	90 - 112	
	500 500 5000 5000 50.0 100 5000 5000	Added Result 500 498.1 500 500.0 5000 5003 500 495.1 50.0 51.14 100 101.8 5000 5042 5000 5056	Added Result Qualifier 500 498.1 500 500.0 5000 5003 500 495.1 50.0 51.14 100 101.8 5000 5042 5000 5056	Added Result Qualifier Unit 500 498.1 ug/L 500 500.0 ug/L 5000 5003 ug/L 500 495.1 ug/L 50.0 51.14 ug/L 100 101.8 ug/L 5000 5042 ug/L 5000 5056 ug/L	Added Result Qualifier Unit D 500 498.1 ug/L ug/L 500 500.0 ug/L ug/L 5000 5003 ug/L ug/L 500 495.1 ug/L ug/L 50.0 51.14 ug/L ug/L 5000 5042 ug/L ug/L 5000 5056 ug/L ug/L	Added Result Qualifier Unit D %Rec 500 498.1 ug/L 100 500 500.0 ug/L 100 5000 5003 ug/L 100 500 495.1 ug/L 99 50.0 51.14 ug/L 102 100 101.8 ug/L 102 5000 5042 ug/L 101 5000 5056 ug/L 101	Added Result Qualifier Unit D %Rec Limits 500 498.1 ug/L 100 85 - 120 500 500.0 ug/L 100 90 - 113 5000 5003 ug/L 100 88 - 119 500 495.1 ug/L 99 89 - 120 50.0 51.14 ug/L 102 85 - 115 100 101.8 ug/L 102 80 - 120 5000 5042 ug/L 101 89 - 112 5000 5056 ug/L 101 90 - 112

Lab Sample ID: MB 410-391006/1-A

Matrix: Water

Analysis Batch: 391479

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 391006

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.700		2.06	0.700	ug/L		06/26/23 21:41	06/27/23 16:21	1
Cobalt	<0.161		0.515	0.161	ug/L		06/26/23 21:41	06/27/23 16:21	1
Iron	<20.6		51.5	20.6	ug/L		06/26/23 21:41	06/27/23 16:21	1
Manganese	<0.979		2.06	0.979	ug/L		06/26/23 21:41	06/27/23 16:21	1
Molybdenum	<0.134		0.515	0.134	ug/L		06/26/23 21:41	06/27/23 16:21	1
Selenium	<0.286		1.03	0.286	ug/L		06/26/23 21:41	06/27/23 16:21	1
Sodium	<92.7		206	92.7	ug/L		06/26/23 21:41	06/27/23 16:21	1
Potassium	<67.0		206	67.0	ug/L		06/26/23 21:41	06/27/23 16:21	1
Magnesium	<16.5		51.5	16.5	ug/L		06/26/23 21:41	06/27/23 16:21	1

Lab Sample ID: LCS 410-391006/2-A **Client Sample ID: Lab Control Sample**

Matrix: Water

Analysis Batch: 391479

Prep Type: Total/NA **Prep Batch: 391006**

Analysis Baton: 001410						1 TOP Dat	011. 00 1000	
	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	500	523.3		ug/L		105	85 - 120	
Cobalt	500	506.8		ug/L		101	90 - 113	
Iron	5000	5145		ug/L		103	88 - 119	
Manganese	500	513.5		ug/L		103	89 - 120	
Molybdenum	50.0	51.89		ug/L		104	85 - 115	
Selenium	100	102.0		ug/L		102	80 - 120	
Sodium	5000	5087		ug/L		102	89 - 112	
Potassium	5000	5145		ug/L		103	90 - 112	
Magnesium	5000	5133		ug/L		103	90 - 112	

Lab Sample ID: 410-132044-4 MS Client Sample ID: MW-7C MF3 Week 1 **Matrix: Water**

Analysis Batch: 391487

Prep Type: Dissolved Prep Batch: 391003

	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.886	J	500	537.9		ug/L		107	75 - 125	
Iron	31.2	J	5000	4892		ug/L		97	75 - 125	
Manganese	62.0		500	556.6		ug/L		99	75 - 125	
Molybdenum	0.262	J	50.0	52.00		ug/L		103	81 - 125	

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Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Lab Sample ID: 410-132044-4 MSD

Client: Terra Systems Inc

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 410-132044-4 MS	•			Client Sample ID: MW-7C MF3 Week 1
Matrix: Water				Prep Type: Dissolved
Analysis Batch: 391487				Prep Batch: 391003
	Sample Sample	Snike	MS MS	%Rec

	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Selenium	1.87		100	107.4		ug/L		106	75 - 125	
Sodium	41000		5000	45230	4	ug/L		84	75 - 125	
Potassium	18800		5000	24010		ug/L		103	75 - 125	

Lab Sample ID: 410-132044-4 MS Matrix: Water							Client	t Sample		C MF3 Week 1 ype: Dissolved
Analysis Batch: 391487									Prep	Batch: 391003
	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Magnesium	223000		5000	225700	4	ug/L		59	75 - 125	

Lab Sample ID: 410-132044-4 MS							Client	t Sample	∍ ID: MW-7	C MF3 Week 1
Matrix: Water									Prep T	ype: Dissolved
Analysis Batch: 391742									Prep	Batch: 391003
	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Cobalt	0.458	JB	500	496.2		ug/L		99	80 - 125	

Matrix: Water Analysis Batch: 391487									Prep Ty Prep I	pe: Diss Batch: 3	
	Sample	Sample	Spike	MSD	MSD				%Rec		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	0.886	J	500	526.9		ug/L		105	75 - 125	2	20
Iron	31.2	J	5000	4841		ug/L		96	75 - 125	1	20
Manganese	62.0		500	546.6		ug/L		97	75 - 125	2	20
Molybdenum	0.262	J	50.0	51.16		ug/L		102	81 - 125	2	20
Selenium	1.87		100	102.7		ug/L		101	75 - 125	4	20
Sodium	41000		5000	44670	4	ug/L		73	75 - 125	1	20
Potassium	18800		5000	23730		ug/L		98	75 - 125	1	20

Lab Sample ID: 410-13204	ab Sample ID: 410-132044-4 MSD									Client Sample ID: MW-7C MF3 Wee						
Matrix: Water									Prep Ty	pe: Diss	olved					
Analysis Batch: 391487									Prep I	Batch: 3	91003					
	Sample	Sample	Spike	MSD	MSD				%Rec		RPD					
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit					
Magnesium	223000		5000	226800	4	ua/L		79	75 - 125		20					

Lab Sample ID: 410-132044-4 Matrix: Water Analysis Batch: 391742	MSD						Client	Sample		C MF3 W /pe: Diss Batch: 3	solved
	Sample	Sample	Spike	MSD	MSD				%Rec		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Cobalt	0.458	JB	500	485.5		ug/L		97	80 - 125	2	20

Eurofins Lancaster Laboratories Environment Testing, LLC

Client Sample ID: MW-7C MF3 Week 1

QC Sample Results

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 410-132044-4 DU	Client Sample ID: MW-7C MF3 Week 1
Matrix: Water	Prep Type: Dissolved
Analysis Batch: 391487	Prep Batch: 391003

	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	R	PD	Limit
Arsenic	0.886	J	0.8405	J	ug/L			5	20
Iron	31.2	J	25.36	JF5	ug/L			21	20
Manganese	62.0		60.62		ug/L			2	20
Molybdenum	0.262	J	0.1957	JF5	ug/L			29	20
Selenium	1.87		1.791		ug/L			4	20
Sodium	41000		40820		ug/L			0.5	20
Potassium	18800		19110		ug/L			1	20

Lab Sample ID: 410-132044-4 DU						Client Samp	ple ID: MW-7C MF3	Week 1
Matrix: Water							Prep Type: Dis	ssolved
Analysis Batch: 391487							Prep Batch:	391003
	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Magnesium	223000		217000		ug/L			20

Lab Sample ID: 410-132044-4 DU Matrix: Water						Client Sam	ple ID: MW-7C MF3 W Prep Type: Diss	
Analysis Batch: 391742							Prep Batch: 3	91003
	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Cobalt	0.458	JB	0.4460	J	ug/L		3	20

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Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

HPLC/IC

Analysis Batch: 391975

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132044-1	MW-7I Influent Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-2	MW-7A Control Day 8 Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-4	MW-7C MF3 Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-5	MW-8I Influent Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-5	MW-8I Influent Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-6	MW-8A Control Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-6	MW-8A Control Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-7	MW-8B FeCl3 NaHCO3 Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-7	MW-8B FeCl3 NaHCO3 Week 1	Total/NA	Water	EPA 300.0 R2.1	
MB 410-391975/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-391975/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-391975/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 392396

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132044-1	MW-7I Influent Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-2	MW-7A Control Day 8 Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-3	MW-7B NaHCO3 Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-3	MW-7B NaHCO3 Week 1	Total/NA	Water	EPA 300.0 R2.1	
410-132044-4	MW-7C MF3 Week 1	Total/NA	Water	EPA 300.0 R2.1	
MB 410-392396/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-392396/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-392396/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 392446

Lab Sample ID 410-132044-7	Client Sample ID MW-8B FeCl3 NaHCO3 Week 1	Prep Type Total/NA	Matrix Water	Method EPA 300.0 R2.1	Prep Batch
MB 410-392446/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-392446/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-392446/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Metals

Prep Batch: 391003

Lab Cample ID	Client Semale ID	Draw Time	Matrix	Mathad	Duan Datah
Lab Sample ID 410-132044-4	Client Sample ID MW-7C MF3 Week 1	Prep Type Dissolved	Matrix Water	Method Non-Digest Prep	Prep Batch
MB 410-391003/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-391003/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	
410-132044-4 MS	MW-7C MF3 Week 1	Dissolved	Water	Non-Digest Prep	
410-132044-4 MSD	MW-7C MF3 Week 1	Dissolved	Water	Non-Digest Prep	
410-132044-4 DU	MW-7C MF3 Week 1	Dissolved	Water	Non-Digest Prep	

Prep Batch: 391006

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132044-1	MW-7I Influent Week 1	Dissolved	Water	Non-Digest Prep	
410-132044-2	MW-7A Control Day 8 Week 1	Dissolved	Water	Non-Digest Prep	
410-132044-3	MW-7B NaHCO3 Week 1	Dissolved	Water	Non-Digest Prep	
410-132044-5	MW-8I Influent Week 1	Dissolved	Water	Non-Digest Prep	
410-132044-6	MW-8A Control Week 1	Dissolved	Water	Non-Digest Prep	
410-132044-7	MW-8B FeCl3 NaHCO3 Week 1	Dissolved	Water	Non-Digest Prep	
MB 410-391006/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	

Eurofins Lancaster Laboratories Environment Testing, LLC

QC Association Summary

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Metals (Continued)

Prep Batch: 391006	(Continued)
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Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 410-391006/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 391479

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132044-1	MW-7I Influent Week 1	Dissolved	Water	6020B	391006
410-132044-1	MW-7I Influent Week 1	Dissolved	Water	6020B	391006
410-132044-2	MW-7A Control Day 8 Week 1	Dissolved	Water	6020B	391006
410-132044-2	MW-7A Control Day 8 Week 1	Dissolved	Water	6020B	391006
410-132044-3	MW-7B NaHCO3 Week 1	Dissolved	Water	6020B	391006
410-132044-3	MW-7B NaHCO3 Week 1	Dissolved	Water	6020B	391006
410-132044-5	MW-8I Influent Week 1	Dissolved	Water	6020B	391006
410-132044-6	MW-8A Control Week 1	Dissolved	Water	6020B	391006
410-132044-7	MW-8B FeCl3 NaHCO3 Week 1	Dissolved	Water	6020B	391006
410-132044-7	MW-8B FeCl3 NaHCO3 Week 1	Dissolved	Water	6020B	391006
MB 410-391006/1-A	Method Blank	Total/NA	Water	6020B	391006
LCS 410-391006/2-A	Lab Control Sample	Total/NA	Water	6020B	391006

Analysis Batch: 391487

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132044-4	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003
410-132044-4	10-132044-4 MW-7C MF3 Week 1		Water	6020B	391003
MB 410-391003/1-A	Method Blank	Total/NA	Water	6020B	391003
LCS 410-391003/2-A	Lab Control Sample	Total/NA	Water	6020B	391003
410-132044-4 MS	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003
410-132044-4 MS	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003
410-132044-4 MSD	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003
410-132044-4 MSD	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003
410-132044-4 DU	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003
410-132044-4 DU	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003

Analysis Batch: 391512

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batcl
410-132044-1	MW-7I Influent Week 1	Dissolved	Water	6010D	391006
410-132044-2	MW-7A Control Day 8 Week 1	Dissolved	Water	6010D	391006
410-132044-3	MW-7B NaHCO3 Week 1	Dissolved	Water	6010D	391006
410-132044-4	MW-7C MF3 Week 1	Dissolved	Water	6010D	391003
410-132044-5 MW-8I Influent Week 1		Dissolved	Water	6010D	391006
410-132044-6	0-132044-6 MW-8A Control Week 1		Water	6010D	391006
410-132044-7	MW-8B FeCl3 NaHCO3 Week 1	Dissolved	Water	6010D	391006
MB 410-391003/1-A	Method Blank	Total/NA	Water	6010D	391003
MB 410-391006/1-A	Method Blank	Total/NA	Water	6010D	391006
LCS 410-391003/2-A	Lab Control Sample	Total/NA	Water	6010D	391003
LCS 410-391006/2-A	Lab Control Sample	Total/NA	Water	6010D	391006
410-132044-4 MS	MW-7C MF3 Week 1	Dissolved	Water	6010D	391003
410-132044-4 MSD	MW-7C MF3 Week 1	Dissolved	Water	6010D	391003
410-132044-4 DU	MW-7C MF3 Week 1	Dissolved	Water	6010D	39100

Analysis Batch: 391742

Γ					
Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132044-4	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003
410-132044-4 MS	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003

Eurofins Lancaster Laboratories Environment Testing, LLC

QC Association Summary

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Metals (Continued)

Analysis Batch: 391742 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132044-4 MSD	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003
410-132044-4 DU	MW-7C MF3 Week 1	Dissolved	Water	6020B	391003

Analysis Batch: 391998

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 410-391003/1-A	Method Blank	Total/NA	Water	6020B	391003

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Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7I Influent Week 1

Date Collected: 06/23/23 09:00 Date Received: 06/23/23 17:00

Client: Terra Systems Inc

Lab Sample ID: 410-132044-1

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	391975	L4QM	ELLE	06/28/23 21:49
Total/NA	Analysis	EPA 300.0 R2.1		250	392396	L4QM	ELLE	06/29/23 22:27
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6010D		1	391512	T8CQ	ELLE	06/27/23 18:42
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6020B		1	391479	UCIG	ELLE	06/27/23 16:59
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6020B		10	391479	UCIG	ELLE	06/27/23 17:32

Client Sample ID: MW-7A Control Day 8 Week 1

Date Collected: 06/23/23 09:15

Date Received: 06/23/23 17:00

Lab Sample ID: 410-132044-2

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	391975	L4QM	ELLE	06/28/23 22:12
Total/NA	Analysis	EPA 300.0 R2.1		250	392396	L4QM	ELLE	06/29/23 22:39
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6010D		1	391512	T8CQ	ELLE	06/27/23 19:14
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6020B		1	391479	UCIG	ELLE	06/27/23 17:17
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6020B		50	391479	UCIG	ELLE	06/27/23 17:38

Client Sample ID: MW-7B NaHCO3 Week 1

Date Collected: 06/23/23 09:30

Date Received: 06/23/23 17:00

Lab Sample	ID: 410-132044-3
------------	------------------

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	392396	L4QM	ELLE	06/29/23 21:30
Total/NA	Analysis	EPA 300.0 R2.1		250	392396	L4QM	ELLE	06/29/23 21:42
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6010D		1	391512	T8CQ	ELLE	06/27/23 18:55
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6020B		1	391479	UCIG	ELLE	06/27/23 17:13
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6020B		50	391479	UCIG	ELLE	06/27/23 17:36

Client Sample ID: MW-7C MF3 Week 1

Date Collected: 06/23/23 09:45

Date Received: 06/23/23 17:00

Lab Sample	ID: 410-132044-4

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	391975	L4QM	ELLE	06/28/23 22:34
Total/NA	Analysis	EPA 300.0 R2.1		500	392396	L4QM	ELLE	06/29/23 22:16

Eurofins Lancaster Laboratories Environment Testing, LLC

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7C MF3 Week 1

Date Collected: 06/23/23 09:45 Date Received: 06/23/23 17:00

Lab Sample ID: 410-132044-4

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			391003	UAMX	ELLE	06/26/23 21:26
Dissolved	Analysis	6010D		1	391512	T8CQ	ELLE	06/27/23 20:47
Dissolved	Prep	Non-Digest Prep			391003	UAMX	ELLE	06/26/23 21:26
Dissolved	Analysis	6020B		1	391487	UCIG	ELLE	06/27/23 16:53
Dissolved	Prep	Non-Digest Prep			391003	UAMX	ELLE	06/26/23 21:26
Dissolved	Analysis	6020B		5	391487	UCIG	ELLE	06/27/23 17:32
Dissolved	Prep	Non-Digest Prep			391003	UAMX	ELLE	06/26/23 21:26
Dissolved	Analysis	6020B		1	391742	F7JF	ELLE	06/28/23 07:45

Client Sample ID: MW-8I Influent Week 1

Date Collected: 06/23/23 10:00 Date Received: 06/23/23 17:00

Lab Sample ID: 410-132044-5

Lab Sample ID: 410-132044-6

Matrix: Water

Batch Batch Dilution Batch Prepared Method or Analyzed **Prep Type** Type Run Factor Number Analyst Lab Total/NA Analysis EPA 300.0 R2.1 391975 L4QM ELLE 06/28/23 22:57 5 Total/NA Analysis EPA 300.0 R2.1 10 **ELLE** 06/28/23 23:32 391975 L4QM ELLE 06/26/23 21:41 Dissolved Prep Non-Digest Prep 391006 UAMX Dissolved 6010D Analysis 391512 T8CQ **ELLE** 06/27/23 18:46 ELLE 06/26/23 21:41 Dissolved Prep Non-Digest Prep 391006 UAMX Dissolved 6020B 391479 UCIG **ELLE** 06/27/23 17:01 Analysis

Client Sample ID: MW-8A Control Week 1

Date Collected: 06/23/23 10:15

Matrix: Water Date Received: 06/23/23 17:00

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1			391975	L4QM	ELLE	06/28/23 23:43
Total/NA	Analysis	EPA 300.0 R2.1		10	391975	L4QM	ELLE	06/28/23 23:55
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6010D		1	391512	T8CQ	ELLE	06/27/23 18:49
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6020B		1	391479	UCIG	ELLE	06/27/23 17:03

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 1

Lab Sample ID: 410-132044-7 Date Collected: 06/23/23 10:30 **Matrix: Water**

Date Received: 06/23/23 17:00

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		50	392446	W7FX	ELLE	06/30/23 15:53
Total/NA	Analysis	EPA 300.0 R2.1		5	391975	L4QM	ELLE	06/29/23 00:06
Total/NA	Analysis	EPA 300.0 R2.1		10	391975	L4QM	ELLE	06/29/23 00:18
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6010D		1	391512	T8CQ	ELLE	06/27/23 18:52
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6020B		1	391479	UCIG	ELLE	06/27/23 17:11

Eurofins Lancaster Laboratories Environment Testing, LLC

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Lab Chronicle

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 1

Lab Sample ID: 410-132044-7 Date Collected: 06/23/23 10:30

Matrix: Water

Date Received: 06/23/23 17:00

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			391006	UAMX	ELLE	06/26/23 21:41
Dissolved	Analysis	6020B		10	391479	UCIG	ELLE	06/27/23 17:34

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alabama	State	43200	01-31-24
Alaska	State	PA00009	06-30-23
Alaska (UST)	State	17-027	02-28-24
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-23
California	State	2792	11-30-23
Colorado	State	PA00009	06-30-23
Connecticut	State	PH-0746	06-30-23
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	06-30-23
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Illinois	NELAP	200027	01-31-24
lowa	State	361	03-01-24
Kansas	NELAP	E-10151	10-31-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	12-31-23
Louisiana (All)	NELAP	02055	06-30-23
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-24
Massachusetts	State	M-PA009	06-30-24
	State	9930	01-31-24
Michigan Minnesete	NELAP	042-999-487	
Minnesota			12-31-23
Mississippi Missauri	State	023	01-31-24
Missouri	State	450	01-31-25
Montana (DW)	State	0098	01-01-24
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	01-10-24
New Jersey	NELAP	PA011	06-30-23
New York	NELAP	10670	04-01-24
North Carolina (DW)	State	42705	07-31-23
North Carolina (WW/SW)	State	521	12-31-23
North Dakota	State	R-205	01-31-24
Oklahoma	NELAP	9804	08-31-23
Oregon	NELAP	PA200001	09-11-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	01-31-24
Rhode Island	State	LAO00338	12-31-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Texas	NELAP	T104704194-23-46	08-31-23
USDA	US Federal Programs	525-22-298-19481	10-25-25
Vermont	State	VT - 36037	10-28-23
Virginia	NELAP	460182	06-14-24
Washington	State	C457	04-11-24
West Virginia (DW)	State	9906 C	12-31-23

Eurofins Lancaster Laboratories Environment Testing, LLC

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Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-132044-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Method	Method Description	Protocol	Laboratory
EPA 300.0 R2.1	Anions, Ion Chromatography	EPA	ELLE
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Job ID: 410-132044-1

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Sample Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-132044-1	MW-7I Influent Week 1	Water	06/23/23 09:00	06/23/23 17:00
410-132044-2	MW-7A Control Day 8 Week 1	Water	06/23/23 09:15	06/23/23 17:00
410-132044-3	MW-7B NaHCO3 Week 1	Water	06/23/23 09:30	06/23/23 17:00
410-132044-4	MW-7C MF3 Week 1	Water	06/23/23 09:45	06/23/23 17:00
410-132044-5	MW-8I Influent Week 1	Water	06/23/23 10:00	06/23/23 17:00
410-132044-6	MW-8A Control Week 1	Water	06/23/23 10:15	06/23/23 17:00
410-132044-7	MW-8B FeCl3 NaHCO3 Week 1	Water	06/23/23 10:30	06/23/23 17:00

Job ID: 410-132044-1

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Environmental A

0-132044 Chain of Custody

eurofins

Lancaster Laboratories Environmental

Client: Terra Systems, Inc.						Matrix			1		A	nalyses l	Requ	este	d		For Lab U	Jse Only
Project Name/#: Stantec CCR AP2 Columns	Site ID #:	Macon, GA				V					F	reservat	ion (Code	s		SF #:	
Project Manager: Michael D. Lee	P.O. #:	222566-6-23	3-23		Tissue	nd es			N	N	N						SCR #:	
Sampler: Michael D. Lee	PWSID#:				Ţis	Ground Surface		_		ίδ							Preserv	ation Codes
Phone #: 302-798-9553	Quote #:	4101181	18					ner	Α̈́	a, Se,							H = HCI	T = Thiosulfate
	Compliance:	Yes 🗌	No	7	Sediment	ole ES		Containers	Co, Fe.	Mo. Na,							N = HNO ₃	B = NeOH
	T			ite	Sedi	Potable		of Co	Ca. C	Man							S = H ₂ SO ₄	P = H ₃ PO ₄
	Collec	tion		bos			Ľ	*	As,	Mg.	SO4						O = Other	
Sample Identification	Date	Time	Grab	Composite	Soil	Water	Other:	Total	Dis (fil)	Dis (fil) Mg.	CI, F,						Re	marks
MW-7I Influent Week 1	6/23/2023	9:00		X	<u> </u>	Х		2	X	Х	Х							
MW-7A Control Day 8 Week 1	6/23/2023	9:15		Х		Х		2	Х	Х	Х							
MW-7B NaHCO3 Week 1	6/23/2023	9:30		Х		Х		2	Х	Х	Х							
MW-7C MF3 Week 1	6/23/2023	9:45		Х		Х		2	Х	Х	Х							
MW-8I Influent Week 1	6/23/2023	10:00		Х		Х		2	Х	Х	Х							
MW-8A Control Week 1	6/23/2023	10:15		X		Х		2	Х	Х	Х							
MW-8B FeCl3 NaHCO3 Week 1	6/23/2023	10:30		X		Х		2	Х	Х	Х							
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(Rush TAT is subject to laboratory a	pproval and surcha	rges.)			Bali	nguished	<u> </u>	14	1		3/23 ate	Time		eived			6/23/23 Date	7 /2 <u>~</u> Time
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E-mail Address: mlee@terrasystems.net					I Vell	nquisneu	by.				alc	1 111116	1,60	civeu	by.		Date	111110
Phone: 302-798-9553					Reli	nquished	hv.	$\overline{}$		D	ate	Time	Rec	eived	hv.		Date	Time
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Group

Eurofins Lancaster Laboratories Environmental, LLC • 2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300

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7/5/2023

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Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-132044-1

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC Login Number: 132044

List Number: 1

Creator: Roth, Stephanie

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	Not present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

JOB DESCRIPTION

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Stantec CCR AP2 Columns

JOB NUMBER

410-132157-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

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Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Testing Group of Companies

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Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

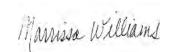
Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-132157-1

Project/Site: Stantec CCR AP2 Columns

Qualifiers

 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.

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.

Glossary

Abbreviation	These commonly	y used abbreviations may	or may not be	present in this report
ADDIEVIALIOII	THESE COMMISSIONS	y useu abbi evialions maj	y Oi illay liot 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

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Case Narrative

Client: Terra Systems Inc Job ID: 410-132157-1

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132157-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-132157-1

Receipt

The sample was received on 6/26/2023 3:40 PM. Unless otherwise noted below, the sample arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 4.9°C

HPLC/IC

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

Metals

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

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Detection Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8C Week 1

Lab Sample ID: 410-132157-1

Job ID: 410-132157-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Sulfate	500		150	50.0	mg/L	100	EPA 300.0 R2.1	Total/NA
Chloride	6.64	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Lithium	0.0159	J	0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	2.63		1.10	0.117	mg/L	1	6010D	Dissolved
Calcium	73.4		0.515	0.237	mg/L	1	6010D	Dissolved
Magnesium	69500		51.5	16.5	ug/L	1	6020B	Dissolved
Potassium	8300		206	67.0	ug/L	1	6020B	Dissolved
Sodium	19300		206	92.7	ug/L	1	6020B	Dissolved
Molybdenum	1.24		0.515	0.134	ug/L	1	6020B	Dissolved
Arsenic	2.83		2.06	0.700	ug/L	1	6020B	Dissolved
Selenium	0.799	J	1.03	0.286	ug/L	1	6020B	Dissolved
Manganese	27.7		2.06	0.979	ug/L	1	6020B	Dissolved
Cobalt	0.349	J	0.515	0.161	ug/L	1	6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-132157-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8C Week 1

Date Received: 06/26/23 15:40

Lab Sample ID: 410-132157-1 Date Collected: 06/26/23 10:45

Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			06/29/23 00:29	5
Sulfate	500		150	50.0	mg/L			06/30/23 15:07	100
Chloride	6.64	J	7.50	3.00	mg/L			06/29/23 00:29	5
Method: SW846 6010D - M	letals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0159	J	0.0515	0.0113	mg/L		06/29/23 04:22	06/29/23 14:29	1
SiO2	2.63		1.10	0.117	mg/L		06/29/23 04:22	06/29/23 14:29	1
Calcium	73.4		0.515	0.237	mg/L		06/29/23 04:22	06/29/23 14:29	1
Method: SW846 6020B - M	letals (ICP/MS) - Diss	olved Qualifier	0.515	0.237	J	D	06/29/23 04:22 Prepared	06/29/23 14:29 Analyzed	1 Dil Fac
Method: SW846 6020B - M Analyte	letals (ICP/MS) - Diss			MDL	Unit	<u>D</u>			1 Dil Fac
Method: SW846 6020B - M Analyte Magnesium	letals (ICP/MS) - Diss		RL	MDL 16.5	Unit	<u>D</u>	Prepared	Analyzed	1 Dil Fac
Method: SW846 6020B - M Analyte Magnesium Potassium	letals (ICP/MS) - Diss Result 69500			MDL 16.5	Unit ug/L ug/L	<u>D</u>	Prepared 06/29/23 04:22	Analyzed 06/29/23 20:21	1 Dil Fac
Method: SW846 6020B - M Analyte Magnesium Potassium Sodium				MDL 16.5 67.0	Unit ug/L ug/L	<u>D</u>	Prepared 06/29/23 04:22 06/29/23 04:22	Analyzed 06/29/23 20:21 06/29/23 20:21	Dil Fac 1 1 1 1
Method: SW846 6020B - M Analyte Magnesium Potassium Sodium Molybdenum	letals (ICP/MS) - Diss Result 69500 8300 19300		RL 51.5 206 206	MDL 16.5 67.0 92.7	Unit ug/L ug/L ug/L	<u>D</u>	Prepared 06/29/23 04:22 06/29/23 04:22 06/29/23 04:22	Analyzed 06/29/23 20:21 06/29/23 20:21 06/29/23 20:21	1 1
Method: SW846 6020B - M Analyte Magnesium Potassium Sodium Molybdenum Iron	letals (ICP/MS) - Diss Result 69500 8300 19300		RL 51.5 206 206 0.515	MDL 16.5 67.0 92.7 0.134	Unit ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/29/23 04:22 06/29/23 04:22 06/29/23 04:22 06/29/23 04:22	Analyzed 06/29/23 20:21 06/29/23 20:21 06/29/23 20:21 06/29/23 20:21	1 1
Method: SW846 6020B - M Analyte Magnesium Potassium Sodium Molybdenum Iron Arsenic	Result 69500 8300 19300 1.24 <20.6	Qualifier	RL 51.5 206 206 0.515 51.5	MDL 16.5 67.0 92.7 0.134 20.6	Unit ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/29/23 04:22 06/29/23 04:22 06/29/23 04:22 06/29/23 04:22 06/29/23 04:22	Analyzed 06/29/23 20:21 06/29/23 20:21 06/29/23 20:21 06/29/23 20:21	1 1
Calcium Method: SW846 6020B - M Analyte Magnesium Potassium Sodium Molybdenum Iron Arsenic Selenium Manganese	Result 69500 8300 19300 1.24 <20.6 2.83	Qualifier	RL 51.5 206 206 0.515 51.5 2.06	MDL 16.5 67.0 92.7 0.134 20.6 0.700	Unit ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 06/29/23 04:22 06/29/23 04:22 06/29/23 04:22 06/29/23 04:22 06/29/23 04:22	Analyzed 06/29/23 20:21 06/29/23 20:21 06/29/23 20:21 06/29/23 20:21 06/29/23 20:21	1 1

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Job ID: 410-132157-1

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-391975/5 Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Water

Analysis Batch: 391975

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			06/28/23 20:40	1
Sulfate	<0.500		1.50	0.500	mg/L			06/28/23 20:40	1
Chloride	<0.600		1.50	0.600	mg/L			06/28/23 20:40	1
	Fluoride Sulfate	Analyte Result Fluoride <0.0900 Sulfate <0.500	Fluoride <0.0900 Sulfate <0.500	Analyte Result Qualifier RL Fluoride <0.0900 0.200 Sulfate <0.500 1.50	Analyte Result valifier Qualifier RL valifier MDL valifier Fluoride <0.0900 0.200 0.0900 Sulfate <0.500 1.50 0.500	Analyte Result Fluoride Qualifier RL 0.0900 MDL 0.0900 Unit Sulfate <0.500 0.200 0.0900 mg/L	Analyte Result Fluoride Qualifier RL 0.0900 MDL 0.0900 mg/L Unit mg/L D mg/L Sulfate <0.500 1.50 0.500 mg/L mg/L	Analyte Result Fluoride Qualifier RL One MDL Unit one D One Prepared Sulfate <0.0900 0.200 0.0900 mg/L	Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Fluoride <0.0900 0.200 0.0900 mg/L 06/28/23 20:40 Sulfate <0.500 1.50 0.500 mg/L 06/28/23 20:40

Lab Sample ID: LCS 410-391975/3 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 391975

	Spike	LCS	LCS		%Rec	
Analyte	Added	Result	Qualifier U	nit D %Re	c Limits	
Fluoride	0.750	0.7171	m	g/L 9	90 - 110	
Sulfate	7.50	7.342	m	g/L 9	90 - 110	
Chloride	3.00	3.010	m	g/L 10	90 - 110	

Lab Sample ID: LCSD 410-391975/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 391975

LCSD LCSD %Rec RPD Spike Result Qualifier Analyte Added Unit D %Rec Limits RPD Limit Fluoride 0.750 0.7181 mg/L 96 90 - 110 0 20 Sulfate 7.50 7.355 98 90 - 110 20 mg/L 0 Chloride 3.00 3.002 mg/L 100 90 - 110 0 20

Lab Sample ID: MB 410-392446/5 Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Water

Analysis Batch: 392446

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	<0.500	1.50	0.500 mg/L			06/30/23 10:29	1

MR MR

Lab Sample ID: LCS 410-392446/3 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 392446

•	Spike	LCS LCS			%Rec	
Analyte	Added	Result Qualifier	Unit D	%Rec	Limits	
Sulfate	7.50	7 484	ma/l	100	90 110	

Lab Sample ID: LCSD 410-392446/4 Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA

Matrix: Water

Analysis Batch: 392446

Spi	te LCSD	LCSD			%Rec		RPD
Analyte Add	d Result	Qualifier Un	nit D	%Rec	Limits	RPD	Limit
Sulfate 7.	7.274	mo	g/L	97	90 - 110	3	20

Eurofins Lancaster Laboratories Environment Testing, LLC

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QC Sample Results

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132157-1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-392024/1-A

Matrix: Water

Analysis Batch: 392498

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 392024

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		06/29/23 04:22	06/29/23 13:49	1
SiO2	<0.117		1.10	0.117	mg/L		06/29/23 04:22	06/29/23 13:49	1
Calcium	<0.237		0.515	0.237	mg/L		06/29/23 04:22	06/29/23 13:49	1

Lab Sample ID: LCS 410-392024/2-A

Matrix: Water

Analysis Batch: 392498

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 392024

	Spike	LCS	LCS			%Rec	
Analyte	Added	Result	Qualifier Un	it D	%Rec	Limits	
Lithium	0.500	0.4863	mg	/L	97	80 - 120	
Calcium	5.00	4.948	mg	/L	99	80 - 120	

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-392024/1-A

Matrix: Water

Analysis Batch: 392466

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 392024

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Magnesium	<16.5		51.5	16.5	ug/L		06/29/23 04:22	06/29/23 18:40	1
Potassium	<67.0		206	67.0	ug/L		06/29/23 04:22	06/29/23 18:40	1
Sodium	<92.7		206	92.7	ug/L		06/29/23 04:22	06/29/23 18:40	1
Molybdenum	<0.134		0.515	0.134	ug/L		06/29/23 04:22	06/29/23 18:40	1
Iron	<20.6		51.5	20.6	ug/L		06/29/23 04:22	06/29/23 18:40	1
Arsenic	<0.700		2.06	0.700	ug/L		06/29/23 04:22	06/29/23 18:40	1
Selenium	<0.286		1.03	0.286	ug/L		06/29/23 04:22	06/29/23 18:40	1
Manganese	<0.979		2.06	0.979	ug/L		06/29/23 04:22	06/29/23 18:40	1
Cobalt	<0.161		0.515	0.161	ug/L		06/29/23 04:22	06/29/23 18:40	1

Lab Sample ID: LCS 410-392024/2-A

Matrix: Water

Analysis Batch: 392466

Client Sample ID: Lab Control Sample

Prep Type: Total/NA Prep Batch: 392024

Allalysis Datch. 332400							i iep bat	CII. 332024
	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Magnesium	5000	4972		ug/L		99	90 - 112	
Potassium	5000	5051		ug/L		101	90 - 112	
Sodium	5000	4995		ug/L		100	89 - 112	
Molybdenum	50.0	48.21		ug/L		96	85 - 115	
Iron	5000	4933		ug/L		99	88 - 119	
Arsenic	500	491.5		ug/L		98	85 - 120	
Selenium	100	98.36		ug/L		98	80 - 120	
Manganese	500	491.9		ug/L		98	89 - 120	
Cobalt	500	491.6		ug/L		98	90 - 113	

QC Association Summary

Client: Terra Systems Inc Job ID: 410-132157-1

Project/Site: Stantec CCR AP2 Columns

HPLC/IC

Analysis Batch: 391975

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132157-1	MW-8C Week 1	Total/NA	Water	EPA 300.0 R2.1	
MB 410-391975/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-391975/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-391975/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 392446

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Prep Batch
410-132157-1	MW-8C Week 1	Total/NA	Water	EPA 300.0 R2.1
MB 410-392446/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1
LCS 410-392446/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1
LCSD 410-392446/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1

Metals

Prep Batch: 392024

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132157-1	MW-8C Week 1	Dissolved	Water	Non-Digest Prep	
MB 410-392024/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-392024/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 392466

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132157-1	MW-8C Week 1	Dissolved	Water	6020B	392024
MB 410-392024/1-A	Method Blank	Total/NA	Water	6020B	392024
LCS 410-392024/2-A	Lab Control Sample	Total/NA	Water	6020B	392024

Analysis Batch: 392498

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132157-1	MW-8C Week 1	Dissolved	Water	6010D	392024
MB 410-392024/1-A	Method Blank	Total/NA	Water	6010D	392024
LCS 410-392024/2-A	Lab Control Sample	Total/NA	Water	6010D	392024

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Lab Chronicle

Client: Terra Systems Inc Job ID: 410-132157-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8C Week 1

Date Received: 06/26/23 15:40

Lab Sample ID: 410-132157-1 Date Collected: 06/26/23 10:45

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		100	392446	W7FX	ELLE	06/30/23 15:07
Total/NA	Analysis	EPA 300.0 R2.1		5	391975	L4QM	ELLE	06/29/23 00:29
Dissolved	Prep	Non-Digest Prep			392024	UAMX	ELLE	06/29/23 04:22
Dissolved	Analysis	6010D		1	392498	T8CQ	ELLE	06/29/23 14:29
Dissolved	Prep	Non-Digest Prep			392024	UAMX	ELLE	06/29/23 04:22
Dissolved	Analysis	6020B		1	392466	UCIG	ELLE	06/29/23 20:21

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-132157-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alabama	State	43200	01-31-24
Alaska	State	PA00009	06-30-23
Alaska (UST)	State	17-027	02-28-24
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-23
California	State	2792	11-30-23
Colorado	State	PA00009	06-30-23
Connecticut	State	PH-0746	06-30-23
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	06-30-23
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Illinois	NELAP	200027	01-31-24
lowa	State	361	03-01-24
Kansas	NELAP	E-10151	10-31-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	12-31-23
Louisiana (All)	NELAP	02055	06-30-23
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-24
Massachusetts	State	M-PA009	06-30-24
Michigan	State	9930	01-31-24
Minnesota	NELAP	042-999-487	12-31-23
Mississippi	State	023	01-31-24
Missouri	State	450	01-31-25
Montana (DW)	State	0098	01-01-24
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	01-10-24
New Jersey	NELAP	PA011	06-30-23
New York	NELAP	10670	04-01-24
North Carolina (DW)	State	42705	07-31-23
North Carolina (WW/SW)	State	521	12-31-23
North Dakota	State	R-205	01-31-24
Oklahoma	NELAP	9804	08-31-23
Oregon	NELAP	PA200001	09-11-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	01-31-24
Rhode Island	State	LAO00338	12-31-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Texas	NELAP	T104704194-23-46	08-31-23
USDA	US Federal Programs	525-22-298-19481	10-25-25
Vermont	State	VT - 36037	10-28-23
Virginia	NELAP	460182	06-14-24
Washington	State	C457	04-11-24
West Virginia (DW)	State	9906 C	12-31-23

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Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-132157-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132157-1

Method	Method Description	Protocol	Laboratory
EPA 300.0 R2.1	Anions, Ion Chromatography	EPA	ELLE
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Sample Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132157-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-132157-1	MW-8C Week 1	Water	06/26/23 10:45	06/26/23 15:40

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Environn



quest/Chain of Custody

eurofins

Lancaster Laboratories

Acct. #

410-132157 Chain of Custody

ple # _____

Environmental		7000						,			- !	NG #						
Client: Terra Systems, Inc.						Matrix					- A	nalyses	Requ	ueste	ed		For Lab U	se Only
Project Name/#: Stantec CCR AP2 Columns	Site ID #:	Macon, GA				1					F	reserva	tion (Code	s		SF #:	
Project Manager: Michael D. Lee	P.O. #:	222566-6-26	5-23		Tissue	ace			N	N	N						SCR #:	
Sampler: Michael D. Lee	PWSID #:				Ĕ	Ground Surface		w	_	i <u>s</u>							Preserva	ition Codes
Phone #: 302-798-9553	Quote #:	4101181	8					nen	K.L	Na, Se,			İ				H = HCI	T = Thiosulfate
State where samples were collected: GA For 0	Compliance:	Yes	No	7	Ë	ble		Containers	Co, Fe,	Mo. N							N = HNO3	B = NaOH
	Collec	ction	۵	Composite	☐ Sediment	Potable NPDES		# of	As, Ca,	Dis (fil) Mg, Mn, Mo,	SO4						S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄
Sample Identification	Date	Time	Grab	Con	Soil	Water	Other:	Total	Dis (fil)	Dis (f							Rer	narks
MW-8C Week 1	6/26/2023	10:45		Х		Х		2	Х	Х	Х							
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Turnaround Time Requested (TAT) (please chec	•		Rusi	h 🗆	Relin	nquished	by:	7	200		ate	Time		eived	. (Date	Time
(Rush TAT is subject to laboratory ap	proval and surcha	rges.)			100	nquished	<u>VI</u>	VI	ll	6/26	ate	10:45		eived		<u> </u>	6/26/2	7 1045
Date results are needed: 7/10/23				-	2	iquisned	TE					Time 81540		eivea	by.		Date	Time
	lail 🔽	Phone	e [Ralis	ے ارس nquished	by:			-	.0/ය ate	D 127W		eived	bw:		Date	Time
E-mail Address: mlee@terrasystems.net Phone: 302-798-9553					1.6	iquisileu	Uy.				210	11110	INCO	EIVEU	Dy.		Date	111116
		· · · · · · · · · · · · · · · · · · ·			Reli	nquished	bv:			B	ate	Time	Rec	eived	bv:		Date	Time
Data Package Options (please check if required) Type I (Validation/non-CLP) MA MCP)					.,,	-,.										00.0	1 11110
Type III (Reduced non-CLP) CT RCP					Relin	nquished	by:	1		D	ate	Time	Reco	eived	by:		Date	Time
Type VI (Raw Data Only) TX TRRE	2-13 □												1//	alle	/	nallo	6/24/2	540
	Category	☐ A or		В	Reli	nquished	by C	omme	ercial	Carrie	er:		11,11	AUT (WANIN !	PI	(1
	es, format:				UPS		FedE	Ξx		Other			Tem	perat	ure ur	oon receip	1201/4	14°C
			-		_								_				7	

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Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-132157-1

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC Login Number: 132157

List Number: 1 Creator: Wrye, Shaun

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	Not present.
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
ls the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

Generated 7/10/2023 4:08:28 AM

JOB DESCRIPTION

Stantec CCR AP2 Columns

JOB NUMBER

410-132990-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601

EOL EOL

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 7/10/2023 4:08:28 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

7/10/2023

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns Laboratory Job ID: 410-132990-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

Qualifiers

Qualifier Description

Method Detection Limit

Minimum Level (Dioxin)

Most Probable Number

Not Calculated

Negative / Absent

Positive / Present

Presumptive

Quality Control

Method Quantitation Limit

Practical Quantitation Limit

Relative Error Ratio (Radiochemistry)

Toxicity Equivalent Factor (Dioxin)

Too Numerous To Count

Toxicity Equivalent Quotient (Dioxin)

Reporting Limit or Requested Limit (Radiochemistry)

Relative Percent Difference, a measure of the relative difference between two points

Not Detected at the reporting limit (or MDL or EDL if shown)

HPLC/IC
Qualifier

F1	MS and/or MSD recovery exceeds control limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

MDL

MPN

MQL

NC

ND

NEG

POS

PQL

PRES

QC

RER

RPD TEF

TEQ

TNTC

RL

ML

Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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)					

Eurofins Lancaster Laboratories Environment Testing, LLC

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Case Narrative

Client: Terra Systems Inc

Job ID: 410-132990-1 Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132990-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-132990-1

Receipt

The samples were received on 6/30/2023 3:10 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 0.8°C

HPLC/IC

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

Metals

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

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132990-1

Client Sample ID: MW-7A Control Week 2

Lab Sample ID: 410-132990-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D Method	Prep Type
Sulfate	1050	F1	300	100	mg/L	200	EPA 300.0 R2.1	Total/NA
Chloride	5.69	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Lithium	0.0729		0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2, Silica	58.0		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	2.00	J	2.06	0.700	ug/L	1	6020B	Dissolved
Calcium	262000		1030	515	ug/L	10	6020B	Dissolved
Calcium	262000		1030	515	ug/L	10	6020B	Dissolved
Magnesium	75000		51.5	16.5	ug/L	1	6020B	Dissolved
Cobalt	5.21		0.515	0.161	ug/L	1	6020B	Dissolved
Potassium	23500		206	67.0	ug/L	1	6020B	Dissolved
Iron	40.5	J	51.5	20.6	ug/L	1	6020B	Dissolved
Sodium	29200		206	92.7	ug/L	1	6020B	Dissolved
Magnesium	75000		51.5	16.5	ug/L	1	6020B	Dissolved
Manganese	10600		20.6	9.79	ug/L	10	6020B	Dissolved
Molybdenum	1.46		0.515	0.134	ug/L	1	6020B	Dissolved
Potassium	23500		206	67.0	ug/L	1	6020B	Dissolved
Sodium	29200		206	92.7	ug/L	1	6020B	Dissolved

Client Sample ID: MW-8A Control Week 2

Lab Sample ID: 410-132990-2

•							-	
Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Sulfate	118		15.0	5.00	mg/L	10	EPA 300.0 R2.1	Total/NA
Chloride	5.88	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
SiO2, Silica	18.9		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	2.60		2.06	0.700	ug/L	1	6020B	Dissolved
Calcium	62900		103	51.5	ug/L	1	6020B	Dissolved
Calcium	62900		103	51.5	ug/L	1	6020B	Dissolved
Magnesium	29800		51.5	16.5	ug/L	1	6020B	Dissolved
Cobalt	0.195	J	0.515	0.161	ug/L	1	6020B	Dissolved
Potassium	8890		206	67.0	ug/L	1	6020B	Dissolved
Iron	108		51.5	20.6	ug/L	1	6020B	Dissolved
Sodium	17300		206	92.7	ug/L	1	6020B	Dissolved
Magnesium	29800		51.5	16.5	ug/L	1	6020B	Dissolved
Manganese	101		2.06	0.979	ug/L	1	6020B	Dissolved
Molybdenum	158		0.515	0.134	ug/L	1	6020B	Dissolved
Potassium	8890		206	67.0	ug/L	1	6020B	Dissolved
Selenium	0.957	J	1.03	0.286	ug/L	1	6020B	Dissolved
Sodium	17300		206	92.7	ug/L	1	6020B	Dissolved

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 2

Lab Sample ID: 410-132990-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	111		15.0	5.00	mg/L	10	_	EPA 300.0 R2.1	Total/NA
Chloride	10.2		7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0162	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2, Silica	5.20		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	2.03	J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	29100		103	51.5	ug/L	1		6020B	Dissolved
Calcium	29100		103	51.5	ug/L	1		6020B	Dissolved
Magnesium	14800		51.5	16.5	ug/L	1		6020B	Dissolved
Cobalt	0.312	J	0.515	0.161	ug/L	1		6020B	Dissolved
Potassium	8910		206	67.0	ug/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Detection Summary

Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 2 (Continued)

Lab Sample ID: 410-132990-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Iron	60.5		51.5	20.6	ug/L	1	_	6020B	Dissolved
Sodium	112000		2060	927	ug/L	10		6020B	Dissolved
Magnesium	14800		51.5	16.5	ug/L	1		6020B	Dissolved
Manganese	51.7	^2	2.06	0.979	ug/L	1		6020B	Dissolved
Molybdenum	17.5		0.515	0.134	ug/L	1		6020B	Dissolved
Potassium	8910		206	67.0	ug/L	1		6020B	Dissolved
Selenium	0.299	J	1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	112000		2060	927	ug/L	10		6020B	Dissolved

Client Sample ID: MW-8C MF3 Week 2

Lab Sample ID: 410-132990-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	336		75.0	25.0	mg/L	50	_	EPA 300.0 R2.1	Total/NA
Chloride	5.76	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0182	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2, Silica	2.33		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	1.33	J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	47300		103	51.5	ug/L	1		6020B	Dissolved
Magnesium	43700		51.5	16.5	ug/L	1		6020B	Dissolved
Manganese	13.6		2.06	0.979	ug/L	1		6020B	Dissolved
Molybdenum	0.437	J	0.515	0.134	ug/L	1		6020B	Dissolved
Potassium	6950		206	67.0	ug/L	1		6020B	Dissolved
Sodium	17600		206	92.7	ug/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

7/10/2023

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Client Sample Results

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7A Control Week 2

Date Collected: 06/30/23 08:15

Date Received: 06/30/23 15:10

Lab Sample ID: 410-132990-1

. Matrix: Water

Job ID: 410-132990-1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/06/23 01:01	5
Sulfate	1050	F1	300	100	mg/L			07/07/23 06:03	200
Chloride	5.69	J	7.50	3.00	mg/L			07/06/23 01:01	5
- Method: SW846 6010D - M	etals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0729		0.0515	0.0113	mg/L		07/05/23 01:48	07/07/23 18:47	
SiO2, Silica	58.0		1.10	0.117	mg/L		07/05/23 01:48	07/07/23 18:47	•
- Method: SW846 6020B - M	etals (ICP/MS) - Diss	olved							
Analyte		Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.00	J	2.06	0.700	ug/L		07/05/23 01:48	07/07/23 09:28	1
Calcium	262000		1030	515	ug/L		07/05/23 01:48	07/07/23 12:27	10
Calcium	262000		1030	515	ug/L		07/05/23 01:48	07/07/23 12:27	10
Magnesium	75000		51.5	16.5	ug/L		07/05/23 01:48	07/07/23 09:28	
Cobalt	5.21		0.515	0.161	ug/L		07/05/23 01:48	07/07/23 09:28	
Potassium	23500		206	67.0	ug/L		07/05/23 01:48	07/07/23 09:28	1
Iron	40.5	J	51.5	20.6	ug/L		07/05/23 01:48	07/07/23 09:28	1
Sodium	29200		206	92.7	ug/L		07/05/23 01:48	07/07/23 09:28	
Magnesium	75000		51.5	16.5	ug/L		07/05/23 01:48	07/07/23 09:28	•
Manganese	10600		20.6	9.79	ug/L		07/05/23 01:48	07/07/23 12:27	10
Molybdenum	1.46		0.515	0.134	ug/L		07/05/23 01:48	07/07/23 09:28	1
Potassium	23500		206	67.0	ug/L		07/05/23 01:48	07/07/23 09:28	•
Selenium	<0.286		1.03	0.286	ug/L		07/05/23 01:48	07/07/23 09:28	1
Sodium	29200		206	92.7	ug/L		07/05/23 01:48	07/07/23 09:28	1

Client Sample ID: MW-8A Control Week 2

Date Collected: 06/30/23 09:00

Date Received: 06/30/23 15:10

lient Sample ID: MW-8A Control Week 2	Lab Sample ID: 410-132990-2
ate Collected: 06/30/23 09:00	Matrix: Water

Wethod: EPA 300.0 R2.1 -	Anions, ion Chromate	ograpny							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/06/23 01:27	5
Sulfate	118		15.0	5.00	mg/L			07/06/23 01:39	10
Chloride	5.88	J	7.50	3.00	mg/L			07/06/23 01:27	5

Method: SW846 6010D - Metals (ICP) - Dissolved										
	Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Lithium	<0.0113		0.0515	0.0113	mg/L		07/05/23 01:48	07/07/23 18:56	1
	SiO2, Silica	18.9		1.10	0.117	mg/L		07/05/23 01:48	07/07/23 18:56	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.60		2.06	0.700	ug/L		07/05/23 01:48	07/07/23 09:54	1
Calcium	62900		103	51.5	ug/L		07/05/23 01:48	07/07/23 09:54	1
Calcium	62900		103	51.5	ug/L		07/05/23 01:48	07/07/23 09:54	1
Magnesium	29800		51.5	16.5	ug/L		07/05/23 01:48	07/07/23 09:54	1
Cobalt	0.195	J	0.515	0.161	ug/L		07/05/23 01:48	07/07/23 09:54	1
Potassium	8890		206	67.0	ug/L		07/05/23 01:48	07/07/23 09:54	1
Iron	108		51.5	20.6	ug/L		07/05/23 01:48	07/07/23 09:54	1
Sodium	17300		206	92.7	ug/L		07/05/23 01:48	07/07/23 09:54	1

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Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8A Control Week 2

Lab Sample ID: 410-132990-2 Date Collected: 06/30/23 09:00 Matrix: Water

Date Received: 06/30/23 15:10

Analyte	Result (Qualifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Magnesium	29800	51.5	16.5	ug/L		07/05/23 01:48	07/07/23 09:54	1
Manganese	101	2.06	0.979	ug/L		07/05/23 01:48	07/07/23 09:54	1
Molybdenum	158	0.515	0.134	ug/L		07/05/23 01:48	07/07/23 09:54	1
Potassium	8890	206	67.0	ug/L		07/05/23 01:48	07/07/23 09:54	1
Selenium	0.957	J 1.03	0.286	ug/L		07/05/23 01:48	07/07/23 09:54	1
Sodium	17300	206	92.7	ug/L		07/05/23 01:48	07/07/23 09:54	1

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 2

Lab Sample ID: 410-132990-3 Date Collected: 06/30/23 09:15 **Matrix: Water**

Date Received: 06/30/23 15:10

Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450	1.00	0.450	mg/L			07/06/23 01:52	5
Sulfate	111	15.0	5.00	mg/L			07/06/23 02:05	10
Chloride	10.2	7.50	3.00	mg/L			07/06/23 01:52	5

Method: SW846 6010D - Metals (ICF	P) - Dissolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0162 J	0.0515	0.0113	mg/L		07/05/23 01:48	07/07/23 18:50	1
SiO2, Silica	5.20	1.10	0.117	mg/L		07/05/23 01:48	07/07/23 18:50	1

0.20				3. =			***************************************	•
tals (ICP/MS) - Diss	olved							
Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2.03	J	2.06	0.700	ug/L		07/05/23 01:48	07/07/23 09:36	1
29100		103	51.5	ug/L		07/05/23 01:48	07/07/23 09:36	1
29100		103	51.5	ug/L		07/05/23 01:48	07/07/23 09:36	1
14800		51.5	16.5	ug/L		07/05/23 01:48	07/07/23 09:36	1
0.312	J	0.515	0.161	ug/L		07/05/23 01:48	07/07/23 09:36	1
8910		206	67.0	ug/L		07/05/23 01:48	07/07/23 09:36	1
60.5		51.5	20.6	ug/L		07/05/23 01:48	07/07/23 09:36	1
112000		2060	927	ug/L		07/05/23 01:48	07/07/23 12:29	10
14800		51.5	16.5	ug/L		07/05/23 01:48	07/07/23 09:36	1
51.7	^2	2.06	0.979	ug/L		07/05/23 01:48	07/07/23 09:36	1
17.5		0.515	0.134	ug/L		07/05/23 01:48	07/07/23 09:36	1
8910		206	67.0	ug/L		07/05/23 01:48	07/07/23 09:36	1
0.299	J	1.03	0.286	ug/L		07/05/23 01:48	07/07/23 09:36	1
112000		2060	927	ug/L		07/05/23 01:48	07/07/23 12:29	10
	tals (ICP/MS) - Disservature 2.03 29100 29100 14800 0.312 8910 60.5 112000 14800 51.7 17.5 8910 0.299	Result Qualifier 2.03 J 29100 29100 14800 0.312 J 8910 60.5 112000 14800 51.7 ^2 17.5 8910 0.299 J	tals (ICP/MS) - Dissolved Result 2.03 Qualifier 3.06 29100 103 29100 103 14800 51.5 0.312 J 0.515 8910 206 60.5 51.5 112000 2060 14800 51.5 51.7 ^2 2.06 17.5 0.515 8910 206 0.299 J 1.03	tals (ICP/MS) - Dissolved Result Qualifier RL MDL 2.03 J 2.06 0.700 29100 103 51.5 29100 103 51.5 14800 51.5 16.5 0.312 J 0.515 0.161 8910 206 67.0 60.5 51.5 20.6 112000 2060 927 14800 51.5 16.5 51.7 ^2 2.06 0.979 17.5 0.515 0.134 8910 206 67.0 0.299 J 1.03 0.286	tals (ICP/MS) - Dissolved Result 2.03 J Qualifier RL 2.06 0.700 ug/L 0.700 ug/L 29100 103 51.5 ug/L 51.5 ug/L 29100 103 51.5 ug/L 16.5 ug/L 14800 51.5 0.161 ug/L 16.5 ug/L 8910 206 67.0 ug/L 60.5 1.5 20.6 ug/L 112000 2060 927 ug/L 14800 51.5 16.5 ug/L 14800 51.5 16.5 ug/L 16.5 ug/L 51.7 ^2 2.06 0.979 ug/L 17.5 0.515 0.134 ug/L 8910 206 67.0 ug/L 67.0 ug/L 0.299 J 1.03 0.286 ug/L	tals (ICP/MS) - Dissolved Result Qualifier RL Qualifier MDL Qualifier Unit Qualifier D 2.03 J 2.06 0.700 ug/L 0.700 ug/L 0.700 ug/L 29100 103 51.5 ug/L 103 51.5 ug/L 0.51.5 ug/L 14800 51.5 16.5 ug/L 0.515 0.161 ug/L 0.60.5 ug/L 8910 206 67.0 ug/L 206 ug/L 0.97 ug/L 14800 51.5 16.5 ug/L 16.5 ug/L 0.979 ug/L 17.5 0.515 0.134 ug/L 0.515 0.134 ug/L 0.299 J 0.299 J 1.03 0.286 ug/L	tals (ICP/MS) - Dissolved Result Qualifier RL Qualifier MDL Unit QUAL D Prepared 2.03 J 2.06 0.700 ug/L 07/05/23 01:48 29100 103 51.5 ug/L 07/05/23 01:48 29100 51.5 10.5 ug/L 07/05/23 01:48 14800 51.5 16.5 ug/L 07/05/23 01:48 0.312 J 0.515 0.161 ug/L 07/05/23 01:48 8910 206 67.0 ug/L 07/05/23 01:48 60.5 51.5 20.6 ug/L 07/05/23 01:48 112000 2060 927 ug/L 07/05/23 01:48 14800 51.5 16.5 ug/L 07/05/23 01:48 51.7 ^2 2.06 0.979 ug/L 07/05/23 01:48 17.5 0.515 0.134 ug/L 07/05/23 01:48 17.5 0.515 0.134 ug/L 07/05/23 01:48 8910 206 67.0 ug/L 07/05/23 01:48 0.299 J 1.03 0.286 ug/L 07/05/23 01:48	tals (ICP/MS) - Dissolved Result Qualifier RL MDL Unit D Prepared Analyzed 2.03 J 2.06 0.700 ug/L 07/05/23 01:48 07/07/23 09:36 29100 103 51.5 ug/L 07/05/23 01:48 07/07/23 09:36 29100 103 51.5 ug/L 07/05/23 01:48 07/07/23 09:36 14800 51.5 16.5 ug/L 07/05/23 01:48 07/07/23 09:36 0.312 J 0.515 0.161 ug/L 07/05/23 01:48 07/07/23 09:36 8910 206 67.0 ug/L 07/05/23 01:48 07/07/23 09:36 60.5 51.5 20.6 ug/L 07/05/23 01:48 07/07/23 09:36 112000 2060 927 ug/L 07/05/23 01:48 07/07/23 09:36 51.7 ^2 2.06 0.979 ug/L 07/05/23 01:48 07/07/23 09:36 17.5 0.515 0.134 ug/L 07/05/23 01:48 07/07/23 09:36 51.7 ^2 2.06 0.979 ug/L 07/05/23 01:48 07/07/23 09:36 8910 206 67.0 ug/L 07/05/23 01:4

Client Sample ID: MW-8C MF3 Week 2

Lab Sample ID: 410-132990-4 Date Collected: 06/30/23 09:30 **Matrix: Water**

Date Received: 06/30/23 15:10

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/06/23 02:43	5
Sulfate	336		75.0	25.0	mg/L			07/06/23 18:39	50
Chloride	5.76	J	7.50	3.00	mg/L			07/06/23 02:43	5

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

Sodium

Client Sample ID: MW-8C MF3 Week 2

Lab Sample ID: 410-132990-4 Date Collected: 06/30/23 09:30 Matrix: Water

Date Received: 06/30/23 15:10

Method: SW846 6010D - N	Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0182	J	0.0515	0.0113	mg/L		07/05/23 01:48	07/07/23 18:44	
SiO2, Silica	2.33		1.10	0.117	mg/L		07/05/23 01:48	07/07/23 18:44	
- Method: SW846 6020B - N	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Arsenic	1.33	J	2.06	0.700	ug/L		07/05/23 01:48	07/07/23 09:26	
Calcium	47300		103	51.5	ug/L		07/05/23 01:48	07/07/23 09:26	
Cobalt	<0.161		0.515	0.161	ug/L		07/05/23 01:48	07/07/23 09:26	
Iron	<20.6		51.5	20.6	ug/L		07/05/23 01:48	07/07/23 09:26	
Magnesium	43700		51.5	16.5	ug/L		07/05/23 01:48	07/07/23 09:26	•
Manganese	13.6		2.06	0.979	ug/L		07/05/23 01:48	07/07/23 12:25	1
Molybdenum	0.437	J	0.515	0.134	ug/L		07/05/23 01:48	07/07/23 09:26	1
Potassium	6950		206	67.0	ug/L		07/05/23 01:48	07/07/23 09:26	
Selenium	<0.286		1.03	0.286	ua/L		07/05/23 01:48	07/07/23 09:26	4

206

92.7 ug/L

07/05/23 01:48

07/07/23 09:26

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132990-1

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Client Sample ID: Method Blank

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-393811/5

Matrix: Water

Analysis Batch: 393811

Client Sample ID: Method Blank

Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample Dup

Client Sample ID: Method Blank

Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

MB MB Dil Fac Analyte Result Qualifier RLMDL Unit D Prepared Analyzed Fluoride <0.0900 0.200 0.0900 mg/L 07/05/23 23:32 Sulfate <0.500 1.50 0.500 mg/L 07/05/23 23:32 Chloride 07/05/23 23:32 < 0.600 1.50 0.600 mg/L

Lab Sample ID: LCS 410-393811/3

Matrix: Water

Analysis Batch: 393811

Spike LCS LCS %Rec Added Analyte Result Qualifier %Rec I imits Unit D Fluoride 0.750 0.7225 mg/L 96 90 - 110 Sulfate 7.50 7.350 mg/L 98 90 - 110 Chloride 3.00 2.994 mg/L 100 90 - 110

Lab Sample ID: LCSD 410-393811/4

Matrix: Water

Analysis Batch: 393811

RPD Spike LCSD LCSD %Rec Limit Analyte Added Result Qualifier Unit D %Rec Limits RPD Fluoride 0.750 0.7238 mg/L 97 90 - 110 0 20 Sulfate 7.50 7.353 98 90 - 110 20 mg/L 0 Chloride 3.00 2.994 mg/L 100 90 - 110 0 20

Lab Sample ID: MB 410-394337/5

Matrix: Water

Analysis Batch: 394337

MB MB

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Sulfate <0.500 1.50 0.500 mg/L 07/06/23 15:33

Lab Sample ID: LCS 410-394337/3

Matrix: Water

Analysis Batch: 394337

LCS LCS Spike %Rec Analyte Added Result Qualifier Unit %Rec Limits Sulfate 7.50 7.120 90 - 110 mg/L

Lab Sample ID: LCSD 410-394337/4

Matrix: Water

Analysis Batch: 394337

Spike LCSD LCSD %Rec RPD Analyte Added Result Qualifier Unit D %Rec Limits **RPD** Limit Sulfate 7.50 7.025 94 90 - 110 mg/L

Lab Sample ID: MB 410-394376/5

Matrix: Water

Analysis Batch: 394376

MB MB

Result Qualifier RLMDL Dil Fac Analyte Unit D Prepared Analyzed 1.50 07/07/23 03:57 Sulfate <0.500 0.500 mg/L

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Job ID: 410-132990-1

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Prep Type: Total/NA

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 410-394376/3

Matrix: Water

Lab Sample ID: LCSD 410-394376/4

Analysis Batch: 394376

	Spike	L
Analyte	Added	Res
Sulfate	7.50	7.9

LCS LCS sult 995

Qualifier

Unit mg/L

%Rec Limits 107 90 - 110

Client Sample ID: Lab Control Sample

%Rec

%Rec

Client Sample ID: MW-7A Control Week 2

Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA

Matrix: Water

Analysis Batch: 394376

Amalista		
Analyte		
Sulfate		

Spike Added 7.50

LCSD LCSD Result Qualifier 7.921

DU DU

Qualifier

Result

1044

Unit mg/L

D %Rec 106

Limits RPD Limit 90 - 110

Lab Sample ID: 410-132990-1 MS

Matrix: Water

Analysis Batch: 394376

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Analyte	
Sulfate	

Lab Sample ID: 410-132990-1 DU

Sample Sample Spike Result Qualifier Added 1050 F1 1000

MS MS Result Qualifier 2162 F1

Unit mg/L

Unit

mg/L

%Rec

Limits 90 - 110

%Rec

Client Sample ID: MW-7A Control Week 2 Prep Type: Total/NA

RPD

Prep Type: Total/NA

Prep Batch: 393494

Prep Type: Total/NA

Prep Batch: 393494

Prep Type: Total/NA

Matrix: Water

Analysis Batch: 394376

l	Analyte
ı	Sulfate

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-393494/1-A **Matrix: Water**

Analysis Batch: 394826

MB MB

< 0.117

Sample Sample

1050

Result Qualifier

Result Qualifier <0.0113

MDL Unit RL 0.0515 0.0113 1.10

ma/L 0.117 mg/L

Prepared 07/05/23 01:48 07/05/23 01:48

Analyzed 07/07/23 18:10 07/07/23 18:10

Client Sample ID: Lab Control Sample

Client Sample ID: Method Blank

Lab Sample ID: LCS 410-393494/2-A

Matrix: Water

Analyte

Lithium

Lithium

SiO2, Silica

Analysis Batch: 394826

Analyte

Spike LCS LCS Added

RL

2.06

103

0.515

0.500

Result Qualifier 0.5013

MDL Unit

Unit mg/L

D %Rec 100

%Rec Limits 80 - 120

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-393494/1-A

Matrix: Water Analysis Batch: 394643

	IVID	IVID
Analyte	Result	Qualifier
Arsenic	<0.700	

Calcium <51.5 Cobalt <0.161

Client Sample ID: Method Blank

Analyzed

Prep Type: Total/NA **Prep Batch: 393494**

0.700 ug/L 07/05/23 01:48 07/07/23 08:52 51.5 ug/L 07/05/23 01:48 07/07/23 08:52 0.161 ug/L 07/05/23 01:48 07/07/23 08:52

Prepared

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Dil Fac

RPD

RPD

Limit

Dil Fac

QC Sample Results

Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 410-393494/1-A

Matrix: Water

Analysis Batch: 394643

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Type: Total/NA

90 - 112

80 - 120

89 - 112

97

101

97

Prep Batch: 393494

	MB	MR							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	<20.6		51.5	20.6	ug/L		07/05/23 01:48	07/07/23 08:52	1
Magnesium	<16.5		51.5	16.5	ug/L		07/05/23 01:48	07/07/23 08:52	1
Manganese	<0.979		2.06	0.979	ug/L		07/05/23 01:48	07/07/23 08:52	1
Molybdenum	<0.134		0.515	0.134	ug/L		07/05/23 01:48	07/07/23 08:52	1
Potassium	<67.0		206	67.0	ug/L		07/05/23 01:48	07/07/23 08:52	1
Selenium	<0.286		1.03	0.286	ug/L		07/05/23 01:48	07/07/23 08:52	1
Sodium	<92.7		206	92.7	ug/L		07/05/23 01:48	07/07/23 08:52	1

5000

100

5000

4868

101.0

4830

Lab Sample ID: LCS 410-393494/2-A **Client Sample ID: Lab Control Sample Matrix: Water**

Analysis Batch: 394643

Analyte Arsenic Calcium Cobalt

Magnesium Manganese Molybdenum

Potassium

Selenium

Sodium

					Prep I	Batch: 393494
Spike	LCS	LCS			%Rec	
Added	Result	Qualifier Unit	D	%Rec	Limits	
500	504.7	ug/L		101	85 - 120	
5000	4716	ug/L		94	85 - 120	
500	469.2	ug/L		94	90 - 113	
5000	4860	ug/L		97	88 - 119	
5000	4824	ug/L		96	90 - 112	
500	484.8	ug/L		97	89 - 120	
50.0	49.97	ug/L		100	85 - 115	

ug/L

ug/L

ug/L

QC Association Summary

Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

HPLC/IC

Analysis Batch: 393811

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132990-1	MW-7A Control Week 2	Total/NA	Water	EPA 300.0 R2.1	
410-132990-2	MW-8A Control Week 2	Total/NA	Water	EPA 300.0 R2.1	
410-132990-2	MW-8A Control Week 2	Total/NA	Water	EPA 300.0 R2.1	
410-132990-3	MW-8B FeCl3 NaHCO3 Week 2	Total/NA	Water	EPA 300.0 R2.1	
410-132990-3	MW-8B FeCl3 NaHCO3 Week 2	Total/NA	Water	EPA 300.0 R2.1	
410-132990-4	MW-8C MF3 Week 2	Total/NA	Water	EPA 300.0 R2.1	
MB 410-393811/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-393811/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-393811/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 394337

Lab Sample ID 410-132990-4	Client Sample ID MW-8C MF3 Week 2	Prep Type Total/NA	Matrix Water	Method EPA 300.0 R2.1	Prep Batch
MB 410-394337/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-394337/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-394337/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 394376

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132990-1	MW-7A Control Week 2	Total/NA	Water	EPA 300.0 R2.1	
MB 410-394376/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-394376/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-394376/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	
410-132990-1 MS	MW-7A Control Week 2	Total/NA	Water	EPA 300.0 R2.1	
410-132990-1 DU	MW-7A Control Week 2	Total/NA	Water	EPA 300.0 R2.1	

Metals

Prep Batch: 393494

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132990-1	MW-7A Control Week 2	Dissolved	Water	Non-Digest Prep	
410-132990-2	MW-8A Control Week 2	Dissolved	Water	Non-Digest Prep	
410-132990-3	MW-8B FeCl3 NaHCO3 Week 2	Dissolved	Water	Non-Digest Prep	
410-132990-4	MW-8C MF3 Week 2	Dissolved	Water	Non-Digest Prep	
MB 410-393494/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-393494/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 394643

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132990-1	MW-7A Control Week 2	Dissolved	Water	6020B	393494
410-132990-2	MW-8A Control Week 2	Dissolved	Water	6020B	393494
410-132990-3	MW-8B FeCl3 NaHCO3 Week 2	Dissolved	Water	6020B	393494
410-132990-4	MW-8C MF3 Week 2	Dissolved	Water	6020B	393494
MB 410-393494/1-A	Method Blank	Total/NA	Water	6020B	393494
LCS 410-393494/2-A	Lab Control Sample	Total/NA	Water	6020B	393494

Analysis Batch: 394682

Lab Sample ID 410-132990-1	Client Sample ID MW-7A Control Week 2	Prep Type Dissolved	Water	Method 6020B	Prep Batch 393494
410-132990-3	MW-8B FeCl3 NaHCO3 Week 2	Dissolved	Water	6020B	393494
410-132990-4	MW-8C MF3 Week 2	Dissolved	Water	6020B	393494

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QC Association Summary

Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

Metals

Analysis Batch: 394826

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-132990-1	MW-7A Control Week 2	Dissolved	Water	6010D	393494
410-132990-2	MW-8A Control Week 2	Dissolved	Water	6010D	393494
410-132990-3	MW-8B FeCl3 NaHCO3 Week 2	Dissolved	Water	6010D	393494
410-132990-4	MW-8C MF3 Week 2	Dissolved	Water	6010D	393494
MB 410-393494/1-A	Method Blank	Total/NA	Water	6010D	393494
LCS 410-393494/2-A	Lab Control Sample	Total/NA	Water	6010D	393494

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7A Control Week 2

Date Collected: 06/30/23 08:15 Date Received: 06/30/23 15:10 Lab Sample ID: 410-132990-1

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	393811	W7FX	ELLE	07/06/23 01:01
Total/NA	Analysis	EPA 300.0 R2.1		200	394376	L4QM	ELLE	07/07/23 06:03
Dissolved	Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Dissolved	Analysis	6010D		1	394826	T8CQ	ELLE	07/07/23 18:47
Dissolved	Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Dissolved	Analysis	6020B		10	394682	F7JF	ELLE	07/07/23 12:27
Dissolved	Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Dissolved	Analysis	6020B		1	394643	F7JF	ELLE	07/07/23 09:28

Client Sample ID: MW-8A Control Week 2

Date Collected: 06/30/23 09:00

Date Received: 06/30/23 15:10

Lab Sample ID: 410-132990-2

Matrix: Water

Batch	Batch		Dilution	Batch			Prepared
Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Analysis	EPA 300.0 R2.1		5	393811	W7FX	ELLE	07/06/23 01:27
Analysis	EPA 300.0 R2.1		10	393811	W7FX	ELLE	07/06/23 01:39
Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Analysis	6010D		1	394826	T8CQ	ELLE	07/07/23 18:56
Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Analysis	6020B		1	394643	F7JF	ELLE	07/07/23 09:54
	Type Analysis Analysis Prep Analysis Prep	Type Method Analysis EPA 300.0 R2.1 Analysis EPA 300.0 R2.1 Prep Non-Digest Prep Analysis 6010D Prep Non-Digest Prep	Type Method Run Analysis EPA 300.0 R2.1 Analysis EPA 300.0 R2.1 Prep Non-Digest Prep Analysis 6010D Prep Non-Digest Prep	Type Method Run Factor Analysis EPA 300.0 R2.1 5 Analysis EPA 300.0 R2.1 10 Prep Non-Digest Prep Analysis 6010D 1 Prep Non-Digest Prep	Type Method Run Factor Number Analysis EPA 300.0 R2.1 5 393811 Analysis EPA 300.0 R2.1 10 393811 Prep Non-Digest Prep 393494 Analysis 6010D 1 394826 Prep Non-Digest Prep 393494	Type Method Run Factor Number Analyst Analysis EPA 300.0 R2.1 5 393811 W7FX Analysis EPA 300.0 R2.1 10 393811 W7FX Prep Non-Digest Prep 393494 UAMX Analysis 6010D 1 394826 T8CQ Prep Non-Digest Prep 393494 UAMX	Type Method Run Factor Number Analyst Lab Analysis EPA 300.0 R2.1 5 393811 W7FX ELLE Analysis EPA 300.0 R2.1 10 393811 W7FX ELLE Prep Non-Digest Prep 393494 UAMX ELLE Analysis 6010D 1 394826 T8CQ ELLE Prep Non-Digest Prep 393494 UAMX ELLE

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 2

Date Collected: 06/30/23 09:15

Date Received: 06/30/23 15:10

Lab Sample ID: 410-132990-3

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	393811	W7FX	ELLE	07/06/23 01:52
Total/NA	Analysis	EPA 300.0 R2.1		10	393811	W7FX	ELLE	07/06/23 02:05
Dissolved	Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Dissolved	Analysis	6010D		1	394826	T8CQ	ELLE	07/07/23 18:50
Dissolved	Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Dissolved	Analysis	6020B		10	394682	F7JF	ELLE	07/07/23 12:29
Dissolved	Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Dissolved	Analysis	6020B		1	394643	F7JF	ELLE	07/07/23 09:36

Client Sample ID: MW-8C MF3 Week 2

Date Collected: 06/30/23 09:30

Date Received: 06/30/23 15:10

Lab Sample ID: 410-132990-4

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		50	394337	L4QM	ELLE	07/06/23 18:39
Total/NA	Analysis	EPA 300.0 R2.1		5	393811	W7FX	ELLE	07/06/23 02:43
Dissolved	Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Dissolved	Analysis	6010D		1	394826	T8CQ	ELLE	07/07/23 18:44

Eurofins Lancaster Laboratories Environment Testing, LLC

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Lab Chronicle

Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

Date Received: 06/30/23 15:10

Client Sample ID: MW-8C MF3 Week 2

Lab Sample ID: 410-132990-4 Date Collected: 06/30/23 09:30

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Dissolved	Analysis	6020B		1	394682	F7JF	ELLE	07/07/23 12:25
Dissolved	Prep	Non-Digest Prep			393494	UAMX	ELLE	07/05/23 01:48
Dissolved	Analysis	6020B		1	394643	F7JF	ELLE	07/07/23 09:26

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date		
A2LA	Dept. of Defense ELAP	0001.01	11-30-24		
A2LA	ISO/IEC 17025	0001.01	11-30-24		
Alabama	State	43200	01-31-24		
Alaska	State	PA00009	06-30-24		
Alaska (UST)	State	17-027	02-28-24		
Arizona	State	AZ0780	03-12-24		
Arkansas DEQ	State	88-00660	08-09-23		
California	State	2792	11-30-23		
Colorado	State	PA00009	06-30-24		
Connecticut	State	PH-0746	06-30-25		
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24		
Delaware (DW)	State	N/A	01-31-24		
Georgia (DW)	State	C048	01-31-24		
Hawaii	State	N/A	01-31-24		
Illinois	NELAP	200027	01-31-24		
lowa	State	361	03-01-24		
Kansas	NELAP	E-10151	10-31-23		
Kentucky (DW)	State	KY90088	12-31-23		
Kentucky (UST)	State	0001.01	11-30-24		
Kentucky (WW)	State	KY90088	12-31-23		
• • •	NELAP	02055			
Louisiana (All) Maine	State		06-30-24		
		2019012	03-12-25		
Maryland	State	100 M DA 000	06-30-24		
Massachusetts	State	M-PA009	06-30-24		
Michigan	State	9930	01-31-24		
Minnesota	NELAP	042-999-487	12-31-23		
Mississippi	State	023	01-31-24		
Missouri	State	450	01-31-25		
Montana (DW)	State	0098	01-01-24		
Nebraska	State	NE-OS-32-17	01-31-24		
New Hampshire	NELAP	2730	01-10-24		
New Jersey	NELAP	PA011	06-30-24		
New York	NELAP	10670	04-01-24		
North Carolina (DW)	State	42705	07-31-23		
North Carolina (WW/SW)	State	521	12-31-23		
North Dakota	State	R-205	01-31-24		
Oklahoma	NELAP	9804	08-31-23		
Oregon	NELAP	PA200001	09-11-23		
PALA	Canada	1978	09-16-24		
Pennsylvania	NELAP	36-00037	01-31-24		
Rhode Island	State	LAO00338	12-31-23		
South Carolina	State	89002	01-31-24		
Tennessee	State	02838	01-31-24		
Texas	NELAP	T104704194-23-46	08-31-23		
USDA	US Federal Programs	525-22-298-19481	10-25-25		
Vermont	State	VT - 36037	10-28-23		
Virginia	NELAP	460182	06-14-24		
Washington	State	C457	04-11-24		
West Virginia (DW)	State	9906 C	12-31-23		
West Virginia DEP	State	055	07-31-24		

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Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-132990-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-132990-1

Method	Method Description	Protocol	Laboratory
EPA 300.0 R2.1	Anions, Ion Chromatography	EPA	ELLE
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Sample Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-132990-1	MW-7A Control Week 2	Water	06/30/23 08:15	06/30/23 15:10
410-132990-2	MW-8A Control Week 2	Water	06/30/23 09:00	06/30/23 15:10
410-132990-3	MW-8B FeCl3 NaHCO3 Week 2	Water	06/30/23 09:15	06/30/23 15:10
410-132990-4	MW-8C MF3 Week 2	Water	06/30/23 09:30	06/30/23 15:10

Job ID: 410-132990-1

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Environmental Analysis Request/Chain of Custody

🍪 eurofins	1.								- 9				4 a o				, out	,
	Lancaster Laboratories Environmental		Acc	t. #			Group #					Samp	ole #					
Client: Terra S	ystems, Inc.						Matrix					A	nalyses	Reque	sted		For Lab Us	e Only
Project Name/#:	Stantec CCR AP2 Columns	Site ID #:	Macon, GA				7					F	reservat	ion Co	des		SF #:	
Project Manager:	Michael D. Lee	P.O. #:	222566-6-30	0-23		Tissue	nd ace			N	N	N					SCR #:	
Sampler: Michael	D. Lee	PWSID#:				Ë	Ground Surface		10		ίδ						Preservat	ion Codes
Phone #: 302-7	798-9553	Quote #:	4101181	18					ner	, K	B. Se.				-		H = HCI	T = Thiosulfate
State where sample	es were collected: GA For	Compliance:	Yes	No	7	ne.	ole ES		ntai	Ca, Co, Fe, K. Li	S.						N = HNO ₃	B = NaOH
		Collec	ction	٩	Composite	☐ Sediment	Potable er NPDES	er:	Il # of Containers	9	Dis (fil) Mg. Mn. Mo, Na.	804					S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄
Sample Identific	ation	Date	Time	Grab	Con	Soil	Water	Other:	Total #	Dis (fil)	Dis (fi	CI, F,					Rem	arks
MW-7A Control We	eek 2	6/30/2023	8:15		Х		X		2	Х	Х	Х						
MW-8A Control We	eek 2	6/30/2023	9:00		Х		X		2	Х	Х	Х					I, , , , ,	5-07-01
MW-8B FeCI3 Nah	ICO3 Week 2	6/30/2023	9:15		X		X		2	Х	Х	Х		11111				
MW-8C MF3 Week	< 2	6/30/2023	9:30		Х		X		2	Х	Х	Х		410	-132990	Chain of Cu	ustody	_
																		_
	ne Requested (TAT) (please check (Rush TAT is subject to laboratory ap	•		Rus	h 🗌		inquished		DE OC	ee .		ate	Time 12.45	Receiv B&		10	Date 6/30/23	Time 1245
Date results are ne	eeded: 7/14/23					Reli	nquished	by:	10	_		ate		Receiv	ed by:		Date	Time
Rush results reque	ested by (please check): E-M	lail 🔽	Phon	e [3 Br	4	<u>'</u>	\prec	43	0/2:	1510					
E-mail Address: Phone:	mlee@terrasystems.net 302-798-9553					Reli	nquished	by:			Da	ate	Time	Receiv	ed by:		Date	Time
Data Package O	Options (please check if required non-CLP) MA MCP					Reli	inquished	by		\	Di	ate	Time	Receiv	ed by:		Date	Time
Type III (Reduced	- =	2-13				Reli	nquished	by:			Di	ate	Time	Receiv	ed by:	1 61	Date 2	Time

Eurofins Lancaster Laboratories Environmental, LLC • 2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300

A or B

NYSDEC Category

If yes, format:

No

Yes

NJ DKQP

EDD Required?

(O() C 8 7045 021

Temperature upon receipt

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Relinquished by Commercial Carrier:

Other

Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-132990-1

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC Login Number: 132990

List Number: 1

Creator: Kanagy, Nicholas

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
s the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703 Generated 7/12/2023 12:46:53 PM Revision 1

JOB DESCRIPTION

Stantec CCR AP2 Columns

JOB NUMBER

410-133264-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601

EOL EOL

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

Jarrissa Williams

Generated 7/12/2023 12:46:53 PM Revision 1

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246 3

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Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

This report shall not be reproduced except in full, without the written approval of the laboratory.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. The foregoing express warranty is exclusive and is given in lieu of all other warranties, expressed or implied, except as otherwise agreed. We disclaim any other warranties, expressed or implied, including a warranty of fitness for particular purpose and warranty of merchantability. In no event shall Eurofins Lancaster Laboratories Environmental, LLC be liable for indirect, special, consequential, or incidental damages including, but not limited to, damages for loss of profit or goodwill regardless of (A) the negligence (either sole or concurrent) of Eurofins Lancaster Laboratories Environmental and (B) whether Eurofins Lancaster Laboratories Environmental has been informed of the possibility of such damages. We accept no legal responsibility for the purposes for which the client uses the test results. Except as otherwise agreed, no purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

Marrissa Williams

Page 3 of 18

7/12/2023 (Rev. 1)

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns Laboratory Job ID: 410-133264-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-133264-1

Project/Site: Stantec CCR AP2 Columns

Qualifiers

	_		_		_
ш	О		г.	/1	_
п	_	_		•	

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.

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.

Glossary

Abbreviation	These commonly	v used abbreviations may	or may not be	present in this report.
ADDIEVIALIOII	THESE COMMISSION	/ useu abbievialions may	y OI IIIay IIOL De	present in tins repor

Eisted 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

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Case Narrative

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-133264-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-133264-1

REVISION

The report being provided is a revision of the original report sent on 7/10/2023. The report (revision 1) is being revised due to results for silica (SiO2) are now included. Results for Silver (Ag) are removed.

Receipt

The samples were received on 7/5/2023 3:02 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 0.7°C

HPLC/IC

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

Metals

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

Job ID: 410-133264-1

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Detection Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-133264-1

Client Sample ID: MW-7B NaHCO3 Week 2

Lab Sample ID: 410-133264-1

Analyte	Result Qu	ualifier RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1020	750	250	mg/L	500	_	EPA 300.0 R2.1	Total/NA
Chloride	5.73 J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0635	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	51.1	1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	1.96 J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	229000	1030	515	ug/L	10		6020B	Dissolved
Cobalt	23.5	0.515	0.161	ug/L	1		6020B	Dissolved
Iron	22.8 J	51.5	20.6	ug/L	1		6020B	Dissolved
Magnesium	79200	51.5	16.5	ug/L	1		6020B	Dissolved
Manganese	7580	20.6	9.79	ug/L	10		6020B	Dissolved
Molybdenum	0.638	0.515	0.134	ug/L	1		6020B	Dissolved
Potassium	23700	206	67.0	ug/L	1		6020B	Dissolved
Sodium	42600	2060	927	ug/L	10		6020B	Dissolved

Client Sample ID: MW-7C MF3 Week 2

Lab Sample ID: 410-133264-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0370	J	0.0515	0.0113	mg/L	1	_	6010D	Dissolved
SiO2	1.49		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	2.70		2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	323000		10300	5150	ug/L	100		6020B	Dissolved
Cobalt	0.679		0.515	0.161	ug/L	1		6020B	Dissolved
Iron	342		51.5	20.6	ug/L	1		6020B	Dissolved
Magnesium	96500		5150	1650	ug/L	100		6020B	Dissolved
Manganese	54.6		2.06	0.979	ug/L	1		6020B	Dissolved
Molybdenum	0.209	J	0.515	0.134	ug/L	1		6020B	Dissolved
Potassium	22000		206	67.0	ug/L	1		6020B	Dissolved
Selenium	1.09		1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	43500		20600	9270	ug/L	100		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-133264-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7B NaHCO3 Week 2

Date Collected: 07/03/23 08:30 Date Received: 07/05/23 15:02 Lab Sample ID: 410-133264-1

Matrix: Water

Analyte	Result Qual	lifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450	1.00	0.450	mg/L			07/06/23 09:32	5
Sulfate	1020	750	250	mg/L			07/06/23 19:25	500
Chloride	5.73 J	7.50	3.00	mg/L			07/06/23 09:32	5

Method: SW846 6010D	- Metals (ICP) - Dissolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0635	0.0515	0.0113	mg/L		07/06/23 05:48	07/07/23 16:48	1
SiO2	51.1	1.10	0.117	mg/L		07/06/23 05:48	07/07/23 16:48	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.96	J	2.06	0.700	ug/L		07/06/23 05:48	07/07/23 07:40	1
Calcium	229000		1030	515	ug/L		07/06/23 05:48	07/07/23 10:02	10
Cobalt	23.5		0.515	0.161	ug/L		07/06/23 05:48	07/07/23 07:40	1
Iron	22.8	J	51.5	20.6	ug/L		07/06/23 05:48	07/07/23 07:40	1
Magnesium	79200		51.5	16.5	ug/L		07/06/23 05:48	07/07/23 07:40	1
Manganese	7580		20.6	9.79	ug/L		07/06/23 05:48	07/07/23 10:02	10
Molybdenum	0.638		0.515	0.134	ug/L		07/06/23 05:48	07/07/23 07:40	1
Potassium	23700		206	67.0	ug/L		07/06/23 05:48	07/07/23 07:40	1
Selenium	<0.286		1.03	0.286	ug/L		07/06/23 05:48	07/07/23 07:40	1
Sodium	42600		2060	927	ug/L		07/06/23 05:48	07/07/23 10:02	10

Client Sample ID: MW-7C MF3 Week 2

Date Collected: 07/03/23 08:45 Date Received: 07/05/23 15:02 Lab Sample ID: 410-133264-2 **Matrix: Water**

Method: SW846 6010D - Metals (ICP) - Dissolved										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Lithium	0.0370	J	0.0515	0.0113	mg/L		07/06/23 05:48	07/07/23 16:51	1	
SiO2	1.49		1.10	0.117	mg/L		07/06/23 05:48	07/07/23 16:51	1	

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.70		2.06	0.700	ug/L		07/06/23 05:48	07/07/23 07:42	1
Calcium	323000		10300	5150	ug/L		07/06/23 05:48	07/07/23 10:04	100
Cobalt	0.679		0.515	0.161	ug/L		07/06/23 05:48	07/07/23 07:42	1
Iron	342		51.5	20.6	ug/L		07/06/23 05:48	07/07/23 07:42	1
Magnesium	96500		5150	1650	ug/L		07/06/23 05:48	07/07/23 10:04	100
Manganese	54.6		2.06	0.979	ug/L		07/06/23 05:48	07/07/23 07:42	1
Molybdenum	0.209	J	0.515	0.134	ug/L		07/06/23 05:48	07/07/23 07:42	1
Potassium	22000		206	67.0	ug/L		07/06/23 05:48	07/07/23 07:42	1
Selenium	1.09		1.03	0.286	ug/L		07/06/23 05:48	07/07/23 07:42	1
Sodium	43500		20600	9270	ug/L		07/06/23 05:48	07/07/23 10:04	100

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-133264-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-393923/5

Matrix: Water

Analysis Batch: 393923

Analyte

Fluoride

Chloride

Client Sample ID: Method Blank **Prep Type: Total/NA**

MB MB Result Qualifier RL **MDL** Unit Analyzed Dil Fac D Prepared 0.200 <0.0900 0.0900 mg/L 07/06/23 08:54 < 0.600 1.50 0.600 mg/L 07/06/23 08:54

Lab Sample ID: LCS 410-393923/3 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 393923

Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits 90 - 110 Fluoride 0.750 0.7159 mg/L 95 Chloride 3.00 100 90 - 110 3.014 mg/L

Lab Sample ID: LCSD 410-393923/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 393923

Spike LCSD LCSD %Rec **RPD** Added Result Qualifier %Rec RPD Analyte Unit D Limits Limit Fluoride 0.750 0.7150 95 90 - 110 0 20 mg/L Chloride 3 00 3 013 100 90 - 110 mg/L 0 20

Lab Sample ID: MB 410-394337/5 Client Sample ID: Method Blank **Matrix: Water Prep Type: Total/NA**

Analysis Batch: 394337

MB MB

Analyte Result Qualifier RL **MDL** Unit D Prepared Analyzed Dil Fac Sulfate <0.500 1.50 0.500 mg/L 07/06/23 15:33

Lab Sample ID: LCS 410-394337/3 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 394337

Spike LCS LCS %Rec Added Result Qualifier Analyte Unit D %Rec Limits 7.50 7.120 90 - 110 Sulfate mg/L 95

Lab Sample ID: LCSD 410-394337/4 Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA

Matrix: Water

Analysis Batch: 394337

Spike LCSD LCSD %Rec **RPD** Added Result Qualifier Limits **RPD Analyte** Unit %Rec Limit Sulfate 7.50 7.025 94 90 - 110 mg/L

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-393950/1-A Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 394804

MB MB RL **MDL** Unit Dil Fac **Analyte** Result Qualifier Analyzed Prepared Lithium <0.0113 0.0515 0.0113 mg/L 07/06/23 05:48 07/07/23 16:11 SiO2 < 0.117 07/06/23 05:48 07/07/23 16:11 1.10 0.117 mg/L

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Prep Batch: 393950

QC Sample Results

Client: Terra Systems Inc Job ID: 410-133264-1

Spike

Added

0.500

Project/Site: Stantec CCR AP2 Columns

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: LCS 410-393950/2-A

Matrix: Water

Analysis Batch: 394804

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 393950

%Rec Limits 101 80 - 120

Client Sample ID: Method Blank

D %Rec

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-393950/1-A

Matrix: Water

Analyte

Lithium

Analysis Batch: 394643

Prep Type: Total/NA

Unit

mg/L

LCS LCS

0.5053

Result Qualifier

Prep Batch: 393950

MB MB Analyte Result Qualifier RL **MDL** Unit Prepared Analyzed Dil Fac <0.700 2.06 0.700 ug/L Arsenic 07/06/23 05:48 07/07/23 06:52 Calcium 07/06/23 05:48 07/07/23 06:52 <51.5 103 51.5 ug/L Cobalt < 0.161 0.515 0.161 ug/L 07/06/23 05:48 07/07/23 06:52 Iron <20.6 51.5 20.6 ug/L 07/06/23 05:48 07/07/23 06:52 07/06/23 05:48 07/07/23 06:52 Magnesium <16.5 51.5 16.5 ug/L Manganese < 0.979 2.06 0.979 ug/L 07/06/23 05:48 07/07/23 06:52 Molybdenum 0.134 ug/L 07/06/23 05:48 07/07/23 06:52 < 0.134 0.515 Potassium <67.0 206 67.0 ug/L 07/06/23 05:48 07/07/23 06:52 Selenium 1.03 0.286 ug/L 07/06/23 05:48 07/07/23 06:52 < 0.286 07/06/23 05:48 07/07/23 06:52 Sodium <92.7 206 92.7 ug/L

Lab Sample ID: LCS 410-393950/2-A

Matrix: Water

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Analysis Batch: 394643							Prep Batch: 393950
	Spike	LCS	LCS				%Rec
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits
Arsenic	500	498.6		ug/L		100	85 - 120
Calcium	5000	4881		ug/L		98	85 - 120
Cobalt	500	480.7		ug/L		96	90 - 113
Iron	5000	4955		ug/L		99	88 - 119
Magnesium	5000	4875		ug/L		98	90 - 112
Manganese	500	489.0		ug/L		98	89 - 120
Molybdenum	50.0	49.98		ug/L		100	85 - 115
Potassium	5000	4886		ug/L		98	90 - 112
Selenium	100	99.74		ug/L		100	80 - 120
Sodium	5000	4856		ug/L		97	89 - 112

QC Association Summary

Client: Terra Systems Inc Job ID: 410-133264-1

Project/Site: Stantec CCR AP2 Columns

HPLC/IC

Analysis Batch: 393923

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133264-1	MW-7B NaHCO3 Week 2	Total/NA	Water	EPA 300.0 R2.1	
MB 410-393923/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-393923/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-393923/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 394337

Lab Sample ID 410-133264-1	Client Sample ID MW-7B NaHCO3 Week 2	Prep Type Total/NA	Matrix Water	Method EPA 300.0 R2.1	Prep Batch
MB 410-394337/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-394337/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-394337/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Metals

Prep Batch: 393950

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133264-1	MW-7B NaHCO3 Week 2	Dissolved	Water	Non-Digest Prep	
410-133264-2	MW-7C MF3 Week 2	Dissolved	Water	Non-Digest Prep	
MB 410-393950/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-393950/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 394643

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133264-1	MW-7B NaHCO3 Week 2	Dissolved	Water	6020B	393950
410-133264-1	MW-7B NaHCO3 Week 2	Dissolved	Water	6020B	393950
410-133264-2	MW-7C MF3 Week 2	Dissolved	Water	6020B	393950
410-133264-2	MW-7C MF3 Week 2	Dissolved	Water	6020B	393950
MB 410-393950/1-A	Method Blank	Total/NA	Water	6020B	393950
LCS 410-393950/2-A	Lab Control Sample	Total/NA	Water	6020B	393950

Analysis Batch: 394804

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133264-1	MW-7B NaHCO3 Week 2	Dissolved	Water	6010D	393950
410-133264-2	MW-7C MF3 Week 2	Dissolved	Water	6010D	393950
MB 410-393950/1-A	Method Blank	Total/NA	Water	6010D	393950
LCS 410-393950/2-A	Lab Control Sample	Total/NA	Water	6010D	393950

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Lab Chronicle

Client: Terra Systems Inc Job ID: 410-133264-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7B NaHCO3 Week 2

Lab Sample ID: 410-133264-1 Date Collected: 07/03/23 08:30 **Matrix: Water**

Date Received: 07/05/23 15:02

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		500	394337	L4QM	ELLE	07/06/23 19:25
Total/NA	Analysis	EPA 300.0 R2.1		5	393923	L4QM	ELLE	07/06/23 09:32
Dissolved	Prep	Non-Digest Prep			393950	UAMX	ELLE	07/06/23 05:48
Dissolved	Analysis	6010D		1	394804	T8CQ	ELLE	07/07/23 16:48
Dissolved	Prep	Non-Digest Prep			393950	UAMX	ELLE	07/06/23 05:48
Dissolved	Analysis	6020B		1	394643	F7JF	ELLE	07/07/23 07:40
Dissolved	Prep	Non-Digest Prep			393950	UAMX	ELLE	07/06/23 05:48
Dissolved	Analysis	6020B		10	394643	F7JF	ELLE	07/07/23 10:02

Client Sample ID: MW-7C MF3 Week 2

Lab Sample ID: 410-133264-2 Date Collected: 07/03/23 08:45 **Matrix: Water**

Date Received: 07/05/23 15:02

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep	_		393950	UAMX	ELLE	07/06/23 05:48
Dissolved	Analysis	6010D		1	394804	T8CQ	ELLE	07/07/23 16:51
Dissolved	Prep	Non-Digest Prep			393950	UAMX	ELLE	07/06/23 05:48
Dissolved	Analysis	6020B		1	394643	F7JF	ELLE	07/07/23 07:42
Dissolved	Prep	Non-Digest Prep			393950	UAMX	ELLE	07/06/23 05:48
Dissolved	Analysis	6020B		100	394643	F7JF	ELLE	07/07/23 10:04

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-133264-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date	
A2LA	Dept. of Defense ELAP	0001.01	11-30-24	
A2LA	ISO/IEC 17025	0001.01	11-30-24	
Alabama	State	43200	01-31-24	
Alaska	State	PA00009	06-30-24	
Alaska (UST)	State	17-027	02-28-24	
Arizona	State	AZ0780	03-12-24	
Arkansas DEQ	State	88-00660	08-09-23	
California	State	2792	11-30-23	
Colorado	State	PA00009	06-30-24	
Connecticut	State	PH-0746	06-30-25	
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24	
Delaware (DW)	State	N/A	01-31-24	
Florida	NELAP	E87997	06-30-24	
Georgia (DW)	State	C048	01-31-24	
Hawaii	State	N/A	01-31-24	
Illinois	NELAP	200027	01-31-24	
lowa	State	361	03-01-24	
Kansas	NELAP	E-10151	10-31-23	
Kentucky (DW)	State	KY90088	12-31-23	
Kentucky (UST)	State	0001.01	11-30-24	
Kentucky (WW)	State	KY90088	12-31-23	
Louisiana (All)	NELAP	02055	06-30-24	
Maine	State	2019012	03-12-25	
Maryland	State	100	06-30-24	
Massachusetts	State	M-PA009	06-30-24	
Michigan	State	9930	01-31-24	
Minnesota	NELAP	042-999-487	12-31-23	
Mississippi	State	023	01-31-24	
Missouri	State	450	01-31-25	
Montana (DW)	State	0098	01-01-24	
Nebraska	State	NE-OS-32-17	01-01-24	
New Hampshire	NELAP	2730	01-31-24	
New Trampshire New Jersey	NELAP	PA011	06-30-24	
New York	NELAP	10670	04-01-24	
North Carolina (DW)	State	42705 521	07-31-23	
North Carolina (WW/SW)	State	521	12-31-23 01-31-24	
North Dakota	State	R-205		
Oklahoma Oragan	NELAP	9804 PA 200004	08-31-23	
Oregon	NELAP	PA200001	09-11-23	
PALA	Canada	1978	09-16-24	
Pennsylvania	NELAP	36-00037	01-31-24	
Rhode Island	State	LAO00338	12-31-23	
South Carolina -	State	89002	01-31-24	
Tennessee -	State	02838	01-31-24	
Texas	NELAP	T104704194-23-46	08-31-23	
USDA	US Federal Programs	525-22-298-19481	10-25-25	
Vermont	State	VT - 36037	10-28-23	
Virginia	NELAP	460182	06-14-24	
Washington	State	C457	04-11-24	
West Virginia (DW)	State	9906 C	12-31-23	

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Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-133264-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	uthority Program		Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Laboratory Method **Method Description** Protocol EPA 300.0 R2.1 Anions, Ion Chromatography EPA ELLE 6010D Metals (ICP) SW846 **ELLE** 6020B Metals (ICP/MS) SW846 **ELLE** Non-Digest Prep Preparation, Non-Digested Aqueous Metals EPA ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Job ID: 410-133264-1

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Sample Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

 Lab Sample ID
 Client Sample ID
 Matrix
 Collected
 Received

 410-133264-1
 MW-7B NaHCO3 Week 2
 Water
 07/03/23 08:30
 07/05/23 15:02

 410-133264-2
 MW-7C MF3 Week 2
 Water
 07/03/23 08:45
 07/05/23 15:02

Job ID: 410-133264-1

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Environmental



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Acct. #_

410-133264 Chain of Custody	'Chair

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Client: Terra Systems, Inc.						Matrix					Α	nalyse	s Req	ueste	d			For Lab U	se Only
Project Name/#: Stantec CCR AP2 Columns	Site ID #:	Macon, GA									F	reserv	ation	Code	s			SF #:	
Project Manager: Michael D. Lee	P.O. #:	222566-7-3	-23		Tissue	nud ace			N	N	N							SCR #:	
Sampler: Michael D. Lee	PWSID#:				Œ	Ground Surface		yı	-,	e, Si								Preserva	tion Codes
Phone #: 302-798-9553	Quote #:	410118	18		닡			iner	, X	va, Se,								H = HCI	T = Thiosulfate
State where samples were collected: GA For 0	Compliance:	Yes 🗌	No	1	Sediment	ble		onta	Ca, Co, Fe, K. Li	Mo. h								N = HNO ₃	B = NaOH
	Collec	ction		Composite		Potable NPDES	:10	Total # of Containers	As,	Dis (fil) Mg, Mn, Mo, Na,	SO4							S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄
Sample Identification	Date	Time	Grab	Соп	Soil	Water	Other:	Tota	Dis (fil)	Dis (fi	CI, F,		1					Ren	narks
MW-7B NaHCO3 Week 2	7/3/2023	8:30		Х		Х		2	Х	Х	Х								
MW-7C MF3 Week 2	7/3/2023	8:45		X		Х		1	Х	Х									
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Turnaround Time Requested (TAT) (please chec			Rus	h 🗌		nquished		00		1 .	ate	Time	_ _	eived	by:	ے در		Date	Time
(Rush TAT is subject to laboratory ap	proval and surcha	irges.)				Nicka		Va	Q		13	10.40		200	-14		4	7/5/23	
Date results are needed: 7/19/23						inquished	Dy:	0		j	ate 	Time		eived	Dy:			Dáte	Time
Rush results requested by (please check): E-M	lail 🗹	Phon	ie [7/5	_	150		- t d	h		_	D-4-	
E-mail Address: <u>mlee@terrasystems.net</u>					Rei	inquished	Dy:			Da	ate	Time	Red	eived	Dy:		- 1	Date	Time
Phone: 302-798-9553								<u></u>	_	_	- A -	771		-11	To a second		\longrightarrow	-	-
Data Package Options (please check if required)				Rei	inquished	by:			Di	ate	Time	Rec	eived	by:			Date	Time
Type I (Validation/non-CLP)					<u>_</u>					_	_								
Type III (Reduced non-CLP) CT RCP					Rel	inquished	by:			Di	ate	Time	Rec	eived	Dy:			Date	Time
Type VI (Raw Data Only) TX TRR					_								1	the	- A			71512-3	1500
	Category	☐ A or		В	Rel	inquished	by C	omme	ercial	Carrie	er:		0					12/10	
EDD Required? Yes No 🗸 If ye	es, format:				UPS	S	Fed	Ξx		Other			Ten	nperat	ure u	pon re	ceipt	0.7/0.7	°C

Eurofins Lancaster Laboratories Environmental, LLC • 2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300

Client: Terra Systems Inc Job Number: 410-133264-1

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC Login Number: 133264

List Number: 1

Creator: Arroyo, Haley

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	Not present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
MV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
NV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
s the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

JOB DESCRIPTION

Generated 7/21/2023 12:38:33 PM

Stantec CCR AP2 Columns

JOB NUMBER

410-133750-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike Lancaster PA 17601

EOI

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 7/21/2023 12:38:33 PM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Marrissa Williams

7/21/2023

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns Laboratory Job ID: 410-133750-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Qualifiers

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 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.

Metals

Qualifier Description

^2 Calibration Blank (ICB and/or CCB) is outside acceptance limits.

J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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

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Case Narrative

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-133750-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-133750-1

Receipt

The samples were received on 7/7/2023 4:35 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 0.6°C

HPLC/IC

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

Metals

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

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-133750-1

Client Sample ID: MW-7I Influent Week 3

Lab Sample ID: 410-133750-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac I	D Method	Prep Type
Sulfate	998		300	100	mg/L	200	EPA 300.0 R2.1	Total/NA
Chloride	5.54	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Calcium	293		0.515	0.237	mg/L	1	6010D	Dissolved
Lithium	0.0549		0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	70.2		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.756	J	2.06	0.700	ug/L	1	6020B	Dissolved
Cobalt	44.8		0.515	0.161	ug/L	1	6020B	Dissolved
Iron	95.9		51.5	20.6	ug/L	1	6020B	Dissolved
Magnesium	78100		51.5	16.5	ug/L	1	6020B	Dissolved
Manganese	12700		20.6	9.79	ug/L	10	6020B	Dissolved
Molybdenum	0.341	J	0.515	0.134	ug/L	1	6020B	Dissolved
Potassium	9310		206	67.0	ug/L	1	6020B	Dissolved
Sodium	28500		206	92.7	ug/L	1	6020B	Dissolved

Client Sample ID: MW-7A Control Week 3

Lab Sample ID: 410-133750-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	995		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	5.63	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Calcium	289		0.515	0.237	mg/L	1		6010D	Dissolved
Lithium	0.0756		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	57.1		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	2.99		2.06	0.700	ug/L	1		6020B	Dissolved
Cobalt	36.7		0.515	0.161	ug/L	1		6020B	Dissolved
Iron	98.5		51.5	20.6	ug/L	1		6020B	Dissolved
Magnesium	79800		51.5	16.5	ug/L	1		6020B	Dissolved
Manganese	12400		20.6	9.79	ug/L	10		6020B	Dissolved
Molybdenum	1.52		0.515	0.134	ug/L	1		6020B	Dissolved
Potassium	33300		206	67.0	ug/L	1		6020B	Dissolved
Sodium	35000		206	92.7	ug/L	1		6020B	Dissolved

Client Sample ID: MW-7B NaHCO3 Week 13

Lab Sample ID: 410-133750-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1100		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	5.70	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Calcium	311		0.515	0.237	mg/L	1		6010D	Dissolved
Lithium	0.0747		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	52.0		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	1.31	J	2.06	0.700	ug/L	1		6020B	Dissolved
Cobalt	19.2		0.515	0.161	ug/L	1		6020B	Dissolved
Iron	30.9	J	51.5	20.6	ug/L	1		6020B	Dissolved
Magnesium	81100		51.5	16.5	ug/L	1		6020B	Dissolved
Manganese	9230		20.6	9.79	ug/L	10		6020B	Dissolved
Molybdenum	0.757		0.515	0.134	ug/L	1		6020B	Dissolved
Potassium	28900		206	67.0	ug/L	1		6020B	Dissolved
Sodium	37300		206	92.7	ug/L	1		6020B	Dissolved

Client Sample ID: MW-7C MF3 Week 3

Lab Sample ID: 410-133750-4

Analyte	Result Qualit	tier RL	MDL	Unit	Dil Fac	D	Method	Prep Type	
Sulfate	1140	300	100	ma/L	200		EPA 300.0 R2.1	Total/NA	

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7C MF3 Week 3 (Continued)

Lab Sample ID: 410-133750-4

Job ID: 410-133750-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	5.96	J	7.50	3.00	mg/L	5	_	EPA 300.0 R2.1	Total/NA
Calcium	294		0.515	0.237	mg/L	1		6010D	Dissolved
Lithium	0.0402	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	0.847	J	1.10	0.117	mg/L	1		6010D	Dissolved
Cobalt	0.246	J	0.515	0.161	ug/L	1		6020B	Dissolved
Iron	36.1	J	51.5	20.6	ug/L	1		6020B	Dissolved
Magnesium	94000		258	82.4	ug/L	5		6020B	Dissolved
Manganese	70.7	^2	2.06	0.979	ug/L	1		6020B	Dissolved
Potassium	14900		206	67.0	ug/L	1		6020B	Dissolved
Selenium	1.01	J	1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	35600		206	92.7	ug/L	1		6020B	Dissolved

Client Sample ID: MW-8I Influent Week 3

Lab Sample ID: 410-133750-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Sulfate	110		30.0	10.0	mg/L		EPA 300.0 R2.1	Total/NA
Chloride	5.51	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Calcium	74.0		0.515	0.237	mg/L	1	6010D	Dissolved
SiO2	29.7		1.10	0.117	mg/L	1	6010D	Dissolved
Cobalt	4.50		0.515	0.161	ug/L	1	6020B	Dissolved
Magnesium	30100		51.5	16.5	ug/L	1	6020B	Dissolved
Manganese	383	^2	2.06	0.979	ug/L	1	6020B	Dissolved
Molybdenum	166		0.515	0.134	ug/L	1	6020B	Dissolved
Potassium	5950		206	67.0	ug/L	1	6020B	Dissolved
Sodium	17600		206	92.7	ug/L	1	6020B	Dissolved

Client Sample ID: MW-8A Control Week 3

Lab Sample ID: 410-133750-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	110		30.0	10.0	mg/L		_	EPA 300.0 R2.1	Total/NA
Chloride	5.76	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Calcium	65.2		0.515	0.237	mg/L	1		6010D	Dissolved
SiO2	19.6		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	1.85	J	2.06	0.700	ug/L	1		6020B	Dissolved
Cobalt	0.246	J	0.515	0.161	ug/L	1		6020B	Dissolved
Iron	30.3	J	51.5	20.6	ug/L	1		6020B	Dissolved
Magnesium	32700		51.5	16.5	ug/L	1		6020B	Dissolved
Manganese	67.3	^2	2.06	0.979	ug/L	1		6020B	Dissolved
Molybdenum	150		0.515	0.134	ug/L	1		6020B	Dissolved
Potassium	8990		206	67.0	ug/L	1		6020B	Dissolved
Selenium	0.427	J	1.03	0.286	ug/L	1		6020B	Dissolved
Sodium	18100		206	92.7	ug/L	1		6020B	Dissolved

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 3

Lab Sample ID: 410-133750-7

7/21/2023

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	111		30.0	10.0	mg/L	20	_	EPA 300.0 R2.1	Total/NA
Chloride	6.06	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Calcium	62.2		0.515	0.237	mg/L	1		6010D	Dissolved
Lithium	0.0147	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	7.60		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.930	J	2.06	0.700	ug/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Detection Summary

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 3 (Continued)

Lab Sample ID: 410-133750-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cobalt	0.171	J	0.515	0.161	ug/L	1	_	6020B	Dissolved
Iron	31.5	J	51.5	20.6	ug/L	1		6020B	Dissolved
Magnesium	31500		51.5	16.5	ug/L	1		6020B	Dissolved
Manganese	55.5	^2	2.06	0.979	ug/L	1		6020B	Dissolved
Molybdenum	31.5		0.515	0.134	ug/L	1		6020B	Dissolved
Potassium	12500		206	67.0	ug/L	1		6020B	Dissolved
Sodium	37100		206	92.7	ug/L	1		6020B	Dissolved

Client Sample ID: MW-8C MF3 Week 3

Lab Sample ID: 410-133750-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Sulfate	340		75.0	25.0	mg/L	50	EPA 300.0 R2.1	Total/NA
Chloride	6.06	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Calcium	42.8		0.515	0.237	mg/L	1	6010D	Dissolved
Lithium	0.0116	J	0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	2.59		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	1.06	J	2.06	0.700	ug/L	1	6020B	Dissolved
Cobalt	0.180	J	0.515	0.161	ug/L	1	6020B	Dissolved
Iron	42.9	J	51.5	20.6	ug/L	1	6020B	Dissolved
Magnesium	43800		51.5	16.5	ug/L	1	6020B	Dissolved
Manganese	14.9		2.06	0.979	ug/L	1	6020B	Dissolved
Molybdenum	0.444	J	0.515	0.134	ug/L	1	6020B	Dissolved
Potassium	6710		206	67.0	ug/L	1	6020B	Dissolved
Sodium	17800		206	92.7	ug/L	1	6020B	Dissolved

This Detection Summary does not include radiochemical test results.

7/21/2023

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Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7I Influent Week 3

Lab Sample ID: 410-133750-1 Date Collected: 07/07/23 09:00 Matrix: Water

Date Received: 07/07/23 16:35

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/10/23 21:29	5
Sulfate	998		300	100	mg/L			07/11/23 20:49	200
Chloride	5.54	J	7.50	3.00	mg/L			07/10/23 21:29	5
Method: SW846 6010D - I	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	293		0.515	0.237	mg/L		07/10/23 14:31	07/12/23 21:46	1
Lithium	0.0549		0.0515	0.0113	mg/L		07/10/23 14:31	07/12/23 21:46	1
				0.447			07/10/00 1101	07/40/00 04 40	
SiO2	70.2		1.10	0.117	mg/L		07/10/23 14:31	07/12/23 21:46	1
SiO2 : Method: SW846 6020B - I		olved	1.10	0.117	mg/L		07/10/23 14:31	07/12/23 21:46	1
	Metals (ICP/MS) - Diss	<mark>olved</mark> Qualifier	1.10 RL	0.11 <i>7</i>	J	D	07/10/23 14:31 Prepared	07/12/23 21:46 Analyzed	1 Dil Fac
 Method: SW846 6020B 	Metals (ICP/MS) - Diss	Qualifier			Unit	<u>D</u>			·
Method: SW846 6020B - I Analyte	Metals (ICP/MS) - Disse Result	Qualifier	RL	MDL	Unit ug/L	<u>D</u>	Prepared	Analyzed	·
Method: SW846 6020B - Analyte Arsenic	Metals (ICP/MS) - Disse Result 0.756	Qualifier	RL 2.06	MDL 0.700 0.161	Unit ug/L	<u>D</u>	Prepared 07/10/23 14:31	Analyzed 07/12/23 19:36	Dil Fac
Method: SW846 6020B - Analyte Arsenic Cobalt	Metals (ICP/MS) - Disso Result 0.756 44.8	Qualifier	RL 2.06 0.515	MDL 0.700 0.161 20.6	Unit ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:36 07/12/23 19:36	Dil Fac
Method: SW846 6020B - Analyte Arsenic Cobalt Iron	Metals (ICP/MS) - Disson Result 0.756 44.8 95.9	Qualifier	RL 2.06 0.515 51.5	MDL 0.700 0.161 20.6	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:36 07/12/23 19:36 07/12/23 19:36	Dil Fac 1 1 1
Method: SW846 6020B - Analyte Arsenic Cobalt Iron Magnesium Manganese	Metals (ICP/MS) - Dissa Result 0.756 44.8 95.9 78100	Qualifier J	2.06 0.515 51.5	MDL 0.700 0.161 20.6 16.5	Unit ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:36 07/12/23 19:36 07/12/23 19:36 07/12/23 19:36	Dil Fac 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Cobalt Iron Magnesium Manganese Molybdenum	Metals (ICP/MS) - Dissa Result 0.756 44.8 95.9 78100 12700	Qualifier J	2.06 0.515 51.5 51.5 20.6	MDL 0.700 0.161 20.6 16.5 9.79 0.134	Unit ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:36 07/12/23 19:36 07/12/23 19:36 07/12/23 20:49	Dil Fac 1 1 1 1 1 1 10
Method: SW846 6020B - Analyte Arsenic Cobalt Iron Magnesium	Metals (ICP/MS) - Dissa Result 0.756 44.8 95.9 78100 12700 0.341	Qualifier J	2.06 0.515 51.5 51.5 20.6 0.515	MDL 0.700 0.161 20.6 16.5 9.79 0.134	Unit ug/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:36 07/12/23 19:36 07/12/23 19:36 07/12/23 20:49 07/12/23 19:36	Dil Fac 1 1 1 1 1 10 1

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Sodium

Client Sample ID: MW-7A Control Week 3	Lab Sample ID: 410-133750-2
Pate Collected: 07/07/23 09:15	Matrix: Water
Pate Received: 07/07/23 16:35	

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/10/23 21:54	5
Sulfate	995		300	100	mg/L			07/11/23 21:02	200
Chloride	5.63	J	7.50	3.00	mg/L			07/10/23 21:54	5
Method: SW846 6010D - I	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	289		0.515	0.237	mg/L		07/10/23 14:31	07/12/23 21:40	1
Lithium	0.0756		0.0515	0.0113	mg/L		07/10/23 14:31	07/12/23 21:40	1
SiO2	57.1		1.10	0.117	mg/L		07/10/23 14:31	07/12/23 21:40	1
-									-
: Method: SW846 6020B - I	Metals (ICP/MS) - Diss	olved							
Method: SW846 6020B - I Analyte	• •	olved Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Analyte	• •			MDL 0.700	Unit ug/L	<u>D</u>	Prepared 07/10/23 14:31	Analyzed 07/12/23 19:32	Dil Fac
	Result				ug/L	<u>D</u>			Dil Fac
Analyte Arsenic	Result 2.99		2.06	0.700 0.161	ug/L	<u>D</u>	07/10/23 14:31	07/12/23 19:32	Dil Fac 1 1 1
Analyte Arsenic Cobalt	Result 2.99 36.7		2.06 0.515	0.700 0.161 20.6	ug/L ug/L	<u>D</u>	07/10/23 14:31 07/10/23 14:31	07/12/23 19:32 07/12/23 19:32	Dil Fac 1 1 1
Analyte Arsenic Cobalt Iron	Result 2.99 36.7 98.5		2.06 0.515 51.5	0.700 0.161 20.6 16.5	ug/L ug/L ug/L	<u>D</u>	07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	07/12/23 19:32 07/12/23 19:32 07/12/23 19:32	1 1 1 1
Analyte Arsenic Cobalt Iron Magnesium	Result 2.99 36.7 98.5 79800		2.06 0.515 51.5 51.5	0.700 0.161 20.6 16.5	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	07/12/23 19:32 07/12/23 19:32 07/12/23 19:32 07/12/23 19:32	Dil Fac 1 1 1 1 1 1 1 10 1
Analyte Arsenic Cobalt Iron Magnesium Manganese	Result 2.99 36.7 98.5 79800 12400		2.06 0.515 51.5 51.5 20.6	0.700 0.161 20.6 16.5 9.79 0.134	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	07/12/23 19:32 07/12/23 19:32 07/12/23 19:32 07/12/23 19:32 07/12/23 20:47	1 1 1 1

Eurofins Lancaster Laboratories Environment Testing, LLC

07/10/23 14:31

206

92.7 ug/L

35000

07/12/23 19:32

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7B NaHCO3 Week 13

Lab Sample ID: 410-133750-3 Date Collected: 07/07/23 09:30 Matrix: Water

Date Received: 07/07/23 16:35

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/10/23 22:20	5
Sulfate	1100		300	100	mg/L			07/11/23 19:12	200
Chloride	5.70	J	7.50	3.00	mg/L			07/10/23 22:20	5
Method: SW846 6010D - I	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	311		0.515	0.237	mg/L		07/10/23 14:31	07/12/23 21:50	1
Lithium	0.0747		0.0515	0.0113	mg/L		07/10/23 14:31	07/12/23 21:50	1
0:00	52.0		1.10	0 117	mg/L		07/10/23 14:31	07/12/23 21:50	1
			1.10	0.117	mg/L				
Method: SW846 6020B - I	Metals (ICP/MS) - Diss	olved Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - I Analyte	Metals (ICP/MS) - Diss	Qualifier			Unit	<u>D</u>			Dil Fac
Method: SW846 6020B - I Analyte Arsenic	Metals (ICP/MS) - Disse Result	Qualifier	RL _	MDL	Unit ug/L	<u>D</u>	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - I Analyte Arsenic Cobalt	Metals (ICP/MS) - Diss Result	Qualifier J	RL 2.06	MDL 0.700 0.161	Unit ug/L	<u>D</u>	Prepared 07/10/23 14:31	Analyzed 07/12/23 19:38	Dil Fac 1 1 1
Method: SW846 6020B - I Analyte Arsenic Cobalt Iron	Metals (ICP/MS) - Disso Result 1.31 19.2	Qualifier J	RL 2.06 0.515	MDL 0.700 0.161 20.6	Unit ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:38 07/12/23 19:38	Dil Fac 1 1 1 1
Method: SW846 6020B - I Analyte Arsenic Cobalt Iron Magnesium	Metals (ICP/MS) - Disso Result 1.31 19.2 30.9	Qualifier J	RL 2.06 0.515 51.5	MDL 0.700 0.161 20.6 16.5	Unit ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:38 07/12/23 19:38 07/12/23 19:38	Dil Fac 1 1 1 1 1 1 10
Method: SW846 6020B - I Analyte Arsenic Cobalt Iron Magnesium Manganese	Metals (ICP/MS) - Dissa Result 1.31 19.2 30.9 81100	Qualifier J	2.06 0.515 51.5	MDL 0.700 0.161 20.6 16.5	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:38 07/12/23 19:38 07/12/23 19:38 07/12/23 19:38	1 1 1 1
Method: SW846 6020B - I Analyte Arsenic Cobalt Iron Magnesium Manganese Molybdenum	Metals (ICP/MS) - Dissa Result 1.31 19.2 30.9 81100 9230	Qualifier J	2.06 0.515 51.5 51.5 20.6	MDL 0.700 0.161 20.6 16.5 9.79 0.134	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:38 07/12/23 19:38 07/12/23 19:38 07/12/23 20:51	1 1 1 1
SiO2 Method: SW846 6020B - I Analyte Arsenic Cobalt Iron Magnesium Manganese Molybdenum Potassium Selenium	Metals (ICP/MS) - Diss Result 1.31 19.2 30.9 81100 9230 0.757	Qualifier J	2.06 0.515 51.5 51.5 20.6 0.515	MDL 0.700 0.161 20.6 16.5 9.79 0.134	ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:38 07/12/23 19:38 07/12/23 19:38 07/12/23 20:51 07/12/23 19:38	1 1 1 1

Client Sample ID: MW-7C MF3 Week 3

Date Collected: 07/07/23 09:45

Date Received: 07/07/23 16:35

Method: EPA 300.0 R2.1 - Anio	ons, Ion Chromato	ography							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/10/23 22:45	5
Sulfate	1140		300	100	mg/L			07/11/23 19:47	200
Chloride	5.96	J	7.50	3.00	mg/L			07/10/23 22:45	5

Method: SW846 6010D - Metals (IC	CP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	294		0.515	0.237	mg/L		07/10/23 14:31	07/12/23 21:37	1
Lithium	0.0402	J	0.0515	0.0113	mg/L		07/10/23 14:31	07/12/23 21:37	1
SiO2	0.847	J	1.10	0.117	mg/L		07/10/23 14:31	07/12/23 21:37	1

5102	0.847	J	1.10	0.117	IIIg/L		07/10/23 14.31	01/12/23 21.37	1
Method: SW846 6020B - Metal	s (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.700		2.06	0.700	ug/L		07/10/23 14:31	07/12/23 19:30	1
Cobalt	0.246	J	0.515	0.161	ug/L		07/10/23 14:31	07/12/23 19:30	1
Iron	36.1	J	51.5	20.6	ug/L		07/10/23 14:31	07/12/23 19:30	1
Magnesium	94000		258	82.4	ug/L		07/10/23 14:31	07/12/23 20:45	5
Manganese	70.7	^2	2.06	0.979	ug/L		07/10/23 14:31	07/12/23 19:30	1
Molybdenum	<0.134		0.515	0.134	ug/L		07/10/23 14:31	07/12/23 19:30	1
Potassium	14900		206	67.0	ug/L		07/10/23 14:31	07/12/23 19:30	1
Selenium	1.01	J	1.03	0.286	ug/L		07/10/23 14:31	07/12/23 19:30	1
Sodium	35600		206	92.7	ug/L		07/10/23 14:31	07/12/23 19:30	1

Lab Sample ID: 410-133750-4

Matrix: Water

Eurofins Lancaster Laboratories Environment Testing, LLC

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8I Influent Week 3

Lab Sample ID: 410-133750-5 Date Collected: 07/07/23 10:00 Matrix: Water

Date Received: 07/07/23 16:35

Method: EPA 300.0 R2.1	- Anions, Ion Chromat	ography							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/10/23 23:11	5
Sulfate	110		30.0	10.0	mg/L			07/10/23 23:49	20
Chloride	5.51	J	7.50	3.00	mg/L			07/10/23 23:11	5
- Method: SW846 6010D -	Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	74.0		0.515	0.237	mg/L		07/10/23 14:31	07/12/23 21:53	1
Lithium	<0.0113		0.0515	0.0113	mg/L		07/10/23 14:31	07/12/23 21:53	1
SiO2	29.7		1.10	0.117	mg/L		07/10/23 14:31	07/12/23 21:53	1
- Method: SW846 6020B -	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.700		2.06	0.700	ug/L		07/10/23 14:31	07/12/23 19:47	1
Cobalt	4.50		0.515	0.161	ug/L		07/10/23 14:31	07/12/23 19:47	1
Iron	<20.6		51.5	20.6	ug/L		07/10/23 14:31	07/12/23 19:47	1
Magnesium	30100		51.5	16.5	ug/L		07/10/23 14:31	07/12/23 19:47	1
Manganese	383	^2	2.06	0.979	ug/L		07/10/23 14:31	07/12/23 19:47	1
Molybdenum	166		0.515	0.134	ug/L		07/10/23 14:31	07/12/23 19:47	1

206

1.03

206

67.0 ug/L

0.286 ug/L

92.7 ug/L

Client Sample ID: MW-8A Control Week 3

5950

<0.286

17600

Date Collected: 07/07/23 10:15

Date Received: 07/07/23 16:35

Potassium

Selenium

Sodium

Lab Sample	ID: 410-133750-6
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07/10/23 14:31

07/10/23 14:31

07/10/23 14:31

Matrix: Water

07/12/23 19:47

07/12/23 19:47

07/12/23 19:47

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/11/23 00:02	5
Sulfate	110		30.0	10.0	mg/L			07/11/23 00:15	20
Chloride	5.76	J	7.50	3.00	mg/L			07/11/23 00:02	5
– Method: SW846 6010D ·	· Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ontologic			0.515	0.227			07/10/02 14:21	07/40/02 04:42	

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	65.2		0.515	0.237	mg/L		07/10/23 14:31	07/12/23 21:43	1
Lithium	<0.0113		0.0515	0.0113	mg/L		07/10/23 14:31	07/12/23 21:43	1
SiO2	19.6		1.10	0.117	mg/L		07/10/23 14:31	07/12/23 21:43	1
Method: SW846 6020B - Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

CP/NS) - DISS	oivea							
Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1.85	J	2.06	0.700	ug/L		07/10/23 14:31	07/12/23 19:34	1
0.246	J	0.515	0.161	ug/L		07/10/23 14:31	07/12/23 19:34	1
30.3	J	51.5	20.6	ug/L		07/10/23 14:31	07/12/23 19:34	1
32700		51.5	16.5	ug/L		07/10/23 14:31	07/12/23 19:34	1
67.3	^2	2.06	0.979	ug/L		07/10/23 14:31	07/12/23 19:34	1
150		0.515	0.134	ug/L		07/10/23 14:31	07/12/23 19:34	1
8990		206	67.0	ug/L		07/10/23 14:31	07/12/23 19:34	1
0.427	J	1.03	0.286	ug/L		07/10/23 14:31	07/12/23 19:34	1
18100		206	92.7	ug/L		07/10/23 14:31	07/12/23 19:34	1
	Result 1.85 0.246 30.3 32700 67.3 150 8990 0.427	67.3 ^2 150 8990 0.427 J	Result Qualifier RL 1.85 J 2.06 0.246 J 0.515 30.3 J 51.5 32700 51.5 51.5 67.3 ^2 2.06 150 0.515 8990 206 0.427 J 1.03	Result Qualifier RL MDL 1.85 J 2.06 0.700 0.246 J 0.515 0.161 30.3 J 51.5 20.6 32700 51.5 16.5 67.3 ^2 2.06 0.979 150 0.515 0.134 8990 206 67.0 0.427 J 1.03 0.286	Result Qualifier RL MDL Unit 1.85 J 2.06 0.700 ug/L 0.246 J 0.515 0.161 ug/L 30.3 J 51.5 20.6 ug/L 32700 51.5 16.5 ug/L 67.3 ^2 2.06 0.979 ug/L 150 0.515 0.134 ug/L 8990 206 67.0 ug/L 0.427 J 1.03 0.286 ug/L	Result Qualifier RL MDL Unit D 1.85 J 2.06 0.700 ug/L 0.246 J 0.515 0.161 ug/L 30.3 J 51.5 20.6 ug/L 32700 51.5 16.5 ug/L 67.3 ^2 2.06 0.979 ug/L 150 0.515 0.134 ug/L 8990 206 67.0 ug/L 0.427 J 1.03 0.286 ug/L	Result Qualifier RL MDL Unit D Prepared 1.85 J 2.06 0.700 ug/L 07/10/23 14:31 0.246 J 0.515 0.161 ug/L 07/10/23 14:31 30.3 J 51.5 20.6 ug/L 07/10/23 14:31 32700 51.5 16.5 ug/L 07/10/23 14:31 67.3 ^2 2.06 0.979 ug/L 07/10/23 14:31 150 0.515 0.134 ug/L 07/10/23 14:31 8990 206 67.0 ug/L 07/10/23 14:31 0.427 J 1.03 0.286 ug/L 07/10/23 14:31	Result Qualifier RL MDL Unit D Prepared Analyzed 1.85 J 2.06 0.700 ug/L 07/10/23 14:31 07/12/23 19:34 0.246 J 0.515 0.161 ug/L 07/10/23 14:31 07/12/23 19:34 30.3 J 51.5 20.6 ug/L 07/10/23 14:31 07/12/23 19:34 32700 51.5 16.5 ug/L 07/10/23 14:31 07/12/23 19:34 67.3 ^2 2.06 0.979 ug/L 07/10/23 14:31 07/12/23 19:34 150 0.515 0.134 ug/L 07/10/23 14:31 07/12/23 19:34 8990 206 67.0 ug/L 07/10/23 14:31 07/12/23 19:34 0.427 J 1.03 0.286 ug/L 07/10/23 14:31 07/12/23 19:34

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7/21/2023

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCI3 NaHCO3 Week 3

Lab Sample ID: 410-133750-7 Date Collected: 07/07/23 10:30 Matrix: Water

Date Received: 07/07/23 16:35

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/11/23 00:28	- 5
Sulfate	111		30.0	10.0	mg/L			07/11/23 00:40	20
Chloride	6.06	J	7.50	3.00	mg/L			07/11/23 00:28	ţ
Method: SW846 6010D - Metals (IG	CP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	62.2		0.515	0.237	mg/L		07/10/23 14:31	07/12/23 21:34	1
Lithium	0.0147	J	0.0515	0.0113	mg/L		07/10/23 14:31	07/12/23 21:34	1
SiO2	7.60		1.10	0.117	mg/L		07/10/23 14:31	07/12/23 21:34	1
SiO2 Method: SW846 6020B - Metals (IO		olved	1.10	0.117	mg/L		07/10/23 14:31	07/12/23 21:34	1
Method: SW846 6020B - Metals (IG	CP/MS) - Disse	olved Qualifier	1.10 RL	0.117 MDL	_	D	07/10/23 14:31 Prepared	07/12/23 21:34 Analyzed	1 Dil Fac
Method: SW846 6020B - Metals (IO Analyte	CP/MS) - Disse	Qualifier			_	<u>D</u>			Dil Fac
Method: SW846 6020B - Metals (IO Analyte Arsenic	CP/MS) - Disse Result	Qualifier J	RL	MDL	Unit	<u>D</u>	Prepared	Analyzed	1 Dil Fac
Method: SW846 6020B - Metals (IO Analyte Arsenic Cobalt	CP/MS) - Disse Result 0.930	Qualifier J J	RL 2.06	MDL 0.700 0.161	Unit ug/L	<u>D</u>	Prepared 07/10/23 14:31	Analyzed 07/12/23 19:28	1 Dil Fac
Method: SW846 6020B - Metals (IO Analyte Arsenic Cobalt Iron	CP/MS) - Diss Result 0.930 0.171	Qualifier J J	RL 2.06 0.515	MDL 0.700 0.161	Unit ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:28 07/12/23 19:28	Dil Fac 1 1 1
Method: SW846 6020B - Metals (IO Analyte Arsenic Cobalt Iron Magnesium	CP/MS) - Dissa Result 0.930 0.171 31.5 31500	Qualifier J J	2.06 0.515 51.5	MDL 0.700 0.161 20.6	Unit ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:28 07/12/23 19:28 07/12/23 19:28	Dil Fac 1 1 1 1
Method: SW846 6020B - Metals (IO Analyte Arsenic Cobalt Iron Magnesium Manganese	CP/MS) - Dissa Result 0.930 0.171 31.5 31500	Qualifier J J J	2.06 0.515 51.5	MDL 0.700 0.161 20.6 16.5	Unit ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:28 07/12/23 19:28 07/12/23 19:28 07/12/23 19:28	1 Dil Fac
Method: SW846 6020B - Metals (IO Analyte Arsenic Cobalt Iron Magnesium Manganese Molybdenum	CP/MS) - Disse Result 0.930 0.171 31.5 31500 55.5	Qualifier J J J	2.06 0.515 51.5 51.5 2.06	MDL 0.700 0.161 20.6 16.5 0.979 0.134	Unit ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:28 07/12/23 19:28 07/12/23 19:28 07/12/23 19:28 07/12/23 19:28	Dil Fac
	CP/MS) - Diss Result 0.930 0.171 31.5 31500 55.5 31.5	Qualifier J J J	2.06 0.515 51.5 51.5 2.06 0.515	MDL 0.700 0.161 20.6 16.5 0.979 0.134	Unit ug/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L	D	Prepared 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31 07/10/23 14:31	Analyzed 07/12/23 19:28 07/12/23 19:28 07/12/23 19:28 07/12/23 19:28 07/12/23 19:28	Dil Face 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Client Sample ID: MW-8C MF3 Week 3

Date Collected: 07/07/23 10:45

Date Received: 07/07/23 16:35

Lab Sample	ID: 410-133750-8
	Matrix: Water

Method: EPA 300.0 R2.1 - A	nions, Ion Chromato	ography							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/11/23 00:53	5
Sulfate	340		75.0	25.0	mg/L			07/11/23 19:58	50
Chloride	6.06	J	7.50	3.00	mg/L			07/11/23 00:53	5

Method: SW846 6010D - Metals (ICI	P) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	42.8		0.515	0.237	mg/L		07/10/23 14:31	07/12/23 21:21	1
Lithium	0.0116	J	0.0515	0.0113	mg/L		07/10/23 14:31	07/12/23 21:21	1
SiO2	2.59		1.10	0.117	mg/L		07/10/23 14:31	07/12/23 21:21	1

	2.59		1.10	0.117	IIIg/L		07/10/23 14.31	01/12/23 21.21	
- Method: SW846 6020B - Meta	ls (ICP/MS) - Disso	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.06	J	2.06	0.700	ug/L		07/10/23 14:31	07/12/23 19:26	1
Cobalt	0.180	J	0.515	0.161	ug/L		07/10/23 14:31	07/12/23 19:26	1
Iron	42.9	J	51.5	20.6	ug/L		07/10/23 14:31	07/12/23 19:26	1
Magnesium	43800		51.5	16.5	ug/L		07/10/23 14:31	07/12/23 19:26	1
Manganese	14.9		2.06	0.979	ug/L		07/10/23 14:31	07/20/23 14:48	1
Molybdenum	0.444	J	0.515	0.134	ug/L		07/10/23 14:31	07/12/23 19:26	1
Potassium	6710		206	67.0	ug/L		07/10/23 14:31	07/12/23 19:26	1
Selenium	<0.286		1.03	0.286	ug/L		07/10/23 14:31	07/12/23 19:26	1
Sodium	17800		206	92.7	ug/L		07/10/23 14:31	07/12/23 19:26	1

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Eurofins Lancaster Laboratories Environment Testing, LLC

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-133750-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-395299/5

MB MB

Matrix: Water

Analysis Batch: 395299

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte Result Qualifier RLMDL Unit D Prepared Analyzed Dil Fac Fluoride <0.0900 0.200 0.0900 mg/L 07/10/23 16:35 Sulfate <0.500 1.50 0.500 mg/L 07/10/23 16:35 Chloride 07/10/23 16:35 < 0.600 1.50 0.600 mg/L

Lab Sample ID: LCS 410-395299/3 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 395299

Spike LCS LCS %Rec Added Analyte Result Qualifier %Rec I imits Unit D Fluoride 0.750 0.7198 mg/L 96 90 - 110 Sulfate 7.50 7.294 mg/L 97 90 - 110 Chloride 3.00 2.972 mg/L 99 90 - 110

Lab Sample ID: LCSD 410-395299/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 395299

RPD Spike LCSD LCSD %Rec Limit Analyte Added Result Qualifier Unit D %Rec Limits RPD Fluoride 0.750 0.7215 mg/L 96 90 - 110 0 20 Sulfate 7.50 7.289 97 90 - 110 mg/L 20 0 Chloride 3.00 2.972 mg/L 99 90 - 110 0 20

Lab Sample ID: MB 410-395641/5 Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Water

Analysis Batch: 395641

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Sulfate <0.500 1.50 0.500 mg/L 07/11/23 12:29

Lab Sample ID: LCS 410-395641/3 **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

Matrix: Water

Analysis Batch: 395641

LCS LCS Spike %Rec Analyte Added Result Qualifier Unit %Rec Limits Sulfate 7.50 7.223 96 90 - 110 mg/L

Lab Sample ID: LCSD 410-395641/4 Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA

Matrix: Water

Analysis Batch: 395641

Spike LCSD LCSD %Rec RPD Analyte Added Result Qualifier Unit D %Rec Limits **RPD** Limit Sulfate 7.50 7.245 97 90 - 110 mg/L

Lab Sample ID: MB 410-395644/5 Client Sample ID: Method Blank

Matrix: Water

Analysis Batch: 395644

MB MB

MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			07/11/23 12:30	1
Sulfate	<0.500		1.50	0.500	mg/L			07/11/23 12:30	1

Eurofins Lancaster Laboratories Environment Testing, LLC

Prep Type: Total/NA

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-133750-1

Prep Type: Total/NA

Client Sample ID: Method Blank

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography (Continued)

Lab Sample ID: MB 410-395644/5

MR MR

Matrix: Water

Analysis Batch: 395644

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.600		1.50	0.600	mg/L			07/11/23 12:30	1

Lab Sample ID: LCS 410-395644/3 **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

Matrix: Water

Analysis Batch: 395644

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Fluoride	0.750	0.7094		mg/L		95	90 - 110	
Sulfate	7.50	7.326		mg/L		98	90 - 110	
Chloride	3.00	2.912		mg/L		97	90 - 110	

Lab Sample ID: LCSD 410-395644/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 395644

	Spike	LCSD	LCSD				%Rec		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7128		mg/L		95	90 - 110	0	20
Sulfate	7.50	7.340		mg/L		98	90 - 110	0	20
Chloride	3.00	2.973		mg/L		99	90 - 110	2	20

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-395244/1-A Client Sample ID: Method Blank

Matrix: Water Prep Type: Total/NA Analysis Batch: 396242 Prep Batch: 395244

MB MB Result Qualifier RL MDL Unit Analyte Prepared Analyzed Dil Fac Calcium <0.237 0.515 0.237 mg/L 07/10/23 14:31 07/12/23 20:56 Lithium <0.0113 0.0515 0.0113 mg/L 07/10/23 14:31 07/12/23 20:56 SiO2 07/10/23 14:31 < 0.117 1.10 0.117 mg/L 07/12/23 20:56

Lab Sample ID: LCS 410-395244/2-A Client Sample ID: Lab Control Sample

Matrix: Water							Prep '	Type: Total/N.	Α
Analysis Batch: 396242							Prep	Batch: 39524	4
	Spike	LCS	LCS				%Rec		
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits		
Calcium	5.00	5.058		mg/L		101	80 - 120		_
Lithium	0.500	0.4926		mg/L		99	80 - 120		

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-395244/1-A Client Sample ID: Method Blank

Matrix: Water

Prep Type: Total/NA Analysis Batch: 396237 Prep Batch: 395244

МВ	MB						
Analyte Result	Qualifier RL	. MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic <0.700	2.06	0.700	ug/L		07/10/23 14:31	07/12/23 18:00	1
Cobalt <0.161	0.515	0.161	ug/L		07/10/23 14:31	07/12/23 18:00	1
Iron <20.6	51.5	20.6	ug/L		07/10/23 14:31	07/12/23 18:00	1
Magnesium <16.5	51.5	16.5	ug/L		07/10/23 14:31	07/12/23 18:00	1

Eurofins Lancaster Laboratories Environment Testing, LLC

QC Sample Results

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 410-395244/1-A

Matrix: Water

Analysis Batch: 396237

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 395244

il Fac
1
1
1
1
1
1

Lab Sample ID: LCS 410-395244/2-A

Matrix: Water

Analysis Batch: 396237

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 395244

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	500	494.6		ug/L		99	85 - 120	
Cobalt	500	492.2		ug/L		98	90 - 113	
Iron	5000	5013		ug/L		100	88 - 119	
Magnesium	5000	4939		ug/L		99	90 - 112	
Manganese	500	497.7		ug/L		100	89 - 120	
Molybdenum	50.0	48.80		ug/L		98	85 - 115	
Potassium	5000	4900		ug/L		98	90 - 112	
Selenium	100	101.3		ug/L		101	80 - 120	
Sodium	5000	4912		ug/L		98	89 - 112	

Job ID: 410-133750-1

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns

HPLC/IC

Analysis Batch: 395299

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133750-1	MW-7I Influent Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-2	MW-7A Control Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-3	MW-7B NaHCO3 Week 13	Total/NA	Water	EPA 300.0 R2.1	
410-133750-4	MW-7C MF3 Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-5	MW-8I Influent Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-5	MW-8I Influent Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-6	MW-8A Control Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-6	MW-8A Control Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-7	MW-8B FeCl3 NaHCO3 Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-7	MW-8B FeCl3 NaHCO3 Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-8	MW-8C MF3 Week 3	Total/NA	Water	EPA 300.0 R2.1	
MB 410-395299/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-395299/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-395299/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 395641

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133750-1	MW-7I Influent Week 3	Total/NA	Water	EPA 300.0 R2.1	
410-133750-2	MW-7A Control Week 3	Total/NA	Water	EPA 300.0 R2.1	
MB 410-395641/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-395641/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-395641/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 395644

Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MW-7B NaHCO3 Week 13	Total/NA	Water	EPA 300.0 R2.1	
MW-7C MF3 Week 3	Total/NA	Water	EPA 300.0 R2.1	
MW-8C MF3 Week 3	Total/NA	Water	EPA 300.0 R2.1	
Method Blank	Total/NA	Water	EPA 300.0 R2.1	
Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	
	MW-7B NaHCO3 Week 13 MW-7C MF3 Week 3 MW-8C MF3 Week 3 Method Blank Lab Control Sample	MW-7B NaHCO3 Week 13 MW-7C MF3 Week 3 Total/NA MW-8C MF3 Week 3 Method Blank Lab Control Sample Total/NA	MW-7B NaHCO3 Week 13 Total/NA Water MW-7C MF3 Week 3 Total/NA Water MW-8C MF3 Week 3 Total/NA Water Method Blank Total/NA Water Lab Control Sample Total/NA Water	MW-7B NaHCO3 Week 13 Total/NA Water EPA 300.0 R2.1 MW-7C MF3 Week 3 Total/NA Water EPA 300.0 R2.1 MW-8C MF3 Week 3 Total/NA Water EPA 300.0 R2.1 Method Blank Total/NA Water EPA 300.0 R2.1 Lab Control Sample Total/NA Water EPA 300.0 R2.1

Metals

Prep Batch: 395244

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batcl
410-133750-1	MW-7I Influent Week 3	Dissolved	Water	Non-Digest Prep	
410-133750-2	MW-7A Control Week 3	Dissolved	Water	Non-Digest Prep	
410-133750-3	MW-7B NaHCO3 Week 13	Dissolved	Water	Non-Digest Prep	
410-133750-4	MW-7C MF3 Week 3	Dissolved	Water	Non-Digest Prep	
410-133750-5	MW-8I Influent Week 3	Dissolved	Water	Non-Digest Prep	
410-133750-6	MW-8A Control Week 3	Dissolved	Water	Non-Digest Prep	
410-133750-7	MW-8B FeCl3 NaHCO3 Week 3	Dissolved	Water	Non-Digest Prep	
410-133750-8	MW-8C MF3 Week 3	Dissolved	Water	Non-Digest Prep	
MB 410-395244/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-395244/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 396237

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133750-1	MW-7I Influent Week 3	Dissolved	Water	6020B	395244
410-133750-1	MW-7I Influent Week 3	Dissolved	Water	6020B	395244

Eurofins Lancaster Laboratories Environment Testing, LLC

QC Association Summary

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Metals (Continued)

Analysis Batch: 396237 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133750-2	MW-7A Control Week 3	Dissolved	Water	6020B	395244
410-133750-2	MW-7A Control Week 3	Dissolved	Water	6020B	395244
410-133750-3	MW-7B NaHCO3 Week 13	Dissolved	Water	6020B	395244
410-133750-3	MW-7B NaHCO3 Week 13	Dissolved	Water	6020B	395244
410-133750-4	MW-7C MF3 Week 3	Dissolved	Water	6020B	395244
410-133750-4	MW-7C MF3 Week 3	Dissolved	Water	6020B	395244
410-133750-5	MW-8I Influent Week 3	Dissolved	Water	6020B	395244
410-133750-6	MW-8A Control Week 3	Dissolved	Water	6020B	395244
410-133750-7	MW-8B FeCl3 NaHCO3 Week 3	Dissolved	Water	6020B	395244
410-133750-8	MW-8C MF3 Week 3	Dissolved	Water	6020B	395244
MB 410-395244/1-A	Method Blank	Total/NA	Water	6020B	395244
LCS 410-395244/2-A	Lab Control Sample	Total/NA	Water	6020B	395244

Analysis Batch: 396242

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133750-1	MW-7I Influent Week 3	Dissolved	Water	6010D	395244
410-133750-2	MW-7A Control Week 3	Dissolved	Water	6010D	395244
410-133750-3	MW-7B NaHCO3 Week 13	Dissolved	Water	6010D	395244
410-133750-4	MW-7C MF3 Week 3	Dissolved	Water	6010D	395244
410-133750-5	MW-8I Influent Week 3	Dissolved	Water	6010D	395244
410-133750-6	MW-8A Control Week 3	Dissolved	Water	6010D	395244
410-133750-7	MW-8B FeCl3 NaHCO3 Week 3	Dissolved	Water	6010D	395244
410-133750-8	MW-8C MF3 Week 3	Dissolved	Water	6010D	395244
MB 410-395244/1-A	Method Blank	Total/NA	Water	6010D	395244
LCS 410-395244/2-A	Lab Control Sample	Total/NA	Water	6010D	395244

Analysis Batch: 399238

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-133750-8	MW-8C MF3 Week 3	Dissolved	Water	6020B	395244

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Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7I Influent Week 3

Date Collected: 07/07/23 09:00 Date Received: 07/07/23 16:35

Client: Terra Systems Inc

Lab Sample ID: 410-133750-1

Matrix: Water

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	395299	W7FX	ELLE	07/10/23 21:29
Total/NA	Analysis	EPA 300.0 R2.1		200	395641	L4QM	ELLE	07/11/23 20:49
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6010D		1	396242	T8CQ	ELLE	07/12/23 21:46
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		1	396237	UCIG	ELLE	07/12/23 19:36
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		10	396237	UCIG	ELLE	07/12/23 20:49

Client Sample ID: MW-7A Control Week 3

Date Collected: 07/07/23 09:15

Lab Sample ID: 410-133750-2

Date Received: 07/07/23 16:35

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	395299	W7FX	ELLE	07/10/23 21:54
Total/NA	Analysis	EPA 300.0 R2.1		200	395641	L4QM	ELLE	07/11/23 21:02
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6010D		1	396242	T8CQ	ELLE	07/12/23 21:40
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		1	396237	UCIG	ELLE	07/12/23 19:32
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		10	396237	UCIG	ELLE	07/12/23 20:47

Client Sample ID: MW-7B NaHCO3 Week 13

Date Collected: 07/07/23 09:30

Lab Sample ID: 410-133750-3 **Matrix: Water** Date Received: 07/07/23 16:35

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	395299	W7FX	ELLE	07/10/23 22:20
Total/NA	Analysis	EPA 300.0 R2.1		200	395644	L4QM	ELLE	07/11/23 19:12
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6010D		1	396242	T8CQ	ELLE	07/12/23 21:50
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		1	396237	UCIG	ELLE	07/12/23 19:38
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		10	396237	UCIG	ELLE	07/12/23 20:51

Client Sample ID: MW-7C MF3 Week 3

Date Collected: 07/07/23 09:45

Date Received: 07/07/23 16:35

_	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	395299	W7FX	ELLE	07/10/23 22:45
Total/NA	Analysis	EPA 300.0 R2.1		200	395644	L4QM	ELLE	07/11/23 19:47

Eurofins Lancaster Laboratories Environment Testing, LLC

Lab Sample ID: 410-133750-4

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Matrix: Water

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7C MF3 Week 3

Date Collected: 07/07/23 09:45 Date Received: 07/07/23 16:35

Client: Terra Systems Inc

Lab Sample ID: 410-133750-4

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6010D		1	396242	T8CQ	ELLE	07/12/23 21:37
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		1	396237	UCIG	ELLE	07/12/23 19:30
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		5	396237	UCIG	ELLE	07/12/23 20:45

Client Sample ID: MW-8I Influent Week 3

Date Collected: 07/07/23 10:00 Date Received: 07/07/23 16:35 Lab Sample ID: 410-133750-5

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	395299	W7FX	ELLE	07/10/23 23:11
Total/NA	Analysis	EPA 300.0 R2.1		20	395299	W7FX	ELLE	07/10/23 23:49
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6010D		1	396242	T8CQ	ELLE	07/12/23 21:53
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		1	396237	UCIG	ELLE	07/12/23 19:47

Client Sample ID: MW-8A Control Week 3

Date Collected: 07/07/23 10:15 Date Received: 07/07/23 16:35

Lab Sample	ID:	410-133750-6
Lub Guilipic		410 100700 0

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	395299	W7FX	ELLE	07/11/23 00:02
Total/NA	Analysis	EPA 300.0 R2.1		20	395299	W7FX	ELLE	07/11/23 00:15
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6010D		1	396242	T8CQ	ELLE	07/12/23 21:43
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		1	396237	UCIG	ELLE	07/12/23 19:34

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 3

Date Collected: 07/07/23 10:30

Date Received: 07/07/23 16:35

Sample ID: 410-133750-7

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	395299	W7FX	ELLE	07/11/23 00:28
Total/NA	Analysis	EPA 300.0 R2.1		20	395299	W7FX	ELLE	07/11/23 00:40
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6010D		1	396242	T8CQ	ELLE	07/12/23 21:34
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		1	396237	UCIG	ELLE	07/12/23 19:28

7/21/2023

Lab Chronicle

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Date Received: 07/07/23 16:35

Client Sample ID: MW-8C MF3 Week 3

Lab Sample ID: 410-133750-8 Date Collected: 07/07/23 10:45

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	395299	W7FX	ELLE	07/11/23 00:53
Total/NA	Analysis	EPA 300.0 R2.1		50	395644	L4QM	ELLE	07/11/23 19:58
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6010D		1	396242	T8CQ	ELLE	07/12/23 21:21
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		1	399238	UCIG	ELLE	07/20/23 14:48
Dissolved	Prep	Non-Digest Prep			395244	HUH3	ELLE	07/10/23 14:31
Dissolved	Analysis	6020B		1	396237	UCIG	ELLE	07/12/23 19:26

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date		
A2LA	Dept. of Defense ELAP	0001.01	11-30-24		
A2LA	ISO/IEC 17025	0001.01	11-30-24		
Alabama	State	43200	01-31-24		
Alaska	State	PA00009	06-30-24		
Alaska (UST)	State	17-027	02-28-24		
Arizona	State	AZ0780	03-12-24		
Arkansas DEQ	State	88-00660	08-09-23		
California	State	2792	11-30-23		
Colorado	State	PA00009	06-30-24		
Connecticut	State	PH-0746	06-30-25		
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24		
Delaware (DW)	State	N/A	01-31-24		
Florida	NELAP	E87997	06-30-24		
Georgia (DW)	State	C048	01-31-24		
Hawaii	State	N/A	01-31-24		
Illinois	NELAP	200027	01-31-24		
lowa	State	361	03-01-24		
Kansas	NELAP	E-10151	10-31-23		
Kentucky (DW)	State	KY90088	12-31-23		
Kentucky (UST)	State	0001.01	11-30-24		
Kentucky (WW)	State	KY90088	12-31-23		
Louisiana (All)	NELAP	02055	06-30-24		
Maine	State	2019012	03-12-25		
Maryland	State	100	06-30-24		
Massachusetts	State	M-PA009	06-30-24		
	State	9930	01-31-24		
Michigan Minnesete	NELAP	042-999-487			
Minnesota			12-31-23		
Mississippi	State	023	01-31-24		
Missouri	State	450	01-31-25		
Montana (DW)	State	0098	01-01-24		
Nebraska	State	NE-OS-32-17	01-31-24		
New Hampshire	NELAP	2730	01-10-24		
New Jersey	NELAP	PA011	06-30-24		
New York	NELAP	10670	04-01-24		
North Carolina (DW)	State	42705	07-31-23		
North Carolina (WW/SW)	State	521	12-31-23		
North Dakota	State	R-205	01-31-24		
Oklahoma	NELAP	9804	08-31-23		
Oregon	NELAP	PA200001	09-11-23		
PALA	Canada	1978	09-16-24		
Pennsylvania	NELAP	36-00037	01-31-24		
Rhode Island	State	LAO00338	12-31-23		
South Carolina	State	89002	01-31-24		
Tennessee	State	02838	01-31-24		
Texas	NELAP	T104704194-23-46	08-31-23		
USDA	US Federal Programs	525-22-298-19481	10-25-25		
Vermont	State	VT - 36037	10-28-23		
Virginia	NELAP	460182	06-14-24		
Washington	State	C457	04-11-24		
West Virginia (DW)	State	9906 C	12-31-23		

Eurofins Lancaster Laboratories Environment Testing, LLC

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-133750-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Method **Method Description** Laboratory Protocol ELLE EPA 300.0 R2.1 Anions, Ion Chromatography EPA 6010D Metals (ICP) SW846 ELLE 6020B Metals (ICP/MS) SW846 ELLE

Protocol References:

Non-Digest Prep

EPA = US Environmental Protection Agency

Preparation, Non-Digested Aqueous Metals

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Job ID: 410-133750-1

ELLE

EPA

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Sample Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-133750-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-133750-1	MW-7I Influent Week 3	Water	07/07/23 09:00	07/07/23 16:35
410-133750-2	MW-7A Control Week 3	Water	07/07/23 09:15	07/07/23 16:35
410-133750-3	MW-7B NaHCO3 Week 13	Water	07/07/23 09:30	07/07/23 16:35
410-133750-4	MW-7C MF3 Week 3	Water	07/07/23 09:45	07/07/23 16:35
410-133750-5	MW-8I Influent Week 3	Water	07/07/23 10:00	07/07/23 16:35
410-133750-6	MW-8A Control Week 3	Water	07/07/23 10:15	07/07/23 16:35
410-133750-7	MW-8B FeCl3 NaHCO3 Week 3	Water	07/07/23 10:30	07/07/23 16:35
410-133750-8	MW-8C MF3 Week 3	Water	07/07/23 10:45	07/07/23 16:35

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Request/Chain of Custody

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es curorins	Lancaster Laboratories Environmental		410	-1337	50 Ch	ain of	f Custody			-		Samp	de #					_			
Client: Terra Systems, Inc.							Matrix			Analyses Requested					For Lab U	Jse Only					
Project Name/#: Stantec CCR AP2 Columns Site ID #: Macon, GA							1				Preserv			vation Codes					SF #:		
Project Manager:	Michael D. Lee	P.O. #:	222566-7-7-	-23		Tissue	g 9		1	N	N	_							SCR #:		
Sampler: Michael	D. Lee	PWSID#:				i.	Ground				iō								Preserv	vation Codes	
Phone #: 302-7	798-9553	Quote #:	4101181	18		밑			iner	Co, Fe, K, Li	Na, Se,				1				H = HCI	T = Thiosulfat	.8
State where sample	es were collected: GA For	Compliance:	Yes	No	7	Sediment	ple SES		onta	9. F.	Mo. h								N = HNO ₃	B = NaOH	
		Collec	ction	q	Composite		Potable ler NPDES	er:	Total # of Containers	As, Ca,	Dis (fil) Mg. Mn. Mo.	, SO4						1 1	S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄	
Sample Identific	ation	Date	Time	Grab	Co	Soil	Water	Other	Tot	Dis (fil)	Dis (I	Cl.		\perp					Rei	marks	
MW-71 Influent We	ek 3	7/7/2023	9:00		Х		х		2	Х	Х	Х							ff =field filt	tered	
MW-7A Control We	eek 3	7/7/2023	9:15	$oldsymbol{ol}}}}}}}}}}}}}}}}}$	X		X		2	Х	X	X				'					
MW-7B NaHCO3 V	Neek 13	7/7/2023	9:30		X	\perp	X		2	Х	X	X				'					
MW-7C MF3 Week	k 3	7/7/2023	9:45	$oldsymbol{\perp}$	X	L	Х		2	Х	X	X				'					
MW-81 Influent We	ek 3	7/7/2023	10:00		X	上	X		2	Х	X	X									
MW-8A Control We	eek 3	7/7/2023	10:15		Х		Х		2	Х	X	X									
MW-8B FeCl3 Nah	HCO3 Week 3	7/7/2023	10:30		Х		Х		2	Х	Х	X									
MW-8C MF3 Week	k 3	7/7/2023	10:45		Х	\perp	Х		2	Х	X	X									
				_		_	'														
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	ne Requested (TAT) (please check (Rush TAT is subject to laboratory ap	-		Rus	sh 🗌	Reli	inquished	by:	n	00	Da	ate つじ	Time		eived 20C	-	~(2	Date フ/フ/ス3	Time 3 1045	
Date results are ne	eeded: 7/721/2023					Reli	inquished	by:			DE	ate	Time	Réc	eived	by:			Date	Time	_
Rush results reque	ested by (please check): E-M	Mail 🔽	Phone	ie [B	30R- 14	11	4		17/7	7/23	1635	2				/			
E-mail Address: Phone:	mlee@terrasystems.net 302-798-9553					Reli	inquished	by:			Da	ate	Time	Rec	eived	by:			Defe	Time	
Data Package O	Options (please check if required	d)				Reli	inquished	by:			Da	ate	Time	Rec	eived	by:	7		Date	Time	
Type I (Validation/r											/					- f					
Type III (Reduced	non-CLP) CT RCP					Reli	inquished	by:		/	Da	ate	Time	Rec	eived	by:	1		Date	Time	27
Type VI (Raw Data	a Only) TX TRRF	P-13							/					(10		L		1///	33 10	3
NJ DKQP	☐ NYSDEC	C Category	☐ A or		В	Reli	inquished	by G	бтте	ercial	Carrie	er:		Tr	c nperati	()	8	201	50 6		
EDD Required?	Yes No J If ye	res, format:				UPS	3	FedE	Ex		Other			Tem	iperat	ure ur	Son re	ceipt	10,0	°C	

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7/21/2023

Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-133750-1

Login Number: 133750

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

7/21/2023

List Number: 1 Creator: Foreman, Kai

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	Not present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

Eurofins Lancaster Laboratories Environment Testing, LLC

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PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

Generated 7/28/2023 12:57:33 AM

JOB DESCRIPTION

Stantec CCR AP2 COlumns

JOB NUMBER

410-134762-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601

Lancaster PA 17601



Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 7/28/2023 12:57:33 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

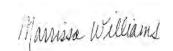
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Client: Terra Systems Inc Project/Site: Stantec CCR AP2 COlumns Laboratory Job ID: 410-134762-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Qualifiers

н	P	C	/	C

 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.

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.

Glossary

Abbreviation	These commonly	used abbreviations may	or may	not be	nresent 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

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Case Narrative

Client: Terra Systems Inc

Job ID: 410-134762-1 Project/Site: Stantec CCR AP2 COlumns

Job ID: 410-134762-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-134762-1

Receipt

The samples were received on 7/14/2023 4:03 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 0.9°C

HPLC/IC

Method 300_ORGFM_28D: (CCV 410-397719/18) is compliant under method criteria for fluoride. The software does not display the data to the whole number as is listed in the method. When applying the evaluation to a whole number of +/-10%D, the QC passes the criteria.

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

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

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 COlumns

Job ID: 410-134762-1

Client Sample ID: MW-7A Control Week 4

Lab Sample ID: 410-134762-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Sulfate	1070		750	250	mg/L	500	EPA 300.0 R2.1	Total/NA
Chloride	6.51	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Lithium	0.0632		0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	59.3		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	1.39	J	2.06	0.700	ug/L	1	6020B	Dissolved
Calcium	261000		515	258	ug/L	5	6020B	Dissolved
Cobalt	28.0		0.515	0.161	ug/L	1	6020B	Dissolved
Magnesium	77000		51.5	16.5	ug/L	1	6020B	Dissolved
Iron	26.8	J	51.5	20.6	ug/L	1	6020B	Dissolved
Potassium	28800		206	67.0	ug/L	1	6020B	Dissolved
Manganese	10200		10.3	4.89	ug/L	5	6020B	Dissolved
Sodium	25800		2060	927	ug/L	10	6020B	Dissolved
Molybdenum	0.695	J	2.58	0.670	ug/L	5	6020B	Dissolved

Client Sample ID: MW-7B NaHCO3 Week 4

Lab Sample ID: 410-134762-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	O Method	Prep Type
Sulfate	1090		375	125	mg/L	250	EPA 300.0 R2.1	Total/NA
Chloride	6.08	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Lithium	0.0735		0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	59.5		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.955	J	2.06	0.700	ug/L	1	6020B	Dissolved
Calcium	289000		515	258	ug/L	5	6020B	Dissolved
Cobalt	14.6		0.515	0.161	ug/L	1	6020B	Dissolved
Magnesium	74300		51.5	16.5	ug/L	1	6020B	Dissolved
Potassium	24300		206	67.0	ug/L	1	6020B	Dissolved
Manganese	9600		103	48.9	ug/L	50	6020B	Dissolved
Sodium	29500		206	92.7	ug/L	1	6020B	Dissolved
Molybdenum	0.396	J	0.515	0.134	ug/L	1	6020B	Dissolved

Client Sample ID: MW-7C MF3 Week 4

Lab Sample ID: 410-134762-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1120		750	250	mg/L	500	_	EPA 300.0 R2.1	Total/NA
Chloride	6.38	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0534		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	0.892	J	1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.793	J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	243000		515	258	ug/L	5		6020B	Dissolved
Cobalt	0.312	J	0.515	0.161	ug/L	1		6020B	Dissolved
Magnesium	97100		258	82.4	ug/L	5		6020B	Dissolved
Iron	20.8	J	51.5	20.6	ug/L	1		6020B	Dissolved
Potassium	13200		206	67.0	ug/L	1		6020B	Dissolved
Manganese	75.8		2.06	0.979	ug/L	1		6020B	Dissolved
Sodium	33800		206	92.7	ug/L	1		6020B	Dissolved
Molybdenum	0.165	J	0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	0.868	J	1.03	0.286	ug/L	1		6020B	Dissolved

Client Sample ID: MW-8A Control Week 4

Lab Sample ID: 410-134762-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type	
Fluoride	0.495	J	1.00	0.450	ma/L	5		EPA 300.0 R2.1	Total/NA	

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 COlumns

Job ID: 410-134762-1

Client Sample ID: MW-8A Control Week 4 (Continued)

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•	an	Sam	nie	11).	410-	1.34	/h2-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	111		75.0	25.0	mg/L	50	_	EPA 300.0 R2.1	Total/NA
Chloride	7.32	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	19.9		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	1.31	J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	54700		103	51.5	ug/L	1		6020B	Dissolved
Magnesium	29800		51.5	16.5	ug/L	1		6020B	Dissolved
Potassium	7710		206	67.0	ug/L	1		6020B	Dissolved
Manganese	15.6		2.06	0.979	ug/L	1		6020B	Dissolved
Sodium	16700		206	92.7	ug/L	1		6020B	Dissolved
Molybdenum	152		0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	0.437	J	1.03	0.286	ug/L	1		6020B	Dissolved

Client Sample ID: MW-8B FeCl3 Week 4

Lab Sample ID: 410-134762-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Sulfate			75.0	25.0	mg/L	50	EPA 300.0 R2.1	Total/NA
Chloride	6.68	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
SiO2	8.28		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.735	J	2.06	0.700	ug/L	1	6020B	Dissolved
Calcium	65500		103	51.5	ug/L	1	6020B	Dissolved
Magnesium	30600		51.5	16.5	ug/L	1	6020B	Dissolved
Potassium	10300		206	67.0	ug/L	1	6020B	Dissolved
Manganese	55.6		2.06	0.979	ug/L	1	6020B	Dissolved
Sodium	20100		206	92.7	ug/L	1	6020B	Dissolved
Molybdenum	47.6		0.515	0.134	ug/L	1	6020B	Dissolved

Client Sample ID: MW-8C MF3 Week 4

Lab Sample ID: 410-134762-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	287		75.0	25.0	mg/L	50	_	EPA 300.0 R2.1	Total/NA
Chloride	7.41	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	2.40		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	1.20	J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	33700		103	51.5	ug/L	1		6020B	Dissolved
Magnesium	45300		51.5	16.5	ug/L	1		6020B	Dissolved
Potassium	6440		206	67.0	ug/L	1		6020B	Dissolved
Manganese	46.8		2.06	0.979	ug/L	1		6020B	Dissolved
Sodium	18300		206	92.7	ug/L	1		6020B	Dissolved
Molybdenum	0.364	J	0.515	0.134	ug/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Client: Terra Systems Inc Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Client Sample ID: MW-7A Control Week 4

Date Collected: 07/14/23 08:15

Date Received: 07/14/23 16:03

Lab Sample ID: 410-134762-1

. Matrix: Water

Analyte	Result C	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/17/23 19:40	5
Sulfate	1070		750	250	mg/L			07/17/23 20:03	500
Chloride	6.51 J	l	7.50	3.00	mg/L			07/17/23 19:40	5

Method: SW846 6010D - Metals (IC	P) - Dissolved							
Analyte	Result Qua	alifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0632	0.0515	0.0113	mg/L		07/18/23 03:39	07/18/23 16:41	1
SiO2	59.3	1.10	0.117	mg/L		07/18/23 03:39	07/18/23 16:41	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.39	J	2.06	0.700	ug/L		07/18/23 03:39	07/27/23 18:31	1
Calcium	261000		515	258	ug/L		07/18/23 03:39	07/20/23 21:22	5
Cobalt	28.0		0.515	0.161	ug/L		07/18/23 03:39	07/20/23 20:51	1
Magnesium	77000		51.5	16.5	ug/L		07/18/23 03:39	07/20/23 20:51	1
Iron	26.8	J	51.5	20.6	ug/L		07/18/23 03:39	07/20/23 20:51	1
Potassium	28800		206	67.0	ug/L		07/18/23 03:39	07/20/23 20:51	1
Manganese	10200		10.3	4.89	ug/L		07/18/23 03:39	07/20/23 21:22	5
Sodium	25800		2060	927	ug/L		07/18/23 03:39	07/27/23 18:36	10
Molybdenum	0.695	J	2.58	0.670	ug/L		07/18/23 03:39	07/20/23 21:22	5
Selenium	<0.286		1.03	0.286	ug/L		07/18/23 03:39	07/27/23 18:31	1

Client Sample ID: MW-7B NaHCO3 Week 4

Date Collected: 07/14/23 08:30 Date Received: 07/14/23 16:03 Lab Sample ID: 410-134762-2 Matrix: Water

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography											
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac		
Fluoride	<0.450		1.00	0.450	mg/L			07/17/23 22:09	5		
Sulfate	1090		375	125	mg/L			07/18/23 16:53	250		
Chloride	6.08	J	7.50	3.00	mg/L			07/17/23 22:09	5		

Method: SW846 6010D - Metals (IC	P) - Dissolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0735	0.0515	0.0113	mg/L		07/19/23 02:59	07/19/23 10:44	1
SiO2	59.5	1.10	0.117	mg/L		07/19/23 02:59	07/19/23 10:44	1

39.3		1.10	0.117	mg/L		07/19/20 02.09	01/13/23 10.44	
(ICP/MS) - Disso	olved							
Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
0.955	J	2.06	0.700	ug/L		07/19/23 02:59	07/25/23 15:29	1
289000		515	258	ug/L		07/19/23 02:59	07/25/23 16:21	5
14.6		0.515	0.161	ug/L		07/19/23 02:59	07/25/23 15:29	1
74300		51.5	16.5	ug/L		07/19/23 02:59	07/25/23 15:29	1
<20.6		51.5	20.6	ug/L		07/19/23 02:59	07/25/23 15:29	1
24300		206	67.0	ug/L		07/19/23 02:59	07/25/23 15:29	1
9600		103	48.9	ug/L		07/19/23 02:59	07/25/23 16:42	50
29500		206	92.7	ug/L		07/19/23 02:59	07/25/23 15:29	1
0.396	J	0.515	0.134	ug/L		07/19/23 02:59	07/25/23 15:29	1
<0.286		1.03	0.286	ug/L		07/19/23 02:59	07/25/23 15:29	1
	Result 0.955 289000 14.6 74300 <20.6 24300 9600 29500 0.396	Result Qualifier 0.955 J 289000 14.6 74300 <20.6 24300 9600 29500 0.396 J	Company Comp	Columbia	Company Comp	Company Comp	Company Comp	CICP/MS - Dissolved Result Qualifier RL MDL Unit D Prepared Analyzed

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Client: Terra Systems Inc Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Client Sample ID: MW-7C MF3 Week 4

Lab Sample ID: 410-134762-3 Date Collected: 07/14/23 08:45 Matrix: Water

Date Received: 07/14/23 16:03

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/17/23 20:14	- 5
Sulfate	1120		750	250	mg/L			07/17/23 20:37	500
Chloride	6.38	J	7.50	3.00	mg/L			07/17/23 20:14	Ę
Method: SW846 6010D - Me	etals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0534		0.0515	0.0113	mg/L		07/19/23 02:59	07/19/23 10:50	-
SiO2	0.892	J	1.10	0.117	mg/L		07/19/23 02:59	07/19/23 10:50	
Method: SW846 6020B - Me	,								
Analyte	Result	Qualifier	RL		Unit	<u>D</u>	Prepared 07/40/03 03/50	Analyzed	Dil Fa
Analyte Arsenic	Result 0.793	Qualifier	2.06	0.700	ug/L	<u>D</u>	07/19/23 02:59	07/25/23 15:33	
Analyte Arsenic Calcium	Result 0.793 243000	Qualifier J	2.06 515	0.700 258	ug/L ug/L	<u>D</u>	07/19/23 02:59 07/19/23 02:59	07/25/23 15:33 07/25/23 16:23	
Analyte Arsenic Calcium	Result 0.793	Qualifier J	2.06 515 0.515	0.700 258 0.161	ug/L ug/L ug/L	<u>D</u>	07/19/23 02:59 07/19/23 02:59 07/19/23 02:59	07/25/23 15:33 07/25/23 16:23 07/25/23 15:33	
Analyte Arsenic Calcium Cobalt	Result 0.793 243000	Qualifier J	2.06 515	0.700 258 0.161	ug/L ug/L	<u>D</u>	07/19/23 02:59 07/19/23 02:59	07/25/23 15:33 07/25/23 16:23	
Analyte Arsenic Calcium Cobalt Magnesium	Result 0.793 243000 0.312	Qualifier J	2.06 515 0.515	0.700 258 0.161 82.4	ug/L ug/L ug/L	<u>D</u>	07/19/23 02:59 07/19/23 02:59 07/19/23 02:59	07/25/23 15:33 07/25/23 16:23 07/25/23 15:33	
Analyte Arsenic Calcium Cobalt Magnesium ron	Result 0.793 243000 0.312 97100	Qualifier J	2.06 515 0.515 258	0.700 258 0.161 82.4 20.6	ug/L ug/L ug/L ug/L	<u>D</u>	07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59	07/25/23 15:33 07/25/23 16:23 07/25/23 15:33 07/25/23 16:23	
Analyte Arsenic Calcium Cobalt Magnesium ron Potassium	Result 0.793 243000 0.312 97100 20.8	Qualifier J	2.06 515 0.515 258 51.5	0.700 258 0.161 82.4 20.6	ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59	07/25/23 15:33 07/25/23 16:23 07/25/23 15:33 07/25/23 16:23 07/25/23 15:33	
Analyte Arsenic Calcium Cobalt Magnesium ron Potassium Manganese	Result 0.793 243000 0.312 97100 20.8 13200	Qualifier J	2.06 515 0.515 258 51.5 206	0.700 258 0.161 82.4 20.6 67.0 0.979	ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59	07/25/23 15:33 07/25/23 16:23 07/25/23 15:33 07/25/23 16:23 07/25/23 15:33 07/25/23 15:33	
Method: SW846 6020B - Me Analyte Arsenic Calcium Cobalt Magnesium Iron Potassium Manganese Sodium Molybdenum	Result 0.793 243000 0.312 97100 20.8 13200 75.8	Qualifier J J	2.06 515 0.515 258 51.5 206 2.06	0.700 258 0.161 82.4 20.6 67.0 0.979	ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59 07/19/23 02:59	07/25/23 15:33 07/25/23 16:23 07/25/23 15:33 07/25/23 16:23 07/25/23 15:33 07/25/23 15:33	Dil Fac

Client Sample ID: MW-8A Control Week 4

Date Collected: 07/14/23 09:00

Date Received: 07/14/23 16:03

Chloride

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography										
	Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Fluoride	0.495	J	1.00	0.450	mg/L			07/17/23 22:32	5
	Sulfate	111		75.0	25.0	mg/L			07/17/23 22:43	50

7.50

7.32 J

3.00 mg/L

Method: SW846 6010D - Metals (ICI	P) - Dissolved							
Analyte	Result Qualifier	r RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113	0.0515	0.0113	mg/L		07/19/23 02:59	07/19/23 10:47	1
SiO2	19.9	1.10	0.117	mg/L		07/19/23 02:59	07/19/23 10:47	1

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- Method: SW846 6020B - N	letals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.31	J	2.06	0.700	ug/L		07/19/23 02:59	07/25/23 15:31	1
Calcium	54700		103	51.5	ug/L		07/19/23 02:59	07/25/23 15:31	1
Cobalt	<0.161		0.515	0.161	ug/L		07/19/23 02:59	07/25/23 15:31	1
Magnesium	29800		51.5	16.5	ug/L		07/19/23 02:59	07/25/23 15:31	1
Iron	<20.6		51.5	20.6	ug/L		07/19/23 02:59	07/25/23 15:31	1
Potassium	7710		206	67.0	ug/L		07/19/23 02:59	07/25/23 15:31	1
Manganese	15.6		2.06	0.979	ug/L		07/19/23 02:59	07/25/23 15:31	1
Sodium	16700		206	92.7	ug/L		07/19/23 02:59	07/25/23 15:31	1
Molybdenum	152		0.515	0.134	ug/L		07/19/23 02:59	07/25/23 15:31	1
Selenium	0.437	J	1.03	0.286	ug/L		07/19/23 02:59	07/25/23 15:31	1

Lab Sample ID: 410-134762-4

07/17/23 22:32

Matrix: Water

Client: Terra Systems Inc Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Client Sample ID: MW-8B FeCI3 Week 4

Lab Sample ID: 410-134762-5 Date Collected: 07/14/23 09:15

Date Received: 07/14/23 16:03

Met	thod: EPA 300.0 R2.1 - Anions, lo	n Chromate	ography							
Ana	lyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluo	ride	<0.450		1.00	0.450	mg/L			07/17/23 20:49	5
Sulf	fate	111		75.0	25.0	mg/L			07/17/23 21:00	50
Chle	oride	6.68	J	7.50	3.00	mg/L			07/17/23 20:49	5

Method: SW846 6010D - Metals (ICF	P) - Dissolved	d l							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		07/19/23 02:59	07/19/23 10:37	1
SiO2	8.28		1.10	0.117	mg/L		07/19/23 02:59	07/19/23 10:37	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.735	J	2.06	0.700	ug/L		07/19/23 02:59	07/25/23 15:19	1
Calcium	65500		103	51.5	ug/L		07/19/23 02:59	07/25/23 15:19	1
Cobalt	<0.161		0.515	0.161	ug/L		07/19/23 02:59	07/25/23 15:19	1
Magnesium	30600		51.5	16.5	ug/L		07/19/23 02:59	07/25/23 15:19	1
Iron	<20.6		51.5	20.6	ug/L		07/19/23 02:59	07/25/23 15:19	1
Potassium	10300		206	67.0	ug/L		07/19/23 02:59	07/25/23 15:19	1
Manganese	55.6		2.06	0.979	ug/L		07/19/23 02:59	07/25/23 15:19	1
Sodium	20100		206	92.7	ug/L		07/19/23 02:59	07/25/23 15:19	1
Molybdenum	47.6		0.515	0.134	ug/L		07/19/23 02:59	07/25/23 15:19	1
Selenium	<0.286		1.03	0.286	ug/L		07/19/23 02:59	07/25/23 15:19	1

Client Sample ID: MW-8C MF3 Week 4

Date Collected: 07/14/23 09:30

Date Received: 07/14/23 16:03

Lab Sample ID	: 410-134762-6
	Matrix: Water

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography											
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac		
Fluoride	<0.450		1.00	0.450	mg/L			07/17/23 22:54	5		
Sulfate	287		75.0	25.0	mg/L			07/17/23 23:06	50		
Chloride	7.41	J	7.50	3.00	mg/L			07/17/23 22:54	5		

Method: SW846 6010D - Metals (I	CP) - Dissolved							
Analyte	Result Quali	lifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113	0.0515	0.0113	mg/L		07/19/23 02:59	07/19/23 10:41	1
SiO2	2.40	1.10	0.117	mg/L		07/19/23 02:59	07/19/23 10:41	1

	2:40		1.10	0.117	mg/L		01713/20 02:00	07/13/20 10.41	
– Method: SW846 6020B - N	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.20	J	2.06	0.700	ug/L		07/19/23 02:59	07/25/23 15:21	1
Calcium	33700		103	51.5	ug/L		07/19/23 02:59	07/25/23 15:21	1
Cobalt	<0.161		0.515	0.161	ug/L		07/19/23 02:59	07/25/23 15:21	1
Magnesium	45300		51.5	16.5	ug/L		07/19/23 02:59	07/25/23 15:21	1
Iron	<20.6		51.5	20.6	ug/L		07/19/23 02:59	07/25/23 15:21	1
Potassium	6440		206	67.0	ug/L		07/19/23 02:59	07/25/23 15:21	1
Manganese	46.8		2.06	0.979	ug/L		07/19/23 02:59	07/25/23 15:21	1
Sodium	18300		206	92.7	ug/L		07/19/23 02:59	07/25/23 15:21	1
Molybdenum	0.364	J	0.515	0.134	ug/L		07/19/23 02:59	07/25/23 15:21	1
Selenium	<0.286		1.03	0.286	ug/L		07/19/23 02:59	07/25/23 15:21	1

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Matrix: Water

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 COlumns

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-397719/5

Analysis Batch: 397719

Matrix: Water

Client Sample ID: Method Blank
Prep Type: Total/NA

MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			07/17/23 16:01	1
Sulfate	<0.500		1.50	0.500	mg/L			07/17/23 16:01	1
Chloride	<0.600		1.50	0.600	mg/L			07/17/23 16:01	1
					Ü				

Lab Sample ID: LCS 410-397719/3

Matrix: Water

Analysis Batch: 397719

	Spike	LCS	LCS				%Rec
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits
Fluoride	0.750	0.6997		mg/L		93	90 - 110
Sulfate	7.50	7.236		mg/L		96	90 - 110
Chloride	3.00	2.954		mg/L		98	90 - 110

Lab Sample ID: LCSD 410-397719/4

Matrix: Water

Analysis Batch: 397719

	Spike	LCSD	LCSD				%Rec		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7019		mg/L		94	90 - 110	0	20
Sulfate	7.50	7.250		mg/L		97	90 - 110	0	20
Chloride	3.00	2.947		mg/L		98	90 - 110	0	20

Lab Sample ID: MB 410-398089/5

Matrix: Water

Analysis Batch: 398089

MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			07/18/23 14:01	1
Sulfate	<0.500		1.50	0.500	mg/L			07/18/23 14:01	1
Chloride	<0.600		1.50	0.600	ma/L			07/18/23 14:01	1

Lab Sample ID: LCS 410-398089/3

Matrix: Water

Analysis Batch: 398089

•	Spike	LCS	LCS				%Rec
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits
Fluoride	0.750	0.7516		mg/L		100	90 - 110
Sulfate	7.50	7.534		mg/L		100	90 - 110
Chloride	3.00	2.971		mg/L		99	90 - 110

Lab Sample ID: LCSD 410-398089/4

Matrix: Water

Analysis Batch: 398089

Analysis Batch: 390009									
	Spike	LCSD	LCSD				%Rec		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7745		mg/L		103	90 - 110	3	20
Sulfate	7.50	7.743		mg/L		103	90 - 110	3	20
Chloride	3.00	3.093		mg/L		103	90 - 110	4	20

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Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Client Sample ID: Method Blank

Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample Dup

4.0

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 COlumns

Job ID: 410-134762-1

Prep Type: Total/NA

Prep Batch: 397793

Prep Type: Total/NA

Prep Batch: 397793

Client Sample ID: Method Blank

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-397793/1-A

Matrix: Water

Analysis Batch: 398247

MB	MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		07/18/23 03:39	07/18/23 15:53	1
SiO2	<0.117		1.10	0.117	mg/L		07/18/23 03:39	07/18/23 15:53	1

Lab Sample ID: LCS 410-397793/2-A

Matrix: Water

Lab Sample ID: MB 410-398286/1-A

Analysis Batch: 398247

Analysis Batch: 398552

Analyte	
Lithium	

LCS LCS Spike Added

0.500

Result Qualifier 0.4815

Unit

mg/L

%Rec

Limits 80 - 120

Client Sample ID: Lab Control Sample

80 - 120

%Rec

Client Sample ID: Lab Control Sample

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 398286

MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		07/19/23 02:59	07/19/23 09:48	1
SiO2	<0.117		1.10	0.117	mg/L		07/19/23 02:59	07/19/23 09:48	1

Lab Sample ID: LCS 410-398286/2-A

Matrix: Water

Analyte

Lithium

Matrix: Water

Analysis Batch: 398552

Spike Added 0.500

LCS LCS Result Qualifier 0.4888

Unit mg/L

%Rec

Prep Batch: 398286 %Rec Limits

Prep Type: Total/NA

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-397793/1-A

Matrix: Water

Analysis Batch: 399238

Client Sample ID: Method Blank

Prep Type: Total/NA **Prep Batch: 397793**

	INID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.700		2.06	0.700	ug/L		07/18/23 03:39	07/20/23 20:03	1
Calcium	<51.5		103	51.5	ug/L		07/18/23 03:39	07/20/23 20:03	1
Cobalt	<0.161		0.515	0.161	ug/L		07/18/23 03:39	07/20/23 20:03	1
Magnesium	<16.5		51.5	16.5	ug/L		07/18/23 03:39	07/20/23 20:03	1
Iron	<20.6		51.5	20.6	ug/L		07/18/23 03:39	07/20/23 20:03	1
Potassium	<67.0		206	67.0	ug/L		07/18/23 03:39	07/20/23 20:03	1
Manganese	<0.979		2.06	0.979	ug/L		07/18/23 03:39	07/20/23 20:03	1
Sodium	<92.7		206	92.7	ug/L		07/18/23 03:39	07/20/23 20:03	1
Molybdenum	<0.134		0.515	0.134	ug/L		07/18/23 03:39	07/20/23 20:03	1
Selenium	<0.286		1.03	0.286	ua/L		07/18/23 03:39	07/20/23 20:03	1

Lab Sample ID: LCS 410-397793/2-A

Matrix: Water

Analysis Batch: 399238

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Prep Batch: 397793

		Spike	LCS	LCS					%Rec	
Analyte		Added	Result	Qualifier	Unit	I	D	%Rec	Limits	
Arsenic		500	487.4		ug/L			97	85 - 120	
Calcium		5000	5102		ug/L			102	85 - 120	

Eurofins Lancaster Laboratories Environment Testing, LLC

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Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 410-397793/2-A

Matrix: Water

Analysis Batch: 399238

Client: Terra Systems Inc

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 397793

	Spike	LUG	LUS				/onec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Cobalt	500	489.0		ug/L		98	90 - 113	
Magnesium	5000	4986		ug/L		100	90 - 112	
Iron	5000	4906		ug/L		98	88 - 119	
Potassium	5000	4898		ug/L		98	90 - 112	
Manganese	500	497.0		ug/L		99	89 - 120	
Sodium	5000	5020		ug/L		100	89 - 112	
Molybdenum	50.0	51.18		ug/L		102	85 - 115	

Snike

LCS LCS

Lab Sample ID: LCS 410-397793/2-A

Matrix: Water

Analysis Batch: 401743

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 397793

Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits Selenium 100 ug/L 80 - 120 98.65

Lab Sample ID: MB 410-398286/1-A

Matrix: Water

Analysis Batch: 400723

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 398286

MB MB Result Qualifier RL MDL Unit Prepared Dil Fac Analyte Analyzed <0.700 07/19/23 02:59 Arsenic 2.06 0.700 ug/L 07/25/23 14:41 Calcium <51.5 103 51.5 ug/L 07/19/23 02:59 07/25/23 14:41 Cobalt <0.161 0.515 0.161 ug/L 07/19/23 02:59 07/25/23 14:41 07/19/23 02:59 07/25/23 14:41 Magnesium <16.5 51.5 16.5 ug/L <20.6 51.5 20.6 ug/L 07/19/23 02:59 07/25/23 14:41 Iron 07/19/23 02:59 07/25/23 14:41 Potassium <67.0 206 67.0 ug/L 2.06 07/19/23 02:59 07/25/23 14:41 Manganese < 0.979 0.979 ug/L Sodium 206 92.7 ug/L 07/19/23 02:59 07/25/23 14:41 Molybdenum 0.515 0.134 ug/L 07/19/23 02:59 07/25/23 14:41 < 0.134 Selenium <0.286 1.03 0.286 ug/L 07/19/23 02:59 07/25/23 14:41

Lab Sample ID: LCS 410-398286/2-A

Matrix: Water

Analysis Batch: 400723

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Prep Batch: 398286

						op But	000200
Spike	LCS	LCS				%Rec	
Added	Result	Qualifier	Unit	D	%Rec	Limits	
500	493.9		ug/L		99	85 - 120	
5000	5104		ug/L		102	85 - 120	
500	490.9		ug/L		98	90 - 113	
5000	4936		ug/L		99	90 - 112	
5000	4840		ug/L		97	88 - 119	
5000	4890		ug/L		98	90 - 112	
500	487.4		ug/L		97	89 - 120	
5000	4902		ug/L		98	89 - 112	
50.0	50.25		ug/L		100	85 - 115	
100	100.4		ug/L		100	80 - 120	
	500 5000 5000 5000 5000 5000 5000 5000	Added Result 500 493.9 5000 5104 500 490.9 5000 4936 5000 4840 5000 487.4 5000 4902 50.0 50.25	Added Result Qualifier 500 493.9 5000 5104 500 490.9 5000 4936 5000 4840 5000 4890 500 487.4 5000 4902 50.0 50.25	Added Result Qualifier Unit 500 493.9 ug/L 5000 5104 ug/L 500 490.9 ug/L 5000 4936 ug/L 5000 4840 ug/L 5000 4890 ug/L 500 487.4 ug/L 5000 4902 ug/L 50.0 50.25 ug/L	Added Result Qualifier Unit D 500 493.9 ug/L ug/L 5000 5104 ug/L ug/L 5000 490.9 ug/L ug/L 5000 4936 ug/L ug/L 5000 4840 ug/L ug/L 5000 487.4 ug/L ug/L 5000 4902 ug/L ug/L 50.0 50.25 ug/L	Added Result Qualifier Unit D %Rec 500 493.9 ug/L 99 5000 5104 ug/L 102 500 490.9 ug/L 98 5000 4936 ug/L 99 5000 4840 ug/L 97 5000 487.4 ug/L 97 5000 4902 ug/L 98 50.0 50.25 ug/L 100	Spike LCS LCS %Rec Added Result Qualifier Unit D %Rec Limits 500 493.9 ug/L 99 85 - 120 5000 5104 ug/L 102 85 - 120 500 490.9 ug/L 98 90 - 113 5000 4936 ug/L 99 90 - 112 5000 4840 ug/L 97 88 - 119 5000 4890 ug/L 98 90 - 112 500 487.4 ug/L 97 89 - 120 5000 4902 ug/L 98 89 - 112 50.0 50.25 ug/L 100 85 - 115

Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

HPLC/IC

Analysis Batch: 397719

Client: Terra Systems Inc

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batcl
410-134762-1	MW-7A Control Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-1	MW-7A Control Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-2	MW-7B NaHCO3 Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-3	MW-7C MF3 Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-3	MW-7C MF3 Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-4	MW-8A Control Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-4	MW-8A Control Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-5	MW-8B FeCl3 Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-5	MW-8B FeCl3 Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-6	MW-8C MF3 Week 4	Total/NA	Water	EPA 300.0 R2.1	
410-134762-6	MW-8C MF3 Week 4	Total/NA	Water	EPA 300.0 R2.1	
MB 410-397719/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-397719/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-397719/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 398089

Lab Sample ID 410-134762-2	Client Sample ID MW-7B NaHCO3 Week 4	Prep Type Total/NA	Matrix Water	Method EPA 300.0 R2.1	Prep Batch
MB 410-398089/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-398089/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-398089/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Metals

Prep Batch: 397793

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-134762-1	MW-7A Control Week 4	Dissolved	Water	Non-Digest Prep	
MB 410-397793/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-397793/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 398247

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-134762-1	MW-7A Control Week 4	Dissolved	Water	6010D	397793
MB 410-397793/1-A	Method Blank	Total/NA	Water	6010D	397793
LCS 410-397793/2-A	Lab Control Sample	Total/NA	Water	6010D	397793

Prep Batch: 398286

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Prep B
410-134762-2	MW-7B NaHCO3 Week 4	Dissolved	Water	Non-Digest Prep
410-134762-3	MW-7C MF3 Week 4	Dissolved	Water	Non-Digest Prep
410-134762-4	MW-8A Control Week 4	Dissolved	Water	Non-Digest Prep
410-134762-5	MW-8B FeCl3 Week 4	Dissolved	Water	Non-Digest Prep
410-134762-6	MW-8C MF3 Week 4	Dissolved	Water	Non-Digest Prep
MB 410-398286/1-A	Method Blank	Total/NA	Water	Non-Digest Prep
LCS 410-398286/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep

Analysis Batch: 398552

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-134762-2	MW-7B NaHCO3 Week 4	Dissolved	Water	6010D	398286
410-134762-3	MW-7C MF3 Week 4	Dissolved	Water	6010D	398286
410-134762-4	MW-8A Control Week 4	Dissolved	Water	6010D	398286

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QC Association Summary

Client: Terra Systems Inc Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Metals (Continued)

Analysis Batch: 398552 (Continued)

Lab S	Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-1	134762-5	MW-8B FeCl3 Week 4	Dissolved	Water	6010D	398286
410-1	134762-6	MW-8C MF3 Week 4	Dissolved	Water	6010D	398286
MB 4	10-398286/1-A	Method Blank	Total/NA	Water	6010D	398286
LCS 4	410-398286/2-A	Lab Control Sample	Total/NA	Water	6010D	398286

Analysis Batch: 399238

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-134762-1	MW-7A Control Week 4	Dissolved	Water	6020B	397793
410-134762-1	MW-7A Control Week 4	Dissolved	Water	6020B	397793
MB 410-397793/1-A	Method Blank	Total/NA	Water	6020B	397793
LCS 410-397793/2-A	Lab Control Sample	Total/NA	Water	6020B	397793

Analysis Batch: 400723

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-134762-2	MW-7B NaHCO3 Week 4	Dissolved	Water	6020B	398286
410-134762-2	MW-7B NaHCO3 Week 4	Dissolved	Water	6020B	398286
410-134762-2	MW-7B NaHCO3 Week 4	Dissolved	Water	6020B	398286
410-134762-3	MW-7C MF3 Week 4	Dissolved	Water	6020B	398286
410-134762-3	MW-7C MF3 Week 4	Dissolved	Water	6020B	398286
410-134762-4	MW-8A Control Week 4	Dissolved	Water	6020B	398286
410-134762-5	MW-8B FeCl3 Week 4	Dissolved	Water	6020B	398286
410-134762-6	MW-8C MF3 Week 4	Dissolved	Water	6020B	398286
MB 410-398286/1-A	Method Blank	Total/NA	Water	6020B	398286
LCS 410-398286/2-A	Lab Control Sample	Total/NA	Water	6020B	398286

Analysis Batch: 401743

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-134762-1	MW-7A Control Week 4	Dissolved	Water	6020B	397793
410-134762-1	MW-7A Control Week 4	Dissolved	Water	6020B	397793
LCS 410-397793/2-A	Lab Control Sample	Total/NA	Water	6020B	397793

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 COlumns

Client Sample ID: MW-7A Control Week 4

Date Collected: 07/14/23 08:15 Date Received: 07/14/23 16:03 Lab Sample ID: 410-134762-1

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	397719	L4QM	ELLE	07/17/23 19:40
Total/NA	Analysis	EPA 300.0 R2.1		500	397719	L4QM	ELLE	07/17/23 20:03
Dissolved	Prep	Non-Digest Prep			397793	HUH3	ELLE	07/18/23 03:39
Dissolved	Analysis	6010D		1	398247	T8CQ	ELLE	07/18/23 16:41
Dissolved	Prep	Non-Digest Prep			397793	HUH3	ELLE	07/18/23 03:39
Dissolved	Analysis	6020B		1	399238	UCIG	ELLE	07/20/23 20:51
Dissolved	Prep	Non-Digest Prep			397793	HUH3	ELLE	07/18/23 03:39
Dissolved	Analysis	6020B		5	399238	UCIG	ELLE	07/20/23 21:22
Dissolved	Prep	Non-Digest Prep			397793	HUH3	ELLE	07/18/23 03:39
Dissolved	Analysis	6020B		1	401743	UCIG	ELLE	07/27/23 18:31
Dissolved	Prep	Non-Digest Prep			397793	HUH3	ELLE	07/18/23 03:39
Dissolved	Analysis	6020B		10	401743	UCIG	ELLE	07/27/23 18:36

Client Sample ID: MW-7B NaHCO3 Week 4

Date Collected: 07/14/23 08:30 Date Received: 07/14/23 16:03 Lab Sample ID: 410-134762-2

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	397719	L4QM	ELLE	07/17/23 22:09
Total/NA	Analysis	EPA 300.0 R2.1		250	398089	W7FX	ELLE	07/18/23 16:53
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6010D		1	398552	MT26	ELLE	07/19/23 10:44
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6020B		1	400723	UCIG	ELLE	07/25/23 15:29
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6020B		5	400723	UCIG	ELLE	07/25/23 16:21
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6020B		50	400723	UCIG	ELLE	07/25/23 16:42

Client Sample ID: MW-7C MF3 Week 4

Date Collected: 07/14/23 08:45 Date Received: 07/14/23 16:03 Lab Sample ID: 410-134762-3

Matrix: Water

_	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	397719	L4QM	ELLE	07/17/23 20:14
Total/NA	Analysis	EPA 300.0 R2.1		500	397719	L4QM	ELLE	07/17/23 20:37
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6010D		1	398552	MT26	ELLE	07/19/23 10:50
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6020B		1	400723	UCIG	ELLE	07/25/23 15:33
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6020B		5	400723	UCIG	ELLE	07/25/23 16:23

Lab Chronicle

Client: Terra Systems Inc Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Date Received: 07/14/23 16:03

Client Sample ID: MW-8A Control Week 4

Lab Sample ID: 410-134762-4 Date Collected: 07/14/23 09:00

Matrix: Water

Batch Batch Dilution Batch Prepared Prep Type Туре Method Run Factor **Number Analyst** Lab or Analyzed EPA 300.0 R2.1 07/17/23 22:32 Total/NA Analysis 5 397719 L4QM ELLE Total/NA Analysis EPA 300.0 R2.1 50 397719 L4QM **ELLE** 07/17/23 22:43 Dissolved Prep 398286 UAMX ELLE 07/19/23 02:59 Non-Digest Prep **ELLE** Dissolved Analysis 6010D 398552 MT26 07/19/23 10:47 Dissolved ELLE 07/19/23 02:59 Prep Non-Digest Prep 398286 UAMX 6020B Dissolved Analysis 400723 UCIG **ELLE** 07/25/23 15:31

Client Sample ID: MW-8B FeCI3 Week 4

Lab Sample ID: 410-134762-5

Matrix: Water

Lab Sample ID: 410-134762-6

Date Collected: 07/14/23 09:15 Date Received: 07/14/23 16:03

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	397719	L4QM	ELLE	07/17/23 20:49
Total/NA	Analysis	EPA 300.0 R2.1		50	397719	L4QM	ELLE	07/17/23 21:00
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6010D		1	398552	MT26	ELLE	07/19/23 10:37
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6020B		1	400723	UCIG	ELLE	07/25/23 15:19

Client Sample ID: MW-8C MF3 Week 4

Date Collected: 07/14/23 09:30 **Matrix: Water**

Date Received: 07/14/23 16:03

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	397719	L4QM	ELLE	07/17/23 22:54
Total/NA	Analysis	EPA 300.0 R2.1		50	397719	L4QM	ELLE	07/17/23 23:06
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6010D		1	398552	MT26	ELLE	07/19/23 10:41
Dissolved	Prep	Non-Digest Prep			398286	UAMX	ELLE	07/19/23 02:59
Dissolved	Analysis	6020B		1	400723	UCIG	ELLE	07/25/23 15:21

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alabama	State	43200	01-31-24
Alaska	State	PA00009	06-30-24
Alaska (UST)	State	17-027	02-28-24
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-23
California	State	2792	11-30-23
Colorado	State	PA00009	06-30-24
Connecticut	State	PH-0746	06-30-25
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	06-30-24
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Ilinois	NELAP	200027	01-31-24
owa	State	361	03-01-24
Kansas	NELAP	E-10151	10-31-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	12-31-23
Louisiana (All)	NELAP	02055	06-30-24
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-24
Massachusetts	State	M-PA009	06-30-24
	State	9930	
Michigan Minnesota	NELAP	042-999-487	01-31-24
Minnesota			12-31-23
Mississippi	State	023	01-31-24
Missouri	State	450	01-31-25
Montana (DW)	State	0098	01-01-24
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	01-10-24
New Jersey	NELAP	PA011	06-30-24
New York	NELAP	10670	04-01-24
North Carolina (DW)	State	42705	07-31-24
North Carolina (WW/SW)	State	521	12-31-23
North Dakota	State	R-205	01-31-24
Oklahoma	NELAP	9804	08-31-23
Oregon	NELAP	PA200001	09-11-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	01-31-24
Rhode Island	State	LAO00338	12-31-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Гехаs	NELAP	T104704194-23-46	08-31-23
JSDA	US Federal Programs	525-22-298-19481	10-25-25
/ermont	State	VT - 36037	10-28-23
⁄irginia	NELAP	460182	06-14-25
Vashington	State	C457	04-11-24
Vest Virginia (DW)	State	9906 C	12-31-23

Eurofins Lancaster Laboratories Environment Testing, LLC

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 COlumns

Job ID: 410-134762-1

Method	Method Description	Protocol	Laboratory
EPA 300.0 R2.1	Anions, Ion Chromatography	EPA	ELLE
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Sample Summary

Client: Terra Systems Inc Job ID: 410-134762-1

Project/Site: Stantec CCR AP2 COlumns

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-134762-1	MW-7A Control Week 4	Water	07/14/23 08:15	07/14/23 16:03
410-134762-2	MW-7B NaHCO3 Week 4	Water	07/14/23 08:30	07/14/23 16:03
410-134762-3	MW-7C MF3 Week 4	Water	07/14/23 08:45	07/14/23 16:03
410-134762-4	MW-8A Control Week 4	Water	07/14/23 09:00	07/14/23 16:03
410-134762-5	MW-8B FeCl3 Week 4	Water	07/14/23 09:15	07/14/23 16:03
410-134762-6	MW-8C MF3 Week 4	Water	07/14/23 09:30	07/14/23 16:03

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Environmental Analysis Request



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Lancaster Laboratories

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					Matrix					Α	naly	ses l	Requ	este	d			For Lab Us	se Only
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PWSID #:				Ĕ	Grou		w	-	12									Preserva	tion Codes
Quote #:	4101181	18		닐			inen	, K										H = HCI	T = Thiosulfate
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Collec	tion	Д	nposite			er:	al # of Cc	As, Ca,) Mg. Mn. Mo	SO4								S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄
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7/14/2023	8:45		Х		X		2	Х	Х	Х									
7/14/2023	9:00		Х		X		2	Х	Х	Х									
7/14/2023	9:15		Х		X		2	X	Х	Х									
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DD Required? Yes No . If yes, format:					UPS FedEx				Other				Temperature upon receipt				0, 1	°C	
	P.O. #: PWSID #: Quote #: Compliance: Collect Date 7/14/2023 7/14/2023 7/14/2023 7/14/2023 7/14/2023 7/14/2023 7/14/2023 7/14/2023 7/14/2023 7/14/2023 7/14/2023 7/14/2023 7/14/2023 Category	P.O. #: 222566-7-14 PWSID #: Quote #: 410118: Compliance: Yes Collection Date Time 7/14/2023 8:15 7/14/2023 8:45 7/14/2023 9:00 7/14/2023 9:15 7/14/2023 9:30 Category A or	P.O. #: 222566-7-14-23 PWSID #: Quote #: 41011818 Compliance: Yes No Collection Date Time 5 7/14/2023 8:15 7/14/2023 8:45 7/14/2023 9:00 7/14/2023 9:15 7/14/2023 9:30 Phone A or Cottegory A or	P.O. #: 222566-7-14-23 PWSID #: Quote #: 41011818 Compliance: Yes	P.O. #: 222566-7-14-23 PWSID #: Quote #: 41011818 Compliance: Yes	Site ID #: Macon, GA P.O. #: 222566-7-14-23 PWSID #: Quote #: 41011818 Quote #: 4101818 Site ID #:	Site ID #: Macon, GA	Site ID #: Macon, GA	Site ID #: Macon, GA P.O. #: 222566-7-14-23 PWSID #: Quote #: 41011818 Compliance: Yes No V V Quote #: A1011818 V	Site ID #: Macon, GA	Site ID #: Macon, GA P.O. #: 222566-7-14-23 PWSID #: Quote #: 41011818 Compliance: Yes No Ves Prese Pool Po	Site ID #: Macon, GA P.O. # 222566-7-14-23 PWSID #: Quote #: 41011818 Analyses I Analyses I Preservation N N - Preservation N N - Preservation N N N N - Preservation N N N N - Preservation N N N N - Preservation N N N N - Preservation N N N N - Preservation N N N N - Preservation N N N N N N N N N N N N N N N N N N	Site ID #: Macon, GA	Matrix	Site ID #: Macon, GA	Matrix	Site ID #: Macon, GA	Matrix	

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Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-134762-1

Login Number: 134762

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

7/28/2023

List Number: 1 Creator: Foreman, Kai

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	Not present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

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PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

Generated 8/3/2023 3:42:58 AM

JOB DESCRIPTION

Stantec CCR AP2 Columns

JOB NUMBER

410-135670-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike Lancaster PA 17601



Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 8/3/2023 3:42:58 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

8/3/2023

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Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Marrissa Williams

Page 3 of 29 8/3/2023

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns Laboratory Job ID: 410-135670-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Qualifiers

HPLC/IC	
Qualifier	

cn Refer to Case Narrative for further detail

J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier Qualifier Description

Qualifier Description

J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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

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Case Narrative

Client: Terra Systems Inc

Job ID: 410-135670-1 Project/Site: Stantec CCR AP2 Columns

Job ID: 410-135670-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-135670-1

Receipt

The samples were received on 7/21/2023 3:25 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 2.6°C

HPLC/IC

Method 300_ORGFM_28D: The following sample was diluted due to the nature of the sample matrix: MW-7BI NaHCO3 Week 5 (410-135670-9) at 10.0. Elevated reporting limits (RLs) are provided.

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

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

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-135670-1

Client Sample ID: MW-7I Influent Week 5

Lab Sample ID: 410-135670-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1030		375	125	mg/L	250	_	EPA 300.0 R2.1	Total/NA
Chloride	6.94	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0637		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	70.4		1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	278		0.515	0.258	mg/L	5		6020B	Dissolved
Cobalt	0.0432		0.000515	0.000161	mg/L	1		6020B	Dissolved
Magnesium	77.5		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	11.4		0.0103	0.00489	mg/L	5		6020B	Dissolved
Molybdenum	0.000213	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	9.62		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	28.6		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7A Control Week 5

Lab Sample ID: 410-135670-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	Method	Prep Type
Sulfate	1010		375	125	mg/L	250	EPA 300.0 R2.1	Total/NA
Chloride	6.43	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Lithium	0.0878		0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	60.3		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.00138	J	0.00206	0.000700	mg/L	1	6020B	Dissolved
Calcium	266		0.515	0.258	mg/L	5	6020B	Dissolved
Cobalt	0.0293		0.000515	0.000161	mg/L	1	6020B	Dissolved
Iron	0.0233	J	0.0515	0.0206	mg/L	1	6020B	Dissolved
Magnesium	77.8		0.0515	0.0165	mg/L	1	6020B	Dissolved
Manganese	10.3		0.0103	0.00489	mg/L	5	6020B	Dissolved
Molybdenum	0.00109		0.000515	0.000134	mg/L	1	6020B	Dissolved
Potassium	29.3		0.206	0.0670	mg/L	1	6020B	Dissolved
Selenium	0.000316	J	0.00103	0.000286	mg/L	1	6020B	Dissolved
Sodium	29.1		0.206	0.0927	mg/L	1	6020B	Dissolved

Client Sample ID: MW-7B NaHCO3 Week 5

Lab Sample ID: 410-135670-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1100		750	250	mg/L	500	_	EPA 300.0 R2.1	Total/NA
Chloride	7.01	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.108		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	60.6		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00453		0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	23.4		0.103	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.00146		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0575		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	73.3		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.714		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.00117		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	54.5		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000638	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	2600		20.6	9.27	mg/L	100		6020B	Dissolved

Client Sample ID: MW-7C MF3 Week 5

Lab Sample ID: 410-135670-4

Analyte	Result Qualifier	RL	MDL Unit	ethod Prep Type	
Sulfate	1200	300	100 mg/L	 PA 300.0 R2.1 Total/NA	

This Detection Summary does not include radiochemical test results.

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Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7C MF3 Week 5 (Continued)

Lab Sample ID: 410-135670-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	6.49	J	7.50	3.00	mg/L	5	_	EPA 300.0 R2.1	Total/NA
Lithium	0.0603		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	0.852	J	1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	230		0.515	0.258	mg/L	5		6020B	Dissolved
Cobalt	0.000293	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Magnesium	91.6		0.258	0.0824	mg/L	5		6020B	Dissolved
Manganese	0.0576		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000416	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	12.9		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000610	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	31.7		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8I Influent Week 5

Lab Sample ID: 410-135670-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac I	Method	Prep Type
Sulfate	122		75.0	25.0	mg/L	50	EPA 300.0 R2.1	Total/NA
Chloride	6.63	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
SiO2	29.7		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.000726	J	0.00206	0.000700	mg/L	1	6020B	Dissolved
Calcium	57.9		0.103	0.0515	mg/L	1	6020B	Dissolved
Cobalt	0.00164		0.000515	0.000161	mg/L	1	6020B	Dissolved
Magnesium	29.3		0.0515	0.0165	mg/L	1	6020B	Dissolved
Manganese	0.0388		0.00206	0.000979	mg/L	1	6020B	Dissolved
Molybdenum	0.160		0.000515	0.000134	mg/L	1	6020B	Dissolved
Potassium	6.06		0.206	0.0670	mg/L	1	6020B	Dissolved
Sodium	17.4		0.206	0.0927	mg/L	1	6020B	Dissolved

Client Sample ID: MW-8A Control Week 5

Lab Sample ID: 410-135670-6

- Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	120		75.0	25.0	mg/L	50	_	EPA 300.0 R2.1	Total/NA
Chloride	6.27	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	21.0		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00165	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	51.1		0.103	0.0515	mg/L	1		6020B	Dissolved
Magnesium	33.4		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.00555		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.155		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	7.54		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000418	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	17.3		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 5

Lab Sample ID: 410-135670-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	120		75.0	25.0	mg/L	50	_	EPA 300.0 R2.1	Total/NA
Chloride	6.53	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	9.52		1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	68.0		0.103	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.000179	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Magnesium	30.8		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.0494		0.00206	0.000979	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Detection Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 5 (Continued)

Lab Sam

Lab Sample ID: 410-135670-7

Job ID: 410-135670-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Molybdenum	0.0883		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	9.61		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	18.2		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8C MF3 Week 5

Lab Sample ID: 410-135670-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	280		75.0	25.0	mg/L	50	_	EPA 300.0 R2.1	Total/NA
Chloride	7.18	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	2.42		1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	23.5		0.103	0.0515	mg/L	1		6020B	Dissolved
Magnesium	49.1		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.00779		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000873		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	6.43		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	18.1		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7BI NaHCO3 Week 5

Lab Sample ID: 410-135670-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D Method	Prep Type
Sulfate	1120	-	150	50.0	mg/L	100	EPA 300.0 R2.1	Total/NA
Chloride	7.07	J cn	15.0	6.00	mg/L	10	EPA 300.0 R2.1	Total/NA
Lithium	0.0608		0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	66.8		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.000911	J	0.00206	0.000700	mg/L	1	6020B	Dissolved
Calcium	35.0		0.103	0.0515	mg/L	1	6020B	Dissolved
Cobalt	0.00226		0.000515	0.000161	mg/L	1	6020B	Dissolved
Iron	0.0373	J	0.0515	0.0206	mg/L	1	6020B	Dissolved
Magnesium	69.1		0.0515	0.0165	mg/L	1	6020B	Dissolved
Manganese	0.0798		0.00206	0.000979	mg/L	1	6020B	Dissolved
Molybdenum	0.000765		0.000515	0.000134	mg/L	1	6020B	Dissolved
Potassium	8.85		0.206	0.0670	mg/L	1	6020B	Dissolved
Sodium	2600		20.6	9.27	mg/L	100	6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7I Influent Week 5

Lab Sample ID: 410-135670-1 Date Collected: 07/21/23 09:00 Matrix: Water

Date Received: 07/21/23 15:25

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/26/23 01:44	5
Sulfate	1030		375	125	mg/L			07/27/23 18:36	250
Chloride	6.94	J	7.50	3.00	mg/L			07/26/23 01:44	5
Method: SW846 6010D - I	Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0637		0.0515	0.0113	mg/L		07/24/23 00:21	07/25/23 04:24	1
SiO2	70.4		1.10	0.117	mg/L		07/24/23 00:21	07/25/23 04:24	1
Method: SW846 6020B - I	• • •								
Method: SW846 6020B - I Analyte	• • •	olved Qualifier	RL	MDL	Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
	• • •		RL 0.00206	MDL 0.000700	Unit mg/L	<u>D</u>	Prepared 07/24/23 00:21	Analyzed 07/26/23 19:03	Dil Fac
Analyte Arsenic	Result					<u>D</u>	<u> </u>		Dil Fac
Analyte	Result <0.000700		0.00206	0.000700	mg/L	<u>D</u>	07/24/23 00:21	07/26/23 19:03	1
Analyte Arsenic Calcium Cobalt	Result <0.000700 278		0.00206 0.515	0.000700 0.258	mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21	07/26/23 19:03 07/26/23 19:22	1
Analyte Arsenic Calcium Cobalt Iron	Result <0.000700 278 0.0432		0.00206 0.515 0.000515	0.000700 0.258 0.000161	mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 19:03 07/26/23 19:22 07/26/23 19:03	1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result <0.000700 278 0.0432 <0.0206		0.00206 0.515 0.000515 0.0515	0.000700 0.258 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 19:03 07/26/23 19:22 07/26/23 19:03 07/26/23 19:03	1 5 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese	Result <0.000700 278 0.0432 <0.0206 77.5	Qualifier	0.00206 0.515 0.000515 0.0515 0.0515	0.000700 0.258 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 19:03 07/26/23 19:22 07/26/23 19:03 07/26/23 19:03 07/26/23 19:03	1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum	Result <0.000700 278 0.0432 <0.0206 77.5 11.4	Qualifier	0.00206 0.515 0.000515 0.0515 0.0515 0.0103	0.000700 0.258 0.000161 0.0206 0.0165 0.00489	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 19:03 07/26/23 19:22 07/26/23 19:03 07/26/23 19:03 07/26/23 19:03 07/26/23 19:22	1 5 1 1
Analyte Arsenic Calcium	Result <0.000700 278 0.0432 <0.0206 77.5 11.4 0.000213	Qualifier	0.00206 0.515 0.000515 0.0515 0.0515 0.0103	0.000700 0.258 0.000161 0.0206 0.0165 0.00489 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 19:03 07/26/23 19:22 07/26/23 19:03 07/26/23 19:03 07/26/23 19:03 07/26/23 19:22 07/26/23 19:03	1 5 1 1

Client Sample ID: MW-7A Control Week 5

Date Collected: 07/21/23 09:15

Date Received: 07/21/23 15:25

Lab	Sample	ID:	410-	135	670-2	

Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/26/23 02:07	5
Sulfate	1010		375	125	mg/L			07/27/23 18:18	250
Chloride	6.43	J	7.50	3.00	mg/L			07/26/23 02:07	5
Method: SW846 6010D -	· Metals (ICP) - Dissolve	d							
Analyte	` '	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0878		0.0515	0.0113	mg/L		07/24/23 00:21	07/25/23 04:28	1
	60.3		1.10	0.117	mg/L		07/24/23 00:21	07/25/23 04:28	

_	00.0			•	9/ =		0172 1720 00121	01720720 0 1120	•
- Method: SW846 6020B - I	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00138	J	0.00206	0.000700	mg/L		07/24/23 00:21	07/26/23 19:05	1
Calcium	266		0.515	0.258	mg/L		07/24/23 00:21	07/26/23 19:24	5
Cobalt	0.0293		0.000515	0.000161	mg/L		07/24/23 00:21	07/26/23 19:05	1
Iron	0.0233	J	0.0515	0.0206	mg/L		07/24/23 00:21	07/26/23 19:05	1
Magnesium	77.8		0.0515	0.0165	mg/L		07/24/23 00:21	07/26/23 19:05	1
Manganese	10.3		0.0103	0.00489	mg/L		07/24/23 00:21	07/26/23 19:24	5
Molybdenum	0.00109		0.000515	0.000134	mg/L		07/24/23 00:21	07/26/23 19:05	1
Potassium	29.3		0.206	0.0670	mg/L		07/24/23 00:21	07/26/23 19:05	1
Selenium	0.000316	J	0.00103	0.000286	mg/L		07/24/23 00:21	07/26/23 19:05	1
Sodium	29.1		0.206	0.0927	mg/L		07/24/23 00:21	07/26/23 19:05	1

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Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7B NaHCO3 Week 5

Lab Sample ID: 410-135670-3 Date Collected: 07/21/23 09:30 Matrix: Water

Date Received: 07/21/23 15:25

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/26/23 04:59	5
Sulfate	1100		750	250	mg/L			07/26/23 05:22	500
Chloride	7.01	J	7.50	3.00	mg/L			07/26/23 04:59	5
Method: SW846 6010D -	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.108		0.0515	0.0113	mg/L		07/25/23 01:47	07/25/23 21:38	1
SiO2	60.6		1.10	0.117	mg/L		07/25/23 01:47	07/25/23 21:38	1
	• •		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Method: SW846 6020B -	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Olved Qualifier	RL 0.00206		Unit mg/L	<u>D</u>	Prepared 07/25/23 01:47	Analyzed 07/29/23 10:36	Dil Fac
Analyte Arsenic	• •			0.000700		<u>D</u>	<u>.</u>		Dil Fac
Analyte Arsenic Calcium	Result 0.00453		0.00206	0.000700	mg/L	<u>D</u>	07/25/23 01:47	07/29/23 10:36	Dil Fac 1 1
Analyte Arsenic Calcium Cobalt	Result 0.00453 23.4		0.00206	0.000700 0.0515	mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47	07/29/23 10:36 07/29/23 10:36	1
Analyte Arsenic Calcium Cobalt Iron	Result 0.00453 23.4 0.00146		0.00206 0.103 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:36 07/29/23 10:36 07/29/23 10:36	1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result 0.00453 23.4 0.00146 0.0575		0.00206 0.103 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36	1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese	Result 0.00453 23.4 0.00146 0.0575 73.3		0.00206 0.103 0.000515 0.0515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36	1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum	Result 0.00453 23.4 0.00146 0.0575 73.3 0.714		0.00206 0.103 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36	1 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum Potassium Selenium	Result 0.00453 23.4 0.00146 0.0575 73.3 0.714 0.00117	Qualifier	0.00206 0.103 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36 07/29/23 10:36	1 1 1 1 1

Client Sample ID: MW-7C MF3 Week 5

Date Collected: 07/21/23 09:45

Date Received: 07/21/23 15:25

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography										
	Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Fluoride	<0.450		1.00	0.450	ma/l			07/26/23 05:33	

300 07/27/23 23:43 200 Sulfate 1200 100 mg/L 07/26/23 05:33 Chloride 6.49 J 7.50 3.00 mg/L 5

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0603		0.0515	0.0113	mg/L		07/24/23 00:21	07/25/23 04:21	1
SiO2	0.852	J	1.10	0.117	mg/L		07/24/23 00:21	07/25/23 04:21	1

Method: SW846 6020B - Metals (ICP/MS) - Dissolved

Wethod: 544646 6020B - I	vietais (ICP/IVIS) - Diss	oivea							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		07/24/23 00:21	07/26/23 19:01	1
Calcium	230		0.515	0.258	mg/L		07/24/23 00:21	07/26/23 19:20	5
Cobalt	0.000293	J	0.000515	0.000161	mg/L		07/24/23 00:21	07/26/23 19:01	1
Iron	<0.0206		0.0515	0.0206	mg/L		07/24/23 00:21	07/26/23 19:01	1
Magnesium	91.6		0.258	0.0824	mg/L		07/24/23 00:21	07/26/23 19:20	5
Manganese	0.0576		0.00206	0.000979	mg/L		07/24/23 00:21	07/26/23 19:01	1
Molybdenum	0.000416	J	0.000515	0.000134	mg/L		07/24/23 00:21	07/26/23 19:01	1
Potassium	12.9		0.206	0.0670	mg/L		07/24/23 00:21	07/26/23 19:01	1
Selenium	0.000610	J	0.00103	0.000286	mg/L		07/24/23 00:21	07/26/23 19:01	1
Sodium	31.7		0.206	0.0927	mg/L		07/24/23 00:21	07/26/23 19:01	1

Eurofins Lancaster Laboratories Environment Testing, LLC

Lab Sample ID: 410-135670-4

Matrix: Water

8/3/2023

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8I Influent Week 5

Lab Sample ID: 410-135670-5 Date Collected: 07/21/23 10:00 Matrix: Water

Date Received: 07/21/23 15:25

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/26/23 05:56	
Sulfate	122		75.0	25.0	mg/L			07/26/23 06:07	50
Chloride	6.63	J	7.50	3.00	mg/L			07/26/23 05:56	Ę
Method: SW846 6010D -	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		07/24/23 00:21	07/25/23 03:59	1
SiO2	29.7		1.10	0.117	mg/L		07/24/23 00:21	07/25/23 03:59	
						<u>D</u>	<u>.</u>		Dil Fa
Method: SW846 6020B - Analyte		Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.000726	J	0.00206	0.000700	mg/L		07/24/23 00:21	07/26/23 18:55	1
Calcium	57.9		0.103	0.0515	n				
	57.5		0.103	0.0515	mg/L		07/24/23 00:21	07/26/23 18:55	1
Cobalt	0.00164		0.000515	0.00161	•		07/24/23 00:21 07/24/23 00:21	07/26/23 18:55 07/26/23 18:55	1 1
					mg/L				1
Iron	0.00164		0.000515	0.000161	mg/L mg/L		07/24/23 00:21	07/26/23 18:55	1 1 1
lron Magnesium	0.00164 < 0.0206		0.000515 0.0515	0.000161	mg/L mg/L mg/L		07/24/23 00:21 07/24/23 00:21	07/26/23 18:55 07/26/23 18:55	1 1 1 1
lron Magnesium Manganese	0.00164 <0.0206 29.3		0.000515 0.0515 0.0515	0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L		07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:55 07/26/23 18:55 07/26/23 18:55	1 1 1 1
lron Magnesium Manganese Molybdenum	0.00164 <0.0206 29.3 0.0388		0.000515 0.0515 0.0515 0.00206	0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L		07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:55 07/26/23 18:55 07/26/23 18:55 07/26/23 18:55	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Cobalt Iron Magnesium Manganese Molybdenum Potassium Selenium	0.00164 <0.0206 29.3 0.0388 0.160		0.000515 0.0515 0.0515 0.00206 0.000515	0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L		07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:55 07/26/23 18:55 07/26/23 18:55 07/26/23 18:55 07/26/23 18:55	1 1 1 1 1

Client Sample ID: MW-8A Control Week 5

Date Collected: 07/21/23 10:15

Date Received: 07/21/23 15:25

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/26/23 06:42	5
Sulfate	120		75.0	25.0	mg/L			07/26/23 06:53	50
Chloride	6.27	J	7.50	3.00	mg/L			07/26/23 06:42	5

Method: SW846 6010D - Metals (I	CP) - Dissolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113	0.0515	0.0113	mg/L		07/24/23 00:21	07/25/23 04:18	1
SiO2	21.0	1.10	0.117	mg/L		07/24/23 00:21	07/25/23 04:18	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00165	J	0.00206	0.000700	mg/L		07/24/23 00:21	07/26/23 18:59	1
Calcium	51.1		0.103	0.0515	mg/L		07/24/23 00:21	07/26/23 18:59	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		07/24/23 00:21	07/26/23 18:59	1
Iron	<0.0206		0.0515	0.0206	mg/L		07/24/23 00:21	07/26/23 18:59	1
Magnesium	33.4		0.0515	0.0165	mg/L		07/24/23 00:21	07/26/23 18:59	1
Manganese	0.00555		0.00206	0.000979	mg/L		07/24/23 00:21	07/26/23 18:59	1
Molybdenum	0.155		0.000515	0.000134	mg/L		07/24/23 00:21	07/26/23 18:59	1
Potassium	7.54		0.206	0.0670	mg/L		07/24/23 00:21	07/26/23 18:59	1
Selenium	0.000418	J	0.00103	0.000286	mg/L		07/24/23 00:21	07/26/23 18:59	1
Sodium	17.3		0.206	0.0927	mg/L		07/24/23 00:21	07/26/23 18:59	1

Eurofins Lancaster Laboratories Environment Testing, LLC

Lab Sample ID: 410-135670-6

Matrix: Water

8/3/2023

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCI3 NaHCO3 Week 5

Lab Sample ID: 410-135670-7 Date Collected: 07/21/23 10:30 Matrix: Water

Date Received: 07/21/23 15:25

Method: EPA 300.0 R2.1 Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/26/23 07:05	5
Sulfate	120		75.0	25.0	mg/L			07/26/23 07:16	50
Chloride	6.53	J	7.50	3.00	mg/L			07/26/23 07:05	5
- Method: SW846 6010D -	Metals (ICP) - Dissolve	ed							
Analyte	· · ·	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		07/24/23 00:21	07/25/23 03:56	1
SiO2	9.52		1.10	0.117	mg/L		07/24/23 00:21	07/25/23 03:56	1
Method: SW846 6020B -			DI	MDI	Unit	n	Drongrad	Analyzod	Dil Ea
-									
Analyte	Result	Olved Qualifier	RL 0.00206		Unit	<u>D</u>	Prepared 07/04/03 00:21	Analyzed	Dil Fac
Analyte Arsenic	Result <0.000700		0.00206	0.000700	mg/L	<u>D</u>	07/24/23 00:21	07/26/23 18:53	Dil Fac
Analyte Arsenic Calcium	Result <0.000700 68.0	Qualifier	0.00206	0.000700 0.0515	mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21	07/26/23 18:53 07/26/23 18:53	Dil Fac
Analyte Arsenic Calcium Cobalt	Result <0.000700 68.0 0.000179	Qualifier	0.00206 0.103 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:53 07/26/23 18:53 07/26/23 18:53	Dil Fac 1 1
Analyte Arsenic Calcium Cobalt	Result <0.000700 68.0 0.000179 <0.0206	Qualifier	0.00206 0.103 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53	Dil Fac 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result <0.000700 68.0 0.000179 <0.0206 30.8	Qualifier	0.00206 0.103 0.000515 0.0515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53	Dil Fac 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese	Result <0.000700 68.0 0.000179 <0.0206 30.8 0.0494	Qualifier	0.00206 0.103 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53	Dil Fac 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum	Result <0.000700 68.0 0.000179 <0.0206 30.8 0.0494 0.0883	Qualifier	0.00206 0.103 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53	Dil Fac 1 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result <0.000700 68.0 0.000179 <0.0206 30.8 0.0494	Qualifier	0.00206 0.103 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53 07/26/23 18:53	Dil Fac

Client Sample ID: MW-8C MF3 Week 5

Date Collected: 07/21/23 10:45 **Matrix: Water**

Date Received: 07/21/23 15:25

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			07/26/23 07:28	5
Sulfate	280		75.0	25.0	mg/L			07/26/23 07:39	50
Chloride	7.18	J	7.50	3.00	mg/L			07/26/23 07:28	5
Method: SW846 6010D -	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		07/24/23 00:21	07/25/23 04:15	1
SiO2	2.42		1.10	0.117	mg/L		07/24/23 00:21	07/25/23 04:15	1
Method: SW846 6020B -	•		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Markarda CMO4C COCOD	Matala (IOD/MO) Diag	a la caral							
Analyte	Result	Olved Qualifier	RL		Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
Analyte Arsenic	Result <0.000700		0.00206	0.000700	mg/L	<u>D</u>	07/24/23 00:21	07/26/23 18:57	Dil Fac
Analyte Arsenic Calcium	Result <0.000700 23.5		0.00206	0.000700 0.0515	mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21	07/26/23 18:57 07/26/23 18:57	Dil Fac
Analyte Arsenic Calcium Cobalt	Result <0.000700 23.5 <0.000161		0.00206 0.103 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:57 07/26/23 18:57 07/26/23 18:57	Dil Fac 1 1
Analyte Arsenic Calcium Cobalt	Result <0.000700 23.5 <0.000161 <0.0206		0.00206 0.103 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57	Dil Fac 1 1 1
Analyte Arsenic Calcium Cobalt	Result <0.000700 23.5 <0.000161 <0.0206 49.1		0.00206 0.103 0.000515 0.0515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L	<u> </u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57	Dil Fac 1 1 1 1
Analyte Arsenic Calcium Cobalt	Result <0.000700 23.5 <0.000161 <0.0206		0.00206 0.103 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57	Dil Fac 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result <0.000700 23.5 <0.000161 <0.0206 49.1		0.00206 0.103 0.000515 0.0515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57	Dil Fac 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese	Result <0.000700 23.5 <0.000161 <0.0206 49.1 0.00779		0.00206 0.103 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum	Result <0.000700 23.5 <0.000161 <0.0206 49.1 0.00779 0.000873		0.00206 0.103 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21 07/24/23 00:21	07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57 07/26/23 18:57	Dil Face 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Eurofins Lancaster Laboratories Environment Testing, LLC

Lab Sample ID: 410-135670-8

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7BI NaHCO3 Week 5

Lab Sample ID: 410-135670-9 Date Collected: 07/21/23 11:00 Matrix: Water

Date Received: 07/21/23 15:25

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.900	cn	2.00	0.900	mg/L			07/26/23 04:24	10
Sulfate	1120		150	50.0	mg/L			07/26/23 04:36	100
Chloride	7.07	J cn	15.0	6.00	mg/L			07/26/23 04:24	10
Wethod: SW846 6010D - N	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
_ithium	0.0608		0.0515	0.0113	mg/L		07/25/23 01:47	07/25/23 21:35	1
SiO2	66.8		1.10	0.117	mg/L		07/25/23 01:47	07/25/23 21:35	1
	•		RI	MDI	Unit	n	Prenared	Analyzed	Dil Fa
Method: SW846 6020B - Manual	•		DI	MDI	Unit	Ь	Propared	Analyzod	Dil Eac
Analyte	•	Qualifier	RL 0.00206	MDL 0.000700	Unit mg/L	<u>D</u>	Prepared 07/25/23 01:47	Analyzed 07/29/23 10:34	Dil Fac
Analyte Arsenic	Result	Qualifier			mg/L	<u>D</u>			Dil Fac
analyte Arsenic Calcium	Result 0.000911	Qualifier	0.00206	0.000700	mg/L	<u>D</u>	07/25/23 01:47	07/29/23 10:34	Dil Fac
analyte Arsenic Calcium Cobalt	Result 0.000911 35.0	Qualifier J	0.00206	0.000700 0.0515 0.000161	mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47	07/29/23 10:34 07/29/23 10:34	Dil Fac
Analyte Arsenic Calcium Cobalt ron	Result 0.000911 35.0 0.00226	Qualifier J	0.00206 0.103 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:34 07/29/23 10:34 07/29/23 10:34	Dil Fac 1 1 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium	Result 0.000911 35.0 0.00226 0.0373	Qualifier J	0.00206 0.103 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34	Dil Fac 1 1 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium Manganese	Result 0.000911 35.0 0.00226 0.0373 69.1	Qualifier J	0.00206 0.103 0.000515 0.0515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34	Dil Fac 1 1 1 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium Manganese Molybdenum	Result 0.000911 35.0 0.00226 0.0373 69.1 0.0798	Qualifier J	0.00206 0.103 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34	Dil Fac
Method: SW846 6020B - Manalyte Arsenic Calcium Cobalt ron Magnesium Manganese Molybdenum Potassium Selenium	Result 0.000911 35.0 0.00226 0.0373 69.1 0.0798 0.000765	Qualifier J	0.00206 0.103 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47 07/25/23 01:47	07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34 07/29/23 10:34	_

8/3/2023

Job ID: 410-135670-1

07/25/23 17:20

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-400678/5 Client Sample ID: Method Blank

Matrix: Water

Analyte

Fluoride

Sulfate

Chloride

Analysis Batch: 400678

Prep Type: Total/NA

MB MB Dil Fac Result Qualifier RL MDL Unit D Prepared Analyzed <0.0900 0.200 0.0900 mg/L 07/25/23 17:20 <0.500 1.50 0.500 mg/L 07/25/23 17:20

0.600 mg/L

Lab Sample ID: LCS 410-400678/3 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

1.50

Analysis Batch: 400678

Spike LCS LCS %Rec Added Analyte Result Qualifier %Rec Limits Unit D Fluoride 0.750 0.7147 mg/L 95 90 - 110 Sulfate 7.50 7.805 mg/L 104 90 - 110 Chloride 3.00 3.128 mg/L 104 90 - 110

Lab Sample ID: LCSD 410-400678/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 400678

	Spike	LCSD	LCSD				%Rec		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7255	-	mg/L		97	90 - 110	2	20
Sulfate	7.50	7.855		mg/L		105	90 - 110	1	20
Chloride	3.00	3.174		mg/L		106	90 - 110	1	20

Lab Sample ID: MB 410-400712/5 Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Water

Analysis Batch: 400712

мв мв

< 0.600

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			07/26/23 03:50	1
Sulfate	<0.500		1.50	0.500	mg/L			07/26/23 03:50	1
Chloride	<0.600		1.50	0.600	mg/L			07/26/23 03:50	1

Lab Sample ID: LCS 410-400712/3 **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

Matrix: Water

Analysis Batch: 400712

	Spike	LCS	LCS				%Rec
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits
Fluoride	 0.750	0.7594		mg/L		101	90 - 110
Sulfate	7.50	8.198		mg/L		109	90 - 110
Chloride	3.00	3.230		mg/L		108	90 - 110

Lab Sample ID: LCSD 410-400712/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 400712

, ,									
	Spike	LCSD	LCSD			%Rec		RPD	
Analyte	Added	Result	Qualifier L	Jnit D	%Rec	Limits	RPD	Limit	
Fluoride	0.750	0.7811	n	ng/L	104	90 - 110	3	20	
Sulfate	7.50	8.228	n	ng/L	110	90 - 110	0	20	
Chloride	3.00	3.243	n	na/L	108	90 - 110	0	20	

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8/3/2023

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-135670-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography (Continued)

Lab Sample ID: MB 410-401997/5

Matrix: Water

Analysis Batch: 401997

Client Sample ID: Method Blank Prep Type: Total/NA

Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample Dup

Client Sample ID: MW-7I Influent Week 5

Client Sample ID: MW-7I Influent Week 5

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	İ	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L				07/27/23 14:59	1
Sulfate	<0.500		1.50	0.500	mg/L				07/27/23 14:59	1
Chloride	<0.600		1.50	0.600	mg/L				07/27/23 14:59	1

Lab Sample ID: LCS 410-401997/3

Matrix: Water

Prep Type: Total/NA Analysis Batch: 401997 Spike LCS LCS %Rec

nalyte	Added	Result C	Qualifier Unit	D %Re	c Limits	
luoride	0.750	0.7187	mg/L	9	90 - 110	
ulfate	7.50	7.057	mg/L	9	4 90 - 110	
hloride	3.00	3.068	mg/L	10	2 90 - 110	

Lab Sample ID: LCSD 410-401997/4

Matrix: Water

Analysis Batch: 401997

	Spike	LCSD	LCSD				%Rec		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7114		mg/L		95	90 - 110	1	20
Sulfate	7.50	6.980		mg/L		93	90 - 110	1	20
Chloride	3.00	3.060		mg/L		102	90 - 110	0	20

Lab Sample ID: 410-135670-1 MS

Matrix: Water

Analysis Batch: 401997

Analysis Daton. 401001										
	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Sulfate	1030		1250	2310		ma/l		103	90 - 110	

Lab Sample ID: 410-135670-1 DU

Matrix: Water

Analysis Batch: 401997								
	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Sulfate	1030		1015		mg/L			15

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-399906/1-A

Matrix: Water

Analysis Batch: 400518

Client Sample	ID: Method Blank
Pr	en Type: Total/NA

Prep Batch: 399906

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		07/24/23 00:21	07/25/23 03:25	1
SiO2	<0.117		1.10	0.117	mg/L		07/24/23 00:21	07/25/23 03:25	1

Eurofins Lancaster Laboratories Environment Testing, LLC

Job ID: 410-135670-1

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: LCS 410-399906/2-A

Lab Sample ID: MB 410-400292/1-A

Matrix: Water

Matrix: Water

Analysis Batch: 400518

Client Sample ID: Lab Control Sample

Prep Type: Total/NA **Prep Batch: 399906**

Spike LCS LCS Analyte Added Result Qualifier Unit %Rec Limits Lithium 0.500 0.4919 mg/L 98 80 - 120

Client Sample ID: Method Blank

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 400292

Analysis Batch: 401007

мв мв

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		07/25/23 01:47	07/25/23 21:22	1
SiO2	<0.117		1.10	0.117	mg/L		07/25/23 01:47	07/25/23 21:22	1

Lab Sample ID: LCS 410-400292/2-A

Matrix: Water

Analysis Batch: 401007

Prep Type: Total/NA

Prep Batch: 400292

LCS LCS Spike Analyte Added Result Qualifier Unit Limits %Rec 0.500 Lithium 0.4928 80 - 120 mg/L 99

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-399906/1-A

Matrix: Water

Analysis Batch: 401244

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 399906

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		07/24/23 00:21	07/26/23 18:24	1
Calcium	<0.0515		0.103	0.0515	mg/L		07/24/23 00:21	07/26/23 18:24	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		07/24/23 00:21	07/26/23 18:24	1
Iron	<0.0206		0.0515	0.0206	mg/L		07/24/23 00:21	07/26/23 18:24	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		07/24/23 00:21	07/26/23 18:24	1
Manganese	<0.000979		0.00206	0.000979	mg/L		07/24/23 00:21	07/26/23 18:24	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		07/24/23 00:21	07/26/23 18:24	1
Potassium	<0.0670		0.206	0.0670	mg/L		07/24/23 00:21	07/26/23 18:24	1
Selenium	<0.000286		0.00103	0.000286	mg/L		07/24/23 00:21	07/26/23 18:24	1
Sodium	<0.0927		0.206	0.0927	mg/L		07/24/23 00:21	07/26/23 18:24	1

Lab Sample ID: LCS 410-399906/2-A

Matrix: Water

Analysis Batch: 401244

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Prep Batch: 399906

7 mm, y 0.0 = 0.00 m . 0 . = 1 .								
	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.5130		mg/L		103	85 - 120	
Calcium	5.00	5.030		mg/L		101	85 - 120	
Cobalt	0.500	0.4938		mg/L		99	90 - 113	
Iron	5.00	5.078		mg/L		102	88 - 119	
Magnesium	5.00	5.126		mg/L		103	90 - 112	
Manganese	0.500	0.5097		mg/L		102	89 - 120	
Molybdenum	0.0500	0.05115		mg/L		102	85 - 115	
Potassium	5.00	5.124		mg/L		102	90 - 112	
Selenium	0.100	0.09878		mg/L		99	80 - 120	
Sodium	5.00	5.022		ma/L		100	89 - 112	

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QC Sample Results

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-400292/1-A

Analysis Batch: 402313

Matrix: Water

Client Sample ID: Method Blank
Prep Type: Total/NA

Prep Batch: 400292

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		07/25/23 01:47	07/29/23 10:01	1
Calcium	<0.0515		0.103	0.0515	mg/L		07/25/23 01:47	07/29/23 10:01	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		07/25/23 01:47	07/29/23 10:01	1
Iron	<0.0206		0.0515	0.0206	mg/L		07/25/23 01:47	07/29/23 10:01	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		07/25/23 01:47	07/29/23 10:01	1
Manganese	<0.000979		0.00206	0.000979	mg/L		07/25/23 01:47	07/29/23 10:01	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		07/25/23 01:47	07/29/23 10:01	1
Potassium	<0.0670		0.206	0.0670	mg/L		07/25/23 01:47	07/29/23 10:01	1
Selenium	<0.000286		0.00103	0.000286	mg/L		07/25/23 01:47	07/29/23 10:01	1
Sodium	<0.0927		0.206	0.0927	mg/L		07/25/23 01:47	07/29/23 10:01	1

Lab Sample ID: LCS 410-400292/2-A

Matrix: Water

Sodium

Analysis Batch: 402313

Client Sample ID: Lab Control Sample

89 - 112

Prep Type: Total/NA Prep Batch: 400292

LCS LCS Spike %Rec Result Qualifier Analyte Added Unit %Rec Limits Arsenic 0.500 0.5065 101 85 - 120 mg/L Calcium 5.00 5.102 mg/L 102 85 - 120 Cobalt 0.500 0.4948 mg/L 99 90 - 113 5.00 5.030 Iron mg/L 101 88 - 119 Magnesium 5.00 5.042 mg/L 101 90 - 112 0.500 Manganese 0.5045 mg/L 101 89 - 120 Molybdenum 0.0500 0.05028 mg/L 101 85 - 115 Potassium 5.00 5.086 mg/L 102 90 - 112 0.100 0.1024 102 Selenium mg/L 80 - 120

4.906

mg/L

5.00

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QC Association Summary

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

HPLC/IC

Analysis Batch: 400678

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-135670-1	MW-7I Influent Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-2	MW-7A Control Week 5	Total/NA	Water	EPA 300.0 R2.1	
MB 410-400678/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-400678/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-400678/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 400712

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-135670-3	MW-7B NaHCO3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-3	MW-7B NaHCO3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-4	MW-7C MF3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-5	MW-8I Influent Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-5	MW-8I Influent Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-6	MW-8A Control Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-6	MW-8A Control Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-7	MW-8B FeCl3 NaHCO3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-7	MW-8B FeCl3 NaHCO3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-8	MW-8C MF3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-8	MW-8C MF3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-9	MW-7BI NaHCO3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-9	MW-7BI NaHCO3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
MB 410-400712/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-400712/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-400712/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 401997

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-135670-1	MW-7I Influent Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-2	MW-7A Control Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-4	MW-7C MF3 Week 5	Total/NA	Water	EPA 300.0 R2.1	
MB 410-401997/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-401997/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-401997/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	
410-135670-1 MS	MW-7I Influent Week 5	Total/NA	Water	EPA 300.0 R2.1	
410-135670-1 DU	MW-7I Influent Week 5	Total/NA	Water	EPA 300.0 R2.1	

Metals

Prep Batch: 399906

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-135670-1	MW-7I Influent Week 5	Dissolved	Water	Non-Digest Prep	
410-135670-2	MW-7A Control Week 5	Dissolved	Water	Non-Digest Prep	
410-135670-4	MW-7C MF3 Week 5	Dissolved	Water	Non-Digest Prep	
410-135670-5	MW-8I Influent Week 5	Dissolved	Water	Non-Digest Prep	
410-135670-6	MW-8A Control Week 5	Dissolved	Water	Non-Digest Prep	
410-135670-7	MW-8B FeCl3 NaHCO3 Week 5	Dissolved	Water	Non-Digest Prep	
410-135670-8	MW-8C MF3 Week 5	Dissolved	Water	Non-Digest Prep	
MB 410-399906/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-399906/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

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QC Association Summary

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Metals

Prep	Batch:	400292
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Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Prep E	3atch
410-135670-3	MW-7B NaHCO3 Week 5	Dissolved	Water	Non-Digest Prep	
410-135670-9	MW-7BI NaHCO3 Week 5	Dissolved	Water	Non-Digest Prep	
MB 410-400292/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-400292/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 400518

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-135670-1	MW-7I Influent Week 5	Dissolved	Water	6010D	399906
410-135670-2	MW-7A Control Week 5	Dissolved	Water	6010D	399906
410-135670-4	MW-7C MF3 Week 5	Dissolved	Water	6010D	399906
410-135670-5	MW-8I Influent Week 5	Dissolved	Water	6010D	399906
410-135670-6	MW-8A Control Week 5	Dissolved	Water	6010D	399906
410-135670-7	MW-8B FeCl3 NaHCO3 Week 5	Dissolved	Water	6010D	399906
410-135670-8	MW-8C MF3 Week 5	Dissolved	Water	6010D	399906
MB 410-399906/1-A	Method Blank	Total/NA	Water	6010D	399906
LCS 410-399906/2-A	Lab Control Sample	Total/NA	Water	6010D	399906

Analysis Batch: 401007

Lab Sample I 410-135670-3		Prep Type Dissolved	Matrix Water	Method 6010D	Prep Batch 400292
410-135670-9	MW-7BI NaHCO3 Week 5	Dissolved	Water	6010D	400292
MB 410-4002	92/1-A Method Blank	Total/NA	Water	6010D	400292
LCS 410-4002	92/2-A Lab Control Sample	Total/NA	Water	6010D	400292

Analysis Batch: 401244

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-135670-1	MW-7I Influent Week 5	Dissolved	Water	6020B	399906
410-135670-1	MW-7I Influent Week 5	Dissolved	Water	6020B	399906
410-135670-2	MW-7A Control Week 5	Dissolved	Water	6020B	399906
410-135670-2	MW-7A Control Week 5	Dissolved	Water	6020B	399906
410-135670-4	MW-7C MF3 Week 5	Dissolved	Water	6020B	399906
410-135670-4	MW-7C MF3 Week 5	Dissolved	Water	6020B	399906
410-135670-5	MW-8I Influent Week 5	Dissolved	Water	6020B	399906
410-135670-6	MW-8A Control Week 5	Dissolved	Water	6020B	399906
410-135670-7	MW-8B FeCl3 NaHCO3 Week 5	Dissolved	Water	6020B	399906
410-135670-8	MW-8C MF3 Week 5	Dissolved	Water	6020B	399906
MB 410-399906/1-A	Method Blank	Total/NA	Water	6020B	399906
LCS 410-399906/2-A	Lab Control Sample	Total/NA	Water	6020B	399906

Analysis Batch: 402313

Lab Sample ID 410-135670-3	Client Sample ID MW-7B NaHCO3 Week 5	Prep Type Dissolved	Matrix Water	Method 6020B	Prep Batch 400292
410-135670-9	MW-7BI NaHCO3 Week 5	Dissolved	Water	6020B	400292
MB 410-400292/1-A	Method Blank	Total/NA	Water	6020B	400292
LCS 410-400292/2-A	Lab Control Sample	Total/NA	Water	6020B	400292

Analysis Batch: 403556

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-135670-3	MW-7B NaHCO3 Week 5	Dissolved	Water	6020B	400292
410-135670-9	MW-7BI NaHCO3 Week 5	Dissolved	Water	6020B	400292

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Client Sample ID: MW-7I Influent Week 5

Lab Sample ID: 410-135670-1

Matrix: Water

Date Collected: 07/21/23 09:00 Date Received: 07/21/23 15:25

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		250	401997	W7FX	ELLE	07/27/23 18:36
Total/NA	Analysis	EPA 300.0 R2.1		5	400678	L4QM	ELLE	07/26/23 01:44
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6010D		1	400518	T8CQ	ELLE	07/25/23 04:24
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		1	401244	UCIG	ELLE	07/26/23 19:03
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		5	401244	UCIG	ELLE	07/26/23 19:22

Client Sample ID: MW-7A Control Week 5

Lab Sample ID: 410-135670-2 Date Collected: 07/21/23 09:15

Matrix: Water

Date Received: 07/21/23 15:25

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		250	401997	W7FX	ELLE	07/27/23 18:18
Total/NA	Analysis	EPA 300.0 R2.1		5	400678	L4QM	ELLE	07/26/23 02:07
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6010D		1	400518	T8CQ	ELLE	07/25/23 04:28
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		1	401244	UCIG	ELLE	07/26/23 19:05
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		5	401244	UCIG	ELLE	07/26/23 19:24

Client Sample ID: MW-7B NaHCO3 Week 5

Lab Sample ID: 410-135670-3 Date Collected: 07/21/23 09:30 **Matrix: Water**

Date Received: 07/21/23 15:25

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	400712	W7FX	ELLE	07/26/23 04:59
Total/NA	Analysis	EPA 300.0 R2.1		500	400712	W7FX	ELLE	07/26/23 05:22
Dissolved	Prep	Non-Digest Prep			400292	UAMX	ELLE	07/25/23 01:47
Dissolved	Analysis	6010D		1	401007	T8CQ	ELLE	07/25/23 21:38
Dissolved	Prep	Non-Digest Prep			400292	UAMX	ELLE	07/25/23 01:47
Dissolved	Analysis	6020B		1	402313	LC3M	ELLE	07/29/23 10:36
Dissolved	Prep	Non-Digest Prep			400292	UAMX	ELLE	07/25/23 01:47
Dissolved	Analysis	6020B		100	403556	F7JF	ELLE	08/02/23 10:43

Client Sample ID: MW-7C MF3 Week 5

Date Collected: 07/21/23 09:45 **Matrix: Water**

Date Received: 07/21/23 15:25

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		200	401997	W7FX	ELLE	07/27/23 23:43
Total/NA	Analysis	EPA 300.0 R2.1		5	400712	W7FX	ELLE	07/26/23 05:33

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Lab Sample ID: 410-135670-4

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Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7C MF3 Week 5

Date Collected: 07/21/23 09:45 Date Received: 07/21/23 15:25

Client: Terra Systems Inc

Lab Sample ID: 410-135670-4

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6010D		1	400518	T8CQ	ELLE	07/25/23 04:21
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		1	401244	UCIG	ELLE	07/26/23 19:01
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		5	401244	UCIG	ELLE	07/26/23 19:20

Client Sample ID: MW-8I Influent Week 5

Date Collected: 07/21/23 10:00

Date Received: 07/21/23 15:25

Lab Sample ID: 410-135670-5

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	400712	W7FX	ELLE	07/26/23 05:56
Total/NA	Analysis	EPA 300.0 R2.1		50	400712	W7FX	ELLE	07/26/23 06:07
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6010D		1	400518	T8CQ	ELLE	07/25/23 03:59
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		1	401244	UCIG	ELLE	07/26/23 18:55

Client Sample ID: MW-8A Control Week 5

Date Collected: 07/21/23 10:15

Date Received: 07/21/23 15:25

Lab	Sample	ID: 410-135670-6
	Gampio	151 410 100010 0

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	400712	W7FX	ELLE	07/26/23 06:42
Total/NA	Analysis	EPA 300.0 R2.1		50	400712	W7FX	ELLE	07/26/23 06:53
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6010D		1	400518	T8CQ	ELLE	07/25/23 04:18
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		1	401244	UCIG	ELLE	07/26/23 18:59

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 5

Date Collected: 07/21/23 10:30

Date Received: 07/21/23 15:25

Lab Sample ID: 410-1356	70-7
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Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	400712	W7FX	ELLE	07/26/23 07:05
Total/NA	Analysis	EPA 300.0 R2.1		50	400712	W7FX	ELLE	07/26/23 07:16
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6010D		1	400518	T8CQ	ELLE	07/25/23 03:56
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		1	401244	UCIG	ELLE	07/26/23 18:53

Lab Chronicle

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8C MF3 Week 5

Lab Sample ID: 410-135670-8 Date Collected: 07/21/23 10:45

Matrix: Water

Date Received: 07/21/23 15:25

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1			400712	W7FX	ELLE	07/26/23 07:28
Total/NA	Analysis	EPA 300.0 R2.1		50	400712	W7FX	ELLE	07/26/23 07:39
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6010D		1	400518	T8CQ	ELLE	07/25/23 04:15
Dissolved	Prep	Non-Digest Prep			399906	UAMX	ELLE	07/24/23 00:21
Dissolved	Analysis	6020B		1	401244	UCIG	ELLE	07/26/23 18:57

Client Sample ID: MW-7BI NaHCO3 Week 5

Lab Sample ID: 410-135670-9

Matrix: Water

Date Collected: 07/21/23 11:00 Date Received: 07/21/23 15:25

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		10	400712	W7FX	ELLE	07/26/23 04:24
Total/NA	Analysis	EPA 300.0 R2.1		100	400712	W7FX	ELLE	07/26/23 04:36
Dissolved	Prep	Non-Digest Prep			400292	UAMX	ELLE	07/25/23 01:47
Dissolved	Analysis	6010D		1	401007	T8CQ	ELLE	07/25/23 21:35
Dissolved	Prep	Non-Digest Prep			400292	UAMX	ELLE	07/25/23 01:47
Dissolved	Analysis	6020B		1	402313	LC3M	ELLE	07/29/23 10:34
Dissolved	Prep	Non-Digest Prep			400292	UAMX	ELLE	07/25/23 01:47
Dissolved	Analysis	6020B		100	403556	F7JF	ELLE	08/02/23 10:41

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alabama	State	43200	01-31-24
Alaska	State	PA00009	06-30-24
Alaska (UST)	State	17-027	02-28-24
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-08-23
California	State	2792	11-30-23
Colorado	State	PA00009	06-30-24
Connecticut	State	PH-0746	06-30-25
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	06-30-24
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Ilinois	NELAP	200027	01-31-24
owa	State	361	03-01-24
Kansas	NELAP	E-10151	10-31-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	12-31-23
Louisiana (All)	NELAP	02055	06-30-24
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-24
Massachusetts	State	M-PA009	06-30-24
	State	9930	
Michigan Minnesota	NELAP	042-999-487	01-31-24
Minnesota			12-31-23
Mississippi	State	023	01-31-24
Missouri	State	450	01-31-25
Montana (DW)	State	0098	01-01-24
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	01-10-24
New Jersey	NELAP	PA011	06-30-24
New York	NELAP	10670	04-01-24
North Carolina (DW)	State	42705	07-31-24
North Carolina (WW/SW)	State	521	12-31-23
North Dakota	State	R-205	01-31-24
Oklahoma	NELAP	9804	08-31-23
Oregon	NELAP	PA200001	09-11-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	01-31-24
Rhode Island	State	LAO00338	12-31-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Гехаs	NELAP	T104704194-23-46	08-31-23
JSDA	US Federal Programs	525-22-298-19481	10-25-25
/ermont	State	VT - 36037	10-28-23
⁄irginia	NELAP	460182	06-14-25
Vashington	State	C457	04-11-24
West Virginia (DW)	State	9906 C	12-31-23

Eurofins Lancaster Laboratories Environment Testing, LLC

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Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-135670-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Method Method Description Protocol Laboratory

Method	Method Description	Protocol	Laboratory
EPA 300.0 R2.1	Anions, Ion Chromatography	EPA	ELLE
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Job ID: 410-135670-1

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Sample Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-135670-1	MW-7I Influent Week 5	Water	07/21/23 09:00	07/21/23 15:25
410-135670-2	MW-7A Control Week 5	Water	07/21/23 09:15	07/21/23 15:25
410-135670-3	MW-7B NaHCO3 Week 5	Water	07/21/23 09:30	07/21/23 15:25
410-135670-4	MW-7C MF3 Week 5	Water	07/21/23 09:45	07/21/23 15:25
410-135670-5	MW-8I Influent Week 5	Water	07/21/23 10:00	07/21/23 15:25
410-135670-6	MW-8A Control Week 5	Water	07/21/23 10:15	07/21/23 15:25
410-135670-7	MW-8B FeCl3 NaHCO3 Week 5	Water	07/21/23 10:30	07/21/23 15:25
410-135670-8	MW-8C MF3 Week 5	Water	07/21/23 10:45	07/21/23 15:25
410-135670-9	MW-7BI NaHCO3 Week 5	Water	07/21/23 11:00	07/21/23 15:25

Job ID: 410-135670-1

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Lancaster Laboratories

equest/Chain of Custody

Environmental																	1	
Client: Terra Systems, Inc.						Matrix					Α	nalyses	Req	ueste	ed		For Lab (lse Only
Project Name/#: Stantec CCR AP2 Columns	Site ID #:	Macon, GA									F	reserva	tion	Code	es		SF #:	
Project Manager: Michael D. Lee	P.O. #:	222566-7-2	1-23		Tissue	nud			N	N	-						SCR #:	
Sampler: Michael D. Lee	PWSID #:				Ĕ	Ground Surface		_s	5	22							Preserv	ation Codes
Phone #: 302-798-9553	Quote #:	4101181	18		٣			iner	Fe, K, L	Se, SiO2							H = HCI	T = Thiosulfate
State where samples were collected: GA For 0	Compliance:	Yes 🗌	No	1	Ē	els Els		Containers	Co, Fe	S S							N = HNO ₃	B = NaOH
	Collec	tion	۵	Composite	☐ Sediment	Potable er NPDES	er:	Total # of Co	As, Ca,	Dis (fil) Mg. Mn, Mo,	SO4						S = H ₂ SO ₄ O = Other	P = H ₃ PO ₄
Sample Identification	Date	Time	Grab	Cor	Soil	Water	Other:	Tot	Dis (fil)	Dis (fi	CI, F,						Re	marks
MW-7I Influent Week 5	7/21/2023	9:00		Х		Х		2	Х	Х	Х						ff =field fil	tered
MW-7A Control Week 5	7/21/2023	9:15		X		Х		2	Х	X	Х							
MW-7B NaHCO3 Week 5	7/21/2023	9:30		X	$oxed{oxed}$	X		2	Х	Х	Х							
MW-7C MF3 Week 5	7/21/2023	9:45		X		Х		2	Х	Х	Х							
MW-8I Influent Week 5	7/21/2023	10:00		X		X		2	Х	Х	Х				Ш			
MW-8A Control Week 5	7/21/2023	10:15		X		Х		2	Х	Х	Х							
MW-8B FeCl3 NaHCO3 Week 5	7/21/2023	10:30		X		Х		2	Х	Х	Х							
MW-8C MF3 Week 5	7/21/2023	10:45		X		X		2	X	X	Х							
MW-7BI NaHCO3 Week 5	7/21/2023	11:00		X	\vdash	X		2	Х	Х	Х		-	-				
Turnaround Time Requested (TAT) (please chec (Rush TAT is subject to laboratory ap			Rus	h 🗌	1	nquished Who	Wo	00	20	1/2	ate		2 6	eived	-12	Q	Date	-
Date results are needed: 8/4/23						nquished	by:	(7		ate	Time		eived	by:		Date	Time
Rush results requested by (please check): E-M	lail 🔽	Phon	e [30-	1	1	۷_	-		3152	_					
E-mail Address: <u>mlee@terrasystems.net</u>					Reli	nquished	by:			Di	ate	Time	Rec	eived	by:		Date	Time
Phone: 302-798-9553																/		
Data Package Options (please check if required					Reli	nquished	by:			D:	ate	Time	Red	eived	by		Date	Time
Type I (Validation/non-CLP)									_				/		.1		-	
Type III (Reduced non-CLP) CT RCP					Reli	nquished	by:			D	ate	Time	Rec	eived	'by -	57	706 b	Time
Type VI (Raw Data Only) TX TRRF													1-1	1		a	10/2	15.00
NJ DKQP NYSDEC	Category	☐ A or		В	Reli	nquished	by C	omme	ercial	Carrie	er:			0			2.5	
EDD Required? Yes No 🗸 If ye	es, format:				UPS		FedE	Ex		Other			Ten	n Page	rate ht	on receip	1	°C

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Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-135670-1

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC Login Number: 135670

List Number: 1

Creator: Kanagy, Nicholas

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
NV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
s the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from NV)?	N/A	

Eurofins Lancaster Laboratories Environment Testing, LLC

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

Generated 8/17/2023 4:38:15 AM

JOB DESCRIPTION

Stantec CCR AP2 Columns

JOB NUMBER

410-136831-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 8/17/2023 4:38:15 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

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Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Marrissa Williams

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Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns Laboratory Job ID: 410-136831-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-136831-1

Project/Site: Stantec CCR AP2 Columns

Qualifier Description

Qualifiers

HPLC/IC	
Qualifier	

cn	Refer to Case Narrative for further detail
F1	MS and/or MSD recovery exceeds control limits.

Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier Qualifier Description

^2 Calibration Blank (ICB and/or CCB) is outside acceptance limits.

J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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

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Case Narrative

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-136831-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-136831-1

Receipt

The samples were received on 7/31/2023 4:20 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 -0.1°C

HPLC/IC

Method 300_ORGFM_28D: The following sample was diluted due to the nature of the sample matrix: MW-7BI NaHCO3 Week 6 (410-136831-2). Elevated reporting limit (RL) is provided for fluoride.

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

Metals

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

Job ID: 410-136831-1

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-136831-1

Client Sample ID: MW-7A Control Week 6

Lab Sample ID: 410-136831-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1030		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	6.17	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0587		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	61.4		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	1.53	J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	256000		618	258	ug/L	5		6020B	Dissolved
Cobalt	64.0		0.515	0.161	ug/L	1		6020B	Dissolved
Magnesium	78500		51.5	16.5	ug/L	1		6020B	Dissolved
Potassium	33300		206	67.0	ug/L	1		6020B	Dissolved
Manganese	12400		10.3	4.89	ug/L	5		6020B	Dissolved
Sodium	28900		206	92.7	ug/L	1		6020B	Dissolved
Molybdenum	0.846		0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	0.534	J	1.03	0.286	ug/L	1		6020B	Dissolved

Client Sample ID: MW-7BI NaHCO3 Week 6

Lab Sample ID: 410-136831-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Sulfate	1040		300	100	mg/L	200	EPA 300.0 R2.1	Total/NA
Chloride	22.9	F1 cn	15.0	6.00	mg/L	10	EPA 300.0 R2.1	Total/NA
Lithium	0.0808		0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	68.3		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	1.02	J	2.06	0.700	ug/L	1	6020B	Dissolved
Calcium	21500		124	51.5	ug/L	1	6020B	Dissolved
Cobalt	1.18		0.515	0.161	ug/L	1	6020B	Dissolved
Magnesium	73500	^2	51.5	16.5	ug/L	1	6020B	Dissolved
Iron	38.3	J	51.5	20.6	ug/L	1	6020B	Dissolved
Potassium	8980		206	67.0	ug/L	1	6020B	Dissolved
Manganese	45.5		2.06	0.979	ug/L	1	6020B	Dissolved
Sodium	3460000	^2	206000	92700	ug/L	1000	6020B	Dissolved
Molybdenum	0.965		0.515	0.134	ug/L	1	6020B	Dissolved

Client Sample ID: MW-7C MF3 Week 6

Lab Sample ID: 410-136831-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1050		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	6.20	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0362	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	0.569	J	1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	212000		618	258	ug/L	5		6020B	Dissolved
Cobalt	0.181	J	0.515	0.161	ug/L	1		6020B	Dissolved
Magnesium	103000		258	82.4	ug/L	5		6020B	Dissolved
Iron	22.9	J	51.5	20.6	ug/L	1		6020B	Dissolved
Potassium	11500		206	67.0	ug/L	1		6020B	Dissolved
Manganese	15.6		2.06	0.979	ug/L	1		6020B	Dissolved
Sodium	29900		206	92.7	ug/L	1		6020B	Dissolved
Molybdenum	0.311	J	0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	0.755	J	1.03	0.286	ug/L	1		6020B	Dissolved

Client Sample ID: MW-8A Control Week 6

Lab Sample ID: 410-136831-4

Analyte	Result Qualifier	RL	MDL Unit	Dil Fac D	Method	Prep Type
Sulfate	110	75.0	25.0 mg/L	50	EPA 300.0 R2.1	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins Lancaster Laboratories Environment Testing, LLC

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-136831-1

Client Sample ID: MW-8A Control Week 6 (Continued)

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Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	8.31		7.50	3.00	mg/L	5	_	EPA 300.0 R2.1	Total/NA
SiO2	21.1		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	1.49	J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	51100		124	51.5	ug/L	1		6020B	Dissolved
Magnesium	38000		51.5	16.5	ug/L	1		6020B	Dissolved
Potassium	7460		206	67.0	ug/L	1		6020B	Dissolved
Manganese	6.21		2.06	0.979	ug/L	1		6020B	Dissolved
Sodium	18200		206	92.7	ug/L	1		6020B	Dissolved
Molybdenum	162		0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	0.346	J	1.03	0.286	ug/L	1		6020B	Dissolved

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 6

Lab Sample ID: 410-136831-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	109		37.5	12.5	mg/L	25	_	EPA 300.0 R2.1	Total/NA
Chloride	6.96	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	11.0		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.932	J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	66900		124	51.5	ug/L	1		6020B	Dissolved
Magnesium	31500		51.5	16.5	ug/L	1		6020B	Dissolved
Potassium	8950		206	67.0	ug/L	1		6020B	Dissolved
Manganese	31.9		2.06	0.979	ug/L	1		6020B	Dissolved
Sodium	18100		206	92.7	ug/L	1		6020B	Dissolved
Molybdenum	130		0.515	0.134	ug/L	1		6020B	Dissolved

Client Sample ID: MW-8C MF3 Week 6

Lab Sample ID: 410-136831-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	256		75.0	25.0	mg/L	50	_	EPA 300.0 R2.1	Total/NA
Chloride	6.41	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	2.65		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	1.09	J	2.06	0.700	ug/L	1		6020B	Dissolved
Calcium	20300		124	51.5	ug/L	1		6020B	Dissolved
Magnesium	48800		51.5	16.5	ug/L	1		6020B	Dissolved
Potassium	6360		206	67.0	ug/L	1		6020B	Dissolved
Manganese	8.48		2.06	0.979	ug/L	1		6020B	Dissolved
Sodium	19000		206	92.7	ug/L	1		6020B	Dissolved
Molybdenum	0.654		0.515	0.134	ug/L	1		6020B	Dissolved
Selenium	0.310	J	1.03	0.286	ug/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

8/17/2023

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Client Sample Results

Client: Terra Systems Inc Job ID: 410-136831-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7A Control Week 6

Date Collected: 07/31/23 08:00

Date Received: 07/31/23 16:20

Lab Sample ID: 410-136831-1

Matrix: Water

Method: EPA 300.0 R2.1	•								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			08/02/23 14:41	5
Sulfate	1030		300	100	mg/L			08/03/23 18:46	200
Chloride	6.17	J	7.50	3.00	mg/L			08/02/23 14:41	5
Method: SW846 6010D -	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0587		0.0515	0.0113	mg/L		08/03/23 00:27	08/03/23 07:18	1
							00/00/00 00 07	00/00/00 07 40	4
SiO2	61.4		1.10	0.117	mg/L		08/03/23 00:27	08/03/23 07:18	1
SiO2 : Method: SW846 6020B -		olved	1.10	0.117	mg/L		08/03/23 00:27	08/03/23 07:18	1
- -	Metals (ICP/MS) - Disse	olved Qualifier	1.10 RL	0.117 MDL	J	D	08/03/23 00:27 Prepared	08/03/23 07:18 Analyzed	Dil Fac
Method: SW846 6020B -	Metals (ICP/MS) - Disse	Qualifier			J	<u>D</u>			Dil Fac
Method: SW846 6020B - Analyte	Metals (ICP/MS) - Disse Result	Qualifier	RL_	MDL 0.700	Unit ug/L	<u>D</u>	Prepared	Analyzed	Dil Fac 1 5
Method: SW846 6020B - Analyte Arsenic	Metals (ICP/MS) - Disso Result	Qualifier	RL 2.06	MDL 0.700	Unit ug/L	<u>D</u>	Prepared 08/03/23 00:27	Analyzed 08/03/23 20:05	1
Method: SW846 6020B - Analyte Arsenic Calcium	Metals (ICP/MS) - Disso Result 1.53 256000	Qualifier		MDL 0.700 258 0.161	Unit ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 20:05 08/03/23 20:32	1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt	Metals (ICP/MS) - Disservation Result 1.53 256000 64.0	Qualifier	RL 2.06 618 0.515	MDL 0.700 258 0.161	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 20:05 08/03/23 20:32 08/03/23 20:05	1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt Magnesium	Metals (ICP/MS) - Dissa Result 1.53 256000 64.0 78500	Qualifier	RL 2.06 618 0.515 51.5	MDL 0.700 258 0.161 16.5 20.6	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 20:05 08/03/23 20:32 08/03/23 20:05 08/03/23 20:05	1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt Magnesium Iron	Metals (ICP/MS) - Dissa Result 1.53 256000 64.0 78500 <20.6	Qualifier	2.06 618 0.515 51.5 51.5	MDL 0.700 258 0.161 16.5 20.6	Unit ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 20:05 08/03/23 20:32 08/03/23 20:05 08/03/23 20:05 08/03/23 20:05	1

0.515

1.03

0.134 ug/L

0.286 ug/L

0.286 ug/L

Client Sample ID: MW-7BI NaHCO3 Week 6

0.846

<0.286

0.534 J

Date Collected: 07/31/23 08:15

Date Received: 07/31/23 16:20

Molybdenum

Selenium

Selenium

Lab Sample ID: 410-136831-2

08/03/23 20:05

08/03/23 20:05

08/03/23 00:27

08/03/23 00:27

Matrix: Water

						_			
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.900	cn	2.00	0.900	mg/L			08/02/23 16:59	10
Sulfate	1040		300	100	mg/L			08/03/23 18:57	200
Chloride	22.9	F1 cn	15.0	6.00	mg/L			08/02/23 16:59	10
Method: SW846 6010D - I	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0808		0.0515	0.0113	mg/L		08/08/23 07:37	08/08/23 19:18	1
SiO2	68.3		1.10	0.117	ma/L		08/08/23 07:37	08/08/23 19:18	1
Method: SW846 6020B - I	,				-	_			
Method: SW846 6020B - I	Metals (ICP/MS) - Diss	olved			9				
Method: SW846 6020B - I Analyte	,	Olved Qualifier	RL	MDL	-	<u>D</u>	Prepared	Analyzed	Dil Fac
	,	Qualifier			Unit	<u>D</u>		Analyzed 08/14/23 19:18	Dil Fac
Analyte	Result	Qualifier	RL	MDL	Unit ug/L	<u>D</u>	Prepared		Dil Fac
Analyte Arsenic	Result 1.02	Qualifier	RL 2.06	MDL 0.700	Unit ug/L	<u>D</u>	Prepared 08/08/23 07:37	08/14/23 19:18	Dil Fac 1 1 1
Analyte Arsenic Calcium	Result 1.02 21500	Qualifier J		MDL 0.700 51.5	Unit ug/L ug/L ug/L	<u>D</u>	Prepared 08/08/23 07:37 08/08/23 07:37	08/14/23 19:18 08/14/23 19:18	Dil Fac 1 1 1 1
Analyte Arsenic Calcium Cobalt	Result 1.02 21500 1.18	Qualifier J	RL 2.06 124 0.515	MDL 0.700 51.5 0.161 16.5	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/08/23 07:37 08/08/23 07:37 08/08/23 07:37	08/14/23 19:18 08/14/23 19:18 08/14/23 19:18	Dil Fac 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Magnesium	Result 1.02 21500 1.18 73500	Qualifier J	RL 2.06 124 0.515 51.5	MDL 0.700 51.5 0.161 16.5 20.6	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/08/23 07:37 08/08/23 07:37 08/08/23 07:37 08/08/23 07:37	08/14/23 19:18 08/14/23 19:18 08/14/23 19:18 08/14/23 19:18	Dil Fac 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Magnesium Iron	Result 1.02 21500 1.18 73500 38.3	Qualifier J	2.06 124 0.515 51.5 51.5	MDL 0.700 51.5 0.161 16.5 20.6	Unit ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/08/23 07:37 08/08/23 07:37 08/08/23 07:37 08/08/23 07:37 08/08/23 07:37	08/14/23 19:18 08/14/23 19:18 08/14/23 19:18 08/14/23 19:18 08/14/23 19:18	Dil Fac 1 1 1 1 1 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Magnesium Iron Potassium	Result 1.02 21500 1.18 73500 38.3 8980	Qualifier J ^2 J	2.06 124 0.515 51.5 51.5 206	MDL 0.700 51.5 0.161 16.5 20.6 67.0	Unit ug/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/08/23 07:37 08/08/23 07:37 08/08/23 07:37 08/08/23 07:37 08/08/23 07:37	08/14/23 19:18 08/14/23 19:18 08/14/23 19:18 08/14/23 19:18 08/14/23 19:18 08/14/23 19:18	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1 1 1000

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08/08/23 07:37

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1.03

8/17/2023

08/16/23 11:59

Client Sample Results

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7C MF3 Week 6

Date Collected: 07/31/23 08:30

Date Received: 07/31/23 16:20

Lab Sample ID: 410-136831-3

Matrix: Water

Job ID: 410-136831-1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			08/02/23 15:04	5
Sulfate	1050		300	100	mg/L			08/03/23 19:08	200
Chloride	6.20	J	7.50	3.00	mg/L			08/02/23 15:04	5
Method: SW846 6010D - N	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0362	J	0.0515	0.0113	mg/L		08/03/23 00:27	08/03/23 07:12	1
SiO2	0.569	J	1.10	0.117	mg/L		08/03/23 00:27	08/03/23 07:12	1
Analyte		Qualifier	RL _	MDL		D	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - N	,								
Arsenic	<0.700		2.06	0.700	ug/L		08/03/23 00:27	08/03/23 20:01	1
Calcium	212000		618	258	ug/L		08/03/23 00:27	08/03/23 20:30	5
Cobalt	0.181	J	0.515	0.161	ug/L		08/03/23 00:27	08/03/23 20:01	1
Magnesium	103000		258	82.4	ug/L		08/03/23 00:27	08/03/23 20:30	5
•	103000 22.9	J	258 51.5	82.4 20.6	-		08/03/23 00:27 08/03/23 00:27	08/03/23 20:30 08/03/23 20:01	5
ron		J		20.6	-				5 1 1
lron Potassium	22.9	J	51.5	20.6	ug/L ug/L		08/03/23 00:27	08/03/23 20:01	5 1 1
ron Potassium Manganese	22.9 11500	J	51.5 206	20.6 67.0	ug/L ug/L		08/03/23 00:27 08/03/23 00:27	08/03/23 20:01 08/03/23 20:01	5 1 1 1
Magnesium Iron Potassium Manganese Sodium Molybdenum	22.9 11500 15.6		51.5 206 2.06	20.6 67.0 0.979	ug/L ug/L ug/L ug/L		08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	08/03/23 20:01 08/03/23 20:01 08/03/23 20:01	5 1 1 1 1

Client Sample ID: MW-8A Control Week 6

Date Collected: 07/31/23 08:45

Date Received: 07/31/23 16:20

Molybdenum

Selenium

Lab Sample	D: 410-136831-4
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Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			08/02/23 15:50	5
Sulfate	110		75.0	25.0	mg/L			08/03/23 19:20	50
Chloride	8.31		7.50	3.00	mg/L			08/02/23 15:50	5
Method: SW846 6010D -	Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113	·	0.0515	0.0113	mg/L		08/03/23 00:27	08/03/23 07:15	1
SiO2	21.1		1.10	0 117	mg/L		08/03/23 00:27	08/03/23 07:15	1
	2		1.10	0.117	mg/L		00/03/23 00.27	00/00/20 07.10	'
Method: SW846 6020B -		olved	1.10	0.117	g/L		00/03/23 00.27	00/00/20 07:10	'
- -	Metals (ICP/MS) - Diss	olved Qualifier	RL	MDL	J	D	Prepared	Analyzed	Dil Fac
Method: SW846 6020B -	Metals (ICP/MS) - Diss	Qualifier			Unit	<u>D</u>			Dil Fac
Method: SW846 6020B - Analyte	Metals (ICP/MS) - Diss	Qualifier	RL	MDL	Unit ug/L	<u>D</u>	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - Analyte Arsenic	Metals (ICP/MS) - Diss Result 1.49	Qualifier	RL 2.06	MDL 0.700	Unit ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27	Analyzed 08/03/23 20:03	Dil Fac 1 1
Method: SW846 6020B - Analyte Arsenic Calcium	Metals (ICP/MS) - Diss Result 1.49 51100	Qualifier	RL 2.06	MDL 0.700 51.5 0.161	Unit ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 20:03 08/03/23 20:03	Dil Fac 1 1 1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt	Metals (ICP/MS) - Diss Result 1.49 51100 <0.161	Qualifier	RL 2.06 124 0.515	MDL 0.700 51.5 0.161 16.5	Unit ug/L ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 20:03 08/03/23 20:03 08/03/23 20:03	Dil Fac 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt Magnesium	Metals (ICP/MS) - Diss Result 1.49 51100 <0.161 38000	Qualifier	RL 2.06 124 0.515 51.5	MDL 0.700 51.5 0.161 16.5 20.6	Unit ug/L ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 20:03 08/03/23 20:03 08/03/23 20:03 08/03/23 20:03	Dil Fac 1 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt Magnesium Iron	Metals (ICP/MS) - Diss Result 1.49 51100 <0.161 38000 <20.6	Qualifier	2.06 124 0.515 51.5 51.5	MDL 0.700 51.5 0.161 16.5 20.6	Unit ug/L ug/L ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 20:03 08/03/23 20:03 08/03/23 20:03 08/03/23 20:03 08/03/23 20:03	Dil Fac 1 1 1 1 1 1 1 1 1 1 1

Eurofins Lancaster Laboratories Environment Testing, LLC

08/03/23 00:27

08/03/23 00:27

08/03/23 20:03

08/03/23 20:03

0.515

1.03

0.134 ug/L

0.286 ug/L

162

0.346 J

2

3

7

8

10

12

13

Client Sample Results

Client: Terra Systems Inc Job ID: 410-136831-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 6

Lab Sample ID: 410-136831-5 Date Collected: 07/31/23 09:00 Matrix: Water

Date Received: 07/31/23 16:20

Method: EPA 300.0 R2.1	,								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			08/02/23 17:35	5
Sulfate	109		37.5	12.5	mg/L			08/03/23 20:17	25
Chloride	6.96	J	7.50	3.00	mg/L			08/02/23 17:35	5
- Method: SW846 6010D -	Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/03/23 00:27	08/03/23 07:09	1
SiO2	11.0		1.10	0.117	mg/L		08/03/23 00:27	08/03/23 07:09	1
SiO2 Method: SW846 6020B -		olved	1.10	0.117	mg/L		08/03/23 00:27	08/03/23 07:09	1
- -	Metals (ICP/MS) - Diss	olved Qualifier	1.10 RL		mg/L Unit	D	08/03/23 00:27 Prepared	08/03/23 07:09 Analyzed	1 Dil Fac
Method: SW846 6020B -	Metals (ICP/MS) - Diss	Qualifier			Unit	<u>D</u>			Dil Fac
Method: SW846 6020B - Analyte	Metals (ICP/MS) - Diss Result	Qualifier	RL	MDL 0.700	Unit	<u>D</u>	Prepared	Analyzed	Dil Fac 1
Method: SW846 6020B - Analyte Arsenic	Metals (ICP/MS) - Diss Result 0.932	Qualifier	RL 2.06	MDL 0.700	Unit ug/L	<u>D</u>	Prepared 08/03/23 00:27	Analyzed 08/03/23 19:59	Dil Fac 1 1 1
Method: SW846 6020B - Analyte Arsenic Calcium	Metals (ICP/MS) - Diss	Qualifier	RL 2.06	MDL 0.700 51.5 0.161	Unit ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 19:59 08/03/23 19:59	Dil Fac 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt	Metals (ICP/MS) - Diss	Qualifier	RL 2.06 124 0.515	MDL 0.700 51.5 0.161	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 19:59 08/03/23 19:59 08/03/23 19:59	Dil Fac 1 1 1 1 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt Magnesium	Metals (ICP/MS) - Diss Result 0.932 66900 <0.161 31500	Qualifier	RL 2.06 124 0.515 51.5	MDL 0.700 51.5 0.161 16.5 20.6	Unit ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 19:59 08/03/23 19:59 08/03/23 19:59 08/03/23 19:59	Dil Fac 1 1 1 1 1 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt Magnesium Iron	Metals (ICP/MS) - Diss Result 0.932 66900 <0.161 31500 <20.6	Qualifier	RL 2.06 124 0.515 51.5 51.5	MDL 0.700 51.5 0.161 16.5 20.6	Unit ug/L ug/L ug/L ug/L ug/L	<u>D</u>	Prepared 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	Analyzed 08/03/23 19:59 08/03/23 19:59 08/03/23 19:59 08/03/23 19:59 08/03/23 19:59	Dil Fac 1 1 1 1 1 1 1 1 1 1

0.515

1.03

0.134 ug/L

0.286 ug/L

Client Sample ID: MW-8C MF3 Week 6

130

0.310 J

<0.286

Date Collected: 07/31/23 09:15

Date Received: 07/31/23 16:20

Molybdenum

Selenium

Selenium

08/03/23 19:59

08/03/23 19:59

08/03/23 00:27

08/03/23 00:27

Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			08/02/23 15:27	5
Sulfate	256		75.0	25.0	mg/L			08/03/23 20:29	50
Chloride	6.41	J	7.50	3.00	mg/L			08/02/23 15:27	5
- Method: SW846 6010D -	· Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/03/23 00:27	08/03/23 07:22	1
SiO2	2.65		1.10	0.117	mg/L		08/03/23 00:27	08/03/23 07:22	1
Method: SW846 6020B -	Metals (ICP/MS) - Disse	olved							
Martina de OMO 40 0000D	M-4-1- (IOD(MO) DI	and the second							
Method: SW846 6020B - Analyte	•	Olved Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	•	Qualifier	RL	MDL 0.700		<u>D</u>	Prepared 08/03/23 00:27	Analyzed 08/03/23 20:07	Dil Fac
Analyte	Result	Qualifier				<u>D</u>	<u>.</u>		Dil Fac
Analyte Arsenic	Result 1.09	Qualifier	2.06	0.700	ug/L	<u>D</u>	08/03/23 00:27	08/03/23 20:07	1
Analyte Arsenic Calcium	1.09 20300	Qualifier	2.06 124	0.700 51.5	ug/L ug/L ug/L	<u>D</u>	08/03/23 00:27 08/03/23 00:27	08/03/23 20:07 08/03/23 20:07	1
Analyte Arsenic Calcium Cobalt	Result 1.09 20300 <0.161	Qualifier	2.06 124 0.515	0.700 51.5 0.161	ug/L ug/L ug/L	<u>D</u>	08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	08/03/23 20:07 08/03/23 20:07 08/03/23 20:07	1
Analyte Arsenic Calcium Cobalt Magnesium	Result 1.09 20300 <0.161 48800	Qualifier	2.06 124 0.515 51.5	0.700 51.5 0.161 16.5	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	08/03/23 20:07 08/03/23 20:07 08/03/23 20:07 08/03/23 20:07	1 1 1 1
Analyte Arsenic Calcium Cobalt Magnesium Iron	Result 1.09 20300 <0.161 48800 <20.6	Qualifier	2.06 124 0.515 51.5 51.5	0.700 51.5 0.161 16.5 20.6	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	08/03/23 20:07 08/03/23 20:07 08/03/23 20:07 08/03/23 20:07 08/03/23 20:07	1 1 1 1
Analyte Arsenic Calcium Cobalt Magnesium Iron Potassium	Result 1.09 20300 <0.161 48800 <20.6 6360	Qualifier	2.06 124 0.515 51.5 51.5 206	0.700 51.5 0.161 16.5 20.6 67.0	ug/L ug/L ug/L ug/L ug/L	<u>D</u>	08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27 08/03/23 00:27	08/03/23 20:07 08/03/23 20:07 08/03/23 20:07 08/03/23 20:07 08/03/23 20:07 08/03/23 20:07	1 1 1 1 1

Eurofins Lancaster Laboratories Environment Testing, LLC

08/03/23 00:27

1.03

0.286 ug/L

08/03/23 20:07

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-136831-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-403337/5

Lab Sample ID: LCS 410-403337/3

Matrix: Water

Analysis Batch: 403337

Client Sample ID: Method Blank Prep Type: Total/NA

мв мв Dil Fac Analyte Result Qualifier RLMDL Unit D Prepared Analyzed Fluoride <0.0900 0.200 0.0900 mg/L 08/02/23 11:50 Sulfate <0.500 1.50 0.500 mg/L 08/02/23 11:50 Chloride < 0.600 0.600 mg/L 08/02/23 11:50 1.50

Client Sample ID: Lab Control Sample

105

90 - 110

20

Prep Type: Total/NA

Matrix: Water Prep Type: Total/NA

Analysis Batch: 403337

Spike LCS LCS %Rec Added Analyte Result Qualifier %Rec Limits Unit D Fluoride 0.750 0.7526 mg/L 100 90 - 110 Sulfate 7.50 7.850 mg/L 105 90 - 110 Chloride 3.00 3.152 mg/L 105 90 - 110

Lab Sample ID: LCSD 410-403337/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 403337

LCSD LCSD RPD Spike %Rec Analyte Added Result Qualifier Unit D %Rec Limits RPD Limit Fluoride 0.750 0.7583 mg/L 101 90 - 110 20 Sulfate 7.50 7.877 105 90 - 110 20 mg/L 0

3.00

Lab Sample ID: 410-136831-2 MS Client Sample ID: MW-7BI NaHCO3 Week 6

3.163

mg/L

Matrix: Water

Chloride

Analysis Batch: 403337

Tananyono Battorii 100001										
	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Fluoride	<0.900	cn	5.00	5.073		mg/L		101	90 - 110	
Chloride	22.9	F1 cn	20.0	31 36	F1	ma/l		42	90 - 110	

Lab Sample ID: 410-136831-2 DU Client Sample ID: MW-7BI NaHCO3 Week 6 Prep Type: Total/NA

Matrix: Water

Analysis Batch: 403337

	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Fluoride	<0.900	cn	<0.900		mg/L			NC	15
Chloride	22.9	F1 cn	22.74		mg/L			0.6	15

Lab Sample ID: MB 410-404269/5 Client Sample ID: Method Blank

Matrix: Water Prep Type: Total/NA

Analysis Batch: 404269

MB MB Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Fluoride <0.0900 0.200 0.0900 08/03/23 16:24 mg/L Sulfate <0.500 1.50 0.500 mg/L 08/03/23 16:24 Chloride <0.600 1.50 0.600 mg/L 08/03/23 16:24

Eurofins Lancaster Laboratories Environment Testing, LLC

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-136831-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 410-404269/3

Matrix: Water

Analysis Batch: 404269

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits Fluoride 0.750 0.7590 mg/L 101 90 - 110 Sulfate 7.50 7.786 mg/L 104 90 - 110 Chloride 3.00 mg/L 90 - 110 3.121 104

Lab Sample ID: LCSD 410-404269/4 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 404269

Spike LCSD LCSD %Rec RPD Added RPD Limit Analyte Result Qualifier %Rec I imits Unit D Fluoride 0.750 0.7451 mg/L 99 90 - 110 20 Sulfate 7.50 7.807 mg/L 104 90 - 110 20 0 Chloride 3.00 3.116 mg/L 104 90 - 110 20

Lab Sample ID: 410-136831-4 MS Client Sample ID: MW-8A Control Week 6 **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 404269

Sample Sample Spike MS MS %Rec Result Qualifier Analyte Added Result Qualifier Unit D %Rec Limits Sulfate 110 250 367.5 mg/L 103 90 - 110

Lab Sample ID: 410-136831-4 DU Client Sample ID: MW-8A Control Week 6 Matrix: Water

Prep Type: Total/NA

Analysis Batch: 404269

		Sample	Sample	DU	DU					RPD
	Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Į	Sulfate	110		110.1		mg/L			0.3	15

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-403818/1-A

Matrix: Water

Analysis Batch: 403966

Client Sample ID: Method Blank

Prep Type: Total/NA **Prep Batch: 403818**

Prep Type: Total/NA

Prep Batch: 405565

мв мв Analyte Qualifier RL MDL Unit Prepared Dil Fac Result Analyzed Lithium < 0.0113 0.0515 0.0113 mg/L 08/03/23 00:27 08/03/23 06:23 SiO2 < 0.117 1.10 0.117 mg/L 08/03/23 00:27 08/03/23 06:23

Lab Sample ID: LCS 410-403818/2-A Client Sample ID: Lab Control Sample Prep Type: Total/NA

Analysis Batch: 403966

Prep Batch: 403818

Spike LCS LCS %Rec Added Result Qualifier Analyte Unit D %Rec Limits Lithium 0.500 0.4729 mg/L 95 80 - 120

Lab Sample ID: MB 410-405565/1-A Client Sample ID: Method Blank

Matrix: Water

Matrix: Water

Analysis Batch: 406031

MB MB

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Lithium <0.0113 0.0515 0.0113 08/08/23 07:37 08/08/23 18:41 mg/L

Eurofins Lancaster Laboratories Environment Testing, LLC

Job ID: 410-136831-1

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: MB 410-405565/1-A

Matrix: Water

Analysis Batch: 406031

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 405565

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
SiO2	<0.117	1.10	0.117 mg/L		08/08/23 07:37	08/08/23 18:41	1

Lab Sample ID: LCS 410-405565/2-A

Matrix: Water

Analysis Batch: 406031

Client Sample ID: Lab Control Sample

Prep Type: Total/NA **Prep Batch: 405565**

Spike LCS LCS %Rec Added Analyte Result Qualifier Unit Limits D %Rec Lithium 0.500 0.4963 mg/L 99 80 - 120

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-403818/1-A

Matrix: Water

Analysis Batch: 404322

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 403818

MB MB Analyte Result Qualifier RL MDL Unit <0.700 2.06 Arsenic 0.700

MB MB

Dil Fac D Prepared Analyzed 08/03/23 00:27 08/03/23 18:55 ug/L Calcium <51.5 124 08/03/23 00:27 08/03/23 18:55 51.5 ug/L Cobalt < 0.161 0.515 0.161 ug/L 08/03/23 00:27 08/03/23 18:55 Magnesium <16.5 51.5 16.5 ug/L 08/03/23 00:27 08/03/23 18:55 08/03/23 00:27 08/03/23 18:55 Iron <20.6 51.5 20.6 ug/L Potassium <67.0 206 67.0 ug/L 08/03/23 00:27 08/03/23 18:55 2.06 0.979 ug/L 08/03/23 00:27 08/03/23 18:55 Manganese < 0.979 Sodium <92.7 206 08/03/23 00:27 08/03/23 18:55 92.7 ug/L 0.515 Molybdenum < 0.134 0.134 ug/L 08/03/23 00:27 08/03/23 18:55 Selenium <0.286 1.03 0.286 ug/L 08/03/23 00:27 08/03/23 18:55

Lab Sample ID: LCS 410-403818/2-A

Matrix: Water

Analysis Batch: 404322

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 403818

Alialysis Dalcii. 404322							Frep Ball	11. 403010
	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	500	493.3		ug/L		99	85 - 120	
Calcium	5000	4884		ug/L		98	85 - 120	
Cobalt	500	481.0		ug/L		96	90 - 113	
Magnesium	5000	5024		ug/L		100	90 - 112	
Iron	5000	5020		ug/L		100	88 - 119	
Potassium	5000	5089		ug/L		102	90 - 112	
Manganese	500	510.0		ug/L		102	89 - 120	
Sodium	5000	4910		ug/L		98	89 _ 112	
Molybdenum	50.0	48.12		ug/L		96	85 - 115	
Selenium	100	102.1		ua/L		102	80 - 120	

Lab Sample ID: MB 410-405565/1-A

Matrix: Water

Analysis Batch: 408127

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 405565

	IVID	MID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.700		2.06	0.700	ug/L		08/08/23 07:37	08/14/23 18:22	1
Calcium	<51.5		124	51.5	ug/L		08/08/23 07:37	08/14/23 18:22	1

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QC Sample Results

Client: Terra Systems Inc Job ID: 410-136831-1

Project/Site: Stantec CCR AP2 Columns

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 410-405565/1-A

Matrix: Water

Analysis Batch: 408127

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 405565

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	<0.161		0.515	0.161	ug/L		08/08/23 07:37	08/14/23 18:22	1
Magnesium	<16.5		51.5	16.5	ug/L		08/08/23 07:37	08/14/23 18:22	1
Iron	<20.6		51.5	20.6	ug/L		08/08/23 07:37	08/14/23 18:22	1
Potassium	<67.0		206	67.0	ug/L		08/08/23 07:37	08/14/23 18:22	1
Manganese	<0.979		2.06	0.979	ug/L		08/08/23 07:37	08/14/23 18:22	1
Sodium	<92.7		206	92.7	ug/L		08/08/23 07:37	08/14/23 18:22	1
Molybdenum	<0.134		0.515	0.134	ug/L		08/08/23 07:37	08/14/23 18:22	1
Selenium	<0.286		1.03	0.286	ug/L		08/08/23 07:37	08/14/23 18:22	1

Lab Sample ID: LCS 410-405565/2-A Client Sample ID: Lab Control Sample Prep Type: Total/NA

Matrix: Water

Analysis Batch: 408127							Prep Batch: 4055	65
	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	500	497.9		ug/L		100	85 - 120	
Calcium	5000	4924		ug/L		98	85 - 120	
Cobalt	500	477.8		ug/L		96	90 - 113	
Magnesium	5000	4938		ug/L		99	90 - 112	
Iron	5000	4855		ug/L		97	88 - 119	
Potassium	5000	4796		ug/L		96	90 - 112	
Manganese	500	484.0		ug/L		97	89 - 120	
Sodium	5000	4786		ug/L		96	89 - 112	
Molybdenum	50.0	49.98		ug/L		100	85 - 115	
Selenium	100	98.78		ug/L		99	80 - 120	

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Job ID: 410-136831-1

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns

HPLC/IC

Analysis Batch: 403337

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-136831-1	MW-7A Control Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-2	MW-7BI NaHCO3 Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-3	MW-7C MF3 Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-4	MW-8A Control Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-5	MW-8B FeCl3 NaHCO3 Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-6	MW-8C MF3 Week 6	Total/NA	Water	EPA 300.0 R2.1	
MB 410-403337/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-403337/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-403337/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	
410-136831-2 MS	MW-7BI NaHCO3 Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-2 DU	MW-7BI NaHCO3 Week 6	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 404269

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-136831-1	MW-7A Control Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-2	MW-7BI NaHCO3 Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-3	MW-7C MF3 Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-4	MW-8A Control Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-5	MW-8B FeCl3 NaHCO3 Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-6	MW-8C MF3 Week 6	Total/NA	Water	EPA 300.0 R2.1	
MB 410-404269/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-404269/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-404269/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	
410-136831-4 MS	MW-8A Control Week 6	Total/NA	Water	EPA 300.0 R2.1	
410-136831-4 DU	MW-8A Control Week 6	Total/NA	Water	EPA 300.0 R2.1	

Metals

Prep Batch: 403818

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-136831-1	MW-7A Control Week 6	Dissolved	Water	Non-Digest Prep	
410-136831-3	MW-7C MF3 Week 6	Dissolved	Water	Non-Digest Prep	
410-136831-4	MW-8A Control Week 6	Dissolved	Water	Non-Digest Prep	
410-136831-5	MW-8B FeCl3 NaHCO3 Week 6	Dissolved	Water	Non-Digest Prep	
410-136831-6	MW-8C MF3 Week 6	Dissolved	Water	Non-Digest Prep	
MB 410-403818/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-403818/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 403966

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-136831-1	MW-7A Control Week 6	Dissolved	Water	6010D	403818
410-136831-3	MW-7C MF3 Week 6	Dissolved	Water	6010D	403818
410-136831-4	MW-8A Control Week 6	Dissolved	Water	6010D	403818
410-136831-5	MW-8B FeCl3 NaHCO3 Week 6	Dissolved	Water	6010D	403818
410-136831-6	MW-8C MF3 Week 6	Dissolved	Water	6010D	403818
MB 410-403818/1-A	Method Blank	Total/NA	Water	6010D	403818
LCS 410-403818/2-A	Lab Control Sample	Total/NA	Water	6010D	403818

Analysis Batch: 404322

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-136831-1	MW-7A Control Week 6	Dissolved	Water	6020B	403818

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8/17/2023

QC Association Summary

Client: Terra Systems Inc Job ID: 410-136831-1

Project/Site: Stantec CCR AP2 Columns

Metals (Continued)

Analysis Batch: 404322 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-136831-1	MW-7A Control Week 6	Dissolved	Water	6020B	403818
410-136831-3	MW-7C MF3 Week 6	Dissolved	Water	6020B	403818
410-136831-3	MW-7C MF3 Week 6	Dissolved	Water	6020B	403818
410-136831-4	MW-8A Control Week 6	Dissolved	Water	6020B	403818
410-136831-5	MW-8B FeCl3 NaHCO3 Week 6	Dissolved	Water	6020B	403818
410-136831-6	MW-8C MF3 Week 6	Dissolved	Water	6020B	403818
MB 410-403818/1-A	Method Blank	Total/NA	Water	6020B	403818
LCS 410-403818/2-A	Lab Control Sample	Total/NA	Water	6020B	403818

Prep Batch: 405565

Lab Sample ID 410-136831-2	Client Sample ID MW-7BI NaHCO3 Week 6	Prep Type Dissolved	Matrix Water	Method Non-Digest Prep	Prep Batch
MB 410-405565/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-405565/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 406031

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-136831-2	MW-7BI NaHCO3 Week 6	Dissolved	Water	6010D	405565
MB 410-405565/1-A	Method Blank	Total/NA	Water	6010D	405565
LCS 410-405565/2-A	Lab Control Sample	Total/NA	Water	6010D	405565

Analysis Batch: 408127

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-136831-2	MW-7BI NaHCO3 Week 6	Dissolved	Water	6020B	405565
MB 410-405565/1-A	Method Blank	Total/NA	Water	6020B	405565
LCS 410-405565/2-A	Lab Control Sample	Total/NA	Water	6020B	405565

Analysis Batch: 408949

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-136831-2	MW-7BI NaHCO3 Week 6	Dissolved	Water	6020B	405565
410-136831-2	MW-7BI NaHCO3 Week 6	Dissolved	Water	6020B	405565

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7A Control Week 6

Date Collected: 07/31/23 08:00 Date Received: 07/31/23 16:20 Lab Sample ID: 410-136831-1

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	403337	L4QM	ELLE	08/02/23 14:41
Total/NA	Analysis	EPA 300.0 R2.1		200	404269	L4QM	ELLE	08/03/23 18:46
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6010D		1	403966	MT26	ELLE	08/03/23 07:18
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6020B		1	404322	UCIG	ELLE	08/03/23 20:05
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6020B		5	404322	UCIG	ELLE	08/03/23 20:32

Client Sample ID: MW-7BI NaHCO3 Week 6

Date Collected: 07/31/23 08:15

Date Received: 07/31/23 16:20

Lab Sample ID: 410-136831-2

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		10	403337	L4QM	ELLE	08/02/23 16:59
Total/NA	Analysis	EPA 300.0 R2.1		200	404269	L4QM	ELLE	08/03/23 18:57
Dissolved	Prep	Non-Digest Prep			405565	HUH3	ELLE	08/08/23 07:37
Dissolved	Analysis	6010D		1	406031	T8CQ	ELLE	08/08/23 19:18
Dissolved	Prep	Non-Digest Prep			405565	HUH3	ELLE	08/08/23 07:37
Dissolved	Analysis	6020B		1	408127	UCIG	ELLE	08/14/23 19:18
Dissolved	Prep	Non-Digest Prep			405565	HUH3	ELLE	08/08/23 07:37
Dissolved	Analysis	6020B		1	408949	LC3M	ELLE	08/16/23 11:59
Dissolved	Prep	Non-Digest Prep			405565	HUH3	ELLE	08/08/23 07:37
Dissolved	Analysis	6020B		1000	408949	LC3M	ELLE	08/16/23 12:01

Client Sample ID: MW-7C MF3 Week 6

Date Collected: 07/31/23 08:30

Date Received: 07/31/23 16:20

Lab Sample ID: 410-13683

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	403337	L4QM	ELLE	08/02/23 15:04
Total/NA	Analysis	EPA 300.0 R2.1		200	404269	L4QM	ELLE	08/03/23 19:08
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6010D		1	403966	MT26	ELLE	08/03/23 07:12
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6020B		1	404322	UCIG	ELLE	08/03/23 20:01
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6020B		5	404322	UCIG	ELLE	08/03/23 20:30

Client Sample ID: MW-8A Control Week 6

Date Collected: 07/31/23 08:45

Date Received: 07/31/23 16:20

Lab Sampl	le ID: 4	10-136	831-4
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Matrix: Water

	Batch	Batch		Dilution	Batch		Prepared
Prep Type	Type	Method	Run	Factor	Number Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	403337 L4QM	ELLE	08/02/23 15:50

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Lab Chronicle

Client: Terra Systems Inc Job ID: 410-136831-1

Project/Site: Stantec CCR AP2 Columns

Date Received: 07/31/23 16:20

Client Sample ID: MW-8A Control Week 6

Lab Sample ID: 410-136831-4 Date Collected: 07/31/23 08:45 Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		50	404269	L4QM	ELLE	08/03/23 19:20
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6010D		1	403966	MT26	ELLE	08/03/23 07:15
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6020B		1	404322	UCIG	ELLE	08/03/23 20:03

Client Sample ID: MW-8B FeCI3 NaHCO3 Week 6

Lab Sample ID: 410-136831-5

Date Collected: 07/31/23 09:00 Date Received: 07/31/23 16:20

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	403337	L4QM	ELLE	08/02/23 17:35
Total/NA	Analysis	EPA 300.0 R2.1		25	404269	L4QM	ELLE	08/03/23 20:17
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6010D		1	403966	MT26	ELLE	08/03/23 07:09
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6020B		1	404322	UCIG	ELLE	08/03/23 19:59

Client Sample ID: MW-8C MF3 Week 6

Lab Sample ID: 410-136831-6

Date Collected: 07/31/23 09:15 Matrix: Water Date Received: 07/31/23 16:20

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1			403337	L4QM	ELLE	08/02/23 15:27
Total/NA	Analysis	EPA 300.0 R2.1		50	404269	L4QM	ELLE	08/03/23 20:29
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6010D		1	403966	MT26	ELLE	08/03/23 07:22
Dissolved	Prep	Non-Digest Prep			403818	UAMX	ELLE	08/03/23 00:27
Dissolved	Analysis	6020B		1	404322	UCIG	ELLE	08/03/23 20:07

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Eurofins Lancaster Laboratories Environment Testing, LLC

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-136831-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alabama	State	43200	01-31-24
Alaska	State	PA00009	06-30-24
Alaska (UST)	State	17-027	02-28-24
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-24
California	State	2792	11-30-23
Colorado	State	PA00009	06-30-24
Connecticut	State	PH-0746	06-30-25
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	06-30-24
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Illinois	NELAP	200027	01-31-24
lowa	State	361	03-01-24
Kansas	NELAP	E-10151	10-31-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	12-31-23
Louisiana (All)	NELAP	02055	06-30-24
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-24
Massachusetts	State	M-PA009	06-30-24
	State	9930	01-31-24
Michigan Minnesoto			
Minnesota	NELAP	042-999-487	12-31-23
Mississippi	State	023	01-31-24
Missouri	State	450	01-31-25
Montana (DW)	State	0098	01-01-24
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	01-10-24
New Jersey	NELAP	PA011	06-30-24
New York	NELAP	10670	04-01-24
North Carolina (DW)	State	42705	07-31-24
North Carolina (WW/SW)	State	521	12-31-23
North Dakota	State	R-205	01-31-24
Oklahoma	NELAP	9804	08-31-23
Oregon	NELAP	PA200001	09-11-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	01-31-24
Rhode Island	State	LAO00338	12-31-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Texas	NELAP	T104704194-23-46	08-31-23
USDA	US Federal Programs	525-22-298-19481	10-25-25
Vermont	State	VT - 36037	10-28-23
Virginia	NELAP	460182	06-14-25
Washington	State	C457	04-11-24
West Virginia (DW)	State	9906 C	12-31-23

Eurofins Lancaster Laboratories Environment Testing, LLC

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Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-136831-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

 Method
 Method Description
 Protocol
 Laboratory

 EPA 300.0 R2.1
 Anions, Ion Chromatography
 EPA
 ELLE

SW846 ELLE
SW846 ELLE
EPA ELLE

Job ID: 410-136831-1

Protocol References:

6010D

6020B

Non-Digest Prep

EPA = US Environmental Protection Agency

Metals (ICP)

Metals (ICP/MS)

Preparation, Non-Digested Aqueous Metals

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Sample Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

MW-8C MF3 Week 6

410-136831-6

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-136831-1	MW-7A Control Week 6	Water	07/31/23 08:00	07/31/23 16:20
410-136831-2	MW-7BI NaHCO3 Week 6	Water	07/31/23 08:15	07/31/23 16:20
410-136831-3	MW-7C MF3 Week 6	Water	07/31/23 08:30	07/31/23 16:20
410-136831-4	MW-8A Control Week 6	Water	07/31/23 08:45	07/31/23 16:20
410-136831-5	MW-8B FeCl3 NaHCO3 Week 6	Water	07/31/23 09:00	07/31/23 16:20

07/31/23 09:15 07/31/23 16:20

Water

Job ID: 410-136831-1

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Environmental Analysis Request/Chain of Custody

		Acc	t.#			_ Group #					Samp	le #						
Client: Terra Systems, Inc.						Matrix					Α	nalyses	Req	ueste	ed		For Lal	b Use Only
Project Name/#: Stantec CCR AP2 Columns	Site ID #;	Macon, GA									F	reserva	tion	Code	s		SF #: _	
Project Manager: Michael D. Lee	P.O. #:	222566-7-3	1-23		Tissue	and and			N	N	-						SCR#:	
Sampler: Michael D. Lee	PWSID#:				≓	Ground		_		2							Pre	servation Codes
Phone #: 302-798-9553	Quote #:	4101181	18					Containers	X	Se, SiO2							H = HCI	T = Thiosulfate
	r Compliance:	Yes 🗌	No	7	E E	e SI		ntai	o, Fe.								N = HNO ₃	B = NaOH
		ection		Composite	☐ Sediment	Potable er NPDES		# of	II) As, Ca, Co,	(fil) Mg. Mn. Mo. Na.	804						$S = H_2SO_4$ O = Other	P = H ₃ PO ₄
Sample Identification	Date	Time	Grab	Co	Soil	Water	Other:	Total	Dis (fil)	Dis (fil	CI. F.							Remarks
MW-7A Control Week 6	7/31/2023	8:00		Х		Х		2	Х	Х	Х							
MW-7BI NaHCO3 Week 6	7/31/2023	8:15		Х		X		2	Х	Х	Х							
MW-7C MF3 Week 6	7/31/2023	8:30		Х		Х		2	Х	Х	Х							
MW-8A Control Week 6	7/31/2023	8:45		Х		Х		2	Х	Х	Х							
MW-8B FeCl3 NaHCO3 Week 6	7/31/2023	9:00		X		Х		2	Х	Х	Х							
MW-8C MF3 Week 6	7/31/2023	9:15		X		Х		2	Х	Х	Х							
			_				_						\perp					
					<u> </u>					_				<u> </u>	$oxed{oxed}$		1	
Turnaround Time Requested (TAT) (please ch	· ·		Rus	h 🗌	Reli	nquished	by:	0/		1 4	ate	Time		eived	1	(()	Date	
(Rush TAT is subject to laboratory	approval and surch	arges.)			111	relat	<u> </u>	V		_	1/23	14'3		3.R		<u> </u>	- 7/31/	
Date results are needed: 8/14/23						nquished	-				ate	Time		ceived	by:		Date	Time
• • • • • • • • • • • • • • • • • • • •	Mail 🔽	Phon	e L		Ė	R-12		0				1620	Por	eived	bu		Date	Time
E-mail Address: mlee@terrasystems.net					Reil	nquished	Dy.			Di	ate	Time	- Rec	eivea	by.		Date	Time
Phone: 302-798-9553					Poli	nquished	bye			0.	ate	Time	Por	ejved	but		Date	Time
Data Package Options (please check if require					Kell	nquisneu	υy.			1 00	ale	Tille	Ket	eneu	Dy.		Date	1 IIIIe
Type I (Validation/non-CLP) MA MC					Poli	pquished	by			D.	ate	Time	Por	o in the	DV:	1	Date	Time
Type III (Reduced non-CLP) CT RCI	_				V. Gil	refuisite()	υy.			"	ale	Tille	/	eive	NY.	Dec	7/21	23/6/20
Type VI (Raw Data Only) TX TRF					Poli	nquished	by C	omm	arcial	Carrie	ar:		4-	10	4	0	101	
	C Category	A or	. 📙	R	1				oruidi				Ton	nnere	ure um	000 r000	ipt 0.1/-	0.) _c
EDD Required? Yes No 7	ves. format:				UPS		Fedi	Ξx		Other			160	uhaigi	ure up	JULI 1606	ibr	

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Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-136831-1

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC Login Number: 136831

List Number: 1

Creator: Jeremiah, Cory T

Question	Answer	Comment
The cooler's custody seal is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
s the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

JOB DESCRIPTION

Generated 8/21/2023 4:38:48 PM

Stantec CCR AP2 Columns

JOB NUMBER

410-137866-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike Lancaster PA 17601

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

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Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Marrissa Williams

Page 3 of 32 8/21/2023

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns Laboratory Job ID: 410-137866-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Qualifiers

			_	/1	_
п	М	Ц	U	ı	u

Qualifier	Qualifier Description
cn	Refer to Case Narrative for further detail
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

Metals

MDL

MPN

MQL

NC ND

NEG

POS

PQL

PRES

QC

ML

Method Detection Limit

Minimum Level (Dioxin)

Most Probable Number

Not Calculated

Negative / Absent

Positive / Present

Presumptive

Quality Control

Method Quantitation Limit

Practical Quantitation Limit

Wictais	
Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

	Nesult is less than the NE but greater than or equal to the MDE and the concentration is an approximate value.
Glossary	
Abbreviation	These commonly used abbreviations may or may not be present in this report.
n	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)

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

Not Detected at the reporting limit (or MDL or EDL if shown)

Case Narrative

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-137866-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-137866-1

Receipt

The samples were received on 8/7/2023 4:42 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 1.1°C

HPLC/IC

Method 300_ORGFM_28D: The following samples were diluted due to the nature of the sample matrix: MW-7B NaHCO3 Week 7 (410-137866-3) and MW-7BI NAHCO3 Week 7 (410-137866-9) at 10.0. Elevated reporting limits (RLs) are provided.

Method 300_ORGFM_28D: The following samples were diluted due to the nature of the sample matrix: MW-7I Influent Week 7 (410-137866-1) and MW-7A Control Week 7 (410-137866-2) at 10.0 and 10.0. Elevated reporting limits (RLs) are provided.

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

Metals

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

Job ID: 410-137866-1

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-137866-1

Client Sample ID: MW-7I Influent Week 7

Lab Sample ID: 410-137866-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1020		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	5.83	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0566		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	71.9		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00114	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	283		1.24	0.515	mg/L	10		6020B	Dissolved
Cobalt	0.0522		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0604		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	71.7		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	13.3		0.0206	0.00979	mg/L	10		6020B	Dissolved
Potassium	8.90		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	26.5		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7A Control Week 7

Lab Sample ID: 410-137866-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1030		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	5.57	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0807		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	66.8		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00123	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	250		1.24	0.515	mg/L	10		6020B	Dissolved
Cobalt	0.0561		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0410	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	71.2		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	11.3		0.0206	0.00979	mg/L	10		6020B	Dissolved
Molybdenum	0.000336	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	29.6		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000642	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	26.5		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7B NaHCO3 Week 7

Lab Sample ID: 410-137866-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1060		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	7.01	J cn	15.0	6.00	mg/L	10		EPA 300.0 R2.1	Total/NA
Lithium	0.203	J	0.515	0.113	mg/L	10		6010D	Dissolved
SiO2	58.2		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00496		0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	10.2		0.124	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.00575	^2	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0762		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	68.0		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.429		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.00114		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	41.0		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000391	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	2740		20.6	9.27	mg/L	100		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-137866-1

Client Sample ID: MW-7C MF3 Week 7

Lab Sample ID: 410-137866-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1020		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	5.56	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0505	J	0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	0.563	J	1.10	0.117	mg/L	1		6010D	Dissolved
Calcium	216		1.24	0.515	mg/L	10		6020B	Dissolved
Cobalt	0.000231	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0255	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	99.5		0.515	0.165	mg/L	10		6020B	Dissolved
Manganese	0.0237		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000427	J	0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	11.5		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000688	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	31.2		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8I Influent Week 7

Lab Sample ID: 410-137866-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	105		30.0	10.0	mg/L	20	_	EPA 300.0 R2.1	Total/NA
Chloride	5.39	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	27.6		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000736	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	68.1		0.124	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.00372		0.000515	0.000161	mg/L	1		6020B	Dissolved
Magnesium	29.3		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.249		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.168		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	5.96		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	16.5		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8A Control Week 7

Lab Sample ID: 410-137866-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	107		30.0	10.0	mg/L		_	EPA 300.0 R2.1	Total/NA
Chloride	5.76	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	21.8		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00114	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	49.7		0.124	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.000188	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Magnesium	37.1		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.0138		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.165		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	7.03		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000320	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	17.1		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8B FeCI3 NaHCO3 Week 7

Lab Sample ID: 410-137866-7

8/21/2023

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	107		30.0	10.0	mg/L	20	_	EPA 300.0 R2.1	Total/NA
Chloride	5.61	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	13.7		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000853	J	0.00206	0.000700	mg/L	1		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Detection Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCI3 NaHCO3 Week 7 (Continued)

roject/Site. Stanted CCN AF2 Columns

Lab Sample ID: 410-137866-7

Result Qualifier MDL Unit Dil Fac D Method Analyte **Prep Type** 66.1 0.124 0.0515 mg/L 6020B Calcium Dissolved 0.000164 0.000515 6020B Cobalt 0.000161 mg/L 1 Dissolved 6020B Dissolved Magnesium 28.4 0.0515 0.0165 mg/L 0.000979 mg/L 6020B Manganese 0.0205 0.00206 1 Dissolved 6020B Molybdenum 0.143 0.000515 0.000134 mg/L Dissolved Potassium 8.40 0.206 0.0670 mg/L 6020B Dissolved 6020B Sodium 16.4 0.206 0.0927 mg/L Dissolved

Client Sample ID: MW-8C MF3 Week 7

Lab Sample ID: 410-137866-8

Job ID: 410-137866-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	231		30.0	10.0	mg/L	20	_	EPA 300.0 R2.1	Total/NA
Chloride	5.79	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	2.42		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00133	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	10.3		0.124	0.0515	mg/L	1		6020B	Dissolved
Magnesium	51.8		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.00521		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.00561		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	6.22		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	17.1		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7BI NAHCO3 Week 7

Lab Sample ID: 410-137866-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1100		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	6.77	J cn	15.0	6.00	mg/L	10		EPA 300.0 R2.1	Total/NA
SiO2	64.0		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00112	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	13.4		0.124	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.00114	^5-	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0709		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	70.9		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.0666		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000770		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	9.19		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	2830		20.6	9.27	mg/L	100		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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8/21/2023

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7I Influent Week 7

Lab Sample ID: 410-137866-1 Date Collected: 08/06/23 09:00 Matrix: Water

Date Received: 08/07/23 16:42

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.900	cn	2.00	0.900	mg/L			08/10/23 08:54	10
Sulfate	1020		300	100	mg/L			08/10/23 09:06	200
Chloride	5.83	J	7.50	3.00	mg/L			08/09/23 05:59	5
Method: SW846 6010D - N	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0566		0.0515	0.0113	mg/L		08/11/23 12:16	08/12/23 09:26	1
SiO2	71.9		1.10	0.117	mg/L		08/11/23 12:16	08/12/23 09:26	1
						_			
Method: SW846 6020B - N	Result	Qualifier	RL		Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
Analyte Arsenic	Result 0.00114	Qualifier	0.00206	0.000700	mg/L	<u>D</u>	08/11/23 12:16	08/20/23 14:50	1
Analyte Arsenic Calcium	Result 0.00114 283	Qualifier	0.00206	0.000700 0.515	mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16	08/20/23 14:50 08/21/23 10:50	Dil Fac
Analyte Arsenic Calcium Cobalt	Result 0.00114 283 0.0522	Qualifier	0.00206 1.24 0.000515	0.000700 0.515 0.000161	mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:50 08/21/23 10:50 08/20/23 14:50	1
Analyte Arsenic Calcium Cobalt Iron	Result 0.00114 283 0.0522 0.0604	Qualifier	0.00206 1.24 0.000515 0.0515	0.000700 0.515 0.000161 0.0206	mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:50 08/21/23 10:50 08/20/23 14:50 08/20/23 14:50	1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result 0.00114 283 0.0522 0.0604 71.7	Qualifier	0.00206 1.24 0.000515 0.0515 0.0515	0.000700 0.515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:50 08/21/23 10:50 08/20/23 14:50 08/20/23 14:50 08/20/23 14:50	1 10 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result 0.00114 283 0.0522 0.0604	Qualifier	0.00206 1.24 0.000515 0.0515	0.000700 0.515 0.000161 0.0206	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:50 08/21/23 10:50 08/20/23 14:50 08/20/23 14:50	1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese	Result 0.00114 283 0.0522 0.0604 71.7	Qualifier	0.00206 1.24 0.000515 0.0515 0.0515	0.000700 0.515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:50 08/21/23 10:50 08/20/23 14:50 08/20/23 14:50 08/20/23 14:50	1 10 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum	Result 0.00114 283 0.0522 0.0604 71.7 13.3	Qualifier	0.00206 1.24 0.000515 0.0515 0.0515 0.0206	0.000700 0.515 0.000161 0.0206 0.0165 0.00979	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:50 08/21/23 10:50 08/20/23 14:50 08/20/23 14:50 08/20/23 14:50 08/21/23 10:50	1 10 1 1 1
	Result 0.00114 283 0.0522 0.0604 71.7 13.3 <0.000134	Qualifier	0.00206 1.24 0.000515 0.0515 0.0515 0.0206	0.000700 0.515 0.000161 0.0206 0.0165 0.00979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:50 08/21/23 10:50 08/20/23 14:50 08/20/23 14:50 08/20/23 14:50 08/21/23 10:50 08/20/23 14:50	1 10 1 1 1

Client Sample ID: MW-7A Control Week 7

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Pate Collected: 08/06/23 09:15	Matrix: Water
Pate Received: 08/07/23 16:42	

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.900	cn	2.00	0.900	mg/L			08/10/23 09:40	10
Sulfate	1030		300	100	mg/L			08/10/23 09:52	200
Chloride	5.57	J	7.50	3.00	mg/L			08/09/23 06:22	5
Method: SW846 6010D - I	Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0807		0.0515	0.0113	mg/L		08/11/23 12:16	08/12/23 09:14	1
SiO2	66.8		1.10	0.117	mg/L		08/11/23 12:16	08/12/23 09:14	1
Arsenic	0.00123				Oiiit		rreparea	Allulyzou	
Method: SW846 6020B - I Analyte	• •	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic				0.000700	ma/l		00/11/02 12:16	00/20/22 14:40	1
O-1-1		J	0.00206	0.000700	mg/L		08/11/23 12:16	08/20/23 14:48	1
	250	J	1.24	0.515	mg/L		08/11/23 12:16	08/21/23 10:48	1
Cobalt	250 0.0561		1.24 0.000515	0.515 0.000161	mg/L mg/L		08/11/23 12:16 08/11/23 12:16	08/21/23 10:48 08/20/23 14:48	1
Cobalt	250		1.24 0.000515 0.0515	0.515 0.000161 0.0206	mg/L mg/L mg/L		08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/21/23 10:48 08/20/23 14:48 08/20/23 14:48	10 11
Cobalt	250 0.0561		1.24 0.000515	0.515 0.000161	mg/L mg/L mg/L		08/11/23 12:16 08/11/23 12:16	08/21/23 10:48 08/20/23 14:48	1
Cobalt Iron Magnesium	250 0.0561 0.0410		1.24 0.000515 0.0515	0.515 0.000161 0.0206	mg/L mg/L mg/L		08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/21/23 10:48 08/20/23 14:48 08/20/23 14:48	1 10 1 1 1
Calcium Cobalt Iron Magnesium Manganese Molybdenum	250 0.0561 0.0410 71.2	J	1.24 0.000515 0.0515 0.0515	0.515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L		08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/21/23 10:48 08/20/23 14:48 08/20/23 14:48 08/20/23 14:48	1 10 1 1
Cobalt Iron Magnesium Manganese Molybdenum	250 0.0561 0.0410 71.2 11.3	J	1.24 0.000515 0.0515 0.0515 0.0206	0.515 0.000161 0.0206 0.0165 0.00979	mg/L mg/L mg/L mg/L mg/L		08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/21/23 10:48 08/20/23 14:48 08/20/23 14:48 08/20/23 14:48 08/21/23 10:48	1 10 1 1
Cobalt Iron Magnesium Manganese	250 0.0561 0.0410 71.2 11.3 0.000336	J	1.24 0.000515 0.0515 0.0515 0.0206 0.000515	0.515 0.000161 0.0206 0.0165 0.00979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L		08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/21/23 10:48 08/20/23 14:48 08/20/23 14:48 08/20/23 14:48 08/21/23 10:48 08/20/23 14:48	1

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Lab Sample ID: 410-137866-2

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7B NaHCO3 Week 7

Lab Sample ID: 410-137866-3 Date Collected: 08/06/23 09:30 Matrix: Water

Date Received: 08/07/23 16:42

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.900	cn	2.00	0.900	mg/L			08/10/23 00:53	10
Sulfate	1060		300	100	mg/L			08/11/23 03:26	200
Chloride	7.01	J cn	15.0	6.00	mg/L			08/10/23 00:53	10
Method: SW846 6010D - Metal	ls (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.203	J	0.515	0.113	mg/L		08/14/23 01:44	08/15/23 17:18	10
SiO2	58.2		1.10	0.117	mg/L		08/14/23 01:44	08/14/23 20:32	,
	• •		DI	MDI	Unit	ь	Propared	Analyzod	Dil Ea
Method: SW846 6020B - Metal	Result	Olved Qualifier	RL	MDL		<u>D</u>	Prepared	Analyzed	Dil Fac
Analyte Arsenic	Result 0.00496		0.00206	0.000700	mg/L	<u>D</u>	08/14/23 01:44	08/15/23 08:47	Dil Fac
Analyte Arsenic Calcium	Result 0.00496 10.2	Qualifier	0.00206	0.000700 0.0515	mg/L	<u>D</u>	08/14/23 01:44 08/14/23 01:44	08/15/23 08:47 08/15/23 08:47	Dil Fac
Analyte Arsenic Calcium Cobalt	Result 0.00496 10.2 0.00575	Qualifier	0.00206 0.124 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L	<u>D</u>	08/14/23 01:44 08/14/23 01:44 08/14/23 01:44	08/15/23 08:47 08/15/23 08:47 08/15/23 08:47	Dil Fac 1 1
Analyte Arsenic Calcium Cobalt	Result 0.00496 10.2	Qualifier	0.00206	0.000700 0.0515	mg/L mg/L mg/L	<u>D</u>	08/14/23 01:44 08/14/23 01:44	08/15/23 08:47 08/15/23 08:47	Dil Fac 1 1 1
Analyte Arsenic Calcium Cobalt ron	Result 0.00496 10.2 0.00575	Qualifier	0.00206 0.124 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L mg/L	<u>D</u>	08/14/23 01:44 08/14/23 01:44 08/14/23 01:44	08/15/23 08:47 08/15/23 08:47 08/15/23 08:47	Dil Fac 1 1 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium	Result 0.00496 10.2 0.00575 0.0762	Qualifier	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L	<u>D</u>	08/14/23 01:44 08/14/23 01:44 08/14/23 01:44 08/14/23 01:44	08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47	Dil Fac 1 1 1 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium Manganese	Result 0.00496 10.2 0.00575 0.0762 68.0	Qualifier	0.00206 0.124 0.000515 0.0515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/14/23 01:44 08/14/23 01:44 08/14/23 01:44 08/14/23 01:44 08/14/23 01:44	08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47	Dil Fac 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium Manganese Molybdenum	Result 0.00496 10.2 0.00575 0.0762 68.0 0.429	Qualifier	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/14/23 01:44 08/14/23 01:44 08/14/23 01:44 08/14/23 01:44 08/14/23 01:44 08/14/23 01:44	08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47	Dil Fac 1 1 1 1 1 1 1
	Result 0.00496 10.2 0.00575 0.0762 68.0 0.429 0.00114	Qualifier ^2	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134 0.0670	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/14/23 01:44 08/14/23 01:44 08/14/23 01:44 08/14/23 01:44 08/14/23 01:44 08/14/23 01:44	08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47 08/15/23 08:47	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Client Sample ID: MW-7C MF3 Week 7

Date Collected: 08/06/23 09:45

Date Received: 08/07/23 16:42

Matrix: Water

Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450	1.00	0.450	mg/L			08/09/23 22:36	5
Sulfate	1020	300	100	mg/L			08/11/23 03:37	200
Chloride	5.56 J	7.50	3.00	mg/L			08/09/23 22:36	5

Method: SW846 6010D - Metals (ICF	P) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0505	J	0.0515	0.0113	mg/L		08/11/23 12:16	08/12/23 09:33	1
SiO2	0.563	J	1.10	0.117	mg/L		08/11/23 12:16	08/12/23 09:33	1

_SiO2	0.563	J	1.10	0.117	mg/L		08/11/23 12:16	08/12/23 09:33	1
 Method: SW846 6020B - N	Metals (ICP/MS) - Diss	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		08/11/23 12:16	08/20/23 14:54	1
Calcium	216		1.24	0.515	mg/L		08/11/23 12:16	08/21/23 10:52	10
Cobalt	0.000231	J	0.000515	0.000161	mg/L		08/11/23 12:16	08/20/23 14:54	1
Iron	0.0255	J	0.0515	0.0206	mg/L		08/11/23 12:16	08/20/23 14:54	1
Magnesium	99.5		0.515	0.165	mg/L		08/11/23 12:16	08/21/23 10:52	10
Manganese	0.0237		0.00206	0.000979	mg/L		08/11/23 12:16	08/20/23 14:54	1
Molybdenum	0.000427	J	0.000515	0.000134	mg/L		08/11/23 12:16	08/20/23 14:54	1
Potassium	11.5		0.206	0.0670	mg/L		08/11/23 12:16	08/20/23 14:54	1
Selenium	0.000688	J	0.00103	0.000286	mg/L		08/11/23 12:16	08/20/23 14:54	1
Sodium	31.2		0.206	0.0927	mg/L		08/11/23 12:16	08/20/23 14:54	1

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Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8I Influent Week 7

Lab Sample ID: 410-137866-5 Date Collected: 08/06/23 10:00 Matrix: Water

Date Received: 08/07/23 16:42

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			08/09/23 22:59	5
Sulfate	105		30.0	10.0	mg/L			08/09/23 23:10	20
Chloride	5.39	J	7.50	3.00	mg/L			08/09/23 22:59	5
Method: SW846 6010D - N	Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/11/23 12:05	08/12/23 08:46	1
SiO2	27.6		1.10	0.117	mg/L		08/11/23 12:05	08/12/23 08:46	1
Method: SW846 6020B - N	Metais (ICP/MS) - Diss	oived							
Analyte	• •	Qualifier	RL	MDL	Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
Analyte Arsenic	• •	Qualifier		MDL 0.000700		<u>D</u>	Prepared 08/11/23 12:05	Analyzed 08/15/23 15:03	Dil Fac
Arsenic	Result	Qualifier			mg/L	<u>D</u>	<u> </u>		Dil Fac
Arsenic Calcium	Result 0.000736	Qualifier	0.00206	0.000700	mg/L mg/L	<u>D</u>	08/11/23 12:05	08/15/23 15:03	1 1 1
Arsenic Calcium Cobalt	Result 0.000736 68.1	Qualifier	0.00206	0.000700 0.0515	mg/L mg/L mg/L	<u>D</u>	08/11/23 12:05 08/11/23 12:05	08/15/23 15:03 08/15/23 15:03	Dil Fac 1 1 1
Arsenic Calcium Cobalt Iron	Result 0.000736 68.1 0.00372	Qualifier	0.00206 0.124 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:05 08/11/23 12:05 08/11/23 12:05	08/15/23 15:03 08/15/23 15:03 08/15/23 15:03	Dil Fac 1 1 1 1
Arsenic Calcium Cobalt ron Magnesium	Result 0.000736 68.1 0.00372 <0.0206	Qualifier	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05	08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03	Dil Fac 1 1 1 1 1
Arsenic Calcium Cobalt ron Magnesium Manganese	Result 0.000736 68.1 0.00372 <0.0206 29.3	Qualifier	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05	08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03	Dil Fac 1 1 1 1 1 1
Arsenic Calcium Cobalt ron Magnesium Manganese Molybdenum	Result 0.000736 68.1 0.00372 <0.0206 29.3 0.249	Qualifier	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05	08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03	Dil Fac 1 1 1 1 1 1 1
	Result 0.000736 68.1 0.00372 <0.0206 29.3 0.249 0.168	Qualifier	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05 08/11/23 12:05	08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03 08/15/23 15:03	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Client Sample ID: MW-8A Control Week 7

Date Collected: 08/06/23 10:15

Date Received: 08/07/23 16:42

Lab Sample	ID: 410-137866-6
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Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Fluoride	<0.450		1.00	0.450	mg/L			08/09/23 23:22	
Sulfate	107		30.0	10.0	mg/L			08/09/23 23:33	20
Chloride	5.76	J	7.50	3.00	mg/L			08/09/23 23:22	
- Method: SW846 6010D -	- Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
			0.0515	0.0113	ma/l		08/11/23 12:05	08/12/23 08:43	
Lithium	<0.0113		0.0515	0.0113	IIIg/L		00/11/23 12.03	00/12/23 00.43	

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00114	J	0.00206	0.000700	mg/L		08/11/23 12:05	08/15/23 15:01	1
Calcium	49.7		0.124	0.0515	mg/L		08/11/23 12:05	08/15/23 15:01	1
Cobalt	0.000188	J	0.000515	0.000161	mg/L		08/11/23 12:05	08/15/23 15:01	1
Iron	<0.0206		0.0515	0.0206	mg/L		08/11/23 12:05	08/15/23 15:01	1
Magnesium	37.1		0.0515	0.0165	mg/L		08/11/23 12:05	08/15/23 15:01	1
Manganese	0.0138		0.00206	0.000979	mg/L		08/11/23 12:05	08/15/23 15:01	1
Molybdenum	0.165		0.000515	0.000134	mg/L		08/11/23 12:05	08/15/23 15:01	1
Potassium	7.03		0.206	0.0670	mg/L		08/11/23 12:05	08/15/23 15:01	1
Selenium	0.000320	J	0.00103	0.000286	mg/L		08/11/23 12:05	08/15/23 15:01	1
Sodium	17.1		0.206	0.0927	mg/L		08/11/23 12:05	08/15/23 15:01	1

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8/21/2023

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCI3 NaHCO3 Week 7

Lab Sample ID: 410-137866-7 Date Collected: 08/06/23 10:30 **Matrix: Water**

Date Received: 08/07/23 16:42

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			08/09/23 23:44	
Sulfate	107		30.0	10.0	mg/L			08/09/23 23:56	20
Chloride	5.61	J	7.50	3.00	mg/L			08/09/23 23:44	
Method: SW846 6010D - I	Metals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Lithium	<0.0113		0.0515	0.0113	mg/L		08/11/23 12:16	08/12/23 09:30	
SiO2	13.7		1.10	0.117	mg/L		08/11/23 12:16	08/12/23 09:30	
Method: SW846 6020B -	Motale (ICP/MS) - Dies	olyad							
Analyte	Result	Qualifier	RL		Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
Analyte		Qualifier	0.00206	0.000700	mg/L	<u>D</u>	08/11/23 12:16	08/20/23 14:52	Dil Fac
Analyte Arsenic	Result	Qualifier			mg/L	<u>D</u>			Dil Fac
Analyte Arsenic Calcium	Result 0.000853	Qualifier J	0.00206	0.000700	mg/L	<u>D</u>	08/11/23 12:16	08/20/23 14:52	Dil Fac
Analyte Arsenic Calcium Cobalt	Result 0.000853 66.1	Qualifier J	0.00206	0.000700 0.0515	mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16	08/20/23 14:52 08/20/23 14:52	Dil Fac
Analyte Arsenic Calcium Cobalt	Result 0.000853 66.1 0.000164	Qualifier J	0.00206 0.124 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:52 08/20/23 14:52 08/20/23 14:52	Dil Fac
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result 0.000853 66.1 0.000164 <0.0206	Qualifier J	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52	Dil Fa
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese	Result 0.000853 66.1 0.000164 <0.0206 28.4	Qualifier J	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52	Dil Fac
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum	Result 0.000853 66.1 0.000164 <0.0206 28.4 0.0205	Qualifier J	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52	Dil Fa
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum Potassium Selenium	Result 0.000853 66.1 0.000164 <0.0206 28.4 0.0205 0.143	Qualifier J	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16 08/11/23 12:16	08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52 08/20/23 14:52	Dil Fac

Client Sample ID: MW-8C MF3 Week 7

Date Collected: 08/06/23 10:45

Date Received: 08/07/23 16:42	Date Received: 08/07/23 16:42									
Method: EPA 300.0 R2.1 - Anion	s, Ion Chromatography									
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac			

Fluoride <0.450 1.00 0.450 mg/L 08/10/23 00:07 5 30.0 08/10/23 00:19 20 Sulfate 231 10.0 mg/L 08/10/23 00:07 Chloride 5.79 J 7.50 3.00 mg/L 5

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/11/23 12:16	08/12/23 09:36	1
SiO2	2.42		1.10	0.117	mg/L		08/11/23 12:16	08/12/23 09:36	1

Method: SW846 6020B - Metals (ICP/MS) - Dissolved

MCtiloa. 011040 0020D -	metals (ioi /ino) - biss	oivea							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00133	J	0.00206	0.000700	mg/L		08/11/23 12:16	08/20/23 14:56	1
Calcium	10.3		0.124	0.0515	mg/L		08/11/23 12:16	08/20/23 14:56	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		08/11/23 12:16	08/20/23 14:56	1
Iron	<0.0206		0.0515	0.0206	mg/L		08/11/23 12:16	08/20/23 14:56	1
Magnesium	51.8		0.0515	0.0165	mg/L		08/11/23 12:16	08/20/23 14:56	1
Manganese	0.00521		0.00206	0.000979	mg/L		08/11/23 12:16	08/20/23 14:56	1
Molybdenum	0.00561		0.000515	0.000134	mg/L		08/11/23 12:16	08/20/23 14:56	1
Potassium	6.22		0.206	0.0670	mg/L		08/11/23 12:16	08/20/23 14:56	1
Selenium	<0.000286		0.00103	0.000286	mg/L		08/11/23 12:16	08/20/23 14:56	1
Sodium	17.1		0.206	0.0927	mg/L		08/11/23 12:16	08/20/23 14:56	1

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Lab Sample ID: 410-137866-8

Matrix: Water

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7BI NAHCO3 Week 7

Lab Sample ID: 410-137866-9 Date Collected: 08/06/23 11:00 Matrix: Water

Date Received: 08/07/23 16:42

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.900	cn	2.00	0.900	mg/L			08/10/23 01:27	10
Sulfate	1100		300	100	mg/L			08/11/23 03:49	200
Chloride	6.77	J cn	15.0	6.00	mg/L			08/10/23 01:27	10
Method: SW846 6010D -	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
₋ithium	<0.0113		0.0515	0.0113	mg/L		08/14/23 01:44	08/14/23 20:35	1
SiO2	64.0		1.10	0.117	mg/L		08/14/23 01:44	08/14/23 20:35	1
Analyte		Qualifier	RL	MDL		D	Prepared	Analyzed	Dil Fac
Method: SW846 6020B -	•		DI	MDI	Unit	n	Dronarod	Analyzod	Dil Eac
Arsenic	0.00112	J	0.00206	0.000700	mg/L		08/14/23 01:44	08/15/23 08:49	1
Calcium	13.4		0.124	0.0515	mg/L		08/14/23 01:44	08/15/23 08:49	1
Cobalt	0.00114	^5-	0.000515	0.000161	ma/L		08/14/23 01:44	08/16/23 10:35	
	0.00114	•		0.000101				00/10/20 10:00	1
	0.0709		0.0515	0.0206			08/14/23 01:44	08/15/23 08:49	
ron					mg/L		08/14/23 01:44 08/14/23 01:44		1 1 1
ron Wagnesium	0.0709		0.0515	0.0206	mg/L mg/L			08/15/23 08:49	1 1 1
ron Magnesium Manganese	0.0709 70.9		0.0515 0.0515	0.0206 0.0165	mg/L mg/L mg/L		08/14/23 01:44	08/15/23 08:49 08/15/23 08:49	1 1 1 1
ron Magnesium Manganese Molybdenum	0.0709 70.9 0.0666		0.0515 0.0515 0.00206	0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L		08/14/23 01:44 08/14/23 01:44	08/15/23 08:49 08/15/23 08:49 08/15/23 08:49	1 1 1 1 1
Iron Magnesium Manganese Molybdenum Potassium Selenium	0.0709 70.9 0.0666 0.000770		0.0515 0.0515 0.00206 0.000515	0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L		08/14/23 01:44 08/14/23 01:44 08/14/23 01:44	08/15/23 08:49 08/15/23 08:49 08/15/23 08:49 08/15/23 08:49	1 1 1 1 1 1

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-137866-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-405900/5

Matrix: Water

Analysis Batch: 405900

Client Sample ID: Method Blank

Prep Type: Total/NA

MB MB Dil Fac Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Fluoride <0.0900 0.200 0.0900 mg/L 08/08/23 23:53 Sulfate < 0.500 1.50 0.500 mg/L 08/08/23 23:53 Chloride <0.600 0.600 mg/L 08/08/23 23:53 1.50

Lab Sample ID: LCS 410-405900/3

Matrix: Water

Analysis Batch: 405900

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Client Sample ID: Lab Control Sample Dup

102

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Fluoride	0.750	0.7371		mg/L		98	90 - 110	
Sulfate	7.50	7.576		mg/L		101	90 - 110	
Chloride	3.00	3.045		mg/L		102	90 - 110	

Lab Sample ID: LCSD 410-405900/4

Matrix: Water

ı	Analysis Batch: 405900									
		Spike	LCSD	LCSD				%Rec		RPD
	Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
	Fluoride	0.750	0.7517		mg/L		100	90 - 110	2	20
	Sulfate	7.50	7.550		mg/L		101	90 - 110	0	20

3.066

mg/L

3.00

мв мв

Lab Sample ID: MB 410-405980/5

Matrix: Water

Chloride

Analysis Batch: 405980

Client Sample ID: Method Blank

90 - 110

Prep Type: Total/NA

Prep Type: Total/NA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L	_		08/09/23 18:12	1
Sulfate	<0.500		1.50	0.500	mg/L			08/09/23 18:12	1
Chloride	< 0.600		1.50	0.600	ma/L			08/09/23 18:12	1

Matrix: Water

Analysis Batch: 405980

Lab Sample ID: LCS 410-405980/3 Client Sample ID: Lab Control Sample Prep Type: Total/NA

	Spik	e LCS	LCS			%Rec	
Analyte	Adde	d Result	Qualifier Unit	D	%Rec	Limits	
Fluoride	0.75	0.7229	mg/L		96	90 - 110	
Sulfate	7.5	0 7.527	mg/L		100	90 - 110	
Chloride	3.0	0 3.023	mg/L		101	90 - 110	

Lab Sample ID: LCSD 410-405980/4

Matrix: Water

Analysis Ratch: 405980

Client Sample ID: Lab	Control Sample Dup
	Prep Type: Total/NA

Alialysis Dalcii. 400000								
	Spike	LCSD	LCSD			%Rec		RPD
Analyte	Added	Result	Qualifier Un	it D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7526	mg	ı/L	100	90 - 110	4	20
Sulfate	7.50	7.527	mg	ı/L	100	90 - 110	0	20
Chloride	3.00	3.017	mg	ı/L	101	90 - 110	0	20

Eurofins Lancaster Laboratories Environment Testing, LLC

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-137866-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography (Continued)

Lab Sample ID: 410-137866-3 MS

Lab Sample ID: 410-137866-3 DU

Matrix: Water

Analysis Batch: 405980

Client Sample ID: MW-7B NaHCO3 Week 7

Prep Type: Total/NA

Sample Sample Spike MS MS %Rec Result Qualifier Analyte Added Result Qualifier Unit %Rec Limits Fluoride <0.900 cn 5.00 4.955 mg/L 99 90 - 110 Chloride 7.01 J cn 20.0 27.04 mg/L 100 90 - 110

Client Sample ID: MW-7B NaHCO3 Week 7

Prep Type: Total/NA

Matrix: Water

Analysis Batch: 405980

_	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Fluoride	<0.900	cn	<0.900		mg/L	_	NC	15
Chloride	7.01	J cn	6.602	J	mg/L		6	15

Lab Sample ID: MB 410-406487/5 Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Water

Analysis Batch: 406487

мв мв

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			08/10/23 04:31	1
Sulfate	<0.500		1.50	0.500	mg/L			08/10/23 04:31	1
Chloride	<0.600		1.50	0.600	mg/L			08/10/23 04:31	1

Client Sample ID: Lab Control Sample Lab Sample ID: LCS 410-406487/3 Prep Type: Total/NA

Matrix: Water

Analysis Batch: 406487

_	Sp	ike LC:	S LCS				%Rec	
Analyte	Add	ded Resu	lt Qualifier	Unit	D	%Rec	Limits	
Fluoride	0.	750 0.730	5	mg/L		97	90 - 110	
Sulfate	7	.50 7.52	2	mg/L		100	90 - 110	
Chloride	3	.00 3.02	7	mg/L		101	90 - 110	

Lab Sample ID: LCSD 410-406487/4 Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA

Matrix: Water

Analysis Batch: 406487

	Spike	LCSD	LCSD				%Rec		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7439		mg/L		99	90 - 110	2	20
Sulfate	7.50	7.515		mg/L		100	90 - 110	0	20
Chloride	3.00	3.022		mg/L		101	90 - 110	0	20

Lab Sample ID: MB 410-406980/5 Client Sample ID: Method Blank

Matrix: Water Prep Type: Total/NA

Analysis Batch: 406980

мв мв

Analyte	Result	Qualifier R	_ MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900	0.20	0.0900	mg/L			08/10/23 20:56	1
Sulfate	<0.500	1.5	0.500	mg/L			08/10/23 20:56	1
Chloride	<0.600	1.5	0.600	ma/L			08/10/23 20:56	1

Eurofins Lancaster Laboratories Environment Testing, LLC

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Lab Sample ID: LCS 410-406980/3

Lab Sample ID: LCSD 410-406980/4

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography (Continued)

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analysis Batch: 406980

Matrix: Water

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Fluoride	0.750	0.7453		mg/L		99	90 - 110	
Sulfate	7.50	7.499		mg/L		100	90 - 110	
Chloride	3.00	3.020		mg/L		101	90 - 110	

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Type: Total/NA

Prep Batch: 407270

Prep Batch: 407270

Analysis Batch: 406980

Matrix: Water

Spike LCSD LCSD %Rec RPD Added RPD Limit Analyte Result Qualifier %Rec Limits Unit D Fluoride 0.750 0.7509 mg/L 100 90 - 110 20 Sulfate 7.50 7.500 mg/L 100 90 - 110 20 0 Chloride 3.00 3.054 mg/L 102 90 - 110 20

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-407270/1-A Client Sample ID: Method Blank

Matrix: Water

Analysis Batch: 407524

MB MB Result Qualifier Analyte RL MDL Unit D Prepared Dil Fac Analyzed Lithium <0.0113 0.0515 08/11/23 12:05 08/12/23 07:07 0.0113 mg/L SiO2 < 0.117 1.10 0.117 mg/L 08/11/23 12:05 08/12/23 07:07

Lab Sample ID: LCS 410-407270/2-A **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

Matrix: Water

Analysis Batch: 407524

LCS LCS Spike %Rec Analyte Added Result Qualifier Unit %Rec Limits Lithium 0.500 0.4834 80 - 120 mg/L

Lab Sample ID: MB 410-407273/1-A Client Sample ID: Method Blank

Matrix: Water

Prep Type: Total/NA Analysis Batch: 407525 **Prep Batch: 407273** MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/11/23 12:16	08/12/23 08:49	1
SiO2	<0.117		1.10	0.117	mg/L		08/11/23 12:16	08/12/23 08:49	1

Lab Sample ID: LCS 410-407273/2-A **Client Sample ID: Lab Control Sample**

Matrix: Water

Prep Batch: 407273 Analysis Batch: 407525 LCS LCS Spike %Rec Analyte Added Result Qualifier Unit %Rec Limits Lithium 0.500 0.5052 101 80 - 120 mg/L

Eurofins Lancaster Laboratories Environment Testing, LLC

8/21/2023

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: MB 410-407621/1-A

Matrix: Water

Analysis Batch: 408148

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 407621

Analyte	Result	Qualifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113	0.0515	0.0113	mg/L		08/14/23 01:44	08/14/23 19:36	1
SiO2	<0.117	1.10	0.117	mg/L		08/14/23 01:44	08/14/23 19:36	1

Lab Sample ID: LCS 410-407621/2-A

Matrix: Water

Analysis Batch: 408148

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Prep Batch: 407621

%Rec

LCS LCS Spike Analyte Added Result Qualifier Unit %Rec Limits 80 - 120 Lithium 0.500 0.4968 mg/L

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 410-407270/1-A

Matrix: Water

Analysis Batch: 408637

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 407270

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		08/11/23 12:05	08/15/23 14:24	1
Calcium	<0.0515		0.124	0.0515	mg/L		08/11/23 12:05	08/15/23 14:24	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		08/11/23 12:05	08/15/23 14:24	1
Iron	<0.0206		0.0515	0.0206	mg/L		08/11/23 12:05	08/15/23 14:24	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		08/11/23 12:05	08/15/23 14:24	1
Manganese	<0.000979		0.00206	0.000979	mg/L		08/11/23 12:05	08/15/23 14:24	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		08/11/23 12:05	08/15/23 14:24	1
Potassium	<0.0670		0.206	0.0670	mg/L		08/11/23 12:05	08/15/23 14:24	1
Selenium	<0.000286		0.00103	0.000286	mg/L		08/11/23 12:05	08/15/23 14:24	1
Sodium	<0.0927		0.206	0.0927	ma/l		08/11/23 12:05	08/15/23 14:24	1

Lab Sample ID: LCS 410-407270/2-A

Matrix: Water

Analysis Batch: 408637

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 407270

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.5072		mg/L		101	85 - 120	
Calcium	5.00	4.805		mg/L		96	85 - 120	
Cobalt	0.500	0.4834		mg/L		97	90 - 113	
Iron	5.00	4.997		mg/L		100	88 - 119	
Magnesium	5.00	4.958		mg/L		99	90 - 112	
Manganese	0.500	0.5076		mg/L		102	89 - 120	
Molybdenum	0.0500	0.04941		mg/L		99	85 - 115	
Potassium	5.00	4.976		mg/L		100	90 - 112	
Selenium	0.100	0.09850		mg/L		99	80 - 120	
Sodium	5.00	4.718		mg/L		94	89 - 112	

Lab Sample ID: MB 410-407273/1-A

Matrix: Water

Analysis Batch: 410431

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 407273

MB MB

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac <0.000700 0.00206 0.000700 mg/L 08/11/23 12:16 08/20/23 13:59 Arsenic

Eurofins Lancaster Laboratories Environment Testing, LLC

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 410-407273/1-A

Matrix: Water

Analysis Batch: 410431

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 407273

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	<0.0515		0.124	0.0515	mg/L		08/11/23 12:16	08/20/23 13:59	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		08/11/23 12:16	08/20/23 13:59	1
Iron	<0.0206		0.0515	0.0206	mg/L		08/11/23 12:16	08/20/23 13:59	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		08/11/23 12:16	08/20/23 13:59	1
Manganese	<0.000979		0.00206	0.000979	mg/L		08/11/23 12:16	08/20/23 13:59	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		08/11/23 12:16	08/20/23 13:59	1
Potassium	<0.0670		0.206	0.0670	mg/L		08/11/23 12:16	08/20/23 13:59	1
Selenium	<0.000286		0.00103	0.000286	mg/L		08/11/23 12:16	08/20/23 13:59	1
Sodium	<0.0927		0.206	0.0927	mg/L		08/11/23 12:16	08/20/23 13:59	1

Lab Sample ID: LCS 410-407273/2-A

мв мв

Matrix: Water

Analysis Batch: 410431

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 407273

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.4958		mg/L		99	85 - 120	
Calcium	5.00	4.908		mg/L		98	85 - 120	
Cobalt	0.500	0.4897		mg/L		98	90 - 113	
Iron	5.00	4.908		mg/L		98	88 - 119	
Magnesium	5.00	4.910		mg/L		98	90 - 112	
Manganese	0.500	0.5005		mg/L		100	89 - 120	
Molybdenum	0.0500	0.04836		mg/L		97	85 _ 115	
Potassium	5.00	5.082		mg/L		102	90 - 112	
Selenium	0.100	0.1005		mg/L		101	80 - 120	
Sodium	5.00	4.933		mg/L		99	89 - 112	

Lab Sample ID: MB 410-407621/1-A Client Sample ID: Method Blank

Matrix: Water

Analysis Batch: 408421

Prep Type: Total/NA

Prep Batch: 407621

	MB	MB						-	
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.000700		0.00206	0.000700	mg/L		08/14/23 01:44	08/15/23 08:13	1
Calcium	<0.0515		0.124	0.0515	mg/L		08/14/23 01:44	08/15/23 08:13	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		08/14/23 01:44	08/15/23 08:13	1
Iron	<0.0206		0.0515	0.0206	mg/L		08/14/23 01:44	08/15/23 08:13	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		08/14/23 01:44	08/15/23 08:13	1
Manganese	<0.000979		0.00206	0.000979	mg/L		08/14/23 01:44	08/15/23 08:13	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		08/14/23 01:44	08/15/23 08:13	1
Potassium	<0.0670		0.206	0.0670	mg/L		08/14/23 01:44	08/15/23 08:13	1
Selenium	<0.000286		0.00103	0.000286	mg/L		08/14/23 01:44	08/15/23 08:13	1
Sodium	<0.0927		0.206	0.0927	mg/L		08/14/23 01:44	08/15/23 08:13	1

Lab Sample ID: LCS 410-407621/2-A Client Sample ID: Lab Control Sample

Matrix: Water

Analysis Batch: 408421

Prep Type: Total/NA Prep Batch: 407621

LCS LCS Spike %Rec Result Qualifier Analyte Added Unit %Rec Limits Arsenic 0.500 0.5029 mg/L 101 85 - 120 100 Calcium 5.00 4.993 85 - 120 mg/L

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QC Sample Results

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID:	LCS 410-407621/2-A
Matrix: Water	

Analysis Batch: 408421

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Prep Batch: 407621

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Cobalt	0.500	0.4872		mg/L		97	90 - 113	
Iron	5.00	4.997		mg/L		100	88 - 119	
Magnesium	5.00	4.955		mg/L		99	90 - 112	
Manganese	0.500	0.4986		mg/L		100	89 - 120	
Molybdenum	0.0500	0.04816		mg/L		96	85 - 115	
Potassium	5.00	5.053		mg/L		101	90 - 112	
Selenium	0.100	0.09991		mg/L		100	80 - 120	
Sodium	5.00	4.851		mg/L		97	89 - 112	

Project/Site: Stantec CCR AP2 Columns

HPLC/IC

Analysis Batch: 405900

Client: Terra Systems Inc

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-1	MW-7I Influent Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-2	MW-7A Control Week 7	Total/NA	Water	EPA 300.0 R2.1	
MB 410-405900/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-405900/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-405900/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 405980

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-3	MW-7B NaHCO3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-4	MW-7C MF3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-5	MW-8I Influent Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-5	MW-8I Influent Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-6	MW-8A Control Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-6	MW-8A Control Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-7	MW-8B FeCl3 NaHCO3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-7	MW-8B FeCl3 NaHCO3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-8	MW-8C MF3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-8	MW-8C MF3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-9	MW-7BI NAHCO3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
MB 410-405980/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-405980/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-405980/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	
410-137866-3 MS	MW-7B NaHCO3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-3 DU	MW-7B NaHCO3 Week 7	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 406487

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-1	MW-7I Influent Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-1	MW-7I Influent Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-2	MW-7A Control Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-2	MW-7A Control Week 7	Total/NA	Water	EPA 300.0 R2.1	
MB 410-406487/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-406487/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-406487/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 406980

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-3	MW-7B NaHCO3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-4	MW-7C MF3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
410-137866-9	MW-7BI NAHCO3 Week 7	Total/NA	Water	EPA 300.0 R2.1	
MB 410-406980/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-406980/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-406980/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Metals

Prep Batch: 407270

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-5	MW-8I Influent Week 7	Dissolved	Water	Non-Digest Prep	
410-137866-6	MW-8A Control Week 7	Dissolved	Water	Non-Digest Prep	
MB 410-407270/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	

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QC Association Summary

Client: Terra Systems Inc

Job ID: 410-137866-1 Project/Site: Stantec CCR AP2 Columns

Metals (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 410-407270/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Prep Batch: 407273

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-1	MW-7I Influent Week 7	Dissolved	Water	Non-Digest Prep	
410-137866-2	MW-7A Control Week 7	Dissolved	Water	Non-Digest Prep	
410-137866-4	MW-7C MF3 Week 7	Dissolved	Water	Non-Digest Prep	
410-137866-7	MW-8B FeCl3 NaHCO3 Week 7	Dissolved	Water	Non-Digest Prep	
410-137866-8	MW-8C MF3 Week 7	Dissolved	Water	Non-Digest Prep	
MB 410-407273/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-407273/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 407524

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-5	MW-8I Influent Week 7	Dissolved	Water	6010D	407270
410-137866-6	MW-8A Control Week 7	Dissolved	Water	6010D	407270
MB 410-407270/1-A	Method Blank	Total/NA	Water	6010D	407270
LCS 410-407270/2-A	Lab Control Sample	Total/NA	Water	6010D	407270

Analysis Batch: 407525

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-1	MW-7I Influent Week 7	Dissolved	Water	6010D	407273
410-137866-2	MW-7A Control Week 7	Dissolved	Water	6010D	407273
410-137866-4	MW-7C MF3 Week 7	Dissolved	Water	6010D	407273
410-137866-7	MW-8B FeCl3 NaHCO3 Week 7	Dissolved	Water	6010D	407273
410-137866-8	MW-8C MF3 Week 7	Dissolved	Water	6010D	407273
MB 410-407273/1-A	Method Blank	Total/NA	Water	6010D	407273
LCS 410-407273/2-A	Lab Control Sample	Total/NA	Water	6010D	407273

Prep Batch: 407621

Lab Sample ID 410-137866-3	Client Sample ID MW-7B NaHCO3 Week 7	Prep Type Dissolved	Matrix Water	Method Prep Batch Non-Digest Prep
410-137866-9	MW-7BI NAHCO3 Week 7	Dissolved	Water	Non-Digest Prep
MB 410-407621/1-A	Method Blank	Total/NA	Water	Non-Digest Prep
LCS 410-407621/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep

Analysis Batch: 408148

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-3	MW-7B NaHCO3 Week 7	Dissolved	Water	6010D	407621
410-137866-9	MW-7BI NAHCO3 Week 7	Dissolved	Water	6010D	407621
MB 410-407621/1-A	Method Blank	Total/NA	Water	6010D	407621
LCS 410-407621/2-A	Lab Control Sample	Total/NA	Water	6010D	407621

Analysis Batch: 408421

Lab Sample ID 410-137866-3	Client Sample ID MW-7B NaHCO3 Week 7	Prep Type Dissolved	Matrix Water	Method 6020B	Prep Batch 407621
410-137866-9	MW-7BI NAHCO3 Week 7	Dissolved	Water	6020B	407621
MB 410-407621/1-A	Method Blank	Total/NA	Water	6020B	407621
LCS 410-407621/2-A	Lab Control Sample	Total/NA	Water	6020B	407621

Eurofins Lancaster Laboratories Environment Testing, LLC

8/21/2023

QC Association Summary

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Metals

Analysis Batch: 408637

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-5	MW-8I Influent Week 7	Dissolved	Water	6020B	407270
410-137866-6	MW-8A Control Week 7	Dissolved	Water	6020B	407270
MB 410-407270/1-A	Method Blank	Total/NA	Water	6020B	407270
LCS 410-407270/2-A	Lab Control Sample	Total/NA	Water	6020B	407270

Analysis Batch: 408662

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-3	MW-7B NaHCO3 Week 7	Dissolved	Water	6010D	407621

Analysis Batch: 408949

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-3	MW-7B NaHCO3 Week 7	Dissolved	Water	6020B	407621
410-137866-9	MW-7BI NAHCO3 Week 7	Dissolved	Water	6020B	407621
410-137866-9	MW-7BI NAHCO3 Week 7	Dissolved	Water	6020B	407621

Analysis Batch: 410431

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-1	MW-7I Influent Week 7	Dissolved	Water	6020B	407273
410-137866-2	MW-7A Control Week 7	Dissolved	Water	6020B	407273
410-137866-4	MW-7C MF3 Week 7	Dissolved	Water	6020B	407273
410-137866-7	MW-8B FeCl3 NaHCO3 Week 7	Dissolved	Water	6020B	407273
410-137866-8	MW-8C MF3 Week 7	Dissolved	Water	6020B	407273
MB 410-407273/1-A	Method Blank	Total/NA	Water	6020B	407273
LCS 410-407273/2-A	Lab Control Sample	Total/NA	Water	6020B	407273

Analysis Batch: 410601

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-1	MW-7I Influent Week 7	Dissolved	Water	6020B	407273
410-137866-2	MW-7A Control Week 7	Dissolved	Water	6020B	407273
410-137866-4	MW-7C MF3 Week 7	Dissolved	Water	6020B	407273

Lab Chronicle

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7I Influent Week 7

Date Collected: 08/06/23 09:00 Date Received: 08/07/23 16:42

Matrix: Water

Lab Sample ID: 410-137866-1

Batch Batch Dilution Batch Prepared Prep Type Туре Method Run Factor **Number Analyst** Lab or Analyzed EPA 300.0 R2.1 08/09/23 05:59 Total/NA Analysis 5 405900 W7FX ELLE Total/NA Analysis EPA 300.0 R2.1 10 406487 W7FX **ELLE** 08/10/23 08:54 406487 W7FX Total/NA EPA 300.0 R2.1 200 **ELLE** 08/10/23 09:06 Analysis **ELLE** Dissolved Prep Non-Digest Prep 407273 UAMX 08/11/23 12:16 Dissolved 6010D 407525 MT26 ELLE 08/12/23 09:26 Analysis 1 Dissolved Prep Non-Digest Prep 407273 UAMX ELLE 08/11/23 12:16 Dissolved 6020B 410431 F7JF ELLE 08/20/23 14:50 Analysis 1 Dissolved Prep Non-Digest Prep 407273 UAMX **ELLE** 08/11/23 12:16

Client Sample ID: MW-7A Control Week 7

Analysis

6020B

Dissolved

Lab Sample ID: 410-137866-2 Date Collected: 08/06/23 09:15

Matrix: Water Date Received: 08/07/23 16:42

410601 F7JF

ELLE

08/21/23 10:50

10

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	405900	W7FX	ELLE	08/09/23 06:22
Total/NA	Analysis	EPA 300.0 R2.1		10	406487	W7FX	ELLE	08/10/23 09:40
Total/NA	Analysis	EPA 300.0 R2.1		200	406487	W7FX	ELLE	08/10/23 09:52
Dissolved	Prep	Non-Digest Prep			407273	UAMX	ELLE	08/11/23 12:16
Dissolved	Analysis	6010D		1	407525	MT26	ELLE	08/12/23 09:14
Dissolved	Prep	Non-Digest Prep			407273	UAMX	ELLE	08/11/23 12:16
Dissolved	Analysis	6020B		1	410431	F7JF	ELLE	08/20/23 14:48
Dissolved	Prep	Non-Digest Prep			407273	UAMX	ELLE	08/11/23 12:16
Dissolved	Analysis	6020B		10	410601	F7JF	ELLE	08/21/23 10:48

Client Sample ID: MW-7B NaHCO3 Week 7

Lab Sample ID: 410-137866-3 Date Collected: 08/06/23 09:30 **Matrix: Water** Date Received: 08/07/23 16:42

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1			405980	W7FX	ELLE	08/10/23 00:53
Total/NA	Analysis	EPA 300.0 R2.1		200	406980	W7FX	ELLE	08/11/23 03:26
Dissolved	Prep	Non-Digest Prep			407621	UAMX	ELLE	08/14/23 01:44
Dissolved	Analysis	6010D		10	408662	T8CQ	ELLE	08/15/23 17:18
Dissolved	Prep	Non-Digest Prep			407621	UAMX	ELLE	08/14/23 01:44
Dissolved	Analysis	6010D		1	408148	T8CQ	ELLE	08/14/23 20:32
Dissolved	Prep	Non-Digest Prep			407621	UAMX	ELLE	08/14/23 01:44
Dissolved	Analysis	6020B		1	408421	LC3M	ELLE	08/15/23 08:47
Dissolved	Prep	Non-Digest Prep			407621	UAMX	ELLE	08/14/23 01:44
Dissolved	Analysis	6020B		100	408949	LC3M	ELLE	08/16/23 10:27

Eurofins Lancaster Laboratories Environment Testing, LLC

Client Sample ID: MW-7C MF3 Week 7

Date Collected: 08/06/23 09:45 Date Received: 08/07/23 16:42

Client: Terra Systems Inc

Lab Sample ID: 410-137866-4

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	405980	W7FX	ELLE	08/09/23 22:36
Total/NA	Analysis	EPA 300.0 R2.1		200	406980	W7FX	ELLE	08/11/23 03:37
Dissolved	Prep	Non-Digest Prep			407273	UAMX	ELLE	08/11/23 12:16
Dissolved	Analysis	6010D		1	407525	MT26	ELLE	08/12/23 09:33
Dissolved	Prep	Non-Digest Prep			407273	UAMX	ELLE	08/11/23 12:16
Dissolved	Analysis	6020B		1	410431	F7JF	ELLE	08/20/23 14:54
Dissolved	Prep	Non-Digest Prep			407273	UAMX	ELLE	08/11/23 12:16
Dissolved	Analysis	6020B		10	410601	F7JF	ELLE	08/21/23 10:52

Client Sample ID: MW-8I Influent Week 7

Date Collected: 08/06/23 10:00

Date Received: 08/07/23 16:42

Lab Sample ID: 410-137866-5

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	405980	W7FX	ELLE	08/09/23 22:59
Total/NA	Analysis	EPA 300.0 R2.1		20	405980	W7FX	ELLE	08/09/23 23:10
Dissolved	Prep	Non-Digest Prep			407270	UAMX	ELLE	08/11/23 12:05
Dissolved	Analysis	6010D		1	407524	MT26	ELLE	08/12/23 08:46
Dissolved	Prep	Non-Digest Prep			407270	UAMX	ELLE	08/11/23 12:05
Dissolved	Analysis	6020B		1	408637	UCIG	ELLE	08/15/23 15:03

Client Sample ID: MW-8A Control Week 7

Date Collected: 08/06/23 10:15

Date Received: 08/07/23 16:42

Lab Sample ID: 410-137866-6

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	405980	W7FX	ELLE	08/09/23 23:22
Total/NA	Analysis	EPA 300.0 R2.1		20	405980	W7FX	ELLE	08/09/23 23:33
Dissolved	Prep	Non-Digest Prep			407270	UAMX	ELLE	08/11/23 12:05
Dissolved	Analysis	6010D		1	407524	MT26	ELLE	08/12/23 08:43
Dissolved	Prep	Non-Digest Prep			407270	UAMX	ELLE	08/11/23 12:05
Dissolved	Analysis	6020B		1	408637	UCIG	ELLE	08/15/23 15:01

Client Sample ID: MW-8B FeCI3 NaHCO3 Week 7

Date Collected: 08/06/23 10:30

Date Received: 08/07/23 16:42

Lab Samp	ole II	D: 41	0-137	866-7
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Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	405980	W7FX	ELLE	08/09/23 23:44
Total/NA	Analysis	EPA 300.0 R2.1		20	405980	W7FX	ELLE	08/09/23 23:56
Dissolved	Prep	Non-Digest Prep			407273	UAMX	ELLE	08/11/23 12:16
Dissolved	Analysis	6010D		1	407525	MT26	ELLE	08/12/23 09:30
Dissolved	Prep	Non-Digest Prep			407273	UAMX	ELLE	08/11/23 12:16
Dissolved	Analysis	6020B		1	410431	F7JF	ELLE	08/20/23 14:52

Eurofins Lancaster Laboratories Environment Testing, LLC

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8/21/2023

Lab Chronicle

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Date Received: 08/07/23 16:42

Dissolved

Client Sample ID: MW-8C MF3 Week 7

Lab Sample ID: 410-137866-8 Date Collected: 08/06/23 10:45

Matrix: Water

08/20/23 14:56

Batch Batch Dilution Batch Prepared Prep Type Туре Method Run Factor **Number Analyst** Lab or Analyzed EPA 300.0 R2.1 08/10/23 00:07 Total/NA Analysis 5 405980 W7FX ELLE Total/NA Analysis EPA 300.0 R2.1 20 405980 W7FX **ELLE** 08/10/23 00:19 Dissolved Prep 407273 UAMX ELLE 08/11/23 12:16 Non-Digest Prep **ELLE** 08/12/23 09:36 Dissolved Analysis 6010D 407525 MT26 Dissolved Prep **ELLE** 08/11/23 12:16 Non-Digest Prep 407273 UAMX

Client Sample ID: MW-7BI NAHCO3 Week 7

Analysis

6020B

Lab Sample ID: 410-137866-9

410431 F7JF

ELLE

Date Collected: 08/06/23 11:00 **Matrix: Water** Date Received: 08/07/23 16:42

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		10	405980	W7FX	ELLE	08/10/23 01:27
Total/NA	Analysis	EPA 300.0 R2.1		200	406980	W7FX	ELLE	08/11/23 03:49
Dissolved	Prep	Non-Digest Prep			407621	UAMX	ELLE	08/14/23 01:44
Dissolved	Analysis	6010D		1	408148	T8CQ	ELLE	08/14/23 20:35
Dissolved	Prep	Non-Digest Prep			407621	UAMX	ELLE	08/14/23 01:44
Dissolved	Analysis	6020B		1	408421	LC3M	ELLE	08/15/23 08:49
Dissolved	Prep	Non-Digest Prep			407621	UAMX	ELLE	08/14/23 01:44
Dissolved	Analysis	6020B		1	408949	LC3M	ELLE	08/16/23 10:35
Dissolved	Prep	Non-Digest Prep			407621	UAMX	ELLE	08/14/23 01:44
Dissolved	Analysis	6020B		100	408949	LC3M	ELLE	08/16/23 10:37

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alabama	State	43200	01-31-24
Alaska	State	PA00009	06-30-24
Alaska (UST)	State	17-027	02-28-24
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-24
California	State	2792	11-30-23
Colorado	State	PA00009	06-30-24
Connecticut	State	PH-0746	06-30-25
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	06-30-24
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Ilinois	NELAP	200027	01-31-24
owa	State	361	03-01-24
owa Kansas	NELAP	E-10151	10-31-23
Karisas Kentucky (DW)	State	E-10151 KY90088	12-31-23
- ', '			
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	12-31-23
Louisiana (All)	NELAP	02055	06-30-24
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-24
Massachusetts	State	M-PA009	06-30-24
Michigan	State	9930	01-31-24
Minnesota	NELAP	042-999-487	12-31-23
Mississippi	State	023	01-31-24
Missouri	State	450	01-31-25
Montana (DW)	State	0098	01-01-24
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	01-10-24
New Jersey	NELAP	PA011	06-30-24
New York	NELAP	10670	04-01-24
North Carolina (DW)	State	42705	07-31-24
North Carolina (WW/SW)	State	521	12-31-23
North Dakota	State	R-205	01-31-24
Oklahoma	NELAP	9804	08-31-23
Oregon	NELAP	PA200001	09-11-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	01-31-24
Rhode Island	State	LAO00338	12-31-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
- Texas	NELAP	T104704194-23-46	08-31-23
JSDA	US Federal Programs	525-22-298-19481	10-25-25
/ermont	State	VT - 36037	10-28-23
/irginia	NELAP	460182	06-14-25
<i>N</i> ashington	State	C457	04-11-24
พลราเกฎเอก West Virginia (DW)	State	9906 C	12-31-23

Eurofins Lancaster Laboratories Environment Testing, LLC

8/21/2023

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-137866-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-137866-1

Method	Method Description	Protocol	Laboratory
EPA 300.0 R2.1	Anions, Ion Chromatography	EPA	ELLE
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Sample Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-137866-1	MW-7I Influent Week 7	Water	08/06/23 09:00	08/07/23 16:42
410-137866-2	MW-7A Control Week 7	Water	08/06/23 09:15	08/07/23 16:42
410-137866-3	MW-7B NaHCO3 Week 7	Water	08/06/23 09:30	08/07/23 16:42
410-137866-4	MW-7C MF3 Week 7	Water	08/06/23 09:45	08/07/23 16:42
410-137866-5	MW-8I Influent Week 7	Water	08/06/23 10:00	08/07/23 16:42
410-137866-6	MW-8A Control Week 7	Water	08/06/23 10:15	08/07/23 16:42
410-137866-7	MW-8B FeCl3 NaHCO3 Week 7	Water	08/06/23 10:30	08/07/23 16:42
410-137866-8	MW-8C MF3 Week 7	Water	08/06/23 10:45	08/07/23 16:42
410-137866-9	MW-7BI NAHCO3 Week 7	Water	08/06/23 11:00	08/07/23 16:42

Job ID: 410-137866-1

Enviro

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Request/Chain of Custody

signature entire

Project Name/#:

Project Manager:

Sampler: Michael D. Lee

Sample Identification

MW-7I Influent Week 7

MW-7A Control Week 7

MW-7C MF3 Week 7

MW-8I Influent Week 7

MW-8A Control Week 7

MW-8C MF3 Week 7

MW-7BI NaHCO3 Week 7

Date results are needed:

Type I (Validation/non-CLP)

Type III (Reduced non-CLP)

Type VI (Raw Data Only)

E-mail Address:

Phone:

NJ DKQP

EDD Required?

Rush results requested by (please check):

MW-8B FeCl3 NaHCO3 Week 7

Turnaround Time Requested (TAT) (please check):

Data Package Options (please check if required)

Yes

8/21/23

MA MCP

CT RCP

TX TRRP-13

mlee@terrasystems.net

302-798-9553

□ No

MW-7B NaHCO3 Week 7

Client:

Phone #:

Lancaster Laboratories Environmental

Michael D. Lee

Stantec CCR AP2 Columns

Terra Systems, Inc.

302-798-9553

State where samples were collected

	. [] [] [] [] [] [] [] [] [] [

410-137866 Chain of Custody Sample # For Lab Use Only **Analyses Requested** Matrix 4 SF #: **Preservation Codes** Site ID #: Macon, GA Tissue Ground Surface P.O. #: SCR #: 222566-8-6-23 Ν N PWSID#: Preservation Codes Containers K, Li Sediment Quote #: 41011818 H = HCI T = Thiosulfate Fe. Na GA For Compliance: Yes N = HNO₃ No ပိ B = NaOH Composite Ca of S = H2SO4 P = H₃PO₄ Collection Dis (fil) As, Total # 504 Other: O = Other Grab Soil u. Remarks Date Time 2 Х Х Х ff =field filtered 8/6/2023 Х Х 9:00 Х Х Χ 8/6/2023 Х 9:15 2 8/6/2023 Х Χ Х Х Х 9:30 Χ Х Х 8/6/2023 Х Х 9:45 Х Х 2 Х Х Х 8/6/2023 10:00 8/6/2023 Х Х Х Х 10:15 Х Х 2 Χ Х Х 8/6/2023 10:30 Х Х 2 Х Х 8/6/2023 10:45 Х 2 Х Х Х 8/6/2023 11:00 Relinquished by: Received by: Time Rush Standard (Rush TAT is subject to laboratory approval and surcharges.) Relinquished by Date Time Received by: Date 1642 E-Mail Phone Relinquished by: Date/ Time Received by: Date Tilme Time Relinquished by: Date Received by: **D**ate Time Date Received by: Relinquished by: Time Time Relinquished by Commercial Carrier: **NYSDEC Category** A or B Temperature upon receipt If yes, format:

Eurofins Lancaster Laboratories Environmental, LLC • 2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300

8/21/2023

Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-137866-1

Login Number: 137866

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

8/21/2023

List Number: 1 Creator: Wrye, Shaun

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	Not present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

Eurofins Lancaster Laboratories Environment Testing, LLC

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ANALYTICAL REPORT

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703

Generated 8/29/2023 2:32:51 AM

JOB DESCRIPTION

Stantec CCR AP2 Columns

JOB NUMBER

410-137866-2

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601

EOL EOL

Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 8/29/2023 2:32:51 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- · QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- · Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

This report shall not be reproduced except in full, without the written approval of the laboratory.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. The foregoing express warranty is exclusive and is given in lieu of all other warranties, expressed or implied, except as otherwise agreed. We disclaim any other warranties, expressed or implied, including a warranty of fitness for particular purpose and warranty of merchantability. In no event shall Eurofins Lancaster Laboratories Environmental, LLC be liable for indirect, special, consequential, or incidental damages including, but not limited to, damages for loss of profit or goodwill regardless of (A) the negligence (either sole or concurrent) of Eurofins Lancaster Laboratories Environmental and (B) whether Eurofins Lancaster Laboratories Environmental has been informed of the possibility of such damages. We accept no legal responsibility for the purposes for which the client uses the test results. Except as otherwise agreed, no purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

Marrissa Williams

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8/29/2023

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns Laboratory Job ID: 410-137866-2

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-137866-2

Project/Site: Stantec CCR AP2 Columns

Qualifiers

M	leta	ıls

Qualifier Description Qualifier Description

Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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

Eurofins Lancaster Laboratories Environment Testing, LLC

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Case Narrative

Client: Terra Systems Inc Job ID: 410-137866-2

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-137866-2

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-137866-2

Receipt

The samples were received on 8/7/2023 4:42 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 1.1°C

Metals

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

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Detection Summary

Client: Terra Systems Inc Job ID: 410-137866-2

Project/Site: Stantec CCR AP2 Columns

Lab Sample ID: 410-137866-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0525		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	67.4		1.10	0.117	mg/L	1		6010D	Dissolved

Client Sample ID: MW-7BI NAHCO3 Week 7

Lab Samp	le ID:	410-13	37866-11
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Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0567		0.0515	0.0113	mg/L	1		6010D	 Dissolved
SiO2	67.4		1.10	0.117	mg/L	1		6010D	Dissolved

Client Sample ID: MW-7B NaHCO3 Week 7

Lab Sample ID: 410-137866-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.286	J	1.03	0.227	mg/L	20		6010D	 Dissolved
SiO2	59.5		1.10	0.117	mg/L	1		6010D	Dissolved

Client Sample ID: MW-7B NaHCO3 Week 7

Lab Sample ID: 410-137866-13

Analyte	Result Qualifier	RL	MDL Unit	Dil Fac D	Method	Prep Type
Lithium	0.341 J	1.03	0.227 mg/L	20	6010D	Dissolved
SiO2	58.9	1.10	0.117 mg/L	1	6010D	Dissolved

Client: Terra Systems Inc Job ID: 410-137866-2

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7BI NAHCO3 Week 7

Lab Sample ID: 410-137866-10 Date Collected: 08/06/23 11:00

Matrix: Water

Date Received: 08/07/23 16:42

Method: SW846 6010D - Metals (ICP) - Dissolved										
Analyte	Result Q	Qualifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac		
Lithium	0.0525	0.0515	0.0113	mg/L		08/24/23 23:28	08/25/23 16:29	1		
SiO2	67.4	1.10	0.117	mg/L		08/24/23 23:28	08/25/23 16:29	1		

Client Sample ID: MW-7BI NAHCO3 Week 7

Lab Sample ID: 410-137866-11

Date Collected: 08/06/23 11:00 **Matrix: Water**

Date Received: 08/07/23 16:42

Method: SW846 6010D - Metals (ICP) - Dissolved											
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac			
Lithium	0.0567	0.0515	0.0113	mg/L		08/24/23 23:28	08/25/23 16:32	1			
SiO2	67.4	1.10	0.117	mg/L		08/24/23 23:28	08/25/23 16:32	1			

Client Sample ID: MW-7B NaHCO3 Week 7

Lab Sample ID: 410-137866-12

Date Collected: 08/06/23 09:30 **Matrix: Water**

Date Received: 08/07/23 16:42

Method: SW846 6010D - Metals (ICP) - Dissolved										
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Lithium	0.286	J	1.03	0.227	mg/L		08/28/23 01:39	08/28/23 19:20	20	
SiO2	59.5		1.10	0.117	mg/L		08/28/23 01:39	08/28/23 18:27	1	

Client Sample ID: MW-7B NaHCO3 Week 7

Lab Sample ID: 410-137866-13 Date Collected: 08/06/23 09:30 **Matrix: Water**

Date Received: 08/07/23 16:42

Method: SW846 6010D - Metals (ICP) - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.341	J	1.03	0.227	mg/L		08/28/23 01:39	08/28/23 19:23	20
SiO2	58.9		1.10	0.117	mg/L		08/28/23 01:39	08/28/23 18:30	1

Eurofins Lancaster Laboratories Environment Testing, LLC

8/29/2023

QC Sample Results

Client: Terra Systems Inc Job ID: 410-137866-2

Project/Site: Stantec CCR AP2 Columns

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-412322/1-A

< 0.117

Matrix: Water

Analysis Batch: 412799

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 412322

Prep Type: Total/NA

Prep Batch: 413052

Prep Batch: 413052

08/28/23 17:00

MB MB Dil Fac Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Lithium <0.0113 0.0515 0.0113 mg/L 08/24/23 23:28 08/25/23 15:19 SiO2 < 0.117 1.10 0.117 mg/L 08/24/23 23:28 08/25/23 15:19

Lab Sample ID: LCS 410-412322/2-A **Client Sample ID: Lab Control Sample**

Matrix: Water

Analysis Batch: 412799

Prep Batch: 412322 LCS LCS Spike %Rec Analyte Added Result Qualifier Unit %Rec Limits Lithium 0.500 0.4783 80 - 120 mg/L

Lab Sample ID: MB 410-413052/1-A Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Water

SiO2

Analysis Batch: 413506

мв мв MDL Unit Analyte Result Qualifier RL D Prepared Analyzed Dil Fac Lithium 0.0515 0.0113 mg/L 08/28/23 01:39 <0.0113 08/28/23 17:00

1.10

0.117 mg/L

Lab Sample ID: LCS 410-413052/2-A Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 413506

Spike LCS LCS %Rec Added

Analyte Result Qualifier Unit %Rec Limits Lithium 0.500 0.4973 mg/L 99 80 - 120

08/28/23 01:39

QC Association Summary

Client: Terra Systems Inc Job ID: 410-137866-2

Project/Site: Stantec CCR AP2 Columns

Metals

Prep Batch: 412322

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-10	MW-7BI NAHCO3 Week 7	Dissolved	Water	Non-Digest Prep	
410-137866-11	MW-7BI NAHCO3 Week 7	Dissolved	Water	Non-Digest Prep	
MB 410-412322/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-412322/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 412799

Lab Sample 410-137866		eek 7 Prep Typ Dissolved		Method 6010D	Prep Batch 412322
410-137866	6-11 MW-7BI NAHCO3 W	eek 7 Dissolved	d Water	6010D	412322
MB 410-41	2322/1-A Method Blank	Total/NA	Water	6010D	412322
LCS 410-41	12322/2-A Lab Control Sample	Total/NA	Water	6010D	412322

Prep Batch: 413052

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-12	MW-7B NaHCO3 Week 7	Dissolved	Water	Non-Digest Prep	
410-137866-13	MW-7B NaHCO3 Week 7	Dissolved	Water	Non-Digest Prep	
MB 410-413052/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-413052/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 413506

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-137866-12	MW-7B NaHCO3 Week 7	Dissolved	Water	6010D	413052
410-137866-12	MW-7B NaHCO3 Week 7	Dissolved	Water	6010D	413052
410-137866-13	MW-7B NaHCO3 Week 7	Dissolved	Water	6010D	413052
410-137866-13	MW-7B NaHCO3 Week 7	Dissolved	Water	6010D	413052
MB 410-413052/1-A	Method Blank	Total/NA	Water	6010D	413052
LCS 410-413052/2-A	Lab Control Sample	Total/NA	Water	6010D	413052

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Lab Chronicle

Client: Terra Systems Inc Job ID: 410-137866-2

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7BI NAHCO3 Week 7

Lab Sample ID: 410-137866-10 Date Collected: 08/06/23 11:00 **Matrix: Water**

Date Received: 08/07/23 16:42

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			412322	UAMX	ELLE	08/24/23 23:28
Dissolved	Analysis	6010D		1	412799	T8CQ	ELLE	08/25/23 16:29

Client Sample ID: MW-7BI NAHCO3 Week 7

Lab Sample ID: 410-137866-11

Matrix: Water

Date Collected: 08/06/23 11:00 Date Received: 08/07/23 16:42

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			412322	UAMX	ELLE	08/24/23 23:28
Dissolved	Analysis	6010D		1	412799	T8CQ	ELLE	08/25/23 16:32

Client Sample ID: MW-7B NaHCO3 Week 7

Lab Sample ID: 410-137866-12

Date Collected: 08/06/23 09:30 Date Received: 08/07/23 16:42

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			413052	UAMX	ELLE	08/28/23 01:39
Dissolved	Analysis	6010D		1	413506	T8CQ	ELLE	08/28/23 18:27
Dissolved	Prep	Non-Digest Prep			413052	UAMX	ELLE	08/28/23 01:39
Dissolved	Analysis	6010D		20	413506	T8CQ	ELLE	08/28/23 19:20

Client Sample ID: MW-7B NaHCO3 Week 7

Lab Sample ID: 410-137866-13

Matrix: Water

Date Collected: 08/06/23 09:30

Date Received: 08/07/23 16:42

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			413052	UAMX	ELLE	08/28/23 01:39
Dissolved	Analysis	6010D		1	413506	T8CQ	ELLE	08/28/23 18:30
Dissolved	Prep	Non-Digest Prep			413052	UAMX	ELLE	08/28/23 01:39
Dissolved	Analysis	6010D		20	413506	T8CQ	ELLE	08/28/23 19:23

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-137866-2

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alabama	State	43200	01-31-24
Alaska	State	PA00009	06-30-24
Alaska (UST)	State	17-027	02-28-24
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-24
California	State	2792	11-30-23
Colorado	State	PA00009	06-30-24
Connecticut	State	PH-0746	06-30-25
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	06-30-24
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Ilinois	NELAP	200027	01-31-24
lowa	State	361	03-01-24
Kansas	NELAP	E-10151	10-31-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	12-31-23
Louisiana (All)	NELAP	02055	06-30-24
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-24
Massachusetts	State	M-PA009	06-30-24
Michigan	State	9930	01-31-24
Minnesota	NELAP	042-999-487	12-31-23
	State	023	01-31-24
Mississippi Missouri	State	450	01-31-25
	State	0098	01-01-24
Montana (DW)			
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	01-10-24
New Jersey	NELAP	PA011	06-30-24
New York	NELAP	10670	04-01-24
North Carolina (DW)	State	42705	07-31-24
North Carolina (WW/SW)	State	521	12-31-23
North Dakota	State	R-205	01-31-24
Oklahoma	NELAP	9804	08-31-23
Oregon	NELAP	PA200001	09-11-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	01-31-24
Rhode Island	State	LAO00338	12-31-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Гехаs	NELAP	T104704194-23-46	08-31-23
JSDA	US Federal Programs	525-22-298-19481	10-25-25
Vermont	State	VT - 36037	10-28-23
/irginia	NELAP	460182	06-14-25
Vashington	State	C457	04-11-24
West Virginia (DW)	State	9906 C	12-31-23

Eurofins Lancaster Laboratories Environment Testing, LLC

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Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-137866-2

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-137866-2

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Sample Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-137866-10	MW-7BI NAHCO3 Week 7	Water	08/06/23 11:00	08/07/23 16:42
410-137866-11	MW-7BI NAHCO3 Week 7	Water	08/06/23 11:00	08/07/23 16:42
410-137866-12	MW-7B NaHCO3 Week 7	Water	08/06/23 09:30	08/07/23 16:42
410-137866-13	MW-7B NaHCO3 Week 7	Water	08/06/23 09:30	08/07/23 16:42

Job ID: 410-137866-2

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Client: Terra Systems Inc

Job Number: 410-137866-2

Login Number: 137866

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Number: 1 Creator: Wrye, Shaun

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	Not present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	Not present.
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

Eurofins Lancaster Laboratories Environment Testing, LLC

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8/29/2023

ANALYTICAL REPORT

PREPARED FOR

Attn: Dr. Michael D Lee Terra Systems Inc 130 Hickman Road Suite 1 Claymont, Delaware 19703 Generated 8/25/2023 4:02:52 AM

JOB DESCRIPTION

Stantec CCR AP2 Columns

JOB NUMBER

410-138725-1

Eurofins Lancaster Laboratories Environment Testing, LLC 2425 New Holland Pike
Lancaster PA 17601



Eurofins Lancaster Laboratories Environment Testing, LLC

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

arrissa Williams

Generated 8/25/2023 4:02:52 AM

Authorized for release by Marrissa Williams, Project Manager Marrissa.Williams@et.eurofinsus.com (717)556-7246

Eurofins Lancaster Laboratories Environment Testing, LLC

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
- · Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

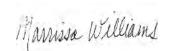
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns Laboratory Job ID: 410-138725-1

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Definitions/Glossary

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Qualifiers

Qualifier Description

HPLC/IC
Qualifier

cn	Refer to Case Narrative for further detail
F1	MS and/or MSD recovery exceeds control limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary	
Abbreviation	These commonly used abbreviations may or may not be present in this report.
п	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"

MPN MQL

MDA

MDC

MDL

ML

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)

Method Detection Limit

Minimum Level (Dioxin)

Most Probable Number

Method Quantitation Limit

RL Reporting Limit or Requested Limit (Radiochemistry)

Minimum Detectable Activity (Radiochemistry)

Minimum Detectable Concentration (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

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Case Narrative

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-138725-1

Job ID: 410-138725-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative 410-138725-1

Receipt

The samples were received on 8/11/2023 6:06 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 -0.6°C

Receipt Exceptions

The container label for the following samples did not match the information listed on the Chain-of-Custody (COC): MW-7I Influent Week 8 (410-138725-1), MW-7A Control Week 8 (410-138725-2), MW-7B NaHCO3 Week 8 (410-138725-3), MW-7C MF3 Week 8 (410-138725-4), MW-8I Influent Week 8 (410-138725-5), MW-8A Control Week 8 (410-138725-6), MW-8B FeCI3 NaHCO3 Week 8 (410-138725-7), MW-8C MF3 Week 8 (410-138725-8) and MW-7BI NaHCO3 Week 8 (410-138725-9). The container labels list Week 8, while the COC lists Week 7. Entered per COC.

HPLC/IC

Method 300_ORGFM_28D: The continuing calibration verification (CCV) associated with batch 410-409143 recovered above the upper control limit for fluoride. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported.

Method 300_ORGFM_28D: The following sample was diluted due to the nature of the sample matrix: MW-7BI NaHCO3 Week 8 (410-138725-9) at 10.0. Elevated reporting limits (RLs) are provided.

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

Metals

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

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Project/Site: Stantec CCR AP2 Columns

Job ID: 410-138725-1

Client Sample ID: MW-7I Influent Week 8

Lab Sample ID: 410-138725-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1060		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	6.12	J	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
Lithium	0.0672		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	71.3		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00141	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	269		12.4	5.15	mg/L	100		6020B	Dissolved
Cobalt	0.0537		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0259	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	78.5		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	13.3		0.206	0.0979	mg/L	100		6020B	Dissolved
Molybdenum	0.00731		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.99		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	27.9		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-7A Control Week 8

Lab Sample ID: 410-138725-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	Method	Prep Type
Sulfate	1040		300	100	mg/L	200	EPA 300.0 R2.1	Total/NA
Chloride	6.25	J	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Lithium	0.0861		0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	67.0		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.00142	J	0.00206	0.000700	mg/L	1	6020B	Dissolved
Calcium	286		12.4	5.15	mg/L	100	6020B	Dissolved
Cobalt	0.0489		0.000515	0.000161	mg/L	1	6020B	Dissolved
Iron	0.0533		0.0515	0.0206	mg/L	1	6020B	Dissolved
Magnesium	76.9		0.0515	0.0165	mg/L	1	6020B	Dissolved
Manganese	12.8		0.206	0.0979	mg/L	100	6020B	Dissolved
Molybdenum	0.00105		0.000515	0.000134	mg/L	1	6020B	Dissolved
Potassium	27.0		0.206	0.0670	mg/L	1	6020B	Dissolved
Selenium	0.000408	J	0.00103	0.000286	mg/L	1	6020B	Dissolved
Sodium	27.8		0.206	0.0927	mg/L	1	6020B	Dissolved

Client Sample ID: MW-7B NaHCO3 Week 8

Lab Sample ID: 410-138725-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1050		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	6.27	J cn	15.0	6.00	mg/L	10		EPA 300.0 R2.1	Total/NA
Lithium	0.0770		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	63.8		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00283		0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	5.92		0.124	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.00532		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0506	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	72.7		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.178		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000776		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	32.7		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000298	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	2670		20.6	9.27	mg/L	100		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Project/Site: Stantec CCR AP2 Columns

Job ID: 410-138725-1

Client Sample ID: MW-7C MF3 Week 8

Lab Sample ID: 410-138725-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Sulfate	1080		300	100	mg/L	200	EPA 300.0 R2.1	Total/NA
Chloride	6.15	J cn	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
Lithium	0.0662		0.0515	0.0113	mg/L	1	6010D	Dissolved
SiO2	0.683	J	1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.00120	J	0.00206	0.000700	mg/L	1	6020B	Dissolved
Calcium	231		12.4	5.15	mg/L	100	6020B	Dissolved
Cobalt	0.000248	J	0.000515	0.000161	mg/L	1	6020B	Dissolved
Iron	0.0280	J	0.0515	0.0206	mg/L	1	6020B	Dissolved
Magnesium	108		5.15	1.65	mg/L	100	6020B	Dissolved
Manganese	0.0194	^2	0.00206	0.000979	mg/L	1	6020B	Dissolved
Molybdenum	0.00166		0.000515	0.000134	mg/L	1	6020B	Dissolved
Potassium	11.5		0.206	0.0670	mg/L	1	6020B	Dissolved
Selenium	0.000428	J	0.00103	0.000286	mg/L	1	6020B	Dissolved
Sodium	33.0		0.206	0.0927	mg/L	1	6020B	Dissolved

Client Sample ID: MW-8I Influent Week 8

Lab Sample	e ID: 410-138725-5	
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Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	115		30.0	10.0	mg/L	20	_	EPA 300.0 R2.1	Total/NA
Chloride	6.02	J cn	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	30.2		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.000818	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	65.8		0.124	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.00320		0.000515	0.000161	mg/L	1		6020B	Dissolved
Magnesium	29.7		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.242	^2	0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.159		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	5.94		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	17.0		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8A Control Week 8

Lab Sample ID: 410-138725-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	117		30.0	10.0	mg/L	20	_	EPA 300.0 R2.1	Total/NA
Chloride	5.47	J cn	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA
SiO2	23.8		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00128	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	48.2		0.124	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.000203	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0317	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	36.3		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.00770		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.157		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	6.54		0.206	0.0670	mg/L	1		6020B	Dissolved
Selenium	0.000332	J	0.00103	0.000286	mg/L	1		6020B	Dissolved
Sodium	16.6		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 8

Lab Sample ID: 410-138725-7

8/25/2023

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	115		30.0	10.0	mg/L	20	_	EPA 300.0 R2.1	Total/NA
Chloride	5.59	J cn	7.50	3.00	mg/L	5		EPA 300.0 R2.1	Total/NA

This Detection Summary does not include radiochemical test results.

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Project/Site: Stantec CCR AP2 Columns

Job ID: 410-138725-1

Client Sample ID: MW-8B FeCl3 NaHCO3 Week 8 (Continued) Lab Sample ID: 410-138725-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
SiO2	15.2		1.10	0.117	mg/L	1	_	6010D	Dissolved
Calcium	66.5		0.124	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.000219	J	0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0238	J	0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	30.1		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.0406	^2	0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.163		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	8.03		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	17.1		0.206	0.0927	mg/L	1		6020B	Dissolved

Client Sample ID: MW-8C MF3 Week 8

Lab Sample ID: 410-138725-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D Method	Prep Type
Sulfate	189		30.0	10.0	mg/L	20	EPA 300.0 R2.1	Total/NA
Chloride	6.39	J cn	7.50	3.00	mg/L	5	EPA 300.0 R2.1	Total/NA
SiO2	2.38		1.10	0.117	mg/L	1	6010D	Dissolved
Arsenic	0.00139	J	0.00206	0.000700	mg/L	1	6020B	Dissolved
Calcium	6.75		0.124	0.0515	mg/L	1	6020B	Dissolved
Iron	0.0220	J	0.0515	0.0206	mg/L	1	6020B	Dissolved
Magnesium	64.0		0.0515	0.0165	mg/L	1	6020B	Dissolved
Manganese	0.00176	J	0.00206	0.000979	mg/L	1	6020B	Dissolved
Molybdenum	0.0135		0.000515	0.000134	mg/L	1	6020B	Dissolved
Potassium	6.65		0.206	0.0670	mg/L	1	6020B	Dissolved
Selenium	0.000415	J	0.00103	0.000286	mg/L	1	6020B	Dissolved
Sodium	18.7		0.206	0.0927	mg/L	1	6020B	Dissolved

Client Sample ID: MW-7BI NaHCO3 Week 8

Lab Sample ID: 410-138725-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	998		300	100	mg/L	200	_	EPA 300.0 R2.1	Total/NA
Chloride	6.37	J F1 cn	15.0	6.00	mg/L	10		EPA 300.0 R2.1	Total/NA
Lithium	0.0626		0.0515	0.0113	mg/L	1		6010D	Dissolved
SiO2	68.5		1.10	0.117	mg/L	1		6010D	Dissolved
Arsenic	0.00129	J	0.00206	0.000700	mg/L	1		6020B	Dissolved
Calcium	7.86		0.124	0.0515	mg/L	1		6020B	Dissolved
Cobalt	0.00114		0.000515	0.000161	mg/L	1		6020B	Dissolved
Iron	0.0801		0.0515	0.0206	mg/L	1		6020B	Dissolved
Magnesium	71.9		0.0515	0.0165	mg/L	1		6020B	Dissolved
Manganese	0.0472		0.00206	0.000979	mg/L	1		6020B	Dissolved
Molybdenum	0.000746		0.000515	0.000134	mg/L	1		6020B	Dissolved
Potassium	9.28		0.206	0.0670	mg/L	1		6020B	Dissolved
Sodium	2670		20.6	9.27	mg/L	100		6020B	Dissolved

This Detection Summary does not include radiochemical test results.

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Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7I Influent Week 8

Lab Sample ID: 410-138725-1 Date Collected: 08/11/23 09:00 Matrix: Water

Date Received: 08/11/23 18:06

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450	mg/L			08/17/23 15:48	5
Sulfate	1060		300	100	mg/L			08/21/23 18:24	200
Chloride	6.12	J	7.50	3.00	mg/L			08/17/23 15:48	5
Method: SW846 6010D - M	etals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0672		0.0515	0.0113	mg/L		08/16/23 11:03	08/18/23 20:18	1
SiO2	71.3		1.10	0.117	mg/L		08/16/23 11:03	08/18/23 20:18	1
	Result	Qualifier	RL		Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
Analyte		Qualifier	RL 0.00206	0.000700	mg/L	<u>D</u>	Prepared 08/16/23 11:03	Analyzed 08/21/23 11:21	Dil Fac
Analyte Arsenic	Result	Qualifier		0.000700		<u>D</u>			1
Analyte Arsenic Calcium	Result 0.00141	Qualifier	0.00206	0.000700	mg/L mg/L	<u>D</u>	08/16/23 11:03	08/21/23 11:21	1
Analyte Arsenic Calcium Cobalt	Result 0.00141 269	Qualifier J	0.00206	0.000700 5.15	mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03	08/21/23 11:21 08/22/23 09:40	1
Analyte Arsenic Calcium Cobalt Iron	Result 0.00141 269 0.0537	Qualifier J	0.00206 12.4 0.000515	0.000700 5.15 0.000161	mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:21 08/22/23 09:40 08/21/23 11:21	1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result 0.00141 269 0.0537 0.0259	Qualifier J	0.00206 12.4 0.000515 0.0515	0.000700 5.15 0.000161 0.0206	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:21 08/22/23 09:40 08/21/23 11:21 08/21/23 11:21	1 100 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium Manganese	Result 0.00141 269 0.0537 0.0259 78.5	Qualifier J	0.00206 12.4 0.000515 0.0515 0.0515	0.000700 5.15 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:21 08/22/23 09:40 08/21/23 11:21 08/21/23 11:21 08/21/23 11:21	1 100 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum	Result 0.00141 269 0.0537 0.0259 78.5 13.3	Qualifier J	0.00206 12.4 0.000515 0.0515 0.0515 0.206	0.000700 5.15 0.000161 0.0206 0.0165 0.0979	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:21 08/22/23 09:40 08/21/23 11:21 08/21/23 11:21 08/21/23 11:21 08/22/23 09:40	1 100 1 1
Method: SW846 6020B - M Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum Potassium Selenium	Result 0.00141 269 0.0537 0.0259 78.5 13.3 0.00731	Qualifier J	0.00206 12.4 0.000515 0.0515 0.0515 0.206	0.000700 5.15 0.000161 0.0206 0.0165 0.0979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:21 08/22/23 09:40 08/21/23 11:21 08/21/23 11:21 08/21/23 11:21 08/22/23 09:40 08/21/23 11:21	Dil Fac 1 1000 1 1 1000 1 1 1000 1 1 1000 1 1 1 1

Client Sample ID: MW-7A Control Week 8

Lab Sample ID: 410-138725-2 Date Collected: 08/11/23 09:15

Date Received: 08/11/23 18	8:06								
Method: EPA 300.0 R2.1	- Anions, Ion Chromato	graphy							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
Fluoride	<0.450		1.00	0.450	mg/L			08/17/23 16:22	
Sulfate	1040		300	100	mg/L			08/21/23 18:41	200
Chloride	6.25	J	7.50	3.00	mg/L			08/17/23 16:22	į
Method: SW846 6010D - Analyte		Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fa
		Qualifier				D			Dil Fac
Lithium	0.0861		0.0515	0.0113	o		08/16/23 11:03	08/18/23 20:25	•
SiO2	67.0		1.10	0.117	mg/L		08/16/23 11:03	08/18/23 20:25	•
Method: SW846 6020B -	Metals (ICP/MS) - Disso	olved							
Analyte	D14	Ouglifien	RL	MDI	Unit	D	Prepared	Analyzed	
raidiyio	Result	Qualifier	KL	MIDL	Ullit	U	riepaieu	Analyzeu	Dil Fac

Method: SW846 6020B - I	Metals (ICP/MS) - Disse	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00142	J	0.00206	0.000700	mg/L		08/16/23 11:03	08/21/23 11:26	1
Calcium	286		12.4	5.15	mg/L		08/16/23 11:03	08/22/23 09:44	100
Cobalt	0.0489		0.000515	0.000161	mg/L		08/16/23 11:03	08/21/23 11:26	1
Iron	0.0533		0.0515	0.0206	mg/L		08/16/23 11:03	08/21/23 11:26	1
Magnesium	76.9		0.0515	0.0165	mg/L		08/16/23 11:03	08/21/23 11:26	1
Manganese	12.8		0.206	0.0979	mg/L		08/16/23 11:03	08/22/23 09:44	100
Molybdenum	0.00105		0.000515	0.000134	mg/L		08/16/23 11:03	08/21/23 11:26	1
Potassium	27.0		0.206	0.0670	mg/L		08/16/23 11:03	08/21/23 11:26	1
Selenium	0.000408	J	0.00103	0.000286	mg/L		08/16/23 11:03	08/21/23 11:26	1
Sodium	27.8		0.206	0.0927	mg/L		08/16/23 11:03	08/21/23 11:26	1

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Job ID: 410-138725-1

Matrix: Water

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7B NaHCO3 Week 8

Date Collected: 08/11/23 09:30 Matrix: Water

Date Received: 08/11/23 18:06

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.900	F1 cn	2.00	0.900	mg/L			08/17/23 20:56	10
Sulfate	1050		300	100	mg/L			08/23/23 08:48	200
Chloride	6.27	J cn	15.0	6.00	mg/L			08/17/23 20:56	10
Method: SW846 6010D - N	letals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0770		0.0515	0.0113	mg/L		08/17/23 12:14	08/18/23 02:19	1
SiO2	63.8		1.10	0.117	mg/L		08/17/23 12:14	08/18/23 02:19	1
Method: SW846 6020B - M	letals (ICP/MS) - Diss	olved							
Mashadi CWO4C COOOD N	Intelle (ICD/MC) Dies	a leas al							
Method: SW846 6020B - N Analyte	•	Olved Qualifier	RL	MDL	Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
Analyte	•		RL 0.00206			<u>D</u>	Prepared 08/17/23 12:14	Analyzed 08/18/23 14:36	Dil Fac
Analyte Arsenic	Result				mg/L	<u>D</u>	<u> </u>		Dil Fac
Analyte Arsenic Calcium	Result 0.00283		0.00206	0.000700	mg/L mg/L	<u>D</u>	08/17/23 12:14	08/18/23 14:36	Dil Fac
Analyte Arsenic Calcium Cobalt	Result 0.00283 5.92	Qualifier	0.00206	0.000700 0.0515	mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14	08/18/23 14:36 08/18/23 14:36	Dil Fac 1 1 1
Analyte Arsenic Calcium Cobalt Iron	Result 0.00283 5.92 0.00532	Qualifier	0.00206 0.124 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:36 08/18/23 14:36 08/18/23 14:36	Dil Fac 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result 0.00283 5.92 0.00532 0.0506	Qualifier	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:36 08/18/23 14:36 08/18/23 14:36 08/18/23 14:36	Dil Fac 1 1 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese	Result 0.00283 5.92 0.00532 0.0506 72.7	Qualifier	0.00206 0.124 0.000515 0.0515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:36 08/18/23 14:36 08/18/23 14:36 08/18/23 14:36 08/18/23 14:36	Dil Fac 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum	Result 0.00283 5.92 0.00532 0.0506 72.7 0.178	Qualifier	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:36 08/18/23 14:36 08/18/23 14:36 08/18/23 14:36 08/18/23 14:36 08/18/23 14:36	Dil Fac 1 1 1 1 1 1 1
	Result 0.00283 5.92 0.00532 0.0506 72.7 0.178 0.000776	Qualifier J	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:36 08/18/23 14:36 08/18/23 14:36 08/18/23 14:36 08/18/23 14:36 08/18/23 14:36	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Client Sample ID: MW-7C MF3 Week 8

Lab Sample ID: 410-138725-4 Date Collected: 08/11/23 09:45 **Matrix: Water**

Date Received: 08/11/23 18:06

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450	cn	1.00	0.450	mg/L			08/17/23 17:31	5
Sulfate	1080		300	100	mg/L			08/23/23 09:01	200
Chloride	6.15	J cn	7.50	3.00	mg/L			08/17/23 17:31	5
Method: SW846 6010D - I	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0662		0.0515	0.0113	mg/L		08/16/23 11:03	08/18/23 20:22	1
SiO2	0.683	J	1.10	0.117	mg/L		08/16/23 11:03	08/18/23 20:22	1
Method: SW846 6020B - I									
Method: SW846 6020B - I	Result	Qualifier	RL 0.00000		Unit	<u>D</u>	Prepared 14.00	Analyzed	Dil Fac
Analyte Arsenic	Result 0.00120	Qualifier	0.00206	0.000700	mg/L	<u>D</u>	08/16/23 11:03	08/21/23 11:24	1
Analyte Arsenic Calcium	Result 0.00120 231	Qualifier J	0.00206	0.000700 5.15	mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03	08/21/23 11:24 08/22/23 09:42	100
Analyte Arsenic Calcium Cobalt	Result 0.00120 231 0.000248	Qualifier J	0.00206 12.4 0.000515	0.000700 5.15 0.000161	mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:24 08/22/23 09:42 08/21/23 11:24	1 100 1
Analyte Arsenic Calcium Cobalt	Result 0.00120 231 0.000248 0.0280	Qualifier J	0.00206 12.4 0.000515 0.0515	0.000700 5.15 0.000161 0.0206	mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:24 08/22/23 09:42 08/21/23 11:24 08/21/23 11:24	1 100 1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result 0.00120 231 0.000248 0.0280 108	Qualifier J J	0.00206 12.4 0.000515 0.0515 5.15	0.000700 5.15 0.000161 0.0206 1.65	mg/L mg/L mg/L mg/L	<u> </u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:24 08/22/23 09:42 08/21/23 11:24 08/21/23 11:24 08/22/23 09:42	1 100 1 1 100
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese	Result 0.00120 231 0.000248 0.0280 108 0.0194	Qualifier J J	0.00206 12.4 0.000515 0.0515 5.15 0.00206	0.000700 5.15 0.000161 0.0206 1.65 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:24 08/22/23 09:42 08/21/23 11:24 08/21/23 11:24 08/22/23 09:42 08/21/23 11:24	1 100 1 1 100
Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum	Result 0.00120 231 0.000248 0.0280 108 0.0194 0.00166	Qualifier J J	0.00206 12.4 0.000515 0.0515 5.15 0.00206	0.000700 5.15 0.000161 0.0206 1.65 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:24 08/22/23 09:42 08/21/23 11:24 08/21/23 11:24 08/22/23 09:42 08/21/23 11:24 08/21/23 11:24	1 100 1 1 100 1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result 0.00120 231 0.000248 0.0280 108 0.0194	Qualifier J J	0.00206 12.4 0.000515 0.0515 5.15 0.00206	0.000700 5.15 0.000161 0.0206 1.65 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:24 08/22/23 09:42 08/21/23 11:24 08/21/23 11:24 08/22/23 09:42 08/21/23 11:24	1 100 1 1 100

Eurofins Lancaster Laboratories Environment Testing, LLC

Lab Sample ID: 410-138725-3

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8I Influent Week 8

Lab Sample ID: 410-138725-5 Date Collected: 08/11/23 10:00 **Matrix: Water**

Date Received: 08/11/23 18:06

Method: EPA 300.0 R2.1 - Al Analyte	•	Qualifier	RL	MDI	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450		1.00	0.450			Frepareu	08/17/23 18:05	
		CII			•				-
Sulfate	115		30.0	10.0	Ü			08/17/23 18:22	20
Chloride	6.02	J cn	7.50	3.00	mg/L			08/17/23 18:05	5
Method: SW846 6010D - Me	tals (ICP) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/16/23 11:03	08/18/23 20:15	1
SiO2	30.2		1.10	0.117	ma/l		08/16/23 11:03	08/18/23 20:15	1
0102	00.2		1.10	0	9/ =		00/10/20 11:00		
		alvad	1.10	0	mg/L		00/10/20 11:00		
Method: SW846 6020B - Me	tals (ICP/MS) - Diss				J	D			Dil Eac
Method: SW846 6020B - Me Analyte	tals (ICP/MS) - Diss Result	Qualifier	RL	MDL	Unit	<u>D</u>	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - Me Analyte Arsenic	tals (ICP/MS) - Diss Result 0.000818	Qualifier	RL 0.00206	MDL 0.000700	Unit mg/L	<u>D</u>	Prepared 08/16/23 11:03	Analyzed 08/21/23 11:11	Dil Fac
Method: SW846 6020B - Me Analyte	tals (ICP/MS) - Diss Result	Qualifier	RL	MDL	Unit mg/L	<u>D</u>	Prepared	Analyzed	Dil Fac
Method: SW846 6020B - Me Analyte Arsenic Calcium	tals (ICP/MS) - Diss Result 0.000818	Qualifier	RL 0.00206	MDL 0.000700	Unit mg/L mg/L	<u>D</u>	Prepared 08/16/23 11:03	Analyzed 08/21/23 11:11	Dil Fac
Method: SW846 6020B - Me Analyte Arsenic Calcium Cobalt	tals (ICP/MS) - Diss Result 0.000818 65.8	Qualifier	RL 0.00206 0.124	MDL 0.000700 0.0515	Unit mg/L mg/L mg/L	<u>D</u>	Prepared 08/16/23 11:03 08/16/23 11:03	Analyzed 08/21/23 11:11 08/21/23 11:11	Dil Fac 1 1 1
Method: SW846 6020B - Me Analyte Arsenic Calcium Cobalt	tals (ICP/MS) - Diss	Qualifier	RL 0.00206 0.124 0.000515	MDL 0.000700 0.0515 0.000161	Unit mg/L mg/L mg/L	<u>D</u>	Prepared 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	Analyzed 08/21/23 11:11 08/21/23 11:11 08/21/23 11:11	Dil Fac 1 1 1 1
Method: SW846 6020B - Me Analyte Arsenic Calcium Cobalt Iron Magnesium	tals (ICP/MS) - Diss Result 0.000818 65.8 0.00320 <0.0206	Qualifier J	RL 0.00206 0.124 0.000515 0.0515	MDL 0.000700 0.0515 0.000161 0.0206	Unit mg/L mg/L mg/L mg/L mg/L	<u>D</u>	Prepared 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	Analyzed 08/21/23 11:11 08/21/23 11:11 08/21/23 11:11 08/21/23 11:11	Dil Fac 1 1 1 1 1
Method: SW846 6020B - Me Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese	tals (ICP/MS) - Diss Result 0.000818 65.8 0.00320 <0.0206 29.7	Qualifier J	RL 0.00206 0.124 0.000515 0.0515	MDL 0.000700 0.0515 0.000161 0.0206 0.0165	Unit mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	Prepared 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	Analyzed 08/21/23 11:11 08/21/23 11:11 08/21/23 11:11 08/21/23 11:11	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1
Method: SW846 6020B - Me Analyte Arsenic	tals (ICP/MS) - Diss Result 0.000818 65.8 0.00320 <0.0206 29.7 0.242	Qualifier J	RL 0.00206 0.124 0.000515 0.0515 0.0515 0.00206	MDL 0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	Prepared 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	Analyzed 08/21/23 11:11 08/21/23 11:11 08/21/23 11:11 08/21/23 11:11 08/21/23 11:11	Dil Fac

Client Sample ID: MW-8A Control Week 8

17.0

Date Collected: 08/11/23 10:15

Date Received: 08/11/23 18:06

Sodium

_									
Method: EPA 300.0 R2.1 - Anions, I	on Chromato	ography							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450	cn	1 00	0.450	ma/L			08/17/23 18:39	5

0.206

0.0927 mg/L

30.0 10.0 mg/L 08/17/23 18:56 20 Sulfate 117 Chloride 5.47 J cn 7.50 3.00 mg/L 08/17/23 18:39 5

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/16/23 11:03	08/18/23 20:28	1
SiO2	23.8		1.10	0.117	mg/L		08/16/23 11:03	08/18/23 20:28	1

Method: SW846 6020B - Metals (I	ICP/MS) - Dissolved
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Welliou. 544040 0020D -	victais (ioi /ivio) - Diss	oiveu							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00128	J	0.00206	0.000700	mg/L		08/16/23 11:03	08/21/23 11:28	1
Calcium	48.2		0.124	0.0515	mg/L		08/16/23 11:03	08/21/23 11:28	1
Cobalt	0.000203	J	0.000515	0.000161	mg/L		08/16/23 11:03	08/21/23 11:28	1
Iron	0.0317	J	0.0515	0.0206	mg/L		08/16/23 11:03	08/21/23 11:28	1
Magnesium	36.3		0.0515	0.0165	mg/L		08/16/23 11:03	08/21/23 11:28	1
Manganese	0.00770		0.00206	0.000979	mg/L		08/16/23 11:03	08/22/23 09:46	1
Molybdenum	0.157		0.000515	0.000134	mg/L		08/16/23 11:03	08/21/23 11:28	1
Potassium	6.54		0.206	0.0670	mg/L		08/16/23 11:03	08/21/23 11:28	1
Selenium	0.000332	J	0.00103	0.000286	mg/L		08/16/23 11:03	08/21/23 11:28	1
Sodium	16.6		0.206	0.0927	mg/L		08/16/23 11:03	08/21/23 11:28	1

Eurofins Lancaster Laboratories Environment Testing, LLC

08/16/23 11:03

08/21/23 11:11

Matrix: Water

Lab Sample ID: 410-138725-6

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-8B FeCI3 NaHCO3 Week 8

Lab Sample ID: 410-138725-7 Date Collected: 08/11/23 10:30 Matrix: Water

Date Received: 08/11/23 18:06

Method: EPA 300.0 R2.1 - A	nions, Ion Chromate	ography							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450	cn	1.00	0.450	mg/L			08/17/23 19:13	5
Sulfate	115		30.0	10.0	mg/L			08/17/23 19:31	20
Chloride	5.59	J cn	7.50	3.00	mg/L			08/17/23 19:13	5
- Method: SW846 6010D - Me	etals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/16/23 11:03	08/18/23 20:32	1
SiO2	15.2		1.10	0.117	mg/L		08/16/23 11:03	08/18/23 20:32	1
<u>-</u>									
Method: SW846 6020B - Me	•		RI	MDI	Unit	n	Prenared	A nalyzed	Dil Fac
Method: SW846 6020B - Me Analyte Arsenic	•	Olved Qualifier	RL 0.00206	MDL 0.000700		<u>D</u>	Prepared 08/16/23 11:03	Analyzed 08/21/23 11:30	Dil Fac
Analyte	Result				mg/L	<u>D</u>	<u> </u>		Dil Fac 1 1
Analyte Arsenic	Result <0.000700	Qualifier	0.00206	0.000700	mg/L	<u>D</u>	08/16/23 11:03	08/21/23 11:30	Dil Fac 1 1 1
Analyte Arsenic Calcium	Result <0.000700 66.5	Qualifier J	0.00206	0.000700 0.0515	mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03	08/21/23 11:30 08/21/23 11:30	Dil Fac 1 1 1 1
Analyte Arsenic Calcium Cobalt	Result <0.000700 66.5 0.000219	Qualifier J	0.00206 0.124 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:30 08/21/23 11:30 08/21/23 11:30	Dil Fac 1 1 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt	Result <0.000700 66.5 0.000219 0.0238	Qualifier J J	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:30 08/21/23 11:30 08/21/23 11:30 08/21/23 11:30	Dil Fac 1 1 1 1 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt Iron Magnesium	Result <0.000700 66.5 0.000219 0.0238 30.1	Qualifier J J	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03 08/16/23 11:03	08/21/23 11:30 08/21/23 11:30 08/21/23 11:30 08/21/23 11:30 08/21/23 11:30	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1

Client Sample ID: MW-8C MF3 Week 8

Lab Sample ID: 410-138725-8 Date Collected: 08/11/23 10:45

<0.000286

17.1

Date Received: 08/11/23 18:06

Selenium

Sodium

Method: EPA 300.0 R2.1 - A	nions, Ion Chromate	ography							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.450	cn	1.00	0.450	mg/L			08/17/23 19:48	5
Sulfate	189		30.0	10.0	mg/L			08/17/23 20:39	20
Chloride	6.39	J cn	7.50	3.00	mg/L			08/17/23 19:48	5

0.00103

0.206

0.000286 mg/L

0.0927 mg/L

Method: SW846 6010D - Metals (IC	P) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/16/23 11:03	08/18/23 20:49	1
SiO2	2.38		1.10	0.117	mg/L		08/16/23 11:03	08/18/23 20:49	1

	ale (ICD/MS) - Diese								
Method: SW846 6020B - Met	ais (ICF/IVIS) - DISSI	olved							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00139	J	0.00206	0.000700	mg/L		08/16/23 11:03	08/21/23 11:32	1
Calcium	6.75		0.124	0.0515	mg/L		08/16/23 11:03	08/21/23 11:32	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		08/16/23 11:03	08/21/23 11:32	1
Iron	0.0220	J	0.0515	0.0206	mg/L		08/16/23 11:03	08/21/23 11:32	1
Magnesium	64.0		0.0515	0.0165	mg/L		08/16/23 11:03	08/21/23 11:32	1
Manganese	0.00176	J	0.00206	0.000979	mg/L		08/16/23 11:03	08/22/23 09:48	1
Molybdenum	0.0135		0.000515	0.000134	mg/L		08/16/23 11:03	08/21/23 11:32	1
Potassium	6.65		0.206	0.0670	mg/L		08/16/23 11:03	08/21/23 11:32	1
Selenium	0.000415	J	0.00103	0.000286	mg/L		08/16/23 11:03	08/21/23 11:32	1
Sodium	18.7		0.206	0.0927	mg/L		08/16/23 11:03	08/21/23 11:32	1

Eurofins Lancaster Laboratories Environment Testing, LLC

08/16/23 11:03

08/16/23 11:03

08/21/23 11:30

08/21/23 11:30

Matrix: Water

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7BI NaHCO3 Week 8

Lab Sample ID: 410-138725-9 Date Collected: 08/11/23 11:00 Matrix: Water

Date Received: 08/11/23 18:06

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.900	F1 cn	2.00	0.900	mg/L			08/18/23 00:53	10
Sulfate	998		300	100	mg/L			08/23/23 09:13	200
Chloride	6.37	J F1 cn	15.0	6.00	mg/L			08/18/23 00:53	10
Method: SW846 6010D -	Metals (ICP) - Dissolve	d							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
_ithium	0.0626		0.0515	0.0113	mg/L		08/17/23 12:14	08/18/23 02:16	1
SiO2	68.5		1.10	0.117	mg/L		08/17/23 12:14	08/18/23 02:16	1
	•		RI	MDI	Unit	п	Prenared	Analyzed	Dil Fac
Mothod: SW846 6020B	Motale (ICP/MS) - Dies	alvad							
Analyte	Result	Qualifier	RL 0.00206		Unit mg/L	<u>D</u>	Prepared 08/17/23 12:14	Analyzed 08/18/23 14:34	Dil Fac
Analyte Arsenic	Result 0.00129	Qualifier	0.00206	0.000700	mg/L	<u>D</u>	08/17/23 12:14	08/18/23 14:34	Dil Fac
Analyte Arsenic Calcium	Result	Qualifier			mg/L mg/L	<u>D</u>	<u>.</u>		Dil Fac 1 1 1
Analyte Arsenic Calcium Cobalt	Result 0.00129 7.86	Qualifier	0.00206	0.000700 0.0515	mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14	08/18/23 14:34 08/18/23 14:34	Dil Fac 1 1 1 1
Analyte Arsenic Calcium Cobalt ron	Result 0.00129 7.86 0.00114	Qualifier	0.00206 0.124 0.000515	0.000700 0.0515 0.000161	mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:34 08/18/23 14:34 08/18/23 14:34	Dil Fac 1 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium	Result 0.00129 7.86 0.00114 0.0801	Qualifier	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206	mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:34 08/18/23 14:34 08/18/23 14:34 08/18/23 14:34	Dil Fac 1 1 1 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium Manganese	Result 0.00129 7.86 0.00114 0.0801 71.9	Qualifier	0.00206 0.124 0.000515 0.0515	0.000700 0.0515 0.000161 0.0206 0.0165	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:34 08/18/23 14:34 08/18/23 14:34 08/18/23 14:34 08/18/23 14:34	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1 1
Analyte Arsenic Calcium Cobalt ron Magnesium Manganese Molybdenum	Result 0.00129 7.86 0.00114 0.0801 71.9 0.0472	Qualifier	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979	mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:34 08/18/23 14:34 08/18/23 14:34 08/18/23 14:34 08/18/23 14:34 08/18/23 14:34	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Method: SW846 6020B - Analyte Arsenic Calcium Cobalt Iron Magnesium Manganese Molybdenum Potassium Selenium	Result 0.00129 7.86 0.00114 0.0801 71.9 0.0472 0.000746	Qualifier	0.00206 0.124 0.000515 0.0515 0.0515 0.00206	0.000700 0.0515 0.000161 0.0206 0.0165 0.000979 0.000134	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14 08/17/23 12:14	08/18/23 14:34 08/18/23 14:34 08/18/23 14:34 08/18/23 14:34 08/18/23 14:34 08/18/23 14:34	Dil Fac 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-138725-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography

Lab Sample ID: MB 410-409143/5

Matrix: Water

Analyte

Fluoride

Sulfate

Chloride

Analysis Batch: 409143

Client Sample ID: Method Blank Prep Type: Total/NA

MB MB Dil Fac Result Qualifier RL MDL Unit D Prepared Analyzed <0.0900 0.200 0.0900 mg/L 08/17/23 12:57 < 0.500 1.50 0.500 mg/L 08/17/23 12:57 <0.600 1.50 0.600 mg/L 08/17/23 12:57

Lab Sample ID: LCS 410-409143/3

Matrix: Water

Analysis Batch: 409143

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Client Sample ID: Lab Control Sample Dup

Client Sample ID: MW-7B NaHCO3 Week 8

Client Sample ID: MW-7B NaHCO3 Week 8

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

		Spike	LCS	LCS				%Rec	
Analyte		Added	Result	Qualifier	Unit	D	%Rec	Limits	
Fluoride	 	0.750	0.7084		mg/L		94	90 - 110	
Sulfate		7.50	7.195		mg/L		96	90 - 110	
Chloride		3.00	3.043		mg/L		101	90 - 110	

Lab Sample ID: LCSD 410-409143/4

Matrix: Water

Analysis Batch: 409143

	Spike	LCSD L	LCSD				%Rec		RPD
Analyte	Added	Result C	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7141		mg/L		95	90 - 110	1	20
Sulfate	7.50	7.221		mg/L		96	90 - 110	0	20
Chloride	3.00	3.041		mg/L		101	90 - 110	0	20

Lab Sample ID: 410-138725-3 MS

Matrix: Water

Analysis Batch: 409143

Analysis Batom 400 140										
	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Fluoride	<0.900	F1 cn	5.00	3.811	F1	mg/L		76	90 - 110	
Chloride	6.27	J cn	20.0	27.26		ma/L		105	90 - 110	

Lab Sample ID: 410-138725-3 DU

Matrix: Water

Matrix: Water

Analysis Batch: 409143

	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Fluoride	<0.900	F1 cn	<0.900		mg/L		NC	15
Chloride	6.27	J cn	6.191	J	mg/L		1	15

Lab Sample ID: MB 410-409152/5

Client Sample ID: Method Blank

Prep Type: Total/NA

Analysis Batch: 409152

мв мв

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			08/18/23 00:14	1
Sulfate	<0.500		1.50	0.500	mg/L			08/18/23 00:14	1
Chloride	<0.600		1.50	0.600	mg/L			08/18/23 00:14	1

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-138725-1

Method: EPA 300.0 R2.1 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 410-409152/3

Matrix: Water

Analysis Batch: 409152

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Client Sample ID: MW-7BI NaHCO3 Week 8

Prep Type: Total/NA

Spike LCS LCS %Rec Analyte Added Result Qualifier Unit %Rec Limits Fluoride 0.750 0.7273 mg/L 97 90 - 110 Sulfate 7.50 7.334 mg/L 98 90 - 110 Chloride 3.00 mg/L 90 - 110 3.032 101

Lab Sample ID: LCSD 410-409152/4 Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA

Matrix: Water

Analysis Batch: 409152

Spike LCSD LCSD %Rec RPD Added Limit Analyte Result Qualifier %Rec Limits RPD Unit D Fluoride 0.750 0.7317 mg/L 98 90 - 110 20 Sulfate 7.50 7.329 mg/L 98 90 - 110 20 0 Chloride 3.00 3.030 mg/L 101 90 - 110 20

Lab Sample ID: 410-138725-9 MS Client Sample ID: MW-7BI NaHCO3 Week 8 **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 409152

	Sample	Sample	Spike	MS	MS				%Rec	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Fluoride	<0.900	F1 cn	5.00	5.839	F1	mg/L		117	90 - 110	
Chloride	6.37	J F1 cn	20.0	28.51	F1	mg/L		111	90 - 110	

Lab Sample ID: 410-138725-9 DU

Matrix: Water

Analysis Batch: 409152

-	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Fluoride	<0.900	F1 cn	<0.900		mg/L		 NC	15
Chloride	6.37	J F1 cn	6.399	J	mg/L		0.4	15

Lab Sample ID: MB 410-410797/5 Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Water

Analysis Batch: 410797

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.0900		0.200	0.0900	mg/L			08/21/23 12:25	1
Sulfate	<0.500		1.50	0.500	mg/L			08/21/23 12:25	1
Chloride	< 0.600		1.50	0.600	ma/L			08/21/23 12:25	1

Lab Sample ID: LCS 410-410797/3 **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

Matrix: Water

Analysis Batch: 410797

Analysis Daton. +10131								
	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Fluoride	0.750	0.7233		mg/L		96	90 - 110	
Sulfate	7.50	7.244		mg/L		97	90 - 110	
Chloride	3.00	3.054		mg/L		102	90 - 110	

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-138725-1

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA

Client Sample ID: Lab Control Sample Dup

90 - 110

Client Sample ID: Lab Control Sample

Client Sample ID: Lab Control Sample Dup

Client Sample ID: Lab Control Sample

Client Sample ID: Method Blank

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Method: EPA 300.0 R2.1 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCSD 410-410797/4

Matrix: Water

Analysis Batch: 410797

Allalysis Datcil. 410731									
	Spike	LCSD	LCSD				%Rec		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7363		mg/L		98	90 - 110	2	20
Sulfate	7.50	7.091		mg/L		95	90 - 110	2	20

3.051

mg/L

3.00

Lab Sample ID: MB 410-410836/5

Matrix: Water

Chloride

Analysis Batch: 410836

MB MB

Dil Fac Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Fluoride <0.0900 0.200 0.0900 08/23/23 08:09 Sulfate <0.500 1.50 0.500 mg/L 08/23/23 08:09 Chloride <0.600 1.50 0.600 mg/L 08/23/23 08:09

Lab Sample ID: LCS 410-410836/3

Matrix: Water

Analysis Batch: 410836

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Fluoride	0.750	0.7450		mg/L		99	90 - 110	
Sulfate	7.50	7.857		mg/L		105	90 - 110	
Chloride	3.00	3.203		mg/L		107	90 - 110	

Lab Sample ID: LCSD 410-410836/4

Matrix: Water

Analysis Batch: 410836

	Spike	LCSD	LCSD				%Rec		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Fluoride	0.750	0.7475		mg/L		100	90 - 110	0	20
Sulfate	7.50	7.851		mg/L		105	90 - 110	0	20
Chloride	3.00	3.197		mg/L		107	90 - 110	0	20

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 410-408910/1-A

Matrix: Water

Analysis Batch: 410169

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 408910

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	<0.0113		0.0515	0.0113	mg/L		08/16/23 11:03	08/18/23 19:31	1
SiO2	<0.117		1.10	0.117	ma/L		08/16/23 11:03	08/18/23 19:31	1

Lab Sample ID: LCS 410-408910/2-A

Matrix: Water						Prep '	Type: Total/NA	
Analysis Batch: 410169						Prep	Batch: 408910	
	Spike	LCS	LCS			%Rec		
Analyte	Added	Result	Qualifier Unit	D	%Rec	Limits		
Lithium	0.500	0.5042	mg/L		101	80 - 120		

Job ID: 410-138725-1

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: MB 410-409495/1-A

Matrix: Water

Analysis Batch: 409896

Analysis Batch: 409896

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 409495

Result Qualifier

мв мв

мв мв

Dil Fac Analyte RLMDL Unit D Prepared Analyzed Lithium <0.0113 0.0515 0.0113 mg/L 08/17/23 12:14 08/18/23 01:07 SiO2 < 0.117 1.10 0.117 mg/L 08/17/23 12:14 08/18/23 01:07

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 409495

LCS LCS Spike %Rec Analyte Added Result Qualifier Unit %Rec Limits Lithium 0.500 0.4846 97 80 - 120 mg/L

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: LCS 410-409495/2-A

Lab Sample ID: MB 410-408910/1-A

Matrix: Water

Matrix: Water

Analysis Batch: 410604

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 408910

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Arsenic <0.000700 0.00206 0.000700 mg/L 08/16/23 11:03 08/21/23 10:57 Calcium <0.0515 0.124 0.0515 mg/L 08/16/23 11:03 08/21/23 10:57 Cobalt < 0.000161 0.000515 0.000161 mg/L 08/16/23 11:03 08/21/23 10:57 Iron < 0.0206 0.0515 0.0206 mg/L 08/16/23 11:03 08/21/23 10:57 0.0165 mg/L <0.0165 0.0515 08/16/23 11:03 08/21/23 10:57 Magnesium Manganese <0.000979 0.00206 0.000979 mg/L 08/16/23 11:03 08/21/23 10:57 Molybdenum < 0.000134 0.000515 0.000134 mg/L 08/16/23 11:03 08/21/23 10:57 Potassium 0.0670 mg/L 08/16/23 11:03 08/21/23 10:57 <0.0670 0.206 0.00103 Selenium <0.000286 0.000286 mg/L 08/16/23 11:03 08/21/23 10:57 Sodium < 0.0927 0.206 0.0927 mg/L 08/16/23 11:03 08/21/23 10:57

Lab Sample ID: LCS 410-408910/2-A

Matrix: Water

Analysis Batch: 410604

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 408910

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.5177	-	mg/L		104	85 - 120	
Calcium	5.00	5.083		mg/L		102	85 - 120	
Cobalt	0.500	0.4918		mg/L		98	90 - 113	
Iron	5.00	5.183		mg/L		104	88 - 119	
Magnesium	5.00	5.197		mg/L		104	90 - 112	
Manganese	0.500	0.5167		mg/L		103	89 - 120	
Molybdenum	0.0500	0.04810		mg/L		96	85 - 115	
Potassium	5.00	5.085		mg/L		102	90 - 112	
Selenium	0.100	0.09988		mg/L		100	80 - 120	
Sodium	5.00	4.867		mg/L		97	89 - 112	

Lab Sample ID: MB 410-409495/1-A

Matrix: Water

Analyte

Arsenic

Analysis Batch: 410146

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 409495

MB MB Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac 0.00206 < 0.000700 0.000700 mg/L 08/17/23 12:14 08/18/23 14:08

QC Sample Results

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 410-409495/1-A

Matrix: Water

Analysis Batch: 410146

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 409495

1								•	
	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	<0.0515		0.124	0.0515	mg/L		08/17/23 12:14	08/18/23 14:08	1
Cobalt	<0.000161		0.000515	0.000161	mg/L		08/17/23 12:14	08/18/23 14:08	1
Iron	<0.0206		0.0515	0.0206	mg/L		08/17/23 12:14	08/18/23 14:08	1
Magnesium	<0.0165		0.0515	0.0165	mg/L		08/17/23 12:14	08/18/23 14:08	1
Manganese	<0.000979		0.00206	0.000979	mg/L		08/17/23 12:14	08/18/23 14:08	1
Molybdenum	<0.000134		0.000515	0.000134	mg/L		08/17/23 12:14	08/18/23 14:08	1
Potassium	<0.0670		0.206	0.0670	mg/L		08/17/23 12:14	08/18/23 14:08	1
Selenium	<0.000286		0.00103	0.000286	mg/L		08/17/23 12:14	08/18/23 14:08	1
Sodium	<0.0927		0.206	0.0927	mg/L		08/17/23 12:14	08/18/23 14:08	1

Lab Sample ID: LCS 410-409495/2-A

Matrix: Water

Analysis Batch: 410146

Client Sample ID: Lab Control Sample Prep Type: Total/NA

Prep Batch: 409495

	Spike	LCS	LCS				%Rec	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.500	0.5218		mg/L		104	85 - 120	
Calcium	5.00	5.021		mg/L		100	85 - 120	
Cobalt	0.500	0.5038		mg/L		101	90 - 113	
Iron	5.00	5.232		mg/L		105	88 - 119	
Magnesium	5.00	5.213		mg/L		104	90 - 112	
Manganese	0.500	0.5148		mg/L		103	89 - 120	
Molybdenum	0.0500	0.05137		mg/L		103	85 - 115	
Potassium	5.00	5.190		mg/L		104	90 - 112	
Selenium	0.100	0.1057		mg/L		106	80 - 120	
Sodium	5.00	5.095		mg/L		102	89 - 112	

9

10

12

13

Job ID: 410-138725-1

Client: Terra Systems Inc Project/Site: Stantec CCR AP2 Columns

HPLC/IC

Analysis Batch: 409143

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batc
410-138725-1	MW-7I Influent Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-2	MW-7A Control Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-3	MW-7B NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-4	MW-7C MF3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-5	MW-8I Influent Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-5	MW-8I Influent Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-6	MW-8A Control Week 8	Total/NA	Water	EPA 300.0 R2.1	
110-138725-6	MW-8A Control Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-7	MW-8B FeCI3 NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-7	MW-8B FeCl3 NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-8	MW-8C MF3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-8	MW-8C MF3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
MB 410-409143/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-409143/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-409143/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	
410-138725-3 MS	MW-7B NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-3 DU	MW-7B NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 409152

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-9	MW-7BI NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
MB 410-409152/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-409152/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-409152/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	
410-138725-9 MS	MW-7BI NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-9 DU	MW-7BI NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 410797

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-1	MW-7I Influent Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-2	MW-7A Control Week 8	Total/NA	Water	EPA 300.0 R2.1	
MB 410-410797/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-410797/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-410797/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Analysis Batch: 410836

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-3	MW-7B NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-4	MW-7C MF3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
410-138725-9	MW-7BI NaHCO3 Week 8	Total/NA	Water	EPA 300.0 R2.1	
MB 410-410836/5	Method Blank	Total/NA	Water	EPA 300.0 R2.1	
LCS 410-410836/3	Lab Control Sample	Total/NA	Water	EPA 300.0 R2.1	
LCSD 410-410836/4	Lab Control Sample Dup	Total/NA	Water	EPA 300.0 R2.1	

Metals

Prep Batch: 408910

Lab Sample ID 410-138725-1	Client Sample ID MW-7I Influent Week 8	Prep Type Dissolved	Matrix Water	Method Prep Ba	atch
410-138725-2	MW-7A Control Week 8	Dissolved	Water	Non-Digest Prep	
410-138725-4	MW-7C MF3 Week 8	Dissolved	Water	Non-Digest Prep	

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QC Association Summary

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Metals (Continued)

Prep Batch: 408910 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-5	MW-8I Influent Week 8	Dissolved	Water	Non-Digest Prep	
410-138725-6	MW-8A Control Week 8	Dissolved	Water	Non-Digest Prep	
410-138725-7	MW-8B FeCl3 NaHCO3 Week 8	Dissolved	Water	Non-Digest Prep	
410-138725-8	MW-8C MF3 Week 8	Dissolved	Water	Non-Digest Prep	
MB 410-408910/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-408910/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Prep Batch: 409495

Lab Sample ID 410-138725-3	Client Sample ID MW-7B NaHCO3 Week 8	Prep Type Dissolved	Matrix Water	Method Prep Non-Digest Prep	Batch
410-138725-9	MW-7BI NaHCO3 Week 8	Dissolved	Water	Non-Digest Prep	
MB 410-409495/1-A	Method Blank	Total/NA	Water	Non-Digest Prep	
LCS 410-409495/2-A	Lab Control Sample	Total/NA	Water	Non-Digest Prep	

Analysis Batch: 409896

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-3	MW-7B NaHCO3 Week 8	Dissolved	Water	6010D	409495
410-138725-9	MW-7BI NaHCO3 Week 8	Dissolved	Water	6010D	409495
MB 410-409495/1-A	Method Blank	Total/NA	Water	6010D	409495
LCS 410-409495/2-A	Lab Control Sample	Total/NA	Water	6010D	409495

Analysis Batch: 410146

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-3	MW-7B NaHCO3 Week 8	Dissolved	Water	6020B	409495
410-138725-9	MW-7BI NaHCO3 Week 8	Dissolved	Water	6020B	409495
MB 410-409495/1-A	Method Blank	Total/NA	Water	6020B	409495
LCS 410-409495/2-A	Lab Control Sample	Total/NA	Water	6020B	409495

Analysis Batch: 410169

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-1	MW-7I Influent Week 8	Dissolved	Water	6010D	408910
410-138725-2	MW-7A Control Week 8	Dissolved	Water	6010D	408910
410-138725-4	MW-7C MF3 Week 8	Dissolved	Water	6010D	408910
410-138725-5	MW-8I Influent Week 8	Dissolved	Water	6010D	408910
410-138725-6	MW-8A Control Week 8	Dissolved	Water	6010D	408910
410-138725-7	MW-8B FeCl3 NaHCO3 Week 8	Dissolved	Water	6010D	408910
410-138725-8	MW-8C MF3 Week 8	Dissolved	Water	6010D	408910
MB 410-408910/1-A	Method Blank	Total/NA	Water	6010D	408910
LCS 410-408910/2-A	Lab Control Sample	Total/NA	Water	6010D	408910

Analysis Batch: 410431

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-3	MW-7B NaHCO3 Week 8	Dissolved	Water	6020B	409495
410-138725-9	MW-7BI NaHCO3 Week 8	Dissolved	Water	6020B	409495

Analysis Batch: 410604

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-1	MW-7I Influent Week 8	Dissolved	Water	6020B	408910
410-138725-2	MW-7A Control Week 8	Dissolved	Water	6020B	408910
410-138725-4	MW-7C MF3 Week 8	Dissolved	Water	6020B	408910
410-138725-5	MW-8I Influent Week 8	Dissolved	Water	6020B	408910

QC Association Summary

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Metals (Continued)

Analysis Batch: 410604 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-6	MW-8A Control Week 8	Dissolved	Water	6020B	408910
410-138725-7	MW-8B FeCl3 NaHCO3 Week 8	Dissolved	Water	6020B	408910
410-138725-8	MW-8C MF3 Week 8	Dissolved	Water	6020B	408910
MB 410-408910/1-A	Method Blank	Total/NA	Water	6020B	408910
LCS 410-408910/2-A	Lab Control Sample	Total/NA	Water	6020B	408910

Analysis Batch: 411047

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-138725-1	MW-7I Influent Week 8	Dissolved	Water	6020B	408910
410-138725-2	MW-7A Control Week 8	Dissolved	Water	6020B	408910
410-138725-4	MW-7C MF3 Week 8	Dissolved	Water	6020B	408910
410-138725-6	MW-8A Control Week 8	Dissolved	Water	6020B	408910
410-138725-8	MW-8C MF3 Week 8	Dissolved	Water	6020B	408910

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7I Influent Week 8

Date Collected: 08/11/23 09:00 Date Received: 08/11/23 18:06 Lab Sample ID: 410-138725-1

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	409143	W7FX	ELLE	08/17/23 15:48
Total/NA	Analysis	EPA 300.0 R2.1		200	410797	W7FX	ELLE	08/21/23 18:24
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6010D		1	410169	T8CQ	ELLE	08/18/23 20:18
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		100	411047	F7JF	ELLE	08/22/23 09:40
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		1	410604	F7JF	ELLE	08/21/23 11:21

Client Sample ID: MW-7A Control Week 8

Date Collected: 08/11/23 09:15

Date Received: 08/11/23 18:06

Lab Sample ID: 410-138725-2

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	409143	W7FX	ELLE	08/17/23 16:22
Total/NA	Analysis	EPA 300.0 R2.1		200	410797	W7FX	ELLE	08/21/23 18:41
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6010D		1	410169	T8CQ	ELLE	08/18/23 20:25
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		100	411047	F7JF	ELLE	08/22/23 09:44
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		1	410604	F7JF	ELLE	08/21/23 11:26

Client Sample ID: MW-7B NaHCO3 Week 8

Date Collected: 08/11/23 09:30 Date Received: 08/11/23 18:06

08/11/23 09:30

Lab Sample ID: 410-138725-3

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		10	409143	W7FX	ELLE	08/17/23 20:56
Total/NA	Analysis	EPA 300.0 R2.1		200	410836	W7FX	ELLE	08/23/23 08:48
Dissolved	Prep	Non-Digest Prep			409495	HUH3	ELLE	08/17/23 12:14
Dissolved	Analysis	6010D		1	409896	MT26	ELLE	08/18/23 02:19
Dissolved	Prep	Non-Digest Prep			409495	HUH3	ELLE	08/17/23 12:14
Dissolved	Analysis	6020B		100	410431	F7JF	ELLE	08/20/23 18:49
Dissolved	Prep	Non-Digest Prep			409495	HUH3	ELLE	08/17/23 12:14
Dissolved	Analysis	6020B		1	410146	LC3M	ELLE	08/18/23 14:36

Client Sample ID: MW-7C MF3 Week 8

Date Collected: 08/11/23 09:45

Date Received: 08/11/23 18:06

Lab Sample ID: 410-138725-4

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	409143	W7FX	ELLE	08/17/23 17:31
Total/NA	Analysis	EPA 300.0 R2.1		200	410836	W7FX	ELLE	08/23/23 09:01

Project/Site: Stantec CCR AP2 Columns

Client Sample ID: MW-7C MF3 Week 8

Date Collected: 08/11/23 09:45 Date Received: 08/11/23 18:06

Lab Sample ID: 410-138725-4

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6010D		1	410169	T8CQ	ELLE	08/18/23 20:22
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		100	411047	F7JF	ELLE	08/22/23 09:42
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		1	410604	F7JF	ELLE	08/21/23 11:24

Client Sample ID: MW-8I Influent Week 8

Date Collected: 08/11/23 10:00 Date Received: 08/11/23 18:06

Lab Sample ID: 410-138725-5

Matrix: Water

Batch Batch Dilution Batch Prepared Prep Type Туре Method Run Factor **Number Analyst** Lab or Analyzed Total/NA Analysis EPA 300.0 R2.1 5 409143 W7FX ELLE 08/17/23 18:05 Total/NA Analysis EPA 300.0 R2.1 20 409143 W7FX **ELLE** 08/17/23 18:22 ELLE Dissolved Prep Non-Digest Prep 408910 HUH3 08/16/23 11:03 Dissolved 6010D 410169 T8CQ **ELLE** 08/18/23 20:15 Analysis Dissolved ELLE 08/16/23 11:03 Prep Non-Digest Prep 408910 HUH3 6020B 08/21/23 11:11 Dissolved Analysis 410604 F7JF **ELLE**

Client Sample ID: MW-8A Control Week 8

Date Collected: 08/11/23 10:15

Date Received: 08/11/23 18:06

Lab Sample ID: 410-138725-6

Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	409143	W7FX	ELLE	08/17/23 18:39
Total/NA	Analysis	EPA 300.0 R2.1		20	409143	W7FX	ELLE	08/17/23 18:56
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6010D		1	410169	T8CQ	ELLE	08/18/23 20:28
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		1	411047	F7JF	ELLE	08/22/23 09:46
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		1	410604	F7JF	ELLE	08/21/23 11:28

Client Sample ID: MW-8B FeCI3 NaHCO3 Week 8

Date Collected: 08/11/23 10:30

Date Received: 08/11/23 18:06

Lab Sample ID: 410-13872	25-7
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Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	409143	W7FX	ELLE	08/17/23 19:13
Total/NA	Analysis	EPA 300.0 R2.1		20	409143	W7FX	ELLE	08/17/23 19:31
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6010D		1	410169	T8CQ	ELLE	08/18/23 20:32
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		1	410604	F7JF	ELLE	08/21/23 11:30

Eurofins Lancaster Laboratories Environment Testing, LLC

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Lab Chronicle

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Date Received: 08/11/23 18:06

Client Sample ID: MW-8C MF3 Week 8

Lab Sample ID: 410-138725-8 Date Collected: 08/11/23 10:45 Matrix: Water

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Туре	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		5	409143	W7FX	ELLE	08/17/23 19:48
Total/NA	Analysis	EPA 300.0 R2.1		20	409143	W7FX	ELLE	08/17/23 20:39
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6010D		1	410169	T8CQ	ELLE	08/18/23 20:49
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		1	411047	F7JF	ELLE	08/22/23 09:48
Dissolved	Prep	Non-Digest Prep			408910	HUH3	ELLE	08/16/23 11:03
Dissolved	Analysis	6020B		1	410604	F7JF	ELLE	08/21/23 11:32

Client Sample ID: MW-7BI NaHCO3 Week 8

Lab Sample ID: 410-138725-9 Date Collected: 08/11/23 11:00

Matrix: Water

Date Received: 08/11/23 18:06

	Batch	Batch		Dilution	Batch			Prepared
Prep Type	Type	Method	Run	Factor	Number	Analyst	Lab	or Analyzed
Total/NA	Analysis	EPA 300.0 R2.1		10	409152	W7FX	ELLE	08/18/23 00:53
Total/NA	Analysis	EPA 300.0 R2.1		200	410836	W7FX	ELLE	08/23/23 09:13
Dissolved	Prep	Non-Digest Prep			409495	HUH3	ELLE	08/17/23 12:14
Dissolved	Analysis	6010D		1	409896	MT26	ELLE	08/18/23 02:16
Dissolved	Prep	Non-Digest Prep			409495	HUH3	ELLE	08/17/23 12:14
Dissolved	Analysis	6020B		100	410431	F7JF	ELLE	08/20/23 18:47
Dissolved	Prep	Non-Digest Prep			409495	HUH3	ELLE	08/17/23 12:14
Dissolved	Analysis	6020B		1	410146	LC3M	ELLE	08/18/23 14:34

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Eurofins Lancaster Laboratories Environment Testing, LLC

Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

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

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24
A2LA	ISO/IEC 17025	0001.01	11-30-24
Alabama	State	43200	01-31-24
Alaska	State	PA00009	06-30-24
Alaska (UST)	State	17-027	02-28-24
Arizona	State	AZ0780	03-12-24
Arkansas DEQ	State	88-00660	08-09-24
California	State	2792	11-30-23
Colorado	State	PA00009	06-30-24
Connecticut	State	PH-0746	06-30-25
DE Haz. Subst. Cleanup Act (HSCA)	State	019-006 (PA cert)	01-31-24
Delaware (DW)	State	N/A	01-31-24
Florida	NELAP	E87997	06-30-24
Georgia (DW)	State	C048	01-31-24
Hawaii	State	N/A	01-31-24
Illinois	NELAP	200027	01-31-24
lowa	State	361	03-01-24
Kansas	NELAP	E-10151	10-31-23
Kentucky (DW)	State	KY90088	12-31-23
Kentucky (UST)	State	0001.01	11-30-24
Kentucky (WW)	State	KY90088	12-31-23
Louisiana (All)	NELAP	02055	06-30-24
Maine	State	2019012	03-12-25
Maryland	State	100	06-30-24
Massachusetts	State	M-PA009	06-30-24
Michigan	State	9930	01-31-24
Minnesota	NELAP	042-999-487	12-31-23
	State	023	01-31-24
Mississippi Missouri	State	450	01-31-25
	State	0098	01-31-23
Montana (DW)			
Nebraska	State	NE-OS-32-17	01-31-24
New Hampshire	NELAP	2730	01-10-24
New Jersey	NELAP	PA011	06-30-24
New York	NELAP	10670	04-01-24
North Carolina (DW)	State	42705	07-31-24
North Carolina (WW/SW)	State	521	12-31-23
North Dakota	State	R-205	01-31-24
Oklahoma	NELAP	9804	08-31-23
Oregon	NELAP	PA200001	09-11-23
PALA	Canada	1978	09-16-24
Pennsylvania	NELAP	36-00037	01-31-24
Rhode Island	State	LAO00338	12-31-23
South Carolina	State	89002	01-31-24
Tennessee	State	02838	01-31-24
Texas	NELAP	T104704194-23-46	08-31-23
USDA	US Federal Programs	525-22-298-19481	10-25-25
Vermont	State	VT - 36037	10-28-23
Virginia	NELAP	460182	06-14-25
Washington	State	C457	04-11-24
West Virginia (DW)	State	9906 C	12-31-23

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Accreditation/Certification Summary

Client: Terra Systems Inc Job ID: 410-138725-1

Project/Site: Stantec CCR AP2 Columns

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

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

Authority	Program	Identification Number	Expiration Date
West Virginia DEP	State	055	07-31-24
Wyoming	State	8TMS-L	01-31-24
Wyoming (UST)	A2LA	0001.01	11-30-24

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Method Summary

Client: Terra Systems Inc

Project/Site: Stantec CCR AP2 Columns

Job ID: 410-138725-1

Method	Method Description	Protocol	Laboratory
EPA 300.0 R2.1	Anions, Ion Chromatography	EPA	ELLE
6010D	Metals (ICP)	SW846	ELLE
6020B	Metals (ICP/MS)	SW846	ELLE
Non-Digest Prep	Preparation, Non-Digested Aqueous Metals	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

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Sample Summary

Project/Site: Stantec CCR AP2 Columns

Client: Terra Systems Inc Job ID: 410-138725-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-138725-1	MW-7I Influent Week 8	Water	08/11/23 09:00	08/11/23 18:06
410-138725-2	MW-7A Control Week 8	Water	08/11/23 09:15	08/11/23 18:06
410-138725-3	MW-7B NaHCO3 Week 8	Water	08/11/23 09:30	08/11/23 18:06
410-138725-4	MW-7C MF3 Week 8	Water	08/11/23 09:45	08/11/23 18:06
410-138725-5	MW-8I Influent Week 8	Water	08/11/23 10:00	08/11/23 18:06
410-138725-6	MW-8A Control Week 8	Water	08/11/23 10:15	08/11/23 18:06
410-138725-7	MW-8B FeCl3 NaHCO3 Week 8	Water	08/11/23 10:30	08/11/23 18:06
410-138725-8	MW-8C MF3 Week 8	Water	08/11/23 10:45	08/11/23 18:06
410-138725-9	MW-7BI NaHCO3 Week 8	Water	08/11/23 11:00	08/11/23 18:06



Environmental Analysis Request/Chain of Custody

Client: Terra Systems, Inc.						Matrix			Analyses Requested							For Lab Us	se Only		
Project Name/#: Stantec CCR AP2 Columns	Site ID #:	Macon, GA										Preserva						SF #:	-
Project Manager: Michael D. Lee	P.O. #:	P.O. #: 222566-8-11-23		Tissue	2 g			N	N	_							SCR #:		
Sampler: Michael D. Lee	PWSID#:				i.i.	Ground													ion Codes
Phone #: 302-798-9553					Û			ners	K, Li	s, Si02									T = Thiosulfate
	Compliance:	Yes 🗌	No	V	E E	e S		Containers	o, Fe,	Na. Se.									B = NøOH
	Collec			Composite	☐ Sediment	Potable er NPDES	er:	# of	il) As, Ca, Co,	Dis (fil) Mg. Mn. Mo.	804								P = H ₃ PO ₄
Sample Identification	Date	Time	Grab	Cor	Soil	Water	Other:	Total	Dis (fil)	Dis (fi	Cl. F.							Rem	arks
MW-7I Influent Week 7	8/11/2023	9:00		Х		Х		2	Х	Х	Х							ff =field filte	red
MW-7A Control Week 7	8/11/2023	9:15		Х		Х		2	Х	Х	Х								
MW-7B NaHCO3 Week 7	8/11/2023	9:30		Х		X		2	Х	X	Х								
MW-7C MF3 Week 7	8/11/2023	9:45		Х		×		2	Х	X	Х								
MW-8I Influent Week 7	8/11/2023	10:00		Х		Х		2_	Х	X	Х								
MW-8A Control Week 7	8/11/2023	10:15		Х	L	Х		2	Х	Х	Х								
MW-8B FeCl3 NaHCO3 Week 7	8/11/2023	10:30		X		X		2	Х	Х	Х					\sqcup			
MW-8C MF3 Week 7	8/11/2023	10:45		X	L	X		2	Х	Х	Х								
MW-7BI NaHCO3 Week 7	8/11/2023	11:00		X	L	Х		2	Х	X	Х								
Turnaround Time Requested (TAT) (please check (Rush TAT is subject to laboratory as			Rus	h 🗌	9	nquished	Da	OCi	0	8/1	ate 13	Time 13.00	Rec	eived	by:	Pr	1	Date 8/1/23	Time 13: 00
Date results are needed: 8/25/23					Rel	nquished	by:				ale	Time		eived	by:			Date	Time
Rush results requested by (please check): E-M	lail 🗹	Phone	e [U	_/	1	_	1	<u> YL</u>	23	18:06	_			~	_		
E-mail Address: mlee@terrasystems.net Phone: 302-798-9553					Reli	nquished	fy:	1		Di	ate	Time	Rec	eived	by:			Date	Time
Data Package Options (please check if required)				Reli	nquished	by:	_	1	D	ate	Time	Rec	eived	by:			Date	Time	
Type I (Validation/non-CLP) MA MCP																			
Type III (Reduced non-CLP)				Reli	nquished	by:			D	ate	Time	Rec	eived	by:			Date	Time	
Type VI (Raw Data Only) TX TRRP-13									St. The			8/11/23	180k						
	Category	☐ A or	П	В	Reli	nquished	by C	omme	ercial	Carrie	er:		10	yw	~ ,			eau: 0	
	es, format:				UPS		FedE	=x		Other			Ten	nperat	ture u	pon re	ceipt	CUY: -U.	

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Environmental Analysis Request/Chain of Custody

eurofins

Lancaster Laboratories

Environmental Acct. # Group # Sample # Sample # _____

Client: Terra Systems, Inc.						Matrix			Analyses Requested							For Lab Us	For Lab Use Only	
Project Name/#: Stantec CCR AP2 Columns	Site ID #:	Macon, GA				/					F	reserv	ation (Code	s		SF #:	
Project Manager: Michael D. Lee	P.O. #:	222566-8-1	1-23		issue	ind			N	N	-						SCR #:	
Sampler: Michael D. Lee	PWSID #:				⊒≅	Ground		6	_	2							Preservat	ion Codes
Phone #: 302-798-9553	Quote #: 41011818				<u>ק</u>			ners	, K, L	Se, SiO2							H = HCI	T = Thiosulfate
	Compliance:	Yes	No	4	ment	elc SI		ntai	o, Fe	Mo, Na, S							N = HNO ₃	B = NaOH
·	Collec		osite		Sedim	Potable er NPDES	er:	Il # of Containers	Dis (fil) As, Ca, Co, Fe, K, Li	Dis (fil) Mg, Mn, Mo,	SO4						$S = H_2SO_4$ $O = Other$	P = H ₃ PO ₄
Sample Identification	Date	Time	Grab	Con	Soil	Water	Other:	Total #	Dis (fi	Dis (fil)	CI, F,						Rem	arks
MW-7I Influent Week 8	8/11/2023	9:00		Х		Х		2	Х	Χ	Χ						ff =field filte	red
MW-7A Control Week 8	8/11/2023	9:15		Х		Х		2	Χ	Χ	Χ							
MW-7B NaHCO3 Week 8	8/11/2023	9:30		Х		Х		2	Χ	Χ	Х							
MW-7C MF3 Week 8	8/11/2023	9:45		Х		Х		2	Χ	Χ	Х							
MW-8I Influent Week 8	8/11/2023	10:00		Χ		Х		2	Χ	Χ	Χ							
MW-8A Control Week 8	8/11/2023	10:15		Χ		Х		2	Χ	Χ	Х							
MW-8B FeCl3 NaHCO3 Week 8	8/11/2023	10:30		Х		Х		2	Χ	Χ	Χ							
MW-8C MF3 Week 8	8/11/2023	10:45		Χ		Х		2	Χ	Χ	Χ							
MW-7BI NaHCO3 Week 8	8/11/2023	11:00		Χ		Х		2	Χ	Χ	Χ							
Turnaround Time Requested (TAT) (please check (Rush TAT is subject to laboratory approximately 1997).	•		Rusl	h 🗌	Relii	nquished	by:			Da	ate	Time	Rec	eived	by:		Date	Time
Date results are needed: 8/25/23					Reli	nquished	by:			Da	ate	Time	Rec	eived	by:		Date	Time
Rush results requested by (please check): E-N	1ail ✓	Phon	e [
E-mail Address: mlee@terrasystems.net					Reli	nquished	by:			Da	ate	Time	Rec	eived	by:		Date	Time
Phone: 302-798-9553																		
Data Package Options (please check if required)				Reli	nquished	by:			Da	ate	Time	Rec	eived	by:		Date	Time
Type I (Validation/non-CLP)																		
Type III (Reduced non-CLP) CT RCP					Reli	nquished	by:			Da	ate	Time	Rec	eived	by:		Date	Time
Type VI (Raw Data Only)	P-13																	
NJ DKQP NYSDEC	Category	A or		В	Reli	nquished	by C	omme	rcial	Carrie	er:							
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Login Sample Receipt Checklist

Client: Terra Systems Inc Job Number: 410-138725-1

Login Number: 138725

List Number: 1

Creator: McBeth, Jessica

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature acceptable, where thermal pres is required(=6C, not frozen).</td <td>True</td> <td></td>	True	
Cooler Temperature is recorded.	True	
WV:Container Temp acceptable, where thermal pres is required (=6C, not frozen).</td <td>N/A</td> <td></td>	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

4 5 6 7 8 9 10 11 12 List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

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APPENDIX B RISK EVALUATION REPORT





FORMER PLANT ARKWRIGHT ASH POND 2 DRY ASH STOCKPILE LANDFILL BIBB COUNTY, GEORGIA

Prepared for

Georgia Power 241 Ralph McGill Boulevard Atlanta, Georgia 30308

Prepared by

WSP USA Environment & Infrastructure Inc.

1075 Big Shanty Road NW, #100 Kennesaw, Georgia 30144

February 2024

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LIST OF ACRONYMS AND ABBREVIATIONS

ACC Atlantic Coast Consulting

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

DAS Dry Ash Storage

EPD [Georgia] Environmental Protection Division

GWPS Groundwater Protection Standard
HSRA Hazardous Site Response Act
ISWQC In-Stream Water Quality Criteria
MCL Maximum Contaminant Level

mg/L Milligrams per liter

ProUCL ProUCL software version 5.1

RME Reasonable Maximum Exposure

RRS Risk Reduction Standards
RSL Regional Screening Level
SSL Statistically Significant Level

UCL 95 Percent Upper Confidence Limit of the Arithmetic Mean

USEPA United States Environmental Protection Agency

VRP Voluntary Remediation Program

EXECUTIVE SUMMARY

Georgia Power's Plant Arkwright (site) is a former four-unit coal-fired, electric-generating facility approximately 6 miles northwest of Macon, Georgia in Bibb County, Georgia. In compliance with applicable regulations, coal combustion residual (CCR) material resulting from power generation were historically transferred and stored at Ash Pond 2 Dry Ash Stockpile Landfill (AP-2). This report focuses on this unit and is hereafter referred to as AP-2.

Georgia Power is currently updating the CCR permit application for AP-2. AP-2 is exempt from the requirements in the Federal CCR Rule¹ in accordance with § 257.50(d), which states that the subpart does not apply to CCR landfills that have ceased receiving CCR prior to October 19, 2015. AP-2 is, however, subject to the requirements of Georgia Environmental Protection Division (EPD) Coal Combustion Residuals Rule 391-3-4-.10 (State CCR Rule) as it is defined as an Inactive CCR Landfill. A closure certificate was issued for AP-2 by the Georgia EPD on July 30, 2010 (hereinafter "Closure Certificate"). The Closure Certificate initiated the post-closure care period for the CCR unit which currently includes semi-annual groundwater monitoring and reporting. Georgia Power has elected to remove CCR material from AP-2 and place it in a new, lined landfill.

This report presents the results of a human health risk evaluation for the CCR constituents that exhibit statistically significant levels (SSLs) in groundwater at the site (cobalt and lithium) and the supporting human health and ecological risk evaluations for the downgradient surface water bodies (i.e., Beaverdam Creek and the Ocmulgee River). A conservative, health-protective approach was used that is consistent with United States Environmental Protection Agency (USEPA) risk assessment guidance, Georgia EPD regulations and guidance, and standard practice for risk assessment in the State of Georgia. The risk evaluation relies on recent (December 2019 to August 2023) groundwater data collected by Georgia Power in compliance with the State CCR Rule and surface water data collected from Beaverdam Creek and the Ocmulgee River by Georgia Power between September 2020 and October 2023.

Former Plant Arkwright AP-2 Risk Evaluation Report

¹ The full citation for the Federal CCR Rule is: 40 C.F.R. § 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. The rule was finalized with an effective date of October 14, 2015 and last amended August 28, 2020 with an effective date of September 28, 2020 (USEPA, 2020).

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-2.
- 2. Initial groundwater risk screening: Comparison of groundwater concentrations for the SSL-related constituents (cobalt and lithium) to conservative, healthprotective criteria to assess whether constituents pose a risk to human health.
- 3. Refined groundwater risk evaluation: Performance of a more refined analysis for the Constituents of Potential Interest (COPIs) that were retained in the initial risk screening in order to evaluate the potential risks to human health due to groundwater exposure.
- 4. Surface water screening: Comparison of surface water concentrations for those constituents identified as groundwater constituents of interest (COIs) to conservative, health-protective criteria to assess whether those constituents pose a risk to human health and/or the environment as an additional line of evidence.
- 5. Development of risk conclusions and identification of associated uncertainties.

Using this approach that includes multiple conservative assumptions, concentrations of the SSL-related constituents (cobalt and lithium) are not expected to pose a risk to human health or the environment. Therefore, no further risk evaluation of groundwater or surface water is warranted. Compliance monitoring for AP-2 under the State CCR Rule will continue. Georgia Power will proactively evaluate the data and update this evaluation, if necessary.

1 INTRODUCTION

This report summarizes a risk evaluation of AP-2 located at the former Georgia Power Plant Arkwright (site) in Bibb County, Georgia (**Figure 1**). Georgia Power is currently in the permitting process for AP-2 in accordance with the State CCR Rule (EPD, 2022a). AP-2 is exempt from the requirements in the Federal CCR Rule, in accordance with § 257.50(d), which states that the subpart does not apply to CCR landfills that have ceased receiving CCR prior to October 19, 2015 (USEPA, 2020). Georgia Power has elected to remove CCR material from AP-2 and place it in a new, lined landfill. AP-2 will be regraded and vegetated after CCR removal.

This risk evaluation provides additional technical review of the human health and environmental protectiveness associated with the planned closure of AP-2 with respect to SSL-related constituent (cobalt and lithium) concentrations in groundwater and in downgradient surface water bodies. The evaluation relies on a conservative, health-protective approach that is consistent with the risk evaluation approaches outlined in Voluntary Remediation Program (VRP) (Georgia Voluntary Remediation Act, OCGA §12-8-100; EPD, 2009) and USEPA Regional Screening Levels (RSLs) User's Guide (USEPA, 2023). This evaluation also incorporated principles and assumptions consistent with the Federal and State CCR Rules.

The risk evaluation includes the development of a site-specific CEM and a stepwise risk screening process for the identified SSL-related constituents at AP-2. Cobalt and lithium were identified as SSL-related constituents in monitoring well ARAMW-7 (Stantec, 2023a). Based on the results of the risk evaluation for these SSL-related constituents, a site-specific recommended path forward is provided.

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 the SSL-related constituents.
- **Section 3, Risk Evaluation Screening** Describes the process for the initial risk-based screening of the SSL-related constituents (cobalt and lithium) in groundwater to identify if they are COPIs.

- Section 4, Refined Risk Evaluation Describes the risk screening process for the groundwater COPIs (cobalt and lithium), including calculation of exposure point concentrations (EPCs) and analysis of concentration trends over time, as well as the surface water risk screening process for the groundwater COIs (cobalt and lithium) in the downgradient surface water bodies.
- **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 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 former Plant Arkwright AP-2 documents, including the *CCR Unit Permit Application Part A, Former Plant Arkwright – AP2-DAS* (Jacobs, 2018a), *CCR Unit Permit Application Part B, Former Plant Arkwright – AP2-DAS Landfill* (Jacobs, 2018b), and the 2023 Annual Groundwater Monitoring and Corrective Action Report (Stantec, 2023a). The CEM includes a conservative evaluation of potential transport pathways, potential exposure pathways, and potential human and ecological receptors.

2.1 Site Description

The former Plant Arkwright is located in Bibb County, Georgia, approximately 6 miles northwest of the city of Macon. The site is bordered by the Ocmulgee River on the east (**Figure 1**). The former Plant Arkwright was a four-unit coal-fired power generating facility that was retired in 2002 and decommissioned in 2003. Beaverdam Creek borders AP-2 to the south (**Figure 2**).

AP-2 was established around 1970 as a disposal area for the plant's CCR material. The footprint of the CCR material encompasses 9.11 acres. The CCR material is covered with a non-uniform layer of soil. Mature trees and thick undergrowth vegetation has been established in and around this area. A closure certificate was issued for AP-2 by the Georgia EPD on July 30, 2010, which initiated the post-closure care period for the CCR unit. Georgia Power has elected to remove CCR material from AP-2 and place it in a new, lined landfill.

Semi-annual groundwater monitoring and reporting for AP-2 is performed in accordance with the monitoring program requirements of the State CCR Rule (EPD, 2022a). A groundwater monitoring network was installed to monitor groundwater quality both upgradient and downgradient of AP-2. The AP-2 certified monitoring well network consists of 2 upgradient monitoring wells and 3 downgradient monitoring wells. Delineation piezometers were installed at AP-2 in November 2019 (ARAMW-1 and ARAMW-2), November 2020 (ARAMW-7 and ARAMW-8), and October 2022

(ARAMW-9). The locations of the certified compliance well network are provided in **Figure 2**.

2.1.1 Topography and Surface Hydrology

The site is located along the southern edge of the Washington Slope Physiographic District. The Washington Slope is characterized by a gently undulating surface which generally slopes to the south and southeast towards the Coastal Plain Physiographic District located approximately 3.8 miles to the southeast of the site. Topography of the Washington Slope ranges from approximately 700 feet above sea level in the areas of southern Atlanta and Athens to approximately 500 feet above sea level at its southern limit along the Georgia Fall Line. Streams follow the structure of underlying crystalline rocks eastward toward the Ocmulgee River. Relief throughout the district is between 50 and 100 feet with the greatest relief being along the Ocmulgee River with steep walled valleys and elevation changes between 150 and 200 feet (Wood, 2020). AP-2 is bordered to the south-southwest by Beaverdam Creek and is approximately 1,000 feet from the western bank of the Ocmulgee River. Beaverdam Creek flows in a southeasterly direction, eventually discharging into the Ocmulgee River at a location approximately 2,600 feet southeast of AP-2. The Ocmulgee River is part of the Lower Ocmulgee River Basin, flowing from north to south in the vicinity of former Plant Arkwright. All surface water and groundwater in the former Plant Arkwright area eventually flows in a southerly direction.

2.1.2 Geology and Hydrogeology

The geologic and hydrogeologic characteristics of the site have been extensively evaluated and compiled in previous reports. The following presents a brief summary of this information from the *Plant Arkwright AP-2 2023 Annual Groundwater Monitoring & Corrective Action Report* (Stantec, 2023a):

The general geology beneath AP-2 DAS consists of clays, silty and sandy clays, silty sands, sandy silts, and minor gravel at depth, underlain by a silty sand saprolite and bedrock. Historical borings advanced at the Site indicate bedrock occurs at depths ranging from approximately 14 to 63 feet below ground surface and consists of weathered quartzofeldspathic gneiss, hornblende gneiss, and schist. Boring logs also indicate a relatively thin zone of partially weathered rock (PWR) above a more competent bedrock, which ranges in thickness from 1 to 4 feet in the southern and eastern portions of the Site, and up to 14 feet in the northeastern portion of the Site.

Pertinent hydrogeologic information from the *Plant Arkwright AP-2 2023 Annual Groundwater Monitoring and Corrective Action Report* (Stantec, 2023a) is presented below:

The uppermost aquifer at the Site consists of two hydrostratigraphic units: the water table (overburden) hydrostratigraphic unit and the underlying shallow fractured bedrock hydrostratigraphic unit. The water table (overburden) unit is composed of unconsolidated silty sands and sandy silts with clays and variable thicknesses of PWR mantling the bedrock surface, whereas the bedrock unit is a zone comprised of weathered and fractured bedrock.

The water table unit is hydraulically connected to the underlying bedrock through fractures in the partially weathered and fractured bedrock (Southern Company Services, 2005) and is considered to be under unconfined conditions. The monitoring well network for AP-2 DAS (Figure 2) monitors the uppermost aquifer at the Site.

Slug testing data from the Site reflects a range of hydraulic conductivities from 10^{-6} to 10^{-3} centimeters per second in the water table hydrostratigraphic unit (Southern Company Services, 2005). Groundwater level gauging data from the Site show stable water level trends and the potentiometric surface maps depict groundwater generally flowing to the south across AP-2 DAS.

The potentiometric surface elevation contours for January 2023 are presented in **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. Potential transport pathways to groundwater and surface water are discussed below.

2.2.1 Groundwater

Pertinent information regarding groundwater transport from Appendix E of the *Arkwright AP-2 2023 Annual Groundwater Monitoring and Corrective Action Report* (Stantec, 2023a) is presented below and is largely consistent with historical observations:

Groundwater level monitoring data collected in 2020 through June 2023 from monitoring wells and piezometers show consistent groundwater flow directions. The potentiometric surface maps reflect groundwater generally flowing across AP-2 DAS toward the south to Beaverdam Creek, which is consistent with previous observations.

Groundwater flow direction in the uppermost aquifer is generally towards the south to Beaverdam Creek.

2.2.2 Surface Water

A conservative assumption for this assessment was made that all the groundwater from the site flows to the downgradient surface water bodies. In addition, for the purpose of this risk evaluation, it was assumed that Beaverdam Creek represents a localized hydraulic discharge boundary for groundwater flow from the area and the Ocmulgee River represents a regional hydraulic discharge boundary for groundwater flow in the upper aquifer from the area. Beaverdam Creek borders AP-2 to the south and flows in a southeasterly direction, eventually discharging into the Ocmulgee River at a location approximately 2,600 feet southeast of AP-2 (**Figure 2**).

2.3 Potential Exposure Pathways and Receptors

The exposure pathways for groundwater and surface water, assumed to be complete as a conservative measure for the purposes of this risk evaluation, were used to identify potential receptors and estimate potential risk. The CEM (**Figure 4**) depicts the conservative 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 the on-site resident was considered incomplete because there is no residential use on-site under current site conditions and future residential use of the site is considered unlikely. Land use surrounding the site is zoned agricultural to the north, planned industrial to the west, agricultural to the southwest, and multi-family residential to the south (Bibb County, 2020). Beyond the Ocmulgee River to the east, land use is predominantly zoned agricultural/forestry (Jones County, 2007).
- Off-site industrial/construction worker: The potential for off-site worker exposure
 through direct contact with groundwater was addressed 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 assumed potentially complete for the purpose of this evaluation. Numerous surveys of potential water supply wells and surface water intakes were conducted at the site. These surveys consisted of reviewing Federal, State, and County records and online sources, in addition to conducting windshield surveys of the area.
 - o Kemron Environmental Services conducted a survey in 2003.
 - Jacobs conducted a water survey in 2018 encompassing a 0.5-mile search radius for private water supply wells and 2-mile search radius for public water supply wells and surface water intakes.
 - NewFields conducted a survey in 2020 which covered a 3-mile radius for water supply wells (**Appendix A**).
 - o Jacobs conducted the surveys in 2021 encompassing a 0.5-mile search radius for private water supply wells and 2-mile search radius for public water supply wells and surface water intakes (Jacobs, 2022).
 - Stantec conducted an updated survey in 2022 within a 2-mile radius (Stantec, 2023b).

The results of all the surveys up to a 3-mile radius surveys have been combined and are presented in **Figure 5**.

Combining well information from all sources with parcel data within the three-mile radius, 639 total parcels likely to be associated with an active or inactive private well within the three-mile radius were identified. Municipal water from the Macon Water Authority is widely available throughout the Bibb County portion of the area. The majority of the water lines around the plant were built in the 1970s, when the nearby homes were constructed. Municipal water is not available in the Monroe County portion of the area. The residential area east of the Ocmulgee River is served by public water. No active public wells were located within the 3-mile radius. The closest private wells to AP-2 are south of the site and Beaverdam Creek, which was assumed to represent a localized hydraulic discharge boundary for groundwater flow in the upper aquifer from the area. The findings from the 2022 survey (Stantec, 2023b) were consistent with the 2020 and 2021 surveys.

According to the 2021 survey (Jacobs, 2022), the Macon Water Authority public water supply is sourced solely from a surface water intake approximately 3.7 miles downstream of the former Plant Arkwright on the Ocmulgee River. However, according to the numerous surveys, no surface water intakes have been identified for public water supplies within three miles downstream of the site. Surface water concentrations of cobalt and lithium in Beaverdam Creek and the Ocmulgee River were well below respective health-protective screening criteria for human receptors. As there are no surface water intakes near the site and surface water concentrations are below screening criteria, surface water as a drinking water source is considered an incomplete exposure pathway.

As a conservative measure, potential off-site residential exposure to the SSL-related constituents were evaluated using on-site groundwater wells around the perimeter and downgradient of AP-2. This comparison makes the conservative assumption that on-site groundwater may potentially migrate to off-site drinking water wells, through advective transport in groundwater without any attenuation within the aquifer media through factors such as dilution, dispersion, or adsorption. The risk evaluation screening conservatively assumed that hypothetical off-site residential receptors could be exposed to the concentrations of the SSL-related constituents (cobalt and lithium) in groundwater through its use as a potable water supply by ingestion and dermal contact with groundwater.

 Recreational surface water receptors: The surface water exposure pathway for recreational receptors was assumed potentially complete for the purpose of this evaluation. Routes of exposure include ingestion of aquatic organisms (mainly

- fish) and potential incidental ingestion and dermal contact with surface water by adult and child recreational receptors.
- Ecological surface water receptors: The surface water exposure pathway for ecological receptors was assumed potentially complete for the purpose of this risk evaluation. Potential routes of exposure include direct contact to surface water by aquatic receptors as well as ingestion.

3 RISK EVALUATION SCREENING

The CEM developed in Section 2 was used to identify the potentially completed exposure pathways to human and ecological receptors that are considered in the risk evaluation. The initial step in the risk evaluation is the comparison of SSL-related constituent concentrations of cobalt and lithium in groundwater collected between November 2020 to August 2023 to health-protective levels for potentially complete exposure pathways. 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 VRP (EPD, 2009).

The initial risk evaluation screening was performed for the potential groundwater exposure pathway by comparing the concentrations of cobalt and lithium in groundwater from monitoring well ARAMW-7 to health-protective screening criteria. These criteria included the risk reduction standards (RRS) 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 November 2020 to August 2023 from on-site monitoring well ARAMW-7 (**Figure 2**) were used for hypothetical off-site residential exposure. Cobalt and lithium data from this well were screened against relevant health-protective screening criteria.

Groundwater data used in the risk screening evaluation were collected from the uppermost aquifer and are considered to be representative of groundwater conditions at the site. The well with the SSL-related constituents is depicted in **Figure 2** and the

groundwater dataset used in the risk evaluation is presented in **Appendix B.** Method detection limits for the groundwater dataset used in the risk evaluation were reviewed and confirmed to be less than the screening levels.

3.1.2 Background Groundwater Quality

Statistical analysis of groundwater monitoring data is performed at the former Plant Arkwright pursuant to §257.93-95 following the established statistical method from the Unified Guidance (USEPA, 2009) for AP-2; background values are routinely updated under the program. Two monitoring wells in the certified monitoring well network are designated as upgradient or background locations, including ARGWA-19 and ARGWA-20. The statistical analyses were performed on groundwater data using Sanitas groundwater statistical software, as described in the 2023 Annual Groundwater Monitoring & Corrective Action Report (Stantec, 2023a) and text from that document is presented below.

Upper Tolerance Limits (UTLs) were calculated from pooled upgradient well data for Appendix IV constituents. Parametric UTLs were calculated when data followed a normal or transformed-normal distribution. When data contained greater than 50% non-detects or were not a normal or transformed-normal distribution, non-parametric tolerance limits were used. When parametric methods were appropriate, a 95% UTL with 95% coverage was calculated. When non-parametric UTLs were appropriate, the level of confidence could not be pre-specified and was a function of the size of the data set. The level of confidence for the non-parametric UTLs were provided in the GSC, 2022 and 2023 reports (Appendix D). The background limits were evaluated when determining the GWPS under 40 CFR § 257.95(h).

Naturally occurring or site-specific background concentrations can exceed health-protective screening criteria. Therefore, site-specific background values were used as the groundwater screening values if background concentrations were identified as greater than the groundwater health-protective screening values, as further described in Section 3.2.

3.2 Groundwater Screening Evaluation

The process of screening the SSL-related constituents in groundwater against human health screening levels for groundwater is discussed below and presented in **Figure 6**. The HSRA RRS evaluated under the VRP approach presented herein included Type 1

and Type 2 standards 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 practice and 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 exposures, which are considered protective of human health for those constituents regulated under HSRA (i.e., cobalt and lithium).
 - The Type 2 RRSs were used for cobalt and lithium, which are the lower of the calculated carcinogenic and non-carcinogenic values derived using the default exposure factors for residential receptors and the methodology found in Appendix III of the HSRA rule (EPD, 2018). Toxicity values for cobalt and lithium used for the Type 2 RRS calculations were identified in the respective Provisional Peer Reviewed Toxicity Value documents (USEPA, 2008a, 2008b). The risk-based Type 2 RRS were calculated using USEPA's RSL calculator (USEPA, 2023) assuming a target cancer risk of 1×10⁻⁵ and a target hazard quotient of 1, consistent with the Georgia EPD guidance (EPD, 2018b). The calculations of the Type 2 RRS values for the SSL-related constituents (cobalt and lithium) are presented in **Appendix C**.
- 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 groundwater protection standards (USEPA, 2020). However, for this evaluation, background was not used as the relevant screening level.

Groundwater data collected from the well identified to have SSL-related constituents were compared to residential screening criteria in order to protect hypothetical off-site receptors. Concentrations of cobalt and lithium in ARAMW-7 were compared to the higher of the HSRA Type 1 RRS, Type 2 RRS, and background values for groundwater pursuant to standard practice for risk assessment within the State of Georgia.

Table 1 presents the maximum detected concentrations of each SSL-related constituent (0.077 mg/L for cobalt and 0.068 mg/L for lithium), which were used to represent potential off-site groundwater quality for comparison to the selected screening level for hypothetical off-site residential receptors (health-based) of 0.006 mg/L for cobalt and 0.040 mg/L for lithium. As noted in **Table 1**, cobalt and lithium were detected at concentrations exceeding respective screening levels, were identified as COPIs, and thereby were retained for further evaluation in the refined risk evaluation.

4 REFINED RISK EVALUATION

A refined risk evaluation was conducted for the groundwater COPIs, cobalt and lithium, that were detected at concentrations that exceeded respective health-protective screening criteria. The refined risk evaluation identified EPCs for potential exposure to cobalt and lithium for the purpose of characterizing potential risk to human receptors. If the EPC is greater than the respective screening level, then the constituent is identified as a groundwater COI with the potential for risk that warrants additional evaluation (e.g., performing a surface water evaluation). Cobalt and lithium were evaluated in the nearest downgradient surface water bodies (i.e., Beaverdam Creek and the Ocmulgee River) because they were identified as groundwater COIs in the refined groundwater risk evaluation.

4.1 Refined Groundwater Risk Evaluation

Potential risk associated with exposure to cobalt and lithium by hypothetical off-site residential receptors was refined using the methodology described in the HSRA and VRP guidance (EPD, 2018; EPD, 2009) and is presented in the following section and in Figure 7.

For the refined risk evaluation, available groundwater data (December 2019 – August 2023) collected from the well identified to have SSL-related constituents (ARAMW-7) and downgradient well (ARGWC-22) that represents groundwater flow in the same hydraulically downgradient direction were used to evaluate hypothetical off-site residential exposure. The groundwater monitoring well/piezometer(s) included in the refined risk evaluation are depicted with yellow well labels in Figure 2. ARAMW-9 was installed in October 2022 with a screened interval approximately 50 feet deeper than ARAMW-7 to provide vertical delineation of ARAMW-7 (Stantec, 2023a). This piezometer ARAMW-9 was not included in the refined evaluation due to the depth of the screened interval; however, cobalt has not been detected above the laboratory method detection limit and lithium concentrations are an order of magnitude lower than the screening level with vertical delineation of ARAMW-7 considered complete.

Groundwater data used in the refined risk 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 the COPIs includes the development of an EPC. The EPC is a conservative estimate of potential exposure to a receptor. The EPC is based on the 95 percent upper confidence limit of the arithmetic mean (UCL) and accounts for uncertainty and variability in the dataset (USEPA, 2002). Consistent with USEPA guidance for developing groundwater EPCs (USEPA, 2014), UCLs were calculated using USEPA ProUCL 5.2 software (ProUCL) (USEPA, 2022a) and user's guide (USEPA, 2022b). For the refined risk evaluation, the approach for UCL calculations for COPIs in groundwater consists of the following specific datasets:

- UCL for the individual well with an SSL-related constituent;
- UCL based on combined data from the well with an SSL-related constituent and other wells/piezometers in the general vicinity to include nearby monitoring wells/piezometers that represent groundwater flow in the same hydraulically downgradient direction; and
- UCL based on the combined data from the farthest downgradient well/piezometer(s) of the well with an SSL-related constituent.

Other assumptions made in the calculations of the UCLs include:

- Primary samples (no duplicates) were used to calculate EPCs as duplicate samples were analyzed for quality assurance purposes.
- If the calculated UCL exceeded the maximum detected concentration or if enough samples were not available to calculate an UCL, then the maximum detected concentration was used as the EPC.

ProUCL software calculates multiple UCLs and provides a recommended UCL that was selected as the EPC. If there were multiple UCLs recommended by ProUCL, the maximum UCL value was selected. **Appendix D-1** provides a summary of the UCLs calculated using the method described above, and **Appendix D-2** presents a figure showing the wells used in the calculation of the EPCs for cobalt and lithium. **Appendix D-3** provides the input and output files associated with the ProUCL software.

Table 2 summarizes the groundwater EPCs selected for cobalt and lithium. This table shows the number of samples, the maximum detected concentrations, the 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 and lithium. Mann-Kendall trend tests with an alpha of 0.05 and Theil-Sen line tests were conducted on the cobalt and lithium data from ARAMW-7 to evaluate the trends in concentrations over time. The test was conducted using the USEPA ProUCL 5.2 software (USEPA, 2022a).

The Mann-Kendall and Theil-Sen line test results are presented on time series graphs in **Appendix D-4** and indicated there is insufficient statistical evidence of a significant trend in cobalt and lithium concentrations at ARAMW-7 but concentrations have decreased over the last three events.

Trend analyses for cobalt and lithium were also evaluated for nearby well ARGWC-22. The Mann-Kendall and Theil-Sen test results presented in **Appendix D-4** indicated a statistically significant decreasing trend in cobalt concentrations over time at ARGWC-22 while lithium had insufficient statistical evidence of a significant trend. Lithium has not been detected above the screening level of 0.040 mg/L at ARGWC-22, while concentrations of cobalt have been below the screening level of 0.0060 mg/L since May 2020.

4.1.3 Refined Groundwater Risk Evaluation Results

Cobalt and lithium were identified as groundwater COPIs in the initial risk screening. In the refined risk evaluation, comparison of the calculated EPCs to the screening level was used to identify whether cobalt or lithium are COIs that may pose a potential risk to hypothetical off-site residential receptors exposed through the use of groundwater as potable water. If the EPC from the farthest downgradient piezometer/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 Cobalt

Cobalt was detected in 7 out of 7 groundwater samples in piezometer ARAMW-7 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 monitoring wells/piezometers shown in **Appendices D-1** and **D-2**:

- Data from ARAMW-7 were combined to represent groundwater exposure for the well with an SSL-related constituent (EPC Step 1 in **Appendix D-1**).
- Data from ARAMW-7 and nearby, downgradient well ARGWC-22 were combined to represent groundwater exposure in the same hydraulically downgradient direction (EPC Step 2 in **Appendix D-1**). Because there are no other wells downgradient of ARAMW-7 and ARGWC-22, EPC Step 2 and EPC Step 3 are the same.

The cobalt UCLs for EPC Step 1 (0.075 mg/L) and EPC Steps 2 and 3 (0.035 mg/L) exceeded the screening level of 0.006 mg/L. Cobalt was identified as a groundwater COI for hypothetical off-site residential receptors, and therefore, is further evaluated in the surface water risk evaluation (**Section 4.2**). It should be noted that vertical delineation of cobalt at ARAMW-7 is achieved by ARAMW-9, where cobalt was not detected above the laboratory method detection limit in the three samples collected between October 2022 and August 2023.

4.1.3.2 Lithium

Lithium was detected in 7 out of 7 groundwater samples in piezometer ARAMW-7 at concentrations that exceeded the off-site groundwater screening level for residential receptors. For the refined risk evaluation, the following EPCs were calculated for lithium using the monitoring wells/piezometers shown in **Appendices D-1** and **D-2**:

- Data from ARAMW-7 were combined to represent groundwater exposure for the well with an SSL-related constituent (EPC Step 1 in **Appendix D-1**).
- Data from ARAMW-7 and nearby, downgradient well ARGWC-22 were combined to represent groundwater exposure in the same hydraulically downgradient direction (EPC Step 2 in **Appendix D-1**). Because there are no other wells downgradient of ARAMW-7 and ARGWC-22, EPC Step 2 and EPC Step 3 are the same.

The lithium UCLs for EPC Step 1 (0.064 mg/L) and EPC Steps 2 and 3 (0.044 mg/L) exceeded the screening level of 0.040 mg/L. Lithium was identified as a groundwater COI for hypothetical off-site residential receptors, and therefore, is further evaluated in the surface water risk evaluation (**Section 4.2**). It should be noted that vertical delineation of lithium at ARAMW-7 is achieved by ARAMW-9, where detected concentrations of

lithium in the three samples collected between October 2022 and August 2023 were an order of magnitude lower than the screening level of 0.040 mg/L.

Table 3 presents the results of the refined screening comparing Step 3 EPCs to the screening criteria. Cobalt and lithium were identified as groundwater COIs for hypothetical off-site residential receptors. Therefore, cobalt and lithium are further evaluated in the surface water risk evaluation (**Section 4.2**).

4.2 Surface Water Risk Evaluation

A surface water screening evaluation was conducted for Beaverdam Creek and the Ocmulgee River for the groundwater COIs (cobalt and lithium) identified in the refined groundwater risk evaluation.

Both human and ecological receptors have the potential to come into contact with surface water. Routes of exposure include ingestion of aquatic organisms (mainly fish) and potential incidental ingestion and dermal contact with surface water by adult and child recreational receptors. Potential routes of exposure for ecological receptors include direct contact to surface water and ingestion by aquatic receptors.

The surface water screening process for cobalt is discussed below and presented in Figure 8.

4.2.1 Surface Water Data

Surface water data for cobalt and lithium include up to seven sampling events conducted between February 2021 and October 2023 at the below locations in Beaverdam Creek and the Ocmulgee River.

- Beaverdam Creek: BC-0.8a (background, located upstream of confluence with Beaverdam Creek Tributary), BC-0.5.7, BC-0.5.6, BC-0.5.5, BC-BR, BC-0.3, and BC-0.1.
- Ocmulgee River: OR-0.8 (background, located upstream of the site), OR-0.3, OR-0.1, OR+0.25, and OR+1.0.

The surface water sampling locations are shown in Figure 9. The surface water dataset used in the risk evaluation is presented in **Appendix B-2**.

4.2.2 Human Health Screening

Surface water human health screening values for the groundwater COI was selected from the following order of hierarchy:

- Georgia In-Stream Water Quality Criteria (ISWQC) for human health (EPD, 2022b), when available.
- National ambient water quality criteria (USEPA, 2015) for human health, ingestion of water and organisms. When there is no numerical value for a constituent in surface water, USEPA (2015) states that USEPA has issued an maximum contaminant level (MCL) which may be more stringent than the National Ambient Water Quality Criteria for these constituents suggesting the use of the MCL for surface water screening. This is a conservative approach.
- In accordance with standard practice using methodologies approved by the Georgia EPD, the higher of the residential groundwater screening levels described in Section 3.2.2 for the remaining constituents due to lack of human health surface water screening levels for these constituents, which is a conservative approach.
- If site-specific surface water background concentrations are greater than the criteria described above, then the site-specific surface water background concentration is used as the screening level. The background concentrations were less than the respective screening levels described above.

For cobalt and lithium, the higher of the residential groundwater screening levels described in Section 3.2 (the Type 2 RRS) were used because of the lack of human health surface water screening levels within the Georgia ISWQC (EPD, 2022b) or national ambient water quality criteria (USEPA, 2015). The use of drinking water screening levels for surface water exposure is a conservative approach as Beaverdam Creek is not used as a source of potable drinking water, and therefore, is an incomplete exposure pathway.

The surface water human health screening levels for cobalt (0.006 mg/L) and lithium (0.040 mg/L) were compared to the maximum detected concentrations for cobalt and lithium in surface water from two exposure units (i.e., Beaverdam Creek and the Ocmulgee River), as shown in **Table 4**. Cobalt and lithium were detected in surface water samples at concentrations at least an order of magnitude lower than the screening criterion in Beaverdam Creek and the Ocmulgee River. Lithium was not detected in surface water samples from the Ocmulgee River. Therefore, cobalt and lithium were not retained as

human health COPIs in surface water for further evaluation and are not expected to pose a risk to human health.

4.2.3 Ecological Screening

Surface water screening values for aquatic ecological receptors were selected from the following order of hierarchy for the COPIs:

- Chronic freshwater Georgia ISWQC (EPD, 2022b), when available.
- USEPA Region 4 chronic freshwater screening levels (USEPA, 2018).
- If site-specific surface water background concentrations were greater than the criteria described above, then the site-specific surface water background concentration is used as the screening level. The background concentrations were less than the screening levels described above.

Because cobalt and lithium do not have chronic freshwater Georgia ISWQC for ecological receptors (EPD, 2022b), the USEPA Region 4 chronic freshwater screening levels for total concentrations (USEPA, 2018) were used in the surface water ecological screening for aquatic ecological receptors.

The ecological surface water screening levels for cobalt (0.019 mg/L) and lithium (0.44 mg/L) were compared to the maximum detected concentrations of cobalt and lithium in surface water from two exposure units, as shown in **Table 5**. Cobalt and lithium were detected in surface water at concentrations at least two orders of magnitude lower than below their respective ecological screening criteria in Beaverdam Creek and the Ocmulgee River. Lithium was not detected in surface water samples from the Ocmulgee River. Therefore, cobalt and lithium were not retained as ecological COPIs in surface water for further evaluation and are not expected to pose a risk to ecological receptors.

4.2.4 Refined Groundwater and Surface Water Risk Evaluation Summary and Conclusions

Detections of cobalt and lithium in piezometer ARAMW-7 were reported at concentrations above their respective groundwater screening values. The results of the refined groundwater and surface water risk evaluations indicate the following:

 Cobalt and lithium were identified as groundwater COIs for hypothetical off-site residential receptors and were evaluated further in the downgradient surface water bodies (i.e., Beaverdam Creek and the Ocmulgee River) for potential exposure to human and ecological receptors.

• Surface water concentrations of cobalt and lithium in Beaverdam Creek and the Ocmulgee River were well below respective health-protective screening criteria for human and ecological receptors. Therefore, cobalt and lithium were not retained as COPIs in surface water for further evaluation and are not expected to pose a risk to human health or ecological receptors.

Based on the multiple lines of evidence and various conservative assumptions, further risk evaluation for groundwater or surface water 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 risk standards and methodologies approved by the Georgia EPD, the Type 2 standards were selected for the residential screening criteria. Selection of the screening criteria per standard practice for risk assessment within the State of Georgia is considered appropriate for risk quantification for AP-2. 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."
- The screening criteria for cobalt and lithium are based on the RRSs, which represent the reasonable maximum exposure (RME). 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). 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 UCL), and therefore, potential exposures are likely overestimated.

Exposure Uncertainties:

- The maximum detected concentration of the SSL-related constituents was compared to conservative screening criteria to identify 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 and used

in the screening process, contributions to exposure and risk were assumed to be entirely CCR-related and natural background sources were not quantified. Thus, SSL-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-2. 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, overestimating 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.
- Multiple well surveys (NewFields, 2020; Jacobs, 2022; Stantec, 2023b) have been conducted and consisted of reviewing federal, state, and county records and online sources, in addition to conducting windshield surveys of the area. WSP relied on the data collected by Jacobs, NewFields, and Stantec.

According to according to the numerous surveys, no surface water intakes have been identified for public water supplies within three miles of the site.

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 do not appear to change the conclusions of the risk evaluation because the closest private wells to AP-2 are south of the site and Beaverdam Creek, which represents a localized hydraulic discharge boundary for groundwater flow in the upper aquifer from the area.

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

es. Therefore, a adverse effect.	screening le	evel exceeda	nce does no	t necess

6 CONCLUSIONS

This human health and ecological risk evaluation for cobalt and lithium in groundwater at AP-2 and the downgradient surface water bodies, Beaverdam Creek and the Ocmulgee River, was conducted using methods consistent with Georgia EPD and USEPA guidance and included multiple conservative assumptions. Based on this risk evaluation, cobalt and lithium are not expected to pose a risk to human health or the environment.

Accordingly, no further risk evaluation for groundwater or surface water is warranted. Compliance monitoring for AP-2 under the State CCR Rule will continue. Georgia Power will proactively evaluate the data and update this evaluation, if necessary.

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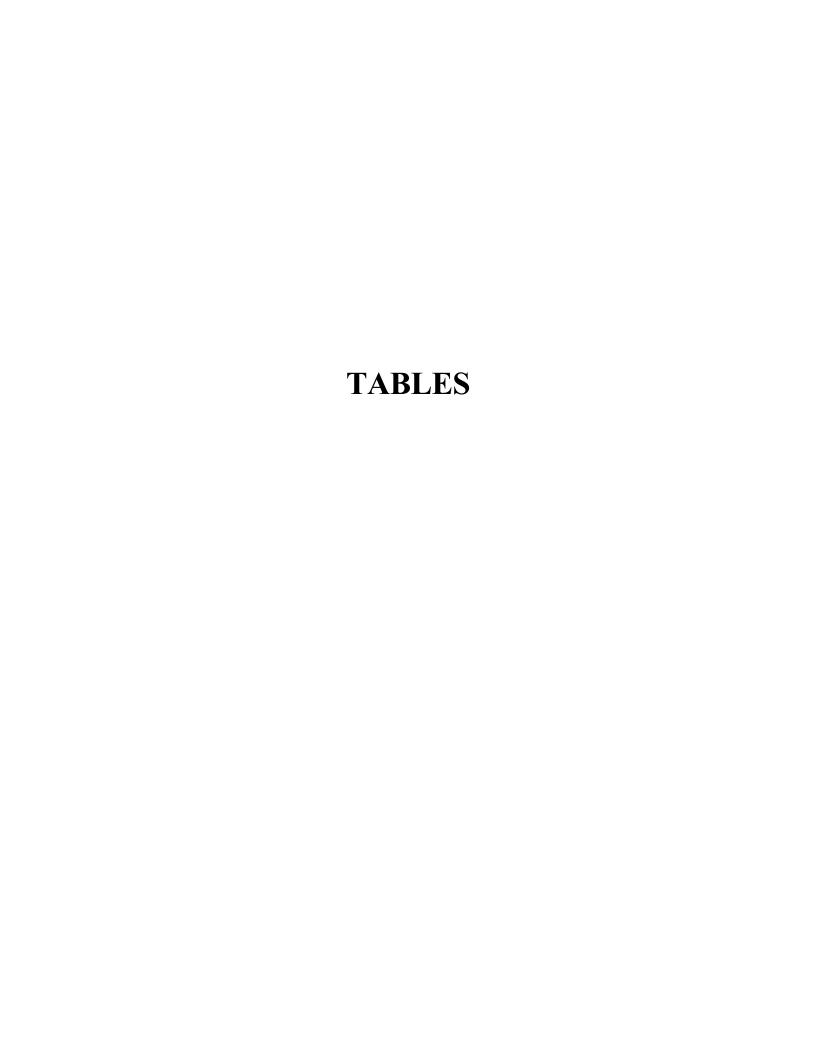


Table 1 SSL-Related Constituent Groundwater Screening Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

CCR Rule Designation	Constituent	CAS No.	Detection Frequency ^[1]	Exceedance Frequency ^[2]	Maximum Concentration (mg/L)	Screening Level (mg/L)	Source	Site-Specific Background (mg/L)	COPI? (Y/N)	Rationale ^[3]
Appendix IV	Cobalt	7440-48-4	7 / 7	7 / 7	0.077	0.006	Type 2 RRS ^[4]	0.0010	Υ	ASL
	Lithium	7439-93-2	7 / 7	7 / 7	0.068	0.040	Type 2 RRS ^[4]	0.013	Υ	ASL

Notes:

- [1] Evaluation includes November 2020 to August 2023 groundwater analytical data from downgradient well ARAMW-7 (cobalt & lithium).
- [2] Exceedance frequency is for the specific constituent that exceeds the first screening value in the hierarchy of screening values.
- [3] Rationale for classification of constituent as a COPI or exclusion as a COPI:
 - ASL = Above respective screening level
 - BSL = Equal to or below respective screening level
- [4] The Type 2 RRSs and site-specific screening levels are calculated by the EPA RSL calculator with exposure factors inputs from HSRA Appendix III, Table 3.

Definitions:

CAS = Chemical Abstract Service

CCR = Coal Combustion Residuals

COPI = Constituent of Potential Interest

EPA = United States Environmental Protection Agency

RRS = Risk Reduction Standard

mg/L = milligrams per Liter

Prepared by/Date: LO 11/03/23

Checked by/Date: IMR 11/07/23

Prepared by/Date: <u>LO 11/20/23</u> Checked by/Date: <u>JHG 11/28/23</u>

Table 2 Groundwater Exposure Point Concentration Summary Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

Exposure Unit	CCR Rule Designation	Constituent	CAS No.	Detection Frequency	Maximum Concentration	95% UCL	Recommended UCL Method	Selected EPC ^[1]
	3 3			- 1	(mg/L)	(mg/L)		(mg/L)
AP-2	Appendix IV	Cobalt	7440-48-4	24 / 24	0.077	0.035	95% Adjusted Gamma UCL	0.035
		Lithium	7439-93-2	24 / 24	0.068	0.044	95% H-UCL	0.044

Notes:

[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. For further detail on the selected EPC, refer to Appendix D.

Definitions:

CAS = Chemical Abstract Service

CCR = Coal Combustion Residuals

mg/L = milligrams per liter

95% UCL = 95 percent upper confidence limit

EPC = Exposure Point Concentration

Table 3 Downgradient Groundwater Refined Evaluation Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

Exposure Unit	CCR Rule Designation	Constituent	CAS No.	Detection Frequency	Exceedance Frequency ^[1]	Selected EPC ^[2] (mg/L)	Screening Level (mg/L)	Source	Site-Specific Background (mg/L)	COI? (Y/N)	Rationale ^[3]
AP-2	Appendix IV	Cobalt	7440-48-4	24 / 24	13 / 24	0.035	0.0060	Type 2 RRS ^[4]	0.0010	Υ	ASL
		Lithium	7439-93-2	24 / 24	7 / 24	0.044	0.040	Type 2 RRS ^[4]	0.013	Υ	ASL

Notes:

[1] The exceedance frequency is based on the number of samples with detected concentrations that exceed the identified screening level.

[2] 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.

For further detail on the selected EPC, refer to Appendix D.

[3] Rationale for classification of constituent as a COI or exclusion as a COI:

ASL = Above respective screening level

BSL = Equal to or below respective screening level

[4] The Type 2 RRSs are calculated by the EPA RSL calculator with exposure factors inputs from HSRA Appendix III, Table 3.

Definitions:

CAS = Chemical Abstract Service

CCR = Coal Combustion Residuals

COI = Constituent of Interest

mg/L = milligrams per liter

EPC = Exposure Point Concentration

Prepared by/Date: <u>LO 11/20/23</u> Checked by/Date: <u>JHG 11/28/23</u>

Table 4 Human Health Surface Water Screening - Beaverdam Creek and Ocmulgee River^[1] Arkwright AP-2 Risk Evaluation Report Arkwright AP-2

CCR Rule Designation	Constituents	CAS No.	Exposure Unit	Sample Locations	Detection Frequency	Exceedance Frequency ^[2]	Maximum Concentration (mg/L)	Screening Level (mg/L)	Source ^[3]	Site-Specific Background ^[4] (mg/L)	COPI? (Y/N)	Rationale ^[5]
	Cobalt	7440-48-4	Beaverdam Creek	BC-0.5.7, BC-0.5.6, BC-0.5.5,	19 / 37	0 / 37	0.0008 J	0.0060	Type 2 RRS ^[6]	0.00057 J	N	BSL
Appendix IV	Lithium	7439-93-2	Beaverdam Creek	BC-BR, BC-0.3, and BC-0.1	4 / 33	0 / 33	0.0015 J	0.040	Type 2 RRS ^[6]	0.0011 J	N	BSL
Appelluix IV	Cobalt	7440-48-4	Ocmulgee River	OR-0.3, OR-0.1, OR+0.25,	4 / 13	0 / 13	0.00018 J	0.0060	Type 2 RRS ^[6]	< 0.00039	N	BSL
	Lithium	7439-93-2	Ochluigee River	OR+1.0	0 / 13	0 / 13	< 0.0034	0.040	Type 2 RRS ^[b]	< 0.00073	N	BSL

Notes

- [1] Surface water evaluation includes data collected from November 2020 to October 2023 from the locations presented in Figure 9.
- [2] Selected exceedance frequency is for the specific constituent that exceeds the first screening value in the hierarchy of screening values.
 - The hierarchy of screening values is GA ISWQC > NRWQC > The maximum between the Type 1 and Type 2 RRS
 - For sites with site-specific background concentrations greater than all applicable screening values, the site-specific background value was used as the screening value.
- [3] The residential groundwater screening levels were used because no human health surface water screening levels were available. The use of drinking water screening levels for surface water exposure is a conservative approach as domestic use of Beaverdam Creek and Ocmulgee River surface water for human receptors is an incomplete exposure pathway.
- [4] The following surface water sample locations represent the site-specific background (maximum or non-detect) for the respective surface water bodies.

Beaverdam Creek: BC-0.8a (located upstream of AP-2 and the confluence of Beaverdam Creek Tributary and Beaverdam Creek)

Ocmulgee River: OR-0.8 (located upstream of AP-1 and Plant Arkwright)

[5] Rationale for classification of constituent as a COPI or exclusion as a COPI:

ASL = Above respective screening level;

BSL = Equal to or below respective screening level;

[6] The Type 2 RRS were calculated by the EPA RSL calculator using residential exposure factor inputs from HSRA Appendix III, Table 3.

Definitions:

J = Estimated value less than the reporting limit but greater than the method detection limit

CAS = Chemical Abstract Service

CCR = Coal Combustion Residuals

GA ISWQC = Georgia Instream Water Quality Criteria

NRWQC = National Recommended Water Quality Criteria

RRS = Risk Reduction Standard

Prepared by/Date: LO 11/20/23

Checked by/Date: IMR 11/20/23

Table 5 Ecological Fresh Surface Water Screening - Beaverdam Creek and Ocmulgee River [1] Arkwright AP-2 Risk Evaluation Report Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

CCR Rule Designation	Constituents	CAS No.	Exposure Unit	Sample Locations	Detection Frequency	Exceedance Frequency ^[2]	Maximum Concentration (mg/L)	Screening Value (mg/L) (Total)	Hardness Dependent? (Y/N)	Source	Site-Specific Background ^[3] (mg/L)	COPI (Y/N)	Rationale ^[4]
	Cobalt	7440-48-4	Beaverdam Creek	BC-0.5.7, BC-0.5.6, BC-0.5.5,	19 / 37	0 / 37	0.0008 J	0.019	N	EPA Reg. 4	0.00057 J	N	BSL
A none or div IV	Lithium	7439-93-2	beaverdam Creek	BC-BR, BC-0.3, and BC-0.1	4 / 33	0 / 33	0.0015 J	0.44	N	EPA Reg. 4	0.0011 J	N	BSL
Appendix IV	Cobalt	7440-48-4	Ocmulgee River	OR-0.3, OR-0.1, OR+0.25,	4 / 13	0 / 13	0.00018 J	0.019	N	EPA Reg. 4	< 0.00039	N	BSL
	Lithium	7439-93-2	Octhulgee River	OR+1.0	0 / 13	0 / 13	< 0.0034	0.44	N	EPA Reg. 4	< 0.00073	N	BSL

Notes

- [1] Surface water evaluation includes data collected from November 2020 to October 2023 from the locations presented in Figure 9.
- [2] Exceedance frequency is for the specific constituent that exceeds the first screening value in the hierarchy of screening values.
 - The hierarchy of screening value sources is GA ISWQC > EPA Region 4
 - For sites with site-specific background concentrations greater than all applicable screening values, the site-specific background value will be used as the screening value
- [3] The following surface water sample locations represent the site-specific background (maximum or non-detect) for the respective surface water bodies.

Beaverdam Creek: BC-0.8a (located upstream of AP-2 and the confluence of Beaverdam Creek Tributary and Beaverdam Creek)

Ocmulgee River: OR-0.8 (located upstream of AP-1 and Plant Arkwright)

[4] Rationale for classification of constituent as a COPI or exclusion as a COPI:

ASL = Above respective screening level;

BSL = Equal to or below respective screening level.

Definitions:

J = Estimated value less than the reporting limit but greater than the method detection limit

CAS = Chemical Abstract Service

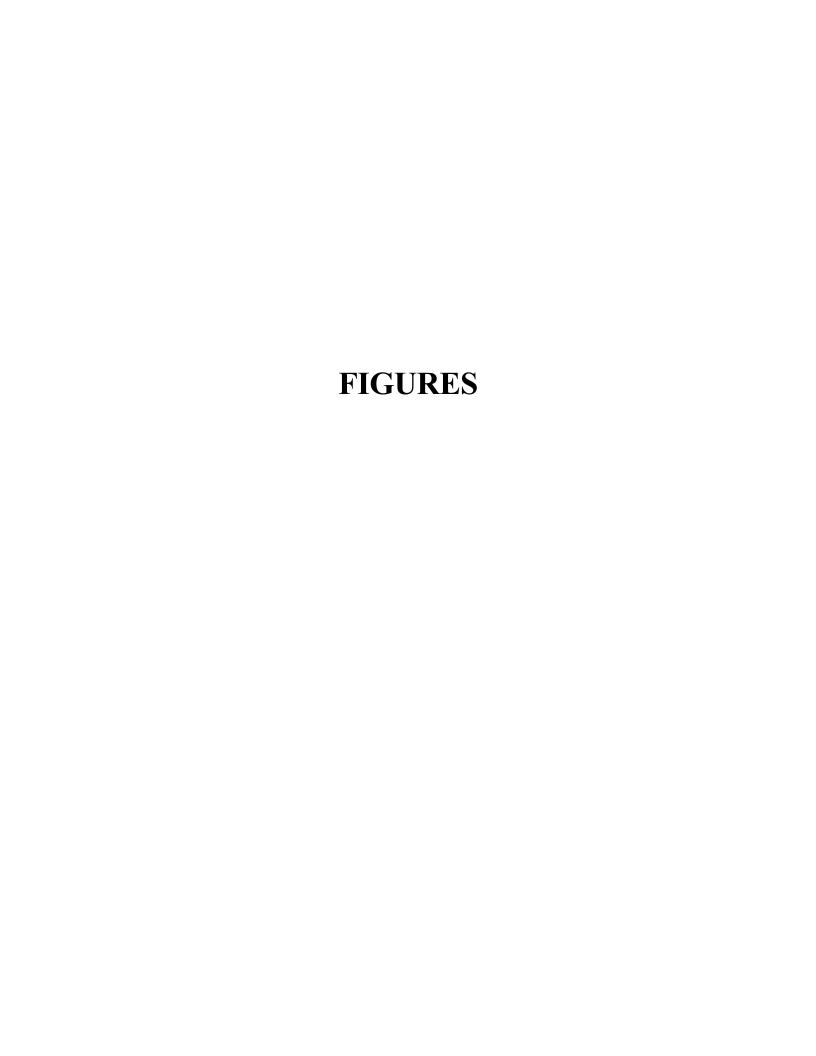
CCR = Coal Combustion Residuals

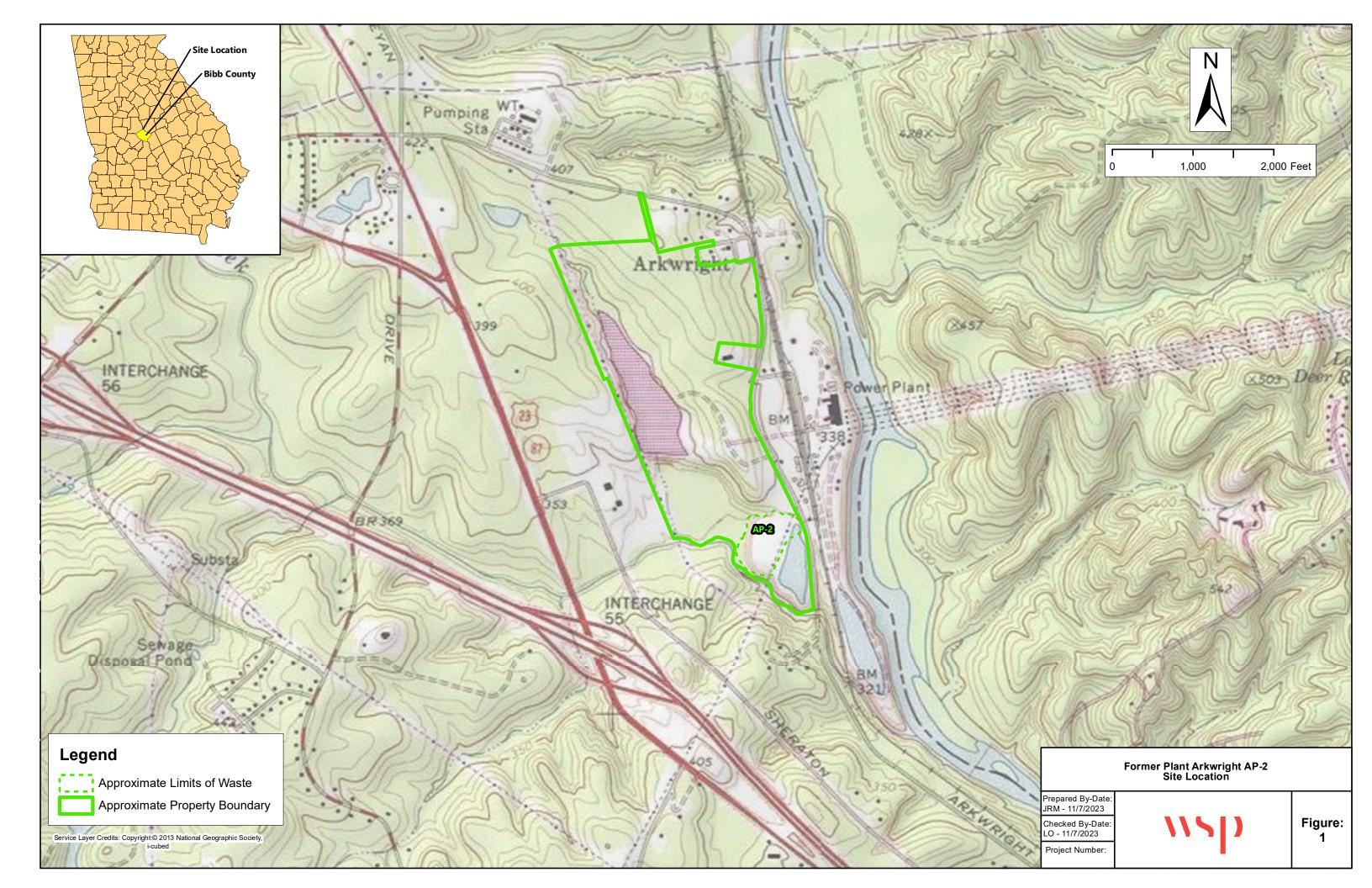
COPI = Constituent of Potential Concern

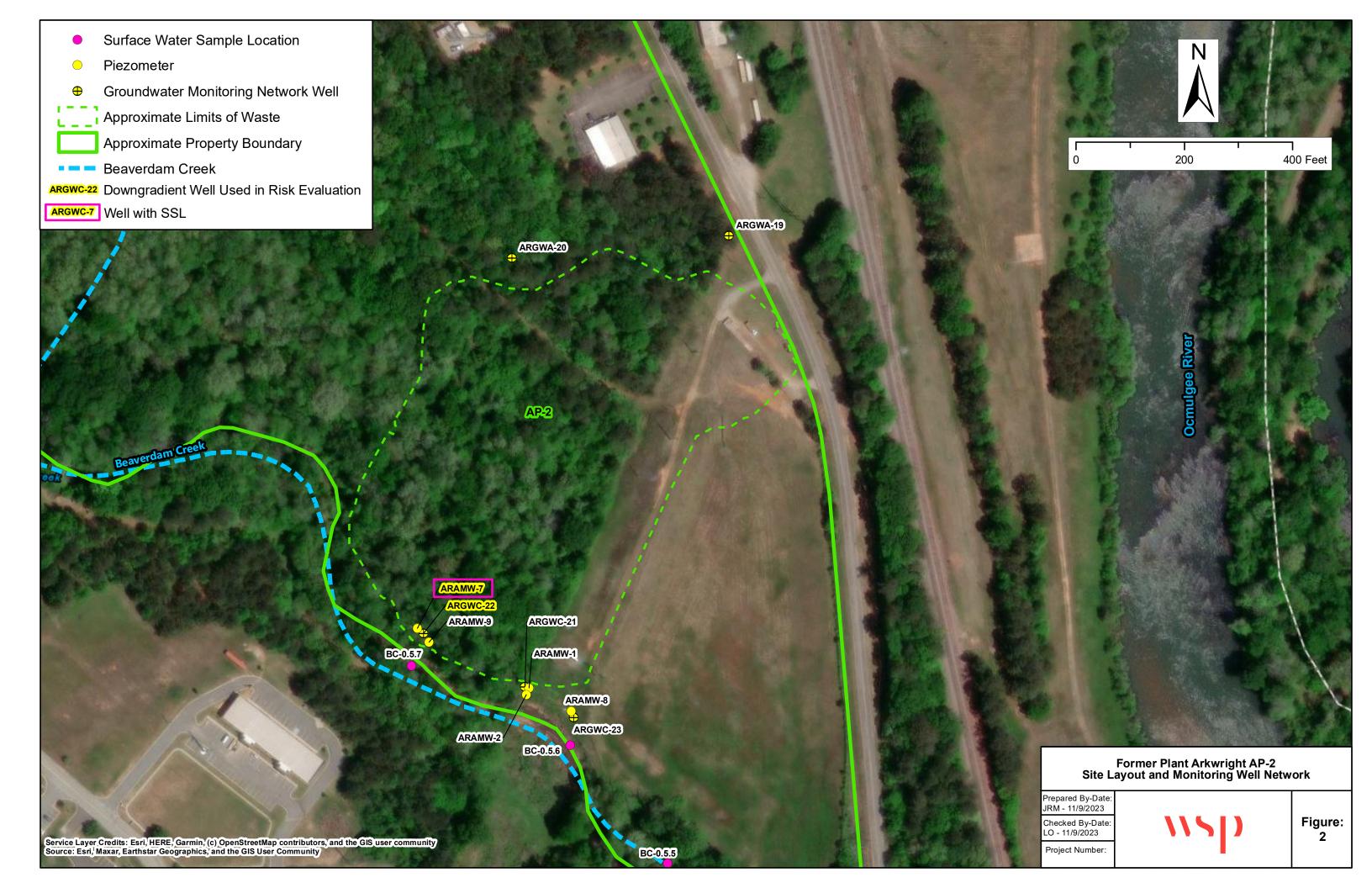
EPA = United States Environmental Protection Agency

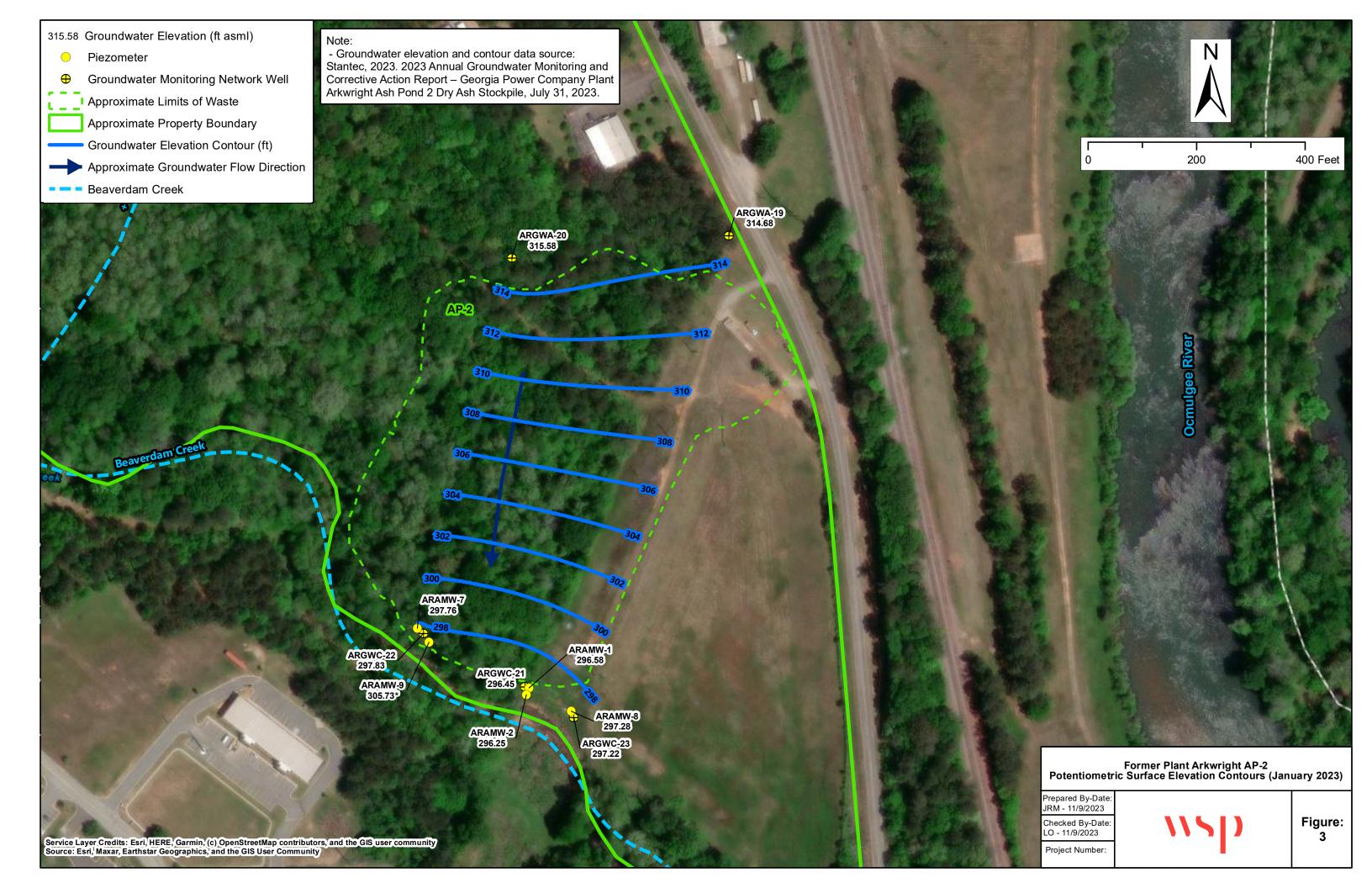
GA ISWQC = Georgia Instream Water Quality Criteria

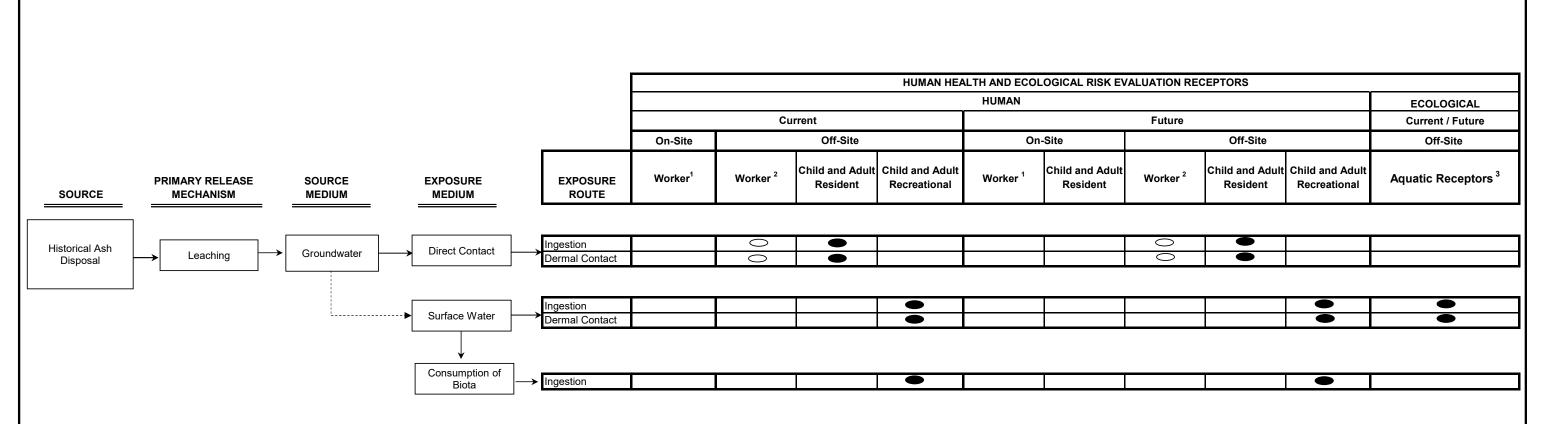
Prepared by/Date: <u>LO 11/20/23</u> Checked by/Date: <u>IMR 11/20/23</u>











Legend

A conservative assumption for this assessment was made that groundwater from the site flows to the downgradient surface water.

Indicates potentially complete pathway, which is evaluated quantitatively.

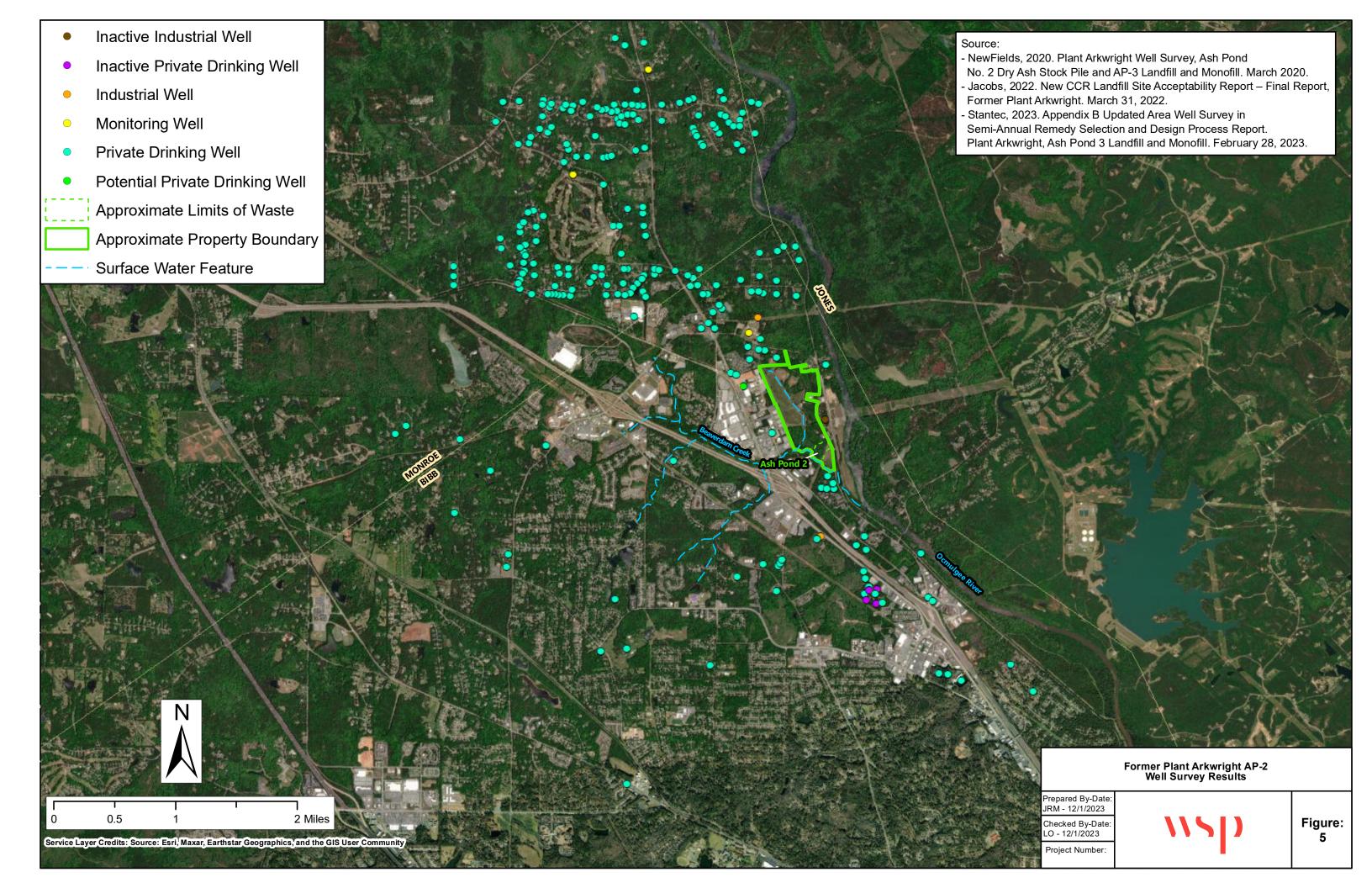
Indicates potentially complete pathway, which is evaluated qualitatively.

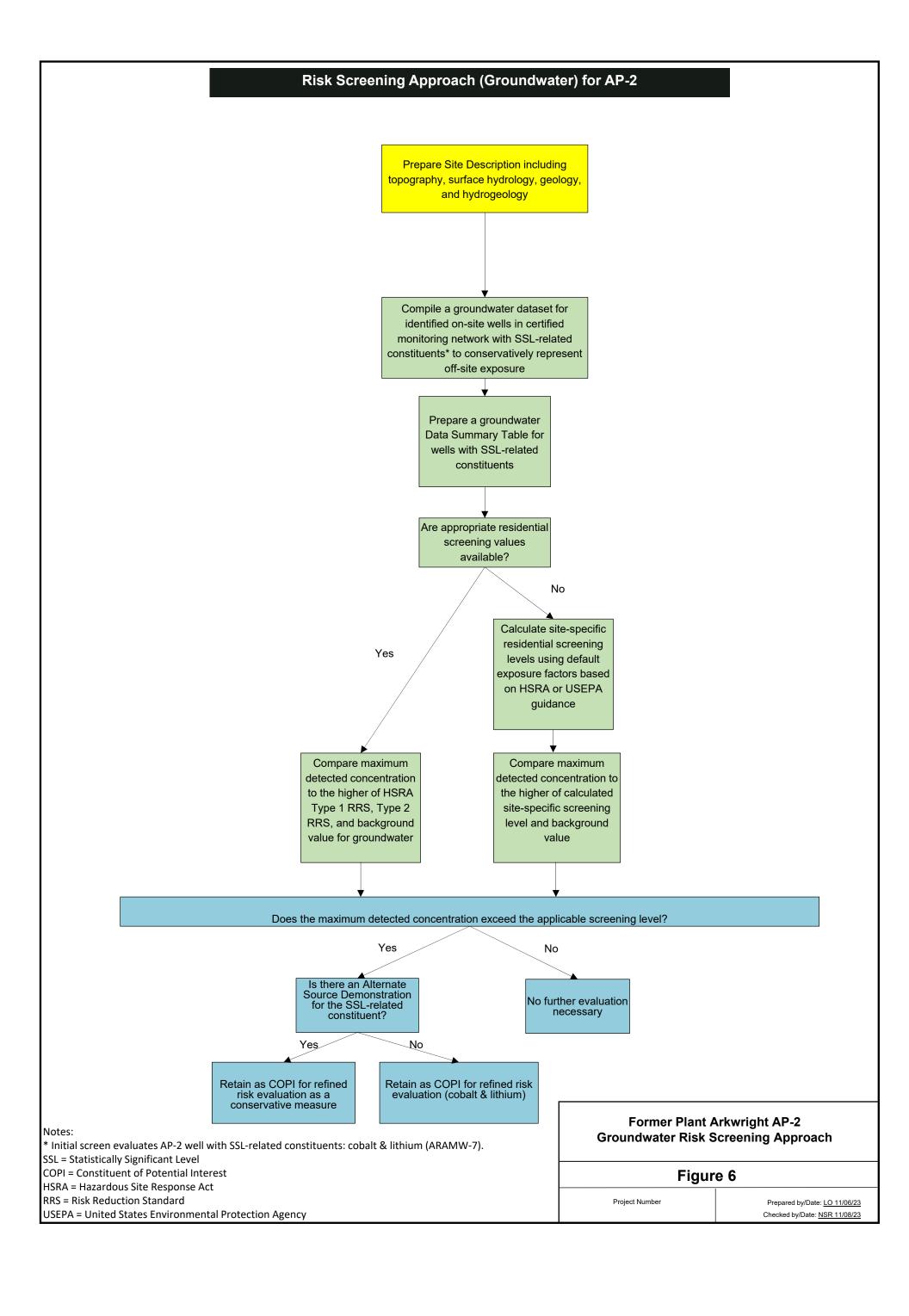
Footnotes

- 1. Industrial worker was considered incomplete 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.

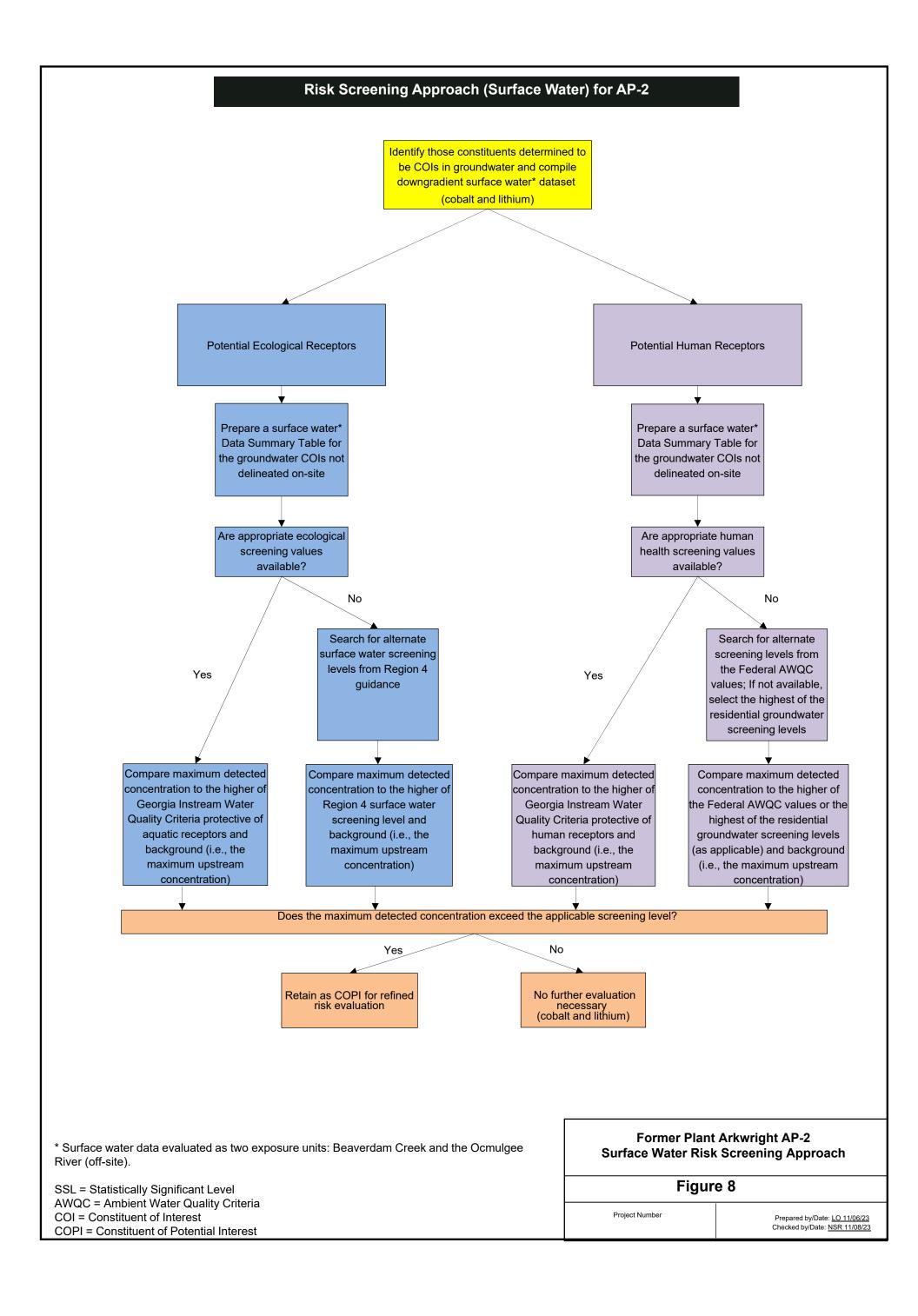
Former Plant Arkwright AP-2 Conceptual Exposure Model Figure 4 Project Number

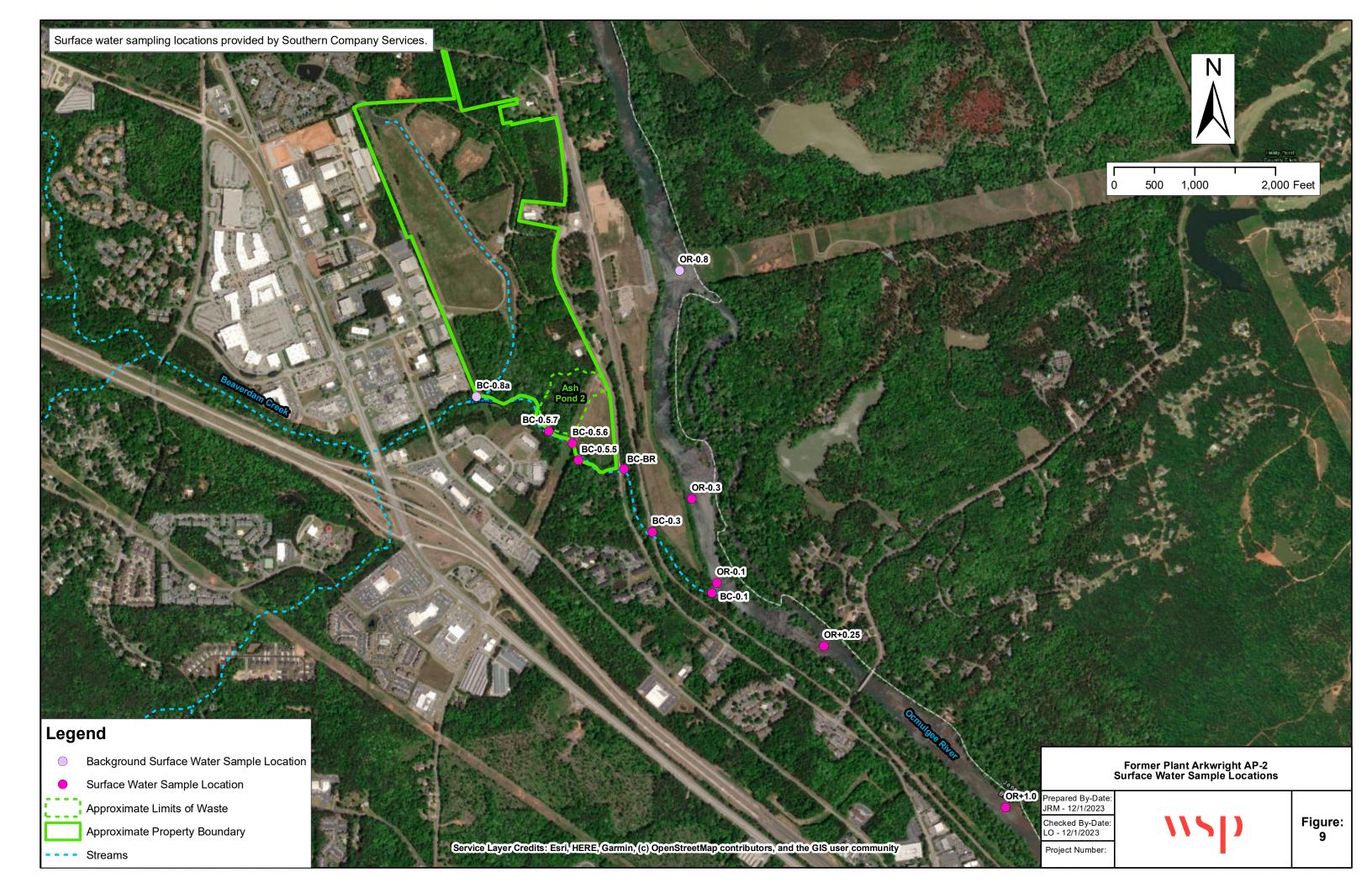
Prepared by/Date: LO 11/06/23 Checked by/Date: NSR 11/08/23





Approach for Refined Risk Evaluation (Groundwater) for AP-2 Identify COPIs in groundwater from initial screen of SSL-related constituents (cobalt & lithium) Compile groundwater dataset for each COPI using: 1) the well identified with SSL-related constituents; 2) combine well with SSL-related constituent with wells/piezometers in the same hydrologically downgradient direction; and 3) refine to the farthest hydrologically downgradient wells/piezometers only Prepare a ProUCL Input file for the identified COPIs and selected datasets Calculate and compare the 95 UCL to the screening level* and generate concentration trend graph for each well with SSLrelated constituent and COPI Does the EPC exceed the applicable screening level? Yes No Further evaluation No further evaluation necessary; retain as COI necessary (cobalt and lithium) Potential for migration to off-site receptors (i.e., surface water) Yes No Recommendations may Evaluate the presence of the include additional data COI in surface water collection (i.e., additional (cobalt and lithium) monitoring or well installation) Former Plant Arkwright AP-2 Notes: Approach for Refined Groundwater Risk *If the 95 UCL exceeds the maximum concentration, use the maximum as the EPC. **Evaluation** SSL = Statistically Significant Level COPI = Constituent of Potential Interest Figure 7 EPC = Exposure Point Concentration UCL = Upper Confidence Limit Project Number Prepared by/Date: LO 11/06/23 Checked by/Date: NSR 11/08/23 COI = Constituent of Interest





APPENDIX A Plant Arkwright Well Survey



Well Survey

Plant Arkwright

Ash Pond No. 2 Dry Ash Stock Pile and AP-3 Landfill and Monofill

Macon, 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 Arkwright is located along the Ocmulgee River approximately six miles northwest of Macon, Ga. Plant Arkwright ceased electricity generation in 2002.

Newfields conducted a well survey of potential drinking water wells within a three-mile radius of the two CCR Units at Plant Arkwright: Ash Pond No. 2 Dry Ash Stock Pile (AP-2DAS) and AP-3 Landfill and Monofill (AP-3 Landfill). Both units received a closure certificate in 2010. 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 a USGS-affiliated program for ground-water levels and/or water quality parameters at any time in the past. Well information and coordinates were downloaded for the state of Georgia and compiled into the GIS database. The wells in the Investigated Area in the USGS database included several that are labelled 'monitoring wells' and one labelled 'private drinking'. Many of the monitoring wells appear to be co-located with drinking water wells and 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.
- 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 Investigated Area is supplied primarily by the Macon Water Authority. Monroe and Jones counties have much smaller municipal water systems.

2. State Sources

- 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 21st, 2019 requesting information about wells in the Investigated Area. Mr. Gillis confirmed that there are no public wells in the Investigated Area.

¹ http://waterdata.usgs.gov/ga/nwis/inventory?introduction



- ii. Hazardous Site Inventory (HSI) files. EPD maintains the Hazardous Site Inventory files for sites which are undergoing state-led corrective action. These files usually contain groundwater data and well surveys. There are no HSI sites within the Investigated Area.
- iii. 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 Bibb, Jones, and Monroe Counties and identified a previous well survey conducted in 2003. The survey identified a public well at what is now the Brickyard Golf Course (approximately 2.25 miles to the northwest of AP-2DAS and AP-3 Landfill) that was active in 2003. NewFields determined that well is now inactive based on the results of the EPD search. The 2003 well survey also identified both active and inactive private wells, active industrial wells on the other side of Arkwright Road to the north of AP-2DAS and AP-3 Landfill, and an inactive industrial well at the former Stewart McElreath Lumber property. These were added to the database as inactive public or industrial wells.
- b. Agricultural and Environmental Services Laboratory (AESL) records. The University of Georgia's AESL Laboratory tests drinking water samples submitted by private individuals to their local county extension service. Maps of these sampling results can be viewed online.² Precise coordinates are not available, but NewFields was able to use online images to find approximate locations. For many of these points, the well appears to be located in the roadway and could not be placed on a real estate parcel.
- c. **State Department of Public Health (DPH).** During July 2012 and January 2013, the Department of Public Health, DPH tested 64 wells in Monroe County as part of an assessment of uranium and radionuclides in the area. Street addresses of the wells sampled were obtained from the DPH with an Open Records Request.
- 3. County and Local Sources
 - a. Health Department Records. The Macon-Bibb County Health Department County maintains records of known private wells within the County. NewFields provided the Health Department the coordinates of the plant and requested a search of a three-mile radius. The Health Department responded with a list of known private drinking water wells. NewFields also contacted the Monroe County Health Department to search septic permits, which typically indicate the water source for each property. Monroe County would not grant NewFields access to the septic permits.

² http://aesl.ces.uga.edu/water/map/



- b. Water Departments. NewFields contacted the Macon Water Authority, which provided a shapefile of waterlines within Bibb County, including the dates of construction. Waterlines began to be constructed as far back as 1922, with most of the lines in the Investigated Area constructed in the 1970s. NewFields also contacted the Monroe County Water System, who indicated that their public water infrastructure does not extend into the Monroe County portion of the Investigated Area. Jones County Water stated that the River North area of the county, the neighborhood across the Ocmulgee River from Plant Arkwright, has public water.
- c. Tax Assessor Records. NewFields contacted the Middle Georgia Regional Commission and obtained parcel shapefiles and parcel improvement data dated January 2019 for Monroe County. The parcel data for Monroe County includes information about the water source for each parcel, and the majority of parcels in the Monroe County portion of the Investigated Area are identified as having a private well.

Parcel shapefiles and parcel improvement data from Bibb County, current as of July 2019, were available for download from the Internet. Parcel shapes for Jones County were downloaded from the county website. Due to the high cost and relatively small number of relevant parcels, the parcel improvement data for Jones County was not acquired.

4. Windshield Surveys

A windshield survey of the area was conducted on November 15, 2019. During the survey wells were visually identified and compiled into the GIS database. The majority of these wells were located near residences. The windshield survey could not be conducted in the area across the Ocmulgee River in Jones County, as the entire area is part of a gated community.

Summary

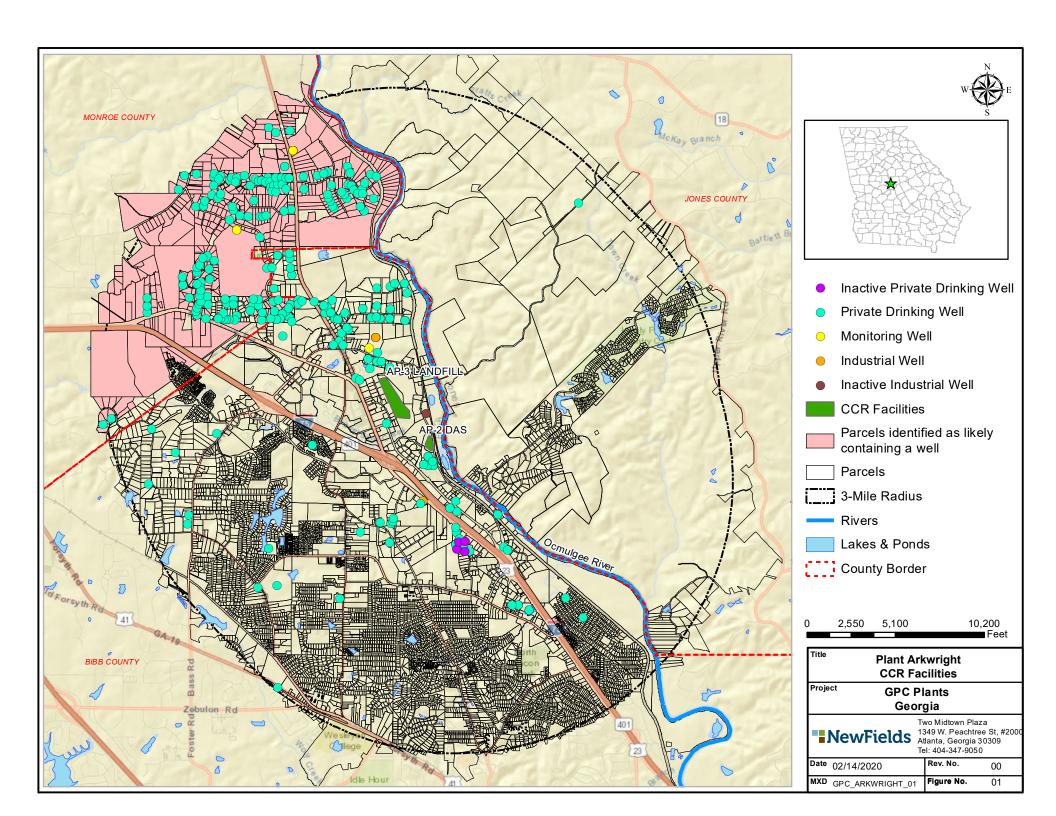
Municipal water from the Macon Water Authority is widely available throughout the Bibb County portion of the Investigated Area. Some water lines dates as far back as 1922, with the majority of the water lines around the plant being built in the 1970s, when the nearby homes were constructed. Municipal water is not available in the Monroe County part of the Investigated Area. The River North community, which constitutes the residential parcels in the Jones County portion of the Investigated Area (east of the Ocmulgee River), are all served by public water. There are no active public wells in the Investigated Area.

Combining well data from all sources with parcel data, NewFields identified 639 total parcels likely to be associated with an active or inactive private well within the Investigated Area. Of these, 515 were identified using parcel data. During the windshield survey, 127 wells were visually identified. Fifty-nine (59) parcels were identified by the Macon-Bibb County Health Department, and 7 parcels by the state Department of Public Health. Fifty-nine (59) wells were shown on a 2003 well survey found in non-HSI files, 40 wells were identified by UGA's AESL sampling program, and 7 wells were in the USGS database (including 3 on one parcel). Most wells were identified by multiple sources.

PLANT ARKWRIGHT WELL SURVEY

Figure 1 shows points for identified wells and shades parcels that were identified from parcel data as likely to contain wells. When viewed as a PDF file, the figure is interactive.





APPENDIX B Data Used in Risk Evaluation

APPENDIX B-1 Groundwater Data

Appendix B-1
Site Groundwater Data for Evaluation of SSLs¹
Arkwright AP-2 Risk Evaluation Report
Arkwright AP-2
Former Plant Arkwright, Bibb County, GA

Well	Date	CAS	Constituent	Units	Result	Flags	MDL	PQL
ARAMW-7	11/30/20	7440-48-4	Cobalt	mg/L	0.028		0.00013	0.0025
ARAMW-7	02/11/21	7440-48-4	Cobalt	mg/L	0.017		0.00013	0.0025
ARAMW-7	09/10/21	7440-48-4	Cobalt	mg/L	0.075		0.00013	0.0025
ARAMW-7	02/02/22	7440-48-4	Cobalt	mg/L	0.077		0.00026	0.0025
ARAMW-7	09/07/22	7440-48-4	Cobalt	mg/L	0.074		0.00030	0.0010
ARAMW-7	01/31/23	7440-48-4	Cobalt	mg/L	0.069		0.00030	0.0010
ARAMW-7	08/08/23	7440-48-4	Cobalt	mg/L	0.061		0.00030	0.0010
ARGWC-22	12/16/19	7440-48-4	Cobalt	mg/L	0.018		0.000075	0.00050
ARGWC-22	01/14/20	7440-48-4	Cobalt	mg/L	0.0072		0.00013	0.00050
ARGWC-22	02/11/20	7440-48-4	Cobalt	mg/L	0.013		0.00013	0.00050
ARGWC-22	03/09/20	7440-48-4	Cobalt	mg/L	0.015		0.00013	0.0025
ARGWC-22	04/07/20	7440-48-4	Cobalt	mg/L	0.0090		0.00013	0.00050
ARGWC-22	05/27/20	7440-48-4	Cobalt	mg/L	0.0059		0.00013	0.0025
ARGWC-22	06/24/20	7440-48-4	Cobalt	mg/L	0.0047		0.00013	0.0025
ARGWC-22	07/15/20	7440-48-4	Cobalt	mg/L	0.0027		0.00013	0.0025
ARGWC-22	08/19/20	7440-48-4	Cobalt	mg/L	0.0032		0.00013	0.0025
ARGWC-22	09/22/20	7440-48-4	Cobalt	mg/L	0.0085		0.00013	0.00050
ARGWC-22	09/30/20	7440-48-4	Cobalt	mg/L	0.0055		0.00013	0.0025
ARGWC-22	02/10/21	7440-48-4	Cobalt	mg/L	0.0015	J	0.00013	0.0025
ARGWC-22	09/10/21	7440-48-4	Cobalt	mg/L	0.0015	J	0.00013	0.0025
ARGWC-22	02/02/22	7440-48-4	Cobalt	mg/L	0.0010	J	0.00026	0.0025
ARGWC-22	09/06/22	7440-48-4	Cobalt	mg/L	0.0020		0.00030	0.0010
ARGWC-22	01/31/23	7440-48-4	Cobalt	mg/L	0.0015		0.00030	0.0010
ARGWC-22	08/08/23	7440-48-4	Cobalt	mg/L	0.0018		0.00030	0.0010
ARAMW-7	11/30/20	7439-93-2	Lithium	mg/L	0.061		0.0034	0.0050
ARAMW-7	02/11/21	7439-93-2	Lithium	mg/L	0.061		0.0034	0.0050
ARAMW-7	09/10/21	7439-93-2	Lithium	mg/L	0.060		0.0034	0.0050
ARAMW-7	02/02/22	7439-93-2	Lithium	mg/L	0.060		0.00083	0.0050
ARAMW-7	09/07/22	7439-93-2	Lithium	mg/L	0.063		0.0030	0.010
ARAMW-7	01/31/23	7439-93-2	Lithium	mg/L	0.068		0.0030	0.010
ARAMW-7	08/08/23	7439-93-2	Lithium	mg/L	0.058		0.0030	0.010
ARGWC-22	12/16/19	7439-93-2	Lithium	mg/L	0.027		0.0034	0.0050
ARGWC-22	01/14/20	7439-93-2	Lithium	mg/L	0.034		0.0034	0.0050
ARGWC-22	02/11/20	7439-93-2	Lithium	mg/L	0.010		0.0034	0.0050
ARGWC-22	03/09/20	7439-93-2	Lithium	mg/L	0.0071		0.0034	0.0050
ARGWC-22	04/07/20	7439-93-2	Lithium	mg/L	0.012		0.0034	0.0050
ARGWC-22	05/27/20	7439-93-2	Lithium	mg/L	0.017		0.0034	0.0050
ARGWC-22	06/24/20	7439-93-2	Lithium	mg/L	0.023		0.0034	0.0050
ARGWC-22	07/15/20	7439-93-2	Lithium	mg/L	0.021		0.0034	0.0050
ARGWC-22	08/19/20	7439-93-2	Lithium	mg/L	0.026		0.0034	0.0050

Appendix B-1 Site Groundwater Data for Evaluation of SSLs¹ Arkwright AP-2 Risk Evaluation Report Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

Well	Date	CAS	Constituent	Units	Result	Flags	MDL	PQL
ARGWC-22	09/22/20	7439-93-2	Lithium	mg/L	0.014		0.0034	0.0050
ARGWC-22	09/30/20	7439-93-2	Lithium	mg/L	0.014		0.0034	0.0050
ARGWC-22	02/10/21	7439-93-2	Lithium	mg/L	0.022		0.0034	0.0050
ARGWC-22	09/10/21	7439-93-2	Lithium	mg/L	0.021		0.0034	0.0050
ARGWC-22	02/02/22	7439-93-2	Lithium	mg/L	0.020		0.00083	0.0050
ARGWC-22	09/06/22	7439-93-2	Lithium	mg/L	0.014		0.0030	0.010
ARGWC-22	01/31/23	7439-93-2	Lithium	mg/L	0.028		0.0030	0.010
ARGWC-22	08/08/23	7439-93-2	Lithium	mg/L	0.028		0.0030	0.010

Notes:

1) Highlighted rows indicate constituent identified in the well at a statistically significant level (SSL).

J - indicates an estimated value; the substance was detected between the laboratory MDL and PQL

MDL - method detection limit

mg/L - milligrams per liter

n/a - not available

U - not detected above the laboratory MDL

PQL - practical quantitation limit

Prepared by/Date: <u>LO 11/09/23</u> Checked by/Date: <u>IMR 11/09/23</u>

APPENDIX B-2 Surface Water Data

Appendix B-2 Surface Water Data Arkwright AP-2 Risk Evaluation Report Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

Location ID	Sample Location		Date CAS	Constituent		action Result Flags	MDL	RL
BC-0.8a	Beaverdam Creek	Upstream of Beaverdam Creek Tributary Confluence			mg/L T	0.00031 J	0.00013	0.0025
BC-0.8a	Beaverdam Creek	Upstream of Beaverdam Creek Tributary Confluence			mg/L T	0.00057 J	0.00026	0.0025
BC-0.8a	Beaverdam Creek	Upstream of Beaverdam Creek Tributary Confluence			mg/L T	< 0.00039 U	0.00039	0.005
BC-0.8a	Beaverdam Creek	Upstream of Beaverdam Creek Tributary Confluence			mg/L T	< 0.00039 U	0.00039	0.005
BC-0.8a BC-0.5.7	Beaverdam Creek Beaverdam Creek	Upstream of Beaverdam Creek Tributary Confluence Downstream of AP-2			mg/L T	< 0.00039 U	0.00039	0.005
BC-0.5.7 BC-0.5.7	Beaverdam Creek	Downstream of AP-2 Downstream of AP-2			mg/L T mg/L T	0.00056 J 0.00045 J	0.00013 0.00013	0.0025 0.0025
BC-0.5.7 BC-0.5.7	Beaverdam Creek	Downstream of AP-2			ng/L T ng/L T	0.00043 J 0.00071 J	0.00013	0.0025
BC-0.5.7 BC-0.5.7	Beaverdam Creek	Downstream of AP-2			ng/L T	< 0.00071 J	0.00020	0.0023
BC-0.5.7	Beaverdam Creek	Downstream of AP-2			ng/L T	< 0.00039 U	0.00039	0.005
BC-0.5.7	Beaverdam Creek	Downstream of AP-2			ng/L T	< 0.00039 U	0.00039	0.005
BC-0.5.6	Beaverdam Creek	Downstream of AP-2			ng/L T	0.00057 J	0.00013	0.0025
BC-0.5.6	Beaverdam Creek	Downstream of AP-2			ng/L T	0.00033 J	0.00013	0.0025
BC-0.5.6	Beaverdam Creek	Downstream of AP-2			mg/L T	0.0008 J	0.00026	0.0025
BC-0.5.6	Beaverdam Creek	Downstream of AP-2			mg/L T	< 0.00039 U	0.00039	0.005
BC-0.5.6	Beaverdam Creek	Downstream of AP-2	02/09/23 7440-48-4 (mg/L T	< 0.00039 U	0.00039	0.005
BC-0.5.6	Beaverdam Creek	Downstream of AP-2	08/10/23 7440-48-4 0	Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
BC-0.5.5	Beaverdam Creek	Downstream of AP-2	11/03/20 7440-48-4 (Cobalt r	mg/L T	0.00047 J	0.00013	0.0025
BC-0.5.5	Beaverdam Creek	Downstream of AP-2	02/10/21 7440-48-4 (Cobalt r	mg/L T	0.0005 J	0.00013	0.0025
BC-0.5.5	Beaverdam Creek	Downstream of AP-2	09/30/21 7440-48-4 (Cobalt r	mg/L T	0.00056 J	0.00013	0.0025
BC-0.5.5	Beaverdam Creek	Downstream of AP-2	02/02/22 7440-48-4 (Cobalt r	mg/L T	0.00052 J	0.00026	0.0025
BC-0.5.5	Beaverdam Creek	Downstream of AP-2	08/16/22 7440-48-4 (Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
BC-0.5.5	Beaverdam Creek	Downstream of AP-2	02/09/23 7440-48-4 (Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
BC-0.5.5	Beaverdam Creek	Downstream of AP-2			mg/L T	< 0.00039 U	0.00039	0.005
BC-BR	Beaverdam Creek	Downstream of AP-2			mg/L T	0.00048 J	0.00013	0.0025
BC-BR	Beaverdam Creek	Downstream of AP-2			mg/L T	0.00052 J	0.00013	0.0025
BC-BR	Beaverdam Creek	Downstream of AP-2			mg/L T	0.00042 J	0.00013	0.0025
BC-BR	Beaverdam Creek	Downstream of AP-2			mg/L T	0.00061 J	0.00026	0.0025
BC-BR	Beaverdam Creek	Downstream of AP-2			mg/L T	< 0.00039 U	0.00039	0.005
BC-BR	Beaverdam Creek	Downstream of AP-2			mg/L T	< 0.00039 U	0.00039	0.005
BC-BR	Beaverdam Creek	Downstream of AP-2			mg/L T	< 0.00039 U	0.00039	0.005
BC-0.3	Beaverdam Creek	Downstream of AP-2			mg/L T	0.0005 J	0.00013	0.0025
BC-0.3 BC-0.3	Beaverdam Creek	Downstream of AP-2			mg/L T mg/L T	0.00029 J	0.00013 0.00026	0.0025 0.0025
BC-0.3	Beaverdam Creek Beaverdam Creek	Downstream of AP-2 Downstream of AP-2			ng/L T ng/L T	0.00058 J < 0.00039 U	0.00026	0.0023
BC-0.3	Beaverdam Creek	Downstream of AP-2	., ., .		ng/L T	< 0.00039 U	0.00039	0.005
BC-0.3	Beaverdam Creek	Downstream of AP-2			ng/L T	< 0.00039 U	0.00039	0.005
BC-0.3 BC-0.1	Beaverdam Creek	Downstream of AP-2			ng/L T	0.00057 J	0.00033	0.003
BC-0.1	Beaverdam Creek	Downstream of AP-2			ng/L T	0.00037 J	0.00013	0.0025
BC-0.1	Beaverdam Creek	Downstream of AP-2			ng/L T	< 0.00039 U	0.00039	0.005
BC-0.1	Beaverdam Creek	Downstream of AP-2			mg/L T	< 0.00039 U	0.00039	0.005
BC-0.1	Beaverdam Creek	Downstream of AP-2	10/3/2023 7440-48-4 (Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
OR-0.8	Ocmulgee River	Upstream of AP-1 and Site	8/16/2022 7440-48-4	Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
OR-0.8	Ocmulgee River	Upstream of AP-1 and Site	2/9/2023 7440-48-4 (Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
OR-0.8	Ocmulgee River	Upstream of AP-1 and Site	10/3/2023 7440-48-4	Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
OR-0.3	Ocmulgee River	Adjacent to AP-1	9/30/2021 7440-48-4	Cobalt r	mg/L T	0.00018 J	0.00013	0.0025
OR-0.3	Ocmulgee River	Adjacent to AP-1	8/16/2022 7440-48-4 (Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
OR-0.3	Ocmulgee River	Adjacent to AP-1	2/9/2023 7440-48-4 (Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
OR-0.3	Ocmulgee River	Adjacent to AP-1	10/3/2023 7440-48-4 (Cobalt r	mg/L T	< 0.00039 U	0.00039	0.005
OR-0.1	Ocmulgee River	Downstream of AP-1		Cobalt r	mg/L T	0.00016 J	0.00013	0.0025
OR-0.1	Ocmulgee River	Downstream of AP-1			mg/L T	< 0.00039 U	0.00039	0.005
OR-0.1	Ocmulgee River	Downstream of AP-1			mg/L T	< 0.00039 U	0.00039	0.005
OR-0.1	Ocmulgee River	Downstream of AP-1			mg/L T	< 0.00039 U	0.00039	0.005
OR+0.25	Ocmulgee River	Downstream of Site	9/30/2021 7440-48-4 (mg/L T	0.00013 J	0.00013	0.0025
OR+0.25	Ocmulgee River	Downstream of Site	8/16/2022 7440-48-4 (mg/L T	< 0.00039 U	0.00039	0.005
OR+0.25	Ocmulgee River	Downstream of Site			mg/L T	< 0.00039 U	0.00039	0.005
OR+0.25	Ocmulgee River	Downstream of Site			mg/L T	< 0.00039 U	0.00039	0.005
OR+1.0	Ocmulgee River	Downstream of Site			mg/L T	0.00015 J	0.00013	0.0025
BC-0.8a	Beaverdam Creek Beaverdam Creek	Upstream of Beaverdam Creek Tributary Confluence	09/30/21 7439-93-2 L 02/02/22 7439-93-2 L		mg/L T	< 0.0034 U	0.0034	0.005
BC-0.8a		Upstream of Beaverdam Creek Tributary Confluence Upstream of Beaverdam Creek Tributary Confluence			ng/L T ng/L T	0.0011 J	0.00083	0.005
BC-0.8a BC-0.8a	Beaverdam Creek	Upstream of Beaverdam Creek Tributary Confluence Upstream of Beaverdam Creek Tributary Confluence	08/16/22 7439-93-2 L 02/08/23 7439-93-2 L		-	< 0.00073 U < 0.00073 U	0.00073 0.00073	0.03
BC-0.8a BC-0.8a	Beaverdam Creek Beaverdam Creek	Upstream of Beaverdam Creek Tributary Confluence Upstream of Beaverdam Creek Tributary Confluence	02/08/23 7439-93-2 L 08/10/23 7439-93-2 L		ng/L T ng/L T	< 0.00073 U	0.00073	0.03
BC-0.5.7	Beaverdam Creek	Downstream of AP-2	02/10/23 7439-93-2 L		ng/L I ng/L T	< 0.00073 U < 0.0034 U	0.00073	0.005
BC-0.5.7 BC-0.5.7	Beaverdam Creek	Downstream of AP-2			ng/L T	< 0.0034 U	0.0034	0.003
BC-0.5.7	Beaverdam Creek	Downstream of AP-2			ng/L T	< 0.00073 U	0.00073	0.03
BC-0.5.7	Beaverdam Creek	Downstream of AP-2	08/10/23 7439-93-2 L		ng/L T	< 0.00073 U	0.00073	0.03
BC-0.5.6	Beaverdam Creek	Downstream of AP-2	02/10/21 7439-93-2 L		ng/L T	< 0.0034 U	0.0034	0.005
BC-0.5.6	Beaverdam Creek	Downstream of AP-2			ng/L T	< 0.0034 U	0.0034	0.005
BC-0.5.6	Beaverdam Creek	Downstream of AP-2	02/02/22 7439-93-2 L		ng/L T	0.0014 J	0.00083	0.005
BC-0.5.6	Beaverdam Creek	Downstream of AP-2	08/16/22 7439-93-2 L		ng/L T	< 0.00073 U	0.00073	0.03
BC-0.5.6	Beaverdam Creek	Downstream of AP-2	02/09/23 7439-93-2 L		ng/L T	< 0.00073 U	0.00073	0.03
BC-0.5.6	Beaverdam Creek	Downstream of AP-2	08/10/23 7439-93-2 L		ng/L T	< 0.00073 U	0.00073	0.03
BC-0.5.5	Beaverdam Creek	Downstream of AP-2	02/10/21 7439-93-2 L		mg/L T	< 0.0034 U	0.0034	0.005
BC-0.5.5	Beaverdam Creek	Downstream of AP-2	09/30/21 7439-93-2 L		mg/L T	< 0.0034 U	0.0034	0.005
BC-0.5.5	Beaverdam Creek	Downstream of AP-2	02/02/22 7439-93-2 L		mg/L T	0.0015 J	0.00083	0.005
DC 0 F F	Beaverdam Creek	Downstream of AP-2	08/16/22 7439-93-2 L		mg/L T	< 0.00073 U	0.00073	0.03
BC-0.5.5								
BC-0.5.5 BC-0.5.5	Beaverdam Creek	Downstream of AP-2	02/09/23 7439-93-2 L	<u>Lithium</u> r	mg/L T	< 0.00073 U	0.00073	0.03

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Appendix B-2 Surface Water Data Arkwright AP-2 Risk Evaluation Report Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

Location ID	Sample Location	Sample Designation	Date	CAS	Constituent	Units	Fraction	Result	Flags	MDL	RL
BC-BR	Beaverdam Creek	Downstream of AP-2	02/10/21	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005
BC-BR	Beaverdam Creek	Downstream of AP-2	09/30/21	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005
BC-BR	Beaverdam Creek	Downstream of AP-2	02/02/22	7439-93-2	Lithium	mg/L	T	0.0015	J	0.00083	0.005
BC-BR	Beaverdam Creek	Downstream of AP-2	08/16/22	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
BC-BR	Beaverdam Creek	Downstream of AP-2	02/08/23	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
BC-BR	Beaverdam Creek	Downstream of AP-2	08/10/23	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
BC-0.3	Beaverdam Creek	Downstream of AP-2	2/10/2021	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005
BC-0.3	Beaverdam Creek	Downstream of AP-2	9/30/2021	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005
BC-0.3	Beaverdam Creek	Downstream of AP-2	2/2/2022	7439-93-2	Lithium	mg/L	T	0.0011	J	0.00083	0.005
BC-0.3	Beaverdam Creek	Downstream of AP-2	8/16/2022	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
BC-0.3	Beaverdam Creek	Downstream of AP-2	2/8/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
BC-0.3	Beaverdam Creek	Downstream of AP-2	10/3/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U,L1	0.00073	0.03
BC-0.1	Beaverdam Creek	Downstream of AP-2	2/10/2021	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005
BC-0.1	Beaverdam Creek	Downstream of AP-2	9/30/2021	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005
BC-0.1	Beaverdam Creek	Downstream of AP-2	8/16/2022	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
BC-0.1	Beaverdam Creek	Downstream of AP-2	2/8/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
BC-0.1	Beaverdam Creek	Downstream of AP-2	10/3/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U,L1	0.00073	0.03
OR-0.8	Ocmulgee River	Upstream of AP-1 and Site	8/16/2022	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
OR-0.8	Ocmulgee River	Upstream of AP-1 and Site	2/9/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
OR-0.8	Ocmulgee River	Upstream of AP-1 and Site	10/3/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U,L1	0.00073	0.03
OR-0.3	Ocmulgee River	Adjacent to AP-1	9/30/2021	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005
OR-0.3	Ocmulgee River	Adjacent to AP-1	8/16/2022	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
OR-0.3	Ocmulgee River	Adjacent to AP-1	2/9/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
OR-0.3	Ocmulgee River	Adjacent to AP-1	10/3/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U,L1	0.00073	0.03
OR-0.1	Ocmulgee River	Downstream of AP-1	9/30/2021	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005
OR-0.1	Ocmulgee River	Downstream of AP-1	8/16/2022	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
OR-0.1	Ocmulgee River	Downstream of AP-1	2/9/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
OR-0.1	Ocmulgee River	Downstream of AP-1	10/3/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U,L1	0.00073	0.03
OR+0.25	Ocmulgee River	Downstream of Site	9/30/2021	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005
OR+0.25	Ocmulgee River	Downstream of Site	8/16/2022	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
OR+0.25	Ocmulgee River	Downstream of Site	2/9/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U	0.00073	0.03
OR+0.25	Ocmulgee River	Downstream of Site	10/3/2023	7439-93-2	Lithium	mg/L	T	< 0.00073	U,L1	0.00073	0.03
OR+1.0	Ocmulgee River	Downstream of Site	9/30/2021	7439-93-2	Lithium	mg/L	T	< 0.0034	U	0.0034	0.005

Notes:

Notes:
J - indicates an estimated value; the substance was detected between the laboratory MDL and PQL.
MDL - method detection limit
mg/L - milligrams per liter
U - not detected above the laboratory MDL
RL - Reporting Limit
T - Total Prepared by/Date: LO 11/03/23 Checked by/Date: IMR 11/07/23

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APPENDIX C USEPA RSL Calculator Generated Residential Screening Levels

Appendix C-1

Arkwright AP-2 Risk Evaluation Report Arkwright AP-2

Former Plant Arkwright, Bibb County, GA

Appendix C-1 Arkwright AP-2 Former Plant Arkwright, Bibb County, 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/m ³	0.5
sc (apparent thickness of stratum corneum) cm	0.001
ED _{res} (exposure duration - resident) years	26
ED _{res-c} (exposure duration - child) years	6
ED _{res-a} (exposure duration - adult) years	20
ED ₀₋₂ (mutagenic exposure duration first phase) years	2
ED ₂₋₆ (mutagenic exposure duration second phase) years	4
ED ₆₋₁₆ (mutagenic exposure duration third phase) years	10
ED ₁₆₋₂₆ (mutagenic exposure duration fourth phase) years	10
EF _{res} (exposure frequency) days/year	350
EF _{res-c} (exposure frequency - child) days/year	350
EF _{res-a} (exposure frequency - adult) days/year	350
EF ₀₋₂ (mutagenic exposure frequency first phase) days/year	350
EF ₂₋₆ (mutagenic exposure frequency second phase) days/year	350
EF ₆₋₁₆ (mutagenic exposure frequency third phase) days/year	350
EF ₁₆₋₂₆ (mutagenic exposure frequency fourth phase) days/year	350
ET _{event-res-adj} (age-adjusted exposure time) hours/event	0.67077
ET _{event-res-madj} (mutagenic age-adjusted exposure time) hours/event	0.67077
ET _{res} (exposure time) hours/day	24
ET _{res-c} (dermal exposure time - child) hours/event	0.54
ET _{res-a} (dermal exposure time - adult) hours/event	0.71
ET _{res-c} (inhalation exposure time - child) hours/day	24
ET _{res-a} (inhalation exposure time - adult) hours/day	24
Appendix D-3	24
ET ₁₆₋₂₆ (mutagenic inhalation exposure time fourth phase) hours/day	24
ET ₀₋₂ (mutagenic dermal exposure time first phase) hours/event	0.54
ET ₂₋₆ (mutagenic dermal exposure time second phase) hours/event	0.54
ET ₆₋₁₆ (mutagenic dermal exposure time third phase) hours/event	0.71
ET ₁₆₋₂₆ (mutagenic dermal exposure time fourth phase) hours/event	0.71
BW _{res-a} (body weight - adult) kg	80

Appendix C-1

Arkwright AP-2 Risk Evaluation Report

Arkwright AP-2

Former Plant Arkwright, Bibb County, GA

Appendix C-1 **Arkwright AP-2** Former Plant Arkwright, Bibb County, GA

Variable	Value
BW _{res-c} (body weight - child) kg	15
BW ₀₋₂ (mutagenic body weight) kg	15
BW ₂₋₆ (mutagenic body weight) kg	15
BW ₆₋₁₆ (mutagenic body weight) kg	80
BW ₁₆₋₂₆ (mutagenic body weight) kg	80
IFW _{res-adj} (adjusted intake factor) L/kg	327.95
IFW _{res-adj} (adjusted intake factor) L/kg	327.95
IFWM _{res-adj} (mutagenic adjusted intake factor) L/kg	1019.9
IFWM _{res-adj} (mutagenic adjusted intake factor) L/kg	1019.9
IRW _{res-c} (water intake rate - child) L/day	0.78
IRW _{res-a} (water intake rate - adult) L/day	2.5
IRW ₀₋₂ (mutagenic water intake rate) L/day	0.78
IRW ₂₋₆ (mutagenic water intake rate) L/day	0.78
IRW ₆₋₁₆ (mutagenic water intake rate) L/day	2.5
IRW ₁₆₋₂₆ (mutagenic water intake rate) L/day	2.5
EV _{res-a} (events - adult) per day	1
EV _{res-c} (events - child) per day	1
EV ₀₋₂ (mutagenic events) per day	1
EV ₂₋₆ (mutagenic events) per day	1
EV ₆₋₁₆ (mutagenic events) per day	1
EV ₁₆₋₂₆ (mutagenic events) per day	1
DFW _{res-adj} (age-adjusted dermal factor) cm ² -event/kg	2610650
DFWM _{res-adj} (mutagenic age-adjusted dermal factor) cm ² -event/kg	8191633
SA _{res-c} (skin surface area - child) cm²	6365
SA _{res-a} (skin surface area - adult) cm²	19652
SA ₀₋₂ (mutagenic skin surface area) cm ²	6365
SA ₂₋₆ (mutagenic skin surface area) cm ²	6365
SA ₆₋₁₆ (mutagenic skin surface area) cm ²	19652
SA ₁₆₋₂₆ (mutagenic skin surface area) cm ²	19652

Appendix C-2 Arkwright AP-2 Risk Evaluation Report Arkwright AP-2

Former Plant Arkwright, Bibb County, GA

Appendix C-2

Default

Resident Risk-Based Regional Screening Levels (RSL) for Tap Water

					SF。	SF	IUR	IUR	RfD	RfD	RfC	RfC		K	
Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	(mg/kg-day) ⁻¹		(ug/m ³) ⁻¹	Ref	מוא (mg/kg-day)	Ref	(mg/m ³)	Ref	GIABS	(cm/hr)	MW
Cobalt	7440-48-4	No	No	Inorganics	-		9.00E-03	Р	3.00E-04	Р	6.00E-06	Р	1.00E+00	4.00E-04	5.89E+01
Lithium	7439-93-2	No	No	Inorganics	-		-		2.00E-03	Р	-		1.00E+00	1.00E-03	6.94E+00

Appendix C-2 Arkwright AP-2 Risk Evaluation Report Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

Appendix C-2

Default

Resident Risk-Based Regional Screening Levels (RSL) for Tap Water

					_	.*	_						
Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	B (unitless)	t (hr)	T _{event} (hr/event)	FA (unitless)	In EPD?	DA	DA	DA _{event (nc adult)}	MCL (ug/L)
Cobalt	7440-48-4	No No	No.	Inorganics	1.18E-03	5.40E-01	2.25E-01	1.00E+00	Yes	Prevent (ca)	7.37E-04	1.27E-03	(ug/L)
Lithium	7439-93-2	No	No	Inorganics	1.01E-03	2.76E-01	1.15E-01	1.00E+00	Yes	-	4.92E-03	8.49E-03	-

Appendix C-2 Arkwright AP-2 Risk Evaluation Report Arkwright AP-2

Former Plant Arkwright, Bibb County, GA

Appendix C-2

Default

Resident Risk-Based Regional Screening Levels (RSL) for Tap Water

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	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)	Dermal SL Child THQ=1 (ug/L)
Cobalt	7440-48-4	No	No	Inorganics	-	-	-	-	6.02E+00	3.41E+03
Lithium 7	7439-93-2	No	No	Inorganics	-	-	-	-	4.01E+01	9.10E+03

Appendix C-2 Arkwright AP-2 Risk Evaluation Report Arkwright AP-2

Former Plant Arkwright, Bibb County, GA

Appendix C-2

Default

Resident Risk-Based Regional Screening Levels (RSL) for Tap Water

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Inhalation SL Child THQ=1 (ug/L)	Noncarcinogenic SL Child THI=1 (ug/L)	Ingestion SL Adult THQ=1 (ug/L)	Dermal SL Adult THQ=1 (ug/L)	Inhalation SL Adult THQ=1 (ug/L)
Cobalt	7440-48-4	No	No	Inorganics	-	6.01E+00	1.00E+01	4.48E+03	
Lithium	7439-93-2	No	No	Inorganics	-	3.99E+01	6.67E+01	1.20E+04	

Appendix C-2 Arkwright AP-2 Risk Evaluation Report Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

Appendix C-2

Default

Resident Risk-Based Regional Screening Levels (RSL) for Tap Water

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Noncarcinogenic SL Adult THI=1 (ug/L)	Screening Level (ug/L)
Cobalt	7440-48-4	No	No	Inorganics	9.99E+00	6.01E+00 nc
Lithium	7439-93-2	No	No	Inorganics	6.64E+01	3.99E+01 nc

APPENDIX D Support for Refined Risk Evaluation

Appendix D-1 Exposure Point Concentration Calculation Results

Appendix D-1 Exposure Point Calculation Details¹ Arkwright AP-2 Former Plant Arkwright, Bibb County, GA

						EPC Step 1	EPC Step 2	EPC Step 3
CCR Rule Designation	Constituent	Well IDs Included	Maximum Concentration	Detection Frequency	Exceedance Frequency	Individual Target Well(s)	Target Well(s) & Downgradient Well(s)	Farthest Downgradient Well(s)
			(mg/L)			2019-2023 (mg/L)	2019-2023 (mg/L)	2019-2023 (mg/L)
Appendix IV	Cobalt	ARAMW-7	0.077	7 / 7	7 / 7	0.075	(3,)	, <u>J</u> , ,
		ARAMW-7 ARGWC-22	0.077	24 / 24	13 / 24		0.035	0.035
	Lithium	ARAMW-7	0.068	7 / 7	7 / 7	0.064		
		ARAMW-7 ARGWC-22	0.068	24 / 24	7 / 24		0.044	0.044

Notes:

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

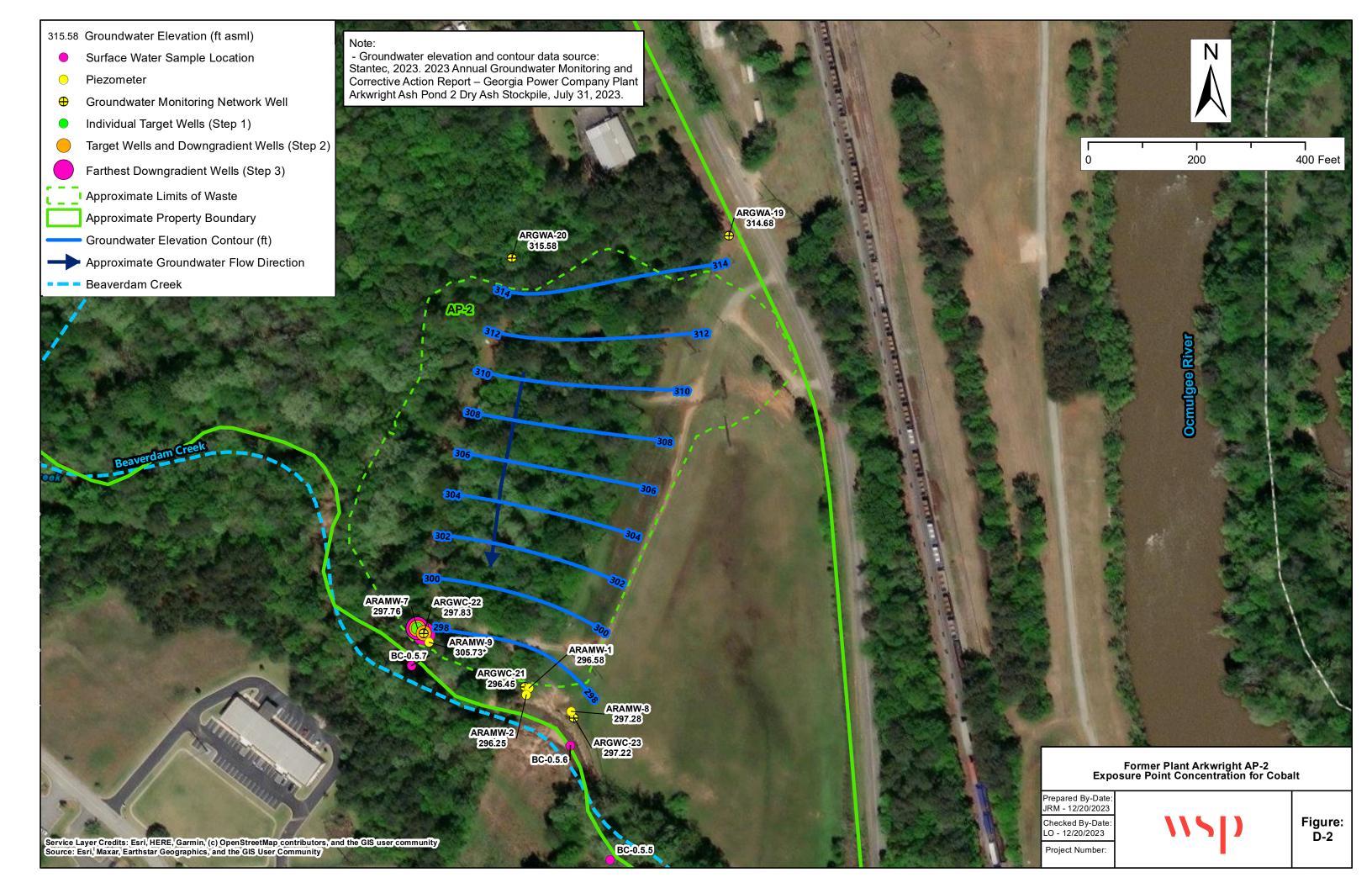
Definitions:

EPC = Exposure Point Concentration mg/L = milligrams per liter

Prepared by/Date: <u>LO 11/20/23</u> Checked by/Date: <u>JHG 12/28/23</u>

Appendix D-2

Exposure Point Concentrations for Cobalt and Lithium



Appendix D-3 ProUCL Input/Output Files

Step 1	-		
Well(1)	Date(1)	Cobalt1	D_Cobalt1
ARAMW-7	11/30/20	0.028	1
ARAMW-7	02/11/21	0.017	1
ARAMW-7	09/10/21	0.075	1
ARAMW-7	02/02/22	0.077	1
ARAMW-7	09/07/22	0.074	1
ARAMW-7	01/31/23	0.069	1
ARAMW-7	08/08/23	0.061	1

Step 2	<u>-</u>			Step 3	
Well(2)	Date(2)	Cobalt2	D_Cobalt2		D_Cobalt3
ARAMW-7	11/30/20	0.028	1	ARAMW-7 11/30/20 0.028	1
ARAMW-7	02/11/21	0.017	1	ARAMW-7 02/11/21 0.017	1
ARAMW-7	09/10/21	0.075	1	ARAMW-7 09/10/21 0.075	1
ARAMW-7	02/02/22	0.077	1	ARAMW-7 02/02/22 0.077	1
ARAMW-7	09/07/22	0.074	1	ARAMW-7 09/07/22 0.074	1
ARAMW-7	01/31/23	0.069	1	ARAMW-7 01/31/23 0.069	1
ARAMW-7	08/08/23	0.061	1	ARAMW-7 08/08/23 0.061	1
ARGWC-22	12/16/19	0.018	1	ARGWC-22 12/16/19 0.018	1
ARGWC-22	01/14/20	0.007	1	ARGWC-22 01/14/20 0.007	1
ARGWC-22	02/11/20	0.013	1	ARGWC-22 02/11/20 0.013	1
ARGWC-22	03/09/20	0.015	1	ARGWC-22 03/09/20 0.015	1
ARGWC-22	04/07/20	0.009	1	ARGWC-22 04/07/20 0.009	1
ARGWC-22	05/27/20	0.006	1	ARGWC-22 05/27/20 0.006	1
ARGWC-22	06/24/20	0.005	1	ARGWC-22 06/24/20 0.005	1
ARGWC-22	07/15/20	0.003	1	ARGWC-22 07/15/20 0.003	1
ARGWC-22	08/19/20	0.003	1	ARGWC-22 08/19/20 0.003	1
ARGWC-22	09/22/20	0.009	1	ARGWC-22 09/22/20 0.009	1
ARGWC-22	09/30/20	0.0055	1	ARGWC-22 09/30/20 0.0055	1
ARGWC-22	02/10/21	0.0015	1	ARGWC-22 02/10/21 0.0015	1
ARGWC-22	09/10/21	0.0015	1	ARGWC-22 09/10/21 0.0015	1
ARGWC-22	02/02/22	0.0010	1	ARGWC-22 02/02/22 0.0010	1
ARGWC-22	09/06/22	0.0020	1	ARGWC-22 09/06/22 0.0020	1
ARGWC-22	01/31/23	0.0015	1	ARGWC-22 01/31/23 0.0015	1
ARGWC-22	08/08/23	0.0018	1	ARGWC-22 08/08/23 0.0018	1

Step 1	•		
Well(1)	Date(1)	Lithium1	D_Lithium1
ARAMW-7	11/30/20	0.061	1
ARAMW-7	02/11/21	0.061	1
ARAMW-7	09/10/21	0.060	1
ARAMW-7	02/02/22	0.060	1
ARAMW-7	09/07/22	0.063	1
ARAMW-7	01/31/23	0.068	1
ARAMW-7	08/08/23	0.058	1

Step 2	-			Step 3	-		
Well(2)	Date(2)	Lithium2	D_Lithium2	Well(3)	Date(3)	Lithium3	D_Lithium3
ARAMW-7	11/30/20	0.061	1	ARAMW-7	11/30/20	0.061	1
ARAMW-7	02/11/21	0.061	1	ARAMW-7	02/11/21	0.061	1
ARAMW-7	09/10/21	0.060	1	ARAMW-7	09/10/21	0.060	1
ARAMW-7	02/02/22	0.060	1	ARAMW-7	02/02/22	0.060	1
ARAMW-7	09/07/22	0.063	1	ARAMW-7	09/07/22	0.063	1
ARAMW-7	01/31/23	0.068	1	ARAMW-7	01/31/23	0.068	1
ARAMW-7	08/08/23	0.058	1	ARAMW-7	08/08/23	0.058	1
ARGWC-22	12/16/19	0.027	1	ARGWC-22	12/16/19	0.027	1
ARGWC-22	01/14/20	0.034	1	ARGWC-22	01/14/20	0.034	1
ARGWC-22	02/11/20	0.010	1	ARGWC-22	02/11/20	0.010	1
ARGWC-22	03/09/20	0.007	1	ARGWC-22	03/09/20	0.007	1
ARGWC-22	04/07/20	0.012	1	ARGWC-22	04/07/20	0.012	1
ARGWC-22	05/27/20	0.017	1	ARGWC-22	05/27/20	0.017	1
ARGWC-22	06/24/20	0.023	1	ARGWC-22	06/24/20	0.023	1
ARGWC-22	07/15/20	0.021	1	ARGWC-22	07/15/20	0.021	1
ARGWC-22	08/19/20	0.026	1	ARGWC-22	08/19/20	0.026	1
ARGWC-22	09/22/20	0.014	1	ARGWC-22	09/22/20	0.014	1
ARGWC-22	09/30/20	0.014	1	ARGWC-22	09/30/20	0.014	1
ARGWC-22	02/10/21	0.022	1	ARGWC-22	02/10/21	0.022	1
ARGWC-22	09/10/21	0.021	1	ARGWC-22	09/10/21	0.021	1
ARGWC-22	02/02/22	0.020	1	ARGWC-22	02/02/22	0.020	1
ARGWC-22	09/06/22	0.014	1	ARGWC-22	09/06/22	0.014	1
ARGWC-22	01/31/23	0.028	1	ARGWC-22	01/31/23	0.028	1
ARGWC-22	08/08/23	0.028	1	ARGWC-22	08/08/23	0.028	1

Notes:

1) Concentrations in units of mg/L.

Prepared by/Date: <u>LO 11/20/23</u> Checked by/Date: <u>JHG 11/28/23</u>

UCL Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation ProUCL 5.2 11/9/2023 10:56:39 AM

From File 20231103 AP2 prouclinput.xls

Full Precision OFF

Confidence Coefficient 95% Number of Bootstrap Operations 2000

Cobalt (step 1)

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	0.017	Mean	0.0571
Maximum	0.077	Median	0.0687
SD	0.0245	Std. Error of Mean	0.00925
Coefficient of Variation	0.428	Skewness	-1.109

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	0.796	Shapiro Wilk GOF Test
1% Shapiro Wilk Critical Value	0.73	Data appear Normal at 1% Significance Level
Lilliefors Test Statistic	0.269	Lilliefors GOF Test
1% Lilliefors Critical Value	0.35	Data appear Normal at 1% Significance Level

Data appear Normal at 1% Significance Level

Note GOF tests may be unreliable for small sample sizes

Assuming Normal Distribution

95% Normal UCL	95% UCLs (Adjusted for Skewness)

95% Student's-t UCL 0.0751 95% Adjusted-CLT UCL (Chen-1995) 0.0682 95% Modified-t UCL (Johnson-1978) 0.0745

Gamma GOF Test

A-D Test Statistic	0.879	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.71	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.325	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.313	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE) 4.239 k star (bias corrected MLE) 2.517

Theta hat (MLE)	0.0135	Theta star (bias corrected MLE)	0.0227
nu hat (MLE)	59.34	nu star (bias corrected)	35.24
MLE Mean (bias corrected)	0.0571	MLE Sd (bias corrected)	0.036
		Approximate Chi Square Value (0.05)	22.66
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	19.67

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.0889 95% Adjusted Gamma UCL 0.102

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.752	Shapiro Wilk Lognormal GOF Test
10% Shapiro Wilk Critical Value	0.838	Data Not Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.333	Lilliefors Lognormal GOF Test
10% Lilliefors Critical Value	0.28	Data Not Lognormal at 10% Significance Level

Data Not Lognormal at 10% Significance Level

Lognormal Statistics

Minimum of Logged Data	-4.075	Mean of logged Data	-2.985
Maximum of Logged Data	-2.564	SD of logged Data	0.597

Assuming Lognormal Distribution

95% H-UCL	0.116	90% Chebyshev (MVUE) UCL	0.0987
95% Chebyshev (MVUE) UCL	0.117	97.5% Chebyshev (MVUE) UCL	0.142
99% Chebyshev (MVUE) UCL	0.191		

Nonparametric Distribution Free UCL Statistics Data appear to follow a Discernible Distribution

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0723	95% BCA Bootstrap UCL	0.0686
95% Standard Bootstrap UCL	0.0714	95% Bootstrap-t UCL	0.071
95% Hall's Bootstrap UCL	0.0675	95% Percentile Bootstrap UCL	0.0709
90% Chebyshev(Mean, Sd) UCL	0.0849	95% Chebyshev(Mean, Sd) UCL	0.0974
97.5% Chebyshev(Mean, Sd) UCL	0.115	99% Chebyshev(Mean, Sd) UCL	0.149

Suggested UCL to Use

95% Student's-t UCL 0.0751

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 positively skewed data sets.

Cobalt (step 2 & 3)

	General	Statistics
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Total Number of Observations	24	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	0.001	Mean	0.0209
Maximum	0.077	Median	0.00785
SD	0.0272	Std. Error of Mean	0.00555
Coefficient of Variation	1.299	Skewness	1.371

Normal GOF Test

Shapiro Wilk Test Statistic	0.698	Shapiro Wilk GOF Test
1% Shapiro Wilk Critical Value	0.884	Data Not Normal at 1% Significance Level
Lilliefors Test Statistic	0.293	Lilliefors GOF Test
1% Lilliefors Critical Value	0.205	Data Not Normal at 1% Significance Level

Data Not Normal at 1% Significance Level

Assuming Normal Distribution

95% Normai UCL			95% UCLS (Adjusted for Skewness)	
	95% Student's-t UCL	0.0304	95% Adjusted-CLT UCL (Chen-1995)	0.0317
			95% Modified-t UCL (Johnson-1978)	0.0307

Gamma GOF Test

Anderson-Darling Gamma GOF Test	1.045	A-D Test Statistic
Data Not Gamma Distributed at 5% Significance Level	0.789	5% A-D Critical Value
Kolmogorov-Smirnov Gamma GOF Test	0.157	K-S Test Statistic
Detected data appear Gamma Distributed at 5% Significance Level	0.186	5% K-S Critical Value

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

0.625	k star (bias corrected MLE)	0.683	k hat (MLE)
0.0335	Theta star (bias corrected MLE)	0.0306	Theta hat (MLE)
30.01	nu star (bias corrected)	32.77	nu hat (MLE)
0.0265	MLE Sd (bias corrected)	0.0209	MLE Mean (bias corrected)
18.5	Approximate Chi Square Value (0.05)		
17.86	Adjusted Chi Square Value	0.0392	Adjusted Level of Significance

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.0339	95% Adjusted Gamma UCL	0.0351
coror approximate dumina con	0.0000	oo /o / lajaoloa Gallilla O O E	0.000.

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.927	Shapiro Wilk Lognormal GOF Test
10% Shapiro Wilk Critical Value	0.93	Data Not Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.123	Lilliefors Lognormal GOF Test
10% Lilliefors Critical Value	0.162	Data appear Lognormal at 10% Significance Level

Data appear Approximate Lognormal at 10% Significance Level

Lognormal Statistics

Minimum of Logged Data	-6.908	Mean of logged Data	-4.756
Maximum of Logged Data	-2.564	SD of logged Data	1.42

Assuming Lognormal Distribution

 95% H-UCL
 0.06
 90% Chebyshev (MVUE) UCL
 0.0449

 95% Chebyshev (MVUE) UCL
 0.0554
 97.5% Chebyshev (MVUE) UCL
 0.0699

 99% Chebyshev (MVUE) UCL
 0.0984

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution

Nonparametric Distribution Free UCLs

95% CLT UCL	0.03	95% BCA Bootstrap UCL	0.0322
95% Standard Bootstrap UCL	0.0301	95% Bootstrap-t UCL	0.0329
95% Hall's Bootstrap UCL	0.0294	95% Percentile Bootstrap UCL	0.0308
90% Chebyshev(Mean, Sd) UCL	0.0376	95% Chebyshev(Mean, Sd) UCL	0.0451
97.5% Chebyshev(Mean, Sd) UCL	0.0556	99% Chebyshev(Mean, Sd) UCL	0.0761

Suggested UCL to Use

95% Adjusted Gamma UCL 0.0351

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.

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.

Lithium (step 1)

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
		Number of Missing Observations	0
Minimum	0.0577	Mean	0.0616
Maximum	0.068	Median	0.061
SD	0.0033	Std. Error of Mean	0.00125
Coefficient of Variation	0.0535	Skewness	1.32

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.

mal		

Shapiro Wilk Test Statistic 0.883 Shapiro Wilk GOF Test

1% Shapiro Wilk Critical Value 0.73 Data appear Normal at 1% Significance Level
Lilliefors Test Statistic 0.285 Lilliefors GOF Test

1% Lilliefors Critical Value 0.35 Data appear Normal at 1% Significance Level

Data appear Normal at 1% Significance Level

Note GOF tests may be unreliable for small sample sizes

Assuming Normal Distribution

95% Normal UCL 95% UCLs (Adjusted for Skewness)

Gamma GOF Test

A-D Test Statistic 0.472 Anderson-Darling Gamma GOF Test

5% A-D Critical Value 0.708 Detected data appear Gamma Distributed at 5% Significance Level

K-S Test Statistic 0.285 Kolmogorov-Smirnov Gamma GOF Test

5% K-S Critical Value 0.311 Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level Note GOF tests may be unreliable for small sample sizes

Gamma Statistics

k hat (MLE) 419.6 k star (bias corrected MLE) 239.9

Theta hat (MLE) 1.4676E-4 Theta star (bias corrected MLE) 2.5673E-4

nu hat (MLE) 5875 nu star (bias corrected) 3358

MLE Mean (bias corrected) 0.0616 MLE Sd (bias corrected) 0.00398

Approximate Chi Square Value (0.05) 3225

Adjusted Level of Significance 0.0158 Adjusted Chi Square Value 3185

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.0641 95% Adjusted Gamma UCL 0.0649

Lognormal GOF Test

Shapiro Wilk Test Statistic 0.896 Shapiro Wilk Lognormal GOF Test

10% Shapiro Wilk Critical Value 0.838 Data appear Lognormal at 10% Significance Level
Lilliefors Test Statistic 0.278 Lilliefors Lognormal GOF Test

10% Lilliefors Critical Value 0.28 Data appear Lognormal at 10% Significance Level

Data appear Lognormal at 10% Significance Level
Note GOF tests may be unreliable for small sample sizes

Lognormal Statistics

Minimum of Logged Data -2.852 Mean of logged Data -2.789

Maximum of Logged Data -2.688 SD of logged Data 0.0523

Assuming Lognormal Distribution

95% H-UCL N/A 90% Chebyshev (MVUE) UCL 0.0652

95% Chebyshev (MVUE) UCL 97.5% Chebyshev (MVUE) UCL 0.0692

99% Chebyshev (MVUE) UCL 0.0737

> Nonparametric Distribution Free UCL Statistics Data appear to follow a Discernible Distribution

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0636	95% BCA Bootstrap UCL	0.0642
95% Standard Bootstrap UCL	0.0635	95% Bootstrap-t UCL	0.0664
95% Hall's Bootstrap UCL	0.078	95% Percentile Bootstrap UCL	0.0637
90% Chebyshev(Mean, Sd) UCL	0.0653	95% Chebyshev(Mean, Sd) UCL	0.067
97.5% Chebyshev(Mean, Sd) UCL	0.0694	99% Chebyshev(Mean, Sd) UCL	0.074

Suggested UCL to Use

95% Student's-t UCL 0.064

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.

Lithium (step 2 & 3)

	General Statistics		
Total Number of Observations	24	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	0.0071	Mean	0.0321
Maximum	0.068	Median	0.0245
SD	0.0204	Std. Error of Mean	0.00416
Coefficient of Variation	0.636	Skewness	0.693
	Normal GOF Test		
Shapiro Wilk Test Statistic	0.836	Shapiro Wilk GOF Test	
1% Shapiro Wilk Critical Value	0.884	Data Not Normal at 1% Significance Level	
Lilliefors Test Statistic	0.238	Lilliefors GOF Test	
1% Lilliefors Critical Value	0.205	Data Not Normal at 1% Significance Level	

Data Not Normal at 1% Significance Level

Ass	uming Normal Distribution				
95% Normal UCL	95% UCLs (Adjusted for Skewness)				
95% Student's-t UCL	0.0392	95% Adjusted-CLT UCL (Chen-1995)	0.0395		
		95% Modified-t UCL (Johnson-1978)	0.0393		
	Gamma GOF Test				
A-D Test Statistic	0.918	Anderson-Darling Gamma GOF Test			

5% A-D Critical Value 0.753 Data Not Gamma Distributed at 5% Significance Level K-S Test Statistic Kolmogorov-Smirnov Gamma GOF Test 0.187 Data Not Gamma Distributed at 5% Significance Level 5% K-S Critical Value 0.18

Data Not Gamma Distributed at 5% Significance Level

Ga	mma	Sta	tieti	ce

k hat (MLE)	2.633	k star (bias corrected MLE)	2.332
Theta hat (MLE)	0.0122	Theta star (bias corrected MLE)	0.0137
nu hat (MLE)	126.4	nu star (bias corrected)	111.9
MLE Mean (bias corrected)	0.0321	MLE Sd (bias corrected)	0.021
		Approximate Chi Square Value (0.05)	88.51
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	87.05

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.0405 95% Adjusted Gamma UCL 0.0412

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.93	Shapiro Wilk Lognormal GOF Test
10% Shapiro Wilk Critical Value	0.93	Data appear Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.175	Lilliefors Lognormal GOF Test
10% Lilliefors Critical Value	0.162	Data Not Lognormal at 10% Significance Level

Data appear Approximate Lognormal at 10% Significance Level

Lognormal Statistics

Minimum of Logged Data	-4.948	Mean of logged Data	-3.642
Maximum of Logged Data	-2.688	SD of logged Data	0.661

Assuming Lognormal Distribution

95% H-UCL	0.0438	90% Chebyshev (MVUE) UCL	0.0462
95% Chebyshev (MVUE) UCL	0.0525	97.5% Chebyshev (MVUE) UCL	0.0613
99% Chebyshev (MVUE) UCL	0.0785		

Nonparametric Distribution Free UCL Statistics Data appear to follow a Discernible Distribution

Nonparametric Distribution Free UCLs

0.0402	95% BCA Bootstrap UCL	0.0389	95% CLT UCL
0.0395	95% Bootstrap-t UCL	0.0389	95% Standard Bootstrap UCL
0.0397	95% Percentile Bootstrap UCL	0.0387	95% Hall's Bootstrap UCL
0.0502	95% Chebyshev(Mean, Sd) UCL	0.0445	90% Chebyshev(Mean, Sd) UCL
0.0735	99% Chebyshev(Mean, Sd) UCL	0.0581	97.5% Chebyshev(Mean, Sd) UCL

Suggested UCL to Use

95% H-UCL 0.0438

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

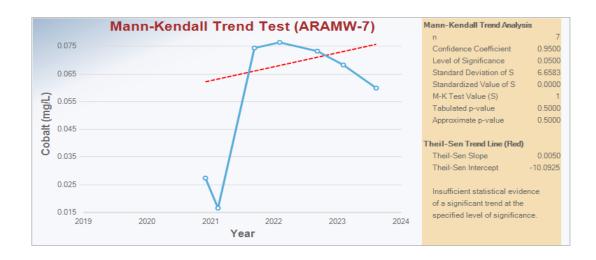
Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.

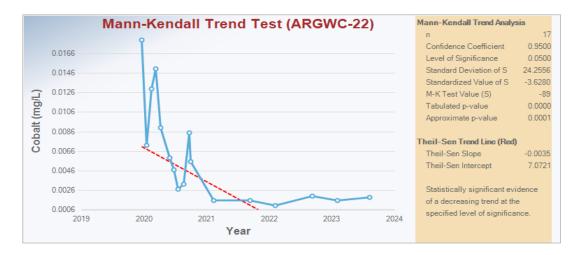
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Prepared by/Date: <u>LO 11/20/23</u> Checked by/Date: <u>JHG 11/28/23</u>

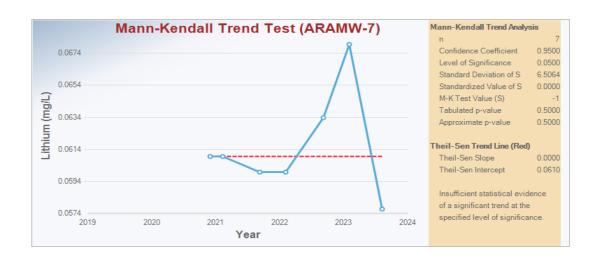
Appendix D-4 Groundwater Trend Graphs

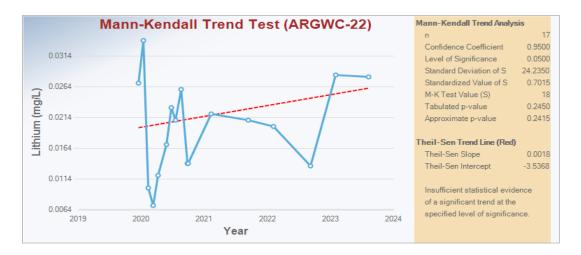
Appendix D-4
Groundwater Mann-Kendall Trend Graph
Arkwright AP-2 Risk Evaluation Report
Arkwright AP-2
Former Plant Arkwright, Bibb County, GA





Appendix D-4
Groundwater Mann-Kendall Trend Graph
Arkwright AP-2 Risk Evaluation Report
Arkwright AP-2
Former Plant Arkwright, Bibb County, GA





APPENDIX C REACTIVE TRANSPORT MODEL REPORT



REACTIVE TRANSPORT MODEL REPORT

Plant Arkwright Ash Pond 2 (AP-2) Dry Ash Stockpile Macon, Georgia

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Prepared for:



Prepared by:

Stantec Consulting Services Inc. 10745 Westside Way, Suite 250 Alpharetta, Georgia 30009-7640 Prepared by:

Thai Phan, Ph.D.

Reviewed by:

Jim B Finley, P.G., Ph.D.

Approved by:

Jennifer L Kolbe, P.E., Ph.D.

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Appendix A PHREEQC Code



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Acronyms / Abbreviations

1-D One dimensional

ACM Assessment of Corrective Measures
AP-2 DAS Ash Pond 2 Dry Ash Stockpile
CCR Coal Combustion Residual
CEC Cation Exchange Capacity

Co Cobalt ft Feet

ft/day Feet per day
ft/ft Feet per foot
g/mol Grams per mole

GCSM Geochemical Conceptual Site Model

Georgia Power Company

GWPS Groundwater Protection Standard
Hao Hydrous aluminum oxide or gibbsite

Hfo Hydrous ferric oxide (Iron hydroxide or ferrihydrite)

Li Lithium m Meters

mg/L Milligrams per liter

MNA Monitored Natural Attenuation

Mole Mole

mole/L Mole per liter

ORP Oxidation Reduction Potential
PHREEQC pH, Redox, Equilibrium
PWR Partially Weathered Rock

Redox Reduction-Oxidation

SEP Sequential Extraction Procedure
SSL Statistically Significant Level
Stantec Stantec Consulting Services Inc.

s.u. Standard units

μg/L Micrograms per liter



1 Introduction

1.1 Purpose

This reactive transport model report (Report) has been prepared for the Georgia Power Company (Georgia Power) Plant Arkwright Ash Pond 2 Dry Ash Stockpile (AP-2 DAS) to support the remedy selection process and is included as Appendix C to the Draft Remedy Selection Report – Plant Arkwright Ash Pond 2 Dry Ash Stockpile (AP-2 DAS) (Draft Remedy Selection Report) (Stantec 2023c). The purpose of this Report is to document the reactive transport model developed to evaluate potential remediation approaches to address statistically significant levels (SSLs) of cobalt (Co) and lithium (Li) above groundwater protection standards (GWPSs) at one monitoring well at AP-2 DAS (ARAMW-7).

1.2 Site Background, Geology, and Hydrogeologic Setting

The Remedy Selection Report includes a description of the site background, including details related to closure of the coal combustion residual (CCR) unit (AP-2 DAS). A Site location map is included in the Remedy Selection Report (Figure 1, Stantec 2023c). Figure 1 is an aerial photograph that shows AP-2 DAS and its immediate surroundings.

Near surface geology and hydrogeologic conditions present in the vicinity of AP-2 DAS influence the geochemical nature and extent of the inorganic constituents present in area groundwater. The geologic and hydrogeologic conditions at AP-2 DAS considered in model development are based on information provided in the *Limited Hydrogeologic Assessment Report for Inactive CCR landfill Former Plant Arkwright, AP-2 DAS Landfill* (Jacobs 2018) and updated with more recent AP-2 DAS area data (Stantec 2023b) as described in Section 3.1 of the Draft Remedy Selection Report. (Stantec 2023c). The groundwater flow direction at AP-2 DAS is shown on Figure 2 and a cross section showing the subsurface geology near the SSL is included on Figure 3.

2 Geochemical Conceptual Site Model

SSLs of the Appendix IV constituents cobalt and lithium exceeding their respective GWPSs have been detected in a single monitoring well (ARAMW-7) located downgradient of AP-2 DAS. The purpose of the geochemical conceptual site model (GCSM) is to provide an assessment of the site-specific geochemical conditions that influence the fate and transport of cobalt and lithium in groundwater, particularly within the intersection of the partially weathered rock (PWR) material and the overburden material in the area coinciding with the screened interval of the ARAMW-7 well.

The GCSM for AP-2 DAS, is described in the Geochemical Conceptual Site Model Report – Plant Arkwright Ash Pond 2 Dry Ash Stockpile (AP-2 DAS), included as Appendix A of the Draft Remedy Selection Report (Stantec 2023c).



3 1-D Geochemical Transport Model

Geochemical boundaries of the GCSM encompass the AP-2 DAS area at Plant Arkwright. The groundwater quality measured in upgradient groundwater monitoring wells provides the basis for evaluating effects of CCR material on groundwater chemistry. Furthermore, the upgradient groundwater monitoring well data were used to develop a one-dimensional (1-D) geochemical model to evaluate the effects and response periods for selected potential remediation approaches (monitored natural attenuation [MNA], and in-situ pH adjustment) for AP-2 DAS on groundwater chemistry. The reactive transport modeling approach, results, and sensitivity analysis are presented in the following sections.

3.1 Modeling Approach

The geochemical model is developed using information presented in the GCSM and consists of a 1-D groundwater flow path, the contributing sources and different water chemistries (upgradient groundwater and CCR pore water), and the geochemical properties of unconsolidated materials. The geochemical model has been calibrated to site-specific conditions and is being used to support the remedy selection process for groundwater remedy evaluation and selection.

The geochemical model relies on groundwater flow direction and estimated groundwater velocities. Table 1 presents a summary of measured hydraulic gradients, hydraulic conductivities, and calculated groundwater velocities for the test locations associated with the AP-2 DAS site. Pre-closure conditions reflect the current status of AP-2 DAS and a groundwater table that is present in the overburden. Based on these conditions, post-closure groundwater flow direction and velocity at AP-2 DAS, is inferred to remain consistent with pre-closure conditions.

3.2 1-D Geochemical Model Setup

Geochemical modeling that incorporates the information described above was completed using the PHREEQC computer code developed and supported by the United States Geological Survey (Parkhurst and Appelo 2013). PHREEQC, which stands for <u>pH</u>, <u>Re</u>dox, <u>Equilibrium</u>, is a public domain computer program that allows aqueous speciation, batch reactions, 1-D transport, and inverse geochemical reactions. The geochemical modeling capabilities of PHREEQC extend to simulation of isotopic systems and representation of kinetically controlled chemical reactions. More detail about PHREEQC capabilities is found in Parkhurst and Appelo (2013). The thermodynamic database used for the model was minteq_v4.dat. Surface master species and surface complexation equilibrium reactions for gibbsite were incorporated in the PHREEQC code (Karamalidis and Dzombak, 2010). The PHREEQC code used in this analysis is included in Appendix A.

One-dimensional transport modeling requires information about the groundwater flow direction and velocity, which is obtained from measured hydraulic gradients, hydraulic conductivities, and calculated groundwater velocities (Table 1).



3.2.1 MODEL DOMAIN

The model domain for geochemical modeling extends spatially from the upgradient groundwater monitoring well location (ARGWA-20) to the groundwater monitoring well (ARAMW-7) located on the downgradient side of the AP-2 DAS unit (Figure 1). A schematic diagram of the 1-D geochemical model for the A-A' transect is presented in Figure 3. Transect A-A' was drawn from the nearest logical upgradient well adjacent to AP-2 DAS (ARGWA-20) to the target downgradient groundwater monitoring well (ARAMW-7) where groundwater cobalt and lithium concentrations currently exceed GWPSs. The model flow tube consists of 15 cells that are each 47 feet (ft) (15 meters [m]) in length along the approximately 706 ft (220 m) flow path (Figure 3). The time step is calculated using groundwater velocity and length of each cell. Model steps (number of shifts) were calculated using the time step and simulation time that is long enough for groundwater chemistry to reach a stable condition as observed at the downgradient monitoring well (ARAMW-7). Dispersion is assumed to be 10%. While there is no explicit modeling of vertical flow, the geochemical model conceptually extends from the CCR material to the base of the unconsolidated material. Time step and model step are calculated as the following:

Time step=
$$\frac{\text{Cell length (ft)}}{\text{Groundwater veolocity }(\frac{\text{ft}}{\text{s}})}$$
 Equation 1

Model step= $\frac{\text{Simulation time (s)}}{\text{Time step (s)}}$ Equation 2

The assumption is that sources contributing chemical mass and geochemical processes removing chemical mass are contained within the area described. Conceptually, CCR pore water from the AP-2 DAS unit, represented by CCR pore water chemistry from temporary well ARK-STN-TW22, mixes with upgradient groundwater, represented by groundwater chemistry from ARGWA-20. The mixing proportion was calculated using ratios of chemically conservative constituents (e.g., boron). The resulting mixture migrates downgradient from the ARGWA-20 groundwater well toward the ARAMW-7 groundwater well. During downgradient migration, geochemical reactions occur between the groundwater and unconsolidated materials as described in Section 3.2.2.

3.2.2 GEOCHEMICAL PROPERTIES

Geochemical modeling for AP-2 DAS at Plant Arkwright uses groundwater chemistry from the upgradient and downgradient groundwater monitoring wells, CCR pore water chemistry from the AP-2 DAS unit, and geochemical properties of unconsolidated materials. Results for unconsolidated material mineralogy and cation exchange capacity (CEC) (Tables 4, 6A, and 6B of the GCSM [Stantec 2023b]) were used to incorporate reactive minerals that could influence groundwater chemistry. Additionally, adsorption of CCR constituents by iron and aluminum hydroxides is included in the geochemical model via two-layer surface complexation modeling based on the theoretical description of Davis and Kent (1990). Further information related to associated constants required to run the geochemical model were developed by Dzombak and Morel (1990) for iron (hydrous ferric oxide [Hfo]) using iron hydroxide, specifically ferrihydrite, and Karamalidis and Dzombak (2010) for aluminum (hydrous aluminum oxide [Hao]) using gibbsite.

Properties of the iron and aluminum adsorbing surfaces were obtained from select data generated from the sequential extraction procedure (SEP) testing (Tables 5, 7A and 7B of the GCSM [Stantec 2023b])



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and relationships between the abundance of iron/aluminum mineral surfaces and the abundance of adsorption sites on the mineral surfaces in units of moles of surface sites per mole of iron/aluminum.

Surface sites for iron hydroxide are differentiated between weak and strong sites and refer to the strength of the bond between the surface and a constituent bound to the sites of hydrous ferric oxide. Weak and strong adsorption sites arise from the molecular composition of the iron hydroxides. There is a single surface defined for adsorption to Hao. An additional assumption is that the molecular weights of Hfo and Hao are 88.85 grams per mole (g/mol) and 78.00 g/mol, respectively. Iron or aluminum used in determining parameters for surface complexation calculations is the sum of iron or aluminum extracted in the non-crystalline and metal hydroxide steps of the SEP. Unconsolidated materials are assumed to have a bulk density of 1.93 kg/L and a porosity of 0.2 for estimating the water to rock ratio which was used to calculate the amount of minerals and surface sites per one liter of pore water for model inputs.

The resulting parameters applied in geochemical modeling for surface complexation (adsorption) modeling are shown in Table 2. Although specific unconsolidated material samples from different locations at Plant Arkwright were tested, the entire dataset was used to determine the minimum, maximum, and geometric mean to incorporate the variability of the unconsolidated materials throughout the Plant Arkwright AP-2 DAS area. Additional details on the calculations of surface sites used in the model are shown in the footnotes of Table 2.

3.2.3 TRANSPORT SETTINGS – PRE-CLOSURE AND POST-CLOSURE CONDITIONS

The geochemical model simulated a total of 94 years in two distinct periods. The first period (14 years) represents development of pre-closure conditions, and the second period (80 years) corresponds to the post-closure conditions where there is no additional contribution of CCR pore water to groundwater chemistry.

The simulation time for the pre-closure period was calibrated by varying the groundwater velocity value within the range (0.019 feet per day (ft/day)–0.557 ft/day) estimated for groundwater flow in unconsolidated materials within AP-2 DAS site at the Plant Arkwright (Table 1). The calibrated groundwater flow of 0.26 ft/day was selected for this base case based on the following constraints:

- Modeled concentrations of boron had to match the concentrations of boron in groundwater at the downgradient well (ARAMW-7) between November 2020 and January 2023 (2,100–2,600 micrograms/liter (μg/L)). Transport of the conservative constituent boron, which is also a CCR tracer, is primarily controlled by advection and dispersion. The arrival time of boron is used to infer the presence of the CCR pore water influenced groundwater at ARMW-7 well, which is matched with the available monitoring data (November 2020–January 2023). This approach assumes that CCR pore water influenced groundwater arrived at the downgradient well ARAMW-7 in 2020.
- For the present geochemical analysis, Stantec assumed that CCR pore water from AP-2 DAS
 mixes with upgradient groundwater (ARGWA-20) at the start of the model path beginning in
 approximately 2010, when post closure care groundwater monitoring began, following the
 issuance of the original closure certificate for AP-2 DAS. As such, the initial model time (0



year) for the pre-closure period corresponds to calendar year 2010. Stantec acknowledges that there is a longer history associated with the AP-2 DAS; however, the assumed start date for geochemical modeling is consistent both with what is known about groundwater velocity and with the timing of available groundwater monitoring data.

The simulation time for the second period (80 years), corresponding to post-closure period, was selected based on the following constraints:

- Groundwater flow post-closure is assumed to remain the same as the calibrated groundwater flow for the current conditions.
- The simulation time is long enough to determine the time required for the modeled concentrations of constituents currently exceeding GWPSs to decrease to levels below GWPSs following closure of the AP-2 DAS unit (i.e., removal of AP-2 DAS CCR materials) under model scenarios including the sensitivity analysis for groundwater flow velocity (Section 3.5.1).

3.3 Geochemical Model Calibration for Pre-closure Conditions

3.3.1 APPROACH

The geochemical model considers four geochemical processes that influence the predicted groundwater chemistry: (1) mixing of CCR pore water and upgradient groundwater, (2) thermodynamic equilibrium with select geochemically reactive mineral phases, (3) surface complexation, or adsorption, of CCR constituents in groundwater with iron and aluminum hydroxide minerals, and (4) cation exchange between positively charged ions in groundwater and positively charged ions in clay minerals. Each of the listed categories of information are used and values adjusted within the observed range of measured data in the geochemical model to produce a reasonable comparison between predicted groundwater chemistry and observed groundwater chemistry. The objective of calibration is to create a geochemical model of the system that matches the measured groundwater chemistry at the downgradient monitoring well (ARAMW-7) over the monitoring period (2020 to 2023; Stantec 2023b). Equally important is to create a model that will reasonably respond to changes in groundwater geochemistry of the system to reflect various remediation options considered during remedy selection.

Groundwater and CCR pore water chemistry are represented by the full suite of constituents measured in the laboratory, plus the field measurements of pH, oxidation reduction potential (ORP), and temperature. However, for purposes of calibration of the geochemical model and determining the mixing fraction for CCR pore water and upgradient groundwater, only constituents least affected by other geochemical reactions are considered for defining the range in mixing. Boron and chloride are considered non-reactive in that there are no other geochemical reactions (e.g., adsorption, CEC, mineral equilibria) that change their concentrations after mixing of CCR pore water and upgradient groundwater. In this report, boron was used to determine the mixing fractions for the model due to the conservative behavior (Ruhl et al., 2012) and the indication of CCR influence at ARAMW-7 (Stantec 2023b).



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Binary mixing (i.e., pore water and upgradient groundwater) is based on determining the proportions, as a percentage, of each source to produce the target concentration. Two unknowns must be determined, the percentages of each source in the mixture. With two equations and two unknowns, the mixing fractions for each source can be calculated. The following example for boron shows the basic method.

$$xC_B^{pw}+yC_B^{upgradient}=C_B^{ARGWC-17}$$
 Equation 3

$$x+y=1$$
 Equation 4

Where:

C = concentration

pw = CCR pore water

B = boron

x = fraction of CCR pore water in the mixture

y = fraction of upgradient groundwater in the mixture

Solving Equation 4 for x, substituting into Equation 3, and algebraically manipulating to solve Equation 3 for x provides the calculated fraction of x (CCR pore water) in the mixture. The fraction of y in the mixture can then be determined using Equation 4.

Minerals identified in the unconsolidated materials characterization that could influence groundwater chemistry and the concentrations of select CCR constituents include iron and aluminum hydroxides. The presence of a given mineral, for example pyrite, is determined by the mineralogical analysis. The amount of mineral phase included in the model represents the estimated amount of the mineral available for the equilibrium reactions, defined using the results of mineralogical analysis and calculated water to rock ratio (Section 3.2.2). For example, cobalt in the aguifer is likely associated with multiple phases including adsorbed species on aquifer minerals as discussed in the GCSM report (Stantec 2023b). Multiple iron hydroxide minerals are included in the model to simulate iron oxyhydroxide transformation as a process explaining the decrease in iron concentration along the flow path (Stantec 2023b). In the geochemical model, desorption of cobalt adsorbed on hydroxide minerals (Hfo and Hao) in the aquifer was used as a second source of cobalt in addition to cobalt sourced from CCR pore water. Cobalt adsorption is primarily controlled by the abundance of adsorption sites and groundwater pH. Given that cobalt adsorption and desorption is expected to be more sensitive to groundwater pH than to the abundance of adsorption sites, groundwater pH was calibrated by changing the saturation index of pyrite mineral (i.e., acidity produced from oxidative dissolution of pyrite) along the flow path instead of by adjusting the adsorption sites (i.e., constant adsorption sites). Calculated lithium concentration of 107 µg/L in the hypothetical mixture of CCR pore water and upgradient groundwater was greater than the lithium concentrations (60–68 µg/L) measured at the downgradient well (ARAMW-7). This infers that lithium is attenuated during transport within the unconsolidated materials, possibly through exchange with other cations in clay minerals as discussed in the GCSM (Stantec 2023b). In the geochemical model, CEC is included as a calibration parameter for the attenuation of lithium.

The ranges in amounts of iron and aluminum hydroxides available for surface complexation reactions (adsorption) are presented in Table 2. The observed ranges serve as the calibration ranges used to establish the probable amount of metal hydroxide present in the groundwater flow system. Changes in



iron and aluminum hydroxide minerals were not coupled to the surface sites available for adsorption and desorption because the changes in the mineral mass associated with dissolution and precipitation reactions are negligible in comparison to the total abundance of surface sites in the unconsolidated materials. In addition to the range for available metal hydroxides, the range in CEC measured in unconsolidated materials and discussed in the GCSM (Stantec 2023b) was used as calibration parameters in developing the geochemical model. Likewise, a range of estimated groundwater velocity reported in the GCSM (Stantec 2023b) was also used as a calibration parameter. A copy of the PHREEQC code is presented in Appendix A.

3.3.2 PRE-CLOSURE CONDITION CALIBRATION RESULTS

Calibration of the geochemical model entails determining mixing ratios for CCR pore water and upgradient groundwater based on CCR material tracer boron and then adjusting other geochemical processes within the limits established by the available geochemical data to match the model outputs with the observed conditions as reasonably as possible. The important advantage of this approach is to create a geochemical model that considers key processes (e.g., advective and dispersive transport, adsorption/desorption, cation exchange, pH variation along the flow path) and results in groundwater chemistry reasonably matching with measured groundwater chemistry at the downgradient well (ARAMW--7). Thus, the model is expected to reasonably respond to changes in the groundwater geochemistry of the system to reflect various remediation options considered during remedy selection. While the measured groundwater concentration can be used in a model to represent current conditions. mimicking the measured concentrations with a mixture of observed mineral phases and allowing probable geochemical reactions (e.g., adsorption), coupled with observed groundwater flow rates, improves the modeling process, and demonstrates the understanding of the geochemical system. This approach also requires an evaluation of the sensitivity of geochemical parameters, as they are modified to mirror current conditions. The results of calibration of the geochemical model for AP-2 DAS at Plant Arkwright are presented in this section.

Cobalt and lithium are the constituents in groundwater with concentrations higher than their respective GWPSs, and the focus of the pre-closure condition simulation is to create a model simulation that captures the main geochemical processes that influence the downgradient groundwater concentrations of these constituents. However, the geochemical model that predicts the concentrations of cobalt and lithium at ARAMW-7 also needs to consider other characteristics of the groundwater solution, including pH, ORP, major ion concentrations, and CCR material tracers. The first two groundwater chemistry characteristics, pH and ORP, influence adsorption/desorption reactions and the stability and distribution of oxidation-reduction (redox)-sensitive species. Major ion concentrations influence the exchange reactions occurring between groundwater and aquifer minerals with high exchange capacity such as clays present along the flow path.

Predicted time-series concentrations of cobalt, lithium, CCR tracer boron, and pH at the downgradient groundwater monitoring well (ARAMW-7) are shown on Figure 4. The predicted concentrations during the calibration period (2020–2023) using the calibrated geochemical model were plotted as box plots for the comparison with the measured groundwater quality data within the same time (Figure 5). The reactive transport model results show that the predicted concentrations of CCR tracer boron stabilized within the



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calibration period (2020–2023); whereas, predicted cobalt and lithium concentrations exhibit an increasing trend during this period, reasonably matching the cobalt and lithium concentration ranges observed at the downgradient well (ARAMW-7; Figure 5). Likewise, the predicted pH and concentration of boron show good agreement with measured pH and boron at the downgradient well (Figure 5).

The predicted concentration of cobalt is primarily driven by adsorption and desorption onto Hfo and Hao along the flow path (Figure 4). The aquifer was originally filled with upgradient groundwater (ARGWA-20) with the current pH value of 5.9 standard units (s.u.) and cobalt concentration of 0.8 µg/L, the highest cobalt concentration observed at the upgradient groundwater well (ARGWA-20) during the monitoring period (2020–2023). Historical groundwater pH is unknown. The model assumes that historical groundwater was in equilibrium with aquifer minerals at a higher pH value (6.66 s.u.) to facilitate the adsorption of cobalt onto Hfo and Hao. While CCR pore water influenced groundwater flows through the aquifer, desorption and adsorption of cobalt take place. Ultimately, cobalt is released into groundwater via desorption of cobalt that was previously adsorbed onto Hfo and Hao minerals, contributing to the increase in cobalt concentration at monitoring well ARAMW-7 (Figure 4). Adsorption/desorption delays the stabilization of cobalt relative to boron which is not influenced by adsorption. The transport of boron is mainly controlled by advection and dispersion. On the other hand, a fraction of lithium in the CCR pore water influenced groundwater was predicted to be retained in the aquifer via exchange with other cations that are held by the net negative charge of clays in the unconsolidated materials. Similar to cobalt, the delay in reaching a stabilized lithium concentration in comparison to boron is caused by exchange reactions.

The modeling approach represents one of many mechanisms controlling the mobility of cobalt and lithium in groundwater at AP-2 DAS. Simulation of pre-closure conditions indicates a combination of four processes listed in the modeling approach (3.3.1) providing a reasonable fit for calibration of the geochemical model to pre-closure conditions. The effect of these geochemical processes can explain the observed behavior of cobalt and lithium in groundwater. For purposes of using geochemical modeling as a tool to assess corrective measures for cobalt and lithium in site groundwater, the model is considered calibrated.

3.4 Geochemical Modeling for Post-Closure Conditions

3.4.1 APPROACH

Post-closure conditions were simulated by the second transport period (80 years) of the calibrated model. The calibrated pre-closure parameters were used to initiate the post-closure modeling through the second transport period of 80 years. The context of the post-closure model is that the CCR material in AP-2 DAS is removed from the current location and placed in a permitted, lined landfill. Thus, the CCR pore water source is entirely removed. Upgradient groundwater post-closure at the start of the 1-D flow path is presented by a mixture of 99% upgradient groundwater and 1% residual CCR pore water influenced groundwater (as defined during the first transport period), which reflects an understanding that there will be some residual CCR influenced groundwater in the system following CCR removal. Groundwater within the flow path is the same as the last model iteration (step) for pre-closure period. The PHREEQC code for the post-closure period is presented in Appendix A. The post-closure model was used to predict changes



in groundwater chemistry resulted from two different remediation scenarios: 1) monitored natural attenuation (MNA) and 2) in-situ pH adjustment followed by MNA.

3.4.1.1 Post-closure Monitored Natural Attenuation Scenario

The post-closure transport period under MNA scenario was run for 80 years to simulate the changes in groundwater chemistry after the removal of CCR material in AP-2 DAS. Model parameters calibrated for pre-closure conditions remain the same for the post-closure transport period.

3.4.1.2 Post-closure In-situ pH Adjustment Scenario

The post-closure transport period under in-situ pH adjustment scenario was run for 80 years to simulate the changes in groundwater chemistry after the removal of CCR material in AP-2 DAS and the adjustment of groundwater pH to 7.0 s.u. at cell 14 within the flow path (15 cells in total), upgradient of the monitoring well (ARAMW-7) that is represented by cell 15 in the model (Figure 3). In-situ pH adjustment at cell 14 is simulated by fixing groundwater pH within this cell to 7.0 s.u. during the entire post-closure transport period. The in-situ pH adjustment scenario represents a remediation alternative such as in-situ injection of reagents such as sodium bicarbonate, sodium hydroxide, or lime or installation of a permeable reactive barrier filled with limestone or other media which ultimately neutralize acidic groundwater to achieve pH 7.0 s.u. Model parameters calibrated for pre-closure conditions remain the same for the post-closure transport period.

3.4.2 RESULTS

3.4.2.1 Post-Closure Monitored Natural Attenuation Scenario

The time-series model results for ARAMW-7's concentrations of select constituents in groundwater are presented in Figure 6. The concentration of CCR tracer boron is predicted to decrease and reach a stable concentration (81 μ g/L), approximately at the upgradient groundwater boron concentration (58 μ g/L on average), about ten years after AP-2 DAS is removed. Lithium concentration is predicted to decrease below GWPS of 40 μ g/L in 11 years and cobalt concentration to below 6 μ g/L in 37 years following the removal of CCR materials from AP-2 DAS.

The concentration of CCR tracer boron is predicted to remain constant for about six years post AP-2 DAS CCR removal, then decrease and eventually reach approximately the upgradient groundwater concentration, which is attributed to the removal of CCR pore water and gradual increase in the influence of upgradient groundwater with low concentration of boron (58 μ g/L on average). Likewise, the pH values are predicted to remain at 5.9 s.u. for about six years, then decrease to pH 5.8 s.u. approximately 12 years after the removal of AP-2 DAS CCR. The decrease in pH is attributed to upgradient groundwater replacement (pH = 5.9 s.u.) and re-establishment of an equilibrium between upgradient groundwater and pyrite. Like the CCR tracer concentration trend, the concentrations of cobalt and lithium are predicted to remain constant for about six years after AP-2 DAS CCR removal, then decrease due to a gradual increase in the influence of upgradient groundwater that is low in both cobalt (< 1 μ g/L) and lithium (< 7 μ g/L). Approximately 37 years after the closure of AP-2 DAS, the concentration of cobalt at ARAMW-7 is predicted to decrease to below the GWPS (6 μ g/L). The duration for cobalt to reach a concentration



below the GWPS is largely controlled by the desorption of cobalt from iron hydroxide in addition to the estimated groundwater velocity post-closure and assumed dispersion. Likewise, the duration for lithium to reach the concentration below GWPS (40 µg/L) is about 11 years, mainly controlled by the estimated groundwater flow post-closure and assumed dispersion in addition to cation exchange reactions between upgradient groundwater and clay minerals in the aquifer.

Within 10 to 15 years after the removal of CCR materials from AP-2 DAS, groundwater flow from upgradient areas is expected to dominate the downgradient groundwater chemistry such that lithium concentration is primarily controlled by natural weathering processes. On the other hand, it takes approximately 37 years for cobalt concentration to reach a level below the GWPS due to gradual desorption of cobalt from hydroxide minerals in the aquifer.

3.4.2.2 Post-closure In-situ pH Adjustment Scenario

Under the in-situ pH adjustment scenario, an increase in pH value upgradient of the monitoring well (ARAMW-7) facilitated the adsorption of cobalt onto hydroxide minerals in the aquifer (e.g., Hfo and Hao). As a result, cobalt concentration in groundwater at the downgradient well dropped quickly within the first year post-closure (the first model time step) and remained stable at the levels below the GWPS of 6 µg/L (Figure 6). On the other hand, in-situ pH adjustment did not affect the time it takes lithium to reach a level below the GWPS, remaining the same as predicted for the MNA scenario (Figure 6). Likewise, in-situ pH adjustment generally did not affect the temporal decreasing trend of boron concentration in the monitoring well (ARAMW-7) as observed under MNA scenario. As expected, pH at ARAMW-7 well increased to about 6.5 s.u. and then decreased to a relatively constant value of approximately 6.4 s.u. Overall, the model results for post-closure conditions under in-situ pH adjustment scenario demonstrated that pH is a critical factor controlling the adsorption and desorption of cobalt onto oxide minerals. Cobalt adsorption is enhanced under circumneutral to basic pH (e.g., pH above 6.5), as demonstrated in experimental studies (e.g., Landry et al., 2009).

3.5 Sensitivity Analysis

The modeling results for both pre-closure and post-closure conditions showed that groundwater velocity, pH, and aquifer properties such as CEC and abundance of hydroxide minerals are expected to affect the predicted durations for cobalt and lithium to meet GWPSs. Thus, these parameters would be critical components of the geochemical model that warrant sensitivity analysis in support of site assessment for remedy selection. Model results for sensitivity analysis are summarized in Table 3 and discussed in the subsections below.

3.5.1 GROUNDWATER VELOCITY

Sensitivity analysis was performed for post-closure conditions using the same calibrated model for the base case scenario (pre-closure conditions) for two groundwater velocities: a half (0.5X model scenario) and two times (2X model scenario) the groundwater flow velocity calibrated for pre-closure conditions (Table 3). Specifically, groundwater flow velocities associated with each scenario are as below:



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• 0.5X model scenario: 0.5 x 0.26 = 0.13 ft/day

• Base case: 0.26 ft/day

2X model scenario: 2 x 0.26 = 0.52 ft/day

Time-series plots (Figure 7) show the influence of groundwater flow on the predicted groundwater chemistry at the downgradient monitoring well (ARAMW-7). Under 0.5X groundwater velocity scenario (0.13 ft/day), the predicted durations for cobalt and lithium to decline below their GWPSs were about 76 years and 22 years, respectively. In contrast, the 2X groundwater flow scenario (0.52 ft/day), predicts that cobalt and lithium will decline below their GWPSs in 17 years and 6 years, respectively. Future hydrogeologic data collected in support of the remedy selection will be evaluated and, if warranted, used to re-evaluate the predicted time frame to reach GWPS and adapt the corrective action strategy.

3.5.2 GROUNDWATER pH

Cobalt adsorption onto hydroxide minerals is most effective at pH above 6.5 (e.g., Landry et al., 2009), which is expected to represent the range of historical (i.e., prior to 2010) groundwater pH values at which cobalt adsorption took place. The cobalt available for adsorption historically could either be derived from a natural source or from the CCR pore water. Cobalt released through desorption under acidic groundwater pH is expected to be the source of cobalt observed in downgradient groundwater. Thus, cobalt concentration in groundwater is controlled by both historical and current groundwater pH values along the flow path which were calibrated to match the predicted cobalt concentration with the observed cobalt concentration at the downgradient well for the base case scenario (pre-closure conditions).

3.5.2.1 Historical Groundwater pH

Under the base case scenario, historical groundwater pH was set to 6.66 s.u. to calibrate the amount of cobalt adsorbed onto hydroxide minerals that was available for desorption during interactions with CCR pore water influenced groundwater. When historical groundwater pH was decreased by 0.5 unit, from 6.66 s.u. to 6.16 s.u., adsorbed cobalt onto iron hydroxide minerals was decreased by an order of magnitude. As a result, modeled cobalt concentrations $(7 - 9 \mu g/L)$ were underpredicted in comparison to cobalt concentrations observed at the downgradient well (17 – 77 µg/L; ARAMW-7). The predicted time to achieve the GWPS for cobalt was 32 years (Table 3), which was shorter than the base case (37 years). When historical groundwater pH was increased by 0.5 unit, from 6.66 s.u. to 7.16 s.u., adsorbed cobalt onto iron hydroxide minerals was increased by about five times. As a result, modeled cobalt concentrations (217 – 244 µg/L) were overpredicted in comparison to cobalt concentration observed at the downgradient well (17 – 77 μg/L; ARAMW-7). The predicted time to achieve the GWPS for cobalt was 44 years (Table 3), which was longer than the base case (37 years). Under both historical groundwater pH model scenarios, predicted lithium concentration and the time for lithium to achieve GWPS remained unchanged in comparison to the base case. Overall, historical groundwater pH is expected to affect the amount of cobalt adsorbed onto hydroxide minerals in the aquifer. Subsequently, the higher the amount of adsorbed cobalt, the longer time needed for cobalt to wash out under a monitored natural attenuation scenario.



3.5.2.2 Current Groundwater pH

Groundwater pH along the flow path (5.45 – 5.90 s.u.) was calibrated for base case (pre-closure conditions) by changing the saturation index of pyrite mineral along the model cells. When current groundwater pH along the flow path was decreased by about 0.25 unit (5.19 - 5.64 s.u.), modeled cobalt concentrations (74 – 118 µg/L) were overpredicted in comparison to cobalt concentration observed at the downgradient well (17 – 77 μg/L; ARAMW-7). In addition, modeled cobalt concentration exhibited a decreasing trend over the calibration period; whereas measured cobalt groundwater concentration at the downgradient well exhibited an increasing trend. The predicted time to achieve the GWPS for cobalt was 16 years (Table 3), which was shorter than the base case (37 years). In contrast, when current groundwater pH was increased by about 0.25 unit (5.71 – 6.16 s.u.), modeled cobalt concentrations (18 – 21 µg/L) were underpredicted in comparison to the cobalt concentration observed at the downgradient well. Under this scenario, the predicted time to achieve the GWPS for cobalt was greater than the model period (80 years; Table 3). Under both current groundwater pH model scenarios, predicted lithium concentration and the time for lithium to decrease below the GWPS remained unchanged in comparison to the base case. Overall, groundwater pH greatly affects the behavior of cobalt in groundwater with a shorter wash out time and higher cobalt concentration under more acidic groundwater pH and a longer wash out time and lower cobalt concentration under mildly acidic groundwater pH values. Under neutral to alkaline pH values, cobalt is effectively attenuated, thus, the wash out time for cobalt would be primarily controlled by groundwater velocity.

3.5.3 ABUNDANCE OF HYDROXIDE MINERALS

In addition to groundwater pH, cobalt adsorption capacity by iron hydroxide minerals in the unconsolidated materials at the downgradient side of the AP-2 DAS unit, as measured by the total number of adsorption sites, is theoretically directly proportional to the amount of iron hydroxide mineral present in the aguifer. A similar argument holds for the effectiveness of aluminum hydroxide. Sensitivity analysis was performed for post-closure conditions using the same calibrated model for the base case scenario (pre-closure conditions) for two values of the hydroxide mineral abundances: a half (0.5X model scenario) and two times (2X model scenario) the abundance of iron and aluminum hydroxide minerals calibrated for pre-closure conditions. Under 0.5X scenario, modeled cobalt concentrations (49 – 57 µg/L) were the same as the cobalt concentrations predicted under base case scenario, which was comparable to the measured concentrations at the downgradient well (ARAMW-7). The time for cobalt to reach the GWPS was also the same as the base case (37 years; Table 3). Under 2X scenario, modeled cobalt concentrations (49 – 57 µg/L) were the same as the cobalt concentrations predicted under the base case scenario, which was comparable to the measured concentrations at the downgradient well (ARAMW-7). The time for cobalt to reach the GWPS was also the same as for the base case (37 years; Table 3). Under both model scenarios, predicted lithium concentration and the time for lithium to decrease below the GWPS remained unchanged in comparison to the base case. Overall, both pre-closure and postclosure model results were not sensitive to the abundance of hydroxide minerals in the aguifer that was varied from half to twice of the calibrated value for the base case scenario.



3.5.4 CATION EXCHANGE CAPACITY

The CEC of the unconsolidated materials directly affects the amount of lithium in groundwater exchanged with other cations from the interlayers of clay minerals in the flow path. The CEC was calibrated for the pre-closure period so that lithium in the upgradient groundwater and CCR pore water mixture was exchanged by other cations on the surface of clay minerals, resulting in a decrease in lithium concentration in groundwater that reasonably matched with the observed values at the downgradient well (ARAMW-7). When the CEC is reduced to half of the calibrated value (0.5X scenario; Table 3), lithium concentration was overpredicted (62 – 105 μ g/L) in comparison to the observed concentration (60 - 68 μ g/L). In contrast, lithium was underpredicted (21 – 34 μ g/L) when CEC was increased to twice of the calibrated value. In both cases, the predicted time to achieve groundwater protection standard for lithium was comparable to the base case (11 years), about 10 years for the 0.5X scenario and 12 years for the 2X scenario under a monitored natural attenuation scenario (Table 3). Therefore, the time for lithium to achieve the groundwater protection standard post remediation was not sensitive to the CEC within the aquifer that was varied from half to twice the calibrated value for the base case scenario.

3.6 Modeling Uncertainty and Limitations

Development of the geochemical model for AP-2 DAS at Plant Arkwright is based on combining information from the hydrogeologic analysis of groundwater flow, measurement of groundwater chemistry, measurement of CCR pore water chemistry, and analysis of the unconsolidated material geochemistry. The hydrogeologic and geochemical data were incorporated into a geochemical modeling computer program (PHREEQC) constructed to represent the GCSM. There are uncertainties inherent to each step of data collection and analysis with the cumulative uncertainty offset by sensitivity testing of the final geochemical model.

The calibrated geochemical model is not an exact match of actual field conditions; however, the calibrated model produces results (predicted groundwater chemistry) that are consistent with the measured groundwater chemistry. Therefore, the geochemical model provides a reasonable basis for evaluating the effects of various CCR management unit closure options and potential groundwater remedies to support the Assessment of Corrective Measures (ACM) Plan. While geochemical modeling results allow reasonable comparison of ACM Plan alternatives, the geochemical modeling results are not absolute, but are comparative.

4 Geochemical Modeling Conclusions

The 1-D reactive transport model presented in this report was built based on the GCSM (Stantec 2023b). The model results suggest that cobalt observed in groundwater downgradient of AP-2 DAS at Plant Arkwright (ARAMW-7) is partially derived from CCR pore water. As CCR pore water-influenced groundwater migrates downstream, desorption of cobalt from hydroxide minerals present in the aquifer releases additional cobalt into groundwater. During post-closure, desorption occurring during transport of upgradient groundwater within the flow path delays the wash out time of cobalt, requiring more time for cobalt to reach a stable concentration than boron, a conservative CCR tracer that is not influenced by



Reactive Transport Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile 4 Geochemical Modeling Conclusions

adsorption. The model predicts that cation exchange is the likely mechanism controlling the mobility of lithium. As groundwater migrates downgradient, lithium is predicted to concurrently be attenuated in the aquifer through exchange with clay minerals. Post-closure, the attenuated lithium is released from the exchange sites, partially delaying the time for lithium to reach a level below the GWPS. Sensitivity analysis shows that groundwater flow velocity and groundwater pH are critical factors affecting the wash out durations for cobalt and lithium. Future monitoring data should be evaluated to refine the currently proposed geochemical conceptual site model and used to revise the geochemical model as necessary.



5 References

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- Stantec Consulting Services Inc. (Stantec), 2023c Remedy Selection Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile (AP-2 DAS), February 28, 2024.



Reactive Transport Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile 5 References

US EPA. 1989. Interim Final RCRA Facility Investigation (RFI) Guidance, Volume II OF IV, Soil, Ground Water and Subsurface Gas Releases, EPA 530/SW-89-031, May 1989, Waste Management Division, Office of Solid Waste, U.S. Environmental Protection Agency.

TABLES

TABLE 1

GROUNDWATER FLOW VELOCITIES

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

Location	Lithology	К _h		K _h		K _h		n _e			Average Linear Velocity at Tested Well Location	
		(cm/s)	(ft/d)		<u> </u>		(ft/ft)		(ft/d)			
AP-2 DAS		T	1					1				
					0.30		0.024		0.064			
ARGWA-20	Overburden: Silty Sand to Sandy Silt	2.84E-04	0.805	[1]	0.20	[2]	0.025	[3]	0.101			
					0.10		0.026		0.209			
					0.30		0.024		0.171			
ARGWA-22	Overburden: Silty Sand to Sandy Silt	7.56E-04	2.14	[1]	0.20	[2]	0.025	[3]	0.268			
				-	0.10		0.026		0.557			
					0.30		0.024	.024	0.019			
ARGWA-23	Overburden: Silty Sand to Sandy Silt	8.35E-05	0.237	[1]	0.20	[2]	0.025	[3]	0.030			
					0.10		0.026		0.062			
DASS-4	Overburden: Clay -Silty Sandy Clay	1.07E-04	0.304	[1]	0.30	[2]	0.024	[3]	0.024			
					0.20		0.025		0.038			
					0.10		0.026		0.079			
					Summa	ary	Statistics					
							minimum		0.019			
							maximum		0.557			
					mean			n	0.135			
				İ	ge	om	etric mea	n	0.082			

Notes:

"kh" - horizontal hydraulic control

"ne" - effective porosity

"i" - horizontal hydraulic gradient

"cm/s" - centimeters per second

"ft/d" - feet per day

"ft/ft" - feet per foot

^[1] Result provided in Table 4 of the. Semi-Annual Remedy Selection and Design Progress Report, Georgia Power Company – Plant Arkwright Ash Pond 2 Dry Ash Stockpile, Macon, Georgia, July 30, 2021 (Wood, 2021)

izi Estimated effective porosity values of 10%-30% was selected for the silty sands/sandy silts/silty sandy clay overburden based on a review of several sources, including Driscoll, 1986; US EPA, 1989; Freeze and Cherry, 1979.

^[3] Recent hydraulic gradient calculated from September 2021, August 2022, and, January 2023 groundwater elevations at AP-2 DAS monitoring wells (ARGWA-20 to ARGWC-21) screened in the uppermost aquifer.

TABLE 2

SURFACE COMPLEXATION PARAMETERS FOR GEOCHEMICAL MODELING

Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

Parameter	Unit	Ferrihydrite			Gibbsite			
		Minimum	Mean	Maximum	Minimum	Mean	Maximum	
Geometric Mean of Unconsolidated Material Solids Composition	mg/kg X ¹	4700	5000	5300	2280	2325	2370	
	mol X/kg²	0.084	0.090	0.095	0.085	0.086	0.088	
Surface Site	mol weak sites / mol X	0.2	0.2	0.2	0.41	0.41	0.41	
Concentration ³	mol strong sites / mol X	0.005	0.005	0.005				
0 5 00 4	mol weak/kg	0.017	0.018	0.019	0.035	0.035	0.036	
Surface Sites ⁴	mol strong/kg	0.00042	0.00045	0.00047				
Surface Sites ⁴	mol weak/L	0.130	0.138	0.147	0.267	0.273	0.278	
Surface Sites	mol strong/L	0.00325	0.00346	0.00366				
Mass Ferrihydrite or Gibbsite ⁵	g/kg	7.5	8.0	8.4	6.6	6.7	6.9	
Mass Ferrihydrite or Gibbsite ⁵	g/L	58	61	65	58	59	60	

Notes:

- 1 milligrams per kilogram (mg/kg) of X where X is either iron (ferrihydrite) or aluminum (gibbsite)
- 2 moles (mol) of X per kilogram (kg)
- 3 Surface site concentrations for ferrihydrite and gibbsite are from Dzombak and Morel (1990) and Karamalidis and Dzombak (2011), respectively
- 4 Surface sites are calculate by multiplying the surface site concentration (mol weak sites/mol X or mol strong sites/mol X) with the number of mol of X per kg of unconsolidated material (mol X/kg). For example, mean surface sites of ferrihydrite (0.018 mol weak site) is obtained by multiplying 0.090 mol Fe/kg with 0.2 mol weak site/mol Fe. Bulk density and porosity of unconsolidate materials are assumed to be 1.93 kg/L and 0.2, respectively. In this case, 1L of pore water (i.e., groundwater) is in contact with 1.93 × (1 0.2) / 0.2 = 7.72 kg unconsolidated material. Thus, surface sites available for 1L of pore water is calculated by multiplying surface sites (mol/kg) to the equivalent unconsoliated material mass (7.72 kg)
- 5 Mass of ferrihydrite or gibbsite is calculated by multiplying the number of mol of Fe or Al with the molecular mass of ferrihydrite (88.85 g/mol) or gibbsite (78.00 g/mol), respectively. It is assumed that one mol of Fe or Al is equivalent to one mol of ferrihydrite or Gibbsite, respectively. For example, mass of ferrihydrite (mean value = 8.0 g) is obtained by multiplying 0.090 mol Fe/kg with 88.85 g/mol. Similar to surface sites, equivalent mass of ferrihydrite and gibbsite available for 1L of pore water is calculated by multiplying mass in one kg of unconsoliated material (g/kg) to the equivalent unconsolidated material mass (7.72 kg). The mass of ferrihydrite and gibbsite is used as a calibration parameter

TABLE 3 MODEL SENSITIVITY ANALYSIS Georgia Power Company - Plant Arkwright Ash Pond 2 Dry Ash Stockpile Macon, Georgia

Parameter	Mode	l Scenario	Time for Cobalt to Reach GWPS Value	Time for Lithium to Reach GWPS Value	
	Scenario Name	Input Value	Year	Year	
	0.5X	0.13	76	22	
Groundwater Velocity (ft/day)	Base Case	0.26	37	11	
	2X	0.52	17	6	
	Low Historical pH	6.16	32	11	
Historical Groundwater pH Along Flow Path (s.u.) ¹	Base Case	6.66	37	11	
(6.d.)	High Historical pH	7.16	40	11	
	Low Current pH	5.19 - 5.64	16	11	
Current Groundwater pH Along Flow Path (s.u.) ²	Base Case	5.45 - 5.90	37	11	
(6.4.)	High Current pH	5.71 - 6.16	>80	11	
	0.5X	Hfo = 15.4; Hao = 13	37	11	
Abundance of Hydroxide Minerals (g/L)	Base Case	Hfo = 31; Hao = 26	37	11	
(3. – /	2X	Hfo = 62; Hao = 52	37	11	
	0.5X	Cell 1-2: 0.07 Cell 3-9: 0.06 Cell 10-15: 0.05	37	10	
Cation Exchange Capacity (mole/L)	Base Case	Cell 1-2: 0.14 Cell 3-9: 0.12 Cell 10-15: 0.10	37	11	
	2X	Cell 1-2: 0.28 Cell 3-9: 0.24 Cell 10-15: 0.20	37	12	

Notes:

ft/day = feet per day

s.u. = standard units

g/L = gram per liter

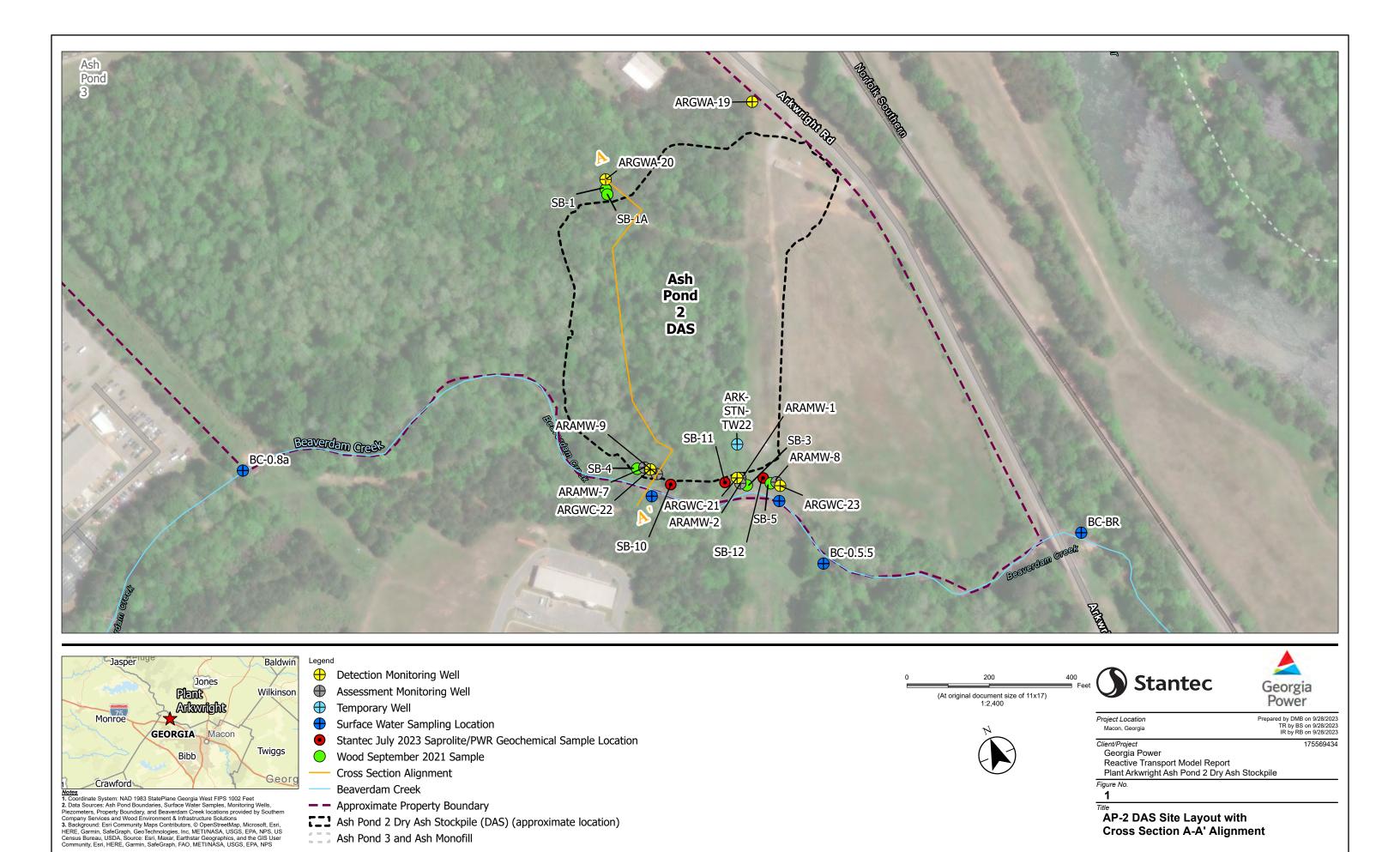
mole/L = mole per liter

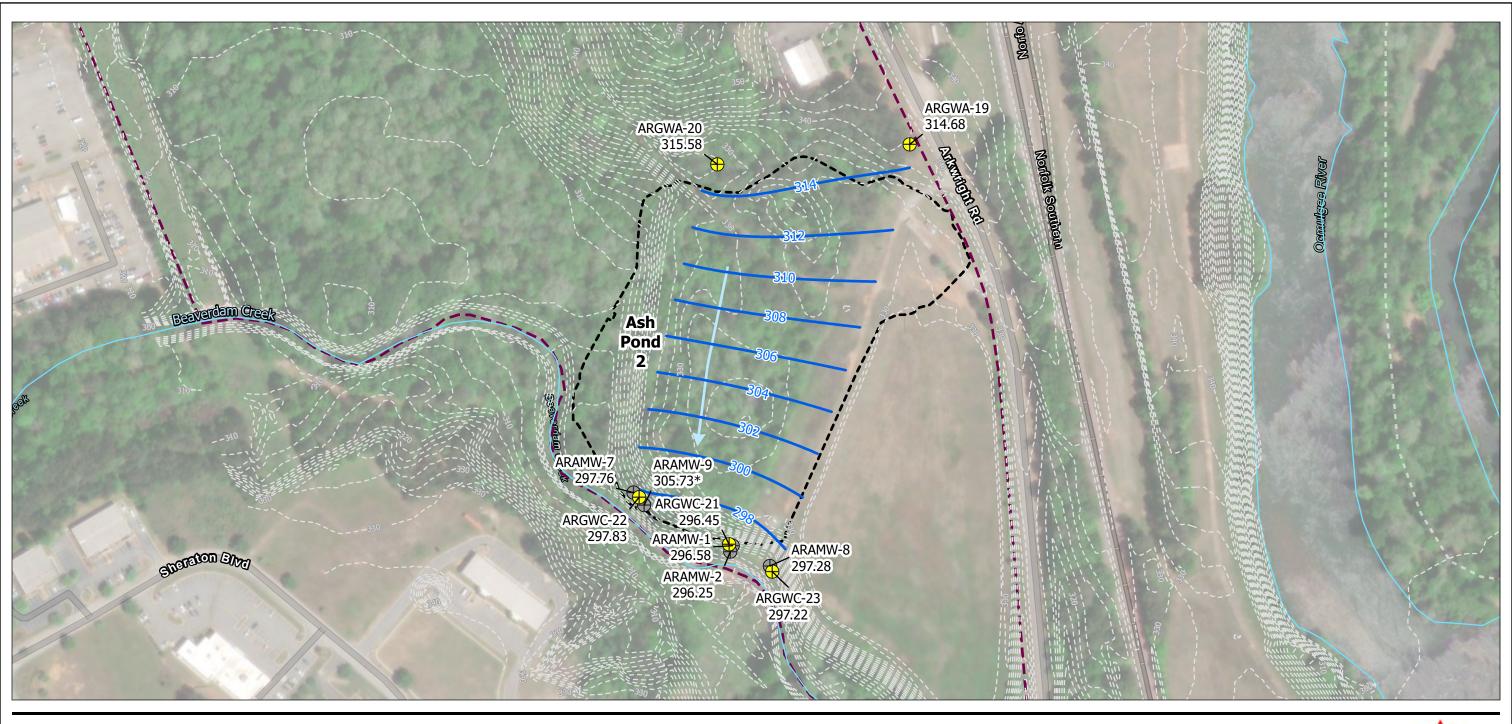
GWPS = Groundwater protection standard

¹Historical groundwater pH refers to the pH at which cobalt adsorption took place prior to placement of CCR materials in AP-2 DAS. Higher historical groundwater pH results in more adsorbed cobalt present in the system, and therefore requires a longer timeframe for groundwater concentrations to decrease below GWPSs.

²Current groundwater pH refers to the pH along the flow path upgradient of monitoring well ARAMW-7. Higher current groundwater pH results in a greater proportion of cobalt remaining in the sorbed phase. The increased sorbed concentration results in a lower cobalt concentration in groundwater, but requires a longer timeframe for groundwater concentrations to decrease below GWPSs.

FIGURES







Notes

1. Coordinate System: NAD 1983 StatePlane Georgia West FIPS 1002 Feet

2. Data Sources: Ash Pond Boundaries, Monitoring Wells, Property Boundary, Topography, and Beaverdam Creek provided by Southern Company Services and Wood Environment & Infrastructure Solutions; Contours, Flow Arrow, and Ocmulgee River provided by Stantec 3. Background: Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

egena

Detection Monitoring Well

Assessment Monitoring Well

Potentiometric Surface Contour Jan 2023 (ft NAVD88)

Interpreted Groundwater Flow Direction

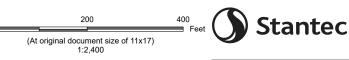
Topographic Contour 2018 (2 ft interval)

Beaverdam Creek/Ocmulgee River (Approximate)

Approximate Property Boundary

Ash Pond 2 Dry Ash Stockpile

296.58 Groundwater Elevation (ft NAVD88) *ARAMW-9 not included in contouring





Prepared by DMB on 5/31/2023 TR by BS on 5/31/2023 IR by MD on 5/31/2023

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Georgia Power
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Plant Arkwright Ash Pond 2 Dry Ash Stockpile

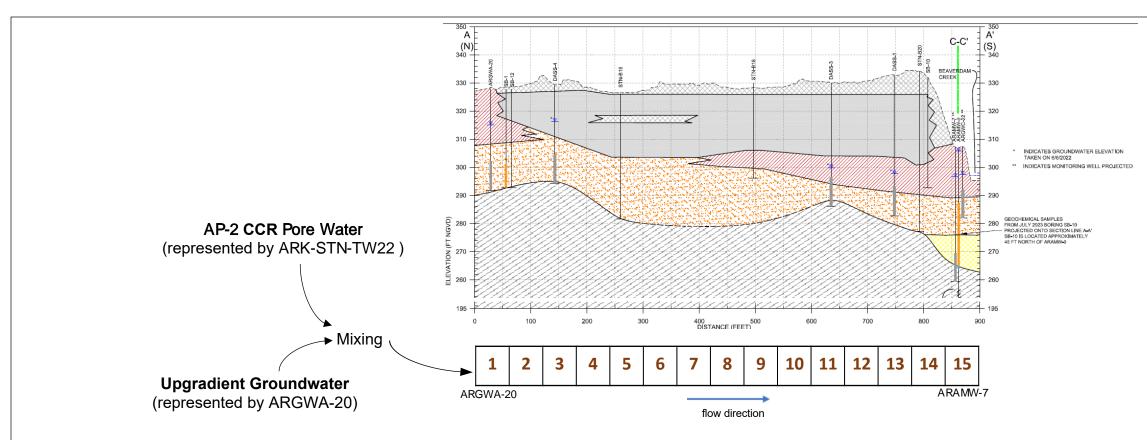
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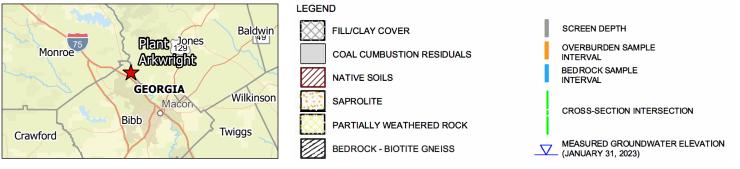
Macon, Georgia

2 itle

Potentiometric Surface Contour Map AP-2 DAS – January 30, 2023



Cells	Mineral	Model Saturation Index	Adsorption Mineral	Cation Exchange (meq/100g)
1 – 2	Maghemite Goethite	0 0		
3	Ferrihydrite Pyrite	0 -100	Ferrihydrite and Gibbsite	
4 – 5	Maghemite	0		
6 – 9	Goethite Ferrihydrite	0 0	None	54
10 –13	Pyrite	-92	Comile delta and	
14 –15	Maghemite Goethite Ferrihydrite Pyrite	3.5 3.5 3.5 -76	Ferrihydrite and Gibbsite	





- 1. Calibrated values are within the observed geochemical properties including mineralogy results, elemental concentration results, and sequential extraction results
- 2. Pyrite was used to control the groundwater pH that influences the adsorption and desorption of cobalt along the flow path. The amount of pyrite required for reaching the calibrated pH value was less than the X-ray Powder Diffraction detection limit (1%)





Project Location
Macon, Georgia

Prepared by TP on 9/29/2023 TR by JF on 9/29/2023 IR by JK on 9/29/2023

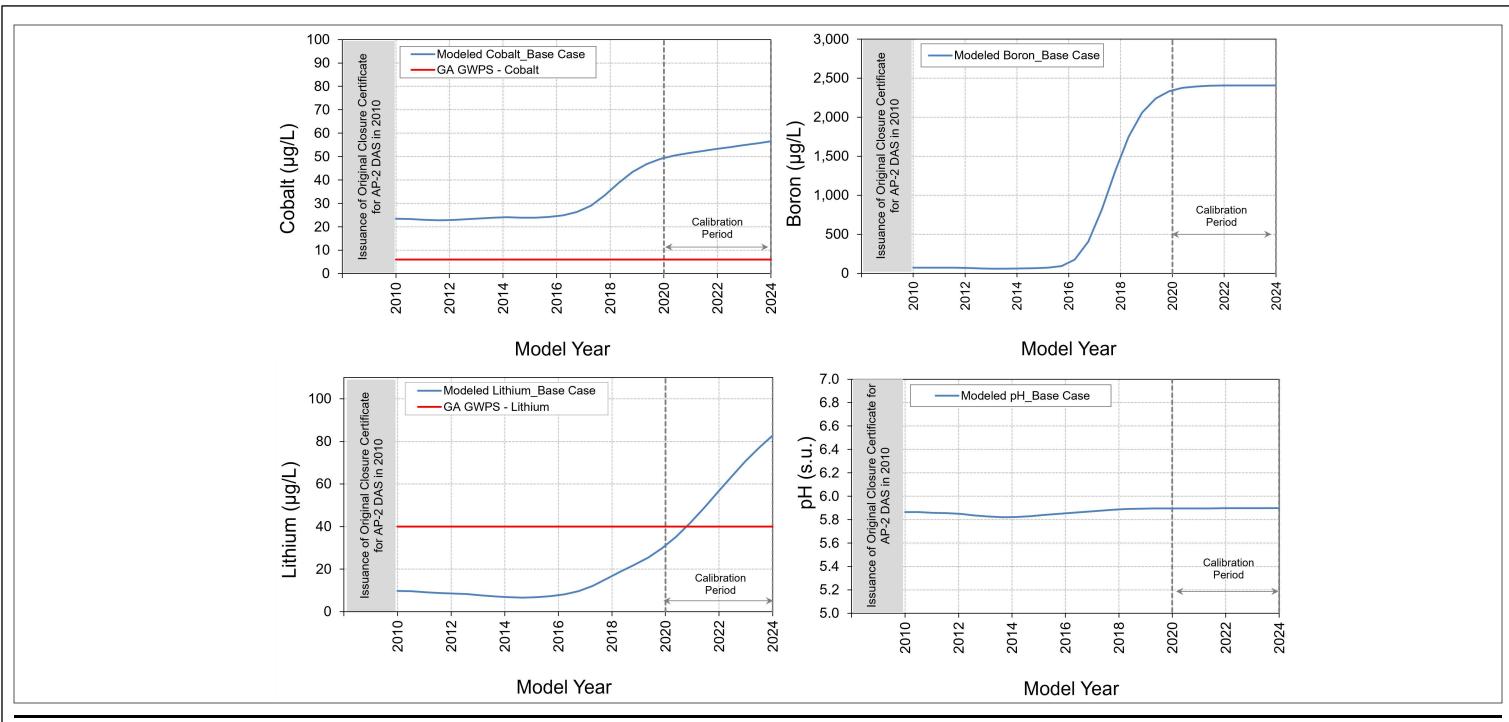
Client/Project Georgia Power

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Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Figure No.

Title

Schematic Diagram of the 1-D Geochemical Model for the A-A' Transect





Notes

1. μg/L - micrograms per liter

2. mV - millivolt

3. ORP - Oxidation Reduction Potential

4. pH - acidity

5. s.u. - standard units





Project Location
Macon, Georgia

Prepared by TP on 9/29/2023 TR by JF on 9/29/2023 IR by JK on 929/2023

17

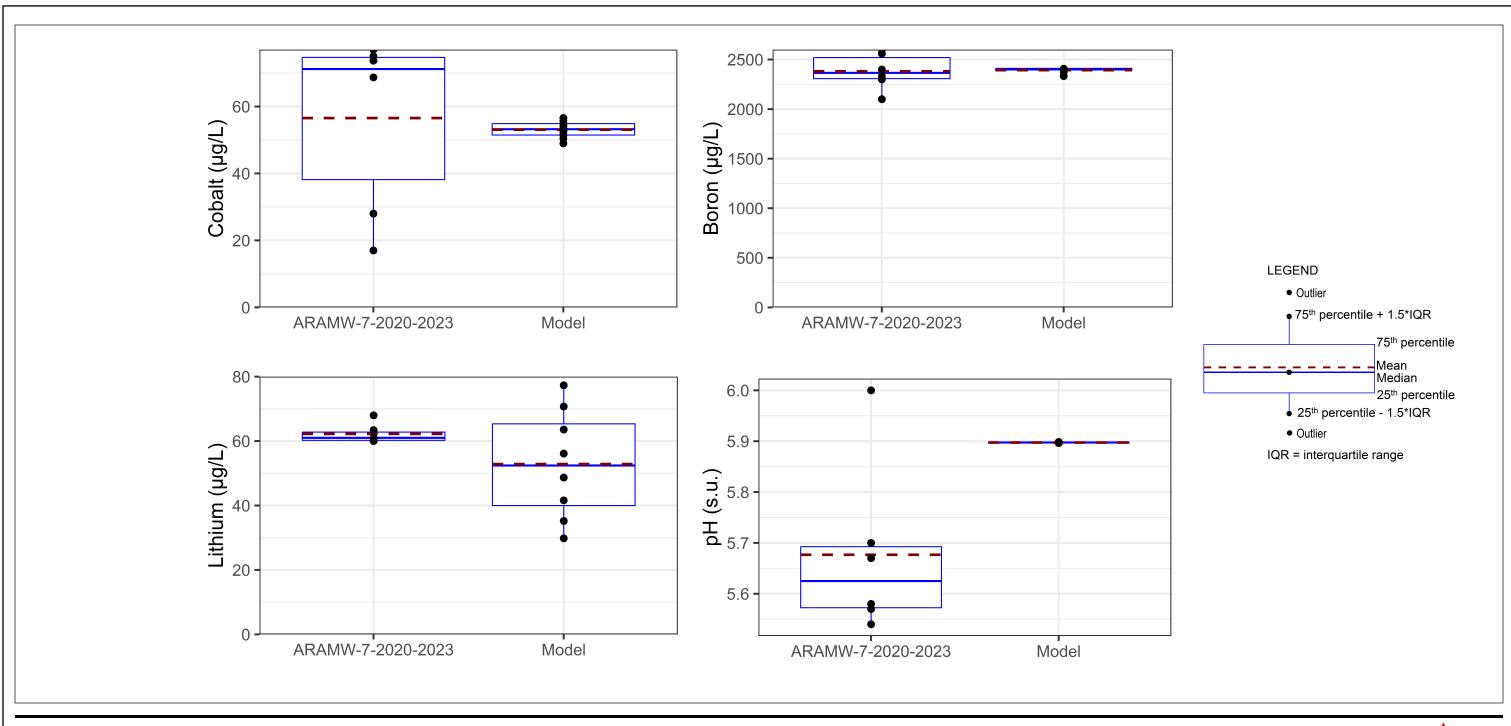
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Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Figure No.

4

Predicted Groundwater Chemistry at ARAMW-7 - Pre-closure Conditions





<u>Notes</u>

- μg/L micrograms per liter
 pH acidity
- 3. s.u. standard units
- 4. Model results for the 2020 2023 period are plotted as box plots for comparison to groundwater chemistry data measured at the downgradient well (ARAMW-7) during the same period





Project Location Macon, Georgia

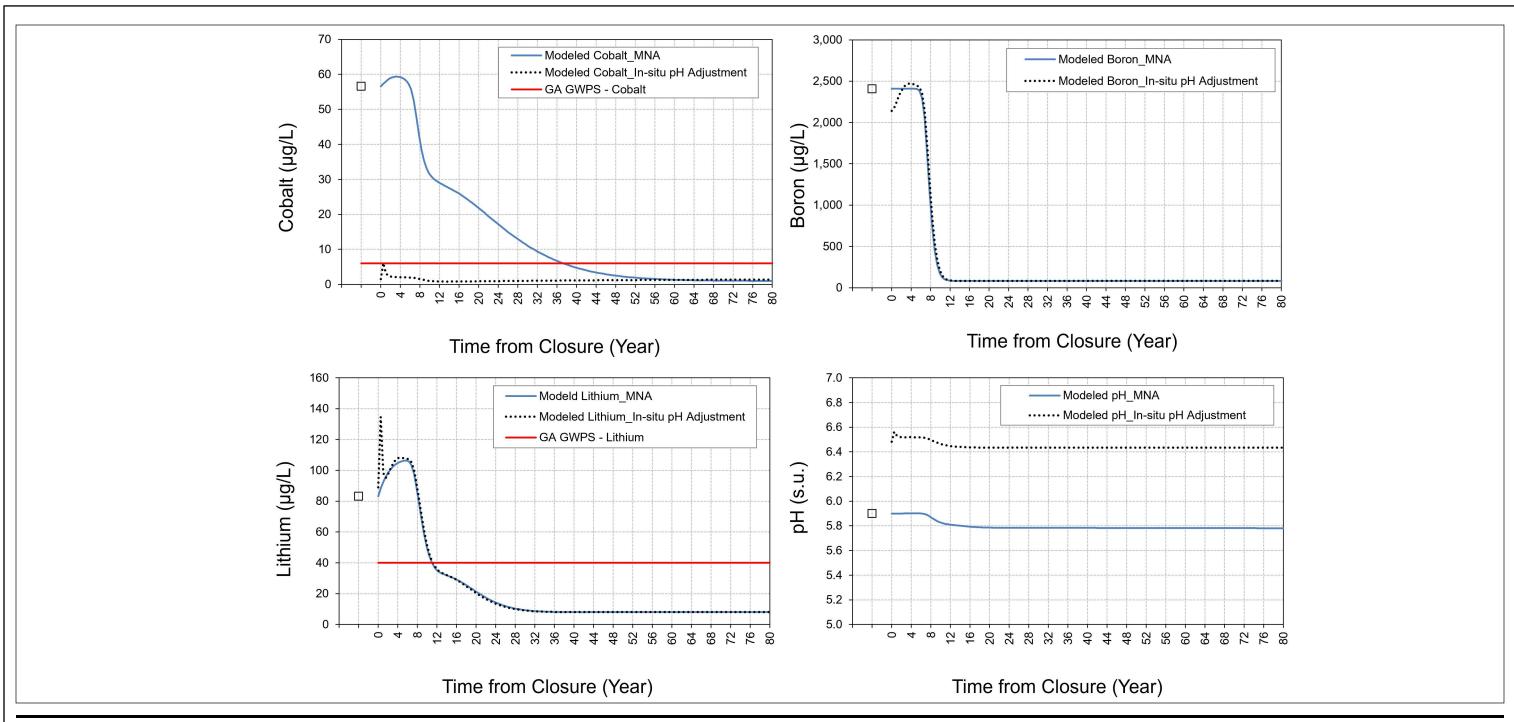
Prepared by TP on 9/29/2023 TR by JF on 9/29/2023 IR by JK on 9/29/2023

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Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Figure No. 5

Comparison Between Measured and Predicted Groundwater Chemistry at **ARAMW-7 - Pre-closure Conditions**





<u>Notes</u>

1. μg/L - micrograms per liter

2. mV - millivolt

3. ORP - Oxidation Reduction Potential

4. pH - acidity

5. s.u. - standard units

6. MNA - Monitored Natural Attenuation

7. In-situ pH Adjustment - Remediation measures such as chemical injection or installation of a passive reactive barrier to maintain pH value of 7 s.u. about 15 m upgradient of ARAMW-7 well (i.e., pH was fixed at 7.0 s.u. for model cell 14)

8. Geochemical model for post-closure period starts at 0 year when remediation (source removal) is complete and upgradient groundwater starts flowing through

9. Model results for the end of pre-closure period (before remediation) are shown for reference (open square symbol)





Project Location
Macon, Georgia

Prepared by TP on 9/29/2023 TR by JF on 9/29/2023 IR by JK on 9/29/2023

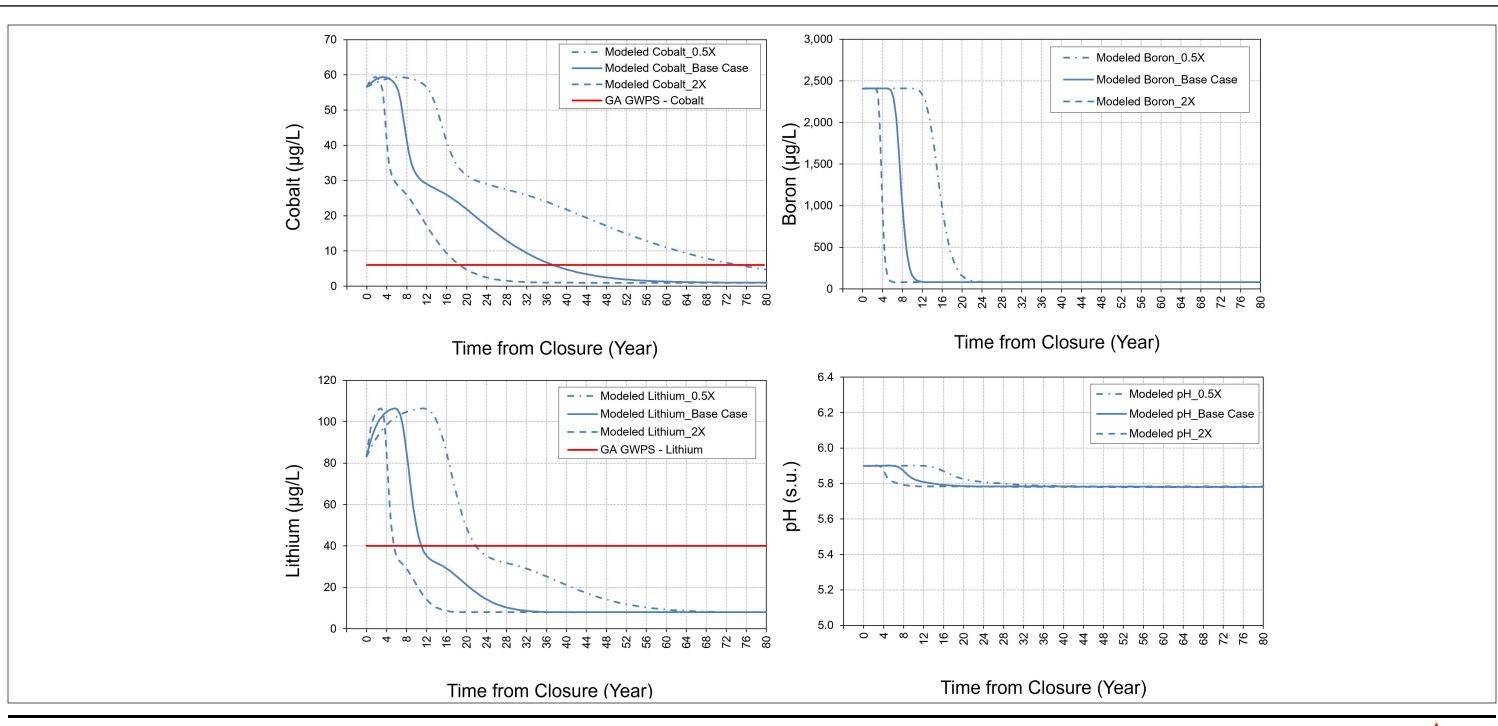
Client/Project
Georgia Power

Reactive Transport Model Report
Plant Arkwright Ash Pond 2 Dry Ash Stockpile

Figure No.

Title

Predictive Groundwater Chemistry at ARAMW-7 - Postclosure Conditions under Monitored Natural Attenuation and In-situ pH Adjustment Scenarios





<u>Notes</u>

- 1. μg/L micrograms per liter
- 2. pH acidity
- 3. s.u. standard units
- 4. Geochemical model for post-closure period starts at 0 year when remediation (source removal) is complete and upgradient groundwater starts flowing through
- 5. Sensitivity of groundwater flow was evaluated for two groundwater velocities, a half (0.5X model scenario) and two times of (2X model scenario) groundwater velocity in the base case scenario





Project Location

Prepared by TP on 9/29/2023 TR by JF on 9/29/2023 IR by JK on 9/29/2023

Client/Project
Georgia Power

Georgia Power Reactive Transport Model Report Plant Arkwright Ash Pond 2 Dry Ash Stockpile

igure No.

Title

Sensitivity of Groundwater Flow Velocity on Predicted Groundwater Chemistry at ARAMW-7 - Post-closure Conditions

APPENDIX A PHREEQC CODE



TITLE - AP-2 Transect AA_Pre-closure (Base Case) and Post-closure (Monitored Natural Attenuation)

```
PHASES
                                                                                                                                                         the first transport represents pre-closure conditions
 pe_Fix
                                                                  # allows fixing pe
                                                                                                                                                          the second transport represents post-closure conditions under monitored natural attenuation scenario
                                                                  e- = e-
log_k 0.0
pH_Fix
                                                                  # allows fixing pH
H+ = H+
                                                                   log_k 0.0
END
SURFACE_MASTER_SPECIES
              Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
HaoOH = HaoOH
                                                                  log k 0.0
HaoOH + H+ = HaoOH2+
 HaoOH = HaoO- + H+
                                                                  log_k 11.18
HaoOH + Co+2 = HaoOCo+ + H+
log_k -2.52
HaoOH + H3BO3 = HaoH2BO3 + H2O
                                                                 Log_k 1.57
EXCHANGE_MASTER_SPECIES
X X-
EXCHANGE_SPECIES
             X- = X-
log_k
                                           0.0
              Na++X-=NaX
             log_k
                                           0.0
             \begin{array}{ll} \text{K+ + X- = KX} \\ \text{log\_k} & 0.7 \end{array}
             Li+ + X- = LiX
              log_k
            H+ + X- = HX
log_k 1.
              Ca+2 + 2X - = CaX2
              Mg+2 + 2X- = MgX2
              Mn+2 + 2X- = MnX2
              log_k
                                         0.52
              Fe+2 + 2X- = FeX2
              log_k
                                         0.44
                                                                   SELECTED_OUTPUT
-file AP-2 TRANSECT AA-PreClosure_PostClosureMNA.bt
                                                                    -solution
                                                                                                                                         TRUE
                                                                    -user_punch
                                                                                                                                         TRUE
                                                                    -water
                                                                                                                                         TRUE
                                                                   USER PUNCH
                                                                    -headings
                                                                                                             pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 PV Ferrihydrite Ferrihydrite Goethite Mag
                                                                                                                                    | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding 
                                                                   -start
                                                                                                     10 PUNCH
20 PUNCH
30 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 40 PUNCH
50 PUNCH
60 PUNCH
                                                                                                      70 PUNCH
                                                                                                   80 PUNCH
90 PUNCH
100 PUNCH
                                                                                                   110 PUNCH
                                                                                                   120 PUNCH
130 PUNCH
                                                                                                   140 PUNCH
150 PUNCH
160 PUNCH
170 PUNCH
                                                                                                  180 PUNCH
190 PUNCH
200 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   # mg/kg of
# mg/kg of
                                                                                                                                     (mol("HTO_SHZASO4"
mol("HX")*1E3
mol("LiX")*1E3
mol("NaX")*1E3
mol("CaX2")*1E3
(STEP_NO + .5)/15
SI("Ferrihydrite")
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         mmol of I
mmol of I
                                                                                                   210 PUNCH
                                                                                                  220 PUNCH
230 PUNCH
240 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          mmol of 0
                                                                                                  250 PUNCH
260 PUNCH
270 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Pore volu
saturation
                                                                                                                                       SI("Ferrihydrite")
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          saturation
                                                                                                  280 PUNCH
290 PUNCH
                                                                                                                                      SI("Goethite")
SI("Maghemite")
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           saturation
saturation
 END
 SOLUTION 990
                                                                                                                                                         # ARK-STN-TW22 (source of CCR pore water influencing downstream groundwater)
                                                                                 19.7
6.5
2.4
      temp
pH
       pe
redox
units
                                                                               pe
mg/kgw
1.0
       density
       Alkalinity
                                                                                   192
                                                                                                              as Ca.5(CO3).5
                                                                                 0.19
4.41
363
7.7
0.032
      As
B
Ca
Cl
Co
                                                                               0.123
```

```
36.3
49.2
0.193
38.9
12.4
0.003
20.3
 Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                         1115
                                                     1 #kg
-water
END
SOLUTION 991
                                                                              # Upgradient groundwater: ARGWA-20 (overburden)
                                  units
                                                        mg/kgw
                                                          20.9
5.9
6.1
                                 temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                                    as Ca.5(CO3).5
                                                           36.5
                                                        0.00036
0.058
11.63
                                                                               #reporting limit
                                                           8.70
                                                                              #max of observed cobalt
                                                           0.13
                                                                              #reporting limit
                                                           0.03
                                                         2.13
0.007
3.893
                                                                              #reporting limit for recent samples 
#reporting limit for recent samples
                                                          0.001
                                                         0.0005
                                                          10.63
                                                           8.61
                                                                     #kg
END
TITLE Mix TW with Aquifer GW MIX 1
                                                              0.54
0.46
                                                                              \ensuremath{\text{\#}} determined by the hypothetical mixing ratios using CCR tracer boron
                                                  990
                                                  991
                                  SAVE Solution 992
END
                                  USE Solution 992
EQUILIBRIUM_PHASES 992
                                  SAVE Solution 0
FND
                                  TITLE Downgradient Transport Simulation
SOLUTION 1-15
                                                                              # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2), 
# assumed to be the water quality from the upgradient well ARGWA-20 (overburden)
                                                        mg/kgw
                                 temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                           20.9
6.66
                                                                              # calibrated/changed to facilitate initial cobalt adsorption onto Hfo and Hao
                                                         6.1
36.5
0.00036
                                                          0.058
                                                          11.6
8.70
                                                         0.0008
                                                                              #max of observed cobalt
                                                         0.129
0.030
2.133
                                                         0.007
3.893
0.001
                                                         0.0005
                                                          10.63
8.61
                                                            1.0
END
EQUILIBRIUM_PHASES
                                 1-3
                                                                              # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                               3.1
1.5
1.5
   Maghemite
Goethite
                                                     0
0
0
   Ferrihydrite
   Pyrite
                                                  -100
                                                              0.39
pe_Fix
EQUILIBRIUM_PHASES
                                                                              # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                  -6.1 O2(g)
                                  4-13
  Maghemite
Goethite
Ferrihydrite
                                                     0
0
0
                                                                3.1
                                                                1.5
   Pyrite
                                                   -92
                                                              0.39
                                                -5.16 O2(g)
   pe Fix
                                                                              # calibration parameter
EQUILIBRIUM_PHASES
                                                              3.1
1.5
1.5
0.39
   Maghemite
                                                   3.5
                                                3.5
3.5
-76 0
-4.16 O2(g)
  Goethite
Ferrihydrite
Pyrite
pe_Fix
                                                                              # fixed to match ORP observed at ARAMW-7
EXCHANGE
                                  1-2
                                                 0.14
                                                                              # eq of exchange sites per one liter (kg) of water
 -equilibrate with Solution 1
                                  3-9
EXCHANGE
                                                 0.12
                                                                              # eq of exchange sites per one liter (kg) of water
 equilibrate with Solution 1
                                 10-15
EXCHANGE
                                                 0.10
                                                                              # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
SURFACE
                                  1-5
-equil with 1
Hfo_wOH
                                       1.38E-01
                                                                       31
                                                                              # calibration parameter
                                                            600
Hfo sOH
                                       3 46F-03
                                                            600
HaoOH
END
SURFACE
                                       2.73E-01
                                                                              # calibration parameter
                                  11-15
-equil with 1
Hfo_wOH
                                       1.38E-01
                                                                       31
                                                                             # calibration parameter
                                       3.46E-03
Hfo sOH
                                                            600
HaoOH
                                       2.73E-01
                                                            600
                                                                       26 # calibration parameter
```

TRANSPORT

```
15
27
1.64E+07
15*15
15*1.5
TRUE
      -cells
-shifts
-time_step
                                                                                                                          # seconds
      -lengths
-dispersivities
-correct_disp
-thermal_diffusion
                                                                                         3.00E-10
                                                                2
1-15
     -thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_restart
                                                                1
1-15
END
                                                      USE Solution 992
                                                     USE Solution 991
MIX 2
                                                                             992
991
                                                                                                  0.01
0.99
                                                                                                                          \# fraction of CCR pore water and upgradient water mixture remaining after remediation \# fraction of upgradient water
                                                     SAVE Solution 0
END
TRANSPORT
                                                               154
15*15
15*1.5
1-15
      -shifts
-lengths
-dispersivities
     -print_cells
-print_frequency
-punch_cells
-dump_frequency
-punch_frequency
                                                                1
1-15
77
1
                                                    USER_GRAPH 1
-chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Co.png true true
                                                      -start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                     USER_GRAPH 2
                                                     USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_B.png true true
                                                     -start

10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
                                                    USER_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Li.png true true
-slart
                                                     -start

10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Li")*GFW("Li")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
```

END

the first transport represents pre-closure con the second transport represents post-closure

scenario

```
PHASES
  pe_Fix
                                                                                       # allows fixing pe
                                                                                      .. anows fi.
e- = e-
log_k 0.0
                                                                                       # allows fixing pH
                                                                                       H+ = H+
log_k 0.0
END
SURFACE_MASTER_SPECIES
Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaOOH
SURFACE_SPECIES
  HaoOH = HaoOH
log_k 0.0
HaoOH + H+ = HaoOH2+
 HaoOH = HaoO- + H+
log_k 11.18
HaoOH + Co+2 = HaoOCo+ + H+
log_k -2.52
HaoOH + H3BO3 = HaoH2BO3 + H2O
 Log_k 1.57
EXCHANGE_MASTER_SPECIES
X Y-
 EXCHANGE_SPECIES
                 X- = X-
log_k
                                                        0.0
                 Na+ + X- = NaX
log\_k 0.0
                  K+ + X- = KX
log_k 0.7
                 Li+ + X- = LiX
loq_k -0.08
                  H+ + X- = HX
                                                      1.0
                  log_k
                  Ca+2 + 2X- = CaX2
                  log_k
                  Mg+2 + 2X- = MgX2
log_k 0.6
                  Mn+2 + 2X- = MnX2
log_k 0.52
                 Fe+2 + 2X- = FeX2
log_k 0.44
                                                                                      SELECTED_OUTPUT
-file AP-2 TRANSECT AA-Injection.txt
                                                                                        -file
-selected_out
-solution
                                                                                                                                                                                  TRUE
                                                                                    -solution
-user_punch
-water
USER_PUNCH
-headings
-start
                                                                                                                                                                                  TRUE
TRUE
                                                                                                                                                                            kalinty CI SO4 Ca Mg Na K F AI As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LIX NaX CaX2 PV Ferrihydrite Goethite Mag

-LA("H+")
-S-LA("e-")*59.2
Aik*50.0355*1000
TOT("C")**GFW("C")**IE3
TOT("S)**GFW("C")**IE3
TOT("A)**GFW("A)**IE3
TOT("A)**GFW("A)**IE3
TOT("A)**GFW("A)**IE3
TOT("A)**GFW("A)**IE3
TOT("A)**GFW("A)**IE6
TOT("A)**GFW("A)**IE6
TOT("A)**GFW("A)**IE6
TOT("A)**GFW("A)**IE6
TOT("A)**GFW("C)**IE3
TOT("C)**GFW("C)**IE3
TOT("C)**GFW("C)**IE6
TOT("C)**GFW("C)**IE3
TOT("C)**GFW("C)**IE6
TOT("G)**GFW("C)**IE3
TOT("C)**GFW("C)**IE3
TOT("L)**GFW("C)**IE3
TOT("L)**GFW("C)**IE3
TOT("L)**GFW("C)**IE3
TOT("L)**GFW("C)**IE3
TOT("L)**GFW("Mo)**IE6
TOT("M)**GFW("Mo)**IE6
TOT("M)**GFW("Mo)**IE6
TOT("M)**GFW("Mo)**IE3
TOT("M)**GFW("Mo)**IE3
TOT("M)**GFW("Mo)**IE3
TOT("M)**GFW("Mo)**IE3
TOT("M)**GFW("Mo)**IE3
TOT("M)**GFW("Mo)**IE3
TOT("M)**GFW("Mo)**IE3
TOT("M)**GFW("Mo)**IE3
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TOT("M)**GFW("M)**IE3
"M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW("M)**GFW
                                                                                                                                             pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 PV Ferrihydrite Ferrihydrite Goethite Mag
                                                                                                                                    10 PUNCH
20 PUNCH
30 PUNCH
40 PUNCH
50 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               # pH
# Eh
# Alkalinity
# Cl
# SO4
                                                                                                                                    60 PUNCH
70 PUNCH
80 PUNCH
90 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                # Ca
# Mg
# Na
# K
                                                                                                                               90 PUNCH
100 PUNCH
110 PUNCH
120 PUNCH
130 PUNCH
140 PUNCH
150 PUNCH
170 PUNCH
180 PUNCH
190 PUNCH
200 PUNCH
210 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Mo mg/kg of sorbed Co, used to compare with S mg/kg of sorbed As, used to compare with S mml of HX mml of HX mml of MX mml of MX mml of MX mml of MX mml of MX mml of MX mml of Salz Pore volume saturation index of ferrihydrite saturation index of prehitie saturation index of goethite saturation index of goethite saturation index of maghemite
                                                                                                                                210 PUNCH
                                                                                                                                220 PUNCH
230 PUNCH
                                                                                                                               230 PUNCH
240 PUNCH
250 PUNCH
260 PUNCH
270 PUNCH
280 PUNCH
290 PUNCH
 END
SOLUTION 990
                                                                                                                                                                                                       # ARK-STN-TW22 (source of CCR pore water influencing downstream groundwater)
                                                                                                          19.7
6.5
2.4
       temp
pH
pe
redox
units
density
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
                                                                                                      pe
mg/kgw
1.0
192
0.19
4.41
363
7.7
0.032
0.123
36.3
49.2
0.193
38.9
12.4
0.003
                                                                                                                                              as Ca.5(CO3).5
         Na
S(6)
                                                                                                          20.3
1115
                                                                                                                                        1 #kg
 FND
 SOLUTION 991
                                                                                                                                                                                                       # Upgradient groundwater: ARGWA-20 (overburden)
```

```
mg/kgw
20.9
5.9
6.1
36.5
0.00036
0.058
11.63
8.70
0.0008
0.13
                                         units
temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                                                      as Ca.5(CO3).5
                                                                                                #max of observed cobalt
                                                                         0.13
0.03
                                                                                                 #reporting limit
                                                                         2.13
0.007
                                                                         3.893
0.001
                                                                                                 #reporting limit for recent samples 
#reporting limit for recent samples
                                                                       0.0005
10.63
8.61
1
 END
 TITLE Mix TW with Aquifer GW
                                                              990
991
                                                                              0.54
0.46
                                                                                                 # determined by the hypothetical mixing ratios using CCR tracer boron
                                          SAVE Solution 992
END
                                          USE Solution 992
 EQUILIBRIUM_PHASES 992
                                          SAVE Solution 0
 END
                                          TITLE Downgradient Transport Simulation # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2),
units mg/kgw # assumed to be the water quality from the upgradient well ARGWA-20 (overburden)
 SOLUTION 1-15
                                                                      mg/kgw
20.9
6.66
6.1
36.5
0.00036
                                         units
temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                                                                 # calibrated/changed to facilitate initial cobalt adsorption onto Hfo and Hao
                                                                         0.058
11.6
                                                                       8.70
0.0008
                                                                                                #max of observed cobalt
                                                                       0.129
0.030
2.133
0.007
3.893
0.001
0.0005
10.63
8.61
                                                                           1.0
 END
EQUILIBRIUM_PHASES 1-3
Maghemite
Goethite
Ferrihydrite
Pyrite
pe_Fix
EQUILIBRIUM_PHASES 4-13
Maghemite
Goethite
Ferrihydrite
Pyrite
pe_Fix
EQUILIBRIUM_PHASES 14-15
Maghemite
 EOUILIBRIUM PHASES 1-3
                                                                                                 # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                                 0 0
                                                                              3.1
1.5
1.5
                                                              -100 0.39
-6.1 O2(g)
                                                                                                  # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                           0 3
0 1
0 1
-92 0.
                                                                            3.1
1.5
1.5
0.39
                                                                                                 # calibration parameter
                                                              3.5
3.5
3.5
-76
    Maghemite
Goethite
                                                                              3.1
1.5
Ferrihydrite
Pyrite
pe_Fix
EXCHANGE
                                                                             1.5
0.39
                                                            -4.16 O2(g)
                                                                                                 # fixed to match ORP observed at ARAMW-7
                                         1-2
                                                             0.14
                                                                                                 # eq of exchange sites per one liter (kg) of water
 -equilibrate with Solution 1
EXCHANGE 3-9
                                                                                                 # eq of exchange sites per one liter (kg) of water
 X
-equilibrate with Solution 1
EXCHANGE 10-15
                                                                                                 # eq of exchange sites per one liter (kg) of water
 -equilibrate with Solution 1
 SURFACE
                                         1-5
SURFACE
-equil with 1
Hfo_wOH
Hfo_SOH
HacOH
END
SURFACE
-equil with 1
Hfo_wOH
Hfo_SOH
HacOH
END
                                                                          600
600
                                                1.38F-01
                                                                                        31 # calibration parameter
                                                 3.46E-03
                                                2.73E-01
                                                                                        26 # calibration parameter
                                          11-15
                                                1.38E-01
3.46E-03
2.73E-01
                                                                                        31 # calibration parameter
                                                                                        26 # calibration parameter
 TRANSPORT
                                                15
27
1.64E+07
      -cells
-shifts
    -shifts
-time_step
-lengths
-dispersivities
-correct_disp
-thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_frequency
-dump_frequency
                                                                                                # seconds
                                                  15*15
15*1.5
15*1.5
TRUE
2
1-15
1
                                                                      3.00E-10
 -dump_restart
END
 EQUILIBRIUM_PHASES 1-3
    #Plagioclase
                                                                              3.1
1.5
1.5
0.39
    Maghemite
Goethite
    Ferrihydrite
                                                              -100 0
-6.1 O2(g)
 PE_FIX
EQUILIBRIUM_PHASES 4-13
Maghemite
Goethite
Ferrihydrite
                                                                 0
0
0
                                                                              3.1
1.5
1.5
```

```
Pyrite
pe Fix

EQUILIBRIUM_PHASES 14
pti_Fix
EQUILIBRIUM_PHASES 15
Maghemite
Goethite
Ferritydrite
Pyrite
pe_Fix
EXCHANGE 1-2
X
                                                                            -92 0.39
-5.16 O2(g)
                                                                            -7.00 Ca(OH)2
                                                                                                                           # in-situ pH adjustment
                                                                           3.5 3.1
3.5 1.5
3.5 1.5
-76 0.39
-3.38 O2(g)
                                      1-2
                                                                            0.14
X
-equilibrate with Solution 1
EXCHANGE 3-9
X
-equilibrate with Solution 1
EXCHANGE 10-15
                                                                            0.12
                                                                             0.10
   -equilibrate with Solution 1
SURFACE
-equil with 1
Hfo_wOH
Hfo_SOH
HaoOH
END
SURFACE
                                                         1.38E-01
3.46E-03
2.73E-01
                                                    11-15
SURFACE
-equil with 1
Hfo_wOH
Hfo_sOH
HaoOH
END
                                                          1.38E-01
3.46E-03
                                                                                             600
600
                                                                                                              31
                                                            2.73E-01
                                                                                                               26
                                                    USE Solution 992
USE Solution 991
MIX 2
                                                     992
991
SAVE Solution 0
                                                                                                 0.01
0.99
                                                                                                                          \# fraction of CCR pore water and upgradient water mixture remaining after remediation \# fraction of upgradient water
END
TRANSPORT
      RANSPORT
-shifts
-lengths
-dispersivities
-print_cells
-print_frequency
-punch_cells
-dump_frequency
-punch_frequency
                                                                  154
                                                               154
15*15
15*1.5
1-15
1
1-15
77
1
                                                    USER_GRAPH 1
-chart_title "Cobalt"
-axis_titles "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_six 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Co.png true true
                                                      -start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                     USER GRAPH 2
                                                    USER_GRAPH 2
-chat_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_B.png true true
-start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
                                                     USER_GRAPH 3
                                                    USER_GRAPH 3
-chart_title "Lihium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Li_png true true
-start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("L")*GFW("L")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
```

TITLE - AP-2 Transect AA_Pre-closure (Base Case) and Post-closure (0.5X Scenario)

```
the first transport represents pre-closure conditions
                                                                      # allows fixing pe
                                                                                                                                                                the second transport represents post-closure conditions under groundwater velocity 0.5X scenario
pe Fix
                                                                     log_k 0.0
pH_Fix
                                                                       # allows fixing pH
                                                                     H+ = H+ log_k 0.0
SURFACE_MASTER_SPECIES
Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
HaoOH = HaoOH
                                                                    log_k 0.0
HaoOH + H+ = HaoOH2+
 HaoOH = HaoO- + H+
log_k 11.18
HaoOH + Co+2 = HaoOCo+ + H+
Log_k 1.57
EXCHANGE_MASTER_SPECIES
EXCHANGE SPECIES
              X- = X- \log_k
              Na++X-=NaX
               log_k
             K+ + X- = KX
log_k 0.7
             Li++X-=LiX
              log_k
              H+ + X- = HX
               log_k
                                              1.0
              Ca+2 + 2X- = CaX2
              loa k
                                             0.8
             \begin{array}{ll} Mg+2 + 2X- = MgX2 \\ log\_k & 0.6 \end{array}
              Mn+2 + 2X- = MnX2
              log_k
                                        0.52
              Fe+2 + 2X- = FeX2
               log_k
                                             0.44
                                                                     SELECTED_OUTPUT
-file AP-
-selected_out 7
-solution
                                                                                                                  AP-2 TRANSECT AA-PreClosure_PostClosureMNA.txt
                                                                       -user_punch
-water
                                                                                                                                               TRUE
TRUE
                                                                     USER_PUNCH
-headings
                                                                                                                                       -LA("H+")
-S-LA("e-")*59.2
Alk*50.0355*1000
TOT("C")*GFW("C")*1E3
TOT("K9)*GFW("C")*1E3
TOT("K9)*GFW("C")*1E3
TOT("K9)*GFW("K9)*1E3
TOT("K9)*GFW("K9)*1E3
TOT("K9)*GFW("K9)*1E3
TOT("K9)*GFW("K9)*1E3
TOT("K9)*GFW("K9)*1E3
TOT("K9)*GFW("K9)*1E3
TOT("K9)*GFW("K9)*1E3
TOT("K9)*GFW("K9)*1E3
TOT("K9)*GFW("K9)*1E3
TOT("K9)*GFW("K9)*1E6
TOT("K9)*GFW("K9)*1E6
TOT("K9)*GFW("K9)*1E6
TOT("K9)*GFW("K9)*1E6
TOT("K9)*GFW("K9)*1E6
TOT("K9)*GFW("K9)*1E6
TOT("M9)*GFW("K9)*1E6
TOT("M9)*GFW("K9)*1E3
TOT("M9)*GFW("K9)*1E3
TOT("M9)*GFW("K9)*1E3
TOT("M9)*GFW("K9)*1E3
TOT("M9)*GFW("M9)*1E6
TOT("M9)*GFW("M9)*1E6
TOT("M9)*GFW("M9)*1E6
TOT("M9)*GFW("M9)*1E6
TOT("M9)*GFW("M9)*1E6
TOT("M9)*GFW("M9)*1E6
TOT("M9)*GFW("M9)*1E6
TOT("M9)*GFW("M9)*1E6
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
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TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
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TOT("M9)*GFW("M9)*1E3
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TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
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TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*1E3
TOT("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*GFW("M9)*
                                                                                                                pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 PV Ferrihydrite Ferrihydrite Goethite Mag
                                                                       -start
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         pH
Eh
Alkalinity
                                                                                                          10 PUNCH
                                                                                                        10 PUNCH
20 PUNCH
30 PUNCH
40 PUNCH
50 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Ca
Mg
Na
K
F
Al
                                                                                                          70 PUNCH
                                                                                                      80 PUNCH
90 PUNCH
100 PUNCH
110 PUNCH
                                                                                                      120 PUNCH
120 PUNCH
130 PUNCH
140 PUNCH
150 PUNCH
160 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          As
B
Co
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Fe
Li
                                                                                                      170 PUNCH
180 PUNCH
190 PUNCH
200 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           mg/kg of sorbed Co, use
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         mg/kg of sorbed Co, use
mg/kg of sorbed As, use
mmol of HX
mmol of LiX
mmol of NaX
mmol of CaX2
                                                                                                      200 PUNCH
210 PUNCH
220 PUNCH
230 PUNCH
240 PUNCH
250 PUNCH
260 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Pore volume
saturation index of ferrih
saturation index of ferrih
saturation index of goeth
saturation index of magh
                                                                                                       270 PUNCH
                                                                                                      280 PUNCH
290 PUNCH
 END
 SOLUTION 990
                                                                                                                                                                # ARK-STN-TW22 (source of CCR pore water influencing downstream groundwater)
                                                                                      19.7
                                                                                       6.5
        redox
                                                                                       pe
                                                                                 mg/kgw
1.0
192
0.19
        units
        units
density
Alkalinity
As
B
Ca
CI
Co
F
Fe
                                                                                                                  as Ca.5(CO3).5
                                                                                       4.41
                                                                                   363
7.7
0.032
                                                                                    0.123
                                                                                      36.3
                                                                                   49.2
0.193
38.9
12.4
        K
Li
```

```
Mo
Na
S(6)
                                           0.003
20.3
1115
                                                        1 #kg
-water
END
SOLUTION 991
                                                                                   # Upgradient groundwater: ARGWA-20 (overburden)
                                                          mg/kgw
20.9
5.9
6.1
36.5
0.00036
                                   temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
                                                                         as Ca.5(CO3).5
                                                                                   #reporting limit
                                                             0.058
11.63
                                                             8.70
0.0008
0.13
0.03
                                                                                   #max of observed cobalt
                                                                                   #reporting limit
                                                              2.13
                                                             0.007
3.893
0.001
                                                                                   #reporting limit for recent samples 
#reporting limit for recent samples
                                                             0.0005
                                                              10.63
                                   S(6)
-wate
                                                              8.61
TITLE Mix TW with Aquifer GW
                                    MIX 1
                                                     990
991
                                                                 0.54
0.46
                                                                                   # determined by the hypothetical mixing ratios using CCR tracer boron
                                   SAVE Solution 992
END
                                   USE Solution 992
EQUILIBRIUM_PHASES 992
                                   SAVE Solution 0
END
                                   TITLE Downgradient Transport Simulation
SOLUTION 1-15
                                                                                   # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2),
# assumed to be the water quality from the upgradient well ARGWA-20 (overburden)
                                                           ma/kaw
                                   units
                                   temp
pH
pe
Alkalinity
                                                              20.9
6.66
6.1
36.5
                                                                                   # calibrated/changed to facilitate initial cobalt adsorption onto Hfo and Hao
                                   As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                            0.00036
                                                             0.058
11.6
8.70
0.0008
                                                                                   #max of observed cobalt
                                                             0.129
                                                             0.030
2.133
0.007
3.893
                                                             0.001
                                                             0.0005
                                                             10.63
8.61
                                    -water
                                                               1.0
FND
EQUILIBRIUM_PHASES
Maghemite
                                                                                   # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                        0
0
0
                                                                   3.1
   Goethite
                                                                   1.5
1.5
   Ferrihydrite
Pyrite
pe_Fix
EQUILIBRIUM_PHASES
                                                    -100 (
-6.1 O2(g)
                                                                  0.39
                                                                                   # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                   4-13
                                                        0
                                                                   3.1
   Maghemite
   Goethite
                                                        0
                                                                   1.5
Ferrihydrite
Pyrite
pe_Fix
EQUILIBRIUM_PHASES
                                                   -92 0.39
-5.16 O2(g)
                                                                                   # calibration parameter
                                   14-15
  Maghemite
Goethite
Ferrihydrite
                                                      3.5
                                                                   3.1
                                                   3.5
3.5
-76 0
-4.16 O2(g)
                                                                  0.39
   Pyrite
pe_Fix
EXCHANGE
                                                                                   # fixed to match ORP observed at ARAMW-7
                                   1-2
                                                    0.14
                                                                                   # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
EXCHANGE
                                                    0.12
                                                                                   # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
EXCHANGE
                                   10-15
                                                                                   # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
SURFACE
                                   1-5
-equil with 1
Hfo_wOH
Hfo_sOH
HaoOH
                                          1.38E-01
                                                                           31 # calibration parameter
                                         3.46E-03
2.73E-01
                                                               600
600
                                                                           26 # calibration parameter
HaoOH
END
SURFACE
-equil with 1
Hfo_wOH
Hfo_SOH
                                    11-15
                                          1.38E-01
                                                               600
                                                                           31 # calibration parameter
                                          3.46E-03
                                                               600
HaoOH
END
                                         2.73E-01
                                                                            26 # calibration parameter
TRANSPORT
                                             15
    -cells
-shifts
-time_step
-lengths
-dispersivities
-correct_disp
-thermal_diffusion
-print_cells
-print_frequency
                                        27
1.64E+07
15*15
15*1.5
                                                                                   # seconds
                                           TRUE
                                            2
1-15
                                                            3.00E-10
    -print_frequency
                                            1
1-15
```

-punch_cells

```
-punch_frequency
-dump_frequency
-dump_restart
                                                                     1
14
1
END
                                                      USE Solution 992
                                                      USE Solution 991
MIX 2
                                                                                 992
991
                                                                                                    0.01
0.99
                                                                                                                              \# fraction of CCR pore water and upgradient water mixture remaining after remediation \# fraction of upgradient water
                                                      SAVE Solution 0
END
TRANSPORT
                                                             15
77
3.27E+07
15*15
15*1.5
TRUE
      -cells
-shifts
     -shifts
-time_step
-lengths
-dispersivities
-correct_disp
-thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_restart
                                                                                                                              # seconds
                                                                   2
1-15
                                                                                            3.00E-10
                                                                    1
1-15
                                                                    1
39
1
                                                     USER_GRAPH 1
-chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Co.png true true
-start
                                                      start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1 -end
                                                   USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_B.png true true
                                                      -bact na_vol_o.p.ng use use -start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                     USER_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale_x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch Ad_V01_Li.png true true
-start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("L")*GFW("Li")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
FND
```

TITLE - AP-2 Transect AA_Pre-closure (Base Case) and Post-closure (2X Scenario)

```
PHASES
                                                                                                                                                            the first transport represents pre-closure conditions
 pe_Fix
                                                                    # allows fixing pe
                                                                                                                                                            the second transport represents post-closure conditions under groundwater velocity 2X scenario
                                                                    e- = e-
log_k 0.0
pH_Fix
                                                                    # allows fixing pH
H+ = H+
                                                                     log_k 0.0
END
SURFACE_MASTER_SPECIES
              Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
HaoOH = HaoOH
                                                                    log k 0.0
HaoOH + H+ = HaoOH2+
 HaoOH = HaoO- + H+
                                                                    log_k 11.18
HaoOH + Co+2 = HaoOCo+ + H+
log_k -2.52
HaoOH + H3BO3 = HaoH2BO3 + H2O
                                                                  Log_k 1.57
EXCHANGE_MASTER_SPECIES
X X-
EXCHANGE_SPECIES
             X- = X-
log_k
                                            0.0
              Na++X-=NaX
             log_k
                                            0.0
             \begin{array}{ll} \text{K+ + X- = KX} \\ \text{log\_k} & 0.7 \end{array}
             Li+ + X- = LiX
              log_k
            H+ + X- = HX
log_k 1.
              Ca+2 + 2X - = CaX2
              Mg+2 + 2X- = MgX2
              Mn+2 + 2X- = MnX2
              log_k
                                          0.52
              Fe+2 + 2X- = FeX2
              log_k
                                          0.44
                                                                     SELECTED_OUTPUT
-file AP-2 TRANSECT AA-PreClosure_PostClosureMNA.bt
                                                                      -solution
                                                                                                                                            TRUE
                                                                      -user_punch
                                                                                                                                            TRUE
                                                                      -water
                                                                                                                                            TRUE
                                                                     USER PUNCH
                                                                      -headings
                                                                                                               pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 PV Ferrihydrite Ferrihydrite Goethite Mag
                                                                                                                                       | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding | Clauding 
                                                                     -start
                                                                                                       10 PUNCH
20 PUNCH
30 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        # pH
# Eh
# Alkalinity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     # Alkan
# Cl
# SO4
# Ca
# Mg
# Na
# K
# F
                                                                                                       40 PUNCH
50 PUNCH
60 PUNCH
                                                                                                        70 PUNCH
                                                                                                     80 PUNCH
90 PUNCH
100 PUNCH
                                                                                                     110 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ΔΙ
                                                                                                    110 PUNCH
120 PUNCH
130 PUNCH
140 PUNCH
150 PUNCH
160 PUNCH
170 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             As
B
Co
Fe
Li
Mn
                                                                                                    180 PUNCH
190 PUNCH
200 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Мо
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               mg/kg of sor
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              mg/kg of sor
mmol of HX
mmol of LiX
mmol of NaX
                                                                                                                                        (mol("HTO_SHZASO4"
mol("HX")*1E3
mol("LiX")*1E3
mol("NaX")*1E3
mol("CaX2")*1E3
(STEP_NO + .5)/15
SI("Ferrihydrite")
                                                                                                    210 PUNCH
220 PUNCH
230 PUNCH
240 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               mmol of CaX
                                                                                                    250 PUNCH
260 PUNCH
270 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Pore volume saturation in
                                                                                                                                          SI("Ferrihydrite")
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         # saturation in
                                                                                                    280 PUNCH
290 PUNCH
                                                                                                                                         SI("Goethite")
SI("Maghemite")
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              saturation in saturation in
 END
 SOLUTION 990
                                                                                                                                                            # ARK-STN-TW22 (source of CCR pore water influencing downstream groundwater)
                                                                                   19.7
6.5
2.4
      temp
pH
       pe
redox
units
                                                                                 pe
mg/kgw
1.0
       density
       Alkalinity
                                                                                    192
                                                                                                                as Ca.5(CO3).5
                                                                                   0.19
4.41
      As
B
Ca
Cl
Co
                                                                                   363
7.7
0.032
                                                                                 0.123
```

```
36.3
49.2
0.193
38.9
12.4
0.003
20.3
 Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                         1115
                                                     1 #kg
-water
END
SOLUTION 991
                                                                              # Upgradient groundwater: ARGWA-20 (overburden)
                                  units
                                                        mg/kgw
                                                          20.9
5.9
6.1
                                 temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                                    as Ca.5(CO3).5
                                                           36.5
                                                        0.00036
0.058
11.63
                                                                               #reporting limit
                                                           8.70
                                                                              #max of observed cobalt
                                                           0.13
                                                                              #reporting limit
                                                           0.03
                                                         2.13
0.007
3.893
                                                                              #reporting limit for recent samples 
#reporting limit for recent samples
                                                          0.001
                                                         0.0005
                                                          10.63
                                                           8.61
                                                                     #kg
END
TITLE Mix TW with Aquifer GW MIX 1
                                                              0.54
0.46
                                                                              \ensuremath{\text{\#}} determined by the hypothetical mixing ratios using CCR tracer boron
                                                  990
                                                  991
                                  SAVE Solution 992
END
                                  USE Solution 992
EQUILIBRIUM_PHASES 992
                                  SAVE Solution 0
FND
                                  TITLE Downgradient Transport Simulation
SOLUTION 1-15
                                                                              # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2), 
# assumed to be the water quality from the upgradient well ARGWA-20 (overburden)
                                                        mg/kgw
                                 temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                           20.9
6.66
                                                                              # calibrated/changed to facilitate initial cobalt adsorption onto Hfo and Hao
                                                         6.1
36.5
0.00036
                                                          0.058
                                                          11.6
8.70
                                                         0.0008
                                                                              #max of observed cobalt
                                                         0.129
0.030
2.133
                                                         0.007
3.893
0.001
                                                         0.0005
                                                          10.63
8.61
                                                            1.0
END
EQUILIBRIUM_PHASES
                                 1-3
                                                                              # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                               3.1
1.5
1.5
   Maghemite
Goethite
                                                     0
0
0
   Ferrihydrite
   Pyrite
                                                  -100
                                                              0.39
pe_Fix
EQUILIBRIUM_PHASES
                                                                              # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                  -6.1 O2(g)
                                  4-13
  Maghemite
Goethite
Ferrihydrite
                                                     0
0
0
                                                                3.1
                                                                1.5
   Pyrite
                                                   -92
                                                              0.39
                                                -5.16 O2(g)
   pe Fix
                                                                              # calibration parameter
EQUILIBRIUM_PHASES
                                                              3.1
1.5
1.5
0.39
   Maghemite
                                                   3.5
                                                3.5
3.5
-76 0
-4.16 O2(g)
  Goethite
Ferrihydrite
Pyrite
pe_Fix
                                                                              # fixed to match ORP observed at ARAMW-7
EXCHANGE
                                  1-2
                                                 0.14
                                                                              # eq of exchange sites per one liter (kg) of water
 -equilibrate with Solution 1
                                  3-9
EXCHANGE
                                                 0.12
                                                                              # eq of exchange sites per one liter (kg) of water
 equilibrate with Solution 1
                                 10-15
EXCHANGE
                                                 0.10
                                                                              # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
SURFACE
                                  1-5
-equil with 1
Hfo_wOH
                                       1.38E-01
                                                                       31
                                                                              # calibration parameter
                                                            600
Hfo sOH
                                       3 46F-03
                                                            600
HaoOH
END
SURFACE
                                       2.73E-01
                                                                              # calibration parameter
                                  11-15
-equil with 1
Hfo_wOH
                                       1.38E-01
                                                                       31
                                                                             # calibration parameter
                                       3.46E-03
Hfo sOH
                                                            600
HaoOH
                                       2.73E-01
                                                            600
                                                                       26 # calibration parameter
```

TRANSPORT

```
15
27
1.64E+07
15*15
15*1.5
TRUE
     -cells
-shifts
-time_step
                                                                                                                        # seconds
     -lengths
-dispersivities
-correct_disp
-thermal_diffusion
                                                                                       3.00E-10
                                                               2
1-15
     -thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_restart
                                                               1
1-15
END
                                                    USE Solution 992
USE Solution 991
MIX 2
                                                                            992
991
                                                                                                0.01
0.99
                                                                                                                        \# fraction of CCR pore water and upgradient water mixture remaining after remediation \# fraction of upgradient water
                                                    SAVE Solution 0
END
TRANSPORT
                                                                                                                        #2X scenario
     -cells
-shifts
-time_step
                                                                  15
                                                           309
8.18E+06
15*15
15*1.5
TRUE
                                                                                                                        # seconds
    -time_step
-lengths
-dispersivities
-correct_disp
-thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_restart
                                                                                       3.00E-10
                                                               2
1-15
                                                               1
1-15
                                                                 155
                                                    USER GRAPH 1
                                                   USER, GRAPH 1
-chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Co.png true true
                                                     10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                   USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
                                                     -batch AA_V01_B.png true true
                                                    -bact ma_vo_s,ping due due -start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                   USER_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Li.png true true
-start
                                                    -start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Li")*GFW("Li")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
END
```

```
PHASES
                                                                                                                                                                  the first transport represent pre-closure conditions
  pe_Fix
                                                                  # allows fixing pe
                                                                                                                                                                                                                                              ent post-closure conditions under monitored natural attenuation scenario, testing sensitivity of historical pH (low)
                                                                 e- = e-
log_k 0.0
                                                                 # allows fixing pH
H+ = H+
log_k 0.0
 pH_Fix
END
SURFACE_MASTER_SPECIES
Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
  HaoOH = HaoOH
log\_k \ 0.0 HaoOH + H+ = HaoOH2+
log_k 7.17
HaoOH = HaoO- + H+
HaoOH = HaoU- + H+

log_k 11.18

HaoOH + Co+2 = HaoOCo+ + H+

log_k -2.52

HaoOH + H3BO3 = HaoH2BO3 + H2O
 Log_k 1.57
EXCHANGE_MASTER_SPECIES
               X X-
 EXCHANGE_SPECIES
               X- = X-
log_k
                                              0.0
                Na++X-=NaX
                K+ + X- = KX
log_k 0.7
               Li+ + X- = LiX
loq_k -0.08
                H+ + X- = HX
                                              1.0
                log_k
                Ca+2 + 2X- = CaX2
                Mg+2 + 2X- = MgX2
log_k 0.6
               Mn+2 + 2X- = MnX2
log_k 0.52
                Fe+2 + 2X- = FeX2
                log_k
                                                                 SELECTED_OUTPUT
                                                                                                                AP-2 TRANSECT AA-V03a_pH_low.txt
                                                                  -file
-selected_out
-solution
                                                                                                                       TRUE
                                                                                                                                               TRUE
                                                                -solution
-user_punch
-water
USER_PUNCH
-headings
-start
                                                                                                                                                 TRUE
TRUE
                                                                                                                                       | Alkalinity CI SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferritydrite CaX2 CaX2 CAL SUL
|-LA("H-")
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                                                                                                               pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferrihydrite CaX2 CaX2 CAL SUL
                                                                                                       10 PUNCH
20 PUNCH
30 PUNCH
40 PUNCH
50 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  # pH
# Eh
# Alkalinity
# CI
# SO4
# Ca
# Mg
# Na
# K
                                                                                                        60 PUNCH
70 PUNCH
80 PUNCH
90 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Ca
Mg
Na
K
F
Al
As
B
Co
Fe
Li
Mn
                                                                                                    90 PUNCH
100 PUNCH
110 PUNCH
120 PUNCH
130 PUNCH
140 PUNCH
150 PUNCH
160 PUNCH
170 PUNCH
190 PUNCH
200 PUNCH
210 PUNCH
210 PUNCH
210 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            mg/kg of sorbed Co, used to compare with SEP mg/kg of sorbed As, used to compare with SEP mmol of HX
                                                                                                      220 PUNCH
230 PUNCH
                                                                                                    230 PUNCH
240 PUNCH
250 PUNCH
260 PUNCH
270 PUNCH
280 PUNCH
290 PUNCH
300 PUNCH
                                                               END
SOLUTION 990
      temp
pH pe
redox
units
density
Alkalinity
As
B Ca
Cl
Co
F
Fe
K
Li
Mg
                                                                                0.003
                                                                                                                                                                    #updated
#updated
                                                                                  1115
        S(6)
                                                                                                                                                                    #updated
                                                                                                           1 #kg
 -wate
```

```
mg/kgw
20.9
5.9
6.1
36.5
0.00036
0.058
11.63
8.70
0.0008
0.13
0.03
                                                          ells: ARGWA-20 (overburden)
                                  units
temp
pH
pe
Alkalir
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
-water
                                                                            as Ca.5(CO3).5
#reporting limit
                                                                                       #max of observed cobalt
                                                                                       #reporting limit
                                                                0.03
2.13
                                                                0.007
                                                                3.893
                                                               3.893
0.001
0.0005
10.63
8.61
1
                                                                                       #reporting limit for recent samples 
#reporting limit for recent samples
TITLE Mix TW with Aquifer GW MIX 1
                                                                    0.54
                                                                                       # determined by the hypothetical mixing ratios for B
                                                                    0.46
                                   991
SAVE Solution 992
END
                                   USE Solution 992
EQUILIBRIUM_PHASES 992
                                                                                       # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                   SAVE Solution 0
END
                                   TITLE Downgradient Transport Simulation
                                                                                                                                            # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2), assumed to be the water quality from the upgradient well ARGWA-20 (overburd
SOLUTION 1-15
                                   units
temp
pH
pe
Alkalinity
                                                            mg/kgw
20.9
6.16
                                                                                       # facilitate initial cobalt adsorption
                                                                 6.1
36.5
                                  As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                              0.00036
                                                                0.058
                                                               11.6
8.70
0.0008
0.129
0.030
2.133
0.007
3.893
0.001
                                                               0.0005
10.63
                                                                8.61
1.0
END
EQUILIBRIUM_PHASES 1-3
                                                                                       # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                     0
0
0
-100
(-6.1 O2(g)
                                                                    3.1
1.5
1.5
0.39
    Maghemite
Goethite
Goethite
Ferrihydrite
Pyrite
pe_Fix
EQUILIBRIUM_PHASES 4-13
Maghemite
Goethite
Ferrihydrite
Pyrite
                                                                                       # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                                      3.1
1.5
1.5
Pyrite
pe_Fix
EQUILIBRIUM_PHASES 14-15
                                                    -92 (
-5.16 O2(g)
                                                                     0.39
                                                                                       # calibration parameter
EQUILIBRIUM
Maghemite
Goethite
Ferrihydrite
Pyrite
pe_Fix
EXCHANGE
X
                                                       3.5
                                                                      3.1
                                                      3.5
3.5
-76
                                                                       1.5
                                                                    0.39
                                                    -4.16 O2(g)
                                                                                       # fixed to match ORP observed at ARAMW-7
                                   1-2
                                                    0.14
-equilibrate with Solution 1
EXCHANGE 3-9
                                                     0.12
                                                                                       # eq of exchange sites per one liter (kg) of water
EXCHANGE
                                   10-15
                                                    0.10
                                                                                       # eq of exchange sites per one liter (kg) of water
 -equilibrate with Solution 1
SURFACE
                                   1-5
SURFACE
-equil with 1
Hfo_wOH
Hfo_sOH
HaoOH
END
SURFACE
-equil with 1
Hfo_wOH
Hfo_sOH
HaoOH
END
                                        1.38E-01
                                                                 600
                                                                              31 # calibration parameter
                                        3.46E-03
2.73E-01
                                                                  600
600
                                                                               26
                                                                                      # calibration parameter
                                   11-15
                                        1.38E-01
3.46E-03
2.73E-01
                                                                               31
TRANSPORT
     -cells
-shifts
                                             15
27
    -shifts
-time_step
-lengths
-dispersivities
-correct_disp
-thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_restart
                                        27
1.64E+07
15*15
15*1.5
TRUE
2
1-15
                                                               3.00E-10
                                            1
1-15
                                             1
14
END
                                  USE Solution 992
USE Solution 991
                                   MIX 2
                                   992
991
SAVE Solution 0
                                                                    0.01
0.99
                                                                                       \# fraction of CCR pore water and upgradient water mixture remaining after remediation \# fraction of upgradient water
END
```

SOLUTION 991

```
TRANSPORT
           RANSPORT
-shifts
-lengths
-dispersivities
-print_cells
-print_frequency
-punch_cells
-dump_frequency
-punch_frequency
                                                                                                                                                154
15*15
15*1.5
1-15
1
1-15
77
1
                                                                                                                USER_GRAPH 1
-chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale_x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch_Ak_v01_Co.png true true
-start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
                                                                                                                  USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch_AA_V01_B.png true true
                                                                                                                      -start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                                                                                    USER_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Li.png true true
                                                                                                                      -start \\ 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0, TOT("Li")*GFW("Li")*1E6, color=Blue, symbol=Circle, symbol\_size=5, y-axis=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line
                                                                                                                      USER_GRAPH 4
                                                                                                                  USER_GRAPH 4
-chart_title "Molybdenum"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Mo.png true true
-start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Mo")*GFW("Mo")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
```

```
PHASES
                                                                                                                                                                the first transport represent pre-closure conditions
  pe_Fix
                                                                 # allows fixing pe
                                                                                                                                                                                                                                            ent post-closure conditions under monitored natural attenuation scenario, testing sensitivity of historical pH (high)
                                                                 e- = e-
log_k 0.0
                                                                 # allows fixing pH
H+ = H+
log_k 0.0
 pH_Fix
END
SURFACE_MASTER_SPECIES
Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
  HaoOH = HaoOH
log_k 0.0
HaoOH + H+ = HaoOH2+
HaoOH + H+ = HaoOH2+

log_k 7.17

HaoOH = HaoO- + H+

log_k 11.18

HaoOH + Co+2 = HaoOCo+ + H+

log_k -2.52

HaoOH + H3BO3 = HaoH2BO3 + H2O
 Log_k 1.57
EXCHANGE_MASTER_SPECIES
              X X-
 EXCHANGE_SPECIES
              X- = X-
log_k
                                             0.0
               Na++X-=NaX
               K+ + X- = KX
log_k 0.7
              Li+ + X- = LiX
log_k -0.08
               H+ + X- = HX
                                             1.0
               log_k
               Ca+2 + 2X- = CaX2
               log_k
               Mg+2 + 2X- = MgX2
log_k 0.6
              Mn+2 + 2X- = MnX2
log_k 0.52
               Fe+2 + 2X- = FeX2
               log_k
                                                                 SELECTED_OUTPUT
                                                                                                               AP-2 TRANSECT AA-V03a_pH_high.txt
                                                                  -file
-selected_out
-solution
                                                                                                                      TRUE
                                                                                                                                              TRUE
                                                               -solution
-user_punch
-water
USER_PUNCH
-headings
-start
                                                                                                                                               TRUE
TRUE
                                                                                                                                      | Alkalinity CI SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferritydrite CaX2 CaX2 CAL SUL
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                                                                                                              pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferrihydrite CaX2 CaX2 CAL SUL
                                                                                                      10 PUNCH
20 PUNCH
30 PUNCH
40 PUNCH
50 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                60 PUNCH
70 PUNCH
                                                                                                        80 PUNCH
90 PUNCH
                                                                                                    90 PUNCH
100 PUNCH
110 PUNCH
120 PUNCH
130 PUNCH
140 PUNCH
150 PUNCH
160 PUNCH
170 PUNCH
190 PUNCH
200 PUNCH
210 PUNCH
210 PUNCH
210 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            mg/kg of sorbed Co, used to compare with SE
mg/kg of sorbed As, used to compare with SE
mmol of HX
                                                                                                     220 PUNCH
230 PUNCH
                                                                                                    230 PUNCH
240 PUNCH
250 PUNCH
260 PUNCH
270 PUNCH
280 PUNCH
290 PUNCH
300 PUNCH
                                                              END
SOLUTION 990
      temp
pH pe redox units density Alkalinity As
B Ca Cl Co F Fe K
Li Mg Mn
        Mo
Na
                                                                               0.003
                                                                                                                                                                   #updated
#updated
                                                                                  1115
        S(6)
                                                                                                                                                                   #updated
                                                                                                          1 #kg
 -wate
```

```
mg/kgw
20.9
5.9
6.1
36.5
0.00036
0.058
11.63
8.70
0.0008
0.13
0.03
SOLUTION 991
                                                          ells: ARGWA-20 (overburden)
                                  units
temp
pH
pe
Alkalir
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
-water
                                                                            as Ca.5(CO3).5
#reporting limit
                                                                                       #max of observed cobalt
                                                                                       #reporting limit
                                                                0.03
2.13
                                                                0.007
                                                                3.893
                                                               3.893
0.001
0.0005
10.63
8.61
1
                                                                                       #reporting limit for recent samples 
#reporting limit for recent samples
TITLE Mix TW with Aquifer GW MIX 1
                                                                    0.54
                                                                                       # determined by the hypothetical mixing ratios for B
                                                                    0.46
                                   991
SAVE Solution 992
END
                                   USE Solution 992
EQUILIBRIUM_PHASES 992
                                                                                       # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                   SAVE Solution 0
END
                                   TITLE Downgradient Transport Simulation
                                                                                                                                              # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2), assumed to be the water quality from the upgradient well ARGWA-20 (over
SOLUTION 1-15
                                   units
temp
pH
pe
Alkalinity
                                                            mg/kgw
20.9
7.16
                                                                                       # facilitate initial cobalt adsorption
                                                                 6.1
36.5
                                  As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                             0.00036
                                                                0.058
                                                               11.6
8.70
0.0008
0.129
0.030
2.133
0.007
3.893
0.001
                                                               0.0005
10.63
                                                                8.61
1.0
END
EQUILIBRIUM_PHASES 1-3
                                                                                       # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                     0
0
0
-100
(-6.1 O2(g)
                                                                    3.1
1.5
1.5
0.39
    Maghemite
Goethite
Goethite
Ferrihydrite
Pyrite
pe_Fix
EQUILIBRIUM_PHASES 4-13
Maghemite
Goethite
Ferrihydrite
Pyrite
                                                                                       # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                                      3.1
1.5
1.5
Pyrite
pe_Fix
EQUILIBRIUM_PHASES 14-15
                                                    -92 (
-5.16 O2(g)
                                                                     0.39
                                                                                       # calibration parameter
EQUILIBRIUM
Maghemite
Goethite
Ferrihydrite
Pyrite
pe_Fix
EXCHANGE
X
                                                       3.5
                                                                      3.1
                                                      3.5
3.5
-76
                                                                       1.5
                                                                    0.39
                                                    -4.16 O2(g)
                                                                                       # fixed to match ORP observed at ARAMW-7
                                   1-2
                                                    0.14
-equilibrate with Solution 1
EXCHANGE 3-9
                                                     0.12
                                                                                       # eq of exchange sites per one liter (kg) of water
EXCHANGE
                                   10-15
                                                    0.10
                                                                                       # eq of exchange sites per one liter (kg) of water
 -equilibrate with Solution 1
SURFACE
                                   1-5
SURFACE
-equil with 1
Hfo_wOH
Hfo_sOH
HaoOH
END
SURFACE
-equil with 1
Hfo_wOH
Hfo_sOH
HaoOH
END
                                        1.38E-01
                                                                 600
                                                                              31 # calibration parameter
                                        3.46E-03
2.73E-01
                                                                  600
600
                                                                               26
                                                                                      # calibration parameter
                                   11-15
                                        1.38E-01
3.46E-03
2.73E-01
                                                                               31
TRANSPORT
     -cells
-shifts
                                             15
27
    -shifts
-time_step
-lengths
-dispersivities
-correct_disp
-thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_restart
                                        27
1.64E+07
15*15
15*1.5
TRUE
2
1-15
                                                               3.00E-10
                                            1
1-15
                                             1
14
END
                                  USE Solution 992
USE Solution 991
                                   MIX 2
                                   992
991
SAVE Solution 0
                                                                    0.01
0.99
                                                                                       \# fraction of CCR pore water and upgradient water mixture remaining after remediation \# fraction of upgradient water
END
```

```
TRANSPORT
           RANSPORT
-shifts
-lengths
-dispersivities
-print_cells
-print_frequency
-punch_cells
-dump_frequency
-punch_frequency
                                                                                                                                                154
15*15
15*1.5
1-15
1
1-15
77
1
                                                                                                                USER_GRAPH 1
-chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale_x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch_Ak_v01_Co.png true true
-start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
                                                                                                                  USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch_AA_V01_B.png true true
                                                                                                                      -start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                                                                                    USER_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Li.png true true
                                                                                                                      -start \\ 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0, TOT("Li")*GFW("Li")*1E6, color=Blue, symbol=Circle, symbol\_size=5, y-axis=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line
                                                                                                                      USER_GRAPH 4
                                                                                                                  USER_GRAPH 4
-chart_title "Molybdenum"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Mo.png true true
-start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Mo")*GFW("Mo")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
```

```
PHASES
                                                                                                                                                                    the first transport represent pre-closure conditions
                                                                                                                                                                      the institution of transport represent post-closure conditions under monitored natural attenuation scenario. 
sensitivity analysis for current groundwater pH (low)
  pe_Fix
                                                                  # allows fixing pe
                                                                  e- = e-
log_k 0.0
                                                                  # allows fixing pH
H+ = H+
log_k 0.0
 pH_Fix
END
SURFACE_MASTER_SPECIES
Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
  HaoOH = HaoOH
log\_k \ 0.0 HaoOH + H+ = HaoOH2+
log_k 7.17
HaoOH = HaoO- + H+
HaoOH = HaoU- + H+

log_k 11.18

HaoOH + Co+2 = HaoOCo+ + H+

log_k -2.52

HaoOH + H3BO3 = HaoH2BO3 + H2O
 Log_k 1.57
EXCHANGE_MASTER_SPECIES
 EXCHANGE_SPECIES
               X- = X-
log_k
                                              0.0
                Na++X-=NaX
                K+ + X- = KX
log_k 0.7
               Li+ + X- = LiX
log_k -0.08
                H+ + X- = HX
                                              1.0
                log_k
                Ca+2 + 2X- = CaX2
                log_k
                Mg+2 + 2X- = MgX2
log_k 0.6
               Mn+2 + 2X- = MnX2
log_k 0.52
                Fe+2 + 2X- = FeX2
                log_k
                                                                  SELECTED_OUTPUT
                                                                                                                  AP-2 TRANSECT AA-V03a_current_pH_low.txt
                                                                   -file
-selected_out
-solution
                                                                                                                        TRUE
                                                                                                                                                 TRUE
                                                                 -solution
-user_punch
-water
USER_PUNCH
-headings
-start
                                                                                                                                                  TRUE
TRUE
                                                                                                                                        Alkalinity CI SO4 Ca Mg Na K F AI As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferrihydrite CaX2 CaX2 CAL SUL

-I-A("H+")

-S-I-A("e-")**59.2

Alk*$0.0355*1000

TO1"("C1)**GPW("C1)**IE3

TO1"("S(G)")**96.06*IE3

TO1"("Na)**GPW("C1)**IE3

TO1"("Na)**GPW("Na")**IE3

TO1"("Na)**GPW("Na")**IE3

TO1"("Na)**GPW("Na")**IE3

TO1"("A)**GPW("Na")**IE3

TO1"("A)**GPW("A)**IE6

TO1"("A)**GPW("A)**IE6

TO1"("C0)**GPW("C0)**IE5

TO1"("C1)**GPW("C1)**IE3

TO1"("C1)**GPW("C1)**IE3

TO1"("Na)**GPW("Na")**IE6

TO1"("No")*GPW("Na")**IE6

TO1"("No")*GPW("Na")**IE6

TO1"("No")*GPW("Na")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE3

mo("No")**IE3**OCO-*)**mo("Hfo_wOCo-*)*"oFBW("C0")**IE3**O.2/1.93

mo("Hfo_st2x0's)**IE3

mo("LiX)**IE3

mo("CX2")**IE3

mo(
                                                                                                                 pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferrihydrite CaX2 CaX2 CAL SUL
                                                                                                        10 PUNCH
20 PUNCH
30 PUNCH
40 PUNCH
50 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          # pH
# Eh
# Alkalinity
# CI
# SO4
                                                                                                         60 PUNCH
70 PUNCH
80 PUNCH
90 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Ca
Mg
Na
K
F
Al
As
B
Co
Fe
Li
Mn
                                                                                                      90 PUNCH
100 PUNCH
110 PUNCH
120 PUNCH
130 PUNCH
140 PUNCH
150 PUNCH
160 PUNCH
170 PUNCH
190 PUNCH
200 PUNCH
210 PUNCH
210 PUNCH
210 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  mg/kg of sorbed Co, used to compare with SEP mg/kg of sorbed As, used to compare with SEP r mmol of HX
                                                                                                       220 PUNCH
230 PUNCH
                                                                                                      230 PUNCH
240 PUNCH
250 PUNCH
260 PUNCH
270 PUNCH
280 PUNCH
290 PUNCH
300 PUNCH
                                                                END
SOLUTION 990
      temp
pH pe redox units density Alkalinity As
B Ca Cl Co F Fe K
Li Mg Mn
                                                                                 0.003
                                                                                                                                                                      #updated
#updated
                                                                                   1115
        S(6)
                                                                                                                                                                      #updated
                                                                                                            1 #kg
 -wate
```

```
SOLUTION 991
                                                              mg/kgw
20.9
5.9
6.1
36.5
0.00036
0.058
11.63
8.70
0.0008
0.13
0.03
                                                             ells: ARGWA-20 (overburden)
                                    units
temp
pH
pe
Alkalir
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
-water
                                                                                as Ca.5(CO3).5
#reporting limit
                                                                                            #max of observed cobalt
                                                                                            #reporting limit
                                                                    0.03
2.13
                                                                   0.007
                                                                    3.893
                                                                  3.893
0.001
0.0005
10.63
8.61
1
                                                                                            #reporting limit for recent samples 
#reporting limit for recent samples
TITLE Mix TW with Aquifer GW MIX 1
                                                                        0.54
0.46
                                                                                            # determined by the hypothetical mixing ratios for B
                                     991
SAVE Solution 992
 END
                                     USE Solution 992
 EQUILIBRIUM_PHASES 992
                                                                                            # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                     SAVE Solution 0
 END
                                     TITLE Downgradient Transport Simulation
                                                                                                                                                   # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2), assumed to be the water quality from the upgradient well ARGWA-20 (overburd
 SOLUTION 1-15
                                                               mg/kgw
20.9
6.66
                                     units
                                    temp
pH pe
Alkalinity
As
B Ca
Cl
Co
F Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                                                            # facilitate initial cobalt adsorption
                                                                     6.1
                                                                 36.5
0.00036
                                                                  0.058
11.6
8.70
0.0008
0.129
0.030
2.133
0.007
3.893
0.001
                                                                  0.0005
10.63
8.61
1.0
 END
EQUILIBRIUM_PHASES 1-3
Maghemite
Goethite
Ferrihydrite
Pyrite
pe_Fix
EQUILIBRIUM_PHASES 4-13
Maghemite
Goethite
Ferrihydrite
Pyrite
pe_Fix
                                                                                            # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                        0
0
0
-95
(-6.1 O2(g)
                                                                          3.1
1.5
1.5
                                                                                            # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                                        3.1
1.5
1.5
0.39
 pe_Fix
EQUILIBRIUM_PHASES 14-15
                                                       -5.16 O2(a)
                                                                                            # calibration parameter
EQUILIBRIUM
Maghemite
Goethite
Ferrihydrite
Pyrite
pe_Fix
EXCHANGE
X
                                                      3.5 3.1
3.5 1.5
3.5 1.5
-71 0.39
-4.16 O2(g)
                                                                                            # fixed to match ORP observed at ARAMW-7
                                     1-2
                                                       0.14
 -equilibrate with Solution 1
EXCHANGE 3-9
                                                       0.12
                                                                                            # eq of exchange sites per one liter (kg) of water
 -equilibrate
EXCHANGE
                                     10-15
                                                       0.10
                                                                                            # eg of exchange sites per one liter (kg) of water
  -equilibrate with Solution 1
 SURFACE
                                     1-5
SURFACE
-equil with 1
Hfo_wOH
Hfo_SOH
HaoOH
END
SURFACE
-equil with 1
Hfo_wOH
Hfo_SOH
HaoOH
END
Hfo_NOH
Ho_SOH
HO_SOH
HO_SOH
                                           1.38E-01
                                                                    600
                                                                                   31 # calibration parameter
                                           3.46E-03
2.73E-01
                                                                     600
                                     11-15
                                           1.38E-01
3.46E-03
2.73E-01
                                                                    600
600
600
                                                                                           # calibration parameter
                                                                                   31
                                                                                   26
                                                                                           # calibration parameter
 TRANSPORT
    RANSPORT
-cells
-shifts
-time_step
-lengths
-dispersivities
-correct_disp
-thermal_diffusion
-print_cells
-print_frequency
-punch_frequency
-dump_frequency
-dump_frequency
-dump_frestart
                                           15
27
1.64E+07
                                            15*15
15*1.5
TRUE
2
1-15
                                                                  3.00E-10
                                               1
1-15
                                                1
14
     -dump_restart
 END
                                    USE Solution 992
USE Solution 991
                                     MIX 2
                                     992
991
SAVE Solution 0
                                                                        0.01
                                                                                            \# fraction of CCR pore water and upgradient water mixture remaining after remediation \# fraction of upgradient water
 END
TRANSPORT
```

```
-shifts
-lengths
-dispersivities
-print_cells
-print_frequency
-punch_cells
-dump_frequency
-punch_frequency
                                                                                                                             154
15*15
15*1.5
1-15
1
1-15
77
1
                                                                                                      USER_GRAPH 1
                                                                                                    USER, GRAPH 1
-chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Co.png true true
                                                                                                    -start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1 -end
                                                                                                  USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_B.png true true
-start
                                                                                                    -start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1 -end
                                                                                                    USER_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Li.png true true
-start
                                                                                                      -start \\ 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0, TOT("Li")*GFW("Li")*1E6, color= Blue, symbol = Circle, symbol\_size = 5, y-axis = 1, line\_width = 1 \\ -start = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1
                                                                                                  USER_GRAPH 4
-chart_title "Molydenum"
-axis_Utles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Mo.png true true
-start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Mo")*GFW("Mo")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
```

```
PHASES
                                                                                                                                                                    the first transport represent pre-closure conditions
                                                                                                                                                                      the instructions of the second transport represent post-closure conditions under monitored natural attenuation scenario sensitivity analysis for current groundwater pH (high)
  pe_Fix
                                                                  # allows fixing pe
                                                                  e- = e-
log_k 0.0
                                                                  # allows fixing pH
H+ = H+
log_k 0.0
 pH_Fix
END
SURFACE_MASTER_SPECIES
Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
  HaoOH = HaoOH
log_k 0.0
HaoOH + H+ = HaoOH2+
log_k 7.17
HaoOH = HaoO- + H+
HaoOH = HaoU- + H+

log_k 11.18

HaoOH + Co+2 = HaoOCo+ + H+

log_k -2.52

HaoOH + H3BO3 = HaoH2BO3 + H2O
 Log_k 1.57
EXCHANGE_MASTER_SPECIES
 EXCHANGE_SPECIES
               X- = X-
log_k
                                              0.0
                Na++X-=NaX
                K+ + X- = KX
log_k 0.7
               Li+ + X- = LiX
log_k -0.08
                H+ + X- = HX
                                              1.0
                log_k
                Ca+2 + 2X- = CaX2
                log_k
                Mg+2 + 2X- = MgX2
log_k 0.6
               Mn+2 + 2X- = MnX2
log_k 0.52
                Fe+2 + 2X- = FeX2
                log_k
                                                                  SELECTED_OUTPUT
                                                                                                                  AP-2 TRANSECT AA-V03a_current_pH_high.txt
                                                                   -file
-selected_out
-solution
                                                                                                                         TRUE
                                                                                                                                                  TRUE
                                                                 -solution
-user_punch
-water
USER_PUNCH
-headings
-start
                                                                                                                                                   TRUE
TRUE
                                                                                                                                        Alkalinity CI SO4 Ca Mg Na K F AI As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferrihydrite CaX2 CaX2 CAL SUL

-I-A("H+")

-S-I-A("e-")**59.2

Alk*$0.0355*1000

TO1"("C1)**GPW("C1)**IE3

TO1"("S(G)")**96.06*IE3

TO1"("Na)**GPW("C1)**IE3

TO1"("Na)**GPW("Na")**IE3

TO1"("Na)**GPW("Na")**IE3

TO1"("Na)**GPW("Na")**IE3

TO1"("A)**GPW("Na")**IE3

TO1"("A)**GPW("A)**IE6

TO1"("A)**GPW("A)**IE6

TO1"("C0)**GPW("C0)**IE5

TO1"("C1)**GPW("C1)**IE3

TO1"("C1)**GPW("C1)**IE3

TO1"("Na)**GPW("Na")**IE6

TO1"("No")*GPW("Na")**IE6

TO1"("No")*GPW("Na")**IE6

TO1"("No")*GPW("Na")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE6

TO1"("No")*GPW("Ma")**IE3

mo("No")**IE3**OCO-*)**mo("Hfo_wOCo-*)*"oFBW("C0")**IE3**O.2/1.93

mo("Hfo_st2x0's)**IE3

mo("LiX)**IE3

mo("CX2")**IE3

mo(
                                                                                                                 pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferrihydrite CaX2 CaX2 CAL SUL
                                                                                                        10 PUNCH
20 PUNCH
30 PUNCH
40 PUNCH
50 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            # pH
# Eh
# Alkalinity
# CI
# SO4
                                                                                                         60 PUNCH
70 PUNCH
80 PUNCH
90 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Ca
Mg
Na
K
F
Al
As
B
Co
Fe
Li
Mn
                                                                                                      90 PUNCH
100 PUNCH
110 PUNCH
120 PUNCH
130 PUNCH
140 PUNCH
150 PUNCH
160 PUNCH
170 PUNCH
190 PUNCH
200 PUNCH
210 PUNCH
210 PUNCH
210 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   mg/kg of sorbed Co, used to compare with SEP mg/kg of sorbed As, used to compare with SEP r mmol of HX
                                                                                                       220 PUNCH
230 PUNCH
                                                                                                      230 PUNCH
240 PUNCH
250 PUNCH
260 PUNCH
270 PUNCH
280 PUNCH
290 PUNCH
300 PUNCH
                                                                END
SOLUTION 990
      temp
pH pe redox units density Alkalinity As
B Ca Cl Co F Fe K
Li Mg Mn
                                                                                 0.003
                                                                                                                                                                      #updated
#updated
                                                                                   1115
        S(6)
                                                                                                                                                                      #updated
                                                                                                             1 #kg
 -wate
```

```
SOLUTION 991
                                                          mg/kgw
20.9
5.9
6.1
36.5
0.00036
0.058
11.63
8.70
0.0008
0.13
0.03
                                                         ells: ARGWA-20 (overburden)
                                 units
temp
pH
pe
Alkalir
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
-water
                                                                          as Ca.5(CO3).5
#reporting limit
                                                                                     #max of observed cobalt
                                                                                    #reporting limit
                                                               0.03
2.13
                                                              0.007
                                                               3.893
                                                             3.893
0.001
0.0005
10.63
8.61
1
                                                                                     #reporting limit for recent samples 
#reporting limit for recent samples
TITLE Mix TW with Aquifer GW MIX 1
                                                                   0.54
                                                                                     # determined by the hypothetical mixing ratios for B
                                                                   0.46
                                  991
SAVE Solution 992
 END
                                  USE Solution 992
 EQUILIBRIUM_PHASES 992
                                                                                     # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                  SAVE Solution 0
 END
                                  TITLE Downgradient Transport Simulation
                                                                                                                                        # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2), assumed to be the water quality from the upgradient well ARGWA-20 (overburd
 SOLUTION 1-15
                                                          mg/kgw
20.9
6.66
6.1
                                 units
temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                                                     # facilitate initial cobalt adsorption
                                                            36.5
0.00036
                                                              0.058
11.6
                                                              8.70
0.0008
                                                              0.129
0.030
2.133
0.007
3.893
0.001
0.0005
10.63
8.61
1.0
                                   -water
 END
 EQUILIBRIUM_PHASES 1-3
                                                                                     # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
   Maghemite
Goethite
Ferrihydrite
                                                                    3.1
1.5
1.5
Ferrihydrite
Pyrite
pe_Fix
EQUILIBRIUM_PHASES 4-13
Maghemite
Goethite
Ferrihydrite
Pyrite
pe_Fix
EQUILIBRIUM_PHASES 14-15
Manbemite
                                                    -105 (
-6.1 O2(g)
                                                                   0.39
                                                                                      # fixed to match ORP observed at upgradient well
                                                                                         mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                  0
0
0
-97
-5.16 O2(g)
                                                                   3.1
1.5
1.5
0.39
                                                                                     # calibration parameter
                                                  3.5
3.5
3.5
-81
-4.16 O2(g)
                                                                    3.1
1.5
1.5
    Maghemite
Goethite
    Ferrihydrite
Pyrite
pe_Fix
EXCHANGE
X
                                                                   0.39
                                                                                     # fixed to match ORP observed at ARAMW-7
                                  1-2
                                                   0.14
                                                                                     # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
EXCHANGE 3-9
                                                   0.12
                                                                                    # eq of exchange sites per one liter (kg) of water
                                                   0.10
                                                                                    # eq of exchange sites per one liter (kg) of water
  -equilibrate with Solution 1
 SURFACE
                                  1-5
SURFACE
-equil with 1
Hfo_wOH
Hfo_SOH
HaoOH
END
SURFACE
-equil with 1
Hfo_wOH
Hfo_SOH
HaoOH
END
                                        1.38E-01
                                                               600
                                                                            31 # calibration parameter
                                        3.46E-03
                                                                600
                                       2.73E-01
                                                                600
                                                                            26
                                                                                    # calibration parameter
                                  11-15
                                       1.38E-01
3.46E-03
2.73E-01
                                                               600
600
600
                                                                            31
 TRANSPORT
                                       15
27
1.64E+07
15*15
15*1.5
TRUE
2
1-15
     -cells
-shifts
    -shifts
-time_step
-lengths
-dispersivities
-correct_disp
-thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_frequency
-dump_frequency
                                                                                     # seconds
                                                             3.00E-10
                                           1
1-15
     -dump_restart
 END
                                 USE Solution 992
USE Solution 991
                                  MIX 2
                                                                                     # fraction of CCR pore water and upgradient water mixture remaining after remediation
                                                    992
                                                                   0.01
                                 991
SAVE Solution 0
                                                                   0.99
                                                                                     # fraction of upgradient water
 END
TRANSPORT
```

```
-shifts
-lengths
-dispersivities
-print_cells
-print_frequency
-punch_cells
-dump_frequency
-punch_frequency
                                                                                                                             154
15*15
15*1.5
1-15
1
1-15
77
1
                                                                                                      USER_GRAPH 1
                                                                                                    USER, GRAPH 1
-chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Co.png true true
                                                                                                    -start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1 -end
                                                                                                  USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_B.png true true
-start
                                                                                                    -start 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1 -end
                                                                                                    USER_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Li.png true true
-start
                                                                                                      -start \\ 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0, TOT("Li")*GFW("Li")*1E6, color= Blue, symbol = Circle, symbol\_size = 5, y-axis = 1, line\_width = 1 \\ -start = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1, line\_width = 1
                                                                                                  USER_GRAPH 4
-chart_title "Molydenum"
-axis_Utles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Mo.png true true
-start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Mo")*GFW("Mo")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
```

```
the first transport represent pre-closure conditions the second transport represent post-closure conditions under monitored natural attenuation scenario
PHASES
                               # allows fixing pe
pe_Fix
                               e- = e-
                                                                              sensitivity analysis for Abundance of Hydroxide Mineral (low)
                               log_k 0.0
pH_Fix
                               # allows fixing pH
                               H+ = H+ log_k 0.0
END
SURFACE_MASTER_SPECIES
Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
HaoOH = HaoOH
log_k 0.0
HaoOH + H+ = HaoOH2+
                               log_k 7.17
HaoOH = HaoO- + H+
                              log_k 11.18
HaoOH + Co + 2 = HaoOCo + H + log_k - 2.52
HaoOH + H3BO3 = HaoH2BO3 + H2O
                               Log_k 1.57
EXCHANGE_MASTER_SPECIES
X X-
EXCHANGE SPECIES
                       0.0
       log_k
       Na+ + X- = NaX
       log_k
                       0.0
       K+ + X- = KX
       log_k
                       0.7
       Li+ + X- = LiX
       log_k
                       -0.08
       H+ + X- = HX
log_k 1.0
                      1.0
       Ca+2 + 2X- = CaX2
       log_k 0.8
       Mg+2 + 2X- = MgX2
       log_k
                     0.6
       Mn+2 + 2X- = MnX2
       log_k 0.52
       Fe+2 + 2X- = FeX2
                      0.44
                               SELECTED_OUTPUT
                               -file
-selected_out
                                                      AP-2 TRANSECT AA-V03a_HFO_LOW.txt
                                                         TRUE
                                                                     TRUE
                                -solution
                                -user_punch
                                -water
                                                                     TRUE
                               USER PUNCH
                                                      pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferrihydrite CaX2 CaX2 CAL SUL
                                -headings
                               -start
                                                                   -LA("H+")
S-LA("e-")*59.2
Alk*50.0355*1000
                                                 10 PUNCH
20 PUNCH
                                                                                                                                                                                                                                                                                                    pH
Eh
                                                  30 PUNCH
                                                                   Alk*50.0355*1000
TOT("CI")*GFW("CI")*1E3
TOT("S(6)")*96.06*1E3
TOT("Ca")*GFW("Ca")*1E3
TOT("Mg")*GFW("Mg")*1E3
TOT("Mg")*GFW("K")*1E3
TOT("K")*GFW("K")*1E3
TOT("F")*GFW("K")*1E3
                                                                                                                                                                                                                                                                                                 # Alkalinity
                                                                                                                                                                                                                                                                                                # Alkal
# CI
# SO4
# Ca
# Mg
# Na
# K
                                                  40 PUNCH
                                                  50 PUNCH
                                                  60 PUNCH
70 PUNCH
                                                  80 PUNCH
                                                  90 PUNCH
                                                100 PUNCH
                                                                   TOT("F")*GFW("A")*1E3
TOT("A")*GFW("A")*1E6
TOT("A")*GFW("A")*1E6
TOT("A")*GFW("Co")*1E6
TOT("CO")*GFW("Co")*1E6
TOT("F")*GFW("F")*1E3
TOT("L")*GFW("L")*1E6
TOT("M")*GFW("M")*1E6
                                                110 PUNCH
120 PUNCH
                                                                                                                                                                                                                                                                                                    Al
As
B
                                                130 PUNCH
                                                                                                                                                                                                                                                                                                    Co
Fe
                                                 140 PUNCH
                                                150 PUNCH
                                                160 PUNCH
170 PUNCH
                                                                                                                                                                                                                                                                                                    Li
Mn
                                                                                                                                                                                                                                                                                                 # Mo
                                                 180 PUNCH
                                                190 PUNCH
200 PUNCH
                                                                                                                                                                                                                                                                                                     mg/kg o
                                                210 PUNCH
                                                                   mol("HX")*1E3
mol("LiX")*1E3
mol("NaX")*1E3
                                                 220 PUNCH
                                                230 PUNCH
                                                240 PUNCH
250 PUNCH
                                                                   mol("CaX2")*1E3
(STEP_NO + .5)/15
                                                                   SI("Ferrihydrite")
SI("Ferrihydrite")
SI("Goethite")
                                                260 PUNCH
                                                270 PUNCH
280 PUNCH
                                                                   SI("Maghemite")
mol("CaX2")*1E3
                                                290 PUNCH
                                                300 PUNCH
END
                               # ARK-STN-TW22 (source of CCR pore water influencing downstream groundwater) 19.7
SOLUTION 990
   temp
   pH
pe
                                       6.5
2.4
    redox
                                        pe
   units
density
                                     mg/kgw
    Alkalinity
                                       192
                                                      as Ca.5(CO3).5 #updated
```

```
4.41
363
7.7
                                                                  #updated
#updated
   B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
                                                                   #updated
                                0.032
0.123
                                                                   #updated
                                                                   #updated
                                36.3
49.2
0.193
                                                                  #updated
#updated
                                                                   #updated
                                 38.9
12.4
                                                                   #updated
                                                                   #updated
                                                                  #updated
#updated
   Мо
                                0.003
   Na
S(6)
                                20.3
1115
                                                                   #updated
-water
END
                                           1 #kg
                          # upgradient wells: ARGWA-20 (overburden) units mg/kgw
SOLUTION 991
                                             mg/kgw
20.9
                          temp
pH
                                                 5.9
6.1
                         pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
                                               36.5
0.00036
                                                          as Ca.5(CO3).5
                                                                  #reporting limit
                                                0.058
                                                11.63
                                                 8.70
                                                0.0008
                                                                   #max of observed cobalt
                                                 0.03
                                                                  #reporting limit
                                                 2.13
                                                0.007
                          Mg
Mn
Mo
                                                3.893
0.001
                                                                   #reporting limit for recent samples
                                                0.0005
                                                                  #reporting limit for recent samples
                          Na
S(6)
                                                 10.63
                                                 8.61
                                                  1
                                                          #kg
END
TITLE Mix TW with Aquifer GW
                          MIX 1
                                                    0.54
0.46
                                         990
                                                                   # determined by the hypothetical mixing ratios for B
                          SAVE Solution 992
END
                          USE Solution 992
EQUILIBRIUM_PHASES 992
                                                                   # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                          SAVE Solution 0
END
                          TITLE Downgradient Transport Simulation
SOLUTION 1-15
                                                                   # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2), assumed to be the water quality from the upgradient well ARGWA-20 (overburder
                          units
                                              mg/kgw
                          temp
pH
                                                 20.9
6.66
                                                                  # facilitate initial cobalt adsorption
                         pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
                                                 6.1
36.5
                                               0.00036
                                                0.058
                                                 11.6
                                                 8.70
                                                0.0008
0.129
                                                0.030
                                                2.133
0.007
                          Mg
Mn
Mo
                                                3.893
                                                0.001
                                                0.0005
                          Na
S(6)
                                                10.63
                                                 8.61
                                                  1.0
END
EQUILIBRIUM_PHASES 1-3
                                                                  # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                     3.1
1.5
                                           0
  Maghemite
  Goethite
   Ferrihydrite
                                                     1.5
                                                    0.39
                                        -100
  Pyrite
pe_Fix
EQUILIBRIUM_PHASES 4-13
                                         -6.1 O2(g)
                                                                  # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                           0
                                                     3.1
  Maghemite
  Goethite
                                           0
                                                     1.5
  Ferrihydrite
                                                     1.5
  Pvrite
                                          -92
                                                    0.39
pe_Fix
EQUILIBRIUM_PHASES 14-15
                                        -5.16 O2(g)
                                                                   # calibration parameter
                                         3.5
3.5
3.5
  Maghemite
Goethite
                                                     3.1
1.5
  Ferrihydrite
                                                     1.5
 Pyrite
pe_Fix
                                       -76
-4.16 O2(g)
                                                    0.39
                                                                  # fixed to match ORP observed at ARAMW-7
EXCHANGE
                          1-2
                                        0.14
                                                                  # eq of exchange sites per one liter (kg) of water
 equilibrate with Solution 1
EXCHANGE
                                        0.12
                                                                  # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
EXCHANGE
                          10-15
                                        0.10
                                                                  # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
SURFACE
                          1-5
-equil with 1
Hfo_wOH
                               1.38E-01
                                                 600
                                                           15.4 # calibration parameter
Hfo_sOH
HaoOH
                               3.46E-03
2.73E-01
                                                            13 # calibration parameter
```

```
END
SURFACE
                                                               11-15
   -equil with 1
 Hfo_wOH
                                                                           1.38E-01
                                                                                                                       600
                                                                                                                                              15.4 # calibration parameter
Hfo sOH
                                                                           3.46E-03
                                                                                                                       600
 HaoOH
                                                                           2.73E-01
                                                                                                                       600
                                                                                                                                                 13 # calibration parameter
END
TRANSPORT
                                                                                 15
27
        -cells
-shifts
                                                                          1.64E+07
15*15
         -time_step
                                                                                                                                                                # seconds
         -lengths
        -dispersivities
-correct_disp
                                                                             15*1.5
                                                                               TRUE
         -thermal diffusion
                                                                                    2
                                                                                                                  3.00E-10
        -print_cells
-print_frequency
                                                                                 1-15
        -punch_frequency
                                                                                1-15
                                                                                   1
14
         -dump_frequency
         -dump_restart
FND
                                                               USE Solution 992
USE Solution 991
                                                                MIX 2
                                                                                                                                                                 # fraction of CCR pore water and upgradient water mixture remaining after remediation
                                                                                                                              0.01
                                                                                                  991
                                                                                                                              0.99
                                                                                                                                                               # fraction of upgradient water
                                                                 SAVE Solution 0
END
TRANSPORT
-shifts
                                                                              154
15*15
         -lengths
                                                                             15*1.5
1-15
         -dispersivities
         -print_cells
         -print_frequency
-punch_cells
                                                                                1-15
77
         -dump frequency
         -punch_frequency
                                                                 USER GRAPH 1
                                                                -chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
                                                                 -axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
                                                                 -initial_solutions FALSE
-batch AA_V01_Co.png true true
                                                                10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                               USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
                                                                -connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_B.png true true
                                                                 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                                 -end
                                                                USER_GRAPH 3
                                                                USEN_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch_AA_V01_Li.png true true
                                                                -start

10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Li")*GFW("Li")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                                USER_GRAPH 4
                                                                USEN_GRAPH 4
-chart_title "Molybdenum"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Mo.png true true
                                                                -start \\ 10 \ PLOT_XY \ (TOTAL_TIME/3.17E+07)-0, TOT("Mo")*GFW("Mo")*1E6, color=Blue, symbol=Circle, symbol\_size=5, y-axis=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1,
```

```
the first transport represent pre-closure conditions the second transport represent poost-closure conditions under monitored natural attenuation scenario
PHASES
                               # allows fixing pe
pe_Fix
                               e- = e-
                                                                            sensitivity analysis for Abundance of Hydroxide Mineral (high)
                               log_k 0.0
pH_Fix
                               # allows fixing pH
                              H+ = H+ log_k 0.0
END
SURFACE_MASTER_SPECIES
Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
HaoOH = HaoOH
log_k 0.0
HaoOH + H+ = HaoOH2+
                              log_k 7.17
HaoOH = HaoO- + H+
                             log_k 11.18
HaoOH + Co + 2 = HaoOCo + H + log_k - 2.52
HaoOH + H3BO3 = HaoH2BO3 + H2O
                              Log_k 1.57
EXCHANGE_MASTER_SPECIES
X X-
EXCHANGE SPECIES
                      0.0
       log_k
       Na+ + X- = NaX
       log_k
                      0.0
       K+ + X- = KX
       log_k
                      0.7
       Li+ + X- = LiX
       log_k
                       -0.08
       H+ + X- = HX
log_k 1.0
                      1.0
       Ca+2 + 2X- = CaX2
       log_k 0.8
       Mg+2 + 2X- = MgX2
                     0.6
       log_k
       Mn+2 + 2X- = MnX2
       log_k 0.52
       Fe+2 + 2X- = FeX2
                     0.44
                              SELECTED_OUTPUT
                               -file
-selected_out
                                                     AP-2 TRANSECT AA-V03a_HFO_LOW.txt
                                                        TRUE
                                                                    TRUE
                               -solution
                               -user_punch
                               -water
                                                                    TRUE
                               USER PUNCH
                                                     pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 Pore_Vol SI_Ferrihydrite CaX2 CaX2 CAL SUL
                               -headings
                               -start
                                                                  -LA("H+")
S-LA("e-")*59.2
Alk*50.0355*1000
                                                 10 PUNCH
20 PUNCH
                                                                                                                                                                                                                                                                                                pH
Eh
                                                 30 PUNCH
                                                                  Alk*50.0355*1000
TOT("CI")*GFW("CI")*1E3
TOT("G(5)")*96.06*1E3
TOT("Ca")*GFW("Ca")*1E3
TOT("Mg")*GFW("Mg")*1E3
TOT("Ma")*GFW("K")*1E3
TOT("K")*GFW("K")*1E3
TOT("F")*GFW("K")*1E3
                                                                                                                                                                                                                                                                                             # Alkalinity
                                                                                                                                                                                                                                                                                            # CI
# SO4
                                                 40 PUNCH
                                                 50 PUNCH
                                                                                                                                                                                                                                                                                            # Ca
# Mg
# Na
                                                 60 PUNCH
70 PUNCH
                                                 80 PUNCH
                                                 90 PUNCH
                                               100 PUNCH
                                                                  TOT("F")*GFW("A")*1E3
TOT("A")*GFW("A")*1E6
TOT("A")*GFW("A")*1E6
TOT("A")*GFW("Co")*1E6
TOT("CO")*GFW("Co")*1E6
TOT("F")*GFW("F")*1E3
TOT("L")*GFW("L")*1E6
TOT("M")*GFW("M")*1E6
                                               110 PUNCH
120 PUNCH
                                                                                                                                                                                                                                                                                                AI
As
B
                                               130 PUNCH
                                               140 PUNCH
150 PUNCH
                                                                                                                                                                                                                                                                                                Co
Fe
                                               160 PUNCH
170 PUNCH
                                                                                                                                                                                                                                                                                                Li
Mn
                                                180 PUNCH
                                                                                                                                                                                                                                                                                                Mo
                                               190 PUNCH
200 PUNCH
                                                                                                                                                                                                                                                                                                mg/kg of sorbed Co, used to co
                                                                                                                                                                                                                                                                                                mg/kg of sorbed As, used to co
                                               210 PUNCH
                                                                  mol("HX")*1E3
mol("LiX")*1E3
mol("NaX")*1E3
                                                                                                                                                                                                                                                                                                mmol of HX
                                                220 PUNCH
                                               230 PUNCH
                                               240 PUNCH
250 PUNCH
                                                                  mol("CaX2")*1E3
(STEP_NO + .5)/15
                                               260 PUNCH
                                                                   SI("Ferrihydrite")
                                               270 PUNCH
280 PUNCH
                                                                  SI("Ferrihydrite")
SI("Goethite")
                                                                  SI("Maghemite")
mol("CaX2")*1E3
                                               290 PUNCH
                                               300 PUNCH
END
                               # ARK-STN-TW22 (source of CCR pore water influencing downstream groundwater) 19.7
SOLUTION 990
   temp
   pH
pe
                                       6.5
2.4
   redox
                                       pe
   units
density
                                    mg/kgw
   Alkalinity
                                       192
                                                     as Ca.5(CO3).5 #updated
```

```
4.41
363
7.7
                                                                 #updated
#updated
  B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
                                                                 #updated
                               0.032
0.123
                                                                 #updated
                                                                 #updated
                                36.3
49.2
0.193
                                                                 #updated
#updated
                                                                 #updated
                                38.9
12.4
                                                                 #updated
                                                                 #updated
                                                                 #updated
#updated
  Мо
                                0.003
  Na
S(6)
                                20.3
1115
                                                                 #updated
-water
END
                                          1 #kg
                         # upgradient wells: ARGWA-20 (overburden) units mg/kgw
SOLUTION 991
                                            mg/kgw
20.9
                         temp
pH
                                                5.9
6.1
                        pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
                                              36.5
0.00036
                                                        as Ca.5(CO3).5
                                                                 #reporting limit
                                               0.058
                                               11.63
                                                8.70
                                               0.0008
                                                                 #max of observed cobalt
                                                0.03
                                                                 #reporting limit
                                                2.13
                                               0.007
                          Mg
Mn
Mo
                                               3.893
0.001
                                                                 #reporting limit for recent samples
                                               0.0005
                                                                 #reporting limit for recent samples
                         Na
S(6)
                                                10.63
                                                8.61
                                                 1
                                                        #kg
END
TITLE Mix TW with Aquifer GW
                          MIX 1
                                                   0.54
0.46
                                        990
                                                                 # determined by the hypothetical mixing ratios for B
                         SAVE Solution 992
END
                          USE Solution 992
EQUILIBRIUM_PHASES 992
                                                                 # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                         SAVE Solution 0
END
                         TITLE Downgradient Transport Simulation
SOLUTION 1-15
                                                                 # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2), assumed to be the water quality from the upgradient well ARGWA-20 (overburden)
                          units
                                             mg/kgw
                         temp
pH
                                                20.9
6.66
                                                                 # facilitate initial cobalt adsorption
                        pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
                                                6.1
36.5
                                              0.00036
                                               0.058
                                                11.6
                                                8.70
                                              0.0008
                                               0.030
                                               2.133
0.007
                          Mg
Mn
Mo
                                               3.893
                                               0.001
                                               0.0005
                         Na
S(6)
                                               10.63
                                                8.61
                                                1.0
END
EQUILIBRIUM_PHASES 1-3
                                                                 # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                    3.1
1.5
                                          0
  Maghemite
  Goethite
  Ferrihydrite
                                                    1.5
                                                   0.39
                                       -100
  Pyrite
pe_Fix
EQUILIBRIUM_PHASES 4-13
                                        -6.1 O2(g)
                                                                 # fixed to match ORP observed at upgradient well
                                                                 # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                          0
                                                    3.1
  Maghemite
  Goethite
                                          0
                                                    1.5
  Ferrihydrite
                                                    1.5
  Pvrite
                                         -92
                                                   0.39
pe_Fix
EQUILIBRIUM_PHASES 14-15
                                       -5.16 O2(g)
                                                                 # calibration parameter
                                        3.5
3.5
3.5
  Maghemite
Goethite
                                                    3.1
1.5
  Ferrihydrite
                                                    1.5
 Pyrite
pe_Fix
                                      -76
-4.16 O2(g)
                                                   0.39
                                                                 # fixed to match ORP observed at ARAMW-7
EXCHANGE
                         1-2
                                       0.14
                                                                 # eq of exchange sites per one liter (kg) of water
 equilibrate with Solution 1
EXCHANGE
                                       0.12
                                                                 # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
EXCHANGE
                         10-15
                                       0.10
                                                                # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
SURFACE
                         1-5
-equil with 1
Hfo_wOH
                              1.38E-01
                                                600
                                                          62 # calibration parameter
Hfo_sOH
HaoOH
                              3.46E-03
2.73E-01
                                                600
600
                                                               # calibration parameter
```

```
END
SURFACE
                                                               11-15
   -equil with 1
 Hfo_wOH
                                                                           1.38E-01
                                                                                                                       600
                                                                                                                                                 62 # calibration parameter
Hfo sOH
                                                                           3.46E-03
                                                                                                                       600
 HaoOH
                                                                           2.73E-01
                                                                                                                       600
                                                                                                                                                 52 # calibration parameter
END
TRANSPORT
                                                                                 15
27
        -cells
-shifts
                                                                          1.64E+07
15*15
         -time_step
                                                                                                                                                                # seconds
         -lengths
        -dispersivities
-correct_disp
                                                                             15*1.5
                                                                               TRUE
         -thermal diffusion
                                                                                    2
                                                                                                                  3.00E-10
        -print_cells
-print_frequency
                                                                                 1-15
        -punch_frequency
                                                                                1-15
                                                                                   1
14
         -dump_frequency
         -dump_restart
FND
                                                               USE Solution 992
USE Solution 991
                                                                MIX 2
                                                                                                                                                                 # fraction of CCR pore water and upgradient water mixture remaining after remediation
                                                                                                                              0.01
                                                                                                  991
                                                                                                                              0.99
                                                                                                                                                               # fraction of upgradient water
                                                                 SAVE Solution 0
END
TRANSPORT
-shifts
                                                                              154
15*15
         -lengths
                                                                             15*1.5
1-15
         -dispersivities
         -print_cells
         -print_frequency
-punch_cells
                                                                                1-15
77
         -dump frequency
         -punch_frequency
                                                                 USER GRAPH 1
                                                                -chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
                                                                 -axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
                                                                 -initial_solutions FALSE
-batch AA_V01_Co.png true true
                                                                10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                               USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
                                                                -connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_B.png true true
                                                                 10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                                 -end
                                                                USER_GRAPH 3
                                                                USEN_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch_AA_V01_Li.png true true
                                                                -start

10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Li")*GFW("Li")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                                USER_GRAPH 4
                                                                USEN_GRAPH 4
-chart_title "Molybdenum"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Mo.png true true
                                                                -start \\ 10 \ PLOT_XY \ (TOTAL_TIME/3.17E+07)-0, TOT("Mo")*GFW("Mo")*1E6, color=Blue, symbol=Circle, symbol\_size=5, y-axis=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1, line\_width=1,
```

TITLE - AP-2 Transect AA_Pre-closure (Base Case) and Post-closure (Monitored Natural Attenuation)

```
PHASES
                                                                                                                                                                   the first transport represents pre-closure conditions
                                                                                                                                                                    the second transport represents post-closure conditions sensitivity analysis for Cation Exchange Capacity (0.5X)
 pe_Fix
                                                                        # allows fixing pe
                                                                                                                                                                                                                                                                                                          ns under monitored natural attenuation scenario
                                                                       e- = e-
log_k 0.0
pH_Fix
                                                                       # allows fixing pH
H+ = H+
                                                                        log_k 0.0
END
SURFACE_MASTER_SPECIES
               Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
HaoOH = HaoOH
                                                                       log k 0.0
HaoOH + H+ = HaoOH2+
 HaoOH = HaoO- + H+
                                                                       log_k 11.18
HaoOH + Co+2 = HaoOCo+ + H+
log_k -2.52
HaoOH + H3BO3 = HaoH2BO3 + H2O
                                                                     Log_k 1.57
EXCHANGE_MASTER_SPECIES

X X-
EXCHANGE_SPECIES
              X- = X-
log_k
                                              0.0
               Na++X-=NaX
              log_k
                                              0.0
              \begin{array}{ll} \text{K+ + X- = KX} \\ \text{log\_k} & 0.7 \end{array}
              Li+ + X- = LiX
               log_k
              H+ + X- = HX
               log_k
               Ca+2 + 2X- = CaX2
               Mg+2 + 2X- = MgX2
               Mn+2 + 2X- = MnX2
               log_k
                                            0.52
               Fe+2 + 2X- = FeX2
               log_k
                                            0.44
                                                                       SELECTED_OUTPUT
-file AP-2 TRANSECT AA-V03a_CEC_LOW.bxt
                                                                                                                                                  TRUE
TRUE
                                                                         -solution
                                                                         -user_punch
                                                                         -water
                                                                                                                                                   TRUE
                                                                        USER PUNCH
                                                                         -headings
                                                                                                                    pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 PV Ferrihydrite Ferrihydrite Goethite Mag
                                                                        -start
                                                                                                           10 PUNCH
20 PUNCH
30 PUNCH
40 PUNCH
50 PUNCH
60 PUNCH
                                                                                                                                                -LA("H+")
S-LA("e-")*59.2
Alk*50.0355*1000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                pH
Eh
Alkalinity
Cl
SO4
Ca
Mg
Na
K
F
Al
As
B
Co
Fe
Li
Mn
Mo
mg/kg of
                                                                                                                                              3-LA( e' ) '39.2.
Alk*50.0355*1000
TOT(*C1)*GFW(*C1)*1E3
TOT(*C2)*GFW(*C2)*1E3
TOT(*C3)*GFW(*C2)*1E3
TOT(*C3)*GFW(*C3)*1E3
TOT(*M3)*GFW(*M3)*1E3
TOT(*M3)*GFW(*M3)*1E3
TOT(*M3)*GFW(*M3)*1E3
TOT(*M3)*GFW(*M3)*1E3
TOT(*M3)*GFW(*M3)*1E6
TOT(*M3)*GFW(*M3)*1E6
TOT(*M3)*GFW(*M3)*1E6
TOT(*M3)*GFW(*M3)*1E6
TOT(*M3)*GFW(*M3)*1E6
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                                                                                                             70 PUNCH
                                                                                                         80 PUNCH
90 PUNCH
100 PUNCH
                                                                                                         110 PUNCH
                                                                                                        110 PUNCH
120 PUNCH
130 PUNCH
140 PUNCH
150 PUNCH
160 PUNCH
170 PUNCH
                                                                                                        180 PUNCH
190 PUNCH
200 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 mg/kg of
mmol of
mmol of
mmol of
                                                                                                                                                (mol("HTO_SHZASO4"
mol("HX")*1E3
mol("LiX")*1E3
mol("NaX")*1E3
mol("CaX2")*1E3
(STEP_NO + .5)/15
SI("Ferrihydrite")
                                                                                                        210 PUNCH
220 PUNCH
230 PUNCH
240 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  mmol of
                                                                                                        250 PUNCH
260 PUNCH
270 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Pore volu
saturation
                                                                                                                                                 SI("Ferrihydrite")
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  saturation
                                                                                                        280 PUNCH
290 PUNCH
                                                                                                                                                SI("Goethite")
SI("Maghemite")
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  saturation
saturation
 END
 SOLUTION 990
                                                                                                                                                                    # ARK-STN-TW22 (source of CCR pore water influencing downstream groundwater)
                                                                                      19.7
6.5
2.4
       temp
pH
        pe
redox
units
                                                                                     pe
mg/kgw
1.0
        density
        Alkalinity
                                                                                        192
                                                                                                                     as Ca.5(CO3).5
                                                                                       0.19
4.41
       As
B
Ca
Cl
Co
                                                                                      363
7.7
0.032
                                                                                     0.123
```

```
36.3
49.2
0.193
38.9
12.4
0.003
20.3
 Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                         1115
                                                     1 #kg
-water
END
SOLUTION 991
                                                                              # Upgradient groundwater: ARGWA-20 (overburden)
                                 units
                                                       mg/kgw
                                                          20.9
5.9
6.1
36.5
                                 temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                                    as Ca.5(CO3).5
                                                        0.00036
0.058
11.63
                                                                              #reporting limit
                                                           8.70
                                                                              #max of observed cobalt
                                                           0.13
0.03
                                                                              #reporting limit
                                                          2.13
0.007
                                                          3.893
                                                                              #reporting limit for recent samples 
#reporting limit for recent samples
                                                          0.001
                                                          10.63
                                                          8.61
                                                                    #kg
END
TITLE Mix TW with Aquifer GW
                                                             0.54
0.46
                                                                              # determined by the hypothetical mixing ratios using CCR tracer boron
                                                  990
                                                  991
                                  SAVE Solution 992
END
                                 USE Solution 992
EQUILIBRIUM_PHASES 992
                                 SAVE Solution 0
FND
                                 TITLE Downgradient Transport Simulation
                                                                              # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2),
# assumed to be the water quality from the upgradient well ARGWA-20 (overburden)
SOLUTION 1-15
                                                       mg/kgw
                                 temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                           20.9
6.66
                                                                              # calibrated/changed to facilitate initial cobalt adsorption onto Hfo and Hao
                                                        6.1
36.5
0.00036
                                                          0.058
                                                          11.6
8.70
                                                         0.0008
                                                                              #max of observed cobalt
                                                          0.129
0.030
                                                          2.133
                                                          0.007
3.893
                                                          0.001
                                                         0.0005
                                                          10.63
8.61
                                                           1.0
END
EQUILIBRIUM_PHASES
                                 1-3
                                                                              # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                               3.1
1.5
1.5
  Maghemite
Goethite
                                                     0
0
0
  Ferrihydrite
  Pyrite
                                                 -100
                                                             0.39
pe_Fix
EQUILIBRIUM_PHASES
                                                                              # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                  -6.1 O2(g)
                                 4-13
  Maghemite
Goethite
Ferrihydrite
                                                    0
0
0
                                                               3.1
  Pyrite
                                                  -92
                                                             0.39
                                                -5.16 O2(g)
  pe Fix
                                                                              # calibration parameter
EQUILIBRIUM_PHASES
                                                             3.1
1.5
1.5
0.39
  Maghemite
                                                  3.5
  Goethite
Ferrihydrite
Pyrite
pe_Fix
                                                  3.5
3.5
-76
                                                -4.16 O2(g)
                                                                              # fixed to match ORP observed at ARAMW-7
EXCHANGE
                                 1-2
                                                 0.07
                                                                              # eq of exchange sites per one liter (kg) of water
 -equilibrate with Solution 1
EXCHANGE
                                 3-9
                                                 0.06
                                                                              # eq of exchange sites per one liter (kg) of water
 equilibrate with Solution 1
                                 10-15
EXCHANGE
                                                 0.05
                                                                              # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
SURFACE
                                 1-5
-equil with 1
Hfo_wOH
                                      1.38E-01
                                                                            # calibration parameter
                                                           600
                                                                       31
Hfo sOH
                                       3 46F-03
                                                           600
HaoOH
END
SURFACE
                                      2.73E-01
                                                           600
                                                                             # calibration parameter
                                 11-15
-equil with 1
Hfo_wOH
                                       1.38E-01
                                                                            # calibration parameter
                                       3.46E-03
Hfo sOH
                                                           600
HaoOH
                                      2.73E-01
                                                           600
                                                                       26 # calibration parameter
```

TRANSPORT

```
15
27
1.64E+07
15*15
15*1.5
TRUE
      -cells
-shifts
-time_step
                                                                                                                           # seconds
      -lengths
-dispersivities
-correct_disp
-thermal_diffusion
                                                                                         3.00E-10
                                                                2
1-15
     -thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_restart
                                                                1
1-15
END
                                                      USE Solution 992
                                                     USE Solution 991
MIX 2
                                                                             992
991
                                                                                                  0.01
0.99
                                                                                                                           \# fraction of CCR pore water and upgradient water mixture remaining after remediation \# fraction of upgradient water
                                                     SAVE Solution 0
END
TRANSPORT
                                                               154
15*15
15*1.5
1-15
      -shifts
-lengths
-dispersivities
     -print_cells
-print_frequency
-punch_cells
-dump_frequency
-punch_frequency
                                                                1
1-15
77
1
                                                    USER_GRAPH 1
-chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Co.png true true
                                                      -start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                     USER_GRAPH 2
                                                     USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_B.png true true
                                                     -start

10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
                                                    USER_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Li.png true true
-slart
                                                     -start

10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Li")*GFW("Li")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
```

TITLE - AP-2 Transect AA_Pre-closure (Base Case) and Post-closure (Monitored Natural Attenuation)

0.123

```
PHASES
                                                                                                                                                        the first transport represents pre-closure conditions
                                                                                                                                                         the second transport represents post-closure conditions under monitored natural attenuation scenario sensitivity analysis for Cation Exchange Capacity (2X)
 pe_Fix
                                                                  # allows fixing pe
                                                                  e- = e-
log_k 0.0
pH_Fix
                                                                  # allows fixing pH
H+ = H+
                                                                   log_k 0.0
END
SURFACE_MASTER_SPECIES
              Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao HaoOH
SURFACE_SPECIES
HaoOH = HaoOH
                                                                  log k 0.0
HaoOH + H+ = HaoOH2+
 HaoOH = HaoO- + H+
                                                                  log_k 11.18
HaoOH + Co+2 = HaoOCo+ + H+
log_k -2.52
HaoOH + H3BO3 = HaoH2BO3 + H2O
                                                                Log_k 1.57
EXCHANGE_MASTER_SPECIES
X X-
EXCHANGE_SPECIES
             X- = X-
log_k
                                          0.0
              Na++X-=NaX
             log_k
                                          0.0
             \begin{array}{ll} \text{K+ + X- = KX} \\ \text{log\_k} & 0.7 \end{array}
             Li+ + X- = LiX
              log_k
              H+ + X- = HX
              log_k
              Ca+2 + 2X- = CaX2
              Mg+2 + 2X- = MgX2
              Mn+2 + 2X- = MnX2
              log_k
                                         0.52
              Fe+2 + 2X- = FeX2
              log_k
                                         0.44
                                                                  SELECTED_OUTPUT
-file AP-2 TRANSECT AA-V03a_CEC_HIGH.bxt
                                                                                                                                        TRUE
TRUE
                                                                    -solution
                                                                    -user_punch
                                                                    -water
                                                                                                                                         TRUE
                                                                   USER PUNCH
                                                                                                            pH Eh Alkalinity Cl SO4 Ca Mg Na K F Al As B Co Fe Li Mn Mo Sorbed_Co Sorbed_As HX LiX NaX CaX2 PV Ferrihydrite Ferrihydrite Goethite Mag
                                                                    -headings
                                                                   -start
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       pH
Eh
Alkalinity
Cl
SO4
Ca
Mg
Na
K
F
                                                                                                     10 PUNCH
20 PUNCH
30 PUNCH
                                                                                                                                      -LA("H+")
S-LA("e-")*59.2
Alk*50.0355*1000
                                                                                                                                     3-LA( e' ) '39.2.
Alk*50.0355*1000
TOT(*C1)*GFW(*C1)*1E3
TOT(*C2)*GFW(*C2)*1E3
TOT(*C3)*GFW(*C2)*1E3
TOT(*C3)*GFW(*C3)*1E3
TOT(*M3)*GFW(*M3)*1E3
TOT(*M3)*GFW(*M3)*1E3
TOT(*M3)*GFW(*M3)*1E3
TOT(*M3)*GFW(*M3)*1E3
TOT(*M3)*GFW(*M3)*1E6
TOT(*M3)*GFW(*M3)*1E6
TOT(*M3)*GFW(*M3)*1E6
TOT(*M3)*GFW(*M3)*1E6
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                                                                                                     40 PUNCH
50 PUNCH
60 PUNCH
                                                                                                     70 PUNCH
                                                                                                  80 PUNCH
90 PUNCH
100 PUNCH
                                                                                                  110 PLINCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Al
As
B
Co
Fe
Li
Mn
                                                                                                  120 PUNCH
130 PUNCH
                                                                                                  140 PUNCH
150 PUNCH
160 PUNCH
170 PUNCH
                                                                                                 180 PUNCH
190 PUNCH
200 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Мо
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         mg/kg of sorbed Co, used to con
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        mg/kg of sorbed As, used to commol of HX
mmol of LiX
mmol of NaX
                                                                                                                                      (mol("HTO_SHZASO4"
mol("HX")*1E3
mol("LiX")*1E3
mol("NaX")*1E3
mol("CaX2")*1E3
(STEP_NO + .5)/15
SI("Ferrihydrite")
                                                                                                  210 PUNCH
                                                                                                  220 PUNCH
230 PUNCH
                                                                                                  240 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         mmol of CaX2
                                                                                                 250 PUNCH
260 PUNCH
270 PUNCH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Pore volume
saturation index of ferrihydrite
                                                                                                                                       SI("Ferrihydrite")
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         saturation index of ferrihydrite
                                                                                                 280 PUNCH
290 PUNCH
                                                                                                                                      SI("Goethite")
SI("Maghemite")
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         saturation index of goethite saturation index of maghemite
 END
 SOLUTION 990
                                                                                                                                                         # ARK-STN-TW22 (source of CCR pore water influencing downstream groundwater)
                                                                                19.7
6.5
2.4
      temp
pH
       pe
redox
units
                                                                               pe
mg/kgw
1.0
       density
       Alkalinity
                                                                                  192
                                                                                                             as Ca.5(CO3).5
                                                                                 0.19
4.41
      As
B
Ca
Cl
Co
                                                                                363
7.7
0.032
```

```
36.3
49.2
0.193
38.9
12.4
0.003
20.3
 Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                         1115
                                                     1 #kg
-water
END
SOLUTION 991
                                                                              # Upgradient groundwater: ARGWA-20 (overburden)
                                 units
                                                       mg/kgw
                                                          20.9
5.9
6.1
36.5
                                 temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                                    as Ca.5(CO3).5
                                                        0.00036
0.058
11.63
                                                                               #reporting limit
                                                           8.70
                                                                              #max of observed cobalt
                                                           0.13
0.03
                                                                              #reporting limit
                                                          2.13
0.007
                                                          3.893
                                                                              #reporting limit for recent samples 
#reporting limit for recent samples
                                                          0.001
                                                          10.63
                                                          8.61
                                                                     #kg
END
TITLE Mix TW with Aquifer GW
                                                              0.54
0.46
                                                                              # determined by the hypothetical mixing ratios using CCR tracer boron
                                                  990
                                                  991
                                  SAVE Solution 992
END
                                 USE Solution 992
EQUILIBRIUM_PHASES 992
                                 SAVE Solution 0
FND
                                 TITLE Downgradient Transport Simulation
                                                                              # fill aquifer with the water observed under baseline conditions (prior to the deposition of AP-2),
# assumed to be the water quality from the upgradient well ARGWA-20 (overburden)
SOLUTION 1-15
                                                       mg/kgw
                                 temp
pH
pe
Alkalinity
As
B
Ca
Cl
Co
F
Fe
K
Li
Mg
Mn
Mo
Na
S(6)
                                                           20.9
6.66
                                                                              # calibrated/changed to facilitate initial cobalt adsorption onto Hfo and Hao
                                                        6.1
36.5
0.00036
                                                          0.058
                                                          11.6
8.70
                                                         0.0008
                                                                              #max of observed cobalt
                                                          0.129
0.030
                                                          2.133
                                                          0.007
3.893
                                                          0.001
                                                         0.0005
                                                          10.63
8.61
                                                            1.0
END
EQUILIBRIUM_PHASES
                                 1-3
                                                                              # mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                               3.1
1.5
1.5
   Maghemite
Goethite
                                                     0
0
0
   Ferrihydrite
   Pyrite
                                                 -100
                                                              0.39
pe_Fix
EQUILIBRIUM_PHASES
                                                                              # fixed to match ORP observed at upgradient well
# mineral phases observed in overburden aquifer in proximity to upgradient and AP-2 source areas (SB-1 sample)
                                                  -6.1 O2(g)
                                 4-13
  Maghemite
Goethite
Ferrihydrite
                                                    0
0
0
                                                                3.1
   Pyrite
                                                   -92
                                                              0.39
                                                -5.16 O2(g)
   pe Fix
                                                                              # calibration parameter
EQUILIBRIUM_PHASES
                                               3.5
3.5
3.5
-76 0
-4.16 O2(g)
                                                              3.1
1.5
1.5
0.39
   Maghemite
  Goethite
Ferrihydrite
Pyrite
pe_Fix
                                                                              # fixed to match ORP observed at ARAMW-7
EXCHANGE
                                 1-2
                                                 0.28
                                                                              # eq of exchange sites per one liter (kg) of water
 -equilibrate with Solution 1
                                 3-9
EXCHANGE
                                                 0.24
                                                                              # eq of exchange sites per one liter (kg) of water
 equilibrate with Solution 1
                                 10-15
EXCHANGE
                                                 0.20
                                                                              # eq of exchange sites per one liter (kg) of water
-equilibrate with Solution 1
SURFACE
                                 1-5
-equil with 1
Hfo_wOH
                                       1.38E-01
                                                                             # calibration parameter
                                                           600
                                                                       31
Hfo sOH
                                       3 46F-03
                                                            600
HaoOH
END
SURFACE
                                       2.73E-01
                                                            600
                                                                             # calibration parameter
                                 11-15
-equil with 1
Hfo_wOH
                                       1.38E-01
                                                                            # calibration parameter
                                       3.46E-03
Hfo sOH
                                                            600
HaoOH
                                       2.73E-01
                                                            600
                                                                       26 # calibration parameter
```

TRANSPORT

```
15
27
1.64E+07
15*15
15*1.5
TRUE
      -cells
-shifts
-time_step
                                                                                                                           # seconds
      -lengths
-dispersivities
-correct_disp
-thermal_diffusion
                                                                                         3.00E-10
                                                                2
1-15
     -thermal_diffusion
-print_cells
-print_frequency
-punch_cells
-punch_frequency
-dump_frequency
-dump_restart
                                                                1
1-15
END
                                                      USE Solution 992
                                                     USE Solution 991
MIX 2
                                                                             992
991
                                                                                                  0.01
0.99
                                                                                                                           \# fraction of CCR pore water and upgradient water mixture remaining after remediation \# fraction of upgradient water
                                                     SAVE Solution 0
END
TRANSPORT
                                                               154
15*15
15*1.5
1-15
      -shifts
-lengths
-dispersivities
     -print_cells
-print_frequency
-punch_cells
-dump_frequency
-punch_frequency
                                                                1
1-15
77
1
                                                    USER_GRAPH 1
-chart_title "Cobalt"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Co.png true true
                                                      -start
10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Co")*GFW("Co")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
                                                     USER_GRAPH 2
                                                     USER_GRAPH 2
-chart_title "Boron"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_B.png true true
                                                     -start

10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("B")*GFW("B")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
-end
                                                    USER_GRAPH 3
-chart_title "Lithium"
-axis_titles "Years" "Concentration (ug/L)"
-axis_scale x_axis 0 auto auto auto
-connect_simulations TRUE
-initial_solutions FALSE
-batch AA_V01_Li.png true true
-slart
                                                     -start

10 PLOT_XY (TOTAL_TIME/3.17E+07)-0,TOT("Li")*GFW("Li")*1E6,color= Blue, symbol = Circle, symbol_size = 5, y-axis = 1, line_width = 1
```