Green Station Closure Extension Demonstration

Big Rivers Electric Corporation (BREC)

Green Station Closure Extension
Project No. 126878

Revision 0
11/25/2020

Green Station Closure Extension Demonstration

prepared for

Big Rivers Electric Corporation (BREC)
Green Station Closure Extension
Robards, Kentucky

Project No. 126878

Revision 0
11/25/2020

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

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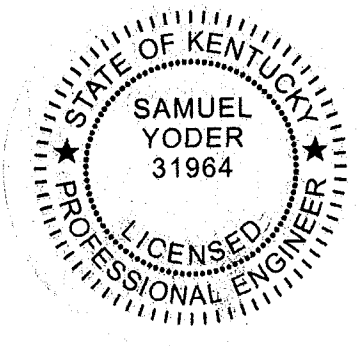
Certification

I hereby certify, as a Professional Engineer in the state of Kentucky, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the Big Rivers Electric Corporation (BREC) or others without specific verification or adaptation by the Engineer.



Samuel Yoder, P.E., Kentucky License # 31964

Date: 11/25/2020

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
BREC	Big Rivers Electric Corporation
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
HMP&L	Henderson Municipal Power & Light
KDEP	Kentucky Department for Environmental Protection
KPDES	Kentucky Pollutant Discharge Elimination System
MISO	Midcontinent Independent System Operator
POTW	Publicly Owned Treatment Works
PSC	Kentucky Public Service Commission
RCRA	Resource Conservation and Recovery Act
SSIs	Statistically Significant Increases
SWPPP	Stormwater Pollution Prevention Plan
WMB	Water Mass Balance

1.0 EXECUTIVE SUMMARY

Big Rivers Electric Corporation (BREC) submits this request to the U.S. Environmental Protection Agency (EPA) for approval of a site-specific alternate deadline to initiate closure pursuant to 40 C.F.R. § 257.103(f)(2) —"Permanent Cessation of a Coal-Fired Boiler(s) by a Date Certain"— for the Ash Pond located at the Robert D. Green Generating Station ("Green" or the "Plant") in Kentucky. The Ash Pond is a 26-acre Coal Combustion Residual (CCR) surface impoundment used to manage CCR and non-CCR wastestreams at Green. The Ash Pond is unlined and fails to meet the location restriction for aquifer separation at 40 C.F.R. § 257.60, and as such must either cease placing wastestreams in the surface impoundment and initiate closure no later than April 11, 2021, under 40 C.F.R. § 257.101(a)(1) and 40 C.F.R. § 257.101(b)(1)(i), or request this site-specific alternate deadline under the modified 40 C.F.R. § 257.103(f). The station will permanently cease coal-fired operation of the boilers on May 31, 2022[1], and the impoundment will complete closure no later than October 17, 2023. Therefore, an extension is requested from EPA pursuant to 40 C.F.R. § 257.103(f)(2) so the Ash Pond may continue to receive CCR and/or non-CCR wastestreams after April 11, 2021, and complete closure no later than October 17, 2023.

This demonstration replaces the document previously developed for the Ash Pond under 40 C.F.R. § 257.103(a)(1), which was prepared on October 31, 2019, and uploaded to the facility's CCR compliance website. Closure under 40 C.F.R. § 257.101(b)(1)(i) was not required to initiate prior to October 31, 2020, per the Phase 1 Part 1 modifications. BREC pre-emptively posted this document to allow for conversion of the facility to a dry ash handling system, but has since decided to cease coal-fired operations and complete impoundment closure as allowed by the Part A Rule modifications and the revisions to 40 C.F.R. § 257.103 (which have essentially nullified the previously published document).

[1] The Green generating units will be classified as idled to allow Big Rivers to maintain generator interconnection rights with Midcontinent Independent System Operator (MISO). Coal-fired operation of the boilers will permanently cease as of the date stated herein. However, dependent on various conditions, BREC may install new noncoal-fired generating capacity (including changing the fuel source to natural gas) at the facility at a later date.

2.0 INTRODUCTION

Green is a coal fired electric generating station near Robards, Kentucky. The plant consists of Unit 1 and Unit 2 which are 250MW and 242MW (gross) units commercialized in 1979 and 1981 respectively. Units 1 and 2 burn bituminous coal (pulverized). Green Station has two CCR units including the Green Station Surface Impoundment (referred to herein as the "Ash Pond" that is the subject of this demonstration) and the Green Station Landfill. The separate Reid/Henderson Municipal Power & Light (HMP&L) coal-fired electric generating station is located adjacent to the Green Station. The Reid/HMP&L station sit on separate parcels of property from the Green Station and is under a separate ownership structure that includes both BREC (Reid) and HMP&L (HMP&L Units 1 and 2). Reid/HMP&L Station consists of three retired coal-fired generating units, a gas-fired combustion turbine, and the Reid/HMP&L Surface Impoundment which is currently undergoing closure.

Green utilizes the Ash Pond to manage the CCR and non-CCR wastestreams. The Ash Pond has been in service for the life of the plant. The CCR wastestreams that are managed in the Ash Pond include sluiced bottom ash and economizer ash. All fly ash is dry handled. The various non-CCR wastewaters routed to the Ash Pond originate from the Unit 1 and 2 boiler sumps, metal cleaning wastes, clarifier blowdown, bottom ash hopper seal water, miscellaneous drains including roof drains, landfill leachate, coal pile runoff, and various stormwater sources. A site plan is provided on Figure 1, and the plant water balance is included on Figure 2.

On April 17, 2015, the EPA issued the federal CCR Rule, 40 C.F.R. Part 257, Subpart D, to regulate the disposal of CCR materials generated at coal fired units. The rule is being administered under Subtitle D of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 et seq.). On August 28, 2020, the EPA Administrator issued revisions to the CCR Rule that require all unlined surface impoundments to initiate closure by April 11, 2021, unless an alternative deadline is requested and approved. 40 C.F.R. § 257.101(a)(1) (85 Fed. Reg. 53,516, Aug. 28, 2020). Specifically, owners and operators of a CCR surface impoundment may continue to receive CCR and non-CCR wastestreams if the facility will cease operation of the coal-fired boiler(s) and complete closure of the impoundments within certain specified timeframes. 40 C.F.R. § 257.103(f)(2). To qualify for an alternate closure deadline under § 257.103(f)(2), a facility must meet the following four criteria:

1) **§ 257.103(f)(2)(i)** – There is no alternative disposal capacity available on-site or off-site. An increase in costs or the inconvenience of existing capacity is not sufficient to support qualification;

2) **§ 257.103(f)(2)(ii)** - Potential risks to human health and the environment from the continued operation of the CCR surface impoundment have been adequately mitigated;
3) **§ 257.103(f)(2)(iii)** - The facility is in compliance with the CCR rule, including the requirement to conduct any necessary corrective action. Note that the Ash Pond does not meet the placement above the uppermost aquifer requirement of 257.60(a).
4) **§ 257.103(f)(2)(iv)** - The coal-fired boilers must cease operation and closure of the impoundment must be completed within the following timeframes:
    a) For a CCR surface impoundment that is 40 acres or smaller, the coal-fired boiler(s) must cease operation and the CCR surface impoundment must complete closure no later than October 17, 2023.
    b) For a CCR surface impoundment that is larger than 40 acres, the coal-fired boiler(s) must cease operation, and the CCR surface impoundment must complete closure no later than October 17, 2028.

Section 257.103(f)(2)(v) sets out the documentation that must be provided to EPA to demonstrate that the four criteria set out above have been met. Therefore, this demonstration is organized based on the documentation requirements of §§ 257.103(f)(2)(v)(A) – (D).

3.0 DOCUMENTATION OF NO ALTERNATIVE DISPOSAL CAPACITY ON-SITE OR OFF-SITE

To demonstrate the criteria in § 257.103(f)(2)(i) has been met, the following provides documentation that no alternative disposal capacity is currently available on-site or off-site for each CCR and non-CCR wastestream that BREC seeks to continue placing into the Ash Pond after April 11, 2021. Consistent with the regulations, neither an increase in costs nor the inconvenience of existing capacity was used to support qualification under these criteria. However, as EPA explained in the preamble to the proposed Part A revisions, "it would be illogical to require facilities [ceasing power generation] to construct new capacity to manage CCR and non-CCR wastestreams." 84 Fed. Reg. 65,941, 65,956 (Dec. 2, 2019). EPA again reiterated in the preamble to the final revisions that "[i]n contrast to the provision under § 257.103(f)(1), the owner or operator does not need to develop alternative capacity because of the impending closure of the coal fired boiler. Since the coal-fired boiler will shortly cease power generation, it would be illogical to require these facilities to construct new capacity to manage CCR and non-CCR wastestreams." 85 Fed. Reg. at 53,547. Thus, new construction or the development of new alternative disposal capacity was not considered a viable option for any wastestream discussed below.

3.1 Site-Layout and Wastewater Processes

The Ash Pond (shown in Figure 1) receives the plant's CCR sluice flows and many of the non-CCR wastewater flows onsite, as shown on Figure 2. These wastestreams are discussed in more detail in the following sections.

3.2 CCR Wastestreams: Lack of Alternative Disposal Capacity and Options Considered

Each CCR wastestream placed in the Ash Pond at Green, which consists mainly of bottom ash sluice, was evaluated and flow data for each of these streams is included in Figure 2. Additionally, detail on the lack of managing these flows with alternative disposal capacity onsite is also discussed in Table 1 and the subsequent paragraphs.

Table 1: Green CCR Wastestreams

CCR Wastestreams	Average Flow (gpm)	Can Reroute to Existing Installed Capacity? YES/NO	Details	Rerouted location
Unit 1 Bottom Ash (and Economizer Ash) Sluice	235	NO	Currently, alternative capacity is not available on or off-site and would have to be installed. Alternative capacity would need to be designed, permitted, and installed on-site. Off-site alternative capacity would include installation of on-site temporary holding tanks and subsequent transporting of this sluice material offsite for disposal. Refer to the discussion below for a more detailed evaluation on the development of alternative capacity.	NA
Unit 2 Bottom Ash (and Economizer Ash) Sluice	235	NO		NA

- Bottom ash (and economizer ash) sluice (470 gpm total for both units):

  - On-site alternative capacity is currently not available and would need to be developed. The Reid/HMP&L Ash Pond is currently being closed. The remaining impoundments onsite (CSI yard drainage runoff pond, coal pile runoff pond, and metal cleaning waste pond) are non-CCR impoundments and as such are not permitted to receive the CCR sluice flows.

  - Development of on-site alternative capacity would require the design, permitting, and installation of a new treatment system including CCR ponds, conveyors, clarifiers, and/or storage tank(s), to provide the necessary retention time to meet the KPDES permit limits. The environmental permitting would include PSC approval, a modification to the current individual KPDES permit (to allow for the rerouting of this wastestream to another outfall) and a Stormwater Pollution Prevention Plan (SWPPP) at a minimum. Based on our experience with environmental permitting, this effort could require at least 18 months (or longer than the expected remaining coal-fired operation of the Green boilers).

  - Off-site alternative capacity is currently not available and would need to be developed. BREC has not yet identified a Publicly Owned Treatment Works (POTW) that will accept these wastestreams. Developed off-site alternative capacity would consist of temporary on-site wet storage (such as frac tanks), the installation of sumps/pumps/piping/and power supply to reroute these flows to that temporary storage, KPDES permit modifications with external

sources (if a POTW can be identified and contracted to receive these flows), and significant daily tanker truck traffic driving an unknown distance across Kentucky roadways. With an average daily flow of 338,400 gallons/day of sluice water for each unit, approximately 32 frac tanks (21,000 gallons) and 90 daily tanker trucks (~7500 gallons per truck to maintain DOT weight restrictions) would be required. The daily tanker truck traffic would result in increased potential for safety and noise impacts and further increases in fugitive dust, greenhouse gas emissions and carbon footprint which may require a Prevention of Significant Deterioration (PSD) permit and modification under the Clean Air Act Permit Program if the calculated increases in emissions are over the PSD limits. The potential for leaks/spills from the tank system or transportation of the wastewater offsite does exist. Furthermore, the temporary wet storage needed to accommodate off-site disposal would require design, associated PSC approval/environmental permitting, and plant reconfiguration (including the addition of sumps, pumps, piping, and power supply to redirect these flows to the temporary storage system). This effort would require at least 18 months (or longer than the expected remaining coal-fired operation of the Green boilers). For all of these reasons, BREC has determined that offsite disposal is not feasible for these flows at Green.

As stated previously, since BREC has elected to pursue the option to cease the use of the coal fired boilers by a date certain, BREC agrees with EPA that developing alternative disposal capacity is illogical. As long as BREC continues to wet handle the bottom ash, there are no other onsite CCR impoundments available to receive and treat these wastestreams. Also, as discussed above, it is not feasible to dispose of the wet-generated material offsite. As EPA explained in the preamble of the 2015 rule, it is not possible for sites that sluice CCR material to an impoundment to eliminate the impoundment and dispose of the material offsite. See 80 Fed. Reg. 21,301, 21,423 (Apr. 17, 2015) (“[W]hile it is possible to transport dry ash off-site to [an] alternate disposal facility that is simply not feasible for wet-generated CCR. Nor can facilities immediately convert to dry handling systems.”). For the reasons discussed above, in order to continue to operate and generate electricity, the bottom ash must continue to be placed in the Green Ash Pond due to lack of alternative capacity both on and off-site.

3.3 Non-CCR Wastestreams: Lack of Alternative Disposal Capacity and Options Considered

The Green Ash Pond receives the following non-CCR wastestreams shown in Table 2.

Table 2: Green Non-CCR Wastestreams

Non-CCR Wastestreams	Average Flow (gpm)	Alternative Disposal Capacity currently Available? YES/NO	Details
Unit 1 and 2 Boiler Blowdown	1.39	NO	These wastestreams could be rerouted to the Metal Cleaning Waste Pond, but the pond has an internal outfall to the Ash Pond. KPDES discharge permit modifications would be required, and additional sumps, pumps, and piping would need to be installed for discharge to an existing or new permitted outfall. Refer to the discussion below for a more detailed evaluation on the development of alternative capacity options.
Metal Cleaning Wastewater	7.64 (per Unit)	NO	
Roof Drains	2.08	NO	
Miscellaneous Drains	100 (per unit)	NO	
Clarifier Blowdown	104.17	NO	Currently, alternative capacity is not available on or off-site and would have to be developed. Alternative capacity would need to be designed, permitted, and installed. Off-site alternative capacity would include development of on-site temporary tanks and transporting of this sluice material offsite for disposal. Refer to the discussion below for a more detailed evaluation on the development of alternative capacity.
Bottom Ash Hopper Seal Water	1,700	NO	
Landfill Leachate	54	NO	
Coal Pile Runoff[1]	37.50 (avg) 1,472 (max)	NO	
Stormwater Runoff from Surrounding Area	546[2]	NO	
FGD Sludge Disposal Area Stormwater Runoff	702[2]	NO	

[1]Coal pile runoff from water balance diagram, based on pump run times and capacities

[2]Stormwater runoff calculations are based on 10-year, 24-hour storm event, averaged over a 24-hour period

With respect to alternative onsite disposal capacity, the Unit 1 and 2 boiler blowdown, metal cleaning wastewater, miscellaneous drains and the roof drains can currently be routed to the Metal Cleaning Waste Pond; however, the current discharge from the Metal Cleaning Waste Pond is routed to the Ash Pond. Consequently, a new discharge from the Metal Cleaning Waste Pond would be required, as well as rerouting the clarifier blowdown, bottom ash hopper seal water, landfill leachate, coal pile runoff,

stormwater runoff and FGD sludge disposal stormwater runoff to a new treatment system including ponds, clarifiers, and/or storage tank(s). These projects would require permit modifications, and installation of new sumps, pumps, piping, and power supply systems. The environmental permitting would include PSC approval, a modification to the current individual KPDES permit (to allow for the rerouting of this wastestream to another outfall) and a Stormwater Pollution Prevention Plan (SWPPP) at a minimum. Based on our experience with environmental permitting, this effort could require at least 18 months (or longer than the expected remaining coal-fired operation of the Green boilers).

Off-site alternative capacity is currently not available and would need to be developed. BREC has not yet identified a POTW that will accept these wastestreams. Developed off-site alternative capacity would consist of on-site temporary storage (such as frac tanks), the installation of sumps/pumps/piping/and power supply to reroute these flows to that temporary storage, KPDES permit modifications with external sources (if a POTW can be identified and contracted to receive these flows), and significant daily tanker truck traffic driving an unknown distance across Kentucky roadways. The requirements for frac tanks and truck frequencies are provided in Table 3. The daily tanker truck traffic would result in increased potential for safety and noise impacts and further increases in fugitive dust, greenhouse gas emissions and carbon footprint which may require a PSD permit and modification under the Clean Air Act Permit Program if the calculated increases in emissions are over the PSD limits. The potential for leaks/spills from the tank system or from transportation of the wastewater offsite does exist. Furthermore, the temporary wet storage needed to accommodate off-site disposal would require design, associated PSC approval/environmental permitting, and plant reconfiguration (including the addition of sumps, pumps, piping, and power supply to redirect these flows to the temporary storage system). This effort would require at least 18 months (or longer than the expected remaining coal-fired operation of the Green boilers).

Table 3: Non-CCR Wastestream Off-Site Disposal

Non-CCR Wastestreams	Average Flow (gpm)	Frac Tanks Required (21,000 gallons)	Daily Trucks Required (7,500 gallons)
Unit 1 and 2 Boiler Blowdown	1.39	1	1
Metal Cleaning Wastewater	7.64 (per unit)	1	3
Roof Drains	2.08	1	1
Miscellaneous Drains	100 (per unit)	13	38

Non-CCR Wastestreams	Average Flow (gpm)	Frac Tanks Required (21,000 gallons)	Daily Trucks Required (7,500 gallons)
Clarifier Blowdown	104.17	7	20
Bottom Ash Hopper Seal Water	1,700	117	326
Landfill Leachate	54	4	10
Coal Pile Runoff	37.50 (avg) 1,472 (max)	100*	283*
Stormwater Runoff from Surrounding Area	546	37	105
FGD Sludge Disposal Area Stormwater Runoff	702	48	67
	Total	**329**	**854**

*Assumes max flow for 24-hours

As stated previously, since BREC has elected to pursue the option to cease the use of the coal fired boilers by a date certain, BREC agrees with EPA that developing alternative disposal capacity is illogical. There is no infrastructure currently available at the plant to support reroute of these flows. BREC cannot feasibly plan for the fluctuations in trucking that would be required to prevent discharges during rain events.

For the reasons discussed above, in order to continue to operate and generate reliable electricity, Green must continue to use the 26-acre Ash Pond to manage the CCR and non-CCR wastestreams due to lack of alternative capacity both on and off-site.

4.0 RISK MITIGATION PLAN

To demonstrate that the criteria in § 257.103(f)(2)(ii) has been met, BREC has prepared and attached a Risk Mitigation Plan for the Ash Pond (see Attachment 1). Per § 257.103(f)(2)(v)(B), this Risk Mitigation Plan is only required for the specific CCR Unit(s) that are the subject of this demonstration.

5.0 DOCUMENTATION AND CERTIFICATION OF COMPLIANCE

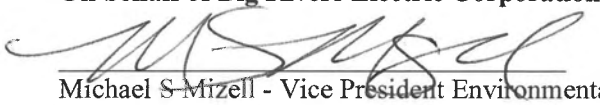
In the Part A rule preamble, EPA reiterates that compliance with the CCR rule is a prerequisite to qualifying for an alternative closure extension, as it "provides some guarantee that the risks at the facility are properly managed and adequately mitigated." 85 Fed. Reg. at 53,543. EPA further stated that it "must be able to affirmatively conclude that the facility meets this criterion prior to authorizing any continued operation." 85 Fed. Reg. at 53,543. Accordingly, EPA "will review a facility's current compliance with the requirements governing groundwater monitoring systems." 85 Fed. Reg. at 53.543. In addition, EPA will also "require and examine a facility's corrective action documentation, structural stability documents and other pertinent compliance information." 85 Fed. Reg. at 53,543. Therefore, EPA is requiring a certification of compliance and specific compliance documentation be submitted as part of the demonstration. 40 C.F.R. § 257.103(f)(2)(v)(C).

Green Station has two CCR units including the Green Station Surface Impoundment (referred to herein as the "Ash Pond" that is the subject of this demonstration) and the Green Station Landfill. The retired Reid/ HMP&L coal-fired electric generating station is located adjacent to Green Station. The Reid/HMP&L station sit on separate parcels of property from Green Station and is under a separate ownership structure that includes both BREC (Reid) and HMP&L (HMP&L Units 1 and 2). The Reid/HMP&L Station consists of three retired coal-fired generating units, a gas fired combustion turbine, and the Reid/HMP&L Surface Impoundment, which is currently undergoing closure. For informational purposes, BREC is including the compliance documents for this adjacent CCR unit as part of the submittal for the Green facility. To demonstrate that the criteria in § 257.103(f)(2)(iii) has been met, BREC is submitting the following information as required by § 257.103(f)(2)(v)(C):

5.1 Owner's Certification of Compliance - § 257.103(f)(2)(v)(C)(1)

I hereby certify that, based on my inquiry of those persons who are immediately responsible for compliance with environmental regulations for the Green station, the facility is in compliance with all of the requirements contained in 40 C.F.R. Part 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. The Green CCR compliance website is up-to-date and contains all the necessary documentation and notification postings.

On behalf of Big Rivers Electric Corporation:



Michael S Mizell - Vice President Environmental Compliance
November 25, 2020

5.2 Visual representation of hydrogeologic information - § 257.103(f)(2)(v)(C)(2)

Consistent with the requirements of § 257.103(f)(2)(v)(C)(2)(i) – (iii), BREC has attached the following items to this demonstration:

- Map(s) of groundwater monitoring well locations in relation to the CCR units (Attachment 2)
- Well construction diagrams and drilling logs for all groundwater monitoring wells (Attachment 3)
- Maps that characterize the direction of groundwater flow accounting for seasonal variations (Attachment 4)

5.3 Groundwater monitoring results - § 257.103(f)(2)(v)(C)(3)

The evaluation of groundwater results from the characterization events for baseline (April 2016 through September 2017) and detection monitoring events (October 2017 through April 2020) was reported to have no statistically significant increases (SSIs) above background concentrations for the CCR Rule Appendix III constituents at the Ash Pond. Results summary tables from the both the characterization and subsequent monitoring events are included in Attachment 5.

The Green Station Landfill and the Reid/HMP&L Station pond are in assessment monitoring. Per the most recent groundwater monitoring reports posted on BREC' CCR compliance website, lithium is present at statistically significant levels above the groundwater protection standard for monitoring wells MW-3A, MW-4, MW-5, and MW-6 at the Green Landfill and for MW-10 at the Reid/HMP&L pond (which is currently in the process of closure). Results summary tables from all groundwater monitoring events at these CCR units are included in Attachment 5.

5.4 Description of site hydrogeology including stratigraphic cross-sections - § 257.103(f)(2)(v)(C)(4)

According to the U.S. Geological Survey (USGS) Geologic Map of the Robards Quadrangle (USGS, 1973), the Site surface geology primarily consists of unconsolidated alluvium (silt, clay, sand, and gravel, and intermixed) with localized loess deposits (silt, light-yellowish brown, locally finely sandy or clayey) that commonly mantle elevated hills. However, much of the surface geology at the Site has been either disturbed/removed and covered/replaced with artificial fill for construction of BREC's Green Station and associated infrastructure and also includes construction of artificial levees along Green River. The consolidated bedrock underlying the alluvium (where present) and artificial fill is composed of Pennsylvanian-aged sedimentary rocks of the Carbondale Formation. A typical sequence of beds deposited during a sedimentary cycle in the Pennsylvanian rocks consists of sandstone, shale, clay, coal, and limestone. The sandstones mostly are channel-fill deposits and are separated by sequences of shale,

coal, and limestone. Generally, the sandstones and some limestones form the principal and most productive aquifers.

As reported by Associated Engineers (2016), the stratigraphic interval considered as the most prominent water transmitting zone within and adjacent to the Green Station is considered to be the Upper Sandstone Member (Sebree sandstone) of the Carbondale Formation. The USGS Geologic Map of the Robards Quadrangle describes the Sebree sandstone sequence as "Siltstone, sandstone, shale and coal: Siltstone, light- to medium-gray, micaceous, thin-bedded, locally calcareous. Sandstone, light- to medium-gray, grayish- and yellowish-brown, fine- to medium-grained slightly micaceous, thin-bedded to massive; locally fills channels." For purposes of compliance with the CCR Rule groundwater monitoring requirements, this sequence, and in particular the member sandstone intervals, is considered to be the uppermost aquifer underlying the Surface Impoundment. All monitoring wells were reportedly completed in the Sebree Sandstone, the upper sandstone member of the Carbondale Formation.

Generalized stratigraphic cross-sections are provided in Attachment 6 to illustrate the hydrogeology beneath the CCR Units based on monitoring well drill logs (included in Attachment 3).

Groundwater primarily moves through fractures and bedding planes in the rocks. Generally, the groundwater typically flows to the east-southeast toward the Green River indicating that the groundwater is discharging from the bedrock aquifer to the Green River (short flow path; hydraulically connected).

5.5 Corrective measures assessment - § 257.103(f)(2)(v)(C)(5)

Due to a lack of SSIs above background concentrations for the CCR Rule Appendix III constituents, characterization monitoring wells, assessment monitoring, and an assessment of corrective measures are not currently required for the Ash Pond. Green will continue to conduct groundwater monitoring in accordance with all state and federal requirements.

In accordance with 40 CFR 257.96, Assessment of Corrective Measures (ACM) were implemented for the Green Landfill (groundwater and non-groundwater) and Reid/HMP&L Ash Pond (Groundwater only). These ACM reports are included in Attachment 7.

5.6 Remedy selection progress report - § 257.103(f)(2)(v)(C)(6)

As noted above, an assessment of corrective measures and the resulting selection of remedy is not currently required for the Green Ash Pond. For the Green Landfill, BREC hosted a public meeting on July 16, 2020, to review the alternatives prior to selecting a remedy. The final remedy selection report for the Green Landfill (groundwater and non-groundwater) was completed in November 2020 and is included in

Attachment 8. The prior semi-annual progress reports from June 2020 and December 2019 are included in Attachment 8 as well. BREC has selected closure in place with additional source controls, including: removal of incidental (or *de minimis*) amounts of accumulated CCR material from the south sedimentation stormwater runoff pond (groundwater corrective action); the addition of a landfill perimeter drainage collection system (groundwater and non-groundwater corrective action); and installation of two containment systems intended as an interim corrective measure to reduce and prevent non-groundwater releases as the remedy for the Green Landfill. The non-groundwater containment systems were installed in late 2019/early 2020 and are currently active and functioning properly. Construction on the perimeter drainage collection system began in the 4th quarter of 2020 and is expected to be completed in the spring of 2021. The cleanout of the south sedimentation pond will be completed as weather allows but will be completed no later than summer of 2021.

BREC entered into an Agreed Order (File #18-3-0138) with the Kentucky Energy and Environment Cabinet, Division of Waste Management on December 16, 2019 to address and monitor ongoing construction and corrective action projects at the Green Landfill. BREC is in compliance with all conditions of the Agreed Order (File #18-3-0138). A copy of the Agreed Order is included as Attachment 9.

BREC is still evaluating the remedy alternatives for the Reid/HMP&L pond; however, the facility has initiated closure in place. BREC and HMP&L are currently in litigation regarding a number of issues related to Reid/HMP&L, the majority of which do not pertain to the Reid/HMP&L surface impoundment. Despite this litigation, BREC is attempting to work with HMP&L to take the steps needed to complete closure of the surface impoundment by April 17, 2024 as required per 40 C.F.R. § 257.101(b)(1)(ii), for failing the location restriction at 40 C.F.R. § 257.63. The June 2020 and December 2019 semi-annual remedy selection progress reports for the Reid/HMP&L pond are included in Attachment 10.

5.7 Structural stability assessment - § 257.103(f)(2)(v)(C)(7)

Pursuant to § 257.73(d), the initial structural stability assessments for the Ash Pond and the Reid/HMP&L pond were prepared in October 2016 and are included as Attachment 11. Periodic structural stability assessments are not required for landfills.

5.8 Safety factor assessment - § 257.103(f)(2)(v)(C)(8)

Pursuant to § 257.73(e), the initial safety factor assessments for the Ash Pond and the Reid/HMP&L pond were prepared in October 2016 and are included as Attachment 12. Periodic safety factor assessments are not required for landfills.

6.0 DOCUMENTATION OF CLOSURE COMPLETION TIMEFRAME

To demonstrate the criteria in § 257.103(f)(2)(iv) has been met, "the owner or operator must submit the closure plan required by § 257.102(b) and a narrative that specifies and justifies the date by which they intend to cease receipt of waste into the unit in order to meet the closure deadlines." BREC has included a closure plan for the Ash Pond as Attachment 13. The closure plan submittal is not required for the CCR units that are not the subject of this demonstration (the Green Landfill and the Reid/HMP&L pond).

In order for a CCR surface impoundment under 40 acres to continue to receive CCR and non-CCR wastestreams after the initial April 11, 2021, deadline, the coal-fired boiler(s) at the facility must cease operation and the CCR surface impoundment must complete closure no later than October 17, 2023. As discussed below, Green will cease receipt of waste into the Ash Pond by May 31, 2022, in order for closure to be completed by this deadline.

A schedule is included in Figure 3, which summarizes the major tasks and durations associated with closing the Ash Pond in place. The design, permitting, and procurement efforts will take place while the units are still in operation. The following activities will be completed during the design/ permitting phase:

- Award engineering services for Ash Pond closure
- Finalize Ash Pond closure plan and seek Kentucky Department for Environmental Protection (KDEP) approval
- Obtain environmental permits (based on KDEP approval of closure plan)
    - Kentucky Air Quality Construction/Operating Permit
    - KPDES Industrial Wastewater Permit Modification
    - General KPDES Permit for Storm Water Discharges from Construction Site Activities and Storm Water Pollution Prevention Plan (SWPPP)
- Receive approval from MISO to cease coal-fired operations on May 31, 2022 (at the end of the MISO operating year)
- Develop specifications
- Bid and award construction services for Ash Pond closure
- Ash Pond closure Contractor mobilization

To facilitate construction of the new water mass balance (WMB) pond and the pond closure, the existing non-CCR wastestreams will need to be managed. The pond water level will be lowered as much as feasible after ceasing the receipt of CCR upon the permanent cessation of the coal-fired boilers and prior

to the Ash Pond closure Contractor coming on site. When the Contractor begins construction, the remaining non-CCR wastestreams (essentially site stormwater and landfill leachate after the boilers cease coal-fired operations) will be managed using a series of temporary berms, ditches, and pumps to temporarily divert site stormwater to other locations. This will likely require KPDES permit modifications following the permanent cessation of the coal-fired boilers operation and the remediation of the coal pile to discharge water from the existing coal pile runoff pond to the Green River. Alternatively, the Contractor may choose to maintain a small portion of the current Ash Pond footprint to continue to receive these flows and pump them through a temporary treatment system to the existing outfall structure. The sequencing of construction and means and methods for the water management will be determined by the Contractor once a contract is finalized with BREC.

While managing the incoming stormwater and leachate flows, the Contractor will initiate grading and relocating CCR material for the WMB pond and pond closure and continue dewatering and removing the interstitial water in the CCR material (with drainage ditches or potentially an engineered dewatering system) so that the consolidated CCR material is stabilized to allow for the closure in place to be performed in phases to meet the performance standards as required by §257.102(d). The discharge will be directed to the KPDES permitted Outfall #009 (the Ash Pond outfall), with temporary treatment systems installed if required by the permit. As grading is completed in certain areas, the contractor will begin forming a 10-acre WMB Pond to treat remaining process and stormwater flows from Green prior to discharge. The approximate volume of CCR in the ash pond is 1,000,000 cubic yards. Approximately 400,000 cubic yards will be removed for the WMB pond construction. The Contractor will remove the CCR material from the portion of the impoundment that will receive the new WMB pond berm and begin placing fill for the new berm. While this fill is placed in lifts, the Contractor will continue removing CCR from the WMB portion of the pond and compacting it on the outside of the berm in the portion of the pond to be capped in place.

In addition to the new berm, the work for the WMB construction may consist of the installation of a HDPE geomembrane liner, 12-inches of protective cover material, and 18-inches of riprap for the pond side slopes. This liner system will be finalized during detailed design and permitting for the WMB Pond, but this scope is included in the overall closure schedule. If the pond liner system is required, the duration shown will be adequate to allow for construction and if not, there will be additional float available to meet the regulatory deadline. Concurrent to the WMB Pond lining work, the contractor will begin placing the final cover system over the closed in place CCR material. For the purposes of providing conservatism in the schedule, we have assumed the alternative cover system outlined in the Ash Pond's closure plan will be constructed.

The planned duration for completing this effort is based on the following assumptions for major scope items:

- CCR Cut to Fill – 3,500 cubic yards per day
- Berm Construction – 3,500 cubic yards per day
- Geomembrane Construction – 25,000 square feet per day
- Protective Cover Installation – 1,500 cubic yards per day
- Topsoil Installation – 2,500 cubic yards per day
- Seeding – 2 acres/day

The schedule presented in Figure 3 includes an additional 20% to account for weather delays. In addition to the 20% weather days, it is known that when the temperatures are below freezing for much of the day, earthwork and compaction activities are difficult. Therefore, a winter break from construction has been factored into the schedule for the timeline between December 1st and March 1st. This timeframe is when the average temperature dips below 40-degrees Fahrenheit in the region, based on data between the years of 1981 and 2010 by the National Oceanic and Atmospheric Administration (NOAA) for Louisville, Kentucky. If possible, the Contractor may elect to continue work during this period; however, that is not accounted for in the current schedule.

7.0 CONCLUSION

Based upon the information included in and attached to this demonstration, BREC has demonstrated that the requirements of 40 C.F.R. § 257.103(f)(2) are satisfied for the 26-acre Ash Pond at Green. This CCR surface impoundment is needed to continue to manage the CCR and non-CCR wastestreams identified in Sections 3.2 and 3.3 above, is smaller than 40 acres, the station will cease coal-fired operation on May 31, 2022, and the Ash Pond will be closed by the October 17, 2023, deadline. Therefore, this CCR unit qualifies for the site-specific alternate deadline for the initiation of closure authorized by 40 C.F.R. § 257.103(f)(2).

Therefore, it is requested that EPA approve BREC' demonstration and authorize the Ash Pond at Green to continue to receive CCR and non-CCR wastestreams notwithstanding the deadline in 40 C.F.R. § 257.101(a)(1) or 40 C.F.R. § 257.101(b)(1)(i) and to grant the alternate deadline of October 17, 2023, by which to complete closure of the impoundment.

FIGURE 1 - SITE PLAN

NORTH

0 200' 400'
SCALE IN FEET

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
A	09/11/20	MDB	ETT	ISSUED FOR OWNER REVIEW

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400

designed M. BLEYTHING | detailed J. RIDDER

Big Rivers ELECTRIC CORPORATION
Your Touchstone Energy® Cooperative
ROBERT D. GREEN STATION
WEBSTER COUNTY, KENTUCKY

BREC GREEN STATION
CCR & ELG COMPLIANCE PROJECT
ASH POND CLOSURE SITE PLAN

project 126878 | contract

drawing **SK-C001** | rev. **A**

sheet | of | sheets

file 126878SK-C001.DGN

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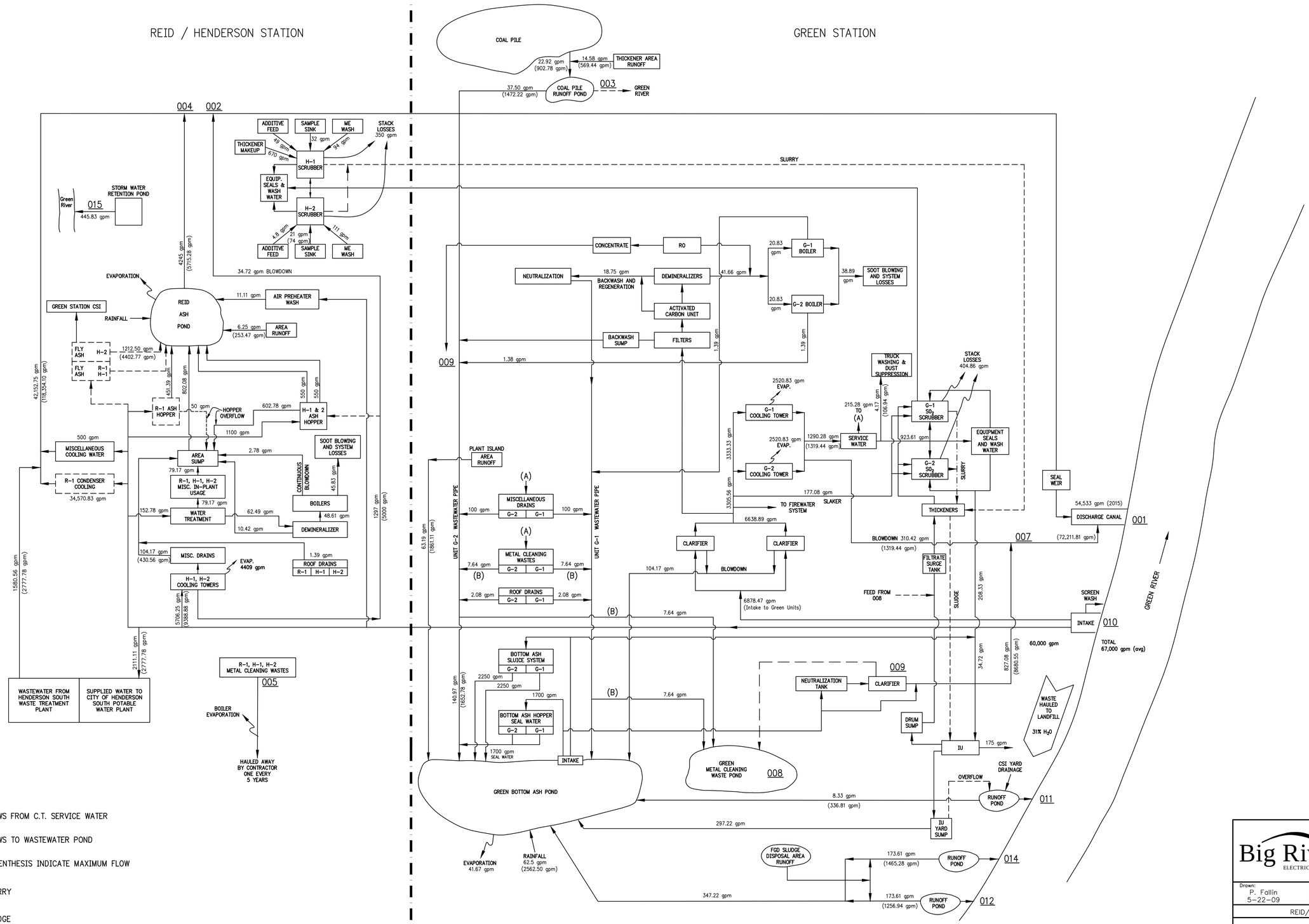
Scale For Microfilming: Millimeters / Inches

FIGURE 2 - WATER BALANCE

REID / HENDERSON STATION

GREEN STATION



NOTES:

(A) FLOWS FROM C.T. SERVICE WATER

(B) FLOWS TO WASTEWATER POND

( ) PARENTHESIS INDICATE MAXIMUM FLOW

—·— SLURRY

– – – SLUDGE

– – – ALTERNATIVE FLOW

Revisions

1	GENERAL REVISION	3-4-85
2	GENERAL REVISION	12-91 pjf/LWG
3	GENERAL REVISION	7-92
4	GENERAL REVISION	1-94 jwz
5	GENERAL REVISION	1-25-94 jwz
6	GENERAL REVISION	4-26-94 jwz
7	GENERAL REVISION	6-7-96 jwz
8	GENERAL REVISION	12-12-01 pjf/
9	GENERAL REVISION	1-26-04 pjf/
10	GENERAL REVISION	5-24-04 pjf/
11	GENERAL REVISION REDRAWN IN AUTOCAD	5-22-09 pjf/TH
12	GENERAL REVISION DUE TO ELG REGULATIONS	7-21-16 pjf/GD
13	GENERAL REVISION DUE TO CHANGE IN PROCESS	10-19-16 pjf/SH

CAD

Big Rivers ELECTRIC CORPORATION Your Touchstone Energy Cooperative

Drawn:	Checked:	Approved:
P. Fallin 5-22-09	T. Hall 5-26-09	

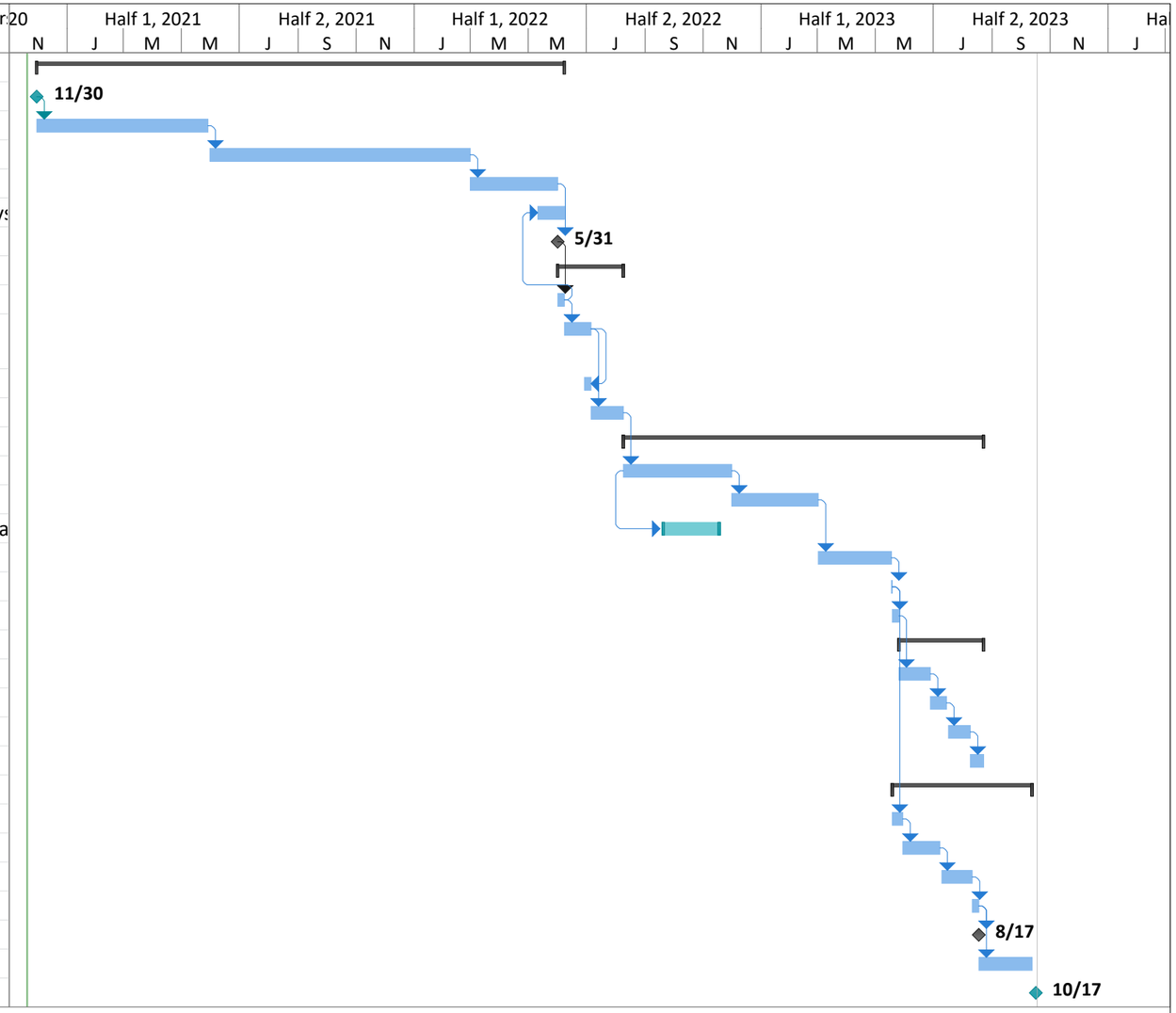
REID/GREEN/HENDERSON STATION

WATER FLOW DIAGRAM

Scale:	Drawing Number:	Revision
None	FIGURE 1	13

FIGURE 3 - SCHEDULE

ID	Task Name	Duration	Start	Finish	Predecessor
1	**Ash Pond Closure Engineering/Permitting**	**397 days**	**Mon 11/30/20**	**Tue 6/7/22**	
2	Award Engineering Services for Impoundment Closure	0 days	Mon 11/30/20	Mon 11/30/20	
3	Finalize Closure Plan and Submit to KDEP for Approval	130 days	Mon 11/30/20	Fri 5/28/21	2
4	Obtain Environmental Permits	196 days	Mon 5/31/21	Mon 2/28/22	3
5	Spec, Bid, Award Construction Services	66 days	Tue 3/1/22	Tue 5/31/22	4
6	BREC to Lower Water Level in Pond	20 days	Wed 5/11/22	Tue 6/7/22	9FS-20 days
7	Cease Sending CCR to Ash Pond/ Initiate Closure	0 days	Tue 5/31/22	Tue 5/31/22	5
8	**Ash Pond Closure Construction Preparation**	**49 days**	**Wed 6/1/22**	**Mon 8/8/22**	
9	Mobilization	5 days	Wed 6/1/22	Tue 6/7/22	7
10	Install Temporary Berms, Ditches, Pumps for non-CCR wastestreams	20 days	Wed 6/8/22	Tue 7/5/22	9
11	Install Temporary Piping Relocate	5 days	Wed 6/29/22	Tue 7/5/22	10FF
12	Pond Dewatering	24 days	Wed 7/6/22	Mon 8/8/22	10
13	**Ash Pond Closure Construction**	**271 days**	**Tue 8/9/22**	**Tue 8/22/23**	
14	Regrade CCR Material	82 days	Tue 8/9/22	Wed 11/30/22	12
15	Winter Break	65 days	Thu 12/1/22	Wed 3/1/23	14
16	Construct Pond Berm for WMB Construction	43 days	Tue 9/20/22	Thu 11/17/22	14SS+30 da
17	Regrade CCR Material	55 days	Thu 3/2/23	Wed 5/17/23	15
18	State Inspection for Removal of Ash	1 day	Thu 5/18/23	Thu 5/18/23	17
19	Subgrade Compaction (top 6")	5 days	Fri 5/19/23	Thu 5/25/23	18
20	**WMB Pond Liner Installation**	**63 days**	**Fri 5/26/23**	**Tue 8/22/23**	
21	HDPE Geomembrane	23 days	Fri 5/26/23	Tue 6/27/23	19
22	12" Protective Cover	13 days	Wed 6/28/23	Fri 7/14/23	21
23	18" Riprap on Pond Slopes	17 days	Mon 7/17/23	Tue 8/8/23	22
24	Permanent Piping Relocate/Place WMB In Service	10 days	Wed 8/9/23	Tue 8/22/23	23
25	**Ash Pond Cover Installation**	**105 days**	**Fri 5/19/23**	**Thu 10/12/23**	
26	Subgrade Finishing	7 days	Fri 5/19/23	Mon 5/29/23	18
27	HDPE Geomembrane	29 days	Tue 5/30/23	Fri 7/7/23	26
28	18" Protective Cover	24 days	Mon 7/10/23	Thu 8/10/23	27
29	Topsoil	5 days	Fri 8/11/23	Thu 8/17/23	28
30	Ash Pond Closure Completion	0 days	Thu 8/17/23	Thu 8/17/23	29
31	Establish Vegetation	40 days	Fri 8/18/23	Thu 10/12/23	29
32	Date to Complete Closure	0 days	Tue 10/17/23	Tue 10/17/23	



Project: BREC Ash Pond Closure
Date: Fri 11/20/20

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline			
Split	External Tasks	Inactive Summary	Manual Summary	Progress			
Milestone	External Milestone	Manual Task	Start-only	Manual Progress			
Summary	Inactive Task	Duration-only	Finish-only				

ATTACHMENT 1 - RISK MANAGEMENT PLAN

Risk Mitigation Plan

Big Rivers Electric Corporation

Green Station Surface Impoundment
Project No. 126878

Revision 0
11/17/2020

Risk Mitigation Plan

prepared for

Big Rivers Electric Corporation
Green Station Surface Impoundment
Robards, Kentucky

Project No. 126878

Revision 0
11/17/2020

prepared by

Burns & McDonnell
Kansas City, Missouri

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Page No.

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ACM	Assessment of Corrective Measures
BREC	Big Rivers Electric Corporation
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
GWPS	Groundwater Protection Standard
HHE	Human Health and Environment
IUCS	Illinois University Conversion System
KPDES	Kentucky Pollution Discharge Elimination System
LTM	Long-Term Monitoring
MNA	Monitored Natural Attenuation
O&M	Operation and Maintenance
P&T	Pump and Treat
RMP	Risk Management Plan
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WMB	Water Management Basin

1.0 INTRODUCTION

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) has prepared this Risk Mitigation Plan (RMP) for the existing Coal Combustion Residuals (CCR) Surface Impoundment, or Ash Pond (AI# 4196 & Kentucky Pollutant Discharge Elimination System [KPDES] # KY0001929; Outfall #009) for the Big Rivers Electric Corporation's (BREC's) Robert D. Green Generating Station (Green) in Kentucky (Site) in Webster County. This RMP supports the facility's compliance with the requirements of the *Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure Part A: Deadline To Initiate Closure* (40 CFR Part 257, U.S. Environmental Protection Agency [EPA], 2020) [CCR Part A Rule] and in obtaining an alternative closure deadline for the existing Ash Pond. The Ash Pond is located directly south of the facility within the property boundaries of BREC. An aerial photographic site plan illustrating the location of the active Ash Pond is provided in Figure 1 of the Closure Extension Demonstration Memorandum.

1.1 Purpose

BREC is seeking EPA approval to obtain a site-specific alternative deadline to initiate closure of the Ash Pond under 40 CFR § 257.103(f)(2) ("Permanent Cessation of a Coal-Fired Boiler(s)") to continue to receive CCR and/or non-CCR wastestreams by ceasing the operations of the coal-fired boiler(s) and complete closure of the Ash Pond no later than October 17, 2023 (for a CCR surface impoundment that is 40 acres or smaller).

Pursuant to the requirements set forth in the CCR Part A Rule for obtaining an alternative closure deadline, this document serves as the RMP for inclusion in BREC's Demonstration for a Site-Specific Alternate to Initiation of Closure Deadline for the Ash Pond in order to continue operating the Ash Pond. In accordance with CFR § 257.103(f)(2)(v)(B), this RMP describes the measures that will be taken to address increased risk from continued operation of the Ash Pond, which EPA will review as part of determining whether to grant the extension. If additional measures to mitigate the risk are necessary to ensure that the statutory standard is met, EPA will require those as a condition of granting the extension. The focus of this document is the RMP.

1.2 Rationale

BREC is subject to the CCR Rule and as such is required to ensure that its CCR units maintain compliance with CCR Rule requirements. Any facility that has currently posted on its publicly accessible CCR internet site a notification to close a CCR surface impoundment pursuant to § 257.103(a) or (b) must submit a demonstration for EPA approval that meets the requirements under § 257.103(f)(1) or (f)(2) in

order to continue operating that unit. Therefore, if a facility has a notification posted and is currently operating under § 257.103(a) or (b), due to closure under § 257.101(b)(1)(ii), and does not submit a demonstration to EPA by November 30, 2020, the facility must cease the receipt of waste into the unit no later than April 11, 2021 and initiate closure. BREC posted its notification of intent to close the Ash Pond, utilizing alternative closure requirements in accordance with 40 C.F.R 257.103, on its publicly accessible CCR internet site on October 31, 2019.

Alternate off-site disposal capacity is not available for wastestreams currently entering the Ash Pond. As acknowledged previously by EPA, it is not feasible to transport wet CCR to an off-site location, nor is it feasible to transport the facility's large volume non-CCR wastestreams off-site for disposal. Alternate on-site disposal capacity is not currently available and cannot be made available prior to April 11, 2021.

As certified in the Closure Extension Demonstration Memorandum, the Ash Pond is in compliance with all the requirements of the CCR Rule and will remain in compliance until closure of the Ash Pond is completed. Regular compliance activities, including required groundwater monitoring and reporting, are continuing and all required documents have been placed into the facility's Operating Record and posted on the publicly available website. The Ash Pond is currently in detection monitoring and concentrations of constituents listed in Appendix III to the CCR Rule have not exhibited statistically significant increases (SSI) above background.

Because of the demonstrated lack of available alternate disposal capacity before April 11, 2021, the compliance status of the Surface Impoundment, and BREC's diligent and good faith efforts since April 2015 to develop alternate disposal capacity in order to close the Ash Pond, BREC respectfully requests a site-specific alternate deadline of October 17, 2023 to initiate closure of the Ash Pond at Green Station.

2.0 RELEASE MITIGATION MEASURES

In accordance with § 257.103(f)(2)(v)(B)(*1*), this section provides discussion on the physical or chemical measures the facility has taken to limit any future releases to groundwater during operation.

2.1 Operational Measures to Limit Future Releases to Groundwater

The Ash Pond is a 26-acre CCR surface impoundment which can receive flows from a coal pile runoff pond, landfill runoff pond, metal cleaning waste pond and Flue Gas Desulfurization area runoff pond.

The Ash Pond receives all CCR transport waters and most of the non-CCR wastewater flows on-site before discharging to the Green River via Outfall 001 in accordance with KPDES Permit No. KY0001929.

Fly ash is typically captured dry via a dry conveying system from the existing electrostatic precipitator. Therefore, current operations already limit the addition of fly ash to the Ash Pond. Economizer ash is wet sluiced to the Ash Pond. Bottom ash is transported through the sluice lines into the Ash Pond.

Green's current physical and chemical treatment operation adequately mitigates potential risks to human health and the environment (HHE). Green will continue this treatment process for the Ash Pond until such time as closure is required per 40 CFR 257. The facility's physical and chemical treatment process is discussed below, followed by a discussion of other chemical and physical treatments required per § 257.103(f)(2)(v)(B)(1).

2.2 Current Physical and Chemical Treatment Processes

The Flue Gas Desulphurization waste streams are currently treated by the IU Conversions Systems, Inc. (IUCS) solidifying treatment process, with filtrate returned to the process for reuse.

The coal pile runoff pond is also a wastewater treatment settling system which allows the solids generated from the IUCS to settle further during upset conditions.

As part of normal maintenance, ash is removed from the Ash Pond and transported to the landfill.

Therefore, the current and future operation encompassing the IUCS and the physical removal of solids from the Ash Pond limit current and future releases to groundwater during operation.

No potential safety impacts or exposure to human health or environmental receptors are expected to result from continued operation of the IUCS and the Ash Pond.

3.0 CURRENT CONDITIONS AND RECEPTOR ANALYSIS

To demonstrate that the criteria in 40 CFR § 257.103(f)(2)(ii) have been met, the following information is submitted pursuant to 40 CFR § 257.103(f)(2)(v)(B) to demonstrate that the Ash Pond is in compliance with the CCR rule. The information presented in this section provides the basis for the conceptual site model.

3.1 Groundwater Monitoring Results

In accordance with § 257.91, monitoring wells comprising a CCR unit groundwater monitoring system were installed at the Green Ash Pond in 2015 and 2016 and the monitoring system was certified on June 28, 2016. As stated in the *CCR Impoundment Groundwater Monitoring System and Statistical Methods Assessment and Certification* (BREC, 2016), temporary piezometers were installed adjacent to the Ash Pond to determine the general direction of groundwater movement. Static water levels measured in these piezometers were used to calculate a hydraulic gradient or apparent direction of groundwater movement that is generally from the northwest to southeast. This groundwater gradient characterization and the ability to locate monitoring wells specific to the Ash Pond justified the placement of the minimum of one upgradient and three downgradient monitoring wells.

A groundwater sampling and analysis program was developed and implemented in accordance with § 257.93 and a detection monitoring program was initiated as required by § 257.94. The first groundwater sampling event at the Green Ash Pond was conducted in April 2016.

In accordance with § 257.103(f)(2)(v)(B)(*2*), the evaluation of groundwater results from the characterization events for baseline (April 2016 through September 2017) and detection monitoring events (October 2017 through April 2020) was reported to have no SSI above background concentrations for the CCR Rule Appendix III constituents (AECOM, 2020). Results summary tables from the both the characterization and detection monitoring events are included in Attachment 5 of the Closure Extension Demonstration Memorandum.

3.2 Plume Delineation

In accordance with § 257.103(f)(2)(v)(B)(*2*), plume delineation is not necessary based on the current groundwater monitoring results showing no SSI above background concentrations for the CCR Rule Appendix III constituents. However, if one or more CCR Rule Appendix IV constituents are detected at statistically significant levels (SSL) exceeding Groundwater Protection Standards (GWPS), established in accordance with 40 CFR §257.95(h), the nature and extent of the release would be characterized to delineate the contaminant plume. The existing conceptual site model – comprised of groundwater

analytical data, potentiometric surface elevation and hydraulic gradient data, subsurface cross-sections, and other hydrogeologic data – would provide an adequate basis for planning and executing a plume delineation investigation. If required, plume delineation activities could consist of additional monitoring well installation and sampling, other subsurface investigation activities (e.g., direct-push soil and groundwater characterization, direct-sensing investigation, aquifer hydraulic conductivity testing, etc.), and/or groundwater / surface water interaction evaluation. A demonstration may also be made that a source other than the CCR unit caused the contamination, or that the SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality [§257.95(g)(3)(ii)].

3.2.1 Receptor Analysis

In accordance with § 257.103(f)(2)(v)(B)(*2*), a receptor analysis has been conducted to determine human and ecological receptors that may come into contact with impacted media associated with the Ash Pond. As presented in previous sections, water from the Ash Pond may permeate underlying soils and impact groundwater. Groundwater flows east-southeast from the Ash Pond through additional property owned and operated by BREC and into the Green River. Once in the Green River, potential contaminants from the groundwater may mix with the surface water or deposit onto sediments.

On October 29, 2013, the Kentucky Department for Environmental Protection – Division of Water published a surface water quality assessment for the segment of the Green River extending from Panther Creek to the Pond River (River Mile 28.05 to 55.0). The Site is located at River Mile 41.7. The Assessment Summary stated that this segment of the Green River fully supports aquatic life and drinking water (domestic water supply). A copy of the Assessment Summary is provided as Attachment 1.

Given the site conditions, on-site exposure to downgradient groundwater potentially impacted by the Ash Pond is not anticipated because BREC owns and operates the property up to the Green River and does not extract downgradient groundwater for use. Potable water for the facility is provided by the municipal Henderson South Water Treatment Plant. The anticipated human receptors to potential groundwater impacts from the Ash Pond include downgradient recreational users of Green River. Recreational users could include adults or children wading, swimming, or fishing in the Green River, who could be exposed to surface water or sediment through ingestion or dermal contact. They could also be exposed by ingesting river biota potentially impacted by contaminants from the Ash Pond. As stated above, the segment of the Green River on which the facility is located was assessed in 2013 and found to be fully supportive of aquatic life and drinking water. If needed, the measures presented in the Contaminant Plume Containment Plan (Section 5.0 of this RMP) will address the potential exposures described above by containing potential groundwater impacts and mitigating impacts to surface water or sediment.

A prior study (AECOM, 2018) that included field surveys and delineations identified two downgradient wetland areas and an intermittent stream southwest of the Ash Pond. The study determined that the Ash Pond would not impact on-site wetlands, threatened or endangered species, or wildlife in general. Groundwater interaction with surface water could result in potential impact to benthic invertebrates and other aquatic life in Green River. As stated above, the segment of the Green River on which the facility is located was assessed in 2013 and found to be fully supportive of aquatic life and drinking water. If needed, the measures presented in The Contaminant Plume Containment Plan (Section 5.0 of this RMP) will address the potential impacts described above by mitigating the migration of groundwater impacts to surface water.

Currently, because groundwater is not impacted at a statistically significant level by constituents from the Ash Pond, no human or ecological receptors are adversely impacted. Potential exposure to future releases would be mitigated as discussed in Section 5.0.

4.0 CONTAMINANT PLUME CONTAINMENT ALTERNATIVES EVALUATION

A contaminant plume containment alternatives evaluation was conducted to evaluate options for addressing an increased risk of groundwater contamination resulting from continued operation of the Ash Pond. This evaluation assumes that potential risks are present under current conditions and presents measures for addressing these in the event they develop into actual, unacceptable risks. These unacceptable risks include any constituent listed in Appendix IV of the CCR Rule that has been detected at a SSL exceeding the GWPS defined under 40 CFR §257.95(h), or immediately upon detection of a release from a CCR unit.

4.1 Containment Objectives

During the development of containment objectives, appropriate consideration must be given to the contaminated media, compounds of interest, exposure pathways and receptors, and media cleanup standards. Containment objectives are media-specific goals for protection of HHE that provide the foundation upon which containment alternatives for a site are identified, assembled, and evaluated. Site-specific containment objectives have been identified and are based on hypothetical (what-if) or potential future risk scenarios that would initiate an Assessment of Corrective Measures (ACM; 40 CFR §257.96) to prevent further releases, to remediate any releases, and to restore the affected area to original condition.

General containment objectives are to protect HHE and to prevent exposure to groundwater contamination at levels that are unacceptable. More specific goals include:

- Prevent further degradation of uppermost aquifer;
- Prevent off-site migration of groundwater impacts;
- Prevent migration to potential receptors; and
- Return the aquifer to the most beneficial use by restoring it to natural background concentrations.

The target area for contaminant plume containment is limited to the Ash Pond area.

4.2 Containment Alternatives

The purpose of this section is to identify, evaluate, screen, and recommend an appropriate containment alternative for the Ash Pond. Consideration should also be given to containment alternatives that will achieve cleanup levels associated with the reasonable anticipated land use of the site in question. Containment objectives can be achieved by eliminating exposure pathways associated with environmental

media, enacting engineering and institutional controls that serve to eliminate exposure pathways associated with environmental media, or by removing the source of contamination.

Containment alternatives developed to address containment objectives for the Site include a "no action" alternative and two containment alternatives consisting of monitored natural attenuation (MNA) and groundwater extraction.

4.2.1 Alternative 1 – No Action

"No Action" means that the Site is left "as is". Under the "No Action" alternative, institutional controls (e.g., land use restrictions, etc.) are not implemented, contamination is not remediated, and monitoring is not conducted. This alternative is used as a baseline for comparing the relative performance of the other alternatives.

4.2.2 Alternative 2 – Monitored Natural Attenuation

MNA refers to the use of "natural attenuation processes as part of the overall site remediation". Natural attenuation processes include a variety of physical, chemical, or biological processes that, under favorable conditions, act without intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil and groundwater. These processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical and/or biological stabilization, transformation, or destruction of contaminants. The MNA technology includes long-term groundwater monitoring and reporting to demonstrate natural attenuation processes are occurring.

4.2.3 Alternative 3 – Groundwater Extraction

Implementation of this alternative would include the installation and operation of a groundwater extraction and treatment (commonly referred to as pump and treat [P&T]) system to address on-site groundwater contamination. The primary objective of a P&T system is to affect groundwater flow and exert hydraulic control over a groundwater contamination plume. Through the extraction (i.e., pumping) of groundwater from wells installed in the vicinity of the plume, a P&T system causes a reduction in hydraulic head (or drawdown). This reduction in hydraulic head drives groundwater flow toward the extraction well, decreasing the migration of contaminated groundwater toward downgradient receptors. Impacted groundwater pumped from the extraction well(s) is treated as required to meet applicable compliance limits and discharged. In addition to exerting local hydraulic control over a groundwater plume, P&T systems can recover contaminants and reduce overall contaminant mass within the subsurface aquifer.

The technical P&T approach developed for potential implementation at the Green Ash Pond includes the use of groundwater extraction well(s) to capture and treat groundwater contamination and provide hydraulic control to reduce plume migration. A pump would be installed in each extraction well and recovered groundwater would be conveyed from the extraction well(s) via subgrade piping to an on-site facility for treatment and discharge. The treatment facility would include the piping, valves, controls, and other equipment required for operation and monitoring of the P&T system. A number of treatment technologies, including physical separation, chemical precipitation, filtration, carbon adsorption, and ion-exchange, may be used to treat recovered groundwater. Treated groundwater may discharged to a permitted outfall or publicly- or privately-owned treatment works facility, repurposed for beneficial use, or injected into the ground. Discharge of treated water via a permitted outfall or underground injection would be conducted in accordance with local and state regulatory requirements.

4.3 Containment Alternatives Evaluation

The purpose of this containment alternatives evaluation is to select a groundwater remedy that can be expeditiously implemented to promptly mitigate potential exposures to receptors in the event a future release is identified during continued operations of the Green Ash Pond. A more detailed evaluation may be performed during an ACM (if required). This ACM may consider other groundwater corrective action alternatives that may be implemented during or after closure of the Ash Pond. An alternate source demonstration may be pursed under 40 CFR §257.94(e)(2) in demonstrating that a source other than the Ash Pond is the cause for an SSI over background levels (Detection Monitoring Program) or SSL over GWPS (Assessment Monitoring Program).

4.3.1 Alternative 1 – No Action

This alternative is not considered protective of HHE as it does not include measures to prevent future exposures to CCR contamination. The no action alternative is the least protective alternative because the site is left “as-is” with no institutional controls, monitoring, or application of any containment technology. This alternative has been eliminated as it does not provide for prompt mitigation of potential exposures.

4.3.2 Alternative 2 – Monitored Natural Attenuation

MNA may be a viable long-term remedy for CCR-impacted groundwater; however, it has been eliminated as a short-term contaminant plume containment alternative as it cannot be expeditiously implemented for the prompt mitigation of potential exposures.

4.3.3 Alternative 3 – Groundwater Extraction

In terms of effectiveness, this P&T technology is proven and widely used for groundwater containment/treatment. P&T could be implemented expeditiously to mitigate contaminant migration and exposure risk, and to reduce contaminant concentrations in groundwater. P&T would be implemented on-site to maintain hydraulic control of the plume through active extraction, treatment, and discharge. Recovered groundwater would be conveyed to an on-site facility for treatment and discharge. This technology provides protection of HHE through hydraulic containment of the plume and reductions in the volume, mobility, and toxicity of groundwater impacts. Groundwater extraction wells would effectively control the movement of CCR contaminants within the P&T capture zone, thereby reducing the migration of contaminants downgradient. The system would also reduce contaminant mass through the removal of CCR constituents.

Implementation of this technology would be feasible but may be met with minor technical challenges (e.g., the installation of extraction wells and piping may be difficult in the vicinity of sensitive utilities, active plant operations, facility access roads, non-CCR ponds, and the Green River). The primary disadvantages associated with the P&T alternative include high capital costs and high annual operating costs due to intensive operation and maintenance (O&M) requirements.

Potentially applicable technologies for the removal of CCR contaminants from recovered groundwater include physical separation, filtration, adsorption, coagulation and precipitation, ion exchange, or reverse osmosis. The treatment system may consist of a combination of treatment technologies to address multiple contaminants prior to discharge. Treated water will be conveyed from the treatment system via discharge piping to a permitted outfall to the Green River in accordance with local and state regulatory requirements. Prior to discharge, the facility may consider utilizing a portion of the treated groundwater for beneficial use at the facility, if deemed viable based on current operations and capacities.

The extraction wells, pumps, and other components associated with a P&T system are designed and operated to achieve a specific hydraulic capture zone. The design parameters for a P&T system are dependent on the site-specific hydrogeological characteristics of the subsurface (i.e., saturated thickness, permeability, transmissivity, etc.). Aquifer pump testing would be required evaluate the overall effectiveness of P&T under site-specific conditions, estimate the achievable or appropriate groundwater capture zone for each well, and establish design parameters such as extraction well quantities, locations, and pumping rates, and raw water quality characteristics. This information would be used to complete detailed design, permitting, and construction planning for the P&T system. Implementation of the P&T

containment measure would require extraction well drilling, conveyance and discharge piping installation, treatment system construction, and system startup and commissioning.

The discharge of atmospheric emissions (if any) and liquid effluent from the on-site treatment system would be conducted in accordance with applicable regulatory requirements and permit conditions. Controls may also be required prior to discharging emissions or effluent generated by the P&T system to maintain permit compliance.

Ongoing system O&M and performance monitoring would be required following startup. The existing groundwater monitoring well network, and potentially new monitoring wells, would be used to monitor the performance of the remedy and to monitor groundwater plume concentrations and movement. Performance monitoring data would be evaluated to assess the overall effectiveness of P&T system in containing the plume and preventing unacceptable exposures to receptors.

Depending upon the distribution and concentration of contaminants following implementation of this alternative, institutional controls (i.e., environmental use controls) may be required to prevent direct contact with contaminated groundwater.

5.0 CONTAMINANT PLUME CONTAINMENT PLAN

In accordance with 40 CFR §257.103(f)(2)(v)(B)(3), this plan is intended to expedite and maintain the containment of any contaminant plume that is either present or identified during continued operation of the Ash Pond. Based on the containment alternatives evaluated for a future potential groundwater contaminant plume originating from the Ash Pond, with one or more Appendix IV constituents detected at an SSL exceeding the GWPS, Alternative 3 – Groundwater Extraction (P&T), could be used for expeditious, short-term containment of a plume during continued operation of the Ash Pond. This containment alternative would provide hydraulic control and capture of the plume and prevent migration off-site towards receptors associated with the Green River, located east of the Ash Pond. This containment alternative would directly control movement of an on-site contaminant the plume while also reducing the toxicity, mobility, and volume of downgradient CCR impacts to groundwater. If groundwater extraction were implemented, the appropriateness of this remedy would be reevaluated following closure of the Ash Pond.

The existing conceptual site model described in Section 3.2 would serve as the basis for designing the P&T containment remedy. However, due to the proximity of the Ash Pond to the Green River, measures will be taken to facilitate expeditious implementation of a P&T system if the Ash Pond enters into assessment monitoring (i.e., one or more Appendix III constituents are detected at an SSI above background levels). These measures include the following:

- Assessment monitoring will be conducted on a quarterly basis to minimize the length of time between groundwater sampling events; and
- Aquifer pump testing and conceptual (i.e., 30-percent level) P&T system design and planning will be initiated.

In the event a future release is identified during continued operation of the Ash Pond, other groundwater alternatives may be considered for post-closure implementation. The selection and implementation of these alternatives would depend on the location and plume geometry of any Appendix IV exceedances of GWPS, the specific parameter(s) exhibiting exceedances, and the distance between exceedances and potential receptors. These considerations would be evaluated in detail once the plume is characterized to support the selection of a groundwater corrective action alternative during development of the ACM.

6.0 CONCLUSIONS

Based upon the information submitted in this RMP, BREC has demonstrated that potential risks to HHE from the continued operation of the Ash Pond have been adequately addressed in accordance with 40 CFR § 257.103(f)(2)(ii). This RMP meets the criteria in CFR § 257.103(f)(2)(v)(B) in describing the measures that will be taken to expedite any required corrective action to address increased risk from continued operation of the Ash Pond.

7.0 LIMITATIONS AND QUALIFICATIONS

Burns & McDonnell's services were performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time. Burns & McDonnell makes no warranties, express or implied, regarding the findings, estimates, projections, conclusions, or recommendations. Burns & McDonnell does not warrant the work of laboratories, regulatory agencies, or other third parties supplying information used in the preparation of the report.

Findings, conclusions, and recommendations resulting from these services are based upon information derived from third party on-site activities and other services; such information is subject to change over time. Certain indicators of the presence of hazardous substances or other constituents of concern may have been latent, inaccessible, unobservable, nondetectable, or not present during these services. We cannot represent that the site contains no hazardous substances, toxic materials or other latent conditions beyond those identified by third party activities/services. Subsurface conditions may vary from those encountered by third party at specific borings or wells or during other surveys, tests, assessments, investigations, or exploratory services. The data, interpretations, findings, and our recommendations are based solely upon third party data provided by BREC at the time and within the scope of these services.

8.0 REFERENCES

AECOM Technical Services, Inc. (AECOM), 2020, *2019 Annual Groundwater Monitoring and Corrective Action Report, Coal Combustion Residuals (CCR) Rule, Sebree Generation Station, Henderson and Webster Counties, Kentucky*.

AECOM, 2018, Big Rivers Electric Corporation, *Existing Green CCR Surface Impoundment, Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule, Wetlands Demonstration for Coal Combustion Residuals (CCR)*, October 17, 2018.

Big Rivers Electric Corporation (BREC), 2019, *RE: Green Surface Impoundment (AI# 4196 & KPDES# KY0001929): Notification of intent to close the Green Surface Impoundment (Outfall #009) utilizing alternative closure requirements in accordance with 40 CFR 257.103*., October 31, 2019.

Big Rivers Electric Corporation (BREC), 2016, *Big Rivers Electric Corporation, Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule, CCR Impoundment Groundwater Monitoring System and Statistical Methods Assessment and Certification*, June 28, 2016.

United States Environmental Protection Agency (EPA), 2020, *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; A Holistic Approach to Closure Part A: Deadline to Initiate Closure*, 40 CFR Parts 257, Federal Register, Vol. 85, No. 168, August 28, 2020, https://www.federalregister.gov/documents/2020/08/28/2020-16872/hazardous-and-solid-waste-management-system-disposal-of-coal-combustion-residuals-from-electric.

EPA, 2015, *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule*, 40 CFR Parts 257 and 261, Federal Register, Vol. 80, No. 74, April 17, 2015, http://www.gpo.gov/fdsys/pkg/FR-2015-04-17/pdf/2015-00257.pdf.

ATTACHMENT 1 – GREEN RIVER WATER QUALITY ASSESSMENT SUMMARY

Assessment Summary

Green River 28.05 to 55.0
KY493284_02

Panther Creek to Pond River

Webster County, Green River Basin

HUC 05110005

Assessment Date: 10/29/2013

This part of the stream fully supports aquatic life, fully supports drinking water (Domestic Water Supply).

Use	Cause of Impairment	Suspected Source(s) of Impairment	Basis for Listing	Data Collection and Analysis Methods[1,2,3]
 (2-FS)				Monitoring Data Collected by Other Agencies or Organizations, Physical/Chemical Monitoring
 (2-FS)				Drinking Water Monitoring (Finished Water), Monitoring data more than 5 years old

[1] Data locations: Physical/chemical monitoring data and pathogen data can be found on the EPA Water Quality Portal; chemical monitoring data for regulated facilities (e.g. wastewater and drinking water) can be found in the EPA ECHO database (online); biological monitoring summary scores and habitat assessment scores can be found in the EPA STORET database (online); and raw community species data and fish tissue analysis data are available on request through KDOW Open Records (expected in STORET 2015).

[2] Data Source(s): ORSANCO, PWS

[3] Data Collection Date(s): 1/10/2008 - 7/24/2013

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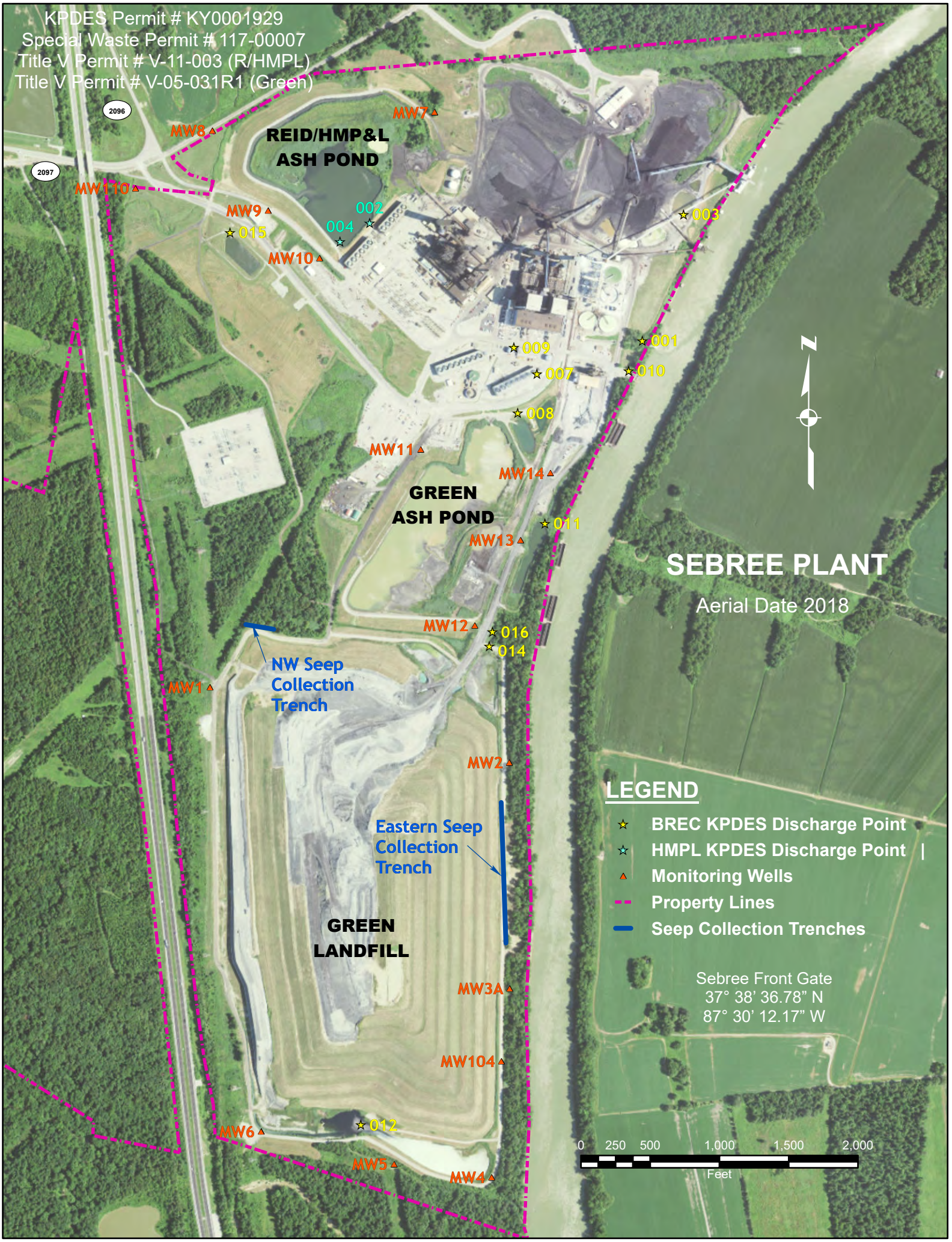
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com

ATTACHMENT 2 - MAP OF GROUNDWATER MONITORING WELL LOCATIONS

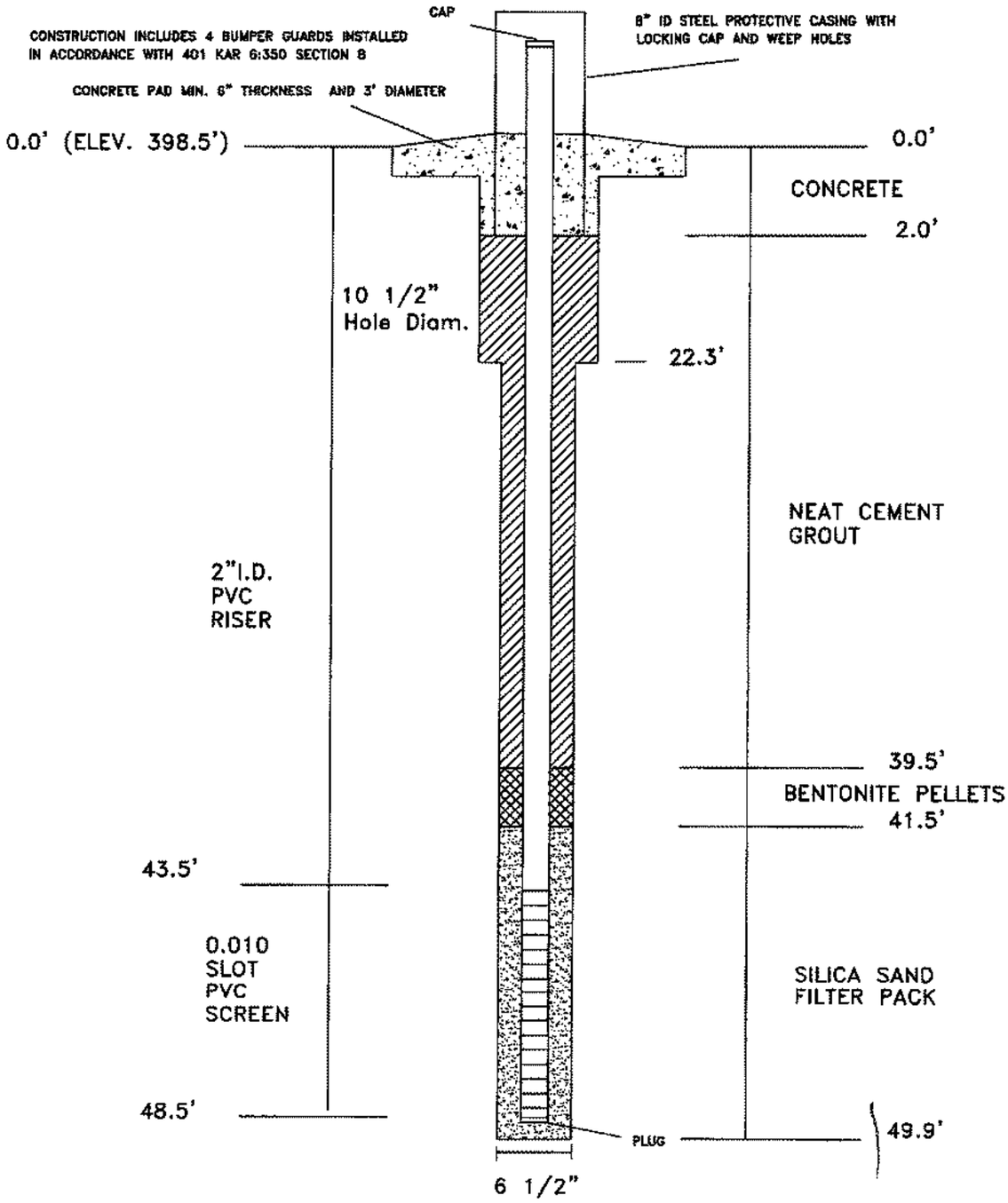

KPDES Permit # KY0001929
Special Waste Permit # 117-00007
Title V Permit # V-11-003 (R/HMPL)
Title V Permit # V-05-031R1 (Green)
2096
2097
MW7
MW8
REID/HMP&L
ASH POND
MW110
MW9
002
004
015
MW10
003
009
001
007
010
008
MW11
MW14
GREEN
ASH POND
011
MW13
SEBREE PLANT
Aerial Date 2018
MW12
016
014
NW Seep
Collection
Trench
MW1
MW2
Eastern Seep
Collection
Trench
GREEN
LANDFILL
MW3A
MW104
012
MW6
MW5
MW4
N
LEGEND
BREC KPDES Discharge Point
HMPL KPDES Discharge Point
Monitoring Wells
Property Lines
Seep Collection Trenches
Sebree Front Gate
37° 38' 36.78" N
87° 30' 12.17" W
0 250 500 1,000 1,500 2,000
Feet

ATTACHMENT 3 - WELL CONSTRUCTION DIAGRAMS AND DRILLING LOGS

48. Lithologic Log MW-11

From depth (ft)	To depth (ft)	Description
0.0	0.3	Ash
0.3	2.0	Silty clay light brown
2.0	3.1	Silty clay brown
3.1	4.0	Silty clay light gray
4.0	6.7	Silty clay gray moist
6.7	15.0	Silty clay yellowish brown moist
15.0	21.3	Silty clay w/weathered shale light gray
21.3	22.3	Sandy shale light gray soft
	22.3	Auger refusal
22.3	33.0	Sandy shale gray
33.0	35.9	Claystone
35.9	40.4	Sandstone gray
40.4	41.5	Claystone
41.5	44.3	Sandstone gray water
44.3	45.1	Shale gray
45.1	49.9	Sandstone with carbonaceous strks gray water
	49.9	TD

MONITORING WELL 8006-3938
(MW-11)



BIG RIVERS ELECTRIC CORPORATION	Job Number:	15-0140G	Revisions:
	Date:	12/24/15	
Well Construction Diagram	Scale:	No Scale	
	Drawn By:	D. Dunbar	

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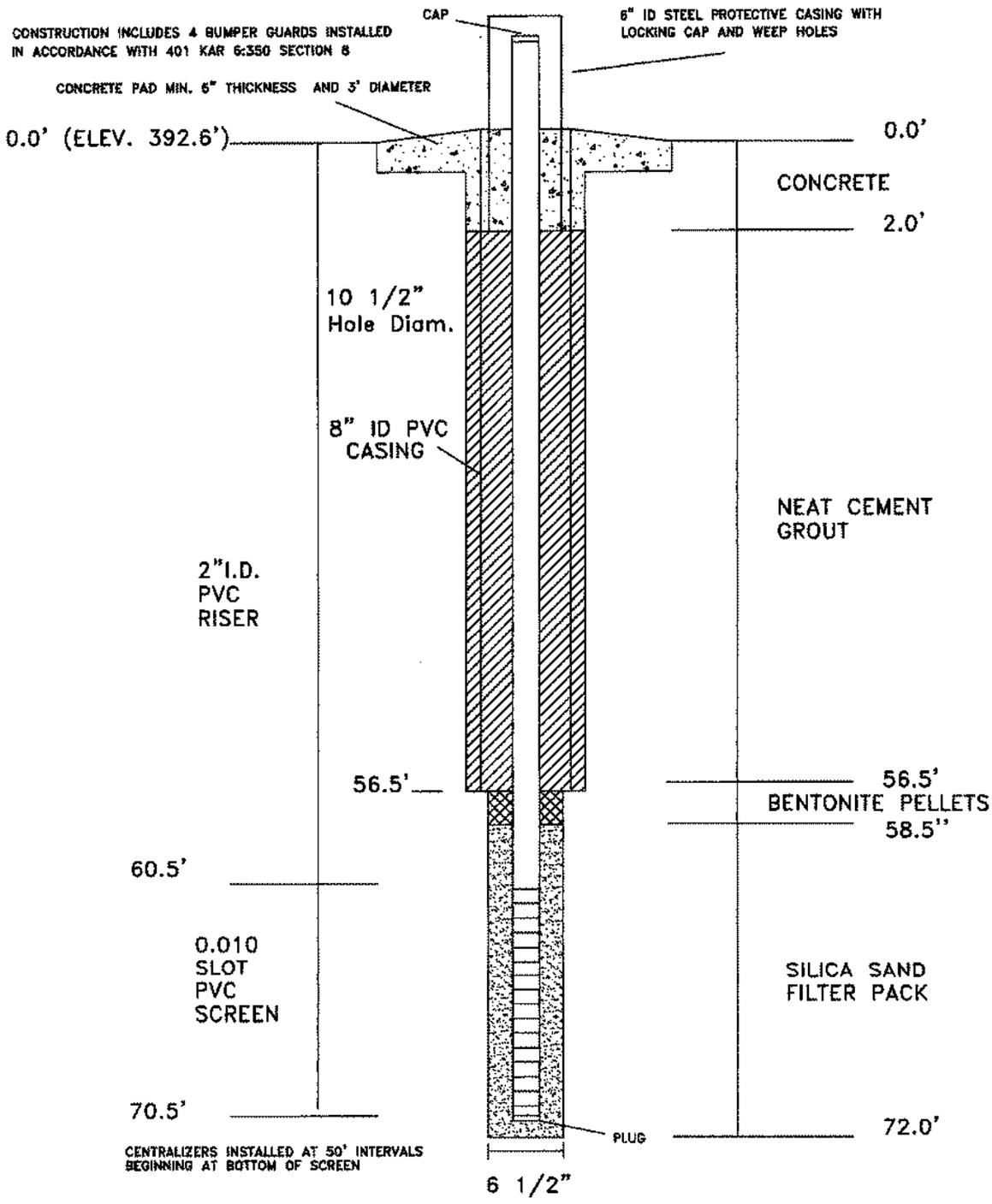
48. Lithologic Log MW-12

From depth (ft)	To depth (ft)	Description
0.0	4.0	Silty clay brown fill
4.0	12.6	Ash gray wet fill
12.6	13.6	Clay gray wet
13.6	21.2	Silty clay yellowish brown very moist
21.2	23.0	Silty clay yellowish brown very moist
23.0	31.5	Silty clay yellowish brown very moist
31.5	37.0	Silty clay brown, moist
37.0	40.5	Silty clay yellowish brown moist
40.5	52.0	Silty clay brown moist
52.0	55.0	Silty clay brown very moist
55.0	56.5	Shale gray soft
56.5	63.0	Shale gray
63.0	63.6	Shale and interbedded sandstone gray
63.6	72.0	Shale gray
	72.0	TD

MONITORING WELL 8006-3939
(MW-12)



BIG RIVERS ELECTRIC CORPORATION			
Well Construction Diagram	Job Number:	150140G	Revisions:
	Date:	1/13/16	
	Scale:	No Scale	
	Drawn By:	D. Dunbar	

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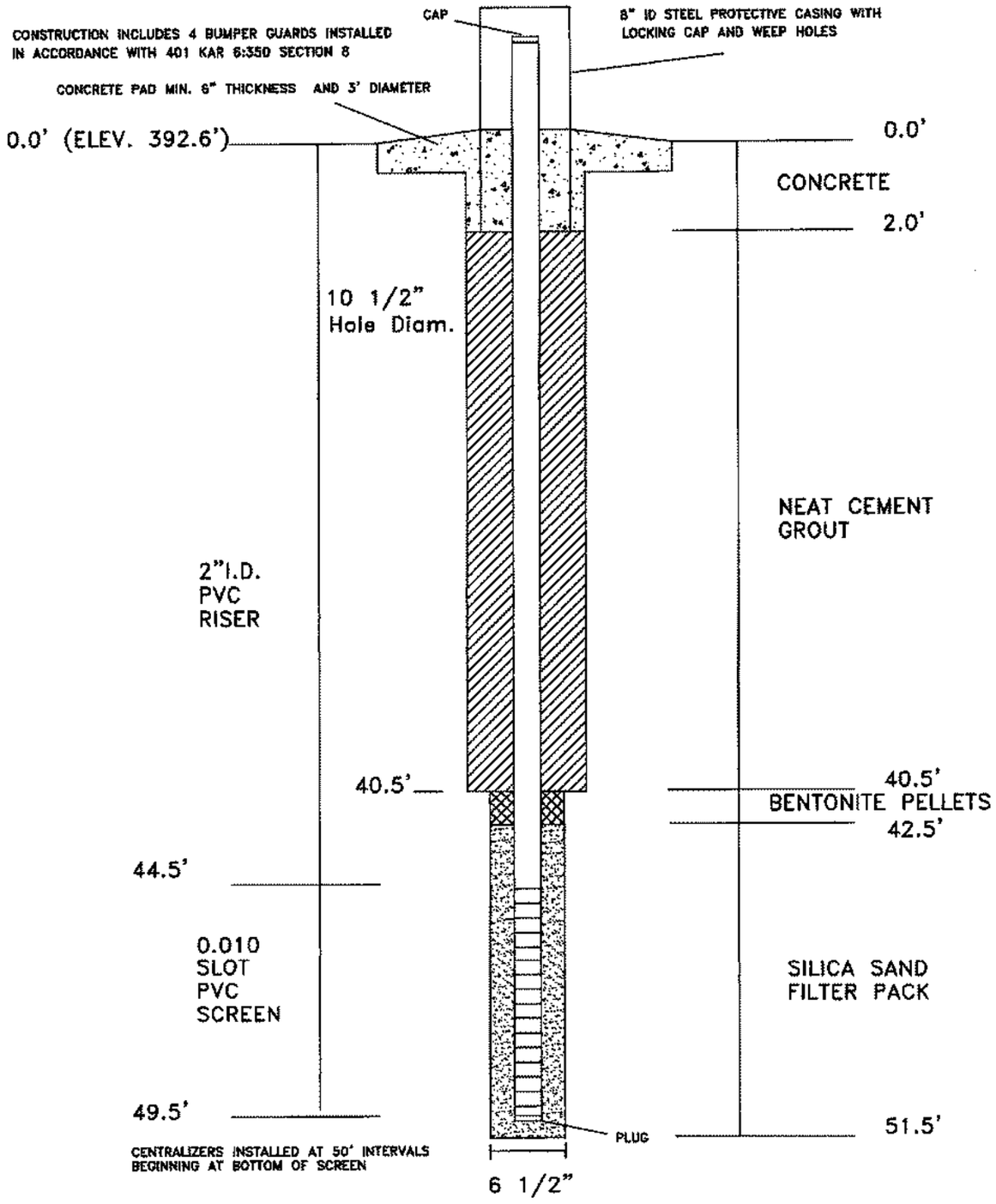
48. Lithologic Log MW-13

From depth (ft)	To depth (ft)	Description
0.0	1.0	Ash black
1.0	2.7	Silty clay gray
2.7	10.6	Silty clay yellowish brown
10.6	12.8	Silty clay light gray
12.8	23.5	Silty clay yellowish brown wet
23.5	34.2	Silty clay brown very moist
34.2	39.5	Silty clay yellowish brown very moist
39.5	40.5	Sandstone yellowish brown soft weathered
	40.5	Auger refusal
40.5	50.4	Sandstone yellowish brown soft weathered
50.4	51.1	Shale gray
51.1	51.5	Sandy shale gray
	51.5	TD

MONITORING WELL 8006-3940
(MW-13)



BIG RIVERS ELECTRIC CORPORATION	Job Number:	150140G	Revisions:
	Date:	1/13/16	
Well Construction Diagram	Scale:	No Scale	
	Drawn By:	D. Dunbar	

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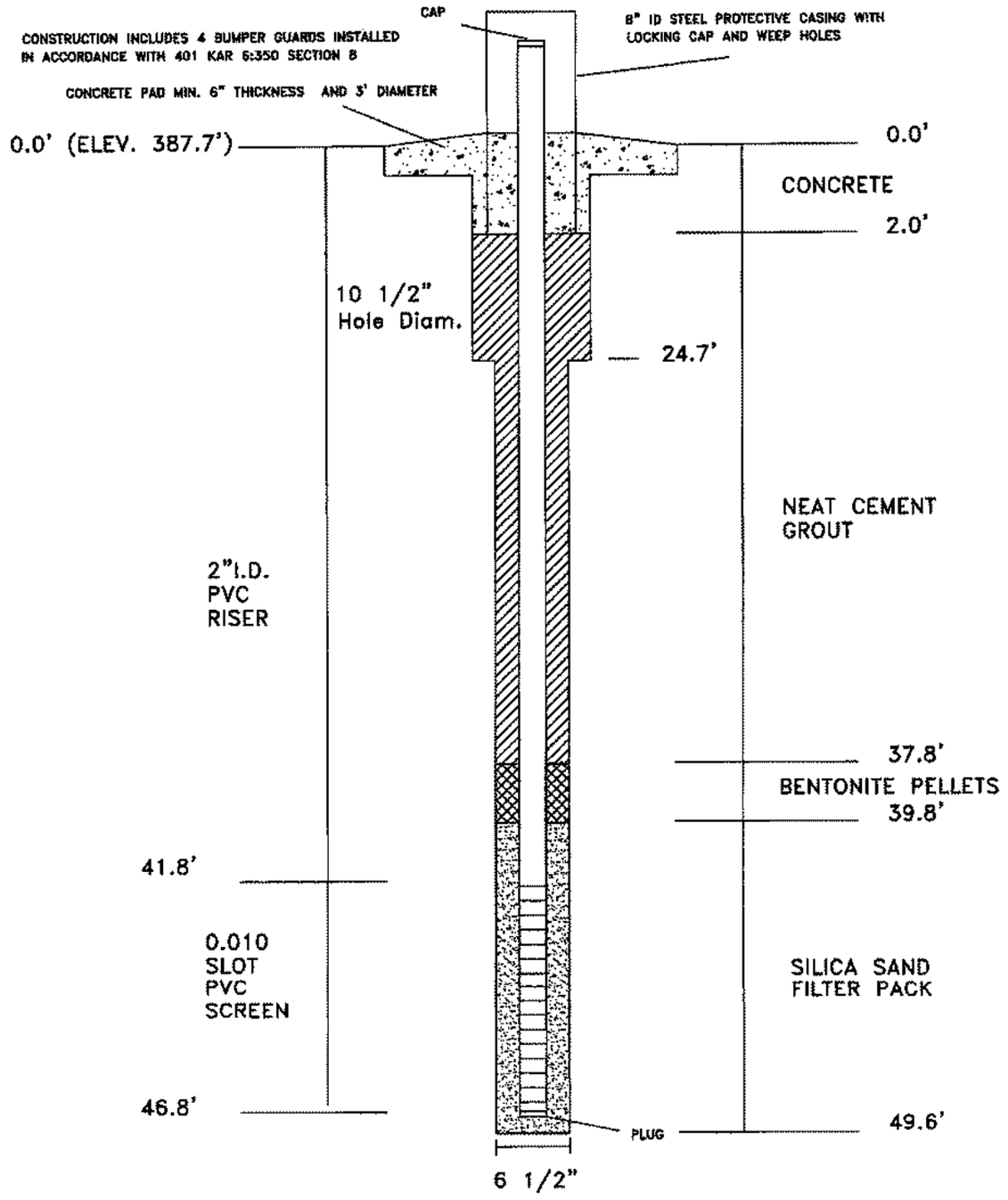
48. Lithologic Log MW-14

From depth (ft)	To depth (ft)	Description
0.0	2.4	Ash black
2.4	3.8	Silty clay yellowish brown
3.8	11.2	Silty clay brown
11.2	16.9	Silty clay yellowish brown w/sandstone fragments
16.9	21.9	Sandstone yellowish brown soft weathered
21.9	24.7	Shale gray soft
	24.7	Auger refusal
24.7	26.5	Shale gray soft
26.5	39.8	Sandy shale gray
39.8	48.3	Sandstone gray, water
48.3	49.1	Shale and interbedded sandstone gray
49.1	49.3	Sandstone gray
49.3	49.6	Shale gray
	49.6	TD

MONITORING WELL 8006-3941
(MW-14)



BIG RIVERS ELECTRIC CORPORATION	Job Number: 15-0140G	Revisions:
Well Construction Diagram	Date: 1/13/16	
	Scale: No Scale	
	Drawn By: D. Dunbar	

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TABLE 2

SUMMARY OF MONITORING WELL CONSTRUCTION, GREEN SURFACE IMPOUNDMENT
CCR GROUNDWATER MONITORING PROGRAM

BIG RIVERS ELECTRIC CORPORATION - SEBREE STATION
GREEN STATION SURFACE IMPOUNDMENT
WEBSTER COUNTY, KENTUCKY

Well No.		Location*		Reference Elevation*		Casing Length	Size / Type	Filter Pack Interval		Screened Interval		Bottom of Boring
		Lat	Long	TOIC (feet, NAD27)	GS (feet, NAD27)	(feet, TOIC)	(ID / Material)	(feet, GS, NAD27)		(feet, GS, NAD27)		(feet, GS)
Program Monitoring Wells								Top	Bottom	Top	Bottom	
MW-11 (8006-3938)	U / B	37.64262	-87.50325	401.32	398.36	51.5	2 inch / PVC	356.86	348.46	354.86	349.86	49.5
MW-12 (8006-3939)	D	37.63915	-87.50182	395.54	392.35	73.7	2 inch / PVC	333.85	320.35	331.85	321.85	72.0
MW-13 (8006-3940)	D	37.64086	-87.50072	394.60	391.46	52.6	2 inch / PVC	348.96	339.96	346.96	341.96	51.5
MW-14 (8006-3941)	D	37.64220	-87.50001	390.71	387.55	50.0	2 inch / PVC	347.75	337.95	345.75	340.75	49.6

*Reference elevation of monitoring wells surveyed by Associated Engineers, Inc., Madisonville, Kentucky, January 2015
Survey coordinates were based on the Kentucky State Plane, Kentucky Southern Zone, NAD27 datum
PVC = Polyvinyl chloride
ID = Internal Diameter
TOIC = Top of internal casing
GS = Ground Surface
U / B = Upgradient / Background

Table 2 from 2019 Annual Groundwater Monitoring and Corrective Action Report (AECOM, January 2020)

(4)

KENTUCKY MONITORING WELL RECORD

Please read all instructions prior to completing this form. Do not write in shaded areas. Completed copies of this form are to be submitted within **30 days** of well completion to the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Water - Groundwater Branch, 18 Reilly Road, Frankfort Office Park, Frankfort, Kentucky 40601 Telephone (502) 564-3410.

(TYPE OR PRINT CLEARLY)

[redacted]

(2) GENERAL INFORMATION:

Facility Name: Big Rivers Electric
Mailing Address: P.O. Box 24
City: Henderson
State: Kentucky Zip: 42420

Facility Address: P.O. Box 325
City: Sebree
State: Kentucky Zip: 42455
Owner's Phone (502) 827-2561

Date Received:

(3) AKGWA NUMBER: 8 0 0 2 – 9 6 2 5

(4) WELL LOCATION:

USGS Quadrangle Name	County	Latitude	Longitude
Robards	Webster	37 38 17 N	87 30 30 W

(5) GENERAL WELL CONSTRUCTION:

Start Date: 11/11/96
Finish Date: 11/15/96
Drilling Method: Air Rotary
Surface Elevation: 420 ft.
Total Depth: 43.0' ft.
Depth to Bedrock: 25' ft. (If Applicable)
Depth to Static Water: 37.10 ft.

(6) PHYSIOGRAPHIC/HYDROLOGIC REGION:

( ) Blue Grass ( ) Ohio River Alluvium
( ) E. Coal Field (X) W. Coal Field
( ) Miss. Plateau ( ) Jackson Purchase

(7) FACILITY TYPE:

( ) RCRA ( ) Surface Mining
( ) CERCLA ( ) TSCA
( ) UST ( ) Site Assessment
( ) Other: _____ (X) Solid Waste Landfill
( ) Landfarm

(8) WELL USE:

(X) Water Quality ( ) Water Level Monitoring
( ) Ambient Monitoring ( ) Remediation
( ) Other _____

(9) LABORATORY ANALYSIS:

(Attach Copy of Results)
Sampling Date
Analysis Date
Laboratory Name: FMSM not performing lab services.

(10) WELL COMPLETION INFORMATION

Feet Below Surface From	To	Hole Diameter	Casing Diameter	Casing Type
0	33	8.75"	4"	Sch 80 PVC Riser
33	43	8.75	4"	Sch 80 PVC Screen (.010)

Attach additional sheets if necessary

(11) WELL CONSTRUCTION SKETCH:

See Attachment

(12) LITHOLOGIC LOG:

Feet Below Surface From	To	Description
0	25	Silty Clay, brown
25	29	Limestone, gray
29	45	Sandstone, gray

Attach additional sheets if necessary

(13) SITE SKETCH MAP:

See Attachment

(14) COMMENTS:

Owners well no. MW-1 FMSM Project no. 96155

(15) AFFIRMATION: The work described above was done under my supervision, and this report is true and correct to the best of my knowledge.

Drilling Company	State Certification Number or Rig Operator's No	Signature of Responsible Certified Driller
FMSM Engineers, Inc.	0202-0237-12	

Company Mailing Address	City	State	Zip Code	Date Month, Day, Year
1409 N. Forbes Rd.	Lexington	Ky	40511	12/3/96

Number of Attached Sheets: 3

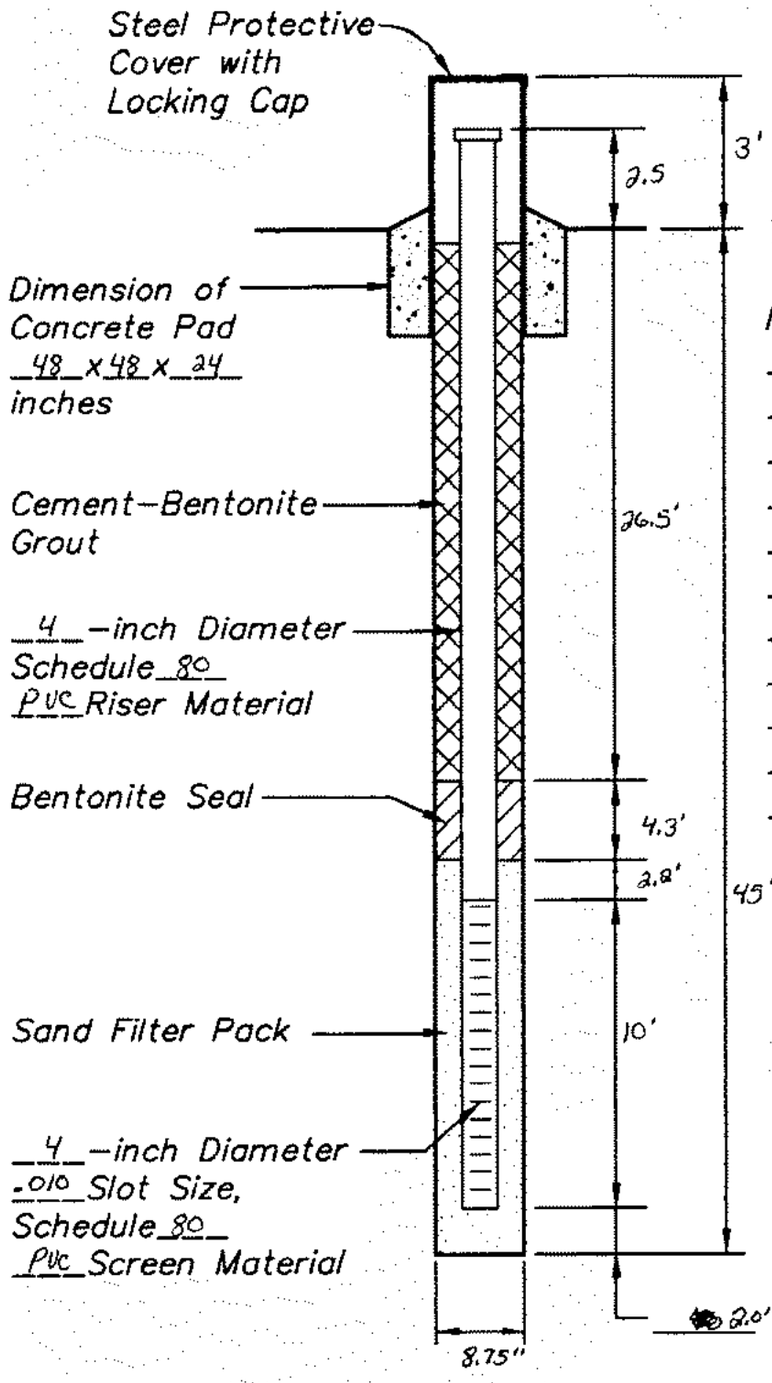
White Copy to Division of Water, Yellow copy to Owner, Pink Copy to Driller's Files

DEP-8043

Printed with State Funds 10/31/91

WELL CONSTRUCTION DATA SHEET

DEC 3 1996



NOTES: _____

PROJECT TITLE: Big Rivers, Green Station

PROJECT NO.: 96155

OWNER'S WELL NO.: MW-1

AKGWA NO.: 8002-9625

NOT TO SCALE

MSM ENGINEERS

KYWLCAP

(4)

KENTUCKY MONITORING WELL RECORD

Please read all instructions prior to completing this form. Do not write in shaded areas. Completed copies of this form are to be submitted within **30 days** of well completion to the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Water - Groundwater Branch, 18 Reilly Road, Frankfort Office Park, Frankfort, Kentucky 40601. Telephone (502) 564-3410

(TYPE OR PRINT CLEARLY)

[redacted]

(2) GENERAL INFORMATION:

Facility Name: Big Rivers Electric
Mailing Address: P.O. Box 24
City: Henderson
State: Kentucky Zip: 42420

Facility Address:
City:
State: Zip:
Owner's Phone: (502) 827-2561

Date Received: DEC 9 1996

(3) AKGWA NUMBER: 8 0 0 2 – 9 6 3 0

(4) WELL LOCATION:

USGS Quadrangle Name	County	Latitude	Longitude
Robards	Webster	37 38 15 N	87 30 05 W

(5) GENERAL WELL CONSTRUCTION:

Start Date: 11/13/96
Finish Date: 11/15/96
Drilling Method: Air Rotary
Surface Elevation: ~~395~~ 380 ft.
Total Depth: 47.8 ft.
Depth to Bedrock: 30 ft. (If Applicable)
Depth to Static Water: 28.78 ft.

(6) PHYSIOGRAPHIC/HYDROLOGIC REGION:

( ) Blue Grass ( ) Ohio River Alluvium
( ) E. Coal Field (X) W. Coal Field
( ) Miss. Plateau ( ) Jackson Purchase

(7) FACILITY TYPE:

( ) RCRA ( ) Surface Mining
( ) CERCLA ( ) TSCA
( ) UST ( ) Site Assessment
( ) Other: ( ) Solid Waste Landfill
( ) Landfarm

(8) WELL USE:

(X) Water Quality ( ) Water Level Monitoring
( ) Ambient Monitoring ( ) Remediation
( ) Other

(9) LABORATORY ANALYSIS:

(Attach Copy of Results)
Sampling Date:
Analysis Date:
Laboratory Name: FMSM not performing lab services.

(10) WELL COMPLETION INFORMATION

Feet Below Surface From	To	Hole Diameter	Casing Diameter	Casing Type
0	37.8	8.75"	4"	Sch 80 PVC Riser
37.8	47.8	8.75"	4"	Sch 80 PVC Screen (.010)

Attach additional sheets if necessary

(11) WELL CONSTRUCTION SKETCH:

See Attachment

(12) LITHOLOGIC LOG:

Feet Below Surface From	To	Description
0	30	Silty Clay, brown
30	49	Sandstone, gray

Attach additional sheets if necessary

(13) SITE SKETCH MAP:

See Attachment

(14) COMMENTS:

Owners well no. MW-2 FMSM Project no. 96155

(15) AFFIRMATION: The work described above was done under my supervision, and this report is true and correct to the best of my knowledge.

Drilling Company	State Certification Number or Rig Operator's No.	Signature of Responsible Certified Driller
FMSM Engineers, Inc.	0202-0237-12	

Company Mailing Address	City	State	Zip Code	Date
1409 N. Forbes Rd.	Lexington	Ky	40511	12/3/96 Month, Day, Year

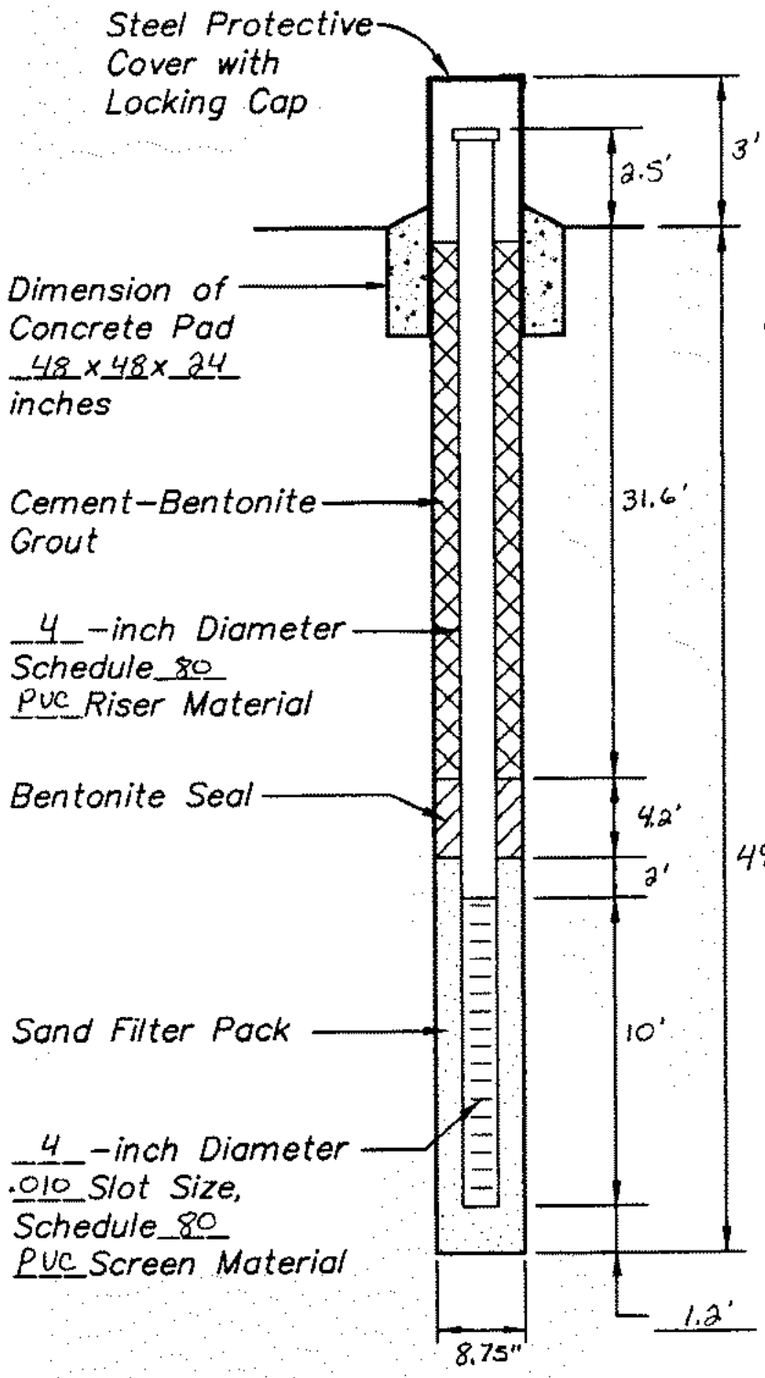
Number of Attached Sheets: 3

White Copy to Division of Water, Yellow copy to Owner, Pink Copy to Driller's Files

DEP-8043

Printed with State Funds 10/31/91

WELL CONSTRUCTION DATA SHEET



NOTES: _____

PROJECT TITLE: Big Rivers, Green Station

PROJECT NO.: 96155

OWNER'S WELL NO.: MW-2

AKGWA NO.: 8002-9630

NOT TO SCALE

MSM ENGINEERS

KYWLCAP

KENTUCKY MONITORING WELL RECORD

Please read all instructions prior to completing this form. Do not write in shaded area. The original copy of this form must be submitted within **30 days** of well completion to the Kentucky Natural Resources and Enviromental Protection Cabinet, Division of Water - Groundwater Branch, 14 Reilly Road, Frankfort, KY 40601. Telephone (502) 564-3410.

(TYPE OR PRINT CLEARLY)

[redacted]

(2) **GENERAL INFORMATION:**

owners
~~Facility~~ Name: Big Rivers Electric
Mailing Address: PO Box 24
City: Henderson
State: Ky Zip: 42419

Facility Name: Reid-Green HMP&L Station
City: Robards
State: Ky Zip: 42452
Owner's Phone: (270) 844-6031

Date Received: DEC 08 1999

(3) **IDENTIFICATION NUMBER:** 8003-6430

(4) **WELL LOCATION:**
USGS Quadrangle Name: Robards
County: Webster
Latitude: N 37 38 06
Longitude: W 87 30 05

(5) **GENERAL WELL CONSTRUCTION:**
Start Date: 11/29/99
Finish Date: 12/2/99
Drilling Method:
( ) Auger HS ( ) Reverse Rotary ( ) Push/probe
(✓) Auger SS ( ) Cable Tool ( ) Excavation
(✓) Air Rotary ( ) Hand Auger ( ) Sonic
( ) Mud Rotary ( ) Other:
Work Type:
(✓) New Well ( ) Nested Well ( ) Rework ( ) Plug
Surface Elevation: 389 Total Depth: 35.5
Depth to Bedrock: 17 Static Water Level: 30.8
Wellhead:
( ) Flush Mount (✓) Locking Cap ( ) No Cap
(✓) Stickup; inches above surface: 72

(6) **FACILITY TYPE:**
( ) RCRA ( ) Surface Mining
( ) CERCLA ( ) Site Assessment
( ) TSCA (✓) Solid Waste Landfill
( ) UST ( ) Landfarm
( ) Other:

(7) **WELL USE:** (check all that apply)
(✓) Water Quality ( ) Dry Hole
( ) Ambient Monitoring ( ) Not Used
( ) Water Level Monitoring ( ) Abandoned
( ) Remediation ( ) Destroyed
( ) Other:

(8) **PHYSIOGRAPHIC REGION:**
( ) Blue Grass ( ) Ohio River Alluvium
( ) E. Coal Field (✓) W. Coal Field
( ) Miss. Plateau ( ) Jackson Purchase

(9) **ATTACHMENTS:**
Required
1. Site plan or sketch map (✓)
2. Well construction diagram (✓)
3. Well location
On topographic map, **or** (✓)
Obtained by GPS unit ( )
Optional
4. Laboratory analysis report ( )
5. Other:

(10) **WELL COMPLETION INFORMATION**

Feet Below Surface From	To	Borehole Diameter	Casing Diameter	Casing Type
0	17	12"	10"	PVC Temporary
0	25.5	8.75"	4"	PVC Sch 80 Riser

Well Screens:
I.D. (in.) 4 From 25.5 To 35.5 Type PVC Slot Size .010
I.D. (in.) From To Type Slot Size
I.D. (in.) From To Type Slot Size

Annulus Fill and Seal:

Feet Below Surface From	To	Material
0	2	Concrete
2	9.5	Cement-Bentonite Grout
9.5	19.6	Bentonite Chips
19.6	23.5	Bentonite Pellets
23.5	36.2	Sand

(11) **LITHOLOGIC LOG**

Feet Below Surface From	To	Description
0	12	Silty Clay, brown
12	17	Clayey Silt, brown
17	36.2	Shaley Sandstone, gray

(12) **COMMENTS** Top of well was completed 6' above ground surface to be above 100 year flood elevation.

Owners well: MW-3A FMSM Proj. 99356

(13) **AFFIRMATION:** The work described above was done under my supervision, and this report is true and correct to the best of my knowledge.

Drilling Company	State Certification Number or Rig Operator's Number	Signature of Responsible Certified Driller
FMSM Engineers, Inc.	0202-0237-14	

Company Mailing Address	City	State	Zip Code	Date (Month, Day, Year)
1409 N. Forbes Rd	Lexington	Ky	40511	12-6-99

Number of Attached Sheets

White Copy to Division of Water, Yellow Copy to Owner, Pink Copy to Driller's Files

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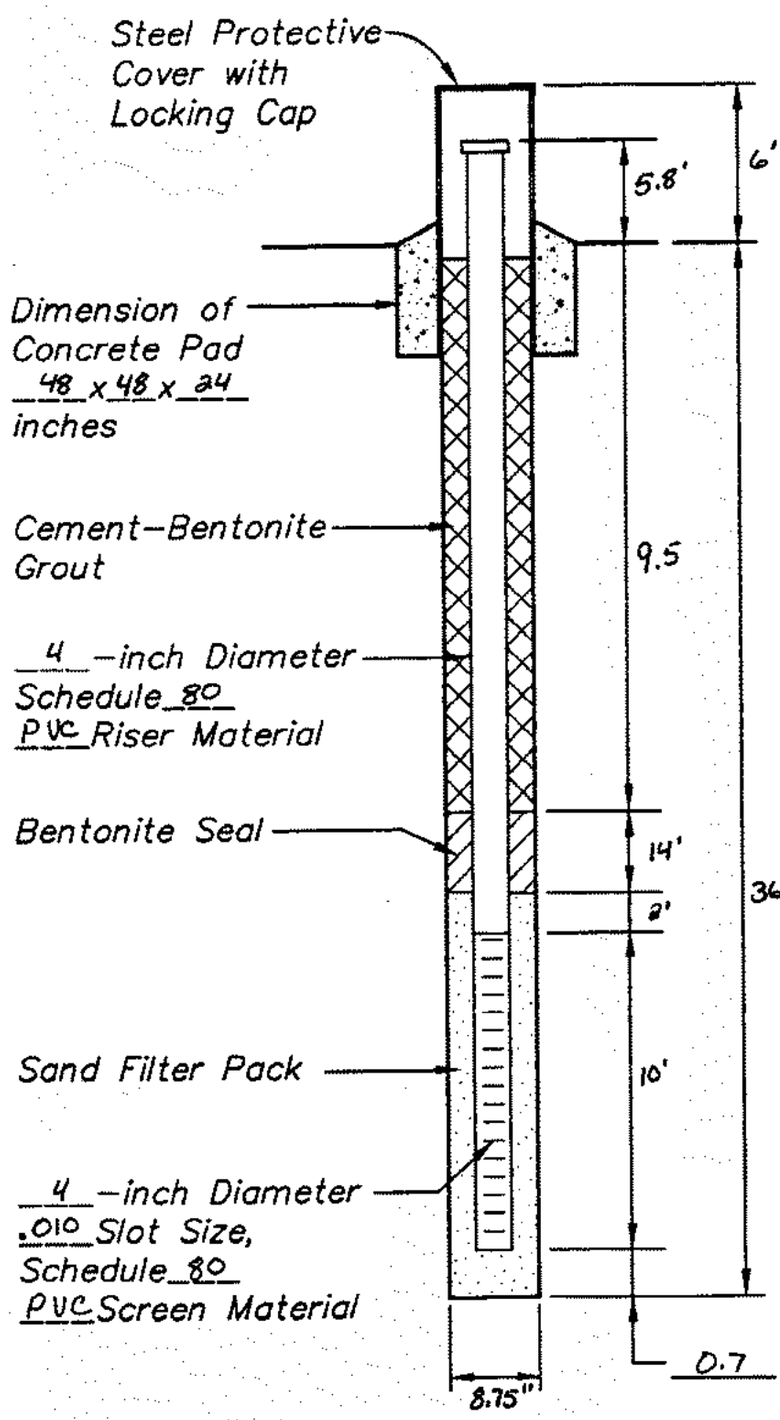
WELL CONSTRUCTION DATA SHEET



NOTES: Bentonite seal is composed of Bentonite chips 9.5' to 19.6' and Bentonite pellets 19.6' to 33.5'.

PROJECT TITLE: _____

PROJECT NO.: 99356

OWNER'S WELL NO.: MW-3A

AKGWA NO.: 8003-6430

EMSM ENGINEERS

NOT TO SCALE

KYNLCAP

(4)

KENTUCKY MONITORING WELL RECORD

Please read all instructions prior to completing this form. Do not write in shaded areas. Completed copies of this form are to be submitted within **30 days** of well completion to the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Water - Groundwater Branch, 18 Reilly Road, Frankfort Office Park, Frankfort, Kentucky 40601 Telephone (502) 564-3410.

(TYPE OR PRINT CLEARLY)

[redacted]

(2) GENERAL INFORMATION:

Facility Name: Big Rivers Electric
Mailing Address: P.O. Box 24
City: Henderson
State: Kentucky Zip: 42420

Facility Address:
City:
State: Zip:
Owner's Phone: (502) 827-2561

Date Received: DEC 9 1996

(3) AKGWA NUMBER: 8002-9628

(4) WELL LOCATION:

USGS Quadrangle Name	County	Latitude	Longitude
Robards	Webster	37 37 44N	87 30 04 W

(5) GENERAL WELL CONSTRUCTION:

Start Date: 11/13/96
Finish Date: 11/15/96
Drilling Method: Air Rotary
Surface Elevation: [redacted] 380 ft.
Total Depth: 32.4 ft.
Depth to Bedrock: 15 ft. (If Applicable)
Depth to Static Water: 29.91 ft.

(6) PHYSIOGRAPHIC/HYDROLOGIC REGION:

( ) Blue Grass ( ) Ohio River Alluvium
( ) E. Coal Field (X) W. Coal Field
( ) Miss. Plateau ( ) Jackson Purchase

(7) FACILITY TYPE:

( ) RCRA ( ) Surface Mining
( ) CERCLA ( ) TSCA
( ) UST ( ) Site Assessment
( ) Other: ( ) Solid Waste Landfill
( ) Landfarm

(8) WELL USE:

( ) Water Level Monitoring
(X) Water Quality ( ) Remediation
( ) Ambient Monitoring
( ) Other

(9) LABORATORY ANALYSIS:

(Attach Copy of Results)
Sampling Date:
Analysis Date:
Laboratory Name: FMSM not performing lab services.

(10) WELL COMPLETION INFORMATION

Feet Below Surface From	To	Hole Diameter	Casing Diameter	Casing Type
0	22.4	8.75"	4"	Sch 80 PVC Riser
22.4	32.4	8.75"	4"	Sch 80 PVC Screen (.010)

Attach additional sheets if necessary

(11) WELL CONSTRUCTION SKETCH:

See Attachment

(12) LITHOLOGIC LOG:

Feet Below Surface From	To	Description
0	15	Silty Clay, brown
15	33	Sandstone, gray

Attach additional sheets if necessary

(13) SITE SKETCH MAP:

See Attachment

(14) COMMENTS:

Owners well no. MW-4 FMSM Project no. 96155

(15) AFFIRMATION: The work described above was done under my supervision, and this report is true and correct to the best of my knowledge.

Drilling Company	State Certification Number or Rig Operator's No.	Signature of Responsible Certified Driller
FMSM Engineers, Inc.	0202-0237-12	[signature]

Company Mailing Address	City	State	Zip Code	Date
1409 N. Forbes Rd.	Lexington	Ky	40511	12/3/96 Month, Day, Year

Number of Attached Sheets: 3

White Copy to Division of Water, Yellow copy to Owner, Pink Copy to Driller's Files

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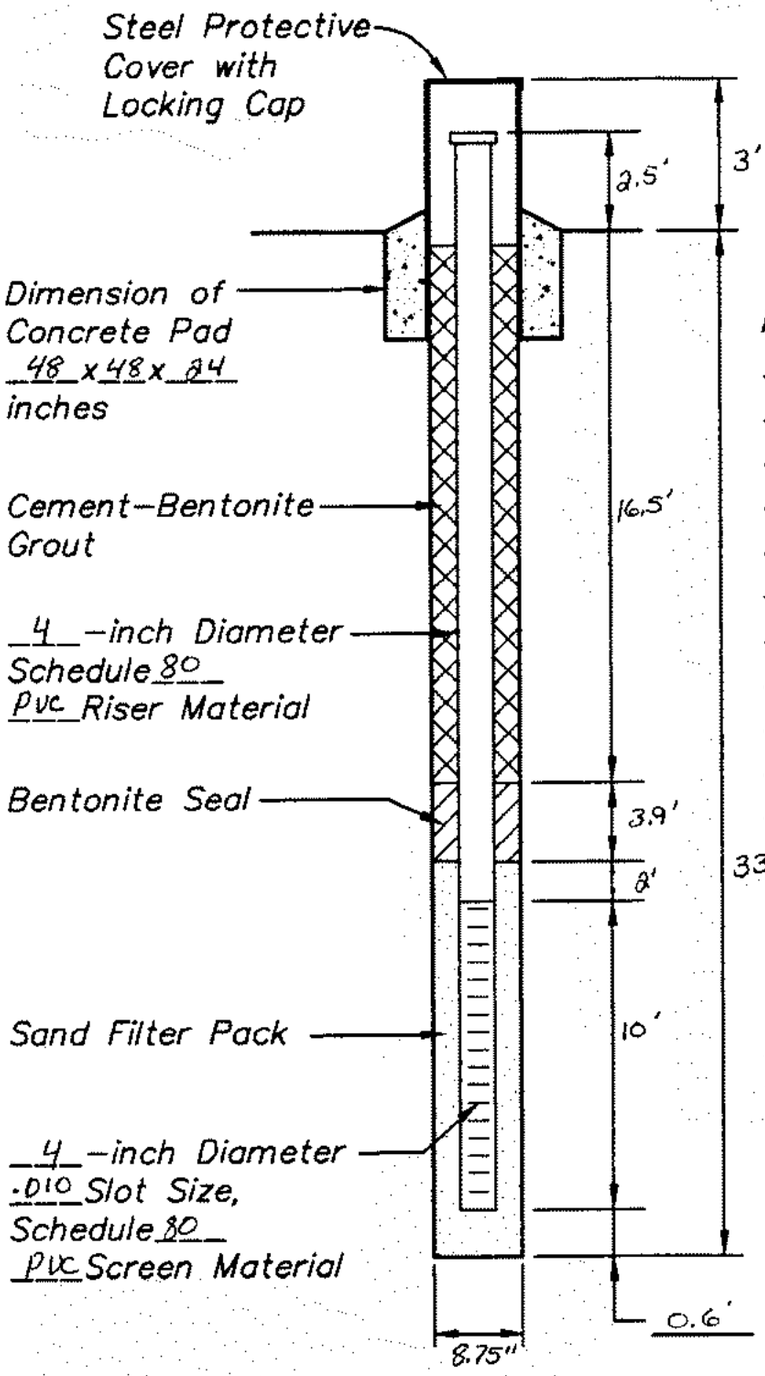
WELL CONSTRUCTION DATA SHEET



NOTES: _____

PROJECT TITLE: Big Rivers, Green Station

PROJECT NO.: 96155

OWNER'S WELL NO.: MW-4

AKGWA NO.: 8002-9628

NOT TO SCALE

EMSM ENGINEERS

KYWLCAP

(4)

KENTUCKY MONITORING WELL RECORD

Please read all instructions prior to completing this form. Do not write in shaded areas. Completed copies of this form are to be submitted within **30 days** of well completion to the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Water - Groundwater Branch, 18 Reilly Road, Frankfort Office Park, Frankfort, Kentucky 40601 Telephone (502) 564-3410.

(TYPE OR PRINT CLEARLY)

8002-8627

(2) GENERAL INFORMATION:

Facility Name: Big Rivers Electric
Mailing Address: P.O. Box 24
City: Henderson
State: Kentucky Zip: 42420

Facility Address:
City:
State: Zip:
Owner's Phone: (502) 827-2561

Date Received: DEC 9 1996

(3) AKGWA NUMBER: 8002-9627

(4) WELL LOCATION:

USGS Quadrangle Name: Robards
County: Webster
Latitude: 37 37 41 N
Longitude: 87 30 10 W

(5) GENERAL WELL CONSTRUCTION:

Start Date: 11/12/96
Finish Date: 11/15/96
Drilling Method: Air Rotary
Surface Elevation: ~~Est~~ 380 ft.
Total Depth: 25 ft.
Depth to Bedrock: 10 ft (If Applicable)
Depth to Static Water: 21.82 ft

(6) PHYSIOGRAPHIC/HYDROLOGIC REGION:

( ) Blue Grass ( ) Ohio River Alluvium
( ) E. Coal Field (X) W. Coal Field
( ) Miss. Plateau ( ) Jackson Purchase

(7) FACILITY TYPE:

( ) RCRA ( ) Surface Mining
( ) CERCLA ( ) TSCA
( ) UST ( ) Site Assessment
( ) Other: ( ) Solid Waste Landfill
( ) Landfarm

(8) WELL USE:

( ) Water Level Monitoring
(X) Water Quality ( ) Remediation
( ) Ambient Monitoring
( ) Other

(9) LABORATORY ANALYSIS:

(Attach Copy of Results)
Sampling Date:
Analysis Date:
Laboratory Name: FMSM not performing lab services.

(10) WELL COMPLETION INFORMATION

Feet Below Surface From	To	Hole Diameter	Casing Diameter	Casing Type
0	15	8.75"	4"	Sch 80 PVC Riser
15	25	8.75"	4"	Sch 80 PVC Screen (.010)

Attach additional sheets if necessary

(11) WELL CONSTRUCTION SKETCH:

See Attachment

(12) LITHOLOGIC LOG:

Feet Below Surface From	To	Description
0	10	Silty Clay, brown
10	26	Sandstone, gray

Attach additional sheets if necessary

(13) SITE SKETCH MAP:

See Attachment

(14) COMMENTS:

Owners well no. MW-5 FMSM Project no. 96155

(15) AFFIRMATION: The work described above was done under my supervision, and this report is true and correct to the best of my knowledge.

Drilling Company: FMSM Engineers, Inc.
State Certification Number or Rig Operator's No.: 0202-0237-12
Signature of Responsible Certified Driller:
Company Mailing Address: 1409 N. Forbes Rd.
City: Lexington State: Ky Zip Code: 40511
Date: 12/3/96 Month, Day, Year

Number of Attached Sheets: 3

White Copy to Division of Water, Yellow copy to Owner, Pink Copy to Driller's Files

DEP-8043

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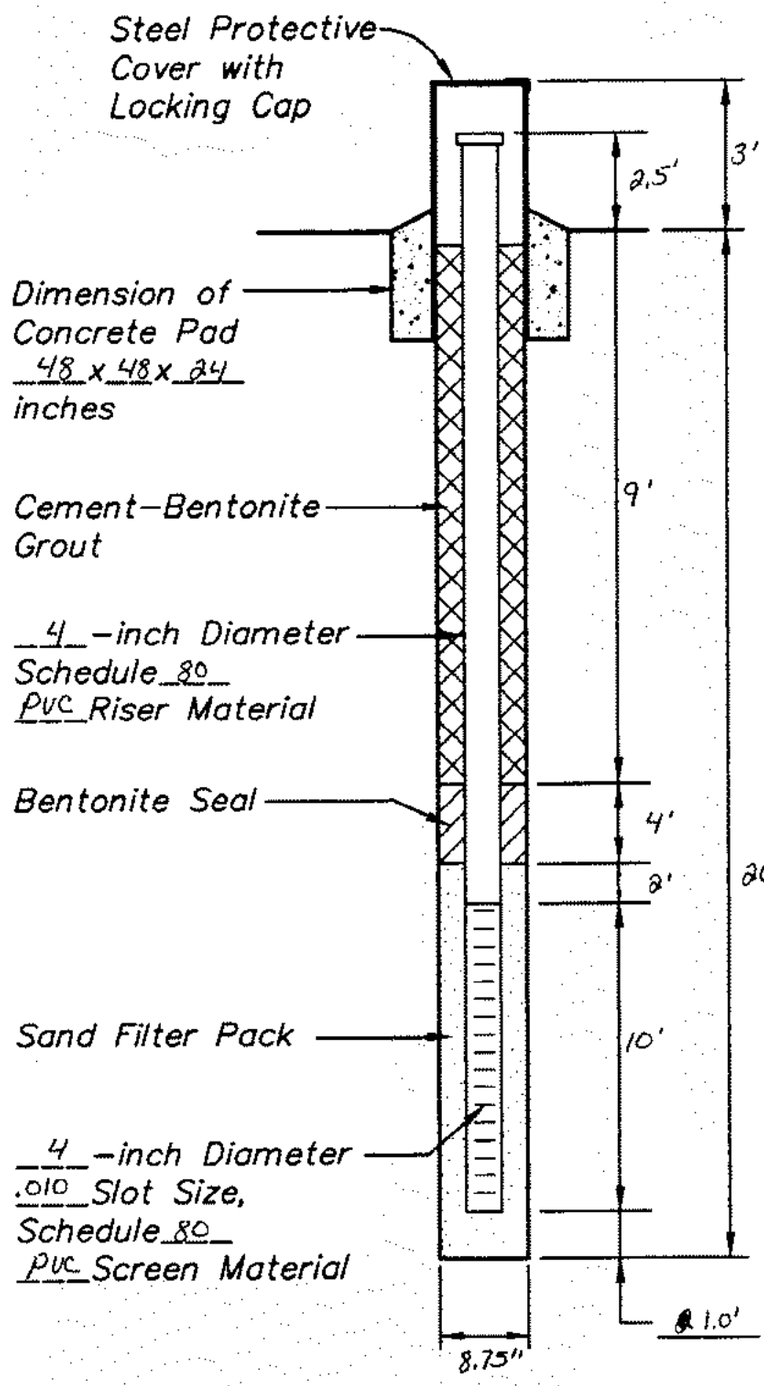
WELL CONSTRUCTION DATA SHEET



NOTES: _____

PROJECT TITLE: Big Rivers, Green Station

PROJECT NO.: 96155

OWNER'S WELL NO.: MW-5

AKGWA NO.: 8002-9627

NOT TO SCALE

MSM ENGINEERS

KYWLCAP

KENTUCKY MONITORING WELL RECORD

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(TYPE OR PRINT CLEARLY)

[redacted]

(2) GENERAL INFORMATION:

Facility Name: Big Rivers Electric
Mailing Address: P.O. Box 24
City: Henderson
State: Kentucky Zip: 42420

Facility Address:
City:
State: Zip:
Owner's Phone: (502) 827-2561

Date Received: DEC 0 [illegible]

(3) AKGWA NUMBER: 8 0 0 2 – 9 6 2 6

(4) WELL LOCATION:

USGS Quadrangle Name	County	Latitude	Longitude
Robards	Webster	37 37 45N	87 30 27 W

(5) GENERAL WELL CONSTRUCTION:

Start Date: 11/14/96
Finish Date: 11/15/96
Drilling Method: Air Rotary
Surface Elevation: ~~388~~ 380 ft.
Total Depth: 43.0 ft.
Depth to Bedrock: 27 ft. (If Applicable)
Depth to Static Water: 20.50 ft.

(6) PHYSIOGRAPHIC/HYDROLOGIC REGION:

( ) Blue Grass
( ) E. Coal Field
( ) Miss. Plateau
( ) Ohio River Alluvium
(X) W. Coal Field
( ) Jackson Purchase

(7) FACILITY TYPE:

( ) RCRA
( ) CERCLA
( ) UST
( ) Other, _____
( ) Surface Mining
( ) TSCA
( ) Site Assessment
(X) Solid Waste Landfill
( ) Landfarm

(8) WELL USE:

(X) Water Quality
( ) Ambient Monitoring
( ) Other_____
( ) Water Level Monitoring
( ) Remediation

(9) LABORATORY ANALYSIS:

(Attach Copy of Results)
Sampling Date
Analysis Date
Laboratory Name: FMSM not performing lab services.

(10) WELL COMPLETION INFORMATION

Feet Below Surface From	To	Hole Diameter	Casing Diameter	Casing Type
0	33	8.75"	4"	Sch 80 PVC Riser
33	43	8.75"	4"	Sch 80 PVC Screen (.010)

Attach additional sheets if necessary

(11) WELL CONSTRUCTION SKETCH:

See Attachment

(12) LITHOLOGIC LOG:

Feet Below Surface From	To	Description
0	27	Silty Clay, brown
27	45	Sandstone, gray

Attach additional sheets if necessary

(13) SITE SKETCH MAP:

See Attachment

(14) COMMENTS:

Owners well no. MW-6
FMSM Project no. 96155

(15) AFFIRMATION: The work described above was done under my supervision, and this report is true and correct to the best of my knowledge.

Drilling Company	State Certification Number or Rig Operator's No.	Signature of Responsible Certified Driller
FMSM Engineers, Inc.	0202-0237-12	[signature]

Company Mailing Address	City	State	Zip Code	Date Month, Day, Year
1409 N. Forbes Rd.	Lexington	Ky	40511	12/3/96

Number of Attached Sheets: _____

White Copy to Division of Water, Yellow copy to Owner, Pink Copy to Driller's Files

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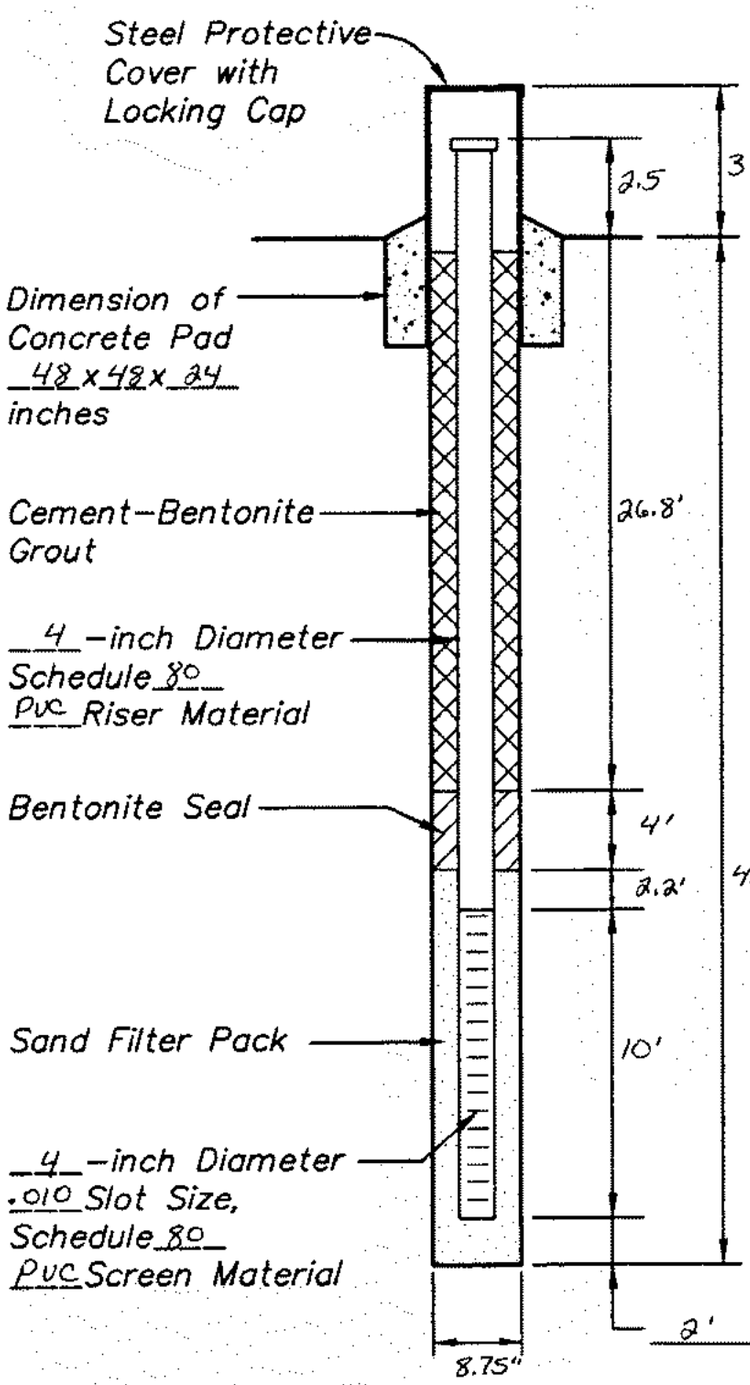
WELL CONSTRUCTION DATA SHEET



NOTES: _____

PROJECT TITLE: Big Rivers, Green Station

PROJECT NO.: 96155

OWNER'S WELL NO.: MW-6

AKGWA NO.: 8002-9626

MSM ENGINEERS

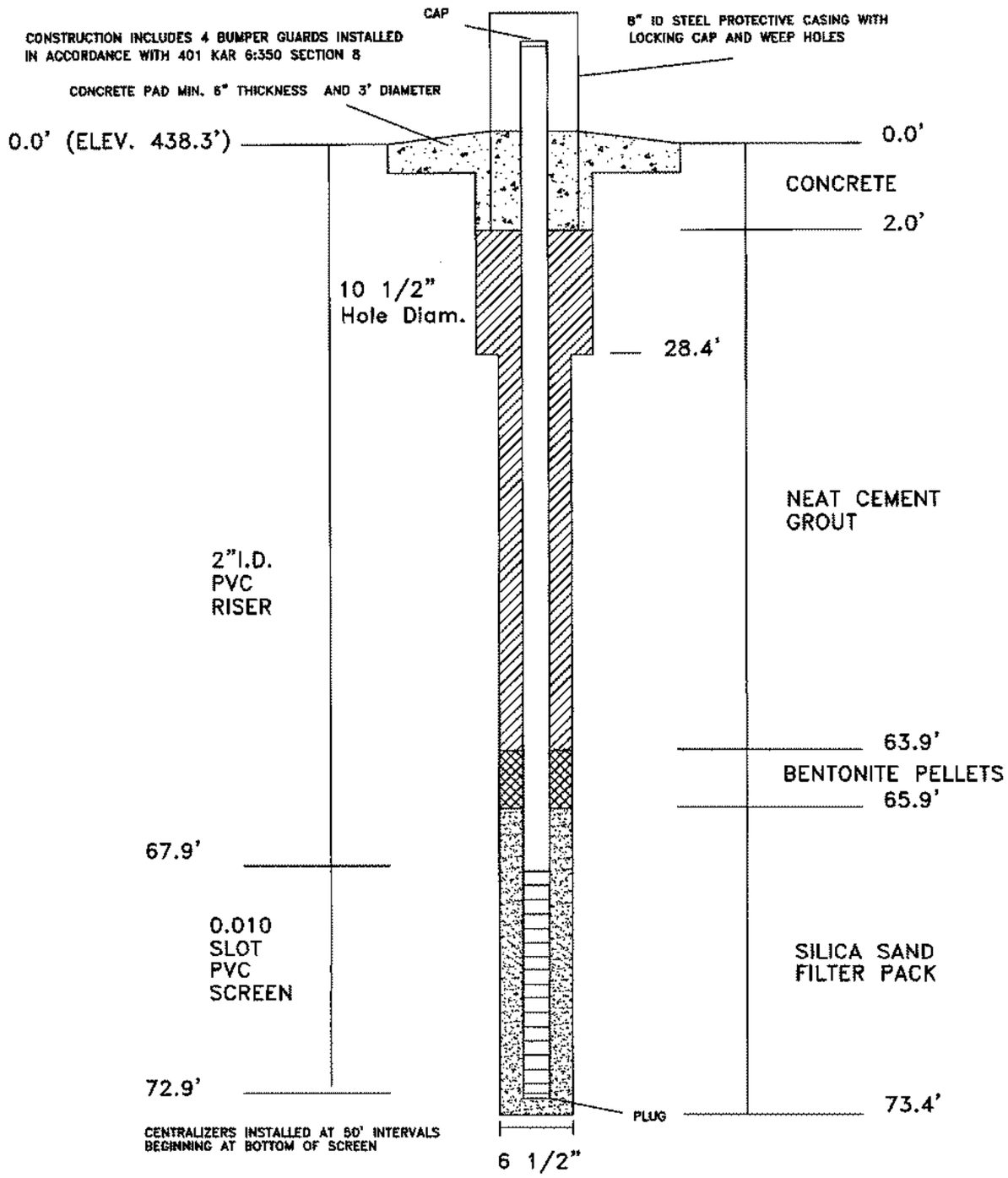
NOT TO SCALE

KYWELCAP

48. Lithologic Log MW-7

From depth (ft)	To depth (ft)	Description
0.0	6.5	Silty clay brown
6.5	11.7	Silty clay brown, moist
11.7	12.9	Silty clay yellowish brown moist
12.9	15.5	Sandy clay yellowish brown moist
15.5	18.8	Sandy clay yellowish brown moist
18.8	24.1	Silty sand yellowish brown wet
24.1	28.4	Sandstone yellowish brown weathered
	28.4	Auger refusal
28.4	33.8	Sandstone yellowish brown weathered
33.8	37.3	Shale dark gray
37.3	49.8	Shale gray soft
49.8	51.4	Shale w/interbedded shale gray soft
51.4	55.3	Sandstone gray hard
55.3	57.6	Sandstone w/sandy shale streaks gray
57.6	63.4	Sandy shale gray
63.4	66.7	Shale gray
66.7	67.0	Sandy shale gray
67.0	67.5	Shale gray w/interbedded sandstone
67.5	73.4	Sandstone gray
	73.4	TD

MONITORING WELL 8006-3934
(MW-7)



BIG RIVERS ELECTRIC CORPORATION	Job Number:	15-0140F	Revisions:
	Date:	12/28/15	
Well Construction Diagram	Scale:	No Scale	
	Drawn By:	D. Dunbar	

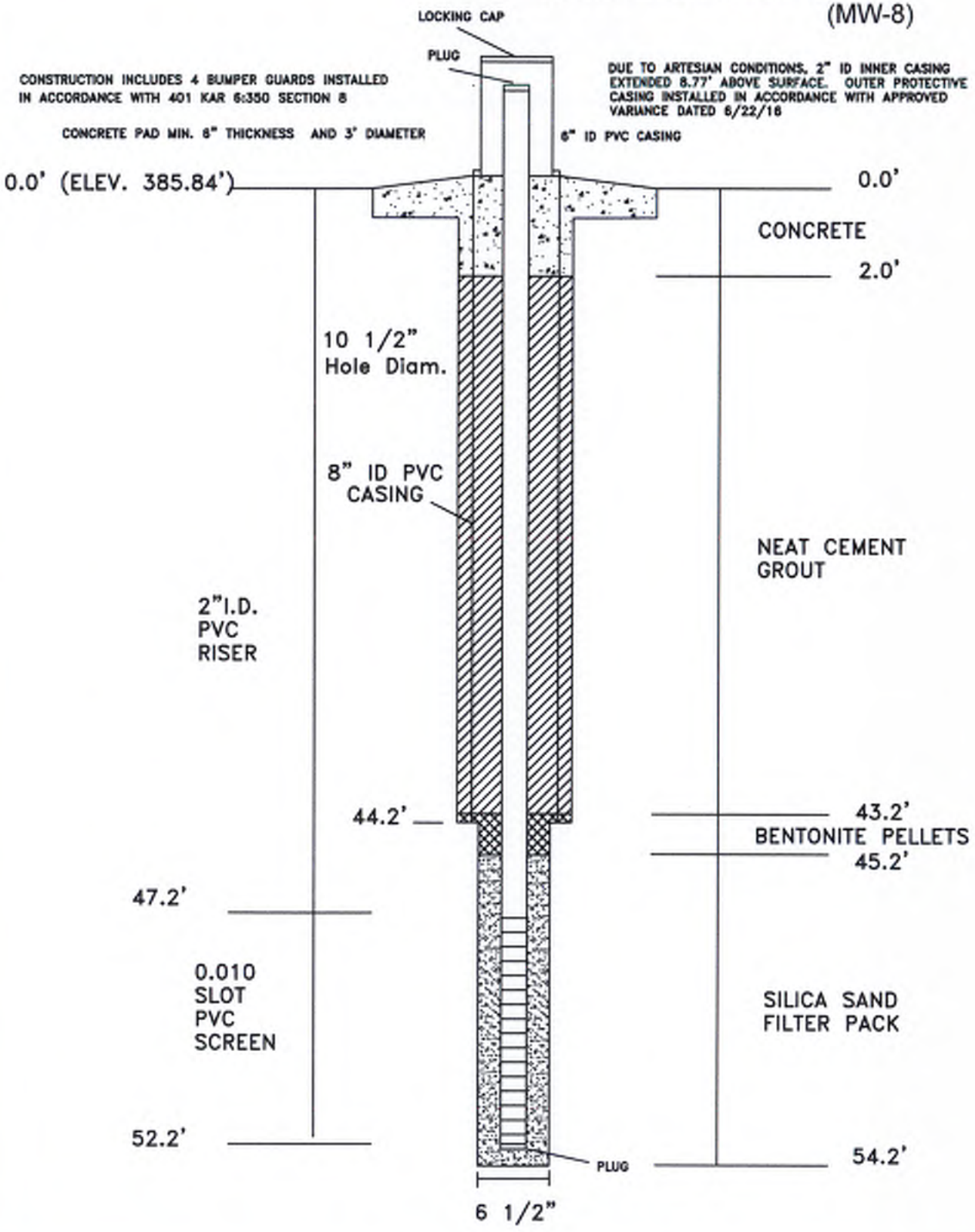
ASSOCIATED ENGINEERS, INC.

2740 North Main St. · Madisonville, KY 42431
Phone: (270) 821-7732 · Fax: (270) 821-7789
www.associatedengineers.com

48. Lithologic Log MW-8

From depth (ft)	To depth (ft)	Description
0.0	0.3	Topsoil
0.3	3.0	Silty clay brown
3.0	7.0	Silty clay gray moist
7.0	10.0	Silty clay brown very moist
10.0	21.5	Silty clay brown wet
21.5	27.0	Silty clay gray wet
27.0	44.2	Silty clay w/gravel gray wet
	44.2	Auger refusal
44.2	48.4	Sandstone gray hard
48.4	49.5	Sandstone w/carbonaceous strks gray hard
49.5	51.0	Sandstone gray hard
51.0	51.8	Sandstone w/ shale strks gray
51.8	54.2	Sandy shale and interbedded sandstone gray
	54.2	TD

MONITORING WELL 8006-3935
(MW-8)



BIG RIVERS ELECTRIC CORPORATION	Job Number:	15-0140F	Revisions:
	Date:	12/28/15	
Well Construction Diagram	Scale:	No Scale	
	Drawn By:	D. Dunbar	

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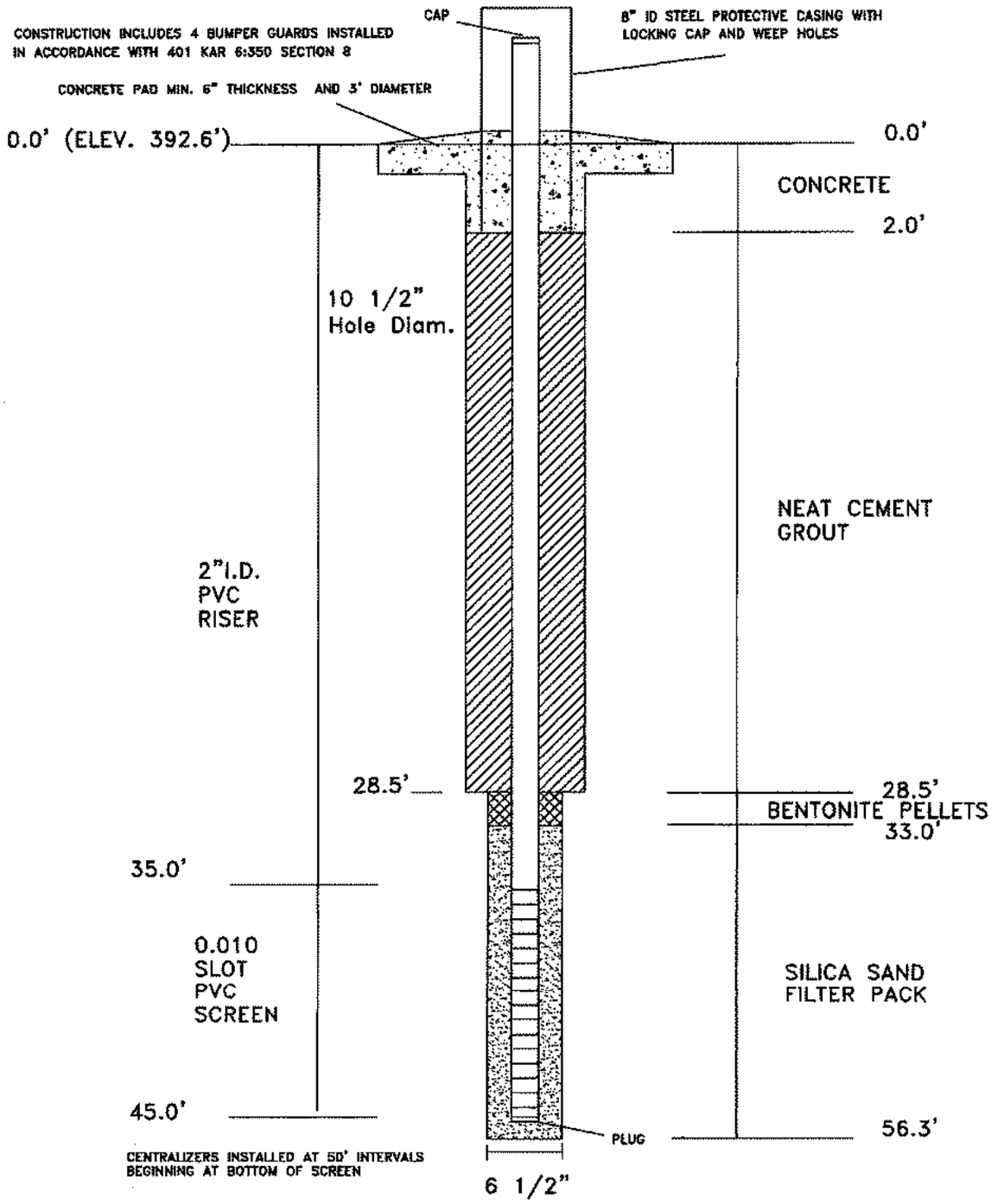
48. Lithologic Log MW-9

From depth (ft)	To depth (ft)	Description
0.0	1.5	Clay dark brown trace grass and roots
1.5	12.0	Clay yellowish brown moist
12.0	23.2	Clay brown wet
23.2	28.2	Sandy clay gray wet
28.2	28.5	Sandstone yellowish brown soft weathered
	28.5	Auger refusal
28.5	30.5	Sandstone yellowish brown soft weathered
30.5	33.2	Sandstone gray soft
33.2	34.8	Sandstone gray
34.8	36.6	Sandstone yellowish brown soft weathered
36.6	44.6	Sandstone gray
44.6	50.8	Shale and interbedded sandstone gray abundant carbonaceous laminations
50.8	53.6	Shale gray
53.6	56.3	Shale and interbedded sandstone gray
	56.3	TD

MONITORING WELL 8006-3936
(MW-9)



BIG RIVERS ELECTRIC CORPORATION			
Well Construction Diagram	Job Number:	15-0140F	Revisions:
	Date:	12/28/15	
	Scale:	No Scale	
	Drawn By:	D. Dunbar	

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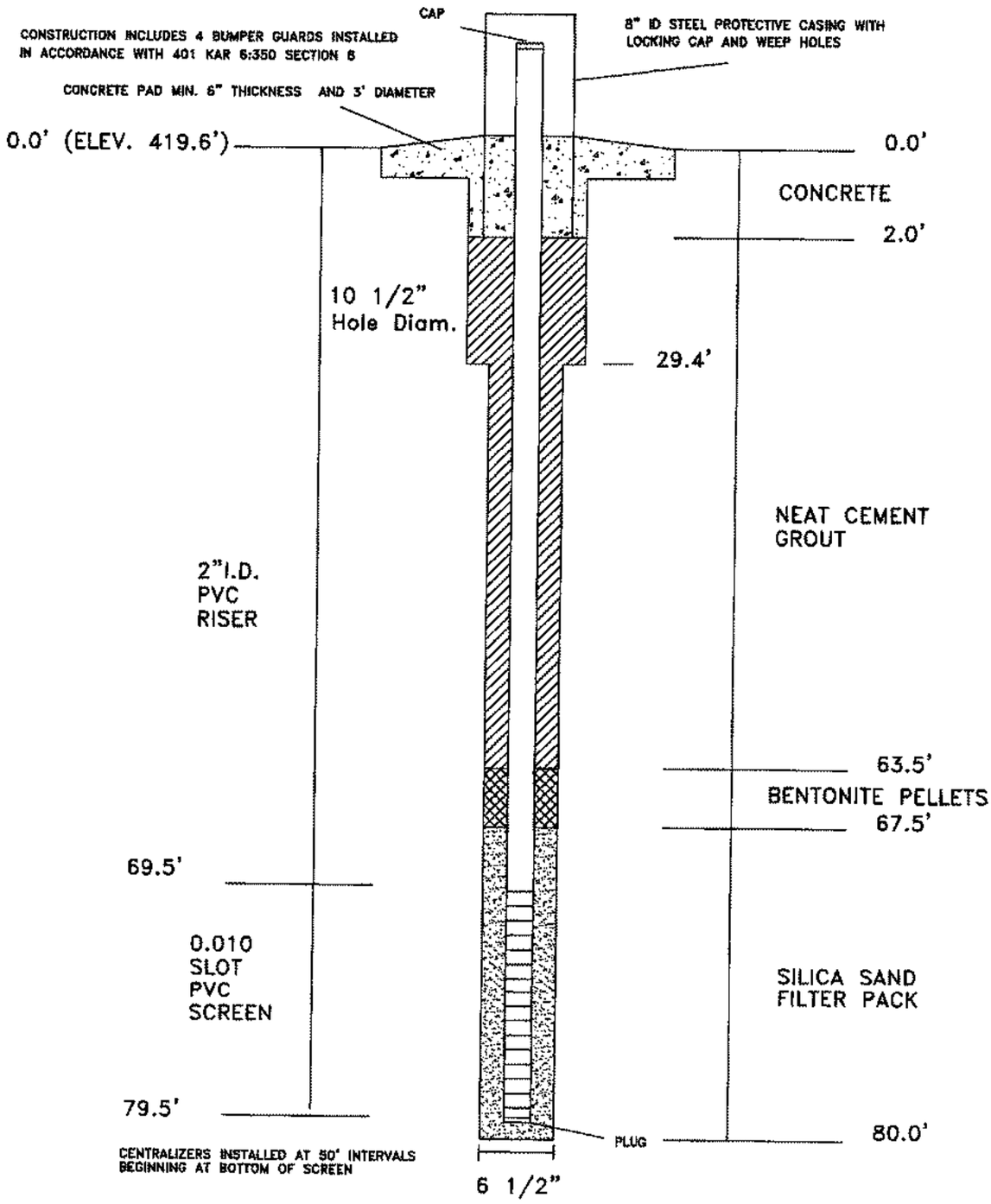
Phone: (270) 821-7732 · Fax: (270) 821-7789
www.associatedengineers.com

48. Lithologic Log MW-10

From depth (ft)	To depth (ft)	Description
0.0	0.3	Dense graded aggregate
0.3	12.9	Silty clay yellowish brown
12.9	14.0	Silty clay brown moist
14.0	17.5	Sandy clay brown wet
17.5	28.5	Sandy clay yellowish brown wet
28.5	29.4	Shale gray soft
	29.4	Auger refusal
30.0	35.8	Shale gray soft
35.8	37.6	Sandstone gray
37.6	48.5	Shale and interbedded sandstone gray
48.5	52.3	Sandstone gray
52.3	54.5	Shale and interbedded sandstone gray
54.5	55.6	Shale gray
55.6	59.7	Shale gray soft
59.7	60.9	Shale and interbedded sandstone gray
60.9	64.6	Shale gray
64.6	65.6	Sandy shale gray
65.6	66.5	Sandstone gray
66.5	68.4	Shale and interbedded sandstone gray
68.4	79.4	Sandstone gray
79.4	80.0	Shale and interbedded sandstone gray
	80.0	TD

MONITORING WELL 8006-3937
(MW-10)



BIG RIVERS ELECTRIC CORPORATION	Job Number:	15-0140F	Revisions:
	Date:	12/28/15	
Well Construction Diagram	Scale:	No Scale	
	Drawn By:	D. Dunbar	

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2740 North Main St. · Madisonville, KY 42431
Phone: (270) 821-7732 · Fax: (270) 821-7789
www.associatedengineers.com

Client: Big Rivers Electric Corporation
Project: Sebree Station - Green Landfill
Site: Robards, KY
Project Number: 60594108

MW-104

Sheet 1 of 3

Date(s) Drilled and Installed	**2/19/19-2/20/19**	Logged By	**S. Lillard**	Reviewed By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Cascade**	Total Depth of Borehole	**60.0 feet**
Sampling Method	**4" Sonic Sampler**	Water Level	**11.1 b.g.s. (measured 2/22/19)**	Top of Casing Elevation	**395.13 feet msl**
Size and Type of Well Casing	**2" PVC Schedule 40**	Screen Perforation	**0.010 inch slotted**	Ground Surface Elevation	**392.47 feet msl**
Seal or Backfill	**Bentonite/Cement Grout**	Coordinates	**N 4,164,939.61 E 455,797.24**	AKGWA #	**8007-1139**

Elevation, feet msl	Depth, feet bgs	Sample Type	Run Number	RQD (%)	% Recovery	Screening PID, ppm	USCS Graphic Symbol	MATERIAL DESCRIPTION
	0							Soft, moist, brown, silty CLAY [Fill]
			HA 1		100			
								Loose, moist, grey FILL
								Grades blue-grey (1.8)
390								Loose, moist, dark grey, FILL with white gypsum mottles and some cemented fragments
			1		167			Cemented fragments grade out
								Seam of soft, dark grey/brown, silty CLAY (3.5-3.6)
	5							Grades grey with some cemented cobbles (5-6)
								Grades very light grey (6-6.7)
								Transition to dark grey with white gypsum mottles (6.7)
385			2		103			
	10							White gypsum mottles grade frequent
380			3		110			
								Loose, wet, black FILL with some organics
								Medium stiff, moist, brown with some light grey mottled, silty CLAY
	15							Grades trace light grey mottles (15.0)
375			4		100			
	20							Grades stiff (20.0)
370			5		100			
	25							

WELL CONSTRUCTION DETAILS

Riser with protective casing and locking cap

2" ID Schedule 40 PVC Riser

Cement Grout

BREC MW INSTALL 2019 FEB 2019 MW INSTALL.GPJ 3/27/19

AECOM

Client: Big Rivers Electric Corporation
Project: Sebree Station - Green Landfill
Site: Robards, KY
Project Number: 60594108

MW-104

Elevation, feet msl	Depth, feet bgs	SAMPLES: Sample Type	Run Number	RQD (%)	% Recovery	Screening PID, ppm	USCS Graphic Symbol	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	25							Grades medium stiff (25.0)	
365			6		100				
	30							Grades reddish brown (31.0)	
360			7		110				
								Trace light grey mottles and trace fine grey sandstone gravel fragments (34-35)	
	35							Grades soft (35.0)	
355			8		120				
	40							Grades grey (40.0)	
350			9		110			Loose, slightly moist, dark brown with light grey and reddish brown mottled, clayey SILT	
	45							Soft, slightly moist, brown silty CLAY	Bentonite Seal (Bentonite Chips)
345			10		112			Grades reddish brown (47.0)	
								Grades to a fine-grained sandy, silty clay (48.0)	Filter Pack Sand #5
	50								
								Grades dark brown (51.8)	2" ID Schedule 40 PVC 0.010" Slotted Screen
340			11		87			Heavily weathered, very soft, dry, light grey, silty, fine-grained SANDSTONE Grades brown with some dark grey lamina (52.5)	
								Grades light grey with frequent dark grey lamina	

BREC MW INSTALL 2019 FEB 2019 MW INSTALL.GPJ 3/27/19

AECOM

Client: Big Rivers Electric Corporation
Project: Sebree Station - Green Landfill
Site: Robards, KY
Project Number: 60594108

MW-104

Sheet 3 of 3

Elevation, feet msl	Depth, feet bgs	SAMPLES: Sample Type	SAMPLES: Run Number	SAMPLES: RQD (%)	SAMPLES: % Recovery	SAMPLES: Screening PID, ppm	USCS Graphic Symbol	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	55							Grades wet (54.9)	
								Loose, wet, brown to reddish brown, clayey, fine-grained SAND with interbedded sandstone	
								Grades greyish brown (56.0)	
335			12		100			Heavily weathered, soft, wet, light grey, fine-grained SANDSTONE	
	60							Soft, wet, grey CLAY with interbedded fine-grained sandstone (1-2" fragments)	
								End of boring at 60' bgs.	
330									
	65								
325									
	70								
320									
	75								
315									
	80								
310									

BREC MW INSTALL 2019 FEB 2019 MW INSTALL.GPJ 3/27/19

AECOM

Client: Big Rivers Electric Corporation
Project: Sebree Station - Reid/HMPL Landfill
Site: Robards, KY
Project Number: 60594107

MW-110

Sheet 1 of 3

Date(s) Drilled and Installed	**2/20/19-2/21/19**	Logged By	**S. Lillard**	Reviewed By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Cascade**	Total Depth of Borehole	**59.0 feet**
Sampling Method	**4" Sonic Sampler**	Water Level	**-4.51 b.g.s. (measured 2/24/19)**	Top of Casing Elevation	**388.70 feet msl**
Size and Type of Well Casing	**2" PVC Schedule 40**	Screen Perforation	**0.010 inch slotted**	Ground Surface Elevation	**382.14 feet msl**
Seal or Backfill	**Bentonite/Cement Grout**	Coordinates	**N 4,166,849.09 E 454,966.80**	AKGWA #	**8007-1138**

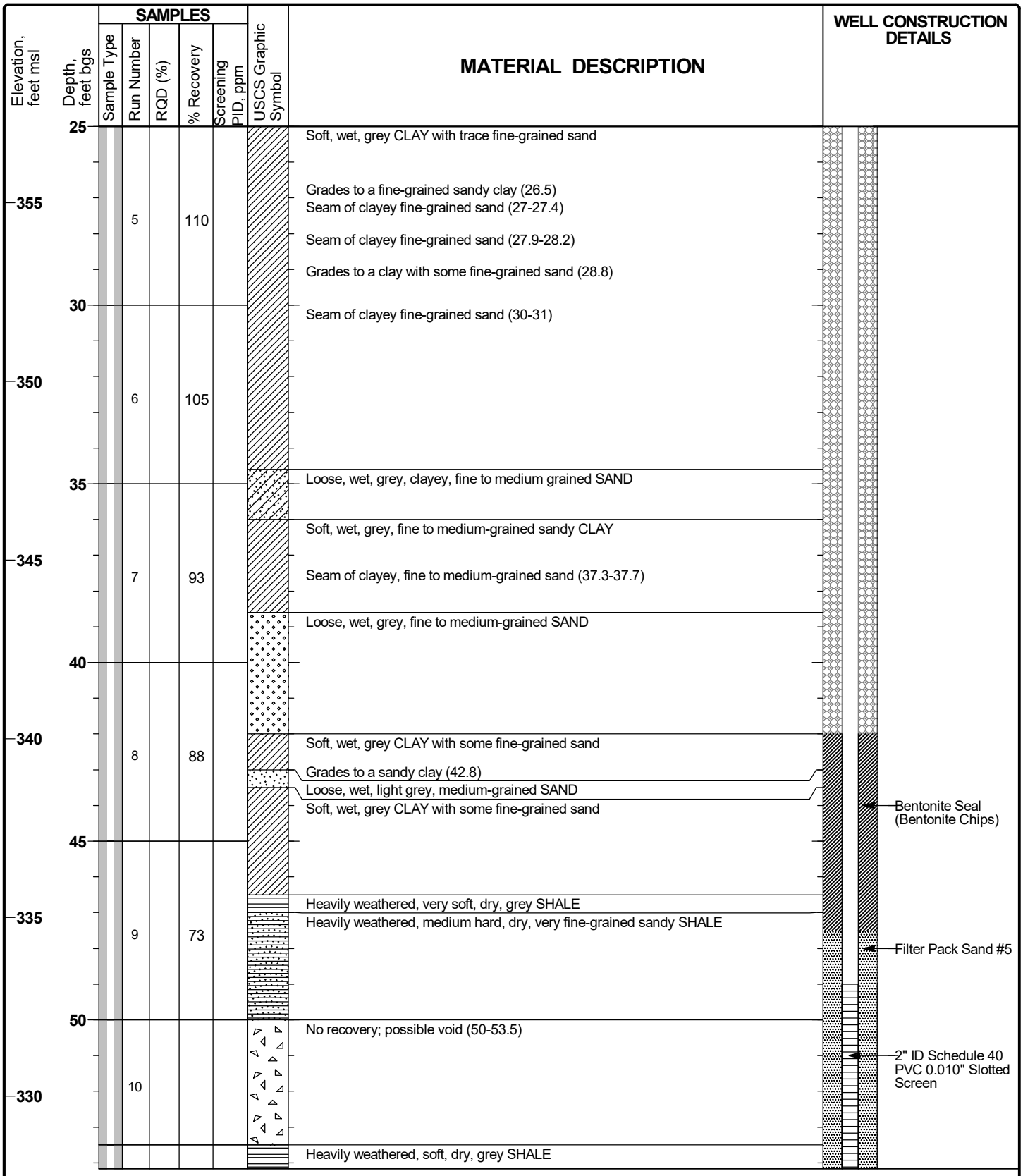
Elevation, feet msl	Depth, feet bgs	SAMPLES: Sample Type	Run Number	RQD (%)	% Recovery	Screening PID, ppm	USCS Graphic Symbol	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	0							Very loose, moist, brown SILT	Riser with protective casing and locking cap
380			HA 1		100			Grades with some clay (2.0) Grades wet (2.5) Soft, wet, brown, silty CLAY	2" ID Schedule 40 PVC Riser Cement Grout
	5							Medium stiff, wet, brown with some reddish brown and light grey mottled, silty CLAY	
375			1		92			Grades soft (8.5)	
	10							Stiff, wet, reddish brown with brown and light grey mottled, silty CLAY	
370			2		105			Trace fine chert nodule (12.5) Brown mottles grade out (13.0)	
	15								
365			3		115			Medium stiff, wet, brown with light grey mottled, silty CLAY	
	20							Soft, wet, light grey CLAY	
360			4		120			Soft, wet, light grey, fine-grained sandy CLAY Loose, wet, light grey, clayey, fine-grained SAND Soft, wet, grey, fine-grained sandy CLAY Soft, wet, grey CLAY	
	25							Soft, wet, grey, fine-grained sandy CLAY	

BREC MW INSTALL 2019 FEB 2019 MW INSTALL.GPJ 3/27/19

AECOM

Client: Big Rivers Electric Corporation
Project: Sebree Station - Reid/HMPL Landfill
Site: Robards, KY
Project Number: 60594107

MW-110



AECOM

Client: Big Rivers Electric Corporation
Project: Sebree Station - Reid/HMPL Landfill
Site: Robards, KY
Project Number: 60594107

MW-110

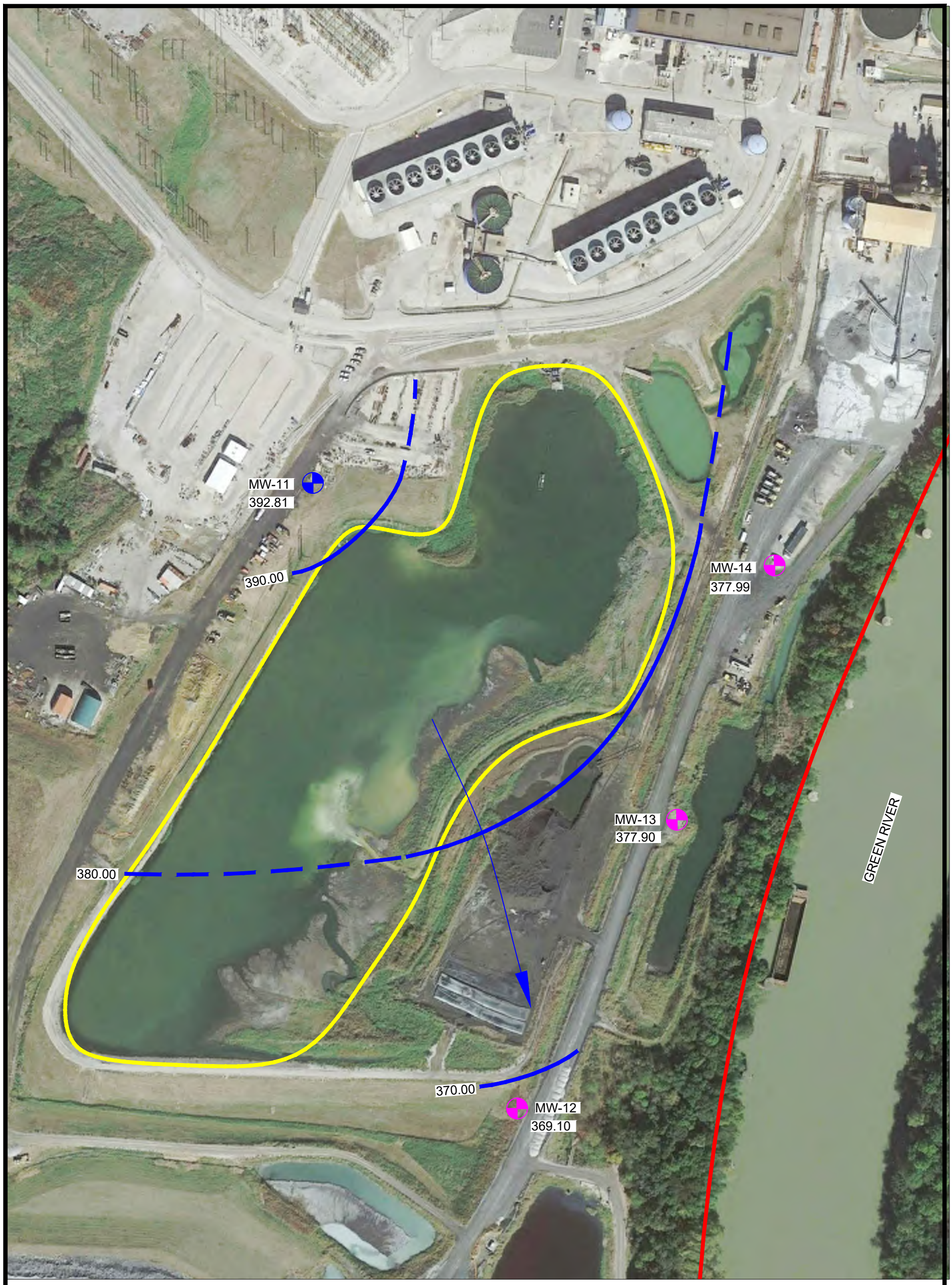
Sheet 3 of 3

Elevation, feet msl	Depth, feet bgs	SAMPLES: Sample Type	SAMPLES: Run Number	SAMPLES: RQD (%)	SAMPLES: % Recovery	SAMPLES: Screening PID, ppm	USCS Graphic Symbol	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
325	55		11		100			Grades wet (55.5)	
	60							End of boring at 59' bgs.	
320									
	65								
315									
	70								
310									
	75								
305									
	80								
300									

BREC MW INSTALL 2019 FEB 2019 MW INSTALL.GPJ 3/27/19

AECOM

ATTACHMENT 4 - MAP OF THE DIRECTION OF GROUNDWATER FLOW



LEGEND

(IMPOUNDMENT) UNIT BOUNDARY

PROPERTY LINE

DOWNGRADIENT CCR MONITORING WELL

UPGRADIENT CCR MONITORING WELL

369.10 GROUNDWATER ELEVATION (MEASURED FEBRUARY 27, 2018)

GROUNDWATER CONTOUR (DASHED WHERE INFERRED)

APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTE: MAP IMAGE: GOOGLE EARTH PRO

0 200' 400'

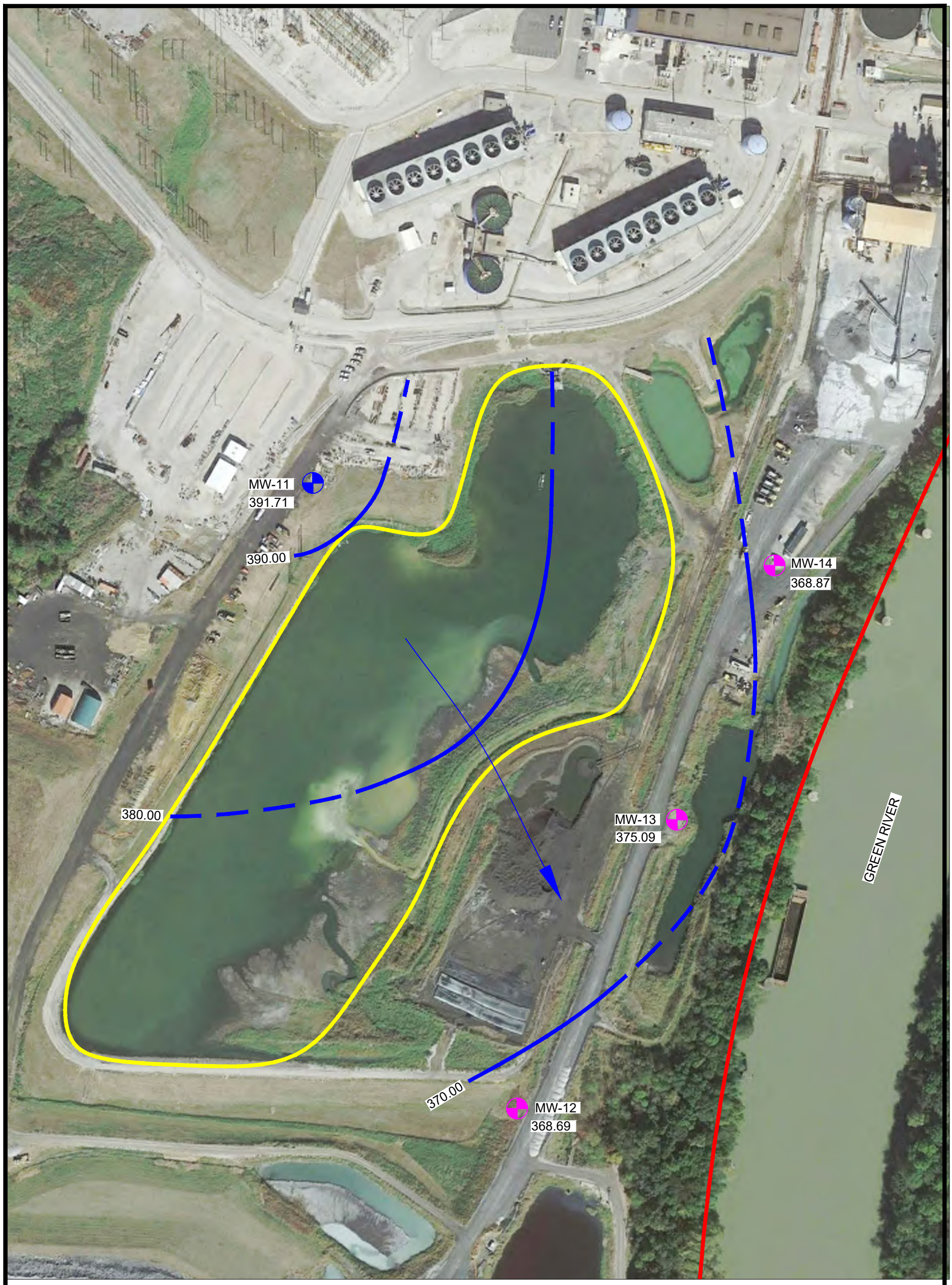
SCALE IN FEET

N

BURNS McDONNELL

POTENTIOMETRIC SURFACE MAP
FEBRUARY 2018
GREEN SURFACE IMPOUNDMENT
WEBSTER COUNTY, KENTUCKY

Z:\CLIENTS\ENS\BIGRIVERSEC_CLIENTINFO\SITES\GREEN STATION\RISK MITIGATION PLAN\DELIVERABLE\FIGURES\FIGURE 4_GROUNDWATER ELEVATION MAP_FEB18.DWG 9/10/2020 9:44 AM KPERINO



LEGEND

- (IMPOUNDMENT) UNIT BOUNDARY
- PROPERTY LINE
- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL
- 368.69 GROUNDWATER ELEVATION (MEASURED JUNE 29, 2018)
- GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTE: MAP IMAGE: GOOGLE EARTH PRO

0 200' 400'

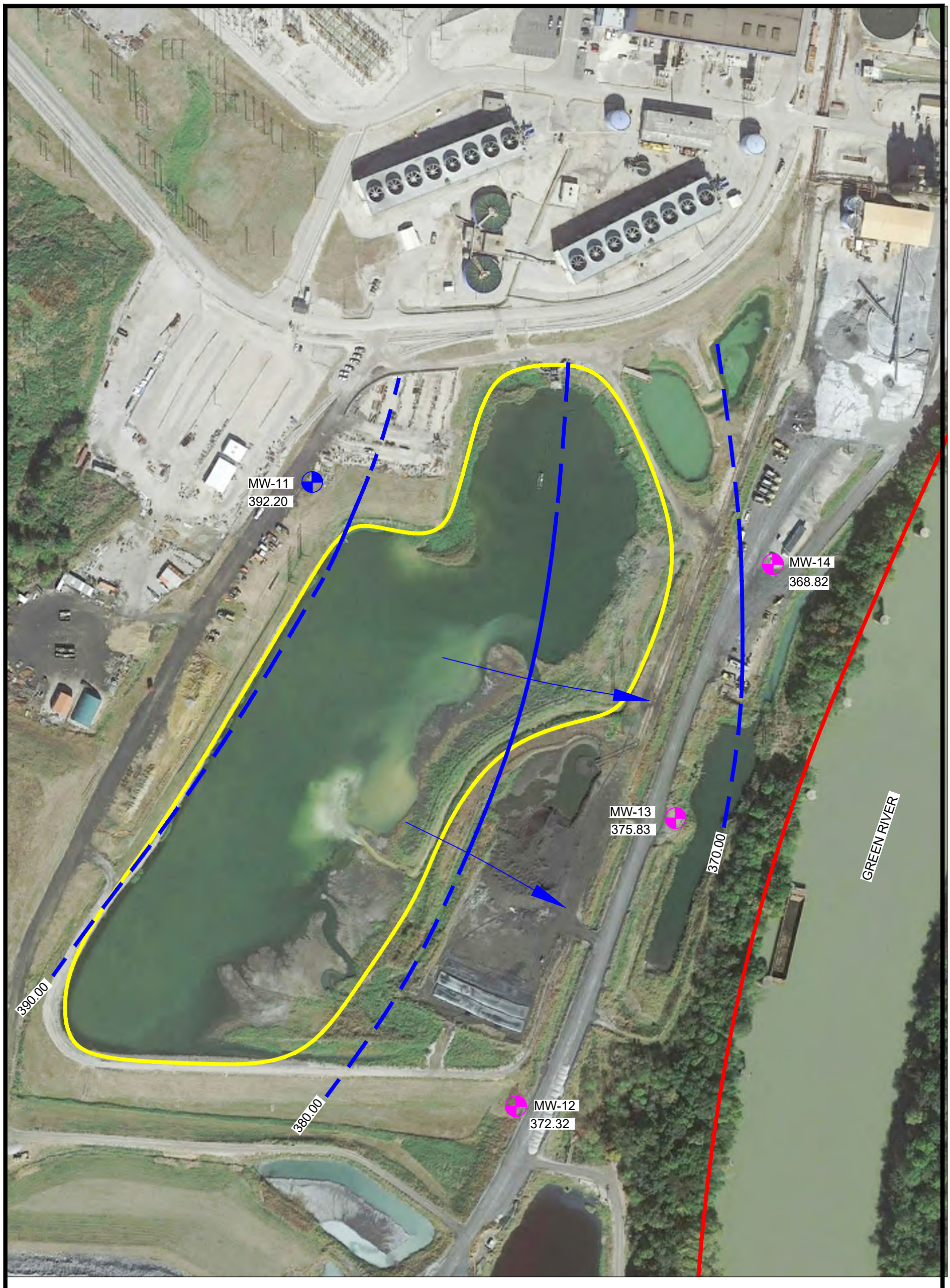
SCALE IN FEET

N

BURNS McDONNELL

POTENTIOMETRIC SURFACE MAP
JUNE 2018
GREEN SURFACE IMPOUNDMENT
WEBSTER COUNTY, KENTUCKY

Z:\CLIENTS\ENS\BIGRIVERSEC_CLIENTINFO\SITES\GREEN STATION\RISK MITIGATION PLAN\DELIVERABLE\FIGURES\FIGURE 5_GROUNDWATER ELEVATION MAP_JUN18.DWG 9/10/2020 9:46 AM KPERINO



LEGEND

(IMPOUNDMENT) UNIT BOUNDARY

PROPERTY LINE

DOWNGRADIENT CCR MONITORING WELL

UPGRADIENT CCR MONITORING WELL

372.32 GROUNDWATER ELEVATION (MEASURED AUGUST 31, 2020)

GROUNDWATER CONTOUR (DASHED WHERE INFERRED)

APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTE: MAP IMAGE: GOOGLE EARTH PRO

0 200' 400'

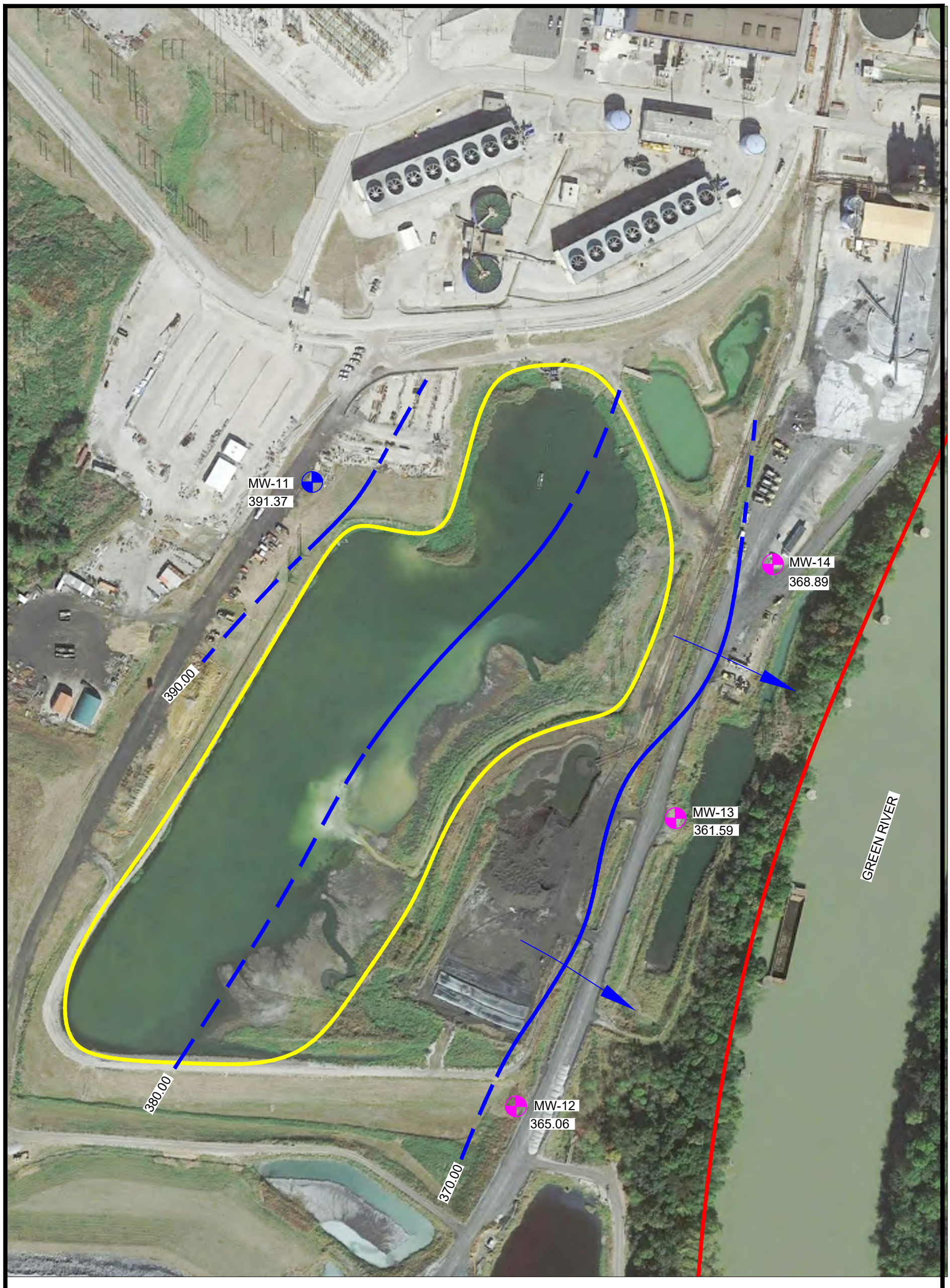
SCALE IN FEET

N

BURNS McDONNELL

POTENTIOMETRIC SURFACE MAP
AUGUST 2020
GREEN SURFACE IMPOUNDMENT
WEBSTER COUNTY, KENTUCKY

Z:\CLIENTS\ENS\BIGRIVERSEC_CLIENTINFO\SITES\GREEN STATION\RISK MITIGATION PLAN\DELIVERABLE\FIGURES\FIGURE 7_GROUNDWATER ELEVATION MAP_AUG20.DWG 9/10/2020 9:46 AM KPERINO



LEGEND

- (IMPOUNDMENT) UNIT BOUNDARY
- PROPERTY LINE
- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL
- 365.06 GROUNDWATER ELEVATION (MEASURED OCTOBER 3, 2019)
- GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTE: MAP IMAGE: GOOGLE EARTH PRO

0 200' 400'

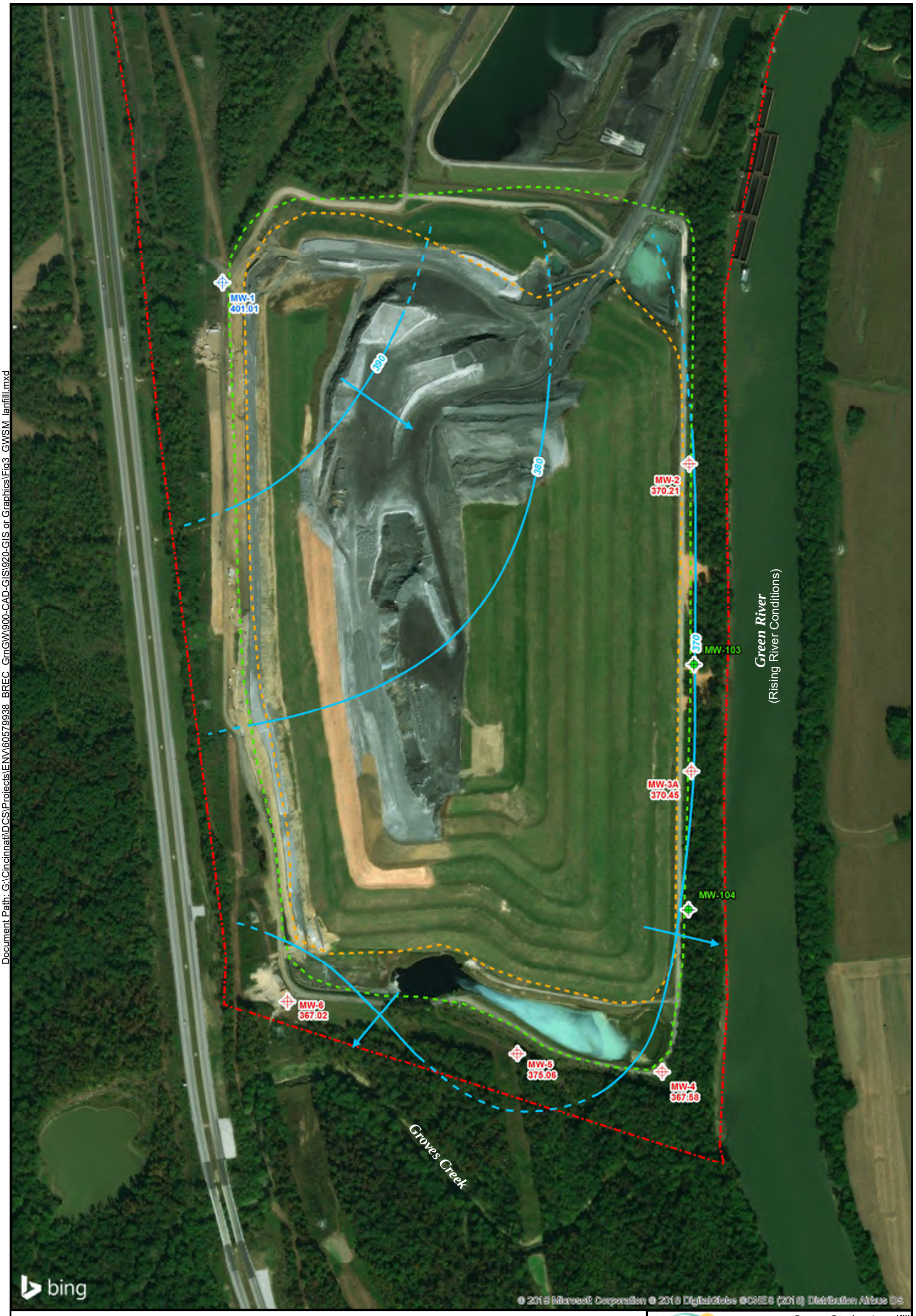
SCALE IN FEET

N

BURNS McDONNELL

POTENTIOMETRIC SURFACE MAP
OCTOBER 2019
GREEN SURFACE IMPOUNDMENT
WEBSTER COUNTY, KENTUCKY

Z:\CLIENTS\ENS\BIGRIVERSEC_CLIENTINFO\SITES\GREEN STATION\RISK MITIGATION PLAN\DELIVERABLE\FIGURES\FIGURE 6_GROUNDWATER ELEVATION MAP_OCT19.DWG 9/9/2020 10:57 AM KPERINO



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Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Proposed Characterization Well
- Water Table Contour (Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 367.58 Groundwater Elevation (Feet, MSL) Measured September 28, 2018

0 400 800
Feet

N

Big Rivers

Green Station Landfill
Webster County, Kentucky

FIGURE 3
GROUNDWATER SURFACE MAP
SEPTEMBER 2018

DATE: 1/14/2019	SCALE: 1IN = 300 FEET
CREATED BY: ALW	
JOB NO. 60579938	

Document Path: G:\Cincinnati\DCS\GIS\ArcMap_GeoDB_Projects\ENV\60579938_BREC_GrnGW\920-GIS or Graphics\Fig4_GWSM_landfill_2019September30.mxd

MW-1
402.98

400

390

380

370

MW-2
370.12

MW-3A
369.58

MW-104
NM

MW-6
366.74

MW-5
374.98

MW-4
366.11

Green River
(Stable River Conditions)

Groves Creek

bing

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Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Water Table Contour (Dashed where Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 366.11 Groundwater Elevation (Feet, MSL) Measured September 30 and October 1, 2019
- NM - not measured

0 400 800
Feet

N

Big Rivers Electric Corporation

Green Station Landfill
Webster County, Kentucky

FIGURE 5
GROUNDWATER SURFACE MAP
SEPTEMBER 30 and OCTOBER 1, 2019

DATE: 11/7/2019	SCALE: 1IN = 400 FEET
CREATED BY: TMJ	
JOB NO. 60579938	

MW-1
403.71

MW-12
373.39

MW-2
376.13

MW-3A
374.40

MW-4
373.43

MW-5
372.56

MW-6
372.55

400
395
390
385
380
375

Green River

Groves Creek

bing

Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Water Table Contour (Dashed where Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 373.43 Groundwater Elevation (Feet, MSL) Measured April 7, 2020
- NM - not measured

0 400 800
Feet

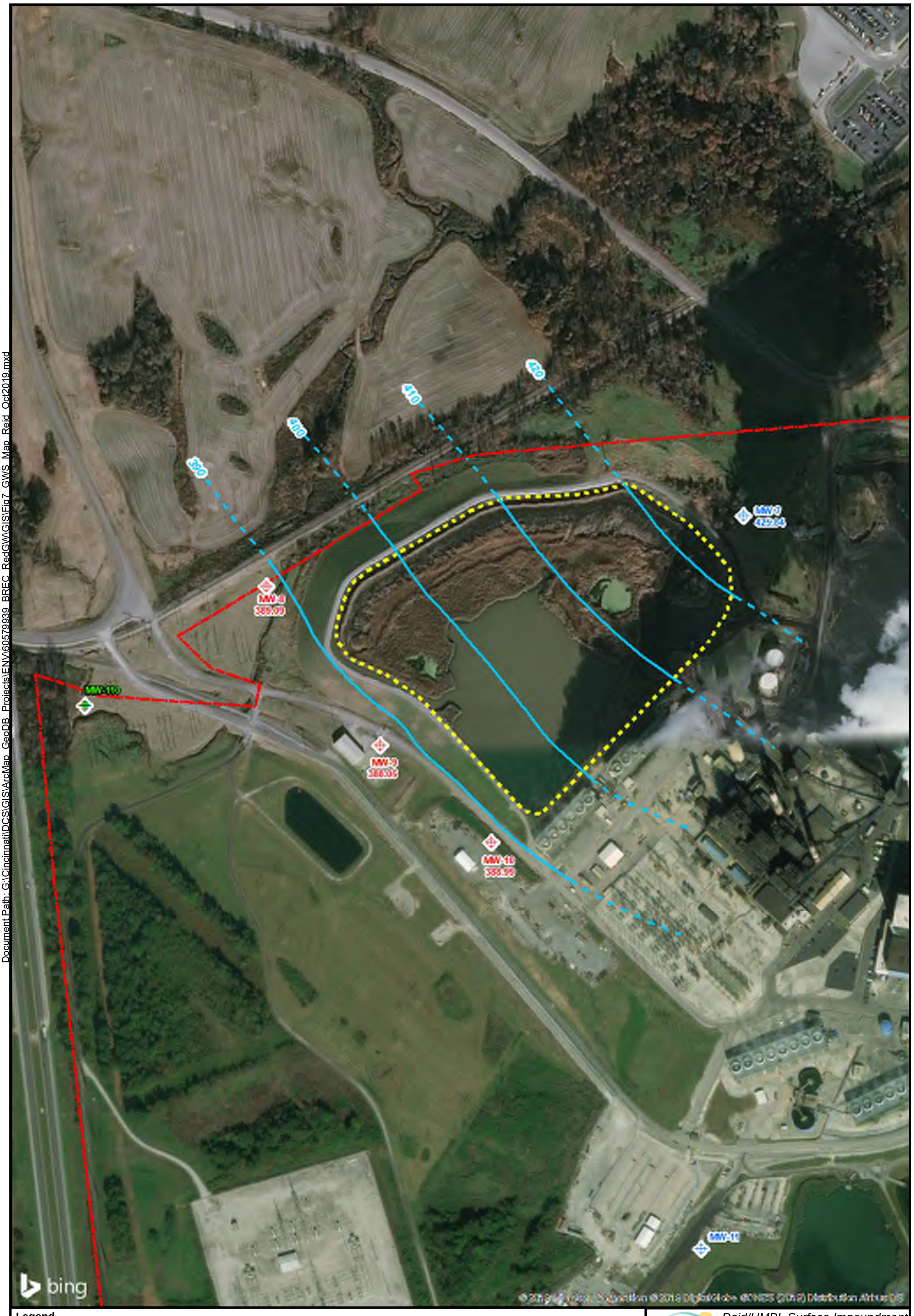
N

Big Rivers Electric Corporation

Green Station Landfill
Webster County, Kentucky

FIGURE 8
POTENTIOMETRIC SURFACE MAP
APRIL 7, 2020

DATE: 4/20/2020	SCALE: 1IN = 400 FEET
CREATED BY: TMJ	
JOB NO. 60579938	



Document Path: G:\Cincinnati\DCS\GIS\ArcMap_GeoDB_Projects\ENV\60579939_BREC_RedGW\GIS\Fig7_GWS_Map_Reid_Oct2019.mxd

Legend

- Proposed Assessment Well
- Downgradient Monitoring Well
- Upgradient Monitoring Well
- Unit Boundary
- Property Line
- Water Table Contour (Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 389.09 Groundwater Elevation (Feet, MSL) Measured October 16, 2019

0 300 600
Feet

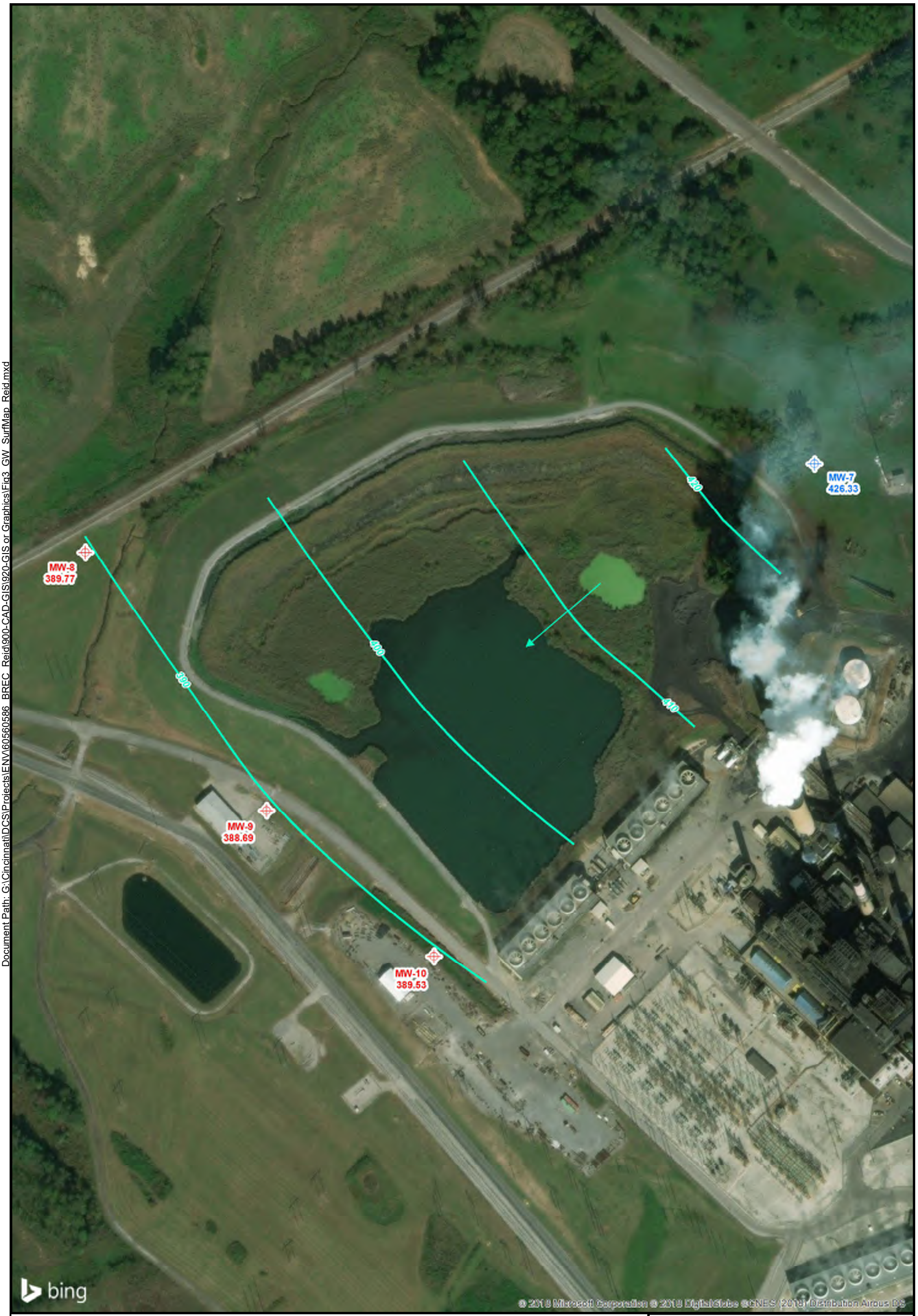
N

Big Rivers

Reid/HMPL Surface Impoundment
Webster County, Kentucky

FIGURE 7
GROUNDWATER SURFACE MAP
OCTOBER 2019

DATE: 12/11/2019	SCALE: 1IN = 200 FEET
CREATED BY: BAW	
JOB NO. 60579939	



Document Path: G:\Cincinnati\DCS\Projects\ENV\60560586_BREC_Reid\900-CAD-GIS\920-GIS or Graphics\Fig3_GW_SurfMap_Reid.mxd

Legend

- Unit Boundary
- Downgradient Monitoring Well
- Upgradient Monitoring Well
- Water Table Contour (Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 426.33 Groundwater Elevation (Feet, MSL) Measured September 2017

0 200 400

Feet

N

Big Rivers

Reid/HMPL Surface Impoundment
Webster County, Kentucky

FIGURE 7
GROUNDWATER SURFACE MAP
SEPTEMBER 2017

DATE: 1/25/2018	SCALE: 1IN = 200 FEET
CREATED BY: ALW	
JOB NO. 60560586	

MW-7
426.50

MW-8
389.87

MW-110

MW-9
388.90

MW-10
389.66

MW-11

410

420

400

390

bing

Legend

- Unit Boundary
- Property Line
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Proposed Characterization Well
- Water Table Contour (Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 426.50 Groundwater Elevation (Feet, MSL) Measured September 26, 2018

0 300 600
Feet

N

Big Rivers

Reid/HMPL Surface Impoundment
Webster County, Kentucky

FIGURE 7
GROUNDWATER SURFACE MAP
SEPTEMBER 2018

DATE: 1/16/2019	SCALE: 1IN = 200 FEET
CREATED BY: ALW	
JOB NO. 60579939	

ATTACHMENT 5 - TABLES SUMMARIZING CONSTITUENT CONCENTRATIONS AT EACH MONITORING WELL

GREEN SURFACE IMPOUNDMENT - CCR ANALYTICAL SUMMARY
MW-11

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																					
			4/1/2016	6/2/2016	8/16/2016	10/25/2016	1/26/2017	5/1/2017	8/11/2017	9/20/2017	10/9/2017	5/7/2018	9/27/2018	4/29/2019	10/3/2019		4/8/2020		9/25/2020	
			Baseline Events												Detection					
Boron	0.08	NA	0.818 JB	0.645 J	0.736 JB^	0.736 J	0.920 JB	0.754 JB	0.695 JB	0.802 J	0.769 J	0.879	0.671 B	0.717	ND	D2, M2. M4, U	0.78	M2, M4	ND	D2, M2, U
Calcium	0.5	NA	371	378 B	243	291	276	326 B	321	299	315 B	317	312	345	318	D1, M1	316	D1. M2	335	D2,M3
Chloride	3	NA	1070 B	1740 B	1880 B	2000 B	1880 B	1910 B	2360 B	1520 B	1940 B	1860 B	2000 B	1900	3900	D	2270	D	2620	D
Fluoride	1	4 mg/L	ND J	ND J	ND JB^	ND	ND JB	ND JB	ND	ND JB	ND J F1	ND J	ND J	0.227 J	0.2		0.2		0.2	
Sulfate	5	NA	1170	1400	1150	1150 B	1060	1010 B	1410	797 J	1050 B	1020 B	1080 B	949 B	971		1210	D	1280	D
pH (Field Measurement)	0.10	NA	7.23	7.24	7.29	7.22	7.20	7.04	6.89	6.88	6.86	7.18	6.70	7.11	6.86		6.78		6.98	
Total Dissolved Solids	10	NA	3920 H	4610	4840	4490	4930	4830	5100	4880	5080	5070	5020	4890 B	682		4650		4510	
APPENDIX IV CONSTIUENTS																				
Antimony	0.002	0.006 mg/L	ND	ND JB	ND JB	ND	ND JB	ND JB	ND JB	ND JB										
Arsenic	0.005	0.01 mg/L	ND J	ND	ND	ND J	ND J	ND JB	ND J	ND JB										
Barium	0.2	2 mg/L	ND J	ND J	ND J	ND J	ND J	ND J	ND J	ND J										
Beryllium	0.002	0.004 mg/L	ND	ND	ND	ND	ND	ND	ND	ND										
Cadmium	0.001	0.005 mg/L	ND	ND	ND	ND	ND	ND	ND	ND										
Chromimum	0.003	0.1 mg/L	ND	ND J	ND	ND	ND	ND	ND	ND J										
Cobalt	0.005	0.006 mg/L	0.00494 J	0.00267 J	0.00277 J	0.00138 J	0.00131 J	0.00129 J	0.000654 J	0.000619 J										
Fluoride	1	4 mg/L	ND J	ND J	ND J	ND	ND J	ND J	ND	ND JB	ND J F1	ND J	ND J	0.227 J	0.2		0.2		0.2	
Lead	0.005	0.015 mg/L	ND	ND JB	ND	ND	ND	ND	ND J	ND										
Lithium	0.05	0.040 mg/L	0.0365 J	0.0685	0.0651	0.0544	0.0591	0.0545	0.0615	0.0596										
Mercury	0.0002	0.002 mg/L	ND	ND	ND	ND	ND	ND	ND	ND										
Molybdenum	0.01	0.1 mg/L	0.0163	ND J	ND J	ND J	ND J	ND J	ND J	ND										
Radium 226 Radium 228	1	5 pCi/L	1.35	0.975	1.61	1.86	1.66	2.18	2.69	2.08										
Selenium	0.01	0.05 mg/L	ND	ND J	ND J	ND	ND J	ND JB	ND	ND J										
Thallium	0.001	0.002 mg/L	ND J	ND	ND	ND	ND	ND J	ND J	ND										

Notes:
MW-11 - Upgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value
B = Compound was found in the blank and sample.
H = Sample was prepped or analyzed beyond the specified holding time
^ = ICV,CCV,ICB,CCB,ISA,ISB,CRI,CRA,DLCK or MRL standard; Instrument related QC is outside acceptance limits
F1 = MS and/or MSD Recovery is outside acceptance limits
D1 = Sample required dilution due to high concentration of target analysis
D2 = Sample required dilution due to matrix interference
D = Results reported from dilution
M1 = Matrix spike recovery was high; the method control sample recovery was acceptable
M2 = Matrix spike recovery was low; the method control sample recovery was acceptable
M4 = The analysis of the spiked sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit

GREEN SURFACE IMPOUNDMENT - CCR ANALYTICAL SUMMARY
MW-12

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																									
			4/1/2016	6/2/2016	8/16/2016	10/25/2016	1/27/2017	5/1/2017	8/11/2017	9/20/2017	10/9/2017	4/29/2018	5/7/2018	9/27/2018	4/29/2019	10/4/2019	4/8/2020	9/25/2020
			Baseline Events										Detection					
Boron	0.08	NA	0.174 JB	0.186 J	0.280 JB	0.286 J	0.335 JB	0.306 JB	0.296 JB	0.334 J	0.274 J	0.717	0.352	0.335 B	0.290	ND D2, U	0.31	ND D2, U
Calcium	0.5	NA	68.6	95.1 B	81.0	99.4	87.7	90.9 B	88.5	94.5	92 B	345	93.5	96.4	93.1	92.0 D2	98.3 D2	89.6 D2
Chloride	3	NA	29.0 B	32.4 B	26.9 B	26.2 B	24.6 JB	21.7 B	21.0 JB	19.8 B	17.4 B	1900	15.4	15.5 B	15.1	14.0	13.9	13.5
Fluoride	1	4 mg/L	ND J	ND J	ND J	ND JB	ND J	ND JB	ND J	ND JB	ND J	0.227 J	ND J	ND J	0.428 J	0.4	0.4	0.4
Sulfate	5	NA	168	146	95.7	64.0 B	54	41.3 B	33.8 J	25.3 J	19.7 B	949 B	13.5 B	14.3	11.9 B	11	9	8
pH (Field Measurement)	0.10	NA	7.85	7.4	7.52	7.33	7.65	5.02	6.56	7.07	7.07	7.11	7.34	6.84	7.36	7.07	6.90	6.83
Total Dissolved Solids	10	NA	472	745	726	677	679	676	674	758	641	4890 B	649	595	618 B	546	532	658
APPENDIX IV CONSTIUENTS																		
Antimony	0.002	0.006 mg/L	0.00204	ND JB	ND JB	ND	ND JB	ND JB	ND JB	ND JB								
Arsenic	0.005	0.01 mg/L	0.00596	0.00566	ND J	ND J	ND J	ND JB	ND J	ND JB								
Barium	0.2	2 mg/L	ND J	ND J	ND J	ND J	ND J	ND JB	ND J	ND J								
Beryllium	0.002	0.004 mg/L	ND	ND	ND	ND	ND	ND	ND	ND								
Cadmium	0.001	0.005 mg/L	ND	ND	ND	ND	ND	ND	ND	ND								
Chromimum	0.003	0.1 mg/L	ND J	ND J	ND	ND	ND	ND	ND	ND J								
Cobalt	0.005	0.006 mg/L	ND	ND J	ND J	ND J	ND J	ND JB	ND J	ND J								
Fluoride	1	4 mg/L	ND J	ND J	ND J	ND JB	ND J	ND JB	ND J	ND JB	ND J	0.227 J	ND J	ND J	0.428 J	0.4	0.4	0.4
Lead	0.005	0.015 mg/L	ND J	ND JB	ND	ND	ND	ND	ND J	ND J								
Lithium	0.05	0.040 mg/L	0.0100 J	0.0194 J	0.0173 J	0.0208 J	0.0215 J	0.0169 JB	0.0244 J	0.0229 J								
Mercury	0.0002	0.002 mg/L	ND	ND	ND	ND	ND	ND	ND	ND								
Molybdenum	0.01	0.1 mg/L	0.0769	0.0234	0.0141	0.0123	0.0100	ND JB	ND J	ND J								
Radium 226 Radium 228	1	5 pCi/L	0.842	ND	ND	0.954	0.361	0.556	0.566	ND								
Selenium	0.01	0.05 mg/L	ND J	ND	ND	ND	ND	ND JB	ND	ND								
Thallium	0.001	0.002 mg/L	ND	ND	ND	ND	ND	ND JB	ND	ND								

Notes:
MW-12 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value
B = Compound was found in the blank and sample
U = Target analyte was analyzed for, but was below detection limit
D1 = Sample required dilution due to high concentration of target analysis
D2 = Sample required dilution due to matrix interference
D = Results reported from dilution
M1 = Matrix spike recovery was high; the method control sample recovery was acceptable
M2 = Matrix spike recovery was low; the method control sample recovery was acceptable
M4 = The analysis of the spiked sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable.

GREEN SURFACE IMPOUNDMENT - CCR ANALYTICAL SUMMARY
MW-13

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																															
			4/1/2016		6/2/2016		8/16/2016		10/25/2016		1/27/2017		5/1/2017		8/11/2017		9/20/2017		10/9/2017		4/29/2018		5/7/2018		9/27/2018		4/29/2019		10/4/2019		4/8/2020		9/25/2020	
			Baseline Events																				Detection											
Boron	0.08	NA	ND	B	ND	J	ND	JB	ND	J	ND	JB	ND	JB	ND	JB	ND	J	ND	J	0.717		ND	J	0.0565	JB	0.0392	J	ND	D2, U	ND	U	ND	D2, U
Calcium	0.5	NA	93.0		95.1	B	85.1		94.5		82.8		90.2	B	92.3		94.3		92.2	B	345		94.3		95.6		95.1		87.4	D2	86.6	D2	84.9	D2
Chloride	3	NA	20.5	B	25.2	B	22.3	B	24.8	B	22.2	JB	21.4	B	21.6	JB	21.3	JB	19.9	B	1900		21.0		26.6	B	24.4		24.6		22.8		33.3	D
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND	J	ND	JB	ND	J	0.227	J	ND	J	ND	J	0.271	J	0.2		0.3		0.4	D
Sulfate	5	NA	118		118		106		104	B	96.2		98.1	J	96.6		88.0		96.4	B	949	B	87.6	B	109	B	98.6	B	41		117	D	87	D
pH (Field Measurement)	0.10	NA	6.78		6.9		6.97		6.86		7.22		8.25		6.48		6.64		6.62		7.11		7.03		6.54		6.94		6.75		6.53		6.80	
Total Dissolved Solids	10	NA	699		721		684		704		678		714		702		727		695		4890	B	673		697		711	B	586		608		552	
APPENDIX IV CONSTIUENTS																																		
Antimony	0.002	0.006 mg/L	ND		ND	JB	ND	JB	ND		ND	JB	ND	JB	ND	JB	ND	JB																
Arsenic	0.005	0.01 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB																
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J																
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND																	
Cadmium	0.001	0.005 mg/L	ND		ND		ND		ND		ND		ND		ND		ND																	
Chromimum	0.003	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND	J																
Cobalt	0.005	0.006 mg/L	0.00378	J	0.00221	J	0.0018	J	0.00149	J	0.000720	J	0.00115	J	0.0009	J	0.000981	J																
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND	J	ND	JB	ND	J	0.227	J	ND	J	ND	J	0.271	J	0.2		0.3		0.4	D
Lead	0.005	0.015 mg/L	ND	J	ND	JB	ND		ND		ND		ND		ND		ND																	
Lithium	0.05	0.040 mg/L	0.00929	J	0.0104	J	0.0123	J	0.0104	J	0.0113	J	ND		0.0111	J	ND																	
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND		ND																	
Molybdenum	0.01	0.1 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J																
Radium 226 Radium 228	1	5 pCi/L	ND		ND		ND		ND		ND		0.164		0.47		0.749																	
Selenium	0.01	0.05 mg/L	ND		ND		ND	J	ND		ND		ND		ND		ND																	
Thallium	0.001	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND		ND																	

Notes:
MW-13 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
U = Target analyte was analyzed for, but was below detection limit
D1 = Sample required dilution due to high concentration of target analysis
D2 = Sample required dilution due to matrix interference
D = Results reported from dilution
M1 = Matrix spike recovery was high; the method control sample recovery was acceptable
M2 = Matrix spike recovery was low; the method control sample recovery was acceptable
M4 = The analysis of the spiked sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable.

GREEN SURFACE IMPOUNDMENT - CCR ANALYTICAL SUMMARY
MW-14

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																									
			4/1/2016		6/2/2016		8/16/2016		10/25/2016		1/27/2017		5/1/2017		8/11/2017		9/20/2017		10/9/2017		5/7/2018		9/27/2018		4/28/2019		4/29/2019		10/3/2019		4/8/2020		9/25/2020	
			Baseline Events																		Detection											
Boron	0.08	NA	0.196	JB	0.186	J	0.234	JB	0.209	J	0.250	JB	0.234	JB	0.277	JB	0.273	J	0.241	J	0.254		0.232	B	0.717		0.206		ND	D2, U	0.20		ND	D2, U
Calcium	0.5	NA	194		194	B	171		193		183		193	B	193		187		194	B	189		200		345		206		194	D1	195	D1	194	D2
Chloride	3	NA	161	B	184	B	185	B	193	B	191	B	185	B	212	B	230	B	199	B	198	B	189	B	1900		165		262	D	121	D	131	D
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND	JB	ND	JB	ND	J	ND		ND	J	0.227	J	0.342	J	0.3		0.3		0.3	
Sulfate	5	NA	188		219		216		215	B	221		197	B	179		198	J	185		222	B	231	B	949	B	222	B	871	D	183	D	221	D
pH (Field Measurement)	0.10	NA	6.63		6.35		7.43		7.34		7.78		5.23		7.33		7.13		7.32		7.26		6.57		7.11		7.05		6.77		6.57		6.75	
Total Dissolved Solids	10	NA	1080		1130		1140		1130		1150		1170		1150		1240		1170		1180		1100		4890	B	1180	B	1120	H2	1030		946	
APPENDIX IV CONSTIUENTS																																		
Antimony	0.002	0.006 mg/L	ND		ND	JB	ND	JB	ND		ND	JB	ND	JB	ND	JB	ND	JB																
Arsenic	0.005	0.01 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB																
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J																
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND																	
Cadmium	0.001	0.005 mg/L	ND		ND		ND		ND		ND		ND		ND		ND																	
Chromimum	0.003	0.1 mg/L	ND		ND		ND		ND		ND		ND		ND		ND	J																
Cobalt	0.005	0.006 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J																
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	JB	ND		ND	JB	ND	J	ND	JB	ND	J	ND		ND	J	0.227	J	0.342	J	0.3		0.3		0.3	
Lead	0.005	0.015 mg/L	ND		ND	JB	ND		ND		ND		ND		ND		ND	J																
Lithium	0.05	0.040 mg/L	0.0400	J	0.0488	J	0.0477	J	0.0456	J	0.0486	J	0.0437	J	0.0494	J	0.0496	J																
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND		ND																	
Molybdenum	0.01	0.1 mg/L	ND	J	ND	J	ND		ND		ND		ND		ND		ND																	
Radium 226 Radium 228	1	5 pCi/L	1.54		1.42		1.86		1.55		1.31		2.17		2.85		1.8																	
Selenium	0.01	0.05 mg/L	ND		ND		ND		ND		ND		ND		ND		ND																	
Thallium	0.001	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND		ND																	

Notes:
MW-14 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
U = Target analyte was analyzed for, but was below detection limit
D1 = Sample required dilution due to high concentration of target analysis
D2 = Sample required dilution due to matrix interference
D = Results reported from dilution
M1 = Matrix spike recovery was high; the method control sample recovery was acceptable
M2 = Matrix spike recovery was low; the method control sample recovery was acceptable
M4 = The analysis of the spiked sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable.

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-1

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE														
			3/26/2016	5/23/2016	8/18/2016	10/26/2016	2/1/2017	5/2/2017	8/7/2017	9/5/2017	10/5/2017	6/4/2018	7/10/2018	9/28/2018	4/22/2019	9/30/2019	4/6/2020	9/22/2020
			Baseline Events									Assessment	Re-Sampling	Assessment				
Boron	0.08	NA	1.67	1.49	2.25	1.70	1.71 J	1.68	1.85 B	1.79	1.92		1.41	1.94 B	1.73 B	1.68 D2 M4	1.69 D1, M3	1.66 D2, M4
Calcium	0.5	NA	29.1	31.8 B	33.0	30.9	20.8	28.1	27.1	29.9 B	26.4		26.5	28.5 B	32.1	29.1 D2	27.7 D1, M3	26.4 D2
Chloride	3	NA	9.03 JB	0.501 JB	6.60 B	6.02 B	5.56 B F1	5.30 B	5.12 B F1	5.71 B	4.07 F1 B		6.34 B	6.17 B	6.41 B F1	7.5	6.5	6.6
Fluoride	1	4 mg/L	ND J	ND JB	ND J	ND JB	ND J F1	ND JB	ND J F1	ND J	ND J F1	ND J	ND J	ND JB	0.521 J	0.6	0.5	0.6
Sulfate	5	NA	25.2	22.8 JB	22.9	20.7 B	28.4	24.0 B	25.3 B	23.4	24.9 JB		23.5	22.5 B	35.1 B F1	19	21	24
pH (SU)	0.10	NA	7.39	7.24	7.57	7.19	7.63	7.54	7.45	7.48	7.63		7.08	8.43	7.87	7.79 H3	7.22	6.88
Total Dissolved Solids	10	NA	598	588	585	585	605	630	614	627	636		585	616	568 B	444 H1	488	388
APPENDIX IV CONSTITUENTS																		
Antimony	0.002	0.006 mg/L	ND	ND J	ND B	ND	ND	ND JB	0.00297 B	ND JB		ND JB	ND J	NA	0.000254 JB	ND M1 V1 U	ND U	ND U
Arsenic	0.005	0.01 mg/L	ND J	ND J	ND J	ND J	ND J	ND J	ND J F1	ND JB		ND JB	ND J	ND JB	0.00167 JB	0.0005 V1 J	0.0019	ND U
Barium	0.2	2 mg/L	ND J	ND J	ND J	ND J	ND J	ND J	ND J F1	ND J		ND JB	ND J	ND J	0.0862 J	0.091 D2	0.087	0.077
Beryllium	0.002	0.004 mg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	NA	0.000533 J	ND D2 U	ND U	ND U
Cadmium	0.001	0.005 mg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	NA	0.000299 J	ND VI U	ND U	ND U
Chromium	0.003	0.1 mg/L	ND	ND J	ND	ND	ND	ND	ND	ND J		ND JB	ND	NA	0.00354 B	ND U	0.0011 J	ND U
Cobalt	0.005	0.006 mg/L	ND J	ND J	ND J	ND J	ND J	ND J	ND J	ND J		ND JB	ND J	NA	0.000571 J	ND U	ND U	ND U
Fluoride	1	4 mg/L	ND J	ND J	ND J	ND JB	ND J F1	ND JB	ND J F1	ND J	ND J F1	ND J	ND J	ND JB	0.521 J	0.6	0.5	0.6
Lead	0.005	0.015 mg/L	ND J	ND J	ND J	ND	ND	ND	ND	ND J		ND	ND J	NA	0.000279 J	ND V1 U	ND U	ND U
Lithium	0.05	0.040 mg/L	0.0293 J	0.0317 J	0.0326 J	0.0286 J	0.0342 J	0.0396 J	0.0314 J	0.0315 J		0.0319 J	0.0298 J	0.0279 J	0.0295 J	ND D2 M3 U	0.03	ND M1, U
Mercury	0.0002	0.002 mg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND V1 U	ND U	ND U
Molybdenum	0.01	0.1 mg/L	ND	ND J	ND J	ND J	ND J	ND J	ND J	ND		ND J	ND J	NA	0.00105 J	ND U	ND U	ND U
Radium 226	1	5 pCi/L	1.05	1.02	0.676	1.02	0.694	0.666	0.491	0.601		1.92	0.882	0.905	0.689	0.782	0.808	0.564
Radium 228																0.733		
Selenium	0.01	0.05 mg/L	ND	ND	ND	ND	ND	ND	ND J	ND		ND	ND	NA	0.00105 J	ND U	ND U	ND U
Thallium	0.001	0.002 mg/L	ND	ND J	ND	ND J	ND	ND	ND J	ND		ND	ND	NA	0.000498 J	0.0001 V1 J	0.0001 J	0.0001 J

Notes:
MW-1 - Upgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-2

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE															
			3/26/2016	5/23/2016	8/18/2016	11/14/2016	2/1/2017	5/2/2017	8/8/2017	9/7/2017	10/6/2017	6/5/2018	7/11/2018	9/28/2018	4/23/2019	10/1/2019	4/7/2020	9/22/2020
			Baseline Events									Assessment	Re-Sampling	Assessment				
Boron	0.08	NA	ND J	ND J	ND J	ND J	ND JB	ND J	0.113 JB	ND JB	ND J		ND J	0.0630 JB	0.101 JB	ND D2 U	ND U	ND U
Calcium	0.5	NA	119	116 B	140	140 B	126	152	154	121	150		155	165 B	156	166 D1	145 D1	157 D1
Chloride	3	NA	126 B	125 B	129 B	133	142 B	129 B	145 B	136 B	129 B		154 B	159 B	144	108 D	120 D	231 D
Fluoride	1	4 mg/L	ND J	ND	ND J	ND JB F1	ND J	ND JB	ND JB	ND JB F1	ND J	ND J	ND J	ND JB	0.193 J	0.3	0.2	0.3
Sulfate	5	NA	80.0	84.5 J	85.5 J	90.1	89.8	83.2	92.0 JB	90.8	88.6 JB		107	108 B	105	79.0 D	85 D	117 D
pH (SU)	0.10	NA	6.81	6.59	6.7	6.78	7.12	7.04	6.77	6.69	6.86	6.64	6.40	7.02	7.15	7.39 H3	6.92	6.22
Total Dissolved Solids	10	NA	764	780	830	880	862	918	913	818	970		884	937	918 B	930 H1	806	914
APPENDIX IV CONSTITUENTS																		
Antimony	0.002	0.006 mg/L	ND	ND J	ND JB	ND JB	ND	ND JB	ND B	ND JB		ND JB	ND J	NA	0.0000670 JB	ND V1 U	ND U	ND U
Arsenic	0.005	0.01 mg/L	0.00703 J	0.00633	0.0110	0.0159	0.0462	0.00755	0.0381	0.00527		0.0327 B	0.0119	0.0211 B	0.00738 B	0.0129 D2	0.0033	0.0095
Barium	0.2	2 mg/L	ND J	ND J	0.280	0.319	0.347	0.332	0.308	ND J		0.369	0.323	0.367	0.362	0.380 D2	0.238	0.336
Beryllium	0.002	0.004 mg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	NA	0.000281 J	ND D2 U	ND U	ND U
Cadmium	0.001	0.005 mg/L	ND J	ND	ND	ND	ND	ND	ND	ND		ND	ND	NA	ND	ND V1 U	ND U	ND U
Chromium	0.003	0.1 mg/L	ND	ND J	ND	ND	ND	ND	ND	ND		ND JB	ND	NA	0.00122 JB	ND D2 U	ND U	ND U
Cobalt	0.005	0.006 mg/L	ND J	ND J	ND J	ND J	ND J	ND J	ND JB	ND J		ND JB	ND J	NA	0.00382 J	ND D2 U	ND U	ND U
Fluoride	1	4 mg/L	ND J	ND	ND J	ND JB F1	ND J	ND JB	ND JB	ND JB F1	ND J	ND J	ND J	ND JB	0.193 J	0.3	0.2	0.3
Lead	0.005	0.015 mg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND J	NA	ND	ND V1 U	ND U	ND U
Lithium	0.05	0.040 mg/L	ND J	ND	ND	ND	ND J	ND J	ND JB	ND		ND	ND	ND	ND	ND D2 VI U	0.007 J	0.006 V1, J
Mercury	0.0002	0.002 mg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND V1 U	ND U	ND U
Molybdenum	0.01	0.1 mg/L	ND J	ND J	ND J	ND J	ND J	ND J	ND JB	ND JB		ND J	ND J	NA	0.00210 J	0.003 J	0.002 J	0.002 J
Radium 226	1	5 pCi/L	0.533	ND	0.46	ND	0.856	0.73	0.968	0.537		1.18	0.733	0.803	0.391	0.136	0.529	0.493
Radium 228																0.834		
Selenium	0.01	0.05 mg/L	ND	ND	ND	ND JB	ND	ND	ND JB	ND		ND	ND	NA	ND	ND U	ND U	ND U
Thallium	0.001	0.002 mg/L	ND	ND J	ND	ND	ND	ND	ND	ND		ND	ND	NA	0.0000800 J	ND V1 U	ND U	ND U

Notes:
MW-2 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-3A

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE															
			3/26/2016	5/23/2016	8/18/2016	11/14/2016	2/1/2017	5/2/2017	8/8/2017	9/6/2017	10/6/2017	6/5/2018	7/11/2018	9/28/2018	4/23/2019	10/1/2019	4/7/2020	9/22/2020
			Baseline Events									Assessment	Re-Sampling	Assessment				
Boron	0.08	NA	0.145	0.135 J	0.279 J	0.213 J	0.235 JB	0.232 J	0.304 JB	0.376 J	0.313		0.177 J	0.257 JB	0.259 JB	ND D2 U	0.26	0.28
Calcium	0.5	NA	431	322 B	362	365 B	327	420	421	438 B	408		469	447 B	411	490 D1	425 D1	423 D1
Chloride	3	NA	2630 HB	3070	2150 B	2150 B	2220 B	2120 B	1790 B	2270 B	1870 B		2180 B	2040 B	1850	4570 D	3220 D	1200 D
Fluoride	1	4 mg/L	ND J	ND J	ND J	ND JB	ND J	ND JB	ND	3.16	ND J	ND J	ND J	ND JB	0.387 J	0.4	0.5	0.4
Sulfate	5	NA	1330	1330	1190	1660	1080	1030 B	942	1130	1030 B		1010	1130 B	1080	1680 D	1840 D	1830 D
pH (SU)	0.10	NA	6.92	6.86	6.95	6.75	7.17	7.11	6.81	6.9	6.95	6.84	6.55	7.98	7.23	7.33 H3	6.86	6.61
Total Dissolved Solids	10	NA	4440	5010	4170	4450	4270	5170	5010	5020	5300		4540	4940	4250 B	6900 H1	5860	5680
APPENDIX IV CONSTITUENTS																		
Antimony	0.002	0.006 mg/L	ND	ND J	ND JB	ND JB	ND	ND JB	ND JB	ND JB		ND JB	ND	NA	0.000102 JB	ND V1 U	ND U	ND U
Arsenic	0.005	0.01 mg/L	ND	ND J	ND J	ND J	ND J	ND J	ND J	ND JB		ND JB	ND J	ND JB	0.000575 JB	ND D2 U	ND U	ND U
Barium	0.2	2 mg/L	ND J	ND J	ND J	ND J	ND J	ND J	ND J	ND J		ND J	ND J	ND J	0.0474 J	0.051 D2 U	0.042	0.043
Beryllium	0.002	0.004 mg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	NA	0.000199 J	ND D2 U	ND U	ND U
Cadmium	0.001	0.005 mg/L	ND J	ND J	ND	ND	ND J	ND J	ND	ND		ND J	ND J	NA	0.000164 J	ND V1 U	0.0001 J	ND U
Chromium	0.003	0.1 mg/L	ND	ND J	ND	ND	ND	ND	ND	ND J		ND JB	ND	NA	0.00168 JB	ND D2 U	ND U	0.0006 J
Cobalt	0.005	0.006 mg/L	ND	ND J	ND J	ND J	ND J	ND J	ND J	ND J		ND JB	ND J	NA	0.000243 J	0.008	ND U	0.004
Fluoride	1	4 mg/L	ND J	ND J	ND J	ND JB	ND J	ND JB	ND	3.16	ND J	ND J	ND J	ND JB	0.387 J	0.4	0.5	0.4
Lead	0.005	0.015 mg/L	ND J	ND	ND	ND	ND	ND	ND J	ND J		ND	ND J	NA	0.000137 J	ND V1 U	ND U	ND U
Lithium	0.05	0.040 mg/L	0.669	0.516	0.648	0.677	0.689	0.746	0.767	0.762		0.699	0.790	0.766	0.678	0.79 D1	0.68	0.8 D2
Mercury	0.0002	0.002 mg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND V1 U	ND U	ND U
Molybdenum	0.01	0.1 mg/L	ND	ND J	ND	ND	ND	ND	ND	ND		ND	ND	NA	ND	ND D2 U	ND U	ND U
Radium 226	1	5 pCi/L	1.38	0.386	0.472	1.15	1.15	0.923	1.53	1.03		1.18	1.43	1.21	0.641	0.139	1.06	1.51
Radium 228																0.734		
Selenium	0.01	0.05 mg/L	ND	ND	ND J	ND JB	ND	ND	ND	ND		ND J	ND	NA	0.00103 J	ND D2 U	ND U	ND U
Thallium	0.001	0.002 mg/L	ND	ND J	ND	ND	ND	ND	ND	ND J		ND	ND	NA	0.000860 J	ND V1 U	ND U	ND U

Notes:
MW-3A - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
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pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-4

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																					
			3/29/2016		5/23/2016		8/18/2016		10/26/2016		2/1/2017		5/2/2017		8/8/2017		9/7/2017		10/6/2017		6/5/2018		7/11/2018		9/28/2018		4/22/2019		10/1/2019		4/7/2020		9/22/2020	
			Baseline Events																		Assessment		Re-Sampling		Assessment							
Boron	0.08	NA	0.602		0.498	J	1.58		1.7		1.54	B	2.09		2.51	B	2.87	B	1.36				0.751	J	1.33	B	1.25	B	1.75	D2	0.83		1.70	D2
Calcium	0.5	NA	660		386	B	464		558		591		774		743		739		828				822		722	B	730		690	D1	464	D1	823	D1
Chloride	3	NA	1450	B	939	B	952	B	1000	B	1420	B	1320	B	1360	B	1880	B	1730	B			1430	B	1310	B	1510		1910	D	1560	D	2030	D
Fluoride	1	4 mg/L	ND	J	ND		ND	J	ND	JB	ND	J	1.06	B	ND		ND	JB	ND	J	ND	J	ND	J	ND	JB	0.102	J	0.2		0.2		0.2	
Sulfate	5	NA	1830		1640		1420		1420	B	1620		1430	B	1600	B	2020		1590	B			1460		1400	B	1440		2490	D	4000	D	2080	D
pH (SU)	0.10	NA	6.36		6.83		7.08		6.61		7.28		7.1		6.84		6.64		6.93		6.86		6.58		8.06		7.26		7.36	H3	6.70		6.64	
Total Dissolved Solids	10	NA	3700		4250		3440		3250		4420		4550		4890		4700	H	6220				4880		5170		4840	B	4820	H1	5120		4470	
APPENDIX IV CONSTITUENTS																																		
Antimony	0.002	0.006 mg/L	ND		ND	J	ND	JB	ND		ND		ND	JB	ND	JB	ND	JB			ND	JB	ND		NA		0.0000360	JB	ND	V1 U	ND	U	ND	U
Arsenic	0.005	0.01 mg/L	ND		ND	J	ND	J	ND		ND	J	ND	J	ND	J	ND	JB			ND	JB	ND	J	ND	JB	0.000445	JB	ND	D2 U	ND	U	ND	U
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	J	ND	J	ND	JB			ND	J	ND	J	ND	J	0.0308	JB	0.029	D2 J	0.022		0.031	
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	D2 U	ND	U	ND	D2, U
Cadmium	0.001	0.005 mg/L	ND	J	ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	V1 U	ND	U	ND	U
Chromium	0.003	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND	JB	ND		NA		0.00110	JB	ND	D2 U	0.0008	J	ND	U
Cobalt	0.005	0.006 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND	JB	ND	J	NA		0.000415	J	ND	U	ND	U	ND	U
Fluoride	1	4 mg/L	ND		ND		ND	J	ND	JB	ND	J	ND	B	ND		ND	JB	ND	J	ND	J	ND	J	ND	JB	0.102	J	0.2		0.2		0.2	
Lead	0.005	0.015 mg/L	ND	J	ND	J	ND		ND		ND		ND		ND		ND				ND		ND	J	NA		ND		ND	V1 U	ND	U	ND	U
Lithium	0.05	0.040 mg/L	1.39		0.838		1.13		1.25		1.35		1.59		1.77		1.66				1.81		1.91		1.81		1.73		ND	D2 V1 U	0.82		1.73	D2
Mercury	0.0002	0.002 mg/L	0.00027		0.000224		ND	J	0.000248		0.000302		0.000717		0.000825		0.000485				0.000824		0.000832		0.000680		0.000825		0.0004	V1 J	0.0003	J	0.0003	J
Molybdenum	0.01	0.1 mg/L	ND	J	ND	J	ND		ND		ND	J	ND		ND		ND				ND		ND		NA		ND		ND	D2 U	0.002	J	ND	U
Radium 226	1	5 pCi/L	1.26		0.592		ND		0.536		1.22		1.43		1.94		1.19				1.62		2.00		1.51		1.66		0.451		1.26		0.877	
Radium 228																													0.804					
Selenium	0.01	0.05 mg/L	ND	J	ND	J	ND	J	ND		ND	J	ND		ND		ND	J			ND	J	ND		NA		0.00211	J	ND	U	0.023		ND	U
Thallium	0.001	0.002 mg/L	ND		ND		ND		ND	J	ND		ND		ND		ND				ND		ND		NA		0.0000410	J	ND	V1 U	ND	U	ND	U

Notes:
MW-4 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
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J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
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H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	3/29/2016	5/23/2016	8/18/2016	10/26/2016	2/1/2017	5/2/2017	8/7/2017	9/7/2017	10/6/2017	6/5/2018	7/11/2018	9/28/2018	4/22/2019	9/30/2019	4/7/2020	9/22/2020
			Baseline Events									Assessment	Re-Sampling	Assessment				
Boron	0.08	NA	0.217	0.0896 J	0.216 J	0.214 J	0.222 JB	0.241 J	0.257 JB	0.276 B	0.262		0.207 J	0.263 JB	0.271 JB	ND D2 U	0.25	0.24
Calcium	0.5	NA	452	189 B	374	399	335	464	423	407 B	383		469	441 B	446	476 D1	464 D1	495 D1
Chloride	3	NA	1630 B	521	688 B	755 B	734 B	722 B	945 B	779 B	608 B		941 B	1140 B	931	1500 D	1860 D	1800 D
Fluoride	1	4 mg/L	ND J	ND	ND J	ND	ND J	ND JB	ND	3.69	ND J	ND J	ND J	ND JB	0.128 J	0.2	0.2	0.2
Sulfate	5	NA	1760 HB	876	1780	1740 B	1880	1760 B	2060 B	1920	1600 B		1800	1890 B	1800	2990 D	3720 D	973 D
pH (SU)	0.10	NA	6.76	6.74	6.99	6.61	7.14	7.44	6.87	7.13	7.06	6.88	6.40	7.99	7.15	7.41 H3	6.77	6.52
Total Dissolved Solids	10	NA	4210	1660	3470	3610	3680	4250	4130	4120	4390		4100	4540	4360 B	5320 H1	4960	5170
APPENDIX IV CONSTITUENTS																		
Antimony	0.002	0.006 mg/L	ND	ND J	ND JB	ND	ND	ND JB	ND JB	ND JB		ND JB	ND	NA	0.0000700 JB	ND V1 U	ND U	ND U
Arsenic	0.005	0.01 mg/L	ND	ND J	ND JB	ND J	ND J	ND J	ND J	ND JB		ND JB	ND J	ND JB	0.000424 JB	ND D2 U	ND U	ND U
Barium	0.2	2 mg/L	ND J	ND J	ND J	ND J	ND J	ND J	ND J	ND J		ND J	ND J	ND J	0.0167 J	0.016 D2 J	0.014	0.014
Beryllium	0.002	0.004 mg/L	ND	ND	ND J	ND	ND	ND	ND	ND		ND	ND	NA	ND	ND D2 U	ND U	ND D2,U
Cadmium	0.001	0.005 mg/L	ND J	ND	ND	ND	ND	ND	ND	ND		ND	ND	NA	ND	ND V1 U	ND U	ND U
Chromium	0.003	0.1 mg/L	ND	ND J	ND	ND	ND J	ND J	ND	ND J		0.00363 B	ND	NA	0.00159 JB	0.0033	ND U	0.0008 J
Cobalt	0.005	0.006 mg/L	ND	ND J	ND J	ND J	ND	ND J	ND	ND J		ND JB	ND J	NA	0.000288 J	ND U	ND U	ND U
Fluoride	1	4 mg/L	ND J	ND	ND J	ND	ND J	ND	ND	3.69	ND J	ND J	ND J	ND JB	0.128 J	0.2	0.2	0.2
Lead	0.005	0.015 mg/L	ND J	ND J	ND	ND	ND	ND	ND	ND		ND J	ND J	NA	0.0000860 J	ND V1 U	ND U	ND U
Lithium	0.05	0.040 mg/L	0.521	0.136	0.305	0.325	0.368	0.415	0.405	0.353		0.459	0.481	0.425	0.434	0.40 D1	0.38	0.42 D2
Mercury	0.0002	0.002 mg/L	ND	ND	ND	ND	ND	ND	0.00351	ND		ND	ND	ND	ND	ND V1 U	ND U	ND U
Molybdenum	0.01	0.1 mg/L	ND	ND J	ND	ND	ND	ND	ND	ND		ND	ND	NA	ND	ND D2 U	ND U	ND U
Radium 226	1	5 pCi/L	1.16	0.736	0.959	0.957	0.765	0.888	1.54	0.773		0.862	1.42	1.37	0.945	0.368	1.48	1.68
Radium 228																0.730		
Selenium	0.01	0.05 mg/L	ND	ND	ND	ND	ND J	ND J	ND	ND		ND J	ND	NA	0.000624 J	ND U	ND U	ND U
Thallium	0.001	0.002 mg/L	ND	ND	ND J	ND J	ND	ND J	ND	ND J		ND J	ND	NA	0.0000890 J	ND V1 U	ND U	ND U

Notes:
MW-5 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
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D1 = Sample required dilution due to high concentration of target analyte
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H1 = Sample analysis performed pasts holding time
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M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-6

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																											
			3/29/2016		5/23/2016		8/18/2016		10/26/2016		2/1/2017		5/2/2017		8/7/2017		9/5/2017		10/5/2017		6/4/2018		7/10/2018		9/28/2018		4/22/2019		9/30/2019		4/6/2020		9/22/2020	
			Baseline Events																		Assessment		Re-Sampling		Assessment							
Boron	0.08	NA	0.156		0.137	J	0.193	J	0.168	J	0.173	B	0.179	J	0.167	JB	0.199	J	0.178				0.155	J	0.196	JB	0.194	JB	ND	D2 U	0.19		0.19	
Calcium	0.5	NA	467		374	B	373		400		320		415		365		382	B	376				386		356	B	421		431	D1	458	D1	417	D1
Chloride	3	NA	167	B	149	B	136	JB	150	B	125	B	129	B	128	B	123	B	138	B			147	B	142	B	142		230	D	181	D	286	D
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND		ND	J	ND	J	ND	J	ND	J	ND	JB	0.409	J	0.5		0.4		0.5	
Sulfate	5	NA	2250	HB	3340		2550		2610	B	2700		2600	B	2820	B	2490		2700	B			2120		2420		2200		3830	D	4650	D	2380	D, H2
pH (SU)	0.10	NA	6.66		6.65		6.96		6.6		6.92		6.97		6.76		6.95		6.86				6.50		7.94		6.86		7.15	H3	6.36		6.32	
Total Dissolved Solids	10	NA	4060		4280		4350		4470		4720		4700		4830		4890		4910				4500		4820		4780	B	4830	H1	4610		4740	
APPENDIX IV CONSTITUENTS																																		
Antimony	0.002	0.006 mg/L	ND		ND	J	ND	JB	ND		ND		ND	JB	ND	JB	ND	JB			ND	JB	ND		NA		0.0000920	JB	ND	V1 U	ND	U	ND	U
Arsenic	0.005	0.01 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	JB			ND	JB	ND	J	ND	JB	0.000722	JB	ND	V1 U	ND	U	ND	U
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			ND	J	ND	J	ND	J	0.0128	J	0.010	D2 J	0.011		0.011	
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	D2 U	ND	U	ND	V1, U
Cadmium	0.001	0.005 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	V1 U	0.0001	J	ND	U
Chromium	0.003	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND	J			ND	JB	ND		NA		0.00196	JB	ND	U	ND	U	0.0006	J
Cobalt	0.005	0.006 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			ND	JB	ND	J	NA		0.000276	J	ND	U	ND	U	ND	U
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND		ND	J	ND	J	ND	J	ND	J	ND	JB	0.409	J	0.5		0.4		0.5	
Lead	0.005	0.015 mg/L	ND	J	ND	J	ND		ND		ND		ND		ND		ND				ND		ND	J	NA		ND		ND	V1 U	ND	U	ND	U
Lithium	0.05	0.040 mg/L	0.0475	J	0.0527		0.0555		0.0524		0.0607		0.0724		0.0589		0.0554				0.0650		0.0592		0.0558		0.0633		0.05	D2 V1 J	0.05		0.05	D2, J
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		ND		ND		ND	V1 U	ND	U	ND	U
Molybdenum	0.01	0.1 mg/L	ND	J	ND	J	ND	J	ND	B	ND	J	ND	J	ND	J	ND	J			ND	J	ND	J	NA		0.000972	J	ND	D2 U	ND	U	ND	U
Radium 226	1	5 pCi/L	0.741		0.386		ND		0.751		ND		ND		0.462		ND				0.392		0.532		ND	U	0.450		0.548		0.744		0.380	
Radium 228																													0.698					
Selenium	0.01	0.05 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND	J	ND		NA		0.00110	J	ND	U	ND	U	ND	U
Thallium	0.001	0.002 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND		ND		NA		0.0000610	J	ND	V1 U	ND	U	ND	U

Notes:
MW-6 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
H1 = Sample analysis performed pasts holding time
H2 = Initial analysis within holding time. Reanalysis was past holding time
H3 = Sample received and analyzed past holding time
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

REID/HMPL SURFACE IMPOUNDMENT - ANATLYCIAL SUMMARY
MW-7

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																									
			3/30/2016		5/31/2016		8/23/2016		10/18/2016		1/31/2017		5/11/2017		8/23/2017		9/22/2017		10/11/2017		4/6/2018		6/29/2018		9/26/2018		5/2/2019		10/16/2019		4/16/2020		9/24/2020	
			Baseline Events																		Assessment		Re-Sample						Assessment					
Boron	0.08	NA	0.246		0.245	J	0.271	J	0.250	J	0.33	J	0.295	J	0.286	JB	0.268	J	0.320	J			0.249	J	0.299	J	0.309	JB	ND	D2, M4, U	0.34	M4	0.33	M2, M4
Calcium	0.5	NA	41.1		42.1	B	42.3		47.6		41.5	B	41.1		45.1		40.6		41.8	B			46.6		41.6	B	46.1		44.4	D2	45.7	D2, M2	41.8	D2, M1, M2
Chloride	3	NA	2.48	JB	2.52	J	2.93	JB F1	3.26	B F1	4.02	B	5.73	B	4.99	F1 B	5.28	F1 B	3.65	B			6.88	B F1	5.38	B	4.94		4.7		4.1		3.3	
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J F1	ND	J F1	ND	JB	ND	J	ND	J F1	ND	J F1	ND	J	ND	J	ND	J	ND	J	0.255	J	0.3		0.3		0.3	
Sulfate	5	NA	12.8		13.2		15.9		18.8		23.6	B	25.7		22.3	B	16.6	B	14.2	F1			23.4		18.7	B	16.8	B	19		15		12	
pH (Field Measurement)	0.10	NA	7.39		7.47		7.6		7.16		7.74		7.26		7.23		7.36		7.36		7.01		7.17		6.94		7.46		7.07		6.86		6.56	
Total Dissolved Solids	10	NA	233		243		243		250		253		291		290		267		278				295		263		271		228		148		114	
APPENDIX IV CONSTIUENTS																																		
Antimony	0.002	0.006 mg/L	ND		ND	JB	ND	JB	ND	J	ND		ND		ND	JB	ND	JB			ND	JB	ND	JB	NA		0.0000760	JB	ND	U	ND	U	ND	M2, U
Arsenic	0.005	0.01 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			ND	JB	ND	JB	NA		0.00116	J	0.0014		0.0025		0.0015	M2
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			ND	J	ND	J	ND	J	0.0824	J	0.062		0.087		0.075	M3
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		NA		NA		ND		ND	U	ND	V1, U	ND	U
Cadmium	0.001	0.005 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		NA		NA		ND		ND	U	ND	U	ND	M2, U
Chromium	0.003	0.1 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND	JB	ND	JB	NA		0.00136	J	ND	U	ND	U	ND	M2, U
Cobalt	0.005	0.006 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	J			ND	J	ND	J	NA		0.000158	J	ND	U	ND	U	ND	M2, U
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J F1	ND	J F1	ND	JB	ND	J	ND	J F1	ND	J F1	ND	J	ND	J	ND	J	ND	J	0.255	J	0.3		0.3		0.3	
Lead	0.005	0.015 mg/L	ND	J	ND	JB	ND		ND	J	ND		ND		ND		ND				ND		ND		NA		0.0000730	J	ND	U	ND	U	ND	M2, U
Lithium	0.05	0.040 mg/L	ND	J	ND		ND		ND		ND	J	ND		ND		ND				ND		ND		ND		ND		0.008	J	0.007	V1, J	0.008	J
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		0.000135		ND				ND		NA		NA		ND		ND	U	ND	U	ND	M2, U
Molybdenum	0.01	0.1 mg/L	0.0109		0.0185		0.0136		0.0118		0.0127		ND	J	ND	J	ND	J			ND	J	ND	J	ND	J	0.00442	J	0.01		0.006	J	0.006	M2, J
Radium 226	1	5 pCi/L	0.865		0.685		0.473		ND		0.921		0.662		0.795		0.642				0.650		1.15		0.730		0.698		0.652		1.83		0.968	
Radium 228																													-0.208					
Selenium	0.01	0.05 mg/L	ND		ND		ND		ND	J	ND		ND		ND		ND				ND		NA		NA		ND		ND	U	ND	U	ND	M2, U
Thallium	0.001	0.002 mg/L	ND		ND	J	ND	J	ND		ND		ND		ND		ND				ND		NA		NA		ND		ND	U	ND	U	ND	M2, U

Notes:
MW-7 - Upgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
M1 = Matrix spike recovery was high; the method control sample recovery was acceptable
M2 = Matrix spike recovery was low; the method control sample recovery was acceptable
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

REID/HMPL SURFACE IMPOUNDMENT - ANATLYCIAL SUMMARY
MW-8

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																									
			3/30/2016		5/31/2016		8/23/2016		10/18/2016		1/31/2017		5/11/2017		8/23/2017		9/22/2017		10/11/2017		5/2/2018		4/6/2018		6/29/2018		9/26/2018		5/2/2019		10/17/2019		4/16/2020		9/24/2020	
			Baseline Events																				Assessment		Re-Sample		Assessment							
Boron	0.08	NA	1.46		1.07		1.3		1.00		1.74		1.60	B	1.37	B	1.32		1.54		0.309	JB			1.32		1.46		1.41	B	1.49	D2	1.56	D1	1.41	D2
Calcium	0.5	NA	283		242	B	228		194		235	B	251		253		228		235	B	46.1				253		254	B	272		267	D1	292	D1	257	D1
Chloride	3	NA	48.7		38.2	J	41.4	B	66.4	JB	42.1	B	43.6	B	47.1	B	58.5	JB	38.6	B	4.94				42.0	B	46.3	B	57.2		49.5		47.3		49.2	
Fluoride	1	4 mg/L	ND	J	ND	J F1	ND	J	ND	J	ND	JB	ND	J	ND	J	ND	J	ND	J	0.255	J	ND	J	ND	J	ND	J	0.370	J	0.4		0.4		0.4	
Sulfate	5	NA	1100	HB	1140		1120		1080		1220	B	1180	B	1110		1440	B	1040		16.8	B			1050		1180	B	1220	B	1240	D	1130	D	1400	D
pH (Field Measurement)	0.10	NA	7.13		7.14		7.37		7.06		7.50		7.10		7.11		7.10		7.15		7.46		6.97		7.09		6.93		7..25		7.04		6.78		6.58	
Total Dissolved Solids	10	NA	1930		1980		1960		2030		2010		1990		2090		2030		2100		271				2060		1990		2090		2200		1930		1940	
APPENDIX IV CONSTIUENTS																																				
Antimony	0.002	0.006 mg/L	ND		ND	JB	ND	JB	ND	J	ND		ND	JB	ND	JB	ND	JB			0.0000760	B	ND	JB	ND	JB	NA		0.000205	JB	ND	U	ND	U	ND	U
Arsenic	0.005	0.01 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND		ND	J			0.00116	J	ND	JB	ND	JB	NA		0.000438	J	ND	U	ND	U	ND	U
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			0.0824	J	ND	J	ND	J	ND	J	0.0188	J	0.016		0.017		0.016	
Beryllium	0.002	0.004 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	V1, U	ND	U
Cadmium	0.001	0.005 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	U	ND	U
Chromium	0.003	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				0.00136	J	ND	JB	ND	JB	NA		0.00320		ND	U	ND	U	ND	U
Cobalt	0.005	0.006 mg/L	ND		ND	J	ND	J	ND	J	ND		ND	J	ND		ND				0.000158	J	ND	J	ND	J	NA		0.000141	J	ND	U	ND	U	ND	U
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	J	ND	J	ND	J	0.255	J	ND	J	ND	J	ND	J	0.370	J	0.4		0.4		0.4	
Lead	0.005	0.015 mg/L	ND		ND		ND		ND	J	ND		ND		ND		ND				0.0000730	J	ND		ND		NA		0.000104	J	ND	U	ND	U	ND	U
Lithium	0.05	0.040 mg/L	0.0314	J	0.035	J	0.0314	J	0.0324	J	0.0408	J	0.0377	J	0.0367	J	0.0375	J			ND		0.0347	J	0.0368	J	0.0375	J	0.0370	J	0.03		0.03		0.03	
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND	JB	ND				ND		ND		NA		NA		ND		ND	U	ND	U	ND	U
Molybdenum	0.01	0.1 mg/L	0.0138	J	0.0186		0.0157		0.0147		0.0173		0.0158		0.0175		0.0139				0.00442	J	0.0147		0.0140		0.0149		0.0146		0.01		0.01		0.01	
Radium 226	1	5 pCi/L	1.98		1.32		1.36		1.36		1.92		1.12		1.48		1.4				0.698		1.29		1.6		1.46		1.43		0.914		1.93		0.366	
Radium 228																															1.59					
Selenium	0.01	0.05 mg/L	ND		ND		ND		ND	J	ND		ND		ND		ND	J			ND		ND		NA		NA		0.000634	J	ND	U	ND	U	ND	U
Thallium	0.001	0.002 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		0.0000470	J	ND	U	ND	U	ND	U

Notes:
MW-8 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
M1 = Matrix spike recovery was high; the method control sample recovery was acceptable
M2 = Matrix spike recovery was low; the method control sample recovery was acceptable
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

REID/HMPL SURFACE IMPOUNDMENT - ANATLYCIAL SUMMARY
MW-9

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																											
			3/30/2016		5/31/2016		8/23/2016		10/18/2016		1/31/2017		5/11/2017		8/23/2017		9/22/2017		10/11/2017		5/2/2018		4/6/2018		6/29/2018		9/26/2018		5/2/2019		10/17/2019		4/16/2020		9/24/2020	
			Baseline Events																				Assessment		Re-Sample		Assessment							
Boron	0.08	NA	0.316		0.264	J	0.333	J	0.257	J	0.431	J	0.362	JB	0.101	JB	0.0844	J	0.0816	J	0.309	JB			0.239	J	0.0857	J	0.307	JB	ND	D2, U	0.32		0.22	
Calcium	0.5	NA	64.1		71.2	B	71.5		72.3		75.0	B	72.9		60.8		57.6		57.0	B	46.1				68.6		60.3	B	68.6		66.8	D2	71.2	D2	65.3	D2
Chloride	3	NA	26.5	B	30.9		36.6	B	32.6	B	42.4	B	38.0	B	6.40	B	7.14	B	5.83	B	4.94				31.2	B	6.93	B	21.8		17.6		22.8		19.9	
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	J	ND	J	ND	J	0.255	J	ND	JB	ND	J	ND	J	0.223	J	0.2		0.3		0.3	
Sulfate	5	NA	9.51		17.6		27.7		39.6		57.2	B	30.4		ND	J	ND	JB	ND	J	16.8	B			ND	J	0.481	JB	0.223	JB	ND	U	ND	U	ND	U
pH (Field Measurement)	0.10	NA	7.32		7.27		7.55		7.13		7.64		7.31		7.04		7.04		7.04		7.46		7.13		7.00		6.69				7.22		7.04		6.67	
Total Dissolved Solids	10	NA	363		389		403		409		465		435		303		308		316		271				399		293				392		320		308	
APPENDIX IV CONSTIUENTS																																				
Antimony	0.002	0.006 mg/L	ND		ND	JB	ND	JB	ND	J	ND		ND	JB	ND	JB	ND	JB			0.0000760	B	ND	JB	ND	JB	NA		0.000192	JB	ND	U	ND	U	ND	U
Arsenic	0.005	0.01 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND				0.00116	J	ND	JB	ND	JB	NA		0.000563	J	ND	U	ND		ND	U
Barium	0.2	2 mg/L	1.1		1.03		0.889		0.635		0.827		0.833		0.253		0.227				0.0824	J	0.967		0.777		0.288		1.03		0.763		1.06	D1	0.730	
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	V1, U	ND	U
Cadmium	0.001	0.005 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	U	ND	U
Chromium	0.003	0.1 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				0.00136	J	ND	JB	ND	JB	NA		0.00316		ND	U	ND	U	ND	U
Cobalt	0.005	0.006 mg/L	ND		ND	J	ND	J	ND	J	ND		ND		ND		ND				0.000158	J	ND	JB	ND	J	NA		0.0000550	J	ND	U	ND	U	ND	U
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	J	ND	J	ND	J	0.255	J	ND	JB	ND	J	ND	J	0.223	J	0.2		0.3		0.3	
Lead	0.005	0.015 mg/L	ND		ND	JB	ND		ND	J	ND		ND		ND		ND				0.0000730	J	ND		ND		NA		0.0000760	J	ND	U	ND	U	ND	U
Lithium	0.05	0.040 mg/L	0.0120	J	0.0105	J	0.0102	J	0.0119	J	0.0179	J	0.0136	J	ND		ND				ND		0.0108	JB	0.0112	J	ND		0.0141	J	0.009	J	0.01	V1, J	0.009	J
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND	JB	ND	J			ND		ND		NA		NA		ND		ND	U	ND	U	ND	U
Molybdenum	0.01	0.1 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				0.00442	J	ND		ND		ND		ND		ND	U	ND	J	ND	U
Radium 226	1	5 pCi/L	2.87		2.84		2.91		1.38		2.11		2.53		1.28		1.26				0.698		2.04		1.93		1.23		2.32		1.09		2.90		3.44	
Radium 228																															1.23					
Selenium	0.01	0.05 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	U	ND	U
Thallium	0.001	0.002 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	U	ND	U

Notes:
MW-9 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
M1 = Matrix spike recovery was high; the method control sample recovery was acceptable
M2 = Matrix spike recovery was low; the method control sample recovery was acceptable
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

REID/HMPL SURFACE IMPOUNDMENT - ANATLYCIAL SUMMARY
MW-10

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																															
			3/30/2016		5/31/2016		8/23/2016		10/18/2016		2/9/2017		5/11/2017		8/23/2017		9/22/2017		10/11/2017		5/2/2018		4/6/2018		6/29/2018		9/26/2018		5/2/2019		10/17/2019		4/16/2020		9/24/2020	
			Baseline Events																				Assessment		Re-Sample						Assessment			
Boron	0.08	NA	0.416		0.336	J	0.460	J	0.489	J	0.540	JB	0.679	JB	0.560	JB	0.543	J	0.637	J	0.309	JB			0.419	J	0.464	J	0.498	JB	ND	D2,U	0.54		0.51	
Calcium	0.5	NA	16.5		21.3	B	23		36		14.3	B	13.1		33.7		21.4		11.9	B	46.1				9.94		10.5	B	19.5		9.76	D2	12.5	D2	8.80	D2
Chloride	3	NA	31.5	B	26.9		28.9	B	31.6	B	29.4	JB	29.1	B	32.3	B	29.7	B	25.8	B	4.94				26.7	B	27.9	B	26.6		25.7		21.5		21.4	
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	J	ND		ND	J	ND	J	ND	J	ND	J	0.255	J	ND	J	ND	J	ND	J	0.570	J	0.6		0.5		0.5	
Sulfate	5	NA	208	HB	135		144		152		145		168		177	B	226	B	147		16.8	B			129		138	B	114	B	80	D	58	D	62	D
pH (Field Measurement)	0.10	NA	9.72		8.95		8.1		7.53		7.08		9.84		8.14		8.14		9.19		7.46		9.37		9.15		8.98		9.15		9.24		8.87		8.74	
Total Dissolved Solids	10	NA	644		532		558		602		679		763		758		763		728		271				721		673		642		568		466		436	
APPENDIX IV CONSTIUENTS																																				
Antimony	0.002	0.006 mg/L	ND		ND	JB	ND	JB	ND	J	ND		ND	JB	ND	JB	ND	JB			0.0000760	B	ND	JB	ND	JB	NA		0.0000580	JB	ND	U	ND	U	ND	U
Arsenic	0.005	0.01 mg/L	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND	J			0.00116	J	ND	JB	ND	JB	NA		0.00254	J	0.0022		0.0019		0.0019	
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND	J			0.0824	J	ND	J	ND	J	ND	J	0.100	J	0.077		0.093		0.084	
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	V1, U	ND	U
Cadmium	0.001	0.005 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	U	ND	U
Chromium	0.003	0.1 mg/L	ND	J	ND	J	ND	J	ND		ND	J	ND	J	ND	JB	ND				0.00136	J	ND	JB	ND	JB	NA		0.00299	J	0.0006	J	ND	U	0.0006	J
Cobalt	0.005	0.006 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J			0.000158	J	ND	J	ND	J	NA		0.000685	J	ND	U	ND	U	ND	U
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	0.255	J	ND	J	ND	J	ND	J	0.570	J	0.6		0.5		0.5	
Lead	0.005	0.015 mg/L	ND		ND	JB	ND		ND	J	ND	J	ND	J	ND		ND				0.0000730	J	ND	J	ND		NA		0.000671	J	ND	U	ND	U	ND	U
Lithium	0.05	0.040 mg/L	0.339		0.199		0.219		0.0736		0.481		0.607		0.204		0.345				ND		0.694		0.630		0.570		0.574		0.51		0.49		0.56	
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND	JB	ND				ND		ND		NA		NA		ND		0.0002	J	0.0002	J	0.0002	J
Molybdenum	0.01	0.1 mg/L	0.0170	J	0.0171		0.0141		ND	J	0.0119		ND	J	ND	J	ND	J			0.00442	J	ND	J	ND	J	ND	J	0.00797	J	0.007	J	0.006	J	0.007	J
Radium 226	1	5 pCi/L	0.612		ND		0.715		ND		0.422		0.287		0.619		0.391				0.698		0.512		0.683		0.704		0.205	U	0.458		1.24		0.594	
Radium 228																															0.379					
Selenium	0.01	0.05 mg/L	ND		ND		ND		ND	J	ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	U	ND	U
Thallium	0.001	0.002 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND		ND		NA		NA		ND		ND	U	ND	U	ND	U

Notes:
MW-10 - Downgradient Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
M1 = Matrix spike recovery was high; the method control sample recovery was acceptable
M2 = Matrix spike recovery was low; the method control sample recovery was acceptable
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-104

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE									
			3/29/2019		4/10/2019		10/25/2019		4/17/2020		10/1/2020	
			Characterization									
Boron	0.08		0.1880	JB	0.2710	JB	ND	D2, U	0.21		0.23	D2
Calcium	0.5		465	B	502		505	D1	527	D1	491	D1
Chloride	3		1430		1430	B	1610	D	2630	D	2220	D
Fluoride	1		ND		0.3230	JB	0.4		0.3		0.3	
Sulfate	5		2870		2880	B	2440	D	4710	D	2730	D
pH (Field Measurement)	0.10		6.88		6.99		6.86		6.58		6.91	
Total Dissolved Solids	10		6990		6690		7330		6320		6270	
APPENDIX IV CONSTITUENTS												
Antimony	0.002	0.006 mg/L	0.0001	JB	0.0001	JB	ND	U	ND	U	ND	U
Arsenic	0.005	0.01 mg/L	0.0022	J	0.0021	J	0.0039		0.0013		0.0013	
Barium	0.2	2 mg/L	0.0243	J	0.0216	JB	0.030		0.018		0.018	
Beryllium	0.002	0.004 mg/L	ND		ND		ND	U	ND	U	ND	U, D2
Cadmium	0.001	0.005 mg/L	ND		ND		0.0004	J	ND	U	ND	U
Chromium	0.003	0.1 mg/L	0.0047	B	0.0036		0.0066		0.0020		0.0013	J
Cobalt	0.005	0.006 mg/L	0.0059	B	0.0052		0.011		0.005		0.005	
Fluoride	1	4 mg/L	ND		0.3230	JB	0.4		0.3		0.3	
Lead	0.005	0.015 mg/L	0.0011	J	0.0002	J	0.003		ND	U	ND	U
Lithium	0.05	0.040 mg/L	0.0281	J	0.0286	J	0.02		0.02		0.02	D2
Mercury	0.0002	0.002 mg/L	ND		ND	^	ND	U	ND	U	ND	U
Molybdenum	0.01	0.1 mg/L	0.0015	J	0.0010	J	0.005	J	0.003	J	ND	U, D2
Radium 226	1	5 pCi/L	0.7760		0.3190	U	0.126		0.655		0.422	
Radium 228							1.52					
Selenium	0.01	0.05 mg/L	ND		ND		ND	U	ND	U	ND	U, D2
Thallium	0.001	0.002 mg/L	ND		ND		ND	U	ND	U	ND	U

Notes:
MW-104 - Characterization Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

REID/HMPL SURFACE IMPOUNDMENT - ANATLYCIAL SUMMARY
MW-110

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE									
			3/29/2019		4/10/2019		10/24/2019		4/17/2020		10/1/2020	
			Characterization									
Boron	0.08		0.484	JB	0.496	JB	ND	D2, U	0.54	M4	0.53	D2, M1, M4
Calcium	0.5		176	B	178		204	D1	181	D1, M2	162	D1, M2
Chloride	3		26.0		30.4	B	30.0		22.1		19.9	
Fluoride	1		0.279	J	0.255	JB	0.3		0.3		0.3	
Sulfate	5		563		596	B	568	D M1	460	D	411	D
pH (Field Measurement)	0.10		7.25		7.50		6.84		7.17		7.56	
Total Dissolved Solids	10		1170		1200		1270		1150		1060	
APPENDIX IV CONSTITUENTS												
Antimony	0.002	0.006 mg/L	0.000240	JB	0.000204	JB	ND	U	ND	U	ND	M4. U
Arsenic	0.005	0.01 mg/L	0.00534		0.00238	J	ND	U	0.0012		0.0004	J
Barium	0.2	2 mg/L	0.118	J	0.107	JB	0.065		0.065		0.056	M1
Beryllium	0.002	0.004 mg/L	0.000716	J	0.000314	J	ND	U	ND	M2, U	ND	M4, U
Cadmium	0.001	0.005 mg/L	ND		ND		ND	U	ND	U	ND	U
Chromium	0.003	0.1 mg/L	0.0180	B	0.0115		0.0010	J	0.0047		0.0016	J
Cobalt	0.005	0.006 mg/L	0.00911	B	0.00384	J	ND	U	ND	U	ND	M4, U
Fluoride	1	4 mg/L	0.279	J	0.255	JB	0.3		0.3		0.3	
Lead	0.005	0.015 mg/L	0.00661		0.00399	J	ND	U	0.002		0.0008	J
Lithium	0.05	0.040 mg/L	0.0299	J	0.0303	J	0.02		0.02		0.02	M4
Mercury	0.0002	0.002 mg/L	ND		ND	^	ND	U	0.0002	J	ND	M1, M4, U
Molybdenum	0.01	0.1 mg/L	0.00153	J	0.00120	J	ND	U	ND	U	ND	M4, U
Radium 226	1	5 pCi/L	1.84		1.93		0.195		1.37		0.941	
Radium 228							0.727					
Selenium	0.01	0.05 mg/L	ND		ND		ND	U	ND	U	ND	M4, U
Thallium	0.001	0.002 mg/L	0.000112	J	0.0000640	J	ND	U	ND	U	ND	U

Notes:
MW-110 - Characterization Well
New Groundwater Protection Standard (GWPS) limit as amended through EPA CCR rule (40 CFR 257) 7/17/2018
Groundwater results provided by Big Rivers Electric Corporation.
All results listed in milligrams per liter (mg/L) unless otherwise noted by the GWPS.

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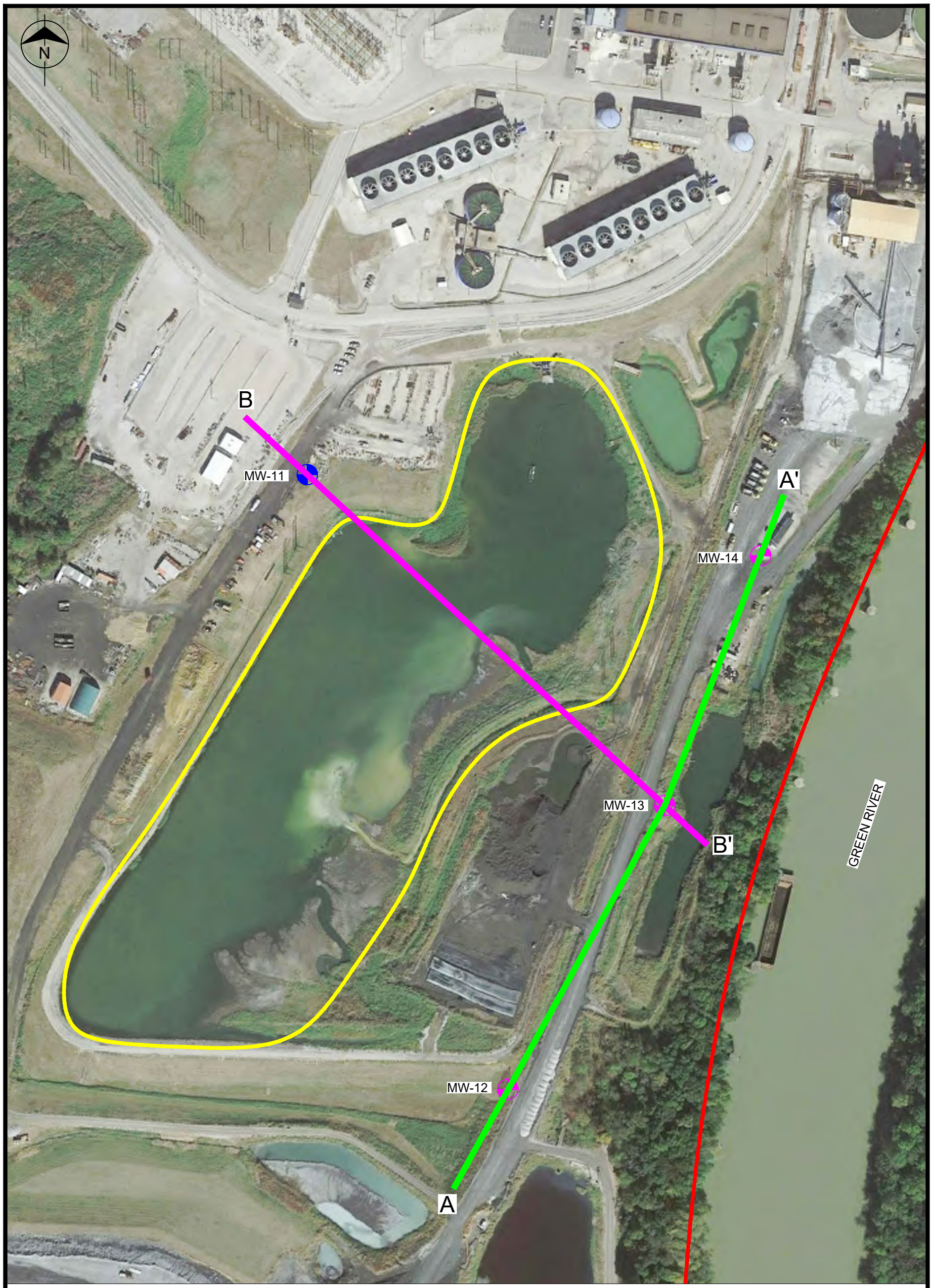
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

ATTACHMENT 6 - A STRATIGRAPHIC CROSS-SECTION OF THE SITE



LEGEND

- (IMPOUNDMENT) UNIT BOUNDARY
- PROPERTY LINE
- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL
- TRANSECT A-A'
- TRANSECT B-B'

NOTE: MAP IMAGE: GOOGLE EARTH PRO

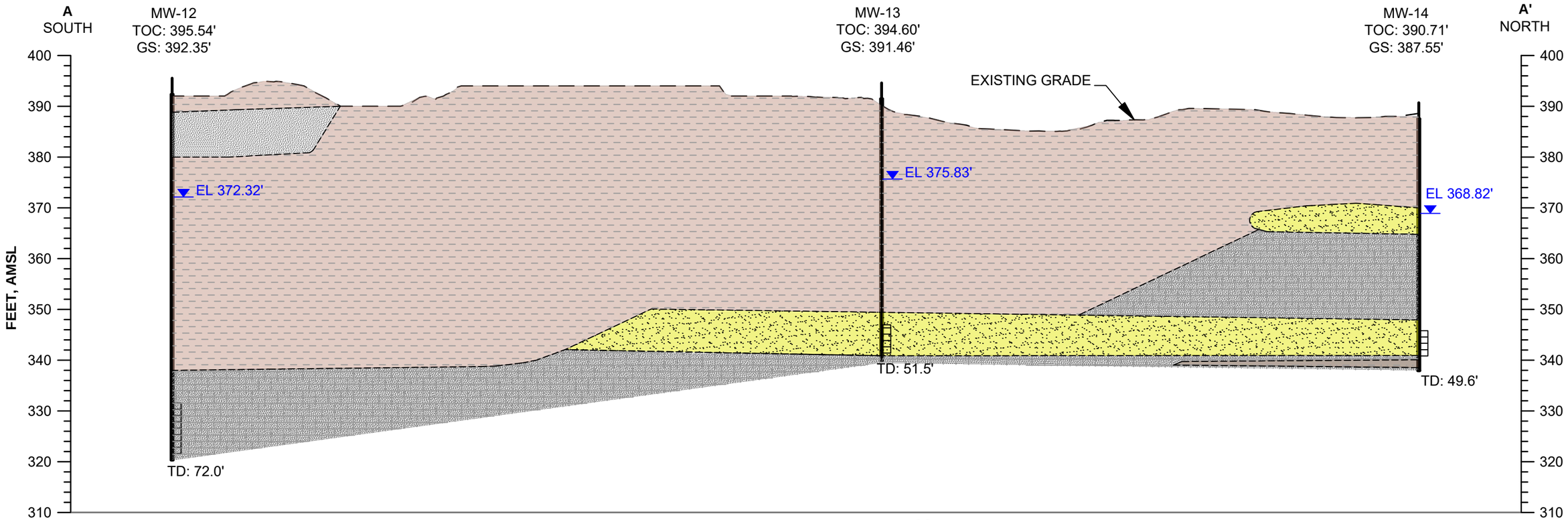
0 200' 400'

SCALE IN FEET

BURNS McDONNELL

PROFILE TRANSECT
LOCATION MAP
GREEN SURFACE IMPOUNDMENT
WEBSTER COUNTY, KENTUCKY

Z:\CLIENTS\ENS\BIGRIVERSEC_CLIENTINFO\SITES\GREEN STATION\RISK MITIGATION PLAN\DELIVERABLE\FIGURES\TRANSECT LINES LOCATION MAP.DWG 9/10/2020 4:36 PM KPERINO



SECTION A-A' — A

LEGEND:

UNCONSOLIDATED MATERIAL:
- CCR
- SILTY CLAY

BEDROCK LITHOLOGY:
- SANDSTONE
- SHALE
- INTERBEDDED SANDSTONE AND SHALE

- POTENTIOMETRIC SURFACE (MEASURED ON 8/31/20)
- MW-12 MONITORING WELL LOCATION ID
- SCREEN INTERVAL
- GS GROUND SURFACE
- TD TOTAL DEPTH
- TOC TOP OF CASING

NOTES:

1. CORRELATION OF UNITS IS AN INTERPRETATION AND NOT NECESSARILY A DELINEATION OF ACTUAL EXTENT AND THICKNESS OF INDIVIDUAL UNITS (DASHED WHERE INFERRED).
2. LITHOLOGY WAS LOGGED BY ASSOCIATED ENGINEERS, INC. PERSONNEL.
3. EXISTING GRADE FROM ASSOCIATED ENGINEERS, INC. (DATED 12/8/2015).

HORIZ: 0 50' 100' 200' SCALE IN FEET

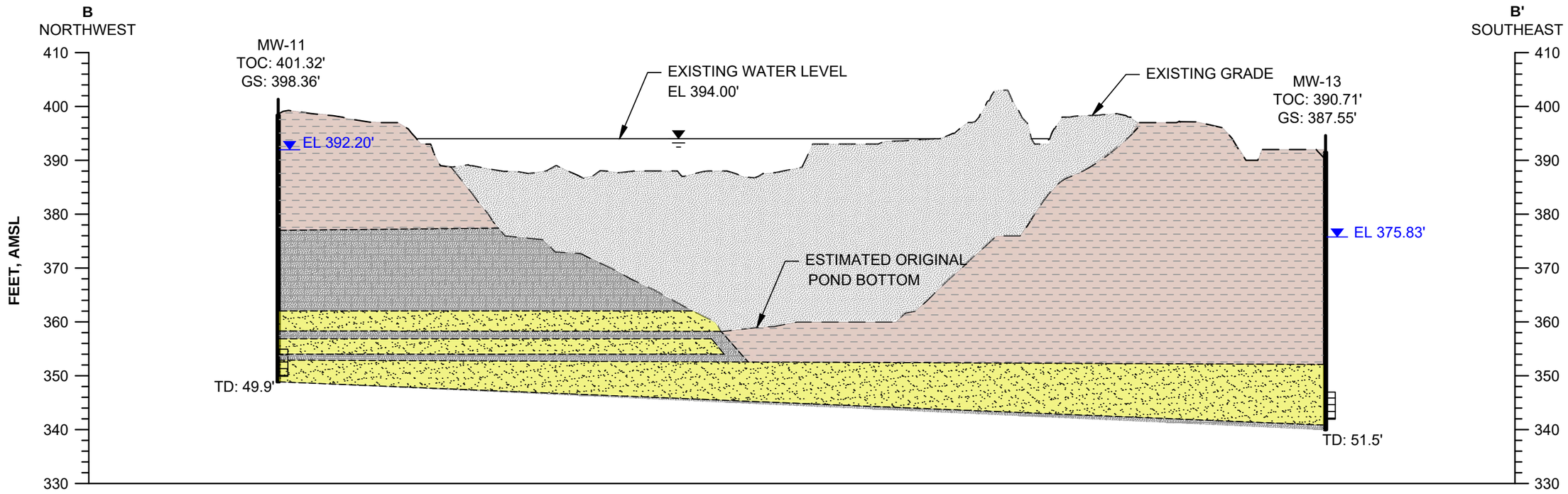
VERT: 0 10' 20' 40' SCALE IN FEET

BURNS McDONNELL

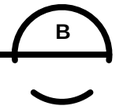
CROSS SECTION A-A'

GREEN SURFACE IMPOUNDMENT
WEBSTER COUNTY, KENTUCKY

Z:\CLIENTS\ENS\BIGRIVERSEC_CLIENTINFO\SITES\GREEN STATION\RISK MITIGATION PLAN\DELIVERABLE\FIGURES\FIGURE 10_CROSS SECTION.DWG 9/11/2020 12:46 PM RCWARNKEN



SECTION B-B'



LEGEND:

UNCONSOLIDATED MATERIAL:

- CCR
- SILTY CLAY

BEDROCK LITHOLOGY:

- SANDSTONE
- SHALE

- POTENTIOMETRIC SURFACE (MEASURED ON 8/31/20)
- MW-12 MONITORING WELL LOCATION ID
- SCREEN INTERVAL
- GS GROUND SURFACE
- TD TOTAL DEPTH
- TOC TOP OF CASING

NOTES:

1. CORRELATION OF UNITS IS AN INTERPRETATION AND NOT NECESSARILY A DELINEATION OF ACTUAL EXTENT AND THICKNESS OF INDIVIDUAL UNITS (DASHED WHERE INFERRED).
2. LITHOLOGY WAS LOGGED BY ASSOCIATED ENGINEERS, INC. PERSONNEL.
3. EXISTING GRADE FROM ASSOCIATED ENGINEERS, INC. (DATED 12/8/2015).

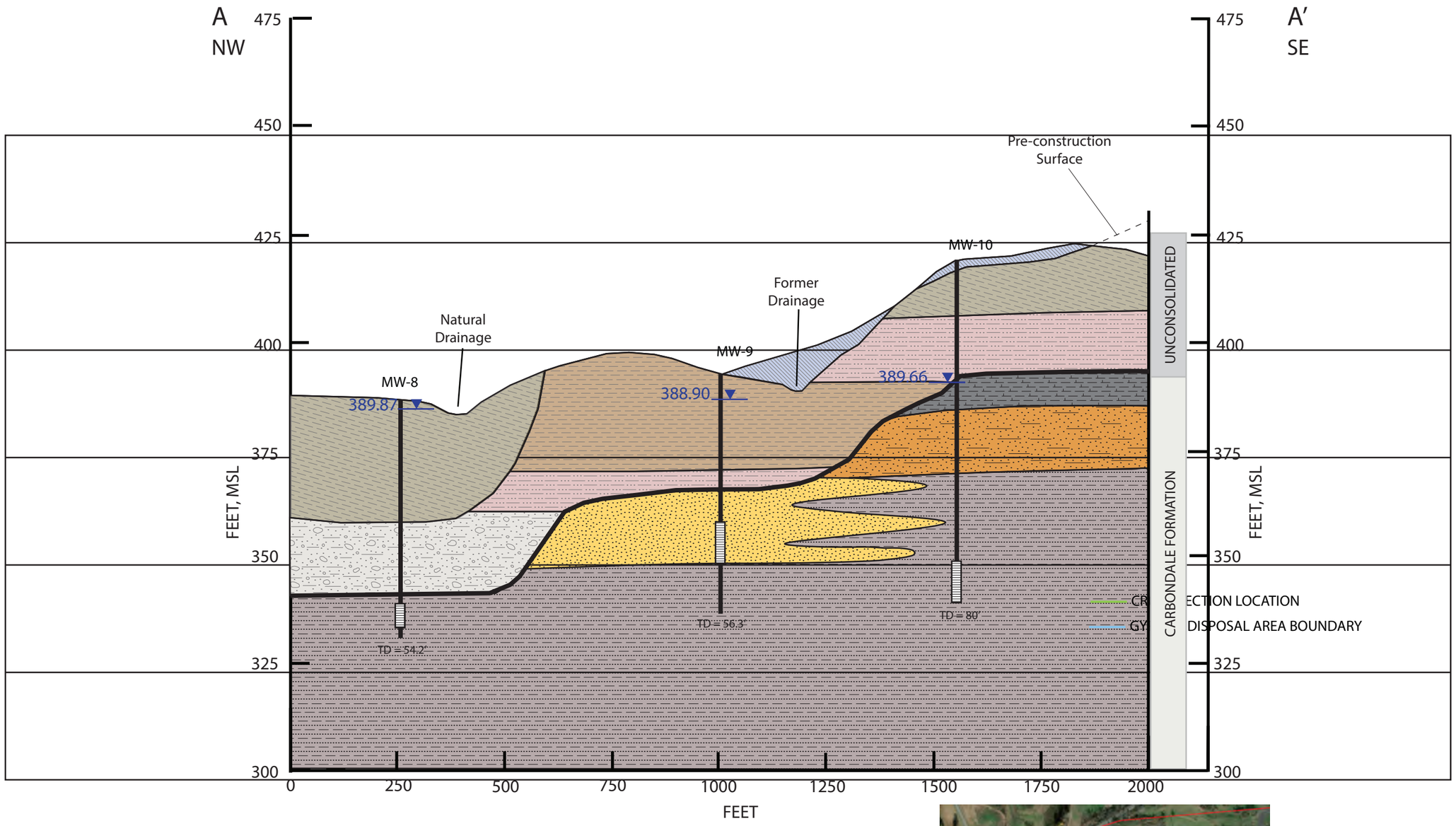
HORIZ: 0 50' 100' 200'
SCALE IN FEET

VERT: 0 10' 20' 40'
SCALE IN FEET

BURNS McDONNELL

CROSS SECTION B-B'

GREEN SURFACE IMPOUNDMENT
WEBSTER COUNTY, KENTUCKY



LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silty Clay
- Sandy Clay
- Clay
- Silty Clay with Gravel

BEDROCK LITHOLOGIES:

- Shale
- Shaley Sandstone
- Sandstone
- Interbedded Sandstone and Shale

Potentiometric Surface September 26, 2018

MW-8
MONITORING WELL LOCATION ID
RISER
MONITORING WELL SCREEN
BACKFILL / COLLAPSE

25 feet
250 feet
(Vertical Exaggeration = 10x)

Big Rivers Electric Corporation

FIGURE 4
CROSS SECTION A - A'

DATE: 4/30/2019	SCALE: 1IN = 25 x 250 FEET
CREATED BY:MRH	
JOB NO. 60602365	

\\Na.aecomnet.com\GFS\AMER\Cincinnati\DCS\Projects\ENV\60602365_BREC_RIACM\900-CAD-GIS\920-GIS or Graphics

B
W

B′
NE

475
450
425
400
375
350
325
300

FEET, MSL

Pre-construction Surface
Pond
Secondary Pond
Former Drainage
MW-110
MW-9
MW-7
388.90
426.50
TD = 59'
TD = 56.3'
TD = 73.4'

UNCONSOLIDATED
SHELBURN FORMATION
CARBONDALE FORMATION

0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000

FEET

LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silt
- Silty Clay
- Silty Sand
- Clay
- Sandy Clay

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Interbedded Sandstone and Shale

Potentiometric Surface September 26, 2018

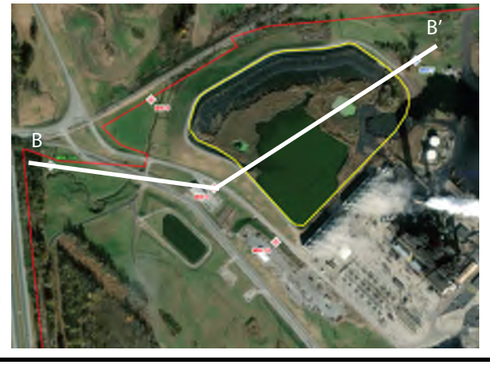
MW-9
MONITORING WELL LOCATION ID

RISER

MONITORING WELL SCREEN

BACKFILL / COLLAPSE

25 feet
250 feet
(Vertical Exaggeration = 10x)



Big Rivers
ELECTRIC CORPORATION

FIGURE 5
CROSS SECTION B - B′

DATE: 4/30/2019	SCALE: 1IN = 25 x 250 FEET
CREATED BY:MRH	
JOB NO. 60602365	

\\Na.aecomnet.com\GFS\AMER\Cincinnati\DCS\Projects\ENV\60602365_BREC_RIACM\900-CAD-GIS\920-GIS or Graphics

S
A

N
A'

South Pond Extent

Historical "Bottom Ash" Pond Extent

MW-4* GESB-29 P-3* GESB-28 B-8* GESB-27 GESB-26 GESB-25 MW-104 GESB-24 GESB-23 B-6 B-5* MW-3A* GESB-22 GESB-21 GESB-20 GESB-19 P-6* Sump A Sump B GESB-18 B-4 GESB-17 GESB-16 GESB-15 GESB-14 GESB-13 GESB-12 GESB-11 Sump C GESB-09 Sump D GESB-08 GESB-07 GESB-06 GESB-05 GESB-04 GESB-03 GESB-02 GESB-01 MW-2 B-2* P-9

AVERAGE ROAD LEVEL

08 07 06 05

FEET, MSL

430 420 410 400 390 380 370 360 350 340 330 320 310

0 500 1000 1500 2000 2500 3000 3500

FEET

(Vertical Exaggeration = 20x)

Bedrock Lithologies:

- Sandstone
- Shale
- Interbedded Sandstone and Shale
- Interbedded Shale and Sandstone

Unconsolidated Materials:

- Silty Clay
- Fill

- Collection Area
- River Seep (projected) (07)
- APROX. RIVER LEVEL
- Sump
- Potentiometric Surface
- 11/11/2019 - 11/12/2019
- Boring (*Projected)
- MW-2 — Well ID
  - Riser
  - Screen

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 4
CROSS SECTION A - A'
East (River) Side of Ash Pile

DATE: 05/01/2020	SCALE: AS SHOWN
CREATED BY: ALY	JOB NO. 60619283

W
B

B′
E

Fly Ash (Landfill)

Pennyrile Parkway

MW-1
P-7*
B-1*
P-8*
P-9*
B-2*
MW-2*

North Settling Basin

Green River

FEET, MSL

430
420
410
400
390
380
370
360
350
340
330
320
310

0
500
1000
1500
2000
2500
3000
3500

FEET

Bedrock Lithologies:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale
- Interbedded Shale and Sandstone

Unconsolidated Materials:

- Silty Clay
- Fill

Potentiometric Surface

11/11/2019 - 11/12/2019

Boring
(*Projected)

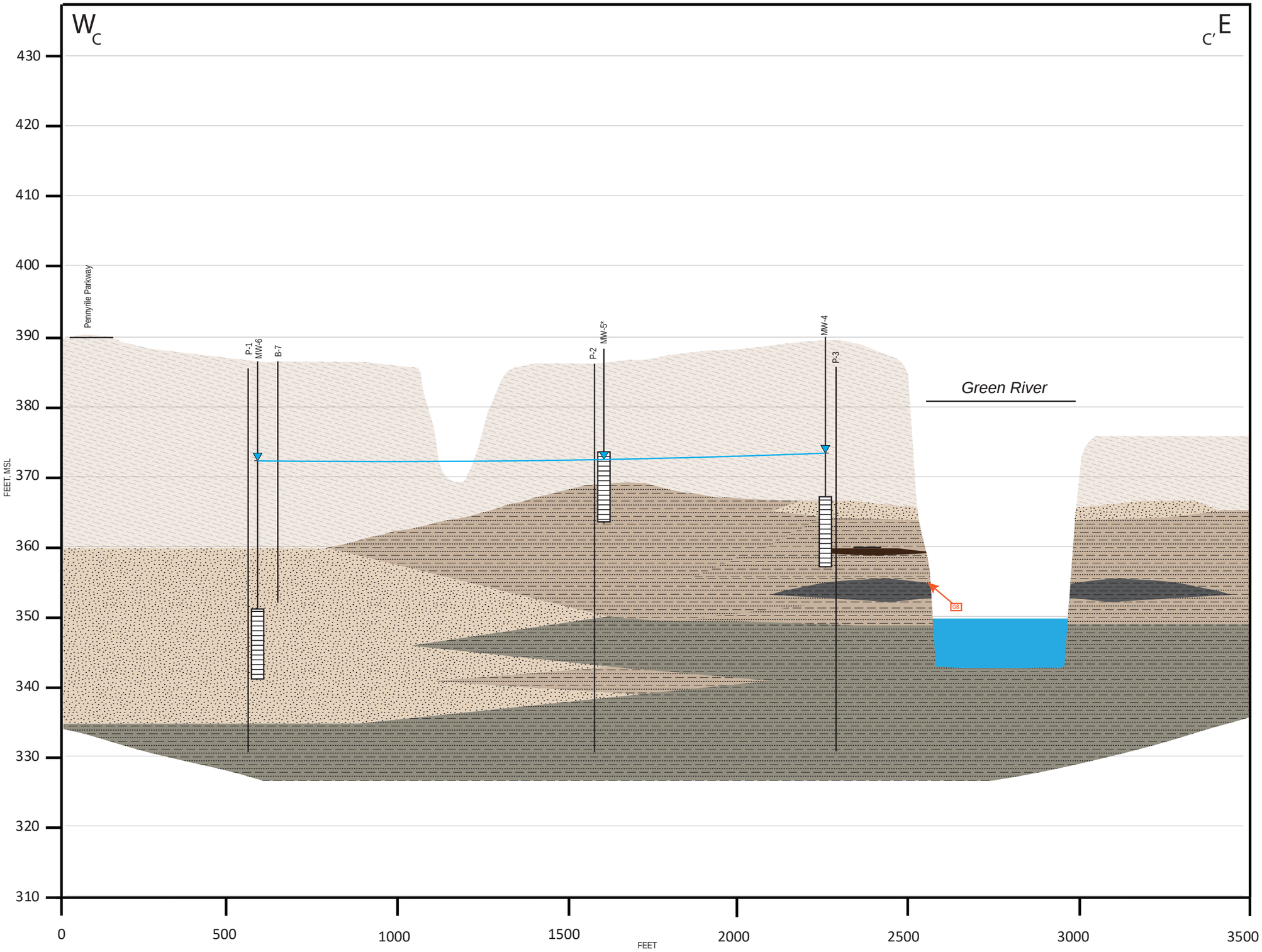
MW-2— Well ID
Riser
Screen

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 5
CROSS SECTION B - B'
North Side of Ash Pile

DATE: 05/01/2020	SCALE: AS SHOWN
CREATED BY: ALY	JOB NO. 60619283



Bedrock Lithologies:

- Sandstone
- Shale
- Interbedded Sandstone and Shale
- Interbedded Shale and Sandstone

Unconsolidated Materials:

- Silty Clay
- Fill

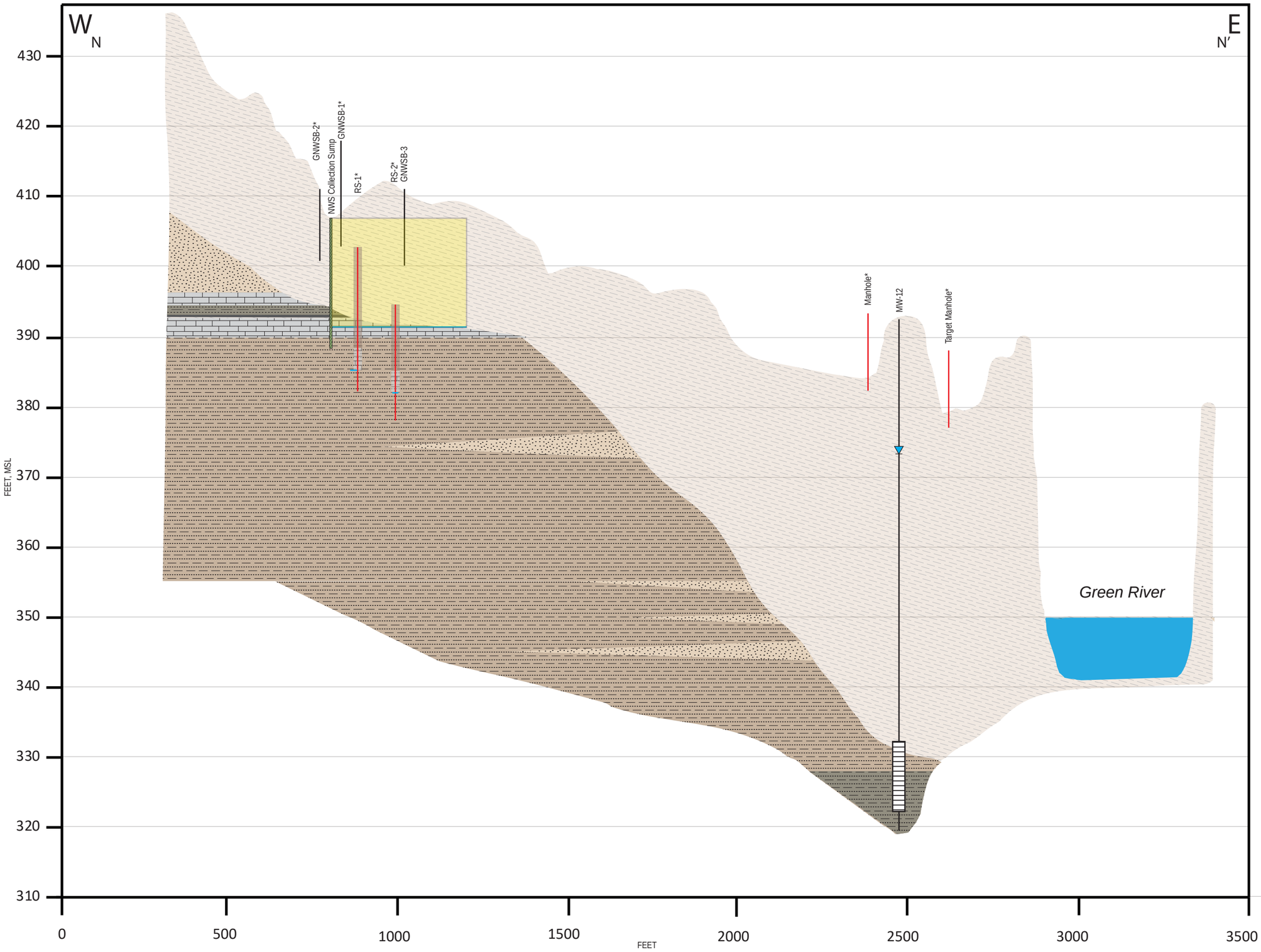
- River Seep (projected)
- Potentiometric Surface
- 11/11/2019 - 11/12/2019
- Boring (*Projected)
- MW-4 — Well ID
  - Riser
  - Screen

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 6
CROSS SECTION C - C'
South Side of Ash Pile

DATE: 05/01/2020	SCALE: AS SHOWN
CREATED BY: ALY	JOB NO. 60619283



Bedrock Lithologies:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale
- Interbedded Shale and Sandstone

Unconsolidated Materials:

- Silty Clay
- Fill

Collection Area — Sump

Boring (*Projected)

MW-12 — Well ID
Riser
Screen

Relay Station

RS-1*
Horizontal Pipe — Transparent Lithology is projected. Perceived dip is a result of localized slumping towards the creek.

* Projected

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 7
CROSS SECTION N - N'
North Side of Ash Pile

DATE: 05/01/2020	SCALE: AS SHOWN
CREATED BY: ALY	JOB NO. 60619283

ATTACHMENT 7 – ASSESSMENT OF CORRECTIVE MEASURES (FOR REID/HMP&L POND AND GREEN LANDFILL)

Assessment of Corrective Measures Under the CCR Rule

GREEN STATION CCR LANDFILL
GREEN STATION
WEBSTER COUNTY, KENTUCKY

June 13, 2019

Prepared For:

Big Rivers Electric Corporation
Sebree Generating Station
9000 Highway 2096
Robards, Kentucky 42452

Prepared by:

AECOM Technical Services

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Job Number: 60602364

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ACRONYMS

ACM	Assessment of Corrective Measures
AECOM	AECOM Technical Services, Inc.
BREC	Big Rivers Electric Corporation
°C	Degrees Celsius
CAO	Corrective Action Objectives
CbR	Closure by Removal
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CiP	Closure in Place
cm/sec	Centimeters per second
COCs	Constituents of Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
ft., amsl	Feet above mean sea level
ft., msl	Feet mean sea level
gpm	Gallons per minute
GWPS	Groundwater Protection Standards
ICs	Institutional Controls
KGS	Kentucky Geological Survey
Li	Lithium
MCL	Maximum Contaminant Level
mg/L	Milligrams per liter
mS/cm	milliSiemens per centimeter
mV	Millivolt
MW	Megawatts
NPDES	National Pollution Discharge Elimination System
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential
RCRA	Resource Conservation and Recovery Act
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

AECOM Technical Services, Inc. (AECOM) was retained by Big Rivers Electric Corporation (BREC) to prepare an Assessment of Corrective Measures (ACM) to identify appropriate corrective measures for groundwater impacted by coal combustion residuals (CCR). The subject groundwater impacts are associated with the CCR that has been historically managed within the Green Station CCR Landfill (Green Landfill) at the Sebree Generating Station (Sebree Station), located near Sebree, Kentucky (Site). Groundwater monitoring was conducted for the CCR management unit in accordance with the United States Environmental Protection Agency's (USEPA) CCR rule (40 Code of Federal Regulations (CFR) Section 257.90 through Section 257.95). Detection and Assessment groundwater monitoring are complete at the Green Landfill, and one constituent of concern (COC), lithium (Li), has been identified based on exceedance of the applicable groundwater protection standard (GWPS) at a statistically significant level (SSL).

Section 257.96(c) requires this assessment to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

Several potential corrective measures technologies were evaluated to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented below:

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established Corrective Action Objectives (CAOs).
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection mode)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a standalone technology.

Potentially Applicable Technology	Status	Description/Overview
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing offsite migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The Conceptual Site Model (CSM) will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations increase implementation difficulty with scale.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies any single technology may not be utilized.

Preliminary assembly of corrective measures alternatives was performed based on site-specific and regional geology and groundwater conditions. For the Green Landfill, six corrective measures alternatives were developed from this list of applicable corrective measures technologies:

- Alternative #1 – No Action and Groundwater Monitoring
- Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- Alternative #3 – CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring

- Alternative #4 – CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #5 – CiP, Other Source Control, ICs, and Groundwater Monitoring

The assembly of corrective measures alternatives is preliminary and could be revised at a later date following detailed analysis during the remedy selection process and/or following comment from the regulatory community and public. Specifically, a public meeting is required under Section 257.96(e) at least 30 days prior to the selection of remedy so that the owner or operator may discuss the results of the corrective measures assessment with interested and affected parties.

Following submittal of the ACM, the Site will begin the remedy selection process that is set forth in Section 257.97. The selected remedy must:

- Meet the requirements of Section 257.97(b) of the CCR Rule;
- Consider the standards in Section 257.97(c), and;
- Address the schedule and other factors specified in Section 257.97(d).

Upon remedy selection, a remedy selection report will be prepared that documents details of the selected remedy and how the selected remedy meets Section 257.97 requirements. As needed to accommodate further investigation(s) and/or evaluation, Section 257.97 requires the preparation of a semiannual report that documents progress toward remedy selection and design.

1.0 INTRODUCTION

The following report presents the Assessment of Corrective Measures (ACM) for groundwater impacts identified at the Green Station CCR Landfill (Green Landfill), which is a coal combustion residuals (CCR) management unit located at the Big Rivers Electric Corporation (BREC) Sebree Generating Station (Sebree Station), located near Sebree, Kentucky (Site).

Groundwater monitoring was conducted for the unit in accordance with the United States Environmental Protection Agency's (USEPA) CCR Rule (40 Code of Federal Regulations (CFR) Section 257.90 through Section 257.95). The results of Detection Monitoring (per Section 257.94) identified the presence of one or more indicator constituents (Appendix III to Section 257) with downgradient concentrations representing a statistically significant increase(s) (SSI) over background or upgradient conditions. The detection of one or more SSI required the implementation of Assessment Monitoring following the requirements of Section 257.95, which was initiated in June 2018. Assessment Monitoring results indicated the downgradient presence of one or more constituent of concern [COC] (Appendix IV to Section 257) at concentrations that represent a SSI over background concentration, and that represent a statistically significant level (SSL) over the groundwater protection standard(s) established in accordance with to Section 257.95(h).

For the Green Landfill, the following SSLs were identified:

- Lithium (Li) in MW-3A, MW-4, MW-5, and MW-6

The identification of these SSLs requires characterization of the nature and extent of impact (sufficient to support the ACM) in accordance with Section 257.95(g)(1) and the initiation of an ACM following the requirements of Section 257.96. Notice of ACM initiation dated January 14, 2019 was posted to BREC's publicly-accessible CCR reporting website.

Section 257.96(c) requires this ACM to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

This report presents the ACM evaluation in the following five sections, along with their associated appendices and attachments.

2.0 DESCRIPTION OF CURRENT CONDITIONS

This section provides information related to the current use of the Site, as well as the history of activities relevant to the ACM for the Green Landfill at the Sebree Station.

2.1 Site Background

BREC owns and operates Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/HMP&L Station. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (see **Figure 1**). Reid Unit 1 (66 Megawatts [MW]) began commercial operation in 1966 and it will be converted from coal to natural gas in the future. The Reid Combustion Turbine (72 MW) was commercialized in 1976. HMP&L Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974 respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (242 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Green Landfill is illustrated on **Figure 2**. The Green Landfill is located directly south of Sebree Station, situated south of the Green Station CCR Surface Impoundment. The Green Landfill is a Kentucky permitted landfill (Permit No. SW11700007) that receives special wastes generated by burning coal (CCRs) from Green and Reid/HMP&L Stations. The landfill began receiving CCR wastes in 1980. The current Green Landfill footprint is approximately 170 acres.

As stated in the published CCR monitoring well network certification, available on the BREC website (http://www.bigrivers.com/), the original ground surface within the landfill footprint was irregular and the dominant features were small stream valleys draining towards the Green River, which is located just east of the landfill; and towards Groves Creek, which is located just south of the landfill. There was also historic oil and gas production at and in the immediate vicinity of the Green Landfill. A review of the records from the Kentucky Geological Survey (KGS) showed that at or immediately adjacent to the Site, there were a number of dry exploratory oil/gas exploration holes, oil production wells, one gas production well, and one secondary recovery injection well. There were also former brine ponds at the Site. Most of these wells were abandoned in accordance with applicable regulations by BREC in 1997 and 1998. The last existing well was decommissioned in 2019.

2.2 Site Investigation and Interim Measures

Monitoring wells were installed in the vicinity of the Green Landfill beginning in November 1996 prior to the implementation of the CCR Rule. However, the existing wells meet the requirements of Section 257.90 of the CCR Rule for installation of a groundwater monitoring system. These requirements are that wells must adequately represent the quality of background groundwater and groundwater representing the downgradient waste boundary. The existing wells are located along the perimeter of the footprint for the Green Landfill (**Figure 2**). One upgradient monitoring well (MW-1) and five downgradient monitoring wells (MW-2, MW-3A, MW-4, MW-5 and MW-6) were installed adjacent to the Green Landfill to determine the general direction of groundwater movement and to monitor groundwater at the Site. The monitoring wells were installed in the uppermost saturated portion of the sandstone bedrock aquifer.

Hydraulic testing (slug tests) was performed in April 2019, and nine rounds of Baseline groundwater sampling for Appendix III constituents were conducted between March 2016 and October 2017. Statistical evaluation for Detection monitoring indicated that SSIs over background had occurred, and therefore, Assessment monitoring was triggered. Detection monitoring activities and data are presented in the annual reports that have been prepared to date, (AECOM 2018 and 2019).

As part of Assessment monitoring, upgradient and downgradient wells for the Landfill were sampled for Appendix IV constituents in June, July, and September 2018. Groundwater Protection Standards (GWPS) were established for Assessment monitoring of the Appendix IV constituents, and statistical evaluation indicated exceedances of GWPSs at SSLs.

For the purposes of this ACM, the COC that exceeds GWPSs at SSLs is Li (see **Table 1**).

Table 1 Green Station CCR Landfill Constituents of Concern

Monitoring Well (Date)	Parameter Lithium Background UPL 0.008 GWPS 0.04 (mg/L)
MW-3A (Jun 2018)	**0.699**
MW-3A (Jul 2018)	**0.790**
MW-3A (Sep 2018)	**0.766**
MW-4 (Jun 2018)	**1.81**
MW-4 (Jul 2018)	**1.91**
MW-4(Sep 2018)	**1.81**
MW-5(Jun 2018)	**0.459**
MW-5 (Jul 2018)	**0.481**
MW-5 (Sep 2018)	**0.425**
MW-6 (Jun 2018)	**0.0650**
MW-6 (Jul 2018)	**0.0590**
MW-6 (Sep 2018)	**0.0558**

GWPSs are the greater of the site-specific background concentrations, the USEPA primary drinking water standard maximum contaminant limits (MCL), or GWPS provided in 40 CFR 257.95(3)(h)(2)
Bold red values exceed the GWPS by direct comparison; yellow shaded indicates an SSL above the GWPS (i.e., 95 LCL > GWPS) mg/L = milligrams per liter; UPL = Upper Prediction Limit.

No formal interim corrective measures have been performed at the Green Landfill but corrective measures for known non-groundwater releases are underway. The compatibility of those corrective measures with potential groundwater remedies is a consideration in this assessment.

2.3 Conceptual Site Model (CSM)

The main purpose of a CSM is to support the decision-making process for groundwater corrective action at the Green Landfill.

2.3.1 Physical Setting

The Site is mapped within the Interior Low Plateaus physiographic province (https://www.nps.gov/subjects/geology/physiographic-provinces.htm). The province is part of the Interior Plains division of the United States. Characteristic features of the province include unglaciated rolling limestone plains with alluvial valleys and entrenched rivers and streams. Several large rivers are in the region, including the Green, the Ohio, the Kentucky, the Tennessee, and the Cumberland Rivers. The

geology underlying the Site consists of unconsolidated materials, including loess and alluvial deposits, underlain by Upper to Middle Pennsylvanian-age clastics and carbonates consisting primarily of sandstone and shale. The unconsolidated material also include fill, silty and clayey residuum, and minor amounts of sandy, clayey channel fill alluvium.

The Green Landfill is located on an upland adjacent to the west bank of the Green River at an elevation of approximately 436 feet, above mean sea level [ft., amsl] (at the north end of the landfill) and 397 ft., amsl (at the south end of the landfill), with a maximum elevation of 608 ft., amsl at the landfill crest. Precipitation falling within the Green Landfill is directed to ponds in the north and south sides of the unit and then to the river under Kentucky Pollution Discharge and Elimination System (KPDES) permit. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands (Associated Engineers 2016, Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan). The Green Landfill does not have an existing leachate collection and management system.

2.3.2 Geology

Figure 3 presents a geologic map of the site and vicinity. The Site lies in the Western Kentucky Coalfields section, characterized by rolling uplands underlain by coal-bearing bedrock of the Pennsylvanian Period. In the vicinity of the site, maximum topographic relief is on the order of 80 feet. The geologic quadrangle (Geologic map of the Robards quadrangle, Henderson and Webster Counties, Kentucky, 1973) for the Site vicinity published by the KGS shows the surficial material to be unconsolidated loess representing the Pleistocene and Holocene geologic epoch. The loess consists of sandy and clayey silt. The unconsolidated surficial materials, which include silty and sandy clay units, are up to approximately 25 feet in thickness.

The unconsolidated materials are shown to be underlain by bedrock of the Upper Pennsylvanian Shelburn Formation (formerly identified as the Lisman Formation (Fairer, 1973)) and the Middle Pennsylvanian Carbondale Formation. At the base of the Shelburn Formation is the Providence Limestone Member, consisting of limestone and interbedded shale, but this unit is absent in much of the area due to erosional channeling. Due to its discontinuous character and the presence of interbedded shale, hydrologically significant karst features are not present in the Providence Limestone Member. The underlying Carbondale Formation consists of cyclic sequences of sandstones, shales, siltstones and coals. The Carbondale sediments were deposited in a fluvial-deltaic system. As a result of this depositional environment, the lithologic units of the Carbondale tend to be lenticular bodies rather than continuous sheet-like strata. Gradational and abrupt horizontal changes in lithology are often encountered.

Cross-sections were prepared during development of this ACM, and cross-section locations are shown on **Figure 2**. The individual cross-sections are presented on **Figures 4, 5 and 6**. These sections illustrate the sequence of geologic materials present under the Green Landfill as evidenced by the currently available data.

2.3.3 Hydrogeology

For purposes of compliance with the CCR Rule groundwater monitoring requirements the interbedded sandstone and shale of the Carbondale Formation, is considered to be the uppermost aquifer underlying the Green Landfill. The uppermost aquifer is unconfined and first encountered at an elevation of approximately 401 ft., amsl at the northwest end of the landfill, and 367 ft., amsl at the southeast end of

the landfill (AECOM, 2019). Flow direction beneath the Site is typically southeast towards the Green River.

Slug tests were performed on April 25, 2019 at monitoring wells MW-3A, MW-4, MW-6, and MW-104 to assess the hydraulic characteristics of the uppermost aquifer. The estimated hydraulic conductivity of the monitoring wells tested ranged from $2x10^{-5}$ to $3x10^{-3}$ centimeters per second (cm/sec).

Although previous site-specific investigations have noted the presence of perched zones of saturation in the overlying unconsolidated materials, these discontinuous zones do not qualify as an uppermost aquifer under the CCR Rule because they do not produce usable quantities of groundwater.

2.3.4 Constituents of Concern (COCs)

As described in Section 2.2, a single Appendix IV constituent, Li, was detected at concentrations exceeding GWPS at multiple monitoring well locations. Li was detected at SSLs above the GWPS at the locations of monitoring wells MW-3A, MW-4, MW-5, and MW-6.

2.3.5 Impacted Media

Groundwater is the sole impacted media of concern addressed by this ACM. Non-groundwater releases will be covered under a separate ACM.

2.3.6 COCs Distribution

Groundwater analytical data from the Site investigations through 2018 indicate that COC concentrations above GWPSs are present in the vicinity of the Green Landfill along the south and east edges of the landfill, near the station's property boundary **(Figure 7**). COC concentrations at MW-1 and MW-2 were not above GWPSs at SSLs. Due to this, the area of projected corrective measures is confined to the area between and adjacent to MW-3A, MW-4, MW-5, and MW-6.

An additional characterization well, MW-104, was subsequently installed to estimate the downgradient extent of impacted groundwater. Sample collection for Appendix III and IV parameters took place in March and April 2019. The analytical results for Li were below the GWPS. The additional characterization data are summarized in **Table 2**.

Table 2 – Green Station CCR Landfill Characterization Sample Results

Monitoring Well (Date)	Parameter
	Lithium UPL 0.008 GWPS 0.04 (mg/L)
MW-104 (March 2019)	0.0281
MW-104 (April 2019)	0.0288

The two sampling event results from the characterization well help confirm the downgradient (southwestern) extent of COC impacts above the GWPS at the Green Landfill.

2.3.7 Groundwater Quality

In addition to the presence of COCs above GWPSs, other geochemical characteristics of the shallow aquifer zone consist of the following:

- The temperature of the samples taken at the downgradient wells during the September 2018 sampling event ranged from 16.92 degrees Celsius (°C) to 17.54 °C.
- Specific conductance ranged from 1.68 to 8.00 milliSiemens per centimeter (mS/cm).
- Dissolved Oxygen (DO) concentration ranged from 0.42 to 6.36 mg/L.
- Oxidation Reduction Potential (ORP) ranged from -83 to 447 milliVolts (mV). The only monitoring well sample with a negative ORP was collected from monitoring well MW-2.
- Turbidity of the samples ranged from 0.14 to 25.6 Nephelometric Turbidity Units (NTU).
- The pH of the samples ranged from 6.50 to 6.72.
- Total Dissolved Solids (TDS) concentration of the samples ranged from 937 to 5,170 mg/L.

2.3.8 Potential Receptors / Pathways

Contact with water (e.g., shallow groundwater or surface water) impacted by COCs at levels above GWPS is regarded as the potential pathway for exposure of potential receptors. Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Green Landfill, thus limiting the potential receptors to the surface water, i.e., the Green River and its tributary, Groves Creek. The pathways to these receptors include seepage of water from the Green Landfill through manmade and natural hydraulic barriers.

Other potential exposure pathways (e.g., soil or vapor) are not considered complete as the CCR material is isolated in the unit. This isolation prevents direct access by individuals that might result in direct contact or ingestion. In addition, the inherent non-volatile nature of the unit-specific COCs eliminates the potential for a complete vapor pathway (i.e., vapor intrusion to indoor air). Therefore, soil and vapor pathways will not be considered within the context of this ACM.

3.0 CORRECTIVE ACTION OBJECTIVE (CAO)

For CCR units, 40 CFR Parts 257.90 through 257.98 outlines the groundwater monitoring programs (Detection and Assessment) and the corrective action evaluation process, which provide the basis for the development of the site-specific CAO. Detection and Assessment groundwater monitoring are complete at the Landfill, and the COC Li has been identified based on exceedance of the GWPS.

Section 257.96(c) requires this assessment to include an analysis of the effectiveness of potential corrective measures to meet the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

The subsequent remedy selection process will evaluate the following objectives for remedies, as required under Section 257.97(b):

- Protect human health and the environment;
- Attain the COC-specific GWPSs as specified pursuant to Section 257.95(h);
- Control the source(s) 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 (applicable to material releases only); and
- Comply with standards for management of wastes as specified in Section 257.98(d).

Together, these requirements comprise the site-specific CAO that will be used during the remedy selection process.

4.0 TECHNOLOGY IDENTIFICATION AND SCREENING

As required under Section 257.97(b), source control is one element of the CAO that is intended to prevent further releases from the source, i.e., the Green Landfill. In adherence with the BREC's permit conditions, the Site will continue to operate as a solid waste disposal facility through its life cycle and will be closed in accordance with the requirements of the permit. Source control through landfill closure will include installation of final cover that will prevent infiltration and contribute to groundwater quality restoration. Control of non-groundwater sources associated with the Green Landfill are also planned and are described separately.

The identification and screening of potentially applicable corrective measures technologies for groundwater downgradient of the Green Landfill is presented in **Appendix A** to this report. The findings of that screening are summarized in the table below.

Table 3 – Potential Corrective Measures Options Technology Description/Overview

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection mode)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a standalone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing offsite migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations increase implementation difficulty with scale.

Potentially Applicable Technology	Status	Description/Overview
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

References: Technology descriptions referenced from 1) FRTR: Federal Remediation Technologies Roundtable, CLU-IN, and/or AECOM reference materials.

5.0 CORRECTIVE ACTION ALTERNATIVES ASSEMBLY

Applicable corrective measures technologies identified in Section 4.0 above were assembled into corrective measures alternatives for evaluation (see **Appendix A** and Section 6.0). Each corrective measures alternative consists of one or more corrective measures technologies assembled into a strategy for the groundwater remedy. Six corrective measures alternatives for the Green Landfill were assembled and are described below.

- **Alternative #1** – No Action and Groundwater Monitoring
- **Alternative #2a** – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- **Alternative #2b** – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- **Alternative #3** – CiP, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- **Alternative #4** – CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- **Alternative #5** – CiP, Other Source Control, ICs, and Groundwater Monitoring

5.1 Assumptions for Corrective Measure Alternatives Development

In developing the corrective measures alternatives, a number of assumptions have been made based on the data available to AECOM at the time of this report and operational plans as reported by the owner/operator. The specific assumptions include:

- The currently observed dissolved phase groundwater impacts are limited to the area between and adjacent to monitoring well locations MW-3A, MW-4, MW-5, and MW-6 along the south and east edges of the landfill.
- Groundwater impacts are limited to the saturated zone between the observed water table at approximate elevation 370 feet mean sea level (ft., msl) and the base of the aquifer at approximately 320 ft-msl.
- Ex-situ treatment of groundwater may involve physical/chemical methods and/or discharge to a permitted National Pollution Discharge and Elimination System (NPDES) outfall.
- Groundwater corrective measures will be conducted until the CAOs are met. The objectives may be met at an earlier date, but the alternatives analysis is based on the conservative assumption that corrective measures and the associated monitoring of groundwater conditions will be required for up to 30 years following the initiation of the corrective measures.
- CiP and Other Source Control are part of planned plant operations.

5.2 Groundwater Corrective Measures Alternatives Overview

The developed groundwater corrective measures alternatives, outlined above, are detailed in the following sections.

5.2.1 Alternative #1 – No Action and Groundwater Monitoring

Alternative #1 consists of taking no action to remedy the CCR impact observed in the Green Landfill groundwater monitoring system. Under the No Action alternative, no corrective measures would be

implemented to remove, control, mitigate, or minimize exposure to impacted groundwater. Groundwater monitoring (Assessment) is required by the CCR rule during the nominal performance period of 30 years to track the effectiveness of the alternative and to identify conditions that allow the return to Detection monitoring. The No Action alternative establishes a baseline, or reference point against which each of the developed corrective measures alternatives may be compared.

5.2.2 Alternative #2a – CiP, ICs, and Groundwater Monitoring

Alternative #2a employs a combination of three of the retained corrective measures technologies:

- CiP source control, which consists of two elements: routine cover management during landfill operation, and planned closure activities to be conducted at the end of the landfill's operational life cycle;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater Monitoring (Assessment) to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection monitoring and ultimately to cessation of corrective measures.

CiP was selected as the source control technology because the unit is a state-permitted solid waste facility subject to operational and closure controls designed to limit the potential for impact to human health and the environment.

Implementation of ICs is employed to help maintain the CiP and associated corrective measures by limiting the accessibility of the unit to unauthorized users and restricting future use of the property to those activities that may result in exposure potentials. ICs for the landfill are specifically addressed by the facility's solid waste permit, which restricts the use of the property and associated resources (groundwater).

Groundwater monitoring of the unit is required by 40 CFR 257.90 through .98. The unit triggered Assessment mode monitoring by the detection of indicator parameters (Appendix III of 40 CFR 257) in downgradient monitoring wells at concentrations representing a SSI over background. Continued groundwater monitoring is required under 40 CFR 257.95 until the CAOs are met. The CAOs are anticipated to be met as the effect of source control technologies are realized and as natural attenuation mechanisms (advection, dilution and dispersion) take effect.

5.2.3 Alternative #2b – CbR, ICs, and Groundwater Monitoring

Alternative #2b is similar to Alternative #2a except that CiP is replaced by CbR, which consists of excavation and removal of the Green Landfill, implementation of ICs and an Environmental Covenant intended to restrict the unit to industrial use and prohibit groundwater use for potable purposes. The excavation of impacted CCR material would typically be completed using standard construction equipment (e.g., backhoe, excavator, wheel loader, dump trucks). The excavated materials are then placed directly into dump trucks for transport/disposal or beneficial use. Excavation limits would typically be verified with confirmation sampling to demonstrate that the underlying soil is not impacted above applicable standards.

Groundwater monitoring of the unit is required by 40 CFR 257.90 through .98. The unit triggered Assessment mode monitoring by the detection of indicator parameters (Appendix III of 40 CFR 257) in downgradient monitoring wells at concentrations representing a SSI over background. Continued groundwater monitoring is required under 40 CFR 257.95 until the CAOs are met. The CAOs are

anticipated to be met as the effect of source control technologies are realized and as natural attenuation mechanisms (advection, dilution and dispersion) take effect.

5.2.4 Alternative #3 – CiP, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, ICs, and Groundwater Monitoring

Alternative #3 builds on Alternative #2a to also include the addition of Hydraulic Containment, Other Source Control, and Ex-Situ Treatment of groundwater:

- CiP source control, which consists of two elements: routine cover management during landfill operation, and planned closure activities to be conducted at the end of the landfill's operational life cycle;
- Hydraulic Containment using one or more vertical wells designed to prevent the movement of impacted groundwater past the limits of the unit to the downgradient groundwater environment and potential points of exposure;
- Other Source Control in the form of draining and lining the south Leachate Pond, which helps eliminate the potential for additional contaminant migration from the landfill, and managing existing non-groundwater seepages;
- Ex-Situ Treatment of groundwater extracted for hydraulic containment, which involves above-ground physical/chemical treatment methods and/or permitted discharge for until the CAOs are achieved;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater Monitoring (Assessment mode) to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection mode monitoring and ultimately to cessation of corrective measures.

Vertical groundwater recovery wells for Hydraulic Containment would be installed near the downgradient limit of the unit. It is noted that Pre-Design Studies will be needed to identify the appropriate number, design, and spacing of the extraction well system, but for the purposes of this ACM, preliminary specifications are as follows:

- Five vertical groundwater extraction wells;
- The extraction wells would be installed along the south side and the southeast corner of the landfill, equally spaced between MW-6 and MW-3A;
- Well installed to a depth of approximately 50-75 ft-bgs;
- Estimated total groundwater extraction rate of 200 gallons per minute (gpm).

Alternative #3 incorporates treatment of extracted groundwater before it can be discharged to an outfall. Treatment will consist of piping the extracted groundwater to an existing surface water impoundment at the Sebree Station, which will allow for compliance with discharge permits through an established NPDES outfall.

Other Source Control would consist of re-design of the pond located south of Green Landfill by dividing the pond into thirds. The east and west sections of the pond will be designed to collect non-groundwater seepage from around the toe of the unit so that it can be isolated and pumped to a central location for treatment. The middle section of the pond will continue to be used for stormwater collection.

The COC concentrations downgradient of the hydraulic containment would also be expected to decrease over time through natural attenuation mechanisms including advection, dilution, and dispersion. As such, groundwater monitoring would be modified to include system performance monitoring, which may require installation of wells at new locations to evaluate the efficacy of hydraulic containment and to identify when CAOs have been achieved.

5.2.5 Alternative #4 – CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring

Alternative #4 is similar to Alternative #2a except for the addition of a Physical Containment barrier such as a slurry wall or grout curtain along the affected downgradient boundary of the unit to contain groundwater flow. Impacted groundwater would be contained by grout curtain constructed in a funnel-and-gate arrangement that directs the flow of groundwater to an extraction point at the gate, from which groundwater is pumped and conveyed to ex-situ treatment. Design of a Physical Containment system is largely driven by the depth and character of the groundwater bearing zone, and the length barrier needed to effect containment. In this case, the aquifer ranges to depths on the order of 75 feet below ground surface near the downgradient limit of the unit. The projected length of a physical barrier is 4,000 feet. Similar to Alternative #3, Treatment will consist of piping the extracted groundwater to an existing surface water impoundment at the Sebree Station, which will allow for compliance with discharge permits through an established NPDES outfall.

5.2.6 Alternative #5 – CiP, Other Source Control, ICs, and Groundwater Monitoring

Alternative #5 builds on Alternative #2a to also include the addition of Other Source Control for non-groundwater releases. Other Source Control would consist of draining and lining the pond located south of Green Landfill with geomembrane, and dividing the pond into sections. The east and west sections of the pond will collect the seepage, where it will be pumped to a central location for treatment. The middle section of the pond will continue to be used for stormwater collection.

6.0 ALTERNATIVE EVALUATION

The formal remedy selection process, in accordance with the CCR Rule 40 CFR Section 257.97, will begin following submission of the ACM Report. The subsequent remedy selection process will evaluate the following objectives for remedies, as required under Section 257.97(b):

- Protect human health and the environment;
- Attain the COC-specific GWPSs as specified pursuant to Section 257.95(h);
- Control the source(s) 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 (applicable to material releases only); and
- Comply with standards for management of wastes as specified in Section 257.98(d).

6.1 Potential Data Gaps

No data gaps investigation is projected at this time.

Depending on which alternative is selected, a data gap investigation may be needed to further refine the targeted areas for corrective measures. Potential data gaps may include the following:

1) Supplemental Groundwater Investigation – This investigation may consist of additional monitoring well installation and sampling to refine the existing CSM as well as to provide data related to the hydraulic characteristics of the subsurface.

2) Physical Containment Profile – Prior to committing to a physical barrier design, it may be necessary to probe the subsurface along the proposed alignment to:

    - Establish the character of the materials through which the barrier would be installed,
    - The depth to confinement where the barrier would terminate.

7.0 REFERENCES

AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Green Station CCR Landfill, Webster County, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Green Station CCR Landfill, Webster County, Kentucky.

Associated Engineers 2016. Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan.

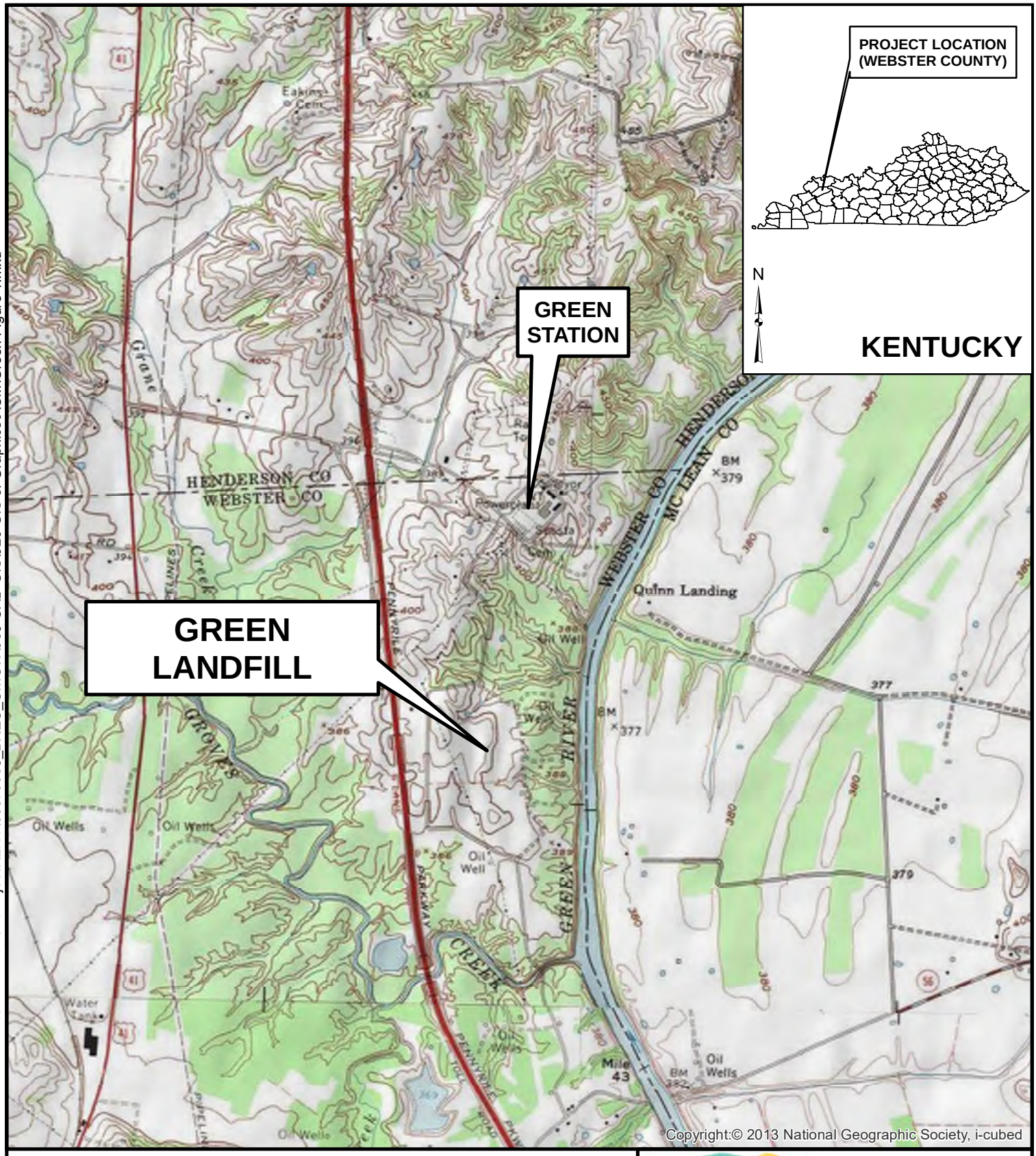
EPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

Fairer, G.M., Geologic Map of the Robards Quadrangle, Henderson and Webster Counties, Kentucky, U.S. Geological Survey, 1973.

Federal Remediation Technologies Roundtable (FRTR). Remediation Technologies Screening Matrix and Reference Guide, Version 4.0. URL: https://frtr.gov/scrntools.htm Page last modified on: Tuesday, May 17, 2016

Interstate Technology Regulatory Council (ITRC), 2009. Evaluating LNAPL Remedial Technologies for Achieving Project Goals. ITRC guidance document LNAPL-2, Washington, DC; 54 pp.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

N

Big Rivers ELECTRIC CORPORATION

Green Station
Webster County, Kentucky

FIGURE 1
SITE LOCATION MAP

DATE: 4/30/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60602364	

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B
B'
C
C'
A
A'
MW-1
MW-2
MW-3A
MW-4
MW-5
MW-6
MW-104
GESB-01
GESB-02
GESB-03
GESB-04
GESB-05
GESB-06
GESB-07
GESB-08
GESB-09
GESB-10
GESB-11
GESB-12
GESB-13
GESB-14
GESB-15
GESB-16
GESB-17
GESB-18
GESB-19
GESB-20
GESB-21
GESB-22
GESB-23
GESB-24
GESB-25
GESB-26
GESB-27
GESB-28
GESB-29
Green River
Groves Creek

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

Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well
- A — A' Transect Line
- GP-01 Seeps Investigation Borings

0 400 800
Feet

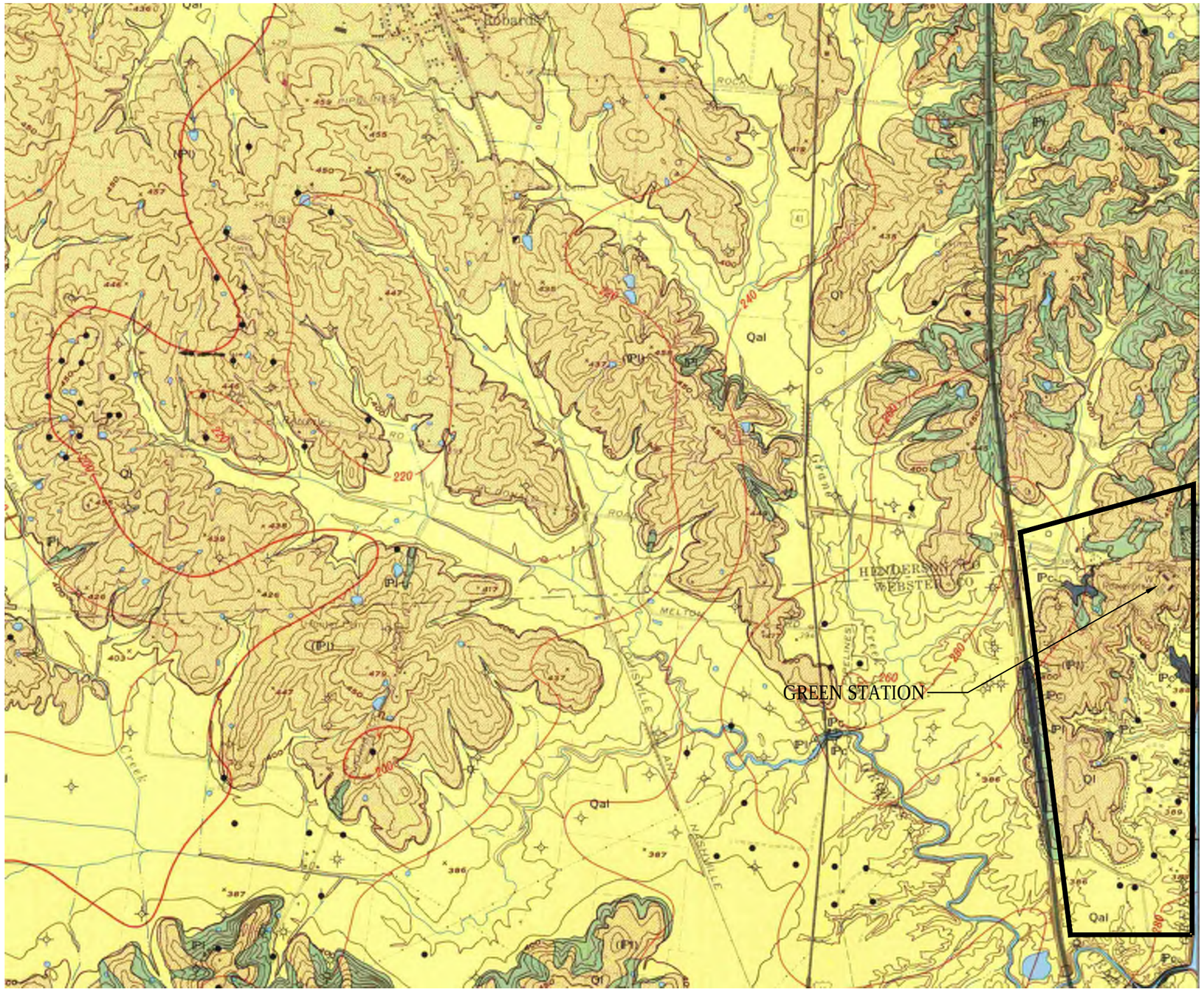
N

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 2
WELL LOCATION MAP

DATE: 5/17/2019	SCALE: 1IN = 300 FEET
CREATED BY: ALW	
JOB NO. 60602364	



SCALE 1:24 000

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

EXPLANATION

QUATERNARY

Pleistocene and Holocene

Qal — Alluvium

Pleistocene

Ql — Loess

Adapted in part from soil map of Henderson County (Converse and Cox, 1967)

PENNSYLVANIAN

Upper Pennsylvanian

Pl — m — Pl — Lisman Formation

m, base of Madisonville Limestone Member

Middle Pennsylvanian

Pc — Carbondale Formation

Formation symbols enclosed in parentheses where units concealed by mapped surficial deposits

Contact or key bed

Dashed where inferred; dotted where concealed. Triangles indicate selected localities where contacts were well exposed at time of mapping

Strike and dip of beds

200

Structure contours

Drawn on base of No. 9 coal bed; projected where contoured horizon is missing. Arrows indicate direction of dip. Contour interval 20 feet

Outline of area where No. 9 coal bed is missing

DRILL HOLES FROM WHICH SUBSURFACE STRUCTURAL DATA WERE OBTAINED, AS OF JANUARY 1, 1971

Dry hole

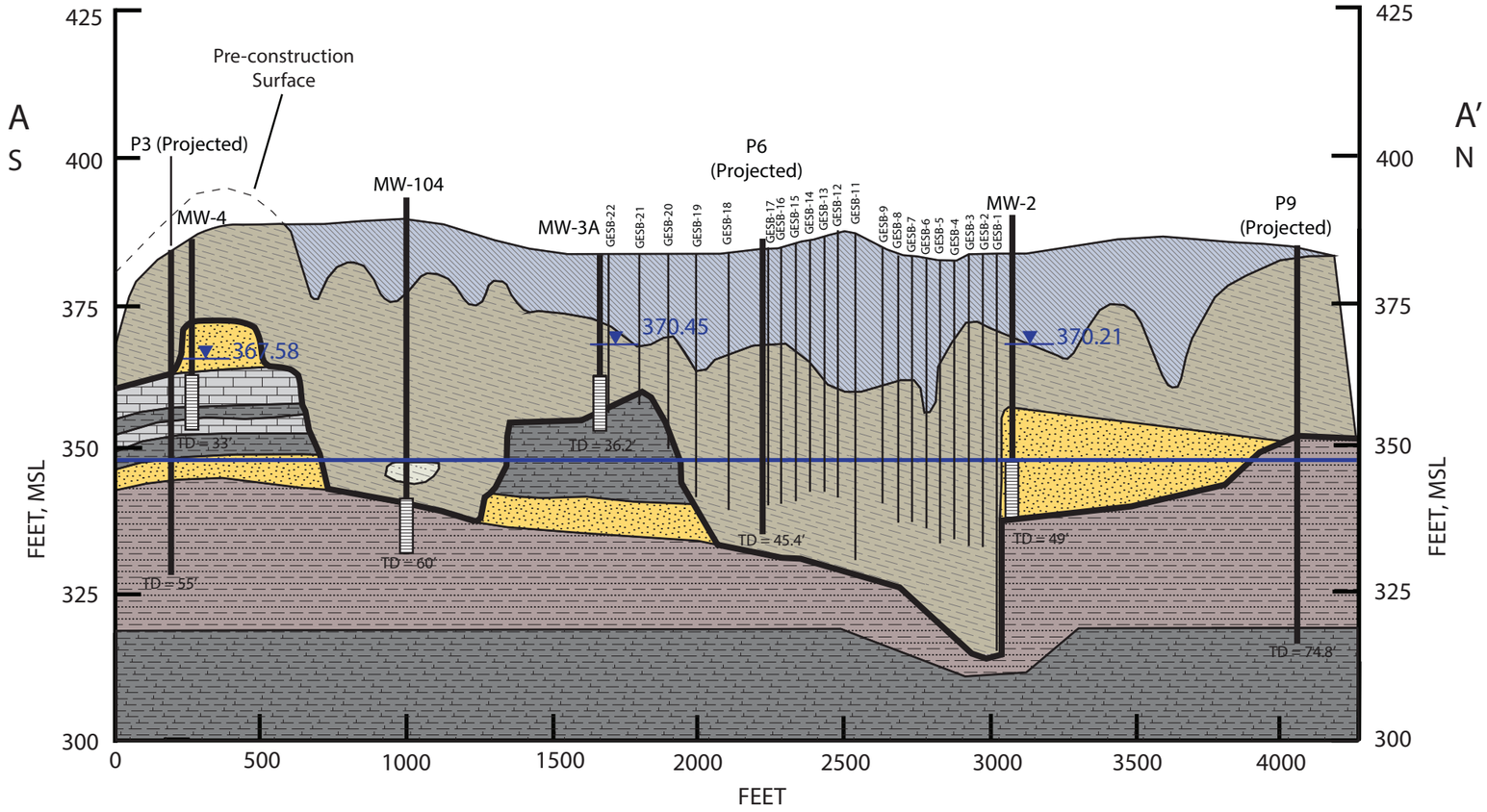
Oil well

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 3
SITE GEOLOGIC MAP
(KENTUCKY GEOLOGICAL SURVEY)

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: DAS	
JOB NO. 60602364	



LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silt
- Silty Clay
- Clayey Silt

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale

- Potentiometric Surface September 28, 2018
- Green River Elevation (348 ft)

MW-2
MONITORING WELL LOCATION ID
RISER
MONITORING WELL SCREEN
BACKFILL / COLLAPSE

25 feet
500 feet
(Vertical Exaggeration = 20x)

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 4
CROSS SECTION A - A'

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: MRH	
JOB NO. 60602365	

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B
W

B′
E

525
500
475
450
425
400
375
350
325
300

FEET, MSL

Fly Ash (Land Fill)

Pre-construction Surface

P7 (Projected)

MW-1

P8 (Projected)

P9 (Projected)

MW-2

401.01

370.21

TD = 45'

TD = 65.5'

TD = 35.5'

TD = 49'

TD = 74.8'

Green River

0
500
1000
1500
2000
2500
3000

FEET

MW-1 — MONITORING WELL LOCATION ID

RISER

MONITORING WELL SCREEN

BACKFILL / COLLAPSE

Potentiometric Surface September 28, 2018

Green River Elevation (348 ft)

LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silty Clay

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale

25 feet

500 feet

(Vertical Exaggeration = 20x)

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 5
CROSS SECTION B - B'

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: MRH	
JOB NO. 60602365	

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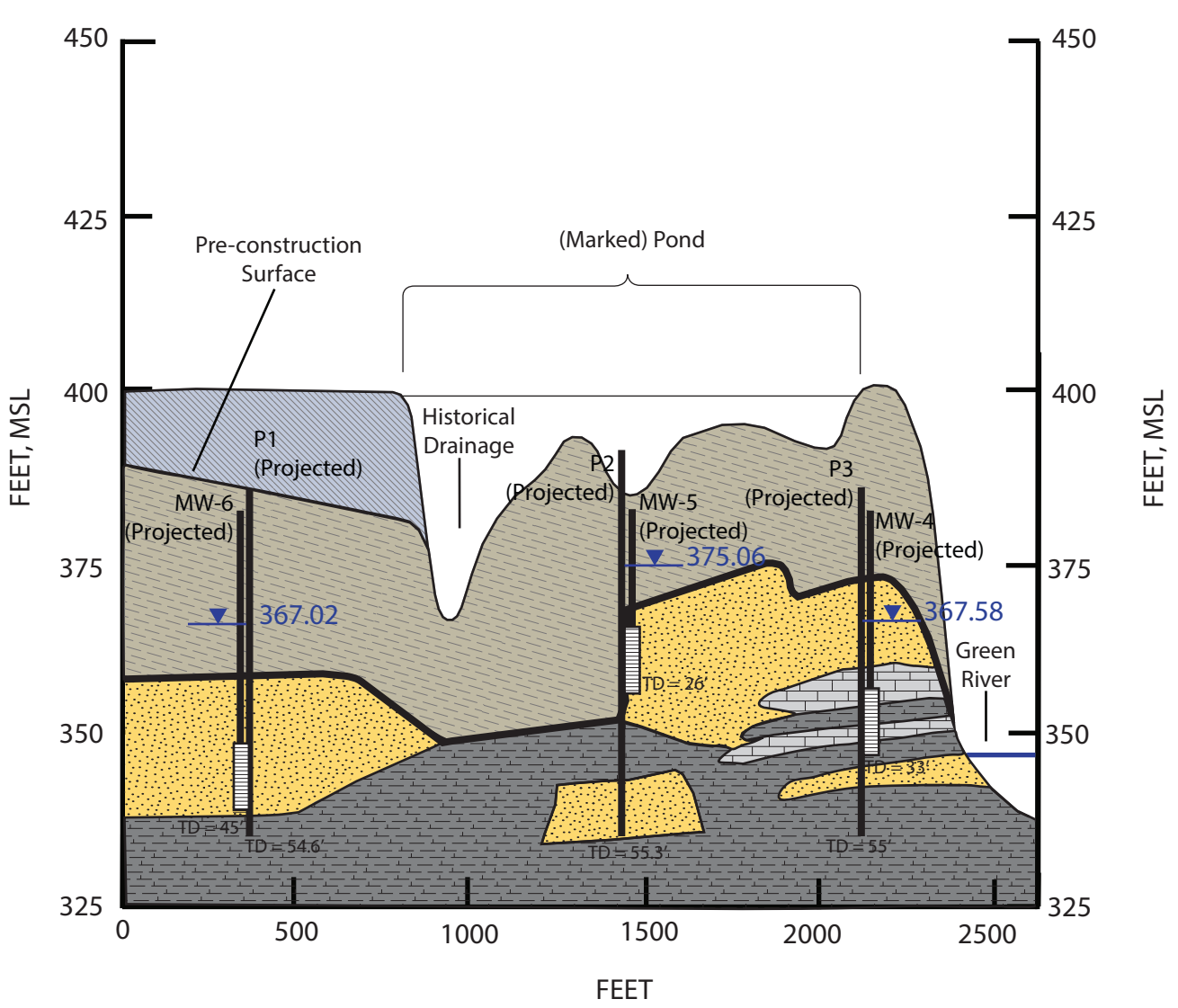

LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silty Clay

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Limestone

25 feet

500 feet

(Vertical Exaggeration = 20x)

MW-4

MONITORING WELL LOCATION ID

RISER

MONITORING WELL SCREEN

BACKFILL / COLLAPSE

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 6
CROSS SECTION C - C’

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: MRH	
JOB NO. 60602365	

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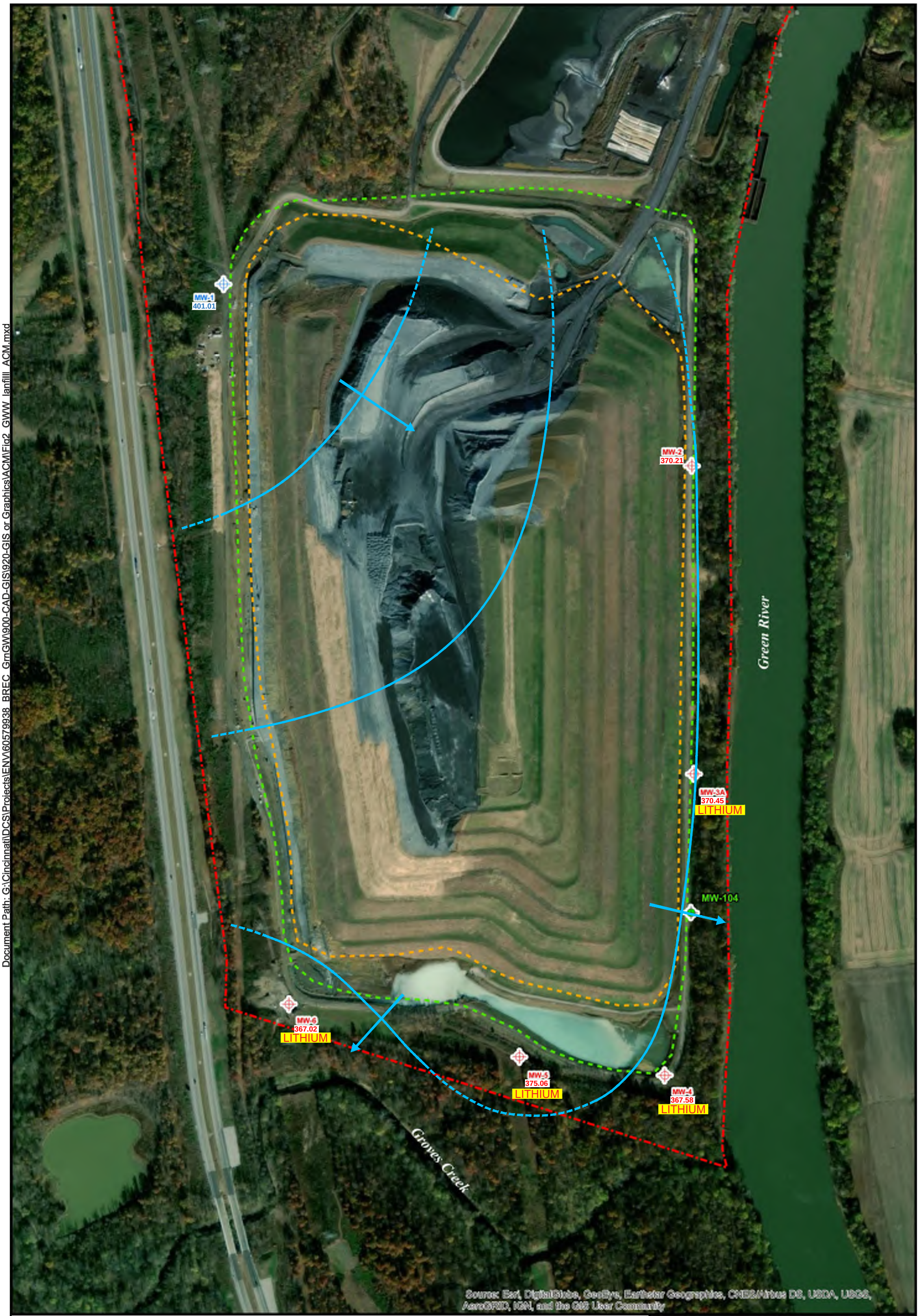

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Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well
- Water Table Contour (Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 387.58 Groundwater Elevation (Feet, MSL) Measured September 28, 2018

0 400 800
Feet

N

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 7
COC DISTRIBUTION

DATE: 5/17/2019	SCALE: 1IN = 300 FEET
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Appendix A

Corrective Measures Technologies and Alternatives Evaluation Process

Appendix A
Corrective Measures Technologies and Alternatives Screening Process

CONTENTS

Section **Page**

Tables

A1.0 CORRECTIVE MEASURES EVALUATION PROCESS

This appendix describes the overall process used in the selection and screening of corrective measures technologies that are considered potentially applicable to Coal Combustion Residuals (CCR) groundwater impacts at the subject Site. This appendix also describes the process for assembling preliminary corrective measures alternatives from one or more applicable technologies and evaluating these alternatives.

A1.1 Potential Remedial Technologies

Section 257.96(c) requires this assessment to include an analysis of the effectiveness of potential corrective measures to meet the objectives for remedies under Section 257.97(b), addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

The following corrective measures technologies are regarded as potentially applicable to corrective measures for CCR groundwater impact:

- No Action (Included as a baseline case)
- Institutional Controls (ICs)
- Groundwater Monitoring
- Hydraulic Containment
- Physical Containment
- Ex-situ Physical/Chemical/Biological Treatment
- In-situ Physical/Chemical/Biological Treatment
- Permeable Reactive Barrier (PRB)
- Closure in Place (CiP) (of the regulated unit)
- Closure by Removal (CbR) (of the regulated unit)

A brief overview of these technologies is provided below in **Table A1**.

Table A1 – Potential Remedial Technologies

Potential Technology	Description/Overview
No Action	Default baseline approach against which other options are evaluated. No corrective action would be taken to remove, control, mitigate or minimize exposure to impacted media.
Institutional Controls (ICs)	Non-engineering measures, such as administrative and/or legal controls that help to minimize the potential for human exposure to contamination, and/or to protect the integrity of a remedy by limiting land or resource use (United States Environmental Protection Agency [USEPA), *Institutional Control Data Standard* EX000015.1, January 6, 2006).
Groundwater Monitoring	Groundwater monitoring (Assessment and/or Detection modes) to assess effectiveness of corrective measures performance, as well as natural subsurface processes such as dilution, adsorption, and chemical reactions that together serve to reduce inorganic constituents of concern (COC) concentrations to acceptable levels.
Hydraulic Containment	Hydraulic containment is a common method for remediating groundwater impacted with metals and other inorganics. Groundwater is pumped from wells or collection trenches to aboveground discharge point or to a treatment system that removes the contaminants. The extraction network would be designed to provide hydraulic containment of the impacted groundwater, preventing it from flowing downgradient towards surface water or other receptors.
Physical Containment	Physical barriers are walls constructed below the ground surface to control or restrict the flow of groundwater. They are constructed by injection grouting or by the use of excavator or deep trenching equipment to insert and thoroughly mix a selected amendment to create a homogenized impermeable wall that prevents impacted groundwater from flowing downgradient. The bottom of the physical containment structure is typically keyed into a low-permeability soil or bedrock (confining layer) to keep groundwater from seeping beneath the wall. To provide hydraulic control of the impacted groundwater behind (upgradient of) the physical barrier and to prevent impacted water from flowing around the edges of the wall, extraction wells would be installed behind the vertical barrier (VB) and the extracted groundwater processed through a treatment system.
Ex-situ Physical/Chemical/Biological Treatment	Ex-situ treatment requires pumping of groundwater and engineering for equipment, possible permitting, and material handling. Physical/chemical treatment uses the physical properties of the contaminants or the contaminated medium to destroy (i.e., chemically convert), separate, or contain the contamination. Physical/chemical treatment can be completed in short time periods (in comparison with biological treatment). Equipment is readily available. Treatment residuals from separation techniques will require treatment or disposal.

Potential Technology	Description/Overview
In-situ Physical/Chemical Treatment	With in-situ treatment, groundwater is treated without being brought to the surface. In-situ processes, however, generally require longer time periods. Physical/chemical treatment uses the physical properties of the contaminants or the contaminated medium to destroy (i.e., chemically convert), or separate the contamination.
Permeable Reactive Barriers (PRB)	A PRB is a constructed subsurface barrier designed to intercept groundwater flow and react with the entrained COCs. PRBs can be established through trench injection or direct-push injection (on closely spaced grids) of reactive material. PRBs are typically installed to the depth of impacted groundwater (often the bottom of the shallow aquifer) and along the length of the impacted zone. The amendment used to generate the PRB is generally permeable as or more permeable than the surrounding material, encouraging impacted groundwater to flow through the reactive material. The reactive material then causes chemical reactions to occur, resulting in adsorption, precipitation, or degradation of the COC. PRBs are commonly used to control organic contamination in groundwater and have been successfully used to remediate metals.
Closure in Place (CiP) (of the regulated unit)	Landfill caps can be installed to minimize generation of leachate and to minimize infiltration into underlying waste. Landfill caps also may be applied to waste masses that are so large that other treatment is impractical. By providing a suitable base for the establishment of vegetation. In conjunction with water diversion and detention structures, landfill caps may be designed to route surface water away from the waste area while minimizing erosion
Closure by Removal (CbR) (of the regulated unit)	Removal of contaminated media for disposal in off-site facility or alternate on-site facility. Media would likely require characterization for proper disposal. Pre-treatment may be necessary to meet land disposal restrictions (LDRs). Once excavated, confirmatory samples would be collected to verify clean-up criteria have been met; the excavation would then be backfilled and covered.

References: Technology descriptions referenced from 1) FRTR: Federal Remediation Technologies Roundtable, CLU-IN, and/or AECOM reference materials.

A1.2 Other Source Control Technologies

In addition to the groundwater corrective measures technologies summarized above, CCR impacts are also mitigated through a variety of engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods for source control.

A1.3 No Action

No Action is included in the evaluation as a baseline against which other technologies are evaluated. With this option, no corrective action would be taken to remove, control, mitigate or minimize exposure to impacted media. In the event that the other identified alternatives do not offer substantial benefits, No Action is the default baseline approach.

Under this alternative, existing impacted media (i.e., CCR materials and impacted soil/groundwater along the exposure pathway) would remain. No capital costs would be incurred, and no cleanup standards would be considered.

No Action does not meet the performance requirement of attaining the established Corrective Action Objective (CAO). Although implementation would be very easy, the required state approval for "No Action" would likely not occur. Safety impacts, cross-media impacts, and residual CCR exposure control

would be no different from current conditions. Therefore, No Action is not an appropriate standalone technology. However, it is retained for use as a baseline against which other technologies and alternatives are evaluated.

A1.4 Institutional Controls (ICs)

The potential use of ICs is considered the least aggressive corrective action technology for CCR impacts.

ICs would not change the concentration or mobility of COCs and therefore would not meet the performance requirement of attaining the established CAO as a standalone technology unless it can be demonstrated that impacted groundwater is not leaving the facility. ICs would be used in combination with other corrective measures to limit human exposures and would be easy to implement, consisting of preparation and recording of Environmental Restrictive Covenants [ERC(s)]. Safety impacts and cross-media impacts would be identical to current conditions. Because ICs would control exposure and thus enhance protection of human health and the environment, the use of ICs can be a component of corrective measures alternatives. The use of ICs as a standalone technology will not be considered.

A1.5 Groundwater Monitoring

The use of groundwater monitoring is only applicable for dissolved-phase groundwater impacts, and it will take place in Assessment and/or Detection modes as appropriate for the current phase of CCR activity. Groundwater monitoring is not a standalone technology, but instead will be combined with other remedial technologies in order to track progress of the overall remedy, which also incorporates natural attenuation processes.

The use of groundwater monitoring as a stand-alone remedial technology will not be considered; instead the incorporation of groundwater monitoring in conjunction with other technologies will be used to monitor effectiveness of a given corrective measures alternative to attain the CAO at points immediately downgradient over an extended period of time. Data reliability is controlled by adherence to the site's groundwater monitoring plan. Implementation of the existing groundwater monitoring plan is easy because it is currently underway. Safety impacts are minimized by use of the existing Health and Safety Plan and there are no construction activities required. There are no cross-media impacts or institutional requirements, nor is there any residual CCR exposure control.

A1.6 Hydraulic Containment

The use of hydraulic containment as a potential remedial technology is considered. The use of groundwater extraction can be effective at hydraulically controlling long-term downgradient dissolved phase impacts.

Hydraulic containment through groundwater extraction and subsequent treatment has historically been a common method for management of groundwater impacted with metals and other inorganics. Groundwater is pumped from wells (vertical or horizontal) or collection trenches to a discharge point (e.g., a permitted outfall) or to an aboveground treatment system. The extraction network would be designed, constructed, and operated to provide a hydraulic barrier between the impacted groundwater and the migration pathway to potential receptors.

This technology attains the established CAO because hydraulic containment rapidly eliminates the offsite migration of impacted groundwater, thereby eliminating the exposure pathway. Performance and reliability would be controlled by adherence to the operations and maintenance plan prepared for the extraction and treatment systems. Implementation would be difficult because of areas of limited access for drilling equipment and uneven groundwater flow in the uppermost aquifer materials that consist of interbedded sandstone and shale having hydraulic conductivity values spanning several orders of

magnitude. Potential safety impacts during construction, operation, and maintenance of the system would be mitigated by health and safety plans prepared for these tasks. There would be no cross-media impacts. Hydraulic containment will reduce mobility due to COCs capture provided by the groundwater extraction system and treatment to remove COCs from the environment. The time period for CAO attainment may be relatively short, but system operation will need to continue until CCR source loading of COCs to groundwater ceases. For institutional requirements, treated discharge would occur under existing or modified National Pollution Discharge Elimination System (NPDES) permit.

Based on the preliminary screening, hydraulic containment is a potentially viable remedial technology and will be retained for further consideration.

A1.7 Physical Containment

The use of physical containment to isolate the impacted materials associated with a CCR unit is considered. Physical containment typically consists of a barrier or wall (i.e., slurry wall, sheet pile wall, or injection grouting) constructed below the ground surface to control or restrict the flow of groundwater. The barrier is typically constructed by excavators and/or deep trenching equipment that thoroughly mix bentonite/cement slurry to create a homogenized impermeable wall, or by driving sheet pile. The construction of the barrier would prevent impacted groundwater from flowing downgradient. Where possible, the bottom of the barrier would be keyed into the low-permeability soil or bedrock (confining layer) at the bottom of the aquifer, keeping groundwater from seeping beneath it. To provide hydraulic control of the impacted groundwater behind the barrier and prevent impacted water from flowing around the edges, a hydraulic containment system would be installed behind the wall. Extracted groundwater would then be discharged or processed through a groundwater treatment system, as needed. Extraction flow rates for this option will generally be lower than in a standalone hydraulic containment option, because the pumping rates will only need to accommodate natural groundwater flow rates, rather than providing a hydraulic barrier. However, pumping would need to be performed indefinitely to maintain water levels behind the barrier. It is also noted that physical barriers can also be utilized in a funnel-and-gate arrangement to direct the flow of groundwater to a small, more permeable area (i.e., the gate) where reactive material can be used to treat the metals in-situ. The “gate” can also be configured as a single extraction point for impacted groundwater directed to it by the “funnel.”

This technology attains the established CAO after combined physical and hydraulic containment eliminates the offsite migration of impacted groundwater, thereby eliminating the exposure pathway. In the long term, this technology will maintain compliance with the established CAO after final cover construction at the Green Landfill, which will end the source loading to the groundwater, and groundwater flushes through the aquifer. Performance and reliability would be controlled by adherence to the operations and maintenance plan prepared for the extraction and treatment systems. The technology would pose substantial challenges to the installation and operation of the physical barrier such as areas of limited access and highly variable depths to bedrock. Potential safety impacts during construction, operation, and maintenance of the system would be mitigated by health and safety plans prepared for these tasks. Cross-media impacts include the potential for airborne fugitive dust issues during construction, which would be mitigated by construction contingency planning. The time period for attainment is based on construction of the barrier. For institutional requirements, treated discharge would occur under existing or modified NPDES permit.

Based on the preliminary screening, physical containment is potentially viable as a potential corrective measures alternative component when combined with supplemental groundwater extraction and treatment. However, physical containment does not appear to add value to a stand-alone hydraulic containment approach.

A1.8 Ex-Situ Physical/Chemical/Biological Treatment

Ex-situ treatment requires the use of groundwater extraction with related engineering, equipment, permitting, and material handling necessary to convey the waste stream to above-ground treatment. Treatment technologies would be designed to remove the specific constituents from groundwater to meet regulatory discharge requirements; treatment options for the varied constituents may include pH adjustment, filtration, coagulation/chemical precipitation, membrane filtration, ion exchange, carbon adsorption, reverse osmosis, chemical reduction, and other potential treatment technologies. Multiple treatment technologies would potentially be needed to effectively remove the different types of contaminants. If this technology is incorporated into a corrective action alternative, further detailed evaluation and/or bench- and pilot-scale studies would be necessary to identify technically effective treatment technologies given the inorganic COCs.

This is not a standalone technology, but would be used in combination with hydraulic containment. System reliability would be controlled by adherence to an operation and maintenance plan prepared for the system. Implementation is expected to be straightforward based on well-established water treatment principles and experience. Potential safety impacts during construction, operation, and maintenance of the system would be mitigated by health and safety plans prepared for these tasks. There would be no cross-media impacts, nor would there be exposure to residual CCR materials. The time period for attainment is based on performance of the overall corrective measure, of which ex-situ treatment would be a component. For institutional requirements, treated discharge would occur under existing or modified NPDES permit.

Based on the preliminary screening, ex-situ treatment is a potentially viable remedial technology and will be retained for further consideration.

A1.9 In-Situ Physical/Chemical/Biological Treatment

For the inorganic COCs at CCR sites, in-situ treatment involves enhancement of natural attenuation processes such as dilution, adsorption, and chemical reactions to reduce concentrations to acceptable levels. This technology is appropriate for sites in which groundwater flow volumes are low, source controls are effective, and impacted groundwater is not expected to be long-lived.

Lithium (Li) is the sole COC for the Assessment of Corrective Measures (ACM) at the Green Landfill, and in-situ treatment methods are ineffective for Li. Therefore, this technology will not meet the performance requirement, and it will not be retained for further consideration.

A1.10 Permeable Reactive Barriers (PRB)

A PRB is an in-situ treatment method consisting of subsurface trench filled with reactive material installed to intercept and react with impacted groundwater. PRBs can be established through direct-push injection (on closely spaced grids) or emplaced as a continuous trench of reactive material. PRBs are typically installed to the depth of impacted groundwater (often the bottom of the shallow aquifer) and are oriented perpendicular to the flow of impacted groundwater. The amendment used to generate the PRB is generally as permeable as or more permeable than the surrounding material, encouraging impacted groundwater to flow through the reactive material. The reactive material then causes chemical reactions to occur within the PRB, resulting in adsorption, precipitation, or degradation.

PRBs are commonly used to control organic contamination in groundwater, and have been successfully used to remediate some metals. However, because Li is the sole COC for the ACM at the Green Landfill,

and in-situ methods are ineffective for Li, PRB will not meet the performance requirement, and it will not be retained for further consideration.

A1.11 Closure-in-Place (CiP) [of the regulated unit]

CiP would entail capping and restoration of the unit that contains the CCR material. Capping would minimize infiltration into the CCR material, thereby minimizing the potential for leachate to impact underlying soil and shallow groundwater. Capping would reduce potential exposure pathways and thus enhance protection of human health and the environment.

CiP will help attain the established CAO after final cover construction ends the source loading to the groundwater, and impacted groundwater flushes through the aquifer. This technology is easily implemented, as CiP is required by conditions of the solid waste permit and re-design of the southern storm water pond requires nominal engineering and construction efforts. Potential safety impacts during construction, operation, and maintenance of the final cover are governed by conditions of the solid waste permit and are mitigated by health and safety plans prepared for these tasks. There are no cross-media impacts associated with CiP, and it will provide for significant reduction in mobility of COCs upon implementation of the CiP source control. Final cover for the Green Landfill is anticipated as part of facility operations. Institutional requirements will consist of solid waste permit renewal(s) and state and community acceptance of the final remedy.

Based on the preliminary screening, CiP is retained for further consideration.

A1.12 Closure by Removal (CbR) [of the regulated unit]

CbR is a proven remedy that can effectively remove the source of contamination. The excavation of impacted CCR material would typically be completed using standard construction equipment (e.g., backhoe, excavator, wheel loader, dump trucks). The excavated materials are then placed directly into dump trucks for transport/disposal or beneficial use. Excavation limits would typically be verified with confirmation sampling to demonstrate that the underlying soil is not impacted above applicable standards.

This technology would help attain the established CAO after CCR removal ends and the source loading to groundwater is eliminated. This technology would be difficult to implement, because of the large-scale construction effort required and resulting disruption to station operations and community impact. Potential safety impacts during excavation and backfilling would be mitigated by health and safety planning. However, the volume of truck traffic for waste and fill hauling would be a significant community safety issue. Potential airborne fugitive dust issues during excavation and hauling would be significant, but would be mitigated by construction contingency planning. CbR will eliminate exposure through removal of the CCR. CbR would begin following state and community approvals, and duration of excavation activities is anticipated to be many years. In addition to state and community acceptance of the proposed remedy, excavation and backfilling may require local building permits and local municipality input and approval. Excavation dewatering discharge would occur under existing or modified NPDES permit.

Based on the preliminary screening, CbR is retained for further consideration.

A1.13 Screened Corrective Measures Technologies Summary

A summary of the results of the corrective measures technologies screening is presented below in **Table A2**. The design and specific application of the retained technologies, either as stand-alone or part of a treatment train, will be crucial in the success of the corrective action.

Table A2 – Screened Corrective Measures Technologies

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection mode)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a standalone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing offsite migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The Conceptual Site Model (CSM) will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations increase the difficulty with scale.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment
In-situ Physical/Chemical Treatment	Not Retained	In-situ treatment technologies are ineffective for the Li

Potentially Applicable Technology	Status	Description/Overview
Permeable Reactive Barriers (PRB)	Not Retained	The use of PRBs is not retained because in-situ treatment technologies are ineffective for Li.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

References: Technology descriptions referenced from 1) FRTR: Federal Remediation Technologies Roundtable, CLU-IN, and/or AECOM reference materials.

A2.0 CORRECTIVE MEASURES ALTERNATIVES

Corrective measures technologies from the initial screening and evaluation (see **Table A2**) were utilized to create corrective measures alternatives. Professional judgment was used to assemble technically efficient pairings of technologies for each corrective measures alternative in consideration of the range of site-specific COCs and concentrations.

The corrective measures alternatives typically incorporate the use of technologies that will require additional investigation needed to 1) finalize the alternative selection, 2) delineate the assumed corrective action areas, 3) provide for full-scale cost estimation and design, and 4) demonstrate alternative efficacy. To this end, data gaps will be identified and addressed as needed.

It should be emphasized that the technology screening and alternatives assembly employed for this ACM is qualitative in nature. The formal remedy selection process, in accordance with the CCR Rule 40 CFR Section 257.97, will begin following submission of the ACM Report. The subsequent remedy selection process will evaluate the following objectives for remedies, as required under Section 257.97(b):

- Protect human health and the environment;
- Attain the COC-specific GWPS as specified pursuant to Section 257.95(h);
- Control the source(s) 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 (applicable to material releases only); and
- Comply with standards for management of wastes as specified in Section 257.98(d).

Assessment of Corrective Measures
Non-Groundwater Releases
Under the CCR Rule

GREEN STATION CCR LANDFILL
GREEN STATION
WEBSTER COUNTY, KENTUCKY

June 28, 2019

Prepared For:

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ACRONYMS

ACM	Assessment of Corrective Measures
AECOM	AECOM Technical Services, Inc.
As	Arsenic
BREC	Big Rivers Electric Corporation
CAO	Corrective Action Objectives
CbR	Closure by Removal
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CiP	Closure in Place
ft. amsl	Feet above mean sea level
KAR	Kentucky Administrative Regulations
KDoW	Kentucky Division of Water
KPDES	Kentucky Pollution Discharge Elimination
mg/L	Milligrams per liter
PRB	Permeable Reactive Barrier
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

AECOM Technical Services, Inc. (AECOM) was retained by Big Rivers Electric Corporation (BREC) to prepare an Assessment of Corrective Measures (ACM) to identify appropriate supplemental corrective measures for non-groundwater impacts from coal combustion residuals (CCR). The subject non-groundwater impacts are associated with seeps that are impacted from CCR that has been historically managed within the Green Station CCR Landfill (Green Landfill) at the Sebree Generating Station (Sebree Station), located near Sebree, Kentucky.

Pursuant to Title 40 of the Code of Federal Regulations (CFR) parts 257.90(d) and 257.84(b)(5), BREC initiated design of containment systems intended to reduce and prevent non-groundwater releases from reaching the Green River as an interim corrective measure. Plans for these measures have been submitted to the Kentucky Energy and Environment Cabinet (Cabinet) for review and comment. The Cabinet has adopted the federal CCR Rule by reference in Title 401 of the Kentucky Administrative Regulations (KAR) Chapter 46:110. Contracting for that work is complete and construction is scheduled to commence in 2019. This ACM is considering and evaluating whether additional remedial measures, that would be supplemental to the interim measures already planned, are warranted to address non-groundwater surface seeps. This ACM is also being coordinated with the ACM for groundwater at the facility.

The United States Environmental Protection Agency (USEPA) is in the process of clarifying the extent to which the assessment of corrective measures provisions of 40 CFR 257.96 apply to surface seeps. Specifically, USEPA announced in a litigation settlement it would remand for further comment the provision in the CCR Rule requiring entities to implement the rule's corrective action requirements for non-groundwater "releases" from CCR units. USEPA has proposed, but has not finalized, amendments to the rule to clarify the type and magnitude of non-groundwater releases that would require a facility to comply with some or all of the corrective action procedures in the CCR rule. USEPA confirmed that while the rule's general obligation to respond to releases from CCR units remains in place, the settlement sends a clear message that not all non-groundwater releases are subject to the rule's corrective action provisions and that the scope of non-groundwater releases subject to the rule's corrective action requirements will be resolved in the future rulemaking.

Consistent with USEPA guidance and 40 CFR 257.90(d) and 257.84(b)(5), BREC has, as noted above, proceeded with an initial containment project consisting of collection trenches, which have been designed, with the designs submitted to the Cabinet for review. Following additional seep sampling conducted in December 2018, BREC is also preparing this supplemental ACM to outline the potentially applicable remedial technologies should the interim corrective measures be insufficient to meet the corrective action objectives. This ACM is being presented even though the CCR Rule is not clear as to whether an ACM is required in these circumstances and the reconsideration rule has not been finalized.

Two types of non-groundwater releases have been identified through inspection and investigation of the site: river seeps and perimeter seeps. The occurrence and chemistry of the seeps was evaluated through observation and sampling as reported in memoranda and analytical reports appended herein. The character of the seepage water was compared to Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure identified in 401 KAR 10:031 Section 6. The samples largely exceeded the criteria for chloride, which became the basis for further investigation and corrective measures. Interim corrective measures to eliminate these non-groundwater seeps have been planned and are under way.

Because of their positions along the water ways where access is restricted, the river seep corrective measures involve the installation of interceptor trenches to capture seepage and route it to discharge via Kentucky Pollution Discharge Elimination (KPDES) permit. The river seep areas to be captured cover the

eastern seepage area adjacent to the Green River between monitoring wells MW-2 and MW-3A, and the northwestern seepage area located adjacent to ditch discharging to the Green River. These measures will commence in 2019, and are scheduled to be completed by the end of the year.

Perimeter seeps corrective measures similarly involve the containment and routing of seepage to permitted discharge, but because they are accessible at the surface, they are amenable to simple piping and ditch lining approaches. The perimeter seeps will be routed either to the North Pond, which will then discharge to the Green Surface Impoundment (KPDES Outfall 009), or the South Pond (KPDES Outfall 012), which will also be routed to the Green Surface Impoundment. The corrective measures will include cleaning and re-design of the South Pond to remove residual CCR material and to create lined sumps on either end to manage the seepage water separately from storm water. The corrective measures for the perimeter seeps are being coordinated with corrective measures to address groundwater impacts at the facility, which are discussed under a separate ACM for groundwater impacts (AECOM, June 13, 2019).

If the interim corrective measures currently under way are not adequate to meet the corrective action objectives, then the assessment of potential technologies identified herein, which follows the requirements of 40 CFR 257.96, will be reconsidered. 40 CFR 257.96(c) requires an ACM to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

Several potential corrective measures technologies were evaluated in order to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented below:

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as stand-alone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Hydraulic Containment	Retained	Hydraulic containment in the form of pumping of vertical or horizontal wells would potentially be used to provide spot control of seepage if the interim corrective measures are unable to fully capture the seepage.
Physical Containment	Retained	Physical containment in the form of a cutoff wall would potentially be used to re-direct or otherwise intercept seepage that was not adequately captured by the interim corrective measures.

Potentially Applicable Technology	Status	Description/Overview
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment is retained as a potential supplement to the interim corrective measures in the event that discharge via the station's KPDES permit is not possible.
In-situ Physical/Chemical Treatment	Retained	In-situ treatment is retained in the form of spot treatment or fixation of seepage areas in the event that the interim corrective measures do not adequately address all seepage areas.
Permeable Reactive Barriers (PRB)	Retained	The use of PRBs is retained in the form of a reactive cell in the event that interim measures result in seepage concentrations that require pre-treatment in-situ prior to discharge.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater releases is being implemented as interim corrective measures but is retained in the event that interim measures need to be evaluated for expansion.

1.0 INTRODUCTION

The following report presents the Assessment of Corrective Measures (ACM) for non-groundwater impacts identified at the Big Rivers Electric Corporation (BREC) Green Station CCR Landfill (Green Landfill) at the Sebree Generating Station (Sebree Station) located near Sebree, Kentucky. The Green Landfill is identified as a coal combustion residuals (CCR) unit under the requirements of the United States Environmental Protection Agency (USEPA) regulations in Title 40 of the Code of Federal Regulations (CFR) Part 257 (CCR rule). The subject non-groundwater impacts are from surface seeps that are impacted by CCR constituents and that are not currently controlled by the station's Kentucky Pollution Discharge Elimination System (KPDES) permit.

Pursuant to 40 CFR 257.90(d) and 257.84(b)(5), BREC initiated design of containment systems intended to reduce and prevent non-groundwater releases from reaching the Green River as an interim corrective measure. Plans for these measures have been submitted to the Kentucky Energy and Environment Cabinet (Cabinet) for review and comment. The Cabinet has adopted the federal CCR Rule by reference in Title 401 of the Kentucky Administrative Regulations (KAR) Chapter 46:110. Contracting for that work is complete and construction is scheduled to commence in 2019. This ACM is considering and evaluating whether additional remedial measures, that would be supplemental to the interim measures already planned, are warranted to address non-groundwater surface seeps. This ACM is also being coordinated with the ACM for groundwater at the facility.

The United States Environmental Protection Agency (USEPA) is in the process of clarifying the extent to which the assessment of corrective measures provisions of 40 CFR 257.96 apply to surface seeps. Specifically, USEPA announced in a litigation settlement it would remand for further comment the provision in the CCR Rule requiring entities to implement the rule's corrective action requirements for non-groundwater "releases" from CCR units. USEPA has proposed, but has not finalized, amendments to the rule to clarify the type and magnitude of non-groundwater releases that would require a facility to comply with some or all of the corrective action procedures in the CCR rule. USEPA confirmed that while the rule's general obligation to respond to releases from CCR units remains in place, the settlement sends a clear message that not all non-groundwater releases are subject to the rule's corrective action provisions and that the scope of non-groundwater releases subject to the rule's corrective action requirements will be resolved in the future rulemaking.

Consistent with USEPA guidance and 40 CFR 257.90(d) and 257.84(b)(5), BREC has, as noted above, proceeded with an initial containment project consisting of collection trenches, which have been designed, with the designs submitted to the Cabinet for review. Following additional seep sampling conducted in December 2018, BREC is also conducting this supplemental ACM to outline the potentially applicable remedial technologies should the interim corrective measures be insufficient to meet the corrective action objectives. This ACM is being presented even though the CCR Rule is not clear as to whether an ACM is required in these circumstances and the reconsideration rule has not been finalized.

As described in Section 2, the character of seeps has been identified through a series of investigations and interim corrective measures have been planned and are underway. Sections 3 provides a description of the corrective action objective (CAO), while Section 4 provide a list of potential technologies. If the interim corrective measures currently under way are not adequate to meet the corrective action objectives, then an assessment of potential technologies that follows the requirements of 40 CFR 257.96 will be performed.

2.0 DESCRIPTION OF CURRENT CONDITIONS

This section provides information related to the current use of the Site, as well as the history of activities relevant to the non-groundwater ACM for the Green Landfill at Sebree Station.

2.1 Site Background

BREC owns and operates Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/HMPL Station. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (**Figure 1**). Reid Unit 1 (66 Megawatts) began commercial operation in 1966 and it will be converted from coal to natural gas in the future. The Reid Combustion Turbine (72 MW) was commercialized in 1976. HMPL Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974, respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (242 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Green Landfill is illustrated on **Figures 1 and 2**. The Green Station CCR Landfill (Green Landfill) is located directly south of Sebree Station, situated south of the Green Station CCR Surface Impoundment. The Green Landfill is a Kentucky permitted landfill (Permit No. SW11700007) that currently receives special wastes generated by burning coal (CCRs) from Green Station. The landfill began receiving CCR wastes in 1980. The current Green Landfill footprint is approximately 170 acres.

The original ground surface within the landfill footprint was irregular and the dominant features were small stream valleys draining towards the Green River, which is located just east of the landfill; and towards Groves Creek, which is located just south of the landfill. There was also historic oil and gas production at and in the immediate vicinity of the Green Landfill. A review of the records from the Kentucky Geological survey showed that at or immediately adjacent to the Site, there were a number of dry exploratory oil/gas exploration holes, oil production wells, one gas production well, and one secondary recovery injection well. There were also former brine ponds at the Site. Most of these wells were abandoned in accordance with applicable regulations by BREC in 1997 and 1998. The last existing well was decommissioned in 2019.

2.2 Site Investigation and Interim Measures

Two types of non-groundwater releases have been identified through inspection and investigation of the site: river seeps and perimeter seeps as discussed below.

2.2.1 River Seeps

The river seeps are those found along the Green River and its tributary streams. Seeps have been observed on the bank of the river, on the slope between the river and the landfill perimeter road, and adjacent to a tributary stream on the northwest side of the Landfill.

Green River Seeps

An investigation of the river seeps was conducted in July 2018 as reported in a technical memorandum from AECOM to BREC dated September 6, 2018 (**Appendix A**). In this investigation, the banks of the Green River were surveyed by boat for evidence of seepage. Samples of seeps having visible flow were collected and tested for CCR indicator parameters (40 CFR 257 Appendix III), CCR constituents of concern (40 CFR 257 Appendix IV), and general chemistry parameters. The data from these analyses were used to evaluate whether individual seeps were likely associated with the Landfill. Three seeps

(RS-05, RS-07, and RS-08 as illustrated on **Figure 2**) were found to be similar to the chemistry of the Landfill (see **Table 1** below). Seeps RS-05 and -07 are located near the center of the Landfill between monitoring wells MW-2 and MW-3A. This is the same area in which seeps have been observed higher on the slope between the river and the perimeter road, suggesting that they have a similar origin. Seep RS-08 is located adjacent to the South Pond and appears to be tied to that unit.

The results of river seep sample testing were compared to Kentucky Water Quality criteria for warm water aquatic habitat identified in 401 KAR 10:031 Section 6. Where there are no Kentucky Water Quality criteria for a specific constituent, the USEPA Region 4 surface water screening values are listed for comparison. The Region 4 screening values are not compliance criteria, but rather values used to determine whether further evaluation is warranted. Samples from RS-05, -07 and -08 were found to exceed the 600 milligrams per liter (mg/L) limit for chloride. RS-05 also exceeded the current criteria for cadmium (0.00029 mg/L) and lead (0.0036 mg/L), but Kentucky has introduced a new cadmium criteria that may bring RS-05 back into compliance. Follow-up sampling conducted in December 2018 by KDEP and BREC confirmed the exceedance of the chloride criteria. Accordingly, this parameter (chloride) is regarded as the primary basis for further investigation and interim action.

The analytical results for the river seep samples are summarized in **Table 1** below. Presented in parallel with the river seep results are deep instream river samples that were collected immediately adjacent to the river seeps to characterize the river water quality that is most likely to be impacted by seepage. The deep samples were collected within 1 foot of the river bed within 3 to 5 feet of the water line. None of the river sample results exceed the water quality or screening criteria.

Options for interim measures were evaluated based on the site topographic setting, the character of the seepage, jurisdictional restrictions around the waterway, and operational logistics. Interception by french drain was selected as the most feasible and effective solution.

To evaluate the logistics of french drain installation, two investigations were conducted to probe the subsurface along in the area between the landfill and the river, creating a profile of the affected subsurface materials. The results of these investigations are in the form of boring logs and a cross section presented in **Appendix B**. These data indicate that the seepage occurs along a specific horizon 3.5 to 26 feet below the perimeter road surface. Accordingly, the french drain has been designed to intercept that horizon across the area of seepage, which covers roughly 1,000 feet between MW-2 and MW-3A. Contractors capable of installing the trench and appurtenant features have been identified and are being contracted for implementation of this interim measure in 2019. The drain is designed to intercept the seepage, thereby eliminating the source of the non-groundwater release. The intercepted water in the collector pipe at the base of the gravel-filled trench will be pumped to a collection sump and conveyed by underground pipe to the Green Surface Impoundment for disposal under the station's KPDES permit.

Table 1 – July 2018 River Seep Sampling Results

Parameter	Water Quality/Screening Criteria (mg/L) [1]	Laboratory Analytical Results (mg/L or pCi/L where noted)					
		RS05	R03B	RS07	R02B	RS08	R01B
Appendix III Constituents							
Boron	7.2 [b]	0.853 J	0.0235 J	1.46	0.0322 J	0.510 J	0.0252 J
Calcium	116 [b]	**916**	32.6	**1120**	35.8	**801**	33.2
Chloride	600 [c]	1670	5.59	1990	6.69	2040	4.52
Fluoride	2.7 [b]	0.0795 J	0.0954 J	0.102J	0.0979 J	0.0915 J	0.105 J
Sulfate	NE [e]	1170	28.9	1480	30.1	1440	28.3
TDS[a]	NE [e]	5140	170	6080	170	5310	161
Appendix IV Constituents							
Antimony	0.19 [b]	0.000366 J	0.000514 J	<0.000002	0.00106 J	0.00141 J	0.000476 J
Arsenic	0.15 [c]	0.0192	0.00131 J	0.00182 J	0.00135 J	0.000404 J	0.00137 J
Barium	0.22 [b]	**0.718**	0.0362 J	0.0605 J	0.0396 J	0.0443 J	0.0374 J
Beryllium	0.011 [b]	0.000545 J	<0.002	<0.000002	<0.002	<0.002	<0.002
Cadmium	0.00029 [d, f]	0.000563 J	<0.001	<0.000001	<0.001	<0.001	<0.001
Chromium III/VI	0.074/0.011 [b]	**0.0124**	0.00119 J	0.000340 J	0.00155 J	0.000560 J	0.00143 J
Cobalt	0.019 [b]	**0.0327**	0.0008 J	**0.0218**	0.000937 J	0.000691 J	0.000623 J
Fluoride	2.7 [b]	0.0795 J	0.0954 J	0.102 J	0.0979 J	0.0915 J	0.105 J
Lead	0.0036 [d]	0.0104	0.00166 J	0.000523 J	0.00199 J	0.000769 J	0.006
Lithium	0.44 [b]	0.340	<0.05	**0.772**	<0.05	**1.80**	<0.05
Mercury	0.00077 [c]	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	0.8 [b]	0.00442 J	0.00103 J	0.00219 J	0.00145 J	0.00296 J	0.0013 J

Note: Table continued on the following page

Table 1 – July 2018 River Seep Sampling Results (cont.)

Parameter	Water Quality/Screening Criteria (mg/L) [1]	Laboratory Analytical Results (mg/L or pCi/L where noted)					
		RS05	R03B	RS07	R02B	RS08	R01B
Radium 228	NE [e]	3.83 pCi/L	-0.197 pCi/L	0.831 pCi/L	0.417 pCi/L	0.983 pCi/L	-0.00993 pCi/L
Radium 226+228	NE [e]	7.64 pCi/L	0.391 pCi/L	1.4 pCi/L	0.735 pCi/L	1.31 pCi/L	0.249 pCi/L
Selenium	0.005 [c]	0.00121 J	<0.01	<0.01	0.000636 J	<0.01	<0.01
Thallium	0.006 [b]	0.000164 J	<0.001	<0.001	<0.001	<0.001	<0.001

Notes:

1. Where a Kentucky Water Quality Criteria has not been adopted for a specific constituent, USEPA Region 4 Surface Water Screening Values are listed for comparison.

a. TDS = total dissolved solids

b. USEPA Region 4 Surface Water Screening Values for freshwater chronic exposure, updated August 2015.

c. Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure (401 KAR 10:031)

d. Calculated Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure using a water hardness value of 110 mg/L. (401 KAR 10:031)

e. NE = not established.

f. The Kentucky Water Quality Criteria for cadmium under 401 KAR 10:031 have been proposed for amendment under the 2018 Triennial Review by KDEP.

J The analytical result is less than the reporting limit but greater than the method detection limit and is an approximate value.

Shaded cells = A result above Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure

Bold Text = A results above USEPA Region 4 Surface Water Screening Values

Northwest Seep

In April 2019, inspection of the Landfill site by the Kentucky Division of Waste Management and Kentucky Division of Water (KDoW) identified an area of seepage outside the perimeter road on the northwest side of the Landfill (See **Figure 2**). This seepage (herein identified as the NW seep) is adjacent to a ditch that flows eastward to an unnamed outfall for which a KPDES discharge permit has been applied for. The outfall was sampled by KDoW and BREC on April 2, 2019. The laboratory results from the April 2, 2019 sampling event are presented in **Appendix C** and summarized below in **Table 2**. A sample from this seep area (identified as sample 023) was collected by BREC personnel on April 11, 2019. The laboratory results from the April 11, 2019 sampling event are presented in **Appendix C** and summarized below in **Table 2**. The results indicate that the seep sample exceeded Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure for chloride and cadmium (until the proposed cadmium criteria is adopted as noted in Section 2.1 above). Therefore, the area will be subject to interim corrective measures.

The NW seep appears to be emanating from a horizon in or above a natural limestone ledge adjacent to the ditch (see photographs below on the following pages). This conclusion is based on the observation of natural springs of groundwater upstream from the seep that clearly flows from fractures in the ledge. A series of three soil borings drilled between the landfill and the NW seep area in May 2019 further suggest the seepage is controlled by this feature.

A trench drain similar to the interim measure being designed for the east side of the Green Landfill was selected as the most feasible and effective interim solution. Accordingly, the trench drain is being designed for implementation in 2019. The trench will be backfilled with gravel and constructed with a sump to pump the intercepted water for underground conveyance to the Green Surface Impoundment for discharge under the station's KPDES permit. Interception via the drain is expected to eliminate this discharge of impacted seep water.

Table 2 – April 2019 Northwest Seep Sampling Results

Parameter	Water Quality/Screening Criteria (mg/L) [1]	Laboratory Analytical Results (mg/L or pCi/L where noted)	
		023 April 11, 2019	SW-Culvert-1 April 2, 2019
Appendix III Constituents			
Boron	7.2 [b]	0.626 J	<1.0
Calcium	116 [b]	**488**	**203**
Chloride	600 [c]	864	344
Fluoride	2.7 [b]	0.0356 J	<0.2
Sulfate	NE [e]	548	401
TDS[1]	NE [e]	2850	Not analyzed
Appendix IV Constituents			
Antimony	0.19 [b]	0.0000690 J	<0.005
Arsenic	0.15 [c]	0.000759 J	<0.01
Barium	0.22 [b]	0.0557 J	0.043
Beryllium	0.011 [b]	<0.002	<0.02
Cadmium	0.00029 [d, f]	0.000411 J	<0.001
Chromium	0.074/0.011 [b]	0.00281 J	<0.02
Cobalt	0.019 [b]	0.000450 J	<0.04
Fluoride	2.7 [b]	0.0356 J	<0.2
Lead	0.0036 [d]	0.000140 J	<0.002
Lithium	0.44 [b]	**0.766**	0.11
Mercury	0.00077 [c]	<0.0002	<0.0005
Molybdenum	0.8 [b]	0.0110	<0.1
Radium 226	NE [e]	Not analyzed	Not analyzed
Radium 228	NE [e]	Not analyzed	Not analyzed
Radium 226+228	NE [e]	Not analyzed	Not analyzed
Selenium	0.005 [c]	<0.01	<0.03
Thallium	0.006 [b]	0.0000670 J	0.0001 J

Notes:

1. Where a Kentucky Water Quality Criteria has not been adopted for a specific constituent, USEPA Region 4 Surface Water Screening Values are listed for comparison.

a. TDS = total dissolved solids

b. USEPA Region 4 Surface Water Screening Values for freshwater chronic exposure, updated August 2015.

c. Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure (401 KAR 10:031)

d. Calculated Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure using a water hardness value of 110 mg/L. (401 KAR 10:031)

e. NE = not established.

f. The Kentucky Water Quality Criteria for cadmium under 401 KAR 10:031 have been proposed for amendment under the 2018 Triennial Review by KDEP.

J The analytical result is less than the reporting limit but greater than the method detection limit and is an approximate value.
Shaded cells = A result above Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure
Bold Text = A results above USEPA Region 4 Surface Water Screening Values

Photo 1: The NW Seep as observed on April 9, 2019.

Photo 2: Bedrock outcrop located west of the NW Seep as observed on April 9, 2019.

2.2.2 Perimeter Seeps

During the July 2018 investigation of River Seeps, the area inside the Landfill perimeter road was also inspected for seeps. Four areas of seepage were identified (see **Figure 2**): along the west side of the landfill (LS-01), the southwest corner (LS-04), the south end adjacent to the South Pond (LS03), and the east side north of MW-2 vicinity (LS02). LS-01, LS-03, LS-04 are directed to the South Pond. LS-02 is directed to the North Pond.

Samples of a select set of these perimeter seeps were collected in July 2018 and tested for the Appendix III, Appendix IV, and general chemistry parameters. The laboratory analytical results are presented in **Appendix D** and summarized below in **Table 3**. The results indicate that these samples exceed Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure for chloride, arsenic, cadmium, and selenium. These seeps do not directly discharge to surface waters, but have the potential to influence groundwater and non-groundwater releases, so they are being addressed by interim corrective measures to manage those potentials.

Table 3 – July 2018 Perimeter Seep Sampling Results

Parameter	Water Quality/Screening Criteria (mg/L) [1]	Laboratory Analytical Results (mg/L)			
		LS01	LS02	LS03	LS04
Appendix III Constituents					
Boron	7.2 [b]	1.15	2.92	2.49	0.799 J
Calcium	116 [b]	**1210**	**1030**	**2250**	**1750**
Chloride	600 [c]	2090	1710	4370	2710
Fluoride	2.7 [b]	1.68	1.19	0.269 J	1.53
Sulfate	NE [e]	1580	1500	2080	1490
TDS[1]	NE [e]	8560	7080	12400	10100
Appendix IV Constituents					
Antimony	0.19 [b]	0.00432	0.00218	0.0000610 J	0.00470
Arsenic	0.15 [c]	0.364	0.126	0.00176 J	0.300
Barium	0.22 [b]	0.0666 J	0.0627 J	0.140 J	0.101 J
Beryllium	0.011 [b]	<0.002	<0.002	<0.002	<0.002
Cadmium	0.00029 [d, f]	<0.001	0.000464 J	0.000279 J	0.000161 J
Chromium	0.074/0.011 [b]	<0.003	<0.003	<0.003	<0.003
Cobalt	0.019 [b]	0.0000370 J	0.000115 J	0.000321 J	<0.005
Fluoride	2.7 [b]	1.68	1.19	0.269 J	1.53
Lead	0.0036 [d]	0.000239 J	0.000247 J	0.000215 J	0.0000730 J
Lithium	0.44 [b]	**3.11**	**2.85**	**7.19**	**4.07**
Mercury	0.00077 [c]	0.000372	0.000167 J	<0.0002	0.000539
Molybdenum	0.8 [b]	0.0925	**1.78**	0.792	0.214
Radium 226	NE [e]	0.656 pCi/L	0.658 pCi/L	1.41 pCi/L	0.897 pCi/L
Radium 228	NE [e]	0.851 pCi/L	0.507 pCi/L	0.136 pCi/L	0.873 pCi/L
Radium 226+228	NE [e]	1.51 pCi/L	1.16 pCi/L	1.54 pCi/L	1.77 pCi/L
Selenium	0.005 [c]	0.00781 J	0.0103	0.00163 J	0.0103
Thallium	0.006 [b]	<0.001	<0.001	<0.001	<0.001

Notes:

1. Where a Kentucky Water Quality Criteria has not been adopted for a specific constituent, USEPA Region 4 Surface Water Screening Values are listed for comparison.

a. TDS = total dissolved solids

b. USEPA Region 4 Surface Water Screening Values for freshwater chronic exposure, updated August 2015.

c. Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure (401 KAR 10:031)

d. Calculated Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure using a water hardness value of 110 mg/L. (401 KAR 10:031)

e. NE = not established.

f. The Kentucky Water Quality Criteria for cadmium under 401 KAR 10:031 have been proposed for amendment under the 2018 Triennial Review by KDEP.

J The analytical result is less than the reporting limit but greater than the method detection limit and is an approximate value.

Shaded cells = A result above Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure
Bold Text = A results above USEPA Region 4 Surface Water Screening Values

Interim corrective measures for the perimeter seeps are being planned in a phased approach. The first step is to provide conveyance of the seepage to either the South Pond or to the North Pond, both of which are routed to the Green Surface Impoundment. Removing them from stormwater channels will prevent mixing with impounded stormwater. The use of the South Pond requires re-lining so that the seepage does not have the potential to infiltrate to groundwater. Partial re-lining of the South Pond is also proposed in the corrective measures planned for groundwater impact, which is the subject of a separate ACM. The re-design of the South Pond involves removal of any sludge and creation of two lined sump areas, one on the east end to collect the South and East perimeter seeps and one on the west end to collect Southwest corner perimeter seeps.

3.0 CORRECTIVE ACTION OBJECTIVE (CAO)

As noted in Section 2, non-groundwater releases have been identified, characterized, and interim corrective measures are being planned and implemented. The site-specific Corrective Action Objective (CAO) for non-groundwater releases is to meet the following objectives under the CCR Rule:

- Protect human health and the environment;
- Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix III and 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 (applicable to material releases only); and
- Comply with standards for management of wastes.

Together, these requirements comprise the site-specific CAO. The interim corrective measures described in Section 2 are expected to meet these objectives. Should any further measures be required, these same objectives will be applied.

3.1 Assessment of Interim Corrective Measure Ability to meet CAO

The Interim Corrective Measure being implemented in 2019 is designed to capture river seepage and divert it to KPDES outfalls, eliminating any potential exposure to public health or the environment. It is anticipated that the Interim Corrective Measure will meet the CAOs by effectively eliminating any future river seepage through source control, and as a result, no supplemental remedies are warranted at this time. Performance monitoring will be performed after the Interim Corrective Measure is constructed to demonstrate source control and evaluate the ability of the measure to meet the CAO. If warranted based on performance monitoring results, additional evaluation of supplemental corrective measures will be performed consistent with 40 CFR 257.98(b).

4.0 TECHNOLOGY IDENTIFICATION

As required under the CCR Rule, source control is a first line of corrective measures. In adherence with the BREC's permit conditions, the Site will continue to operate as a solid waste disposal facility through its life cycle and will be closed in accordance with the requirements of the permit. Source control through landfill closure will include installation of final cover that will prevent infiltration and contribute to groundwater quality restoration. Control of groundwater impacts associated with the Green Landfill is also planned and is described in a separate, concurrent ACM.

The identification of potentially applicable supplemental corrective measures technologies for the subject seeps impacted by CCR at the Green Landfill is presented in **Table 4** below.

Table 4 – Potential Corrective Measures Options Technology Description/Overview

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as stand-alone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because by itself, it will not meet the established CAOs.
Hydraulic Containment	Retained	Hydraulic containment in the form of pumping of vertical or horizontal wells would potentially be used to provide spot control of seepage if the interim corrective measures are unable to fully capture the seepage.
Physical Containment	Retained	Physical containment in the form of a cutoff wall would potentially be used to re-direct or otherwise intercept seepage that was not adequately captured by the interim corrective measures.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment is retained as a potential supplement to the interim corrective measures in the event that discharge via the station's KPDES permit is not possible.
In-situ Physical/Chemical Treatment	Retained	In-situ treatment is retained in the form of spot treatment or fixation of seepage areas in the event that the interim corrective measures do not adequately address all seepage areas.
Permeable Reactive Barriers (PRB)	Retained	The use of PRBs is retained in the form of a reactive cell in the event that interim measures result in seepage concentrations that require pre-treatment in-situ prior to discharge.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.

Potentially Applicable Technology	Status	Description/Overview
Other Source Control Technologies	Retained	Control of source area non-groundwater releases is being implemented as interim corrective measures but is retained in the event that interim measures need to be evaluated for expansion.

If the interim corrective measures currently under way are not adequate to meet the corrective action objectives, then an assessment of additional potential technologies that follows the requirements of 40 CFR 257.96 will be revisited.

40 CFR 257.96(c) requires an ACM (if/when performed) to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

5.0 REFERENCES

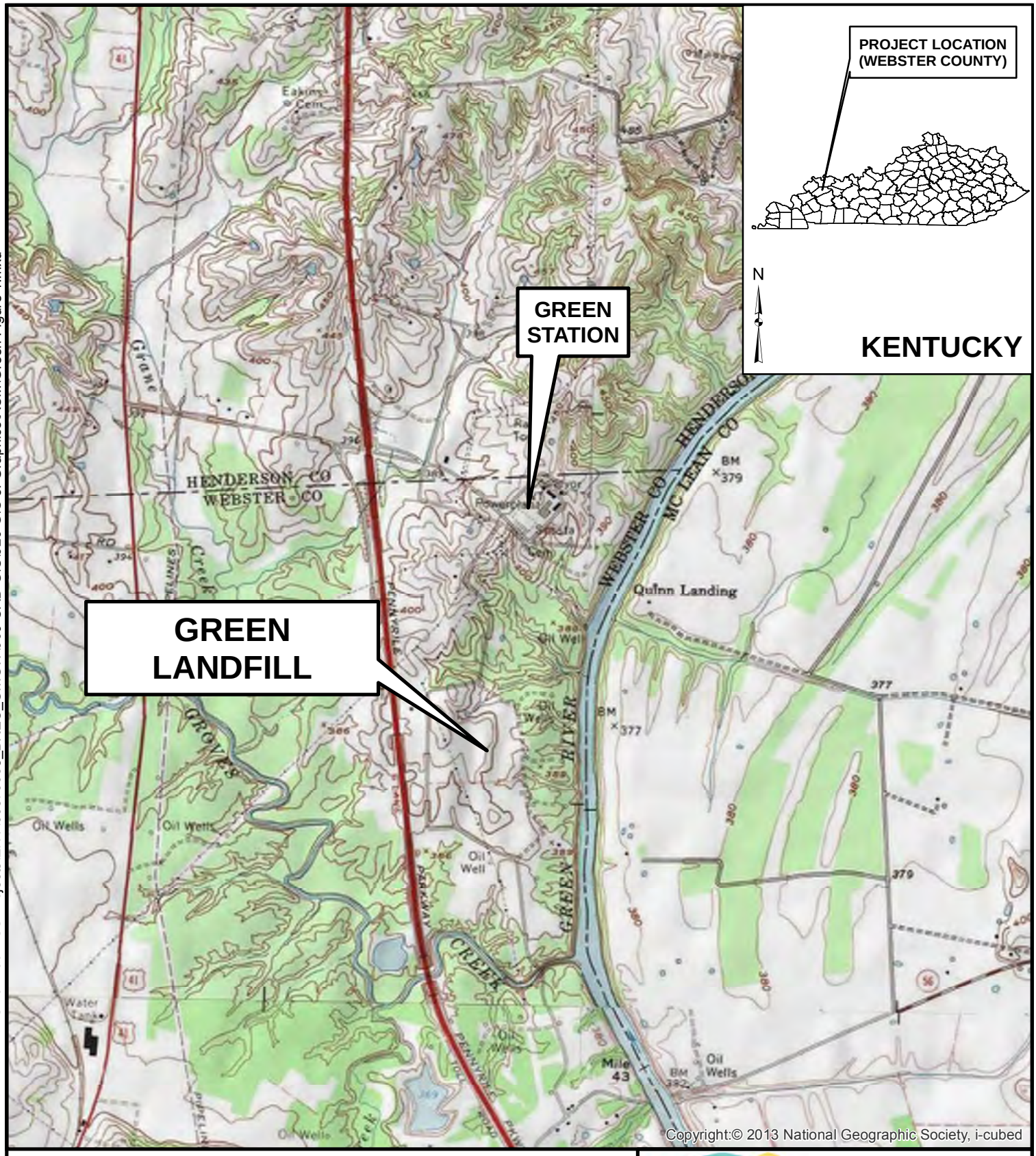
AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Green Station CCR Landfill, Webster County, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Green Station CCR Landfill, Webster County, Kentucky.

EPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

EPA, 40 CFR Part 257. [EPA–HQ–OLEM–2017–0286; FRL–9973–31–OLEM]. RIN–2050–AG88. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Minimum Criteria (Phase One); Proposed Rule. Federal Register / Vol. 83, No. 51 / Thursday, March 15, 2018 / Proposed Rules.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

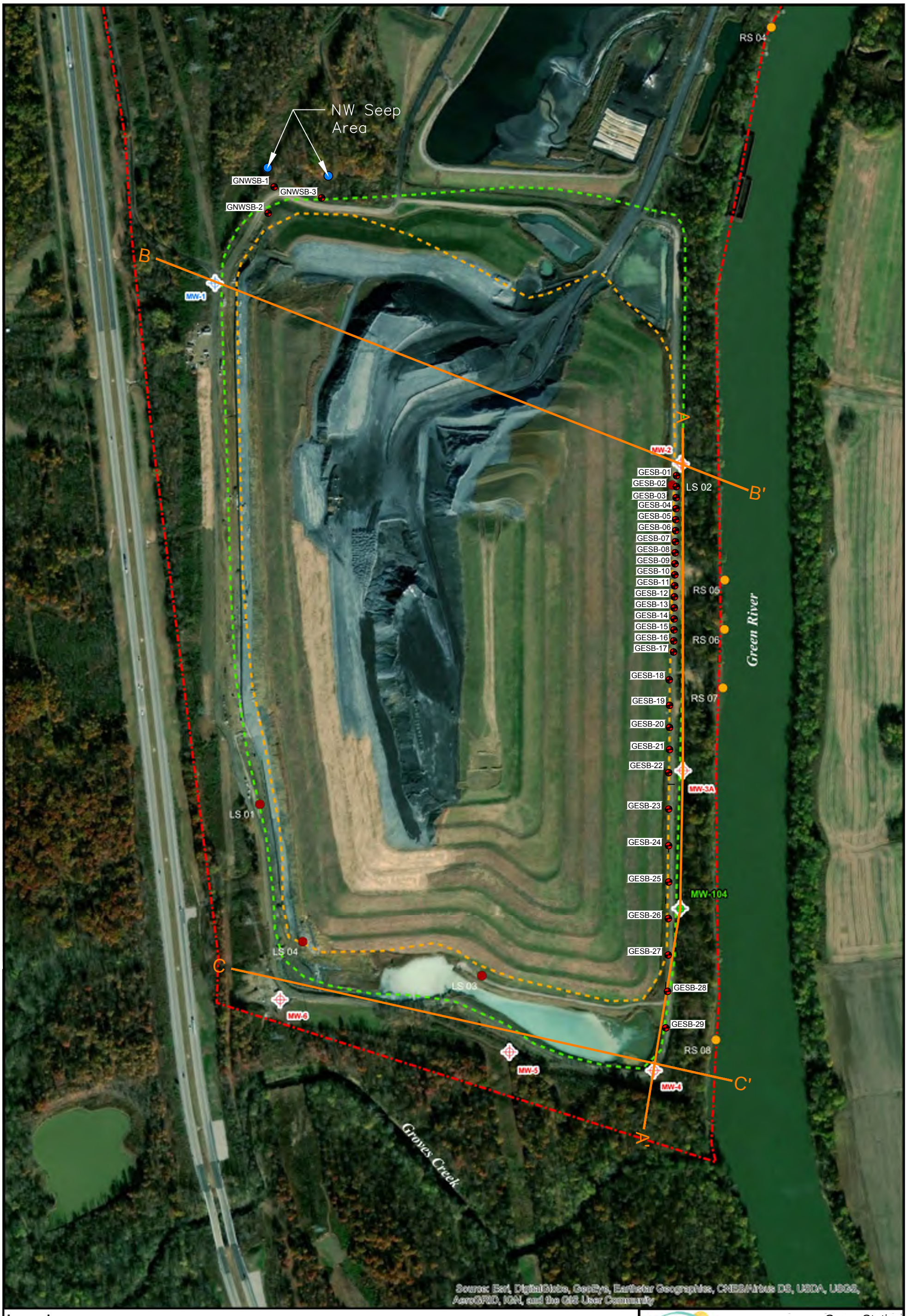
N

Big Rivers ELECTRIC CORPORATION

Green Station
Webster County, Kentucky

FIGURE 1
SITE LOCATION MAP

DATE: 4/30/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60602364	



Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well
- A — A' Transect Line
- GESB-01 Seeps Investigation Borings
- Landfill Seep Sample
- River Seep Sample
- Seep

0 400 800
Feet

N

Big Rivers Electric Corporation

Green Station
Webster County, Kentucky

FIGURE 2
Monitoring Well and Seep Location Map

DATE:06/04/2019	SCALE: 1IN = 300 FEET
CREATED BY: DAS	
JOB NO. 60602364	

Appendix A

Technical Memorandum – River and Seep Sampling and Analysis, September 6, 2018

525 Vine St, Suite 1800
Cincinnati, Ohio 45202
513-651-3440

Technical Memorandum

Date:	September 6, 2018
To:	Mr. Tom Shaw, Ph.D., Big Rivers Electric Corporation Managing Director Environmental
From:	Dennis Connair, Principal Geologist, AECOM
Subject:	River and Seep Sampling and Analysis Green Landfill Sebree Station Big Rivers Electric Corporation

Purpose

On behalf of Big Rivers Electric Corporation, AECOM prepared the following technical memorandum to document the activities and results of water sampling conducted along the Green River near the Big Rivers Electric Corporation (BREC) Sebree Station in Webster County, Kentucky. Sampling and analysis was conducted to identify the character of water quality of the river and of water seeping from the river bank in the vicinity of the station's coal combustion residuals (CCR) Green landfill.

ACTIVITIES AND OBSERVATIONS

Water samples were collected on July 12 and July 13, 2018 by AECOM staff Chris Davis and Dennis Connair. Sampling locations were accessed using a johnboat provided by BREC and piloted by BREC staff. Weather conditions at the time of sampling were hot and sunny with little wind. The Green River was near its pool stage at an approximate elevation of 350 feet mean sea level (msl) based on observations on site and data available from the USGS stream gauging station on the Green River at Lock #1 near Spottsville, Kentucky. The river stage had peaked close to 358 feet msl on June 27, 2018 and had steadily declined to July 12, 2018, exposing the river bank and the sampled seepage points.

River Sampling

River samples were collected on July 12, 2018 at four locations identified on Figure 1. Coordinates for each point (Table 1) were measured using a hand-held global positioning system (GPS) unit with sub-meter accuracy.

- Sample R01 was collected near the west bank of the river upstream of Groves Creek. This location was selected as being outside the potential influence of the landfill.
- Sample R02 was collected near the west bank of the river adjacent to seep number RS07, which is elsewhere referred to as the "Area 6" seep.
- Sample R03 was collected near the west bank of the river adjacent to seep number RS05, which is elsewhere referred to as the "Area 8" seep.

- Sample R04 was collected near the west bank of the river adjacent to the downstream end of the landfill footprint (no adjacent seep).

At each of the four locations, river samples were collected three to five feet from the water line at two depths.

- A shallow sample was collected by dipping a laboratory-supplied clean container and filling the requisite (pre-preserved or unpreserved) sample bottles (see photo #1, Attachment 1).
- A deeper sample was collected from within 12 inches of the river bottom using a "Van Dorn" style sampling device (see photo #2, Attachment 1) and decanting the aliquot to the requisite (pre-preserved or unpreserved) sample bottles.

Field measurements of temperature, pH, specific conductance, and oxidation reduction potential (ORP) were collected from the shallow sample locations and recorded in field notes as reported on Table 1. Field data sheets for the river samples are provided as Attachment 2.

All filled sample containers were appropriately labeled and placed in ice-filled coolers and notes regarding sample time, staff, and conditions were recorded. The samples were later repackaged for shipment and the chain-of-custody form completed prior to shipment by overnight service to the analytical laboratory (TestAmerica in Nashville, Tennessee). All samples were tested for the Appendix III and IV parameters under the federal CCR rule in addition to select ionic constituents used for general chemical characterization (alkalinity, magnesium, potassium, and sodium).

Seep Sampling

River bank seeps were identified at sixteen discrete locations in the vicinity of the station as indicated by the "RS" symbols on Figure 1. Coordinates for each point (Table 1) were measured using a hand-held global positioning system (GPS) unit with sub-meter accuracy. Characterization and sampling of the seeps was conducted on July 12 and July 13, 2018. Field data sheets for the river bank seep locations are provided as Attachment 3.

Seeps were recorded at locations on both the east and west banks of the river over two miles upstream of the landfill footprint and over 1.5 miles downstream of the landfill footprint. Some seeps appeared to potentially be associated with a surface water drainage feature, such as RS11 where there appears to be a beaver pond beyond the river bank, but most emanated from otherwise nondescript sections of river bank.

The observed seeps can generally be described as soft, wet areas of river bank sediment between the river water line and three to six feet higher. The seeps occupy between approximately 5 and 150 feet of bank at each location. Some of the seeps had visibly flowing water, but most had a slow enough flow that, if there was free water visible at the surface, the water was not moving. Most of the seeps had some measure of orange-colored iron bacteria growth and some had a green growth. Photographs of the seeps are included as Attachment 1.

The volume of water seeping at each location ranged from imperceptible up to one or two gallons per minute cumulatively. Seep samples were collected using a transfer container (new plastic cup) to fill the laboratory bottles and to collect field measurements of temperature, pH, specific conductance, and ORP. Where sufficient flow was available, the sample was directly dipped from the seep stream. Where flow was insufficient, a shallow trench (1-3 inches deep) in the sediment was excavated to allow water to accumulate so that it could be dipped over a period estimated to be up to 15 minutes.

All filled sample containers were appropriately labeled and placed in ice-filled coolers and notes regarding sample time, staff, and conditions were recorded. The samples were later repackaged for

shipment and the chain-of-custody form completed prior to shipment by overnight service to the analytical laboratory (TestAmerica in Nashville, Tennessee). All samples were tested for the Appendix III and IV parameters under the federal CCR rule in addition to select ionic constituents used for general chemical characterization (alkalinity, magnesium, potassium, and sodium). Laboratory reports are provided as Attachment 4.

FINDINGS

Analytical results for the river and seep sample field and laboratory analyses are summarized on Table 1. The results are organized from upstream to downstream (left to right columns). A chart illustrating the distribution of key Appendix III and Appendix IV concentrations, also organized from upstream to downstream, is presented on Figure 2.

The river samples were all moderately turbid and some of the seep samples were highly turbid due to their collection from the soft sediments, but all laboratory results appear to conform to applicable quality assurance guidelines.

TABLE 1

CCR ANALYTICAL SUMMARY
RIVER SEEP AND RIVER SAMPLE EVALUATION

JULY 2018

BIG RIVERS ELECTRIC CORPORATION
GREEN STATION LANDFILL
WEBSTER COUNTY, KENTUCKY

Field Parameters	PRIMARY MCL and CCR LIMITS	Water Quality Criteria (mg/L) Human Health: Domestic Water Supply Source	Human Health: Fish	Warm Water Aquatic Habitat: Acute	Warm Water Aquatic Habitat: Chronic	River Seep-14-71318 Lat 37.661126 Long -87.4894	River Seep-12-71318 Lat 37.61732 Long -87.4936	RiverSeep-16-71318 Lat 37.62167 Long -87.4967	River 01A 71218 Lat 37.64610 Long -87.5059	River 01B 71218 Lat 37.64610 Long -87.5059	RiverSeep-08-71318 Lat 37.62860 Long -87.5003	RiverSeep-07-71218 Lat 37.63299 Long -87.5003	River 02A 71218 Lat 37.63303 Long -87.5002	River 02B 71218 Lat 37.63303 Long -87.5002	RiverSeep-05-71218 Lat 37.63433 Long -87.5003	River 03A 71218 Lat 37.63433 Long -87.5002	River 03B 71218 Lat 37.63433 Long -87.5002	River 04A 71218 Lat 37.63789 Long -87.5004	River 04B 71218 Lat 37.63789 Long -87.5004	River-Seep-04-71218 Lat 37.64122 Long -87.4997
pH (Field Measurement) SU	NA					7.54	7.37	7.46	7.94	7.94	7.09	7.27	7.91	7.91	6.92	7.94	7.94	7.86	7.86	5.13
pH (Lab Measurement) SU	NA					8.14	8.00	8.40	7.64	7.62	8.16	8.01	7.45	7.50	7.95	7.50	7.51	7.52	7.53	5.26
Conductivity (µmhos/cm)	NA					1207	226.2	654	268	268	7674	7715	267.7	267.7	6174	262.2	262.2	265.1	265.1	2545
Temperature (°F)	NA					88.34	84.0	91.58	82.9	82.9	70.52	79.7	84.2	84.2	94.28	84.2	84.2	82.6	82.6	71.6
Oxidation-Reduction Potential (m	NA					-92	-98	-48	131	131	29	-123	98	98	-137	133	133	133	133	125
APPENDIX III CONSTITUENTS																				
Boron	NA					0.0694 J	0.0379 J	0.0321 J	0.0281 J	0.0252 J	0.510 J	1.46	0.0323 J	0.0322 J	0.853 J	0.0251 J	0.0235 J	0.0229 J	0.0234 J	2.19
Calcium	NA					171	21.1	93.8	31.8	33.2	801	1120	32.8	35.8	916	34.8	32.6	32.9	34.5	460
Chloride	NA	250	-	1200	600	22.7	32.7	23.2	4.58 B	4.52 B	2040	1990	6.75 B	6.69 B	1670	5.33 B	5.59 B	4.83 B	4.75 B	189
Fluoride	4 mg/L	4	-	-	-	0.144 J	0.0803 J	0.177 J	0.111 J	0.105 J	0.0915 J	0.102 J	0.0958 J	0.0979 J	0.0795 J	0.100 J	0.0954 J	0.0948 J	0.0945 J	0.239 J F1
Sulfate	NA	250	-	-	-	159 B	16.1 B	26.5 B	28.5	28.3	1440 B	1480 B	30.6	30.1	1170 B	28.8	28.9	28.6	28.6	1310 B
Total Dissolved Solids	NA	250	-	-	-	790	157	504	169	161	5310	6080	173	170	5140	175	170	174	156	2130
APPENDIX IV CONSTITUENTS																				
Antimony	0.006 mg/L	0.0056	0.64	-	-	0.000312 J	0.000499 J	0.000270 J	0.000591 JB	0.000476 JB	0.00141 J	ND	0.00276 B	0.00106 JB	0.000366 J	0.000571 JB	0.000514 JB	0.000504 JB	0.000360 JB	0.000200 J
Arsenic	0.01 mg/L	0.01	-	0.340	0.150	0.0173	0.00467 J	0.0247	0.00124 J	0.00137 J	0.000404 J	0.00182 J	0.00131 J	0.00135 J	0.0192	0.00126 J	0.00131 J	0.00118 J	0.00109 J	0.00188 J
Barium	2 mg/L	1	-	-	-	0.242	0.0757 J	0.190 J	0.0330 J	0.0374 J	0.0443 J	0.0605 J	0.0350 J	0.0396 J	0.718	0.0366 J	0.0362 J	0.0382 J	0.0402 J	0.0384 J
Beryllium	0.004 mg/L	0.004	-	-	-	0.000497 J	0.000145 J	0.000211 J	ND	ND	ND	ND	ND	ND	0.000545 J	ND	ND	ND	ND	0.00372
Cadmium	0.005 mg/L	0.005	-	0.00235	0.00029	0.000312 J	0.000183 J	0.000196 J	ND	ND	ND	ND	ND	ND	0.000563 J	ND	ND	ND	ND	0.00307
Chromium	0.1 mg/L	0.1	-	-	-	0.00969	0.00200 J	0.00383	0.000676 J	0.00143 J	0.000560 J	0.000340 J	0.00111 J	0.00155 J	0.0124	0.00112 J	0.00119 J	0.00134 J	0.00105 J	0.00386
Cobalt	0.006 mg/L					0.0125	0.00581	0.00613	0.000401 J	0.000623 J	0.000691 J	0.0218	0.000730 J	0.000937 J	0.0327	0.000934 J	0.000800 J	0.000841 J	0.000738 J	0.0447
Fluoride	4 mg/L	4	-	-	-	0.144 J	0.0803 J	0.177 J	0.111 J	0.105 J	0.0915 J	0.102 J	0.0958 J	0.0979 J	0.0795 J	0.100 J	0.0954 J	0.0948 J	0.0945 J	0.239 J F1
Lead	0.015 mg/L	0.015	-	0.092	0.0036	0.0109	0.00221 J	0.00521	0.000994 JB	0.00600 B	0.000769 J	0.000523 J	0.00125 JB	0.00199 JB	0.0104	0.00115 JB	0.00166 JB	0.00141 JB	0.00147 JB	0.00507
Lithium	0.040 mg/L					0.0126 J	ND	ND	ND	ND	1.80	0.772	ND	ND	0.340	ND	ND	ND	ND	0.0209 J
Mercury	0.002 mg/L	0.002	0.000051	0.0014	0.00077	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Molybdenum	0.1 mg/L					0.00550 J	0.000948 J	0.00878 J	0.00217 J	0.00130 J	0.00296 J	0.00219 J	0.00222 J	0.00145 J	0.00442 J	0.00105 J	0.00103 J	0.00101 J	0.000981 J	ND
Radium 226 / Radium 228	5 pCi/L	5 pCi/L				NS	1.17	NS	0.417	0.249 U	1.31	1.4	0.554	0.735	7.64	0.404 U	0.391 U	0.544	0.423 U	1.48
Selenium	0.05 mg/L	0.17	4.2	-	0.005	0.000582 J	ND	0.000906 J	ND	ND F2	ND	ND	0.000423 J	0.000636 J	0.00121 J	ND	ND	0.000402 J	ND	0.00216 J
Thallium	0.002 mg/L	0.00024	0.00047	-	-	0.000126 J	ND	ND	0.0000500 J	ND	ND	ND	ND	ND	0.000164 J	ND	ND	ND	ND	ND
IONIC CONSTITUENTS																				
Total Alkalinity	NA					443	38.2	393	85.6	85.6	174	87.7	85.7	85.8	229	86.1	86.4	80.9	85.8	ND
Hardness (as mg/L of CaCO3)**	NA					578	74	318	106	110	3198	3010	108	117	2608	115	108	109	114	1411
Magnesium	NA					36.6	5.20	20.3	6.41	6.62	291	51.8	6.32	6.76	77.8	6.87	6.41	6.45	6.73	63.6
Potassium	NA					4.96	2.37	4.85	2.68	2.91	125	262	3.01	3.65	285	3.06	2.87	2.85	2.95	9.51
Sodium	NA					18.5	5.52	26.7	3.79	3.95	274	277	3.98	4.63	285	4.64	4.01	3.87	4.02	42.1

*All results listed in milligrams per liter (mg/L) unless otherwise noted by the Maximum Contaminant Level (MCL)
NA = Not available
pCi/L = picoCuries per Liter
SU = Standards units
µmhos/cm = microSiems per centimeter
°F = Degrees Fahrenheit
mV = millivolts
ND = Not detected above the Method Detection Limit
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
NM = Not measured
U = Result is less than the sample detection limit

Note: River "A" samples collected from surface
River "B" samples collected <1 foot above river bed

** The water hardness is using American degree equivalent to mg/L.
Water hardness(mg/L) = Ca(mg/L)×2.497 + Mg(mg/L)×4.118

Constituent	KY Acute Warm Water Habitat Equation	Hardness (mg/L $CaCO_3$)	Hardness** (mg/L $CaCO_3$)
		50	110
		Criterion (ug/L)	Criterion (ug/L)
Cadmium	Criterion = e(1.0166 (ln Hard*)-3.924)	1.05	2.35
Lead	Criterion = e(1.273 (ln Hard*)-1.460)	34	92

Constituent	KY Chronic Warm Water Habitat Equation	Hardness (mg/L $CaCO_3$)	Hardness** (mg/L $CaCO_3$)
		50	110
		Criterion (ug/L)	Criterion (ug/L)
Cadmium	Criterion = e(0.7409 (ln Hard*)-4.719)	0.16	0.29
Lead	Criterion = e(1.273 (ln Hard*)-4.705)	1.3	3.6

*Hard = Hardness as mg/L $CaCO_3$ **Average hardness concentration from collected River Samples (7/12/18)

Document Path: G:\Cincinnati\DCS\Projects\ENV\60579938_BREC_GrnGW\900-CAD-GIS\920-GIS or Graphics\Seep\Seep_locations_20180906.mxd

Legend

- Pond Sample
- River Seep Sample
- River Sample
- Downgradient Monitoring Well
- Upgradient Monitoring Well

0 1,450 2,900

Feet

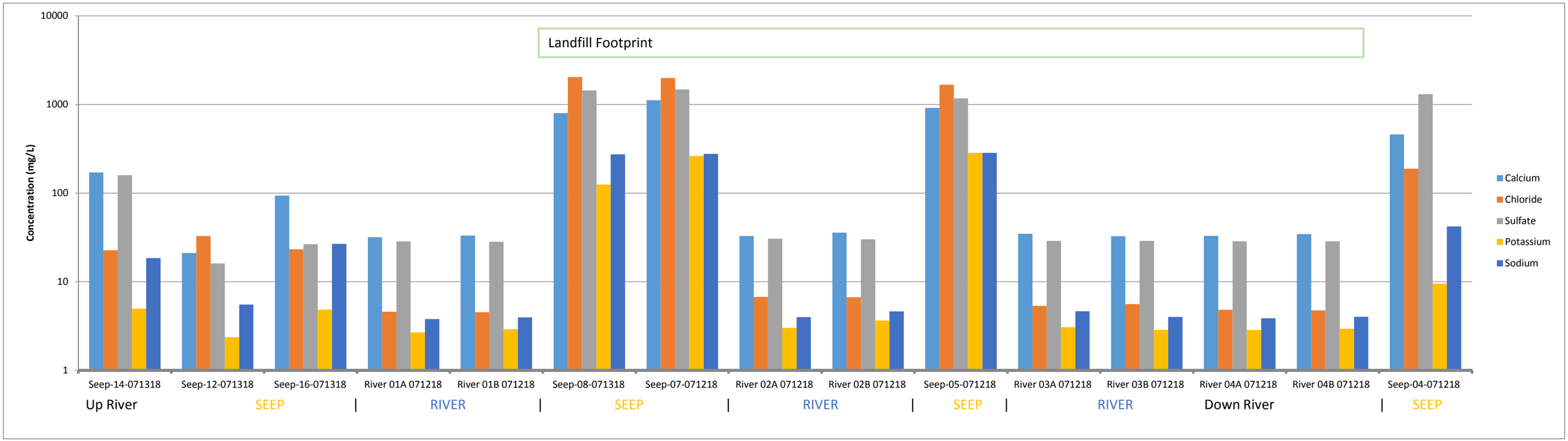
N

Big Rivers Electric Corporation

Green Station Landfill
Webster County, Kentucky

FIGURE 1
RIVER AND SEEP
SAMPLING LOCATIONS

DATE: 9/6/2018	SCALE: 1IN = 1800 FEET
CREATED BY: MRH	
JOB NO. 60579938	



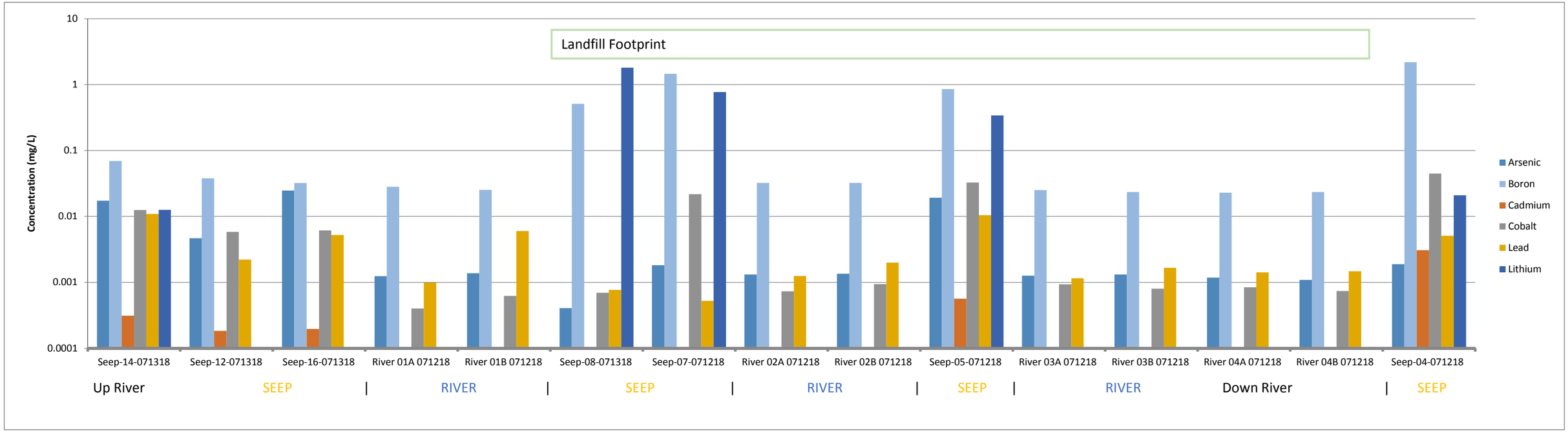


FIGURE 2
CCR ANALYTICAL SUMMARY - GREEN STATION LANDFILL
RIVER SEEP AND RIVER SAMPLE EVALUATION, JULY 2018

8/30/2018

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
1	07/12/18

Direction Photo Taken:
West

Description:

R02 location – River surface water sample.

Photo No.	Date:
2	07/12/18

Direction Photo Taken:
West

Description:

R01 location – "Van Dorn" style sampling device

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
3	07/12/18

Direction Photo Taken:
Southeast

Description:

RS01 - River Seep 01

No sample collected due to insufficient volume

Photo No.	Date:
4	07/12/18

Direction Photo Taken:

Description:

RS02 – River Seep 02

No sample collected due to insufficient volume

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
5	07/12/18

Direction Photo Taken:
Southeast

Description:

RS03 - River Seep 03

No sample collected due to insufficient volume

Field parameters collected

Photo No.	Date:
6	07/12/18

Direction Photo Taken:
West

Description:

RS04 – River Seep 04

Sample collected

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No. 7	Date: 07/12/18

Direction Photo Taken:
West

Description:

RS05 – River Seep 05

Sample collected

Photo No. 8	Date: 07/12/18

Direction Photo Taken:
West

Description:

RS06 – River Seep 06

No sample collected due to insufficient volume

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
9	07/12/18

Direction Photo Taken:
West

Description:

RS07 – River Seep 07

Sample collected

Photo No.	Date:
10	07/13/18

Direction Photo Taken:
North

Description:

RS08 – River Seep 08

Sample collected

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
11	07/13/18

Direction Photo Taken:
South

Description:

RS09 - River Seep 09

No sample collected due to insufficient volume

Photo No.	Date:
12	07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS-10 – River Seep 10

No sample collected due to insufficient volume

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No. 13	Date: 07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS11 – River Seep 11

No sample collected due to insufficient volume

Field parameters collected

Photo No. 14	Date: 07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS12 – River Seep 12

Sample collected

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
15	07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS13 – River Seep 13

No sample collected due to insufficient volume

Field parameters collected

Photo No.	Date:
16	07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS14 – River Seep 14

Sample collected

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No. 17	Date: 08/07/18

Direction Photo Taken:
East, Northeast

Description:

RS15 – River Seep 15

No sample collected due to insufficient volume

Photo No. 18	Date: 07/13/18

Direction Photo Taken:
Northwest

Description:

RS16 - River Seep 16

Sample collected

Attachment 2

Field Data Sheets – River Sample Locations

Surface ~~SPRING/SEEP~~ WATER DATA SHEET

Job Name: GRSC - Green Location: Sebree Ky

Sample Identification: River - 01A, 01B Sampling Order: 1

SAMPLE DATA Date Time: 7/12/18 1110

Measured By: CDD, DRC

Calibration of pH meter in Field: J 4pH J 7pH J 10pH ____ not done

Field pH (units): 7.94

Field Conductivity (µmhos cm): 268

Field Temperature (°F): 83.9

ORP (mV): 131

Dissolved Oxygen (mg/L): —

Turbidity (NTU): —

Sample Odor: None

Sample Color: slt cloudy

Sample Sediment Content: low to mod

Weather Conditions: Sun 80s

Sampling Splits or Duplicate: No

Samples Shipped To: TA - Nashville Date Samples were shipped: 7/12/18

Method of Shipment: Fedex Hand Delivered ____ Other ____

Parameters Collected: Ag111, IV, Anions

COMMENTS

River - 01A at surface

River - 01B 1ft off bottom, 2ft deep

Surface ~~SPRING/SEEP~~ WATER DATA SHEET

Job Name: BAE - Green Location: Shore, by

Sample Identification: River - 02A, 02B Sampling Order: B

SAMPLE DATA Date Time 7/12/18 1150

Measured By CW, DRC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.91

Field Conductivity (µmhos cm) 267.7

Field Temperature (°F) 84.2

ORP (mV) 98

Dissolved Oxygen (mg/L) —

Turbidity (NTU) —

Sample Odor none

Sample Color slt brown

Sample Sediment Content low to mod

Weather Conditions 80s Sun

Sampling Splits or Duplicates No

Samples Shipped To TA - Nashville Date Samples were shipped 7/12/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Anions

COMMENTS

River 02A collected at surface

River 02B 1ft off bottom, 10' from surface

Surface
~~SPRING/SEEP~~ WATER DATA SHEET

Job Name: BREC-Green Location: Section 87

Sample Identification: River-03A, 03B Sampling Order: 3

SAMPLE DATA Date Time: 7/12/18 1215

Measured By: CDD, DRC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.94

Field Conductivity (µmho/cm) 262.2

Field Temperature (°F) 84.2

ORP (mV) 133

Dissolved Oxygen (mg/l) –

Turbidity (NTU) –

Sample Odor slt brown none

Sample Color slt brown

Sample Sediment Content low to mod

Weather Conditions sun 80s

Sampling Splits or Duplicates No

Samples Shipped To Fedex, TA Nashville Date Samples were shipped 7/12/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV

COMMENTS

River 03A at surface = SA from bank

River 03B - 1ft from bottom 4' d.q depth

~~SPRING~~/Surface SEEP WATER DATA SHEET

Job Name: Effect - Green Location: Selma, IN

Sample Identification: River - 04A, 04B Sampling Order: 4

SAMPLE DATA Date/Time: 7/2/18 1240

Measured By: CDD, DEL

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units): 7.86

Field Conductivity (µmhos cm): 2651

Field Temperature (°F): 82.6

ORP (mV): 133

Dissolved Oxygen (mg/L): -

Turbidity (NTU): -

Sample Odor: none

Sample Color: slt brown

Sample Sediment Content: low to med

Weather Conditions: Sun 80s

Sampling Splits or Duplicates: NO

Samples Shipped To: TA Nashville Date Samples were shipped: 7/2/18

Method of Shipment: Fedex Hand Delivered ____ Other ____

Parameters Collected: App III, D, Anions

COMMENTS

River 04A - collected at surface

River 04B - 2ft below surface, 1ft above bottom

Attachment 3

Field Data Sheets – River Bank Seep Locations

SPRING/SEEP WATER DATA SHEET

Job Name: BREC Green Location: Selma, Ky

Sample Identification: River Seep-01 Sampling Order: 5

SAMPLE DATA

Date/Time: 7/12/18 1:31

Measured By: CDW, DK

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) No probe due to low flow conditions

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor NA

Sample Color NA

Sample Sediment Content NA

Weather Conditions Sun 80s

Sampling Splits or Duplicates NO

Samples Shipped To NA Date Samples were shipped NA

Method of Shipment NA Hand Delivered ____ Other ____

Parameters Collected None

COMMENTS

East bank, orange staining

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sublee, Ky

Sample Identification: River Seep - 02 Sampling Order: 6

SAMPLE DATA Date/Time: 7/18/18 1317

Measured By: CSW, DRC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) insufficient volume

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions

Sampling Splits or Duplicates

Samples Shipped To NA Date Samples were shipped

Method of Shipment Hand Delivered Other

Parameters Collected None

COMMENTS

Eastbank; low flow + staining

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sobieski, KY

Sample Identification: River Seep 03 Sampling Order: 7

SAMPLE DATA Date/Time: 7/12/18 1331

Measured By: CDD, DJC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.14

Field Conductivity (µmhos/cm) 804.35

Field Temperature (°F) 77.18

ORP (mV) -73

Dissolved Oxygen (mg/L) –

Turbidity (NTU) –

Sample Odor –

Sample Color –

Sample Sediment Content –

Weather Conditions Sun 80s

Sampling Splits or Duplicates –

Samples Shipped To – Date Samples were shipped –

Method of Shipment – Hand Delivered ____ Other ____

Parameters Collected None

COMMENTS

Insufficient flow to sample, East bank, orange staining

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sebree Ky

Sample Identification: River Seep 04 Sampling Order: 6

SAMPLE DATA Date/Time 7/12/18 1350

Measured By: CDD, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 5.13

Field Conductivity (µmhos cm) 2545

Field Temperature (°F) 71.6

ORP (mV) 125

Dissolved Oxygen (mg/L) –

Turbidity (NTU) –

Sample Odor none

Sample Color clear w orange staining

Sample Sediment Content low

Weather Conditions sun 80s

Sampling Splits or Duplicates NO

Samples Shipped To TA Nashville Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Anions

COMMENTS

Seep bank near pond 011, 1-2 GPM cumulative

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Scbee, Ky

Sample Identification: River Seep-05 Sampling Order: 7

SAMPLE DATA Date/Time: 7/12/18 1425

Measured By: CSS, DL

Calibration of pH meter in Field ✓ 4pH ✓ pH ✓ 10pH ____ not done

Field pH (units) 6.92

Field Conductivity (µmhos cm) 617

Field Temperature (°F) 79.28

ORP (mV) -137

Dissolved Oxygen (mg/l) ~

Turbidity (NTU) ~

Sample Odor none

Sample Color brown

Sample Sediment Content high

Weather Conditions sm 80s

Sampling Splits or Duplicates no

Samples Shipped To TA Nashville Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Metals

COMMENTS

Flow 61 gpm, ~~was there~~ "Acon B"

SPRING/SEEP WATER DATA SHEET

Job Name: FREL - Green Location: Subsidy

Sample Identification: River Seep - 06 Sampling Order: 10

SAMPLE DATA Date/Time: 7/12/18 1439

Measured By: CAS DK

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH not done

Field pH (units): NM - see Miscellaneous

Field Conductivity (µmho/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions: Sun 80s

Sampling Splits or Duplicates: NA

Samples Shipped To: NA Date Samples were shipped: NA

Method of Shipment: NA Hand Delivered Other

Parameters Collected: None collected

COMMENTS

Ground sheet flow ~ 30 ft wide, insufficient for

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sebree, Ky

Sample Identification: River Seep-07 Sampling Order: 11

SAMPLE DATA Date/Time: 7/12/18 1450

Measured By: CO, SE

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units): 7.23

Field Conductivity (µmhos/cm): 771.5

Field Temperature (°F): 79.7

ORP (mV): -123

Dissolved Oxygen (mg/L): -

Turbidity (NTU): -

Sample Odor: clear to slt cloudy

Sample Color: none

Sample Sediment Content: low to mod

Weather Conditions: Sun, 80s

Sampling Splits or Duplicates: no

Samples Shipped To: TL - Nashville Date Samples were shipped: 7/31/18

Method of Shipment: Fedex Hand Delivered: ____ Other: ____

Parameters Collected: App B, IV, Anions

COMMENTS

Flow 1-2 gpm spread over 100', high on bank accum

SPRING/SEEP WATER DATA SHEET

Job Name: ORC - Green Location: Lake

Sample Identification: River Seep 08 Sampling Order: 1

SAMPLE DATA Date/Time: 7/8/13 0750

Measured By: CMA, DJC

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

	S seep	N seep
Field pH (units)	7.09	7.05
Field Conductivity (µmhos/cm)	784	780
Field Temperature (°F)	72.52	65.3
ORP (mV)	29	53
Dissolved Oxygen (mg/L)	-	-
Turbidity (NTU)	-	-

Sample Odor: slight musty

Sample Color: clear

Sample Sediment Content: low

Weather Conditions: sun, clear

Sampling Splits or Duplicates: NO

Samples Shipped To: TA Nashville Date Samples were shipped: 7/8/13

Method of Shipment: Fedex Hand Delivered ____ Other ____

Parameters Collected: App. IV, Iron

COMMENTS

near old pond area ; top of stream bed is dry flow < 1 gpm at sample point.

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sebree, Ky

Sample Identification: River Seep 09 Sampling Order: 13

SAMPLE DATA Date/Time: 7/13/18 0835

Measured By: CSB, DRL

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) ** Insufficient volume for parameters

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions Sun 80s

Sampling Splits or Duplicates NA

Samples Shipped To NA Date Samples were shipped NA

Method of Shipment NA Hand Delivered ____ Other ____

Parameters Collected None

COMMENTS

Minor seepage, Orange staining, no vis flow

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sebree, Ky

Sample Identification: Rigor Seep 10 Sampling Order: 14

SAMPLE DATA

Date Time: 7/13/16 0852

Measured By: COJ, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) Insufficient Volume

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions Sun 80s

Sampling Splits or Duplicates N

Samples Shipped To NA Date Samples were shipped NA

Method of Shipment NA Hand Delivered ____ Other ____

Parameters Collected NA

COMMENTS

minor seepage w orange staining

SPRING/SEEP WATER DATA SHEET

Job Name: BREL - Green Location: Sobee, Ky

Sample Identification: River Seep 11 Sampling Order: 15

SAMPLE DATA Date Time: 7/13/18 0857

Measured By: CDD, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.35

Field Conductivity (µmhos cm) 364

Field Temperature (°) NM

ORP (mV) -65

Dissolved Oxygen (mg/L) —

Turbidity (NTU) —

Sample Odor —

Sample Color —

Sample Sediment Content —

Weather Conditions Sun 80s

Sampling Splits or Duplicates N

Samples Shipped To NA Date Samples were shipped NA

Method of Shipment NA Hand Delivered ____ Other ____

Parameters Collected None

COMMENTS

Pond seen above, flow from high on bank
Not Sampled

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sebree, Ky

Sample Identification: River Seep 12 Sampling Order: 16

SAMPLE DATA

Date Time: 7/13/18 0915

Measured By: CDD, SPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.37

Field Conductivity (µmhos/cm) 226.2

Field Temperature (°F) 84.0

ORP (mV) -98

Dissolved Oxygen (mg/L) -

Turbidity (NTU) -

Sample Odor ~~[illegible]~~ none

Sample Color cloudy to slt brown

Sample Sediment Content low to mod

Weather Conditions sun & clds

Sampling Splits or Duplicates NO

Samples Shipped To TA - Nashville Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Anions

COMMENTS

< ½ gpm flow

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sebree, Ky

Sample Identification: River Seep 13 Sampling Order: 17

SAMPLE DATA

Date Time: 7/13/18 0930

Measured By: CDA, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units)	~~Insufficient flow~~ CD 7.0
Field Conductivity (µmhos/cm)	701.9
Field Temperature (°F)	84.0
ORP (mV)	-152
Dissolved Oxygen (mg/L)	—
Turbidity (NTU)	—
Sample Odor	—
Sample Color	—
Sample Sediment Content	—
Weather Conditions	Sun 80s
Sampling Splits or Duplicates	N
Samples Shipped To	NA
Date Samples were shipped	NA
Method of Shipment	NA
Hand Delivered	____ Other ____
Parameters Collected	None

COMMENTS

Insufficient flow to sample

SPRING/SEEP WATER DATA SHEET

Job Name: BSEL-Green Location: Sebree, Ky

Sample Identification: River Seep 14 Sampling Order: 18

SAMPLE DATA Date Time: 7/13/18 1010

Measured By: CDD, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH _____ not done

Field pH (units) 7.54

Field Conductivity (µmhos/cm) 1207

Field Temperature (°F) 88.34

ORP (mV) -92

Dissolved Oxygen (mg/L) –

Turbidity (NTU) –

Sample Odor –

Sample Color clear

Sample Sediment Content low

Weather Condition Sun 80s

Sampling Splits or Duplicates N

Samples Shipped To TA Nashville Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered _____ Other _____

Parameters Collected App III, III, Anions – No Radium

COMMENTS

orange staining, pooled on soft bank ledge collected from pool dug w tool

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sebree, Ky

Sample Identification: River Seep 15 Sampling Order: 19

SAMPLE DATA Date Time: 7/13/16 1033

Measured By: CDD, DFC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) Insufficient Volum

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions Sun 80s

Sampling Splits or Duplicates NA

Samples Shipped To ____ Date Samples were shipped NA

Method of Shipment ____ Hand Delivered ____ Other ____

Parameters Collected NO Sample

COMMENTS

East Bank upstream, some orange staining, no flow

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sebree, Ky

Sample Identification: River Seep 16 Sampling Order: 20

SAMPLE DATA Date/Time: 7/13/18

Measured By: CAW, DRC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.46

Field Conductivity (µmhos/cm) 654

Field Temperature (°F) 91.58

ORP (mV) -48

Dissolved Oxygen (mg/L) —

Turbidity (NTU) —

Sample Odor —

Sample Color —

Sample Sediment Content ~~fine to moderate~~

Weather Conditions ~~Rain~~ 60s

Sampling Splits or Duplicates NO

Samples Shipped To TA Westborough Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Anions No Radium

COMMENTS

Adj to boat ramp, very low flow 0.17 gpm, collected from trench dug w tool

Attachment 4

LABORATORY REPORTS

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-155625-1
Client Project/Site: Green Landfill

For:
Big Rivers Electric Corporation
PO BOX 24
Henderson, Kentucky 42419

Attn: Greg Dick

Roxanne Cisneros

Authorized for release by:
8/16/2018 3:18:48 PM

Roxanne Cisneros, Senior Project Manager
(615)301-5761
roxanne.cisneros@testamericainc.com

Table of Contents

Sample Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-155625-1	River 01A 071218	Water	07/12/18 11:10	07/13/18 10:10
490-155625-2	River 01B 071218	Water	07/12/18 11:30	07/13/18 10:10
490-155625-3	River 02A 071218	Water	07/12/18 11:50	07/13/18 10:10
490-155625-4	River 02B 071218	Water	07/12/18 12:00	07/13/18 10:10
490-155625-5	River 03A 071218	Water	07/12/18 12:15	07/13/18 10:10
490-155625-6	River 03B 071218	Water	07/12/18 12:20	07/13/18 10:10
490-155625-7	River 04A 071218	Water	07/12/18 12:45	07/13/18 10:10
490-155625-8	River 04B 071218	Water	07/12/18 12:55	07/13/18 10:10

Job ID: 490-155625-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-155625-1

Comments
Revised Report 8/07/2018 to add Potassium and Total Alkalinity per request.

Receipt
The samples were received on 7/13/2018 10:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.5º C and 1.3º C.

HPLC/IC
Method(s) 9056A: The method blank for analytical batch 490-529755 contained Chloride above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

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

Metals
Method(s) 6020A: The matrix spike / matrix spike duplicate / sample duplicate (MS/MSD/DUP) precision for 250895 was outside control limits for selenium. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample / laboratory control sample duplicate (LCS/LCSD) precision was within acceptance limits.

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

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

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

Narrative

Job Narrative
490-155625-2

Comments
No additional comments.

Receipt
The samples were received on 7/13/2018 10:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.5º C and 1.3º C.

RAD
Method(s) PrecSep_0: Radium 228 Prep Batch 160-376424: Sample aliquots reduced due to potential matrix interference. Samples were yellow, murky, and contained heavy amounts of sediment: River 01A 071218 (490-155625-1), River 01B 071218 (490-155625-2), River 02A 071218 (490-155625-3), River 02B 071218 (490-155625-4), River 03A 071218 (490-155625-5), River 03B 071218 (490-155625-6), River 04A 071218 (490-155625-7) and River 04B 071218 (490-155625-8)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376411: Sample aliquots reduced due to potential matrix interference. Samples were yellow, murky, and contained heavy amounts of sediment: River 01A 071218 (490-155625-1), River 01B 071218 (490-155625-2), River 02A 071218 (490-155625-3), River 02B 071218 (490-155625-4), River 03A 071218 (490-155625-5), River 03B 071218 (490-155625-6), River 04A 071218 (490-155625-7) and River 04B 071218 (490-155625-8)

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

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
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.

Metals

Qualifier	Qualifier Description
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.
F2	MS/MSD RPD exceeds control limits

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Client Sample ID: River 01A 071218

Date Collected: 07/12/18 11:10
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-1

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.58	B	3.00	0.200	mg/L			07/19/18 02:20	1
Fluoride	0.111	J	1.00	0.0100	mg/L			07/19/18 02:20	1
Sulfate	28.5		5.00	0.0300	mg/L			07/19/18 02:20	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:09	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000591	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 20:31	1
Arsenic	0.00124	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 20:31	1
Barium	0.0330	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 20:31	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 20:31	1
Boron	0.0281	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 20:31	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 20:31	1
Calcium	31.8		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 20:31	1
Chromium	0.000676	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 20:31	1
Cobalt	0.000401	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 20:31	1
Lead	0.000994	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 20:31	1
Magnesium	6.41		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 20:31	1
Molybdenum	0.00217	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 20:31	1
Potassium	2.68		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 20:31	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 20:31	1
Sodium	3.79		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 20:31	1
Thallium	0.0000500	J	0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 20:31	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:03	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.64		0.100	0.100	SU			07/18/18 10:03	1
Temperature	19.1		0.100	0.100	Degrees C			07/18/18 10:03	1
Alkalinity	85.6		10.0	5.00	mg/L			07/24/18 12:48	1
Total Dissolved Solids	169		10.0	7.00	mg/L			07/13/18 21:20	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.392		0.137	0.142	1.00	0.119	pCi/L	07/18/18 09:53	08/09/18 06:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.9*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:09*	*1*

Client Sample ID: River 01A 071218
Date Collected: 07/12/18 11:10
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-1
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0258	U	0.229	0.229	1.00	0.411	pCi/L	07/18/18 10:47	08/01/18 16:50	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.9*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:50*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:50*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.417**		0.267	0.269	5.00	0.411	pCi/L		08/16/18 13:40	1

Client Sample ID: River 01B 071218

Date Collected: 07/12/18 11:30
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-2

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.52	B	3.00	0.200	mg/L			07/19/18 03:15	1
Fluoride	0.105	J	1.00	0.0100	mg/L			07/19/18 03:15	1
Sulfate	28.3		5.00	0.0300	mg/L			07/19/18 03:15	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:30	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000476	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 20:35	1
Arsenic	0.00137	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 20:35	1
Barium	0.0374	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 20:35	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 20:35	1
Boron	0.0252	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 20:35	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 20:35	1
Calcium	33.2		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 20:35	1
Chromium	0.00143	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 20:35	1
Cobalt	0.000623	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 20:35	1
Lead	0.00600	B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 20:35	1
Magnesium	6.62		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 20:35	1
Molybdenum	0.00130	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 20:35	1
Potassium	2.91		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 20:35	1
Selenium	ND	F2	0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 20:35	1
Sodium	3.95		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 20:35	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 20:35	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.62		0.100	0.100	SU			07/18/18 10:03	1
Temperature	19.1		0.100	0.100	Degrees C			07/18/18 10:03	1
Alkalinity	85.6		10.0	5.00	mg/L			07/24/18 12:55	1
Total Dissolved Solids	161		10.0	7.00	mg/L			07/13/18 21:20	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.249		0.112	0.114	1.00	0.115	pCi/L	07/18/18 09:53	08/09/18 06:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:10*	*1*

Client Sample ID: River 01B 071218
Date Collected: 07/12/18 11:30
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-2
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.00993	U	0.274	0.274	1.00	0.489	pCi/L	07/18/18 10:47	08/01/18 16:50	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:50*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:50*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.249	U	0.296	0.297	5.00	0.489	pCi/L		08/16/18 13:40	1

Client Sample ID: River 02A 071218

Date Collected: 07/12/18 11:50
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-3

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	6.75	B	3.00	0.200	mg/L			07/19/18 03:33	1
Fluoride	0.0958	J	1.00	0.0100	mg/L			07/19/18 03:33	1
Sulfate	30.6		5.00	0.0300	mg/L			07/19/18 03:33	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:35	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00276	B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 20:58	1
Arsenic	0.00131	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 20:58	1
Barium	0.0350	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 20:58	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 20:58	1
Boron	0.0323	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 20:58	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 20:58	1
Calcium	32.8		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 20:58	1
Chromium	0.00111	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 20:58	1
Cobalt	0.000730	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 20:58	1
Lead	0.00125	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 20:58	1
Magnesium	6.32		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 20:58	1
Molybdenum	0.00222	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 20:58	1
Potassium	3.01		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 20:58	1
Selenium	0.000423	J	0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 20:58	1
Sodium	3.98		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 20:58	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 20:58	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.45		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.8		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	85.7		10.0	5.00	mg/L			07/24/18 13:02	1
Total Dissolved Solids	173		10.0	7.00	mg/L			07/13/18 21:20	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.336		0.133	0.136	1.00	0.128	pCi/L	07/18/18 09:53	08/09/18 06:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:10*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 02A 071218
Date Collected: 07/12/18 11:50
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-3
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.218	U	0.288	0.289	1.00	0.480	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.554**		0.317	0.319	5.00	0.480	pCi/L		08/16/18 13:40	1

Client Sample ID: River 02B 071218

Date Collected: 07/12/18 12:00
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-4

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	6.69	B	3.00	0.200	mg/L			07/19/18 03:51	1
Fluoride	0.0979	J	1.00	0.0100	mg/L			07/19/18 03:51	1
Sulfate	30.1		5.00	0.0300	mg/L			07/19/18 03:51	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:41	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00106	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:03	1
Arsenic	0.00135	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:03	1
Barium	0.0396	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:03	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:03	1
Boron	0.0322	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:03	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:03	1
Calcium	35.8		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:03	1
Chromium	0.00155	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:03	1
Cobalt	0.000937	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:03	1
Lead	0.00199	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:03	1
Magnesium	6.76		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:03	1
Molybdenum	0.00145	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:03	1
Potassium	3.65		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:03	1
Selenium	0.000636	J	0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:03	1
Sodium	4.63		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:03	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:03	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.50		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.5		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	85.8		10.0	5.00	mg/L			07/24/18 13:09	1
Total Dissolved Solids	170		10.0	7.00	mg/L			07/13/18 21:20	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.318		0.123	0.126	1.00	0.115	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client Sample ID: River 02B 071218
Date Collected: 07/12/18 12:00
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-4
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.417		0.268	0.271	1.00	0.409	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.735		0.295	0.299	5.00	0.409	pCi/L		08/16/18 13:40	1

Client Sample ID: River 03A 071218

Date Collected: 07/12/18 12:15
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-5

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	5.33	B	3.00	0.200	mg/L			07/19/18 04:09	1
Fluoride	0.100	J	1.00	0.0100	mg/L			07/19/18 04:09	1
Sulfate	28.8		5.00	0.0300	mg/L			07/19/18 04:09	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:56	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000571	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:21	1
Arsenic	0.00126	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:21	1
Barium	0.0366	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:21	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:21	1
Boron	0.0251	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:21	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:21	1
Calcium	34.8		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:21	1
Chromium	0.00112	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:21	1
Cobalt	0.000934	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:21	1
Lead	0.00115	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:21	1
Magnesium	6.87		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:21	1
Molybdenum	0.00105	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:21	1
Potassium	3.06		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:21	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:21	1
Sodium	4.64		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:21	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:21	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:07	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.50		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.3		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	86.1		10.0	5.00	mg/L			07/24/18 13:16	1
Total Dissolved Solids	175		10.0	7.00	mg/L			07/13/18 23:45	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.338		0.126	0.130	1.00	0.110	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 03A 071218
Date Collected: 07/12/18 12:15
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-5
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0661	U	0.244	0.245	1.00	0.429	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*90.8*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.404	U	0.275	0.277	5.00	0.429	pCi/L		08/16/18 13:40	1

Client Sample ID: River 03B 071218

Date Collected: 07/12/18 12:20
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-6

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	5.59	B	3.00	0.200	mg/L			07/19/18 04:27	1
Fluoride	0.0954	J	1.00	0.0100	mg/L			07/19/18 04:27	1
Sulfate	28.9		5.00	0.0300	mg/L			07/19/18 04:27	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 15:02	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000514	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:25	1
Arsenic	0.00131	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:25	1
Barium	0.0362	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:25	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:25	1
Boron	0.0235	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:25	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:25	1
Calcium	32.6		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:25	1
Chromium	0.00119	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:25	1
Cobalt	0.000800	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:25	1
Lead	0.00166	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:25	1
Magnesium	6.41		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:25	1
Molybdenum	0.00103	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:25	1
Potassium	2.87		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:25	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:25	1
Sodium	4.01		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:25	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:25	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.51		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.4		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	86.4		10.0	5.00	mg/L			07/24/18 13:29	1
Total Dissolved Solids	170		10.0	7.00	mg/L			07/13/18 23:45	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.391		0.146	0.150	1.00	0.123	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 03B 071218
Date Collected: 07/12/18 12:20
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-6
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.197	U	0.229	0.230	1.00	0.449	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*90.8*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.391	U	0.272	0.275	5.00	0.449	pCi/L		08/16/18 13:40	1

Client Sample ID: River 04A 071218

Date Collected: 07/12/18 12:45
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-7

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.83	B	3.00	0.200	mg/L			07/19/18 04:45	1
Fluoride	0.0948	J	1.00	0.0100	mg/L			07/19/18 04:45	1
Sulfate	28.6		5.00	0.0300	mg/L			07/19/18 04:45	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 15:07	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000504	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:30	1
Arsenic	0.00118	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:30	1
Barium	0.0382	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:30	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:30	1
Boron	0.0229	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:30	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:30	1
Calcium	32.9		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:30	1
Chromium	0.00134	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:30	1
Cobalt	0.000841	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:30	1
Lead	0.00141	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:30	1
Magnesium	6.45		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:30	1
Molybdenum	0.00101	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:30	1
Potassium	2.85		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:30	1
Selenium	0.000402	J	0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:30	1
Sodium	3.87		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:30	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:30	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:09	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.52		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.4		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	80.9		10.0	5.00	mg/L			07/24/18 13:36	1
Total Dissolved Solids	174		10.0	7.00	mg/L			07/13/18 23:45	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.309		0.117	0.120	1.00	0.0978	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.3*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 04A 071218
Date Collected: 07/12/18 12:45
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-7
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.236	U	0.276	0.277	1.00	0.456	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.3*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*86.7*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.544**		0.300	0.302	5.00	0.456	pCi/L		08/16/18 13:40	1

Client Sample ID: River 04B 071218

Date Collected: 07/12/18 12:55
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-8

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.75	B	3.00	0.200	mg/L			07/19/18 05:03	1
Fluoride	0.0945	J	1.00	0.0100	mg/L			07/19/18 05:03	1
Sulfate	28.6		5.00	0.0300	mg/L			07/19/18 05:03	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 15:12	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000360	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:35	1
Arsenic	0.00109	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:35	1
Barium	0.0402	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:35	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:35	1
Boron	0.0234	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:35	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:35	1
Calcium	34.5		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:35	1
Chromium	0.00105	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:35	1
Cobalt	0.000738	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:35	1
Lead	0.00147	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:35	1
Magnesium	6.73		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:35	1
Molybdenum	0.000981	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:35	1
Potassium	2.95		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:35	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:35	1
Sodium	4.02		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:35	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:35	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.53		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.4		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	85.8		10.0	5.00	mg/L			07/24/18 13:43	1
Total Dissolved Solids	156		10.0	7.00	mg/L			07/13/18 23:45	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.423		0.157	0.162	1.00	0.123	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 04B 071218
Date Collected: 07/12/18 12:55
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-8
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.277	U	0.249	0.250	1.00	0.502	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*89.0*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.423	U	0.294	0.298	5.00	0.502	pCi/L		08/16/18 13:40	1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 490-529755/3
Matrix: Water
Analysis Batch: 529755

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	0.2299	J	3.00	0.200	mg/L			07/19/18 01:26	1
Fluoride	ND		1.00	0.0100	mg/L			07/19/18 01:26	1
Sulfate	ND		5.00	0.0300	mg/L			07/19/18 01:26	1

Lab Sample ID: LCS 490-529755/4
Matrix: Water
Analysis Batch: 529755

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.340		mg/L		93	80 - 120
Fluoride	1.00	0.9436	J	mg/L		94	80 - 120
Sulfate	10.0	9.177		mg/L		92	80 - 120

Lab Sample ID: LCSD 490-529755/5
Matrix: Water
Analysis Batch: 529755

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.258		mg/L		92	80 - 120	1	20
Fluoride	1.00	0.9306	J	mg/L		93	80 - 120	1	20
Sulfate	10.0	9.183		mg/L		92	80 - 120	0	20

Lab Sample ID: 490-155625-1 MS
Matrix: Water
Analysis Batch: 529755

Client Sample ID: River 01A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	4.58	B	10.0	15.84		mg/L		112	80 - 120
Fluoride	0.111	J	1.00	1.158		mg/L		105	80 - 120
Sulfate	28.5		10.0	39.82		mg/L		113	80 - 120

Lab Sample ID: 490-155625-1 MSD
Matrix: Water
Analysis Batch: 529755

Client Sample ID: River 01A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	4.58	B	10.0	14.00		mg/L		94	80 - 120	12	20
Fluoride	0.111	J	1.00	0.9991	J	mg/L		89	80 - 120	15	20
Sulfate	28.5		10.0	38.02		mg/L		95	80 - 120	5	20

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 180-250893/1-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250893

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 13:59	1

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: LCS 180-250893/2-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250893

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	1.00	1.022		mg/L		102	80 - 120

Lab Sample ID: 490-155625-1 MS
Matrix: Water
Analysis Batch: 251527

Client Sample ID: River 01A 071218
Prep Type: Total Recoverable
Prep Batch: 250893

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	ND		1.00	1.007		mg/L		101	75 - 125

Lab Sample ID: 490-155625-1 MSD
Matrix: Water
Analysis Batch: 251527

Client Sample ID: River 01A 071218
Prep Type: Total Recoverable
Prep Batch: 250893

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	ND		1.00	0.9816		mg/L		98	75 - 125	3	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 180-250895/1-A
Matrix: Water
Analysis Batch: 251631

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00006100	J	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 20:21	1
Arsenic	ND		0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 20:21	1
Barium	ND		0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 20:21	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 20:21	1
Boron	ND		1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 20:21	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 20:21	1
Calcium	ND		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 20:21	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 20:21	1
Cobalt	ND		0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 20:21	1
Lead	0.0001510	J	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 20:21	1
Magnesium	ND		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 20:21	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 20:21	1
Potassium	ND		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 20:21	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 20:21	1
Sodium	ND		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 20:21	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 20:21	1

Lab Sample ID: LCS 180-250895/2-A
Matrix: Water
Analysis Batch: 251631

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.500	0.4898		mg/L		98	80 - 120
Arsenic	0.0400	0.03842		mg/L		96	80 - 120
Barium	2.00	1.925		mg/L		96	80 - 120
Beryllium	0.0500	0.04875		mg/L		98	80 - 120

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 180-250895/2-A
Matrix: Water
Analysis Batch: 251631

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1.00	0.8867	J	mg/L		89	80 - 120
Cadmium	0.0500	0.05068		mg/L		101	80 - 120
Calcium	50.0	45.32		mg/L		91	80 - 120
Chromium	0.200	0.1705		mg/L		85	80 - 120
Cobalt	0.500	0.4476		mg/L		90	80 - 120
Lead	0.0200	0.02129		mg/L		106	80 - 120
Magnesium	50.0	46.73		mg/L		93	80 - 120
Molybdenum	1.00	0.9723		mg/L		97	80 - 120
Potassium	50.0	46.91		mg/L		94	80 - 120
Selenium	0.0100	0.01009		mg/L		101	80 - 120
Sodium	50.0	45.47		mg/L		91	80 - 120
Thallium	0.0500	0.04991		mg/L		100	80 - 120

Lab Sample ID: 490-155625-2 MS
Matrix: Water
Analysis Batch: 251631

Client Sample ID: River 01B 071218
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.000476	J B	0.500	0.5115		mg/L		102	75 - 125
Arsenic	0.00137	J	0.0400	0.03802		mg/L		92	75 - 125
Barium	0.0374	J	2.00	2.033		mg/L		100	75 - 125
Beryllium	ND		0.0500	0.05153		mg/L		103	75 - 125
Boron	0.0252	J	1.00	0.9333	J	mg/L		91	75 - 125
Cadmium	ND		0.0500	0.05330		mg/L		107	75 - 125
Calcium	33.2		50.0	85.40		mg/L		105	75 - 125
Chromium	0.00143	J	0.200	0.1788		mg/L		89	75 - 125
Cobalt	0.000623	J	0.500	0.4717		mg/L		94	75 - 125
Lead	0.00600	B	0.0200	0.02673		mg/L		104	75 - 125
Magnesium	6.62		50.0	53.36		mg/L		93	75 - 125
Molybdenum	0.00130	J	1.00	1.007		mg/L		101	75 - 125
Potassium	2.91		50.0	50.11		mg/L		94	75 - 125
Selenium	ND	F2	0.0100	0.01048		mg/L		105	75 - 125
Sodium	3.95		50.0	49.36		mg/L		91	75 - 125
Thallium	ND		0.0500	0.05030		mg/L		101	75 - 125

Lab Sample ID: 490-155625-2 MSD
Matrix: Water
Analysis Batch: 251631

Client Sample ID: River 01B 071218
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	0.000476	J B	0.500	0.5014		mg/L		100	75 - 125	2	20
Arsenic	0.00137	J	0.0400	0.03845		mg/L		93	75 - 125	1	20
Barium	0.0374	J	2.00	2.037		mg/L		100	75 - 125	0	20
Beryllium	ND		0.0500	0.05205		mg/L		104	75 - 125	1	20
Boron	0.0252	J	1.00	0.9436	J	mg/L		92	75 - 125	1	20
Cadmium	ND		0.0500	0.05239		mg/L		105	75 - 125	2	20
Calcium	33.2		50.0	86.42		mg/L		107	75 - 125	1	20
Chromium	0.00143	J	0.200	0.1794		mg/L		89	75 - 125	0	20
Cobalt	0.000623	J	0.500	0.4642		mg/L		93	75 - 125	2	20

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-155625-2 MSD
Matrix: Water
Analysis Batch: 251631

Client Sample ID: River 01B 071218
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lead	0.00600	B	0.0200	0.02698		mg/L		105	75 - 125	1	20
Magnesium	6.62		50.0	54.66		mg/L		96	75 - 125	2	20
Molybdenum	0.00130	J	1.00	0.9933		mg/L		99	75 - 125	1	20
Potassium	2.91		50.0	50.03		mg/L		94	75 - 125	0	20
Selenium	ND	F2	0.0100	0.008497	J F2	mg/L		85	75 - 125	21	20
Sodium	3.95		50.0	50.61		mg/L		93	75 - 125	3	20
Thallium	ND		0.0500	0.04967		mg/L		99	75 - 125	1	20

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 180-250921/1-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 250921

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 09:44	1

Lab Sample ID: LCS 180-250921/2-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 250921

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	2.50	2.427		ug/L		97	80 - 120

Lab Sample ID: 180-79763-F-6-C MS
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike
Prep Type: Dissolved
Prep Batch: 250921

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		1.00	0.8990		ug/L		90	75 - 125

Lab Sample ID: 180-79763-F-6-D MSD
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike Duplicate
Prep Type: Dissolved
Prep Batch: 250921

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		1.00	0.9260		ug/L		93	75 - 125	3	20

Method: 9040C - pH

Lab Sample ID: LCS 490-529671/1
Matrix: Water
Analysis Batch: 529671

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	6.970		SU		100	98 - 103

Method: 9040C - pH (Continued)

Lab Sample ID: 490-155638-D-10 DU
Matrix: Water
Analysis Batch: 529671

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	5.78			5.750		SU				0.5	20
Temperature	18.9			18.50		Degrees C				2	20

Lab Sample ID: LCS 490-529685/1
Matrix: Water
Analysis Batch: 529685

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			7.00	6.970		SU		100	98 - 103		

Lab Sample ID: 490-155625-3 DU
Matrix: Water
Analysis Batch: 529685

Client Sample ID: River 02A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	7.45			7.490		SU				0.5	20
Temperature	19.8			19.80		Degrees C				0	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 490-531384/13
Matrix: Water
Analysis Batch: 531384

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 11:54	1

Lab Sample ID: LCS 490-531384/14
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity			100	102.9		mg/L		103	90 - 110		

Lab Sample ID: LCSD 490-531384/36
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Alkalinity			100	96.04		mg/L		96	90 - 110	7	20

Lab Sample ID: 490-155625-5 DU
Matrix: Water
Analysis Batch: 531384

Client Sample ID: River 03A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Alkalinity	86.1			86.60		mg/L				0.6	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 490-525387/1
Matrix: Water
Analysis Batch: 525387

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10.0	7.00	mg/L			07/13/18 23:45	1

Lab Sample ID: LCS 490-525387/2
Matrix: Water
Analysis Batch: 525387

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	100	107.0		mg/L		107	90 - 110

Lab Sample ID: 490-155592-A-1 DU
Matrix: Water
Analysis Batch: 525387

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	291.0		305.0		mg/L		5	20

Lab Sample ID: 490-155625-5 DU
Matrix: Water
Analysis Batch: 525387

Client Sample ID: River 03A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	175		170.0		mg/L		3	20

Lab Sample ID: MB 490-525388/1
Matrix: Water
Analysis Batch: 525388

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10.0	7.00	mg/L			07/13/18 21:20	1

Lab Sample ID: LCS 490-525388/2
Matrix: Water
Analysis Batch: 525388

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	100	107.0		mg/L		107	90 - 110

Lab Sample ID: 490-155300-J-1 DU
Matrix: Water
Analysis Batch: 525388

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	256		255.0		mg/L		0.4	20

Lab Sample ID: 490-155625-4 DU
Matrix: Water
Analysis Batch: 525388

Client Sample ID: River 02B 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	170		167.0		mg/L		2	20

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-376411/23-A
Matrix: Water
Analysis Batch: 381214

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376411

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.3070		0.119	0.122	1.00	0.128	pCi/L	07/18/18 09:53	08/09/18 08:07	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*104*		*40 - 110*	*07/18/18 09:53*	*08/09/18 08:07*	*1*

Lab Sample ID: LCS 160-376411/1-A
Matrix: Water
Analysis Batch: 381214

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376411

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			15.1	14.12		1.45	1.00	0.135	pCi/L	93	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*97.9*		*40 - 110*

Lab Sample ID: 600-169201-B-1-A DU
Matrix: Water
Analysis Batch: 381214

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 376411

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.203			0.2067		0.0859	1.00	0.0785	pCi/L			0.02	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-376424/23-A
Matrix: Water
Analysis Batch: 379713

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376424

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.1873	U	0.219	0.220	1.00	0.362	pCi/L	07/18/18 10:47	08/01/18 16:54	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*104*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:54*	*1*
Y Carrier	*89.0*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:54*	*1*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-376424/1-A
Matrix: Water
Analysis Batch: 379720

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376424

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			14.9	13.44		1.48	1.00	0.437	pCi/L	90	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*97.9*		*40 - 110*
Y Carrier	*93.8*		*40 - 110*

Lab Sample ID: 600-169201-B-1-B DU
Matrix: Water
Analysis Batch: 379720

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 376424

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	-0.0457	U		-0.06516	U	0.160	1.00	0.300	pCi/L			0.06	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*
Y Carrier	*92.7*		*40 - 110*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Lab Sample ID: 180-78050-A-1 DU
Matrix: Water
Analysis Batch: 382940

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Combined Radium 226 + 228	0.193	U		0.3728	U	0.293	5.00	0.454	pCi/L			0.33	

HPLC/IC

Analysis Batch: 529755

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	9056A	
490-155625-2	River 01B 071218	Total/NA	Water	9056A	
490-155625-3	River 02A 071218	Total/NA	Water	9056A	
490-155625-4	River 02B 071218	Total/NA	Water	9056A	
490-155625-5	River 03A 071218	Total/NA	Water	9056A	
490-155625-6	River 03B 071218	Total/NA	Water	9056A	
490-155625-7	River 04A 071218	Total/NA	Water	9056A	
490-155625-8	River 04B 071218	Total/NA	Water	9056A	
MB 490-529755/3	Method Blank	Total/NA	Water	9056A	
LCS 490-529755/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-529755/5	Lab Control Sample Dup	Total/NA	Water	9056A	
490-155625-1 MS	River 01A 071218	Total/NA	Water	9056A	
490-155625-1 MSD	River 01A 071218	Total/NA	Water	9056A	

Metals

Prep Batch: 250893

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total Recoverable	Water	3005A	
490-155625-2	River 01B 071218	Total Recoverable	Water	3005A	
490-155625-3	River 02A 071218	Total Recoverable	Water	3005A	
490-155625-4	River 02B 071218	Total Recoverable	Water	3005A	
490-155625-5	River 03A 071218	Total Recoverable	Water	3005A	
490-155625-6	River 03B 071218	Total Recoverable	Water	3005A	
490-155625-7	River 04A 071218	Total Recoverable	Water	3005A	
490-155625-8	River 04B 071218	Total Recoverable	Water	3005A	
MB 180-250893/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-250893/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-155625-1 MS	River 01A 071218	Total Recoverable	Water	3005A	
490-155625-1 MSD	River 01A 071218	Total Recoverable	Water	3005A	

Prep Batch: 250895

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total Recoverable	Water	3005A	
490-155625-2	River 01B 071218	Total Recoverable	Water	3005A	
490-155625-3	River 02A 071218	Total Recoverable	Water	3005A	
490-155625-4	River 02B 071218	Total Recoverable	Water	3005A	
490-155625-5	River 03A 071218	Total Recoverable	Water	3005A	
490-155625-6	River 03B 071218	Total Recoverable	Water	3005A	
490-155625-7	River 04A 071218	Total Recoverable	Water	3005A	
490-155625-8	River 04B 071218	Total Recoverable	Water	3005A	
MB 180-250895/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-250895/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-155625-2 MS	River 01B 071218	Total Recoverable	Water	3005A	
490-155625-2 MSD	River 01B 071218	Total Recoverable	Water	3005A	

Prep Batch: 250921

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	7470A	
490-155625-2	River 01B 071218	Total/NA	Water	7470A	

Metals (Continued)

Prep Batch: 250921 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-3	River 02A 071218	Total/NA	Water	7470A	
490-155625-4	River 02B 071218	Total/NA	Water	7470A	
490-155625-5	River 03A 071218	Total/NA	Water	7470A	
490-155625-6	River 03B 071218	Total/NA	Water	7470A	
490-155625-7	River 04A 071218	Total/NA	Water	7470A	
490-155625-8	River 04B 071218	Total/NA	Water	7470A	
MB 180-250921/1-A	Method Blank	Total/NA	Water	7470A	
LCS 180-250921/2-A	Lab Control Sample	Total/NA	Water	7470A	
180-79763-F-6-C MS	Matrix Spike	Dissolved	Water	7470A	
180-79763-F-6-D MSD	Matrix Spike Duplicate	Dissolved	Water	7470A	

Analysis Batch: 251171

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	EPA 7470A	250921
490-155625-2	River 01B 071218	Total/NA	Water	EPA 7470A	250921
490-155625-3	River 02A 071218	Total/NA	Water	EPA 7470A	250921
490-155625-4	River 02B 071218	Total/NA	Water	EPA 7470A	250921
490-155625-5	River 03A 071218	Total/NA	Water	EPA 7470A	250921
490-155625-6	River 03B 071218	Total/NA	Water	EPA 7470A	250921
490-155625-7	River 04A 071218	Total/NA	Water	EPA 7470A	250921
490-155625-8	River 04B 071218	Total/NA	Water	EPA 7470A	250921
MB 180-250921/1-A	Method Blank	Total/NA	Water	EPA 7470A	250921
LCS 180-250921/2-A	Lab Control Sample	Total/NA	Water	EPA 7470A	250921
180-79763-F-6-C MS	Matrix Spike	Dissolved	Water	EPA 7470A	250921
180-79763-F-6-D MSD	Matrix Spike Duplicate	Dissolved	Water	EPA 7470A	250921

Analysis Batch: 251527

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total Recoverable	Water	6010C	250893
490-155625-2	River 01B 071218	Total Recoverable	Water	6010C	250893
490-155625-3	River 02A 071218	Total Recoverable	Water	6010C	250893
490-155625-4	River 02B 071218	Total Recoverable	Water	6010C	250893
490-155625-5	River 03A 071218	Total Recoverable	Water	6010C	250893
490-155625-6	River 03B 071218	Total Recoverable	Water	6010C	250893
490-155625-7	River 04A 071218	Total Recoverable	Water	6010C	250893
490-155625-8	River 04B 071218	Total Recoverable	Water	6010C	250893
MB 180-250893/1-A	Method Blank	Total Recoverable	Water	6010C	250893
LCS 180-250893/2-A	Lab Control Sample	Total Recoverable	Water	6010C	250893
490-155625-1 MS	River 01A 071218	Total Recoverable	Water	6010C	250893
490-155625-1 MSD	River 01A 071218	Total Recoverable	Water	6010C	250893

Analysis Batch: 251631

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total Recoverable	Water	6020A	250895
490-155625-2	River 01B 071218	Total Recoverable	Water	6020A	250895
490-155625-3	River 02A 071218	Total Recoverable	Water	6020A	250895
490-155625-4	River 02B 071218	Total Recoverable	Water	6020A	250895
490-155625-5	River 03A 071218	Total Recoverable	Water	6020A	250895
490-155625-6	River 03B 071218	Total Recoverable	Water	6020A	250895
490-155625-7	River 04A 071218	Total Recoverable	Water	6020A	250895
490-155625-8	River 04B 071218	Total Recoverable	Water	6020A	250895

Metals (Continued)

Analysis Batch: 251631 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 180-250895/1-A	Method Blank	Total Recoverable	Water	6020A	250895
LCS 180-250895/2-A	Lab Control Sample	Total Recoverable	Water	6020A	250895
490-155625-2 MS	River 01B 071218	Total Recoverable	Water	6020A	250895
490-155625-2 MSD	River 01B 071218	Total Recoverable	Water	6020A	250895

General Chemistry

Analysis Batch: 525387

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-5	River 03A 071218	Total/NA	Water	SM 2540C	
490-155625-6	River 03B 071218	Total/NA	Water	SM 2540C	
490-155625-7	River 04A 071218	Total/NA	Water	SM 2540C	
490-155625-8	River 04B 071218	Total/NA	Water	SM 2540C	
MB 490-525387/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 490-525387/2	Lab Control Sample	Total/NA	Water	SM 2540C	
490-155592-A-1 DU	Duplicate	Total/NA	Water	SM 2540C	
490-155625-5 DU	River 03A 071218	Total/NA	Water	SM 2540C	

Analysis Batch: 525388

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	SM 2540C	
490-155625-2	River 01B 071218	Total/NA	Water	SM 2540C	
490-155625-3	River 02A 071218	Total/NA	Water	SM 2540C	
490-155625-4	River 02B 071218	Total/NA	Water	SM 2540C	
MB 490-525388/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 490-525388/2	Lab Control Sample	Total/NA	Water	SM 2540C	
490-155300-J-1 DU	Duplicate	Total/NA	Water	SM 2540C	
490-155625-4 DU	River 02B 071218	Total/NA	Water	SM 2540C	

Analysis Batch: 529671

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	9040C	
490-155625-2	River 01B 071218	Total/NA	Water	9040C	
LCS 490-529671/1	Lab Control Sample	Total/NA	Water	9040C	
490-155638-D-10 DU	Duplicate	Total/NA	Water	9040C	

Analysis Batch: 529685

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-3	River 02A 071218	Total/NA	Water	9040C	
490-155625-4	River 02B 071218	Total/NA	Water	9040C	
490-155625-5	River 03A 071218	Total/NA	Water	9040C	
490-155625-6	River 03B 071218	Total/NA	Water	9040C	
490-155625-7	River 04A 071218	Total/NA	Water	9040C	
490-155625-8	River 04B 071218	Total/NA	Water	9040C	
LCS 490-529685/1	Lab Control Sample	Total/NA	Water	9040C	
490-155625-3 DU	River 02A 071218	Total/NA	Water	9040C	

Analysis Batch: 531384

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	SM 2320B	

General Chemistry (Continued)

Analysis Batch: 531384 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-2	River 01B 071218	Total/NA	Water	SM 2320B	
490-155625-3	River 02A 071218	Total/NA	Water	SM 2320B	
490-155625-4	River 02B 071218	Total/NA	Water	SM 2320B	
490-155625-5	River 03A 071218	Total/NA	Water	SM 2320B	
490-155625-6	River 03B 071218	Total/NA	Water	SM 2320B	
490-155625-7	River 04A 071218	Total/NA	Water	SM 2320B	
490-155625-8	River 04B 071218	Total/NA	Water	SM 2320B	
MB 490-531384/13	Method Blank	Total/NA	Water	SM 2320B	
LCS 490-531384/14	Lab Control Sample	Total/NA	Water	SM 2320B	
LCSD 490-531384/36	Lab Control Sample Dup	Total/NA	Water	SM 2320B	
490-155625-5 DU	River 03A 071218	Total/NA	Water	SM 2320B	

Rad

Prep Batch: 376411

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	PrecSep-21	
490-155625-2	River 01B 071218	Total/NA	Water	PrecSep-21	
490-155625-3	River 02A 071218	Total/NA	Water	PrecSep-21	
490-155625-4	River 02B 071218	Total/NA	Water	PrecSep-21	
490-155625-5	River 03A 071218	Total/NA	Water	PrecSep-21	
490-155625-6	River 03B 071218	Total/NA	Water	PrecSep-21	
490-155625-7	River 04A 071218	Total/NA	Water	PrecSep-21	
490-155625-8	River 04B 071218	Total/NA	Water	PrecSep-21	
MB 160-376411/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-376411/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
600-169201-B-1-A DU	Duplicate	Total/NA	Water	PrecSep-21	

Prep Batch: 376424

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	PrecSep_0	
490-155625-2	River 01B 071218	Total/NA	Water	PrecSep_0	
490-155625-3	River 02A 071218	Total/NA	Water	PrecSep_0	
490-155625-4	River 02B 071218	Total/NA	Water	PrecSep_0	
490-155625-5	River 03A 071218	Total/NA	Water	PrecSep_0	
490-155625-6	River 03B 071218	Total/NA	Water	PrecSep_0	
490-155625-7	River 04A 071218	Total/NA	Water	PrecSep_0	
490-155625-8	River 04B 071218	Total/NA	Water	PrecSep_0	
MB 160-376424/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-376424/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
600-169201-B-1-B DU	Duplicate	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 01A 071218

Date Collected: 07/12/18 11:10
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 02:20	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:09	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 20:31	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:03	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529671	07/18/18 10:03	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 12:48	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525388	07/13/18 21:20	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.47 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381214	08/09/18 06:09	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.47 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:50	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 01B 071218

Date Collected: 07/12/18 11:30
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 03:15	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:30	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 20:35	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:04	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529671	07/18/18 10:03	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 12:55	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525388	07/13/18 21:20	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			749.80 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:10	RTM	TAL SL
Total/NA	Prep	PrecSep_0			749.80 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:50	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 02A 071218

Lab Sample ID: 490-155625-3

Date Collected: 07/12/18 11:50

Matrix: Water

Date Received: 07/13/18 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 03:33	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:35	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 20:58	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:05	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:02	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525388	07/13/18 21:20	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.09 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:10	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.09 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 02B 071218

Lab Sample ID: 490-155625-4

Date Collected: 07/12/18 12:00

Matrix: Water

Date Received: 07/13/18 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 03:51	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:41	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:03	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:06	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:09	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525388	07/13/18 21:20	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.19 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.19 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 03A 071218

Date Collected: 07/12/18 12:15
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 04:09	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:56	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:21	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:07	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:16	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525387	07/13/18 23:45	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.13 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.13 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 03B 071218

Date Collected: 07/12/18 12:20
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-6

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 04:27	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 15:02	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:25	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:08	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:29	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525387	07/13/18 23:45	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			749.72 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			749.72 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 04A 071218

Date Collected: 07/12/18 12:45
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-7

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 04:45	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 15:07	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:30	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:09	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:36	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525387	07/13/18 23:45	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			749.76 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			749.76 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 04B 071218

Date Collected: 07/12/18 12:55
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-8

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 05:03	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 15:12	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:35	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:10	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:43	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525387	07/13/18 23:45	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.03 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.03 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Method Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL NSH
6010C	Metals (ICP)	SW846	TAL PIT
6020A	Metals (ICP/MS)	SW846	TAL PIT
EPA 7470A	Mercury (CVAA)	SW846	TAL PIT
9040C	pH	SW846	TAL NSH
SM 2320B	Alkalinity	SM	TAL NSH
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL NSH
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL PIT
7470A	Preparation, Mercury	SW846	TAL PIT

Protocol References:

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:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Laboratory: TestAmerica Nashville

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Kentucky (UST)	State Program	4	19	06-30-19

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
9040C		Water	pH
9040C		Water	Temperature
9056A		Water	Chloride
9056A		Water	Fluoride
9056A		Water	Sulfate
SM 2320B		Water	Alkalinity
SM 2540C		Water	Total Dissolved Solids

Laboratory: TestAmerica Pittsburgh

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Arkansas DEQ	State Program	6	88-0690	06-27-19
California	State Program	9	2891	04-30-19
Connecticut	State Program	1	PH-0688	09-30-18
Florida	NELAP	4	E871008	06-30-19
Illinois	NELAP	5	200005	06-30-19
Kansas	NELAP	7	E-10350	01-31-19
Louisiana	NELAP	6	04041	06-30-19
Nevada	State Program	9	PA00164	07-31-19
New Hampshire	NELAP	1	2030	04-04-19
New Jersey	NELAP	2	PA005	06-30-19
New York	NELAP	2	11182	03-31-19
North Carolina (WW/SW)	State Program	4	434	12-31-18
Oregon	NELAP	10	PA-2151	01-28-19
Pennsylvania	NELAP	3	02-00416	04-30-19
South Carolina	State Program	4	89014	04-30-18 *
Texas	NELAP	6	T104704528-15-2	03-31-19
US Fish & Wildlife	Federal		LE94312A-1	07-31-19
USDA	Federal		P330-16-00211	06-26-19
Utah	NELAP	8	PA001462015-4	05-31-19
Virginia	NELAP	3	460189	09-14-18 *
West Virginia DEP	State Program	3	142	01-31-19
Wisconsin	State Program	5	998027800	08-31-18

Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	DoD ELAP		L2305	04-06-19
Arizona	State Program	9	AZ0813	12-08-18
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19
Florida	NELAP	4	E87689	06-30-19
Illinois	NELAP	5	200023	11-30-18
Iowa	State Program	7	373	12-01-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Laboratory: TestAmerica St. Louis (Continued)

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Kansas	NELAP	7	E-10236	10-31-18
Kentucky (DW)	State Program	4	90125	12-31-18
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA180017	12-31-18
Maryland	State Program	3	310	09-30-18 *
Michigan	State Program	5	9005	06-30-18 *
Missouri	State Program	7	780	06-30-18 *
Nevada	State Program	9	MO000542018-1	07-31-18 *
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-18 *
Pennsylvania	NELAP	3	68-00540	02-28-19
South Carolina	State Program	4	85002001	06-30-18 *
Texas	NELAP	6	T104704193-18-12	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542016-8	07-31-18 *
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-18 *
West Virginia DEP	State Program	3	381	08-31-18 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

490-155625 Chain of Custody

COOLER RECEIPT FORM

Cooler Received/Opened On 7/13/2018 @ 1010

Time Samples Removed From Cooler 1404 Time Samples Placed In Storage 1425 (2 Hour Window)

1. Tracking # 9868 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960357 pH Strip Lot NA Chlorine Strip Lot NA

2. Temperature of rep. sample or temp blank when opened: 0.5 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) EA

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry Ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #

I certify that I unloaded the cooler and answered questions 7-14 (intial) GH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) GH

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) GH

I certify that I attached a label with the unique LIMS number to each container (intial) GH

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

Loc: 490
155625

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Cooler Received/Opened On 7/13/2018 @1010

Time Samples Removed From Cooler 1404 Time Samples Placed In Storage 1425 (2 Hour Window)

1. Tracking # 9857 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960358 pH Strip Lot NA Chlorine Strip Lot NA

2. Temperature of rep. sample or temp blank when opened: 1.3 Degrees Celsius

3. If item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) GH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) GH

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) GH

I certify that I attached a label with the unique LIMS number to each container (intial) GH

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex	COC No: 490-86693-25173.2
Client Contact: Greg Dick	Phone: 502 513-237-1184	E-Mail: roxanne.cisneros@testamericainc.com		Page: Page 1 of 1
Company: Big Rivers Electric Corporation				Job #:
Address: PO BOX 24	Due Date Requested: Standard			
City: Henderson	TAT Requested (days): Standard			
State, Zip: KY, 42419				
Phone: 270-844-6010(Tel)	PO #: Purchase Order - see DOCs			
Email: Gregory.Dick@bigrivers.com	WO #:			
Project Name: Big Rivers Electric Corp - Henderson KY	Project #: 49002917			
Site: Green Landfill	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL; B - NaOH; C - Zn Acetate; D - Nitric Acid; E - NaHSO4; F - MeOH; G - Amchlor; H - Ascorbic Acid; I - Ice; J - DI Water; K - EDTA; L - EDA; M - Hexane; N - None; O - AsNaO2; P - Na2O4S; Q - Na2SO3; R - Na2S2O3; S - H2SO4; T - TSP Dodecahydrate; U - Acetone; V - MCAA; W - pH 4-5; Z - other (specify)

Other:

2 Coolers

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056_ORGFM_28D	6010B, 7470A	2540C_Calcd - TDS	Redwpo 29673	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N			
River Ø1A 071218	7-12-18	11:10	G	Water	N	N	1	1	1	2	5	pH: 7.94
River Ø1B 071218	7-12-18	11:30	G	Water	N	N	1	1	1	2	5	" "
River Ø2A 071218	7-12-18	~~11~~ 1150	G	Water	N	N	1	1	1	2	5	pH = 7.91
River Ø2B 071218	7-12-18	12:00	G	Water	N	N	1	1	1	2	5	" "
River Ø3A 071218	7-12-18	12:15	G	Water	N	N	1	1	1	2	5	pH: 7.94
River Ø3B 071218	7-12-18	12:20	G	Water	N	N	1	1	1	2	5	" "
River Ø4A 071218	7-12-18	12:45	G	Water	N	N	1	1	1	2	5	pH: 7.86
River Ø4B 071218	7-12-18	12:55	G	Water	N	N	1	1	1	2	5	" "
				Water	X							

Loc: 490
155625

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
1		7/12/18 1700	AECOM		7-13-18 / 1010	TA-NAS
2	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
3	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 0.5 / 1.3

Ver: 08/04/2016

8/16/2018

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

8/16/2018

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-75461.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-155625-1
Address: 13715 Rider Trail North	Due Date Requested: 7/25/2018			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Green Landfill	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
River 01A 071218 (490-155625-1)	7/12/18	11:10 Eastern		Water			X	X	X	2	run once - upload data twice
River 01B 071218 (490-155625-2)	7/12/18	11:30 Eastern		Water			X	X	X	2	run once - upload data twice
River 02A 071218 (490-155625-3)	7/12/18	11:50 Eastern		Water			X	X	X	2	run once - upload data twice
River 02B 071218 (490-155625-4)	7/12/18	12:00 Eastern		Water			X	X	X	2	run once - upload data twice
River 03A 071218 (490-155625-5)	7/12/18	12:15 Eastern		Water			X	X	X	2	run once - upload data twice
River 03B 071218 (490-155625-6)	7/12/18	12:20 Eastern		Water			X	X	X	2	run once - upload data twice
River 04A 071218 (490-155625-7)	7/12/18	12:45 Eastern		Water			X	X	X	2	run once - upload data twice
River 04B 071218 (490-155625-8)	7/12/18	12:55 Eastern		Water			X	X	X	2	run once - upload data twice

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. 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 accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 7/16/18 1509	Company: TALS	Received by:	Date/Time: 7-17-18 @ 0915	Company: TASTL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 18.5

Ver: 09/20/2016

Login Sample Receipt Checklist

Client: Big Rivers Electric Corporation

Job Number: 490-155625-2

Login Number: 155625
List Number: 3
Creator: McBride, Mike

List Source: TestAmerica St. Louis
List Creation: 07/17/18 03:18 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	Thermal preservation not required.
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?	N/A	Received project as a subcontract.
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").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Tracer/Carrier Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Ba Carrier (40-110)
490-155625-1	River 01A 071218	90.9
490-155625-2	River 01B 071218	94.7
490-155625-3	River 02A 071218	87.3
490-155625-4	River 02B 071218	94.7
490-155625-5	River 03A 071218	91.4
490-155625-6	River 03B 071218	92.9
490-155625-7	River 04A 071218	95.3
490-155625-8	River 04B 071218	82.3
600-169201-B-1-A DU	Duplicate	100
LCS 160-376411/1-A	Lab Control Sample	97.9
MB 160-376411/23-A	Method Blank	104

Percent Yield (Acceptance Limits)

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)
490-155625-1	River 01A 071218	90.9	90.1
490-155625-2	River 01B 071218	94.7	90.1
490-155625-3	River 02A 071218	87.3	90.1
490-155625-4	River 02B 071218	94.7	90.1
490-155625-5	River 03A 071218	91.4	90.8
490-155625-6	River 03B 071218	92.9	90.8
490-155625-7	River 04A 071218	95.3	86.7
490-155625-8	River 04B 071218	82.3	89.0
600-169201-B-1-B DU	Duplicate	100	92.7
LCS 160-376424/1-A	Lab Control Sample	97.9	93.8
MB 160-376424/23-A	Method Blank	104	89.0

Percent Yield (Acceptance Limits)

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Y Carrier = Y Carrier

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-155661-1
Client Project/Site: Sebree-Green Landfill
Revision: 3

For:
Big Rivers Electric Corporation
PO BOX 24
Henderson, Kentucky 42419

Attn: Greg Dick

Roxanne Cisneros

Authorized for release by:
9/6/2018 12:40:51 PM

Roxanne Cisneros, Senior Project Manager
(615)301-5761
roxanne.cisneros@testamericainc.com

Table of Contents

Sample Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-155661-1	River Seep-08-071318	Water	07/13/18 07:50	07/14/18 10:50
490-155661-2	River Seep-12-071318	Water	07/13/18 09:15	07/14/18 10:50
490-155661-3	River Seep-16-071318	Water	07/13/18 11:00	07/14/18 10:50
490-155661-4	River Seep-14-071318	Water	07/13/18 10:10	07/14/18 10:50
490-155661-5	River Seep-04-071218	Water	07/12/18 13:50	07/14/18 10:50
490-155661-6	River Seep-07-071218	Water	07/12/18 14:50	07/14/18 10:50
490-155661-7	River Seep-05-071218	Water	07/12/18 14:25	07/14/18 10:50

Job ID: 490-155661-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-155661-1

Comments
Revised Report 9/06/2018 to correct sample ID for River Seep-04-071218 (490-155661-5).

Revised Report 8/24/2018 to includes only the data for the River Seeps per client request.

Revised Report 8/10/2018 to add Potassium per client request.

Receipt
The samples were received on 7/14/2018 10:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 3 coolers at receipt time were 1.0º C, 3.1º C and 5.7º C.

HPLC/IC
Method(s) 9056A: The method blank for analytical batch 490-531256 contained Sulfate above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

Method(s) 9056A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for analytical batch 490-531256 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method(s) 9056A: The method blank for analytical batch 490-531256 contained Fluoride and Sulfate above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

Method(s) 9056A: The following samples were diluted due to the nature of the sample matrix: River Seep-08-071318 (490-155661-1), River Seep-14-071318 (490-155661-4), River Seep-04-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), River Seep-05-071218 (490-155661-7), Elevated reporting limits (RLs) are provided.

Method(s) 9056A: The method blank as well as the continuing calibration blanks for analytical batch 490-531368 contained sulfate above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

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.

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

Narrative

Job Narrative
490-155661-2

Comments
Revised Report 9/06/2018 to correct sample ID for River Seep-04-071218 (490-155661-5).

Revised Report 8/24/2018 to includes only the data for the River Seeps per client request.

Receipt

Job ID: 490-155661-1 (Continued)

Laboratory: TestAmerica Nashville (Continued)

The samples were received on 7/14/2018 10:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 3 coolers at receipt time were 1.0º C, 3.1º C and 5.7º C.

RAD

Method(s) 904.0: Ra-228 Prep Batch 160-376750: The following sample did not meet the requested limit (RL) due to the reduced sample volume attributed to the presence of matrix interferences (see prep NCM 160-144167). The sample was brown, opaque and contained heavy amounts of sediment. The data have been reported with this narrative. River Seep-05-071218 (490-155661-7)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376750:
Sample aliquot 490-155661-2 reduced due to potential matrix interference. Sample was yellow, murky, and contained heavy amounts of sediment.

Sample aliquots 490-155661-5 and 490-155661-7 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy amounts of sediment.

River Seep-12-071318 (490-155661-2), River Seep-04-071218 (490-155661-5), River Seep-05-071218 (490-155661-7)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376750: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: River Seep-08-071318 (490-155661-1), River Seep-12-071318 (490-155661-2), River Seep-04-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), and River Seep-05-071218 (490-155661-7). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376745: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: River Seep-08-071318 (490-155661-1), River Seep-12-071318 (490-155661-2), River Seep-04-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), and River Seep-05-071218 (490-155661-7). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376745:
Sample aliquot 490-155661-2 reduced due to potential matrix interference. Sample was yellow, murky, and contained heavy amounts of sediment.

Sample aliquots 490-155661-5 and 490-155661-7 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy amounts of sediment.

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

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.
B	Compound was found in the blank and sample.
F1	MS and/or MSD Recovery is outside acceptance limits.

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.

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Client Sample ID: River Seep-08-071318

Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2040		300	20.0	mg/L			07/25/18 21:00	100
Fluoride	0.0915	J	1.00	0.0100	mg/L			07/24/18 16:22	1
Sulfate	1440	B	250	1.50	mg/L			07/25/18 20:45	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	1.80		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:24	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00141	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:35	1
Arsenic	0.000404	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:35	1
Barium	0.0443	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:35	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:35	1
Boron	0.510	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:35	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:35	1
Calcium	801		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:35	1
Chromium	0.000560	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:35	1
Cobalt	0.000691	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:35	1
Lead	0.000769	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:35	1
Magnesium	291		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:35	1
Molybdenum	0.00296	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:35	1
Potassium	125		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:35	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:35	1
Sodium	274		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:35	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:35	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.16		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	174		10.0	5.00	mg/L			07/24/18 20:55	1
Total Dissolved Solids	5310		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.332		0.108	0.112	1.00	0.0893	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Client Sample ID: River Seep-08-071318
Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.983		0.295	0.309	1.00	0.370	pCi/L	07/19/18 15:49	08/02/18 09:20	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:20*	*1*
Y Carrier	*90.5*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:20*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.31		0.314	0.329	5.00	0.370	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	32.7		3.00	0.200	mg/L			07/24/18 16:37	1
Fluoride	0.0803	J	1.00	0.0100	mg/L			07/24/18 16:37	1
Sulfate	16.1	B	5.00	0.0300	mg/L			07/24/18 16:37	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:29	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000499	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:40	1
Arsenic	0.00467	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:40	1
Barium	0.0757	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:40	1
Beryllium	0.000145	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:40	1
Boron	0.0379	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:40	1
Cadmium	0.000183	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:40	1
Calcium	21.1		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:40	1
Chromium	0.00200	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:40	1
Cobalt	0.00581		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:40	1
Lead	0.00221	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:40	1
Magnesium	5.20		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:40	1
Molybdenum	0.000948	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:40	1
Potassium	2.37		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:40	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:40	1
Sodium	5.52		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:40	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:40	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.00		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	38.2		10.0	5.00	mg/L			07/24/18 21:02	1
Total Dissolved Solids	157		10.0	7.00	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.542		0.153	0.161	1.00	0.105	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.629		0.351	0.356	1.00	0.527	pCi/L	07/19/18 15:49	08/02/18 09:21	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:21*	*1*
Y Carrier	*85.6*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:21*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.17		0.383	0.391	5.00	0.527	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-16-071318

Lab Sample ID: 490-155661-3

Date Collected: 07/13/18 11:00

Matrix: Water

Date Received: 07/14/18 10:50

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	23.2		3.00	0.200	mg/L			07/24/18 16:52	1
Fluoride	0.177	J	1.00	0.0100	mg/L			07/24/18 16:52	1
Sulfate	26.5	B	5.00	0.0300	mg/L			07/24/18 16:52	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:35	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000270	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:44	1
Arsenic	0.0247		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:44	1
Barium	0.190	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:44	1
Beryllium	0.000211	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:44	1
Boron	0.0321	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:44	1
Cadmium	0.000196	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:44	1
Calcium	93.8		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:44	1
Chromium	0.00383		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:44	1
Cobalt	0.00613		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:44	1
Lead	0.00521		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:44	1
Magnesium	20.3		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:44	1
Molybdenum	0.00878	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:44	1
Potassium	4.85		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:44	1
Selenium	0.000906	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:44	1
Sodium	26.7		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:44	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:44	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.40		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	393		10.0	5.00	mg/L			07/24/18 21:09	1
Total Dissolved Solids	504		20.0	14.0	mg/L			07/18/18 08:50	1

Client Sample ID: River Seep-14-071318

Date Collected: 07/13/18 10:10
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-4

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	22.7		3.00	0.200	mg/L			07/24/18 17:07	1
Fluoride	0.144	J	1.00	0.0100	mg/L			07/24/18 17:07	1
Sulfate	159	B	50.0	0.300	mg/L			07/25/18 21:15	10

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0126	J	0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:50	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000312	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:49	1
Arsenic	0.0173		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:49	1
Barium	0.242		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:49	1
Beryllium	0.000497	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:49	1
Boron	0.0694	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:49	1
Cadmium	0.000312	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:49	1
Calcium	171		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:49	1
Chromium	0.00969		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:49	1
Cobalt	0.0125		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:49	1
Lead	0.0109		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:49	1
Magnesium	36.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:49	1
Molybdenum	0.00550	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:49	1
Potassium	4.96		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:49	1
Selenium	0.000582	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:49	1
Sodium	18.5		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:49	1
Thallium	0.000126	J	0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:49	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:07	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.14		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	443		10.0	5.00	mg/L			07/24/18 21:17	1
Total Dissolved Solids	790		20.0	14.0	mg/L			07/18/18 08:50	1

Client Sample ID: River Seep-04-071218

Date Collected: 07/12/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-5

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	189		30.0	2.00	mg/L			07/25/18 21:59	10
Fluoride	0.239	J F1	1.00	0.0100	mg/L			07/24/18 17:51	1
Sulfate	1310	B	250	1.50	mg/L			07/25/18 22:14	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0209	J	0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:56	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000200	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:06	1
Arsenic	0.00188	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:06	1
Barium	0.0384	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:06	1
Beryllium	0.00372		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:06	1
Boron	2.19		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:06	1
Cadmium	0.00307		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:06	1
Calcium	460		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:06	1
Chromium	0.00386		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:06	1
Cobalt	0.0447		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:06	1
Lead	0.00507		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:06	1
Magnesium	63.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:06	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:06	1
Potassium	9.51		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:06	1
Selenium	0.00216	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:06	1
Sodium	42.1		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:06	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:06	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	5.26		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 21:21	1
Total Dissolved Solids	2130		20.0	14.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.665		0.213	0.221	1.00	0.167	pCi/L	07/19/18 15:20	08/10/18 16:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:40*	*1*

Client Sample ID: River Seep-04-071218

Lab Sample ID: 490-155661-5

Date Collected: 07/12/18 13:50

Matrix: Water

Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.810		0.520	0.525	1.00	0.796	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*87.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.48		0.562	0.570	5.00	0.796	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1990		300	20.0	mg/L			07/25/18 22:29	100
Fluoride	0.102	J	1.00	0.0100	mg/L			07/24/18 18:21	1
Sulfate	1480	B	500	3.00	mg/L			07/25/18 22:29	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.772		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:01	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:11	1
Arsenic	0.00182	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:11	1
Barium	0.0605	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:11	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:11	1
Boron	1.46		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:11	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:11	1
Calcium	1120		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:11	1
Chromium	0.000340	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:11	1
Cobalt	0.0218		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:11	1
Lead	0.000523	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:11	1
Magnesium	51.8		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:11	1
Molybdenum	0.00219	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:11	1
Potassium	262		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:11	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:11	1
Sodium	277		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:11	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:11	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:09	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.01		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	87.7		10.0	5.00	mg/L			07/24/18 21:28	1
Total Dissolved Solids	6080		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.566		0.144	0.152	1.00	0.0969	pCi/L	07/19/18 15:20	08/10/18 16:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:39*	*1*

Client Sample ID: River Seep-07-071218
Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.831		0.318	0.327	1.00	0.434	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*87.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.40		0.349	0.361	5.00	0.434	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1670		300	20.0	mg/L			07/25/18 22:44	100
Fluoride	0.0795	J	1.00	0.0100	mg/L			07/24/18 18:36	1
Sulfate	1170	B	500	3.00	mg/L			07/25/18 22:44	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.340		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:07	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000366	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:16	1
Arsenic	0.0192		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:16	1
Barium	0.718		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:16	1
Beryllium	0.000545	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:16	1
Boron	0.853	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:16	1
Cadmium	0.000563	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:16	1
Calcium	916		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:16	1
Chromium	0.0124		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:16	1
Cobalt	0.0327		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:16	1
Lead	0.0104		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:16	1
Magnesium	77.8		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:16	1
Molybdenum	0.00442	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:16	1
Potassium	238		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:16	1
Selenium	0.00121	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:16	1
Sodium	285		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:16	1
Thallium	0.000164	J	0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:16	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:12	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.95		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	229		10.0	5.00	mg/L			07/24/18 21:41	1
Total Dissolved Solids	5140		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	3.81		0.503	0.609	1.00	0.187	pCi/L	07/19/18 15:20	08/10/18 16:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.9*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:40*	*1*

Client Sample ID: River Seep-05-071218

Lab Sample ID: 490-155661-7

Date Collected: 07/12/18 14:25

Matrix: Water

Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	3.83	G	0.871	0.940	1.00	1.07	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*83.0*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	7.64		1.01	1.12	5.00	1.07	pCi/L		08/21/18 03:20	1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 490-531256/3
Matrix: Water
Analysis Batch: 531256

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/24/18 13:54	1
Fluoride	ND		1.00	0.0100	mg/L			07/24/18 13:54	1
Sulfate	0.3643	J	5.00	0.0300	mg/L			07/24/18 13:54	1

Lab Sample ID: LCS 490-531256/4
Matrix: Water
Analysis Batch: 531256

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.350		mg/L		93	80 - 120
Fluoride	1.00	0.9781	J	mg/L		98	80 - 120
Sulfate	10.0	9.696		mg/L		97	80 - 120

Lab Sample ID: LCSD 490-531256/5
Matrix: Water
Analysis Batch: 531256

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.374		mg/L		94	80 - 120	0	20
Fluoride	1.00	0.9558	J	mg/L		95	80 - 120	2	20
Sulfate	10.0	9.589		mg/L		96	80 - 120	1	20

Lab Sample ID: 490-155661-5 MS
Matrix: Water
Analysis Batch: 531256

Client Sample ID: River Seep-04-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Fluoride	0.239	J F1	1.00	1.702	F1	mg/L		146	80 - 120

Lab Sample ID: MB 490-531368/3
Matrix: Water
Analysis Batch: 531368

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/25/18 18:18	1
Fluoride	ND		1.00	0.0100	mg/L			07/25/18 18:18	1
Sulfate	0.3720	J	5.00	0.0300	mg/L			07/25/18 18:18	1

Lab Sample ID: MB 490-531368/30
Matrix: Water
Analysis Batch: 531368

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/26/18 00:57	1
Fluoride	ND		1.00	0.0100	mg/L			07/26/18 00:57	1
Sulfate	0.3740	J	5.00	0.0300	mg/L			07/26/18 00:57	1

Method: 9056A - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 490-531368/31
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.348		mg/L		93	80 - 120
Fluoride	1.00	0.9475	J	mg/L		95	80 - 120
Sulfate	10.0	9.314		mg/L		93	80 - 120

Lab Sample ID: LCS 490-531368/4
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.348		mg/L		93	80 - 120
Fluoride	1.00	0.9854	J	mg/L		98	80 - 120
Sulfate	10.0	9.495		mg/L		95	80 - 120

Lab Sample ID: LCSD 490-531368/32
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.368		mg/L		94	80 - 120	0	20
Fluoride	1.00	0.9513	J	mg/L		95	80 - 120	0	20
Sulfate	10.0	9.447		mg/L		94	80 - 120	1	20

Lab Sample ID: LCSD 490-531368/5
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.296		mg/L		93	80 - 120	1	20
Fluoride	1.00	0.9931	J	mg/L		99	80 - 120	1	20
Sulfate	10.0	9.710		mg/L		97	80 - 120	2	20

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 180-250902/1-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 16:47	1

Lab Sample ID: LCS 180-250902/2-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	1.00	1.028		mg/L		103	80 - 120

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: 490-155660-A-5-B MS
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	0.0132	J	1.00	1.082		mg/L		107	75 - 125

Lab Sample ID: 490-155660-A-5-C MSD
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	0.0132	J	1.00	1.090		mg/L		108	75 - 125	1	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 180-250903/1-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 18:53	1
Arsenic	ND		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 18:53	1
Barium	ND		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 18:53	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 18:53	1
Boron	ND		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 18:53	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 18:53	1
Calcium	ND		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 18:53	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 18:53	1
Cobalt	ND		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 18:53	1
Lead	ND		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 18:53	1
Magnesium	ND		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 18:53	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 18:53	1
Potassium	ND		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 18:53	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 18:53	1
Sodium	ND		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 18:53	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 18:53	1

Lab Sample ID: LCS 180-250903/2-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.500	0.4729		mg/L		95	80 - 120
Arsenic	0.0400	0.03658		mg/L		91	80 - 120
Barium	2.00	1.840		mg/L		92	80 - 120
Beryllium	0.0500	0.05027		mg/L		101	80 - 120
Boron	1.00	0.8897	J	mg/L		89	80 - 120
Cadmium	0.0500	0.05029		mg/L		101	80 - 120
Calcium	50.0	45.70		mg/L		91	80 - 120
Chromium	0.200	0.1649		mg/L		82	80 - 120
Cobalt	0.500	0.4321		mg/L		86	80 - 120
Lead	0.0200	0.01998		mg/L		100	80 - 120

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 180-250903/2-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Magnesium	50.0	45.74		mg/L		91	80 - 120
Molybdenum	1.00	0.9327		mg/L		93	80 - 120
Potassium	50.0	46.09		mg/L		92	80 - 120
Selenium	0.0100	0.009085	J	mg/L		91	80 - 120
Sodium	50.0	44.98		mg/L		90	80 - 120
Thallium	0.0500	0.04846		mg/L		97	80 - 120

Lab Sample ID: 490-155660-A-6-C MS
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	ND		0.500	0.4679		mg/L		94	75 - 125
Arsenic	ND		0.0400	0.03692		mg/L		92	75 - 125
Barium	ND		2.00	1.839		mg/L		92	75 - 125
Beryllium	ND		0.0500	0.04768		mg/L		95	75 - 125
Boron	0.00422	J	1.00	0.8456	J	mg/L		84	75 - 125
Cadmium	ND		0.0500	0.04723		mg/L		94	75 - 125
Calcium	ND		50.0	45.39		mg/L		91	75 - 125
Chromium	ND		0.200	0.1840		mg/L		92	75 - 125
Cobalt	ND		0.500	0.4386		mg/L		88	75 - 125
Lead	0.000399	J	0.0200	0.01986		mg/L		97	75 - 125
Magnesium	0.0156	J	50.0	46.32		mg/L		93	75 - 125
Molybdenum	ND		1.00	0.9262		mg/L		93	75 - 125
Potassium	0.0680	J	50.0	46.15		mg/L		92	75 - 125
Selenium	ND		0.0100	0.01006		mg/L		101	75 - 125
Sodium	ND		50.0	45.34		mg/L		91	75 - 125
Thallium	ND		0.0500	0.04726		mg/L		95	75 - 125

Lab Sample ID: 490-155660-A-6-D MSD
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	ND		0.500	0.4680		mg/L		94	75 - 125	0	20
Arsenic	ND		0.0400	0.03704		mg/L		93	75 - 125	0	20
Barium	ND		2.00	1.847		mg/L		92	75 - 125	0	20
Beryllium	ND		0.0500	0.04801		mg/L		96	75 - 125	1	20
Boron	0.00422	J	1.00	0.8557	J	mg/L		85	75 - 125	1	20
Cadmium	ND		0.0500	0.04852		mg/L		97	75 - 125	3	20
Calcium	ND		50.0	44.91		mg/L		90	75 - 125	1	20
Chromium	ND		0.200	0.1875		mg/L		94	75 - 125	2	20
Cobalt	ND		0.500	0.4400		mg/L		88	75 - 125	0	20
Lead	0.000399	J	0.0200	0.01961		mg/L		96	75 - 125	1	20
Magnesium	0.0156	J	50.0	45.89		mg/L		92	75 - 125	1	20
Molybdenum	ND		1.00	0.9301		mg/L		93	75 - 125	0	20
Potassium	0.0680	J	50.0	45.93		mg/L		92	75 - 125	0	20
Selenium	ND		0.0100	0.01030		mg/L		103	75 - 125	2	20
Sodium	ND		50.0	45.17		mg/L		90	75 - 125	0	20

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-155660-A-6-D MSD
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Thallium	ND		0.0500	0.04752		mg/L		95	75 - 125	1	20

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 180-250943/1-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 250943

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 10:52	1

Lab Sample ID: LCS 180-250943/2-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	2.50	2.486		ug/L		99	80 - 120

Lab Sample ID: 180-79800-G-1-E MS
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		1.00	0.9270		ug/L		93	75 - 125

Lab Sample ID: 180-79800-G-1-F MSD
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		1.00	0.9210		ug/L		92	75 - 125	1	20

Method: 9040C - pH

Lab Sample ID: LCS 490-531203/1
Matrix: Water
Analysis Batch: 531203

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.000		SU		100	98 - 103

Lab Sample ID: 490-155660-D-5 DU
Matrix: Water
Analysis Batch: 531203

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	8.11		8.110		SU		0	20
Temperature	21.7		21.70		Degrees C		0	20

Method: 9040C - pH (Continued)

Lab Sample ID: LCS 490-531204/1
Matrix: Water
Analysis Batch: 531204

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			7.00	7.000		SU		100	98 - 103		

Lab Sample ID: 490-155661-9 DU
Matrix: Water
Analysis Batch: 531204

Client Sample ID: Landfill Seep-01-071318-DUP
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	10.0			10.03		SU				0	20
Temperature	21.9			21.90		Degrees C				0	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 490-531384/73
Matrix: Water
Analysis Batch: 531384

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 20:09	1

Lab Sample ID: LCS 490-531384/74
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity			100	95.45		mg/L		95	90 - 110		

Lab Sample ID: LCSD 490-531384/95
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Alkalinity			100	95.67		mg/L		96	90 - 110	0	20

Lab Sample ID: 490-155661-6 DU
Matrix: Water
Analysis Batch: 531384

Client Sample ID: River Seep-07-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Alkalinity	87.7			88.85		mg/L				1	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 490-529395/1
Matrix: Water
Analysis Batch: 529395

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10.0	7.00	mg/L			07/18/18 08:50	1

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: LCS 490-529395/2
Matrix: Water
Analysis Batch: 529395

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Dissolved Solids			100	103.0		mg/L		103	90 - 110		

Lab Sample ID: 490-155661-5 DU
Matrix: Water
Analysis Batch: 529395

Client Sample ID: River Seep-04-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	2130			2194		mg/L				3	20

Lab Sample ID: 490-155661-13 DU
Matrix: Water
Analysis Batch: 529395

Client Sample ID: Landfill Seep-04-071318
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	10100			10080		mg/L				0.1	20

HPLC/IC

Analysis Batch: 531256

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-2	River Seep-12-071318	Total/NA	Water	9056A	
490-155661-3	River Seep-16-071318	Total/NA	Water	9056A	
490-155661-4	River Seep-14-071318	Total/NA	Water	9056A	
490-155661-5	River Seep-04-071218	Total/NA	Water	9056A	
490-155661-6	River Seep-07-071218	Total/NA	Water	9056A	
490-155661-7	River Seep-05-071218	Total/NA	Water	9056A	

Analysis Batch: 531368

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-4	River Seep-14-071318	Total/NA	Water	9056A	
490-155661-5	River Seep-04-071218	Total/NA	Water	9056A	
490-155661-5	River Seep-04-071218	Total/NA	Water	9056A	
490-155661-6	River Seep-07-071218	Total/NA	Water	9056A	
490-155661-7	River Seep-05-071218	Total/NA	Water	9056A	

Metals

Prep Batch: 250902

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	3005A	
490-155661-2	River Seep-12-071318	Total Recoverable	Water	3005A	
490-155661-3	River Seep-16-071318	Total Recoverable	Water	3005A	
490-155661-4	River Seep-14-071318	Total Recoverable	Water	3005A	
490-155661-5	River Seep-04-071218	Total Recoverable	Water	3005A	
490-155661-6	River Seep-07-071218	Total Recoverable	Water	3005A	
490-155661-7	River Seep-05-071218	Total Recoverable	Water	3005A	

Prep Batch: 250903

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	3005A	
490-155661-2	River Seep-12-071318	Total Recoverable	Water	3005A	
490-155661-3	River Seep-16-071318	Total Recoverable	Water	3005A	
490-155661-4	River Seep-14-071318	Total Recoverable	Water	3005A	
490-155661-5	River Seep-04-071218	Total Recoverable	Water	3005A	
490-155661-6	River Seep-07-071218	Total Recoverable	Water	3005A	
490-155661-7	River Seep-05-071218	Total Recoverable	Water	3005A	

Prep Batch: 250943

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	7470A	
490-155661-2	River Seep-12-071318	Total/NA	Water	7470A	
490-155661-3	River Seep-16-071318	Total/NA	Water	7470A	
490-155661-4	River Seep-14-071318	Total/NA	Water	7470A	
490-155661-5	River Seep-04-071218	Total/NA	Water	7470A	
490-155661-6	River Seep-07-071218	Total/NA	Water	7470A	
490-155661-7	River Seep-05-071218	Total/NA	Water	7470A	

Metals (Continued)

Analysis Batch: 251171

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	EPA 7470A	250943
490-155661-2	River Seep-12-071318	Total/NA	Water	EPA 7470A	250943
490-155661-3	River Seep-16-071318	Total/NA	Water	EPA 7470A	250943
490-155661-4	River Seep-14-071318	Total/NA	Water	EPA 7470A	250943
490-155661-5	River Seep-04-071218	Total/NA	Water	EPA 7470A	250943
490-155661-6	River Seep-07-071218	Total/NA	Water	EPA 7470A	250943
490-155661-7	River Seep-05-071218	Total/NA	Water	EPA 7470A	250943

Analysis Batch: 251527

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	6010C	250902
490-155661-2	River Seep-12-071318	Total Recoverable	Water	6010C	250902
490-155661-3	River Seep-16-071318	Total Recoverable	Water	6010C	250902
490-155661-4	River Seep-14-071318	Total Recoverable	Water	6010C	250902
490-155661-5	River Seep-04-071218	Total Recoverable	Water	6010C	250902
490-155661-6	River Seep-07-071218	Total Recoverable	Water	6010C	250902
490-155661-7	River Seep-05-071218	Total Recoverable	Water	6010C	250902

Analysis Batch: 252059

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	6020A	250903
490-155661-2	River Seep-12-071318	Total Recoverable	Water	6020A	250903
490-155661-3	River Seep-16-071318	Total Recoverable	Water	6020A	250903
490-155661-4	River Seep-14-071318	Total Recoverable	Water	6020A	250903
490-155661-5	River Seep-04-071218	Total Recoverable	Water	6020A	250903
490-155661-6	River Seep-07-071218	Total Recoverable	Water	6020A	250903
490-155661-7	River Seep-05-071218	Total Recoverable	Water	6020A	250903

General Chemistry

Analysis Batch: 529395

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	SM 2540C	
490-155661-2	River Seep-12-071318	Total/NA	Water	SM 2540C	
490-155661-3	River Seep-16-071318	Total/NA	Water	SM 2540C	
490-155661-4	River Seep-14-071318	Total/NA	Water	SM 2540C	
490-155661-5	River Seep-04-071218	Total/NA	Water	SM 2540C	
490-155661-6	River Seep-07-071218	Total/NA	Water	SM 2540C	
490-155661-7	River Seep-05-071218	Total/NA	Water	SM 2540C	

Analysis Batch: 531203

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9040C	
490-155661-2	River Seep-12-071318	Total/NA	Water	9040C	
490-155661-3	River Seep-16-071318	Total/NA	Water	9040C	
490-155661-4	River Seep-14-071318	Total/NA	Water	9040C	
490-155661-5	River Seep-04-071218	Total/NA	Water	9040C	
490-155661-6	River Seep-07-071218	Total/NA	Water	9040C	
490-155661-7	River Seep-05-071218	Total/NA	Water	9040C	

General Chemistry (Continued)

Analysis Batch: 531384

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	SM 2320B	
490-155661-2	River Seep-12-071318	Total/NA	Water	SM 2320B	
490-155661-3	River Seep-16-071318	Total/NA	Water	SM 2320B	
490-155661-4	River Seep-14-071318	Total/NA	Water	SM 2320B	
490-155661-5	River Seep-04-071218	Total/NA	Water	SM 2320B	
490-155661-6	River Seep-07-071218	Total/NA	Water	SM 2320B	
490-155661-7	River Seep-05-071218	Total/NA	Water	SM 2320B	

Rad

Prep Batch: 376745

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	PrecSep-21	
490-155661-2	River Seep-12-071318	Total/NA	Water	PrecSep-21	
490-155661-5	River Seep-04-071218	Total/NA	Water	PrecSep-21	
490-155661-6	River Seep-07-071218	Total/NA	Water	PrecSep-21	
490-155661-7	River Seep-05-071218	Total/NA	Water	PrecSep-21	

Prep Batch: 376750

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	PrecSep_0	
490-155661-2	River Seep-12-071318	Total/NA	Water	PrecSep_0	
490-155661-5	River Seep-04-071218	Total/NA	Water	PrecSep_0	
490-155661-6	River Seep-07-071218	Total/NA	Water	PrecSep_0	
490-155661-7	River Seep-05-071218	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: River Seep-08-071318

Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:22	SW1	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 20:45	JHS	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 21:00	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:24	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:35	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:04	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 20:55	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			999.94 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381568	08/10/18 16:41	RTM	TAL SL
Total/NA	Prep	PrecSep_0			999.94 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379945	08/02/18 09:20	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:37	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:29	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:40	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:05	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:02	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			750.37 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381568	08/10/18 16:41	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.37 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:21	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-16-071318

Lab Sample ID: 490-155661-3

Date Collected: 07/13/18 11:00

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:52	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:35	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:44	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:06	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:09	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH

Client Sample ID: River Seep-14-071318

Lab Sample ID: 490-155661-4

Date Collected: 07/13/18 10:10

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 17:07	SW1	TAL NSH
Total/NA	Analysis	9056A		10			531368	07/25/18 21:15	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:50	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:49	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:07	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:17	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH

Client Sample ID: River Seep-04-071218

Lab Sample ID: 490-155661-5

Date Collected: 07/12/18 13:50

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 17:51	SW1	TAL NSH
Total/NA	Analysis	9056A		10			531368	07/25/18 21:59	JHS	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 22:14	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:56	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:06	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:08	RJR	TAL PIT

Client Sample ID: River Seep-04-071218

Date Collected: 07/12/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:21	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.17 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:40	RTM	TAL SL
Total/NA	Prep	PrecSep_0			500.17 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:21	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 22:29	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:01	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:11	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:09	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:28	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			999.84 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:39	RTM	TAL SL
Total/NA	Prep	PrecSep_0			999.84 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:36	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 22:44	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:07	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:16	WTR	TAL PIT

Lab Chronicle

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:12	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:41	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			499.95 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:40	RTM	TAL SL
Total/NA	Prep	PrecSep_0			499.95 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177
TAL PIT = TestAmerica Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Method Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL NSH
6010C	Metals (ICP)	SW846	TAL PIT
6020A	Metals (ICP/MS)	SW846	TAL PIT
EPA 7470A	Mercury (CVAA)	SW846	TAL PIT
9040C	pH	SW846	TAL NSH
SM 2320B	Alkalinity	SM	TAL NSH
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL NSH
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL PIT
7470A	Preparation, Mercury	SW846	TAL PIT

Protocol References:

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:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Laboratory: TestAmerica Nashville

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Kentucky (UST)	State Program	4	19	06-30-19

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
9040C		Water	pH
9040C		Water	Temperature
9056A		Water	Chloride
9056A		Water	Fluoride
9056A		Water	Sulfate
SM 2320B		Water	Alkalinity
SM 2540C		Water	Total Dissolved Solids

Laboratory: TestAmerica Pittsburgh

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Arkansas DEQ	State Program	6	88-0690	06-27-19
California	State Program	9	2891	04-30-19
Connecticut	State Program	1	PH-0688	09-30-18
Florida	NELAP	4	E871008	06-30-19
Illinois	NELAP	5	200005	06-30-19
Kansas	NELAP	7	E-10350	01-31-19
Louisiana	NELAP	6	04041	06-30-19
Nevada	State Program	9	PA00164	07-31-19
New Hampshire	NELAP	1	2030	04-04-19
New Jersey	NELAP	2	PA005	06-30-19
New York	NELAP	2	11182	03-31-19
North Carolina (WW/SW)	State Program	4	434	12-31-18
Oregon	NELAP	10	PA-2151	01-28-19
Pennsylvania	NELAP	3	02-00416	04-30-19
South Carolina	State Program	4	89014	04-30-19
Texas	NELAP	6	T104704528-15-2	03-31-19
US Fish & Wildlife	Federal		LE94312A-1	07-31-19
USDA	Federal		P330-16-00211	06-26-19
Utah	NELAP	8	PA001462015-4	05-31-19
Virginia	NELAP	3	460189	09-14-18 *
West Virginia DEP	State Program	3	142	01-31-19
Wisconsin	State Program	5	998027800	08-31-18 *

Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	DoD ELAP		L2305	04-06-19
Arizona	State Program	9	AZ0813	12-08-18
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19
Florida	NELAP	4	E87689	06-30-19
Illinois	NELAP	5	200023	11-30-18
Iowa	State Program	7	373	12-01-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Laboratory: TestAmerica St. Louis (Continued)

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Kansas	NELAP	7	E-10236	10-31-18
Kentucky (DW)	State Program	4	90125	12-31-18
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA180017	12-31-18
Maryland	State Program	3	310	09-30-19
Michigan	State Program	5	9005	06-30-18 *
Missouri	State Program	7	780	06-30-18 *
Nevada	State Program	9	MO000542018-1	07-31-19
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-19
Pennsylvania	NELAP	3	68-00540	02-28-19
South Carolina	State Program	4	85002001	06-30-19
Texas	NELAP	6	T104704193-18-12	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542016-8	07-31-18 *
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-18 *
West Virginia DEP	State Program	3	381	10-31-18 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-155661 Chain of Custody

Cooler Received/Opened On 7/14/2018 @ 1050

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2692 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960357 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 5.9 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (initial) GH

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (initial) AOH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (initial) AOH

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (initial) AOH

I certify that I attached a label with the unique LIMS number to each container (initial) AOH

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

Loc: 490
155661

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Cooler Received/Opened On 7/14/2018 @ 10:50

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2681 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960353 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 1.0 Degrees Celsius

3. If item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES NO NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES NO NA

6. Were custody papers inside cooler? YES NO NA

I certify that I opened the cooler and answered questions 1-6 (intial) YOF

7. Were custody seals on containers: YES NO and Intact YES NO NA

Were these signed and dated correctly? YES NO NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES NO NA

12. Did all container labels and tags agree with custody papers? YES NO NA

13a. Were VOA vials received? YES NO NA

b. Was there any observable headspace present in any VOA vial? YES NO NA

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES NO NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) YOF

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO NA

b. Did the bottle labels indicate that the correct preservatives were used YES NO NA

16. Was residual chlorine present? YES NO NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) YOF

17. Were custody papers properly filled out (ink, signed, etc)? YES NO NA

18. Did you sign the custody papers in the appropriate place? YES NO NA

19. Were correct containers used for the analysis requested? YES NO NA

20. Was sufficient amount of sample sent in each container? YES NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) YOF

I certify that I attached a label with the unique LIMS number to each container (intial) YOF

21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES NO #_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

Loc: 490
155661

COOLER RECEIPT FORM

Cooler Received/Opened On 7/14/2018 @1050

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2670 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 14740456 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 3.1 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) ADT

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) ADT

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) ADT

I certify that I attached a label with the unique LIMS number to each container (intial) ADT

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex 3 Fedex	COC No: 490-86693-25173.1
Client Contact: Greg Dick	Phone: 513-237-1647	E-Mail: roxanne.cisneros@testamericainc.com		Page: Page 1 of 2
Company: Big Rivers Electric Corporation				Job #:
Address: PO BOX 24	Due Date Requested: Standard		Analysis Requested	Preservation Codes:
City: Henderson	TAT Requested (days): Standard			A - HCL; B - NaOH; C - Zn Acetate; D - Nitric Acid; E - NaHSO4; F - MeOH; G - Amchlor; H - Ascorbic Acid; I - Ice; J - DI Water; K - EDTA; L - EDA; M - Hexane; N - None; O - AsNaO2; P - Na2O4S; Q - Na2SO3; R - Na2S2O3; S - H2SO4; T - TSP Dodecahydrate; U - Acetone; V - MCAA; W - pH 4-5; Z - other (specify)
State, Zip: KY, 42419	PO #: Purchase Order - see DOCs			
Phone: 270-844-6010(Tel)	WO #:			Other:
Email: Gregory.Dick@bigrivers.com				
Project Name: Big Rivers Electric Corp - Henderson KY	Sebree Green Landfill			CCR App III, IV + Alk, Na, Mg
Site: Sebree Green Landfill	SSOW#:		Loc: 490 155661	

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056_ORGFM_28D	6010B, 7470A	25400_Calcd - TDS	Radium 226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N			
River Seep - 08 - 071318	7/13/18	0750	G	Water			X	X	X	X	5	pH 7.09
River Seep - 12 - 071318	7/13/18	0915		Water			X	X	X	X	5	7.37
River Seep - 16 - 071318	7/13/18	1100		Water			X	X	X		3	7.46
River Seep - 14 - 071318	7/13/18	1010		Water			X	X	X		3	7.54
River Seep - 04 - 071218	7/12/18	1350		Water			X	X	X	X	5	5.13
River Seep - 07 - 071218	7/12/18	1450		Water			X	X	X	X	5	7.27
River Seep - 05 - 071218	7/12/18	1425		Water			X	X	X	X	5	6.92
Landfill Seep - 01 - 071318	7/13/18	1220		Water			X	X	X	X	5	10.64
Landfill Seep - 01 - 071318 - Dup	7/13/18	1220		Water			X	X	X	X	5	10.64
Landfill Seep - 02 - 071318	7/13/18	1310		Water			X	X	X	X	5	10.20
Landfill Seep - 03 - 071318	7/13/18	1330		Water			X	X	X	X	5	8.02

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:				
Relinquished by:	Date/Time: 7/13/18 1630	Company: AECOM	Received by:	Date/Time: 7/14/18 1050	Company: TA-NAS		
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:		
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:		

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 5.7, 1.0, 3.1

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex Rodeis
Client Contact: Greg Dick	Phone: 513-237-1188	E-Mail: roxanne.cisneros@testamericainc.com	COC No: 490-86693-25173.1
Company: Big Rivers Electric Corporation			Page: Page 1 of 2
Address: PO BOX 24	Due Date Requested: Standard		Job #:
City: Henderson	TAT Requested (days): Standard		
State, Zip: KY, 42419	PO #: Purchase Order - see DOCs		
Phone: 270-844-6010(Tel)	WO #:		
Email: Gregory.Dick@bigrivers.com			
Project Name: Big Rivers Electric Corp - Henderson KY	Sebree Green Landfill		
Site: Sebree Green Landfill	SSOW#:		

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Wastewater, Sewage, Groundwater, Drinking Water, Tissue, Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056, ORGFM_28D	6010C, 6020A	6020B, 7470A	2540C, Calcd - TDS	Radium 226/228	Gross Alpha	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N	D				CCR App III, IV + Alk, Na, Mg
POND-012-071318	7/13/18	1350	G	Water	N	N	X	X	X	X				pH 7.95
Landfill Seep-04-071318	7/13/18	1415	G	Water	N	N	X	X	X	X				pH 10.71
~~Trip Seep 16 071318~~ CS	~~7/13/18~~	~~1044~~		Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										

Loc: 490
155661

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:		Date:		Time:		Method of Shipment:	
Relinquished by:	Date/Time: 7/13/18 1630	Company: Aecom	Received by:		Date/Time: 7/14/18 1050	Company: TA-NAS	
Relinquished by:	Date/Time:	Company	Received by:		Date/Time:	Company	
Relinquished by:	Date/Time:	Company	Received by:		Date/Time:	Company	

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks: 5.7, 1.0, 3.1

Ver: 08/04/2016

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-75463.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-155661-1
Address: 301 Alpha Drive, RIDC Park,	Due Date Requested: 7/26/2018	Analysis Requested		Preservation Codes:
City: Pittsburgh	TAT Requested (days):			A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
State, Zip: PA, 15238	PO #:			
Phone: 412-963-7058(Tel) 412-963-2468(Fax)	WO #:			Other:
Email:				
Project Name: Big Rivers Electric Corp - CCR & SemiAnn	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010C/3005A (MOD) Lithium	6020A/3005A (MOD) ICP/MS Metals	7470A/7470A_Prep Mercury										Total Number of containers	Special Instructions/Note:
			Preservation Code:																	
River Seep-08-071318 (490-155661-1)	7/13/18	07:50 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-12-071318 (490-155661-2)	7/13/18	09:15 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-16-071318 (490-155661-3)	7/13/18	11:00 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-14-071318 (490-155661-4)	7/13/18	10:10 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-09-071218 (490-155661-5)	7/12/18	13:50 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-07-071218 (490-155661-6)	7/12/18	14:50 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-05-071218 (490-155661-7)	7/12/18	14:25 Central		Water			X	X	X										1	Metals - run once, upload together.
Landfill Seep-01-071318 (490-155661-8)	7/13/18	12:20 Central		Water			X	X	X										1	Metals - run once, upload together.
Landfill Seep-01-071318-DUP (490-155661-9)	7/13/18	12:20 Central		Water			X	X	X										1	Metals - run once, upload together.

490-155661 Chain of Custody

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. 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 accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) — Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by: [signature]	Date/Time: 7/17/18 1450	Company: TA-NAS	Received by: [signature] Date/Time: 7/17/18 1220 Company: TA PGH
Relinquished by:	Date/Time:	Company	Received by: Date/Time: Company
Relinquished by:	Date/Time:	Company	Received by: Date/Time: Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 09/20/2016

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-75463.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 2 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-155661-1
Address: 301 Alpha Drive, RIDC Park,	Due Date Requested: 7/26/2018	Analysis Requested		Preservation Codes:
City: Pittsburgh	TAT Requested (days):			A - HCL; B - NaOH; C - Zn Acetate; D - Nitric Acid; E - NaHSO4; F - MeOH; G - Amchlor; H - Ascorbic Acid; I - Ice; J - DI Water; K - EDTA; L - EDA; M - Hexane; N - None; O - AsNaO2; P - Na2O4S; Q - Na2SO3; R - Na2S2O3; S - H2SO4; T - TSP Dodecahydrate; U - Acetone; V - MCAA; W - pH 4-5; Z - other (specify)
State, Zip: PA, 15238				
Phone: 412-963-7058(Tel) 412-963-2468(Fax)	PO #:			
Email:	WO #:			Other:
Project Name: Big Rivers Electric Corp - CCR & SemiAnn	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010C/3005A (MOD) Lithium	6020A/3005A (MOD) ICP/MS Metals	7470A/7470A_Prep Mercury	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
Landfill Seep-02-071318 (490-155661-10)	7/13/18	13:10 Central		Water			X	X	X	1	Metals - run once, upload together.
Landfill Seep-03-071318 (490-155661-11)	7/13/18	13:30 Central		Water			X	X	X	1	Metals - run once, upload together.
Pond-012-071318 (490-155661-12)	7/13/18	13:50 Central		Water			X	X	X	1	Metals - run once, upload together.
Landfill Seep-04-071318 (490-155661-13)	7/13/18	14:15 Central		Water			X	X	X	1	Metals - run once, upload together.

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:				
Relinquished by: [signature]	Date/Time: 7/16/18 1456	Company: TA-NAS	Received by: [signature]	Date/Time: 7/17/18 1320	Company: TA PNT		
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company		
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company		

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 09/20/2016

Login Sample Receipt Checklist

Client: Big Rivers Electric Corporation

Job Number: 490-155661-1

Login Number: 155661
List Number: 2
Creator: DiNardo, Nicholas J

List Source: TestAmerica Pittsburgh
List Creation: 07/17/18 12:54 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	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?	False	
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	

Tracer/Carrier Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)
490-155661-1	River Seep-08-071318	87.3
490-155661-2	River Seep-12-071318	92.9
490-155661-5	River Seep-04-071218	89.4
490-155661-6	River Seep-07-071218	79.4
490-155661-7	River Seep-05-071218	82.9

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)
490-155661-1	River Seep-08-071318	87.3	90.5
490-155661-2	River Seep-12-071318	92.9	85.6
490-155661-5	River Seep-04-071218	89.4	87.1
490-155661-6	River Seep-07-071218	79.4	87.1
490-155661-7	River Seep-05-071218	82.9	83.0

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Y Carrier = Y Carrier

Appendix B

Supplemental Boring Logs and Cross-Sections

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-01

Sheet 1 of 3

Date(s) Drilled	04/23/2019 12:00 AM to 04/24/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	68.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1250 (ft NAD83)	Groundwater Level(s)	28 ft on 4/23/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) 394.0 / Depth (feet) 0.0								
	0		1		2		Hard, moist, brown, lean clay (CL) with gravel [FILL]								
							391.5 / 2.5								
			2		2		Very stiff, moist, dark gray and light gray, mixture of lime and fly ash [FILL]								
390															
	5		3		2										
			4		2										
385			5		2										
	10		6		2										
			7		2		- becomes wet								
							381.0 / 13.0								
380							Stiff, moist, brown, reddish brown, and gray mottled, lean CLAY (CL)								
	15		8		2										
			9		2										
375			10		2										
	20		11		2										
			12		2										
370															
	25		13		2										
			14		2										
			15		2		- becomes wet								*Water encountered at 28 ft bgs during drilling.*
365															
	30						364.0 / 30.0								

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:44:39 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-01

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2		Stiff, moist, brown, fat CLAY (CH)								
			17		2										
360	35		18		2										
			19		2		- becomes gray, with brown mottled								
355			20		2										
	40		21		2										
			22		2										
350			23		2										
	45		24		2										
			25		2		- with wet, 4 inch seam of sand								
345			26		2										
	50		27		2		- with reddish brown ferrous nodules								
340			28		2										
	55		29		2										
335			30		2										
	60		31		2		333.0 61.0								
			32		2		Stiff, moist, brown, reddish brown, sandy lean CLAY (CL)								
330			33		2		329.5 64.5								
	65						Soft, very moist, gray, fat CLAY (CH)								

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-01

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
		33		2										
		34		2										
326.0	68.0					End of Boring at 68 ft								
325	70													
320	75													
315	80													
310	85													
305	90													
300	95													
295	100													

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-02

Sheet 1 of 2

Date(s) Drilled	04/25/2019 12:00 AM to 04/25/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	50.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1200 (ft NAD83)	Groundwater Level(s)	42 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) 394.0 / Depth (feet) 0.0								
	0		1		2		Medium stiff, moist, brown, lean clay (CL) with gravel [FILL]								
			2		2		391.0 / 3.0								
390							Medium dense, moist, dark gray (FILL) 390.0 / 4.0								
	5		3		2		Soft, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
			4		2										
385			5		2										
	10		6		2		382.0 / 12.0								
			7		2		Medium stiff, moist, brown, reddish brown, and gray mottled, lean CLAY (CL)								
380							- becomes very stiff								
	15		8		2										
			9		2										
375			10		2										
	20		11		2										
			12		2										
370															
	25		13		2										
			14		2										
365			15		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-02

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2										
			17		2		- becomes stiff								
360	35		18		2										
			19		2		- becomes very stiff								
							Elevation (feet) 356.0 — Depth (feet) 38.0								
355			20		2		Soft, very moist, gray, lean CLAY (CL)								
	40		21		2										
			22		2		- becomes wet								
350															
	45		23		2										
							Elevation (feet) 348.0 — Depth (feet) 46.0								
			24		2		Stiff, very moist, gray and brown mottled, fat CLAY (CH)								
345			25		2										
	50						Elevation (feet) 344.0 — Depth (feet) 50.0								
							End of Boring at 50 ft								
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-03

Date(s) Drilled	04/25/2019 12:00 AM to 04/25/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	50.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1150 (ft NAD83)	Groundwater Level(s)	9 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
394.0	0.0														
			1		2		Very stiff, moist, brown, yellowish brown, and gray lean clay (CL) with gravel [FILL]								
393.0	1.0														
392.5	1.5						Medium dense, moist, dark gray (FILL)								
			2		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
390.5	3.5														
390			3		2		Very stiff, moist, brown, brown, yellowish brown, lean CLAY (CL) [FILL]								
	5														
388.5	5.5														
			4		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
385.0	9.0														
385			5		2		Loose, wet, black (FILL)								
	10														
			6		2										
383.0	11.0														
382.0	12.0						Medium stiff, very moist, black, brown, silty CLAY (CL-ML) with organics								
			7		2		Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
380															
	15		8		2										
			9		2										
375			10		2										
	20														
			11		2										
			12		2										
370															
	25		13		2										
			14		2										
365			15		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-03

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2										
			17		2										
360	35		18		2										
			19		2										
355			20		2										
	40		21		2										
			22		2										
350							Elevation (feet) 350.0 Depth (feet) 44.0 Stiff, moist, gray, fat CLAY (CH)								
	45		23		2										
			24		2		Elevation (feet) 346.0 Depth (feet) 48.0 Medium stiff, very moist, gray, lean CLAY (CL)								
345			25		2										
	50						Elevation (feet) 344.0 Depth (feet) 50.0 End of Boring at 50 ft								
340	55														
335	60														
330	65														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:44:59 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-04

Date(s) Drilled	04/25/2019 12:00 AM to 04/25/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	48.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	393 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1100 (ft NAD83)	Groundwater Level(s)	4.25 ft on 1/31/2018		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0		1		2		Very stiff, moist, yellowish brown, lean clay (CL) with gravel [FILL]								
390			2		2		Soft, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	5		3		2		- becomes wet								
			4		2		Medium dense, wet, dark gray, black (FILL)								
385			5		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	10		6		2		Loose, wet, black (FILL)								
380			7		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	15		8		2		Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
			9		2										
375			10		2										
	20		11		2										
370			12		2										
	25		13		2										
			14		2										
365			15		2										
	30														

Elevation (feet) / Depth (feet)

Elevation (feet)	Depth (feet)
393.0	0.0
391.0	2.0
387.0	6.0
386.0	7.0
384.0	9.0
382.0	11.0
380.0	13.0

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-04

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	16		2										
360		17		2										
	35	18		2										
		19		2										
355						355.0 / 38.0 Stiff, moist, gray, fat CLAY (CH)									
		20		2										
	40	21		2										
350		22		2										
						349.0 / 44.0 Medium stiff, wet, gray, lean CLAY (CL)								
	45	23		2										
		24		2										
345						345.0 / 48.0 End of Boring at 48 ft									
	50													
340														
	55													
335														
	60													
330														
	65													

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-05

Sheet 1 of 2

Date(s) Drilled	04/25/2019 12:00 AM to 04/25/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	48.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	393 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1050 (ft NAD83)	Groundwater Level(s)	16 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0		1		2		Very stiff, moist, yellowish brown, lean clay (CL) with gravel [FILL]								
							Elevation (feet) 393.0 / Depth (feet) 0.0								
							391.0 / 2.0								
			2		2		Loose, wet, dark gray, black (FILL)								
390							390.0 / 3.0								
							Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	5		3		2										
							387.0 / 6.0								
			4		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
385			5		2										
	10		6		2										
			7		2		380.0 / 13.0								
380							Loose, wet, black (FILL)								
							379.0 / 14.0								
	15		8		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
							377.0 / 16.0								
			9		2		Loose, wet, black (FILL)								
							376.0 / 17.0								
375							Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
			10		2										
	20		11		2										
370			12		2										
	25		13		2										
			14		2										
365			15		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-05

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2										
360			17		2										
	35		18		2										
			19		2										
355			20		2										
	40		21		2		Elevation (feet) 353.0 / Depth (feet) 40.0 Medium stiff, moist, yellowish brown, fat CLAY (CH)								
350			22		2		Elevation (feet) 349.0 / Depth (feet) 44.0 Medium stiff, moist, yellowish brown, gray, lean CLAY (CL) with sand								
	45		23		2										
			24		2		Elevation (feet) 345.0 / Depth (feet) 48.0 End of Boring at 48 ft								
345															
	50														
340															
	55														
335															
	60														
330															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-06

Sheet 1 of 2

Date(s) Drilled	04/26/2019 12:00 AM to 04/26/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	46.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	393 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1000 (ft NAD83)	Groundwater Level(s)	24 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0		1		2		Very stiff, moist, yellowish brown, lean clay (CL) with gravel [FILL]								
							Elevation (feet) 391.0 / Depth (feet) 2.0								
			2		2		Medium stiff, wet, dark gray, black (FILL)								
390							Elevation (feet) 390.0 / Depth (feet) 3.0								
							Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL) - becomes wet								
	5		3		2										
			4		2										
385							Elevation (feet) 385.0 / Depth (feet) 8.0								
			5		2		Loose, wet, black (FILL)								
							Elevation (feet) 384.0 / Depth (feet) 9.0								
	10						Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
			6		2										
380			7		2										
	15		8		2										
			9		2										
375			10		2										
	20						Elevation (feet) 373.0 / Depth (feet) 20.0								
			11		2		Loose, wet, black (FILL)								
							Elevation (feet) 372.0 / Depth (feet) 21.0								
370			12		2		Medium stiff, moist, dark gray and light gray, mixture of fly ash and lime (FILL)								
	25		13		2		- becomes wet								*Water encountered at 24 ft bgs*
							Elevation (feet) 367.0 / Depth (feet) 26.0								
			14		2		Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
365															
			15		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-06

Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
360	30		16		2										
			17		2										
	35		18		2										
			19		2										
355			20		2		354.0 / 39.0 Medium stiff, moist, yellowish brown, fat CLAY (CH)								
	40		21		2										
350			22		2		349.0 / 44.0 Medium stiff, moist, yellowish brown, gray, lean CLAY (CL) with sand								
	45		23		2		347.0 / 46.0 End of Boring at 46 ft								
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-07

Sheet 1 of 2

Date(s) Drilled	04/26/2019 12:00 AM to 04/26/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	46.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 950 (ft NAD83)	Groundwater Level(s)	28 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0		1		2		Very stiff, moist, yellowish brown, lean clay (CL) with gravel [FILL]								
							Elevation (feet) 394.0 / Depth (feet) 0.0								
			2		2		Medium stiff, wet, dark gray, black (FILL)								
							392.0 / 2.0								
390			3		2		Medium stiff, very moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	5						391.0 / 3.0								
			4		2										
385			5		2		- becomes wet								
	10		6		2										
			7		2										
380															
	15		8		2										
			9		2		- with 6" layer of bottom ash								
375			10		2										
	20		11		2		- becomes wet								
							373.0 / 21.0								
			12		2		Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
370															
	25		13		2										
			14		2										
							- becomes wet								
365			15		2										
	30						364.0 / 30.0								

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-07

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2		Medium stiff, moist, yellowish brown, fat CLAY (CH)								
			17		2		- with sand and gravel								
360	35		18		2										
			19		2										
355			20		2										
	40		21		2										
			22		2										
350							Elevation (feet) 350.0 / Depth (feet) 44.0								
	45		23		2		Medium stiff, moist, yellowish brown, gray, lean CLAY (CL) with sand								
							Elevation (feet) 348.0 / Depth (feet) 46.0								
							End of Boring at 46 ft								
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-08

Date(s) Drilled	04/29/2019 12:00 AM to 04/29/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	46.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 900 (ft NAD83)	Groundwater Level(s)	30 ft on 4/29/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) 394.0 / Depth (feet) 0.0								
	0		1		4		Very stiff, dry, brown, yellowish brown, silty clay (CL) with gravel (FILL)								
							391.0 / 3.0								
390							Moist, dense, gray, fly ash and lime (FILL)								
	5		2		2										
			3		2		-becomes wet 6'-8'								
385			4		2										
	10		5		2										
			6		2		-becomes wet 12'-14'								
380															
	15		7		2										
			8		2										
375			9		2										
	20						-becomes wet 20'-21'								
			10		2		372.5 / 21.5								
							Very stiff, dry/moist, yellowish brown, gray, brown, silty lean clay (CL)								
			11		2										
370															
	25		12		2										
			13		2										
			14		2		-becomes sand								
365	30														

AECOM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-08

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2										
			16		2		-becomes without sand and less silt								
360							Elevation (feet) 360.0 Depth (feet) 34.0								
	35		17		2		Moist, brown, yellowish brown, gray fat clay (CH)								
			18		2		-becomes gray -becomes wet 38'-39'								
355			19		2										
	40		20		2										
			21		2		-becomes soft								
350															
	45		22		2		Elevation (feet) 348.0 Depth (feet) 46.0								
							End of Boring at 46 ft								
345															
	50														
340															
	55														
335															
	60														
330															
	65														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-09

Date(s) Drilled	04/29/2019 12:00 AM to 04/29/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 850 (ft NAD83)	Groundwater Level(s)	ft on 4/29/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395	0						395.0 / 0.0								
							394.8 / 0.3 Loose, moist, brown, sand and gravel (FILL)								
							Very stiff, moist, yellowish brown / brown, lean clay (CL)								
			1		2										*hit apparent rock refusal 2.5'. offset 2' SW*
							391.5 / 3.5								
							Wet, dark gray, fly ash and lime (FILL)								
390	5		2		2										
			3		2										
			4		2										
385	10		5		2										
							-3" bottom ash seam								
			6		2										
380	15		7		2										
			8		2										
			9		2										
375	20		10		2										
			11		2		372.0 / 23.0								
							Moist, brown, lean clay (CL)								
370	25		12		2										
							-becomes mottled with gray								
			13		2										
			14		2		-increases in plasticity with silt pockets								*part of sample*
365	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-09

Sheet 2 of 2

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2										
			16		2										
360	35		17		2										
			18		2										
			19		2										
355	40		20		2										
			21		2										
350	45														
345	50														
340	55														
335	60														
330	65														

Elevation (feet) / Depth (feet) / Graphic Symbol / MATERIAL DESCRIPTION

Elevation (feet) | Depth (feet)

357.5 | 37.5 — Moist, gray, fat clay (CH)

354.5 | 40.5 — Moist, gray, lean clay (CL)

351.0 | 44.0 — End of Boring at 44 ft

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AECOM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-11

Date(s) Drilled	04/29/2019 12:00 AM to 04/30/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	56.5 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	398 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 800 (ft NAD83)	Groundwater Level(s)	40 ft on 4/29/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						398.0 / 0.0								
							397.5 / 0.5 Gravel (FILL)								
							Moist, brown/yellowish brown, lean clay (CL) with gravel and trace sand								
			1		2		396.0 / 2.0								
395							Moist, gray, fly ash with lime (FILL)								
	5		2		2		-becomes very moist								
			3		2										
390			4		2		-becomes wet								
	10		5		2										
385			6		2										
	15		7		2										
			8		2		-becomes wet 16'-17'								
380			9		2										
	20		10		2										
375			11		2										
	25		12		2										
			13		2		370.3 / 27.8								
370							Moist, brown, yellowish brown, gray mottled lean clay (CL) with trace sand								
			14		2		369.0 / 29.0								
	30						Moist, brown, gray, yellowish brown, mottled fat clay (CH) with trace gravel								

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-11

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2		-shows trace organics								
							-becomes more brown								
365			16		2										
	35		17		2		Elevation (feet) 362.0 / Depth (feet) 36.0								
			18		2		Moist, orangish, reddish brown, brown lean clay (CL) with trace sand								
360			19		2		-becomes wet on exterior of samples								
	40		20		2		-becomes very wet, higher silt content								
							Elevation (feet) 356.0 / Depth (feet) 42.0								
355			21		2		Wet, reddish brown, brown, silty lean clay (CL)								
	45		22		2		-becomes very wet								
							Elevation (feet) 352.0 / Depth (feet) 46.0								
			23		2		Moist, reddish, brown, gray, sandy lean clay (CL)								
350			24		2										
	50		25		2		Elevation (feet) 347.5 / Depth (feet) 50.5								
							Moist, red, brown, tan clayey sand (CL)								
345			26		2										
	55		27		2										
			28		.5		Elevation (feet) 341.5 / Depth (feet) 56.5								
							End of Boring at 56.5 ft								
340															
	60														
335															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-12

Date(s) Drilled	04/30/2019 12:00 AM to 04/30/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	46.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	398 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 750 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						398.0 / 0.0								
							397.5 / 0.5 Gravel (FILL)								
							Very stiff, moist, yellowish brown / brown, lean clay (CL)								
			1		2										
395							395.5 / 2.5								
							Moist, gray, fly ash and lime (FILL)								
	5		2		2										
			3		2										
390			4		2										
	10		5		2										
385			6		2										
	15		7		2										
			8		2		-wet								
380			9		2										
	20		10		2										
375			11		2										
	25		12		2										
			13		2		371.5 / 26.5 Moist, yellowish brown / brown, lean clay (CL)								
370			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-12

Sheet 2 of 2

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2										
365			16		2										
	35		17		2										
			18		2										
360			19		2										
	40		20		2		Elevation (feet) 357.5 Depth (feet) 40.5 Moist, reddish brown, brown fat clay (CH)								
355			21		2										
	45		22		2		Elevation (feet) 352.0 Depth (feet) 46.0 End of Boring at 46 ft								
350															
	50														
345															
	55														
340															
	60														
335															
	65														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-13

Date(s) Drilled	04/30/2019 12:00 AM to 04/30/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	387 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 700 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 387.0 / Depth (feet) 0.0								
							386.8 Gravel (FILL) — 0.3								
							385.8 Moist, brown silty lean clay (CL) with gravel (FILL) — 1.3								
385			1		4		Moist, gray, fly ash and lime (FILL)								
	5		2		2										
380			3		2										
			4		2		-very moist								
	10		5		2										
375			6		2										
	15		7		2										
370			8		2										
			9		2										
	20		10		2										
365			11		2		-very moist								
	25		12		2		362.0 / 25.0								
							Moist, yellow brown, brown, red, lean clay (CL)								
360			13		2										
			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-13

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2		Elevation (feet) 355.0 / Depth (feet) 32.0 Moist, reddish brown, fat clay (CH)								
355			16		2										
	35		17		2										
350			18		2										
			19		2										
	40		20		2		-becomes fine grained sandy clay								
345			21		2		Elevation (feet) 343.0 / Depth (feet) 44.0 End of Boring at 44 ft								
	45														
340															
	50														
335															
	55														
330															
	60														
325															
	65														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-14

Date(s) Drilled	04/30/2019 12:00 AM to 04/30/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	397 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 650 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						397.0 / 0.0								
							Moist, brown, lean clay (CL) with gravel (FILL)								
							396.0 / 1.0								
							Moist, gray, fly ash and lime (FILL)								
395			1		4										
	5		2		2										
390			3		2										
			4		2										
	10		5		2										
385			6		2										
	15		7		2		-becomes very moist top 5"								
380			8		2										
			9		2										
	20		10		2										
							375.5 / 21.5								
375			11		2		Moist, yellow brown, brown, gray, fat clay (CH)								
	25		12		2										
370			13		2										
			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-14

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2										
365			16		2										
	35		17		2		361.5 35.5 Moist, yellow brown, orangish brown, brown, lean clay (CL)								
360			18		2										
			19		2										
	40		20		2		355.5 41.5 Moist, brown red, brown, fat clay (CH)								
355			21		2		-becomes gray								
							353.0 44.0 End of Boring at 44 ft								
	45														
350															
	50														
345															
	55														
340															
	60														
335															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-15

Date(s) Drilled	05/01/2019 12:00 AM to 05/01/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	396 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 600 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
396.0	0.0														
395.5	0.5						Gravel (FILL)								
							Moist, gray, fly ash and lime (FILL)								
395			1		2										
	5		2		2										
390			3		2										
			4		2										
	10		5		2										
385			6		2										
381.0	15.0		7		2		Wet, black, dary gray, bottom ash (FILL)								
380			8		2										
378.0	18.0		9		2		Moist, yellowish brown, brown, gray mottled fat clay (CH)								
	20		10		2										
375.0	21.0						Moist, silty lean clay (CL) with trace organics								
373.5	22.5		11		2		Moist, yellow brown, brown, gray, mottled fat clay (CH)								
370	25		12		2										
370.0	26.0		13		2		Moist, yellow brown, brown, gray mottled lean clay (CL)								
			14		2		-becomes reddish in color								
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-15

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30														
365			15		2										
			16		2										
	35		17		2										
360			18		2		-increased silt content								
			19		2										
	40						Elevation (feet) 356.0 Depth (feet) 40.0 Moist, brown, reddish brown, fat clay (CH)								
355			20		2										
			21		2		Elevation (feet) 352.0 Depth (feet) 44.0 End of Boring at 44 ft								
	45														
350															
	50														
345															
	55														
340															
	60														
335															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-16

Date(s) Drilled	05/01/2019 12:00 AM to 05/01/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 550 (ft NAD83)	Groundwater Level(s)	42 ft on 5/1/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
395	0						395.0 / 0.0								
							394.5 / 0.5 Gravel (FILL)								
							Moist, brown, reddish brown, yellowish brown (FILL)								
			1		3.5										
							390.5 / 4.5 -becomes dark gray								
390	5		2		2		Moist, gray, fly ash and lime (FILL)								
			3		2										
			4		2										
385	10		5		2										
			6		2										
							-becomes dark gray								
380	15		7		2										
							379.0 / 16.0								
			8		2		Moist, yellowish brown, brown, gray, lean clay (CL)								
			9		2										
375	20		10		2										
			11		2										
370	25		12		2										
			13		2										
			14		2										
365	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-16

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2										
			16		2		Elevation (feet) 361.5 / Depth (feet) 33.5 Moist, yellowish brown, brown, fat clay (CH)								
360	35		17		2										
			18		2										
			19		2										
355	40		20		2										
			21		2		-becomes very moist, gray								
							Elevation (feet) 351.0 / Depth (feet) 44.0 End of Boring at 44 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-17

Date(s) Drilled	05/02/2019 12:00 AM to 05/02/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 500 (ft NAD83)	Groundwater Level(s)	43 ft on 5/2/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395	0						395.0 / 0.0								
							394.5 / 0.5 Gravel (FILL)								
							Moist, yellowish brown, brown, lean clay (CL)								
			1		4		393.0 / 2.0								
							Moist, gray, fly ash and lime (FILL)								
390	5		2		2										
			3		2										
			4		2										
385	10		5		2										
			6		2										
380	15		7		2		379.0 / 16.0								
			8		2		Moist, yellowish brown, brown, gray, lean clay (CL)								
			9		2										
375	20		10		2										
			11		2		373.0 / 22.0								
							Moist, brown, yellowish brown, gray, fat clay (CH)								
370	25		12		2		369.5 / 25.5								
			13		2		Moist, yellowish brown, brown, lean clay (CL)								
			14		2										
365	30														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-17

Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2										
							363.0 / 32.0 Moist, brown, yellowish brown, reddish brown, fat clay (CH)								
			16		2										
360	35		17		2		359.5 / 35.5 Moist, yellowish brown, brown, reddish brown, lean clay (CL)								
			18		2										
			19		2		356.0 / 39.0 Reddish brown, brown, fat clay (CH)								
355	40		20		2										
			21		2		-becomes wet, gray, silty								
							351.0 / 44.0 End of Boring at 44 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-18

Date(s) Drilled	05/02/2019 12:00 AM to 05/02/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 400 (ft NAD83)	Groundwater Level(s)	34 ft on 5/2/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						394.0 / 0.0								
							393.5 / 0.5 Gravel (FILL)								
							Moist, brown, lean clay (CL)								
							392.5 / 1.5								
			1		4		Moist, gray, fly ash and lime (FILL)								
390															
	5		2		2										
			3		2										
385			4		2										
	10		5		2										
			6		2										
380															
	15		7		2										
							377.5 / 16.5								
			8		2		Moist, yellowish brown, brown, gray, lean clay (CL)								
375			9		2										
	20		10		2										
							-becomes very moist, increased silt content								
			11		2										
370															
	25		12		2										
			13		2										
365			14		2										
	30														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-18

Sheet 2 of 2

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION Elevation (feet)	MATERIAL DESCRIPTION Depth (feet)	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2		363.0	31.0	Moist, brown, yellowish brown, reddish brown, fat clay (CH)								
			16		2												
360	35		17		2				-becomes wet 34'-36'								
			18		2												
			19		2		355.5	38.5	Moist, gray, fat clay (CH)								
355	40		20		2		353.0	41.0	Moist, gray, lean clay (CL)								
			21		2												
350							350.0	44.0	End of Boring at 44 ft								
	45																
345																	
	50																
340																	
	55																
335																	
	60																
330																	
	65																

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-19

Date(s) Drilled	05/02/2019 12:00 AM to 05/02/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	42.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 300 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						394.0 / 0.0								
							393.5 / 0.5 Moist, yellowish brown, brown, lean clay (CL) with gravel (FILL)								
			1		4		Moist, gray, fly ash and lime (FILL)								
390															
	5		2		2										
			3		2										
385			4		2										
	10		5		2										
			6		2										
380															
	15		7		2										
			8		2										
375			9		2										
	20						374.0 / 20.0								
			10		2		Yellowish brown, brown, reddish brown, fat clay (CH)								
			11		1.5										
370															
	25		12		1.5										
			13		2										
365			14		2										
	30						364.0 / 30.0								

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-19

Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2		Reddish brown, brown, gray, yellowish brown, lean clay (CL)								
			16		2										
360															
	35		17		2		359.0 / 35.0								
							Reddish brown, brown lean clay (CL)								
			18		2										
							356.0 / 38.0								
355							Moist, brown, gray, mottled red, fat clay (CH)								
	40		19		2										
			20		2										
							352.0 / 42.0								
							End of Boring at 42 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-20

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	33.9 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 200 (ft NAD83)	Groundwater Level(s)	20 ft on 5/6/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 394.0 / Depth (feet) 0.0								
							Moist, yellowish brown, lean clay (CL) with gravel [FILL]								
			1		2		392.0 / 2.0								
							Moist, gray, black, mixture of gravel, sand, fly ash and lime (FILL)								
390							389.5 / 4.5								
	5		2		2		Moist, gray, fly ash and lime (FILL)								*Sample recovery over 100 percent below 4 ft bgs*
							- becomes wet								
			3		2		- becomes moist								
385			4		2										
	10		5		2										
			6		2		380.5 - with few wood fragments and root fibers / 13.5								
380							Moist, yellowish brown, lean CLAY (CL) with few weathered rock fragments [RESIDUUM]								
	15		7		2		- with gray mottling, becomes slightly moist								
			8		2										
375			9		2										
	20						- becomes wet								*Water encountered at 20 ft bgs during drilling.*
			10		2		373.0 / 21.0								
							Very moist, yellowish brown, SILTY CLAY (CL-ML) with sand								
			11		2		- becomes wet								
370							370.5 / 23.5								
	25		12		2		Moist, yellowish brown, orange, gray-brown, blocky, lean CLAY (CL) -with wet seams 24.5 - 25.5, 26 - 27								
			13		2										
365			14		2										
	30						364.0 / 30.0								

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:47:03 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-20

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	15		2		Highly weathered, sandy SHALE, light brown, gray, with orange ferrous staining								
		16		1.9										
360						360.5 / 33.5								
	35					360.1 / 33.9 SHALE, gray								
						End of Boring at 33.9 ft								
355	40													
350	45													
345	50													
340	55													
335	60													
330	65													

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-21

Sheet 1 of 1

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	26.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 100 (ft NAD83)	Groundwater Level(s)	20 ft on 5/6/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 394.0 / Depth (feet) 0.0								
			1		3		Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
							391.5 / 2.5								
390							Wet, dark gray, black, fly ash and lime (FILL)								
	5		2		2		-becomes moist, gray, lightgray								
			3		2		-becomes wet								
385			4		2		-becomes moist								
	10						-becomes dry								
			5		2										
			6		2										
380															
	15		7		2		378.5 / 15.5								
			8		2		Moist, gray-brown, gray lean clay (CL) -becomes yellowish brown								
375			9		2										
	20		10		2		-with wet, CL-ML seams								*Water encountered at 20 ft bgs during drilling.*
			11		2		-becomes moist, with high wear shale fragments								
370							370.5 / 23.5								
	25		12		2		Light brown, yellowish brown with orange staining, highly weathered sandy SHALE								
							368.0 / 26.0								
							End of Boring at 26 ft								
365															
	30														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:47:11 PM

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-22

Sheet 1 of 1

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	27.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E (ft NAD83)	Groundwater Level(s)	20 ft on 5/6/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 394.0 / Depth (feet) 0.0								
							Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
			1		4		392.0 / 2.0								
							Wet, black, gray, mixture of bottom ash, fly ash and lime (FILL)								
390															
	5		2		2		-becomes very moist								
							-becomes wet								
			3		2		-becomes slightly moist								
385			4		2										
	10						-becomes very moist								
			5		2		382.5 -with 6" seam of bottom ash / 11.5								
							Moist, yellowish brown, gray, lean clay (CL)								
			6		2										
380															
	15		7		2		-becomes slightly moist								
			8		2										
							-becomes very moist								
375			9		2		-becomes moist -wet 19-19.5'								
	20						374.0 / 20.0								
			10		2		Wet, yellowish brown, gray silty clay (CL-ML)								*Water encountered at 20 ft bgs during drilling.*
							372.0 / 22.0								
			11		2		Moist, yellowish brown, gray, lean clay (CL)								
370							-becomes slightly moist								
	25		12		2		369.0 -becomes wet / 25.0								
							Moist, gray, orange-brown, sand silty clay (CL-ML) / 368.0 / 26.0								
			13		1		Highly weathered sandy SHALE, lightly yellowish gray / 367.0 / 27.0								
							End of Boring at 27 ft								
365															
	30														

AECOM

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-23

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	32.7 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -150 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						394.0 / 0.0 Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
							392.5 / 1.5 Wet, black, bottom ash (FILL)								
			1		3		-dark gray, fly ash and lime								
390															
	5		2		2		-becomes wet -4" seam of bottom ash -becomes moist								
			3		2		-becomes slightly moist, light gray								
385			4		2										
	10		5		2										
			6		2										
380															
	15		7		2										
			8		2										
375			9		2										
	20		10		2		-becomes wet								
							372.0 / 22.0 -with 4" seam of wet bottom ash								
			11		1.5		Very moist, gray-brown, lean clay (CL) with root fibers								
370															
	25		12		2		-becomes yellowish brown, wet								
			13		2										
							-becomes yellowish brown, gray, with								
365			14		2		365.0 / 29.0 orange weathered sandstone fragment								
	30						Moist, yellowish brown, gray, blocky, fat clay								

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-23

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	15		2		(CH)								
		16		.7		Elevation (feet) 361.5 / Depth (feet) 32.5 361.3 Wet SANDSTONE, orange 32.7 End of Boring at 32.7 ft								
360	35													
355	40													
350	45													
345	50													
340	55													
335	60													
330	65													

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-24

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	40.8 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -300 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 394.0 / Depth (feet) 0.0								
							Moist, brown, yellowish brown, lean clay (CL) with gravel (FILL)								
							392.5 / 1.5								
			1		3.5		Moist, gray, fly ash and lime (FILL)								
390															
	5		2		2		-becomes very moist								
			3		2		-becomes slightly moist								
385			4		1.5		-becomes wet								
	10		5		2		-becomes moist								
			6		2		-becomes wet								
							380.5 / 13.5								
380							Moist, yellowish brown, lean clay (CL)								
	15		7		2										
			8		2										
							-becomes wet								
375			9		2		-becomes moist -wet seam 19'-19.5'								
	20		10		2		-wet seam 20'-20.5'								
			11		2										
370															
	25		12		2										
			13		2										
							-becomes very moist								
365			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-24

Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
360	30		15		2		-becomes moist, orange-brown, with weathered sandstone fragments								
			16		2										
	35		17		1.5		-with black ferrous modules								
			18		2										
355			19		2										
	40		20		0.8		-becomes moist with poorly cemented sandstone fragments (353.5 / 40.5)								
							Light yellow, orange weathered SANDSTONE (353.2 / 40.8)								
							End of Boring at 40.8 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-25

Date(s) Drilled	05/07/2019 12:00 AM to 05/07/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -450 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						394.0 / 0.0								
							393.5 / 0.5 Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
							393.0 / 1.0 Wet, black, dark gray, bottom-ash with fly ash								
							Moist, gray, light gray, mixture of fly ash and lime								
			1		4										
390															
	5		2		2										
			3		2										
385			4		2										
	10		5		2										
							382.5 / 11.5 -becomes black								
							Moist, yellowish brown, light brown, lean clay (CL)								
			6		2		-becomes yellowish brown with gray moltted, with silt pockets and black ferrons modules								
380															
	15		7		2		-becomes orange brown, yellowish brown								
			8		2										
375			9		2										
	20						-becomes very moist, light brown, gray								
			10		2		-becmoise moist								
			11		2										
370							-very moist								
							-becomes moist								
	25		12		2		-very moist 25'-25.5'								
			13		2										
365			14		2										
	30						-becomes very moist								

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:47:35 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-25

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2										
			16		2		-becomes slightly moist, with orange weathered sandstone fragments -becomes moist								
360	35		17		2										
			18		2		-becomes very moist, gray, light brown, with orange brown								
355			19		2										
	40		20		2		-becomes wet, gray								
			21		2										
350							Elevation (feet) 350.0 Depth (feet) 44.0 End of Boring at 44 ft								
	45														
345															
	50														
340															
	55														
335															
	60														
330															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-26

Date(s) Drilled	05/07/2019 12:00 AM to 05/07/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -600 (ft NAD83)	Groundwater Level(s)	10 ft on 5/7/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395	0						Elevation (feet) 395.0 / Depth (feet) 0.0								
			1		3		Moist, yellowish brown, orange, lean clay (CL) with sand and gravel (FILL)								
							393.0 / 2.0								
							Wet, black, dark gray, mixture of bottom ash and fly ash								
390	5		2		2		Moist, gray, light gray, mixture of fly ash and lime								
			3		2										
			4		2		-becomes very moist								
385	10		5		1.5										*Water encountered at 10 ft bgs during drilling.*
							383.5 / 11.5								
							Moist, dark grayish green, lean clay (CL) with root fragments (RESIDUUM)								
							382.5 / 12.5								
			6		2		Moist, yellowish brown with light brown mottled, lean clay (CL)								
380	15		7		2										
			8		2		-with gray mottled								
			9		2										
375	20		10		2		-becomes slightly moist								
			11		2		-becomes moist								
370	25		12		2										
							-becomes very moist								
			13		2		-becomes moist								
							-becomes slightly moist								
			14		2		-becomes moist								
365	30														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-26

Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2		-wet seam								
			16		1.5										
360	35		17		2		360.5 -becomes reddish brown, slightly moist 34.5 Moist, gray, lean to fat clay (CL-CH)								
			18		2										
			19		2		357.0 38.0 Very moist, gray, lean clay (CL)								
355	40		20		2		-with orange-brown ferrous modules								
			21		2		351.0 44.0 End of Boring at 44 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-27

Date(s) Drilled	05/07/2019 12:00 AM to 05/07/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	38.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -750 (ft NAD83)	Groundwater Level(s)	1.5 ft on 5/7/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395	0						Elevation (feet) 395.0 / Depth (feet) 0.0								
							Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
							393.8 / 1.3								
			1		4		Wet, dark gray, mixture of bottom ash and fly ash Moist, gray, mixture of fly ash and lime								
390	5		2		2										
			3		2										
			4		2										
385	10		5		2		-becomes light gray								
			6		2		381.5 / 13.5								
							Moist, yellowish brown, light brown, gray (FILL)								
380	15		7		2		380.0 / 15.0								
			8		2		Moist, greenish gray, with organics, lean clay (CL) -becomes very moist, yellowish brown, light brown and gray mottled								
			9		2										
375	20		10		2		-becomes very moist								
			11		2		-becomes moist								
370	25		12		2		-very moist 25'-25.5								
			13		2										
			14		2		-wet seam at 29'								
365	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-27

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2										
			16		2		-becomes very moist								
			17		2		-becomes moist								
360	35		18		2										
							Elevation (feet) 357.0 / Depth (feet) 38.0								
							End of Boring at 38 ft								
355	40														
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-28

Date(s) Drilled	05/07/2019 12:00 AM to 05/07/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	40.2 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -900 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						394.0 / 0.0								
							393.5 / 0.5 Moist, yellow brown, lean clay (CL) (FILL)								
							Very moist, black, bottom ash and fly ash								
			1		3		Moist, gray, mixture of fly ash and lime								
390															
	5		2		2										
			3		2										
385			4		2										
							384.5 / 9.5								
	10						Moist, yellowish brown, light brown, lean clay (CL) (RESIDUUM)								
			5		2										
			6		2										
380															
	15		7		2		-with wet seam at 15'								
			8		2										
375			9		2										
	20														
			10		2		-very moist 20.5'-21.5'								
			11		2		-becomes light brown, yellowish brown, with black ferrous modules								
370															
	25		12		2										
			13		2										
365			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-28

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2		-with orange-brown weathered sandstone modules								
			16		2		-becomes very moist								
360	35		17		2		-becomes moist								
			18		2										
355			19		2		354.5 39.5								
	40		20		.2		353.8 SANDSTONE, yellow-brown, poorly cemented 40.2								
							End of Boring at 40.2 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-29

Sheet 1 of 1

Date(s) Drilled	05/08/2019 12:00 AM to 05/08/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	25.2 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	393 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -1050 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
393	0						Elevation (feet) 393.0 / Depth (feet) 0.0								
							Moist, yellow-brown, brown, lean clay (CL)								
392	1		1		3.5		392.0 / 1.0								
							Moist, gray, mixture of fly ash and lime								
390															
	5		2		2										
			3		2		386.0 / 7.0								
385							Moist, yellowish brown and gray mottled, fat clay (CH)								
	10		4		2										
			5		2										
							380.5 / 12.5								
380			6		2		Very moist, yellowish brown, light brown, lean clay (CL) with sand								
							379.0 / 14.0								
	15		7		2		Moist, with very moist seams, yellow-brown, with gray mottled, fat clay (CH)								
			8		2										
375															
			9		2		-very moist 19'-19.5'								
	20		10		2		-wet seams 20.5'-21.5'								
							371.0 / 22.0								
370			11		2		Very moist to wet, yellowish brown, yellow, sandy lean clay (CL)								
			12		1.2		368.5 / 24.5								
	25						367.8 / 25.2 Weathered SANDSTONE, brown, yellowish brown								
							End of Boring at 25.2 ft								
365															
	30														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:48:04 PM

AECOM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GNWSB-1

Sheet 1 of 1

Date(s) Drilled	05/08/2019 12:00 AM to 05/08/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	15.5 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	418 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N 1500 E 1000 (ft NAD83)	Groundwater Level(s)	11 ft on 5/8/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						418.0 / 0.0 Moist, orange brown, lean clay (CL) (FILL)								
							417.0 / 1.0 Moist, brown, lean clay (CL) (RESIDUUM)								
415			1		3		-becomes reddish yellow, with fine sand								
	5						-becomes light brown								
			2		3		412.5 / 5.5 -becomes wet; Moist, yellowish brown with gray mottled and black ferrous modules, fat clay (CH)								
410															
	10		3		4		-becomes reddish yellow, with weathered sandstone fragment								
							- wet seam, brown staining								*Water encountered at 11 ft bgs during drilling.*
405			4		3.5		405.0 / 13.0 Highly weathered SHALE, gray, friable								
	15						402.5 / 15.5 End of Boring at 15.5 ft								
400															
	20														
395															
	25														
390															
	30														

AECOM

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:48:09 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GNWSB-2

Sheet 1 of 1

Date(s) Drilled	05/08/2019 12:00 AM to 05/08/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	10.2 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	411 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N 1450 E 1000 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
410	0						Elevation (feet) 411.0 / Depth (feet) 0.0								
							Moist, orange brown, lean clay (CL) (FILL)								
							410.0 / 1.0								
			1		3		Moist, dark gray, greenish gray, lean clay (CL)								
							Very moist, reddish yellow, lean clay (CL)								
405	5		2		3		-becomes yellowish brown, orange, with black ferrous modules								
							403.0 / 8.0								
			3		2.2		Moist, yellowish brown, orange, with gray mottled, fat clay (CH)								
							402.0 / 9.0								
400	10						Moist, yellowish red, sandy lean clay (CL) with weathered sandstone fragments								
							400.8 / 10.2								
							End of Boring at 10.2 ft								
395	15														
390	20														
385	25														
	30														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:48:13 PM

AECOM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GNWSB-3

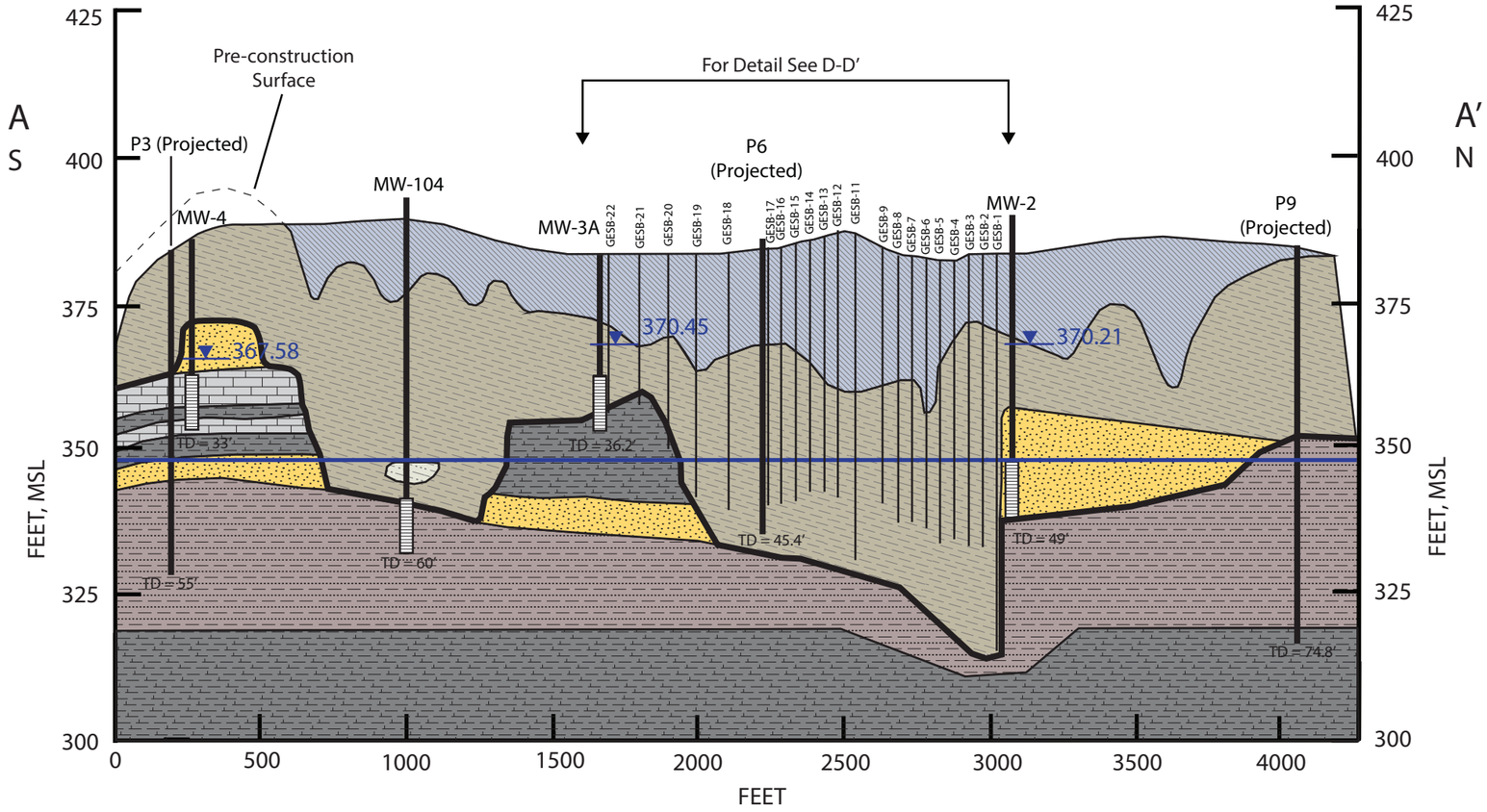
Sheet 1 of 1

Date(s) Drilled	05/08/2019 12:00 AM to 05/08/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	11.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	411 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N 1500 E 1050 (ft NAD83)	Groundwater Level(s)	6 ft on 5/8/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
410	0						411.0 / 0.0 Moist, orange-brown, brown, lean clay with sand (CL) (FILL)								
			1		3		409.0 / 2.0 Moist, gray-brown, dark gray, lean clay (CL) with root fibers								
405	5		2		2.5		-wet seam at 5'								
							404.5 / 6.5 -becomes wet; Moist, reddish yellow, fat clay (CH) with sandstone fragments								*Water encountered at 6 ft bgs during drilling.*
400	10		3		3		-becomes gray, dark gray								
							400.0 / 11.0 -becomes orange-brown, sandy; End of Boring at 11 ft								
395	15														
390	20														
385	25														
	30														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:48:16 PM

AECOM



LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silt
- Silty Clay
- Clayey Silt

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale

- Potentiometric Surface September 28, 2018
- Green River Elevation (348 ft)

MW-2
MONITORING WELL LOCATION ID
RISER
MONITORING WELL SCREEN
BACKFILL / COLLAPSE

25 feet
500 feet
(Vertical Exaggeration = 20x)

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 4
CROSS SECTION A - A'

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: MRH	
JOB NO. 60602365	

\\Na.aecomnet.com\GFS\AMER\Cincinnati\DCS\Projects\ENV\

Appendix C

Northwest Seep Laboratory Analytical Results

McCOY & McCOY LABORATORIES, Inc.
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Certificate of Analysis
9042044

Chad Phillips
Big Rivers Electric Corporation Reid/Green Station
PO Box 24
Henderson KY, 42419

Customer ID: 44-102032
Report Printed: 04/16/2019 10:36

Project Name:	Reid/Green/Sebree Station	Workorder:	9042044

Dear Chad Phillips

Enclosed are the analytical results for samples received at one of our laboratories on 04/03/2019 12:12.

McCoy & McCoy Laboratories, Inc. is a commercial laboratory accredited by various state and national authorities, including Indiana, Kentucky, Tennessee, and Virginia's National Environmental Laboratory Accreditation Program (NELAP). With the NELAP accreditation, applicable test results are certified to meet the requirements of the National Environmental Laboratory Accreditation Program.

If you have any questions concerning this report please contact the individual listed below.

Please visit our website at www.mccoylabs.com for a listing of the NELAP accreditations and Scope of Work, as well as, links to other scientific organizations.

ACCREDITED IN ACCORDANCE WITH nelac

#460210
Madisonville

Rob Whittington, Project Manager

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

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SAMPLE SUMMARY

Lab ID	Client Sample ID/Alias	Matrix	Date Collected	Date Received	Sampled By
9042044-01	RS1/Green Landfill Site	Water	04/02/2019 15:45	04/03/2019 12:12	Gregory Dick
9042044-02	SW-CULVERT-1/Green Landfill Site	Water	04/02/2019 13:43	04/03/2019 12:12	Gregory Dick

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ANALYTICAL RESULTS

Lab Sample ID: **9042044-01**
Description: **RS1 Green Landfill Site**

Sample Collection Date Time: 04/02/2019 15:45
Sample Received Date Time: 04/03/2019 12:12

Volatile Organic Compounds

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
1,1,1-Trichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,1,2,2-Tetrachloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,1,2-Trichloroethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,1-Dichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,1-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2,4-Trichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2,4-Trimethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2-Dichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2-Dichloropropane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,3,5-Trimethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,3-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,3-Dichloropropane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,4-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
2-Butanone	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
2-Chloroethylvinyl Ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
2-Hexanone	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
2-Nitropropane	ND	U	ug/L	10	5	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
4-Methyl-2-pentanone	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Acetone	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Acrolein	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Acrylonitrile	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Benzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Bromodichloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Bromoform	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Bromomethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Carbon disulfide	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Carbon tetrachloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Chlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Chloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Chloroform	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Chloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
cis-1,2-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
cis-1,3-Dichloropropene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Dibromochloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Dichlorodifluoromethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Diethyl ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Ethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Hexachloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Isopropylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
m,p-Xylene	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Methyl tert-Butyl Ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Methylene Chloride	**2**	J	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM

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Volatile Organic Compounds

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Nitrobenzene	ND	U	ug/L	10	5	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
o-Xylene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Styrene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Tetrachloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Tetrahydrofuran	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Toluene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
trans-1,2-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
trans-1,3-Dichloropropene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Trichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Trichlorofluoromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Vinyl Acetate	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Vinyl chloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM

Surrogate: Bromofluorobenzene	*94.3 %*	*85.1-114.2*	*04/03/2019 16:52*	*04/04/2019 16:02*	*HEM*	*SW846-8260 B*

Base Neutral and Acid Extractable Organics

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
1,2,4-Trichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
1,2-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
1,2-Diphenylhydrazine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
1,3-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
1,4-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,2'-oxybis-(1-Chloropropane)	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4,5-Trichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4,6-Trichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4-Dichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4-Dimethylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4-Dinitrophenol	ND	L2, V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4-Dinitrotoluene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,6-Dinitrotoluene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Chloronaphthalene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Chlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Methylnaphthalene	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Nitrophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
3,3'-Dichlorobenzidine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
3-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4,6-Dinitro-2-methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Bromophenyl-phenylether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Chloro-3-methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Chloroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Chlorophenyl-phenylether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Methylphenol	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Nitrophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Acenaphthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Acenaphthylene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR

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Base Neutral and Acid Extractable Organics

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
alpha-Terpineol	ND	V7, U	ug/L	5		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Anthracene	ND	L2, U	ug/L	15		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzidine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(a)anthracene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(a)pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(b)fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(g,h,i)perylene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(k)fluoranthene	ND	L1, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzoic acid	ND	V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzyl alcohol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Bis(2-chloroethoxy)methane	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Bis(2-chloroethyl) ether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Bis(2-ethylhexyl)phthalate	ND	L2, U	ug/L	40		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Butylbenzylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Carbazole	ND	V7, U	ug/L	11		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Chrysene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Dibenzo(a,h)anthracene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Dibenzofuran	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Diethylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Dimethylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Di-n-butylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Di-n-octylphthalate	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Fluorene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Hexachlorobenzene	ND	L2, U	ug/L	13		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Hexachlorobutadiene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Hexachlorocyclopentadiene	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Hexachloroethane	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Indeno(1,2,3-cd)pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Isophorone	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Naphthalene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Nitrobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
N-Nitrosodimethylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
N-Nitroso-di-n-propylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
N-Nitrosodiphenylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Pentachlorophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Phenanthrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Phenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Pyridine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR

Surrogate: 2,4,6-Tribromophenol	*59.2 %*	*45-85*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: 2-Fluorobiphenyl	*59.8 %*	*16-99*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: 2-Fluorophenol	*39.0 %*	*30-77*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: Nitrobenzene-d5	*49.6 %*	*25-157*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: Phenol-d6	*48.5 %*	*21-93*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: Terphenyl-d14	*74.6 %*	*30-125*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*

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Metals by EPA 200 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Aluminum	**0.27**	D2, J	mg/L	0.40	0.14	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Antimony	ND	U	mg/L	0.005	0.002	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Arsenic	ND	D3, U	mg/L	0.0100	0.0020	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Barium	**0.098**		mg/L	0.004	0.001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Beryllium	ND	D2, U	mg/L	0.0200	0.0100	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Boron	**1.15**	D2	mg/L	1.00	1.00	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:13	AKB
Cadmium	**0.0005**	J	mg/L	0.0010	0.0001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Calcium	**1150**	D1	mg/L	400	130	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:29	AKB
Chromium	ND	D2, U	mg/L	0.0200	0.0060	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Cobalt	ND	D2, U	mg/L	0.040	0.040	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Copper	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Iron	**18.1**	D2	mg/L	1.20	0.500	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:13	AKB
Lead	**0.002**		mg/L	0.002	0.0005	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Lithium	**0.06**	D2, J	mg/L	0.20	0.05	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Magnesium	**49.6**	D2	mg/L	2.00	0.900	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:13	AKB
Manganese	**20.5**	D1	mg/L	0.400	0.200	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:16	AKB
Mercury	ND	U	mg/L	0.0005	0.0002	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Molybdenum	ND	D2, U	mg/L	0.10	0.02	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Nickel	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Potassium	**301**	D1, L1	mg/L	50.0	22.0	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:26	AKB
Selenium	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Silver	ND	U	mg/L	0.0010	0.0004	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Sodium	**277**	D1	mg/L	26.0	10.0	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:26	AKB
Thallium	ND	U	mg/L	0.0020	0.0001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Vanadium	ND	D2, U	mg/L	0.040	0.020	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Zinc	ND	D2, U	mg/L	0.20	0.20	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Total Dissolved Solids	**6770**		mg/L	50	50	2540 C-1997	04/04/2019 17:06	04/05/2019 16:24	JTL
Total Suspended Solids	**336**		mg/L	10.0	10.0	2540 D-2011	04/04/2019 16:10	04/04/2019 16:10	ARC

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst

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Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	**4090**	D	mg/L	200	128	EPA 300.0 REV 2.1	04/04/2019 09:33	04/04/2019 09:33	CSC
Fluoride	ND	U	mg/L	0.2		EPA 300.0 REV 2.1	04/04/2019 09:17	04/04/2019 09:17	CSC
Sulfate	**3040**	D	mg/L	100	50.0	EPA 300.0 REV 2.1	04/04/2019 09:17	04/04/2019 09:17	CSC

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ANALYTICAL RESULTS

Lab Sample ID: **9042044-02**
Description: **SW-CULVERT-1 Green Landfill Site**

Sample Collection Date Time: 04/02/2019 13:43
Sample Received Date Time: 04/03/2019 12:12

Volatile Organic Compounds

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
1,1,1-Trichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,1,2,2-Tetrachloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,1,2-Trichloroethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,1-Dichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,1-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2,4-Trichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2,4-Trimethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2-Dichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2-Dichloropropane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,3,5-Trimethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,3-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,3-Dichloropropane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,4-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
2-Butanone	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
2-Chloroethylvinyl Ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
2-Hexanone	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
2-Nitropropane	ND	U	ug/L	10	5	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
4-Methyl-2-pentanone	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Acetone	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Acrolein	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Acrylonitrile	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Benzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Bromodichloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Bromoform	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Bromomethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Carbon disulfide	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Carbon tetrachloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Chlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Chloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Chloroform	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Chloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
cis-1,2-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
cis-1,3-Dichloropropene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Dibromochloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Dichlorodifluoromethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Diethyl ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Ethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Hexachloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Isopropylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
m,p-Xylene	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Methyl tert-Butyl Ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Methylene Chloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM

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Volatile Organic Compounds

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Nitrobenzene	ND	U	ug/L	10	5	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
o-Xylene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Styrene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Tetrachloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Tetrahydrofuran	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Toluene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
trans-1,2-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
trans-1,3-Dichloropropene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Trichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Trichlorofluoromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Vinyl Acetate	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Vinyl chloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM

Surrogate: Bromofluorobenzene	*92.4 %*	*85.1-114.2*	*04/03/2019 16:52*	*04/04/2019 16:33*	*HEM*	*SW846-8260 B*

Base Neutral and Acid Extractable Organics

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
1,2,4-Trichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
1,2-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
1,2-Diphenylhydrazine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
1,3-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
1,4-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,2'-oxybis-(1-Chloropropane)	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4,5-Trichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4,6-Trichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4-Dichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4-Dimethylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4-Dinitrophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4-Dinitrotoluene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,6-Dinitrotoluene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Chloronaphthalene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Chlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Methylnaphthalene	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Nitrophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
3,3'-Dichlorobenzidine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
3-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4,6-Dinitro-2-methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Bromophenyl-phenylether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Chloro-3-methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Chloroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Chlorophenyl-phenylether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Methylphenol	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Nitrophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Acenaphthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Acenaphthylene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR

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Base Neutral and Acid Extractable Organics

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
alpha-Terpineol	ND	V7, U	ug/L	5		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Anthracene	ND	L2, U	ug/L	15		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzidine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(a)anthracene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(a)pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(b)fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(g,h,i)perylene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(k)fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzoic acid	ND	V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzyl alcohol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Bis(2-chloroethoxy)methane	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Bis(2-chloroethyl) ether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Bis(2-ethylhexyl)phthalate	**105**	J, L2	ug/L	40		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Butylbenzylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Carbazole	ND	V7, U	ug/L	11		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Chrysene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Dibenzo(a,h)anthracene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Dibenzofuran	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Diethylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Dimethylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Di-n-butylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Di-n-octylphthalate	ND	L2, V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Fluorene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Hexachlorobenzene	ND	L2, U	ug/L	13		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Hexachlorobutadiene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Hexachlorocyclopentadiene	ND	L2, V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Hexachloroethane	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Indeno(1,2,3-cd)pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Isophorone	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Naphthalene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Nitrobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
N-Nitrosodimethylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
N-Nitroso-di-n-propylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
N-Nitrosodiphenylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Pentachlorophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Phenanthrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Phenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Pyridine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR

Surrogate: 2,4,6-Tribromophenol	*58.3 %*	*45-85*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: 2-Fluorobiphenyl	*64.0 %*	*16-99*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: 2-Fluorophenol	*39.7 %*	*30-77*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: Nitrobenzene-d5	*59.8 %*	*25-157*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: Phenol-d6	*46.8 %*	*21-93*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: Terphenyl-d14	*73.7 %*	*30-125*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*

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Metals by EPA 200 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Aluminum	ND	U, D2	mg/L	0.40	0.14	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Antimony	ND	U	mg/L	0.005	0.002	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Arsenic	ND	D3, U	mg/L	0.0100	0.0020	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Barium	**0.043**		mg/L	0.004	0.001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Beryllium	ND	D2, U	mg/L	0.0200	0.0100	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Boron	ND	D2, U	mg/L	1.00	1.00	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:19	AKB
Cadmium	ND	U	mg/L	0.0010	0.0001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Calcium	**203**	D1	mg/L	40.0	13.0	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:23	AKB
Chromium	ND	D2, U	mg/L	0.0200	0.0060	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Cobalt	ND	D2, U	mg/L	0.040	0.040	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Copper	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Iron	ND	D2, U	mg/L	1.20	0.500	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:19	AKB
Lead	ND	U	mg/L	0.002	0.0005	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Lithium	**0.11**	D2, J	mg/L	0.20	0.05	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Magnesium	**37.8**	D2	mg/L	2.00	0.900	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:19	AKB
Manganese	**0.227**	D2	mg/L	0.040	0.020	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:19	AKB
Mercury	ND	U	mg/L	0.0005	0.0002	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Molybdenum	ND	D2, U	mg/L	0.10	0.02	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Nickel	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Potassium	**21.1**	D2, L1	mg/L	5.00	2.20	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:32	AKB
Selenium	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Silver	ND	U	mg/L	0.0010	0.0004	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Sodium	**49.9**	D2	mg/L	2.60	1.00	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:32	AKB
Thallium	**0.0001**	J	mg/L	0.0020	0.0001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Vanadium	ND	D2, U	mg/L	0.040	0.020	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Zinc	ND	D2, U	mg/L	0.20	0.20	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Specific Conductance (Lab)	**1630**		umhos/cm	1	1	2510 B-2011	04/04/2019 16:31	04/04/2019 16:31	TLB

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst

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Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Bromide	ND	U	mg/L	4.0		EPA 300.1	04/15/2019 23:29	04/15/2019 23:29	CSC
Chloride	**344**	D	mg/L	40.0	25.6	EPA 300.0 REV 2.1	04/04/2019 10:23	04/04/2019 10:23	CSC
Fluoride	ND	M1, U	mg/L	0.2		EPA 300.0 REV 2.1	04/04/2019 10:23	04/04/2019 10:23	CSC
Sulfate	**401**	D, M1	mg/L	20.0	10.0	EPA 300.0 REV 2.1	04/04/2019 10:23	04/04/2019 10:23	CSC

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Notes for work order 9042044

- Samples collected by MMLI personnel are done so in accordance with procedures set forth in MMLI field services SOPs.
- Results contained in this report are only representative of the samples received.
- MMLI does not provide interpretation of these results unless otherwise stated.
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identification based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.

Qualifiers

D	Results reported from dilution.
D1	Sample required dilution due to high concentration of target analyte.
D2	Sample required dilution due to matrix interference.
D3	Sample dilution required due to insufficient sample.
E	Concentration exceeds calibration range
J	Estimated value.
J5	Concentration estimated. Internal standard recoveries did not meet method acceptance criteria.
L1	The associated blank spike recovery was above method acceptance limits.
L2	The associated blank spike recovery was below method acceptance limits.
M1	Matrix spike recovery was high; the method control sample recovery was acceptable.
M2	Matrix spike recovery was low; the method control sample recovery was acceptable.
M3	The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable.
M4	The analysis of the spiked sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable.
S2	Surrogate recovery was below method acceptance limits.
U	Target analyte was analyzed for, but was below detection limit (the value associated with the qualifier is the laboratory method detection limit in our LIMS system).
V7	CCV was below the method control limit for this analyte; however the average % difference or % drift for all the analytes met method criteria.
Y1	Sample RPD exceeded the method control limit.
Y2	MS/MSD RPD exceeded the method control limit. Recovery met acceptance criteria.

Standard Quallifiers/Acronymns

MDL	Method Detection Limit
MRL	Minimum Reporting Limit
ND	Not Detected
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
% Rec	Percent Recovery
RPD	Relative Percent Difference
>	Greater than
<	Less than

McCOY & McCOY LABORATORIES, Inc.
A Pace Analytical Laboratory

P.O. Box 907
Madisonville, KY 42431
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Paducah, KY 270.444.6547

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Certified Analyses included in this Report

Analyte	Certifications
2510 B-2011 in Water	
Specific Conductance (Lab)	KY Drinking Water Mdv (00030)
2540 C-1997 in Water	
Total Dissolved Solids	KY Drinking Water Mdv (00030)
2540 D-2011 in Water	
EPA 200.7 REV 4.4 in Water	
Iron	KY Wastewater Mdv (00030)
EPA 200.8 REV 5.4 in Water	
Mercury	KY Drinking Water Mdv (00030)
EPA 300.0 REV 2.1 in Water	
Chloride	KY Drinking Water Mdv (00030)
Fluoride	KY Drinking Water Mdv (00030)
Sulfate	KY Drinking Water Mdv (00030)
EPA 300.1 in Water	
Bromide	KY Drinking Water Mdv (00030)
SW846-8260 B in Water	
SW846-8270 C in Water	

Sample Acceptance Checklist for Work Order 9042044

Shipped By: Client

Temperature: 0.90° Celcius

Condition	
Check if custody seals were present/intact.	☐
Check if any containers were received damaged.	☐
Check if COC was submitted and complete.	☑
Check if COC agreed with sample labels.	☑
Check if all containers on COC were received	☑
Check if all samples had appropriate containers.	☑
Check if all samples had appropriate volumes.	☑
Check if collection methods were recorded on COC.	☑
Check if flow units were recorded on COC.	☐
Check if any headspace issues with volatile sample	☐
Check if holding times were acceptable.	☑
Check if all containers were preserved properly.	☑

BIG RIVERS ELECTRIC CORP.
CHAIN OF CUSTODY RECORD

No. 1 of 2

Sampling Location: Green Landfill

WO# 9042044

Plant ID. Sample Number	Date Time	Central Lab ID. Sample Number	Station Description	Sampling Method	Sample Size	Type of Preservation	Analysis Requested
-	4/2/2019 3:45 PM	-	"RS1"	G	500 ml	NONE, 4°C	Chloride, Sulfate, Fluoride
-	4/2/2019 3:45 PM	-	"RS1"	G	250 ml	HNO_3, 4°C	Total Metals (see attached)
-	4/2/2019 3:45 PM	-	"RS1"	G	250 ml	HNO_3, 4°C	Total Metals (see attached)
-	4/2/2019 3:45 PM	-	"RS1"	G	1L	NONE, 4°C	sVOC 2
-	4/2/2019 3:45 PM	-	"RS1"	G	500 ml	NONE, 4°C	TDS, TSS
-	4/2/2019 3:45 PM	-	"RS1"	G	40 ml	4°C, HCl	VOC 3

Samplers (Signatures)
Meg Quick

Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Meg Quick	4/3/2019	1212		4-3-19	12:12
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time

White Copy - Central Lab
Yellow Copy - Plant (Final Copy)
Pink Copy - Plant Env. Contact
Gold Copy - Plant Lab

0.90

BIG RIVERS ELECTRIC CORP.
CHAIN OF CUSTODY RECORD

No. 2 of 2

Sampling Location: Green Landfill

WO#9042044

Plant ID. Sample Number	Date Time	Central Lab ID. Sample Number	Station Description	Sampling Method	Sample Size	Type of Preservation	Analysis Requested
-	4/2/2019 1343	-	"SW-Culvert-1"	G	500 ml	None, 4°C	Conductivity Bromide, Fluoride, Sulfate, Chloride
-	4/2/2019 1343	-	"SW-Culvert-1"	G	40 ml	4°C, HCl	VOC
-	4/2/2019 1343	-	"SW-Culvert-1"	G	1L	4°C	sVOC
-	4/2/2019 1343	-	"SW-Culvert-1"	G	250 ml	HNO_3, 4°C	Total Metals (see attached)
-	4/2/2019 1343	-	"SW-Culvert-1"	G	250 ml	HNO_3, 4°C	Total Metals (see attached)
-							

3

Samplers (Signatures) Meg Quick

	Date	Time		Date	Time
Relinquished By (Signature) Meg Quick	4/3/2019	1212	Received By (Signature)	4-3-19	12:12
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time

White Copy - Central Lab
Yellow Copy - Plant (Final Copy)
Pink Copy - Plant Env. Contact
Gold Copy - Plant Lab

WO #
9042044

Green Landfill –Constituent List

Antimony
Aluminum
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Sodium
Silver
Thallium
Vanadium
Zinc

Mary Quirk
BREC
4/3/2019
12:12

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

Laboratory Job ID: 490-172013-1
Laboratory Sample Delivery Group: Sebree Station
Client Project/Site: Sebree Station

For:
Big Rivers Electric Corporation
PO BOX 24
Henderson, Kentucky 42419

Attn: Mark Bertram

Roxanne Cisneros

Authorized for release by:
4/24/2019 3:38:21 PM

Roxanne Cisneros, Senior Project Manager
(615)301-5761
roxanne.cisneros@testamericainc.com

Table of Contents

Sample Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-172013-1	023	Water	04/11/19 11:25	04/12/19 09:55

Job ID: 490-172013-1

Laboratory: Eurofins TestAmerica, Nashville

Narrative

Job Narrative
490-172013-1

Comments
No additional comments.

Receipt
The sample was received on 4/12/2019 9:55 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 0.6º C.

HPLC/IC
Method(s) 9056A: The following sample was diluted due to the nature of the sample matrix: 023 (490-172013-1). 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 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.

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

Definitions/Glossary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
F1	MS and/or MSD Recovery 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.

Metals

Qualifier	Qualifier Description
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.
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.

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Client Sample ID: 023

Date Collected: 04/11/19 11:25
Date Received: 04/12/19 09:55

Lab Sample ID: 490-172013-1

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	864		600	40.0	mg/L			04/16/19 12:06	200
Fluoride	0.0356	J	1.00	0.0100	mg/L			04/15/19 15:10	1
Sulfate	548	B	100	0.600	mg/L			04/16/19 11:33	20

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.766		0.0500	0.00959	mg/L		04/16/19 11:19	04/22/19 16:56	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0000690	J B	0.00200	0.0000213	mg/L		04/16/19 11:17	04/17/19 11:26	1
Arsenic	0.000759	J	0.00500	0.000118	mg/L		04/16/19 11:17	04/17/19 11:26	1
Barium	0.0557	J B	0.200	0.000270	mg/L		04/16/19 11:17	04/17/19 11:26	1
Beryllium	ND		0.00200	0.000102	mg/L		04/16/19 11:17	04/17/19 11:26	1
Boron	0.626	J B	1.00	0.00339	mg/L		04/16/19 11:17	04/17/19 11:26	1
Cadmium	0.000411	J	0.00100	0.000152	mg/L		04/16/19 11:17	04/17/19 11:26	1
Calcium	488		1.00	0.0412	mg/L		04/16/19 11:17	04/17/19 11:26	1
Chromium	0.00281	J	0.00300	0.000339	mg/L		04/16/19 11:17	04/17/19 11:26	1
Cobalt	0.000450	J	0.00500	0.0000218	mg/L		04/16/19 11:17	04/17/19 11:26	1
Lead	0.000140	J	0.00500	0.0000675	mg/L		04/16/19 11:17	04/17/19 11:26	1
Molybdenum	0.0110		0.0100	0.000873	mg/L		04/16/19 11:17	04/17/19 11:26	1
Potassium	69300		1000	147	ug/L		04/16/19 11:17	04/17/19 11:26	1
Selenium	ND		0.0100	0.000348	mg/L		04/16/19 11:17	04/17/19 11:26	1
Thallium	0.0000670	J	0.00100	0.0000360	mg/L		04/16/19 11:17	04/17/19 11:26	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.000200	0.000100	mg/L		04/18/19 12:23	04/18/19 17:30	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.13		0.100	0.100	SU			04/18/19 18:32	1
Temperature	22.8		0.100	0.100	Degrees C			04/18/19 18:32	1
Total Dissolved Solids	2850		100	28.0	mg/L			04/15/19 16:11	1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 490-588042/3
Matrix: Water
Analysis Batch: 588042

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			04/15/19 11:18	1
Fluoride	ND		1.00	0.0100	mg/L			04/15/19 11:18	1
Sulfate	0.2213	J	5.00	0.0300	mg/L			04/15/19 11:18	1

Lab Sample ID: LCS 490-588042/4
Matrix: Water
Analysis Batch: 588042

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.265		mg/L		93	80 - 120
Fluoride	1.00	0.9279	J	mg/L		93	80 - 120
Sulfate	10.0	9.611		mg/L		96	80 - 120

Lab Sample ID: LCSD 490-588042/5
Matrix: Water
Analysis Batch: 588042

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.373		mg/L		94	80 - 120	1	20
Fluoride	1.00	0.9700	J	mg/L		97	80 - 120	4	20
Sulfate	10.0	9.661		mg/L		96	80 - 120	1	20

Lab Sample ID: 490-172052-B-1 MS
Matrix: Water
Analysis Batch: 588042

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	2.12	J	10.0	14.02		mg/L		119	80 - 120
Fluoride	0.0156	J F1	1.00	1.417	F1	mg/L		140	80 - 120
Sulfate	0.601	J B F1	10.0	13.20	F1	mg/L		126	80 - 120

Lab Sample ID: 490-172052-B-1 MSD
Matrix: Water
Analysis Batch: 588042

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	2.12	J	10.0	13.02		mg/L		109	80 - 120	7	20
Fluoride	0.0156	J F1	1.00	1.338	F1	mg/L		132	80 - 120	6	20
Sulfate	0.601	J B F1	10.0	12.63		mg/L		120	80 - 120	4	20

Lab Sample ID: MB 490-588250/3
Matrix: Water
Analysis Batch: 588250

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			04/16/19 10:10	1
Fluoride	ND		1.00	0.0100	mg/L			04/16/19 10:10	1
Sulfate	0.2110	J	5.00	0.0300	mg/L			04/16/19 10:10	1

Method: 9056A - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 490-588250/4
Matrix: Water
Analysis Batch: 588250

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chloride			10.0	9.351		mg/L		93	80 - 120		
Fluoride			1.00	0.9880	J	mg/L		99	80 - 120		
Sulfate			10.0	9.710		mg/L		97	80 - 120		

Lab Sample ID: LCSD 490-588250/5
Matrix: Water
Analysis Batch: 588250

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride			10.0	9.359		mg/L		93	80 - 120	0	20
Fluoride			1.00	0.9895	J	mg/L		99	80 - 120	0	20
Sulfate			10.0	9.756		mg/L		97	80 - 120	0	20

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 180-275853/1-A
Matrix: Water
Analysis Batch: 276485

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 275853

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		04/16/19 11:19	04/22/19 15:56	1

Lab Sample ID: LCS 180-275853/2-A
Matrix: Water
Analysis Batch: 276485

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 275853

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Lithium			1.00	1.006		mg/L		101	80 - 120		

Lab Sample ID: 490-172010-A-3-C MS
Matrix: Water
Analysis Batch: 276485

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 275853

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Lithium	0.0313	J	1.00	1.065		mg/L		103	75 - 125		

Lab Sample ID: 490-172010-A-3-D MSD
Matrix: Water
Analysis Batch: 276485

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 275853

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	0.0313	J	1.00	1.090		mg/L		106	75 - 125	2	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 180-275852/1-A
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00002800	J	0.00200	0.0000213	mg/L		04/16/19 11:17	04/17/19 11:54	1
Arsenic	ND		0.00500	0.000118	mg/L		04/16/19 11:17	04/17/19 11:54	1
Barium	0.0007190	J	0.200	0.000270	mg/L		04/16/19 11:17	04/17/19 11:54	1
Beryllium	ND		0.00200	0.000102	mg/L		04/16/19 11:17	04/17/19 11:54	1
Boron	0.02478	J	1.00	0.00339	mg/L		04/16/19 11:17	04/17/19 11:54	1
Cadmium	ND		0.00100	0.000152	mg/L		04/16/19 11:17	04/17/19 11:54	1
Calcium	ND		1.00	0.0412	mg/L		04/16/19 11:17	04/17/19 11:54	1
Chromium	ND		0.00300	0.000339	mg/L		04/16/19 11:17	04/17/19 11:54	1
Cobalt	ND		0.00500	0.0000218	mg/L		04/16/19 11:17	04/17/19 11:54	1
Lead	ND		0.00500	0.0000675	mg/L		04/16/19 11:17	04/17/19 11:54	1
Molybdenum	ND		0.0100	0.000873	mg/L		04/16/19 11:17	04/17/19 11:54	1
Potassium	ND		1000	147	ug/L		04/16/19 11:17	04/17/19 11:54	1
Selenium	ND		0.0100	0.000348	mg/L		04/16/19 11:17	04/17/19 11:54	1
Thallium	ND		0.00100	0.0000360	mg/L		04/16/19 11:17	04/17/19 11:54	1

Lab Sample ID: LCS 180-275852/2-A
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.500	0.5151		mg/L		103	80 - 120
Arsenic	0.0400	0.03629		mg/L		91	80 - 120
Barium	2.00	2.120		mg/L		106	80 - 120
Beryllium	0.0500	0.05131		mg/L		103	80 - 120
Boron	1.00	1.006		mg/L		101	80 - 120
Cadmium	0.0500	0.05263		mg/L		105	80 - 120
Calcium	50.0	50.60		mg/L		101	80 - 120
Chromium	0.200	0.2148		mg/L		107	80 - 120
Cobalt	0.500	0.4481		mg/L		90	80 - 120
Lead	0.0200	0.02088		mg/L		104	80 - 120
Molybdenum	1.00	0.9910		mg/L		99	80 - 120
Potassium	50000	48340		ug/L		97	80 - 120
Selenium	0.0100	0.01029		mg/L		103	80 - 120
Thallium	0.0500	0.05310		mg/L		106	80 - 120

Lab Sample ID: 490-172010-A-1-B MS
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.000119	J B	0.500	0.5292		mg/L		106	75 - 125
Arsenic	0.00208	J	0.0400	0.03945		mg/L		93	75 - 125
Barium	0.0216	J B	2.00	2.197		mg/L		109	75 - 125
Beryllium	ND		0.0500	0.05176		mg/L		104	75 - 125
Boron	0.271	J B	1.00	1.297		mg/L		103	75 - 125
Cadmium	ND		0.0500	0.05279		mg/L		106	75 - 125
Calcium	502		50.0	557.9	4	mg/L		111	75 - 125
Chromium	0.00360		0.200	0.2213		mg/L		109	75 - 125
Cobalt	0.00522		0.500	0.4645		mg/L		92	75 - 125

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-172010-A-1-B MS
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	0.000233	J	0.0200	0.02146		mg/L		106	75 - 125
Molybdenum	0.00104	J	1.00	1.043		mg/L		104	75 - 125
Potassium	1660		50000	48970		ug/L		95	75 - 125
Selenium	ND		0.0100	0.01059		mg/L		106	75 - 125
Thallium	ND		0.0500	0.05541		mg/L		111	75 - 125

Lab Sample ID: 490-172010-A-1-C MSD
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	0.000119	J B	0.500	0.5401		mg/L		108	75 - 125	2	20
Arsenic	0.00208	J	0.0400	0.03954		mg/L		94	75 - 125	0	20
Barium	0.0216	J B	2.00	2.231		mg/L		110	75 - 125	2	20
Beryllium	ND		0.0500	0.05116		mg/L		102	75 - 125	1	20
Boron	0.271	J B	1.00	1.238		mg/L		97	75 - 125	5	20
Cadmium	ND		0.0500	0.05362		mg/L		107	75 - 125	2	20
Calcium	502		50.0	566.9	4	mg/L		129	75 - 125	2	20
Chromium	0.00360		0.200	0.2201		mg/L		108	75 - 125	1	20
Cobalt	0.00522		0.500	0.4630		mg/L		92	75 - 125	0	20
Lead	0.000233	J	0.0200	0.02185		mg/L		108	75 - 125	2	20
Molybdenum	0.00104	J	1.00	1.061		mg/L		106	75 - 125	2	20
Potassium	1660		50000	50080		ug/L		97	75 - 125	2	20
Selenium	ND		0.0100	0.01045		mg/L		105	75 - 125	1	20
Thallium	ND		0.0500	0.05523		mg/L		110	75 - 125	0	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 490-588899/1-A
Matrix: Water
Analysis Batch: 589024

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 588899

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.000200	0.000100	mg/L		04/18/19 12:23	04/18/19 17:25	1

Lab Sample ID: LCS 490-588899/2-A
Matrix: Water
Analysis Batch: 589024

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 588899

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00100	0.001058		mg/L		106	80 - 120

Lab Sample ID: 490-172013-1 MS
Matrix: Water
Analysis Batch: 589024

Client Sample ID: 023
Prep Type: Total/NA
Prep Batch: 588899

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		0.00100	0.001196		mg/L		120	75 - 125

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: 490-172013-1 MSD — **Client Sample ID: 023**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 589024 — **Prep Batch: 588899**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		0.00100	0.001191		mg/L		119	75 - 125	0	20

Method: 9040C - pH

Lab Sample ID: LCS 490-589003/1 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 589003

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			7.00	7.040		SU		101	98 - 103		

Lab Sample ID: 490-171598-A-10 DU — **Client Sample ID: Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 589003

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	6.94			6.940		SU				0	20
Temperature	23.0			23.00		Degrees C				0	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 490-586704/1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 586704

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		2.50	0.700	mg/L			04/15/19 16:11	1

Lab Sample ID: LCS 490-586704/2 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 586704

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Dissolved Solids			10.0	9.800		mg/L		98	90 - 110		

Lab Sample ID: 490-172007-E-1 DU — **Client Sample ID: Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 586704

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	3370			3384		mg/L				0.4	20

Lab Sample ID: 490-172013-1 DU — **Client Sample ID: 023**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 586704

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	2850			2772		mg/L				3	20

HPLC/IC

Analysis Batch: 588042

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	9056A	
MB 490-588042/3	Method Blank	Total/NA	Water	9056A	
LCS 490-588042/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-588042/5	Lab Control Sample Dup	Total/NA	Water	9056A	
490-172052-B-1 MS	Matrix Spike	Total/NA	Water	9056A	
490-172052-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056A	

Analysis Batch: 588250

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	9056A	
490-172013-1	023	Total/NA	Water	9056A	
MB 490-588250/3	Method Blank	Total/NA	Water	9056A	
LCS 490-588250/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-588250/5	Lab Control Sample Dup	Total/NA	Water	9056A	

Metals

Prep Batch: 275852

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total Recoverable	Water	3005A	
MB 180-275852/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-275852/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-172010-A-1-B MS	Matrix Spike	Total Recoverable	Water	3005A	
490-172010-A-1-C MSD	Matrix Spike Duplicate	Total Recoverable	Water	3005A	

Prep Batch: 275853

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total Recoverable	Water	3005A	
MB 180-275853/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-275853/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-172010-A-3-C MS	Matrix Spike	Total Recoverable	Water	3005A	
490-172010-A-3-D MSD	Matrix Spike Duplicate	Total Recoverable	Water	3005A	

Analysis Batch: 276092

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total Recoverable	Water	6020A	275852
MB 180-275852/1-A	Method Blank	Total Recoverable	Water	6020A	275852
LCS 180-275852/2-A	Lab Control Sample	Total Recoverable	Water	6020A	275852
490-172010-A-1-B MS	Matrix Spike	Total Recoverable	Water	6020A	275852
490-172010-A-1-C MSD	Matrix Spike Duplicate	Total Recoverable	Water	6020A	275852

Analysis Batch: 276485

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total Recoverable	Water	6010C	275853
MB 180-275853/1-A	Method Blank	Total Recoverable	Water	6010C	275853
LCS 180-275853/2-A	Lab Control Sample	Total Recoverable	Water	6010C	275853
490-172010-A-3-C MS	Matrix Spike	Total Recoverable	Water	6010C	275853
490-172010-A-3-D MSD	Matrix Spike Duplicate	Total Recoverable	Water	6010C	275853

QC Association Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Metals

Prep Batch: 588899

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	7470A	
MB 490-588899/1-A	Method Blank	Total/NA	Water	7470A	
LCS 490-588899/2-A	Lab Control Sample	Total/NA	Water	7470A	
490-172013-1 MS	023	Total/NA	Water	7470A	
490-172013-1 MSD	023	Total/NA	Water	7470A	

Analysis Batch: 589024

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	7470A	588899
MB 490-588899/1-A	Method Blank	Total/NA	Water	7470A	588899
LCS 490-588899/2-A	Lab Control Sample	Total/NA	Water	7470A	588899
490-172013-1 MS	023	Total/NA	Water	7470A	588899
490-172013-1 MSD	023	Total/NA	Water	7470A	588899

General Chemistry

Analysis Batch: 586704

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	SM 2540C	
MB 490-586704/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 490-586704/2	Lab Control Sample	Total/NA	Water	SM 2540C	
490-172007-E-1 DU	Duplicate	Total/NA	Water	SM 2540C	
490-172013-1 DU	023	Total/NA	Water	SM 2540C	

Analysis Batch: 589003

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	9040C	
LCS 490-589003/1	Lab Control Sample	Total/NA	Water	9040C	
490-171598-A-10 DU	Duplicate	Total/NA	Water	9040C	

Lab Chronicle

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Client Sample ID: 023

Date Collected: 04/11/19 11:25
Date Received: 04/12/19 09:55

Lab Sample ID: 490-172013-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			588042	04/15/19 15:10	SOO	TAL NSH
Total/NA	Analysis	9056A		20			588250	04/16/19 11:33	SOO	TAL NSH
Total/NA	Analysis	9056A		200			588250	04/16/19 12:06	SOO	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	275853	04/16/19 11:19	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			276485	04/22/19 16:56	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	275852	04/16/19 11:17	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			276092	04/17/19 11:26	RSK	TAL PIT
Total/NA	Prep	7470A			30 mL	30 mL	588899	04/18/19 12:23	CSL	TAL NSH
Total/NA	Analysis	7470A		1			589024	04/18/19 17:30	EHS	TAL NSH
Total/NA	Analysis	9040C		1			589003	04/18/19 18:32	MXX	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	586704	04/15/19 16:11	BMC	TAL NSH

Laboratory References:

TAL NSH = Eurofins TestAmerica, Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Method Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL NSH
6010C	Metals (ICP)	SW846	TAL PIT
6020A	Metals (ICP/MS)	SW846	TAL PIT
7470A	Mercury (CVAA)	SW846	TAL NSH
9040C	pH	SW846	TAL NSH
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL NSH
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL PIT
7470A	Preparation, Mercury	SW846	TAL NSH

Protocol References:

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:

TAL NSH = Eurofins TestAmerica, Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Laboratory: Eurofins TestAmerica, Nashville

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Kentucky (UST)	State Program	4	19	06-30-19

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
9040C		Water	pH
9040C		Water	Temperature
9056A		Water	Chloride
9056A		Water	Fluoride
9056A		Water	Sulfate
SM 2540C		Water	Total Dissolved Solids

Laboratory: Eurofins TestAmerica, Pittsburgh

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Arkansas DEQ	State Program	6	88-0690	06-27-19
California	State Program	9	2891	04-30-19 *
Connecticut	State Program	1	PH-0688	09-30-20
Florida	NELAP	4	E871008	06-30-19
Illinois	NELAP	5	200005	06-30-19
Kansas	NELAP	7	E-10350	01-31-20
Louisiana	NELAP	6	04041	06-30-19
Nevada	State Program	9	PA00164	07-31-19
New Hampshire	NELAP	1	2030	04-04-20
New Jersey	NELAP	2	PA005	06-30-19
New York	NELAP	2	11182	03-31-20
North Carolina (WW/SW)	State Program	4	434	12-31-19
Oregon	NELAP	10	PA-2151	02-06-20
Pennsylvania	NELAP	3	02-00416	04-30-19
South Carolina	State Program	4	89014	04-30-19 *
Texas	NELAP	6	T104704528-15-2	03-31-20
US Fish & Wildlife	Federal		LE94312A-1	07-31-19
USDA	Federal		P330-16-00211	06-26-19
Utah	NELAP	8	PA001462015-4	05-31-19 *
Virginia	NELAP	3	460189	09-14-19
West Virginia DEP	State Program	3	142	01-31-20
Wisconsin	State Program	5	998027800	08-31-19

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-172013 Chain of Custody

Cooler Received/Opened On 4/12/2019 @ 0955

Time Samples Removed From Cooler 14:50 Time Samples Placed In Storage 14:55 (2 Hour Window)

1. Tracking # 1625 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960357 pH Strip Lot NA Chlorine Strip Lot NA

2. Temperature of rep. sample or temp blank when opened: 0.6 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO (NA)

4. Were custody seals on outside of cooler? (YES) NO NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? (YES) NO NA

6. Were custody papers inside cooler? (YES) NO NA

I certify that I opened the cooler and answered questions 1-6 (intial) GH

7. Were custody seals on containers: YES (NO) and intact YES NO (NA)

Were these signed and dated correctly? YES NO (NA)

8. Packing mat'l used? (Bubblewrap) Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: (Ice) Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? (YES) NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? (YES) NO NA

12. Did all container labels and tags agree with custody papers? (YES) NO NA

13a. Were VOA vials received? YES (NO) NA

b. Was there any observable headspace present in any VOA vial? YES NO (NA)

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES (NO) NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) ACE

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO (NA)

b. Did the bottle labels indicate that the correct preservatives were used (YES) NO NA

16. Was residual chlorine present? YES NO (NA)

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) ACE

17. Were custody papers properly filled out (ink, signed, etc)? (YES) NO NA

18. Did you sign the custody papers in the appropriate place? (YES) NO NA

19. Were correct containers used for the analysis requested? (YES) NO NA

20. Was sufficient amount of sample sent in each container? (YES) NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) ACE

I certify that I attached a label with the unique LIMS number to each container (intial) ACE

21. Were there Non-Conformance issues at login? YES (NO) Was a NCM generated? YES (NO) #_____

BIS = Broken in shipment

Chain of Custody Record 299400

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

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

Client Contact	Project Manager: Mark Bertram	Site Contact: Greg Dick	Date: 4/11/2019	COC No: 299400
Company Name: Big Rivers Electric Corp	Tel/Fax: (270)844-5708	Lab Contact: Roxanne Cisneros	Carrier: FedEx	1 of 1 COCs
Address: 9000 Highway 2096	Analysis Turnaround Time			Sampler:
City/State/Zip: Robards, KY 42452	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone: (270) 844-5736	TAT if different from Below _____			Walk-in Client:
Fax:	☑ 2 weeks			Lab Sampling:
Project Name: Sebree Station	☐ 1 week			
Site: Sebree Station	☐ 2 days			Job / SDG No.:
PO# 249349	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	903.0, 904.0	7470A, 6020A, 6010C	9056A 300.0, 9040C	2540C_calc-TDS	Sample Specific Notes:
023	4/11/2019	1125	G	Water	6	N	N	x	x	x	x	

Loc: 490
172013

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

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☑ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments: Run analysis per 40 CFR 257 Appendix III & Appendix IV parameters. See attached constituent list for analysis

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: 0.0 Corr'd: _____ | Therm ID No.: _____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Greg Dick	BREC	4/11/2019 1605			
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:
				TA-MMS	4/12/19 9:55

Page 19 of 23

4/24/2019

4/11/2019

Constituent List:

40 C.F.R. 257 Appendix III
Boron
Calcium
Fluoride
pH
Sulfate
Total Dissolved Solids (TDS)

40 C.F.R. 257 Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 & 228 combined

Meg Dick
BREC
4/11/2019
1605

Loc: 490
172013

SDR

Ex Saturday Delivery

151967 REV 7/08 RRD

estAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ID:RNCA (615) 726-0177
NG MGR
NG TESTAMERICA
OSTER CREIGHTON

LE, IN 37204
STATES US

SHIP DATE: 12APR19
ACTWGT: 10.00 LB MAN
CAD: 020425/CAFE3211

BILL RECIPIENT

PPING/RECEIVING
TAMERICA LABORATORIES, INC.
ALPHA DRIVE
C PARK
TSBURGH PA 15238
7058 REF: 5490-99035

FedEx Express

20 8844 2647

SATURDAY 12:00P
PRIORITY OVERNIGHT

AGCA

Uncorrected temp 15.1
Thermometer ID 10
Initials JT
CF 0

PT-WI-SR-001 effective 11/8/10

490-172013 Waybill

490-172010 Waybill

490-172007 Waybill

RF 639
ST 3

Eurofins TestAmerica, Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-88697.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-172013-1
Address: 301 Alpha Drive, RIDC Park,	Due Date Requested: 4/24/2019	Analysis Requested		Preservation Codes:
City: Pittsburgh	TAT Requested (days):			A - HCL; B - NaOH; C - Zn Acetate; D - Nitric Acid; E - NaHSO4; F - MeOH; G - Amchlor; H - Ascorbic Acid; I - Ice; J - DI Water; K - EDTA; L - EDA; M - Hexane; N - None; O - AsNaO2; P - Na2O4S; Q - Na2SO3; R - Na2S2O3; S - H2SO4; T - TSP Dodecahydrate; U - Acetone; V - MCAA; W - pH 4-5; Z - other (specify)
State, Zip: PA, 15238				
Phone: 412-963-7058(Tel) 412-963-2468(Fax)	PO #:			
Email:	WO #:			Other:
Project Name: Sebree Station	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010C/3005A (MOD) Lithium	6020A/3005A (MOD) ICP/MS Metals	Total Number of containers	Special Instructions/Note:
			Preservation Code:							
023 (490-172013-1)	4/11/19	11:25 Eastern		Water			X	X	2	Metals - run once, upload together.

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	4-12-19 1615	TAN		4-13-19 930	FAPTC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Eurofins TestAmerica, Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-88697.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-172013-1
Address: 301 Alpha Drive, RIDC Park,	Due Date Requested: 4/24/2019			
City: Pittsburgh	TAT Requested (days):			
State, Zip: PA, 15238	PO #:			
Phone: 412-963-7058(Tel) 412-963-2468(Fax)	WO #:			
Email:	Project #: 49010431			
Project Name: Sebree Station	SSOW#:			
Site: Big Rivers CCR				

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify), Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Water, Solid, Oil, Tissue, Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010C/3005A (MOD) Lithium	6020A/3005A (MOD) ICP/MS Metals	Total Number of containers	Special Instructions/Note:
			Preservation Code							
023 (490-172013-1)	4/11/19	11:25 Eastern		Water			X	X	1	Metals - run once, upload together.

490-172013 Chain of Custody

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	4-12-19 1615	TAL		4-13-19 730	TAL PT
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Login Sample Receipt Checklist

Client: Big Rivers Electric Corporation

Job Number: 490-172013-1
SDG Number: Sebree Station

Login Number: 172013
List Number: 2
Creator: Watson, Debbie

List Source: Eurofins TestAmerica, Pittsburgh
List Creation: 04/13/19 01:27 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	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?	False	
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	

Appendix D

Landfill Perimeter Seeps Laboratory Analytical Results

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-155661-1
Client Project/Site: Sebree-Green Landfill

For:
Big Rivers Electric Corporation
PO BOX 24
Henderson, Kentucky 42419

Attn: Greg Dick

Roxanne Cisneros

Authorized for release by:
8/21/2018 10:53:38 AM

Roxanne Cisneros, Senior Project Manager
(615)301-5761
roxanne.cisneros@testamericainc.com

Table of Contents

Sample Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-155661-1	River Seep-08-071318	Water	07/13/18 07:50	07/14/18 10:50
490-155661-2	River Seep-12-071318	Water	07/13/18 09:15	07/14/18 10:50
490-155661-3	River Seep-16-071318	Water	07/13/18 11:00	07/14/18 10:50
490-155661-4	River Seep-14-071318	Water	07/13/18 10:10	07/14/18 10:50
490-155661-5	River Seep-09-071218	Water	07/12/18 13:50	07/14/18 10:50
490-155661-6	River Seep-07-071218	Water	07/12/18 14:50	07/14/18 10:50
490-155661-7	River Seep-05-071218	Water	07/12/18 14:25	07/14/18 10:50
490-155661-8	Landfill Seep-01-071318	Water	07/13/18 12:20	07/14/18 10:50
490-155661-9	Landfill Seep-01-071318-DUP	Water	07/13/18 12:20	07/14/18 10:50
490-155661-10	Landfill Seep-02-071318	Water	07/13/18 13:10	07/14/18 10:50
490-155661-11	Landfill Seep-03-071318	Water	07/13/18 13:30	07/14/18 10:50
490-155661-12	Pond-012-071318	Water	07/13/18 13:50	07/14/18 10:50
490-155661-13	Landfill Seep-04-071318	Water	07/13/18 14:15	07/14/18 10:50

Job ID: 490-155661-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-155661-1

Comments
Revised Report 8/10/2018 to add Potassium per client request.

Receipt
The samples were received on 7/14/2018 10:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 3 coolers at receipt time were 1.0º C, 3.1º C and 5.7º C.

HPLC/IC
Method(s) 9056A: The method blank for analytical batch 490-531256 contained Sulfate above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

Method(s) 9056A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for analytical batch 490-531256 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method(s) 9056A: The method blank for analytical batch 490-531256 contained Fluoride and Sulfate above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

Method(s) 9056A: The following samples were diluted due to the nature of the sample matrix: River Seep-08-071318 (490-155661-1), River Seep-14-071318 (490-155661-4), River Seep-09-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), River Seep-05-071218 (490-155661-7), Landfill Seep-01-071318 (490-155661-8), Landfill Seep-01-071318-DUP (490-155661-9), Landfill Seep-02-071318 (490-155661-10), Landfill Seep-03-071318 (490-155661-11), Pond-012-071318 (490-155661-12) and Landfill Seep-04-071318 (490-155661-13). Elevated reporting limits (RLs) are provided.

Method(s) 9056A: The method blank as well as the continuing calibration blanks for analytical batch 490-531368 contained sulfate above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

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

Metals
Method(s) 6020A: The following samples were diluted to bring the concentration of calcium within the linear range: Landfill Seep-03-071318 (490-155661-11) and Landfill Seep-04-071318 (490-155661-13). 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.

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

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

Narrative

Job Narrative
490-155661-2

Comments
No additional comments.

Receipt
The samples were received on 7/14/2018 10:50 AM; the samples arrived in good condition, properly preserved and, where required, on

Job ID: 490-155661-1 (Continued)

Laboratory: TestAmerica Nashville (Continued)

ice. The temperatures of the 3 coolers at receipt time were 1.0º C, 3.1º C and 5.7º C.

RAD

Method(s) 904.0: Ra-228 Prep Batch 160-376750: The following sample did not meet the requested limit (RL) due to the reduced sample volume attributed to the presence of matrix interferences (see prep NCM 160-144167). The sample was brown, opaque and contained heavy amounts of sediment. The data have been reported with this narrative. River Seep-05-071218 (490-155661-7)

Method(s) 904.0: Radium-228 Prep Batch 260-377705: The detection goal was not met for the following samples due to the presence of matrix interferences: Landfill Seep-03-071318 (490-155661-11). The samples were reduced due to potential matrix interferences. Sample 440-216184-1 was brown, opaque and contained floating debris. Sample 490-155661-11's crystallized precipitation interferes with the method's chemistry. Analytical results are reported with the detection limit achieved.

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376750:
Sample aliquot 490-155661-2 reduced due to potential matrix interference. Sample was yellow, murky, and contained heavy amounts of sediment.

Sample aliquots 490-155661-5 and 490-155661-7 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy amounts of sediment.

Sample aliquot 490-155661-8 reduced due to potential matrix interference. Samples were yellow, opaque, and had a strong odor similar to that of sulfur.

River Seep-12-071318 (490-155661-2), River Seep-09-071218 (490-155661-5), River Seep-05-071218 (490-155661-7) and Landfill Seep-01-071318 (490-155661-8)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376750: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: River Seep-08-071318 (490-155661-1), River Seep-12-071318 (490-155661-2), River Seep-09-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), River Seep-05-071218 (490-155661-7) and Landfill Seep-01-071318 (490-155661-8). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376805:
Sample aliquots 490-155661-9, 490-155661-12, and 490-155661-13 reduced due to potential matrix interference. Samples were yellow, opaque, and had strong odors similar to that of sulfur.

Sample aliquot 490-155661-10 reduced due to potential matrix interference. Sample was brown, opaque, and contained heavy sediment levels.

Sample aliquot 160-29589-1 reduced due to potential matrix interference. Samples were brown, murky, and contained floating debris.

Landfill Seep-01-071318-DUP (490-155661-9), Landfill Seep-02-071318 (490-155661-10), Pond-012-071318 (490-155661-12) and Landfill Seep-04-071318 (490-155661-13)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-377705:
Sample aliquot reduced due to matrix interference during the initial preparation of the sample. Crystallized precipitation interferes with chemistry of the method. Landfill Seep-03-071318 (490-155661-11)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376745: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: River Seep-08-071318 (490-155661-1), River Seep-12-071318 (490-155661-2), River Seep-09-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), River Seep-05-071218 (490-155661-7) and Landfill Seep-01-071318 (490-155661-8). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376745:

Job ID: 490-155661-1 (Continued)

Laboratory: TestAmerica Nashville (Continued)

Sample aliquot 490-155661-2 reduced due to potential matrix interference. Sample was yellow, murky, and contained heavy amounts of sediment.

Sample aliquots 490-155661-5 and 490-155661-7 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy amounts of sediment.

Sample aliquot 490-155661-8 reduced due to potential matrix interference. Samples were yellow, opaque, and had a strong odor similar to that of sulfur.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376796:
Sample aliquots 490-155661-9, 490-155661-12, and 490-155661-13 reduced due to potential matrix interference. Samples were yellow, opaque, and had strong odors similar to that of sulfur.

Sample aliquots 490-155661-10 and 160-29566-2 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy sediment levels.

Sample aliquot 160-29589-1 reduced due to potential matrix interference. Samples were brown, murky, and contained floating debris.

Landfill Seep-01-071318-DUP (490-155661-9), Landfill Seep-02-071318 (490-155661-10), Pond-012-071318 (490-155661-12) and Landfill Seep-04-071318 (490-155661-13)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-377701:
Sample aliquot reduced due to matrix interference during the initial preparation of the sample. Crystallized precipitation interferes with chemistry of the method.

Landfill Seep-03-071318 (490-155661-11)

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

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.
B	Compound was found in the blank and sample.
F1	MS and/or MSD Recovery is outside acceptance limits.

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.

General Chemistry

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.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
G	The Sample MDC is greater than the requested RL.

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Client Sample ID: River Seep-08-071318

Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2040		300	20.0	mg/L			07/25/18 21:00	100
Fluoride	0.0915	J	1.00	0.0100	mg/L			07/24/18 16:22	1
Sulfate	1440	B	250	1.50	mg/L			07/25/18 20:45	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	1.80		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:24	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00141	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:35	1
Arsenic	0.000404	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:35	1
Barium	0.0443	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:35	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:35	1
Boron	0.510	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:35	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:35	1
Calcium	801		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:35	1
Chromium	0.000560	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:35	1
Cobalt	0.000691	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:35	1
Lead	0.000769	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:35	1
Magnesium	291		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:35	1
Molybdenum	0.00296	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:35	1
Potassium	125		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:35	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:35	1
Sodium	274		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:35	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:35	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.16		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	174		10.0	5.00	mg/L			07/24/18 20:55	1
Total Dissolved Solids	5310		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.332		0.108	0.112	1.00	0.0893	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: River Seep-08-071318
Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.983		0.295	0.309	1.00	0.370	pCi/L	07/19/18 15:49	08/02/18 09:20	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:20*	*1*
Y Carrier	*90.5*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:20*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.31		0.314	0.329	5.00	0.370	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	32.7		3.00	0.200	mg/L			07/24/18 16:37	1
Fluoride	0.0803	J	1.00	0.0100	mg/L			07/24/18 16:37	1
Sulfate	16.1	B	5.00	0.0300	mg/L			07/24/18 16:37	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:29	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000499	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:40	1
Arsenic	0.00467	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:40	1
Barium	0.0757	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:40	1
Beryllium	0.000145	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:40	1
Boron	0.0379	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:40	1
Cadmium	0.000183	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:40	1
Calcium	21.1		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:40	1
Chromium	0.00200	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:40	1
Cobalt	0.00581		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:40	1
Lead	0.00221	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:40	1
Magnesium	5.20		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:40	1
Molybdenum	0.000948	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:40	1
Potassium	2.37		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:40	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:40	1
Sodium	5.52		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:40	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:40	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.00		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	38.2		10.0	5.00	mg/L			07/24/18 21:02	1
Total Dissolved Solids	157		10.0	7.00	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.542		0.153	0.161	1.00	0.105	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.629		0.351	0.356	1.00	0.527	pCi/L	07/19/18 15:49	08/02/18 09:21	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:21*	*1*
Y Carrier	*85.6*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:21*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.17		0.383	0.391	5.00	0.527	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-16-071318

Date Collected: 07/13/18 11:00
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-3

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	23.2		3.00	0.200	mg/L			07/24/18 16:52	1
Fluoride	0.177	J	1.00	0.0100	mg/L			07/24/18 16:52	1
Sulfate	26.5	B	5.00	0.0300	mg/L			07/24/18 16:52	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:35	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000270	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:44	1
Arsenic	0.0247		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:44	1
Barium	0.190	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:44	1
Beryllium	0.000211	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:44	1
Boron	0.0321	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:44	1
Cadmium	0.000196	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:44	1
Calcium	93.8		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:44	1
Chromium	0.00383		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:44	1
Cobalt	0.00613		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:44	1
Lead	0.00521		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:44	1
Magnesium	20.3		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:44	1
Molybdenum	0.00878	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:44	1
Potassium	4.85		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:44	1
Selenium	0.000906	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:44	1
Sodium	26.7		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:44	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:44	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.40		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	393		10.0	5.00	mg/L			07/24/18 21:09	1
Total Dissolved Solids	504		20.0	14.0	mg/L			07/18/18 08:50	1

Client Sample ID: River Seep-14-071318

Date Collected: 07/13/18 10:10
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-4

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	22.7		3.00	0.200	mg/L			07/24/18 17:07	1
Fluoride	0.144	J	1.00	0.0100	mg/L			07/24/18 17:07	1
Sulfate	159	B	50.0	0.300	mg/L			07/25/18 21:15	10

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0126	J	0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:50	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000312	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:49	1
Arsenic	0.0173		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:49	1
Barium	0.242		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:49	1
Beryllium	0.000497	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:49	1
Boron	0.0694	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:49	1
Cadmium	0.000312	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:49	1
Calcium	171		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:49	1
Chromium	0.00969		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:49	1
Cobalt	0.0125		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:49	1
Lead	0.0109		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:49	1
Magnesium	36.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:49	1
Molybdenum	0.00550	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:49	1
Potassium	4.96		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:49	1
Selenium	0.000582	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:49	1
Sodium	18.5		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:49	1
Thallium	0.000126	J	0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:49	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:07	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.14		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	443		10.0	5.00	mg/L			07/24/18 21:17	1
Total Dissolved Solids	790		20.0	14.0	mg/L			07/18/18 08:50	1

Client Sample ID: River Seep-09-071218

Date Collected: 07/12/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-5

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	189		30.0	2.00	mg/L			07/25/18 21:59	10
Fluoride	0.239	J F1	1.00	0.0100	mg/L			07/24/18 17:51	1
Sulfate	1310	B	250	1.50	mg/L			07/25/18 22:14	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0209	J	0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:56	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000200	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:06	1
Arsenic	0.00188	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:06	1
Barium	0.0384	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:06	1
Beryllium	0.00372		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:06	1
Boron	2.19		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:06	1
Cadmium	0.00307		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:06	1
Calcium	460		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:06	1
Chromium	0.00386		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:06	1
Cobalt	0.0447		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:06	1
Lead	0.00507		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:06	1
Magnesium	63.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:06	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:06	1
Potassium	9.51		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:06	1
Selenium	0.00216	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:06	1
Sodium	42.1		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:06	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:06	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	5.26		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 21:21	1
Total Dissolved Solids	2130		20.0	14.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.665		0.213	0.221	1.00	0.167	pCi/L	07/19/18 15:20	08/10/18 16:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:40*	*1*

Client Sample ID: River Seep-09-071218

Lab Sample ID: 490-155661-5
Date Collected: 07/12/18 13:50
Matrix: Water
Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.810		0.520	0.525	1.00	0.796	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*87.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.48		0.562	0.570	5.00	0.796	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1990		300	20.0	mg/L			07/25/18 22:29	100
Fluoride	0.102	J	1.00	0.0100	mg/L			07/24/18 18:21	1
Sulfate	1480	B	500	3.00	mg/L			07/25/18 22:29	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.772		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:01	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:11	1
Arsenic	0.00182	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:11	1
Barium	0.0605	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:11	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:11	1
Boron	1.46		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:11	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:11	1
Calcium	1120		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:11	1
Chromium	0.000340	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:11	1
Cobalt	0.0218		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:11	1
Lead	0.000523	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:11	1
Magnesium	51.8		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:11	1
Molybdenum	0.00219	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:11	1
Potassium	262		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:11	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:11	1
Sodium	277		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:11	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:11	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:09	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.01		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	87.7		10.0	5.00	mg/L			07/24/18 21:28	1
Total Dissolved Solids	6080		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.566		0.144	0.152	1.00	0.0969	pCi/L	07/19/18 15:20	08/10/18 16:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:39*	*1*

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6

Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.831		0.318	0.327	1.00	0.434	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*87.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.40		0.349	0.361	5.00	0.434	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1670		300	20.0	mg/L			07/25/18 22:44	100
Fluoride	0.0795	J	1.00	0.0100	mg/L			07/24/18 18:36	1
Sulfate	1170	B	500	3.00	mg/L			07/25/18 22:44	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.340		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:07	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000366	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:16	1
Arsenic	0.0192		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:16	1
Barium	0.718		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:16	1
Beryllium	0.000545	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:16	1
Boron	0.853	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:16	1
Cadmium	0.000563	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:16	1
Calcium	916		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:16	1
Chromium	0.0124		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:16	1
Cobalt	0.0327		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:16	1
Lead	0.0104		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:16	1
Magnesium	77.8		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:16	1
Molybdenum	0.00442	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:16	1
Potassium	238		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:16	1
Selenium	0.00121	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:16	1
Sodium	285		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:16	1
Thallium	0.000164	J	0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:16	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:12	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.95		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	229		10.0	5.00	mg/L			07/24/18 21:41	1
Total Dissolved Solids	5140		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	3.81		0.503	0.609	1.00	0.187	pCi/L	07/19/18 15:20	08/10/18 16:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.9*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:40*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: River Seep-05-071218
Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	3.83	G	0.871	0.940	1.00	1.07	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*83.0*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	7.64		1.01	1.12	5.00	1.07	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-01-071318

Date Collected: 07/13/18 12:20
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-8

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2090		600	40.0	mg/L			07/25/18 23:13	200
Fluoride	1.68		1.00	0.0100	mg/L			07/24/18 18:51	1
Sulfate	1580	B	250	1.50	mg/L			07/25/18 22:58	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	3.11		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:12	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00432		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:20	1
Arsenic	0.364		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:20	1
Barium	0.0666	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:20	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:20	1
Boron	1.15		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:20	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:20	1
Calcium	1210		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:20	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:20	1
Cobalt	0.0000370	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:20	1
Lead	0.000239	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:20	1
Magnesium	0.290	J	1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:20	1
Molybdenum	0.0925		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:20	1
Potassium	179		10.0	0.596	mg/L		07/18/18 12:44	08/07/18 12:06	10
Selenium	0.00781	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:20	1
Sodium	347		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:20	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:20	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.372		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:13	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	9.96		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	828		10.0	5.00	mg/L			07/24/18 21:50	1
Total Dissolved Solids	8560		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.656		0.222	0.229	1.00	0.200	pCi/L	07/19/18 15:20	08/10/18 16:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:38*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: Landfill Seep-01-071318
Date Collected: 07/13/18 12:20
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-8
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.851	U	0.577	0.582	1.00	0.889	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*75.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.51**		0.618	0.625	5.00	0.889	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-01-071318-DUP

Date Collected: 07/13/18 12:20
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-9

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2080		600	40.0	mg/L			07/25/18 23:43	200
Fluoride	1.90		1.00	0.0100	mg/L			07/24/18 19:06	1
Sulfate	1700	B	250	1.50	mg/L			07/25/18 23:28	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	3.13		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:18	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00463		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:25	1
Arsenic	0.393		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:25	1
Barium	0.0690	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:25	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:25	1
Boron	1.21		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:25	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:25	1
Calcium	1230		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:25	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:25	1
Cobalt	0.0000570	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:25	1
Lead	0.000254	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:25	1
Magnesium	0.335	J	1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:25	1
Molybdenum	0.0981		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:25	1
Potassium	37.3		10.0	0.596	mg/L		07/18/18 12:44	08/07/18 12:09	10
Selenium	0.00913	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:25	1
Sodium	362		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:25	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:25	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.388		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:14	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	10.0		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.9		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	841		10.0	5.00	mg/L			07/24/18 21:59	1
Total Dissolved Solids	7880		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.648		0.211	0.218	1.00	0.196	pCi/L	07/20/18 08:40	08/13/18 06:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*40 - 110*	*07/20/18 08:40*	*08/13/18 06:34*	*1*

Client Sample ID: Landfill Seep-01-071318-DUP

Lab Sample ID: 490-155661-9

Date Collected: 07/13/18 12:20

Matrix: Water

Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0841	U	0.488	0.488	1.00	0.874	pCi/L	07/20/18 09:30	08/02/18 09:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*
Y Carrier	*94.6*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.564	U	0.532	0.534	5.00	0.874	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-02-071318

Date Collected: 07/13/18 13:10
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-10
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1710		150	10.0	mg/L			07/25/18 23:58	50
Fluoride	1.19		1.00	0.0100	mg/L			07/24/18 19:20	1
Sulfate	1500	B	250	1.50	mg/L			07/25/18 23:58	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	2.85		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:24	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00218		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:30	1
Arsenic	0.126		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:30	1
Barium	0.0627	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:30	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:30	1
Boron	2.92		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:30	1
Cadmium	0.000464	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:30	1
Calcium	1030		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:30	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:30	1
Cobalt	0.000115	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:30	1
Lead	0.000247	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:30	1
Magnesium	0.804	J	1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:30	1
Molybdenum	1.78		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:30	1
Potassium	228		10.0	0.596	mg/L		07/18/18 12:44	08/07/18 12:12	10
Selenium	0.0103		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:30	1
Sodium	315		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:30	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:30	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.167	J	0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:15	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	9.02		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	178		10.0	5.00	mg/L			07/24/18 22:08	1
Total Dissolved Solids	7080		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.658		0.203	0.211	1.00	0.168	pCi/L	07/20/18 08:40	08/13/18 06:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.8*		*40 - 110*	*07/20/18 08:40*	*08/13/18 06:34*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: Landfill Seep-02-071318
Date Collected: 07/13/18 13:10
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-10
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.507	U	0.520	0.522	1.00	0.848	pCi/L	07/20/18 09:30	08/02/18 09:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.8*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*
Y Carrier	*85.6*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.16**		0.558	0.563	5.00	0.848	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-03-071318

Date Collected: 07/13/18 13:30
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-11

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4370		1500	100	mg/L			07/26/18 01:56	500
Fluoride	0.269	J	1.00	0.0100	mg/L			07/24/18 19:35	1
Sulfate	2080	B	500	3.00	mg/L			07/26/18 01:41	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	7.19		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:29	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0000610	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:34	1
Arsenic	0.00176	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:34	1
Barium	0.140	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:34	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:34	1
Boron	2.49		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:34	1
Cadmium	0.000279	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:34	1
Calcium	2250		10.0	0.412	mg/L		07/18/18 12:44	07/31/18 01:20	10
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:34	1
Cobalt	0.000321	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:34	1
Lead	0.000215	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:34	1
Magnesium	12.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:34	1
Molybdenum	0.792		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:34	1
Potassium	1140		10.0	0.596	mg/L		07/18/18 12:44	07/31/18 01:20	10
Selenium	0.00163	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:34	1
Sodium	566		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:34	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:34	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:16	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.04		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	93.9		10.0	5.00	mg/L			07/24/18 22:15	1
Total Dissolved Solids	12400		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.41		0.418	0.437	1.00	0.322	pCi/L	07/24/18 13:57	08/16/18 05:35	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*07/24/18 13:57*	*08/16/18 05:35*	*1*

Client Sample ID: Landfill Seep-03-071318

Lab Sample ID: 490-155661-11

Date Collected: 07/13/18 13:30

Matrix: Water

Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.136	U G	0.846	0.846	1.00	1.50	pCi/L	07/24/18 14:24	08/02/18 16:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*07/24/18 14:24*	*08/02/18 16:23*	*1*
Y Carrier	*92.7*		*40 - 110*	*07/24/18 14:24*	*08/02/18 16:23*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.54**		0.944	0.952	5.00	1.50	pCi/L		08/21/18 03:20	1

Client Sample ID: Pond-012-071318

Date Collected: 07/13/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-12

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1640		300	20.0	mg/L			07/26/18 02:11	100
Fluoride	0.266	J	1.00	0.0100	mg/L			07/24/18 19:50	1
Sulfate	1920	B	500	3.00	mg/L			07/26/18 02:11	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	2.52		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:35	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00302		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:39	1
Arsenic	0.278		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:39	1
Barium	0.0854	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:39	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:39	1
Boron	2.12		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:39	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:39	1
Calcium	1050		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:39	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:39	1
Cobalt	0.000203	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:39	1
Lead	0.000137	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:39	1
Magnesium	11.9		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:39	1
Molybdenum	0.133		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:39	1
Potassium	231		10.0	0.596	mg/L		07/18/18 12:44	08/07/18 12:15	10
Selenium	0.00201	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:39	1
Sodium	316		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:39	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:39	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.0840	J	0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:17	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	6.90		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	7.24	J	10.0	5.00	mg/L			07/24/18 22:22	1
Total Dissolved Solids	7180		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.962		0.258	0.272	1.00	0.223	pCi/L	07/20/18 08:40	08/13/18 06:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*40 - 110*	*07/20/18 08:40*	*08/13/18 06:34*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: Pond-012-071318
Date Collected: 07/13/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-12
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.505	U	0.599	0.600	1.00	0.988	pCi/L	07/20/18 09:30	08/02/18 09:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*
Y Carrier	*77.8*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.47**		0.652	0.659	5.00	0.988	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-04-071318

Date Collected: 07/13/18 14:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-13

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2710		300	20.0	mg/L			07/26/18 02:26	100
Fluoride	1.53		1.00	0.0100	mg/L			07/24/18 20:05	1
Sulfate	1490	B	500	3.00	mg/L			07/26/18 02:26	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	4.07		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:41	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00470		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:43	1
Arsenic	0.300		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:43	1
Barium	0.101	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:43	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:43	1
Boron	0.799	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:43	1
Cadmium	0.000161	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:43	1
Calcium	1750		10.0	0.412	mg/L		07/18/18 12:44	07/31/18 01:47	10
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:43	1
Cobalt	ND		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:43	1
Lead	0.0000730	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:43	1
Magnesium	0.347	J	1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:43	1
Molybdenum	0.214		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:43	1
Potassium	899		10.0	0.596	mg/L		07/18/18 12:44	07/31/18 01:47	10
Selenium	0.0103		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:43	1
Sodium	397		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:43	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:43	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.539		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	10.1		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	1060		10.0	5.00	mg/L			07/25/18 09:02	1
Total Dissolved Solids	10100		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.897		0.234	0.248	1.00	0.171	pCi/L	07/20/18 08:40	08/13/18 06:35	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.6*		*40 - 110*	*07/20/18 08:40*	*08/13/18 06:35*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: Landfill Seep-04-071318
Date Collected: 07/13/18 14:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-13
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.873		0.524	0.530	1.00	0.799	pCi/L	07/20/18 09:30	08/02/18 09:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.6*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*
Y Carrier	*86.4*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.77		0.574	0.585	5.00	0.799	pCi/L		08/21/18 03:20	1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 490-531256/3
Matrix: Water
Analysis Batch: 531256

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/24/18 13:54	1
Fluoride	ND		1.00	0.0100	mg/L			07/24/18 13:54	1
Sulfate	0.3643	J	5.00	0.0300	mg/L			07/24/18 13:54	1

Lab Sample ID: LCS 490-531256/4
Matrix: Water
Analysis Batch: 531256

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.350		mg/L		93	80 - 120
Fluoride	1.00	0.9781	J	mg/L		98	80 - 120
Sulfate	10.0	9.696		mg/L		97	80 - 120

Lab Sample ID: LCSD 490-531256/5
Matrix: Water
Analysis Batch: 531256

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.374		mg/L		94	80 - 120	0	20
Fluoride	1.00	0.9558	J	mg/L		95	80 - 120	2	20
Sulfate	10.0	9.589		mg/L		96	80 - 120	1	20

Lab Sample ID: 490-155661-5 MS
Matrix: Water
Analysis Batch: 531256

Client Sample ID: River Seep-09-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Fluoride	0.239	J F1	1.00	1.702	F1	mg/L		146	80 - 120

Lab Sample ID: MB 490-531368/3
Matrix: Water
Analysis Batch: 531368

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/25/18 18:18	1
Fluoride	ND		1.00	0.0100	mg/L			07/25/18 18:18	1
Sulfate	0.3720	J	5.00	0.0300	mg/L			07/25/18 18:18	1

Lab Sample ID: MB 490-531368/30
Matrix: Water
Analysis Batch: 531368

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/26/18 00:57	1
Fluoride	ND		1.00	0.0100	mg/L			07/26/18 00:57	1
Sulfate	0.3740	J	5.00	0.0300	mg/L			07/26/18 00:57	1

Method: 9056A - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 490-531368/31
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.348		mg/L		93	80 - 120
Fluoride	1.00	0.9475	J	mg/L		95	80 - 120
Sulfate	10.0	9.314		mg/L		93	80 - 120

Lab Sample ID: LCS 490-531368/4
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.348		mg/L		93	80 - 120
Fluoride	1.00	0.9854	J	mg/L		98	80 - 120
Sulfate	10.0	9.495		mg/L		95	80 - 120

Lab Sample ID: LCSD 490-531368/32
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.368		mg/L		94	80 - 120	0	20
Fluoride	1.00	0.9513	J	mg/L		95	80 - 120	0	20
Sulfate	10.0	9.447		mg/L		94	80 - 120	1	20

Lab Sample ID: LCSD 490-531368/5
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.296		mg/L		93	80 - 120	1	20
Fluoride	1.00	0.9931	J	mg/L		99	80 - 120	1	20
Sulfate	10.0	9.710		mg/L		97	80 - 120	2	20

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 180-250902/1-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 16:47	1

Lab Sample ID: LCS 180-250902/2-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	1.00	1.028		mg/L		103	80 - 120

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: 490-155660-A-5-B MS
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	0.0132	J	1.00	1.082		mg/L		107	75 - 125

Lab Sample ID: 490-155660-A-5-C MSD
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	0.0132	J	1.00	1.090		mg/L		108	75 - 125	1	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 180-250903/1-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 18:53	1
Arsenic	ND		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 18:53	1
Barium	ND		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 18:53	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 18:53	1
Boron	ND		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 18:53	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 18:53	1
Calcium	ND		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 18:53	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 18:53	1
Cobalt	ND		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 18:53	1
Lead	ND		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 18:53	1
Magnesium	ND		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 18:53	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 18:53	1
Potassium	ND		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 18:53	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 18:53	1
Sodium	ND		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 18:53	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 18:53	1

Lab Sample ID: LCS 180-250903/2-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.500	0.4729		mg/L		95	80 - 120
Arsenic	0.0400	0.03658		mg/L		91	80 - 120
Barium	2.00	1.840		mg/L		92	80 - 120
Beryllium	0.0500	0.05027		mg/L		101	80 - 120
Boron	1.00	0.8897	J	mg/L		89	80 - 120
Cadmium	0.0500	0.05029		mg/L		101	80 - 120
Calcium	50.0	45.70		mg/L		91	80 - 120
Chromium	0.200	0.1649		mg/L		82	80 - 120
Cobalt	0.500	0.4321		mg/L		86	80 - 120
Lead	0.0200	0.01998		mg/L		100	80 - 120

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 180-250903/2-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Magnesium	50.0	45.74		mg/L		91	80 - 120
Molybdenum	1.00	0.9327		mg/L		93	80 - 120
Potassium	50.0	46.09		mg/L		92	80 - 120
Selenium	0.0100	0.009085	J	mg/L		91	80 - 120
Sodium	50.0	44.98		mg/L		90	80 - 120
Thallium	0.0500	0.04846		mg/L		97	80 - 120

Lab Sample ID: 490-155660-A-6-C MS
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	ND		0.500	0.4679		mg/L		94	75 - 125
Arsenic	ND		0.0400	0.03692		mg/L		92	75 - 125
Barium	ND		2.00	1.839		mg/L		92	75 - 125
Beryllium	ND		0.0500	0.04768		mg/L		95	75 - 125
Boron	0.00422	J	1.00	0.8456	J	mg/L		84	75 - 125
Cadmium	ND		0.0500	0.04723		mg/L		94	75 - 125
Calcium	ND		50.0	45.39		mg/L		91	75 - 125
Chromium	ND		0.200	0.1840		mg/L		92	75 - 125
Cobalt	ND		0.500	0.4386		mg/L		88	75 - 125
Lead	0.000399	J	0.0200	0.01986		mg/L		97	75 - 125
Magnesium	0.0156	J	50.0	46.32		mg/L		93	75 - 125
Molybdenum	ND		1.00	0.9262		mg/L		93	75 - 125
Potassium	0.0680	J	50.0	46.15		mg/L		92	75 - 125
Selenium	ND		0.0100	0.01006		mg/L		101	75 - 125
Sodium	ND		50.0	45.34		mg/L		91	75 - 125
Thallium	ND		0.0500	0.04726		mg/L		95	75 - 125

Lab Sample ID: 490-155660-A-6-D MSD
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	ND		0.500	0.4680		mg/L		94	75 - 125	0	20
Arsenic	ND		0.0400	0.03704		mg/L		93	75 - 125	0	20
Barium	ND		2.00	1.847		mg/L		92	75 - 125	0	20
Beryllium	ND		0.0500	0.04801		mg/L		96	75 - 125	1	20
Boron	0.00422	J	1.00	0.8557	J	mg/L		85	75 - 125	1	20
Cadmium	ND		0.0500	0.04852		mg/L		97	75 - 125	3	20
Calcium	ND		50.0	44.91		mg/L		90	75 - 125	1	20
Chromium	ND		0.200	0.1875		mg/L		94	75 - 125	2	20
Cobalt	ND		0.500	0.4400		mg/L		88	75 - 125	0	20
Lead	0.000399	J	0.0200	0.01961		mg/L		96	75 - 125	1	20
Magnesium	0.0156	J	50.0	45.89		mg/L		92	75 - 125	1	20
Molybdenum	ND		1.00	0.9301		mg/L		93	75 - 125	0	20
Potassium	0.0680	J	50.0	45.93		mg/L		92	75 - 125	0	20
Selenium	ND		0.0100	0.01030		mg/L		103	75 - 125	2	20
Sodium	ND		50.0	45.17		mg/L		90	75 - 125	0	20

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-155660-A-6-D MSD
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Thallium	ND		0.0500	0.04752		mg/L		95	75 - 125	1	20

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 180-250943/1-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 250943

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 10:52	1

Lab Sample ID: LCS 180-250943/2-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	2.50	2.486		ug/L		99	80 - 120

Lab Sample ID: 180-79800-G-1-E MS
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		1.00	0.9270		ug/L		93	75 - 125

Lab Sample ID: 180-79800-G-1-F MSD
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		1.00	0.9210		ug/L		92	75 - 125	1	20

Method: 9040C - pH

Lab Sample ID: LCS 490-531203/1
Matrix: Water
Analysis Batch: 531203

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.000		SU		100	98 - 103

Lab Sample ID: 490-155660-D-5 DU
Matrix: Water
Analysis Batch: 531203

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	8.11		8.110		SU		0	20
Temperature	21.7		21.70		Degrees C		0	20

Method: 9040C - pH (Continued)

Lab Sample ID: LCS 490-531204/1
Matrix: Water
Analysis Batch: 531204

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			7.00	7.000		SU		100	98 - 103		

Lab Sample ID: 490-155661-9 DU
Matrix: Water
Analysis Batch: 531204

Client Sample ID: Landfill Seep-01-071318-DUP
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	10.0			10.03		SU				0	20
Temperature	21.9			21.90		Degrees C				0	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 490-531384/73
Matrix: Water
Analysis Batch: 531384

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 20:09	1

Lab Sample ID: LCS 490-531384/74
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity			100	95.45		mg/L		95	90 - 110		

Lab Sample ID: LCSD 490-531384/95
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Alkalinity			100	95.67		mg/L		96	90 - 110	0	20

Lab Sample ID: 490-155661-6 DU
Matrix: Water
Analysis Batch: 531384

Client Sample ID: River Seep-07-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Alkalinity	87.7			88.85		mg/L				1	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 490-529395/1
Matrix: Water
Analysis Batch: 529395

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10.0	7.00	mg/L			07/18/18 08:50	1

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: LCS 490-529395/2
Matrix: Water
Analysis Batch: 529395

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Dissolved Solids			100	103.0		mg/L		103	90 - 110		

Lab Sample ID: 490-155661-5 DU
Matrix: Water
Analysis Batch: 529395

Client Sample ID: River Seep-09-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	2130			2194		mg/L				3	20

Lab Sample ID: 490-155661-13 DU
Matrix: Water
Analysis Batch: 529395

Client Sample ID: Landfill Seep-04-071318
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	10100			10080		mg/L				0.1	20

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-376745/23-A
Matrix: Water
Analysis Batch: 381568

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376745

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.2502		0.100	0.103	1.00	0.106	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.1*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Lab Sample ID: LCS 160-376745/1-A
Matrix: Water
Analysis Batch: 381577

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376745

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	11.66		1.20	1.00	0.0735	pCi/L	103	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*

Lab Sample ID: LCSD 160-376745/2-A
Matrix: Water
Analysis Batch: 381577

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 376745

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226			11.4	10.89		1.13	1.00	0.109	pCi/L	96	68 - 137	0.33	1

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCSD 160-376745/2-A
Matrix: Water
Analysis Batch: 381577

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 376745

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	100		40 - 110

Lab Sample ID: MB 160-376796/18-A
Matrix: Water
Analysis Batch: 381804

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376796

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.2016		0.0795	0.0816	1.00	0.0804	pCi/L	07/20/18 08:40	08/13/18 06:36	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110	07/20/18 08:40	08/13/18 06:36	1

Lab Sample ID: LCS 160-376796/1-A
Matrix: Water
Analysis Batch: 381803

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376796

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	11.79		1.21	1.00	0.0688	pCi/L	104	68 - 137		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	99.7		40 - 110

Lab Sample ID: 400-156511-B-1-B DU
Matrix: Water
Analysis Batch: 381803

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 376796

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.266			0.2898		0.103	1.00	0.0896	pCi/L			0.12	1

Carrier	DU %Yield	DU Qualifier	Limits
Ba Carrier	90.3		40 - 110

Lab Sample ID: MB 160-377701/16-A
Matrix: Water
Analysis Batch: 382769

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 377701

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.2320		0.0970	0.0993	1.00	0.0872	pCi/L	07/24/18 13:57	08/16/18 05:31	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.7		40 - 110	07/24/18 13:57	08/16/18 05:31	1

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCS 160-377701/1-A
Matrix: Water
Analysis Batch: 382767

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 377701

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			15.1	13.45		1.40	1.00	0.0919	pCi/L	89	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.1*		*40 - 110*

Lab Sample ID: 600-169468-C-1-A DU
Matrix: Water
Analysis Batch: 382767

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 377701

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.394			0.3673		0.110	1.00	0.0820	pCi/L			0.12	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*94.4*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-376750/23-A
Matrix: Water
Analysis Batch: 379784

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376750

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.1002	U	0.206	0.206	1.00	0.387	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*85.6*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Lab Sample ID: LCS 160-376750/1-A
Matrix: Water
Analysis Batch: 379945

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376750

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			11.2	11.05		1.23	1.00	0.352	pCi/L	99	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*
Y Carrier	*86.4*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCSD 160-376750/2-A
Matrix: Water
Analysis Batch: 379945

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 376750

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			11.2	11.70		1.29	1.00	0.336	pCi/L	105	56 - 140	0.26	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*
Y Carrier	*87.5*		*40 - 110*

Lab Sample ID: MB 160-376805/18-A
Matrix: Water
Analysis Batch: 379949

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376805

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.4979		0.255	0.259	1.00	0.379	pCi/L	07/20/18 09:30	08/02/18 09:27	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*102*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:27*	*1*
Y Carrier	*91.6*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:27*	*1*

Lab Sample ID: LCS 160-376805/1-A
Matrix: Water
Analysis Batch: 379784

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376805

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			11.2	11.33		1.25	1.00	0.352	pCi/L	102	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*99.7*		*40 - 110*
Y Carrier	*91.2*		*40 - 110*

Lab Sample ID: 400-156511-B-1-D DU
Matrix: Water
Analysis Batch: 379784

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 376805

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	0.131	U		0.2403	U	0.319	1.00	0.528	pCi/L			0.20	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*90.3*		*40 - 110*
Y Carrier	*84.5*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: MB 160-377705/16-A
Matrix: Water
Analysis Batch: 380015

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 377705

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.3838	U	0.431	0.433	1.00	0.707	pCi/L	07/24/18 14:24	08/02/18 20:52	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/24/18 14:24*	*08/02/18 20:52*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/24/18 14:24*	*08/02/18 20:52*	*1*

Lab Sample ID: LCS 160-377705/1-A
Matrix: Water
Analysis Batch: 380015

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 377705

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			14.9	14.45		1.62	1.00	0.461	pCi/L	97	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.1*		*40 - 110*
Y Carrier	*88.6*		*40 - 110*

Lab Sample ID: 600-169468-C-1-B DU
Matrix: Water
Analysis Batch: 380015

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 377705

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	0.0185	U		0.1918	U	0.201	1.00	0.325	pCi/L			0.43	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*94.4*		*40 - 110*
Y Carrier	*90.8*		*40 - 110*

HPLC/IC

Analysis Batch: 531256

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-2	River Seep-12-071318	Total/NA	Water	9056A	
490-155661-3	River Seep-16-071318	Total/NA	Water	9056A	
490-155661-4	River Seep-14-071318	Total/NA	Water	9056A	
490-155661-5	River Seep-09-071218	Total/NA	Water	9056A	
490-155661-6	River Seep-07-071218	Total/NA	Water	9056A	
490-155661-7	River Seep-05-071218	Total/NA	Water	9056A	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	9056A	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	9056A	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	9056A	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	9056A	
490-155661-12	Pond-012-071318	Total/NA	Water	9056A	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	9056A	
MB 490-531256/3	Method Blank	Total/NA	Water	9056A	
LCS 490-531256/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-531256/5	Lab Control Sample Dup	Total/NA	Water	9056A	
490-155661-5 MS	River Seep-09-071218	Total/NA	Water	9056A	

Analysis Batch: 531368

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-4	River Seep-14-071318	Total/NA	Water	9056A	
490-155661-5	River Seep-09-071218	Total/NA	Water	9056A	
490-155661-5	River Seep-09-071218	Total/NA	Water	9056A	
490-155661-6	River Seep-07-071218	Total/NA	Water	9056A	
490-155661-7	River Seep-05-071218	Total/NA	Water	9056A	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	9056A	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	9056A	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	9056A	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	9056A	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	9056A	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	9056A	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	9056A	
490-155661-12	Pond-012-071318	Total/NA	Water	9056A	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	9056A	
MB 490-531368/3	Method Blank	Total/NA	Water	9056A	
MB 490-531368/30	Method Blank	Total/NA	Water	9056A	
LCS 490-531368/31	Lab Control Sample	Total/NA	Water	9056A	
LCS 490-531368/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-531368/32	Lab Control Sample Dup	Total/NA	Water	9056A	
LCSD 490-531368/5	Lab Control Sample Dup	Total/NA	Water	9056A	

Metals

Prep Batch: 250902

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	3005A	
490-155661-2	River Seep-12-071318	Total Recoverable	Water	3005A	
490-155661-3	River Seep-16-071318	Total Recoverable	Water	3005A	

Metals (Continued)

Prep Batch: 250902 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-4	River Seep-14-071318	Total Recoverable	Water	3005A	
490-155661-5	River Seep-09-071218	Total Recoverable	Water	3005A	
490-155661-6	River Seep-07-071218	Total Recoverable	Water	3005A	
490-155661-7	River Seep-05-071218	Total Recoverable	Water	3005A	
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	3005A	
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	3005A	
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	3005A	
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	3005A	
490-155661-12	Pond-012-071318	Total Recoverable	Water	3005A	
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	3005A	
MB 180-250902/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-250902/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-155660-A-5-B MS	Matrix Spike	Total Recoverable	Water	3005A	
490-155660-A-5-C MSD	Matrix Spike Duplicate	Total Recoverable	Water	3005A	

Prep Batch: 250903

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	3005A	
490-155661-2	River Seep-12-071318	Total Recoverable	Water	3005A	
490-155661-3	River Seep-16-071318	Total Recoverable	Water	3005A	
490-155661-4	River Seep-14-071318	Total Recoverable	Water	3005A	
490-155661-5	River Seep-09-071218	Total Recoverable	Water	3005A	
490-155661-6	River Seep-07-071218	Total Recoverable	Water	3005A	
490-155661-7	River Seep-05-071218	Total Recoverable	Water	3005A	
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	3005A	
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	3005A	
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	3005A	
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	3005A	
490-155661-12	Pond-012-071318	Total Recoverable	Water	3005A	
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	3005A	
MB 180-250903/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-250903/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-155660-A-6-C MS	Matrix Spike	Total Recoverable	Water	3005A	
490-155660-A-6-D MSD	Matrix Spike Duplicate	Total Recoverable	Water	3005A	

Prep Batch: 250943

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	7470A	
490-155661-2	River Seep-12-071318	Total/NA	Water	7470A	
490-155661-3	River Seep-16-071318	Total/NA	Water	7470A	
490-155661-4	River Seep-14-071318	Total/NA	Water	7470A	
490-155661-5	River Seep-09-071218	Total/NA	Water	7470A	
490-155661-6	River Seep-07-071218	Total/NA	Water	7470A	
490-155661-7	River Seep-05-071218	Total/NA	Water	7470A	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	7470A	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	7470A	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	7470A	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	7470A	
490-155661-12	Pond-012-071318	Total/NA	Water	7470A	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	7470A	
MB 180-250943/1-A	Method Blank	Total/NA	Water	7470A	

Metals (Continued)

Prep Batch: 250943 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 180-250943/2-A	Lab Control Sample	Total/NA	Water	7470A	
180-79800-G-1-E MS	Matrix Spike	Total/NA	Water	7470A	
180-79800-G-1-F MSD	Matrix Spike Duplicate	Total/NA	Water	7470A	

Analysis Batch: 251171

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	EPA 7470A	250943
490-155661-2	River Seep-12-071318	Total/NA	Water	EPA 7470A	250943
490-155661-3	River Seep-16-071318	Total/NA	Water	EPA 7470A	250943
490-155661-4	River Seep-14-071318	Total/NA	Water	EPA 7470A	250943
490-155661-5	River Seep-09-071218	Total/NA	Water	EPA 7470A	250943
490-155661-6	River Seep-07-071218	Total/NA	Water	EPA 7470A	250943
490-155661-7	River Seep-05-071218	Total/NA	Water	EPA 7470A	250943
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	EPA 7470A	250943
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	EPA 7470A	250943
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	EPA 7470A	250943
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	EPA 7470A	250943
490-155661-12	Pond-012-071318	Total/NA	Water	EPA 7470A	250943
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	EPA 7470A	250943
MB 180-250943/1-A	Method Blank	Total/NA	Water	EPA 7470A	250943
LCS 180-250943/2-A	Lab Control Sample	Total/NA	Water	EPA 7470A	250943
180-79800-G-1-E MS	Matrix Spike	Total/NA	Water	EPA 7470A	250943
180-79800-G-1-F MSD	Matrix Spike Duplicate	Total/NA	Water	EPA 7470A	250943

Analysis Batch: 251527

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	6010C	250902
490-155661-2	River Seep-12-071318	Total Recoverable	Water	6010C	250902
490-155661-3	River Seep-16-071318	Total Recoverable	Water	6010C	250902
490-155661-4	River Seep-14-071318	Total Recoverable	Water	6010C	250902
490-155661-5	River Seep-09-071218	Total Recoverable	Water	6010C	250902
490-155661-6	River Seep-07-071218	Total Recoverable	Water	6010C	250902
490-155661-7	River Seep-05-071218	Total Recoverable	Water	6010C	250902
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	6010C	250902
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	6010C	250902
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	6010C	250902
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	6010C	250902
490-155661-12	Pond-012-071318	Total Recoverable	Water	6010C	250902
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	6010C	250902
MB 180-250902/1-A	Method Blank	Total Recoverable	Water	6010C	250902
LCS 180-250902/2-A	Lab Control Sample	Total Recoverable	Water	6010C	250902
490-155660-A-5-B MS	Matrix Spike	Total Recoverable	Water	6010C	250902
490-155660-A-5-C MSD	Matrix Spike Duplicate	Total Recoverable	Water	6010C	250902

Analysis Batch: 252059

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	6020A	250903
490-155661-2	River Seep-12-071318	Total Recoverable	Water	6020A	250903
490-155661-3	River Seep-16-071318	Total Recoverable	Water	6020A	250903
490-155661-4	River Seep-14-071318	Total Recoverable	Water	6020A	250903
490-155661-5	River Seep-09-071218	Total Recoverable	Water	6020A	250903

Metals (Continued)

Analysis Batch: 252059 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-6	River Seep-07-071218	Total Recoverable	Water	6020A	250903
490-155661-7	River Seep-05-071218	Total Recoverable	Water	6020A	250903
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	6020A	250903
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	6020A	250903
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	6020A	250903
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	6020A	250903
490-155661-12	Pond-012-071318	Total Recoverable	Water	6020A	250903
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	6020A	250903
MB 180-250903/1-A	Method Blank	Total Recoverable	Water	6020A	250903
LCS 180-250903/2-A	Lab Control Sample	Total Recoverable	Water	6020A	250903
490-155660-A-6-C MS	Matrix Spike	Total Recoverable	Water	6020A	250903
490-155660-A-6-D MSD	Matrix Spike Duplicate	Total Recoverable	Water	6020A	250903

Analysis Batch: 252316

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	6020A	250903
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	6020A	250903

Analysis Batch: 253104

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	6020A	250903
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	6020A	250903
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	6020A	250903
490-155661-12	Pond-012-071318	Total Recoverable	Water	6020A	250903

General Chemistry

Analysis Batch: 529395

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	SM 2540C	
490-155661-2	River Seep-12-071318	Total/NA	Water	SM 2540C	
490-155661-3	River Seep-16-071318	Total/NA	Water	SM 2540C	
490-155661-4	River Seep-14-071318	Total/NA	Water	SM 2540C	
490-155661-5	River Seep-09-071218	Total/NA	Water	SM 2540C	
490-155661-6	River Seep-07-071218	Total/NA	Water	SM 2540C	
490-155661-7	River Seep-05-071218	Total/NA	Water	SM 2540C	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	SM 2540C	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	SM 2540C	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	SM 2540C	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	SM 2540C	
490-155661-12	Pond-012-071318	Total/NA	Water	SM 2540C	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	SM 2540C	
MB 490-529395/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 490-529395/2	Lab Control Sample	Total/NA	Water	SM 2540C	
490-155661-5 DU	River Seep-09-071218	Total/NA	Water	SM 2540C	
490-155661-13 DU	Landfill Seep-04-071318	Total/NA	Water	SM 2540C	

Analysis Batch: 531203

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9040C	

General Chemistry (Continued)

Analysis Batch: 531203 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-2	River Seep-12-071318	Total/NA	Water	9040C	
490-155661-3	River Seep-16-071318	Total/NA	Water	9040C	
490-155661-4	River Seep-14-071318	Total/NA	Water	9040C	
490-155661-5	River Seep-09-071218	Total/NA	Water	9040C	
490-155661-6	River Seep-07-071218	Total/NA	Water	9040C	
490-155661-7	River Seep-05-071218	Total/NA	Water	9040C	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	9040C	
LCS 490-531203/1	Lab Control Sample	Total/NA	Water	9040C	
490-155660-D-5 DU	Duplicate	Total/NA	Water	9040C	

Analysis Batch: 531204

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	9040C	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	9040C	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	9040C	
490-155661-12	Pond-012-071318	Total/NA	Water	9040C	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	9040C	
LCS 490-531204/1	Lab Control Sample	Total/NA	Water	9040C	
490-155661-9 DU	Landfill Seep-01-071318-DUP	Total/NA	Water	9040C	

Analysis Batch: 531384

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	SM 2320B	
490-155661-2	River Seep-12-071318	Total/NA	Water	SM 2320B	
490-155661-3	River Seep-16-071318	Total/NA	Water	SM 2320B	
490-155661-4	River Seep-14-071318	Total/NA	Water	SM 2320B	
490-155661-5	River Seep-09-071218	Total/NA	Water	SM 2320B	
490-155661-6	River Seep-07-071218	Total/NA	Water	SM 2320B	
490-155661-7	River Seep-05-071218	Total/NA	Water	SM 2320B	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	SM 2320B	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	SM 2320B	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	SM 2320B	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	SM 2320B	
490-155661-12	Pond-012-071318	Total/NA	Water	SM 2320B	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	SM 2320B	
MB 490-531384/73	Method Blank	Total/NA	Water	SM 2320B	
LCS 490-531384/74	Lab Control Sample	Total/NA	Water	SM 2320B	
LCSD 490-531384/95	Lab Control Sample Dup	Total/NA	Water	SM 2320B	
490-155661-6 DU	River Seep-07-071218	Total/NA	Water	SM 2320B	

Rad

Prep Batch: 376745

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	PrecSep-21	
490-155661-2	River Seep-12-071318	Total/NA	Water	PrecSep-21	
490-155661-5	River Seep-09-071218	Total/NA	Water	PrecSep-21	
490-155661-6	River Seep-07-071218	Total/NA	Water	PrecSep-21	
490-155661-7	River Seep-05-071218	Total/NA	Water	PrecSep-21	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	PrecSep-21	

Rad (Continued)

Prep Batch: 376745 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 160-376745/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-376745/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-376745/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 376750

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	PrecSep_0	
490-155661-2	River Seep-12-071318	Total/NA	Water	PrecSep_0	
490-155661-5	River Seep-09-071218	Total/NA	Water	PrecSep_0	
490-155661-6	River Seep-07-071218	Total/NA	Water	PrecSep_0	
490-155661-7	River Seep-05-071218	Total/NA	Water	PrecSep_0	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	PrecSep_0	
MB 160-376750/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-376750/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-376750/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Prep Batch: 376796

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	PrecSep-21	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	PrecSep-21	
490-155661-12	Pond-012-071318	Total/NA	Water	PrecSep-21	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	PrecSep-21	
MB 160-376796/18-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-376796/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
400-156511-B-1-B DU	Duplicate	Total/NA	Water	PrecSep-21	

Prep Batch: 376805

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	PrecSep_0	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	PrecSep_0	
490-155661-12	Pond-012-071318	Total/NA	Water	PrecSep_0	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	PrecSep_0	
MB 160-376805/18-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-376805/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
400-156511-B-1-D DU	Duplicate	Total/NA	Water	PrecSep_0	

Prep Batch: 377701

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	PrecSep-21	
MB 160-377701/16-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-377701/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
600-169468-C-1-A DU	Duplicate	Total/NA	Water	PrecSep-21	

Prep Batch: 377705

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	PrecSep_0	
MB 160-377705/16-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-377705/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
600-169468-C-1-B DU	Duplicate	Total/NA	Water	PrecSep_0	

Client Sample ID: River Seep-08-071318

Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:22	SW1	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 20:45	JHS	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 21:00	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:24	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:35	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:04	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 20:55	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			999.94 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381568	08/10/18 16:41	RTM	TAL SL
Total/NA	Prep	PrecSep_0			999.94 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379945	08/02/18 09:20	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:37	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:29	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:40	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:05	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:02	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			750.37 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381568	08/10/18 16:41	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.37 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:21	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-16-071318

Lab Sample ID: 490-155661-3

Date Collected: 07/13/18 11:00

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:52	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:35	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:44	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:06	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:09	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH

Client Sample ID: River Seep-14-071318

Lab Sample ID: 490-155661-4

Date Collected: 07/13/18 10:10

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 17:07	SW1	TAL NSH
Total/NA	Analysis	9056A		10			531368	07/25/18 21:15	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:50	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:49	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:07	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:17	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH

Client Sample ID: River Seep-09-071218

Lab Sample ID: 490-155661-5

Date Collected: 07/12/18 13:50

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 17:51	SW1	TAL NSH
Total/NA	Analysis	9056A		10			531368	07/25/18 21:59	JHS	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 22:14	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:56	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:06	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:08	RJR	TAL PIT

Client Sample ID: River Seep-09-071218

Date Collected: 07/12/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:21	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.17 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:40	RTM	TAL SL
Total/NA	Prep	PrecSep_0			500.17 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:21	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 22:29	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:01	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:11	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:09	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:28	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			999.84 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:39	RTM	TAL SL
Total/NA	Prep	PrecSep_0			999.84 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:36	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 22:44	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:07	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:16	WTR	TAL PIT

Client Sample ID: River Seep-05-071218

Lab Sample ID: 490-155661-7

Date Collected: 07/12/18 14:25
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:12	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:41	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			499.95 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:40	RTM	TAL SL
Total/NA	Prep	PrecSep_0			499.95 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-01-071318

Lab Sample ID: 490-155661-8

Date Collected: 07/13/18 12:20
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:51	SW1	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 22:58	JHS	TAL NSH
Total/NA	Analysis	9056A		200			531368	07/25/18 23:13	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:12	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10			253104	08/07/18 12:06	RSK	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:20	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:13	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:50	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.48 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381577	08/10/18 16:38	RTM	TAL SL
Total/NA	Prep	PrecSep_0			500.48 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-01-071318-DUP

Lab Sample ID: 490-155661-9

Date Collected: 07/13/18 12:20
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 19:06	SW1	TAL NSH

Client Sample ID: Landfill Seep-01-071318-DUP

Lab Sample ID: 490-155661-9

Date Collected: 07/13/18 12:20
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		50			531368	07/25/18 23:28	JHS	TAL NSH
Total/NA	Analysis	9056A		200			531368	07/25/18 23:43	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:18	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10			253104	08/07/18 12:09	RSK	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:25	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:14	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:59	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.28 mL	1.0 g	376796	07/20/18 08:40	JLC	TAL SL
Total/NA	Analysis	903.0		1			381803	08/13/18 06:34	CDR	TAL SL
Total/NA	Prep	PrecSep_0			500.28 mL	1.0 g	376805	07/20/18 09:30	JLC	TAL SL
Total/NA	Analysis	904.0		1	1.0 mL	1.0 mL	379784	08/02/18 09:25	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-02-071318

Lab Sample ID: 490-155661-10

Date Collected: 07/13/18 13:10
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 19:20	SW1	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 23:58	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:24	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10			253104	08/07/18 12:12	RSK	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:30	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:15	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 22:08	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.14 mL	1.0 g	376796	07/20/18 08:40	JLC	TAL SL
Total/NA	Analysis	903.0		1			381803	08/13/18 06:34	CDR	TAL SL
Total/NA	Prep	PrecSep_0			500.14 mL	1.0 g	376805	07/20/18 09:30	JLC	TAL SL
Total/NA	Analysis	904.0		1	1.0 mL	1.0 mL	379784	08/02/18 09:25	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-03-071318

Lab Sample ID: 490-155661-11

Date Collected: 07/13/18 13:30
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 19:35	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/26/18 01:41	JHS	TAL NSH
Total/NA	Analysis	9056A		500			531368	07/26/18 01:56	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:29	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:34	WTR	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10	1.0 mL	1.0 mL	252316	07/31/18 01:20	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:16	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 22:15	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			250.40 mL	1.0 g	377701	07/24/18 13:57	JLC	TAL SL
Total/NA	Analysis	903.0		1			382767	08/16/18 05:35	ALS	TAL SL
Total/NA	Prep	PrecSep_0			250.40 mL	1.0 g	377705	07/24/18 14:24	JLC	TAL SL
Total/NA	Analysis	904.0		1			380015	08/02/18 16:23	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Pond-012-071318

Lab Sample ID: 490-155661-12

Date Collected: 07/13/18 13:50
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 19:50	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/26/18 02:11	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:35	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10			253104	08/07/18 12:15	RSK	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:39	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:17	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 22:22	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.18 mL	1.0 g	376796	07/20/18 08:40	JLC	TAL SL
Total/NA	Analysis	903.0		1			381803	08/13/18 06:34	CDR	TAL SL
Total/NA	Prep	PrecSep_0			500.18 mL	1.0 g	376805	07/20/18 09:30	JLC	TAL SL
Total/NA	Analysis	904.0		1	1.0 mL	1.0 mL	379784	08/02/18 09:25	CDR	TAL SL

Client Sample ID: Pond-012-071318

Lab Sample ID: 490-155661-12

Date Collected: 07/13/18 13:50

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-04-071318

Lab Sample ID: 490-155661-13

Date Collected: 07/13/18 14:15

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 20:05	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/26/18 02:26	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:41	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:43	WTR	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10	1.0 mL	1.0 mL	252316	07/31/18 01:47	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:18	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/25/18 09:02	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.06 mL	1.0 g	376796	07/20/18 08:40	JLC	TAL SL
Total/NA	Analysis	903.0		1			381803	08/13/18 06:35	CDR	TAL SL
Total/NA	Prep	PrecSep_0			500.06 mL	1.0 g	376805	07/20/18 09:30	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:25	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Method Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL NSH
6010C	Metals (ICP)	SW846	TAL PIT
6020A	Metals (ICP/MS)	SW846	TAL PIT
EPA 7470A	Mercury (CVAA)	SW846	TAL PIT
9040C	pH	SW846	TAL NSH
SM 2320B	Alkalinity	SM	TAL NSH
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL NSH
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL PIT
7470A	Preparation, Mercury	SW846	TAL PIT

Protocol References:

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:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Laboratory: TestAmerica Nashville

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Kentucky (UST)	State Program	4	19	06-30-19

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
9040C		Water	pH
9040C		Water	Temperature
9056A		Water	Chloride
9056A		Water	Fluoride
9056A		Water	Sulfate
SM 2320B		Water	Alkalinity
SM 2540C		Water	Total Dissolved Solids

Laboratory: TestAmerica Pittsburgh

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Arkansas DEQ	State Program	6	88-0690	06-27-19
California	State Program	9	2891	04-30-19
Connecticut	State Program	1	PH-0688	09-30-18
Florida	NELAP	4	E871008	06-30-19
Illinois	NELAP	5	200005	06-30-19
Kansas	NELAP	7	E-10350	01-31-19
Louisiana	NELAP	6	04041	06-30-19
Nevada	State Program	9	PA00164	07-31-19
New Hampshire	NELAP	1	2030	04-04-19
New Jersey	NELAP	2	PA005	06-30-19
New York	NELAP	2	11182	03-31-19
North Carolina (WW/SW)	State Program	4	434	12-31-18
Oregon	NELAP	10	PA-2151	01-28-19
Pennsylvania	NELAP	3	02-00416	04-30-19
South Carolina	State Program	4	89014	04-30-19
Texas	NELAP	6	T104704528-15-2	03-31-19
US Fish & Wildlife	Federal		LE94312A-1	07-31-19
USDA	Federal		P330-16-00211	06-26-19
Utah	NELAP	8	PA001462015-4	05-31-19
Virginia	NELAP	3	460189	09-14-18 *
West Virginia DEP	State Program	3	142	01-31-19
Wisconsin	State Program	5	998027800	08-31-18

Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	DoD ELAP		L2305	04-06-19
Arizona	State Program	9	AZ0813	12-08-18
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19
Florida	NELAP	4	E87689	06-30-19
Illinois	NELAP	5	200023	11-30-18
Iowa	State Program	7	373	12-01-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Laboratory: TestAmerica St. Louis (Continued)

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Kansas	NELAP	7	E-10236	10-31-18
Kentucky (DW)	State Program	4	90125	12-31-18
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA180017	12-31-18
Maryland	State Program	3	310	09-30-18 *
Michigan	State Program	5	9005	06-30-18 *
Missouri	State Program	7	780	06-30-18 *
Nevada	State Program	9	MO000542018-1	07-31-19
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-18 *
Pennsylvania	NELAP	3	68-00540	02-28-19
South Carolina	State Program	4	85002001	06-30-18 *
Texas	NELAP	6	T104704193-18-12	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542016-8	07-31-18 *
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-18 *
West Virginia DEP	State Program	3	381	08-31-18 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-155661 Chain of Custody

Cooler Received/Opened On 7/14/2018 @ 1050

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2692 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960357 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 5.9 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO (NA)

4. Were custody seals on outside of cooler? (YES) NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? (YES) NO...NA

6. Were custody papers inside cooler? (YES) NO...NA

I certify that I opened the cooler and answered questions 1-6 (initial) GH

7. Were custody seals on containers: YES (NO) and Intact YES...NO...(NA)

Were these signed and dated correctly? YES...NO...(NA)

8. Packing mat'l used? (Bubblewrap) Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: (Ice) Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? (YES) NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? (YES) NO...NA

12. Did all container labels and tags agree with custody papers? (YES) NO...NA

13a. Were VOA vials received? YES (NO) NA

b. Was there any observable headspace present in any VOA vial? YES...NO...(NA)

Larger than this.

14. Was there a Trip Blank in this cooler? YES (NO) NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (initial) AOH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...(NA)

b. Did the bottle labels indicate that the correct preservatives were used (YES) NO...NA

16. Was residual chlorine present? YES...NO...(NA)

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (initial) AOH

17. Were custody papers properly filled out (ink, signed, etc)? (YES) NO...NA

18. Did you sign the custody papers in the appropriate place? (YES) NO...NA

19. Were correct containers used for the analysis requested? (YES) NO...NA

20. Was sufficient amount of sample sent in each container? (YES) NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (initial) AOH

I certify that I attached a label with the unique LIMS number to each container (initial) AOH

21. Were there Non-Conformance issues at login? YES (NO) Was a NCM generated? YES (NO) #_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

Loc: 490
155661

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Cooler Received/Opened On 7/14/2018 @ 10:50

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2681 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960353 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 1.0 Degrees Celsius

3. If item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES NO NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES NO NA

6. Were custody papers inside cooler? YES NO NA

I certify that I opened the cooler and answered questions 1-6 (intial) YOF

7. Were custody seals on containers: YES NO and Intact YES NO NA

Were these signed and dated correctly? YES NO NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES NO NA

12. Did all container labels and tags agree with custody papers? YES NO NA

13a. Were VOA vials received? YES NO NA

b. Was there any observable headspace present in any VOA vial? YES NO NA

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES NO NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) YOF

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO NA

b. Did the bottle labels indicate that the correct preservatives were used YES NO NA

16. Was residual chlorine present? YES NO NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) YOF

17. Were custody papers properly filled out (ink, signed, etc)? YES NO NA

18. Did you sign the custody papers in the appropriate place? YES NO NA

19. Were correct containers used for the analysis requested? YES NO NA

20. Was sufficient amount of sample sent in each container? YES NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) YOF

I certify that I attached a label with the unique LIMS number to each container (intial) YOF

21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES NO #_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

Loc: 490
155661

COOLER RECEIPT FORM

Cooler Received/Opened On 7/14/2018 @1050

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2670 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 14740456 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 3.1 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) ADT

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) ADT

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) ADT

I certify that I attached a label with the unique LIMS number to each container (intial) ADT

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex 3 Fedex	COC No: 490-86693-25173.1
Client Contact: Greg Dick	Phone: 513-237-1647	E-Mail: roxanne.cisneros@testamericainc.com		Page: Page 1 of 2
Company: Big Rivers Electric Corporation				Job #:
Address: PO BOX 24	Due Date Requested: Standard		Analysis Requested	Preservation Codes:
City: Henderson	TAT Requested (days): Standard			A - HCL M - Hexane B - NaOH N - None C - Zn Acetate O - AsNaO2 D - Nitric Acid P - Na2O4S E - NaHSO4 Q - Na2SO3 F - MeOH R - Na2S2O3 G - Amchlor S - H2SO4 H - Ascorbic Acid T - TSP Dodecahydrate I - Ice U - Acetone J - DI Water V - MCAA K - EDTA W - pH 4-5 L - EDA Z - other (specify)
State, Zip: KY, 42419				
Phone: 270-844-6010(Tel)	PO #: Purchase Order - see DOCs			Other:
Email: Gregory.Dick@bigrivers.com	WO #:			
Project Name: Big Rivers Electric Corp - Henderson KY	Sebree Green Landfill			CCR App III, IV + Alk, Na, Mg
Site: Sebree Green Landfill	SSOW#:			

Loc: 490
155661

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056_ORGFM_28D	6010B, 7470A	25400_Calcd - TDS	Redox 226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N			
River Seep - 08 - 071318	7/13/18	0750	G	Water			X	X	X	X	5	pH 7.09
River Seep - 12 - 071318	7/13/18	0915		Water			X	X	X	X	5	7.37
River Seep - 16 - 071318	7/13/18	1100		Water			X	X	X		3	7.46
River Seep - 14 - 071318	7/13/18	1010		Water			X	X	X		3	7.54
River Seep - 04 - 071218	7/12/18	1350		Water			X	X	X	X	5	5.13
River Seep - 07 - 071218	7/12/18	1450		Water			X	X	X	X	5	7.27
River Seep - 05 - 071218	7/12/18	1425		Water			X	X	X	X	5	6.92
Landfill Seep - 01 - 071318	7/13/18	1220		Water			X	X	X	X	5	10.64
Landfill Seep - 01 - 071318 - Dup	7/13/18	1220		Water			X	X	X	X	5	10.64
Landfill Seep - 02 - 071318	7/13/18	1310		Water			X	X	X	X	5	10.20
Landfill Seep - 03 - 071318	7/13/18	1330		Water			X	X	X	X	5	8.02

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 7/13/18 1630	Company: AECOM	Received by:	Date/Time: 7/14/18 1050	Company: TALAS
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 5.7, 1.0, 3.1

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex Rodeis	COC No: 490-86693-25173.1
Client Contact: Greg Dick	Phone: 513-237-1188	E-Mail: roxanne.cisneros@testamericainc.com		Page: Page 1 of 2
Company: Big Rivers Electric Corporation				Job #:
Address: PO BOX 24	Due Date Requested: Standard			
City: Henderson	TAT Requested (days): Standard			
State, Zip: KY, 42419				
Phone: 270-844-6010(Tel)	PO #: Purchase Order - see DOCs			
Email: Gregory.Dick@bigrivers.com	WO #:			
Project Name: Big Rivers Electric Corp - Henderson KY	Sebree Green Landfill			
Site: Sebree Green Landfill	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Wastewater, Sewage, Drinking Water, Tissue, Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056, ORGFM_28D	6010C, 6020A	6020B, 7470A	2540C, Calcd - TDS	Radium 226/228	Cl, SO4	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N	D				CCR App III, IV + Alk, Na, Mg
POND-012-071318	7/13/18	1350	G	Water	N	N	X	X	X	X				pH 7.95
Landfill Seep-04-071318	7/13/18	1415	G	Water	N	N	X	X	X	X				pH 10.71
~~Trip Seep 16 071318~~ CS	~~7/13/18~~	~~1044~~		Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										

Loc: 490
155661

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:				
Relinquished by:	Date/Time: 7/13/18 1630	Company: Aecom	Received by:	Date/Time: 7/14/18 1050	Company: TA-NAS
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 5.7, 1.0, 3.1

Ver: 08/04/2016

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-75464.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-155661-2
Address: 13715 Rider Trail North,	Due Date Requested: 8/13/2018			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Big Rivers Electric Corp - CCR & SemiAnn	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)
	Other:

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
River Seep-08-071318 (490-155661-1)	7/13/18	07:50 Central		Water			X	X	X	2	run once - upload data twice
River Seep-12-071318 (490-155661-2)	7/13/18	09:15 Central		Water			X	X	X	2	run once - upload data twice
River Seep-09-071218 (490-155661-5)	7/12/18	13:50 Central		Water			X	X	X	2	run once - upload data twice
River Seep-07-071218 (490-155661-6)	7/12/18	14:50 Central		Water			X	X	X	2	run once - upload data twice
River Seep-05-071218 (490-155661-7)	7/12/18	14:25 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-01-071318 (490-155661-8)	7/13/18	12:20 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-01-071318-DUP (490-155661-9)	7/13/18	12:20 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-02-071318 (490-155661-10)	7/13/18	13:10 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-03-071318 (490-155661-11)	7/13/18	13:30 Central		Water			X	X	X	2	run once - upload data twice

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. 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 accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:			
Relinquished by:	Date/Time: 7/16/18 1506	Company: TA-NA	Received by:	Date/Time: 7/17/18 @ 095	Company: TASL	
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:	
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:	

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 18.5c

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

490-155661

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	COC No: 490-75464.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 2 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)	Job #: 490-155661-2
Address: 13715 Rider Trail North,	Due Date Requested: 8/13/2018		
City: Earth City	TAT Requested (days):		
State, Zip: MO, 63045			
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:		
Email:	WO #:		
Project Name: Big Rivers Electric Corp - CCR & SemiAnn	Project #: 49010431		
Site: Big Rivers CCR	SSOW#:		

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Water, Solid, Oil/waste, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
Pond-012-071318 (490-155661-12)	7/13/18	13:50 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-04-071318 (490-155661-13)	7/13/18	14:15 Central		Water			X	X	X	2	run once - upload data twice

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. I

Possible Hazard Identification Unconfirmed	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 7/14 1506	Company: TA-NV	Received by:	Date/Time: 7-17-18 0915	Company: TAN
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 09/20/2016

Login Sample Receipt Checklist

Client: Big Rivers Electric Corporation

Job Number: 490-155661-2

Login Number: 155661
List Number: 3
Creator: McBride, Mike

List Source: TestAmerica St. Louis
List Creation: 07/17/18 05:06 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	Thermal preservation not required.
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?	N/A	Received project as a subcontract.
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").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Tracer/Carrier Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits) Ba Carrier (40-110)
400-156511-B-1-B DU	Duplicate	90.3
490-155661-1	River Seep-08-071318	87.3
490-155661-2	River Seep-12-071318	92.9
490-155661-5	River Seep-09-071218	89.4
490-155661-6	River Seep-07-071218	79.4
490-155661-7	River Seep-05-071218	82.9
490-155661-8	Landfill Seep-01-071318	87.6
490-155661-9	Landfill Seep-01-071318-DUP	94.4
490-155661-10	Landfill Seep-02-071318	96.8
490-155661-11	Landfill Seep-03-071318	89.7
490-155661-12	Pond-012-071318	93.2
490-155661-13	Landfill Seep-04-071318	97.6
600-169468-C-1-A DU	Duplicate	94.4
LCS 160-376745/1-A	Lab Control Sample	100
LCS 160-376796/1-A	Lab Control Sample	99.7
LCS 160-377701/1-A	Lab Control Sample	94.1
LCSD 160-376745/2-A	Lab Control Sample Dup	100
MB 160-376745/23-A	Method Blank	97.1
MB 160-376796/18-A	Method Blank	102
MB 160-377701/16-A	Method Blank	94.7

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits) Ba Carrier (40-110)	Y Carrier (40-110)
400-156511-B-1-D DU	Duplicate	90.3	84.5
490-155661-1	River Seep-08-071318	87.3	90.5
490-155661-2	River Seep-12-071318	92.9	85.6
490-155661-5	River Seep-09-071218	89.4	87.1
490-155661-6	River Seep-07-071218	79.4	87.1
490-155661-7	River Seep-05-071218	82.9	83.0
490-155661-8	Landfill Seep-01-071318	87.6	75.9
490-155661-9	Landfill Seep-01-071318-DUP	94.4	94.6
490-155661-10	Landfill Seep-02-071318	96.8	85.6
490-155661-11	Landfill Seep-03-071318	89.7	92.7
490-155661-12	Pond-012-071318	93.2	77.8
490-155661-13	Landfill Seep-04-071318	97.6	86.4
600-169468-C-1-B DU	Duplicate	94.4	90.8
LCS 160-376750/1-A	Lab Control Sample	100	86.4
LCS 160-376805/1-A	Lab Control Sample	99.7	91.2
LCS 160-377705/1-A	Lab Control Sample	94.1	88.6
LCSD 160-376750/2-A	Lab Control Sample Dup	100	87.5
MB 160-376750/23-A	Method Blank	97.1	85.6
MB 160-376805/18-A	Method Blank	102	91.6

Tracer/Carrier Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)									
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)								
MB 160-377705/16-A	Method Blank	94.7	90.1								

Tracer/Carrier Legend

Ba Carrier = Ba Carrier
Y Carrier = Y Carrier

Big Rivers
ELECTRIC CORPORATION

Reid/Green/HMPL-2 Station
9000 Highway 2096
Robards, KY 42452
www.bigrivers.com

July 11, 2019

Re: ***Big Rivers Electric Corporation***

Reid/ Green/HMP&L Station II (Sebree Station AI 4196)

Assessment of Corrective Measures Reports

An Assessment of Corrective Measures (ACM) for groundwater was initiated by Big Rivers Electric Corporation at the Green Station Landfill and Reid/HMP&L Station II Surface Impoundment on January 14, 2019. The ACM was initiated based on the Green Station Landfill and Reid-HMP&L Surface Impoundment having one (1) constituent from Appendix IV of Part 257 that was detected at a statistically significant level (SSL) above the Regional Screening Level (RSL) for lithium. Regional Screening Levels were used in lieu of Maximum Contaminant Levels (MCL), since an MCL has not been established for the constituent of concern (i.e. Lithium) associated with the Green Landfill and the Reid-HMP&L Surface Impoundment.

The Coal Combustion Residuals Rule found at 40 CFR Part 257.96(a) requires that a facility initiate an ACM within 90 days of finding that any constituent listed in Appendix IV of Part 257 has been detected at a SSL exceeding the groundwater protection standard defined under 257.95(h). The ACM must be completed within 90 days. The 90-day deadline to complete the ACM may be extended for no longer than 60 days.

The documents contained herein fulfill the requirements of 40 CFR Part 257.96(a), (c) and (d).

Furthermore, pursuant to 40 CFR 257.90(d) and 257.84(b)(5), Big Rivers initiated design of containment systems at the Green Station Landfill intended to control sources of landfill surface seeps to reduce or eliminate, to the maximum extent feasible, further non-groundwater releases of contaminants to surface waters. An ACM report for the non-groundwater releases from the Green Station Landfill, in light of the remedial measures initiated pursuant to 40 CFR 257.90(d) and 257.84(b)(5), has also been completed and is made available herein.

Assessment of Corrective Measures Under the CCR Rule

CCR SURFACE IMPOUNDMENT
REID/HMP&L STATION
WEBSTER COUNTY, KENTUCKY

June 13, 2019

Prepared For:

Big Rivers Electric Corporation
Sebree Generating Station
9000 Highway 2096
Robards, Kentucky 42452

Prepared by:

AECOM Technical Services

525 Vine Street
Suite 1800
Cincinnati, Ohio 45202
Phone: (513) 651-3440
Fax: (877) 660-7727

Job Number: 60602365

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List of Tables

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ACRONYMS

ACM	Assessment of Corrective Measures
AECOM	AECOM Technical Services, Inc.
ARARs	Applicable or Relevant and Appropriate Requirements
BREC	Big Rivers Electric Corporation
°C	Degrees Celsius
CAO	Corrective Action Objectives
CbR	Closure by Removal
CCR	Coal Combustion Residuals
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CiP	Closure in Place
cm/sec	Centimeters per second
COCs	Constituents of Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
ft., amsl	Feet above mean sea level
GWPS	Groundwater Protection Standards
ICs	Institutional Controls
KGS	Kentucky Geological Survey
KPDES	Kentucky Pollution Discharge Elimination System
Li	Lithium
µS/cm	MicroSiemens per centimeter
MCL	Maximum Contaminant Level
mg/L	Milligrams per liter
mV	Millivolt
O&M	Operation and Maintenance
ORP	Oxidation Reduction Potential
PRB	Permeable Reactive Barrier
RCRA	Resource Conservation and Recovery Act
Sebree Station	Sebree Generating Station
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

AECOM Technical Services, Inc. (AECOM) was retained by Big Rivers Electric Corporation (BREC) to prepare an Assessment of Corrective Measures (ACM) to identify appropriate corrective measures for groundwater impacted by coal combustion residuals (CCR). The subject groundwater impacts are associated with the CCR that has been historically managed within the Reid/HMP&L Station CCR Surface Impoundment (Reid/HMP&L Station Surface Impoundment) at the Sebree Generating Station (Sebree Station), located near Sebree, Kentucky (Site).

Groundwater monitoring was conducted for the CCR management unit in accordance with the United States Environmental Protection Agency's (USEPA) CCR Rule (40 Code of Federal Regulations (CFR) Section 257.90 through Section 257.95). Detection and Assessment groundwater monitoring are complete at the Reid/HMP&L Station Surface Impoundment, and one constituent of concern (COC), lithium (Li), has been identified based on exceedance of the applicable Groundwater Protection Standard (GWPS) at a statistically significant level (SSL).

Section 257.96(c) requires this assessment to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

Several potential corrective measures technologies were evaluated to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented below:

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenants, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.

Groundwater Monitoring (Assessment and Detection modes)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a stand-alone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing off-site migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The Conceptual Site Model (CSM) will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations may increase implementation difficulty with scale.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies, any single technology may not be utilized.

Preliminary assembly of corrective measures alternatives was performed based on site-specific and regional geology and groundwater conditions. For the Reid/HMP&L Station Surface Impoundment, five corrective measures alternatives were developed from this list of applicable corrective measures technologies:

- Alternative #1 – No Action, and Groundwater Monitoring
- Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring

- Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- Alternative #3 – CiP, ICs, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, and Groundwater Monitoring
- Alternative #4 – CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

The assembly of corrective measures alternatives is preliminary and could be revised at a later date following detailed analysis during the remedy selection process and/or following comment from the regulatory community and public. Specifically, a public meeting is required under Section 257.96(e) at least 30 days prior to the selection of remedy so that the owner or operator may discuss the results of the corrective measures assessment with interested and affected parties.

Following submittal of the ACM, the Site will begin the remedy selection process that is set forth in Section 257.97. The selected remedy must:

- Meet the requirements of Section 257.97(b) of the CCR Rule;
- Consider the standards in Section 257.97(c), and;
- Address the schedule and other factors specified in Section 257.97(d).

Upon remedy selection, a remedy selection report will be prepared that documents details of the selected remedy and how the selected remedy meets Section 257.97 requirements. As needed to accomodate further investigation(s) and/or evaluation, Section 257.97 requires the preparation of a semiannual report that documents progress toward remedy selection and design.

1.0 INTRODUCTION

The following report presents the Assessment of Corrective Measures (ACM) for groundwater impact identified at the Reid/HMP&L Station CCR Surface Impoundment (Reid/HMP&L Station Surface Impoundment), which is a coal combustion residuals (CCR) management unit located at the Big Rivers Electric Corporation (BREC) at the Sebree Generating Station (Sebree Station), located near Sebree, Kentucky (Site).

Groundwater monitoring was conducted for the unit in accordance with the United States Environmental Protection Agency's (USEPA) CCR Rule (40 Code of Federal Regulations [CFR] Section 257.90 through Section 257.95). The results of Detection Monitoring (per Section 257.94) identified the presence of one or more indicator constituents (Appendix III to Section 257) with downgradient concentrations representing a statistically significant increase(s) (SSI) over background or upgradient conditions. The detection of one or more SSI required the implementation of Assessment Monitoring following the requirements of Section 257.95, which was initiated in April 2018. Assessment Monitoring results indicated the downgradient presence of one or more constituents of concern [COCs] (Appendix IV to Section 257) at concentrations that represent an SSI over background concentration, and that represent a statistically significant level (SSL) over the groundwater protection standard(s) established in accordance with to Section 257.95(h).

For the Reid/HMP&L Station Surface Impoundment unit, the following SSL was identified:

- Lithium (Li) in MW-10

The identification of the SSL requires characterization of the nature and extent of impact (sufficient to support the ACM) in accordance with Section 257.95(g)(1) and the initiation of an ACM following the requirements of Section 257.96. Notice of ACM initiation dated January 14, 2019 was posted to BREC's publicly-accessible CCR reporting website.

Section 257.96(c) requires this ACM to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

This report presents the ACM evaluation in the following five sections, along with their associated appendices and attachments.

2.0 DESCRIPTION OF CURRENT CONDITIONS

This section provides information related to the current use of the site, as well as the history of activities relevant to the ACM for the Reid/HMP&L Station Surface Impoundment at the Sebree Station.

2.1 Site Background

BREC owns and operates the Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/HMP&L Station. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (see **Figure 1**). Reid Unit 1 (66 Megawatts) began commercial operation in 1966 and it will be converted from coal to natural gas in the future. The Reid Combustion Turbine (72 MW) was commercialized in 1976. HMP&L Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974 respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (242 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Reid/HMP&L Station Surface Impoundment is illustrated in **Figure 2**. The CCR Surface Impoundment has been in place for more than 40 years and is used for the placement of CCR material. As stated in the published CCR monitoring well network certification, available on the BREC website, the Reid/HMP&L Station Surface Impoundment is a combined incised/dike earthen embankment structure. It is diked on the west, south and east sides, while the north side is incised. The south dike has the greatest height, reaching approximately 20 feet. The original ground surface within the pond footprint was irregular and the dominant features were small stream valleys draining eastward to the Green River. Most of the central portion of the south dike was constructed on a subdued ridge.

2.2 Site Investigation and Interim Measures

Monitoring wells were installed in the vicinity of the Reid/HMP&L Station Surface Impoundment in December 2015 prior to the implementation of the CCR Rule. These wells meet the requirements of §257.90 of the CCR Rule for installation of a groundwater monitoring system. These requirements are that wells must adequately represent the quality of background groundwater and groundwater representing the downgradient waste boundary. The wells are located along the perimeter of the footprint for the Reid/HMP&L Station Surface Impoundment. One upgradient monitoring well (MW-7) and three downgradient monitoring wells (MW-8, MW-9, and MW-10) were installed adjacent to the Reid/HMP&L Station Surface Impoundment to determine the general direction of groundwater movement and to monitor groundwater at the Site. The monitoring wells were installed in the uppermost saturated portion of the sandstone bedrock aquifer.

Hydraulic testing (slug tests) was performed in April 2019, and nine rounds of Baseline groundwater sampling for Appendix III constituents was conducted between March 2016 and October 2017. Statistical evaluation for Detection monitoring indicated that SSIs over background have occurred, and therefore, Assessment monitoring was triggered. Detection monitoring activities and data are presented in the annual reports that have been prepared to date, (AECOM 2018 and 2019. Annual Groundwater Monitoring).

As part of Assessment monitoring, upgradient and downgradient wells for the CCR Surface Impoundment were sampled for Appendix IV constituents in April, July, and September 2018. GWPSs were established for Assessment monitoring of the Appendix IV constituents, and statistical evaluation indicated exceedances of GWPSs at SSLs.

For the purposes of this ACM, the COC that exceeds GWPSs at SSLs is Li (see **Table 1**).

Table 1 – Reid/HMP&L Station Surface Impoundment Constituents of Concern (COCs)

Monitoring Well (Date)	Parameter
	Lithium UPL 0.008 GWPS 0.04 (mg/L)
MW-10 (Apr 2018)	**0.694**
MW-10 (Jul 2018)	**0.630**
MW-10 (Sep 2018)	**0.570**

NOTES:
GWPSs are the greater of the site-specific background concentrations, the USEPA primary drinking water standard maximum contaminant limits (MCL), or GWPS provided in 40 CFR 257.95(3)(h)(2)
Bold red values exceed the GWPS by direct comparison; yellow shaded indicates an SSL above the GWPS (i.e., 95 LCL > GWPS) UPL = Upper Prediction Limit; mg/L = milligrams per liter; < = constituent concentration is less than laboratory reporting limit.

No formal interim corrective measures have been performed at the Reid/HMP&L Station Surface Impoundment but waste is no longer placed in the unit and closure activities have been initiated.

2.3 Conceptual Site Model (CSM)

The main purpose of a CSM is to support the decision-making process for groundwater corrective action at the Reid/HMP&L Station Surface Impoundment.

2.3.1 Physical Setting

The Site is mapped within the Interior Low Plateaus physiographic province (https://www.nps.gov/subjects/geology/physiographic-provinces.htm). The province is part of the Interior Plains division of the United States. Characteristic features of the province include unglaciated rolling limestone plains with alluvial valleys and entrenched rivers and streams. Several large rivers are in the region, including the Green, the Ohio, the Kentucky, the Tennessee, and the Cumberland Rivers. The geology underlying the Site consists of unconsolidated materials, including loess and alluvial deposits, underlain by Upper to Middle Pennsylvanian-age clastics and carbonates consisting primarily of sandstone and shale. The unconsolidated material also include fill, silty and clayey residuum, and minor amounts of sandy, clayey channel fill alluvium.

The Reid/HMP&L Station Surface Impoundment is located on upland adjacent to the west bank of the Green River at an elevation of approximately 389 feet, above mean sea level [ft., amsl] (at the west corner) and 400 ft., amsl (at the northeast corner). Although the Green River is located less than 0.5 miles from the site, the structure does not extend significantly into the floodplain. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands (Associated Engineers 2016, Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan). The immediate watershed that drains to the unit, and in which the unit is considered to be located, is unnamed and 25.45 acres in size. The unnamed watershed discharges from the Reid/HMP&L Station Surface Impoundment outflow structure and is routed, under a Kentucky Pollution Discharge and Elimination System (KPDES) permit, to the Green River.

2.3.2 Geology

Figure 3 presents a geologic map of the site and vicinity. The site lies in the Western Kentucky Coalfields, characterized by rolling uplands underlain by coal-bearing bedrock of the Pennsylvanian Period. In the vicinity of the site, maximum topographic relief is on the order of 80 feet. The geologic quadrangle (Geologic map of the Robards quadrangle, Henderson and Webster Counties, Kentucky, 1973) for the Site vicinity published by the Kentucky Geological Survey (KGS) shows the surficial material to be unconsolidated loess representing the Pleistocene and Holocene geologic epoch. The loess consists of sandy and clayey silt. The unconsolidated surficial materials, which include silty and sandy clay units, are approximately 25 feet in thickness.

The unconsolidated surficial materials are underlain by bedrock of the Upper Pennsylvanian Shelburn Formation (formerly identified as the Lisman Formation [Fairer, 1973]) and the Middle Pennsylvanian Carbondale Formation. At the base of the Shelburn Formation is the Providence Limestone Member, consisting of limestone and interbedded shale, but this unit is absent in much of the area due to erosional channeling. Due to its discontinuous character and the presence of interbedded shale, hydrologically significant karst features are not present in the Providence Limestone Member. The underlying Carbondale Formation consists of cyclic sequences of sandstones, shales, siltstones and coals. The Carbondale sediments were deposited in a fluvial-deltaic system. As a result of this depositional environment, the lithologic units of the Carbondale tend to be lenticular bodies rather than continuous sheet-like strata. Gradational and abrupt horizontal changes in lithology are often encountered.

Cross-sections were prepared during development of this ACM, and cross-section locations are shown on **Figure 2**. The individual cross-sections are presented on **Figures 4** and **5**. These sections illustrate the sequence of geologic units present under the Reid/HMP&L Station Surface Impoundment as evidenced by the currently available data.

2.3.3 Hydrogeology

For purposes of compliance with the CCR Rule groundwater monitoring requirements, the interbedded sandstone and shale of the Carbondale Formation is considered to be the uppermost aquifer underlying the Reid/HMP&L Station Surface Impoundment. The uppermost aquifer is unconfined and first encountered at an elevation of approximately 413.4 ft., amsl at the northeast end (at MW-7), and 341.6 ft. amsl at the west end of the Surface Impoundment (at MW-8). Flow direction beneath the site is typically to the southwest towards an unnamed tributary to Groves Creek located west/southwest of the impoundment.

Slug tests were performed between April 24, 2019 and April 25, 2019 at monitoring wells MW-10, and MW-110 to assess the hydraulic characteristics of the uppermost aquifer. The estimated hydraulic conductivity of the monitoring wells tested ranged from 3×10^{-6} to 5×10^{-4} centimeters per second (cm/sec).

Although previous site-specific investigations have noted the presence of perched zones of saturation in the overlying unconsolidated materials, these discontinuous zones do not qualify as an uppermost aquifer under the CCR Rule because they do not produce usable quantities of groundwater.

2.3.4 Constituents of Concern (COCs)

As described in Section 2.2, a single Appendix IV constituent, Li, was detected at concentrations exceeding GWPS at one monitoring well location: Li was detected at SSLs above the GWPS at the monitoring well MW-10 location.

2.3.5 Impacted Media

Groundwater is the sole impacted media of concern addressed by this ACM.

2.3.6 COCs Distribution

Groundwater analytical data from the site investigations through 2018 indicate that COC concentrations above GWPSs are present in the vicinity of the Reid/HMP&L Station Surface Impoundment along the southwest edge (**Figure 6**). COC concentrations at MW-7, MW-8, and MW-9 were not above GWPSs at SSLs. Due to this, the area of projected corrective measures is confined to the area at and adjacent to MW-10.

An additional characterization well, MW-110, was subsequently installed to estimate the downgradient extent of impacted groundwater. Sample collection for Appendix III and IV parameters took place in March and April 2019. The analytical results for Li were below the GWPS. The characterization data are summarized in **Table 2**.

Table 2 – Reid/HMP&L Station Surface Impoundment Characterization Sample Results

Monitoring Well (Date)	Parameter
	Lithium UPL 0.008 GWPS 0.04 (mg/L)
MW-110 (March 2019)	0.0299
MW-110 (April 2019)	0.0303

The two sampling event results from the characterization well helps confirm the downgradient (southwestern) extent of COC impacts above the GWPS at the Reid/HMP&L Station Surface Impoundment.

2.3.7 Groundwater Quality

In addition to the presence of COCs above GWPSs, other geochemical characteristics of the uppermost aquifer consist of the following:

- The temperature of the samples taken at the downgradient wells during the September 2018 sampling event ranged from 18.53 degrees Celsius (°C) to 18.62 °C.
- Specific conductance ranged from 0.534 to 2.64 microSiemens (µS/cm).
- Dissolved Oxygen (DO) concentration ranged from 0.41 to 0.44 mg/L.
- Oxidation Reduction Potential (ORP) ranged from -74 to -95 milliVolts (mV).
- The pH of the samples ranged from 6.69 to 8.98.
- Total Dissolved Solids (TDS) concentration of the samples ranged from 293 to 1,990 mg/L.

2.3.8 Potential Receptors / Pathways

Contact with water (e.g., shallow groundwater or surface water) impacted by COCs at levels above GWPS is regarded as the potential pathway for exposure of potential receptors. Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Reid/HMP&L Station, thus limiting the potential receptors to the surface water, i.e., tributaries to the Green River. The pathways to these receptors include seepage of water from the Reid/HMP&L Station Surface Impoundment through manmade and natural hydraulic barriers.

Other potential exposure pathways (e.g., soil or vapor) are not considered complete as the CCR material is isolated in the unit. This isolation prevents direct access by individuals that might result in direct contact or ingestion. In addition, the inherent non-volatile nature of the unit-specific COCs eliminates the potential for a complete vapor pathway (i.e., vapor intrusion to indoor air). Therefore, soil and vapor pathways will not be considered within the context of this ACM.

3.0 Corrective Action Objective (CAO)

For CCR units, 40 CFR Parts 257.90 through 257.98 outlines the groundwater monitoring programs (Detection and Assessment) and the corrective action evaluation process, which provide the basis for the development of the site-specific CAO. Detection and Assessment groundwater monitoring are complete at the Reid/HMP&L Station Surface Impoundment, and the COC Li has been identified based on exceedance of the GWPS.

Section 257.96(c) requires this assessment to include an analysis of the effectiveness of potential corrective measures to meet the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

The subsequent remedy selection process will evaluate the following objectives for remedies, as required under Section 257.97(b):

- Protect human health and the environment;
- Attain the COC-specific GWPS as specified pursuant to Section 257.95(h);
- Control the source(s) of releases to reduce or eliminate, to the maximum extent feasible, further releases of Appendix III and 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, considering factors such as avoiding inappropriate disturbance of sensitive ecosystems (applicable to material releases only); and
- Comply with standards for management of wastes as specified in Section 257.98(d).

Together, these requirements comprise the site-specific CAO that will be used during the remedy selection process.

4.0 TECHNOLOGY IDENTIFICATION AND SCREENING

As required under Section 257.97(b), source control is one element of the CAO that is intended to prevent further releases from the source, i.e., the Reid/HMP&L Surface Impoundment. In adherence with the BREC's permit conditions, the Site will continue to operate through the end of its life cycle and will be closed in accordance with the requirements of the permit. Source control through pond closure will include installation of final cover that will prevent infiltration and contribute to groundwater quality restoration.

The identification and screening of potentially applicable corrective measures technologies for groundwater downgradient of the Reid/HMP&L Surface Impoundment is presented in **Appendix A** to this report. The findings of that screening are summarized in the table below.

Table 3 – Potential Corrective Measures Options Technology Description/Overview

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenants, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection modes)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a stand-alone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing off-site migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.

Potentially Applicable Technology	Status	Description/Overview
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations may increase implementation difficulty with scale.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

References: Technology descriptions referenced from 1) FRTR: Federal Remediation Technologies Roundtable, CLU-IN, and/or AECOM reference materials.

5.0 Corrective Action Alternatives Assembly

Applicable corrective measures technologies identified in Section 4.0 above were assembled into corrective measures alternatives for evaluation (see Section 6.0). Each corrective measures alternative consists of one or more corrective measures technologies assembled into a strategy for the groundwater remedy. Five corrective measures alternatives for the Reid/HMP&L Station Surface Impoundment were assembled and are described below:

- **Alternative #1** – No Action, and Groundwater Monitoring
- **Alternative #2a** – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- **Alternative #2b** – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- **Alternative #3** – CiP, ICs, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, and Groundwater Monitoring
- **Alternative #4** – CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

5.1 Assumptions for Corrective Measure Alternatives Development

In developing the corrective measures alternatives, a number of assumptions have been made based on the data available to AECOM at the time of this report and operational plans as reported by the owner/operator. The specific assumptions include:

- The currently observed dissolved-phase groundwater impacts are limited to the area adjacent to monitoring well location MW-10 along the southeastern corner of the Reid/HMP&L Station Surface Impoundment; groundwater impacts do not extend offsite from the Sebree Station property.

- Groundwater impacts are limited to the saturated zone between the observed water table at approximate elevation 390 feet mean sea level (ft-msl) and an assumed depth below the MW-10 well screen of approximately 325 ft-msl.

- Ex-situ treatment of groundwater may involve physical/chemical methods and/or discharge to a permitted National Pollution Discharge and Elimination System (NPDES) outfall.

- Groundwater corrective measures will be conducted until the CAOs are met. The objectives may be met at an earlier date, but the alternatives analysis is based on the conservative assumption that corrective measures and the associated monitoring of groundwater conditions will be required for up to 30 years following the initiation of the corrective measures.

5.2 Groundwater Corrective Measures Alternatives Overview

The developed groundwater corrective measures alternatives, outlined above, are detailed in the following sections.

5.2.1 Alternative #1 – No Action and Groundwater Monitoring

Alternative #1 consists of taking no action to remedy the CCR impacts observed in the Reid/HMP&L Station Surface Impoundment groundwater monitoring system. Under the No Action alternative, no corrective measures would be implemented to remove, control, mitigate, or minimize exposure to

impacted groundwater. Groundwater monitoring (Assessment) is required by the CCR Rule during the nominal performance period of 30 years to track the effectiveness of the alternative and to identify conditions that allow the return to Detection monitoring. The No Action alternative establishes a baseline, or reference point against which each of the developed corrective measures alternatives may be compared.

5.2.2 Alternative #2a – CIP, ICs, and Groundwater Monitoring

Alternative #2a employs a combination of three of the retained corrective measures technologies:

- CiP source control, which consists of planned Reid/HMP&L Station Surface Impoundment closure activities;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater Monitoring (Assessment) to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection monitoring and ultimately to cessation of corrective measures.

CiP was selected as the source control technology because the site's operational planning includes closure-related activities that will eventually result in placement of an engineered cap. CiP via CCR stabilization and capping would serve to control the source of constituents of concern (COCs) and thereby reduce contaminant loading to the surrounding environment.

Implementation of ICs is employed to help maintain the CiP and associated corrective measures by limiting the accessibility of the unit to unauthorized users and restricting future use of the property to those activities that may result in exposure potentials.

Groundwater monitoring of the unit is required by 40 CFR Section 257.90 through .98. The unit triggered Assessment-mode monitoring by the detection of indicator parameters (Appendix III of 40 CFR 257) in downgradient monitoring wells at concentrations representing a SSI over background. Continued groundwater monitoring is required under 40 CFR 257.95 until the CAOs are met. The CAOs are anticipated to be met as the effect of source control technologies are realized and as natural attenuation mechanisms (advection, dilution and dispersion) take effect.

5.2.3 Alternative #2b – CbR, ICs, and Groundwater Monitoring

Alternative #2b is similar to Alternative #2a except that CiP is replaced by CbR, which consists of excavation and removal of the Reid/HMP&L Station Surface Impoundment, implementation of ICs and an Environmental Covenant intended to restrict the unit to industrial use and prohibit groundwater use for potable purposes. The excavation of impacted CCR material would typically be completed using standard construction equipment (e.g., backhoe, excavator, wheel loader, dump trucks). The excavated materials are then placed directly into dump trucks for transport/disposal or beneficial use. Excavation limits would typically be verified with confirmation sampling to demonstrate that the underlying soil is not impacted above applicable standards.

Groundwater monitoring of the unit is required by 40 CFR 257.90 through .98. The unit triggered Assessment-mode monitoring by the detection of indicator parameters (Appendix III of 40 CFR 257) in downgradient monitoring wells at concentrations representing a SSI over background. Continued groundwater monitoring is required under 40 CFR 257.95 until the CAOs are met. The CAOs are

anticipated to be met as the effect of source control technologies are realized and as natural attenuation mechanisms (advection, dilution and dispersion) take effect.

5.2.4 Alternative #3 – CiP, Hydraulic Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring

Alternative #3 builds on Alternative #2a to also include the addition of Hydraulic Containment and Ex-Situ Treatment of groundwater:

- CiP source control, which consists of planned Surface Impoundment closure activities;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes;
- Hydraulic Containment using one or more vertical wells designed to prevent the movement of impacted groundwater past the limits of the unit to the downgradient groundwater environment and potential points of exposure;
- Ex-Situ Treatment of groundwater extracted for hydraulic containment, which involves above-ground physical/chemical treatment methods and/or permitted discharge until the CAOs are achieved;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater Monitoring (Assessment mode) to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection-mode monitoring and ultimately to cessation of corrective measures.

Vertical groundwater recovery wells for Hydraulic Containment would be installed near the downgradient limit of the unit in the vicinity of MW-10. Due to the low hydraulic conductivity of the uppermost aquifer, Pre-Design Studies are anticipated to be needed to identify the appropriate number, design, and spacing of the extraction well system. For the purposes of this ACM, preliminary specifications are as follows:

- Two vertical groundwater extraction wells;
- Extraction wells would be placed at the southeast corner of the Reid/HMP&L Station Surface Impoundment and upgradient of monitoring well MW-10;
- Wells screen depths would be approximately 50-100 feet-below ground surface (ft-bgs);
- Estimated groundwater extraction rates of 20 gallons per minute (gpm) per well.

Alternative #3 incorporates treatment of extracted groundwater before it can be discharged to an outfall. Treatment will consist of piping the extracted groundwater to an existing surface water impoundment at the Sebree Station, which will allow for compliance with discharge permits through an established NPDES outfall.

The COC concentrations downgradient of the hydraulic containment would also be expected to decrease over time through natural attenuation mechanisms including advection, dilution, and dispersion. As such, groundwater monitoring would be modified to include system performance monitoring, which may require installation of wells at new locations to evaluate the efficacy of hydraulic containment and to identify when CAOs have been achieved.

5.2.5 Alternative #4 – CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

Alternative #4 consists of BREC's planned unit closure activities, physical containment of impacted groundwater via installation of a funnel-gate system, and ex-situ treatment of contained groundwater via an extraction well installed at the containment gate. Impacted groundwater would be contained by grout curtain constructed in a funnel-and-gate arrangement that directs the flow of groundwater to an extraction point. The grout curtain would be installed by drilling two lines of grout injection points that extend northwestward and northeastward from the southeast corner of the unit. The length of each limb of the barrier would be 500 feet, and the target depth would be approximately 325 ft-amsl. A single extraction well would be installed at the "gate" with a screened interval of 50 to 100 ft-bgs and a pumping capacity of up to 20 gpm. Groundwater will be pumped and conveyed to an existing surface water impoundment at the Sebree Station, which will allow for compliance with discharge permits through an established NPDES outfall.

CiP via ash stabilization and capping would control the source of COCs and thereby reduce contaminant loading to the extraction system. Concentrations downgradient of the physical barrier would be expected to decrease over time through several natural attenuation mechanisms including advection, dilution, and dispersion. Groundwater Monitoring (Assessment) would continue to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection monitoring and ultimately to cessation of corrective measures.

6.0 ALTERNATIVE EVALUATION

The formal remedy selection process, in accordance with the CCR Rule 40 CFR Section 257.97, will begin following submission of the ACM Report. The subsequent remedy selection process will evaluate the following objectives for remedies, as required under Section 257.97(b):

- Protect human health and the environment;
- Attain the COC-specific GWPSs as specified pursuant to Section 257.95(h);
- Control the source(s) 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 (applicable to material releases only); and
- Comply with standards for management of wastes as specified in Section 257.98(d).

6.1 Potential Data Gaps

No data gap investigation is projected at this time.

Depending on which alternative is selected, a data gap investigation may be needed to further refine the targeted areas for corrective measures,. Potential data gaps may include the following:

1) Supplemental Groundwater Investigation – This investigation may consist of additional monitoring well installation and sampling to refine the existing CSM as well as to provide data related to the hydraulic characteristics of the subsurface.
2) Groundwater Treatment Amendment Evaluation – This evaluation may involve the completion of bench-scale testing of potentially applicable treatment amendments to determine their efficacy and loading rates to address the observed groundwater impacts from site-specific COCs. Additionally, testing on the pilot-scale may also be completed in the field to demonstrate that the groundwater treatment system could be successfully installed and operated at the Site.
3) Physical Containment Profile – Prior to committing to a physical barrier design, it may be necessary to probe the subsurface along the proposed alignment to:
    - Establish the character of the materials through which the barrier would be installed;
    - The depth to confinement where the barrier would terminate;

7.0 REFERENCES

AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Reid/HMP&L Station CCR Surface Impoundment, Webster County, Kentucky.

AECOM, 2018. Placement above the Uppermost Aquifer Demonstration for Coal Combustion Residuals (CCR) Rule. Reid/HMP&L Surface Impoundment, Sebree Station, Sebree, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Reid/HMP&L Station CCR Surface Impoundment, Webster County, Kentucky.

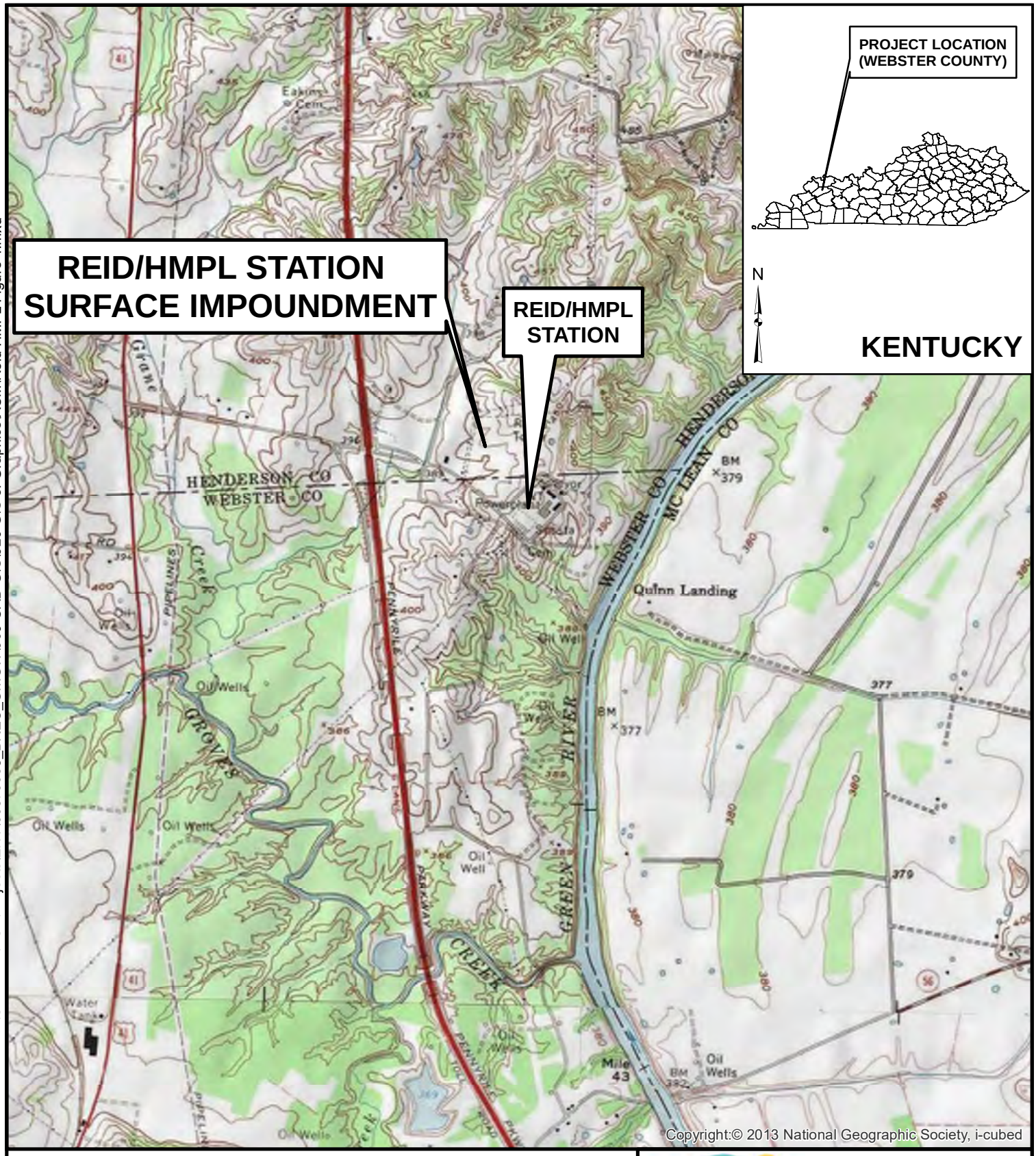
Associated Engineers 2016. Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan.

EPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. EPA/540/G-89/004.

EPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

Fairer, G.M., Geologic Map of the Robards Quadrangle, Henderson and Webster Counties, Kentucky, U.S. Geological Survey, 1973.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

N

Big Rivers ELECTRIC CORPORATION

Reid/HMPL Station
Webster County, Kentucky

FIGURE 1
SITE LOCATION MAP

DATE: 4/30/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60602365	

Legend

- Unit Boundary
- Property Line
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Proposed Characterization Well

A — A' Transect Line

0 300 600
Feet

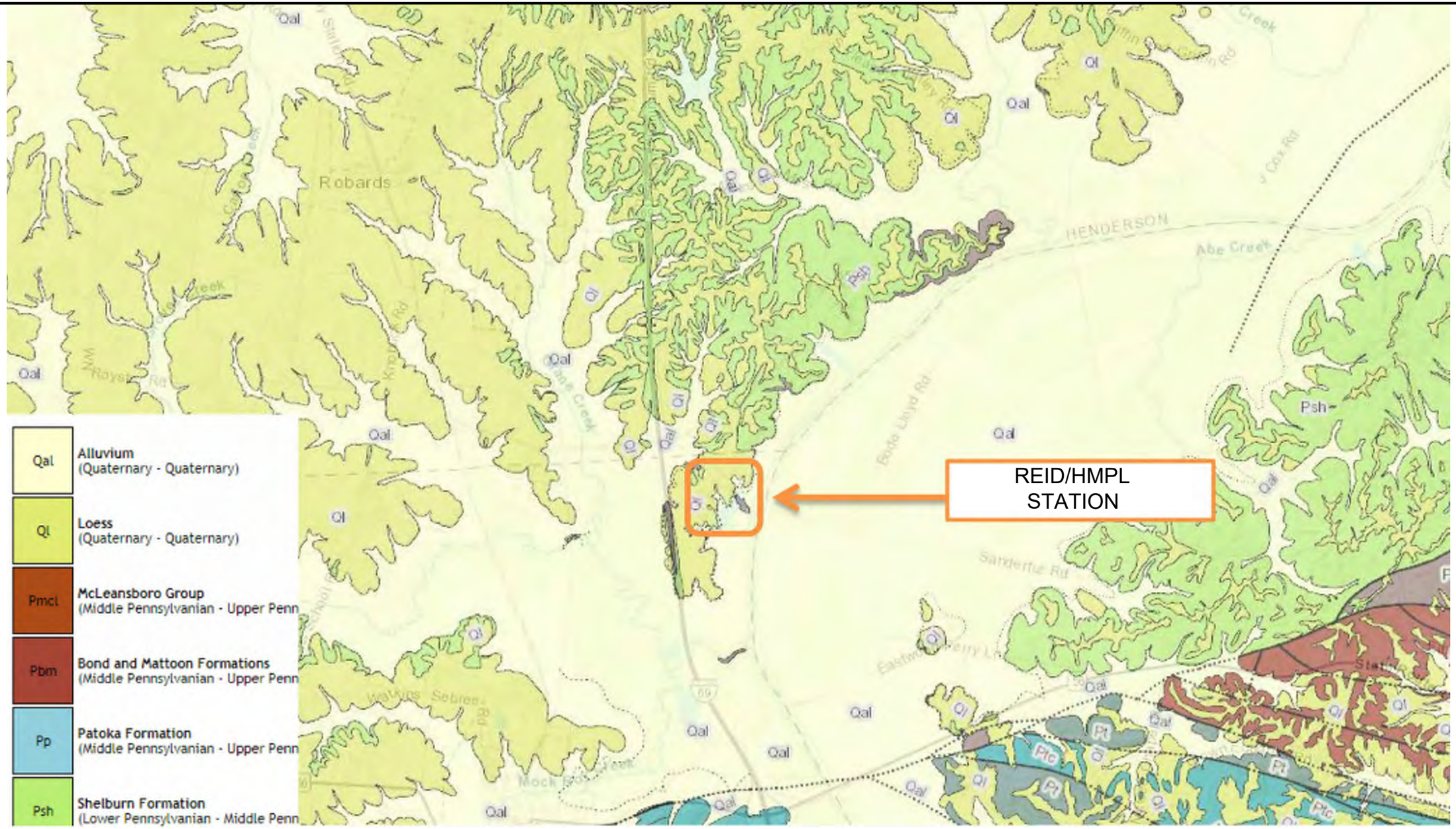
N

Big Rivers

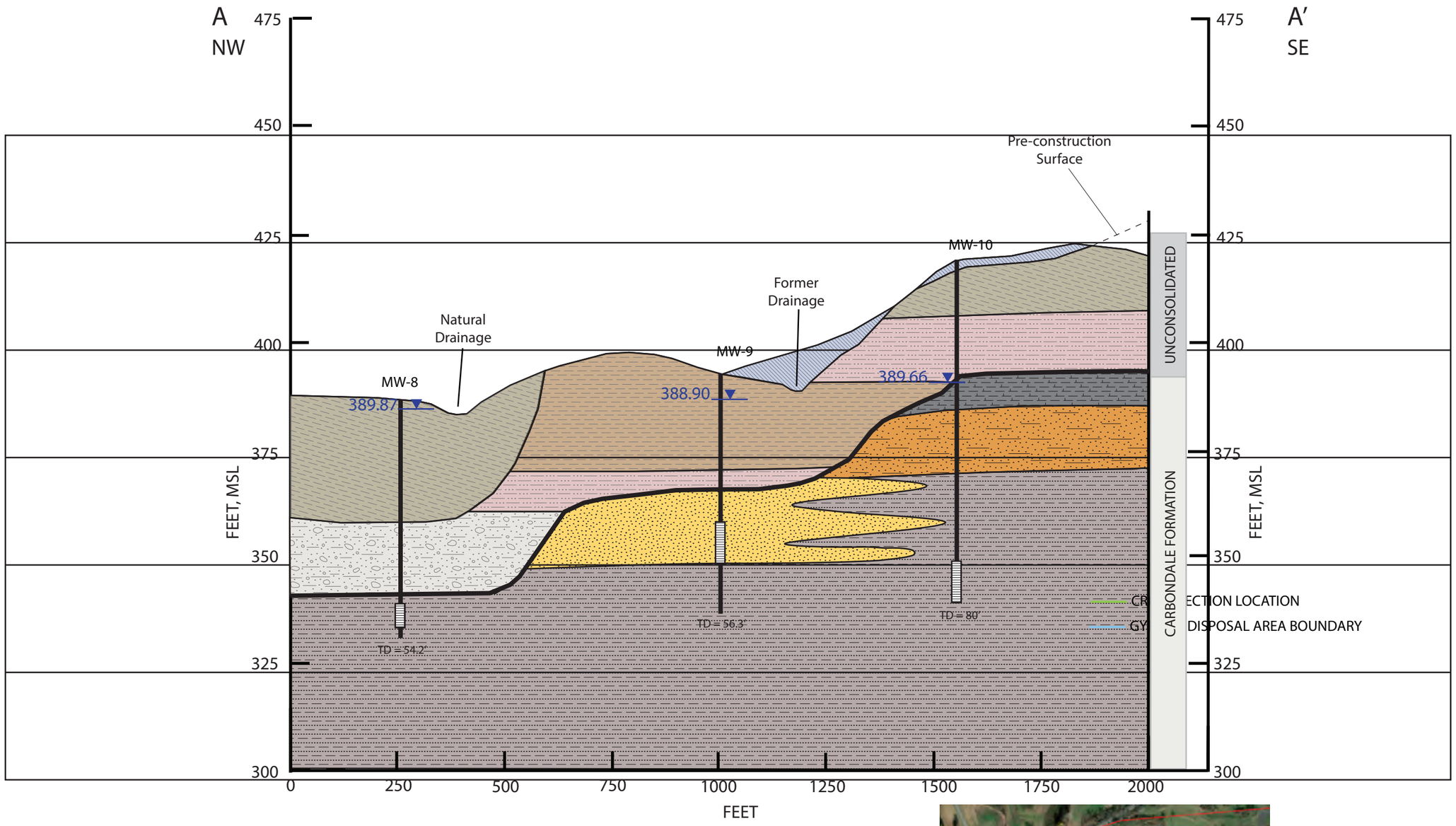
Reid/HMPL Station
Webster County, Kentucky

FIGURE 2
WELL LOCATION MAP

DATE: 5/16/2019	SCALE: 1IN = 200 FEET
CREATED BY: ALW	
JOB NO. 60602365	



BigRivers	*Reid/HMPL Station* *Webster County, Kentucky*
FIGURE 3 SITE GEOLOGIC MAP (KENTUCKY GEOLOGICAL SURVEY)	
DATE: 4/30/2019	SCALE: AS SHOWN
CREATED BY: DAS	
JOB NO. 60602365	



LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silty Clay
- Sandy Clay
- Clay
- Silty Clay with Gravel

BEDROCK LITHOLOGIES:

- Shale
- Shaley Sandstone
- Sandstone
- Interbedded Sandstone and Shale

Potentiometric Surface September 26, 2018

MW-8 — MONITORING WELL LOCATION ID

RISER

MONITORING WELL SCREEN

BACKFILL / COLLAPSE

25 feet

250 feet

(Vertical Exaggeration = 10x)

Big Rivers Electric Corporation

FIGURE 4
CROSS SECTION A - A'

DATE: 4/30/2019	SCALE: 1IN = 25 x 250 FEET
CREATED BY:MRH	
JOB NO. 60602365	

\\Na.aecomnet.com\GFS\AMER\Cincinnati\DCS\Projects\ENV\60602365_BREC_RIACM\900-CAD-GIS\920-GIS or Graphics

B
W

B′
NE

475
450
425
400
375
350
325
300

FEET, MSL

Pre-construction Surface
Pond
Secondary Pond
Former Drainage
MW-110
MW-9
MW-7
388.90
426.50
TD = 59'
TD = 56.3'
TD = 73.4'

UNCONSOLIDATED
SHELBURN FORMATION
CARBONDALE FORMATION

0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000

FEET

LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silt
- Silty Clay
- Silty Sand
- Clay
- Sandy Clay

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Interbedded Sandstone and Shale

Potentiometric Surface September 26, 2018

MW-9 — MONITORING WELL LOCATION ID

RISER

MONITORING WELL SCREEN

BACKFILL / COLLAPSE

25 feet
250 feet
(Vertical Exaggeration = 10x)

Big Rivers
ELECTRIC CORPORATION

FIGURE 5
CROSS SECTION B - B'

DATE: 4/30/2019	SCALE: 1IN = 25 x 250 FEET
CREATED BY:MRH	
JOB NO. 60602365	

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Legend

- Unit Boundary
- Property Line
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Proposed Characterization Well

0 300 600

Feet

N

Big Rivers Electric Corporation

Reid/HMPL Station
Webster County, Kentucky

FIGURE 6
COC DISTRIBUTION

DATE: 5/16/2019	SCALE: 1IN = 200 FEET
CREATED BY: ALW	
JOB NO. 60602365	

Appendix A

Corrective Measures Technologies and Alternatives Evaluation Process

Appendix A
Corrective Measures Technologies and Alternatives Evaluation Process

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Tables

A1.0 CORRECTIVE MEASURES EVALUATION PROCESS

This appendix describes the overall process used in the selection and screening of remedial technologies that are considered potentially applicable to Coal Combustion Residuals (CCR) groundwater impacts at the subject Site. This appendix also describes the process for assembling preliminary corrective measures alternatives from one or more applicable technologies and evaluating these alternatives.

A1.1 Potential Remedial Technologies

Section 257.96(c) requires this assessment to include an analysis of the effectiveness of potential corrective measures to meet the objectives for remedies under Section 257.97(b), addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

The following remedial technologies are regarded as potentially applicable to corrective measures for CCR groundwater impact:

- No Action (Included as a baseline case)
- Institutional Controls (ICs)
- Groundwater Monitoring
- Hydraulic Containment
- Physical Containment
- Ex-situ Physical/Chemical/Biological Treatment
- In-situ Physical/Chemical/Biological Treatment
- Permeable Reactive Barrier (PRB)
- Closure in Place (CiP) (of the regulated unit)
- Closure by Removal (CbR) (of the regulated unit)

A brief overview of these technologies is provided below in **Table A1**.

Table A1 – Potential Remedial Technologies

Potential Technology	Description/Overview
No Action	Default baseline approach against which other options are evaluated. No corrective action would be taken to remove, control, mitigate or minimize exposure to impacted media.
Institutional Controls (ICs)	Non-engineering measures, such as administrative and/or legal controls that help to minimize the potential for human exposure to contamination, and/or to protect the integrity of a remedy by limiting land or resource use (United States Environmental Protection Agency [USEPA), *Institutional Control Data Standard* EX000015.1, January 6, 2006).
Groundwater Monitoring	Groundwater monitoring (Assessment and/or Detection modes) to assess effectiveness of corrective measures performance, as well as natural subsurface processes such as dilution, adsorption, and chemical reactions that together serve to reduce inorganic COC concentrations to acceptable levels.
Hydraulic Containment	Hydraulic containment is a common method for remediating groundwater impacted with metals and other inorganics. Groundwater is pumped from wells or collection trenches to aboveground discharge point or to a treatment system that removes the contaminants. The extraction network would be designed to provide hydraulic containment of the impacted groundwater, preventing it from flowing downgradient towards surface water or other receptors.
Physical Containment	Physical barriers are walls constructed below the ground surface to control or restrict the flow of groundwater. They are constructed by injection grouting or by the use of excavator or deep trenching equipment to insert and thoroughly mix a selected amendment to create a homogenized impermeable wall that prevents impacted groundwater from flowing downgradient. The bottom of the physical containment structure is typically keyed into a low-permeability soil or bedrock (confining layer) to keep groundwater from seeping beneath the wall. To provide hydraulic control of the impacted groundwater behind (upgradient of) the physical barrier and to prevent impacted water from flowing around the edges of the wall, extraction wells would be installed behind the vertical barrier (VB) and the extracted groundwater processed through a treatment system.
Ex-situ Physical/Chemical/Biological Treatment	Ex-situ treatment requires pumping of groundwater and engineering for equipment, possible permitting, and material handling. Physical/chemical treatment uses the physical properties of the contaminants or the contaminated medium to destroy (i.e., chemically convert), separate, or contain the contamination. Physical/chemical treatment can be completed in short time periods (in comparison with biological treatment). Equipment is readily available. Treatment residuals from separation techniques will require treatment or disposal.

Potential Technology	Description/Overview
In-situ Physical/Chemical Treatment	With in-situ treatment, groundwater is treated without being brought to the surface. In-situ processes, however, generally require longer time periods. Physical/chemical treatment uses the physical properties of the contaminants or the contaminated medium to destroy (i.e., chemically convert), or separate the contamination.
Permeable Reactive Barriers (PRB)	A PRB is a constructed subsurface barrier designed to intercept groundwater flow and react with the entrained COCs. PRBs can be established through trench injection or direct-push injection (on closely spaced grids) of reactive material. PRBs are typically installed to the depth of impacted groundwater (often the bottom of the shallow aquifer) and along the length of the impacted zone. The amendment used to generate the PRB is generally permeable as or more permeable than the surrounding material, encouraging impacted groundwater to flow through the reactive material. The reactive material then causes chemical reactions to occur, resulting in adsorption, precipitation, or degradation of the COC. PRBs are commonly used to control organic contamination in groundwater and have been successfully used to remediate metals.
Closure in Place (CiP) (of the regulated unit)	Landfill caps can be installed to minimize generation of leachate and to minimize infiltration into underlying waste. Landfill caps also may be applied to waste masses that are so large that other treatment is impractical. By providing a suitable base for the establishment of vegetation. In conjunction with water diversion and detention structures, landfill caps may be designed to route surface water away from the waste area while minimizing erosion.
Closure by Removal (CbR) (of the regulated unit)	Removal of contaminated media for disposal in off-site facility or alternate on-site facility. Media would likely require characterization for proper disposal. Pre-treatment may be necessary to meet land disposal restrictions (LDRs). Once excavated, confirmatory samples would be collected to verify clean-up criteria have been met; the excavation would then be backfilled and covered.

References: Technology descriptions referenced from 1) FRTR: Federal Remediation Technologies Roundtable, CLU-IN, and/or AECOM reference materials.

A1.2 Other Source Control Technologies

In addition to the groundwater corrective measures technologies summarized above, CCR impacts are also mitigated through a variety of engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods for source control.

A1.3 No Action

No Action is included in the evaluation as a baseline against which other technologies are evaluated. With this option, no corrective action would be taken to remove, control, mitigate or minimize exposure to impacted media. In the event that the other identified alternatives do not offer substantial benefits, No Action is the default baseline approach.

Under this alternative, existing impacted media (i.e., CCR materials and impacted soil/groundwater along the exposure pathway) would remain. No capital costs would be incurred, and no cleanup standards would be considered.

No Action does not meet the performance requirement of attaining the established Corrective Action Objective (CAO). Although implementation would be very easy, the required state approval for "No Action" would likely not occur. Safety impacts, cross-media impacts, and residual CCR exposure control

would be no different from current conditions. Therefore, No Action is not an appropriate standalone technology. However, it is retained for use as a baseline against which other technologies and alternatives are evaluated.

A1.4 Institutional Controls (ICs)

The potential use of ICs is considered the least aggressive corrective action technology for CCR impacts.

ICs would not change the concentration or mobility of COCs and therefore would not meet the performance requirement of attaining the established CAO as a standalone technology unless it can be demonstrated that impacted groundwater is not leaving the facility. ICs would be used in combination with other corrective measures to limit human exposures and would be easy to implement, consisting of preparation and recording of Environmental Restrictive Covenants [ERC(s)]. Safety impacts and cross-media impacts would be identical to current conditions. Because ICs would control exposure and thus enhance protection of human health and the environment, the use of ICs can be a component of corrective measures alternatives. The use of ICs as a standalone technology will not be considered.

A1.5 Groundwater Monitoring

The use of groundwater monitoring is only applicable for dissolved-phase groundwater impacts, and it will take place in Assessment and/or Detection modes as appropriate for the current phase of CCR activity. Groundwater monitoring is not a standalone technology, but instead will be combined with other remedial technologies in order to track progress of the overall remedy, which also incorporates natural attenuation processes.

The use of groundwater monitoring as a stand-alone remedial technology will not be considered; instead the incorporation of groundwater monitoring in conjunction with other technologies will be used to monitor effectiveness of a given corrective measures alternative to attain the CAO at points immediately downgradient over an extended period of time. Data reliability is controlled by adherence to the site's groundwater monitoring plan. Implementation of the existing groundwater monitoring plan is easy because it is currently underway. Safety impacts are minimized by use of the existing Health and Safety Plan and there are no construction activities required. There are no cross-media impacts or institutional requirements, nor is there any residual CCR exposure control.

A1.6 Hydraulic Containment

The use of hydraulic containment as a potential remedial technology is considered. The use of groundwater extraction can be effective at hydraulically controlling long-term downgradient dissolved phase impacts.

Hydraulic containment through groundwater extraction and subsequent treatment has historically been a common method for management of groundwater impacted with metals and other inorganics. Groundwater is pumped from wells (vertical or horizontal) or collection trenches to a discharge point (e.g., a permitted outfall) or to an aboveground treatment system. The extraction network would be designed, constructed and operated to provide a hydraulic barrier between the impacted groundwater and the migration pathway to potential receptors.

This technology attains the established CAO because hydraulic containment rapidly eliminates the offsite migration of impacted groundwater, thereby eliminating the exposure pathway. Performance and reliability would be controlled by adherence to the operations and maintenance plan prepared for the extraction and treatment systems. Implementation would be difficult because of areas of limited access

for drilling equipment and uneven groundwater flow in the uppermost aquifer materials that consist of interbedded sandstone and shale having hydraulic conductivity values spanning several orders of magnitude. Potential safety impacts during construction, operation, and maintenance of the system would be mitigated by health and safety plans prepared for these tasks. There would be no cross-media impacts. Hydraulic containment will reduce mobility due to COCs capture provided by the groundwater extraction system and treatment to remove COCs from the environment. The time period for CAO attainment may be relatively short, but system operation will need to continue until CCR source loading of COCs to groundwater ceases. For institutional requirements, treated discharge would occur under existing or modified National Pollution Discharge Elimination System (NPDES) permit.

Based on the preliminary screening, hydraulic containment is a potentially viable remedial technology and will be retained for further consideration.

A1.7 Physical Containment

The use of physical containment to isolate the impacted materials associated with a CCR unit is considered. Physical containment typically consists of a barrier or wall (i.e., slurry wall, sheet pile wall, or injection grouting) constructed below the ground surface to control or restrict the flow of groundwater. The barrier is typically constructed by excavators and/or deep trenching equipment that thoroughly mix bentonite/cement slurry to create a homogenized impermeable wall, or by driving sheet pile. The construction of the barrier would prevent impacted groundwater from flowing downgradient. Where possible, the bottom of the barrier would be keyed into the low-permeability soil or bedrock (confining layer) at the bottom of the aquifer, keeping groundwater from seeping beneath it. To provide hydraulic control of the impacted groundwater behind the barrier and prevent impacted water from flowing around the edges, a hydraulic containment system would be installed behind the wall. Extracted groundwater would then be discharged or processed through a groundwater treatment system, as needed. Extraction flow rates for this option will generally be lower than in a standalone hydraulic containment option, because the pumping rates will only need to accommodate natural groundwater flow rates, rather than providing a hydraulic barrier. However, pumping would need to be performed indefinitely to maintain water levels behind the barrier. It is also noted that physical barriers can also be utilized in a funnel-and-gate arrangement to direct the flow of groundwater to a small, more permeable area (i.e., the gate) where reactive material can be used to treat the metals in-situ. The “gate” can also be configured as a single extraction point for impacted groundwater directed to it by the “funnel.”

This technology attains the established CAO after combined physical and hydraulic containment eliminates the offsite migration of impacted groundwater, thereby eliminating the exposure pathway. In the long term, this technology will maintain compliance with the established CAO after final cover construction at the Green Landfill, which will end the source loading to the groundwater, and groundwater flushes through the aquifer. Performance and reliability would be controlled by adherence to the operations and maintenance plan prepared for the extraction and treatment systems. The technology would pose substantial challenges to the installation and operation of the physical barrier such as areas of limited access and highly variable depths to bedrock. Potential safety impacts during construction, operation, and maintenance of the system would be mitigated by health and safety plans prepared for these tasks. Cross-media impacts include the potential for airborne fugitive dust issues during construction, which would be mitigated by construction contingency planning. The time period for attainment is based on construction of the barrier. For institutional requirements, treated discharge would occur under existing or modified National Pollution Discharge Elimination System (NPDES) permit.

Based on the preliminary screening, physical containment is potentially viable as a potential corrective measures alternative component, when combined with supplemental groundwater extraction and

treatment. However, physical containment does not appear to add value to a stand-alone hydraulic containment approach.

A1.8 Ex-Situ Physical/Chemical/Biological Treatment

Ex-situ treatment requires the use of groundwater extraction with related engineering, equipment, permitting, and material handling necessary to convey the waste stream to above-ground treatment. Treatment technologies would be designed to remove the specific constituents from groundwater to meet regulatory discharge requirements; treatment options for the varied constituents may include pH adjustment, filtration, coagulation/chemical precipitation, membrane filtration, ion exchange, carbon adsorption, reverse osmosis, chemical reduction, and other potential treatment technologies. Multiple treatment technologies would potentially be needed to effectively remove the different types of contaminants. If this technology is incorporated into a corrective action alternative, further detailed evaluation and/or bench- and pilot-scale studies would be necessary to identify technically effective treatment technologies given the inorganic COCs.

This is not a standalone technology, but would be used in combination with hydraulic containment. System reliability would be controlled by adherence to an operation and maintenance plan prepared for the system. Implementation is expected to be straightforward based on well-established water treatment principles and experience. Potential safety impacts during construction, operation, and maintenance of the system would be mitigated by health and safety plans prepared for these tasks. There would be no cross-media impacts, nor would there be exposure to residual CCR materials. The time period for attainment is based on performance of the overall corrective measure, of which ex-situ treatment would be a component. For institutional requirements, treated discharge would occur under existing or modified National Pollution Discharge Elimination System (NPDES) permit.

Based on the preliminary screening, ex-situ treatment is a potentially viable remedial technology and will be retained for further consideration.

A1.9 In-Situ Physical/Chemical/Biological Treatment

For the inorganic COCs at CCR site, in-situ treatment involves enhancement of natural attenuation processes such as dilution, adsorption, and chemical reactions to reduce concentrations to acceptable levels. This technology is appropriate for site in which groundwater flow volumes are low, source controls are effective, and impacted groundwater is not expected to be long-lived.

Lithium (Li) is the sole COC for the ACM at the Reid/HMPL Surface Impoundment, and in-situ treatment methods are ineffective for Li. Therefore, this technology will not meet the performance requirement, and it will not be retained for further consideration.

A1.10 Permeable Reactive Barriers (PRB)

A PRB is an in-situ treatment method consisting of a subsurface trench filled with reactive material installed to intercept and react with impacted groundwater. PRBs can be established through direct-push injection (on closely spaced grids) or emplaced as a continuous trench of reactive material. PRBs are typically installed to the depth of impacted groundwater (often the bottom of the shallow aquifer) and are oriented perpendicular to the flow of impacted groundwater. The amendment used to generate the PRB is generally as permeable as or more permeable than the surrounding material, encouraging impacted groundwater to flow through the reactive material. The reactive material then causes chemical reactions to occur within the PRB, resulting in adsorption, precipitation, or degradation.

PRBs are commonly used to control organic contamination in groundwater, and have been successfully used to remediate some metals. However, because Li is the sole COC for the ACM at the Reid/HMPL Surface Impoundment, and in-situ methods are ineffective for Li, PRB will not meet the performance requirement, and it will not be retained for further consideration.

A1.11 Closure-in-Place (CiP) [of the regulated unit]

CiP would entail capping and restoration of the unit that contains the CCR material. Capping would minimize infiltration into the CCR material, thereby minimizing the potential for leachate to impact underlying soil and shallow groundwater. Capping would reduce potential exposure pathways and thus enhance protection of human health and the environment.

CiP will help attain the established CAO after final cap construction ends the source loading to the groundwater, and impacted groundwater flushes through the aquifer. This technology is easily implemented, as CiP is required by conditions of the solid waste permit. Potential safety impacts during construction, operation, and maintenance of the final cover are governed by conditions of the solid waste permit and are mitigated by health and safety plans prepared for these tasks. There are no cross-media impacts associated with CiP, and it will provide for significant reduction in mobility of COCs upon implementation of the CiP source control. Final cover for the Reid/HMPL Surface Impoundment is anticipated as part of facility operations. Institutional requirements will consist of solid waste permit renewal(s) and state and community acceptance of the final remedy.

Based on the preliminary screening, CiP is retained for further consideration.

A1.12 Closure by Removal (CbR) [of the regulated unit]

CbR is a proven remedy that can effectively remove the source of contamination. The excavation of impacted CCR material would typically be completed using standard construction equipment (e.g., backhoe, excavator, wheel loader, dump trucks). The excavated materials are then placed directly into dump trucks for transport/disposal or beneficial use. Excavation limits would typically be verified with confirmation sampling to demonstrate that the underlying soil is not impacted above applicable standards.

This technology would help attain the established CAO after CCR removal ends and the source loading to groundwater is eliminated. This technology would be difficult to implement, because of the large-scale construction effort required and resulting disruption to station operations and community impact. Potential safety impacts during excavation and backfilling would be mitigated by health and safety planning. However, the volume of truck traffic for waste and fill hauling would be a significant community safety issue. Potential airborne fugitive dust issues during excavation and hauling would be significant, but would be mitigated by construction contingency planning. CbR will eliminate exposure through removal of the CCR. CbR would begin following state and community approvals, and duration of excavation activities is anticipated to be many years. In addition to state and community acceptance of the proposed remedy, excavation and backfilling may require local building permits and local municipality input and approval. Excavation dewatering discharge would occur under existing or modified NPDES permit.

Based on the preliminary screening, CbR is retained for further consideration.

A1.13 Screened Remedial Technologies Summary

A summary of the results of the remedial technologies screening is presented below in **Table A2**. The design and specific application of the retained technologies, either as stand-alone or part of a treatment train, will be crucial in the success of the corrective action.

Table A2 – Screened Corrective Measures Technologies

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenants, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection modes)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a stand-alone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing off-site migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations may increase the difficulty with scale.

Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies, any single technology may not be utilized.

A2.0 CORRECTIVE MEASURES ALTERNATIVES

Corrective measures technologies from the initial screening and evaluation (see **Table A2**) were utilized to create corrective measures alternatives. Professional judgment was used to assemble technically efficient pairings of technologies for each corrective measures alternative in consideration of the range of site-specific COCs and concentrations.

The corrective measures alternatives typically incorporate the use of technologies that will require additional investigation needed to 1) finalize the alternative selection, 2) delineate the assumed corrective action areas, 3) provide for full-scale cost estimation and design, and 4) demonstrate alternative efficacy. To this end, data gaps will be identified and addressed as needed.

It should be emphasized that the technology screening and alternatives assembly employed for this ACM is qualitative in nature. The formal remedy selection process, in accordance with the CCR Rule 40 CFR Section 257.97, will begin following submission of the ACM Report. The subsequent remedy selection process will evaluate the following objectives for remedies, as required under Section 257.97(b):

- Protect human health and the environment;
- Attain the COC-specific GWPS as specified pursuant to Section 257.95(h);
- Control the source(s) 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 (applicable to material releases only); and
- Comply with standards for management of wastes as specified in Section 257.98(d).

Assessment of Corrective Measures Under the CCR Rule

GREEN STATION CCR LANDFILL
GREEN STATION
WEBSTER COUNTY, KENTUCKY

June 13, 2019

Prepared For:

Big Rivers Electric Corporation
Sebree Generating Station
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ACRONYMS

ACM	Assessment of Corrective Measures
AECOM	AECOM Technical Services, Inc.
BREC	Big Rivers Electric Corporation
°C	Degrees Celsius
CAO	Corrective Action Objectives
CbR	Closure by Removal
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CiP	Closure in Place
cm/sec	Centimeters per second
COCs	Constituents of Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
ft., amsl	Feet above mean sea level
ft., msl	Feet mean sea level
gpm	Gallons per minute
GWPS	Groundwater Protection Standards
ICs	Institutional Controls
KGS	Kentucky Geological Survey
Li	Lithium
MCL	Maximum Contaminant Level
mg/L	Milligrams per liter
mS/cm	milliSiemens per centimeter
mV	Millivolt
MW	Megawatts
NPDES	National Pollution Discharge Elimination System
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential
RCRA	Resource Conservation and Recovery Act
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

AECOM Technical Services, Inc. (AECOM) was retained by Big Rivers Electric Corporation (BREC) to prepare an Assessment of Corrective Measures (ACM) to identify appropriate corrective measures for groundwater impacted by coal combustion residuals (CCR). The subject groundwater impacts are associated with the CCR that has been historically managed within the Green Station CCR Landfill (Green Landfill) at the Sebree Generating Station (Sebree Station), located near Sebree, Kentucky (Site). Groundwater monitoring was conducted for the CCR management unit in accordance with the United States Environmental Protection Agency's (USEPA) CCR rule (40 Code of Federal Regulations (CFR) Section 257.90 through Section 257.95). Detection and Assessment groundwater monitoring are complete at the Green Landfill, and one constituent of concern (COC), lithium (Li), has been identified based on exceedance of the applicable groundwater protection standard (GWPS) at a statistically significant level (SSL).

Section 257.96(c) requires this assessment to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

Several potential corrective measures technologies were evaluated to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented below:

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established Corrective Action Objectives (CAOs).
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection mode)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a standalone technology.

Potentially Applicable Technology	Status	Description/Overview
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing offsite migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The Conceptual Site Model (CSM) will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations increase implementation difficulty with scale.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies any single technology may not be utilized.

Preliminary assembly of corrective measures alternatives was performed based on site-specific and regional geology and groundwater conditions. For the Green Landfill, six corrective measures alternatives were developed from this list of applicable corrective measures technologies:

- Alternative #1 – No Action and Groundwater Monitoring
- Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- Alternative #3 – CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring

- Alternative #4 – CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #5 – CiP, Other Source Control, ICs, and Groundwater Monitoring

The assembly of corrective measures alternatives is preliminary and could be revised at a later date following detailed analysis during the remedy selection process and/or following comment from the regulatory community and public. Specifically, a public meeting is required under Section 257.96(e) at least 30 days prior to the selection of remedy so that the owner or operator may discuss the results of the corrective measures assessment with interested and affected parties.

Following submittal of the ACM, the Site will begin the remedy selection process that is set forth in Section 257.97. The selected remedy must:

- Meet the requirements of Section 257.97(b) of the CCR Rule;
- Consider the standards in Section 257.97(c), and;
- Address the schedule and other factors specified in Section 257.97(d).

Upon remedy selection, a remedy selection report will be prepared that documents details of the selected remedy and how the selected remedy meets Section 257.97 requirements. As needed to accommodate further investigation(s) and/or evaluation, Section 257.97 requires the preparation of a semiannual report that documents progress toward remedy selection and design.

1.0 INTRODUCTION

The following report presents the Assessment of Corrective Measures (ACM) for groundwater impacts identified at the Green Station CCR Landfill (Green Landfill), which is a coal combustion residuals (CCR) management unit located at the Big Rivers Electric Corporation (BREC) Sebree Generating Station (Sebree Station), located near Sebree, Kentucky (Site).

Groundwater monitoring was conducted for the unit in accordance with the United States Environmental Protection Agency's (USEPA) CCR Rule (40 Code of Federal Regulations (CFR) Section 257.90 through Section 257.95). The results of Detection Monitoring (per Section 257.94) identified the presence of one or more indicator constituents (Appendix III to Section 257) with downgradient concentrations representing a statistically significant increase(s) (SSI) over background or upgradient conditions. The detection of one or more SSI required the implementation of Assessment Monitoring following the requirements of Section 257.95, which was initiated in June 2018. Assessment Monitoring results indicated the downgradient presence of one or more constituent of concern [COC] (Appendix IV to Section 257) at concentrations that represent a SSI over background concentration, and that represent a statistically significant level (SSL) over the groundwater protection standard(s) established in accordance with to Section 257.95(h).

For the Green Landfill, the following SSLs were identified:

- Lithium (Li) in MW-3A, MW-4, MW-5, and MW-6

The identification of these SSLs requires characterization of the nature and extent of impact (sufficient to support the ACM) in accordance with Section 257.95(g)(1) and the initiation of an ACM following the requirements of Section 257.96. Notice of ACM initiation dated January 14, 2019 was posted to BREC's publicly-accessible CCR reporting website.

Section 257.96(c) requires this ACM to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

This report presents the ACM evaluation in the following five sections, along with their associated appendices and attachments.

2.0 DESCRIPTION OF CURRENT CONDITIONS

This section provides information related to the current use of the Site, as well as the history of activities relevant to the ACM for the Green Landfill at the Sebree Station.

2.1 Site Background

BREC owns and operates Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/HMP&L Station. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (see **Figure 1**). Reid Unit 1 (66 Megawatts [MW]) began commercial operation in 1966 and it will be converted from coal to natural gas in the future. The Reid Combustion Turbine (72 MW) was commercialized in 1976. HMP&L Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974 respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (242 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Green Landfill is illustrated on **Figure 2**. The Green Landfill is located directly south of Sebree Station, situated south of the Green Station CCR Surface Impoundment. The Green Landfill is a Kentucky permitted landfill (Permit No. SW11700007) that receives special wastes generated by burning coal (CCRs) from Green and Reid/HMP&L Stations. The landfill began receiving CCR wastes in 1980. The current Green Landfill footprint is approximately 170 acres.

As stated in the published CCR monitoring well network certification, available on the BREC website (http://www.bigrivers.com/), the original ground surface within the landfill footprint was irregular and the dominant features were small stream valleys draining towards the Green River, which is located just east of the landfill; and towards Groves Creek, which is located just south of the landfill. There was also historic oil and gas production at and in the immediate vicinity of the Green Landfill. A review of the records from the Kentucky Geological Survey (KGS) showed that at or immediately adjacent to the Site, there were a number of dry exploratory oil/gas exploration holes, oil production wells, one gas production well, and one secondary recovery injection well. There were also former brine ponds at the Site. Most of these wells were abandoned in accordance with applicable regulations by BREC in 1997 and 1998. The last existing well was decommissioned in 2019.

2.2 Site Investigation and Interim Measures

Monitoring wells were installed in the vicinity of the Green Landfill beginning in November 1996 prior to the implementation of the CCR Rule. However, the existing wells meet the requirements of Section 257.90 of the CCR Rule for installation of a groundwater monitoring system. These requirements are that wells must adequately represent the quality of background groundwater and groundwater representing the downgradient waste boundary. The existing wells are located along the perimeter of the footprint for the Green Landfill (**Figure 2**). One upgradient monitoring well (MW-1) and five downgradient monitoring wells (MW-2, MW-3A, MW-4, MW-5 and MW-6) were installed adjacent to the Green Landfill to determine the general direction of groundwater movement and to monitor groundwater at the Site. The monitoring wells were installed in the uppermost saturated portion of the sandstone bedrock aquifer.

Hydraulic testing (slug tests) was performed in April 2019, and nine rounds of Baseline groundwater sampling for Appendix III constituents were conducted between March 2016 and October 2017. Statistical evaluation for Detection monitoring indicated that SSIs over background had occurred, and therefore, Assessment monitoring was triggered. Detection monitoring activities and data are presented in the annual reports that have been prepared to date, (AECOM 2018 and 2019).

As part of Assessment monitoring, upgradient and downgradient wells for the Landfill were sampled for Appendix IV constituents in June, July, and September 2018. Groundwater Protection Standards (GWPS) were established for Assessment monitoring of the Appendix IV constituents, and statistical evaluation indicated exceedances of GWPSs at SSLs.

For the purposes of this ACM, the COC that exceeds GWPSs at SSLs is Li (see **Table 1**).

Table 1 Green Station CCR Landfill Constituents of Concern

Monitoring Well (Date)	Parameter Lithium Background UPL 0.008 GWPS 0.04 (mg/L)
MW-3A (Jun 2018)	**0.699**
MW-3A (Jul 2018)	**0.790**
MW-3A (Sep 2018)	**0.766**
MW-4 (Jun 2018)	**1.81**
MW-4 (Jul 2018)	**1.91**
MW-4(Sep 2018)	**1.81**
MW-5(Jun 2018)	**0.459**
MW-5 (Jul 2018)	**0.481**
MW-5 (Sep 2018)	**0.425**
MW-6 (Jun 2018)	**0.0650**
MW-6 (Jul 2018)	**0.0590**
MW-6 (Sep 2018)	**0.0558**

GWPSs are the greater of the site-specific background concentrations, the USEPA primary drinking water standard maximum contaminant limits (MCL), or GWPS provided in 40 CFR 257.95(3)(h)(2)
Bold red values exceed the GWPS by direct comparison; yellow shaded indicates an SSL above the GWPS (i.e., 95 LCL > GWPS) mg/L = milligrams per liter; UPL = Upper Prediction Limit.

No formal interim corrective measures have been performed at the Green Landfill but corrective measures for known non-groundwater releases are underway. The compatibility of those corrective measures with potential groundwater remedies is a consideration in this assessment.

2.3 Conceptual Site Model (CSM)

The main purpose of a CSM is to support the decision-making process for groundwater corrective action at the Green Landfill.

2.3.1 Physical Setting

The Site is mapped within the Interior Low Plateaus physiographic province (https://www.nps.gov/subjects/geology/physiographic-provinces.htm). The province is part of the Interior Plains division of the United States. Characteristic features of the province include unglaciated rolling limestone plains with alluvial valleys and entrenched rivers and streams. Several large rivers are in the region, including the Green, the Ohio, the Kentucky, the Tennessee, and the Cumberland Rivers. The

geology underlying the Site consists of unconsolidated materials, including loess and alluvial deposits, underlain by Upper to Middle Pennsylvanian-age clastics and carbonates consisting primarily of sandstone and shale. The unconsolidated material also include fill, silty and clayey residuum, and minor amounts of sandy, clayey channel fill alluvium.

The Green Landfill is located on an upland adjacent to the west bank of the Green River at an elevation of approximately 436 feet, above mean sea level [ft., amsl] (at the north end of the landfill) and 397 ft., amsl (at the south end of the landfill), with a maximum elevation of 608 ft., amsl at the landfill crest. Precipitation falling within the Green Landfill is directed to ponds in the north and south sides of the unit and then to the river under Kentucky Pollution Discharge and Elimination System (KPDES) permit. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands (Associated Engineers 2016, Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan). The Green Landfill does not have an existing leachate collection and management system.

2.3.2 Geology

Figure 3 presents a geologic map of the site and vicinity. The Site lies in the Western Kentucky Coalfields section, characterized by rolling uplands underlain by coal-bearing bedrock of the Pennsylvanian Period. In the vicinity of the site, maximum topographic relief is on the order of 80 feet. The geologic quadrangle (Geologic map of the Robards quadrangle, Henderson and Webster Counties, Kentucky, 1973) for the Site vicinity published by the KGS shows the surficial material to be unconsolidated loess representing the Pleistocene and Holocene geologic epoch. The loess consists of sandy and clayey silt. The unconsolidated surficial materials, which include silty and sandy clay units, are up to approximately 25 feet in thickness.

The unconsolidated materials are shown to be underlain by bedrock of the Upper Pennsylvanian Shelburn Formation (formerly identified as the Lisman Formation (Fairer, 1973)) and the Middle Pennsylvanian Carbondale Formation. At the base of the Shelburn Formation is the Providence Limestone Member, consisting of limestone and interbedded shale, but this unit is absent in much of the area due to erosional channeling. Due to its discontinuous character and the presence of interbedded shale, hydrologically significant karst features are not present in the Providence Limestone Member. The underlying Carbondale Formation consists of cyclic sequences of sandstones, shales, siltstones and coals. The Carbondale sediments were deposited in a fluvial-deltaic system. As a result of this depositional environment, the lithologic units of the Carbondale tend to be lenticular bodies rather than continuous sheet-like strata. Gradational and abrupt horizontal changes in lithology are often encountered.

Cross-sections were prepared during development of this ACM, and cross-section locations are shown on **Figure 2**. The individual cross-sections are presented on **Figures 4, 5 and 6**. These sections illustrate the sequence of geologic materials present under the Green Landfill as evidenced by the currently available data.

2.3.3 Hydrogeology

For purposes of compliance with the CCR Rule groundwater monitoring requirements the interbedded sandstone and shale of the Carbondale Formation, is considered to be the uppermost aquifer underlying the Green Landfill. The uppermost aquifer is unconfined and first encountered at an elevation of approximately 401 ft., amsl at the northwest end of the landfill, and 367 ft., amsl at the southeast end of

the landfill (AECOM, 2019). Flow direction beneath the Site is typically southeast towards the Green River.

Slug tests were performed on April 25, 2019 at monitoring wells MW-3A, MW-4, MW-6, and MW-104 to assess the hydraulic characteristics of the uppermost aquifer. The estimated hydraulic conductivity of the monitoring wells tested ranged from $2x10^{-5}$ to $3x10^{-3}$ centimeters per second (cm/sec).

Although previous site-specific investigations have noted the presence of perched zones of saturation in the overlying unconsolidated materials, these discontinuous zones do not qualify as an uppermost aquifer under the CCR Rule because they do not produce usable quantities of groundwater.

2.3.4 Constituents of Concern (COCs)

As described in Section 2.2, a single Appendix IV constituent, Li, was detected at concentrations exceeding GWPS at multiple monitoring well locations. Li was detected at SSLs above the GWPS at the locations of monitoring wells MW-3A, MW-4, MW-5, and MW-6.

2.3.5 Impacted Media

Groundwater is the sole impacted media of concern addressed by this ACM. Non-groundwater releases will be covered under a separate ACM.

2.3.6 COCs Distribution

Groundwater analytical data from the Site investigations through 2018 indicate that COC concentrations above GWPSs are present in the vicinity of the Green Landfill along the south and east edges of the landfill, near the station's property boundary **(Figure 7**). COC concentrations at MW-1 and MW-2 were not above GWPSs at SSLs. Due to this, the area of projected corrective measures is confined to the area between and adjacent to MW-3A, MW-4, MW-5, and MW-6.

An additional characterization well, MW-104, was subsequently installed to estimate the downgradient extent of impacted groundwater. Sample collection for Appendix III and IV parameters took place in March and April 2019. The analytical results for Li were below the GWPS. The additional characterization data are summarized in **Table 2**.

Table 2 – Green Station CCR Landfill Characterization Sample Results

Monitoring Well (Date)	Parameter
	Lithium UPL 0.008 GWPS 0.04 (mg/L)
MW-104 (March 2019)	0.0281
MW-104 (April 2019)	0.0288

The two sampling event results from the characterization well help confirm the downgradient (southwestern) extent of COC impacts above the GWPS at the Green Landfill.

2.3.7 Groundwater Quality

In addition to the presence of COCs above GWPSs, other geochemical characteristics of the shallow aquifer zone consist of the following:

- The temperature of the samples taken at the downgradient wells during the September 2018 sampling event ranged from 16.92 degrees Celsius (°C) to 17.54 °C.
- Specific conductance ranged from 1.68 to 8.00 milliSiemens per centimeter (mS/cm).
- Dissolved Oxygen (DO) concentration ranged from 0.42 to 6.36 mg/L.
- Oxidation Reduction Potential (ORP) ranged from -83 to 447 milliVolts (mV). The only monitoring well sample with a negative ORP was collected from monitoring well MW-2.
- Turbidity of the samples ranged from 0.14 to 25.6 Nephelometric Turbidity Units (NTU).
- The pH of the samples ranged from 6.50 to 6.72.
- Total Dissolved Solids (TDS) concentration of the samples ranged from 937 to 5,170 mg/L.

2.3.8 Potential Receptors / Pathways

Contact with water (e.g., shallow groundwater or surface water) impacted by COCs at levels above GWPS is regarded as the potential pathway for exposure of potential receptors. Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Green Landfill, thus limiting the potential receptors to the surface water, i.e., the Green River and its tributary, Groves Creek. The pathways to these receptors include seepage of water from the Green Landfill through manmade and natural hydraulic barriers.

Other potential exposure pathways (e.g., soil or vapor) are not considered complete as the CCR material is isolated in the unit. This isolation prevents direct access by individuals that might result in direct contact or ingestion. In addition, the inherent non-volatile nature of the unit-specific COCs eliminates the potential for a complete vapor pathway (i.e., vapor intrusion to indoor air). Therefore, soil and vapor pathways will not be considered within the context of this ACM.

3.0 CORRECTIVE ACTION OBJECTIVE (CAO)

For CCR units, 40 CFR Parts 257.90 through 257.98 outlines the groundwater monitoring programs (Detection and Assessment) and the corrective action evaluation process, which provide the basis for the development of the site-specific CAO. Detection and Assessment groundwater monitoring are complete at the Landfill, and the COC Li has been identified based on exceedance of the GWPS.

Section 257.96(c) requires this assessment to include an analysis of the effectiveness of potential corrective measures to meet the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

The subsequent remedy selection process will evaluate the following objectives for remedies, as required under Section 257.97(b):

- Protect human health and the environment;
- Attain the COC-specific GWPSs as specified pursuant to Section 257.95(h);
- Control the source(s) 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 (applicable to material releases only); and
- Comply with standards for management of wastes as specified in Section 257.98(d).

Together, these requirements comprise the site-specific CAO that will be used during the remedy selection process.

4.0 TECHNOLOGY IDENTIFICATION AND SCREENING

As required under Section 257.97(b), source control is one element of the CAO that is intended to prevent further releases from the source, i.e., the Green Landfill. In adherence with the BREC's permit conditions, the Site will continue to operate as a solid waste disposal facility through its life cycle and will be closed in accordance with the requirements of the permit. Source control through landfill closure will include installation of final cover that will prevent infiltration and contribute to groundwater quality restoration. Control of non-groundwater sources associated with the Green Landfill are also planned and are described separately.

The identification and screening of potentially applicable corrective measures technologies for groundwater downgradient of the Green Landfill is presented in **Appendix A** to this report. The findings of that screening are summarized in the table below.

Table 3 – Potential Corrective Measures Options Technology Description/Overview

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection mode)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a standalone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing offsite migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations increase implementation difficulty with scale.

Potentially Applicable Technology	Status	Description/Overview
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

References: Technology descriptions referenced from 1) FRTR: Federal Remediation Technologies Roundtable, CLU-IN, and/or AECOM reference materials.

5.0 CORRECTIVE ACTION ALTERNATIVES ASSEMBLY

Applicable corrective measures technologies identified in Section 4.0 above were assembled into corrective measures alternatives for evaluation (see **Appendix A** and Section 6.0). Each corrective measures alternative consists of one or more corrective measures technologies assembled into a strategy for the groundwater remedy. Six corrective measures alternatives for the Green Landfill were assembled and are described below.

- **Alternative #1** – No Action and Groundwater Monitoring
- **Alternative #2a** – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- **Alternative #2b** – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- **Alternative #3** – CiP, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- **Alternative #4** – CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- **Alternative #5** – CiP, Other Source Control, ICs, and Groundwater Monitoring

5.1 Assumptions for Corrective Measure Alternatives Development

In developing the corrective measures alternatives, a number of assumptions have been made based on the data available to AECOM at the time of this report and operational plans as reported by the owner/operator. The specific assumptions include:

- The currently observed dissolved phase groundwater impacts are limited to the area between and adjacent to monitoring well locations MW-3A, MW-4, MW-5, and MW-6 along the south and east edges of the landfill.
- Groundwater impacts are limited to the saturated zone between the observed water table at approximate elevation 370 feet mean sea level (ft., msl) and the base of the aquifer at approximately 320 ft-msl.
- Ex-situ treatment of groundwater may involve physical/chemical methods and/or discharge to a permitted National Pollution Discharge and Elimination System (NPDES) outfall.
- Groundwater corrective measures will be conducted until the CAOs are met. The objectives may be met at an earlier date, but the alternatives analysis is based on the conservative assumption that corrective measures and the associated monitoring of groundwater conditions will be required for up to 30 years following the initiation of the corrective measures.
- CiP and Other Source Control are part of planned plant operations.

5.2 Groundwater Corrective Measures Alternatives Overview

The developed groundwater corrective measures alternatives, outlined above, are detailed in the following sections.

5.2.1 Alternative #1 – No Action and Groundwater Monitoring

Alternative #1 consists of taking no action to remedy the CCR impact observed in the Green Landfill groundwater monitoring system. Under the No Action alternative, no corrective measures would be

implemented to remove, control, mitigate, or minimize exposure to impacted groundwater. Groundwater monitoring (Assessment) is required by the CCR rule during the nominal performance period of 30 years to track the effectiveness of the alternative and to identify conditions that allow the return to Detection monitoring. The No Action alternative establishes a baseline, or reference point against which each of the developed corrective measures alternatives may be compared.

5.2.2 Alternative #2a – CiP, ICs, and Groundwater Monitoring

Alternative #2a employs a combination of three of the retained corrective measures technologies:

- CiP source control, which consists of two elements: routine cover management during landfill operation, and planned closure activities to be conducted at the end of the landfill's operational life cycle;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater Monitoring (Assessment) to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection monitoring and ultimately to cessation of corrective measures.

CiP was selected as the source control technology because the unit is a state-permitted solid waste facility subject to operational and closure controls designed to limit the potential for impact to human health and the environment.

Implementation of ICs is employed to help maintain the CiP and associated corrective measures by limiting the accessibility of the unit to unauthorized users and restricting future use of the property to those activities that may result in exposure potentials. ICs for the landfill are specifically addressed by the facility's solid waste permit, which restricts the use of the property and associated resources (groundwater).

Groundwater monitoring of the unit is required by 40 CFR 257.90 through .98. The unit triggered Assessment mode monitoring by the detection of indicator parameters (Appendix III of 40 CFR 257) in downgradient monitoring wells at concentrations representing a SSI over background. Continued groundwater monitoring is required under 40 CFR 257.95 until the CAOs are met. The CAOs are anticipated to be met as the effect of source control technologies are realized and as natural attenuation mechanisms (advection, dilution and dispersion) take effect.

5.2.3 Alternative #2b – CbR, ICs, and Groundwater Monitoring

Alternative #2b is similar to Alternative #2a except that CiP is replaced by CbR, which consists of excavation and removal of the Green Landfill, implementation of ICs and an Environmental Covenant intended to restrict the unit to industrial use and prohibit groundwater use for potable purposes. The excavation of impacted CCR material would typically be completed using standard construction equipment (e.g., backhoe, excavator, wheel loader, dump trucks). The excavated materials are then placed directly into dump trucks for transport/disposal or beneficial use. Excavation limits would typically be verified with confirmation sampling to demonstrate that the underlying soil is not impacted above applicable standards.

Groundwater monitoring of the unit is required by 40 CFR 257.90 through .98. The unit triggered Assessment mode monitoring by the detection of indicator parameters (Appendix III of 40 CFR 257) in downgradient monitoring wells at concentrations representing a SSI over background. Continued groundwater monitoring is required under 40 CFR 257.95 until the CAOs are met. The CAOs are

anticipated to be met as the effect of source control technologies are realized and as natural attenuation mechanisms (advection, dilution and dispersion) take effect.

5.2.4 Alternative #3 – CiP, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, ICs, and Groundwater Monitoring

Alternative #3 builds on Alternative #2a to also include the addition of Hydraulic Containment, Other Source Control, and Ex-Situ Treatment of groundwater:

- CiP source control, which consists of two elements: routine cover management during landfill operation, and planned closure activities to be conducted at the end of the landfill's operational life cycle;
- Hydraulic Containment using one or more vertical wells designed to prevent the movement of impacted groundwater past the limits of the unit to the downgradient groundwater environment and potential points of exposure;
- Other Source Control in the form of draining and lining the south Leachate Pond, which helps eliminate the potential for additional contaminant migration from the landfill, and managing existing non-groundwater seepages;
- Ex-Situ Treatment of groundwater extracted for hydraulic containment, which involves above-ground physical/chemical treatment methods and/or permitted discharge for until the CAOs are achieved;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater Monitoring (Assessment mode) to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection mode monitoring and ultimately to cessation of corrective measures.

Vertical groundwater recovery wells for Hydraulic Containment would be installed near the downgradient limit of the unit. It is noted that Pre-Design Studies will be needed to identify the appropriate number, design, and spacing of the extraction well system, but for the purposes of this ACM, preliminary specifications are as follows:

- Five vertical groundwater extraction wells;
- The extraction wells would be installed along the south side and the southeast corner of the landfill, equally spaced between MW-6 and MW-3A;
- Well installed to a depth of approximately 50-75 ft-bgs;
- Estimated total groundwater extraction rate of 200 gallons per minute (gpm).

Alternative #3 incorporates treatment of extracted groundwater before it can be discharged to an outfall. Treatment will consist of piping the extracted groundwater to an existing surface water impoundment at the Sebree Station, which will allow for compliance with discharge permits through an established NPDES outfall.

Other Source Control would consist of re-design of the pond located south of Green Landfill by dividing the pond into thirds. The east and west sections of the pond will be designed to collect non-groundwater seepage from around the toe of the unit so that it can be isolated and pumped to a central location for treatment. The middle section of the pond will continue to be used for stormwater collection.

The COC concentrations downgradient of the hydraulic containment would also be expected to decrease over time through natural attenuation mechanisms including advection, dilution, and dispersion. As such, groundwater monitoring would be modified to include system performance monitoring, which may require installation of wells at new locations to evaluate the efficacy of hydraulic containment and to identify when CAOs have been achieved.

5.2.5 Alternative #4 – CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring

Alternative #4 is similar to Alternative #2a except for the addition of a Physical Containment barrier such as a slurry wall or grout curtain along the affected downgradient boundary of the unit to contain groundwater flow. Impacted groundwater would be contained by grout curtain constructed in a funnel-and-gate arrangement that directs the flow of groundwater to an extraction point at the gate, from which groundwater is pumped and conveyed to ex-situ treatment. Design of a Physical Containment system is largely driven by the depth and character of the groundwater bearing zone, and the length barrier needed to effect containment. In this case, the aquifer ranges to depths on the order of 75 feet below ground surface near the downgradient limit of the unit. The projected length of a physical barrier is 4,000 feet. Similar to Alternative #3, Treatment will consist of piping the extracted groundwater to an existing surface water impoundment at the Sebree Station, which will allow for compliance with discharge permits through an established NPDES outfall.

5.2.6 Alternative #5 – CiP, Other Source Control, ICs, and Groundwater Monitoring

Alternative #5 builds on Alternative #2a to also include the addition of Other Source Control for non-groundwater releases. Other Source Control would consist of draining and lining the pond located south of Green Landfill with geomembrane, and dividing the pond into sections. The east and west sections of the pond will collect the seepage, where it will be pumped to a central location for treatment. The middle section of the pond will continue to be used for stormwater collection.

6.0 ALTERNATIVE EVALUATION

The formal remedy selection process, in accordance with the CCR Rule 40 CFR Section 257.97, will begin following submission of the ACM Report. The subsequent remedy selection process will evaluate the following objectives for remedies, as required under Section 257.97(b):

- Protect human health and the environment;
- Attain the COC-specific GWPSs as specified pursuant to Section 257.95(h);
- Control the source(s) 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 (applicable to material releases only); and
- Comply with standards for management of wastes as specified in Section 257.98(d).

6.1 Potential Data Gaps

No data gaps investigation is projected at this time.

Depending on which alternative is selected, a data gap investigation may be needed to further refine the targeted areas for corrective measures. Potential data gaps may include the following:

1) Supplemental Groundwater Investigation – This investigation may consist of additional monitoring well installation and sampling to refine the existing CSM as well as to provide data related to the hydraulic characteristics of the subsurface.

2) Physical Containment Profile – Prior to committing to a physical barrier design, it may be necessary to probe the subsurface along the proposed alignment to:

    - Establish the character of the materials through which the barrier would be installed,
    - The depth to confinement where the barrier would terminate.

7.0 REFERENCES

AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Green Station CCR Landfill, Webster County, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Green Station CCR Landfill, Webster County, Kentucky.

Associated Engineers 2016. Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan.

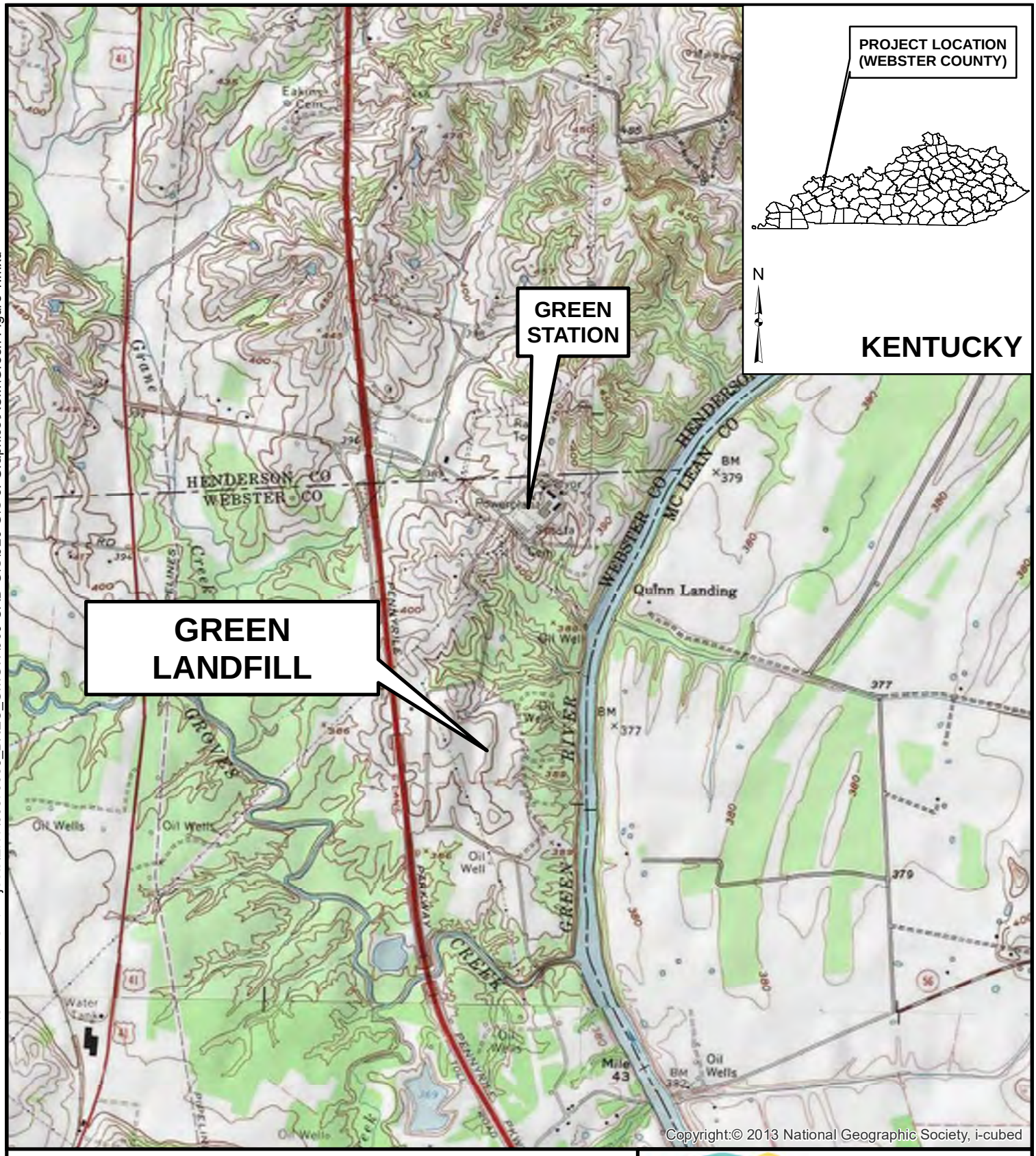
EPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

Fairer, G.M., Geologic Map of the Robards Quadrangle, Henderson and Webster Counties, Kentucky, U.S. Geological Survey, 1973.

Federal Remediation Technologies Roundtable (FRTR). Remediation Technologies Screening Matrix and Reference Guide, Version 4.0. URL: https://frtr.gov/scrntools.htm Page last modified on: Tuesday, May 17, 2016

Interstate Technology Regulatory Council (ITRC), 2009. Evaluating LNAPL Remedial Technologies for Achieving Project Goals. ITRC guidance document LNAPL-2, Washington, DC; 54 pp.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

N

Big Rivers ELECTRIC CORPORATION

Green Station
Webster County, Kentucky

FIGURE 1
SITE LOCATION MAP

DATE: 4/30/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60602364	

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Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well
- A — A' Transect Line
- GP-01 Seeps Investigation Borings

0 400 800
Feet

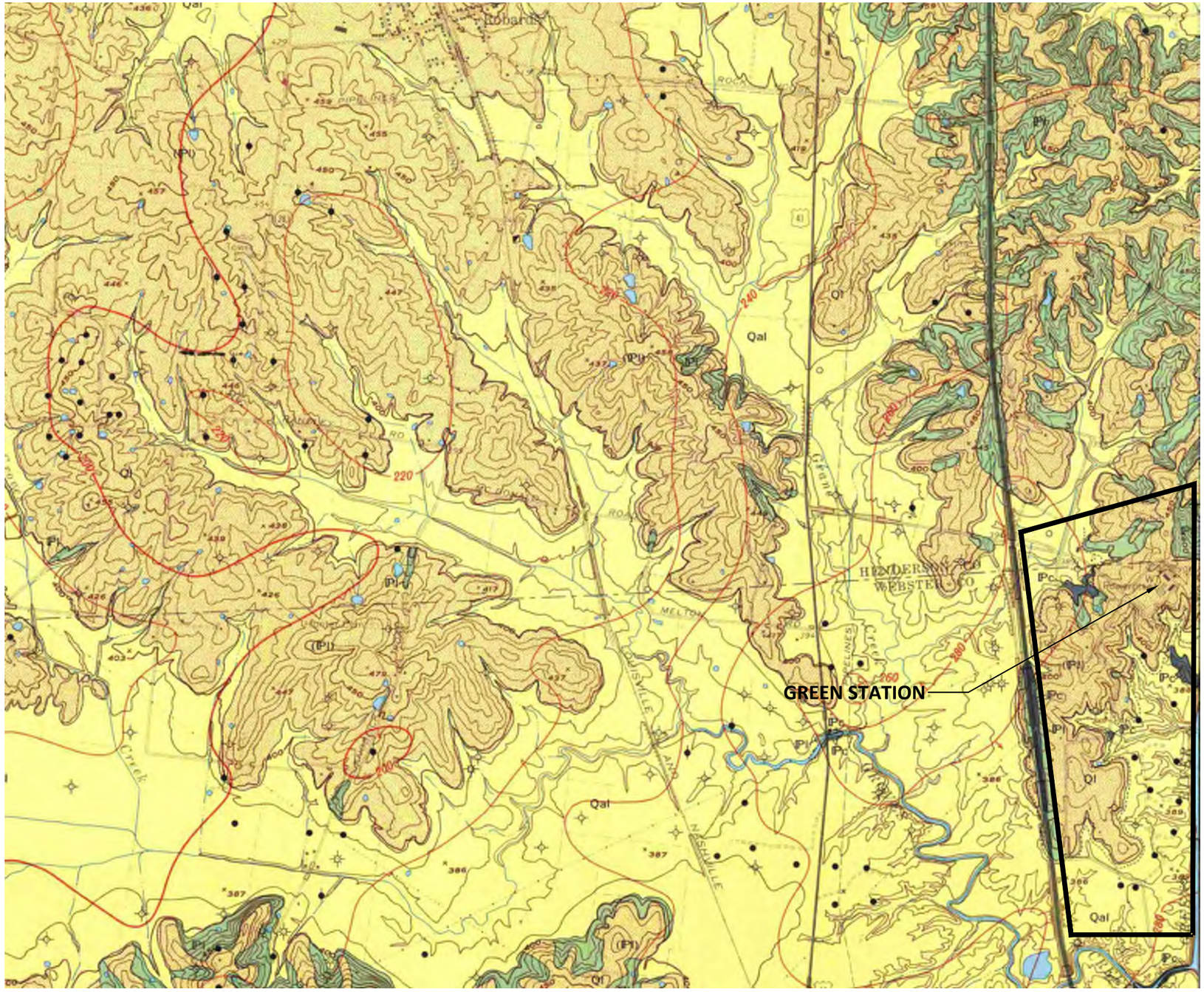
N

Big Rivers Electric Corporation

Green Station
Webster County, Kentucky

FIGURE 2
WELL LOCATION MAP

DATE: 5/17/2019	SCALE: 1IN = 300 FEET
CREATED BY: ALW	
JOB NO. 60602364	



EXPLANATION

QUATERNARY

Pleistocene and Holocene

Qal — Alluvium

Pleistocene

Ql — Loess

Adapted in part from soil map of Henderson County (Converse and Cox, 1967)

PENNSYLVANIAN

Upper Pennsylvanian

Pl — m — Pl — Lisman Formation

m, base of Madisonville Limestone Member

Middle Pennsylvanian

Pc — Carbondale Formation

Formation symbols enclosed in parentheses where units concealed by mapped surficial deposits

Contact or key bed

Dashed where inferred; dotted where concealed. Triangles indicate selected localities where contacts were well exposed at time of mapping

Strike and dip of beds

Structure contours

Drawn on base of No. 9 coal bed; projected where contoured horizon is missing. Arrows indicate direction of dip. Contour interval 20 feet

Outline of area where No. 9 coal bed is missing

DRILL HOLES FROM WHICH SUBSURFACE STRUCTURAL DATA WERE OBTAINED, AS OF JANUARY 1, 1971

Dry hole

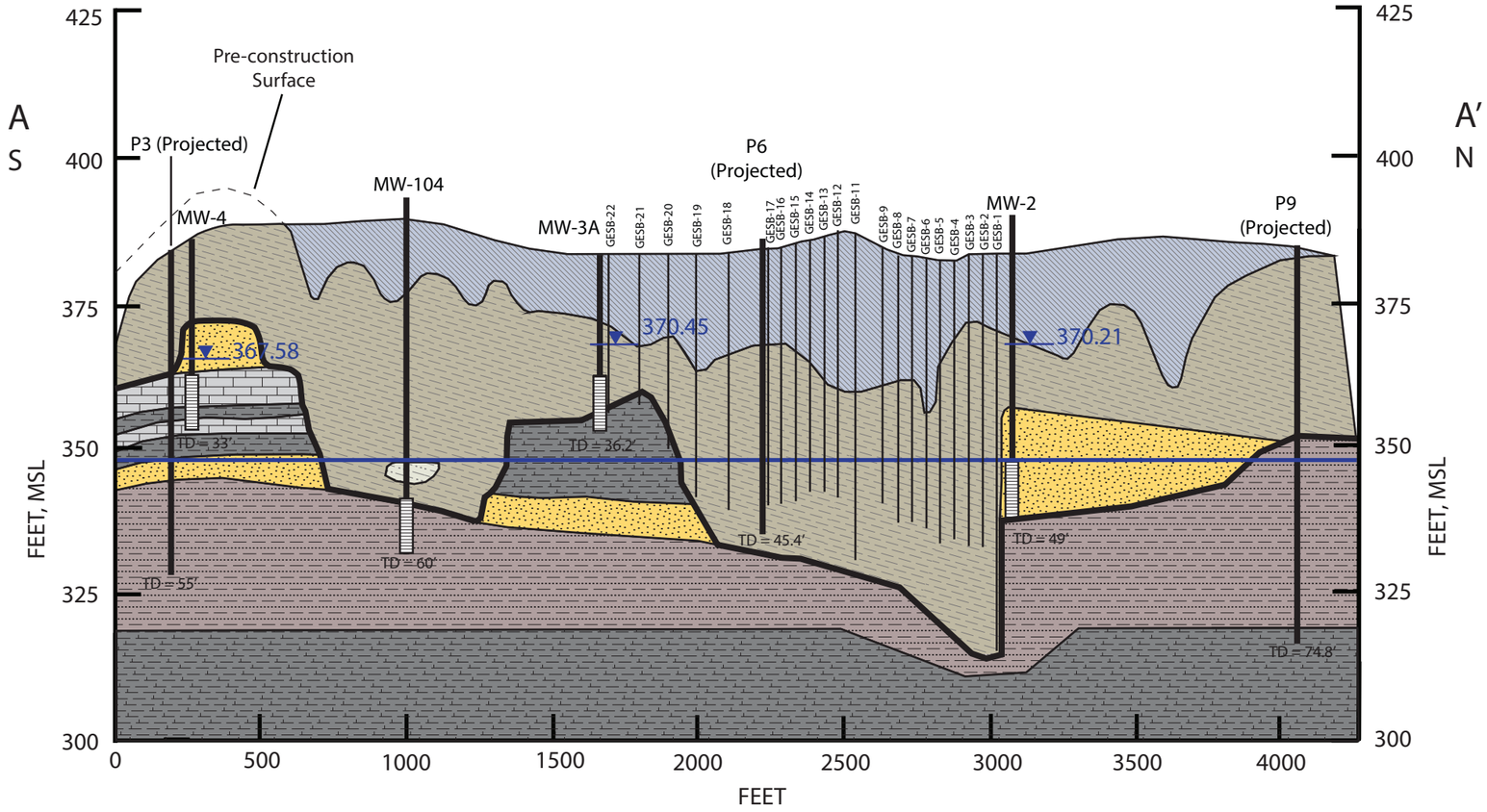
Oil well

Big Rivers Electric Corporation

Green Station
Webster County, Kentucky

FIGURE 3
SITE GEOLOGIC MAP
(KENTUCKY GEOLOGICAL SURVEY)

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: DAS	
JOB NO. 60602364	



LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silt
- Silty Clay
- Clayey Silt

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale

- Potentiometric Surface September 28, 2018
- Green River Elevation (348 ft)

MW-2
MONITORING WELL LOCATION ID
RISER
MONITORING WELL SCREEN
BACKFILL / COLLAPSE

25 feet
500 feet
(Vertical Exaggeration = 20x)

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 4
CROSS SECTION A - A'

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: MRH	
JOB NO. 60602365	

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B
W

B′
E

525
500
475
450
425
400
375
350
325
300

FEET, MSL

Fly Ash (Land Fill)

Pre-construction Surface

P7 (Projected)

MW-1

P8 (Projected)

P9 (Projected)

MW-2

401.01

370.21

TD = 45'

TD = 65.5'

TD = 35.5'

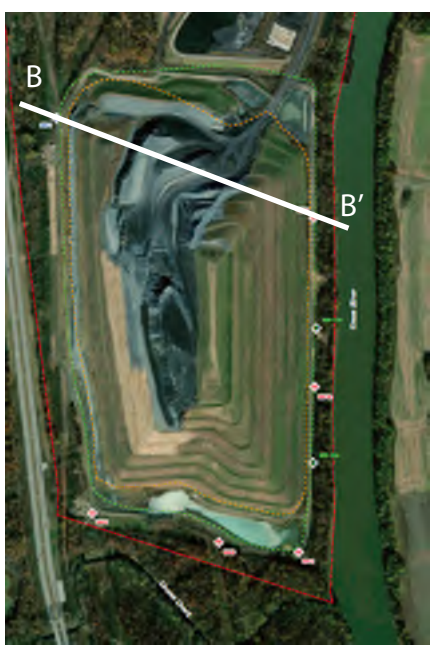
TD = 49'

TD = 74.8'

Green River

0
500
1000
1500
2000
2500
3000

FEET



MW-1 — MONITORING WELL LOCATION ID

RISER

MONITORING WELL SCREEN

BACKFILL / COLLAPSE

Potentiometric Surface September 28, 2018

Green River Elevation (348 ft)

LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silty Clay

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale

25 feet

500 feet

(Vertical Exaggeration = 20x)

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 5
CROSS SECTION B - B'

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: MRH	
JOB NO. 60602365	

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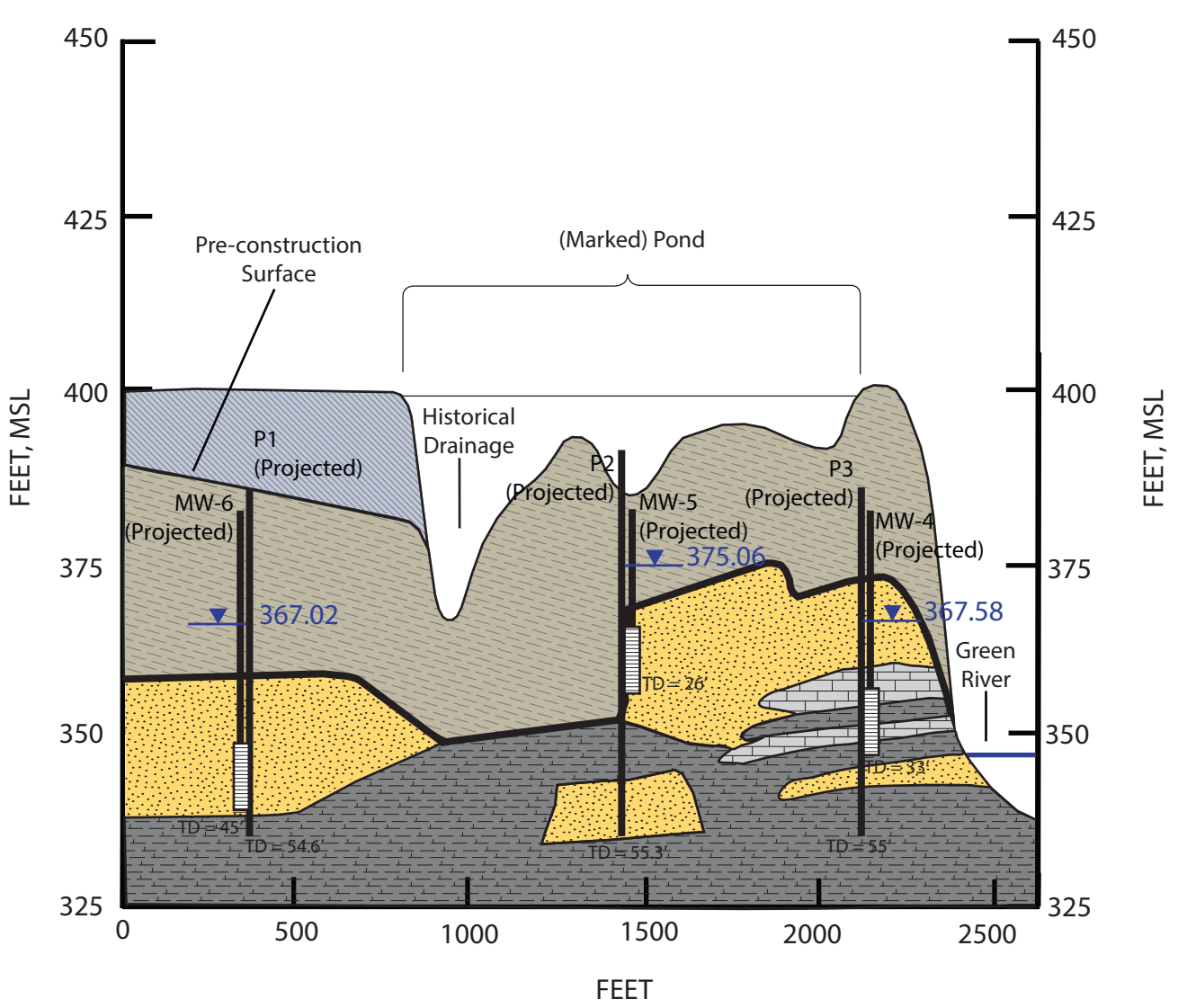

LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silty Clay

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Limestone

25 feet

500 feet

(Vertical Exaggeration = 20x)

MW-4

MONITORING WELL LOCATION ID

RISER

MONITORING WELL SCREEN

BACKFILL / COLLAPSE

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 6
CROSS SECTION C - C'

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: MRH	
JOB NO. 60602365	

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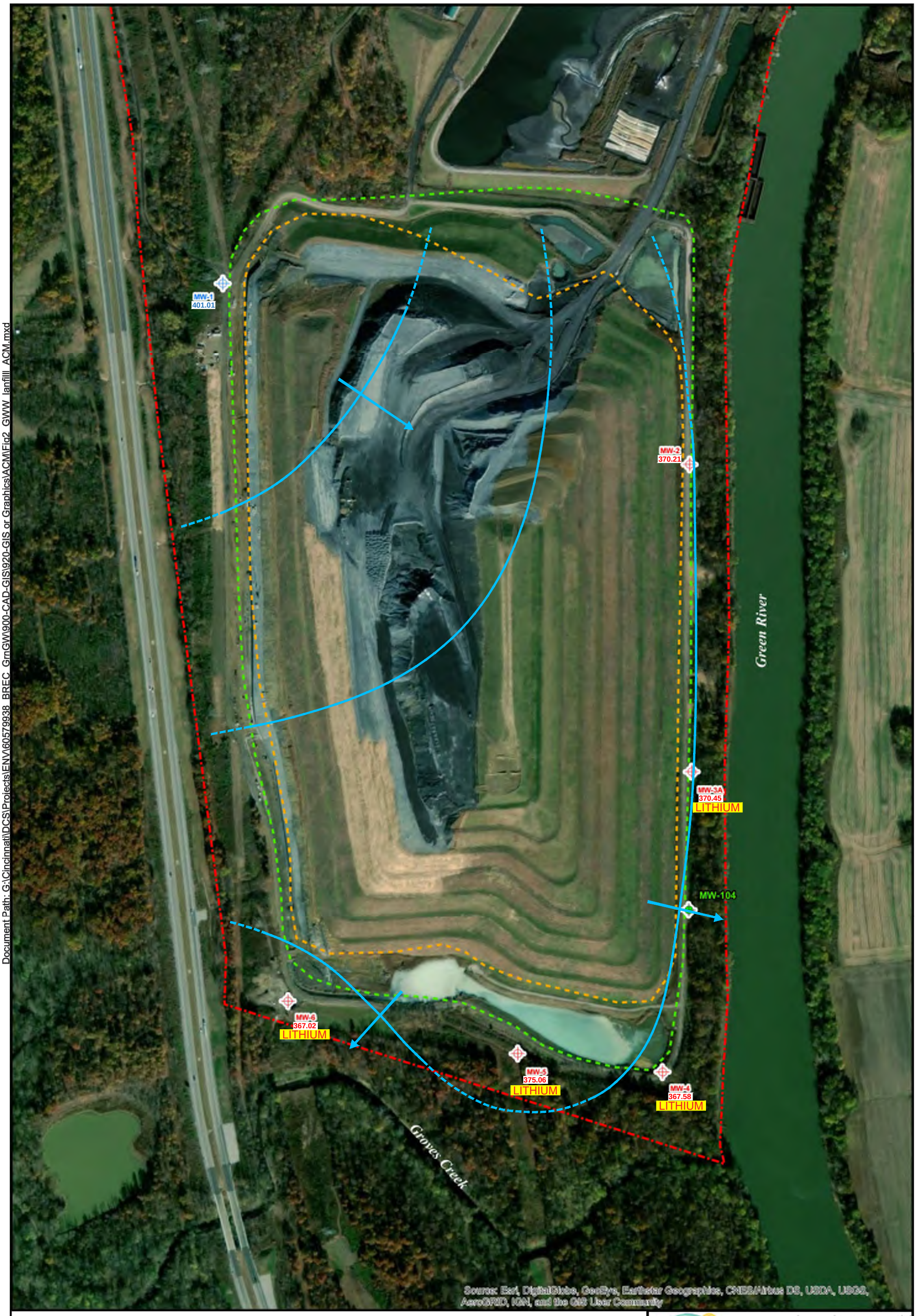

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Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well
- Water Table Contour (Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 367.58 Groundwater Elevation (Feet, MSL) Measured September 28, 2018

0 400 800
Feet

N

Big Rivers Electric Corporation

Green Station
Webster County, Kentucky

FIGURE 7
COC DISTRIBUTION

DATE: 5/17/2019	SCALE: 1IN = 300 FEET
CREATED BY: ALW	
JOB NO. 60602364	

Appendix A

Corrective Measures Technologies and Alternatives Evaluation Process

Appendix A
Corrective Measures Technologies and Alternatives Screening Process

CONTENTS

Section **Page**

Tables

A1.0 CORRECTIVE MEASURES EVALUATION PROCESS

This appendix describes the overall process used in the selection and screening of corrective measures technologies that are considered potentially applicable to Coal Combustion Residuals (CCR) groundwater impacts at the subject Site. This appendix also describes the process for assembling preliminary corrective measures alternatives from one or more applicable technologies and evaluating these alternatives.

A1.1 Potential Remedial Technologies

Section 257.96(c) requires this assessment to include an analysis of the effectiveness of potential corrective measures to meet the objectives for remedies under Section 257.97(b), addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

The following corrective measures technologies are regarded as potentially applicable to corrective measures for CCR groundwater impact:

- No Action (Included as a baseline case)
- Institutional Controls (ICs)
- Groundwater Monitoring
- Hydraulic Containment
- Physical Containment
- Ex-situ Physical/Chemical/Biological Treatment
- In-situ Physical/Chemical/Biological Treatment
- Permeable Reactive Barrier (PRB)
- Closure in Place (CiP) (of the regulated unit)
- Closure by Removal (CbR) (of the regulated unit)

A brief overview of these technologies is provided below in **Table A1**.

Table A1 – Potential Remedial Technologies

Potential Technology	Description/Overview
No Action	Default baseline approach against which other options are evaluated. No corrective action would be taken to remove, control, mitigate or minimize exposure to impacted media.
Institutional Controls (ICs)	Non-engineering measures, such as administrative and/or legal controls that help to minimize the potential for human exposure to contamination, and/or to protect the integrity of a remedy by limiting land or resource use (United States Environmental Protection Agency [USEPA), *Institutional Control Data Standard* EX000015.1, January 6, 2006).
Groundwater Monitoring	Groundwater monitoring (Assessment and/or Detection modes) to assess effectiveness of corrective measures performance, as well as natural subsurface processes such as dilution, adsorption, and chemical reactions that together serve to reduce inorganic constituents of concern (COC) concentrations to acceptable levels.
Hydraulic Containment	Hydraulic containment is a common method for remediating groundwater impacted with metals and other inorganics. Groundwater is pumped from wells or collection trenches to aboveground discharge point or to a treatment system that removes the contaminants. The extraction network would be designed to provide hydraulic containment of the impacted groundwater, preventing it from flowing downgradient towards surface water or other receptors.
Physical Containment	Physical barriers are walls constructed below the ground surface to control or restrict the flow of groundwater. They are constructed by injection grouting or by the use of excavator or deep trenching equipment to insert and thoroughly mix a selected amendment to create a homogenized impermeable wall that prevents impacted groundwater from flowing downgradient. The bottom of the physical containment structure is typically keyed into a low-permeability soil or bedrock (confining layer) to keep groundwater from seeping beneath the wall. To provide hydraulic control of the impacted groundwater behind (upgradient of) the physical barrier and to prevent impacted water from flowing around the edges of the wall, extraction wells would be installed behind the vertical barrier (VB) and the extracted groundwater processed through a treatment system.
Ex-situ Physical/Chemical/Biological Treatment	Ex-situ treatment requires pumping of groundwater and engineering for equipment, possible permitting, and material handling. Physical/chemical treatment uses the physical properties of the contaminants or the contaminated medium to destroy (i.e., chemically convert), separate, or contain the contamination. Physical/chemical treatment can be completed in short time periods (in comparison with biological treatment). Equipment is readily available. Treatment residuals from separation techniques will require treatment or disposal.

Potential Technology	Description/Overview
In-situ Physical/Chemical Treatment	With in-situ treatment, groundwater is treated without being brought to the surface. In-situ processes, however, generally require longer time periods. Physical/chemical treatment uses the physical properties of the contaminants or the contaminated medium to destroy (i.e., chemically convert), or separate the contamination.
Permeable Reactive Barriers (PRB)	A PRB is a constructed subsurface barrier designed to intercept groundwater flow and react with the entrained COCs. PRBs can be established through trench injection or direct-push injection (on closely spaced grids) of reactive material. PRBs are typically installed to the depth of impacted groundwater (often the bottom of the shallow aquifer) and along the length of the impacted zone. The amendment used to generate the PRB is generally permeable as or more permeable than the surrounding material, encouraging impacted groundwater to flow through the reactive material. The reactive material then causes chemical reactions to occur, resulting in adsorption, precipitation, or degradation of the COC. PRBs are commonly used to control organic contamination in groundwater and have been successfully used to remediate metals.
Closure in Place (CiP) (of the regulated unit)	Landfill caps can be installed to minimize generation of leachate and to minimize infiltration into underlying waste. Landfill caps also may be applied to waste masses that are so large that other treatment is impractical. By providing a suitable base for the establishment of vegetation. In conjunction with water diversion and detention structures, landfill caps may be designed to route surface water away from the waste area while minimizing erosion
Closure by Removal (CbR) (of the regulated unit)	Removal of contaminated media for disposal in off-site facility or alternate on-site facility. Media would likely require characterization for proper disposal. Pre-treatment may be necessary to meet land disposal restrictions (LDRs). Once excavated, confirmatory samples would be collected to verify clean-up criteria have been met; the excavation would then be backfilled and covered.

References: Technology descriptions referenced from 1) FRTR: Federal Remediation Technologies Roundtable, CLU-IN, and/or AECOM reference materials.

A1.2 Other Source Control Technologies

In addition to the groundwater corrective measures technologies summarized above, CCR impacts are also mitigated through a variety of engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods for source control.

A1.3 No Action

No Action is included in the evaluation as a baseline against which other technologies are evaluated. With this option, no corrective action would be taken to remove, control, mitigate or minimize exposure to impacted media. In the event that the other identified alternatives do not offer substantial benefits, No Action is the default baseline approach.

Under this alternative, existing impacted media (i.e., CCR materials and impacted soil/groundwater along the exposure pathway) would remain. No capital costs would be incurred, and no cleanup standards would be considered.

No Action does not meet the performance requirement of attaining the established Corrective Action Objective (CAO). Although implementation would be very easy, the required state approval for "No Action" would likely not occur. Safety impacts, cross-media impacts, and residual CCR exposure control

would be no different from current conditions. Therefore, No Action is not an appropriate standalone technology. However, it is retained for use as a baseline against which other technologies and alternatives are evaluated.

A1.4 Institutional Controls (ICs)

The potential use of ICs is considered the least aggressive corrective action technology for CCR impacts.

ICs would not change the concentration or mobility of COCs and therefore would not meet the performance requirement of attaining the established CAO as a standalone technology unless it can be demonstrated that impacted groundwater is not leaving the facility. ICs would be used in combination with other corrective measures to limit human exposures and would be easy to implement, consisting of preparation and recording of Environmental Restrictive Covenants [ERC(s)]. Safety impacts and cross-media impacts would be identical to current conditions. Because ICs would control exposure and thus enhance protection of human health and the environment, the use of ICs can be a component of corrective measures alternatives. The use of ICs as a standalone technology will not be considered.

A1.5 Groundwater Monitoring

The use of groundwater monitoring is only applicable for dissolved-phase groundwater impacts, and it will take place in Assessment and/or Detection modes as appropriate for the current phase of CCR activity. Groundwater monitoring is not a standalone technology, but instead will be combined with other remedial technologies in order to track progress of the overall remedy, which also incorporates natural attenuation processes.

The use of groundwater monitoring as a stand-alone remedial technology will not be considered; instead the incorporation of groundwater monitoring in conjunction with other technologies will be used to monitor effectiveness of a given corrective measures alternative to attain the CAO at points immediately downgradient over an extended period of time. Data reliability is controlled by adherence to the site's groundwater monitoring plan. Implementation of the existing groundwater monitoring plan is easy because it is currently underway. Safety impacts are minimized by use of the existing Health and Safety Plan and there are no construction activities required. There are no cross-media impacts or institutional requirements, nor is there any residual CCR exposure control.

A1.6 Hydraulic Containment

The use of hydraulic containment as a potential remedial technology is considered. The use of groundwater extraction can be effective at hydraulically controlling long-term downgradient dissolved phase impacts.

Hydraulic containment through groundwater extraction and subsequent treatment has historically been a common method for management of groundwater impacted with metals and other inorganics. Groundwater is pumped from wells (vertical or horizontal) or collection trenches to a discharge point (e.g., a permitted outfall) or to an aboveground treatment system. The extraction network would be designed, constructed, and operated to provide a hydraulic barrier between the impacted groundwater and the migration pathway to potential receptors.

This technology attains the established CAO because hydraulic containment rapidly eliminates the offsite migration of impacted groundwater, thereby eliminating the exposure pathway. Performance and reliability would be controlled by adherence to the operations and maintenance plan prepared for the extraction and treatment systems. Implementation would be difficult because of areas of limited access for drilling equipment and uneven groundwater flow in the uppermost aquifer materials that consist of interbedded sandstone and shale having hydraulic conductivity values spanning several orders of

magnitude. Potential safety impacts during construction, operation, and maintenance of the system would be mitigated by health and safety plans prepared for these tasks. There would be no cross-media impacts. Hydraulic containment will reduce mobility due to COCs capture provided by the groundwater extraction system and treatment to remove COCs from the environment. The time period for CAO attainment may be relatively short, but system operation will need to continue until CCR source loading of COCs to groundwater ceases. For institutional requirements, treated discharge would occur under existing or modified National Pollution Discharge Elimination System (NPDES) permit.

Based on the preliminary screening, hydraulic containment is a potentially viable remedial technology and will be retained for further consideration.

A1.7 Physical Containment

The use of physical containment to isolate the impacted materials associated with a CCR unit is considered. Physical containment typically consists of a barrier or wall (i.e., slurry wall, sheet pile wall, or injection grouting) constructed below the ground surface to control or restrict the flow of groundwater. The barrier is typically constructed by excavators and/or deep trenching equipment that thoroughly mix bentonite/cement slurry to create a homogenized impermeable wall, or by driving sheet pile. The construction of the barrier would prevent impacted groundwater from flowing downgradient. Where possible, the bottom of the barrier would be keyed into the low-permeability soil or bedrock (confining layer) at the bottom of the aquifer, keeping groundwater from seeping beneath it. To provide hydraulic control of the impacted groundwater behind the barrier and prevent impacted water from flowing around the edges, a hydraulic containment system would be installed behind the wall. Extracted groundwater would then be discharged or processed through a groundwater treatment system, as needed. Extraction flow rates for this option will generally be lower than in a standalone hydraulic containment option, because the pumping rates will only need to accommodate natural groundwater flow rates, rather than providing a hydraulic barrier. However, pumping would need to be performed indefinitely to maintain water levels behind the barrier. It is also noted that physical barriers can also be utilized in a funnel-and-gate arrangement to direct the flow of groundwater to a small, more permeable area (i.e., the gate) where reactive material can be used to treat the metals in-situ. The “gate” can also be configured as a single extraction point for impacted groundwater directed to it by the “funnel.”

This technology attains the established CAO after combined physical and hydraulic containment eliminates the offsite migration of impacted groundwater, thereby eliminating the exposure pathway. In the long term, this technology will maintain compliance with the established CAO after final cover construction at the Green Landfill, which will end the source loading to the groundwater, and groundwater flushes through the aquifer. Performance and reliability would be controlled by adherence to the operations and maintenance plan prepared for the extraction and treatment systems. The technology would pose substantial challenges to the installation and operation of the physical barrier such as areas of limited access and highly variable depths to bedrock. Potential safety impacts during construction, operation, and maintenance of the system would be mitigated by health and safety plans prepared for these tasks. Cross-media impacts include the potential for airborne fugitive dust issues during construction, which would be mitigated by construction contingency planning. The time period for attainment is based on construction of the barrier. For institutional requirements, treated discharge would occur under existing or modified NPDES permit.

Based on the preliminary screening, physical containment is potentially viable as a potential corrective measures alternative component when combined with supplemental groundwater extraction and treatment. However, physical containment does not appear to add value to a stand-alone hydraulic containment approach.

A1.8 Ex-Situ Physical/Chemical/Biological Treatment

Ex-situ treatment requires the use of groundwater extraction with related engineering, equipment, permitting, and material handling necessary to convey the waste stream to above-ground treatment. Treatment technologies would be designed to remove the specific constituents from groundwater to meet regulatory discharge requirements; treatment options for the varied constituents may include pH adjustment, filtration, coagulation/chemical precipitation, membrane filtration, ion exchange, carbon adsorption, reverse osmosis, chemical reduction, and other potential treatment technologies. Multiple treatment technologies would potentially be needed to effectively remove the different types of contaminants. If this technology is incorporated into a corrective action alternative, further detailed evaluation and/or bench- and pilot-scale studies would be necessary to identify technically effective treatment technologies given the inorganic COCs.

This is not a standalone technology, but would be used in combination with hydraulic containment. System reliability would be controlled by adherence to an operation and maintenance plan prepared for the system. Implementation is expected to be straightforward based on well-established water treatment principles and experience. Potential safety impacts during construction, operation, and maintenance of the system would be mitigated by health and safety plans prepared for these tasks. There would be no cross-media impacts, nor would there be exposure to residual CCR materials. The time period for attainment is based on performance of the overall corrective measure, of which ex-situ treatment would be a component. For institutional requirements, treated discharge would occur under existing or modified NPDES permit.

Based on the preliminary screening, ex-situ treatment is a potentially viable remedial technology and will be retained for further consideration.

A1.9 In-Situ Physical/Chemical/Biological Treatment

For the inorganic COCs at CCR sites, in-situ treatment involves enhancement of natural attenuation processes such as dilution, adsorption, and chemical reactions to reduce concentrations to acceptable levels. This technology is appropriate for sites in which groundwater flow volumes are low, source controls are effective, and impacted groundwater is not expected to be long-lived.

Lithium (Li) is the sole COC for the Assessment of Corrective Measures (ACM) at the Green Landfill, and in-situ treatment methods are ineffective for Li. Therefore, this technology will not meet the performance requirement, and it will not be retained for further consideration.

A1.10 Permeable Reactive Barriers (PRB)

A PRB is an in-situ treatment method consisting of subsurface trench filled with reactive material installed to intercept and react with impacted groundwater. PRBs can be established through direct-push injection (on closely spaced grids) or emplaced as a continuous trench of reactive material. PRBs are typically installed to the depth of impacted groundwater (often the bottom of the shallow aquifer) and are oriented perpendicular to the flow of impacted groundwater. The amendment used to generate the PRB is generally as permeable as or more permeable than the surrounding material, encouraging impacted groundwater to flow through the reactive material. The reactive material then causes chemical reactions to occur within the PRB, resulting in adsorption, precipitation, or degradation.

PRBs are commonly used to control organic contamination in groundwater, and have been successfully used to remediate some metals. However, because Li is the sole COC for the ACM at the Green Landfill,

and in-situ methods are ineffective for Li, PRB will not meet the performance requirement, and it will not be retained for further consideration.

A1.11 Closure-in-Place (CiP) [of the regulated unit]

CiP would entail capping and restoration of the unit that contains the CCR material. Capping would minimize infiltration into the CCR material, thereby minimizing the potential for leachate to impact underlying soil and shallow groundwater. Capping would reduce potential exposure pathways and thus enhance protection of human health and the environment.

CiP will help attain the established CAO after final cover construction ends the source loading to the groundwater, and impacted groundwater flushes through the aquifer. This technology is easily implemented, as CiP is required by conditions of the solid waste permit and re-design of the southern storm water pond requires nominal engineering and construction efforts. Potential safety impacts during construction, operation, and maintenance of the final cover are governed by conditions of the solid waste permit and are mitigated by health and safety plans prepared for these tasks. There are no cross-media impacts associated with CiP, and it will provide for significant reduction in mobility of COCs upon implementation of the CiP source control. Final cover for the Green Landfill is anticipated as part of facility operations. Institutional requirements will consist of solid waste permit renewal(s) and state and community acceptance of the final remedy.

Based on the preliminary screening, CiP is retained for further consideration.

A1.12 Closure by Removal (CbR) [of the regulated unit]

CbR is a proven remedy that can effectively remove the source of contamination. The excavation of impacted CCR material would typically be completed using standard construction equipment (e.g., backhoe, excavator, wheel loader, dump trucks). The excavated materials are then placed directly into dump trucks for transport/disposal or beneficial use. Excavation limits would typically be verified with confirmation sampling to demonstrate that the underlying soil is not impacted above applicable standards.

This technology would help attain the established CAO after CCR removal ends and the source loading to groundwater is eliminated. This technology would be difficult to implement, because of the large-scale construction effort required and resulting disruption to station operations and community impact. Potential safety impacts during excavation and backfilling would be mitigated by health and safety planning. However, the volume of truck traffic for waste and fill hauling would be a significant community safety issue. Potential airborne fugitive dust issues during excavation and hauling would be significant, but would be mitigated by construction contingency planning. CbR will eliminate exposure through removal of the CCR. CbR would begin following state and community approvals, and duration of excavation activities is anticipated to be many years. In addition to state and community acceptance of the proposed remedy, excavation and backfilling may require local building permits and local municipality input and approval. Excavation dewatering discharge would occur under existing or modified NPDES permit.

Based on the preliminary screening, CbR is retained for further consideration.

A1.13 Screened Corrective Measures Technologies Summary

A summary of the results of the corrective measures technologies screening is presented below in **Table A2**. The design and specific application of the retained technologies, either as stand-alone or part of a treatment train, will be crucial in the success of the corrective action.

Table A2 – Screened Corrective Measures Technologies

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection mode)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a standalone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing offsite migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The Conceptual Site Model (CSM) will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations increase the difficulty with scale.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment
In-situ Physical/Chemical Treatment	Not Retained	In-situ treatment technologies are ineffective for the Li

Potentially Applicable Technology	Status	Description/Overview
Permeable Reactive Barriers (PRB)	Not Retained	The use of PRBs is not retained because in-situ treatment technologies are ineffective for Li.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

References: Technology descriptions referenced from 1) FRTR: Federal Remediation Technologies Roundtable, CLU-IN, and/or AECOM reference materials.

A2.0 CORRECTIVE MEASURES ALTERNATIVES

Corrective measures technologies from the initial screening and evaluation (see **Table A2**) were utilized to create corrective measures alternatives. Professional judgment was used to assemble technically efficient pairings of technologies for each corrective measures alternative in consideration of the range of site-specific COCs and concentrations.

The corrective measures alternatives typically incorporate the use of technologies that will require additional investigation needed to 1) finalize the alternative selection, 2) delineate the assumed corrective action areas, 3) provide for full-scale cost estimation and design, and 4) demonstrate alternative efficacy. To this end, data gaps will be identified and addressed as needed.

It should be emphasized that the technology screening and alternatives assembly employed for this ACM is qualitative in nature. The formal remedy selection process, in accordance with the CCR Rule 40 CFR Section 257.97, will begin following submission of the ACM Report. The subsequent remedy selection process will evaluate the following objectives for remedies, as required under Section 257.97(b):

- Protect human health and the environment;
- Attain the COC-specific GWPS as specified pursuant to Section 257.95(h);
- Control the source(s) 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 (applicable to material releases only); and
- Comply with standards for management of wastes as specified in Section 257.98(d).

Assessment of Corrective Measures
Non-Groundwater Releases
Under the CCR Rule

GREEN STATION CCR LANDFILL
GREEN STATION
WEBSTER COUNTY, KENTUCKY

June 28, 2019

Prepared For:

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ACRONYMS

ACM	Assessment of Corrective Measures
AECOM	AECOM Technical Services, Inc.
As	Arsenic
BREC	Big Rivers Electric Corporation
CAO	Corrective Action Objectives
CbR	Closure by Removal
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CiP	Closure in Place
ft. amsl	Feet above mean sea level
KAR	Kentucky Administrative Regulations
KDoW	Kentucky Division of Water
KPDES	Kentucky Pollution Discharge Elimination
mg/L	Milligrams per liter
PRB	Permeable Reactive Barrier
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

AECOM Technical Services, Inc. (AECOM) was retained by Big Rivers Electric Corporation (BREC) to prepare an Assessment of Corrective Measures (ACM) to identify appropriate supplemental corrective measures for non-groundwater impacts from coal combustion residuals (CCR). The subject non-groundwater impacts are associated with seeps that are impacted from CCR that has been historically managed within the Green Station CCR Landfill (Green Landfill) at the Sebree Generating Station (Sebree Station), located near Sebree, Kentucky.

Pursuant to Title 40 of the Code of Federal Regulations (CFR) parts 257.90(d) and 257.84(b)(5), BREC initiated design of containment systems intended to reduce and prevent non-groundwater releases from reaching the Green River as an interim corrective measure. Plans for these measures have been submitted to the Kentucky Energy and Environment Cabinet (Cabinet) for review and comment. The Cabinet has adopted the federal CCR Rule by reference in Title 401 of the Kentucky Administrative Regulations (KAR) Chapter 46:110. Contracting for that work is complete and construction is scheduled to commence in 2019. This ACM is considering and evaluating whether additional remedial measures, that would be supplemental to the interim measures already planned, are warranted to address non-groundwater surface seeps. This ACM is also being coordinated with the ACM for groundwater at the facility.

The United States Environmental Protection Agency (USEPA) is in the process of clarifying the extent to which the assessment of corrective measures provisions of 40 CFR 257.96 apply to surface seeps. Specifically, USEPA announced in a litigation settlement it would remand for further comment the provision in the CCR Rule requiring entities to implement the rule's corrective action requirements for non-groundwater "releases" from CCR units. USEPA has proposed, but has not finalized, amendments to the rule to clarify the type and magnitude of non-groundwater releases that would require a facility to comply with some or all of the corrective action procedures in the CCR rule. USEPA confirmed that while the rule's general obligation to respond to releases from CCR units remains in place, the settlement sends a clear message that not all non-groundwater releases are subject to the rule's corrective action provisions and that the scope of non-groundwater releases subject to the rule's corrective action requirements will be resolved in the future rulemaking.

Consistent with USEPA guidance and 40 CFR 257.90(d) and 257.84(b)(5), BREC has, as noted above, proceeded with an initial containment project consisting of collection trenches, which have been designed, with the designs submitted to the Cabinet for review. Following additional seep sampling conducted in December 2018, BREC is also preparing this supplemental ACM to outline the potentially applicable remedial technologies should the interim corrective measures be insufficient to meet the corrective action objectives. This ACM is being presented even though the CCR Rule is not clear as to whether an ACM is required in these circumstances and the reconsideration rule has not been finalized.

Two types of non-groundwater releases have been identified through inspection and investigation of the site: river seeps and perimeter seeps. The occurrence and chemistry of the seeps was evaluated through observation and sampling as reported in memoranda and analytical reports appended herein. The character of the seepage water was compared to Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure identified in 401 KAR 10:031 Section 6. The samples largely exceeded the criteria for chloride, which became the basis for further investigation and corrective measures. Interim corrective measures to eliminate these non-groundwater seeps have been planned and are under way.

Because of their positions along the water ways where access is restricted, the river seep corrective measures involve the installation of interceptor trenches to capture seepage and route it to discharge via Kentucky Pollution Discharge Elimination (KPDES) permit. The river seep areas to be captured cover the

eastern seepage area adjacent to the Green River between monitoring wells MW-2 and MW-3A, and the northwestern seepage area located adjacent to ditch discharging to the Green River. These measures will commence in 2019, and are scheduled to be completed by the end of the year.

Perimeter seeps corrective measures similarly involve the containment and routing of seepage to permitted discharge, but because they are accessible at the surface, they are amenable to simple piping and ditch lining approaches. The perimeter seeps will be routed either to the North Pond, which will then discharge to the Green Surface Impoundment (KPDES Outfall 009), or the South Pond (KPDES Outfall 012), which will also be routed to the Green Surface Impoundment. The corrective measures will include cleaning and re-design of the South Pond to remove residual CCR material and to create lined sumps on either end to manage the seepage water separately from storm water. The corrective measures for the perimeter seeps are being coordinated with corrective measures to address groundwater impacts at the facility, which are discussed under a separate ACM for groundwater impacts (AECOM, June 13, 2019).

If the interim corrective measures currently under way are not adequate to meet the corrective action objectives, then the assessment of potential technologies identified herein, which follows the requirements of 40 CFR 257.96, will be reconsidered. 40 CFR 257.96(c) requires an ACM to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

Several potential corrective measures technologies were evaluated in order to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented below:

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as stand-alone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Hydraulic Containment	Retained	Hydraulic containment in the form of pumping of vertical or horizontal wells would potentially be used to provide spot control of seepage if the interim corrective measures are unable to fully capture the seepage.
Physical Containment	Retained	Physical containment in the form of a cutoff wall would potentially be used to re-direct or otherwise intercept seepage that was not adequately captured by the interim corrective measures.

Potentially Applicable Technology	Status	Description/Overview
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment is retained as a potential supplement to the interim corrective measures in the event that discharge via the station's KPDES permit is not possible.
In-situ Physical/Chemical Treatment	Retained	In-situ treatment is retained in the form of spot treatment or fixation of seepage areas in the event that the interim corrective measures do not adequately address all seepage areas.
Permeable Reactive Barriers (PRB)	Retained	The use of PRBs is retained in the form of a reactive cell in the event that interim measures result in seepage concentrations that require pre-treatment in-situ prior to discharge.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater releases is being implemented as interim corrective measures but is retained in the event that interim measures need to be evaluated for expansion.

1.0 INTRODUCTION

The following report presents the Assessment of Corrective Measures (ACM) for non-groundwater impacts identified at the Big Rivers Electric Corporation (BREC) Green Station CCR Landfill (Green Landfill) at the Sebree Generating Station (Sebree Station) located near Sebree, Kentucky. The Green Landfill is identified as a coal combustion residuals (CCR) unit under the requirements of the United States Environmental Protection Agency (USEPA) regulations in Title 40 of the Code of Federal Regulations (CFR) Part 257 (CCR rule). The subject non-groundwater impacts are from surface seeps that are impacted by CCR constituents and that are not currently controlled by the station's Kentucky Pollution Discharge Elimination System (KPDES) permit.

Pursuant to 40 CFR 257.90(d) and 257.84(b)(5), BREC initiated design of containment systems intended to reduce and prevent non-groundwater releases from reaching the Green River as an interim corrective measure. Plans for these measures have been submitted to the Kentucky Energy and Environment Cabinet (Cabinet) for review and comment. The Cabinet has adopted the federal CCR Rule by reference in Title 401 of the Kentucky Administrative Regulations (KAR) Chapter 46:110. Contracting for that work is complete and construction is scheduled to commence in 2019. This ACM is considering and evaluating whether additional remedial measures, that would be supplemental to the interim measures already planned, are warranted to address non-groundwater surface seeps. This ACM is also being coordinated with the ACM for groundwater at the facility.

The United States Environmental Protection Agency (USEPA) is in the process of clarifying the extent to which the assessment of corrective measures provisions of 40 CFR 257.96 apply to surface seeps. Specifically, USEPA announced in a litigation settlement it would remand for further comment the provision in the CCR Rule requiring entities to implement the rule's corrective action requirements for non-groundwater "releases" from CCR units. USEPA has proposed, but has not finalized, amendments to the rule to clarify the type and magnitude of non-groundwater releases that would require a facility to comply with some or all of the corrective action procedures in the CCR rule. USEPA confirmed that while the rule's general obligation to respond to releases from CCR units remains in place, the settlement sends a clear message that not all non-groundwater releases are subject to the rule's corrective action provisions and that the scope of non-groundwater releases subject to the rule's corrective action requirements will be resolved in the future rulemaking.

Consistent with USEPA guidance and 40 CFR 257.90(d) and 257.84(b)(5), BREC has, as noted above, proceeded with an initial containment project consisting of collection trenches, which have been designed, with the designs submitted to the Cabinet for review. Following additional seep sampling conducted in December 2018, BREC is also conducting this supplemental ACM to outline the potentially applicable remedial technologies should the interim corrective measures be insufficient to meet the corrective action objectives. This ACM is being presented even though the CCR Rule is not clear as to whether an ACM is required in these circumstances and the reconsideration rule has not been finalized.

As described in Section 2, the character of seeps has been identified through a series of investigations and interim corrective measures have been planned and are underway. Sections 3 provides a description of the corrective action objective (CAO), while Section 4 provide a list of potential technologies. If the interim corrective measures currently under way are not adequate to meet the corrective action objectives, then an assessment of potential technologies that follows the requirements of 40 CFR 257.96 will be performed.

2.0 DESCRIPTION OF CURRENT CONDITIONS

This section provides information related to the current use of the Site, as well as the history of activities relevant to the non-groundwater ACM for the Green Landfill at Sebree Station.

2.1 Site Background

BREC owns and operates Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/HMPL Station. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (**Figure 1**). Reid Unit 1 (66 Megawatts) began commercial operation in 1966 and it will be converted from coal to natural gas in the future. The Reid Combustion Turbine (72 MW) was commercialized in 1976. HMPL Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974, respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (242 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Green Landfill is illustrated on **Figures 1 and 2**. The Green Station CCR Landfill (Green Landfill) is located directly south of Sebree Station, situated south of the Green Station CCR Surface Impoundment. The Green Landfill is a Kentucky permitted landfill (Permit No. SW11700007) that currently receives special wastes generated by burning coal (CCRs) from Green Station. The landfill began receiving CCR wastes in 1980. The current Green Landfill footprint is approximately 170 acres.

The original ground surface within the landfill footprint was irregular and the dominant features were small stream valleys draining towards the Green River, which is located just east of the landfill; and towards Groves Creek, which is located just south of the landfill. There was also historic oil and gas production at and in the immediate vicinity of the Green Landfill. A review of the records from the Kentucky Geological survey showed that at or immediately adjacent to the Site, there were a number of dry exploratory oil/gas exploration holes, oil production wells, one gas production well, and one secondary recovery injection well. There were also former brine ponds at the Site. Most of these wells were abandoned in accordance with applicable regulations by BREC in 1997 and 1998. The last existing well was decommissioned in 2019.

2.2 Site Investigation and Interim Measures

Two types of non-groundwater releases have been identified through inspection and investigation of the site: river seeps and perimeter seeps as discussed below.

2.2.1 River Seeps

The river seeps are those found along the Green River and its tributary streams. Seeps have been observed on the bank of the river, on the slope between the river and the landfill perimeter road, and adjacent to a tributary stream on the northwest side of the Landfill.

Green River Seeps

An investigation of the river seeps was conducted in July 2018 as reported in a technical memorandum from AECOM to BREC dated September 6, 2018 (**Appendix A**). In this investigation, the banks of the Green River were surveyed by boat for evidence of seepage. Samples of seeps having visible flow were collected and tested for CCR indicator parameters (40 CFR 257 Appendix III), CCR constituents of concern (40 CFR 257 Appendix IV), and general chemistry parameters. The data from these analyses were used to evaluate whether individual seeps were likely associated with the Landfill. Three seeps

(RS-05, RS-07, and RS-08 as illustrated on **Figure 2**) were found to be similar to the chemistry of the Landfill (see **Table 1** below). Seeps RS-05 and -07 are located near the center of the Landfill between monitoring wells MW-2 and MW-3A. This is the same area in which seeps have been observed higher on the slope between the river and the perimeter road, suggesting that they have a similar origin. Seep RS-08 is located adjacent to the South Pond and appears to be tied to that unit.

The results of river seep sample testing were compared to Kentucky Water Quality criteria for warm water aquatic habitat identified in 401 KAR 10:031 Section 6. Where there are no Kentucky Water Quality criteria for a specific constituent, the USEPA Region 4 surface water screening values are listed for comparison. The Region 4 screening values are not compliance criteria, but rather values used to determine whether further evaluation is warranted. Samples from RS-05, -07 and -08 were found to exceed the 600 milligrams per liter (mg/L) limit for chloride. RS-05 also exceeded the current criteria for cadmium (0.00029 mg/L) and lead (0.0036 mg/L), but Kentucky has introduced a new cadmium criteria that may bring RS-05 back into compliance. Follow-up sampling conducted in December 2018 by KDEP and BREC confirmed the exceedance of the chloride criteria. Accordingly, this parameter (chloride) is regarded as the primary basis for further investigation and interim action.

The analytical results for the river seep samples are summarized in **Table 1** below. Presented in parallel with the river seep results are deep instream river samples that were collected immediately adjacent to the river seeps to characterize the river water quality that is most likely to be impacted by seepage. The deep samples were collected within 1 foot of the river bed within 3 to 5 feet of the water line. None of the river sample results exceed the water quality or screening criteria.

Options for interim measures were evaluated based on the site topographic setting, the character of the seepage, jurisdictional restrictions around the waterway, and operational logistics. Interception by french drain was selected as the most feasible and effective solution.

To evaluate the logistics of french drain installation, two investigations were conducted to probe the subsurface along in the area between the landfill and the river, creating a profile of the affected subsurface materials. The results of these investigations are in the form of boring logs and a cross section presented in **Appendix B**. These data indicate that the seepage occurs along a specific horizon 3.5 to 26 feet below the perimeter road surface. Accordingly, the french drain has been designed to intercept that horizon across the area of seepage, which covers roughly 1,000 feet between MW-2 and MW-3A. Contractors capable of installing the trench and appurtenant features have been identified and are being contracted for implementation of this interim measure in 2019. The drain is designed to intercept the seepage, thereby eliminating the source of the non-groundwater release. The intercepted water in the collector pipe at the base of the gravel-filled trench will be pumped to a collection sump and conveyed by underground pipe to the Green Surface Impoundment for disposal under the station's KPDES permit.

Table 1 – July 2018 River Seep Sampling Results

Parameter	Water Quality/Screening Criteria (mg/L) [1]	Laboratory Analytical Results (mg/L or pCi/L where noted)					
		RS05	R03B	RS07	R02B	RS08	R01B
Appendix III Constituents							
Boron	7.2 [b]	0.853 J	0.0235 J	1.46	0.0322 J	0.510 J	0.0252 J
Calcium	116 [b]	**916**	32.6	**1120**	35.8	**801**	33.2
Chloride	600 [c]	1670	5.59	1990	6.69	2040	4.52
Fluoride	2.7 [b]	0.0795 J	0.0954 J	0.102J	0.0979 J	0.0915 J	0.105 J
Sulfate	NE [e]	1170	28.9	1480	30.1	1440	28.3
TDS[a]	NE [e]	5140	170	6080	170	5310	161
Appendix IV Constituents							
Antimony	0.19 [b]	0.000366 J	0.000514 J	<0.000002	0.00106 J	0.00141 J	0.000476 J
Arsenic	0.15 [c]	0.0192	0.00131 J	0.00182 J	0.00135 J	0.000404 J	0.00137 J
Barium	0.22 [b]	**0.718**	0.0362 J	0.0605 J	0.0396 J	0.0443 J	0.0374 J
Beryllium	0.011 [b]	0.000545 J	<0.002	<0.000002	<0.002	<0.002	<0.002
Cadmium	0.00029 [d, f]	0.000563 J	<0.001	<0.000001	<0.001	<0.001	<0.001
Chromium III/VI	0.074/0.011 [b]	**0.0124**	0.00119 J	0.000340 J	0.00155 J	0.000560 J	0.00143 J
Cobalt	0.019 [b]	**0.0327**	0.0008 J	**0.0218**	0.000937 J	0.000691 J	0.000623 J
Fluoride	2.7 [b]	0.0795 J	0.0954 J	0.102 J	0.0979 J	0.0915 J	0.105 J
Lead	0.0036 [d]	0.0104	0.00166 J	0.000523 J	0.00199 J	0.000769 J	0.006
Lithium	0.44 [b]	0.340	<0.05	**0.772**	<0.05	**1.80**	<0.05
Mercury	0.00077 [c]	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	0.8 [b]	0.00442 J	0.00103 J	0.00219 J	0.00145 J	0.00296 J	0.0013 J

Note: Table continued on the following page

Table 1 – July 2018 River Seep Sampling Results (cont.)

Parameter	Water Quality/Screening Criteria (mg/L) [1]	Laboratory Analytical Results (mg/L or pCi/L where noted)					
		RS05	R03B	RS07	R02B	RS08	R01B
Radium 228	NE [e]	3.83 pCi/L	-0.197 pCi/L	0.831 pCi/L	0.417 pCi/L	0.983 pCi/L	-0.00993 pCi/L
Radium 226+228	NE [e]	7.64 pCi/L	0.391 pCi/L	1.4 pCi/L	0.735 pCi/L	1.31 pCi/L	0.249 pCi/L
Selenium	0.005 [c]	0.00121 J	<0.01	<0.01	0.000636 J	<0.01	<0.01
Thallium	0.006 [b]	0.000164 J	<0.001	<0.001	<0.001	<0.001	<0.001

Notes:

1. Where a Kentucky Water Quality Criteria has not been adopted for a specific constituent, USEPA Region 4 Surface Water Screening Values are listed for comparison.

a. TDS = total dissolved solids

b. USEPA Region 4 Surface Water Screening Values for freshwater chronic exposure, updated August 2015.

c. Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure (401 KAR 10:031)

d. Calculated Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure using a water hardness value of 110 mg/L. (401 KAR 10:031)

e. NE = not established.

f. The Kentucky Water Quality Criteria for cadmium under 401 KAR 10:031 have been proposed for amendment under the 2018 Triennial Review by KDEP.

J The analytical result is less than the reporting limit but greater than the method detection limit and is an approximate value.

Shaded cells = A result above Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure

Bold Text = A results above USEPA Region 4 Surface Water Screening Values

Northwest Seep

In April 2019, inspection of the Landfill site by the Kentucky Division of Waste Management and Kentucky Division of Water (KDoW) identified an area of seepage outside the perimeter road on the northwest side of the Landfill (See **Figure 2**). This seepage (herein identified as the NW seep) is adjacent to a ditch that flows eastward to an unnamed outfall for which a KPDES discharge permit has been applied for. The outfall was sampled by KDoW and BREC on April 2, 2019. The laboratory results from the April 2, 2019 sampling event are presented in **Appendix C** and summarized below in **Table 2**. A sample from this seep area (identified as sample 023) was collected by BREC personnel on April 11, 2019. The laboratory results from the April 11, 2019 sampling event are presented in **Appendix C** and summarized below in **Table 2**. The results indicate that the seep sample exceeded Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure for chloride and cadmium (until the proposed cadmium criteria is adopted as noted in Section 2.1 above). Therefore, the area will be subject to interim corrective measures.

The NW seep appears to be emanating from a horizon in or above a natural limestone ledge adjacent to the ditch (see photographs below on the following pages). This conclusion is based on the observation of natural springs of groundwater upstream from the seep that clearly flows from fractures in the ledge. A series of three soil borings drilled between the landfill and the NW seep area in May 2019 further suggest the seepage is controlled by this feature.

A trench drain similar to the interim measure being designed for the east side of the Green Landfill was selected as the most feasible and effective interim solution. Accordingly, the trench drain is being designed for implementation in 2019. The trench will be backfilled with gravel and constructed with a sump to pump the intercepted water for underground conveyance to the Green Surface Impoundment for discharge under the station's KPDES permit. Interception via the drain is expected to eliminate this discharge of impacted seep water.

Table 2 – April 2019 Northwest Seep Sampling Results

Parameter	Water Quality/Screening Criteria (mg/L) [1]	Laboratory Analytical Results (mg/L or pCi/L where noted)	
		023 April 11, 2019	SW-Culvert-1 April 2, 2019
Appendix III Constituents			
Boron	7.2 [b]	0.626 J	<1.0
Calcium	116 [b]	**488**	**203**
Chloride	600 [c]	864	344
Fluoride	2.7 [b]	0.0356 J	<0.2
Sulfate	NE [e]	548	401
TDS[1]	NE [e]	2850	Not analyzed
Appendix IV Constituents			
Antimony	0.19 [b]	0.0000690 J	<0.005
Arsenic	0.15 [c]	0.000759 J	<0.01
Barium	0.22 [b]	0.0557 J	0.043
Beryllium	0.011 [b]	<0.002	<0.02
Cadmium	0.00029 [d, f]	0.000411 J	<0.001
Chromium	0.074/0.011 [b]	0.00281 J	<0.02
Cobalt	0.019 [b]	0.000450 J	<0.04
Fluoride	2.7 [b]	0.0356 J	<0.2
Lead	0.0036 [d]	0.000140 J	<0.002
Lithium	0.44 [b]	**0.766**	0.11
Mercury	0.00077 [c]	<0.0002	<0.0005
Molybdenum	0.8 [b]	0.0110	<0.1
Radium 226	NE [e]	Not analyzed	Not analyzed
Radium 228	NE [e]	Not analyzed	Not analyzed
Radium 226+228	NE [e]	Not analyzed	Not analyzed
Selenium	0.005 [c]	<0.01	<0.03
Thallium	0.006 [b]	0.0000670 J	0.0001 J

Notes:

1. Where a Kentucky Water Quality Criteria has not been adopted for a specific constituent, USEPA Region 4 Surface Water Screening Values are listed for comparison.

a. TDS = total dissolved solids

b. USEPA Region 4 Surface Water Screening Values for freshwater chronic exposure, updated August 2015.

c. Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure (401 KAR 10:031)

d. Calculated Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure using a water hardness value of 110 mg/L. (401 KAR 10:031)

e. NE = not established.

f. The Kentucky Water Quality Criteria for cadmium under 401 KAR 10:031 have been proposed for amendment under the 2018 Triennial Review by KDEP.

J The analytical result is less than the reporting limit but greater than the method detection limit and is an approximate value.
Shaded cells = A result above Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure
Bold Text = A results above USEPA Region 4 Surface Water Screening Values

Photo 1: The NW Seep as observed on April 9, 2019.

Photo 2: Bedrock outcrop located west of the NW Seep as observed on April 9, 2019.

2.2.2 Perimeter Seeps

During the July 2018 investigation of River Seeps, the area inside the Landfill perimeter road was also inspected for seeps. Four areas of seepage were identified (see **Figure 2**): along the west side of the landfill (LS-01), the southwest corner (LS-04), the south end adjacent to the South Pond (LS03), and the east side north of MW-2 vicinity (LS02). LS-01, LS-03, LS-04 are directed to the South Pond. LS-02 is directed to the North Pond.

Samples of a select set of these perimeter seeps were collected in July 2018 and tested for the Appendix III, Appendix IV, and general chemistry parameters. The laboratory analytical results are presented in **Appendix D** and summarized below in **Table 3**. The results indicate that these samples exceed Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure for chloride, arsenic, cadmium, and selenium. These seeps do not directly discharge to surface waters, but have the potential to influence groundwater and non-groundwater releases, so they are being addressed by interim corrective measures to manage those potentials.

Table 3 – July 2018 Perimeter Seep Sampling Results

Parameter	Water Quality/Screening Criteria (mg/L) [1]	Laboratory Analytical Results (mg/L)			
		LS01	LS02	LS03	LS04
Appendix III Constituents					
Boron	7.2 [b]	1.15	2.92	2.49	0.799 J
Calcium	116 [b]	**1210**	**1030**	**2250**	**1750**
Chloride	600 [c]	2090	1710	4370	2710
Fluoride	2.7 [b]	1.68	1.19	0.269 J	1.53
Sulfate	NE [e]	1580	1500	2080	1490
TDS[1]	NE [e]	8560	7080	12400	10100
Appendix IV Constituents					
Antimony	0.19 [b]	0.00432	0.00218	0.0000610 J	0.00470
Arsenic	0.15 [c]	0.364	0.126	0.00176 J	0.300
Barium	0.22 [b]	0.0666 J	0.0627 J	0.140 J	0.101 J
Beryllium	0.011 [b]	<0.002	<0.002	<0.002	<0.002
Cadmium	0.00029 [d, f]	<0.001	0.000464 J	0.000279 J	0.000161 J
Chromium	0.074/0.011 [b]	<0.003	<0.003	<0.003	<0.003
Cobalt	0.019 [b]	0.0000370 J	0.000115 J	0.000321 J	<0.005
Fluoride	2.7 [b]	1.68	1.19	0.269 J	1.53
Lead	0.0036 [d]	0.000239 J	0.000247 J	0.000215 J	0.0000730 J
Lithium	0.44 [b]	**3.11**	**2.85**	**7.19**	**4.07**
Mercury	0.00077 [c]	0.000372	0.000167 J	<0.0002	0.000539
Molybdenum	0.8 [b]	0.0925	**1.78**	0.792	0.214
Radium 226	NE [e]	0.656 pCi/L	0.658 pCi/L	1.41 pCi/L	0.897 pCi/L
Radium 228	NE [e]	0.851 pCi/L	0.507 pCi/L	0.136 pCi/L	0.873 pCi/L
Radium 226+228	NE [e]	1.51 pCi/L	1.16 pCi/L	1.54 pCi/L	1.77 pCi/L
Selenium	0.005 [c]	0.00781 J	0.0103	0.00163 J	0.0103
Thallium	0.006 [b]	<0.001	<0.001	<0.001	<0.001

Notes:

1. Where a Kentucky Water Quality Criteria has not been adopted for a specific constituent, USEPA Region 4 Surface Water Screening Values are listed for comparison.

a. TDS = total dissolved solids

b. USEPA Region 4 Surface Water Screening Values for freshwater chronic exposure, updated August 2015.

c. Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure (401 KAR 10:031)

d. Calculated Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure using a water hardness value of 110 mg/L. (401 KAR 10:031)

e. NE = not established.

f. The Kentucky Water Quality Criteria for cadmium under 401 KAR 10:031 have been proposed for amendment under the 2018 Triennial Review by KDEP.

J The analytical result is less than the reporting limit but greater than the method detection limit and is an approximate value.

Shaded cells = A result above Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure
Bold Text = A results above USEPA Region 4 Surface Water Screening Values

Interim corrective measures for the perimeter seeps are being planned in a phased approach. The first step is to provide conveyance of the seepage to either the South Pond or to the North Pond, both of which are routed to the Green Surface Impoundment. Removing them from stormwater channels will prevent mixing with impounded stormwater. The use of the South Pond requires re-lining so that the seepage does not have the potential to infiltrate to groundwater. Partial re-lining of the South Pond is also proposed in the corrective measures planned for groundwater impact, which is the subject of a separate ACM. The re-design of the South Pond involves removal of any sludge and creation of two lined sump areas, one on the east end to collect the South and East perimeter seeps and one on the west end to collect Southwest corner perimeter seeps.

3.0 CORRECTIVE ACTION OBJECTIVE (CAO)

As noted in Section 2, non-groundwater releases have been identified, characterized, and interim corrective measures are being planned and implemented. The site-specific Corrective Action Objective (CAO) for non-groundwater releases is to meet the following objectives under the CCR Rule:

- Protect human health and the environment;
- Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix III and 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 (applicable to material releases only); and
- Comply with standards for management of wastes.

Together, these requirements comprise the site-specific CAO. The interim corrective measures described in Section 2 are expected to meet these objectives. Should any further measures be required, these same objectives will be applied.

3.1 Assessment of Interim Corrective Measure Ability to meet CAO

The Interim Corrective Measure being implemented in 2019 is designed to capture river seepage and divert it to KPDES outfalls, eliminating any potential exposure to public health or the environment. It is anticipated that the Interim Corrective Measure will meet the CAOs by effectively eliminating any future river seepage through source control, and as a result, no supplemental remedies are warranted at this time. Performance monitoring will be performed after the Interim Corrective Measure is constructed to demonstrate source control and evaluate the ability of the measure to meet the CAO. If warranted based on performance monitoring results, additional evaluation of supplemental corrective measures will be performed consistent with 40 CFR 257.98(b).

4.0 TECHNOLOGY IDENTIFICATION

As required under the CCR Rule, source control is a first line of corrective measures. In adherence with the BREC's permit conditions, the Site will continue to operate as a solid waste disposal facility through its life cycle and will be closed in accordance with the requirements of the permit. Source control through landfill closure will include installation of final cover that will prevent infiltration and contribute to groundwater quality restoration. Control of groundwater impacts associated with the Green Landfill is also planned and is described in a separate, concurrent ACM.

The identification of potentially applicable supplemental corrective measures technologies for the subject seeps impacted by CCR at the Green Landfill is presented in **Table 4** below.

Table 4 – Potential Corrective Measures Options Technology Description/Overview

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as stand-alone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because by itself, it will not meet the established CAOs.
Hydraulic Containment	Retained	Hydraulic containment in the form of pumping of vertical or horizontal wells would potentially be used to provide spot control of seepage if the interim corrective measures are unable to fully capture the seepage.
Physical Containment	Retained	Physical containment in the form of a cutoff wall would potentially be used to re-direct or otherwise intercept seepage that was not adequately captured by the interim corrective measures.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment is retained as a potential supplement to the interim corrective measures in the event that discharge via the station's KPDES permit is not possible.
In-situ Physical/Chemical Treatment	Retained	In-situ treatment is retained in the form of spot treatment or fixation of seepage areas in the event that the interim corrective measures do not adequately address all seepage areas.
Permeable Reactive Barriers (PRB)	Retained	The use of PRBs is retained in the form of a reactive cell in the event that interim measures result in seepage concentrations that require pre-treatment in-situ prior to discharge.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.

Potentially Applicable Technology	Status	Description/Overview
Other Source Control Technologies	Retained	Control of source area non-groundwater releases is being implemented as interim corrective measures but is retained in the event that interim measures need to be evaluated for expansion.

If the interim corrective measures currently under way are not adequate to meet the corrective action objectives, then an assessment of additional potential technologies that follows the requirements of 40 CFR 257.96 will be revisited.

40 CFR 257.96(c) requires an ACM (if/when performed) to include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

5.0 REFERENCES

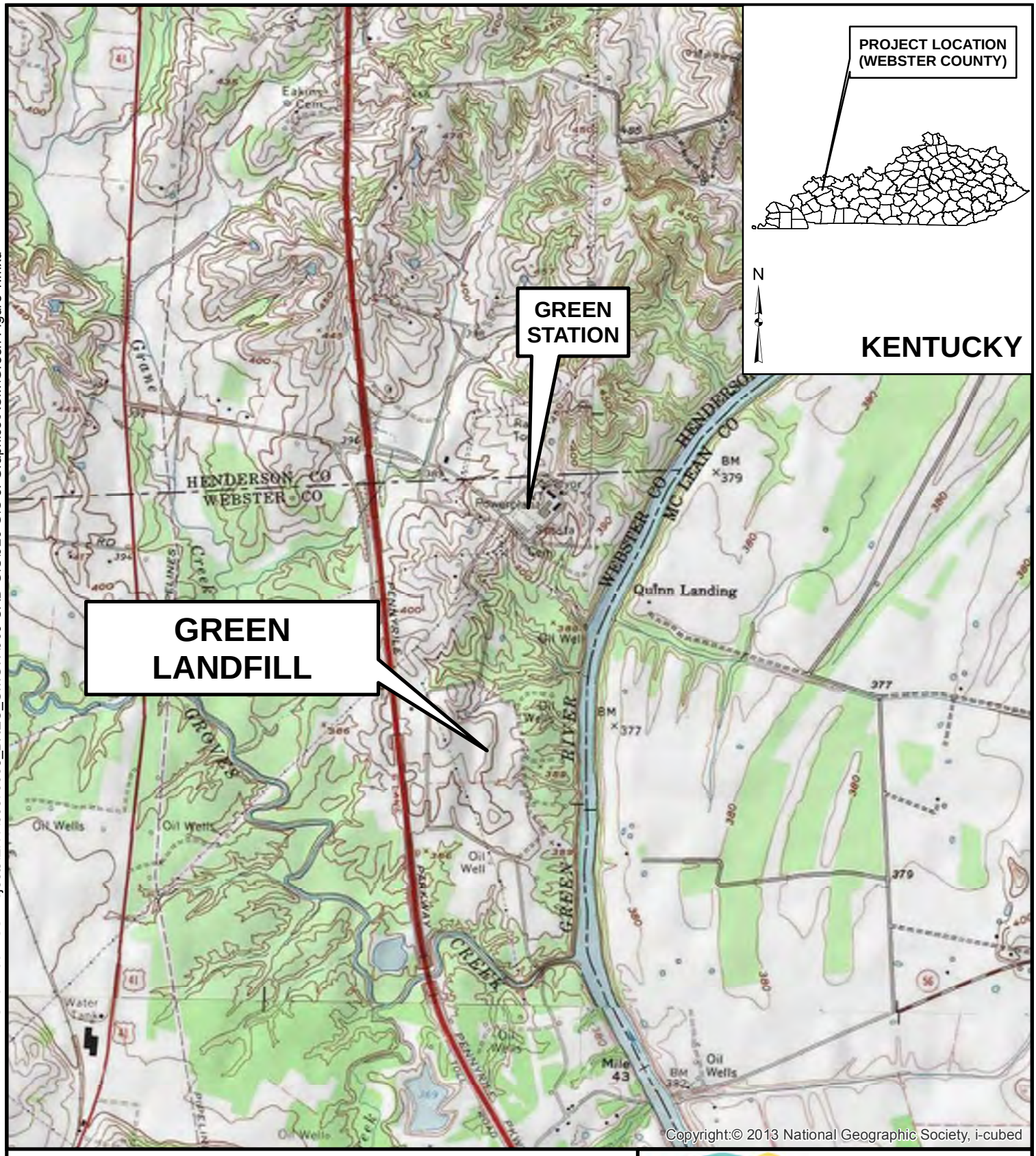
AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Green Station CCR Landfill, Webster County, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Green Station CCR Landfill, Webster County, Kentucky.

EPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

EPA, 40 CFR Part 257. [EPA–HQ–OLEM–2017–0286; FRL–9973–31–OLEM]. RIN–2050–AG88. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Minimum Criteria (Phase One); Proposed Rule. Federal Register / Vol. 83, No. 51 / Thursday, March 15, 2018 / Proposed Rules.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

N

Big Rivers ELECTRIC CORPORATION

Green Station
Webster County, Kentucky

FIGURE 1
SITE LOCATION MAP

DATE: 4/30/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60602364	

NW Seep Area

GNWSB-1
GNWSB-3
GNWSB-2

B
B'
A
A'
C
C'

MW-1
MW-2
MW-3A
MW-4
MW-5
MW-6
MW-104

GESB-01
GESB-02
GESB-03
GESB-04
GESB-05
GESB-06
GESB-07
GESB-08
GESB-09
GESB-10
GESB-11
GESB-12
GESB-13
GESB-14
GESB-15
GESB-16
GESB-17
GESB-18
GESB-19
GESB-20
GESB-21
GESB-22
GESB-23
GESB-24
GESB-25
GESB-26
GESB-27
GESB-28
GESB-29

LS 01
LS 02
LS 03
LS 04

RS 04
RS 05
RS 06
RS 07
RS 08

Green River
Groves Creek

Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well
- A — A' Transect Line
- GESB-01 Seeps Investigation Borings
- Landfill Seep Sample
- River Seep Sample
- Seep

0 400 800
Feet

N

Big Rivers Electric Corporation

Green Station
Webster County, Kentucky

FIGURE 2
Monitoring Well and Seep Location Map

DATE:06/04/2019	SCALE: 1IN = 300 FEET
CREATED BY: DAS	
JOB NO. 60602364	

Appendix A

Technical Memorandum – River and Seep Sampling and Analysis, September 6, 2018

525 Vine St, Suite 1800
Cincinnati, Ohio 45202
513-651-3440

Technical Memorandum

Date:	September 6, 2018
To:	Mr. Tom Shaw, Ph.D., Big Rivers Electric Corporation Managing Director Environmental
From:	Dennis Connair, Principal Geologist, AECOM
Subject:	River and Seep Sampling and Analysis Green Landfill Sebree Station Big Rivers Electric Corporation

Purpose

On behalf of Big Rivers Electric Corporation, AECOM prepared the following technical memorandum to document the activities and results of water sampling conducted along the Green River near the Big Rivers Electric Corporation (BREC) Sebree Station in Webster County, Kentucky. Sampling and analysis was conducted to identify the character of water quality of the river and of water seeping from the river bank in the vicinity of the station's coal combustion residuals (CCR) Green landfill.

ACTIVITIES AND OBSERVATIONS

Water samples were collected on July 12 and July 13, 2018 by AECOM staff Chris Davis and Dennis Connair. Sampling locations were accessed using a johnboat provided by BREC and piloted by BREC staff. Weather conditions at the time of sampling were hot and sunny with little wind. The Green River was near its pool stage at an approximate elevation of 350 feet mean sea level (msl) based on observations on site and data available from the USGS stream gauging station on the Green River at Lock #1 near Spottsville, Kentucky. The river stage had peaked close to 358 feet msl on June 27, 2018 and had steadily declined to July 12, 2018, exposing the river bank and the sampled seepage points.

River Sampling

River samples were collected on July 12, 2018 at four locations identified on Figure 1. Coordinates for each point (Table 1) were measured using a hand-held global positioning system (GPS) unit with sub-meter accuracy.

- Sample R01 was collected near the west bank of the river upstream of Groves Creek. This location was selected as being outside the potential influence of the landfill.
- Sample R02 was collected near the west bank of the river adjacent to seep number RS07, which is elsewhere referred to as the "Area 6" seep.
- Sample R03 was collected near the west bank of the river adjacent to seep number RS05, which is elsewhere referred to as the "Area 8" seep.

- Sample R04 was collected near the west bank of the river adjacent to the downstream end of the landfill footprint (no adjacent seep).

At each of the four locations, river samples were collected three to five feet from the water line at two depths.

- A shallow sample was collected by dipping a laboratory-supplied clean container and filling the requisite (pre-preserved or unpreserved) sample bottles (see photo #1, Attachment 1).
- A deeper sample was collected from within 12 inches of the river bottom using a "Van Dorn" style sampling device (see photo #2, Attachment 1) and decanting the aliquot to the requisite (pre-preserved or unpreserved) sample bottles.

Field measurements of temperature, pH, specific conductance, and oxidation reduction potential (ORP) were collected from the shallow sample locations and recorded in field notes as reported on Table 1. Field data sheets for the river samples are provided as Attachment 2.

All filled sample containers were appropriately labeled and placed in ice-filled coolers and notes regarding sample time, staff, and conditions were recorded. The samples were later repackaged for shipment and the chain-of-custody form completed prior to shipment by overnight service to the analytical laboratory (TestAmerica in Nashville, Tennessee). All samples were tested for the Appendix III and IV parameters under the federal CCR rule in addition to select ionic constituents used for general chemical characterization (alkalinity, magnesium, potassium, and sodium).

Seep Sampling

River bank seeps were identified at sixteen discrete locations in the vicinity of the station as indicated by the "RS" symbols on Figure 1. Coordinates for each point (Table 1) were measured using a hand-held global positioning system (GPS) unit with sub-meter accuracy. Characterization and sampling of the seeps was conducted on July 12 and July 13, 2018. Field data sheets for the river bank seep locations are provided as Attachment 3.

Seeps were recorded at locations on both the east and west banks of the river over two miles upstream of the landfill footprint and over 1.5 miles downstream of the landfill footprint. Some seeps appeared to potentially be associated with a surface water drainage feature, such as RS11 where there appears to be a beaver pond beyond the river bank, but most emanated from otherwise nondescript sections of river bank.

The observed seeps can generally be described as soft, wet areas of river bank sediment between the river water line and three to six feet higher. The seeps occupy between approximately 5 and 150 feet of bank at each location. Some of the seeps had visibly flowing water, but most had a slow enough flow that, if there was free water visible at the surface, the water was not moving. Most of the seeps had some measure of orange-colored iron bacteria growth and some had a green growth. Photographs of the seeps are included as Attachment 1.

The volume of water seeping at each location ranged from imperceptible up to one or two gallons per minute cumulatively. Seep samples were collected using a transfer container (new plastic cup) to fill the laboratory bottles and to collect field measurements of temperature, pH, specific conductance, and ORP. Where sufficient flow was available, the sample was directly dipped from the seep stream. Where flow was insufficient, a shallow trench (1-3 inches deep) in the sediment was excavated to allow water to accumulate so that it could be dipped over a period estimated to be up to 15 minutes.

All filled sample containers were appropriately labeled and placed in ice-filled coolers and notes regarding sample time, staff, and conditions were recorded. The samples were later repackaged for

shipment and the chain-of-custody form completed prior to shipment by overnight service to the analytical laboratory (TestAmerica in Nashville, Tennessee). All samples were tested for the Appendix III and IV parameters under the federal CCR rule in addition to select ionic constituents used for general chemical characterization (alkalinity, magnesium, potassium, and sodium). Laboratory reports are provided as Attachment 4.

FINDINGS

Analytical results for the river and seep sample field and laboratory analyses are summarized on Table 1. The results are organized from upstream to downstream (left to right columns). A chart illustrating the distribution of key Appendix III and Appendix IV concentrations, also organized from upstream to downstream, is presented on Figure 2.

The river samples were all moderately turbid and some of the seep samples were highly turbid due to their collection from the soft sediments, but all laboratory results appear to conform to applicable quality assurance guidelines.

TABLE 1

CCR ANALYTICAL SUMMARY
RIVER SEEP AND RIVER SAMPLE EVALUATION

JULY 2018

BIG RIVERS ELECTRIC CORPORATION
GREEN STATION LANDFILL
WEBSTER COUNTY, KENTUCKY

Field Parameters	PRIMARY MCL and CCR LIMITS	Water Quality Criteria (mg/L) Human Health: Domestic Water Supply Source	Human Health: Fish	Warm Water Aquatic Habitat: Acute	Warm Water Aquatic Habitat: Chronic	River Seep-14-71318 Lat 37.661126 Long -87.4894		River Seep-12-71318 Lat 37.61732 Long -87.4936		RiverSeep-16-71318 Lat 37.62167 Long -87.4967		River 01A 71218 Lat 37.64610 Long -87.5059		River 01B 71218 Lat 37.64610 Long -87.5059		RiverSeep-08-71318 Lat 37.62860 Long -87.5003		RiverSeep-07-71218 Lat 37.63299 Long -87.5003		River 02A 71218 Lat 37.63303 Long -87.5002		River 02B 71218 Lat 37.63303 Long -87.5002		RiverSeep-05-71218 Lat 37.63433 Long -87.5003		River 03A 71218 Lat 37.63433 Long -87.5002		River 03B 71218 Lat 37.63433 Long -87.5002		River 04A 71218 Lat 37.63789 Long -87.5004		River 04B 71218 Lat 37.63789 Long -87.5004		River-Seep-04-71218 Lat 37.64122 Long -87.4997	
pH (Field Measurement) SU	NA					7.54		7.37		7.46		7.94		7.94		7.09		7.27		7.91		7.91		6.92		7.94		7.94		7.86		7.86		5.13	
pH (Lab Measurement) SU	NA					8.14		8.00		8.40		7.64		7.62		8.16		8.01		7.45		7.50		7.95		7.50		7.51		7.52		7.53		5.26	
Conductivity (µmhos/cm)	NA					1207		226.2		654		268		268		7674		7715		267.7		267.7		6174		262.2		262.2		265.1		265.1		2545	
Temperature (°F)	NA					88.34		84.0		91.58		82.9		82.9		70.52		79.7		84.2		84.2		94.28		84.2		84.2		82.6		82.6		71.6	
Oxidation-Reduction Potential (m	NA					-92		-98		-48		131		131		29		-123		98		98		-137		133		133		133		133		125	
APPENDIX III CONSTITUENTS																																			
Boron	NA					0.0694	J	0.0379	J	0.0321	J	0.0281	J	0.0252	J	0.510	J	1.46		0.0323	J	0.0322	J	0.853	J	0.0251	J	0.0235	J	0.0229	J	0.0234	J	2.19	
Calcium	NA					171		21.1		93.8		31.8		33.2		801		1120		32.8		35.8		916		34.8		32.6		32.9		34.5		460	
Chloride	NA	250	-	1200	600	22.7		32.7		23.2		4.58	B	4.52	B	2040		1990		6.75	B	6.69	B	1670		5.33	B	5.59	B	4.83	B	4.75	B	189	
Fluoride	4 mg/L	4	-	-	-	0.144	J	0.0803	J	0.177	J	0.111	J	0.105	J	0.0915	J	0.102	J	0.0958	J	0.0979	J	0.0795	J	0.100	J	0.0954	J	0.0948	J	0.0945	J	0.239	J F1
Sulfate	NA	250	-	-	-	159	B	16.1	B	26.5	B	28.5		28.3		1440	B	1480	B	30.6		30.1		1170	B	28.8		28.9		28.6		28.6		1310	B
Total Dissolved Solids	NA	250	-	-	-	790		157		504		169		161		5310		6080		173		170		5140		175		170		174		156		2130	
APPENDIX IV CONSTITUENTS																																			
Antimony	0.006 mg/L	0.0056	0.64	-	-	0.000312	J	0.000499	J	0.000270	J	0.000591	JB	0.000476	JB	0.00141	J	ND		0.00276	B	0.00106	JB	0.000366	J	0.000571	JB	0.000514	JB	0.000504	JB	0.000360	JB	0.000200	J
Arsenic	0.01 mg/L	0.01	-	0.340	0.150	0.0173		0.00467	J	0.0247		0.00124	J	0.00137	J	0.000404	J	0.00182	J	0.00131	J	0.00135	J	0.0192		0.00126	J	0.00131	J	0.00118	J	0.00109	J	0.00188	J
Barium	2 mg/L	1	-	-	-	0.242		0.0757	J	0.190	J	0.0330	J	0.0374	J	0.0443	J	0.0605	J	0.0350	J	0.0396	J	0.718		0.0366	J	0.0362	J	0.0382	J	0.0402	J	0.0384	J
Beryllium	0.004 mg/L	0.004	-	-	-	0.000497	J	0.000145	J	0.000211	J	ND		ND		ND		ND		ND		ND		0.000545	J	ND		ND		ND		ND		0.00372	
Cadmium	0.005 mg/L	0.005	-	0.00235	0.00029	0.000312	J	0.000183	J	0.000196	J	ND		ND		ND		ND		ND		ND		0.000563	J	ND		ND		ND		ND		0.00307	
Chromium	0.1 mg/L	0.1	-	-	-	0.00969		0.00200	J	0.00383		0.000676	J	0.00143	J	0.000560	J	0.000340	J	0.00111	J	0.00155	J	0.0124		0.00112	J	0.00119	J	0.00134	J	0.00105	J	0.00386	
Cobalt	0.006 mg/L					0.0125		0.00581		0.00613		0.000401	J	0.000623	J	0.000691	J	0.0218		0.000730	J	0.000937	J	0.0327		0.000934	J	0.000800	J	0.000841	J	0.000738	J	0.0447	
Fluoride	4 mg/L	4	-	-	-	0.144	J	0.0803	J	0.177	J	0.111	J	0.105	J	0.0915	J	0.102	J	0.0958	J	0.0979	J	0.0795	J	0.100	J	0.0954	J	0.0948	J	0.0945	J	0.239	J F1
Lead	0.015 mg/L	0.015	-	0.092	0.0036	0.0109		0.00221	J	0.00521		0.000994	JB	0.00600	B	0.000769	J	0.000523	J	0.00125	JB	0.00199	JB	0.0104		0.00115	JB	0.00166	JB	0.00141	JB	0.00147	JB	0.00507	
Lithium	0.040 mg/L					0.0126	J	ND		ND		ND		ND		1.80		0.772		ND		ND		0.340		ND		ND		ND		ND		0.0209	J
Mercury	0.002 mg/L	0.002	0.000051	0.0014	0.00077	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Molybdenum	0.1 mg/L					0.00550	J	0.000948	J	0.00878	J	0.00217	J	0.00130	J	0.00296	J	0.00219	J	0.00222	J	0.00145	J	0.00442	J	0.00105	J	0.00103	J	0.00101	J	0.000981	J	ND	
Radium 226 Radium 228	5 pCi/L	5 pCi/L				NS		1.17		NS		0.417		0.249	U	1.31		1.4		0.554		0.735		7.64		0.404	U	0.391	U	0.544		0.423	U	1.48	
Selenium	0.05 mg/L	0.17	4.2	-	0.005	0.000582	J	ND		0.000906	J	ND		ND	F2	ND		ND		0.000423	J	0.000636	J	0.00121	J	ND		ND		0.000402	J	ND		0.00216	J
Thallium	0.002 mg/L	0.00024	0.00047	-	-	0.000126	J	ND		ND		0.0000500	J	ND		ND		ND		ND		ND		0.000164	J	ND		ND		ND		ND		ND	
IONIC CONSTITUENTS																																			
Total Alkalinity	NA					443		38.2		393		85.6		85.6		174		87.7		85.7		85.8		229		86.1		86.4		80.9		85.8		ND	
Hardness (as mg/L of CaCO3)**	NA					578		74		318		106		110		3198		3010		108		117		2608		115		108		109		114		1411	
Magnesium	NA					36.6		5.20		20.3		6.41		6.62		291		51.8		6.32		6.76		77.8		6.87		6.41		6.45		6.73		63.6	
Potassium	NA					4.96		2.37		4.85		2.68		2.91		125		262		3.01		3.65		285		3.06		2.87		2.85		2.95		9.51	
Sodium	NA					18.5		5.52		26.7		3.79		3.95		274		277		3.98		4.63		285		4.64		4.01		3.87		4.02		42.1	

*All results listed in milligrams per liter (mg/L) unless otherwise noted by the Maximum Contaminant Level (MCL)
NA = Not available
pCi/L = picoCuries per Liter
SU = Standards units
µmhos/cm = microSiems per centimeter
°F = Degrees Fahrenheit
mV = millivolts
ND = Not detected above the Method Detection Limit
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
NM = Not measured
U = Result is less than the sample detection limit

Note: River "A" samples collected from surface
River "B" samples collected <1 foot above river bed

** The water hardness is using American degree equivalent to mg/L.
Water hardness(mg/L)=Ca(mg/L)×2.497 + Mg(mg/L)×4.118

Constituent	KY Acute Warm Water Habitat Equation	Hardness (mg/L $CaCO_3$)	Hardness** (mg/L $CaCO_3$)
		50	110
		Criterion (ug/L)	Criterion (ug/L)
Cadmium	Criterion = e(1.0166 (ln Hard*)-3.924)	1.05	2.35
Lead	Criterion = e(1.273 (ln Hard*)-1.460)	34	92

Constituent	KY Chronic Warm Water Habitat Equation	Hardness (mg/L $CaCO_3$)	Hardness** (mg/L $CaCO_3$)
		50	110
		Criterion (ug/L)	Criterion (ug/L)
Cadmium	Criterion = e(0.7409 (ln Hard*)-4.719)	0.16	0.29
Lead	Criterion = e(1.273 (ln Hard*)-4.705)	1.3	3.6

*Hard = Hardness as mg/L $CaCO_3$ **Average hardness concentration from collected River Samples (7/12/18)

Document Path: G:\Cincinnati\DCS\Projects\ENV\60579938_BREC_GrnGW\900-CAD-GIS\920-GIS or Graphics\Seep\Seep_locations_20180906.mxd

Legend

- Pond Sample
- River Seep Sample
- River Sample
- Downgradient Monitoring Well
- Upgradient Monitoring Well

0 1,450 2,900

Feet

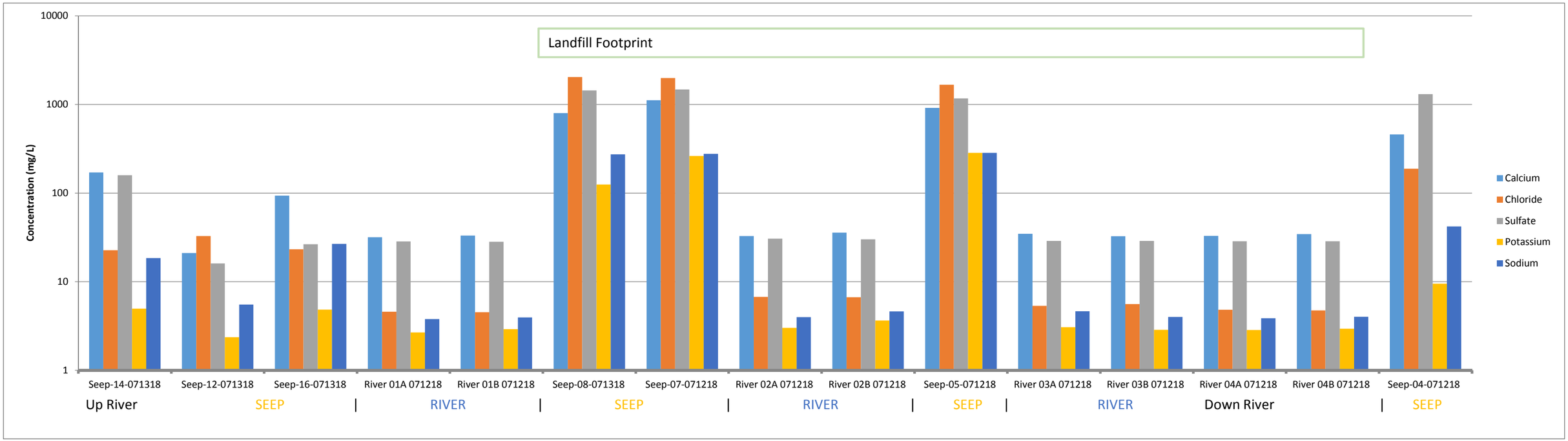
N

Big Rivers Electric Corporation

Green Station Landfill
Webster County, Kentucky

FIGURE 1
RIVER AND SEEP
SAMPLING LOCATIONS

DATE: 9/6/2018	SCALE: 1IN = 1800 FEET
CREATED BY: MRH	
JOB NO. 60579938	



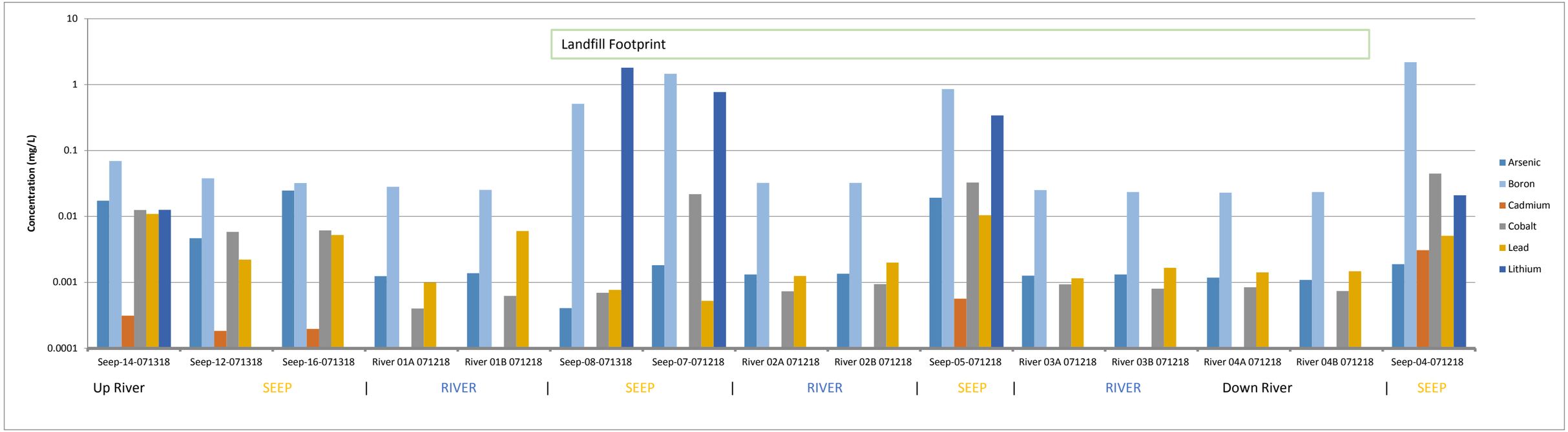


FIGURE 2
CCR ANALYTICAL SUMMARY - GREEN STATION LANDFILL
RIVER SEEP AND RIVER SAMPLE EVALUATION, JULY 2018

8/30/2018

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
1	07/12/18

Direction Photo Taken:
West

Description:

R02 location – River surface water sample.

Photo No.	Date:
2	07/12/18

Direction Photo Taken:
West

Description:

R01 location – "Van Dorn" style sampling device

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
3	07/12/18

Direction Photo Taken:
Southeast

Description:

RS01 - River Seep 01

No sample collected due to insufficient volume

Photo No.	Date:
4	07/12/18

Direction Photo Taken:

Description:

RS02 – River Seep 02

No sample collected due to insufficient volume

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
5	07/12/18

Direction Photo Taken:
Southeast

Description:

RS03 - River Seep 03

No sample collected due to insufficient volume

Field parameters collected

Photo No.	Date:
6	07/12/18

Direction Photo Taken:
West

Description:

RS04 – River Seep 04

Sample collected

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No. 7	Date: 07/12/18

Direction Photo Taken:
West

Description:

RS05 – River Seep 05

Sample collected

Photo No. 8	Date: 07/12/18

Direction Photo Taken:
West

Description:

RS06 – River Seep 06

No sample collected due to insufficient volume

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
9	07/12/18

Direction Photo Taken:
West

Description:

RS07 – River Seep 07

Sample collected

Photo No.	Date:
10	07/13/18

Direction Photo Taken:
North

Description:

RS08 – River Seep 08

Sample collected

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
11	07/13/18

Direction Photo Taken:
South

Description:

RS09 - River Seep 09

No sample collected due to insufficient volume

Photo No.	Date:
12	07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS-10 – River Seep 10

No sample collected due to insufficient volume

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No. 13	Date: 07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS11 – River Seep 11

No sample collected due to insufficient volume

Field parameters collected

Photo No. 14	Date: 07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS12 – River Seep 12

Sample collected

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No.	Date:
15	07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS13 – River Seep 13

No sample collected due to insufficient volume

Field parameters collected

Photo No.	Date:
16	07/13/18

Direction Photo Taken:
West, Southwest

Description:

RS14 – River Seep 14

Sample collected

ATTACHMENT 1 - PHOTOGRAPH LOG

Facility Name:	Site Sampling Location:	Project No.
Big Rivers - Sebree Station	Green River, between river marker 41 and 43	60579938

Photo No. 17	Date: 08/07/18

Direction Photo Taken:
East, Northeast

Description:

RS15 – River Seep 15

No sample collected due to insufficient volume

Photo No. 18	Date: 07/13/18

Direction Photo Taken:
Northwest

Description:

RS16 - River Seep 16

Sample collected

Attachment 2

Field Data Sheets – River Sample Locations

Surface ~~SPRING/SEEP~~ WATER DATA SHEET

Job Name: GRSC - Green Location: Sebree Ky

Sample Identification: River - 01A, 01B Sampling Order: 1

SAMPLE DATA Date Time: 7/12/18 1110

Measured By: CDD, DRC

Calibration of pH meter in Field: J 4pH J 7pH J 10pH ____ not done

Field pH (units): 7.94

Field Conductivity (µmhos cm): 268

Field Temperature (°F): 83.9

ORP (mV): 131

Dissolved Oxygen (mg/L): —

Turbidity (NTU): —

Sample Odor: None

Sample Color: slt cloudy

Sample Sediment Content: low to mod

Weather Conditions: Sun 80s

Sampling Splits or Duplicate: No

Samples Shipped To: TA - Nashville Date Samples were shipped: 7/12/18

Method of Shipment: Fedex Hand Delivered ____ Other ____

Parameters Collected: Ag111, IV, Anions

COMMENTS

River - 01A at surface

River - 01B 1ft off bottom, 2ft deep

Surface ~~SPRING/SEEP~~ WATER DATA SHEET

Job Name: BAE - Green Location: Shore, by

Sample Identification: River - 02A, 02B Sampling Order: B

SAMPLE DATA Date Time 7/12/18 1150

Measured By CW, DRC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.91

Field Conductivity (µmhos cm) 267.7

Field Temperature (°F) 84.2

ORP (mV) 98

Dissolved Oxygen (mg/L) —

Turbidity (NTU) —

Sample Odor none

Sample Color slt brown

Sample Sediment Content low to mod

Weather Conditions 80s Sun

Sampling Splits or Duplicates No

Samples Shipped To TA - Nashville Date Samples were shipped 7/12/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Anions

COMMENTS

River 02A collected at surface

River 02B 1ft off bottom, 10' from surface

Surface
~~SPRING/SEEP~~ WATER DATA SHEET

Job Name: BREC-Green Location: Section 87

Sample Identification: River-03A, 03B Sampling Order: 3

SAMPLE DATA Date Time: 7/12/18 1215

Measured By: CDD, DRC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.94

Field Conductivity (µmho/cm) 262.2

Field Temperature (°F) 84.2

ORP (mV) 133

Dissolved Oxygen (mg/l) –

Turbidity (NTU) –

Sample Odor slt brown none

Sample Color slt brown

Sample Sediment Content low to mod

Weather Conditions sun 80s

Sampling Splits or Duplicates No

Samples Shipped To Fedex, TA Nashville Date Samples were shipped 7/12/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV

COMMENTS

River 03A at surface = SA from bank

River 03B - 1ft from bottom 4' d.q depth

~~SPRING~~/Surface SEEP WATER DATA SHEET

Job Name: Effect - Green Location: Selma, IN

Sample Identification: River - 04A, 04B Sampling Order: 4

SAMPLE DATA Date/Time: 7/2/18 1240

Measured By: CDD, DEL

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units): 7.86

Field Conductivity (µmhos cm): 2651

Field Temperature (°F): 82.6

ORP (mV): 133

Dissolved Oxygen (mg/L): -

Turbidity (NTU): -

Sample Odor: none

Sample Color: slt brown

Sample Sediment Content: low to med

Weather Conditions: Sun 80s

Sampling Splits or Duplicates: NO

Samples Shipped To: TA Nashville Date Samples were shipped: 7/2/18

Method of Shipment: Fedex Hand Delivered ____ Other ____

Parameters Collected: App III, D, Anions

COMMENTS

River 04A - collected at surface

River 04B - 2ft below surface, 1ft above bottom

Attachment 3

Field Data Sheets – River Bank Seep Locations

SPRING/SEEP WATER DATA SHEET

Job Name: BREC Green Location: Selma, Ky

Sample Identification: River Seep-01 Sampling Order: 5

SAMPLE DATA

Date/Time: 7/12/18 1:31

Measured By: CDW, DK

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) No probe due to low flow conditions

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor NA

Sample Color NA

Sample Sediment Content NA

Weather Conditions Sun 80s

Sampling Splits or Duplicates NO

Samples Shipped To NA Date Samples were shipped NA

Method of Shipment NA Hand Delivered ____ Other ____

Parameters Collected None

COMMENTS

East bank, orange staining

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sublee, Ky

Sample Identification: River Seep - 02 Sampling Order: 6

SAMPLE DATA Date/Time: 7/18/18 1317

Measured By: CSW, DRC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) insufficient volume

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions

Sampling Splits or Duplicates

Samples Shipped To NA Date Samples were shipped

Method of Shipment Hand Delivered Other

Parameters Collected None

COMMENTS

Eastbank; low flow + staining

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sobieski, KY

Sample Identification: River Seep 03 Sampling Order: 7

SAMPLE DATA Date/Time: 7/12/18 1331

Measured By: CDD, DJC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.14

Field Conductivity (µmhos/cm) 804.35

Field Temperature (°F) 77.18

ORP (mV) -73

Dissolved Oxygen (mg/L) –

Turbidity (NTU) –

Sample Odor –

Sample Color –

Sample Sediment Content –

Weather Conditions Sun 80s

Sampling Splits or Duplicates –

Samples Shipped To – Date Samples were shipped –

Method of Shipment – Hand Delivered ____ Other ____

Parameters Collected None

COMMENTS

Insufficient flow to sample, East bank, orange staining

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sebree Ky

Sample Identification: River Seep 04 Sampling Order: 6

SAMPLE DATA Date/Time 7/12/18 1350

Measured By: CDD, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 5.13

Field Conductivity (µmhos cm) 2545

Field Temperature (°F) 71.6

ORP (mV) 125

Dissolved Oxygen (mg/L) –

Turbidity (NTU) –

Sample Odor none

Sample Color clear w orange staining

Sample Sediment Content low

Weather Conditions sun 80s

Sampling Splits or Duplicates NO

Samples Shipped To TA Nashville Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Anions

COMMENTS

Seep bank near pond 011, 1-2 GPM cumulative

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Scbee, Ky

Sample Identification: River Seep-05 Sampling Order: 7

SAMPLE DATA Date/Time: 7/12/18 1425

Measured By: CSS, DL

Calibration of pH meter in Field ✓ 4pH ✓ pH ✓ 10pH ____ not done

Field pH (units) 6.92

Field Conductivity (µmhos cm) 617

Field Temperature (°F) 79.28

ORP (mV) -137

Dissolved Oxygen (mg/l) ~

Turbidity (NTU) ~

Sample Odor none

Sample Color brown

Sample Sediment Content high

Weather Conditions sm 80s

Sampling Splits or Duplicates no

Samples Shipped To TA Nashville Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Metals

COMMENTS

Flow 61 gpm, ~~was there~~ "Acon B"

SPRING/SEEP WATER DATA SHEET

Job Name: FREL - Green Location: Subsidy

Sample Identification: River Seep - 06 Sampling Order: 10

SAMPLE DATA Date/Time: 7/12/18 1439

Measured By: CAS DK

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH not done

Field pH (units): NM - see Miscellaneous

Field Conductivity (µmho/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions: Sun 80s

Sampling Splits or Duplicates: NA

Samples Shipped To: NA Date Samples were shipped: NA

Method of Shipment: NA Hand Delivered Other

Parameters Collected: None collected

COMMENTS

Ground sheet flow ~ 30 ft wide, insufficient for

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sebree, Ky

Sample Identification: River Seep-07 Sampling Order: 11

SAMPLE DATA Date/Time: 7/12/18 1450

Measured By: CO, SE

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units): 7.23

Field Conductivity (µmhos/cm): 771.5

Field Temperature (°F): 79.7

ORP (mV): -123

Dissolved Oxygen (mg/L): -

Turbidity (NTU): -

Sample Odor: clear to slt cloudy

Sample Color: none

Sample Sediment Content: low to mod

Weather Conditions: Sun, 80s

Sampling Splits or Duplicates: no

Samples Shipped To: TL - Nashville Date Samples were shipped: 7/31/18

Method of Shipment: Fedex Hand Delivered: ____ Other: ____

Parameters Collected: App B, IV, Anions

COMMENTS

Flow 1-2 gpm spread over 100', high on bank accum

SPRING/SEEP WATER DATA SHEET

Job Name: ORC - Green Location: Lake

Sample Identification: River Seep 08 Sampling Order: 1

SAMPLE DATA Date/Time: 7/8/13 0750

Measured By: CMA, DJC

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

	S seep	N seep
Field pH (units)	7.09	7.05
Field Conductivity (µmhos/cm)	784	780
Field Temperature (°F)	72.52	65.3
ORP (mV)	29	53
Dissolved Oxygen (mg/L)	-	-
Turbidity (NTU)	-	-

Sample Odor: slight musty

Sample Color: clear

Sample Sediment Content: low

Weather Conditions: sun, clear

Sampling Splits or Duplicates: NO

Samples Shipped To: TA Nashville Date Samples were shipped: 7/8/13

Method of Shipment: Fedex Hand Delivered ____ Other ____

Parameters Collected: App. IV, Iron

COMMENTS

near old pond area ; top of stream bed is dry flow < 1 gpm at sample point.

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sebree, Ky

Sample Identification: River Seep 09 Sampling Order: 13

SAMPLE DATA Date/Time: 7/13/18 0835

Measured By: CSB, DRL

Calibration of pH meter in Field: ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) ** Insufficient volume for parameters

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions Sun 80s

Sampling Splits or Duplicates NA

Samples Shipped To NA Date Samples were shipped NA

Method of Shipment NA Hand Delivered ____ Other ____

Parameters Collected None

COMMENTS

Minor seepage, Orange staining, no vis flow

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sebree, Ky

Sample Identification: Rigor Seep 10 Sampling Order: 14

SAMPLE DATA

Date Time: 7/13/16 0852

Measured By: COJ, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) Insufficient Volume

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions Sun 80s

Sampling Splits or Duplicates N

Samples Shipped To NA Date Samples were shipped NA

Method of Shipment NA Hand Delivered ____ Other ____

Parameters Collected NA

COMMENTS

minor seepage w orange staining

SPRING/SEEP WATER DATA SHEET

Job Name: BREL - Green Location: Sobee, Ky

Sample Identification: River Seep 11 Sampling Order: 15

SAMPLE DATA Date Time: 7/13/18 0857

Measured By: CDD, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.35

Field Conductivity (µmhos cm) 364

Field Temperature (°) NM

ORP (mV) -65

Dissolved Oxygen (mg/L) —

Turbidity (NTU) —

Sample Odor —

Sample Color —

Sample Sediment Content —

Weather Conditions Sun 80s

Sampling Splits or Duplicates N

Samples Shipped To NA Date Samples were shipped NA

Method of Shipment NA Hand Delivered ____ Other ____

Parameters Collected None

COMMENTS

Pond seen above, flow from high on bank
Not Sampled

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sebree, Ky

Sample Identification: River Seep 12 Sampling Order: 16

SAMPLE DATA

Date Time: 7/13/18 0915

Measured By: CDD, SPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.37

Field Conductivity (µmhos/cm) 226.2

Field Temperature (°F) 84.0

ORP (mV) -98

Dissolved Oxygen (mg/L) -

Turbidity (NTU) -

Sample Odor ~~[illegible]~~ none

Sample Color cloudy to slt brown

Sample Sediment Content low to mod

Weather Conditions sun & clds

Sampling Splits or Duplicates NO

Samples Shipped To TA - Nashville Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Anions

COMMENTS

< ½ gpm flow

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sebree, Ky

Sample Identification: River Seep 13 Sampling Order: 17

SAMPLE DATA

Date Time: 7/13/18 0930

Measured By: CDA, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units)	~~Insufficient flow~~ CD 7.0
Field Conductivity (µmhos/cm)	701.9
Field Temperature (°F)	84.0
ORP (mV)	-152
Dissolved Oxygen (mg/L)	—
Turbidity (NTU)	—
Sample Odor	—
Sample Color	—
Sample Sediment Content	—
Weather Conditions	Sun 80s
Sampling Splits or Duplicates	N
Samples Shipped To	NA
Date Samples were shipped	NA
Method of Shipment	NA
Hand Delivered	____ Other ____
Parameters Collected	None

COMMENTS

Insufficient flow to sample

SPRING/SEEP WATER DATA SHEET

Job Name: BSEL-Green Location: Sebree, Ky

Sample Identification: River Seep 14 Sampling Order: 18

SAMPLE DATA Date Time: 7/13/18 1010

Measured By: CDD, DPC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH _____ not done

Field pH (units) 7.54

Field Conductivity (µmhos/cm) 1207

Field Temperature (°F) 88.34

ORP (mV) -92

Dissolved Oxygen (mg/L) –

Turbidity (NTU) –

Sample Odor –

Sample Color clear

Sample Sediment Content low

Weather Condition Sun 80s

Sampling Splits or Duplicates N

Samples Shipped To TA Nashville Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered _____ Other _____

Parameters Collected App III, III, Anions – No Radium

COMMENTS

orange staining, pooled on soft bank ledge collected from pool dug w tool

SPRING/SEEP WATER DATA SHEET

Job Name: BREC-Green Location: Sebree, Ky

Sample Identification: River Seep 15 Sampling Order: 19

SAMPLE DATA Date Time: 7/13/16 1033

Measured By: CDD, DFC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) Insufficient Volum

Field Conductivity (µmhos/cm)

Field Temperature (°F)

ORP (mV)

Dissolved Oxygen (mg/L)

Turbidity (NTU)

Sample Odor

Sample Color

Sample Sediment Content

Weather Conditions Sun 80s

Sampling Splits or Duplicates NA

Samples Shipped To ____ Date Samples were shipped NA

Method of Shipment ____ Hand Delivered ____ Other ____

Parameters Collected NO Sample

COMMENTS

East Bank upstream, some orange staining, no flow

SPRING/SEEP WATER DATA SHEET

Job Name: BREC - Green Location: Sebree, Ky

Sample Identification: River Seep 16 Sampling Order: 20

SAMPLE DATA Date/Time: 7/13/18

Measured By: CAW, DRC

Calibration of pH meter in Field ✓ 4pH ✓ 7pH ✓ 10pH ____ not done

Field pH (units) 7.46

Field Conductivity (µmhos/cm) 654

Field Temperature (°F) 91.58

ORP (mV) -48

Dissolved Oxygen (mg/L) —

Turbidity (NTU) —

Sample Odor —

Sample Color —

Sample Sediment Content ~~fine to moderate~~

Weather Conditions ~~Rain~~ 60s

Sampling Splits or Duplicates NO

Samples Shipped To TA Westborough Date Samples were shipped 7/13/18

Method of Shipment Fedex Hand Delivered ____ Other ____

Parameters Collected App III, IV, Anions No Radium

COMMENTS

Adj to boat ramp, very low flow 0.17 gpm, collected from trench dug w tool

Attachment 4

LABORATORY REPORTS

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-155625-1
Client Project/Site: Green Landfill

For:
Big Rivers Electric Corporation
PO BOX 24
Henderson, Kentucky 42419

Attn: Greg Dick

Roxanne Cisneros

Authorized for release by:
8/16/2018 3:18:48 PM

Roxanne Cisneros, Senior Project Manager
(615)301-5761
roxanne.cisneros@testamericainc.com

Table of Contents

Sample Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-155625-1	River 01A 071218	Water	07/12/18 11:10	07/13/18 10:10
490-155625-2	River 01B 071218	Water	07/12/18 11:30	07/13/18 10:10
490-155625-3	River 02A 071218	Water	07/12/18 11:50	07/13/18 10:10
490-155625-4	River 02B 071218	Water	07/12/18 12:00	07/13/18 10:10
490-155625-5	River 03A 071218	Water	07/12/18 12:15	07/13/18 10:10
490-155625-6	River 03B 071218	Water	07/12/18 12:20	07/13/18 10:10
490-155625-7	River 04A 071218	Water	07/12/18 12:45	07/13/18 10:10
490-155625-8	River 04B 071218	Water	07/12/18 12:55	07/13/18 10:10

Job ID: 490-155625-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-155625-1

Comments
Revised Report 8/07/2018 to add Potassium and Total Alkalinity per request.

Receipt
The samples were received on 7/13/2018 10:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.5º C and 1.3º C.

HPLC/IC
Method(s) 9056A: The method blank for analytical batch 490-529755 contained Chloride above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

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

Metals
Method(s) 6020A: The matrix spike / matrix spike duplicate / sample duplicate (MS/MSD/DUP) precision for 250895 was outside control limits for selenium. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample / laboratory control sample duplicate (LCS/LCSD) precision was within acceptance limits.

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

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

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

Narrative

Job Narrative
490-155625-2

Comments
No additional comments.

Receipt
The samples were received on 7/13/2018 10:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.5º C and 1.3º C.

RAD
Method(s) PrecSep_0: Radium 228 Prep Batch 160-376424: Sample aliquots reduced due to potential matrix interference. Samples were yellow, murky, and contained heavy amounts of sediment: River 01A 071218 (490-155625-1), River 01B 071218 (490-155625-2), River 02A 071218 (490-155625-3), River 02B 071218 (490-155625-4), River 03A 071218 (490-155625-5), River 03B 071218 (490-155625-6), River 04A 071218 (490-155625-7) and River 04B 071218 (490-155625-8)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376411: Sample aliquots reduced due to potential matrix interference. Samples were yellow, murky, and contained heavy amounts of sediment: River 01A 071218 (490-155625-1), River 01B 071218 (490-155625-2), River 02A 071218 (490-155625-3), River 02B 071218 (490-155625-4), River 03A 071218 (490-155625-5), River 03B 071218 (490-155625-6), River 04A 071218 (490-155625-7) and River 04B 071218 (490-155625-8)

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

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
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.

Metals

Qualifier	Qualifier Description
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.
F2	MS/MSD RPD exceeds control limits

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Client Sample ID: River 01A 071218

Date Collected: 07/12/18 11:10
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-1

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.58	B	3.00	0.200	mg/L			07/19/18 02:20	1
Fluoride	0.111	J	1.00	0.0100	mg/L			07/19/18 02:20	1
Sulfate	28.5		5.00	0.0300	mg/L			07/19/18 02:20	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:09	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000591	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 20:31	1
Arsenic	0.00124	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 20:31	1
Barium	0.0330	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 20:31	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 20:31	1
Boron	0.0281	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 20:31	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 20:31	1
Calcium	31.8		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 20:31	1
Chromium	0.000676	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 20:31	1
Cobalt	0.000401	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 20:31	1
Lead	0.000994	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 20:31	1
Magnesium	6.41		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 20:31	1
Molybdenum	0.00217	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 20:31	1
Potassium	2.68		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 20:31	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 20:31	1
Sodium	3.79		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 20:31	1
Thallium	0.0000500	J	0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 20:31	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:03	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.64		0.100	0.100	SU			07/18/18 10:03	1
Temperature	19.1		0.100	0.100	Degrees C			07/18/18 10:03	1
Alkalinity	85.6		10.0	5.00	mg/L			07/24/18 12:48	1
Total Dissolved Solids	169		10.0	7.00	mg/L			07/13/18 21:20	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.392		0.137	0.142	1.00	0.119	pCi/L	07/18/18 09:53	08/09/18 06:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.9*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:09*	*1*

Client Sample ID: River 01A 071218
Date Collected: 07/12/18 11:10
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-1
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0258	U	0.229	0.229	1.00	0.411	pCi/L	07/18/18 10:47	08/01/18 16:50	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.9*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:50*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:50*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.417**		0.267	0.269	5.00	0.411	pCi/L		08/16/18 13:40	1

Client Sample ID: River 01B 071218

Date Collected: 07/12/18 11:30
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-2

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.52	B	3.00	0.200	mg/L			07/19/18 03:15	1
Fluoride	0.105	J	1.00	0.0100	mg/L			07/19/18 03:15	1
Sulfate	28.3		5.00	0.0300	mg/L			07/19/18 03:15	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:30	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000476	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 20:35	1
Arsenic	0.00137	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 20:35	1
Barium	0.0374	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 20:35	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 20:35	1
Boron	0.0252	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 20:35	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 20:35	1
Calcium	33.2		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 20:35	1
Chromium	0.00143	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 20:35	1
Cobalt	0.000623	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 20:35	1
Lead	0.00600	B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 20:35	1
Magnesium	6.62		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 20:35	1
Molybdenum	0.00130	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 20:35	1
Potassium	2.91		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 20:35	1
Selenium	ND	F2	0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 20:35	1
Sodium	3.95		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 20:35	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 20:35	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.62		0.100	0.100	SU			07/18/18 10:03	1
Temperature	19.1		0.100	0.100	Degrees C			07/18/18 10:03	1
Alkalinity	85.6		10.0	5.00	mg/L			07/24/18 12:55	1
Total Dissolved Solids	161		10.0	7.00	mg/L			07/13/18 21:20	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.249		0.112	0.114	1.00	0.115	pCi/L	07/18/18 09:53	08/09/18 06:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:10*	*1*

Client Sample ID: River 01B 071218
Date Collected: 07/12/18 11:30
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-2
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.00993	U	0.274	0.274	1.00	0.489	pCi/L	07/18/18 10:47	08/01/18 16:50	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:50*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:50*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.249	U	0.296	0.297	5.00	0.489	pCi/L		08/16/18 13:40	1

Client Sample ID: River 02A 071218

Date Collected: 07/12/18 11:50
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-3

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	6.75	B	3.00	0.200	mg/L			07/19/18 03:33	1
Fluoride	0.0958	J	1.00	0.0100	mg/L			07/19/18 03:33	1
Sulfate	30.6		5.00	0.0300	mg/L			07/19/18 03:33	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:35	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00276	B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 20:58	1
Arsenic	0.00131	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 20:58	1
Barium	0.0350	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 20:58	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 20:58	1
Boron	0.0323	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 20:58	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 20:58	1
Calcium	32.8		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 20:58	1
Chromium	0.00111	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 20:58	1
Cobalt	0.000730	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 20:58	1
Lead	0.00125	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 20:58	1
Magnesium	6.32		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 20:58	1
Molybdenum	0.00222	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 20:58	1
Potassium	3.01		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 20:58	1
Selenium	0.000423	J	0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 20:58	1
Sodium	3.98		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 20:58	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 20:58	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.45		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.8		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	85.7		10.0	5.00	mg/L			07/24/18 13:02	1
Total Dissolved Solids	173		10.0	7.00	mg/L			07/13/18 21:20	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.336		0.133	0.136	1.00	0.128	pCi/L	07/18/18 09:53	08/09/18 06:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:10*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 02A 071218
Date Collected: 07/12/18 11:50
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-3
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.218	U	0.288	0.289	1.00	0.480	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.554**		0.317	0.319	5.00	0.480	pCi/L		08/16/18 13:40	1

Client Sample ID: River 02B 071218

Date Collected: 07/12/18 12:00
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-4

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	6.69	B	3.00	0.200	mg/L			07/19/18 03:51	1
Fluoride	0.0979	J	1.00	0.0100	mg/L			07/19/18 03:51	1
Sulfate	30.1		5.00	0.0300	mg/L			07/19/18 03:51	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:41	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00106	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:03	1
Arsenic	0.00135	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:03	1
Barium	0.0396	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:03	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:03	1
Boron	0.0322	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:03	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:03	1
Calcium	35.8		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:03	1
Chromium	0.00155	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:03	1
Cobalt	0.000937	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:03	1
Lead	0.00199	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:03	1
Magnesium	6.76		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:03	1
Molybdenum	0.00145	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:03	1
Potassium	3.65		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:03	1
Selenium	0.000636	J	0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:03	1
Sodium	4.63		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:03	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:03	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.50		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.5		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	85.8		10.0	5.00	mg/L			07/24/18 13:09	1
Total Dissolved Solids	170		10.0	7.00	mg/L			07/13/18 21:20	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.318		0.123	0.126	1.00	0.115	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client Sample ID: River 02B 071218
Date Collected: 07/12/18 12:00
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-4
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.417		0.268	0.271	1.00	0.409	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.735		0.295	0.299	5.00	0.409	pCi/L		08/16/18 13:40	1

Client Sample ID: River 03A 071218

Date Collected: 07/12/18 12:15
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-5

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	5.33	B	3.00	0.200	mg/L			07/19/18 04:09	1
Fluoride	0.100	J	1.00	0.0100	mg/L			07/19/18 04:09	1
Sulfate	28.8		5.00	0.0300	mg/L			07/19/18 04:09	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 14:56	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000571	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:21	1
Arsenic	0.00126	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:21	1
Barium	0.0366	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:21	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:21	1
Boron	0.0251	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:21	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:21	1
Calcium	34.8		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:21	1
Chromium	0.00112	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:21	1
Cobalt	0.000934	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:21	1
Lead	0.00115	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:21	1
Magnesium	6.87		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:21	1
Molybdenum	0.00105	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:21	1
Potassium	3.06		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:21	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:21	1
Sodium	4.64		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:21	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:21	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:07	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.50		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.3		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	86.1		10.0	5.00	mg/L			07/24/18 13:16	1
Total Dissolved Solids	175		10.0	7.00	mg/L			07/13/18 23:45	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.338		0.126	0.130	1.00	0.110	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 03A 071218
Date Collected: 07/12/18 12:15
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-5
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0661	U	0.244	0.245	1.00	0.429	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*90.8*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.404	U	0.275	0.277	5.00	0.429	pCi/L		08/16/18 13:40	1

Client Sample ID: River 03B 071218

Date Collected: 07/12/18 12:20
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-6

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	5.59	B	3.00	0.200	mg/L			07/19/18 04:27	1
Fluoride	0.0954	J	1.00	0.0100	mg/L			07/19/18 04:27	1
Sulfate	28.9		5.00	0.0300	mg/L			07/19/18 04:27	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 15:02	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000514	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:25	1
Arsenic	0.00131	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:25	1
Barium	0.0362	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:25	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:25	1
Boron	0.0235	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:25	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:25	1
Calcium	32.6		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:25	1
Chromium	0.00119	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:25	1
Cobalt	0.000800	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:25	1
Lead	0.00166	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:25	1
Magnesium	6.41		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:25	1
Molybdenum	0.00103	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:25	1
Potassium	2.87		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:25	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:25	1
Sodium	4.01		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:25	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:25	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.51		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.4		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	86.4		10.0	5.00	mg/L			07/24/18 13:29	1
Total Dissolved Solids	170		10.0	7.00	mg/L			07/13/18 23:45	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.391		0.146	0.150	1.00	0.123	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 03B 071218
Date Collected: 07/12/18 12:20
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-6
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.197	U	0.229	0.230	1.00	0.449	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*90.8*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.391	U	0.272	0.275	5.00	0.449	pCi/L		08/16/18 13:40	1

Client Sample ID: River 04A 071218

Date Collected: 07/12/18 12:45
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-7

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.83	B	3.00	0.200	mg/L			07/19/18 04:45	1
Fluoride	0.0948	J	1.00	0.0100	mg/L			07/19/18 04:45	1
Sulfate	28.6		5.00	0.0300	mg/L			07/19/18 04:45	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 15:07	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000504	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:30	1
Arsenic	0.00118	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:30	1
Barium	0.0382	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:30	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:30	1
Boron	0.0229	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:30	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:30	1
Calcium	32.9		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:30	1
Chromium	0.00134	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:30	1
Cobalt	0.000841	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:30	1
Lead	0.00141	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:30	1
Magnesium	6.45		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:30	1
Molybdenum	0.00101	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:30	1
Potassium	2.85		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:30	1
Selenium	0.000402	J	0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:30	1
Sodium	3.87		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:30	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:30	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:09	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.52		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.4		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	80.9		10.0	5.00	mg/L			07/24/18 13:36	1
Total Dissolved Solids	174		10.0	7.00	mg/L			07/13/18 23:45	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.309		0.117	0.120	1.00	0.0978	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.3*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 04A 071218
Date Collected: 07/12/18 12:45
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-7
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.236	U	0.276	0.277	1.00	0.456	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.3*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*86.7*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.544**		0.300	0.302	5.00	0.456	pCi/L		08/16/18 13:40	1

Client Sample ID: River 04B 071218

Date Collected: 07/12/18 12:55
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-8

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.75	B	3.00	0.200	mg/L			07/19/18 05:03	1
Fluoride	0.0945	J	1.00	0.0100	mg/L			07/19/18 05:03	1
Sulfate	28.6		5.00	0.0300	mg/L			07/19/18 05:03	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 15:12	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000360	J B	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 21:35	1
Arsenic	0.00109	J	0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 21:35	1
Barium	0.0402	J	0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 21:35	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 21:35	1
Boron	0.0234	J	1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 21:35	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 21:35	1
Calcium	34.5		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 21:35	1
Chromium	0.00105	J	0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 21:35	1
Cobalt	0.000738	J	0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 21:35	1
Lead	0.00147	J B	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 21:35	1
Magnesium	6.73		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 21:35	1
Molybdenum	0.000981	J	0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 21:35	1
Potassium	2.95		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 21:35	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 21:35	1
Sodium	4.02		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 21:35	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 21:35	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 10:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.53		0.100	0.100	SU			07/18/18 10:21	1
Temperature	19.4		0.100	0.100	Degrees C			07/18/18 10:21	1
Alkalinity	85.8		10.0	5.00	mg/L			07/24/18 13:43	1
Total Dissolved Solids	156		10.0	7.00	mg/L			07/13/18 23:45	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.423		0.157	0.162	1.00	0.123	pCi/L	07/18/18 09:53	08/09/18 06:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*40 - 110*	*07/18/18 09:53*	*08/09/18 06:11*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 04B 071218
Date Collected: 07/12/18 12:55
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-8
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.277	U	0.249	0.250	1.00	0.502	pCi/L	07/18/18 10:47	08/01/18 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*
Y Carrier	*89.0*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:51*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.423	U	0.294	0.298	5.00	0.502	pCi/L		08/16/18 13:40	1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 490-529755/3
Matrix: Water
Analysis Batch: 529755

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	0.2299	J	3.00	0.200	mg/L			07/19/18 01:26	1
Fluoride	ND		1.00	0.0100	mg/L			07/19/18 01:26	1
Sulfate	ND		5.00	0.0300	mg/L			07/19/18 01:26	1

Lab Sample ID: LCS 490-529755/4
Matrix: Water
Analysis Batch: 529755

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.340		mg/L		93	80 - 120
Fluoride	1.00	0.9436	J	mg/L		94	80 - 120
Sulfate	10.0	9.177		mg/L		92	80 - 120

Lab Sample ID: LCSD 490-529755/5
Matrix: Water
Analysis Batch: 529755

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.258		mg/L		92	80 - 120	1	20
Fluoride	1.00	0.9306	J	mg/L		93	80 - 120	1	20
Sulfate	10.0	9.183		mg/L		92	80 - 120	0	20

Lab Sample ID: 490-155625-1 MS
Matrix: Water
Analysis Batch: 529755

Client Sample ID: River 01A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	4.58	B	10.0	15.84		mg/L		112	80 - 120
Fluoride	0.111	J	1.00	1.158		mg/L		105	80 - 120
Sulfate	28.5		10.0	39.82		mg/L		113	80 - 120

Lab Sample ID: 490-155625-1 MSD
Matrix: Water
Analysis Batch: 529755

Client Sample ID: River 01A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	4.58	B	10.0	14.00		mg/L		94	80 - 120	12	20
Fluoride	0.111	J	1.00	0.9991	J	mg/L		89	80 - 120	15	20
Sulfate	28.5		10.0	38.02		mg/L		95	80 - 120	5	20

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 180-250893/1-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250893

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:28	07/24/18 13:59	1

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: LCS 180-250893/2-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250893

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	1.00	1.022		mg/L		102	80 - 120

Lab Sample ID: 490-155625-1 MS
Matrix: Water
Analysis Batch: 251527

Client Sample ID: River 01A 071218
Prep Type: Total Recoverable
Prep Batch: 250893

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	ND		1.00	1.007		mg/L		101	75 - 125

Lab Sample ID: 490-155625-1 MSD
Matrix: Water
Analysis Batch: 251527

Client Sample ID: River 01A 071218
Prep Type: Total Recoverable
Prep Batch: 250893

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	ND		1.00	0.9816		mg/L		98	75 - 125	3	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 180-250895/1-A
Matrix: Water
Analysis Batch: 251631

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00006100	J	0.00200	0.0000213	mg/L		07/18/18 12:33	07/24/18 20:21	1
Arsenic	ND		0.00500	0.000118	mg/L		07/18/18 12:33	07/24/18 20:21	1
Barium	ND		0.200	0.000270	mg/L		07/18/18 12:33	07/24/18 20:21	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:33	07/24/18 20:21	1
Boron	ND		1.00	0.00339	mg/L		07/18/18 12:33	07/24/18 20:21	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:33	07/24/18 20:21	1
Calcium	ND		1.00	0.0412	mg/L		07/18/18 12:33	07/24/18 20:21	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:33	07/24/18 20:21	1
Cobalt	ND		0.00500	0.0000218	mg/L		07/18/18 12:33	07/24/18 20:21	1
Lead	0.0001510	J	0.00500	0.0000675	mg/L		07/18/18 12:33	07/24/18 20:21	1
Magnesium	ND		1.00	0.0152	mg/L		07/18/18 12:33	07/24/18 20:21	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:33	07/24/18 20:21	1
Potassium	ND		1.00	0.136	mg/L		07/18/18 12:33	07/24/18 20:21	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:33	07/24/18 20:21	1
Sodium	ND		1.00	0.251	mg/L		07/18/18 12:33	07/24/18 20:21	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:33	07/24/18 20:21	1

Lab Sample ID: LCS 180-250895/2-A
Matrix: Water
Analysis Batch: 251631

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.500	0.4898		mg/L		98	80 - 120
Arsenic	0.0400	0.03842		mg/L		96	80 - 120
Barium	2.00	1.925		mg/L		96	80 - 120
Beryllium	0.0500	0.04875		mg/L		98	80 - 120

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 180-250895/2-A
Matrix: Water
Analysis Batch: 251631

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1.00	0.8867	J	mg/L		89	80 - 120
Cadmium	0.0500	0.05068		mg/L		101	80 - 120
Calcium	50.0	45.32		mg/L		91	80 - 120
Chromium	0.200	0.1705		mg/L		85	80 - 120
Cobalt	0.500	0.4476		mg/L		90	80 - 120
Lead	0.0200	0.02129		mg/L		106	80 - 120
Magnesium	50.0	46.73		mg/L		93	80 - 120
Molybdenum	1.00	0.9723		mg/L		97	80 - 120
Potassium	50.0	46.91		mg/L		94	80 - 120
Selenium	0.0100	0.01009		mg/L		101	80 - 120
Sodium	50.0	45.47		mg/L		91	80 - 120
Thallium	0.0500	0.04991		mg/L		100	80 - 120

Lab Sample ID: 490-155625-2 MS
Matrix: Water
Analysis Batch: 251631

Client Sample ID: River 01B 071218
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.000476	J B	0.500	0.5115		mg/L		102	75 - 125
Arsenic	0.00137	J	0.0400	0.03802		mg/L		92	75 - 125
Barium	0.0374	J	2.00	2.033		mg/L		100	75 - 125
Beryllium	ND		0.0500	0.05153		mg/L		103	75 - 125
Boron	0.0252	J	1.00	0.9333	J	mg/L		91	75 - 125
Cadmium	ND		0.0500	0.05330		mg/L		107	75 - 125
Calcium	33.2		50.0	85.40		mg/L		105	75 - 125
Chromium	0.00143	J	0.200	0.1788		mg/L		89	75 - 125
Cobalt	0.000623	J	0.500	0.4717		mg/L		94	75 - 125
Lead	0.00600	B	0.0200	0.02673		mg/L		104	75 - 125
Magnesium	6.62		50.0	53.36		mg/L		93	75 - 125
Molybdenum	0.00130	J	1.00	1.007		mg/L		101	75 - 125
Potassium	2.91		50.0	50.11		mg/L		94	75 - 125
Selenium	ND	F2	0.0100	0.01048		mg/L		105	75 - 125
Sodium	3.95		50.0	49.36		mg/L		91	75 - 125
Thallium	ND		0.0500	0.05030		mg/L		101	75 - 125

Lab Sample ID: 490-155625-2 MSD
Matrix: Water
Analysis Batch: 251631

Client Sample ID: River 01B 071218
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	0.000476	J B	0.500	0.5014		mg/L		100	75 - 125	2	20
Arsenic	0.00137	J	0.0400	0.03845		mg/L		93	75 - 125	1	20
Barium	0.0374	J	2.00	2.037		mg/L		100	75 - 125	0	20
Beryllium	ND		0.0500	0.05205		mg/L		104	75 - 125	1	20
Boron	0.0252	J	1.00	0.9436	J	mg/L		92	75 - 125	1	20
Cadmium	ND		0.0500	0.05239		mg/L		105	75 - 125	2	20
Calcium	33.2		50.0	86.42		mg/L		107	75 - 125	1	20
Chromium	0.00143	J	0.200	0.1794		mg/L		89	75 - 125	0	20
Cobalt	0.000623	J	0.500	0.4642		mg/L		93	75 - 125	2	20

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-155625-2 MSD
Matrix: Water
Analysis Batch: 251631

Client Sample ID: River 01B 071218
Prep Type: Total Recoverable
Prep Batch: 250895

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lead	0.00600	B	0.0200	0.02698		mg/L		105	75 - 125	1	20
Magnesium	6.62		50.0	54.66		mg/L		96	75 - 125	2	20
Molybdenum	0.00130	J	1.00	0.9933		mg/L		99	75 - 125	1	20
Potassium	2.91		50.0	50.03		mg/L		94	75 - 125	0	20
Selenium	ND	F2	0.0100	0.008497	J F2	mg/L		85	75 - 125	21	20
Sodium	3.95		50.0	50.61		mg/L		93	75 - 125	3	20
Thallium	ND		0.0500	0.04967		mg/L		99	75 - 125	1	20

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 180-250921/1-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 250921

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/19/18 07:20	07/20/18 09:44	1

Lab Sample ID: LCS 180-250921/2-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 250921

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	2.50	2.427		ug/L		97	80 - 120

Lab Sample ID: 180-79763-F-6-C MS
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike
Prep Type: Dissolved
Prep Batch: 250921

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		1.00	0.8990		ug/L		90	75 - 125

Lab Sample ID: 180-79763-F-6-D MSD
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike Duplicate
Prep Type: Dissolved
Prep Batch: 250921

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		1.00	0.9260		ug/L		93	75 - 125	3	20

Method: 9040C - pH

Lab Sample ID: LCS 490-529671/1
Matrix: Water
Analysis Batch: 529671

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	6.970		SU		100	98 - 103

Method: 9040C - pH (Continued)

Lab Sample ID: 490-155638-D-10 DU
Matrix: Water
Analysis Batch: 529671

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	5.78			5.750		SU				0.5	20
Temperature	18.9			18.50		Degrees C				2	20

Lab Sample ID: LCS 490-529685/1
Matrix: Water
Analysis Batch: 529685

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			7.00	6.970		SU		100	98 - 103		

Lab Sample ID: 490-155625-3 DU
Matrix: Water
Analysis Batch: 529685

Client Sample ID: River 02A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	7.45			7.490		SU				0.5	20
Temperature	19.8			19.80		Degrees C				0	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 490-531384/13
Matrix: Water
Analysis Batch: 531384

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 11:54	1

Lab Sample ID: LCS 490-531384/14
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity			100	102.9		mg/L		103	90 - 110		

Lab Sample ID: LCSD 490-531384/36
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Alkalinity			100	96.04		mg/L		96	90 - 110	7	20

Lab Sample ID: 490-155625-5 DU
Matrix: Water
Analysis Batch: 531384

Client Sample ID: River 03A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Alkalinity	86.1			86.60		mg/L				0.6	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 490-525387/1
Matrix: Water
Analysis Batch: 525387

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10.0	7.00	mg/L			07/13/18 23:45	1

Lab Sample ID: LCS 490-525387/2
Matrix: Water
Analysis Batch: 525387

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	100	107.0		mg/L		107	90 - 110

Lab Sample ID: 490-155592-A-1 DU
Matrix: Water
Analysis Batch: 525387

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	291.0		305.0		mg/L		5	20

Lab Sample ID: 490-155625-5 DU
Matrix: Water
Analysis Batch: 525387

Client Sample ID: River 03A 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	175		170.0		mg/L		3	20

Lab Sample ID: MB 490-525388/1
Matrix: Water
Analysis Batch: 525388

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10.0	7.00	mg/L			07/13/18 21:20	1

Lab Sample ID: LCS 490-525388/2
Matrix: Water
Analysis Batch: 525388

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	100	107.0		mg/L		107	90 - 110

Lab Sample ID: 490-155300-J-1 DU
Matrix: Water
Analysis Batch: 525388

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	256		255.0		mg/L		0.4	20

Lab Sample ID: 490-155625-4 DU
Matrix: Water
Analysis Batch: 525388

Client Sample ID: River 02B 071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	170		167.0		mg/L		2	20

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-376411/23-A
Matrix: Water
Analysis Batch: 381214

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376411

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.3070		0.119	0.122	1.00	0.128	pCi/L	07/18/18 09:53	08/09/18 08:07	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*104*		*40 - 110*	*07/18/18 09:53*	*08/09/18 08:07*	*1*

Lab Sample ID: LCS 160-376411/1-A
Matrix: Water
Analysis Batch: 381214

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376411

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			15.1	14.12		1.45	1.00	0.135	pCi/L	93	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*97.9*		*40 - 110*

Lab Sample ID: 600-169201-B-1-A DU
Matrix: Water
Analysis Batch: 381214

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 376411

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.203			0.2067		0.0859	1.00	0.0785	pCi/L			0.02	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-376424/23-A
Matrix: Water
Analysis Batch: 379713

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376424

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.1873	U	0.219	0.220	1.00	0.362	pCi/L	07/18/18 10:47	08/01/18 16:54	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*104*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:54*	*1*
Y Carrier	*89.0*		*40 - 110*	*07/18/18 10:47*	*08/01/18 16:54*	*1*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-376424/1-A
Matrix: Water
Analysis Batch: 379720

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376424

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			14.9	13.44		1.48	1.00	0.437	pCi/L	90	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*97.9*		*40 - 110*
Y Carrier	*93.8*		*40 - 110*

Lab Sample ID: 600-169201-B-1-B DU
Matrix: Water
Analysis Batch: 379720

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 376424

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	-0.0457	U		-0.06516	U	0.160	1.00	0.300	pCi/L			0.06	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*
Y Carrier	*92.7*		*40 - 110*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Lab Sample ID: 180-78050-A-1 DU
Matrix: Water
Analysis Batch: 382940

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Combined Radium 226 + 228	0.193	U		0.3728	U	0.293	5.00	0.454	pCi/L			0.33	

HPLC/IC

Analysis Batch: 529755

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	9056A	
490-155625-2	River 01B 071218	Total/NA	Water	9056A	
490-155625-3	River 02A 071218	Total/NA	Water	9056A	
490-155625-4	River 02B 071218	Total/NA	Water	9056A	
490-155625-5	River 03A 071218	Total/NA	Water	9056A	
490-155625-6	River 03B 071218	Total/NA	Water	9056A	
490-155625-7	River 04A 071218	Total/NA	Water	9056A	
490-155625-8	River 04B 071218	Total/NA	Water	9056A	
MB 490-529755/3	Method Blank	Total/NA	Water	9056A	
LCS 490-529755/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-529755/5	Lab Control Sample Dup	Total/NA	Water	9056A	
490-155625-1 MS	River 01A 071218	Total/NA	Water	9056A	
490-155625-1 MSD	River 01A 071218	Total/NA	Water	9056A	

Metals

Prep Batch: 250893

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total Recoverable	Water	3005A	
490-155625-2	River 01B 071218	Total Recoverable	Water	3005A	
490-155625-3	River 02A 071218	Total Recoverable	Water	3005A	
490-155625-4	River 02B 071218	Total Recoverable	Water	3005A	
490-155625-5	River 03A 071218	Total Recoverable	Water	3005A	
490-155625-6	River 03B 071218	Total Recoverable	Water	3005A	
490-155625-7	River 04A 071218	Total Recoverable	Water	3005A	
490-155625-8	River 04B 071218	Total Recoverable	Water	3005A	
MB 180-250893/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-250893/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-155625-1 MS	River 01A 071218	Total Recoverable	Water	3005A	
490-155625-1 MSD	River 01A 071218	Total Recoverable	Water	3005A	

Prep Batch: 250895

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total Recoverable	Water	3005A	
490-155625-2	River 01B 071218	Total Recoverable	Water	3005A	
490-155625-3	River 02A 071218	Total Recoverable	Water	3005A	
490-155625-4	River 02B 071218	Total Recoverable	Water	3005A	
490-155625-5	River 03A 071218	Total Recoverable	Water	3005A	
490-155625-6	River 03B 071218	Total Recoverable	Water	3005A	
490-155625-7	River 04A 071218	Total Recoverable	Water	3005A	
490-155625-8	River 04B 071218	Total Recoverable	Water	3005A	
MB 180-250895/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-250895/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-155625-2 MS	River 01B 071218	Total Recoverable	Water	3005A	
490-155625-2 MSD	River 01B 071218	Total Recoverable	Water	3005A	

Prep Batch: 250921

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	7470A	
490-155625-2	River 01B 071218	Total/NA	Water	7470A	

Metals (Continued)

Prep Batch: 250921 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-3	River 02A 071218	Total/NA	Water	7470A	
490-155625-4	River 02B 071218	Total/NA	Water	7470A	
490-155625-5	River 03A 071218	Total/NA	Water	7470A	
490-155625-6	River 03B 071218	Total/NA	Water	7470A	
490-155625-7	River 04A 071218	Total/NA	Water	7470A	
490-155625-8	River 04B 071218	Total/NA	Water	7470A	
MB 180-250921/1-A	Method Blank	Total/NA	Water	7470A	
LCS 180-250921/2-A	Lab Control Sample	Total/NA	Water	7470A	
180-79763-F-6-C MS	Matrix Spike	Dissolved	Water	7470A	
180-79763-F-6-D MSD	Matrix Spike Duplicate	Dissolved	Water	7470A	

Analysis Batch: 251171

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	EPA 7470A	250921
490-155625-2	River 01B 071218	Total/NA	Water	EPA 7470A	250921
490-155625-3	River 02A 071218	Total/NA	Water	EPA 7470A	250921
490-155625-4	River 02B 071218	Total/NA	Water	EPA 7470A	250921
490-155625-5	River 03A 071218	Total/NA	Water	EPA 7470A	250921
490-155625-6	River 03B 071218	Total/NA	Water	EPA 7470A	250921
490-155625-7	River 04A 071218	Total/NA	Water	EPA 7470A	250921
490-155625-8	River 04B 071218	Total/NA	Water	EPA 7470A	250921
MB 180-250921/1-A	Method Blank	Total/NA	Water	EPA 7470A	250921
LCS 180-250921/2-A	Lab Control Sample	Total/NA	Water	EPA 7470A	250921
180-79763-F-6-C MS	Matrix Spike	Dissolved	Water	EPA 7470A	250921
180-79763-F-6-D MSD	Matrix Spike Duplicate	Dissolved	Water	EPA 7470A	250921

Analysis Batch: 251527

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total Recoverable	Water	6010C	250893
490-155625-2	River 01B 071218	Total Recoverable	Water	6010C	250893
490-155625-3	River 02A 071218	Total Recoverable	Water	6010C	250893
490-155625-4	River 02B 071218	Total Recoverable	Water	6010C	250893
490-155625-5	River 03A 071218	Total Recoverable	Water	6010C	250893
490-155625-6	River 03B 071218	Total Recoverable	Water	6010C	250893
490-155625-7	River 04A 071218	Total Recoverable	Water	6010C	250893
490-155625-8	River 04B 071218	Total Recoverable	Water	6010C	250893
MB 180-250893/1-A	Method Blank	Total Recoverable	Water	6010C	250893
LCS 180-250893/2-A	Lab Control Sample	Total Recoverable	Water	6010C	250893
490-155625-1 MS	River 01A 071218	Total Recoverable	Water	6010C	250893
490-155625-1 MSD	River 01A 071218	Total Recoverable	Water	6010C	250893

Analysis Batch: 251631

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total Recoverable	Water	6020A	250895
490-155625-2	River 01B 071218	Total Recoverable	Water	6020A	250895
490-155625-3	River 02A 071218	Total Recoverable	Water	6020A	250895
490-155625-4	River 02B 071218	Total Recoverable	Water	6020A	250895
490-155625-5	River 03A 071218	Total Recoverable	Water	6020A	250895
490-155625-6	River 03B 071218	Total Recoverable	Water	6020A	250895
490-155625-7	River 04A 071218	Total Recoverable	Water	6020A	250895
490-155625-8	River 04B 071218	Total Recoverable	Water	6020A	250895

Metals (Continued)

Analysis Batch: 251631 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 180-250895/1-A	Method Blank	Total Recoverable	Water	6020A	250895
LCS 180-250895/2-A	Lab Control Sample	Total Recoverable	Water	6020A	250895
490-155625-2 MS	River 01B 071218	Total Recoverable	Water	6020A	250895
490-155625-2 MSD	River 01B 071218	Total Recoverable	Water	6020A	250895

General Chemistry

Analysis Batch: 525387

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-5	River 03A 071218	Total/NA	Water	SM 2540C	
490-155625-6	River 03B 071218	Total/NA	Water	SM 2540C	
490-155625-7	River 04A 071218	Total/NA	Water	SM 2540C	
490-155625-8	River 04B 071218	Total/NA	Water	SM 2540C	
MB 490-525387/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 490-525387/2	Lab Control Sample	Total/NA	Water	SM 2540C	
490-155592-A-1 DU	Duplicate	Total/NA	Water	SM 2540C	
490-155625-5 DU	River 03A 071218	Total/NA	Water	SM 2540C	

Analysis Batch: 525388

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	SM 2540C	
490-155625-2	River 01B 071218	Total/NA	Water	SM 2540C	
490-155625-3	River 02A 071218	Total/NA	Water	SM 2540C	
490-155625-4	River 02B 071218	Total/NA	Water	SM 2540C	
MB 490-525388/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 490-525388/2	Lab Control Sample	Total/NA	Water	SM 2540C	
490-155300-J-1 DU	Duplicate	Total/NA	Water	SM 2540C	
490-155625-4 DU	River 02B 071218	Total/NA	Water	SM 2540C	

Analysis Batch: 529671

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	9040C	
490-155625-2	River 01B 071218	Total/NA	Water	9040C	
LCS 490-529671/1	Lab Control Sample	Total/NA	Water	9040C	
490-155638-D-10 DU	Duplicate	Total/NA	Water	9040C	

Analysis Batch: 529685

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-3	River 02A 071218	Total/NA	Water	9040C	
490-155625-4	River 02B 071218	Total/NA	Water	9040C	
490-155625-5	River 03A 071218	Total/NA	Water	9040C	
490-155625-6	River 03B 071218	Total/NA	Water	9040C	
490-155625-7	River 04A 071218	Total/NA	Water	9040C	
490-155625-8	River 04B 071218	Total/NA	Water	9040C	
LCS 490-529685/1	Lab Control Sample	Total/NA	Water	9040C	
490-155625-3 DU	River 02A 071218	Total/NA	Water	9040C	

Analysis Batch: 531384

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	SM 2320B	

General Chemistry (Continued)

Analysis Batch: 531384 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-2	River 01B 071218	Total/NA	Water	SM 2320B	
490-155625-3	River 02A 071218	Total/NA	Water	SM 2320B	
490-155625-4	River 02B 071218	Total/NA	Water	SM 2320B	
490-155625-5	River 03A 071218	Total/NA	Water	SM 2320B	
490-155625-6	River 03B 071218	Total/NA	Water	SM 2320B	
490-155625-7	River 04A 071218	Total/NA	Water	SM 2320B	
490-155625-8	River 04B 071218	Total/NA	Water	SM 2320B	
MB 490-531384/13	Method Blank	Total/NA	Water	SM 2320B	
LCS 490-531384/14	Lab Control Sample	Total/NA	Water	SM 2320B	
LCSD 490-531384/36	Lab Control Sample Dup	Total/NA	Water	SM 2320B	
490-155625-5 DU	River 03A 071218	Total/NA	Water	SM 2320B	

Rad

Prep Batch: 376411

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	PrecSep-21	
490-155625-2	River 01B 071218	Total/NA	Water	PrecSep-21	
490-155625-3	River 02A 071218	Total/NA	Water	PrecSep-21	
490-155625-4	River 02B 071218	Total/NA	Water	PrecSep-21	
490-155625-5	River 03A 071218	Total/NA	Water	PrecSep-21	
490-155625-6	River 03B 071218	Total/NA	Water	PrecSep-21	
490-155625-7	River 04A 071218	Total/NA	Water	PrecSep-21	
490-155625-8	River 04B 071218	Total/NA	Water	PrecSep-21	
MB 160-376411/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-376411/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
600-169201-B-1-A DU	Duplicate	Total/NA	Water	PrecSep-21	

Prep Batch: 376424

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155625-1	River 01A 071218	Total/NA	Water	PrecSep_0	
490-155625-2	River 01B 071218	Total/NA	Water	PrecSep_0	
490-155625-3	River 02A 071218	Total/NA	Water	PrecSep_0	
490-155625-4	River 02B 071218	Total/NA	Water	PrecSep_0	
490-155625-5	River 03A 071218	Total/NA	Water	PrecSep_0	
490-155625-6	River 03B 071218	Total/NA	Water	PrecSep_0	
490-155625-7	River 04A 071218	Total/NA	Water	PrecSep_0	
490-155625-8	River 04B 071218	Total/NA	Water	PrecSep_0	
MB 160-376424/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-376424/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
600-169201-B-1-B DU	Duplicate	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Client Sample ID: River 01A 071218

Date Collected: 07/12/18 11:10
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 02:20	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:09	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 20:31	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:03	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529671	07/18/18 10:03	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 12:48	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525388	07/13/18 21:20	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.47 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381214	08/09/18 06:09	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.47 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:50	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 01B 071218

Date Collected: 07/12/18 11:30
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 03:15	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:30	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 20:35	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:04	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529671	07/18/18 10:03	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 12:55	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525388	07/13/18 21:20	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			749.80 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:10	RTM	TAL SL
Total/NA	Prep	PrecSep_0			749.80 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:50	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 02A 071218

Lab Sample ID: 490-155625-3

Date Collected: 07/12/18 11:50

Matrix: Water

Date Received: 07/13/18 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 03:33	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:35	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 20:58	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:05	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:02	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525388	07/13/18 21:20	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.09 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:10	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.09 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 02B 071218

Lab Sample ID: 490-155625-4

Date Collected: 07/12/18 12:00

Matrix: Water

Date Received: 07/13/18 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 03:51	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:41	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:03	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:06	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:09	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525388	07/13/18 21:20	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.19 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.19 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 03A 071218

Date Collected: 07/12/18 12:15
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 04:09	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 14:56	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:21	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:07	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:16	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525387	07/13/18 23:45	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.13 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.13 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 03B 071218

Date Collected: 07/12/18 12:20
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-6

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 04:27	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 15:02	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:25	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:08	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:29	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525387	07/13/18 23:45	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			749.72 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			749.72 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 04A 071218

Date Collected: 07/12/18 12:45
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-7

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 04:45	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 15:07	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:30	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:09	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:36	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525387	07/13/18 23:45	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			749.76 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			749.76 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Client Sample ID: River 04B 071218

Date Collected: 07/12/18 12:55
Date Received: 07/13/18 10:10

Lab Sample ID: 490-155625-8

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			529755	07/19/18 05:03	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250893	07/18/18 12:28	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 15:12	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250895	07/18/18 12:33	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			251631	07/24/18 21:35	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250921	07/19/18 07:20	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 10:10	RJR	TAL PIT
Total/NA	Analysis	9040C		1			529685	07/18/18 10:21	AJK	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 13:43	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	525387	07/13/18 23:45	AEC	TAL NSH
Total/NA	Prep	PrecSep-21			750.03 mL	1.0 g	376411	07/18/18 09:53	JLC	TAL SL
Total/NA	Analysis	903.0		1			381227	08/09/18 06:11	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.03 mL	1.0 g	376424	07/18/18 10:47	JLC	TAL SL
Total/NA	Analysis	904.0		1			379720	08/01/18 16:51	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			382940	08/16/18 13:40	RTM	TAL SL

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Method Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL NSH
6010C	Metals (ICP)	SW846	TAL PIT
6020A	Metals (ICP/MS)	SW846	TAL PIT
EPA 7470A	Mercury (CVAA)	SW846	TAL PIT
9040C	pH	SW846	TAL NSH
SM 2320B	Alkalinity	SM	TAL NSH
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL NSH
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL PIT
7470A	Preparation, Mercury	SW846	TAL PIT

Protocol References:

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:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Laboratory: TestAmerica Nashville

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Kentucky (UST)	State Program	4	19	06-30-19

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
9040C		Water	pH
9040C		Water	Temperature
9056A		Water	Chloride
9056A		Water	Fluoride
9056A		Water	Sulfate
SM 2320B		Water	Alkalinity
SM 2540C		Water	Total Dissolved Solids

Laboratory: TestAmerica Pittsburgh

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Arkansas DEQ	State Program	6	88-0690	06-27-19
California	State Program	9	2891	04-30-19
Connecticut	State Program	1	PH-0688	09-30-18
Florida	NELAP	4	E871008	06-30-19
Illinois	NELAP	5	200005	06-30-19
Kansas	NELAP	7	E-10350	01-31-19
Louisiana	NELAP	6	04041	06-30-19
Nevada	State Program	9	PA00164	07-31-19
New Hampshire	NELAP	1	2030	04-04-19
New Jersey	NELAP	2	PA005	06-30-19
New York	NELAP	2	11182	03-31-19
North Carolina (WW/SW)	State Program	4	434	12-31-18
Oregon	NELAP	10	PA-2151	01-28-19
Pennsylvania	NELAP	3	02-00416	04-30-19
South Carolina	State Program	4	89014	04-30-18 *
Texas	NELAP	6	T104704528-15-2	03-31-19
US Fish & Wildlife	Federal		LE94312A-1	07-31-19
USDA	Federal		P330-16-00211	06-26-19
Utah	NELAP	8	PA001462015-4	05-31-19
Virginia	NELAP	3	460189	09-14-18 *
West Virginia DEP	State Program	3	142	01-31-19
Wisconsin	State Program	5	998027800	08-31-18

Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	DoD ELAP		L2305	04-06-19
Arizona	State Program	9	AZ0813	12-08-18
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19
Florida	NELAP	4	E87689	06-30-19
Illinois	NELAP	5	200023	11-30-18
Iowa	State Program	7	373	12-01-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Laboratory: TestAmerica St. Louis (Continued)

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Kansas	NELAP	7	E-10236	10-31-18
Kentucky (DW)	State Program	4	90125	12-31-18
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA180017	12-31-18
Maryland	State Program	3	310	09-30-18 *
Michigan	State Program	5	9005	06-30-18 *
Missouri	State Program	7	780	06-30-18 *
Nevada	State Program	9	MO000542018-1	07-31-18 *
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-18 *
Pennsylvania	NELAP	3	68-00540	02-28-19
South Carolina	State Program	4	85002001	06-30-18 *
Texas	NELAP	6	T104704193-18-12	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542016-8	07-31-18 *
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-18 *
West Virginia DEP	State Program	3	381	08-31-18 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

490-155625 Chain of Custody

COOLER RECEIPT FORM

Cooler Received/Opened On 7/13/2018 @ 1010

Time Samples Removed From Cooler 1404 Time Samples Placed In Storage 1425 (2 Hour Window)

1. Tracking # 9868 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960357 pH Strip Lot NA Chlorine Strip Lot NA

2. Temperature of rep. sample or temp blank when opened: 0.5 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) EA

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry Ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #

I certify that I unloaded the cooler and answered questions 7-14 (intial) GH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) GH

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) GH

I certify that I attached a label with the unique LIMS number to each container (intial) GH

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

Loc: 490
155625

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Cooler Received/Opened On 7/13/2018 @1010

Time Samples Removed From Cooler 1404 Time Samples Placed In Storage 1425 (2 Hour Window)

1. Tracking # 9857 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960358 pH Strip Lot NA Chlorine Strip Lot NA

2. Temperature of rep. sample or temp blank when opened: 1.3 Degrees Celsius

3. If item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) GH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) GH

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) GH

I certify that I attached a label with the unique LIMS number to each container (intial) GH

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex	COC No: 490-86693-25173.2
Client Contact: Greg Dick	Phone: 502 513-237-1184	E-Mail: roxanne.cisneros@testamericainc.com		Page: Page 1 of 1
Company: Big Rivers Electric Corporation				Job #:
Address: PO BOX 24	Due Date Requested: Standard			
City: Henderson	TAT Requested (days): Standard			
State, Zip: KY, 42419				
Phone: 270-844-6010(Tel)	PO #: Purchase Order - see DOCs			
Email: Gregory.Dick@bigrivers.com	WO #:			
Project Name: Big Rivers Electric Corp - Henderson KY	Project #: 49002917			
Site: Green Landfill	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL; B - NaOH; C - Zn Acetate; D - Nitric Acid; E - NaHSO4; F - MeOH; G - Amchlor; H - Ascorbic Acid; I - Ice; J - DI Water; K - EDTA; L - EDA; M - Hexane; N - None; O - AsNaO2; P - Na2O4S; Q - Na2SO3; R - Na2S2O3; S - H2SO4; T - TSP Dodecahydrate; U - Acetone; V - MCAA; W - pH 4-5; Z - other (specify)

Other:

2 Coolers

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056_ORGFM_28D	6010B, 7470A	2540C_Calcd - TDS	Redwpo 29673	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N			
River Ø1A 071218	7-12-18	11:10	G	Water	N	N	1	1	1	2	5	pH: 7.94
River Ø1B 071218	7-12-18	11:30	G	Water	N	N	1	1	1	2	5	" "
River Ø2A 071218	7-12-18	~~11~~ 1150	G	Water	N	N	1	1	1	2	5	pH = 7.91
River Ø2B 071218	7-12-18	12:00	G	Water	N	N	1	1	1	2	5	" "
River Ø3A 071218	7-12-18	12:15	G	Water	N	N	1	1	1	2	5	pH: 7.94
River Ø3B 071218	7-12-18	12:20	G	Water	N	N	1	1	1	2	5	" "
River Ø4A 071218	7-12-18	12:45	G	Water	N	N	1	1	1	2	5	pH: 7.86
River Ø4B 071218	7-12-18	12:55	G	Water	N	N	1	1	1	2	5	" "
				Water	X							

Loc: 490
155625

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
1		7/12/18 1700	AECOM		7-13-18 / 1010	TA-NAS
2	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
3	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 0.5 / 1.3

Ver: 08/04/2016

8/16/2018

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

8/16/2018

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-75461.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-155625-1
Address: 13715 Rider Trail North	Due Date Requested: 7/25/2018			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Green Landfill	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
River 01A 071218 (490-155625-1)	7/12/18	11:10 Eastern		Water			X	X	X	2	run once - upload data twice
River 01B 071218 (490-155625-2)	7/12/18	11:30 Eastern		Water			X	X	X	2	run once - upload data twice
River 02A 071218 (490-155625-3)	7/12/18	11:50 Eastern		Water			X	X	X	2	run once - upload data twice
River 02B 071218 (490-155625-4)	7/12/18	12:00 Eastern		Water			X	X	X	2	run once - upload data twice
River 03A 071218 (490-155625-5)	7/12/18	12:15 Eastern		Water			X	X	X	2	run once - upload data twice
River 03B 071218 (490-155625-6)	7/12/18	12:20 Eastern		Water			X	X	X	2	run once - upload data twice
River 04A 071218 (490-155625-7)	7/12/18	12:45 Eastern		Water			X	X	X	2	run once - upload data twice
River 04B 071218 (490-155625-8)	7/12/18	12:55 Eastern		Water			X	X	X	2	run once - upload data twice

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. 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 accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 7/16/18 1509	Company: TALS	Received by:	Date/Time: 7-17-18 @ 0915	Company: TASTL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 18.5

Ver: 09/20/2016

Login Sample Receipt Checklist

Client: Big Rivers Electric Corporation

Job Number: 490-155625-2

Login Number: 155625
List Number: 3
Creator: McBride, Mike

List Source: TestAmerica St. Louis
List Creation: 07/17/18 03:18 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	Thermal preservation not required.
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?	N/A	Received project as a subcontract.
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").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Tracer/Carrier Summary

Client: Big Rivers Electric Corporation
Project/Site: Green Landfill

TestAmerica Job ID: 490-155625-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Ba Carrier (40-110)
490-155625-1	River 01A 071218	90.9
490-155625-2	River 01B 071218	94.7
490-155625-3	River 02A 071218	87.3
490-155625-4	River 02B 071218	94.7
490-155625-5	River 03A 071218	91.4
490-155625-6	River 03B 071218	92.9
490-155625-7	River 04A 071218	95.3
490-155625-8	River 04B 071218	82.3
600-169201-B-1-A DU	Duplicate	100
LCS 160-376411/1-A	Lab Control Sample	97.9
MB 160-376411/23-A	Method Blank	104

Percent Yield (Acceptance Limits)

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)
490-155625-1	River 01A 071218	90.9	90.1
490-155625-2	River 01B 071218	94.7	90.1
490-155625-3	River 02A 071218	87.3	90.1
490-155625-4	River 02B 071218	94.7	90.1
490-155625-5	River 03A 071218	91.4	90.8
490-155625-6	River 03B 071218	92.9	90.8
490-155625-7	River 04A 071218	95.3	86.7
490-155625-8	River 04B 071218	82.3	89.0
600-169201-B-1-B DU	Duplicate	100	92.7
LCS 160-376424/1-A	Lab Control Sample	97.9	93.8
MB 160-376424/23-A	Method Blank	104	89.0

Percent Yield (Acceptance Limits)

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Y Carrier = Y Carrier

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-155661-1
Client Project/Site: Sebree-Green Landfill
Revision: 3

For:
Big Rivers Electric Corporation
PO BOX 24
Henderson, Kentucky 42419

Attn: Greg Dick

Roxanne Cisneros

Authorized for release by:
9/6/2018 12:40:51 PM

Roxanne Cisneros, Senior Project Manager
(615)301-5761
roxanne.cisneros@testamericainc.com

Table of Contents

Sample Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-155661-1	River Seep-08-071318	Water	07/13/18 07:50	07/14/18 10:50
490-155661-2	River Seep-12-071318	Water	07/13/18 09:15	07/14/18 10:50
490-155661-3	River Seep-16-071318	Water	07/13/18 11:00	07/14/18 10:50
490-155661-4	River Seep-14-071318	Water	07/13/18 10:10	07/14/18 10:50
490-155661-5	River Seep-04-071218	Water	07/12/18 13:50	07/14/18 10:50
490-155661-6	River Seep-07-071218	Water	07/12/18 14:50	07/14/18 10:50
490-155661-7	River Seep-05-071218	Water	07/12/18 14:25	07/14/18 10:50

Job ID: 490-155661-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-155661-1

Comments
Revised Report 9/06/2018 to correct sample ID for River Seep-04-071218 (490-155661-5).

Revised Report 8/24/2018 to includes only the data for the River Seeps per client request.

Revised Report 8/10/2018 to add Potassium per client request.

Receipt
The samples were received on 7/14/2018 10:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 3 coolers at receipt time were 1.0º C, 3.1º C and 5.7º C.

HPLC/IC
Method(s) 9056A: The method blank for analytical batch 490-531256 contained Sulfate above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

Method(s) 9056A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for analytical batch 490-531256 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method(s) 9056A: The method blank for analytical batch 490-531256 contained Fluoride and Sulfate above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

Method(s) 9056A: The following samples were diluted due to the nature of the sample matrix: River Seep-08-071318 (490-155661-1), River Seep-14-071318 (490-155661-4), River Seep-04-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), River Seep-05-071218 (490-155661-7), Elevated reporting limits (RLs) are provided.

Method(s) 9056A: The method blank as well as the continuing calibration blanks for analytical batch 490-531368 contained sulfate above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

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.

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

Narrative

Job Narrative
490-155661-2

Comments
Revised Report 9/06/2018 to correct sample ID for River Seep-04-071218 (490-155661-5).

Revised Report 8/24/2018 to includes only the data for the River Seeps per client request.

Receipt

Job ID: 490-155661-1 (Continued)

Laboratory: TestAmerica Nashville (Continued)

The samples were received on 7/14/2018 10:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 3 coolers at receipt time were 1.0º C, 3.1º C and 5.7º C.

RAD

Method(s) 904.0: Ra-228 Prep Batch 160-376750: The following sample did not meet the requested limit (RL) due to the reduced sample volume attributed to the presence of matrix interferences (see prep NCM 160-144167). The sample was brown, opaque and contained heavy amounts of sediment. The data have been reported with this narrative. River Seep-05-071218 (490-155661-7)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376750:
Sample aliquot 490-155661-2 reduced due to potential matrix interference. Sample was yellow, murky, and contained heavy amounts of sediment.

Sample aliquots 490-155661-5 and 490-155661-7 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy amounts of sediment.

River Seep-12-071318 (490-155661-2), River Seep-04-071218 (490-155661-5), River Seep-05-071218 (490-155661-7)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376750: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: River Seep-08-071318 (490-155661-1), River Seep-12-071318 (490-155661-2), River Seep-04-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), and River Seep-05-071218 (490-155661-7). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376745: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: River Seep-08-071318 (490-155661-1), River Seep-12-071318 (490-155661-2), River Seep-04-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), and River Seep-05-071218 (490-155661-7). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376745:
Sample aliquot 490-155661-2 reduced due to potential matrix interference. Sample was yellow, murky, and contained heavy amounts of sediment.

Sample aliquots 490-155661-5 and 490-155661-7 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy amounts of sediment.

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

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.
B	Compound was found in the blank and sample.
F1	MS and/or MSD Recovery is outside acceptance limits.

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.

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Client Sample ID: River Seep-08-071318

Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2040		300	20.0	mg/L			07/25/18 21:00	100
Fluoride	0.0915	J	1.00	0.0100	mg/L			07/24/18 16:22	1
Sulfate	1440	B	250	1.50	mg/L			07/25/18 20:45	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	1.80		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:24	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00141	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:35	1
Arsenic	0.000404	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:35	1
Barium	0.0443	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:35	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:35	1
Boron	0.510	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:35	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:35	1
Calcium	801		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:35	1
Chromium	0.000560	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:35	1
Cobalt	0.000691	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:35	1
Lead	0.000769	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:35	1
Magnesium	291		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:35	1
Molybdenum	0.00296	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:35	1
Potassium	125		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:35	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:35	1
Sodium	274		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:35	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:35	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.16		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	174		10.0	5.00	mg/L			07/24/18 20:55	1
Total Dissolved Solids	5310		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.332		0.108	0.112	1.00	0.0893	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Client Sample ID: River Seep-08-071318
Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.983		0.295	0.309	1.00	0.370	pCi/L	07/19/18 15:49	08/02/18 09:20	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:20*	*1*
Y Carrier	*90.5*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:20*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.31		0.314	0.329	5.00	0.370	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	32.7		3.00	0.200	mg/L			07/24/18 16:37	1
Fluoride	0.0803	J	1.00	0.0100	mg/L			07/24/18 16:37	1
Sulfate	16.1	B	5.00	0.0300	mg/L			07/24/18 16:37	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:29	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000499	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:40	1
Arsenic	0.00467	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:40	1
Barium	0.0757	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:40	1
Beryllium	0.000145	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:40	1
Boron	0.0379	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:40	1
Cadmium	0.000183	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:40	1
Calcium	21.1		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:40	1
Chromium	0.00200	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:40	1
Cobalt	0.00581		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:40	1
Lead	0.00221	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:40	1
Magnesium	5.20		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:40	1
Molybdenum	0.000948	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:40	1
Potassium	2.37		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:40	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:40	1
Sodium	5.52		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:40	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:40	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.00		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	38.2		10.0	5.00	mg/L			07/24/18 21:02	1
Total Dissolved Solids	157		10.0	7.00	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.542		0.153	0.161	1.00	0.105	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.629		0.351	0.356	1.00	0.527	pCi/L	07/19/18 15:49	08/02/18 09:21	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:21*	*1*
Y Carrier	*85.6*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:21*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.17		0.383	0.391	5.00	0.527	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-16-071318

Lab Sample ID: 490-155661-3

Date Collected: 07/13/18 11:00

Matrix: Water

Date Received: 07/14/18 10:50

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	23.2		3.00	0.200	mg/L			07/24/18 16:52	1
Fluoride	0.177	J	1.00	0.0100	mg/L			07/24/18 16:52	1
Sulfate	26.5	B	5.00	0.0300	mg/L			07/24/18 16:52	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:35	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000270	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:44	1
Arsenic	0.0247		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:44	1
Barium	0.190	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:44	1
Beryllium	0.000211	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:44	1
Boron	0.0321	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:44	1
Cadmium	0.000196	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:44	1
Calcium	93.8		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:44	1
Chromium	0.00383		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:44	1
Cobalt	0.00613		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:44	1
Lead	0.00521		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:44	1
Magnesium	20.3		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:44	1
Molybdenum	0.00878	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:44	1
Potassium	4.85		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:44	1
Selenium	0.000906	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:44	1
Sodium	26.7		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:44	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:44	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.40		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	393		10.0	5.00	mg/L			07/24/18 21:09	1
Total Dissolved Solids	504		20.0	14.0	mg/L			07/18/18 08:50	1

Client Sample ID: River Seep-14-071318

Date Collected: 07/13/18 10:10
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-4

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	22.7		3.00	0.200	mg/L			07/24/18 17:07	1
Fluoride	0.144	J	1.00	0.0100	mg/L			07/24/18 17:07	1
Sulfate	159	B	50.0	0.300	mg/L			07/25/18 21:15	10

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0126	J	0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:50	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000312	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:49	1
Arsenic	0.0173		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:49	1
Barium	0.242		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:49	1
Beryllium	0.000497	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:49	1
Boron	0.0694	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:49	1
Cadmium	0.000312	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:49	1
Calcium	171		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:49	1
Chromium	0.00969		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:49	1
Cobalt	0.0125		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:49	1
Lead	0.0109		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:49	1
Magnesium	36.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:49	1
Molybdenum	0.00550	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:49	1
Potassium	4.96		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:49	1
Selenium	0.000582	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:49	1
Sodium	18.5		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:49	1
Thallium	0.000126	J	0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:49	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:07	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.14		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	443		10.0	5.00	mg/L			07/24/18 21:17	1
Total Dissolved Solids	790		20.0	14.0	mg/L			07/18/18 08:50	1

Client Sample ID: River Seep-04-071218

Date Collected: 07/12/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-5

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	189		30.0	2.00	mg/L			07/25/18 21:59	10
Fluoride	0.239	J F1	1.00	0.0100	mg/L			07/24/18 17:51	1
Sulfate	1310	B	250	1.50	mg/L			07/25/18 22:14	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0209	J	0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:56	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000200	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:06	1
Arsenic	0.00188	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:06	1
Barium	0.0384	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:06	1
Beryllium	0.00372		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:06	1
Boron	2.19		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:06	1
Cadmium	0.00307		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:06	1
Calcium	460		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:06	1
Chromium	0.00386		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:06	1
Cobalt	0.0447		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:06	1
Lead	0.00507		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:06	1
Magnesium	63.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:06	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:06	1
Potassium	9.51		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:06	1
Selenium	0.00216	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:06	1
Sodium	42.1		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:06	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:06	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	5.26		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 21:21	1
Total Dissolved Solids	2130		20.0	14.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.665		0.213	0.221	1.00	0.167	pCi/L	07/19/18 15:20	08/10/18 16:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:40*	*1*

Client Sample ID: River Seep-04-071218

Lab Sample ID: 490-155661-5

Date Collected: 07/12/18 13:50

Matrix: Water

Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.810		0.520	0.525	1.00	0.796	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*87.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.48		0.562	0.570	5.00	0.796	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1990		300	20.0	mg/L			07/25/18 22:29	100
Fluoride	0.102	J	1.00	0.0100	mg/L			07/24/18 18:21	1
Sulfate	1480	B	500	3.00	mg/L			07/25/18 22:29	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.772		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:01	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:11	1
Arsenic	0.00182	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:11	1
Barium	0.0605	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:11	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:11	1
Boron	1.46		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:11	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:11	1
Calcium	1120		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:11	1
Chromium	0.000340	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:11	1
Cobalt	0.0218		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:11	1
Lead	0.000523	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:11	1
Magnesium	51.8		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:11	1
Molybdenum	0.00219	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:11	1
Potassium	262		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:11	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:11	1
Sodium	277		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:11	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:11	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:09	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.01		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	87.7		10.0	5.00	mg/L			07/24/18 21:28	1
Total Dissolved Solids	6080		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.566		0.144	0.152	1.00	0.0969	pCi/L	07/19/18 15:20	08/10/18 16:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:39*	*1*

Client Sample ID: River Seep-07-071218
Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.831		0.318	0.327	1.00	0.434	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*87.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.40		0.349	0.361	5.00	0.434	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1670		300	20.0	mg/L			07/25/18 22:44	100
Fluoride	0.0795	J	1.00	0.0100	mg/L			07/24/18 18:36	1
Sulfate	1170	B	500	3.00	mg/L			07/25/18 22:44	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.340		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:07	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000366	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:16	1
Arsenic	0.0192		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:16	1
Barium	0.718		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:16	1
Beryllium	0.000545	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:16	1
Boron	0.853	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:16	1
Cadmium	0.000563	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:16	1
Calcium	916		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:16	1
Chromium	0.0124		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:16	1
Cobalt	0.0327		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:16	1
Lead	0.0104		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:16	1
Magnesium	77.8		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:16	1
Molybdenum	0.00442	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:16	1
Potassium	238		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:16	1
Selenium	0.00121	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:16	1
Sodium	285		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:16	1
Thallium	0.000164	J	0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:16	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:12	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.95		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	229		10.0	5.00	mg/L			07/24/18 21:41	1
Total Dissolved Solids	5140		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	3.81		0.503	0.609	1.00	0.187	pCi/L	07/19/18 15:20	08/10/18 16:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.9*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:40*	*1*

Client Sample ID: River Seep-05-071218

Lab Sample ID: 490-155661-7

Date Collected: 07/12/18 14:25

Matrix: Water

Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	3.83	G	0.871	0.940	1.00	1.07	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*83.0*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	7.64		1.01	1.12	5.00	1.07	pCi/L		08/21/18 03:20	1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 490-531256/3
Matrix: Water
Analysis Batch: 531256

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/24/18 13:54	1
Fluoride	ND		1.00	0.0100	mg/L			07/24/18 13:54	1
Sulfate	0.3643	J	5.00	0.0300	mg/L			07/24/18 13:54	1

Lab Sample ID: LCS 490-531256/4
Matrix: Water
Analysis Batch: 531256

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.350		mg/L		93	80 - 120
Fluoride	1.00	0.9781	J	mg/L		98	80 - 120
Sulfate	10.0	9.696		mg/L		97	80 - 120

Lab Sample ID: LCSD 490-531256/5
Matrix: Water
Analysis Batch: 531256

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.374		mg/L		94	80 - 120	0	20
Fluoride	1.00	0.9558	J	mg/L		95	80 - 120	2	20
Sulfate	10.0	9.589		mg/L		96	80 - 120	1	20

Lab Sample ID: 490-155661-5 MS
Matrix: Water
Analysis Batch: 531256

Client Sample ID: River Seep-04-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Fluoride	0.239	J F1	1.00	1.702	F1	mg/L		146	80 - 120

Lab Sample ID: MB 490-531368/3
Matrix: Water
Analysis Batch: 531368

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/25/18 18:18	1
Fluoride	ND		1.00	0.0100	mg/L			07/25/18 18:18	1
Sulfate	0.3720	J	5.00	0.0300	mg/L			07/25/18 18:18	1

Lab Sample ID: MB 490-531368/30
Matrix: Water
Analysis Batch: 531368

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/26/18 00:57	1
Fluoride	ND		1.00	0.0100	mg/L			07/26/18 00:57	1
Sulfate	0.3740	J	5.00	0.0300	mg/L			07/26/18 00:57	1

Method: 9056A - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 490-531368/31
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.348		mg/L		93	80 - 120
Fluoride	1.00	0.9475	J	mg/L		95	80 - 120
Sulfate	10.0	9.314		mg/L		93	80 - 120

Lab Sample ID: LCS 490-531368/4
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.348		mg/L		93	80 - 120
Fluoride	1.00	0.9854	J	mg/L		98	80 - 120
Sulfate	10.0	9.495		mg/L		95	80 - 120

Lab Sample ID: LCSD 490-531368/32
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.368		mg/L		94	80 - 120	0	20
Fluoride	1.00	0.9513	J	mg/L		95	80 - 120	0	20
Sulfate	10.0	9.447		mg/L		94	80 - 120	1	20

Lab Sample ID: LCSD 490-531368/5
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.296		mg/L		93	80 - 120	1	20
Fluoride	1.00	0.9931	J	mg/L		99	80 - 120	1	20
Sulfate	10.0	9.710		mg/L		97	80 - 120	2	20

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 180-250902/1-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 16:47	1

Lab Sample ID: LCS 180-250902/2-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	1.00	1.028		mg/L		103	80 - 120

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: 490-155660-A-5-B MS
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	0.0132	J	1.00	1.082		mg/L		107	75 - 125

Lab Sample ID: 490-155660-A-5-C MSD
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	0.0132	J	1.00	1.090		mg/L		108	75 - 125	1	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 180-250903/1-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 18:53	1
Arsenic	ND		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 18:53	1
Barium	ND		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 18:53	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 18:53	1
Boron	ND		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 18:53	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 18:53	1
Calcium	ND		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 18:53	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 18:53	1
Cobalt	ND		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 18:53	1
Lead	ND		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 18:53	1
Magnesium	ND		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 18:53	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 18:53	1
Potassium	ND		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 18:53	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 18:53	1
Sodium	ND		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 18:53	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 18:53	1

Lab Sample ID: LCS 180-250903/2-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.500	0.4729		mg/L		95	80 - 120
Arsenic	0.0400	0.03658		mg/L		91	80 - 120
Barium	2.00	1.840		mg/L		92	80 - 120
Beryllium	0.0500	0.05027		mg/L		101	80 - 120
Boron	1.00	0.8897	J	mg/L		89	80 - 120
Cadmium	0.0500	0.05029		mg/L		101	80 - 120
Calcium	50.0	45.70		mg/L		91	80 - 120
Chromium	0.200	0.1649		mg/L		82	80 - 120
Cobalt	0.500	0.4321		mg/L		86	80 - 120
Lead	0.0200	0.01998		mg/L		100	80 - 120

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 180-250903/2-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Magnesium	50.0	45.74		mg/L		91	80 - 120
Molybdenum	1.00	0.9327		mg/L		93	80 - 120
Potassium	50.0	46.09		mg/L		92	80 - 120
Selenium	0.0100	0.009085	J	mg/L		91	80 - 120
Sodium	50.0	44.98		mg/L		90	80 - 120
Thallium	0.0500	0.04846		mg/L		97	80 - 120

Lab Sample ID: 490-155660-A-6-C MS
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	ND		0.500	0.4679		mg/L		94	75 - 125
Arsenic	ND		0.0400	0.03692		mg/L		92	75 - 125
Barium	ND		2.00	1.839		mg/L		92	75 - 125
Beryllium	ND		0.0500	0.04768		mg/L		95	75 - 125
Boron	0.00422	J	1.00	0.8456	J	mg/L		84	75 - 125
Cadmium	ND		0.0500	0.04723		mg/L		94	75 - 125
Calcium	ND		50.0	45.39		mg/L		91	75 - 125
Chromium	ND		0.200	0.1840		mg/L		92	75 - 125
Cobalt	ND		0.500	0.4386		mg/L		88	75 - 125
Lead	0.000399	J	0.0200	0.01986		mg/L		97	75 - 125
Magnesium	0.0156	J	50.0	46.32		mg/L		93	75 - 125
Molybdenum	ND		1.00	0.9262		mg/L		93	75 - 125
Potassium	0.0680	J	50.0	46.15		mg/L		92	75 - 125
Selenium	ND		0.0100	0.01006		mg/L		101	75 - 125
Sodium	ND		50.0	45.34		mg/L		91	75 - 125
Thallium	ND		0.0500	0.04726		mg/L		95	75 - 125

Lab Sample ID: 490-155660-A-6-D MSD
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	ND		0.500	0.4680		mg/L		94	75 - 125	0	20
Arsenic	ND		0.0400	0.03704		mg/L		93	75 - 125	0	20
Barium	ND		2.00	1.847		mg/L		92	75 - 125	0	20
Beryllium	ND		0.0500	0.04801		mg/L		96	75 - 125	1	20
Boron	0.00422	J	1.00	0.8557	J	mg/L		85	75 - 125	1	20
Cadmium	ND		0.0500	0.04852		mg/L		97	75 - 125	3	20
Calcium	ND		50.0	44.91		mg/L		90	75 - 125	1	20
Chromium	ND		0.200	0.1875		mg/L		94	75 - 125	2	20
Cobalt	ND		0.500	0.4400		mg/L		88	75 - 125	0	20
Lead	0.000399	J	0.0200	0.01961		mg/L		96	75 - 125	1	20
Magnesium	0.0156	J	50.0	45.89		mg/L		92	75 - 125	1	20
Molybdenum	ND		1.00	0.9301		mg/L		93	75 - 125	0	20
Potassium	0.0680	J	50.0	45.93		mg/L		92	75 - 125	0	20
Selenium	ND		0.0100	0.01030		mg/L		103	75 - 125	2	20
Sodium	ND		50.0	45.17		mg/L		90	75 - 125	0	20

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-155660-A-6-D MSD
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Thallium	ND		0.0500	0.04752		mg/L		95	75 - 125	1	20

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 180-250943/1-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 250943

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 10:52	1

Lab Sample ID: LCS 180-250943/2-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	2.50	2.486		ug/L		99	80 - 120

Lab Sample ID: 180-79800-G-1-E MS
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		1.00	0.9270		ug/L		93	75 - 125

Lab Sample ID: 180-79800-G-1-F MSD
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		1.00	0.9210		ug/L		92	75 - 125	1	20

Method: 9040C - pH

Lab Sample ID: LCS 490-531203/1
Matrix: Water
Analysis Batch: 531203

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.000		SU		100	98 - 103

Lab Sample ID: 490-155660-D-5 DU
Matrix: Water
Analysis Batch: 531203

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	8.11		8.110		SU		0	20
Temperature	21.7		21.70		Degrees C		0	20

Method: 9040C - pH (Continued)

Lab Sample ID: LCS 490-531204/1
Matrix: Water
Analysis Batch: 531204

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			7.00	7.000		SU		100	98 - 103		

Lab Sample ID: 490-155661-9 DU
Matrix: Water
Analysis Batch: 531204

Client Sample ID: Landfill Seep-01-071318-DUP
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	10.0			10.03		SU				0	20
Temperature	21.9			21.90		Degrees C				0	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 490-531384/73
Matrix: Water
Analysis Batch: 531384

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 20:09	1

Lab Sample ID: LCS 490-531384/74
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity			100	95.45		mg/L		95	90 - 110		

Lab Sample ID: LCSD 490-531384/95
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Alkalinity			100	95.67		mg/L		96	90 - 110	0	20

Lab Sample ID: 490-155661-6 DU
Matrix: Water
Analysis Batch: 531384

Client Sample ID: River Seep-07-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Alkalinity	87.7			88.85		mg/L				1	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 490-529395/1
Matrix: Water
Analysis Batch: 529395

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10.0	7.00	mg/L			07/18/18 08:50	1

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: LCS 490-529395/2
Matrix: Water
Analysis Batch: 529395

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Dissolved Solids			100	103.0		mg/L		103	90 - 110		

Lab Sample ID: 490-155661-5 DU
Matrix: Water
Analysis Batch: 529395

Client Sample ID: River Seep-04-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	2130			2194		mg/L				3	20

Lab Sample ID: 490-155661-13 DU
Matrix: Water
Analysis Batch: 529395

Client Sample ID: Landfill Seep-04-071318
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	10100			10080		mg/L				0.1	20

HPLC/IC

Analysis Batch: 531256

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-2	River Seep-12-071318	Total/NA	Water	9056A	
490-155661-3	River Seep-16-071318	Total/NA	Water	9056A	
490-155661-4	River Seep-14-071318	Total/NA	Water	9056A	
490-155661-5	River Seep-04-071218	Total/NA	Water	9056A	
490-155661-6	River Seep-07-071218	Total/NA	Water	9056A	
490-155661-7	River Seep-05-071218	Total/NA	Water	9056A	

Analysis Batch: 531368

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-4	River Seep-14-071318	Total/NA	Water	9056A	
490-155661-5	River Seep-04-071218	Total/NA	Water	9056A	
490-155661-5	River Seep-04-071218	Total/NA	Water	9056A	
490-155661-6	River Seep-07-071218	Total/NA	Water	9056A	
490-155661-7	River Seep-05-071218	Total/NA	Water	9056A	

Metals

Prep Batch: 250902

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	3005A	
490-155661-2	River Seep-12-071318	Total Recoverable	Water	3005A	
490-155661-3	River Seep-16-071318	Total Recoverable	Water	3005A	
490-155661-4	River Seep-14-071318	Total Recoverable	Water	3005A	
490-155661-5	River Seep-04-071218	Total Recoverable	Water	3005A	
490-155661-6	River Seep-07-071218	Total Recoverable	Water	3005A	
490-155661-7	River Seep-05-071218	Total Recoverable	Water	3005A	

Prep Batch: 250903

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	3005A	
490-155661-2	River Seep-12-071318	Total Recoverable	Water	3005A	
490-155661-3	River Seep-16-071318	Total Recoverable	Water	3005A	
490-155661-4	River Seep-14-071318	Total Recoverable	Water	3005A	
490-155661-5	River Seep-04-071218	Total Recoverable	Water	3005A	
490-155661-6	River Seep-07-071218	Total Recoverable	Water	3005A	
490-155661-7	River Seep-05-071218	Total Recoverable	Water	3005A	

Prep Batch: 250943

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	7470A	
490-155661-2	River Seep-12-071318	Total/NA	Water	7470A	
490-155661-3	River Seep-16-071318	Total/NA	Water	7470A	
490-155661-4	River Seep-14-071318	Total/NA	Water	7470A	
490-155661-5	River Seep-04-071218	Total/NA	Water	7470A	
490-155661-6	River Seep-07-071218	Total/NA	Water	7470A	
490-155661-7	River Seep-05-071218	Total/NA	Water	7470A	

Metals (Continued)

Analysis Batch: 251171

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	EPA 7470A	250943
490-155661-2	River Seep-12-071318	Total/NA	Water	EPA 7470A	250943
490-155661-3	River Seep-16-071318	Total/NA	Water	EPA 7470A	250943
490-155661-4	River Seep-14-071318	Total/NA	Water	EPA 7470A	250943
490-155661-5	River Seep-04-071218	Total/NA	Water	EPA 7470A	250943
490-155661-6	River Seep-07-071218	Total/NA	Water	EPA 7470A	250943
490-155661-7	River Seep-05-071218	Total/NA	Water	EPA 7470A	250943

Analysis Batch: 251527

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	6010C	250902
490-155661-2	River Seep-12-071318	Total Recoverable	Water	6010C	250902
490-155661-3	River Seep-16-071318	Total Recoverable	Water	6010C	250902
490-155661-4	River Seep-14-071318	Total Recoverable	Water	6010C	250902
490-155661-5	River Seep-04-071218	Total Recoverable	Water	6010C	250902
490-155661-6	River Seep-07-071218	Total Recoverable	Water	6010C	250902
490-155661-7	River Seep-05-071218	Total Recoverable	Water	6010C	250902

Analysis Batch: 252059

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	6020A	250903
490-155661-2	River Seep-12-071318	Total Recoverable	Water	6020A	250903
490-155661-3	River Seep-16-071318	Total Recoverable	Water	6020A	250903
490-155661-4	River Seep-14-071318	Total Recoverable	Water	6020A	250903
490-155661-5	River Seep-04-071218	Total Recoverable	Water	6020A	250903
490-155661-6	River Seep-07-071218	Total Recoverable	Water	6020A	250903
490-155661-7	River Seep-05-071218	Total Recoverable	Water	6020A	250903

General Chemistry

Analysis Batch: 529395

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	SM 2540C	
490-155661-2	River Seep-12-071318	Total/NA	Water	SM 2540C	
490-155661-3	River Seep-16-071318	Total/NA	Water	SM 2540C	
490-155661-4	River Seep-14-071318	Total/NA	Water	SM 2540C	
490-155661-5	River Seep-04-071218	Total/NA	Water	SM 2540C	
490-155661-6	River Seep-07-071218	Total/NA	Water	SM 2540C	
490-155661-7	River Seep-05-071218	Total/NA	Water	SM 2540C	

Analysis Batch: 531203

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9040C	
490-155661-2	River Seep-12-071318	Total/NA	Water	9040C	
490-155661-3	River Seep-16-071318	Total/NA	Water	9040C	
490-155661-4	River Seep-14-071318	Total/NA	Water	9040C	
490-155661-5	River Seep-04-071218	Total/NA	Water	9040C	
490-155661-6	River Seep-07-071218	Total/NA	Water	9040C	
490-155661-7	River Seep-05-071218	Total/NA	Water	9040C	

General Chemistry (Continued)

Analysis Batch: 531384

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	SM 2320B	
490-155661-2	River Seep-12-071318	Total/NA	Water	SM 2320B	
490-155661-3	River Seep-16-071318	Total/NA	Water	SM 2320B	
490-155661-4	River Seep-14-071318	Total/NA	Water	SM 2320B	
490-155661-5	River Seep-04-071218	Total/NA	Water	SM 2320B	
490-155661-6	River Seep-07-071218	Total/NA	Water	SM 2320B	
490-155661-7	River Seep-05-071218	Total/NA	Water	SM 2320B	

Rad

Prep Batch: 376745

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	PrecSep-21	
490-155661-2	River Seep-12-071318	Total/NA	Water	PrecSep-21	
490-155661-5	River Seep-04-071218	Total/NA	Water	PrecSep-21	
490-155661-6	River Seep-07-071218	Total/NA	Water	PrecSep-21	
490-155661-7	River Seep-05-071218	Total/NA	Water	PrecSep-21	

Prep Batch: 376750

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	PrecSep_0	
490-155661-2	River Seep-12-071318	Total/NA	Water	PrecSep_0	
490-155661-5	River Seep-04-071218	Total/NA	Water	PrecSep_0	
490-155661-6	River Seep-07-071218	Total/NA	Water	PrecSep_0	
490-155661-7	River Seep-05-071218	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: River Seep-08-071318

Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:22	SW1	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 20:45	JHS	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 21:00	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:24	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:35	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:04	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 20:55	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			999.94 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381568	08/10/18 16:41	RTM	TAL SL
Total/NA	Prep	PrecSep_0			999.94 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379945	08/02/18 09:20	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:37	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:29	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:40	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:05	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:02	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			750.37 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381568	08/10/18 16:41	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.37 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:21	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-16-071318

Lab Sample ID: 490-155661-3

Date Collected: 07/13/18 11:00

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:52	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:35	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:44	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:06	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:09	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH

Client Sample ID: River Seep-14-071318

Lab Sample ID: 490-155661-4

Date Collected: 07/13/18 10:10

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 17:07	SW1	TAL NSH
Total/NA	Analysis	9056A		10			531368	07/25/18 21:15	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:50	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:49	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:07	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:17	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH

Client Sample ID: River Seep-04-071218

Lab Sample ID: 490-155661-5

Date Collected: 07/12/18 13:50

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 17:51	SW1	TAL NSH
Total/NA	Analysis	9056A		10			531368	07/25/18 21:59	JHS	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 22:14	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:56	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:06	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:08	RJR	TAL PIT

Client Sample ID: River Seep-04-071218

Date Collected: 07/12/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:21	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.17 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:40	RTM	TAL SL
Total/NA	Prep	PrecSep_0			500.17 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:21	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 22:29	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:01	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:11	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:09	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:28	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			999.84 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:39	RTM	TAL SL
Total/NA	Prep	PrecSep_0			999.84 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:36	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 22:44	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:07	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:16	WTR	TAL PIT

Lab Chronicle

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:12	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:41	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			499.95 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:40	RTM	TAL SL
Total/NA	Prep	PrecSep_0			499.95 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177
TAL PIT = TestAmerica Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Method Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL NSH
6010C	Metals (ICP)	SW846	TAL PIT
6020A	Metals (ICP/MS)	SW846	TAL PIT
EPA 7470A	Mercury (CVAA)	SW846	TAL PIT
9040C	pH	SW846	TAL NSH
SM 2320B	Alkalinity	SM	TAL NSH
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL NSH
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL PIT
7470A	Preparation, Mercury	SW846	TAL PIT

Protocol References:

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:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Laboratory: TestAmerica Nashville

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Kentucky (UST)	State Program	4	19	06-30-19

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
9040C		Water	pH
9040C		Water	Temperature
9056A		Water	Chloride
9056A		Water	Fluoride
9056A		Water	Sulfate
SM 2320B		Water	Alkalinity
SM 2540C		Water	Total Dissolved Solids

Laboratory: TestAmerica Pittsburgh

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Arkansas DEQ	State Program	6	88-0690	06-27-19
California	State Program	9	2891	04-30-19
Connecticut	State Program	1	PH-0688	09-30-18
Florida	NELAP	4	E871008	06-30-19
Illinois	NELAP	5	200005	06-30-19
Kansas	NELAP	7	E-10350	01-31-19
Louisiana	NELAP	6	04041	06-30-19
Nevada	State Program	9	PA00164	07-31-19
New Hampshire	NELAP	1	2030	04-04-19
New Jersey	NELAP	2	PA005	06-30-19
New York	NELAP	2	11182	03-31-19
North Carolina (WW/SW)	State Program	4	434	12-31-18
Oregon	NELAP	10	PA-2151	01-28-19
Pennsylvania	NELAP	3	02-00416	04-30-19
South Carolina	State Program	4	89014	04-30-19
Texas	NELAP	6	T104704528-15-2	03-31-19
US Fish & Wildlife	Federal		LE94312A-1	07-31-19
USDA	Federal		P330-16-00211	06-26-19
Utah	NELAP	8	PA001462015-4	05-31-19
Virginia	NELAP	3	460189	09-14-18 *
West Virginia DEP	State Program	3	142	01-31-19
Wisconsin	State Program	5	998027800	08-31-18 *

Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	DoD ELAP		L2305	04-06-19
Arizona	State Program	9	AZ0813	12-08-18
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19
Florida	NELAP	4	E87689	06-30-19
Illinois	NELAP	5	200023	11-30-18
Iowa	State Program	7	373	12-01-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Laboratory: TestAmerica St. Louis (Continued)

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Kansas	NELAP	7	E-10236	10-31-18
Kentucky (DW)	State Program	4	90125	12-31-18
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA180017	12-31-18
Maryland	State Program	3	310	09-30-19
Michigan	State Program	5	9005	06-30-18 *
Missouri	State Program	7	780	06-30-18 *
Nevada	State Program	9	MO000542018-1	07-31-19
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-19
Pennsylvania	NELAP	3	68-00540	02-28-19
South Carolina	State Program	4	85002001	06-30-19
Texas	NELAP	6	T104704193-18-12	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542016-8	07-31-18 *
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-18 *
West Virginia DEP	State Program	3	381	10-31-18 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-155661 Chain of Custody

Cooler Received/Opened On 7/14/2018 @ 1050

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2692 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960357 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 5.9 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (initial) GH

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (initial) AOH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (initial) AOH

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (initial) AOH

I certify that I attached a label with the unique LIMS number to each container (initial) AOH

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

Loc: 490
155661

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Cooler Received/Opened On 7/14/2018 @ 10:50

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2681 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960353 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 1.0 Degrees Celsius

3. If item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES NO NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES NO NA

6. Were custody papers inside cooler? YES NO NA

I certify that I opened the cooler and answered questions 1-6 (intial) YOF

7. Were custody seals on containers: YES NO and Intact YES NO NA

Were these signed and dated correctly? YES NO NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES NO NA

12. Did all container labels and tags agree with custody papers? YES NO NA

13a. Were VOA vials received? YES NO NA

b. Was there any observable headspace present in any VOA vial? YES NO NA

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES NO NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) YOF

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO NA

b. Did the bottle labels indicate that the correct preservatives were used YES NO NA

16. Was residual chlorine present? YES NO NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) YOF

17. Were custody papers properly filled out (ink, signed, etc)? YES NO NA

18. Did you sign the custody papers in the appropriate place? YES NO NA

19. Were correct containers used for the analysis requested? YES NO NA

20. Was sufficient amount of sample sent in each container? YES NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) YOF

I certify that I attached a label with the unique LIMS number to each container (intial) YOF

21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES NO #_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

Loc: 490
155661

COOLER RECEIPT FORM

Cooler Received/Opened On 7/14/2018 @1050

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2670 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 14740456 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 3.1 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) ADT

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) ADT

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) ADT

I certify that I attached a label with the unique LIMS number to each container (intial) ADT

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex 3 Fedex	COC No: 490-86693-25173.1
Client Contact: Greg Dick	Phone: 513-237-1647	E-Mail: roxanne.cisneros@testamericainc.com		Page: Page 1 of 2
Company: Big Rivers Electric Corporation				Job #:
Address: PO BOX 24	Due Date Requested: Standard		Analysis Requested	Preservation Codes:
City: Henderson	TAT Requested (days): Standard			A - HCL; B - NaOH; C - Zn Acetate; D - Nitric Acid; E - NaHSO4; F - MeOH; G - Amchlor; H - Ascorbic Acid; I - Ice; J - DI Water; K - EDTA; L - EDA; M - Hexane; N - None; O - AsNaO2; P - Na2O4S; Q - Na2SO3; R - Na2S2O3; S - H2SO4; T - TSP Dodecahydrate; U - Acetone; V - MCAA; W - pH 4-5; Z - other (specify)
State, Zip: KY, 42419	PO #: Purchase Order - see DOCs			
Phone: 270-844-6010(Tel)	WO #:			Other:
Email: Gregory.Dick@bigrivers.com				
Project Name: Big Rivers Electric Corp - Henderson KY	Sebree Green Landfill			CCR App III, IV + Alk, Na, Mg
Site: Sebree Green Landfill	SSOW#:		Loc: 490 155661	

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056_ORGFM_28D	6010B, 7470A	25400_Calcd - TDS	Radium 226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N			
River Seep - 08 - 071318	7/13/18	0750	G	Water			X	X	X	X	5	pH 7.09
River Seep - 12 - 071318	7/13/18	0915		Water			X	X	X	X	5	7.37
River Seep - 16 - 071318	7/13/18	1100		Water			X	X	X		3	7.46
River Seep - 14 - 071318	7/13/18	1010		Water			X	X	X		3	7.54
River Seep - 04 - 071218	7/12/18	1350		Water			X	X	X	X	5	5.13
River Seep - 07 - 071218	7/12/18	1450		Water			X	X	X	X	5	7.27
River Seep - 05 - 071218	7/12/18	1425		Water			X	X	X	X	5	6.92
Landfill Seep - 01 - 071318	7/13/18	1220		Water			X	X	X	X	5	10.64
Landfill Seep - 01 - 071318 - Dup	7/13/18	1220		Water			X	X	X	X	5	10.64
Landfill Seep - 02 - 071318	7/13/18	1310		Water			X	X	X	X	5	10.20
Landfill Seep - 03 - 071318	7/13/18	1330		Water			X	X	X	X	5	8.02

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:				
Relinquished by:	Date/Time: 7/13/18 1630	Company: AECOM	Received by:	Date/Time: 7/14/18 1050	Company: TA-NAS		
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:		
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:		

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 5.7, 1.0, 3.1

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex Rodeis
Client Contact: Greg Dick	Phone: 513-237-1188	E-Mail: roxanne.cisneros@testamericainc.com	COC No: 490-86693-25173.1
Company: Big Rivers Electric Corporation			Page: Page 1 of 2
Address: PO BOX 24	Due Date Requested: Standard		Job #:
City: Henderson	TAT Requested (days): Standard		
State, Zip: KY, 42419	PO #: Purchase Order - see DOCs		
Phone: 270-844-6010(Tel)	WO #:		
Email: Gregory.Dick@bigrivers.com			
Project Name: Big Rivers Electric Corp - Henderson KY	Sebree Green Landfill		
Site: Sebree Green Landfill	SSOW#:		

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Wastewater, Sewage, Groundwater, Drinking Water, Tissue, Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056, ORGFM_28D	6010C, 6020A	6020B, 7470A	2540C, Calcd - TDS	Radium 226/228	Gross Alpha	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N	D				CCR App III, IV + Alk, Na, Mg
POND-012-071318	7/13/18	1350	G	Water	N	N	X	X	X	X				pH 7.95
Landfill Seep-04-071318	7/13/18	1415	G	Water	N	N	X	X	X	X				pH 10.71
~~Trip Seep 16 071318~~ CS	~~7/13/18~~	~~1044~~		Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										

Loc: 490
155661

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:		Date:		Time:		Method of Shipment:	
Relinquished by:	Date/Time: 7/13/18 1630	Company: Aecom	Received by:		Date/Time: 7/14/18 1050	Company: TA-NAS	
Relinquished by:	Date/Time:	Company	Received by:		Date/Time:	Company	
Relinquished by:	Date/Time:	Company	Received by:		Date/Time:	Company	

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks: 5.7, 1.0, 3.1

Ver: 08/04/2016

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-75463.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-155661-1
Address: 301 Alpha Drive, RIDC Park,	Due Date Requested: 7/26/2018	Analysis Requested		Preservation Codes:
City: Pittsburgh	TAT Requested (days):			A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
State, Zip: PA, 15238	PO #:			
Phone: 412-963-7058(Tel) 412-963-2468(Fax)	WO #:			Other:
Email:				
Project Name: Big Rivers Electric Corp - CCR & SemiAnn	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010C/3005A (MOD) Lithium	6020A/3005A (MOD) ICP/MS Metals	7470A/7470A_Prep Mercury										Total Number of containers	Special Instructions/Note:
			Preservation Code:																	
River Seep-08-071318 (490-155661-1)	7/13/18	07:50 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-12-071318 (490-155661-2)	7/13/18	09:15 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-16-071318 (490-155661-3)	7/13/18	11:00 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-14-071318 (490-155661-4)	7/13/18	10:10 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-09-071218 (490-155661-5)	7/12/18	13:50 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-07-071218 (490-155661-6)	7/12/18	14:50 Central		Water			X	X	X										1	Metals - run once, upload together.
River Seep-05-071218 (490-155661-7)	7/12/18	14:25 Central		Water			X	X	X										1	Metals - run once, upload together.
Landfill Seep-01-071318 (490-155661-8)	7/13/18	12:20 Central		Water			X	X	X										1	Metals - run once, upload together.
Landfill Seep-01-071318-DUP (490-155661-9)	7/13/18	12:20 Central		Water			X	X	X										1	Metals - run once, upload together.

490-155661 Chain of Custody

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. 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 accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) — Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by: [signature]	Date/Time: 7/17/18 1450	Company: TA-NAS	Received by: [signature] Date/Time: 7/17/18 1220 Company: TA PGH
Relinquished by:	Date/Time:	Company	Received by: Date/Time: Company
Relinquished by:	Date/Time:	Company	Received by: Date/Time: Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 09/20/2016

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-75463.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 2 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-155661-1
Address: 301 Alpha Drive, RIDC Park,	Due Date Requested: 7/26/2018	Analysis Requested		Preservation Codes:
City: Pittsburgh	TAT Requested (days):			A - HCL; B - NaOH; C - Zn Acetate; D - Nitric Acid; E - NaHSO4; F - MeOH; G - Amchlor; H - Ascorbic Acid; I - Ice; J - DI Water; K - EDTA; L - EDA; M - Hexane; N - None; O - AsNaO2; P - Na2O4S; Q - Na2SO3; R - Na2S2O3; S - H2SO4; T - TSP Dodecahydrate; U - Acetone; V - MCAA; W - pH 4-5; Z - other (specify)
State, Zip: PA, 15238				
Phone: 412-963-7058(Tel) 412-963-2468(Fax)	PO #:			
Email:	WO #:			Other:
Project Name: Big Rivers Electric Corp - CCR & SemiAnn	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010C/3005A (MOD) Lithium	6020A/3005A (MOD) ICP/MS Metals	7470A/7470A_Prep Mercury	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
Landfill Seep-02-071318 (490-155661-10)	7/13/18	13:10 Central		Water			X	X	X	1	Metals - run once, upload together.
Landfill Seep-03-071318 (490-155661-11)	7/13/18	13:30 Central		Water			X	X	X	1	Metals - run once, upload together.
Pond-012-071318 (490-155661-12)	7/13/18	13:50 Central		Water			X	X	X	1	Metals - run once, upload together.
Landfill Seep-04-071318 (490-155661-13)	7/13/18	14:15 Central		Water			X	X	X	1	Metals - run once, upload together.

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:				
Relinquished by: [signature]	Date/Time: 7/16/18 1456	Company: TA-NAS	Received by: [signature]	Date/Time: 7/17/18 1320	Company: TA PNT		
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company		
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company		

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 09/20/2016

Login Sample Receipt Checklist

Client: Big Rivers Electric Corporation

Job Number: 490-155661-1

Login Number: 155661
List Number: 2
Creator: DiNardo, Nicholas J

List Source: TestAmerica Pittsburgh
List Creation: 07/17/18 12:54 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	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?	False	
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	

Tracer/Carrier Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)
490-155661-1	River Seep-08-071318	87.3
490-155661-2	River Seep-12-071318	92.9
490-155661-5	River Seep-04-071218	89.4
490-155661-6	River Seep-07-071218	79.4
490-155661-7	River Seep-05-071218	82.9

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)
490-155661-1	River Seep-08-071318	87.3	90.5
490-155661-2	River Seep-12-071318	92.9	85.6
490-155661-5	River Seep-04-071218	89.4	87.1
490-155661-6	River Seep-07-071218	79.4	87.1
490-155661-7	River Seep-05-071218	82.9	83.0

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Y Carrier = Y Carrier

Appendix B

Supplemental Boring Logs and Cross-Sections

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-01

Sheet 1 of 3

Date(s) Drilled	04/23/2019 12:00 AM to 04/24/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	68.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1250 (ft NAD83)	Groundwater Level(s)	28 ft on 4/23/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) 394.0 / Depth (feet) 0.0								
	0		1		2		Hard, moist, brown, lean clay (CL) with gravel [FILL]								
							391.5 / 2.5								
			2		2		Very stiff, moist, dark gray and light gray, mixture of lime and fly ash [FILL]								
390															
	5		3		2										
			4		2										
385			5		2										
	10		6		2										
			7		2		- becomes wet								
							381.0 / 13.0								
380							Stiff, moist, brown, reddish brown, and gray mottled, lean CLAY (CL)								
	15		8		2										
			9		2										
375			10		2										
	20		11		2										
			12		2										
370															
	25		13		2										
			14		2										
			15		2		- becomes wet								*Water encountered at 28 ft bgs during drilling.*
365															
	30						364.0 / 30.0								

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:44:39 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-01

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2		Stiff, moist, brown, fat CLAY (CH)								
			17		2										
360	35		18		2										
			19		2		- becomes gray, with brown mottled								
355			20		2										
	40		21		2										
			22		2										
350															
	45		23		2										
			24		2										
							- with wet, 4 inch seam of sand								
345			25		2										
	50		26		2		- with reddish brown ferrous nodules								
			27		2										
340															
	55		28		2										
			29		2										
335			30		2										
	60		31		2		333.0 / 61.0 Stiff, moist, brown, reddish brown, sandy lean CLAY (CL)								
			32		2										
330			33		2		329.5 / 64.5 Soft, very moist, gray, fat CLAY (CH)								
	65														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:44:39 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-01

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
		33		2										
		34		2										
						Elevation (feet) 326.0 / Depth (feet) 68.0								
						End of Boring at 68 ft								
325	70													
320	75													
315	80													
310	85													
305	90													
300	95													
295	100													

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-02

Sheet 1 of 2

Date(s) Drilled	04/25/2019 12:00 AM to 04/25/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	50.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1200 (ft NAD83)	Groundwater Level(s)	42 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) 394.0 / Depth (feet) 0.0								
	0		1		2		Medium stiff, moist, brown, lean clay (CL) with gravel [FILL]								
			2		2		391.0 / 3.0								
390							Medium dense, moist, dark gray (FILL) 390.0 / 4.0								
	5		3		2		Soft, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
			4		2										
385			5		2										
	10		6		2		382.0 / 12.0								
			7		2		Medium stiff, moist, brown, reddish brown, and gray mottled, lean CLAY (CL)								
380							- becomes very stiff								
	15		8		2										
			9		2										
375			10		2										
	20		11		2										
			12		2										
370															
	25		13		2										
			14		2										
365			15		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-02

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2										
			17		2		- becomes stiff								
360	35		18		2										
			19		2		- becomes very stiff								
							Elevation (feet) 356.0 — Depth (feet) 38.0								
355			20		2		Soft, very moist, gray, lean CLAY (CL)								
	40		21		2										
			22		2		- becomes wet								
350															
	45		23		2										
							Elevation (feet) 348.0 — Depth (feet) 46.0								
			24		2		Stiff, very moist, gray and brown mottled, fat CLAY (CH)								
345			25		2										
	50						Elevation (feet) 344.0 — Depth (feet) 50.0								
							End of Boring at 50 ft								
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-03

Date(s) Drilled	04/25/2019 12:00 AM to 04/25/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	50.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1150 (ft NAD83)	Groundwater Level(s)	9 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
394.0	0.0														
			1		2		Very stiff, moist, brown, yellowish brown, and gray lean clay (CL) with gravel [FILL]								
393.0	1.0														
392.5	1.5						Medium dense, moist, dark gray (FILL)								
			2		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
390.5	3.5														
390			3		2		Very stiff, moist, brown, brown, yellowish brown, lean CLAY (CL) [FILL]								
	5														
388.5	5.5														
			4		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
385.0	9.0														
385			5		2		Loose, wet, black (FILL)								
	10														
			6		2										
383.0	11.0														
382.0	12.0						Medium stiff, very moist, black, brown, silty CLAY (CL-ML) with organics								
			7		2		Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
380															
	15		8		2										
			9		2										
375			10		2										
	20														
			11		2										
			12		2										
370															
	25		13		2										
			14		2										
365			15		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-03

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2										
			17		2										
360	35		18		2										
			19		2										
355			20		2										
	40		21		2										
			22		2										
350							Elevation (feet) 350.0 Depth (feet) 44.0 Stiff, moist, gray, fat CLAY (CH)								
	45		23		2										
			24		2		Elevation (feet) 346.0 Depth (feet) 48.0 Medium stiff, very moist, gray, lean CLAY (CL)								
345			25		2										
	50						Elevation (feet) 344.0 Depth (feet) 50.0 End of Boring at 50 ft								
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-04

Date(s) Drilled	04/25/2019 12:00 AM to 04/25/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	48.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	393 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1100 (ft NAD83)	Groundwater Level(s)	4.25 ft on 1/31/2018		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0		1		2		Very stiff, moist, yellowish brown, lean clay (CL) with gravel [FILL]								
390			2		2		Soft, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	5		3		2		- becomes wet								
			4		2		Medium dense, wet, dark gray, black (FILL)								
385			5		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	10		6		2		Loose, wet, black (FILL)								
380			7		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	15		8		2		Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
			9		2										
375			10		2										
	20		11		2										
370			12		2										
	25		13		2										
			14		2										
365			15		2										
	30														

Elevation (feet) / Depth (feet)

Elevation (feet)	Depth (feet)
393.0	0.0
391.0	2.0
387.0	6.0
386.0	7.0
384.0	9.0
382.0	11.0
380.0	13.0

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-04

Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2										
360			17		2										
	35		18		2										
			19		2										
355							Elevation (feet) 355.0 / Depth (feet) 38.0								
			20		2		Stiff, moist, gray, fat CLAY (CH)								
	40		21		2										
350			22		2										
							Elevation (feet) 349.0 / Depth (feet) 44.0								
	45		23		2		Medium stiff, wet, gray, lean CLAY (CL)								
			24		2										
345							Elevation (feet) 345.0 / Depth (feet) 48.0								
	50						End of Boring at 48 ft								
340															
	55														
335															
	60														
330															
	65														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:45:06 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-05

Sheet 1 of 2

Date(s) Drilled	04/25/2019 12:00 AM to 04/25/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	48.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	393 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1050 (ft NAD83)	Groundwater Level(s)	16 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0		1		2		Very stiff, moist, yellowish brown, lean clay (CL) with gravel [FILL]								
							Elevation (feet) 393.0 / Depth (feet) 0.0								
							391.0 / 2.0								
			2		2		Loose, wet, dark gray, black (FILL)								
390							390.0 / 3.0								
							Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	5		3		2										
							387.0 / 6.0								
			4		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
385			5		2										
	10		6		2										
			7		2		380.0 / 13.0								
380							Loose, wet, black (FILL)								
							379.0 / 14.0								
	15		8		2		Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
							377.0 / 16.0								
			9		2		Loose, wet, black (FILL)								
							376.0 / 17.0								
375							Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
			10		2										
	20		11		2										
370			12		2										
	25		13		2										
			14		2										
365			15		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-05

Sheet 2 of 2

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2										
360			17		2										
	35		18		2										
			19		2										
355			20		2										
	40		21		2		Elevation (feet) 353.0 / Depth (feet) 40.0 Medium stiff, moist, yellowish brown, fat CLAY (CH)								
350			22		2		Elevation (feet) 349.0 / Depth (feet) 44.0 Medium stiff, moist, yellowish brown, gray, lean CLAY (CL) with sand								
	45		23		2										
			24		2		Elevation (feet) 345.0 / Depth (feet) 48.0 End of Boring at 48 ft								
345															
	50														
340															
	55														
335															
	60														
330															
	65														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:45:14 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-06

Sheet 1 of 2

Date(s) Drilled	04/26/2019 12:00 AM to 04/26/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	46.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	393 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 1000 (ft NAD83)	Groundwater Level(s)	24 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0		1		2		Very stiff, moist, yellowish brown, lean clay (CL) with gravel [FILL]								
							Elevation (feet) 391.0 / Depth (feet) 2.0								
			2		2		Medium stiff, wet, dark gray, black (FILL)								
390							Elevation (feet) 390.0 / Depth (feet) 3.0								
							Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL) - becomes wet								
	5		3		2										
			4		2										
385							Elevation (feet) 385.0 / Depth (feet) 8.0								
			5		2		Loose, wet, black (FILL)								
							Elevation (feet) 384.0 / Depth (feet) 9.0								
	10						Medium stiff, moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
			6		2										
380			7		2										
	15		8		2										
			9		2										
375			10		2										
	20						Elevation (feet) 373.0 / Depth (feet) 20.0								
			11		2		Loose, wet, black (FILL)								
							Elevation (feet) 372.0 / Depth (feet) 21.0								
370			12		2		Medium stiff, moist, dark gray and light gray, mixture of fly ash and lime (FILL)								
	25		13		2		- becomes wet								*Water encountered at 24 ft bgs*
							Elevation (feet) 367.0 / Depth (feet) 26.0								
			14		2		Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
365															
			15		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-06

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2										
360			17		2										
	35		18		2										
			19		2										
355			20		2		Elevation (feet) 354.0 — Depth (feet) 39.0 Medium stiff, moist, yellowish brown, fat CLAY (CH)								
	40		21		2										
350			22		2		Elevation (feet) 349.0 — Depth (feet) 44.0 Medium stiff, moist, yellowish brown, gray, lean CLAY (CL) with sand								
	45		23		2		Elevation (feet) 347.0 — Depth (feet) 46.0 End of Boring at 46 ft								
345															
	50														
340															
	55														
335															
	60														
330															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-07

Sheet 1 of 2

Date(s) Drilled	04/26/2019 12:00 AM to 04/26/2019 12:00 AM	Logged By	A. Burke	Checked By	M. Keown
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	46.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 950 (ft NAD83)	Groundwater Level(s)	28 ft on 4/25/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0		1		2		Very stiff, moist, yellowish brown, lean clay (CL) with gravel [FILL]								
							Elevation (feet) 394.0 / Depth (feet) 0.0								
			2		2		Medium stiff, wet, dark gray, black (FILL)								
							392.0 / 2.0								
390			3		2		Medium stiff, very moist, dark gray and light gray, mixture of lime and fly ash (FILL)								
	5						391.0 / 3.0								
			4		2										
385			5		2		- becomes wet								
	10		6		2										
			7		2										
380															
	15		8		2										
			9		2		- with 6" layer of bottom ash								
375			10		2										
	20		11		2		- becomes wet								
							373.0 / 21.0								
			12		2		Very stiff, moist, yellowish brown, brown, gray, lean CLAY (CL)								
370															
	25		13		2										
			14		2										
							- becomes wet								
365			15		2										
	30						364.0 / 30.0								

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:45:30 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-07

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		16		2		Medium stiff, moist, yellowish brown, fat CLAY (CH)								
			17		2		- with sand and gravel								
360	35		18		2										
			19		2										
355			20		2										
	40		21		2										
			22		2										
350							Elevation (feet) 350.0 Depth (feet) 44.0								
	45		23		2		Medium stiff, moist, yellowish brown, gray, lean CLAY (CL) with sand								
							348.0 46.0								
							End of Boring at 46 ft								
345	50														
340	55														
335	60														
330	65														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:45:30 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-08

Date(s) Drilled	04/29/2019 12:00 AM to 04/29/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	46.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 900 (ft NAD83)	Groundwater Level(s)	30 ft on 4/29/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) 394.0 / Depth (feet) 0.0								
	0		1		4		Very stiff, dry, brown, yellowish brown, silty clay (CL) with gravel (FILL)								
							391.0 / 3.0								
390							Moist, dense, gray, fly ash and lime (FILL)								
	5		2		2										
			3		2		-becomes wet 6'-8'								
385			4		2										
	10		5		2										
			6		2		-becomes wet 12'-14'								
380															
	15		7		2										
			8		2										
375			9		2										
	20						-becomes wet 20'-21'								
			10		2		372.5 / 21.5								
							Very stiff, dry/moist, yellowish brown, gray, brown, silty lean clay (CL)								
			11		2										
370															
	25		12		2										
			13		2										
			14		2		-becomes sand								
365	30														

AECOM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-08

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2		-becomes without sand and less silt								
			16		2										
360							Elevation (feet) 360.0 — Depth (feet) 34.0								
	35		17		2		Moist, brown, yellowish brown, gray fat clay (CH)								
			18		2		-becomes gray -becomes wet 38'-39'								
355			19		2										
	40		20		2										
			21		2		-becomes soft								
350															
	45		22		2		Elevation (feet) 348.0 — Depth (feet) 46.0 End of Boring at 46 ft								
345															
	50														
340															
	55														
335															
	60														
330															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-09

Date(s) Drilled	04/29/2019 12:00 AM to 04/29/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 850 (ft NAD83)	Groundwater Level(s)	ft on 4/29/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395	0						395.0 / 0.0								
							394.8 / 0.3 Loose, moist, brown, sand and gravel (FILL)								
							Very stiff, moist, yellowish brown / brown, lean clay (CL)								
			1		2										*hit apparent rock refusal 2.5'. offset 2' SW*
							391.5 / 3.5								
							Wet, dark gray, fly ash and lime (FILL)								
390	5		2		2										
			3		2										
			4		2										
385	10		5		2										
							-3" bottom ash seam								
			6		2										
380	15		7		2										
			8		2										
			9		2										
375	20		10		2										
			11		2		372.0 / 23.0								
							Moist, brown, lean clay (CL)								
370	25		12		2										
							-becomes mottled with gray								
			13		2										
			14		2		-increases in plasticity with silt pockets								*part of sample*
365	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-09

Sheet 2 of 2

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2										
			16		2										
360	35		17		2										
			18		2										
							Elevation (feet) 357.5 — Depth (feet) 37.5 Moist, gray, fat clay (CH)								
			19		2										
355	40						Elevation (feet) 354.5 — Depth (feet) 40.5 Moist, gray, lean clay (CL)								
			20		2										
			21		2										
							Elevation (feet) 351.0 — Depth (feet) 44.0 End of Boring at 44 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-11

Date(s) Drilled	04/29/2019 12:00 AM to 04/30/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	56.5 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	398 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 800 (ft NAD83)	Groundwater Level(s)	40 ft on 4/29/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						398.0 / 0.0								
							397.5 / 0.5 Gravel (FILL)								
							Moist, brown/yellowish brown, lean clay (CL) with gravel and trace sand								
			1		2		396.0 / 2.0								
395							Moist, gray, fly ash with lime (FILL)								
	5		2		2		-becomes very moist								
			3		2										
390			4		2		-becomes wet								
	10		5		2										
385			6		2										
	15		7		2										
			8		2		-becomes wet 16'-17'								
380			9		2										
	20		10		2										
375			11		2										
	25		12		2										
			13		2		370.3 / 27.8								
370							Moist, brown, yellowish brown, gray mottled lean clay (CL) with trace sand								
			14		2		369.0 / 29.0								
	30						Moist, brown, gray, yellowish brown, mottled fat clay (CH) with trace gravel								

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-11

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2		-shows trace organics								
365			16		2		-becomes more brown								
	35		17		2										
			18		2		362.0 36.0 Moist, orangish, reddish brown, brown lean clay (CL) with trace sand								
360			19		2		-becomes wet on exterior of samples								
	40		20		2		-becomes very wet, higher silt content								
			21		2		356.0 42.0 Wet, reddish brown, brown, silty lean clay (CL)								
355			22		2		-becomes very wet								
	45		23		2		352.0 46.0 Moist, reddish, brown, gray, sandy lean clay (CL)								
350			24		2										
	50		25		2		347.5 50.5 Moist, red, brown, tan clayey sand (CL)								
345			26		2										
	55		27		2										
			28		.5		341.5 56.5 End of Boring at 56.5 ft								
340															
	60														
335															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-12

Date(s) Drilled	04/30/2019 12:00 AM to 04/30/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	46.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	398 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 750 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						398.0 / 0.0								
							397.5 / 0.5 Gravel (FILL)								
							Very stiff, moist, yellowish brown / brown, lean clay (CL)								
			1		2										
395							395.5 / 2.5								
							Moist, gray, fly ash and lime (FILL)								
	5		2		2										
			3		2										
390			4		2										
	10		5		2										
385			6		2										
	15		7		2										
			8		2		-wet								
380			9		2										
	20		10		2										
375			11		2										
	25		12		2										
			13		2		371.5 / 26.5 Moist, yellowish brown / brown, lean clay (CL)								
370			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-12

Sheet 2 of 2

Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30														
			15		2										
365			16		2										
	35		17		2										
			18		2										
360			19		2										
	40						Elevation (feet) 357.5 — Depth (feet) 40.5								
			20		2		Moist, reddish brown, brown fat clay (CH)								
355			21		2										
	45		22		2		Elevation (feet) 352.0 — Depth (feet) 46.0								
							End of Boring at 46 ft								
350															
	50														
345															
	55														
340															
	60														
335															
	65														

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AECOM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-13

Date(s) Drilled	04/30/2019 12:00 AM to 04/30/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	387 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 700 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 387.0 / Depth (feet) 0.0								
							386.8 Gravel (FILL) — 0.3								
							385.8 Moist, brown silty lean clay (CL) with gravel (FILL) — 1.3								
385			1		4		Moist, gray, fly ash and lime (FILL)								
	5		2		2										
380			3		2										
			4		2		-very moist								
	10		5		2										
375			6		2										
	15		7		2										
370			8		2										
			9		2										
	20		10		2										
365			11		2		-very moist								
	25		12		2		362.0 / 25.0								
							Moist, yellow brown, brown, red, lean clay (CL)								
360			13		2										
			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-13

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
355	30		15		2		Elevation (feet) 355.0 / Depth (feet) 32.0 Moist, reddish brown, fat clay (CH)								
			16		2										
	35		17		2										
350			18		2										
			19		2										
	40		20		2		-becomes fine grained sandy clay								
345			21		2		Elevation (feet) 343.0 / Depth (feet) 44.0 End of Boring at 44 ft								
	45														
340															
	50														
335															
	55														
330															
	60														
325															
	65														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-14

Date(s) Drilled	04/30/2019 12:00 AM to 04/30/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	397 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 650 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						397.0 / 0.0								
							Moist, brown, lean clay (CL) with gravel (FILL)								
							396.0 / 1.0								
							Moist, gray, fly ash and lime (FILL)								
395			1		4										
	5		2		2										
390			3		2										
			4		2										
	10		5		2										
385			6		2										
	15		7		2		-becomes very moist top 5"								
380			8		2										
			9		2										
	20		10		2										
							375.5 / 21.5								
375			11		2		Moist, yellow brown, brown, gray, fat clay (CH)								
	25		12		2										
370			13		2										
			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-14

Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2										
365			16		2										
	35		17		2		361.5 / 35.5								
							Moist, yellow brown, orangish brown, brown, lean clay (CL)								
360			18		2										
			19		2										
	40		20		2		355.5 / 41.5								
355							Moist, brown red, brown, fat clay (CH)								
			21		2		-becomes gray								
							353.0 / 44.0								
							End of Boring at 44 ft								
	45														
350															
	50														
345															
	55														
340															
	60														
335															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-15

Date(s) Drilled	05/01/2019 12:00 AM to 05/01/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	396 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 600 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
396.0	0.0														
395.5	0.5						Gravel (FILL)								
							Moist, gray, fly ash and lime (FILL)								
395			1		2										
	5		2		2										
390			3		2										
			4		2										
	10		5		2										
385			6		2										
381.0	15.0		7		2		Wet, black, dary gray, bottom ash (FILL)								
380			8		2										
378.0	18.0		9		2		Moist, yellowish brown, brown, gray mottled fat clay (CH)								
	20		10		2										
375.0	21.0						Moist, silty lean clay (CL) with trace organics								
373.5	22.5		11		2		Moist, yellow brown, brown, gray, mottled fat clay (CH)								
370	25		12		2										
370.0	26.0		13		2		Moist, yellow brown, brown, gray mottled lean clay (CL)								
			14		2		-becomes reddish in color								
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-15

Sheet 2 of 2

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30														
365			15		2										
			16		2										
	35		17		2										
360			18		2		-increased silt content								
			19		2										
	40						Elevation (feet) 356.0 — Depth (feet) 40.0 Moist, brown, reddish brown, fat clay (CH)								
355			20		2										
			21		2		Elevation (feet) 352.0 — Depth (feet) 44.0 End of Boring at 44 ft								
	45														
350															
	50														
345															
	55														
340															
	60														
335															
	65														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:46:25 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-16

Date(s) Drilled	05/01/2019 12:00 AM to 05/01/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 550 (ft NAD83)	Groundwater Level(s)	42 ft on 5/1/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
395	0						395.0 / 0.0								
							394.5 / 0.5 Gravel (FILL)								
							Moist, brown, reddish brown, yellowish brown (FILL)								
			1		3.5										
							390.5 / 4.5 -becomes dark gray								
390	5		2		2		Moist, gray, fly ash and lime (FILL)								
			3		2										
			4		2										
385	10		5		2										
			6		2										
							-becomes dark gray								
380	15		7		2										
							379.0 / 16.0								
			8		2		Moist, yellowish brown, brown, gray, lean clay (CL)								
			9		2										
375	20		10		2										
			11		2										
370	25		12		2										
			13		2										
			14		2										
365	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-16

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2										
			16		2		361.5 (33.5) Moist, yellowish brown, brown, fat clay (CH)								
360	35		17		2										
			18		2										
			19		2										
355	40		20		2										
			21		2		-becomes very moist, gray								
							351.0 (44.0) End of Boring at 44 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-17

Date(s) Drilled	05/02/2019 12:00 AM to 05/02/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 500 (ft NAD83)	Groundwater Level(s)	43 ft on 5/2/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395	0						395.0 / 0.0								
							394.5 / 0.5 Gravel (FILL)								
							Moist, yellowish brown, brown, lean clay (CL)								
			1		4		393.0 / 2.0								
							Moist, gray, fly ash and lime (FILL)								
390	5		2		2										
			3		2										
			4		2										
385	10		5		2										
			6		2										
380	15		7		2		379.0 / 16.0								
			8		2		Moist, yellowish brown, brown, gray, lean clay (CL)								
			9		2										
375	20		10		2										
			11		2		373.0 / 22.0								
							Moist, brown, yellowish brown, gray, fat clay (CH)								
370	25		12		2		369.5 / 25.5								
			13		2		Moist, yellowish brown, brown, lean clay (CL)								
			14		2										
365	30														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-17

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2										
							363.0 / 32.0 Moist, brown, yellowish brown, reddish brown, fat clay (CH)								
			16		2										
360	35		17		2		359.5 / 35.5 Moist, yellowish brown, brown, reddish brown, lean clay (CL)								
			18		2										
			19		2		356.0 / 39.0 Reddish brown, brown, fat clay (CH)								
355	40		20		2										
			21		2		-becomes wet, gray, silty								
							351.0 / 44.0 End of Boring at 44 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-18

Date(s) Drilled	05/02/2019 12:00 AM to 05/02/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 400 (ft NAD83)	Groundwater Level(s)	34 ft on 5/2/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						394.0 / 0.0								
							393.5 / 0.5 Gravel (FILL)								
							Moist, brown, lean clay (CL)								
							392.5 / 1.5								
			1		4		Moist, gray, fly ash and lime (FILL)								
390															
	5		2		2										
			3		2										
385			4		2										
	10		5		2										
			6		2										
380															
	15		7		2										
							377.5 / 16.5								
			8		2		Moist, yellowish brown, brown, gray, lean clay (CL)								
375			9		2										
	20		10		2										
							-becomes very moist, increased silt content								
			11		2										
370															
	25		12		2										
			13		2										
365			14		2										
	30														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-18

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30						Elevation (feet) / Depth (feet)								
			15		2		363.0 / 31.0 Moist, brown, yellowish brown, reddish brown, fat clay (CH)								
			16		2										
360	35		17		2		-becomes wet 34'-36'								
			18		2										
			19		2		355.5 / 38.5 Moist, gray, fat clay (CH)								
355	40		20		2		353.0 / 41.0 Moist, gray, lean clay (CL)								
			21		2										
350							350.0 / 44.0 End of Boring at 44 ft								
	45														
345															
	50														
340															
	55														
335															
	60														
330															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-19

Date(s) Drilled	05/02/2019 12:00 AM to 05/02/2019 12:00 AM	Logged By	A. Burke	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	42.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 300 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						394.0 / 0.0								
							393.5 / 0.5 Moist, yellowish brown, brown, lean clay (CL) with gravel (FILL)								
			1		4		Moist, gray, fly ash and lime (FILL)								
390															
	5		2		2										
			3		2										
385			4		2										
	10		5		2										
			6		2										
380															
	15		7		2										
			8		2										
375			9		2										
	20						374.0 / 20.0								
			10		2		Yellowish brown, brown, reddish brown, fat clay (CH)								
			11		1.5										
370															
	25		12		1.5										
			13		2										
365			14		2										
	30						364.0 / 30.0								

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-19

Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30						Reddish brown, brown, gray, yellowish brown, lean clay (CL)								
			15		2										
			16		2										
360															
	35		17		2		359.0 / 35.0								
							Reddish brown, brown lean clay (CL)								
			18		2										
							356.0 / 38.0								
355							Moist, brown, gray, mottled red, fat clay (CH)								
	40		19		2										
			20		2										
							352.0 / 42.0								
							End of Boring at 42 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-20

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	33.9 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 200 (ft NAD83)	Groundwater Level(s)	20 ft on 5/6/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 394.0 / Depth (feet) 0.0								
							Moist, yellowish brown, lean clay (CL) with gravel [FILL]								
			1		2		392.0 / 2.0								
							Moist, gray, black, mixture of gravel, sand, fly ash and lime (FILL)								
390							389.5 / 4.5								
	5		2		2		Moist, gray, fly ash and lime (FILL)								*Sample recovery over 100 percent below 4 ft bgs*
							- becomes wet								
			3		2		- becomes moist								
385			4		2										
	10		5		2										
			6		2		380.5 - with few wood fragments and root fibers / 13.5								
380							Moist, yellowish brown, lean CLAY (CL) with few weathered rock fragments [RESIDUUM]								
	15		7		2		- with gray mottling, becomes slightly moist								
			8		2										
375			9		2										
	20						- becomes wet								*Water encountered at 20 ft bgs during drilling.*
			10		2		373.0 / 21.0								
							Very moist, yellowish brown, SILTY CLAY (CL-ML) with sand								
			11		2		- becomes wet								
370							370.5 / 23.5								
	25		12		2		Moist, yellowish brown, orange, gray-brown, blocky, lean CLAY (CL) -with wet seams 24.5 - 25.5, 26 - 27								
			13		2										
365			14		2										
	30						364.0 / 30.0								

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-20

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	15		2		Highly weathered, sandy SHALE, light brown, gray, with orange ferrous staining								
		16		1.9										
360						360.5 / 33.5								
	35					360.1 / 33.9 SHALE, gray								
						End of Boring at 33.9 ft								
355	40													
350	45													
345	50													
340	55													
335	60													
330	65													

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-21

Sheet 1 of 1

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	26.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E 100 (ft NAD83)	Groundwater Level(s)	20 ft on 5/6/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 394.0 / Depth (feet) 0.0								
			1		3		Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
							391.5 / 2.5								
390							Wet, dark gray, black, fly ash and lime (FILL)								
	5		2		2		-becomes moist, gray, lightgray								
			3		2		-becomes wet								
385			4		2		-becomes moist								
	10						-becomes dry								
			5		2										
			6		2										
380															
	15		7		2		378.5 / 15.5								
			8		2		Moist, gray-brown, gray lean clay (CL) -becomes yellowish brown								
375			9		2										
	20		10		2		-with wet, CL-ML seams								*Water encountered at 20 ft bgs during drilling.*
			11		2		-becomes moist, with high wear shale fragments								
370							370.5 / 23.5								
	25		12		2		Light brown, yellowish brown with orange staining, highly weathered sandy SHALE								
							368.0 / 26.0								
							End of Boring at 26 ft								
365															
	30														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-22

Sheet 1 of 1

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	27.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E (ft NAD83)	Groundwater Level(s)	20 ft on 5/6/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 394.0 / Depth (feet) 0.0								
							Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
			1		4		392.0 / 2.0								
							Wet, black, gray, mixture of bottom ash, fly ash and lime (FILL)								
390															
	5		2		2		-becomes very moist								
							-becomes wet								
			3		2		-becomes slightly moist								
385			4		2										
	10						-becomes very moist								
			5		2		382.5 -with 6" seam of bottom ash / 11.5								
							Moist, yellowish brown, gray, lean clay (CL)								
			6		2										
380															
	15		7		2		-becomes slightly moist								
			8		2										
							-becomes very moist								
375			9		2		-becomes moist -wet 19-19.5'								
	20						374.0 / 20.0								
			10		2		Wet, yellowish brown, gray silty clay (CL-ML)								*Water encountered at 20 ft bgs during drilling.*
							372.0 / 22.0								
			11		2		Moist, yellowish brown, gray, lean clay (CL)								
370							-becomes slightly moist								
	25		12		2		369.0 -becomes wet / 25.0								
							Moist, gray, orange-brown, sand silty clay (CL-ML) / 368.0 / 26.0								
			13		1		Highly weathered sandy SHALE, lightly yellowish gray / 367.0 / 27.0								
							End of Boring at 27 ft								
365															
	30														

AECOM

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-23

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	32.7 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -150 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						394.0 / 0.0 Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
							392.5 / 1.5 Wet, black, bottom ash (FILL)								
			1		3		-dark gray, fly ash and lime								
390															
	5		2		2		-becomes wet -4" seam of bottom ash -becomes moist								
			3		2		-becomes slightly moist, light gray								
385			4		2										
	10		5		2										
			6		2										
380															
	15		7		2										
			8		2										
375			9		2										
	20		10		2		-becomes wet								
							372.0 / 22.0 -with 4" seam of wet bottom ash								
			11		1.5		Very moist, gray-brown, lean clay (CL) with root fibers								
370															
	25		12		2		-becomes yellowish brown, wet								
			13		2										
							-becomes yellowish brown, gray, with								
365			14		2		365.0 / 29.0 orange weathered sandstone fragment								
	30						Moist, yellowish brown, gray, blocky, fat clay								

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-23

Elevation (feet)	Depth (feet)	SAMPLES: Type Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	15		2		(CH)								
		16		.7		Elevation (feet) 361.5 / Depth (feet) 32.5 361.3 Wet SANDSTONE, orange 32.7 End of Boring at 32.7 ft								
360	35													
355	40													
350	45													
345	50													
340	55													
335	60													
330	65													

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:47:20 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-24

Date(s) Drilled	05/06/2019 12:00 AM to 05/06/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	40.8 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -300 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						Elevation (feet) 394.0 / Depth (feet) 0.0								
							Moist, brown, yellowish brown, lean clay (CL) with gravel (FILL)								
							392.5 / 1.5								
			1		3.5		Moist, gray, fly ash and lime (FILL)								
390															
	5		2		2		-becomes very moist								
			3		2		-becomes slightly moist								
385			4		1.5		-becomes wet								
	10		5		2		-becomes moist								
			6		2		-becomes wet								
							380.5 / 13.5								
380							Moist, yellowish brown, lean clay (CL)								
	15		7		2										
			8		2										
							-becomes wet								
375			9		2		-becomes moist -wet seam 19'-19.5'								
	20		10		2		-wet seam 20'-20.5'								
			11		2										
370															
	25		12		2										
			13		2										
							-becomes very moist								
365			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-24

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30														
			15		2		-becomes moist, orange-brown, with weathered sandstone fragments								
			16		2										
360							-with black ferrous modules								
	35		17		1.5										
			18		2										
355															
			19		2										
	40						-becomes moist with poorly cemented								
			20		0.8		353.5 sandstone fragments 40.5								
							353.2 Light yellow, orange weathered SANDSTONE 40.8								
							End of Boring at 40.8 ft								
350															
	45														
345															
	50														
340															
	55														
335															
	60														
330															
	65														

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Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-25

Date(s) Drilled	05/07/2019 12:00 AM to 05/07/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -450 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						394.0 / 0.0								
							393.5 / 0.5 Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
							393.0 / 1.0 Wet, black, dark gray, bottom-ash with fly ash								
							Moist, gray, light gray, mixture of fly ash and lime								
			1		4										
390															
	5		2		2										
			3		2										
385			4		2										
	10		5		2										
							382.5 / 11.5 -becomes black								
							Moist, yellowish brown, light brown, lean clay (CL)								
			6		2		-becomes yellowish brown with gray moltted, with silt pockets and black ferrons modules								
380															
	15		7		2		-becomes orange brown, yellowish brown								
			8		2										
375			9		2										
	20						-becomes very moist, light brown, gray								
			10		2		-becmoise moist								
			11		2										
370							-very moist								
							-becomes moist								
	25		12		2		-very moist 25'-25.5'								
			13		2										
365			14		2										
	30						-becomes very moist								

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:47:35 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-25

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2										
			16		2		-becomes slightly moist, with orange weathered sandstone fragments -becomes moist								
360	35		17		2										
			18		2		-becomes very moist, gray, light brown, with orange brown								
355			19		2										
	40		20		2		-becomes wet, gray								
			21		2										
350							Elevation (feet) 350.0 Depth (feet) 44.0 End of Boring at 44 ft								
	45														
345															
	50														
340															
	55														
335															
	60														
330															
	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-26

Date(s) Drilled	05/07/2019 12:00 AM to 05/07/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	44.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -600 (ft NAD83)	Groundwater Level(s)	10 ft on 5/7/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395	0						Elevation (feet) 395.0 / Depth (feet) 0.0								
			1		3		Moist, yellowish brown, orange, lean clay (CL) with sand and gravel (FILL)								
							393.0 / 2.0								
							Wet, black, dark gray, mixture of bottom ash and fly ash								
390	5		2		2		Moist, gray, light gray, mixture of fly ash and lime								
			3		2										
			4		2		-becomes very moist								
385	10		5		1.5										*Water encountered at 10 ft bgs during drilling.*
							383.5 / 11.5								
							Moist, dark grayish green, lean clay (CL) with root fragments (RESIDUUM)								
							382.5 / 12.5								
			6		2		Moist, yellowish brown with light brown mottled, lean clay (CL)								
380	15		7		2										
			8		2		-with gray mottled								
			9		2										
375	20		10		2		-becomes slightly moist								
			11		2		-becomes moist								
370	25		12		2										
							-becomes very moist								
			13		2		-becomes moist								
							-becomes slightly moist								
			14		2		-becomes moist								
365	30														

AECOM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-26

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2		-wet seam								
			16		1.5										
360	35		17		2		360.5 -becomes reddish brown, slightly moist 34.5 Moist, gray, lean to fat clay (CL-CH)								
			18		2										
			19		2		357.0 38.0 Very moist, gray, lean clay (CL)								
355	40		20		2		-with orange-brown ferrous modules								
			21		2		351.0 44.0 End of Boring at 44 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-27

Date(s) Drilled	05/07/2019 12:00 AM to 05/07/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	38.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	395 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -750 (ft NAD83)	Groundwater Level(s)	1.5 ft on 5/7/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395	0						Elevation (feet) 395.0 / Depth (feet) 0.0								
							Moist, yellowish brown, lean clay (CL) with gravel (FILL)								
							393.8 / 1.3								
			1		4		Wet, dark gray, mixture of bottom ash and fly ash Moist, gray, mixture of fly ash and lime								
390	5		2		2										
			3		2										
			4		2										
385	10		5		2		-becomes light gray								
			6		2		381.5 / 13.5								
							Moist, yellowish brown, light brown, gray (FILL)								
380	15		7		2		380.0 / 15.0								
			8		2		Moist, greenish gray, with organics, lean clay (CL) -becomes very moist, yellowish brown, light brown and gray mottled								
			9		2										
375	20		10		2		-becomes very moist								
			11		2		-becomes moist								
370	25		12		2		-very moist 25'-25.5								
			13		2										
			14		2		-wet seam at 29'								
365	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-27

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
365	30		15		2										
			16		2		-becomes very moist								
			17		2		-becomes moist								
360	35		18		2										
							Elevation (feet) 357.0 Depth (feet) 38.0								
							End of Boring at 38 ft								
355	40														
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-28

Date(s) Drilled	05/07/2019 12:00 AM to 05/07/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	40.2 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	394 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -900 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						394.0 / 0.0								
							393.5 / 0.5 Moist, yellow brown, lean clay (CL) (FILL)								
							Very moist, black, bottom ash and fly ash								
			1		3		Moist, gray, mixture of fly ash and lime								
390															
	5		2		2										
			3		2										
385			4		2										
							384.5 / 9.5								
	10						Moist, yellowish brown, light brown, lean clay (CL) (RESIDUUM)								
			5		2										
			6		2										
380															
	15		7		2		-with wet seam at 15'								
			8		2										
375			9		2										
	20														
			10		2		-very moist 20.5'-21.5'								
			11		2		-becomes light brown, yellowish brown, with black ferrous modules								
370															
	25		12		2										
			13		2										
365			14		2										
	30														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-28

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		15		2		-with orange-brown weathered sandstone modules								
			16		2		-becomes very moist								
360	35		17		2		-becomes moist								
			18		2										
355			19		2		Elevation (feet) 354.5 Depth (feet) 39.5								
	40		20		.2		353.8 SANDSTONE, yellow-brown, poorly cemented 40.2								
							End of Boring at 40.2 ft								
350	45														
345	50														
340	55														
335	60														
330	65														

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GESB-29

Sheet 1 of 1

Date(s) Drilled	05/08/2019 12:00 AM to 05/08/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	25.2 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	393 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N E -1050 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
393	0						Elevation (feet) 393.0 / Depth (feet) 0.0								
							Moist, yellow-brown, brown, lean clay (CL)								
392	1		1		3.5		392.0 / 1.0								
							Moist, gray, mixture of fly ash and lime								
390															
	5		2		2										
			3		2		386.0 / 7.0								
385							Moist, yellowish brown and gray mottled, fat clay (CH)								
	10		4		2										
			5		2										
							380.5 / 12.5								
380			6		2		Very moist, yellowish brown, light brown, lean clay (CL) with sand								
							379.0 / 14.0								
	15		7		2		Moist, with very moist seams, yellow-brown, with gray mottled, fat clay (CH)								
			8		2										
375															
			9		2		-very moist 19'-19.5'								
	20		10		2		-wet seams 20.5'-21.5'								
							371.0 / 22.0								
370			11		2		Very moist to wet, yellowish brown, yellow, sandy lean clay (CL)								
			12		1.2		368.5 / 24.5								
	25						367.8 / 25.2 Weathered SANDSTONE, brown, yellowish brown								
							End of Boring at 25.2 ft								
365															
	30														

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AECOM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GNWSB-1

Sheet 1 of 1

Date(s) Drilled	05/08/2019 12:00 AM to 05/08/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	15.5 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	418 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N 1500 E 1000 (ft NAD83)	Groundwater Level(s)	11 ft on 5/8/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
	0						418.0 / 0.0 Moist, orange brown, lean clay (CL) (FILL)								
							417.0 / 1.0 Moist, brown, lean clay (CL) (RESIDUUM)								
415			1		3		-becomes reddish yellow, with fine sand								
	5						-becomes light brown								
			2		3		412.5 / 5.5 -becomes wet; Moist, yellowish brown with gray mottled and black ferrous modules, fat clay (CH)								
410															
	10		3		4		-becomes reddish yellow, with weathered sandstone fragment								
							- wet seam, brown staining								*Water encountered at 11 ft bgs during drilling.*
405			4		3.5		405.0 / 13.0 Highly weathered SHALE, gray, friable								
	15						402.5 / 15.5 End of Boring at 15.5 ft								
400															
	20														
395															
	25														
390															
	30														

AECOM

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:48:09 PM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GNWSB-2

Sheet 1 of 1

Date(s) Drilled	05/08/2019 12:00 AM to 05/08/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	10.2 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	411 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N 1450 E 1000 (ft NAD83)	Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
410	0						Elevation (feet) 411.0 / Depth (feet) 0.0								
							Moist, orange brown, lean clay (CL) (FILL)								
							410.0 / 1.0								
			1		3		Moist, dark gray, greenish gray, lean clay (CL)								
							Very moist, reddish yellow, lean clay (CL)								
405	5		2		3		-becomes yellowish brown, orange, with black ferrous modules								
							403.0 / 8.0								
			3		2.2		Moist, yellowish brown, orange, with gray mottled, fat clay (CH)								
							402.0 / 9.0								
400	10						Moist, yellowish red, sandy lean clay (CL) with weathered sandstone fragments								
							400.8 / 10.2								
							End of Boring at 10.2 ft								
395	15														
390	20														
385	25														
	30														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:48:13 PM

AECOM

Project: Sebree Station, Green Landfill Cutoff Trench

Project Location: Webster County, Kentucky

Project Number: 60601031

Log of Boring GNWSB-3

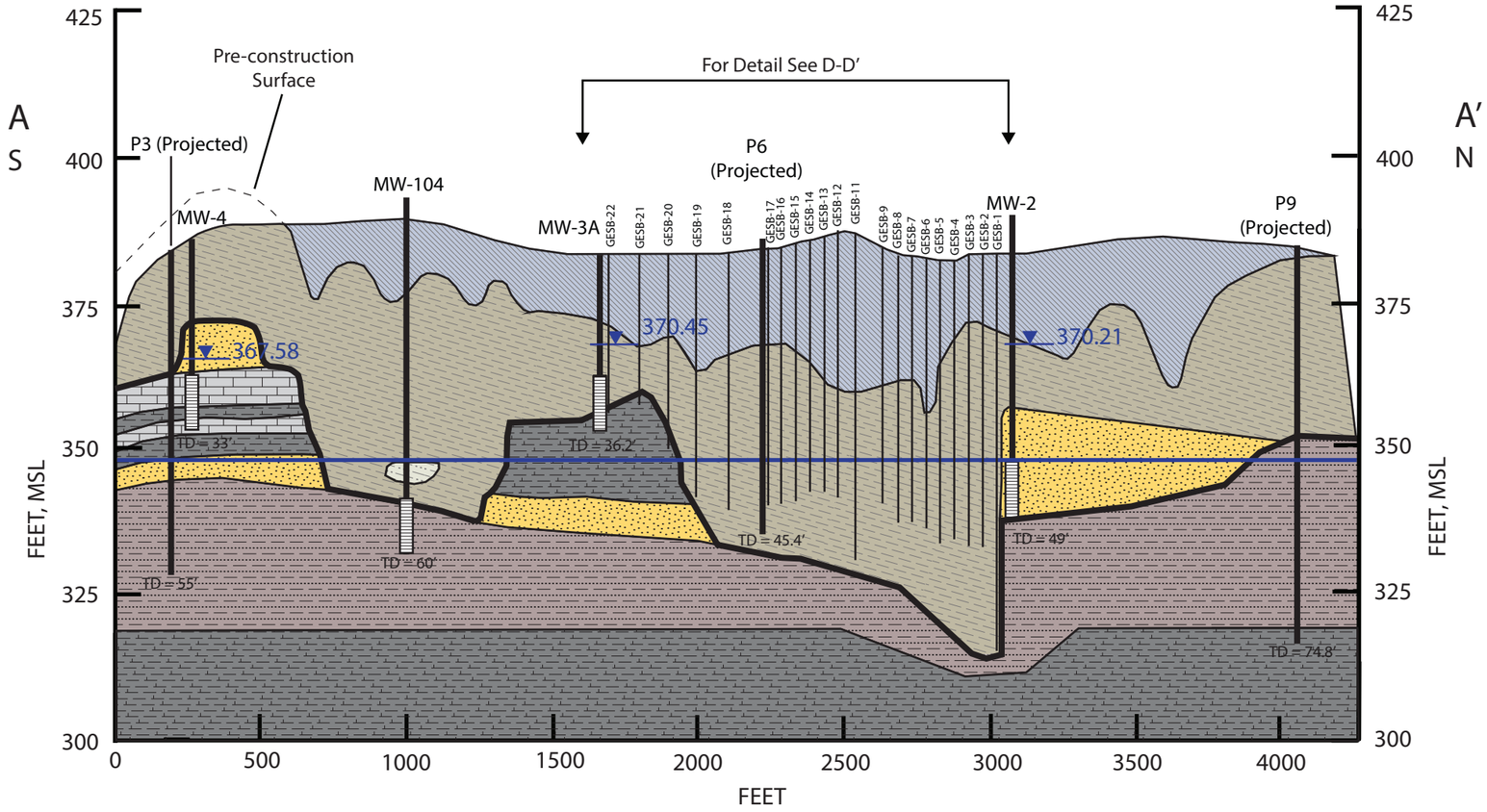
Sheet 1 of 1

Date(s) Drilled	05/08/2019 12:00 AM to 05/08/2019 12:00 AM	Logged By	M. Keown	Checked By	
Drilling Method	GeoProbe Core	Drill Bit Size/Type	GeoProbe Core	Borehole Depth	11.0 ft
Drill Rig Type	GeoProbe 7822DT	Drilling Contractor	AST Environmental	Surface Elevation	411 ft NAVD88
Borehole Backfill	Bentonite Chips	Sampling Method(s)	Direct Push	Hammer Data	N/A
Boring Location	N 1500 E 1050 (ft NAD83)	Groundwater Level(s)	6 ft on 5/8/2019		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
							Elevation (feet) / Depth (feet)								
410	0						411.0 / 0.0 Moist, orange-brown, brown, lean clay with sand (CL) (FILL)								
			1		3		409.0 / 2.0 Moist, gray-brown, dark gray, lean clay (CL) with root fibers								
405	5		2		2.5		-wet seam at 5'								
							404.5 / 6.5 -becomes wet; Moist, reddish yellow, fat clay (CH) with sandstone fragments								*Water encountered at 6 ft bgs during drilling.*
400	10		3		3		-becomes gray, dark gray								
							400.0 / 11.0 -becomes orange-brown, sandy; End of Boring at 11 ft								
395	15														
390	20														
385	25														
	30														

Report: GEO_SOIL; File G:\LOUISVILLE\DCS\PROJECTS\BIG RIVERS\60601031 - GREEN GEOPROBING\400_TECHNICAL\LOGS\GREEN LANDFILL LOGS DRAFT.GPJ; 5/21/2019 1:48:16 PM

AECOM



LEGEND

UNCONSOLIDATED MATERIALS:

- Fill
- Silt
- Silty Clay
- Clayey Silt

BEDROCK LITHOLOGIES:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale

- Potentiometric Surface September 28, 2018
- Green River Elevation (348 ft)

MW-2
MONITORING WELL LOCATION ID
RISER
MONITORING WELL SCREEN
BACKFILL / COLLAPSE

25 feet
500 feet
(Vertical Exaggeration = 20x)

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 4
CROSS SECTION A - A'

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: MRH	
JOB NO. 60602365	

\\Na.aecomnet.com\GFS\AMER\Cincinnati\DCS\Projects\ENV\

Appendix C

Northwest Seep Laboratory Analytical Results

McCOY & McCOY LABORATORIES, Inc.
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Certificate of Analysis
9042044

Chad Phillips
Big Rivers Electric Corporation Reid/Green Station
PO Box 24
Henderson KY, 42419

Customer ID: 44-102032
Report Printed: 04/16/2019 10:36

Project Name:	Reid/Green/Sebree Station	Workorder:	9042044

Dear Chad Phillips

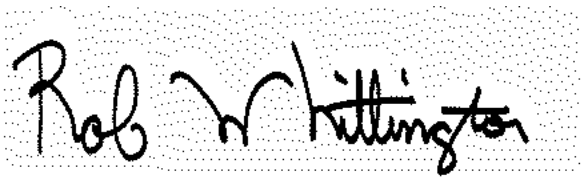
Enclosed are the analytical results for samples received at one of our laboratories on 04/03/2019 12:12.

McCoy & McCoy Laboratories, Inc. is a commercial laboratory accredited by various state and national authorities, including Indiana, Kentucky, Tennessee, and Virginia's National Environmental Laboratory Accreditation Program (NELAP). With the NELAP accreditation, applicable test results are certified to meet the requirements of the National Environmental Laboratory Accreditation Program.

If you have any questions concerning this report please contact the individual listed below.

Please visit our website at www.mccoylabs.com for a listing of the NELAP accreditations and Scope of Work, as well as, links to other scientific organizations.

ACCREDITED IN ACCORDANCE WITH nelac
#460210
Madisonville



Rob Whittington, Project Manager

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

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SAMPLE SUMMARY

Lab ID	Client Sample ID/Alias	Matrix	Date Collected	Date Received	Sampled By
9042044-01	RS1/Green Landfill Site	Water	04/02/2019 15:45	04/03/2019 12:12	Gregory Dick
9042044-02	SW-CULVERT-1/Green Landfill Site	Water	04/02/2019 13:43	04/03/2019 12:12	Gregory Dick

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ANALYTICAL RESULTS

Lab Sample ID: **9042044-01**
Description: **RS1 Green Landfill Site**

Sample Collection Date Time: 04/02/2019 15:45
Sample Received Date Time: 04/03/2019 12:12

Volatile Organic Compounds

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
1,1,1-Trichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,1,2,2-Tetrachloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,1,2-Trichloroethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,1-Dichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,1-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2,4-Trichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2,4-Trimethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2-Dichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,2-Dichloropropane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,3,5-Trimethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,3-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,3-Dichloropropane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
1,4-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
2-Butanone	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
2-Chloroethylvinyl Ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
2-Hexanone	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
2-Nitropropane	ND	U	ug/L	10	5	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
4-Methyl-2-pentanone	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Acetone	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Acrolein	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Acrylonitrile	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Benzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Bromodichloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Bromoform	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Bromomethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Carbon disulfide	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Carbon tetrachloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Chlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Chloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Chloroform	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Chloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
cis-1,2-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
cis-1,3-Dichloropropene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Dibromochloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Dichlorodifluoromethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Diethyl ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Ethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Hexachloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Isopropylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
m,p-Xylene	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Methyl tert-Butyl Ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Methylene Chloride	**2**	J	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM

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Volatile Organic Compounds

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Nitrobenzene	ND	U	ug/L	10	5	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
o-Xylene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Styrene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Tetrachloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Tetrahydrofuran	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Toluene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
trans-1,2-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
trans-1,3-Dichloropropene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Trichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Trichlorofluoromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Vinyl Acetate	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM
Vinyl chloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:02	HEM

Surrogate: Bromofluorobenzene	*94.3 %*	*85.1-114.2*	*04/03/2019 16:52*	*04/04/2019 16:02*	*HEM*	*SW846-8260 B*

Base Neutral and Acid Extractable Organics

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
1,2,4-Trichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
1,2-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
1,2-Diphenylhydrazine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
1,3-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
1,4-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,2'-oxybis-(1-Chloropropane)	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4,5-Trichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4,6-Trichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4-Dichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4-Dimethylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4-Dinitrophenol	ND	L2, V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,4-Dinitrotoluene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2,6-Dinitrotoluene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Chloronaphthalene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Chlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Methylnaphthalene	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
2-Nitrophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
3,3'-Dichlorobenzidine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
3-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4,6-Dinitro-2-methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Bromophenyl-phenylether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Chloro-3-methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Chloroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Chlorophenyl-phenylether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Methylphenol	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
4-Nitrophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Acenaphthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Acenaphthylene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR

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Base Neutral and Acid Extractable Organics

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
alpha-Terpineol	ND	V7, U	ug/L	5		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Anthracene	ND	L2, U	ug/L	15		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzidine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(a)anthracene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(a)pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(b)fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(g,h,i)perylene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzo(k)fluoranthene	ND	L1, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzoic acid	ND	V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Benzyl alcohol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Bis(2-chloroethoxy)methane	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Bis(2-chloroethyl) ether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Bis(2-ethylhexyl)phthalate	ND	L2, U	ug/L	40		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Butylbenzylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Carbazole	ND	V7, U	ug/L	11		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Chrysene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Dibenzo(a,h)anthracene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Dibenzofuran	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Diethylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Dimethylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Di-n-butylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Di-n-octylphthalate	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Fluorene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Hexachlorobenzene	ND	L2, U	ug/L	13		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Hexachlorobutadiene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Hexachlorocyclopentadiene	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Hexachloroethane	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Indeno(1,2,3-cd)pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Isophorone	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Naphthalene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Nitrobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
N-Nitrosodimethylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
N-Nitroso-di-n-propylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
N-Nitrosodiphenylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Pentachlorophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Phenanthrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Phenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR
Pyridine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 15:37	JDR

Surrogate: 2,4,6-Tribromophenol	*59.2 %*	*45-85*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: 2-Fluorobiphenyl	*59.8 %*	*16-99*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: 2-Fluorophenol	*39.0 %*	*30-77*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: Nitrobenzene-d5	*49.6 %*	*25-157*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: Phenol-d6	*48.5 %*	*21-93*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*
Surrogate: Terphenyl-d14	*74.6 %*	*30-125*	*04/03/2019 17:00*	*04/08/2019 15:37*	*JDR*	*SW846-8270 C*

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Metals by EPA 200 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Aluminum	**0.27**	D2, J	mg/L	0.40	0.14	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Antimony	ND	U	mg/L	0.005	0.002	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Arsenic	ND	D3, U	mg/L	0.0100	0.0020	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Barium	**0.098**		mg/L	0.004	0.001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Beryllium	ND	D2, U	mg/L	0.0200	0.0100	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Boron	**1.15**	D2	mg/L	1.00	1.00	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:13	AKB
Cadmium	**0.0005**	J	mg/L	0.0010	0.0001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Calcium	**1150**	D1	mg/L	400	130	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:29	AKB
Chromium	ND	D2, U	mg/L	0.0200	0.0060	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Cobalt	ND	D2, U	mg/L	0.040	0.040	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Copper	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Iron	**18.1**	D2	mg/L	1.20	0.500	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:13	AKB
Lead	**0.002**		mg/L	0.002	0.0005	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Lithium	**0.06**	D2, J	mg/L	0.20	0.05	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Magnesium	**49.6**	D2	mg/L	2.00	0.900	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:13	AKB
Manganese	**20.5**	D1	mg/L	0.400	0.200	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:16	AKB
Mercury	ND	U	mg/L	0.0005	0.0002	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Molybdenum	ND	D2, U	mg/L	0.10	0.02	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Nickel	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Potassium	**301**	D1, L1	mg/L	50.0	22.0	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:26	AKB
Selenium	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Silver	ND	U	mg/L	0.0010	0.0004	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Sodium	**277**	D1	mg/L	26.0	10.0	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:26	AKB
Thallium	ND	U	mg/L	0.0020	0.0001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 11:59	DMH
Vanadium	ND	D2, U	mg/L	0.040	0.020	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH
Zinc	ND	D2, U	mg/L	0.20	0.20	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 19:54	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Total Dissolved Solids	**6770**		mg/L	50	50	2540 C-1997	04/04/2019 17:06	04/05/2019 16:24	JTL
Total Suspended Solids	**336**		mg/L	10.0	10.0	2540 D-2011	04/04/2019 16:10	04/04/2019 16:10	ARC

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst

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Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	**4090**	D	mg/L	200	128	EPA 300.0 REV 2.1	04/04/2019 09:33	04/04/2019 09:33	CSC
Fluoride	ND	U	mg/L	0.2		EPA 300.0 REV 2.1	04/04/2019 09:17	04/04/2019 09:17	CSC
Sulfate	**3040**	D	mg/L	100	50.0	EPA 300.0 REV 2.1	04/04/2019 09:17	04/04/2019 09:17	CSC

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ANALYTICAL RESULTS

Lab Sample ID: **9042044-02**
Description: **SW-CULVERT-1 Green Landfill Site**

Sample Collection Date Time: 04/02/2019 13:43
Sample Received Date Time: 04/03/2019 12:12

Volatile Organic Compounds

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
1,1,1-Trichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,1,2,2-Tetrachloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,1,2-Trichloroethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,1-Dichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,1-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2,4-Trichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2,4-Trimethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2-Dichloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,2-Dichloropropane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,3,5-Trimethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,3-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,3-Dichloropropane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
1,4-Dichlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
2-Butanone	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
2-Chloroethylvinyl Ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
2-Hexanone	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
2-Nitropropane	ND	U	ug/L	10	5	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
4-Methyl-2-pentanone	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Acetone	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Acrolein	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Acrylonitrile	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Benzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Bromodichloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Bromoform	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Bromomethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Carbon disulfide	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Carbon tetrachloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Chlorobenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Chloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Chloroform	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Chloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
cis-1,2-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
cis-1,3-Dichloropropene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Dibromochloromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Dichlorodifluoromethane	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Diethyl ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Ethylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Hexachloroethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Isopropylbenzene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
m,p-Xylene	ND	U	ug/L	5	3	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Methyl tert-Butyl Ether	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Methylene Chloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM

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Volatile Organic Compounds

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Nitrobenzene	ND	U	ug/L	10	5	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
o-Xylene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Styrene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Tetrachloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Tetrahydrofuran	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Toluene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
trans-1,2-Dichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
trans-1,3-Dichloropropene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Trichloroethene	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Trichlorofluoromethane	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Vinyl Acetate	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM
Vinyl chloride	ND	U	ug/L	5	2	SW846-8260 B	04/03/2019 16:52	04/04/2019 16:33	HEM

Surrogate: Bromofluorobenzene	*92.4 %*	*85.1-114.2*	*04/03/2019 16:52*	*04/04/2019 16:33*	*HEM*	*SW846-8260 B*

Base Neutral and Acid Extractable Organics

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
1,2,4-Trichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
1,2-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
1,2-Diphenylhydrazine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
1,3-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
1,4-Dichlorobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,2'-oxybis-(1-Chloropropane)	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4,5-Trichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4,6-Trichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4-Dichlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4-Dimethylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4-Dinitrophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,4-Dinitrotoluene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2,6-Dinitrotoluene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Chloronaphthalene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Chlorophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Methylnaphthalene	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
2-Nitrophenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
3,3'-Dichlorobenzidine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
3-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4,6-Dinitro-2-methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Bromophenyl-phenylether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Chloro-3-methylphenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Chloroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Chlorophenyl-phenylether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Methylphenol	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Nitroaniline	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
4-Nitrophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Acenaphthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Acenaphthylene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR

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Base Neutral and Acid Extractable Organics

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
alpha-Terpineol	ND	V7, U	ug/L	5		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Anthracene	ND	L2, U	ug/L	15		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzidine	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(a)anthracene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(a)pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(b)fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(g,h,i)perylene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzo(k)fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzoic acid	ND	V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Benzyl alcohol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Bis(2-chloroethoxy)methane	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Bis(2-chloroethyl) ether	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Bis(2-ethylhexyl)phthalate	**105**	J, L2	ug/L	40		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Butylbenzylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Carbazole	ND	V7, U	ug/L	11		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Chrysene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Dibenzo(a,h)anthracene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Dibenzofuran	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Diethylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Dimethylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Di-n-butylphthalate	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Di-n-octylphthalate	ND	L2, V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Fluoranthene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Fluorene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Hexachlorobenzene	ND	L2, U	ug/L	13		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Hexachlorobutadiene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Hexachlorocyclopentadiene	ND	L2, V7, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Hexachloroethane	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Indeno(1,2,3-cd)pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Isophorone	ND	U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Naphthalene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Nitrobenzene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
N-Nitrosodimethylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
N-Nitroso-di-n-propylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
N-Nitrosodiphenylamine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Pentachlorophenol	ND	V7, L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Phenanthrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Phenol	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Pyrene	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR
Pyridine	ND	L2, U	ug/L	10		SW846-8270 C	04/03/2019 17:00	04/08/2019 16:06	JDR

Surrogate: 2,4,6-Tribromophenol	*58.3 %*	*45-85*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: 2-Fluorobiphenyl	*64.0 %*	*16-99*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: 2-Fluorophenol	*39.7 %*	*30-77*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: Nitrobenzene-d5	*59.8 %*	*25-157*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: Phenol-d6	*46.8 %*	*21-93*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*
Surrogate: Terphenyl-d14	*73.7 %*	*30-125*	*04/03/2019 17:00*	*04/08/2019 16:06*	*JDR*	*SW846-8270 C*

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Metals by EPA 200 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Aluminum	ND	U, D2	mg/L	0.40	0.14	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Antimony	ND	U	mg/L	0.005	0.002	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Arsenic	ND	D3, U	mg/L	0.0100	0.0020	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Barium	**0.043**		mg/L	0.004	0.001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Beryllium	ND	D2, U	mg/L	0.0200	0.0100	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Boron	ND	D2, U	mg/L	1.00	1.00	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:19	AKB
Cadmium	ND	U	mg/L	0.0010	0.0001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Calcium	**203**	D1	mg/L	40.0	13.0	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:23	AKB
Chromium	ND	D2, U	mg/L	0.0200	0.0060	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Cobalt	ND	D2, U	mg/L	0.040	0.040	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Copper	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Iron	ND	D2, U	mg/L	1.20	0.500	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:19	AKB
Lead	ND	U	mg/L	0.002	0.0005	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Lithium	**0.11**	D2, J	mg/L	0.20	0.05	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Magnesium	**37.8**	D2	mg/L	2.00	0.900	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:19	AKB
Manganese	**0.227**	D2	mg/L	0.040	0.020	EPA 200.7 REV 4.4	04/05/2019 11:19	04/08/2019 15:19	AKB
Mercury	ND	U	mg/L	0.0005	0.0002	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Molybdenum	ND	D2, U	mg/L	0.10	0.02	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Nickel	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Potassium	**21.1**	D2, L1	mg/L	5.00	2.20	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:32	AKB
Selenium	ND	D2, U	mg/L	0.030	0.010	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Silver	ND	U	mg/L	0.0010	0.0004	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Sodium	**49.9**	D2	mg/L	2.60	1.00	EPA 200.7 REV 4.4	04/05/2019 11:19	04/09/2019 11:32	AKB
Thallium	**0.0001**	J	mg/L	0.0020	0.0001	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 12:06	DMH
Vanadium	ND	D2, U	mg/L	0.040	0.020	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH
Zinc	ND	D2, U	mg/L	0.20	0.20	EPA 200.8 REV 5.4	04/05/2019 11:19	04/10/2019 20:01	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Specific Conductance (Lab)	**1630**		umhos/cm	1	1	2510 B-2011	04/04/2019 16:31	04/04/2019 16:31	TLB

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst

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Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Bromide	ND	U	mg/L	4.0		EPA 300.1	04/15/2019 23:29	04/15/2019 23:29	CSC
Chloride	**344**	D	mg/L	40.0	25.6	EPA 300.0 REV 2.1	04/04/2019 10:23	04/04/2019 10:23	CSC
Fluoride	ND	M1, U	mg/L	0.2		EPA 300.0 REV 2.1	04/04/2019 10:23	04/04/2019 10:23	CSC
Sulfate	**401**	D, M1	mg/L	20.0	10.0	EPA 300.0 REV 2.1	04/04/2019 10:23	04/04/2019 10:23	CSC

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Notes for work order 9042044

- Samples collected by MMLI personnel are done so in accordance with procedures set forth in MMLI field services SOPs.
- Results contained in this report are only representative of the samples received.
- MMLI does not provide interpretation of these results unless otherwise stated.
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identification based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.

Qualifiers

D	Results reported from dilution.
D1	Sample required dilution due to high concentration of target analyte.
D2	Sample required dilution due to matrix interference.
D3	Sample dilution required due to insufficient sample.
E	Concentration exceeds calibration range
J	Estimated value.
J5	Concentration estimated. Internal standard recoveries did not meet method acceptance criteria.
L1	The associated blank spike recovery was above method acceptance limits.
L2	The associated blank spike recovery was below method acceptance limits.
M1	Matrix spike recovery was high; the method control sample recovery was acceptable.
M2	Matrix spike recovery was low; the method control sample recovery was acceptable.
M3	The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable.
M4	The analysis of the spiked sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable.
S2	Surrogate recovery was below method acceptance limits.
U	Target analyte was analyzed for, but was below detection limit (the value associated with the qualifier is the laboratory method detection limit in our LIMS system).
V7	CCV was below the method control limit for this analyte; however the average % difference or % drift for all the analytes met method criteria.
Y1	Sample RPD exceeded the method control limit.
Y2	MS/MSD RPD exceeded the method control limit. Recovery met acceptance criteria.

Standard Quallifiers/Acronymns

MDL	Method Detection Limit
MRL	Minimum Reporting Limit
ND	Not Detected
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
% Rec	Percent Recovery
RPD	Relative Percent Difference
>	Greater than
<	Less than

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Certified Analyses included in this Report

Analyte	Certifications
2510 B-2011 in Water	
Specific Conductance (Lab)	KY Drinking Water Mdv (00030)
2540 C-1997 in Water	
Total Dissolved Solids	KY Drinking Water Mdv (00030)
2540 D-2011 in Water	
EPA 200.7 REV 4.4 in Water	
Iron	KY Wastewater Mdv (00030)
EPA 200.8 REV 5.4 in Water	
Mercury	KY Drinking Water Mdv (00030)
EPA 300.0 REV 2.1 in Water	
Chloride	KY Drinking Water Mdv (00030)
Fluoride	KY Drinking Water Mdv (00030)
Sulfate	KY Drinking Water Mdv (00030)
EPA 300.1 in Water	
Bromide	KY Drinking Water Mdv (00030)
SW846-8260 B in Water	
SW846-8270 C in Water	

Sample Acceptance Checklist for Work Order 9042044

Shipped By: Client

Temperature: 0.90° Celcius

Condition	
Check if custody seals were present/intact.	☐
Check if any containers were received damaged.	☐
Check if COC was submitted and complete.	☑
Check if COC agreed with sample labels.	☑
Check if all containers on COC were received	☑
Check if all samples had appropriate containers.	☑
Check if all samples had appropriate volumes.	☑
Check if collection methods were recorded on COC.	☑
Check if flow units were recorded on COC.	☐
Check if any headspace issues with volatile sample	☐
Check if holding times were acceptable.	☑
Check if all containers were preserved properly.	☑

BIG RIVERS ELECTRIC CORP.
CHAIN OF CUSTODY RECORD

No. 1 of 2

Sampling Location: Green Landfill

WO# 9042044

Plant ID. Sample Number	Date Time	Central Lab ID. Sample Number	Station Description	Sampling Method	Sample Size	Type of Preservation	Analysis Requested
-	4/2/2019 3:45 PM	-	"RS1"	G	500 ml	NONE, 4°C	Chloride, Sulfate, Fluoride
-	4/2/2019 3:45 PM	-	"RS1"	G	250 ml	HNO_3, 4°C	Total Metals (see attached)
-	4/2/2019 3:45 PM	-	"RS1"	G	250 ml	HNO_3, 4°C	Total Metals (see attached)
-	4/2/2019 3:45 PM	-	"RS1"	G	1L	NONE, 4°C	sVOC 2
-	4/2/2019 3:45 PM	-	"RS1"	G	500 ml	NONE, 4°C	TDS, TSS
-	4/2/2019 3:45 PM	-	"RS1"	G	40 ml	4°C, HCl	VOC 3

Samplers (Signatures)
Meg Quick

Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Meg Quick	4/3/2019	1212		4-3-19	12:12
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time

White Copy - Central Lab
Yellow Copy - Plant (Final Copy)
Pink Copy - Plant Env. Contact
Gold Copy - Plant Lab

0.90

BIG RIVERS ELECTRIC CORP.
CHAIN OF CUSTODY RECORD

No. 2 of 2

Sampling Location: Green Landfill

WO#9042044

Plant ID. Sample Number	Date Time	Central Lab ID. Sample Number	Station Description	Sampling Method	Sample Size	Type of Preservation	Analysis Requested
-	4/2/2019 1343	-	"SW-Culvert-1"	G	500 ml	None, 4°C	Conductivity Bromide, Fluoride, Sulfate, Chloride
-	4/2/2019 1343	-	"SW-Culvert-1"	G	40 ml	4°C, HCl	VOC
-	4/2/2019 1343	-	"SW-Culvert-1"	G	1L	4°C	sVOC
-	4/2/2019 1343	-	"SW-Culvert-1"	G	250 ml	HNO_3, 4°C	Total Metals (see attached)
-	4/2/2019 1343	-	"SW-Culvert-1"	G	250 ml	HNO_3, 4°C	Total Metals (see attached)
-							

3

Samplers (Signatures) Meg Quick

	Date	Time		Date	Time
Relinquished By (Signature) Meg Quick	4/3/2019	1212	Received By (Signature)	4-3-19	12:12
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time
Relinquished By (Signature)	Date	Time	Received By (Signature)	Date	Time

White Copy - Central Lab
Yellow Copy - Plant (Final Copy)
Pink Copy - Plant Env. Contact
Gold Copy - Plant Lab

WO #
9042044

Green Landfill –Constituent List

Antimony
Aluminum
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Sodium
Silver
Thallium
Vanadium
Zinc

Mary Quirk
BREC
4/3/2019
12:12

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

Laboratory Job ID: 490-172013-1
Laboratory Sample Delivery Group: Sebree Station
Client Project/Site: Sebree Station

For:
Big Rivers Electric Corporation
PO BOX 24
Henderson, Kentucky 42419

Attn: Mark Bertram

Roxanne Cisneros

Authorized for release by:
4/24/2019 3:38:21 PM

Roxanne Cisneros, Senior Project Manager
(615)301-5761
roxanne.cisneros@testamericainc.com

Table of Contents

Sample Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-172013-1	023	Water	04/11/19 11:25	04/12/19 09:55

Job ID: 490-172013-1

Laboratory: Eurofins TestAmerica, Nashville

Narrative

Job Narrative
490-172013-1

Comments
No additional comments.

Receipt
The sample was received on 4/12/2019 9:55 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 0.6º C.

HPLC/IC
Method(s) 9056A: The following sample was diluted due to the nature of the sample matrix: 023 (490-172013-1). 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 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.

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

Definitions/Glossary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
F1	MS and/or MSD Recovery 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.

Metals

Qualifier	Qualifier Description
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.
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.

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Client Sample ID: 023

Date Collected: 04/11/19 11:25
Date Received: 04/12/19 09:55

Lab Sample ID: 490-172013-1

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	864		600	40.0	mg/L			04/16/19 12:06	200
Fluoride	0.0356	J	1.00	0.0100	mg/L			04/15/19 15:10	1
Sulfate	548	B	100	0.600	mg/L			04/16/19 11:33	20

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.766		0.0500	0.00959	mg/L		04/16/19 11:19	04/22/19 16:56	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0000690	J B	0.00200	0.0000213	mg/L		04/16/19 11:17	04/17/19 11:26	1
Arsenic	0.000759	J	0.00500	0.000118	mg/L		04/16/19 11:17	04/17/19 11:26	1
Barium	0.0557	J B	0.200	0.000270	mg/L		04/16/19 11:17	04/17/19 11:26	1
Beryllium	ND		0.00200	0.000102	mg/L		04/16/19 11:17	04/17/19 11:26	1
Boron	0.626	J B	1.00	0.00339	mg/L		04/16/19 11:17	04/17/19 11:26	1
Cadmium	0.000411	J	0.00100	0.000152	mg/L		04/16/19 11:17	04/17/19 11:26	1
Calcium	488		1.00	0.0412	mg/L		04/16/19 11:17	04/17/19 11:26	1
Chromium	0.00281	J	0.00300	0.000339	mg/L		04/16/19 11:17	04/17/19 11:26	1
Cobalt	0.000450	J	0.00500	0.0000218	mg/L		04/16/19 11:17	04/17/19 11:26	1
Lead	0.000140	J	0.00500	0.0000675	mg/L		04/16/19 11:17	04/17/19 11:26	1
Molybdenum	0.0110		0.0100	0.000873	mg/L		04/16/19 11:17	04/17/19 11:26	1
Potassium	69300		1000	147	ug/L		04/16/19 11:17	04/17/19 11:26	1
Selenium	ND		0.0100	0.000348	mg/L		04/16/19 11:17	04/17/19 11:26	1
Thallium	0.0000670	J	0.00100	0.0000360	mg/L		04/16/19 11:17	04/17/19 11:26	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.000200	0.000100	mg/L		04/18/19 12:23	04/18/19 17:30	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.13		0.100	0.100	SU			04/18/19 18:32	1
Temperature	22.8		0.100	0.100	Degrees C			04/18/19 18:32	1
Total Dissolved Solids	2850		100	28.0	mg/L			04/15/19 16:11	1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 490-588042/3
Matrix: Water
Analysis Batch: 588042

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			04/15/19 11:18	1
Fluoride	ND		1.00	0.0100	mg/L			04/15/19 11:18	1
Sulfate	0.2213	J	5.00	0.0300	mg/L			04/15/19 11:18	1

Lab Sample ID: LCS 490-588042/4
Matrix: Water
Analysis Batch: 588042

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.265		mg/L		93	80 - 120
Fluoride	1.00	0.9279	J	mg/L		93	80 - 120
Sulfate	10.0	9.611		mg/L		96	80 - 120

Lab Sample ID: LCSD 490-588042/5
Matrix: Water
Analysis Batch: 588042

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.373		mg/L		94	80 - 120	1	20
Fluoride	1.00	0.9700	J	mg/L		97	80 - 120	4	20
Sulfate	10.0	9.661		mg/L		96	80 - 120	1	20

Lab Sample ID: 490-172052-B-1 MS
Matrix: Water
Analysis Batch: 588042

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	2.12	J	10.0	14.02		mg/L		119	80 - 120
Fluoride	0.0156	J F1	1.00	1.417	F1	mg/L		140	80 - 120
Sulfate	0.601	J B F1	10.0	13.20	F1	mg/L		126	80 - 120

Lab Sample ID: 490-172052-B-1 MSD
Matrix: Water
Analysis Batch: 588042

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	2.12	J	10.0	13.02		mg/L		109	80 - 120	7	20
Fluoride	0.0156	J F1	1.00	1.338	F1	mg/L		132	80 - 120	6	20
Sulfate	0.601	J B F1	10.0	12.63		mg/L		120	80 - 120	4	20

Lab Sample ID: MB 490-588250/3
Matrix: Water
Analysis Batch: 588250

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			04/16/19 10:10	1
Fluoride	ND		1.00	0.0100	mg/L			04/16/19 10:10	1
Sulfate	0.2110	J	5.00	0.0300	mg/L			04/16/19 10:10	1

Method: 9056A - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 490-588250/4
Matrix: Water
Analysis Batch: 588250

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chloride			10.0	9.351		mg/L		93	80 - 120		
Fluoride			1.00	0.9880	J	mg/L		99	80 - 120		
Sulfate			10.0	9.710		mg/L		97	80 - 120		

Lab Sample ID: LCSD 490-588250/5
Matrix: Water
Analysis Batch: 588250

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride			10.0	9.359		mg/L		93	80 - 120	0	20
Fluoride			1.00	0.9895	J	mg/L		99	80 - 120	0	20
Sulfate			10.0	9.756		mg/L		97	80 - 120	0	20

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 180-275853/1-A
Matrix: Water
Analysis Batch: 276485

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 275853

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		04/16/19 11:19	04/22/19 15:56	1

Lab Sample ID: LCS 180-275853/2-A
Matrix: Water
Analysis Batch: 276485

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 275853

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Lithium			1.00	1.006		mg/L		101	80 - 120		

Lab Sample ID: 490-172010-A-3-C MS
Matrix: Water
Analysis Batch: 276485

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 275853

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Lithium	0.0313	J	1.00	1.065		mg/L		103	75 - 125		

Lab Sample ID: 490-172010-A-3-D MSD
Matrix: Water
Analysis Batch: 276485

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 275853

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	0.0313	J	1.00	1.090		mg/L		106	75 - 125	2	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 180-275852/1-A
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00002800	J	0.00200	0.0000213	mg/L		04/16/19 11:17	04/17/19 11:54	1
Arsenic	ND		0.00500	0.000118	mg/L		04/16/19 11:17	04/17/19 11:54	1
Barium	0.0007190	J	0.200	0.000270	mg/L		04/16/19 11:17	04/17/19 11:54	1
Beryllium	ND		0.00200	0.000102	mg/L		04/16/19 11:17	04/17/19 11:54	1
Boron	0.02478	J	1.00	0.00339	mg/L		04/16/19 11:17	04/17/19 11:54	1
Cadmium	ND		0.00100	0.000152	mg/L		04/16/19 11:17	04/17/19 11:54	1
Calcium	ND		1.00	0.0412	mg/L		04/16/19 11:17	04/17/19 11:54	1
Chromium	ND		0.00300	0.000339	mg/L		04/16/19 11:17	04/17/19 11:54	1
Cobalt	ND		0.00500	0.0000218	mg/L		04/16/19 11:17	04/17/19 11:54	1
Lead	ND		0.00500	0.0000675	mg/L		04/16/19 11:17	04/17/19 11:54	1
Molybdenum	ND		0.0100	0.000873	mg/L		04/16/19 11:17	04/17/19 11:54	1
Potassium	ND		1000	147	ug/L		04/16/19 11:17	04/17/19 11:54	1
Selenium	ND		0.0100	0.000348	mg/L		04/16/19 11:17	04/17/19 11:54	1
Thallium	ND		0.00100	0.0000360	mg/L		04/16/19 11:17	04/17/19 11:54	1

Lab Sample ID: LCS 180-275852/2-A
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.500	0.5151		mg/L		103	80 - 120
Arsenic	0.0400	0.03629		mg/L		91	80 - 120
Barium	2.00	2.120		mg/L		106	80 - 120
Beryllium	0.0500	0.05131		mg/L		103	80 - 120
Boron	1.00	1.006		mg/L		101	80 - 120
Cadmium	0.0500	0.05263		mg/L		105	80 - 120
Calcium	50.0	50.60		mg/L		101	80 - 120
Chromium	0.200	0.2148		mg/L		107	80 - 120
Cobalt	0.500	0.4481		mg/L		90	80 - 120
Lead	0.0200	0.02088		mg/L		104	80 - 120
Molybdenum	1.00	0.9910		mg/L		99	80 - 120
Potassium	50000	48340		ug/L		97	80 - 120
Selenium	0.0100	0.01029		mg/L		103	80 - 120
Thallium	0.0500	0.05310		mg/L		106	80 - 120

Lab Sample ID: 490-172010-A-1-B MS
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.000119	J B	0.500	0.5292		mg/L		106	75 - 125
Arsenic	0.00208	J	0.0400	0.03945		mg/L		93	75 - 125
Barium	0.0216	J B	2.00	2.197		mg/L		109	75 - 125
Beryllium	ND		0.0500	0.05176		mg/L		104	75 - 125
Boron	0.271	J B	1.00	1.297		mg/L		103	75 - 125
Cadmium	ND		0.0500	0.05279		mg/L		106	75 - 125
Calcium	502		50.0	557.9	4	mg/L		111	75 - 125
Chromium	0.00360		0.200	0.2213		mg/L		109	75 - 125
Cobalt	0.00522		0.500	0.4645		mg/L		92	75 - 125

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-172010-A-1-B MS
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	0.000233	J	0.0200	0.02146		mg/L		106	75 - 125
Molybdenum	0.00104	J	1.00	1.043		mg/L		104	75 - 125
Potassium	1660		50000	48970		ug/L		95	75 - 125
Selenium	ND		0.0100	0.01059		mg/L		106	75 - 125
Thallium	ND		0.0500	0.05541		mg/L		111	75 - 125

Lab Sample ID: 490-172010-A-1-C MSD
Matrix: Water
Analysis Batch: 276092

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 275852

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	0.000119	J B	0.500	0.5401		mg/L		108	75 - 125	2	20
Arsenic	0.00208	J	0.0400	0.03954		mg/L		94	75 - 125	0	20
Barium	0.0216	J B	2.00	2.231		mg/L		110	75 - 125	2	20
Beryllium	ND		0.0500	0.05116		mg/L		102	75 - 125	1	20
Boron	0.271	J B	1.00	1.238		mg/L		97	75 - 125	5	20
Cadmium	ND		0.0500	0.05362		mg/L		107	75 - 125	2	20
Calcium	502		50.0	566.9	4	mg/L		129	75 - 125	2	20
Chromium	0.00360		0.200	0.2201		mg/L		108	75 - 125	1	20
Cobalt	0.00522		0.500	0.4630		mg/L		92	75 - 125	0	20
Lead	0.000233	J	0.0200	0.02185		mg/L		108	75 - 125	2	20
Molybdenum	0.00104	J	1.00	1.061		mg/L		106	75 - 125	2	20
Potassium	1660		50000	50080		ug/L		97	75 - 125	2	20
Selenium	ND		0.0100	0.01045		mg/L		105	75 - 125	1	20
Thallium	ND		0.0500	0.05523		mg/L		110	75 - 125	0	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 490-588899/1-A
Matrix: Water
Analysis Batch: 589024

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 588899

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.000200	0.000100	mg/L		04/18/19 12:23	04/18/19 17:25	1

Lab Sample ID: LCS 490-588899/2-A
Matrix: Water
Analysis Batch: 589024

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 588899

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00100	0.001058		mg/L		106	80 - 120

Lab Sample ID: 490-172013-1 MS
Matrix: Water
Analysis Batch: 589024

Client Sample ID: 023
Prep Type: Total/NA
Prep Batch: 588899

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		0.00100	0.001196		mg/L		120	75 - 125

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: 490-172013-1 MSD — **Client Sample ID: 023**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 589024 — **Prep Batch: 588899**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		0.00100	0.001191		mg/L		119	75 - 125	0	20

Method: 9040C - pH

Lab Sample ID: LCS 490-589003/1 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 589003

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			7.00	7.040		SU		101	98 - 103		

Lab Sample ID: 490-171598-A-10 DU — **Client Sample ID: Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 589003

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	6.94			6.940		SU				0	20
Temperature	23.0			23.00		Degrees C				0	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 490-586704/1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 586704

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		2.50	0.700	mg/L			04/15/19 16:11	1

Lab Sample ID: LCS 490-586704/2 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 586704

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Dissolved Solids			10.0	9.800		mg/L		98	90 - 110		

Lab Sample ID: 490-172007-E-1 DU — **Client Sample ID: Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 586704

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	3370			3384		mg/L				0.4	20

Lab Sample ID: 490-172013-1 DU — **Client Sample ID: 023**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 586704

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	2850			2772		mg/L				3	20

HPLC/IC

Analysis Batch: 588042

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	9056A	
MB 490-588042/3	Method Blank	Total/NA	Water	9056A	
LCS 490-588042/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-588042/5	Lab Control Sample Dup	Total/NA	Water	9056A	
490-172052-B-1 MS	Matrix Spike	Total/NA	Water	9056A	
490-172052-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056A	

Analysis Batch: 588250

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	9056A	
490-172013-1	023	Total/NA	Water	9056A	
MB 490-588250/3	Method Blank	Total/NA	Water	9056A	
LCS 490-588250/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-588250/5	Lab Control Sample Dup	Total/NA	Water	9056A	

Metals

Prep Batch: 275852

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total Recoverable	Water	3005A	
MB 180-275852/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-275852/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-172010-A-1-B MS	Matrix Spike	Total Recoverable	Water	3005A	
490-172010-A-1-C MSD	Matrix Spike Duplicate	Total Recoverable	Water	3005A	

Prep Batch: 275853

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total Recoverable	Water	3005A	
MB 180-275853/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-275853/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-172010-A-3-C MS	Matrix Spike	Total Recoverable	Water	3005A	
490-172010-A-3-D MSD	Matrix Spike Duplicate	Total Recoverable	Water	3005A	

Analysis Batch: 276092

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total Recoverable	Water	6020A	275852
MB 180-275852/1-A	Method Blank	Total Recoverable	Water	6020A	275852
LCS 180-275852/2-A	Lab Control Sample	Total Recoverable	Water	6020A	275852
490-172010-A-1-B MS	Matrix Spike	Total Recoverable	Water	6020A	275852
490-172010-A-1-C MSD	Matrix Spike Duplicate	Total Recoverable	Water	6020A	275852

Analysis Batch: 276485

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total Recoverable	Water	6010C	275853
MB 180-275853/1-A	Method Blank	Total Recoverable	Water	6010C	275853
LCS 180-275853/2-A	Lab Control Sample	Total Recoverable	Water	6010C	275853
490-172010-A-3-C MS	Matrix Spike	Total Recoverable	Water	6010C	275853
490-172010-A-3-D MSD	Matrix Spike Duplicate	Total Recoverable	Water	6010C	275853

QC Association Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Metals

Prep Batch: 588899

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	7470A	
MB 490-588899/1-A	Method Blank	Total/NA	Water	7470A	
LCS 490-588899/2-A	Lab Control Sample	Total/NA	Water	7470A	
490-172013-1 MS	023	Total/NA	Water	7470A	
490-172013-1 MSD	023	Total/NA	Water	7470A	

Analysis Batch: 589024

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	7470A	588899
MB 490-588899/1-A	Method Blank	Total/NA	Water	7470A	588899
LCS 490-588899/2-A	Lab Control Sample	Total/NA	Water	7470A	588899
490-172013-1 MS	023	Total/NA	Water	7470A	588899
490-172013-1 MSD	023	Total/NA	Water	7470A	588899

General Chemistry

Analysis Batch: 586704

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	SM 2540C	
MB 490-586704/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 490-586704/2	Lab Control Sample	Total/NA	Water	SM 2540C	
490-172007-E-1 DU	Duplicate	Total/NA	Water	SM 2540C	
490-172013-1 DU	023	Total/NA	Water	SM 2540C	

Analysis Batch: 589003

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-172013-1	023	Total/NA	Water	9040C	
LCS 490-589003/1	Lab Control Sample	Total/NA	Water	9040C	
490-171598-A-10 DU	Duplicate	Total/NA	Water	9040C	

Lab Chronicle

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Client Sample ID: 023

Date Collected: 04/11/19 11:25
Date Received: 04/12/19 09:55

Lab Sample ID: 490-172013-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			588042	04/15/19 15:10	SOO	TAL NSH
Total/NA	Analysis	9056A		20			588250	04/16/19 11:33	SOO	TAL NSH
Total/NA	Analysis	9056A		200			588250	04/16/19 12:06	SOO	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	275853	04/16/19 11:19	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			276485	04/22/19 16:56	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	275852	04/16/19 11:17	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1			276092	04/17/19 11:26	RSK	TAL PIT
Total/NA	Prep	7470A			30 mL	30 mL	588899	04/18/19 12:23	CSL	TAL NSH
Total/NA	Analysis	7470A		1			589024	04/18/19 17:30	EHS	TAL NSH
Total/NA	Analysis	9040C		1			589003	04/18/19 18:32	MXX	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	586704	04/15/19 16:11	BMC	TAL NSH

Laboratory References:

TAL NSH = Eurofins TestAmerica, Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Method Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL NSH
6010C	Metals (ICP)	SW846	TAL PIT
6020A	Metals (ICP/MS)	SW846	TAL PIT
7470A	Mercury (CVAA)	SW846	TAL NSH
9040C	pH	SW846	TAL NSH
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL NSH
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL PIT
7470A	Preparation, Mercury	SW846	TAL NSH

Protocol References:

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:

TAL NSH = Eurofins TestAmerica, Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree Station

Job ID: 490-172013-1
SDG: Sebree Station

Laboratory: Eurofins TestAmerica, Nashville

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Kentucky (UST)	State Program	4	19	06-30-19

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
9040C		Water	pH
9040C		Water	Temperature
9056A		Water	Chloride
9056A		Water	Fluoride
9056A		Water	Sulfate
SM 2540C		Water	Total Dissolved Solids

Laboratory: Eurofins TestAmerica, Pittsburgh

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Arkansas DEQ	State Program	6	88-0690	06-27-19
California	State Program	9	2891	04-30-19 *
Connecticut	State Program	1	PH-0688	09-30-20
Florida	NELAP	4	E871008	06-30-19
Illinois	NELAP	5	200005	06-30-19
Kansas	NELAP	7	E-10350	01-31-20
Louisiana	NELAP	6	04041	06-30-19
Nevada	State Program	9	PA00164	07-31-19
New Hampshire	NELAP	1	2030	04-04-20
New Jersey	NELAP	2	PA005	06-30-19
New York	NELAP	2	11182	03-31-20
North Carolina (WW/SW)	State Program	4	434	12-31-19
Oregon	NELAP	10	PA-2151	02-06-20
Pennsylvania	NELAP	3	02-00416	04-30-19
South Carolina	State Program	4	89014	04-30-19 *
Texas	NELAP	6	T104704528-15-2	03-31-20
US Fish & Wildlife	Federal		LE94312A-1	07-31-19
USDA	Federal		P330-16-00211	06-26-19
Utah	NELAP	8	PA001462015-4	05-31-19 *
Virginia	NELAP	3	460189	09-14-19
West Virginia DEP	State Program	3	142	01-31-20
Wisconsin	State Program	5	998027800	08-31-19

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-172013 Chain of Custody

Cooler Received/Opened On 4/12/2019 @ 0955

Time Samples Removed From Cooler 14:50 Time Samples Placed In Storage 14:55 (2 Hour Window)

1. Tracking # 1625 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960357 pH Strip Lot NA Chlorine Strip Lot NA

2. Temperature of rep. sample or temp blank when opened: 0.6 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO (NA)

4. Were custody seals on outside of cooler? (YES) NO NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? (YES) NO NA

6. Were custody papers inside cooler? (YES) NO NA

I certify that I opened the cooler and answered questions 1-6 (intial) GH

7. Were custody seals on containers: YES (NO) and intact YES NO (NA)

Were these signed and dated correctly? YES NO (NA)

8. Packing mat'l used? (Bubblewrap) Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: (Ice) Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? (YES) NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? (YES) NO NA

12. Did all container labels and tags agree with custody papers? (YES) NO NA

13a. Were VOA vials received? YES (NO) NA

b. Was there any observable headspace present in any VOA vial? YES NO (NA)

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES (NO) NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) ACE

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO (NA)

b. Did the bottle labels indicate that the correct preservatives were used (YES) NO NA

16. Was residual chlorine present? YES NO (NA)

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) ACE

17. Were custody papers properly filled out (ink, signed, etc)? (YES) NO NA

18. Did you sign the custody papers in the appropriate place? (YES) NO NA

19. Were correct containers used for the analysis requested? (YES) NO NA

20. Was sufficient amount of sample sent in each container? (YES) NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) ACE

I certify that I attached a label with the unique LIMS number to each container (intial) ACE

21. Were there Non-Conformance issues at login? YES (NO) Was a NCM generated? YES (NO) #_____

BIS = Broken in shipment

Chain of Custody Record 299400

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

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

Client Contact	Project Manager: Mark Bertram	Site Contact: Greg Dick	Date: 4/11/2019	COC No: 299400
Company Name: Big Rivers Electric Corp	Tel/Fax: (270)844-5708	Lab Contact: Roxanne Cisneros	Carrier: FedEx	1 of 1 COCs
Address: 9000 Highway 2096	Analysis Turnaround Time			Sampler:
City/State/Zip: Robards, KY 42452	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone: (270) 844-5736	TAT if different from Below _____			Walk-in Client:
Fax:	☑ 2 weeks			Lab Sampling:
Project Name: Sebree Station	☐ 1 week			
Site: Sebree Station	☐ 2 days			Job / SDG No.:
PO# 249349	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	903.0, 904.0	7470A, 6020A, 6010C	9056A 300.0, 9040C	2540C_calc-TDS	Sample Specific Notes:
023	4/11/2019	1125	G	Water	6	N	N	x	x	x	x	

Loc: 490
172013

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

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☑ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments: Run analysis per 40 CFR 257 Appendix III & Appendix IV parameters. See attached constituent list for analysis

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: 0.0 Corr'd: _____ | Therm ID No.: _____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Greg Dick	BREC	4/11/2019 1605			
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:
				TA-MMS	4/12/19 9:55

Page 19 of 23

4/24/2019

4/11/2019

Constituent List:

40 C.F.R. 257 Appendix III
Boron
Calcium
Fluoride
pH
Sulfate
Total Dissolved Solids (TDS)

40 C.F.R. 257 Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 & 228 combined

Meg Dick
BREC
4/11/2019
1605

Loc: 490
172013

SDR

Ex Saturday Delivery

151967 REV 7/08 RRD

estAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ID:RNCA (615) 726-0177
NG MGR
NG TESTAMERICA
OSTER CREIGHTON

LE, IN 37204
STATES US

SHIP DATE: 12APR19
ACTWGT: 10.00 LB MAN
CAD: 020425/CAFE3211

BILL RECIPIENT

PPING/RECEIVING
TAMERICA LABORATORIES, INC.
ALPHA DRIVE
C PARK
TSBURGH PA 15238
7058 REF: 5490-99035

FedEx Express

20 8844 2647

SATURDAY 12:00P
PRIORITY OVERNIGHT

AGCA

Uncorrected temp 15.1
Thermometer ID 10
Initials JT
CF 0

PT-WI-SR-001 effective 11/8/10

490-172013 Waybill

490-172010 Waybill

490-172007 Waybill

RF 639
ST 3

Eurofins TestAmerica, Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-88697.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-172013-1
Address: 301 Alpha Drive, RIDC Park,	Due Date Requested: 4/24/2019	Analysis Requested		Preservation Codes:
City: Pittsburgh	TAT Requested (days):			A - HCL; B - NaOH; C - Zn Acetate; D - Nitric Acid; E - NaHSO4; F - MeOH; G - Amchlor; H - Ascorbic Acid; I - Ice; J - DI Water; K - EDTA; L - EDA; M - Hexane; N - None; O - AsNaO2; P - Na2O4S; Q - Na2SO3; R - Na2S2O3; S - H2SO4; T - TSP Dodecahydrate; U - Acetone; V - MCAA; W - pH 4-5; Z - other (specify)
State, Zip: PA, 15238				
Phone: 412-963-7058(Tel) 412-963-2468(Fax)	PO #:			
Email:	WO #:			Other:
Project Name: Sebree Station	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010C/3005A (MOD) Lithium	6020A/3005A (MOD) ICP/MS Metals	Total Number of containers	Special Instructions/Note:
			Preservation Code:							
023 (490-172013-1)	4/11/19	11:25 Eastern		Water			X	X	2	Metals - run once, upload together.

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	4-12-19 1615	TAN		4-13-19 930	FAPTC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Eurofins TestAmerica, Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-88697.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-172013-1
Address: 301 Alpha Drive, RIDC Park,	Due Date Requested: 4/24/2019			
City: Pittsburgh	TAT Requested (days):			
State, Zip: PA, 15238	PO #:			
Phone: 412-963-7058(Tel) 412-963-2468(Fax)	WO #:			
Email:	Project #: 49010431			
Project Name: Sebree Station	SSOW#:			
Site: Big Rivers CCR				

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify), Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Water, Solid, Oil, Tissue, Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010C/3005A (MOD) Lithium	6020A/3005A (MOD) ICP/MS Metals	Total Number of containers	Special Instructions/Note:
			Preservation Code							
023 (490-172013-1)	4/11/19	11:25 Eastern		Water			X	X	1	Metals - run once, upload together.

490-172013 Chain of Custody

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	4-12-19 1615	TAL		4-13-19 730	TAL PT
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Login Sample Receipt Checklist

Client: Big Rivers Electric Corporation

Job Number: 490-172013-1
SDG Number: Sebree Station

Login Number: 172013
List Number: 2
Creator: Watson, Debbie

List Source: Eurofins TestAmerica, Pittsburgh
List Creation: 04/13/19 01:27 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	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?	False	
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	

Appendix D

Landfill Perimeter Seeps Laboratory Analytical Results

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-155661-1
Client Project/Site: Sebree-Green Landfill

For:
Big Rivers Electric Corporation
PO BOX 24
Henderson, Kentucky 42419

Attn: Greg Dick

Roxanne Cisneros

Authorized for release by:
8/21/2018 10:53:38 AM

Roxanne Cisneros, Senior Project Manager
(615)301-5761
roxanne.cisneros@testamericainc.com

Table of Contents

Sample Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-155661-1	River Seep-08-071318	Water	07/13/18 07:50	07/14/18 10:50
490-155661-2	River Seep-12-071318	Water	07/13/18 09:15	07/14/18 10:50
490-155661-3	River Seep-16-071318	Water	07/13/18 11:00	07/14/18 10:50
490-155661-4	River Seep-14-071318	Water	07/13/18 10:10	07/14/18 10:50
490-155661-5	River Seep-09-071218	Water	07/12/18 13:50	07/14/18 10:50
490-155661-6	River Seep-07-071218	Water	07/12/18 14:50	07/14/18 10:50
490-155661-7	River Seep-05-071218	Water	07/12/18 14:25	07/14/18 10:50
490-155661-8	Landfill Seep-01-071318	Water	07/13/18 12:20	07/14/18 10:50
490-155661-9	Landfill Seep-01-071318-DUP	Water	07/13/18 12:20	07/14/18 10:50
490-155661-10	Landfill Seep-02-071318	Water	07/13/18 13:10	07/14/18 10:50
490-155661-11	Landfill Seep-03-071318	Water	07/13/18 13:30	07/14/18 10:50
490-155661-12	Pond-012-071318	Water	07/13/18 13:50	07/14/18 10:50
490-155661-13	Landfill Seep-04-071318	Water	07/13/18 14:15	07/14/18 10:50

Job ID: 490-155661-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-155661-1

Comments
Revised Report 8/10/2018 to add Potassium per client request.

Receipt
The samples were received on 7/14/2018 10:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 3 coolers at receipt time were 1.0º C, 3.1º C and 5.7º C.

HPLC/IC
Method(s) 9056A: The method blank for analytical batch 490-531256 contained Sulfate above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

Method(s) 9056A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for analytical batch 490-531256 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method(s) 9056A: The method blank for analytical batch 490-531256 contained Fluoride and Sulfate above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and re-analysis of samples was not performed.

Method(s) 9056A: The following samples were diluted due to the nature of the sample matrix: River Seep-08-071318 (490-155661-1), River Seep-14-071318 (490-155661-4), River Seep-09-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), River Seep-05-071218 (490-155661-7), Landfill Seep-01-071318 (490-155661-8), Landfill Seep-01-071318-DUP (490-155661-9), Landfill Seep-02-071318 (490-155661-10), Landfill Seep-03-071318 (490-155661-11), Pond-012-071318 (490-155661-12) and Landfill Seep-04-071318 (490-155661-13). Elevated reporting limits (RLs) are provided.

Method(s) 9056A: The method blank as well as the continuing calibration blanks for analytical batch 490-531368 contained sulfate above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

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

Metals
Method(s) 6020A: The following samples were diluted to bring the concentration of calcium within the linear range: Landfill Seep-03-071318 (490-155661-11) and Landfill Seep-04-071318 (490-155661-13). 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.

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

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

Narrative

Job Narrative
490-155661-2

Comments
No additional comments.

Receipt
The samples were received on 7/14/2018 10:50 AM; the samples arrived in good condition, properly preserved and, where required, on

Job ID: 490-155661-1 (Continued)

Laboratory: TestAmerica Nashville (Continued)

ice. The temperatures of the 3 coolers at receipt time were 1.0º C, 3.1º C and 5.7º C.

RAD

Method(s) 904.0: Ra-228 Prep Batch 160-376750: The following sample did not meet the requested limit (RL) due to the reduced sample volume attributed to the presence of matrix interferences (see prep NCM 160-144167). The sample was brown, opaque and contained heavy amounts of sediment. The data have been reported with this narrative. River Seep-05-071218 (490-155661-7)

Method(s) 904.0: Radium-228 Prep Batch 260-377705: The detection goal was not met for the following samples due to the presence of matrix interferences: Landfill Seep-03-071318 (490-155661-11). The samples were reduced due to potential matrix interferences. Sample 440-216184-1 was brown, opaque and contained floating debris. Sample 490-155661-11's crystallized precipitation interferes with the method's chemistry. Analytical results are reported with the detection limit achieved.

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376750:
Sample aliquot 490-155661-2 reduced due to potential matrix interference. Sample was yellow, murky, and contained heavy amounts of sediment.

Sample aliquots 490-155661-5 and 490-155661-7 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy amounts of sediment.

Sample aliquot 490-155661-8 reduced due to potential matrix interference. Samples were yellow, opaque, and had a strong odor similar to that of sulfur.

River Seep-12-071318 (490-155661-2), River Seep-09-071218 (490-155661-5), River Seep-05-071218 (490-155661-7) and Landfill Seep-01-071318 (490-155661-8)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376750: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: River Seep-08-071318 (490-155661-1), River Seep-12-071318 (490-155661-2), River Seep-09-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), River Seep-05-071218 (490-155661-7) and Landfill Seep-01-071318 (490-155661-8). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method(s) PrecSep_0: Radium 228 Prep Batch 160-376805:
Sample aliquots 490-155661-9, 490-155661-12, and 490-155661-13 reduced due to potential matrix interference. Samples were yellow, opaque, and had strong odors similar to that of sulfur.

Sample aliquot 490-155661-10 reduced due to potential matrix interference. Sample was brown, opaque, and contained heavy sediment levels.

Sample aliquot 160-29589-1 reduced due to potential matrix interference. Samples were brown, murky, and contained floating debris.

Landfill Seep-01-071318-DUP (490-155661-9), Landfill Seep-02-071318 (490-155661-10), Pond-012-071318 (490-155661-12) and Landfill Seep-04-071318 (490-155661-13)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-377705:
Sample aliquot reduced due to matrix interference during the initial preparation of the sample. Crystallized precipitation interferes with chemistry of the method. Landfill Seep-03-071318 (490-155661-11)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376745: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: River Seep-08-071318 (490-155661-1), River Seep-12-071318 (490-155661-2), River Seep-09-071218 (490-155661-5), River Seep-07-071218 (490-155661-6), River Seep-05-071218 (490-155661-7) and Landfill Seep-01-071318 (490-155661-8). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376745:

Job ID: 490-155661-1 (Continued)

Laboratory: TestAmerica Nashville (Continued)

Sample aliquot 490-155661-2 reduced due to potential matrix interference. Sample was yellow, murky, and contained heavy amounts of sediment.

Sample aliquots 490-155661-5 and 490-155661-7 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy amounts of sediment.

Sample aliquot 490-155661-8 reduced due to potential matrix interference. Samples were yellow, opaque, and had a strong odor similar to that of sulfur.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-376796:
Sample aliquots 490-155661-9, 490-155661-12, and 490-155661-13 reduced due to potential matrix interference. Samples were yellow, opaque, and had strong odors similar to that of sulfur.

Sample aliquots 490-155661-10 and 160-29566-2 reduced due to potential matrix interference. Samples were brown, opaque, and contained heavy sediment levels.

Sample aliquot 160-29589-1 reduced due to potential matrix interference. Samples were brown, murky, and contained floating debris.

Landfill Seep-01-071318-DUP (490-155661-9), Landfill Seep-02-071318 (490-155661-10), Pond-012-071318 (490-155661-12) and Landfill Seep-04-071318 (490-155661-13)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-377701:
Sample aliquot reduced due to matrix interference during the initial preparation of the sample. Crystallized precipitation interferes with chemistry of the method.

Landfill Seep-03-071318 (490-155661-11)

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

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.
B	Compound was found in the blank and sample.
F1	MS and/or MSD Recovery is outside acceptance limits.

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.

General Chemistry

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.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
G	The Sample MDC is greater than the requested RL.

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Client Sample ID: River Seep-08-071318

Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2040		300	20.0	mg/L			07/25/18 21:00	100
Fluoride	0.0915	J	1.00	0.0100	mg/L			07/24/18 16:22	1
Sulfate	1440	B	250	1.50	mg/L			07/25/18 20:45	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	1.80		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:24	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00141	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:35	1
Arsenic	0.000404	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:35	1
Barium	0.0443	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:35	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:35	1
Boron	0.510	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:35	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:35	1
Calcium	801		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:35	1
Chromium	0.000560	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:35	1
Cobalt	0.000691	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:35	1
Lead	0.000769	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:35	1
Magnesium	291		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:35	1
Molybdenum	0.00296	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:35	1
Potassium	125		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:35	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:35	1
Sodium	274		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:35	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:35	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.16		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	174		10.0	5.00	mg/L			07/24/18 20:55	1
Total Dissolved Solids	5310		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.332		0.108	0.112	1.00	0.0893	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: River Seep-08-071318
Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.983		0.295	0.309	1.00	0.370	pCi/L	07/19/18 15:49	08/02/18 09:20	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.3*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:20*	*1*
Y Carrier	*90.5*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:20*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.31		0.314	0.329	5.00	0.370	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	32.7		3.00	0.200	mg/L			07/24/18 16:37	1
Fluoride	0.0803	J	1.00	0.0100	mg/L			07/24/18 16:37	1
Sulfate	16.1	B	5.00	0.0300	mg/L			07/24/18 16:37	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:29	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000499	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:40	1
Arsenic	0.00467	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:40	1
Barium	0.0757	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:40	1
Beryllium	0.000145	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:40	1
Boron	0.0379	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:40	1
Cadmium	0.000183	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:40	1
Calcium	21.1		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:40	1
Chromium	0.00200	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:40	1
Cobalt	0.00581		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:40	1
Lead	0.00221	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:40	1
Magnesium	5.20		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:40	1
Molybdenum	0.000948	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:40	1
Potassium	2.37		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:40	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:40	1
Sodium	5.52		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:40	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:40	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.00		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	38.2		10.0	5.00	mg/L			07/24/18 21:02	1
Total Dissolved Solids	157		10.0	7.00	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.542		0.153	0.161	1.00	0.105	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2

Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.629		0.351	0.356	1.00	0.527	pCi/L	07/19/18 15:49	08/02/18 09:21	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:21*	*1*
Y Carrier	*85.6*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:21*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.17		0.383	0.391	5.00	0.527	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-16-071318

Date Collected: 07/13/18 11:00
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-3

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	23.2		3.00	0.200	mg/L			07/24/18 16:52	1
Fluoride	0.177	J	1.00	0.0100	mg/L			07/24/18 16:52	1
Sulfate	26.5	B	5.00	0.0300	mg/L			07/24/18 16:52	1

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:35	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000270	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:44	1
Arsenic	0.0247		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:44	1
Barium	0.190	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:44	1
Beryllium	0.000211	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:44	1
Boron	0.0321	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:44	1
Cadmium	0.000196	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:44	1
Calcium	93.8		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:44	1
Chromium	0.00383		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:44	1
Cobalt	0.00613		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:44	1
Lead	0.00521		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:44	1
Magnesium	20.3		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:44	1
Molybdenum	0.00878	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:44	1
Potassium	4.85		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:44	1
Selenium	0.000906	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:44	1
Sodium	26.7		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:44	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:44	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.40		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	393		10.0	5.00	mg/L			07/24/18 21:09	1
Total Dissolved Solids	504		20.0	14.0	mg/L			07/18/18 08:50	1

Client Sample ID: River Seep-14-071318

Date Collected: 07/13/18 10:10
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-4

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	22.7		3.00	0.200	mg/L			07/24/18 17:07	1
Fluoride	0.144	J	1.00	0.0100	mg/L			07/24/18 17:07	1
Sulfate	159	B	50.0	0.300	mg/L			07/25/18 21:15	10

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0126	J	0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:50	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000312	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 19:49	1
Arsenic	0.0173		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 19:49	1
Barium	0.242		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 19:49	1
Beryllium	0.000497	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 19:49	1
Boron	0.0694	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 19:49	1
Cadmium	0.000312	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 19:49	1
Calcium	171		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 19:49	1
Chromium	0.00969		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 19:49	1
Cobalt	0.0125		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 19:49	1
Lead	0.0109		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 19:49	1
Magnesium	36.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 19:49	1
Molybdenum	0.00550	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 19:49	1
Potassium	4.96		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 19:49	1
Selenium	0.000582	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 19:49	1
Sodium	18.5		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 19:49	1
Thallium	0.000126	J	0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 19:49	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:07	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.14		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	443		10.0	5.00	mg/L			07/24/18 21:17	1
Total Dissolved Solids	790		20.0	14.0	mg/L			07/18/18 08:50	1

Client Sample ID: River Seep-09-071218

Date Collected: 07/12/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-5

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	189		30.0	2.00	mg/L			07/25/18 21:59	10
Fluoride	0.239	J F1	1.00	0.0100	mg/L			07/24/18 17:51	1
Sulfate	1310	B	250	1.50	mg/L			07/25/18 22:14	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0209	J	0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 17:56	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000200	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:06	1
Arsenic	0.00188	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:06	1
Barium	0.0384	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:06	1
Beryllium	0.00372		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:06	1
Boron	2.19		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:06	1
Cadmium	0.00307		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:06	1
Calcium	460		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:06	1
Chromium	0.00386		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:06	1
Cobalt	0.0447		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:06	1
Lead	0.00507		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:06	1
Magnesium	63.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:06	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:06	1
Potassium	9.51		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:06	1
Selenium	0.00216	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:06	1
Sodium	42.1		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:06	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:06	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	5.26		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 21:21	1
Total Dissolved Solids	2130		20.0	14.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.665		0.213	0.221	1.00	0.167	pCi/L	07/19/18 15:20	08/10/18 16:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:40*	*1*

Client Sample ID: River Seep-09-071218

Lab Sample ID: 490-155661-5
Date Collected: 07/12/18 13:50
Matrix: Water
Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.810		0.520	0.525	1.00	0.796	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*87.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.48		0.562	0.570	5.00	0.796	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1990		300	20.0	mg/L			07/25/18 22:29	100
Fluoride	0.102	J	1.00	0.0100	mg/L			07/24/18 18:21	1
Sulfate	1480	B	500	3.00	mg/L			07/25/18 22:29	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.772		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:01	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:11	1
Arsenic	0.00182	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:11	1
Barium	0.0605	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:11	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:11	1
Boron	1.46		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:11	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:11	1
Calcium	1120		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:11	1
Chromium	0.000340	J	0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:11	1
Cobalt	0.0218		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:11	1
Lead	0.000523	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:11	1
Magnesium	51.8		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:11	1
Molybdenum	0.00219	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:11	1
Potassium	262		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:11	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:11	1
Sodium	277		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:11	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:11	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:09	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.01		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	87.7		10.0	5.00	mg/L			07/24/18 21:28	1
Total Dissolved Solids	6080		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.566		0.144	0.152	1.00	0.0969	pCi/L	07/19/18 15:20	08/10/18 16:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:39*	*1*

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6

Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.831		0.318	0.327	1.00	0.434	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*87.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.40		0.349	0.361	5.00	0.434	pCi/L		08/21/18 03:20	1

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1670		300	20.0	mg/L			07/25/18 22:44	100
Fluoride	0.0795	J	1.00	0.0100	mg/L			07/24/18 18:36	1
Sulfate	1170	B	500	3.00	mg/L			07/25/18 22:44	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.340		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:07	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.000366	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:16	1
Arsenic	0.0192		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:16	1
Barium	0.718		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:16	1
Beryllium	0.000545	J	0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:16	1
Boron	0.853	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:16	1
Cadmium	0.000563	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:16	1
Calcium	916		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:16	1
Chromium	0.0124		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:16	1
Cobalt	0.0327		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:16	1
Lead	0.0104		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:16	1
Magnesium	77.8		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:16	1
Molybdenum	0.00442	J	0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:16	1
Potassium	238		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 20:16	1
Selenium	0.00121	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:16	1
Sodium	285		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:16	1
Thallium	0.000164	J	0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:16	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:12	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.95		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	229		10.0	5.00	mg/L			07/24/18 21:41	1
Total Dissolved Solids	5140		40.0	28.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	3.81		0.503	0.609	1.00	0.187	pCi/L	07/19/18 15:20	08/10/18 16:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.9*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:40*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: River Seep-05-071218
Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	3.83	G	0.871	0.940	1.00	1.07	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*83.0*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	7.64		1.01	1.12	5.00	1.07	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-01-071318

Date Collected: 07/13/18 12:20
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-8

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2090		600	40.0	mg/L			07/25/18 23:13	200
Fluoride	1.68		1.00	0.0100	mg/L			07/24/18 18:51	1
Sulfate	1580	B	250	1.50	mg/L			07/25/18 22:58	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	3.11		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:12	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00432		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:20	1
Arsenic	0.364		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:20	1
Barium	0.0666	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:20	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:20	1
Boron	1.15		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:20	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:20	1
Calcium	1210		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:20	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:20	1
Cobalt	0.0000370	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:20	1
Lead	0.000239	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:20	1
Magnesium	0.290	J	1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:20	1
Molybdenum	0.0925		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:20	1
Potassium	179		10.0	0.596	mg/L		07/18/18 12:44	08/07/18 12:06	10
Selenium	0.00781	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:20	1
Sodium	347		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:20	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:20	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.372		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:13	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	9.96		0.100	0.100	SU			07/24/18 17:55	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:55	1
Alkalinity	828		10.0	5.00	mg/L			07/24/18 21:50	1
Total Dissolved Solids	8560		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.656		0.222	0.229	1.00	0.200	pCi/L	07/19/18 15:20	08/10/18 16:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:38*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: Landfill Seep-01-071318
Date Collected: 07/13/18 12:20
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-8
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.851	U	0.577	0.582	1.00	0.889	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*75.9*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.51**		0.618	0.625	5.00	0.889	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-01-071318-DUP

Date Collected: 07/13/18 12:20
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-9

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2080		600	40.0	mg/L			07/25/18 23:43	200
Fluoride	1.90		1.00	0.0100	mg/L			07/24/18 19:06	1
Sulfate	1700	B	250	1.50	mg/L			07/25/18 23:28	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	3.13		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:18	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00463		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:25	1
Arsenic	0.393		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:25	1
Barium	0.0690	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:25	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:25	1
Boron	1.21		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:25	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:25	1
Calcium	1230		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:25	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:25	1
Cobalt	0.0000570	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:25	1
Lead	0.000254	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:25	1
Magnesium	0.335	J	1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:25	1
Molybdenum	0.0981		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:25	1
Potassium	37.3		10.0	0.596	mg/L		07/18/18 12:44	08/07/18 12:09	10
Selenium	0.00913	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:25	1
Sodium	362		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:25	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:25	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.388		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:14	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	10.0		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.9		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	841		10.0	5.00	mg/L			07/24/18 21:59	1
Total Dissolved Solids	7880		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.648		0.211	0.218	1.00	0.196	pCi/L	07/20/18 08:40	08/13/18 06:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*40 - 110*	*07/20/18 08:40*	*08/13/18 06:34*	*1*

Client Sample ID: Landfill Seep-01-071318-DUP

Lab Sample ID: 490-155661-9

Date Collected: 07/13/18 12:20

Matrix: Water

Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0841	U	0.488	0.488	1.00	0.874	pCi/L	07/20/18 09:30	08/02/18 09:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*
Y Carrier	*94.6*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.564	U	0.532	0.534	5.00	0.874	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-02-071318

Date Collected: 07/13/18 13:10
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-10
Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1710		150	10.0	mg/L			07/25/18 23:58	50
Fluoride	1.19		1.00	0.0100	mg/L			07/24/18 19:20	1
Sulfate	1500	B	250	1.50	mg/L			07/25/18 23:58	50

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	2.85		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:24	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00218		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:30	1
Arsenic	0.126		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:30	1
Barium	0.0627	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:30	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:30	1
Boron	2.92		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:30	1
Cadmium	0.000464	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:30	1
Calcium	1030		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:30	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:30	1
Cobalt	0.000115	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:30	1
Lead	0.000247	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:30	1
Magnesium	0.804	J	1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:30	1
Molybdenum	1.78		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:30	1
Potassium	228		10.0	0.596	mg/L		07/18/18 12:44	08/07/18 12:12	10
Selenium	0.0103		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:30	1
Sodium	315		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:30	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:30	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.167	J	0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:15	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	9.02		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.8		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	178		10.0	5.00	mg/L			07/24/18 22:08	1
Total Dissolved Solids	7080		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.658		0.203	0.211	1.00	0.168	pCi/L	07/20/18 08:40	08/13/18 06:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.8*		*40 - 110*	*07/20/18 08:40*	*08/13/18 06:34*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: Landfill Seep-02-071318
Date Collected: 07/13/18 13:10
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-10
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.507	U	0.520	0.522	1.00	0.848	pCi/L	07/20/18 09:30	08/02/18 09:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.8*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*
Y Carrier	*85.6*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.16**		0.558	0.563	5.00	0.848	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-03-071318

Date Collected: 07/13/18 13:30
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-11

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4370		1500	100	mg/L			07/26/18 01:56	500
Fluoride	0.269	J	1.00	0.0100	mg/L			07/24/18 19:35	1
Sulfate	2080	B	500	3.00	mg/L			07/26/18 01:41	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	7.19		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:29	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0000610	J	0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:34	1
Arsenic	0.00176	J	0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:34	1
Barium	0.140	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:34	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:34	1
Boron	2.49		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:34	1
Cadmium	0.000279	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:34	1
Calcium	2250		10.0	0.412	mg/L		07/18/18 12:44	07/31/18 01:20	10
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:34	1
Cobalt	0.000321	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:34	1
Lead	0.000215	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:34	1
Magnesium	12.6		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:34	1
Molybdenum	0.792		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:34	1
Potassium	1140		10.0	0.596	mg/L		07/18/18 12:44	07/31/18 01:20	10
Selenium	0.00163	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:34	1
Sodium	566		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:34	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:34	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:16	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.04		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	93.9		10.0	5.00	mg/L			07/24/18 22:15	1
Total Dissolved Solids	12400		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.41		0.418	0.437	1.00	0.322	pCi/L	07/24/18 13:57	08/16/18 05:35	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*07/24/18 13:57*	*08/16/18 05:35*	*1*

Client Sample ID: Landfill Seep-03-071318

Lab Sample ID: 490-155661-11

Date Collected: 07/13/18 13:30

Matrix: Water

Date Received: 07/14/18 10:50

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.136	U G	0.846	0.846	1.00	1.50	pCi/L	07/24/18 14:24	08/02/18 16:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*07/24/18 14:24*	*08/02/18 16:23*	*1*
Y Carrier	*92.7*		*40 - 110*	*07/24/18 14:24*	*08/02/18 16:23*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.54**		0.944	0.952	5.00	1.50	pCi/L		08/21/18 03:20	1

Client Sample ID: Pond-012-071318

Date Collected: 07/13/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-12

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1640		300	20.0	mg/L			07/26/18 02:11	100
Fluoride	0.266	J	1.00	0.0100	mg/L			07/24/18 19:50	1
Sulfate	1920	B	500	3.00	mg/L			07/26/18 02:11	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	2.52		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:35	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00302		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:39	1
Arsenic	0.278		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:39	1
Barium	0.0854	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:39	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:39	1
Boron	2.12		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:39	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:39	1
Calcium	1050		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 20:39	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:39	1
Cobalt	0.000203	J	0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:39	1
Lead	0.000137	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:39	1
Magnesium	11.9		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:39	1
Molybdenum	0.133		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:39	1
Potassium	231		10.0	0.596	mg/L		07/18/18 12:44	08/07/18 12:15	10
Selenium	0.00201	J	0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:39	1
Sodium	316		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:39	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:39	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.0840	J	0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:17	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	6.90		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	7.24	J	10.0	5.00	mg/L			07/24/18 22:22	1
Total Dissolved Solids	7180		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.962		0.258	0.272	1.00	0.223	pCi/L	07/20/18 08:40	08/13/18 06:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*40 - 110*	*07/20/18 08:40*	*08/13/18 06:34*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: Pond-012-071318
Date Collected: 07/13/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-12
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.505	U	0.599	0.600	1.00	0.988	pCi/L	07/20/18 09:30	08/02/18 09:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*
Y Carrier	*77.8*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.47**		0.652	0.659	5.00	0.988	pCi/L		08/21/18 03:20	1

Client Sample ID: Landfill Seep-04-071318

Date Collected: 07/13/18 14:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-13

Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2710		300	20.0	mg/L			07/26/18 02:26	100
Fluoride	1.53		1.00	0.0100	mg/L			07/24/18 20:05	1
Sulfate	1490	B	500	3.00	mg/L			07/26/18 02:26	100

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	4.07		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 18:41	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00470		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 20:43	1
Arsenic	0.300		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 20:43	1
Barium	0.101	J	0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 20:43	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 20:43	1
Boron	0.799	J	1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 20:43	1
Cadmium	0.000161	J	0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 20:43	1
Calcium	1750		10.0	0.412	mg/L		07/18/18 12:44	07/31/18 01:47	10
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 20:43	1
Cobalt	ND		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 20:43	1
Lead	0.0000730	J	0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 20:43	1
Magnesium	0.347	J	1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 20:43	1
Molybdenum	0.214		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 20:43	1
Potassium	899		10.0	0.596	mg/L		07/18/18 12:44	07/31/18 01:47	10
Selenium	0.0103		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 20:43	1
Sodium	397		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 20:43	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 20:43	1

Method: EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.539		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 11:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	10.1		0.100	0.100	SU			07/24/18 17:58	1
Temperature	21.7		0.100	0.100	Degrees C			07/24/18 17:58	1
Alkalinity	1060		10.0	5.00	mg/L			07/25/18 09:02	1
Total Dissolved Solids	10100		100	70.0	mg/L			07/18/18 08:50	1

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.897		0.234	0.248	1.00	0.171	pCi/L	07/20/18 08:40	08/13/18 06:35	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.6*		*40 - 110*	*07/20/18 08:40*	*08/13/18 06:35*	*1*

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Client Sample ID: Landfill Seep-04-071318
Date Collected: 07/13/18 14:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-13
Matrix: Water

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.873		0.524	0.530	1.00	0.799	pCi/L	07/20/18 09:30	08/02/18 09:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.6*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*
Y Carrier	*86.4*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:25*	*1*

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.77		0.574	0.585	5.00	0.799	pCi/L		08/21/18 03:20	1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 490-531256/3
Matrix: Water
Analysis Batch: 531256

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/24/18 13:54	1
Fluoride	ND		1.00	0.0100	mg/L			07/24/18 13:54	1
Sulfate	0.3643	J	5.00	0.0300	mg/L			07/24/18 13:54	1

Lab Sample ID: LCS 490-531256/4
Matrix: Water
Analysis Batch: 531256

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.350		mg/L		93	80 - 120
Fluoride	1.00	0.9781	J	mg/L		98	80 - 120
Sulfate	10.0	9.696		mg/L		97	80 - 120

Lab Sample ID: LCSD 490-531256/5
Matrix: Water
Analysis Batch: 531256

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.374		mg/L		94	80 - 120	0	20
Fluoride	1.00	0.9558	J	mg/L		95	80 - 120	2	20
Sulfate	10.0	9.589		mg/L		96	80 - 120	1	20

Lab Sample ID: 490-155661-5 MS
Matrix: Water
Analysis Batch: 531256

Client Sample ID: River Seep-09-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Fluoride	0.239	J F1	1.00	1.702	F1	mg/L		146	80 - 120

Lab Sample ID: MB 490-531368/3
Matrix: Water
Analysis Batch: 531368

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/25/18 18:18	1
Fluoride	ND		1.00	0.0100	mg/L			07/25/18 18:18	1
Sulfate	0.3720	J	5.00	0.0300	mg/L			07/25/18 18:18	1

Lab Sample ID: MB 490-531368/30
Matrix: Water
Analysis Batch: 531368

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		3.00	0.200	mg/L			07/26/18 00:57	1
Fluoride	ND		1.00	0.0100	mg/L			07/26/18 00:57	1
Sulfate	0.3740	J	5.00	0.0300	mg/L			07/26/18 00:57	1

Method: 9056A - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 490-531368/31
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.348		mg/L		93	80 - 120
Fluoride	1.00	0.9475	J	mg/L		95	80 - 120
Sulfate	10.0	9.314		mg/L		93	80 - 120

Lab Sample ID: LCS 490-531368/4
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.348		mg/L		93	80 - 120
Fluoride	1.00	0.9854	J	mg/L		98	80 - 120
Sulfate	10.0	9.495		mg/L		95	80 - 120

Lab Sample ID: LCSD 490-531368/32
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.368		mg/L		94	80 - 120	0	20
Fluoride	1.00	0.9513	J	mg/L		95	80 - 120	0	20
Sulfate	10.0	9.447		mg/L		94	80 - 120	1	20

Lab Sample ID: LCSD 490-531368/5
Matrix: Water
Analysis Batch: 531368

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	10.0	9.296		mg/L		93	80 - 120	1	20
Fluoride	1.00	0.9931	J	mg/L		99	80 - 120	1	20
Sulfate	10.0	9.710		mg/L		97	80 - 120	2	20

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 180-250902/1-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		0.0500	0.00959	mg/L		07/18/18 12:42	07/24/18 16:47	1

Lab Sample ID: LCS 180-250902/2-A
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	1.00	1.028		mg/L		103	80 - 120

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: 490-155660-A-5-B MS
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	0.0132	J	1.00	1.082		mg/L		107	75 - 125

Lab Sample ID: 490-155660-A-5-C MSD
Matrix: Water
Analysis Batch: 251527

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250902

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	0.0132	J	1.00	1.090		mg/L		108	75 - 125	1	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 180-250903/1-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.00200	0.0000213	mg/L		07/18/18 12:44	07/28/18 18:53	1
Arsenic	ND		0.00500	0.000118	mg/L		07/18/18 12:44	07/28/18 18:53	1
Barium	ND		0.200	0.000270	mg/L		07/18/18 12:44	07/28/18 18:53	1
Beryllium	ND		0.00200	0.000102	mg/L		07/18/18 12:44	07/28/18 18:53	1
Boron	ND		1.00	0.00339	mg/L		07/18/18 12:44	07/28/18 18:53	1
Cadmium	ND		0.00100	0.000152	mg/L		07/18/18 12:44	07/28/18 18:53	1
Calcium	ND		1.00	0.0412	mg/L		07/18/18 12:44	07/28/18 18:53	1
Chromium	ND		0.00300	0.000339	mg/L		07/18/18 12:44	07/28/18 18:53	1
Cobalt	ND		0.00500	0.0000218	mg/L		07/18/18 12:44	07/28/18 18:53	1
Lead	ND		0.00500	0.0000675	mg/L		07/18/18 12:44	07/28/18 18:53	1
Magnesium	ND		1.00	0.0153	mg/L		07/18/18 12:44	07/28/18 18:53	1
Molybdenum	ND		0.0100	0.000873	mg/L		07/18/18 12:44	07/28/18 18:53	1
Potassium	ND		1.00	0.0596	mg/L		07/18/18 12:44	07/28/18 18:53	1
Selenium	ND		0.0100	0.000348	mg/L		07/18/18 12:44	07/28/18 18:53	1
Sodium	ND		1.00	0.155	mg/L		07/18/18 12:44	07/28/18 18:53	1
Thallium	ND		0.00100	0.0000360	mg/L		07/18/18 12:44	07/28/18 18:53	1

Lab Sample ID: LCS 180-250903/2-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.500	0.4729		mg/L		95	80 - 120
Arsenic	0.0400	0.03658		mg/L		91	80 - 120
Barium	2.00	1.840		mg/L		92	80 - 120
Beryllium	0.0500	0.05027		mg/L		101	80 - 120
Boron	1.00	0.8897	J	mg/L		89	80 - 120
Cadmium	0.0500	0.05029		mg/L		101	80 - 120
Calcium	50.0	45.70		mg/L		91	80 - 120
Chromium	0.200	0.1649		mg/L		82	80 - 120
Cobalt	0.500	0.4321		mg/L		86	80 - 120
Lead	0.0200	0.01998		mg/L		100	80 - 120

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 180-250903/2-A
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Magnesium	50.0	45.74		mg/L		91	80 - 120
Molybdenum	1.00	0.9327		mg/L		93	80 - 120
Potassium	50.0	46.09		mg/L		92	80 - 120
Selenium	0.0100	0.009085	J	mg/L		91	80 - 120
Sodium	50.0	44.98		mg/L		90	80 - 120
Thallium	0.0500	0.04846		mg/L		97	80 - 120

Lab Sample ID: 490-155660-A-6-C MS
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	ND		0.500	0.4679		mg/L		94	75 - 125
Arsenic	ND		0.0400	0.03692		mg/L		92	75 - 125
Barium	ND		2.00	1.839		mg/L		92	75 - 125
Beryllium	ND		0.0500	0.04768		mg/L		95	75 - 125
Boron	0.00422	J	1.00	0.8456	J	mg/L		84	75 - 125
Cadmium	ND		0.0500	0.04723		mg/L		94	75 - 125
Calcium	ND		50.0	45.39		mg/L		91	75 - 125
Chromium	ND		0.200	0.1840		mg/L		92	75 - 125
Cobalt	ND		0.500	0.4386		mg/L		88	75 - 125
Lead	0.000399	J	0.0200	0.01986		mg/L		97	75 - 125
Magnesium	0.0156	J	50.0	46.32		mg/L		93	75 - 125
Molybdenum	ND		1.00	0.9262		mg/L		93	75 - 125
Potassium	0.0680	J	50.0	46.15		mg/L		92	75 - 125
Selenium	ND		0.0100	0.01006		mg/L		101	75 - 125
Sodium	ND		50.0	45.34		mg/L		91	75 - 125
Thallium	ND		0.0500	0.04726		mg/L		95	75 - 125

Lab Sample ID: 490-155660-A-6-D MSD
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	ND		0.500	0.4680		mg/L		94	75 - 125	0	20
Arsenic	ND		0.0400	0.03704		mg/L		93	75 - 125	0	20
Barium	ND		2.00	1.847		mg/L		92	75 - 125	0	20
Beryllium	ND		0.0500	0.04801		mg/L		96	75 - 125	1	20
Boron	0.00422	J	1.00	0.8557	J	mg/L		85	75 - 125	1	20
Cadmium	ND		0.0500	0.04852		mg/L		97	75 - 125	3	20
Calcium	ND		50.0	44.91		mg/L		90	75 - 125	1	20
Chromium	ND		0.200	0.1875		mg/L		94	75 - 125	2	20
Cobalt	ND		0.500	0.4400		mg/L		88	75 - 125	0	20
Lead	0.000399	J	0.0200	0.01961		mg/L		96	75 - 125	1	20
Magnesium	0.0156	J	50.0	45.89		mg/L		92	75 - 125	1	20
Molybdenum	ND		1.00	0.9301		mg/L		93	75 - 125	0	20
Potassium	0.0680	J	50.0	45.93		mg/L		92	75 - 125	0	20
Selenium	ND		0.0100	0.01030		mg/L		103	75 - 125	2	20
Sodium	ND		50.0	45.17		mg/L		90	75 - 125	0	20

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-155660-A-6-D MSD
Matrix: Water
Analysis Batch: 252059

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total Recoverable
Prep Batch: 250903

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Thallium	ND		0.0500	0.04752		mg/L		95	75 - 125	1	20

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 180-250943/1-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 250943

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.200	0.0653	ug/L		07/18/18 15:06	07/20/18 10:52	1

Lab Sample ID: LCS 180-250943/2-A
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	2.50	2.486		ug/L		99	80 - 120

Lab Sample ID: 180-79800-G-1-E MS
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		1.00	0.9270		ug/L		93	75 - 125

Lab Sample ID: 180-79800-G-1-F MSD
Matrix: Water
Analysis Batch: 251171

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 250943

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		1.00	0.9210		ug/L		92	75 - 125	1	20

Method: 9040C - pH

Lab Sample ID: LCS 490-531203/1
Matrix: Water
Analysis Batch: 531203

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.000		SU		100	98 - 103

Lab Sample ID: 490-155660-D-5 DU
Matrix: Water
Analysis Batch: 531203

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	8.11		8.110		SU		0	20
Temperature	21.7		21.70		Degrees C		0	20

Method: 9040C - pH (Continued)

Lab Sample ID: LCS 490-531204/1
Matrix: Water
Analysis Batch: 531204

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			7.00	7.000		SU		100	98 - 103		

Lab Sample ID: 490-155661-9 DU
Matrix: Water
Analysis Batch: 531204

Client Sample ID: Landfill Seep-01-071318-DUP
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	10.0			10.03		SU				0	20
Temperature	21.9			21.90		Degrees C				0	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 490-531384/73
Matrix: Water
Analysis Batch: 531384

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	ND		10.0	5.00	mg/L			07/24/18 20:09	1

Lab Sample ID: LCS 490-531384/74
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity			100	95.45		mg/L		95	90 - 110		

Lab Sample ID: LCSD 490-531384/95
Matrix: Water
Analysis Batch: 531384

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Alkalinity			100	95.67		mg/L		96	90 - 110	0	20

Lab Sample ID: 490-155661-6 DU
Matrix: Water
Analysis Batch: 531384

Client Sample ID: River Seep-07-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Alkalinity	87.7			88.85		mg/L				1	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 490-529395/1
Matrix: Water
Analysis Batch: 529395

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10.0	7.00	mg/L			07/18/18 08:50	1

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: LCS 490-529395/2
Matrix: Water
Analysis Batch: 529395

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Dissolved Solids			100	103.0		mg/L		103	90 - 110		

Lab Sample ID: 490-155661-5 DU
Matrix: Water
Analysis Batch: 529395

Client Sample ID: River Seep-09-071218
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	2130			2194		mg/L				3	20

Lab Sample ID: 490-155661-13 DU
Matrix: Water
Analysis Batch: 529395

Client Sample ID: Landfill Seep-04-071318
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	10100			10080		mg/L				0.1	20

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-376745/23-A
Matrix: Water
Analysis Batch: 381568

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376745

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.2502		0.100	0.103	1.00	0.106	pCi/L	07/19/18 15:20	08/10/18 16:41	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.1*		*40 - 110*	*07/19/18 15:20*	*08/10/18 16:41*	*1*

Lab Sample ID: LCS 160-376745/1-A
Matrix: Water
Analysis Batch: 381577

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376745

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	11.66		1.20	1.00	0.0735	pCi/L	103	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*

Lab Sample ID: LCSD 160-376745/2-A
Matrix: Water
Analysis Batch: 381577

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 376745

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226			11.4	10.89		1.13	1.00	0.109	pCi/L	96	68 - 137	0.33	1

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCSD 160-376745/2-A
Matrix: Water
Analysis Batch: 381577

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 376745

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	100		40 - 110

Lab Sample ID: MB 160-376796/18-A
Matrix: Water
Analysis Batch: 381804

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376796

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.2016		0.0795	0.0816	1.00	0.0804	pCi/L	07/20/18 08:40	08/13/18 06:36	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110	07/20/18 08:40	08/13/18 06:36	1

Lab Sample ID: LCS 160-376796/1-A
Matrix: Water
Analysis Batch: 381803

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376796

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	11.79		1.21	1.00	0.0688	pCi/L	104	68 - 137		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	99.7		40 - 110

Lab Sample ID: 400-156511-B-1-B DU
Matrix: Water
Analysis Batch: 381803

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 376796

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.266			0.2898		0.103	1.00	0.0896	pCi/L			0.12	1

Carrier	DU %Yield	DU Qualifier	Limits
Ba Carrier	90.3		40 - 110

Lab Sample ID: MB 160-377701/16-A
Matrix: Water
Analysis Batch: 382769

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 377701

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.2320		0.0970	0.0993	1.00	0.0872	pCi/L	07/24/18 13:57	08/16/18 05:31	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.7		40 - 110	07/24/18 13:57	08/16/18 05:31	1

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCS 160-377701/1-A
Matrix: Water
Analysis Batch: 382767

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 377701

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			15.1	13.45		1.40	1.00	0.0919	pCi/L	89	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.1*		*40 - 110*

Lab Sample ID: 600-169468-C-1-A DU
Matrix: Water
Analysis Batch: 382767

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 377701

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.394			0.3673		0.110	1.00	0.0820	pCi/L			0.12	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*94.4*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-376750/23-A
Matrix: Water
Analysis Batch: 379784

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376750

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.1002	U	0.206	0.206	1.00	0.387	pCi/L	07/19/18 15:49	08/02/18 09:22	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.1*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*
Y Carrier	*85.6*		*40 - 110*	*07/19/18 15:49*	*08/02/18 09:22*	*1*

Lab Sample ID: LCS 160-376750/1-A
Matrix: Water
Analysis Batch: 379945

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376750

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			11.2	11.05		1.23	1.00	0.352	pCi/L	99	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*
Y Carrier	*86.4*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCSD 160-376750/2-A
Matrix: Water
Analysis Batch: 379945

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 376750

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			11.2	11.70		1.29	1.00	0.336	pCi/L	105	56 - 140	0.26	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*100*		*40 - 110*
Y Carrier	*87.5*		*40 - 110*

Lab Sample ID: MB 160-376805/18-A
Matrix: Water
Analysis Batch: 379949

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 376805

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.4979		0.255	0.259	1.00	0.379	pCi/L	07/20/18 09:30	08/02/18 09:27	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*102*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:27*	*1*
Y Carrier	*91.6*		*40 - 110*	*07/20/18 09:30*	*08/02/18 09:27*	*1*

Lab Sample ID: LCS 160-376805/1-A
Matrix: Water
Analysis Batch: 379784

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 376805

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			11.2	11.33		1.25	1.00	0.352	pCi/L	102	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*99.7*		*40 - 110*
Y Carrier	*91.2*		*40 - 110*

Lab Sample ID: 400-156511-B-1-D DU
Matrix: Water
Analysis Batch: 379784

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 376805

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	0.131	U		0.2403	U	0.319	1.00	0.528	pCi/L			0.20	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*90.3*		*40 - 110*
Y Carrier	*84.5*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: MB 160-377705/16-A
Matrix: Water
Analysis Batch: 380015

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 377705

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.3838	U	0.431	0.433	1.00	0.707	pCi/L	07/24/18 14:24	08/02/18 20:52	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*40 - 110*	*07/24/18 14:24*	*08/02/18 20:52*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/24/18 14:24*	*08/02/18 20:52*	*1*

Lab Sample ID: LCS 160-377705/1-A
Matrix: Water
Analysis Batch: 380015

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 377705

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			14.9	14.45		1.62	1.00	0.461	pCi/L	97	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.1*		*40 - 110*
Y Carrier	*88.6*		*40 - 110*

Lab Sample ID: 600-169468-C-1-B DU
Matrix: Water
Analysis Batch: 380015

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 377705

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	0.0185	U		0.1918	U	0.201	1.00	0.325	pCi/L			0.43	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*94.4*		*40 - 110*
Y Carrier	*90.8*		*40 - 110*

HPLC/IC

Analysis Batch: 531256

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-2	River Seep-12-071318	Total/NA	Water	9056A	
490-155661-3	River Seep-16-071318	Total/NA	Water	9056A	
490-155661-4	River Seep-14-071318	Total/NA	Water	9056A	
490-155661-5	River Seep-09-071218	Total/NA	Water	9056A	
490-155661-6	River Seep-07-071218	Total/NA	Water	9056A	
490-155661-7	River Seep-05-071218	Total/NA	Water	9056A	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	9056A	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	9056A	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	9056A	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	9056A	
490-155661-12	Pond-012-071318	Total/NA	Water	9056A	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	9056A	
MB 490-531256/3	Method Blank	Total/NA	Water	9056A	
LCS 490-531256/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-531256/5	Lab Control Sample Dup	Total/NA	Water	9056A	
490-155661-5 MS	River Seep-09-071218	Total/NA	Water	9056A	

Analysis Batch: 531368

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-1	River Seep-08-071318	Total/NA	Water	9056A	
490-155661-4	River Seep-14-071318	Total/NA	Water	9056A	
490-155661-5	River Seep-09-071218	Total/NA	Water	9056A	
490-155661-5	River Seep-09-071218	Total/NA	Water	9056A	
490-155661-6	River Seep-07-071218	Total/NA	Water	9056A	
490-155661-7	River Seep-05-071218	Total/NA	Water	9056A	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	9056A	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	9056A	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	9056A	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	9056A	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	9056A	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	9056A	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	9056A	
490-155661-12	Pond-012-071318	Total/NA	Water	9056A	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	9056A	
MB 490-531368/3	Method Blank	Total/NA	Water	9056A	
MB 490-531368/30	Method Blank	Total/NA	Water	9056A	
LCS 490-531368/31	Lab Control Sample	Total/NA	Water	9056A	
LCS 490-531368/4	Lab Control Sample	Total/NA	Water	9056A	
LCSD 490-531368/32	Lab Control Sample Dup	Total/NA	Water	9056A	
LCSD 490-531368/5	Lab Control Sample Dup	Total/NA	Water	9056A	

Metals

Prep Batch: 250902

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	3005A	
490-155661-2	River Seep-12-071318	Total Recoverable	Water	3005A	
490-155661-3	River Seep-16-071318	Total Recoverable	Water	3005A	

Metals (Continued)

Prep Batch: 250902 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-4	River Seep-14-071318	Total Recoverable	Water	3005A	
490-155661-5	River Seep-09-071218	Total Recoverable	Water	3005A	
490-155661-6	River Seep-07-071218	Total Recoverable	Water	3005A	
490-155661-7	River Seep-05-071218	Total Recoverable	Water	3005A	
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	3005A	
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	3005A	
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	3005A	
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	3005A	
490-155661-12	Pond-012-071318	Total Recoverable	Water	3005A	
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	3005A	
MB 180-250902/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-250902/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-155660-A-5-B MS	Matrix Spike	Total Recoverable	Water	3005A	
490-155660-A-5-C MSD	Matrix Spike Duplicate	Total Recoverable	Water	3005A	

Prep Batch: 250903

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	3005A	
490-155661-2	River Seep-12-071318	Total Recoverable	Water	3005A	
490-155661-3	River Seep-16-071318	Total Recoverable	Water	3005A	
490-155661-4	River Seep-14-071318	Total Recoverable	Water	3005A	
490-155661-5	River Seep-09-071218	Total Recoverable	Water	3005A	
490-155661-6	River Seep-07-071218	Total Recoverable	Water	3005A	
490-155661-7	River Seep-05-071218	Total Recoverable	Water	3005A	
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	3005A	
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	3005A	
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	3005A	
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	3005A	
490-155661-12	Pond-012-071318	Total Recoverable	Water	3005A	
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	3005A	
MB 180-250903/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 180-250903/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
490-155660-A-6-C MS	Matrix Spike	Total Recoverable	Water	3005A	
490-155660-A-6-D MSD	Matrix Spike Duplicate	Total Recoverable	Water	3005A	

Prep Batch: 250943

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	7470A	
490-155661-2	River Seep-12-071318	Total/NA	Water	7470A	
490-155661-3	River Seep-16-071318	Total/NA	Water	7470A	
490-155661-4	River Seep-14-071318	Total/NA	Water	7470A	
490-155661-5	River Seep-09-071218	Total/NA	Water	7470A	
490-155661-6	River Seep-07-071218	Total/NA	Water	7470A	
490-155661-7	River Seep-05-071218	Total/NA	Water	7470A	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	7470A	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	7470A	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	7470A	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	7470A	
490-155661-12	Pond-012-071318	Total/NA	Water	7470A	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	7470A	
MB 180-250943/1-A	Method Blank	Total/NA	Water	7470A	

Metals (Continued)

Prep Batch: 250943 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 180-250943/2-A	Lab Control Sample	Total/NA	Water	7470A	
180-79800-G-1-E MS	Matrix Spike	Total/NA	Water	7470A	
180-79800-G-1-F MSD	Matrix Spike Duplicate	Total/NA	Water	7470A	

Analysis Batch: 251171

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	EPA 7470A	250943
490-155661-2	River Seep-12-071318	Total/NA	Water	EPA 7470A	250943
490-155661-3	River Seep-16-071318	Total/NA	Water	EPA 7470A	250943
490-155661-4	River Seep-14-071318	Total/NA	Water	EPA 7470A	250943
490-155661-5	River Seep-09-071218	Total/NA	Water	EPA 7470A	250943
490-155661-6	River Seep-07-071218	Total/NA	Water	EPA 7470A	250943
490-155661-7	River Seep-05-071218	Total/NA	Water	EPA 7470A	250943
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	EPA 7470A	250943
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	EPA 7470A	250943
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	EPA 7470A	250943
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	EPA 7470A	250943
490-155661-12	Pond-012-071318	Total/NA	Water	EPA 7470A	250943
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	EPA 7470A	250943
MB 180-250943/1-A	Method Blank	Total/NA	Water	EPA 7470A	250943
LCS 180-250943/2-A	Lab Control Sample	Total/NA	Water	EPA 7470A	250943
180-79800-G-1-E MS	Matrix Spike	Total/NA	Water	EPA 7470A	250943
180-79800-G-1-F MSD	Matrix Spike Duplicate	Total/NA	Water	EPA 7470A	250943

Analysis Batch: 251527

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	6010C	250902
490-155661-2	River Seep-12-071318	Total Recoverable	Water	6010C	250902
490-155661-3	River Seep-16-071318	Total Recoverable	Water	6010C	250902
490-155661-4	River Seep-14-071318	Total Recoverable	Water	6010C	250902
490-155661-5	River Seep-09-071218	Total Recoverable	Water	6010C	250902
490-155661-6	River Seep-07-071218	Total Recoverable	Water	6010C	250902
490-155661-7	River Seep-05-071218	Total Recoverable	Water	6010C	250902
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	6010C	250902
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	6010C	250902
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	6010C	250902
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	6010C	250902
490-155661-12	Pond-012-071318	Total Recoverable	Water	6010C	250902
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	6010C	250902
MB 180-250902/1-A	Method Blank	Total Recoverable	Water	6010C	250902
LCS 180-250902/2-A	Lab Control Sample	Total Recoverable	Water	6010C	250902
490-155660-A-5-B MS	Matrix Spike	Total Recoverable	Water	6010C	250902
490-155660-A-5-C MSD	Matrix Spike Duplicate	Total Recoverable	Water	6010C	250902

Analysis Batch: 252059

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total Recoverable	Water	6020A	250903
490-155661-2	River Seep-12-071318	Total Recoverable	Water	6020A	250903
490-155661-3	River Seep-16-071318	Total Recoverable	Water	6020A	250903
490-155661-4	River Seep-14-071318	Total Recoverable	Water	6020A	250903
490-155661-5	River Seep-09-071218	Total Recoverable	Water	6020A	250903

Metals (Continued)

Analysis Batch: 252059 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-6	River Seep-07-071218	Total Recoverable	Water	6020A	250903
490-155661-7	River Seep-05-071218	Total Recoverable	Water	6020A	250903
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	6020A	250903
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	6020A	250903
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	6020A	250903
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	6020A	250903
490-155661-12	Pond-012-071318	Total Recoverable	Water	6020A	250903
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	6020A	250903
MB 180-250903/1-A	Method Blank	Total Recoverable	Water	6020A	250903
LCS 180-250903/2-A	Lab Control Sample	Total Recoverable	Water	6020A	250903
490-155660-A-6-C MS	Matrix Spike	Total Recoverable	Water	6020A	250903
490-155660-A-6-D MSD	Matrix Spike Duplicate	Total Recoverable	Water	6020A	250903

Analysis Batch: 252316

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-11	Landfill Seep-03-071318	Total Recoverable	Water	6020A	250903
490-155661-13	Landfill Seep-04-071318	Total Recoverable	Water	6020A	250903

Analysis Batch: 253104

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-8	Landfill Seep-01-071318	Total Recoverable	Water	6020A	250903
490-155661-9	Landfill Seep-01-071318-DUP	Total Recoverable	Water	6020A	250903
490-155661-10	Landfill Seep-02-071318	Total Recoverable	Water	6020A	250903
490-155661-12	Pond-012-071318	Total Recoverable	Water	6020A	250903

General Chemistry

Analysis Batch: 529395

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	SM 2540C	
490-155661-2	River Seep-12-071318	Total/NA	Water	SM 2540C	
490-155661-3	River Seep-16-071318	Total/NA	Water	SM 2540C	
490-155661-4	River Seep-14-071318	Total/NA	Water	SM 2540C	
490-155661-5	River Seep-09-071218	Total/NA	Water	SM 2540C	
490-155661-6	River Seep-07-071218	Total/NA	Water	SM 2540C	
490-155661-7	River Seep-05-071218	Total/NA	Water	SM 2540C	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	SM 2540C	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	SM 2540C	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	SM 2540C	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	SM 2540C	
490-155661-12	Pond-012-071318	Total/NA	Water	SM 2540C	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	SM 2540C	
MB 490-529395/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 490-529395/2	Lab Control Sample	Total/NA	Water	SM 2540C	
490-155661-5 DU	River Seep-09-071218	Total/NA	Water	SM 2540C	
490-155661-13 DU	Landfill Seep-04-071318	Total/NA	Water	SM 2540C	

Analysis Batch: 531203

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	9040C	

General Chemistry (Continued)

Analysis Batch: 531203 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-2	River Seep-12-071318	Total/NA	Water	9040C	
490-155661-3	River Seep-16-071318	Total/NA	Water	9040C	
490-155661-4	River Seep-14-071318	Total/NA	Water	9040C	
490-155661-5	River Seep-09-071218	Total/NA	Water	9040C	
490-155661-6	River Seep-07-071218	Total/NA	Water	9040C	
490-155661-7	River Seep-05-071218	Total/NA	Water	9040C	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	9040C	
LCS 490-531203/1	Lab Control Sample	Total/NA	Water	9040C	
490-155660-D-5 DU	Duplicate	Total/NA	Water	9040C	

Analysis Batch: 531204

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	9040C	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	9040C	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	9040C	
490-155661-12	Pond-012-071318	Total/NA	Water	9040C	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	9040C	
LCS 490-531204/1	Lab Control Sample	Total/NA	Water	9040C	
490-155661-9 DU	Landfill Seep-01-071318-DUP	Total/NA	Water	9040C	

Analysis Batch: 531384

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	SM 2320B	
490-155661-2	River Seep-12-071318	Total/NA	Water	SM 2320B	
490-155661-3	River Seep-16-071318	Total/NA	Water	SM 2320B	
490-155661-4	River Seep-14-071318	Total/NA	Water	SM 2320B	
490-155661-5	River Seep-09-071218	Total/NA	Water	SM 2320B	
490-155661-6	River Seep-07-071218	Total/NA	Water	SM 2320B	
490-155661-7	River Seep-05-071218	Total/NA	Water	SM 2320B	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	SM 2320B	
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	SM 2320B	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	SM 2320B	
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	SM 2320B	
490-155661-12	Pond-012-071318	Total/NA	Water	SM 2320B	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	SM 2320B	
MB 490-531384/73	Method Blank	Total/NA	Water	SM 2320B	
LCS 490-531384/74	Lab Control Sample	Total/NA	Water	SM 2320B	
LCSD 490-531384/95	Lab Control Sample Dup	Total/NA	Water	SM 2320B	
490-155661-6 DU	River Seep-07-071218	Total/NA	Water	SM 2320B	

Rad

Prep Batch: 376745

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	PrecSep-21	
490-155661-2	River Seep-12-071318	Total/NA	Water	PrecSep-21	
490-155661-5	River Seep-09-071218	Total/NA	Water	PrecSep-21	
490-155661-6	River Seep-07-071218	Total/NA	Water	PrecSep-21	
490-155661-7	River Seep-05-071218	Total/NA	Water	PrecSep-21	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	PrecSep-21	

Rad (Continued)

Prep Batch: 376745 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 160-376745/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-376745/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-376745/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 376750

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-1	River Seep-08-071318	Total/NA	Water	PrecSep_0	
490-155661-2	River Seep-12-071318	Total/NA	Water	PrecSep_0	
490-155661-5	River Seep-09-071218	Total/NA	Water	PrecSep_0	
490-155661-6	River Seep-07-071218	Total/NA	Water	PrecSep_0	
490-155661-7	River Seep-05-071218	Total/NA	Water	PrecSep_0	
490-155661-8	Landfill Seep-01-071318	Total/NA	Water	PrecSep_0	
MB 160-376750/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-376750/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-376750/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Prep Batch: 376796

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	PrecSep-21	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	PrecSep-21	
490-155661-12	Pond-012-071318	Total/NA	Water	PrecSep-21	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	PrecSep-21	
MB 160-376796/18-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-376796/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
400-156511-B-1-B DU	Duplicate	Total/NA	Water	PrecSep-21	

Prep Batch: 376805

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-9	Landfill Seep-01-071318-DUP	Total/NA	Water	PrecSep_0	
490-155661-10	Landfill Seep-02-071318	Total/NA	Water	PrecSep_0	
490-155661-12	Pond-012-071318	Total/NA	Water	PrecSep_0	
490-155661-13	Landfill Seep-04-071318	Total/NA	Water	PrecSep_0	
MB 160-376805/18-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-376805/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
400-156511-B-1-D DU	Duplicate	Total/NA	Water	PrecSep_0	

Prep Batch: 377701

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	PrecSep-21	
MB 160-377701/16-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-377701/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
600-169468-C-1-A DU	Duplicate	Total/NA	Water	PrecSep-21	

Prep Batch: 377705

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-155661-11	Landfill Seep-03-071318	Total/NA	Water	PrecSep_0	
MB 160-377705/16-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-377705/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
600-169468-C-1-B DU	Duplicate	Total/NA	Water	PrecSep_0	

Client Sample ID: River Seep-08-071318

Date Collected: 07/13/18 07:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:22	SW1	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 20:45	JHS	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 21:00	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:24	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:35	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:04	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 20:55	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			999.94 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381568	08/10/18 16:41	RTM	TAL SL
Total/NA	Prep	PrecSep_0			999.94 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379945	08/02/18 09:20	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-12-071318

Date Collected: 07/13/18 09:15
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:37	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:29	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:40	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:05	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:02	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			750.37 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381568	08/10/18 16:41	RTM	TAL SL
Total/NA	Prep	PrecSep_0			750.37 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:21	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-16-071318

Lab Sample ID: 490-155661-3

Date Collected: 07/13/18 11:00

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 16:52	SW1	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:35	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:44	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:06	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:09	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH

Client Sample ID: River Seep-14-071318

Lab Sample ID: 490-155661-4

Date Collected: 07/13/18 10:10

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 17:07	SW1	TAL NSH
Total/NA	Analysis	9056A		10			531368	07/25/18 21:15	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:50	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 19:49	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:07	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:17	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH

Client Sample ID: River Seep-09-071218

Lab Sample ID: 490-155661-5

Date Collected: 07/12/18 13:50

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 17:51	SW1	TAL NSH
Total/NA	Analysis	9056A		10			531368	07/25/18 21:59	JHS	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 22:14	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 17:56	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:06	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:08	RJR	TAL PIT

Client Sample ID: River Seep-09-071218

Date Collected: 07/12/18 13:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:21	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.17 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:40	RTM	TAL SL
Total/NA	Prep	PrecSep_0			500.17 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-07-071218

Date Collected: 07/12/18 14:50
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:21	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 22:29	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:01	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:11	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:09	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:28	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			999.84 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:39	RTM	TAL SL
Total/NA	Prep	PrecSep_0			999.84 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: River Seep-05-071218

Date Collected: 07/12/18 14:25
Date Received: 07/14/18 10:50

Lab Sample ID: 490-155661-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:36	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/25/18 22:44	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:07	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:16	WTR	TAL PIT

Client Sample ID: River Seep-05-071218

Lab Sample ID: 490-155661-7

Date Collected: 07/12/18 14:25
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:12	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:41	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	25 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			499.95 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381569	08/10/18 16:40	RTM	TAL SL
Total/NA	Prep	PrecSep_0			499.95 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-01-071318

Lab Sample ID: 490-155661-8

Date Collected: 07/13/18 12:20
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 18:51	SW1	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 22:58	JHS	TAL NSH
Total/NA	Analysis	9056A		200			531368	07/25/18 23:13	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:12	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10			253104	08/07/18 12:06	RSK	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:20	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:13	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531203	07/24/18 17:55	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:50	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.48 mL	1.0 g	376745	07/19/18 15:20	JLC	TAL SL
Total/NA	Analysis	903.0		1			381577	08/10/18 16:38	RTM	TAL SL
Total/NA	Prep	PrecSep_0			500.48 mL	1.0 g	376750	07/19/18 15:49	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:22	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-01-071318-DUP

Lab Sample ID: 490-155661-9

Date Collected: 07/13/18 12:20
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 19:06	SW1	TAL NSH

Client Sample ID: Landfill Seep-01-071318-DUP

Lab Sample ID: 490-155661-9

Date Collected: 07/13/18 12:20
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		50			531368	07/25/18 23:28	JHS	TAL NSH
Total/NA	Analysis	9056A		200			531368	07/25/18 23:43	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:18	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10			253104	08/07/18 12:09	RSK	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:25	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:14	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 21:59	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.28 mL	1.0 g	376796	07/20/18 08:40	JLC	TAL SL
Total/NA	Analysis	903.0		1			381803	08/13/18 06:34	CDR	TAL SL
Total/NA	Prep	PrecSep_0			500.28 mL	1.0 g	376805	07/20/18 09:30	JLC	TAL SL
Total/NA	Analysis	904.0		1	1.0 mL	1.0 mL	379784	08/02/18 09:25	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-02-071318

Lab Sample ID: 490-155661-10

Date Collected: 07/13/18 13:10
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 19:20	SW1	TAL NSH
Total/NA	Analysis	9056A		50			531368	07/25/18 23:58	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:24	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10			253104	08/07/18 12:12	RSK	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:30	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:15	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 22:08	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.14 mL	1.0 g	376796	07/20/18 08:40	JLC	TAL SL
Total/NA	Analysis	903.0		1			381803	08/13/18 06:34	CDR	TAL SL
Total/NA	Prep	PrecSep_0			500.14 mL	1.0 g	376805	07/20/18 09:30	JLC	TAL SL
Total/NA	Analysis	904.0		1	1.0 mL	1.0 mL	379784	08/02/18 09:25	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-03-071318

Lab Sample ID: 490-155661-11

Date Collected: 07/13/18 13:30
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 19:35	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/26/18 01:41	JHS	TAL NSH
Total/NA	Analysis	9056A		500			531368	07/26/18 01:56	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:29	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:34	WTR	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10	1.0 mL	1.0 mL	252316	07/31/18 01:20	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:16	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 22:15	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			250.40 mL	1.0 g	377701	07/24/18 13:57	JLC	TAL SL
Total/NA	Analysis	903.0		1			382767	08/16/18 05:35	ALS	TAL SL
Total/NA	Prep	PrecSep_0			250.40 mL	1.0 g	377705	07/24/18 14:24	JLC	TAL SL
Total/NA	Analysis	904.0		1			380015	08/02/18 16:23	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Pond-012-071318

Lab Sample ID: 490-155661-12

Date Collected: 07/13/18 13:50
Matrix: Water
Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 19:50	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/26/18 02:11	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:35	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10			253104	08/07/18 12:15	RSK	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:39	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:17	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/24/18 22:22	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.18 mL	1.0 g	376796	07/20/18 08:40	JLC	TAL SL
Total/NA	Analysis	903.0		1			381803	08/13/18 06:34	CDR	TAL SL
Total/NA	Prep	PrecSep_0			500.18 mL	1.0 g	376805	07/20/18 09:30	JLC	TAL SL
Total/NA	Analysis	904.0		1	1.0 mL	1.0 mL	379784	08/02/18 09:25	CDR	TAL SL

Client Sample ID: Pond-012-071318

Lab Sample ID: 490-155661-12

Date Collected: 07/13/18 13:50

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Client Sample ID: Landfill Seep-04-071318

Lab Sample ID: 490-155661-13

Date Collected: 07/13/18 14:15

Matrix: Water

Date Received: 07/14/18 10:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1			531256	07/24/18 20:05	SW1	TAL NSH
Total/NA	Analysis	9056A		100			531368	07/26/18 02:26	JHS	TAL NSH
Total Recoverable	Prep	3005A			50 mL	50 mL	250902	07/18/18 12:42	NAM	TAL PIT
Total Recoverable	Analysis	6010C		1			251527	07/24/18 18:41	RJG	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		1	1.0 mL	1.0 mL	252059	07/28/18 20:43	WTR	TAL PIT
Total Recoverable	Prep	3005A			50 mL	50 mL	250903	07/18/18 12:44	NAM	TAL PIT
Total Recoverable	Analysis	6020A		10	1.0 mL	1.0 mL	252316	07/31/18 01:47	WTR	TAL PIT
Total/NA	Prep	7470A			50 mL	50 mL	250943	07/18/18 15:06	RJR	TAL PIT
Total/NA	Analysis	EPA 7470A		1			251171	07/20/18 11:18	RJR	TAL PIT
Total/NA	Analysis	9040C		1			531204	07/24/18 17:58	JDG	TAL NSH
Total/NA	Analysis	SM 2320B		1	35 mL	35 mL	531384	07/25/18 09:02	BMC	TAL NSH
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	529395	07/18/18 08:50	BMC	TAL NSH
Total/NA	Prep	PrecSep-21			500.06 mL	1.0 g	376796	07/20/18 08:40	JLC	TAL SL
Total/NA	Analysis	903.0		1			381803	08/13/18 06:35	CDR	TAL SL
Total/NA	Prep	PrecSep_0			500.06 mL	1.0 g	376805	07/20/18 09:30	JLC	TAL SL
Total/NA	Analysis	904.0		1			379784	08/02/18 09:25	CDR	TAL SL
Total/NA	Analysis	Ra226_Ra228		1			384175	08/21/18 03:20	RTM	TAL SL

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Method Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL NSH
6010C	Metals (ICP)	SW846	TAL PIT
6020A	Metals (ICP/MS)	SW846	TAL PIT
EPA 7470A	Mercury (CVAA)	SW846	TAL PIT
9040C	pH	SW846	TAL NSH
SM 2320B	Alkalinity	SM	TAL NSH
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL NSH
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL PIT
7470A	Preparation, Mercury	SW846	TAL PIT

Protocol References:

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:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Laboratory: TestAmerica Nashville

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Kentucky (UST)	State Program	4	19	06-30-19

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
9040C		Water	pH
9040C		Water	Temperature
9056A		Water	Chloride
9056A		Water	Fluoride
9056A		Water	Sulfate
SM 2320B		Water	Alkalinity
SM 2540C		Water	Total Dissolved Solids

Laboratory: TestAmerica Pittsburgh

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Arkansas DEQ	State Program	6	88-0690	06-27-19
California	State Program	9	2891	04-30-19
Connecticut	State Program	1	PH-0688	09-30-18
Florida	NELAP	4	E871008	06-30-19
Illinois	NELAP	5	200005	06-30-19
Kansas	NELAP	7	E-10350	01-31-19
Louisiana	NELAP	6	04041	06-30-19
Nevada	State Program	9	PA00164	07-31-19
New Hampshire	NELAP	1	2030	04-04-19
New Jersey	NELAP	2	PA005	06-30-19
New York	NELAP	2	11182	03-31-19
North Carolina (WW/SW)	State Program	4	434	12-31-18
Oregon	NELAP	10	PA-2151	01-28-19
Pennsylvania	NELAP	3	02-00416	04-30-19
South Carolina	State Program	4	89014	04-30-19
Texas	NELAP	6	T104704528-15-2	03-31-19
US Fish & Wildlife	Federal		LE94312A-1	07-31-19
USDA	Federal		P330-16-00211	06-26-19
Utah	NELAP	8	PA001462015-4	05-31-19
Virginia	NELAP	3	460189	09-14-18 *
West Virginia DEP	State Program	3	142	01-31-19
Wisconsin	State Program	5	998027800	08-31-18

Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	DoD ELAP		L2305	04-06-19
Arizona	State Program	9	AZ0813	12-08-18
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19
Florida	NELAP	4	E87689	06-30-19
Illinois	NELAP	5	200023	11-30-18
Iowa	State Program	7	373	12-01-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Laboratory: TestAmerica St. Louis (Continued)

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Kansas	NELAP	7	E-10236	10-31-18
Kentucky (DW)	State Program	4	90125	12-31-18
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA180017	12-31-18
Maryland	State Program	3	310	09-30-18 *
Michigan	State Program	5	9005	06-30-18 *
Missouri	State Program	7	780	06-30-18 *
Nevada	State Program	9	MO000542018-1	07-31-19
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-18 *
Pennsylvania	NELAP	3	68-00540	02-28-19
South Carolina	State Program	4	85002001	06-30-18 *
Texas	NELAP	6	T104704193-18-12	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542016-8	07-31-18 *
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-18 *
West Virginia DEP	State Program	3	381	08-31-18 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-155661 Chain of Custody

Cooler Received/Opened On 7/14/2018 @ 1050

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2692 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960357 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 5.9 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO (NA)

4. Were custody seals on outside of cooler? (YES) NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? (YES) NO...NA

6. Were custody papers inside cooler? (YES) NO...NA

I certify that I opened the cooler and answered questions 1-6 (initial) GH

7. Were custody seals on containers: YES (NO) and Intact YES...NO...(NA)

Were these signed and dated correctly? YES...NO...(NA)

8. Packing mat'l used? (Bubblewrap) Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: (Ice) Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? (YES) NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? (YES) NO...NA

12. Did all container labels and tags agree with custody papers? (YES) NO...NA

13a. Were VOA vials received? YES (NO) NA

b. Was there any observable headspace present in any VOA vial? YES...NO...(NA)

Larger than this.

14. Was there a Trip Blank in this cooler? YES (NO) NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (initial) AOH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...(NA)

b. Did the bottle labels indicate that the correct preservatives were used (YES) NO...NA

16. Was residual chlorine present? YES...NO...(NA)

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (initial) AOH

17. Were custody papers properly filled out (ink, signed, etc)? (YES) NO...NA

18. Did you sign the custody papers in the appropriate place? (YES) NO...NA

19. Were correct containers used for the analysis requested? (YES) NO...NA

20. Was sufficient amount of sample sent in each container? (YES) NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (initial) AOH

I certify that I attached a label with the unique LIMS number to each container (initial) AOH

21. Were there Non-Conformance issues at login? YES (NO) Was a NCM generated? YES (NO) #_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

Loc: 490
155661

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Cooler Received/Opened On 7/14/2018 @ 10:50

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2681 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960353 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 1.0 Degrees Celsius

3. If item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES NO NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES NO NA

6. Were custody papers inside cooler? YES NO NA

I certify that I opened the cooler and answered questions 1-6 (intial) YOF

7. Were custody seals on containers: YES NO and Intact YES NO NA

Were these signed and dated correctly? YES NO NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES NO NA

12. Did all container labels and tags agree with custody papers? YES NO NA

13a. Were VOA vials received? YES NO NA

b. Was there any observable headspace present in any VOA vial? YES NO NA

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES NO NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) YOF

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO NA

b. Did the bottle labels indicate that the correct preservatives were used YES NO NA

16. Was residual chlorine present? YES NO NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) YOF

17. Were custody papers properly filled out (ink, signed, etc)? YES NO NA

18. Did you sign the custody papers in the appropriate place? YES NO NA

19. Were correct containers used for the analysis requested? YES NO NA

20. Was sufficient amount of sample sent in each container? YES NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) YOF

I certify that I attached a label with the unique LIMS number to each container (intial) YOF

21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES NO #_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

Loc: 490
155661

COOLER RECEIPT FORM

Cooler Received/Opened On 7/14/2018 @1050

Time Samples Removed From Cooler_____ Time Samples Placed In Storage_____ (2 Hour Window)

1. Tracking # 2670 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 14740456 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 3.1 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) ADT

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) ADT

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) ADT

I certify that I attached a label with the unique LIMS number to each container (intial) ADT

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex 3 Fedex	COC No: 490-86693-25173.1
Client Contact: Greg Dick	Phone: 513-237-1647	E-Mail: roxanne.cisneros@testamericainc.com		Page: Page 1 of 2
Company: Big Rivers Electric Corporation				Job #:
Address: PO BOX 24	Due Date Requested: Standard		Analysis Requested	Preservation Codes:
City: Henderson	TAT Requested (days): Standard			A - HCL M - Hexane B - NaOH N - None C - Zn Acetate O - AsNaO2 D - Nitric Acid P - Na2O4S E - NaHSO4 Q - Na2SO3 F - MeOH R - Na2S2O3 G - Amchlor S - H2SO4 H - Ascorbic Acid T - TSP Dodecahydrate I - Ice U - Acetone J - DI Water V - MCAA K - EDTA W - pH 4-5 L - EDA Z - other (specify)
State, Zip: KY, 42419				
Phone: 270-844-6010(Tel)	PO #: Purchase Order - see DOCs			Other:
Email: Gregory.Dick@bigrivers.com	WO #:			
Project Name: Big Rivers Electric Corp - Henderson KY	Sebree Green Landfill			CCR App III, IV + Alk, Na, Mg
Site: Sebree Green Landfill	SSOW#:			

Loc: 490
155661

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056_ORGFM_28D	6010B, 7470A	25400_Calcd - TDS	Redox 226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N			
River Seep - 08 - 071318	7/13/18	0750	G	Water			X	X	X	X	5	pH 7.09
River Seep - 12 - 071318	7/13/18	0915		Water			X	X	X	X	5	7.37
River Seep - 16 - 071318	7/13/18	1100		Water			X	X	X		3	7.46
River Seep - 14 - 071318	7/13/18	1010		Water			X	X	X		3	7.54
River Seep - 04 - 071218	7/12/18	1350		Water			X	X	X	X	5	5.13
River Seep - 07 - 071218	7/12/18	1450		Water			X	X	X	X	5	7.27
River Seep - 05 - 071218	7/12/18	1425		Water			X	X	X	X	5	6.92
Landfill Seep - 01 - 071318	7/13/18	1220		Water			X	X	X	X	5	10.64
Landfill Seep - 01 - 071318 - Dup	7/13/18	1220		Water			X	X	X	X	5	10.64
Landfill Seep - 02 - 071318	7/13/18	1310		Water			X	X	X	X	5	10.20
Landfill Seep - 03 - 071318	7/13/18	1330		Water			X	X	X	X	5	8.02

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 7/13/18 1630	Company: AECOM	Received by:	Date/Time: 7/14/18 1050	Company: TALAS
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 5.7, 1.0, 3.1

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Chris Davis	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s): Fedex Rodeis	COC No: 490-86693-25173.1
Client Contact: Greg Dick	Phone: 513-237-1188	E-Mail: roxanne.cisneros@testamericainc.com		Page: Page 1 of 2
Company: Big Rivers Electric Corporation				Job #:
Address: PO BOX 24	Due Date Requested: Standard			
City: Henderson	TAT Requested (days): Standard			
State, Zip: KY, 42419				
Phone: 270-844-6010(Tel)	PO #: Purchase Order - see DOCs			
Email: Gregory.Dick@bigrivers.com	WO #:			
Project Name: Big Rivers Electric Corp - Henderson KY	Sebree Green Landfill			
Site: Sebree Green Landfill	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Wastewater, Sewage, Drinking Water, Tissue, Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	2320B, 9040C, 9056, ORGFM_28D	6010C, 6020A	6020B, 7470A	2540C, Calcd - TDS	Radium 226/228	Cl, SO4	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N	D				CCR App III, IV + Alk, Na, Mg
POND-012-071318	7/13/18	1350	G	Water	N	N	X	X	X	X				pH 7.95
Landfill Seep-04-071318	7/13/18	1415	G	Water	N	N	X	X	X	X				pH 10.71
~~Trip Seep 16 071318~~ CS	~~7/13/18~~	~~1044~~		Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										

Loc: 490
155661

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

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

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:				
Relinquished by:	Date/Time: 7/13/18 1630	Company: Aecom	Received by:	Date/Time: 7/14/18 1050	Company: TA-NAS
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 5.7, 1.0, 3.1

Ver: 08/04/2016

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	Carrier Tracking No(s):	COC No: 490-75464.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 1 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)		Job #: 490-155661-2
Address: 13715 Rider Trail North,	Due Date Requested: 8/13/2018			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Big Rivers Electric Corp - CCR & SemiAnn	Project #: 49010431			
Site: Big Rivers CCR	SSOW#:			

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)
	Other:

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
River Seep-08-071318 (490-155661-1)	7/13/18	07:50 Central		Water			X	X	X	2	run once - upload data twice
River Seep-12-071318 (490-155661-2)	7/13/18	09:15 Central		Water			X	X	X	2	run once - upload data twice
River Seep-09-071218 (490-155661-5)	7/12/18	13:50 Central		Water			X	X	X	2	run once - upload data twice
River Seep-07-071218 (490-155661-6)	7/12/18	14:50 Central		Water			X	X	X	2	run once - upload data twice
River Seep-05-071218 (490-155661-7)	7/12/18	14:25 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-01-071318 (490-155661-8)	7/13/18	12:20 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-01-071318-DUP (490-155661-9)	7/13/18	12:20 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-02-071318 (490-155661-10)	7/13/18	13:10 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-03-071318 (490-155661-11)	7/13/18	13:30 Central		Water			X	X	X	2	run once - upload data twice

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. 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 accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:			
Relinquished by:	Date/Time: 7/16/18 1506	Company: TA-NA	Received by:	Date/Time: 7/17/18 @ 095	Company: TASL	
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:	
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:	

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 18.5c

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

490-155661

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Cisneros, Roxanne	COC No: 490-75464.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: roxanne.cisneros@testamericainc.com	State of Origin: Kentucky	Page: Page 2 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Kentucky (UST)	Job #: 490-155661-2
Address: 13715 Rider Trail North,	Due Date Requested: 8/13/2018		
City: Earth City	TAT Requested (days):		
State, Zip: MO, 63045			
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:		
Email:	WO #:		
Project Name: Big Rivers Electric Corp - CCR & SemiAnn	Project #: 49010431		
Site: Big Rivers CCR	SSOW#:		

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Water, Solid, Oil/waste, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
Pond-012-071318 (490-155661-12)	7/13/18	13:50 Central		Water			X	X	X	2	run once - upload data twice
Landfill Seep-04-071318 (490-155661-13)	7/13/18	14:15 Central		Water			X	X	X	2	run once - upload data twice

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. I

Possible Hazard Identification Unconfirmed	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 7/14 1506	Company: TA-NV	Received by:	Date/Time: 7-17-18 0915	Company: TAN
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 09/20/2016

Login Sample Receipt Checklist

Client: Big Rivers Electric Corporation

Job Number: 490-155661-2

Login Number: 155661
List Number: 3
Creator: McBride, Mike

List Source: TestAmerica St. Louis
List Creation: 07/17/18 05:06 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	Thermal preservation not required.
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?	N/A	Received project as a subcontract.
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").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Tracer/Carrier Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits) Ba Carrier (40-110)
400-156511-B-1-B DU	Duplicate	90.3
490-155661-1	River Seep-08-071318	87.3
490-155661-2	River Seep-12-071318	92.9
490-155661-5	River Seep-09-071218	89.4
490-155661-6	River Seep-07-071218	79.4
490-155661-7	River Seep-05-071218	82.9
490-155661-8	Landfill Seep-01-071318	87.6
490-155661-9	Landfill Seep-01-071318-DUP	94.4
490-155661-10	Landfill Seep-02-071318	96.8
490-155661-11	Landfill Seep-03-071318	89.7
490-155661-12	Pond-012-071318	93.2
490-155661-13	Landfill Seep-04-071318	97.6
600-169468-C-1-A DU	Duplicate	94.4
LCS 160-376745/1-A	Lab Control Sample	100
LCS 160-376796/1-A	Lab Control Sample	99.7
LCS 160-377701/1-A	Lab Control Sample	94.1
LCSD 160-376745/2-A	Lab Control Sample Dup	100
MB 160-376745/23-A	Method Blank	97.1
MB 160-376796/18-A	Method Blank	102
MB 160-377701/16-A	Method Blank	94.7

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits) Ba Carrier (40-110)	Y Carrier (40-110)
400-156511-B-1-D DU	Duplicate	90.3	84.5
490-155661-1	River Seep-08-071318	87.3	90.5
490-155661-2	River Seep-12-071318	92.9	85.6
490-155661-5	River Seep-09-071218	89.4	87.1
490-155661-6	River Seep-07-071218	79.4	87.1
490-155661-7	River Seep-05-071218	82.9	83.0
490-155661-8	Landfill Seep-01-071318	87.6	75.9
490-155661-9	Landfill Seep-01-071318-DUP	94.4	94.6
490-155661-10	Landfill Seep-02-071318	96.8	85.6
490-155661-11	Landfill Seep-03-071318	89.7	92.7
490-155661-12	Pond-012-071318	93.2	77.8
490-155661-13	Landfill Seep-04-071318	97.6	86.4
600-169468-C-1-B DU	Duplicate	94.4	90.8
LCS 160-376750/1-A	Lab Control Sample	100	86.4
LCS 160-376805/1-A	Lab Control Sample	99.7	91.2
LCS 160-377705/1-A	Lab Control Sample	94.1	88.6
LCSD 160-376750/2-A	Lab Control Sample Dup	100	87.5
MB 160-376750/23-A	Method Blank	97.1	85.6
MB 160-376805/18-A	Method Blank	102	91.6

Tracer/Carrier Summary

Client: Big Rivers Electric Corporation
Project/Site: Sebree-Green Landfill

TestAmerica Job ID: 490-155661-1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)									
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)								
MB 160-377705/16-A	Method Blank	94.7	90.1								

Tracer/Carrier Legend

Ba Carrier = Ba Carrier
Y Carrier = Y Carrier

ATTACHMENT 8 – REMEDY SELECTION REPORTS FOR GREEN LANDFILL

Final Groundwater and Non-Groundwater Corrective Action Remedy Selection Report

Green Landfill
Sebree Station
Webster County, Kentucky

Prepared for:

Big Rivers Electric Corporation
Sebree Generating Station
9000 Highway 2096
Robards, KY 42452

Prepared by:

AECOM Technical Services
525 Vine Street, Suite 1800
Cincinnati, Ohio 45202

AECOM PN 60626688

November 18, 2020

Certification Statement 40 CFR § 257.97(a) – Selection of a Remedy for the Corrective Action Program for Green Station CCR Landfill

Big Rivers Electric Corporation Sebree Generating Station, Green CCR Landfill

AECOM ("Consultant") has been retained by Big Rivers Electric Corporation to certify whether the selected groundwater remedy presented herein for the Green Station coal combustion residuals (CCR) landfill meets the requirements of Chapter 40 of the Code of Federal Regulations (CFR) §257.97.

LIMITATIONS

The signature of Consultant's authorized representative on this document represents that to the best of Consultant's knowledge, information, and belief in the exercise of its professional judgment, it is Consultant's professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by Consultant are made on the basis of Consultant's experience, qualifications, and professional judgment and are not to be construed as warranties or guaranties. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

CERTIFICATION

I, Brian Cole, being a Registered Professional Engineer in the State of Kentucky, certify to the best of my knowledge, information, and belief, that the remedy selected by Big Rivers Electric Corporation for the Green Station CCR Landfill meets the requirements of 40 CFR § 257.97, and that this certification is true and correct and has been prepared in accordance with generally accepted good engineering practices.

M. Brian Cole

_____

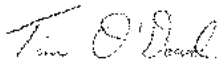
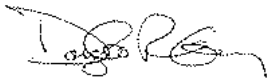
Printed Name

11/18/2020

_____

Date

Quality information

Prepared by	Checked by	Verified by	Approved by
			
Timothy P. O'Dowd, PG	Doug Gray, CGWP	M. Brian Cole, PE	Dennis P. Connair, PG
Project Manager	Principal Project Manager	Senior Civil Engineer	Principal Geologist

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	6-18-20				
2	8-18-20				
Final	10-5-20				
Amended Final	11-18-20				

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1. Introduction

In accordance with provisions of the United States Environmental Protection Agency's (USEPA) coal combustion residual (CCR) rule, Title 40 of the Code of Federal Regulations (CFR) Part 257.97, Big Rivers Electric Corperation (BREC) is required to select a remedy to address groundwater impacts identified at the Green Station CCR Landfill (the Unit) at the Sebree Generating Station located in Webster County, Robards, Kentucky **(Figure 1)**. Previous monitoring results indicate the presence of lithium at a Statistically Significant Level (SSL) above the Ground Water Protection Standard (GWPS) in four monitoring wells (MW-3A, MW-4, MW-5, and MW-6) at the Unit. In June 2019, BREC performed an Assessment of Corrective Measures (ACM) for the Unit to identify remedial alternatives to address groundwater impacts. A public meeting was held on July 16, 2020 in Henderson, Kentucky to dicuss the results of the ACM. No public input was received at this meeting. Additional technical assessment has been utilized by BREC to select the final remedy for the Unit in accordance with 40 CFR Part 257.97, which is presented in this report.

On December 16, 2019, an Agreed Order was filed with the Kentucky Office of Administrative Hearings between BREC and the Commonwealth of Kentucky, Energy and Environment Cabinet, Division of Waste Management (KDWM) to address Notices of Violation (NOVs) received in regard to unpermitted discharges and seepage emanating form the Unit (see Section 1.2). Within the AGREED ORDER are requirements for remedy selection reporting, including a timeline for review by the KDWM. These requirements are discussed in Paragraphs 18 and 23 of the Agreed Order and listed in Exhibit 4 to the Agreed Order. This report has been prepared to address these requirements in the Agreed Order and Exhibit 4 to the Agreed Order, in addition to the Federal CCR Rule requirements.

In parallel with addressing groundwater impacts, BREC performed an ACM for non-groundwater release surface seeps at the Unit in June 2019. In September and October 2019, BREC initiated interim corrective measures (ICMs) to address non-groundwater releases at the Unit. The ICMs are currently being evalauted through performance monitoring and are expected to benefit corrective action as a whole for the Unit. As a result, no separate remedy selection report is currently being developed for non-groundwater releases. BREC intendes for this report to address the remedy selection requirements for both groundwater and non-groundwater impacts under 40 CFR Part 257.

1.1 Regulatory Background

Kentucky Revised Statue (KRS) Chapter 224.50-760 governs the disposal of special waste, including utility wastes. The Commonwealth of Kentucky, Energy and Environment Cabinet (The Cabinet) promulgated regulations under Title 401 of the Kentucky Administrative Regulations (KAR) Chapters 45 and 46 to regulate the disposal of special wastes The Unit is a Kentucky permitted landfill (Permit No. SW11700007) subject to permitting requirements for special wastes established under 401 KAR Chapter 45.

In 2015 the USEPA promulgated 40 CFR Parts 257.50 through 257.107 which established national standards to govern the location, design, construction, and operation of landfills and surface impoundments utilized to manage CCR. In 2017, the Cabinet promulgated 401 KAR 46:110 which incorporates the federal CCR standards by reference into Kentucky regulations. As noted in the Agreed Order, the Unit is an existing CCR landfill under the Federal CCR rule and therefore subject to the operating criteria and corrective action standards of 401 KAR 46:110.

Corrective actions at the Unit are being performed to address both the federal requirements in 40 CFR Part 257 and state requirements in 401 KAR Chapter 46 as described below.

1.1.1 Federal CCR Background

In response to SSL exceedances in groundwater at the Unit, BREC evaluated the nature and extent of groundwater impacts as required by Title 40 CFR Part 257.95(g) for characterization monitoring.

Following chracterization monitoring, BREC performed an ACM, to identify potential corrective measures to address lithium impacts in groundwater pursuant to Title 40 CFR Part 257.96. A notice of ACM initiation dated January 14, 2019 was posted to BREC's publicly-accessible CCR reporting website. A report summarizing the results of the groundwater ACM (AECOM, June 2019) was posted to BREC's publicly-accessible CCR reporting website on June 14, 2019.

On March 15, 2018, the USEPA proposed a modification to the federal CCR regualtions to address four provisions within 40 CFR Section 257 that were remanded back to the USEPA on June 14, 2016 by the United States Court of Appeals for the District of Columbia Circuit. The proposed modifications to 40 CFR 257 (also known as the Remand Rule) also included provisions for owners and operators of CCR units in states that have approved CCR permit programs. Title 40 CFR Part 257.99 established procedures for owners and operators of CCR units to perforrm corrective action for eligible non-groundwater releases at a CCR unit. In alignment with corrective actions being performed to address the NOVs received from the KDWM for unpermitted discharges and seepage emanating from the Unit, BREC perfomed an ACM for non-groundwater releases in addition to the ACM for groundwater impacts. A report summarizing the results of the groundwater ACM (AECOM, June 2019) was posted to BREC's publicly-accessible CCR reporting website on June 28, 2019. In 2019, pursuant to 40 CFR Parts 257.90(d) and 257.84(b)(5), BREC initiated design of ICMs (i.e., containment systems) intended to reduce and prevent non-groundwater releases from reaching the Green River. In September and October 2019, BREC intiated construction of ICMs to address non-groundwater releases at the Unit (which are referred to herein as river seeps), including:

- Construction of a collection trench along the east side of the Green Landfill (refered to as the Deep Seep Collection Trench) to address seeps adjacent to the Green River; and

- Construction of a series of collection trenchs along the north side of the Green Landfill (refered to as the Northwest Seep Collection Trench) to address seeps near the northwest corner of the landfill discharging toward an east-flowing unnamed tributary to the Green River.

Construction of the ICMs was functionally completed in Janaury 2020, within the 180 day required timeframe required under proposed 40 CFR Part 257.99, although piping, pumping, and control system installation, and installation of supplemental collector systems were not completed until later in 2020. The ICMs completed to address non-groundwater releases under 40 CFR Part 257 and the Agreed Order are expected to benefit groundwater corrective action and are discussed collectively within this report (see Section 2.4).

Title 40 CFR Section 257.97(a) requires that progress reports be prepared on a semi-annual basis describing progress made in selecting and designing a remedy. The first Remedy Selection Progress Report was finalized on December 9, 2019 and posted to BREC's publicly-accessible CCR reporting website on December 12, 2019.

BREC held a public meeting on July 16, 2020 in Henderson, Kentucky to discuss the results of the Groundwater ACM in accordance with 40 CFR Part 257.96(e). No public input influencing the remedy for the Unit was received during the meeting. BREC has selected the remedy for groundwater and non-groundwater impacts at the Unit in accordance with 40 CFR Part 257.97 as detailed within this report.

1.1.2 Kentucky Division of Waste Management Background

On December 6, 2019, BREC signed Agreed Order #18-3-0138 with the KDWM to address NOVs received regarding unpermitted discharges and seepage emanating from the Unit. The Agreed Order was filed on December 16, 2019. Under the Agreed Order the following actions were required:

- Development of Standard Operating Procedures (SOPs) to characterize and mitigate leachate and seep releases to the surface (Exhibit 1);

- Development of construction and post-construction plans for implementing the Northwestern Seep Collection Trench Remedy (Exhibit 2);

- Development of construction and post-construction plans for implementing the Eastern “Deep Seep” Collection Trench Remedy (Exhibit 3); and
- Establishment of the process to complete the evaluation of groundwater corrective action remedies at the Unit pursuant to 401 KAR 46:110 (Exhibit 4).

Within Exhibit 4 of the Agreed Order, the following milestones for groundwater corrective action were identified:

1) Within 180 days of the entry of the Agreed Order, BREC shall conduct a public meeting as required by 40 CFR 257.96(e) and 401 KAR 46:110.
2) Within 90 days of the public meeting, BREC shall submit a draft groundwater remedy selection report for submittal to KDWM for a 30-day review and comment period.
3) As soon as possible, following receipt of KDWM comments on the draft groundwater remedy selection report, select the final groundwater corrective action remedy.
4) Posting of the Final *Groundwater and Non-Groundwater Corrective Action Remedy Selection Report* to BREC’s CCR Rule compliance website in accordance with 40 CFR 257.97 and 257.107 (no timeline specified).

Although the milestone schedule has been adjusted due to the COVID-19 pandemic, which prevented BREC from holding the public meeting at an earlier date, BREC has moved forward with the activities required in the Agreed Order as documented in this report. A revised schedule for corrective action implementation is discussed in Section 5.0.

2. Site Background

2.1 Site Description

BREC owns and operates Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/Henderson Municipal Power & Light (HMP&L) Station. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (see **Figure 1**). Reid Unit 1 (65 Megawatts [MW]) began commercial operation in 1966 and is scheduled to be retired in 2020 pending regulatory approval from the Kentucky Public Service Commission and Rural Utilities Service. The Reid Combustion Turbine (65 MW) was commercialized in 1976. HMP&L Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974 respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (250 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Green Landfill is illustrated on **Figure 1**. The Green Landfill is located directly south of Sebree Station, situated south of the Green Station CCR Surface Impoundment. The Green Landfill is a Kentucky permitted landfill (Permit No. SW11700007) that receives special wastes generated by burning coal (CCRs) from Green and Reid/HMP&L Stations. The landfill began receiving CCR wastes in 1980. The current Green Landfill footprint is approximately 170 acres.

As stated in the published CCR monitoring well network certification, available on the BREC website (http://www.bigrivers.com/), the original ground surface within the landfill footprint was irregular and the dominant features were small stream valleys draining towards the Green River, which is located just east of the landfill; and towards Groves Creek, which is located just south of the landfill. There was also historic oil and gas production at and in the immediate vicinity of the Green Landfill. A review of the records from the Kentucky Geological Survey (KGS) showed that at or immediately adjacent to the Site, there were a number of dry exploratory oil/gas exploration holes, oil production wells, one gas production well, and one secondary recovery injection well. There were also former brine ponds at the Site. Most of these wells were abandoned in accordance with applicable regulations by BREC in 1997 and 1998. The last existing oil well was decommissioned in 2019.

2.2 Groundwater Investigation Summary

Monitoring wells were installed at the Unit beginning in November 1996 prior to the implementation of the CCR Rule. However, the existing wells meet the requirements of Title 40 CFR Section 257.90 of the CCR Rule for installation of a groundwater monitoring system. These regulations require that monitoring wells adequately represent the quality of background groundwater and groundwater representing the downgradient waste boundary. The existing wells are located along the perimeter of the landfill footprint. One upgradient monitoring well (MW-1) and five downgradient monitoring wells (MW-2, MW-3A, MW-4, MW-5 and MW-6) were installed at the Unit to determine the general direction of groundwater movement and to monitor groundwater impacts. One additional characterization monitoring well (MW-104) was installed downgradient of the Unit in 2018. All monitoring wells were installed in the uppermost saturated portion of the sandstone bedrock aquifer. A map illustrating the location of all program monitoring wells is presented as **Figure 2**.

Nine rounds of Baseline groundwater sampling for Appendix III constituents were conducted between March 2016 and October 2017. Statistical evaluation for Detection monitoring indicated that statistically significant increases (SSIs) over background had occurred, and therefore, Assessment monitoring was triggered. Detection monitoring activities and data are presented in the annual reports that have been prepared to date, (AECOM 2018, 2019, and 2020).

As part of Assessment monitoring, upgradient and downgradient wells for the Unit were sampled for Appendix IV constituents in June, July, and September 2018. GWPSs were established for the Appendix IV constituents occurring at SSIs (lithium only), and statistical evaluation of the lithium concentrations indicated exceedances of GWPSs at SSLs, as detailed in **Table 1** below.

Table 1. Green Landfill Constituents of Concern

Monitoring Well (Date)	Parameter Lithium GWPS 0.04 (mg/L)
MW-3A (Jun 2018)	**0.699**
MW-3A (Jul 2018)	**0.790**
MW-3A (Sep 2018)	**0.766**
MW-4 (Jun 2018)	**1.81**
MW-4 (Jul 2018)	**1.91**
MW-4(Sep 2018)	**1.81**
MW-5(Jun 2018)	**0.459**
MW-5 (Jul 2018)	**0.481**
MW-5 (Sep 2018)	**0.425**
MW-6 (Jun 2018)	**0.0650**
MW-6 (Jul 2018)	**0.0590**
MW-6 (Sep 2018)	**0.0558**

GWPSs are the greater of the site-specific background concentrations, the USEPA primary drinking water standard maximum contaminant limits (MCL), or GWPS provided in 40 CFR 257.95(3)(h)(2)

An additional characterization well, MW-104, was subsequently installed to estimate the downgradient extent of impacted groundwater. Sample collection from MW-104 for Appendix III and IV parameters took place in March and April 2019. The analytical results for lithium were below the GWPS. The additional characterization data are summarized in **Table 2** below.

Table 2. Green Landfill -2019 Characterization Sample Results

Monitoring Well (Date)	Parameter
	Lithium GWPS 0.04 [a] (mg/L)
MW-104 (March 2019)	0.0281
MW-104 (April 2019)	0.0288

a The Upper Prediction Limit for lithium was calculated as 0.008 mg/L.

The results from both characterization sampling events helped to confirm the downgradient (southwestern) extent of constituent of concern (COC) impacts above GWPS at the Unit.

Semi-annual Assessment monitoring continued at the Unit in 2019 and 2020 in accordance with 40 CFR 257.95.

2.3 Conceptual Site Model

Development and refinement of a Conceptual Site Model (CSM) is necessary to support remedy selection for the Unit. A CSM is based on a set of working hypotheses regarding how contaminants of concern (COCs) entered the environment at a site, how they were and continue to be transported to various media, what the potential routes of exposure are, and who may be exposed, including both human and ecological receptors. As such, the CSM is a "living" model. As new data become available or site conditions change, a CSM should be evaluated and updated as necessary.

The CSM for the Unit was first provided in the June 2019 ACM for the Unit (AECOM 2019). The CSM presents the physical setting of the Unit (adjacent to the Green River), the unconsolidated and bedrock geologic strata underling the Unit, the occurrence and movement of groundwater, the distribution of COCs in groundwater, and the potential receptors (or lack thereof) for impacted groundwater. These elements are described in detail below and have been updated with new information for this report as appropriate.

2.3.1 Physical Setting

The Unit is located within the Interior Low Plateaus physiographic province. The province is part of the Interior Plains division of the United States. Characteristic features of the province include unglaciated rolling limestone plains with alluvial valleys and entrenched rivers and streams. Several large rivers are in the region, including the Green, Ohio, Kentucky, Tennessee, and the Cumberland Rivers. The geology underlying the Unit consists of unconsolidated materials, including loess and alluvial deposits, underlain by Upper to Middle Pennsylvanian-age clastic and carbonate bedrock consisting primarily of sandstone and shale. The unconsolidated materials also include fill, silty and clayey residuum, and minor amounts of sandy, clayey channel fill alluvium.

The Unit is located on an upland adjacent to the west bank of the Green River at an elevation of approximately 436 feet, above mean sea level [ft., amsl] (at the north end of the landfill) and 397 ft., amsl (at the south end of the landfill), with a maximum elevation of 608 ft., amsl at the landfill crest. Precipitation falling within the Green Landfill is directed to ponds on the north and south sides of the Unit and then to the river under Kentucky Pollution Discharge and Elimination System (KPDES) permit No. KY0001929. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands (Associated Engineers 2016, Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan).

2.3.2 Geology

The Unit lies in the Western Kentucky Coalfields section, characterized by rolling uplands underlain by coal-bearing bedrock of the Pennsylvanian Period. Near the Unit, maximum topographic relief is on the order of 80 feet. The geologic quadrangle (Geologic map of the Robards quadrangle, Henderson and Webster Counties, Kentucky, 1973) for the area published by the Kentucky Geologic Survey (KGS) shows the surficial material in portions of the western half of the Unit to be unconsolidated loess representing the Pleistocene geologic epoch. The loess consists of sandy and clayey silt. Underlying the loess deposits and exposed at the surface on the eastern half of the Unit are broadly distributed Pleistocene and Holocene alluvium deposits consisting of intermixed and interlensing clay, silt, sand, and gravel. In close proximity to the Unit, the alluvium is generally a low permeability unit that forms terraces along the Green River at elevations of roughly 380 and 395 ft., amsl. The unconsolidated surficial materials range from approximately 10 feet (MW-5) to 52 feet (MW-104) in thickness surrounding the Unit. **Figure 3** provides an excerpt from the geologic quadrangle for the immediate area surrounding the Unit.

The unconsolidated materials are underlain by bedrock of the Upper Pennsylvanian Shelburn Formation [formerly identified as the Lisman Formation (Fairer, 1973)] and the Middle Pennsylvanian Carbondale Formation. At the base of the Shelburn Formation is the Providence Limestone Member, consisting of two distinct limestone beds separated by a sandy shale. The member is exposed in a streambed near the northwest corner of the Unit but is absent beneath much of the Unit footprint due to erosional channeling.

The underlying Carbondale Formation consists of cyclic sequences of sandstones, shales, siltstones and coals. The Carbondale sediments were deposited in a fluvial-deltaic system. As a result of this depositional environment, the lithologic units of the Carbondale tend to be lenticular bodies rather than continuous sheet-like strata. Gradational and abrupt horizontal changes in lithology are often encountered.

Cross-sections have been developed to support the CSM and are presented as **Figures 4, 5, 6** and **7**. Cross-section locations are shown on **Figure 2**. These sections illustrate the sequence of geologic materials present under the Unit as interpreted using the currently available data.

2.3.3 Groundwater Hydrogeology

For purposes of compliance with the CCR Rule groundwater monitoring requirements, the interbedded sandstone and shale of the Carbondale Formation is considered the uppermost aquifer underlying the Unit. The uppermost aquifer is hydraulically confined and first encountered at an elevation of approximately 401 ft., amsl at the northwest end of the landfill, and 367 ft., amsl at the southeast end of the landfill (AECOM, 2019).

Groundwater elevation data collected in April 2020 are summarized on **Table 3** below. These data were utilized to construct a piezometric surface map illustrating groundwater flow conditions for the uppermost aquifer (see **Figure 8**). Overall groundwater flow beneath the footprint of the Unit is to the east towards the Green River and south-southeast towards Groves Creek.

Table 3. Green Landfill -April 2020 Groundwater Elevation Data

Monitoring Well	Top of Casing Elevation (ft) [1]	Depth to Groundwater (ft)	Groundwater Elevation (ft, amsl)
MW-1	423.23	19.52	403.71
MW-2	392.37	16.24	376.13
MW-3A	386.48	12.08	374.40
MW-4	391.33	17.90	373.43
MW-5	390.18	17.62	372.56
MW-6	388.17	15.62	372.55
MW-12 [2]	395.54	22.15	373.39

1 Reference elevation of monitoring wells surveyed by Fuller, Mossbarger, Scott and May, Civil Engineers, Inc., Lexington, Kentucky, December 1996, December 1999. Survey coordinates were based on the Kentucky State Plane, Kentucky Southern Zone, NAD27 datum.
2. MW-12 is utilized for collection of piezometric data only and is not part of the CCR monitoring well network for the Green Landfill.

Slug tests were performed on April 25, 2019 at monitoring wells MW-3A, MW-4, MW-6, and MW-104 to assess the hydraulic characteristics of the uppermost aquifer. The estimated hydraulic conductivity of the monitoring wells tested ranged from 2×10^{-5} to 3×10^{-3} centimeters per second (cm/sec).

Although previous site-specific investigations have noted the presence of perched zones of saturation in the overlying unconsolidated materials, these discontinuous zones do not qualify as an uppermost aquifer under the CCR Rule because they do not produce usable quantities of groundwater (40CFR Part 257.53).

2.3.4 Non-Groundwater Hydrogeology

Two types of non-groundwater releases have been identified through inspection and investigation of the Unit: river seeps and perimeter seeps. The river seeps are those found along the Green River and its tributary streams. River seeps have been observed on the bank of the river/tributary and on the slope between the river/tributary and the landfill perimeter road. The river seeps on the northwest side of the

landfill drain to a KPDES permitted outfall, whereas the river seeps on the Green River side do not. Perimeter seeps are more surficial in nature and have been observed in various surface ditches located around the perimeter of the Green Landfill, all of which drain to sedimentation basins that discharge to a KPDES permitted outfall.

2.3.4.1 River Seeps

An investigation of the seeps along the Green River was conducted in July 2018 and was reported in a Technical Memorandum from AECOM to BREC dated September 6, 2018. The results of laboratory analysis of seep samples collected during this investigation are summarized in **Appendix A**. During this investigation, the banks of the Green River were surveyed by boat for evidence of seepage. The survey was conducted when the river stage had retreated to a low pool after a prolonged elevated stage so that the maximum number of seeps might be surveyed, and seepage rates might be high enough to allow sampling. Samples of seeps having visible flow were collected and tested for CCR indicator parameters (40 CFR Part 257 Appendix III), CCR constituents of concern (40 CFR Part 257 Appendix IV), and general chemistry parameters. The data from these analyses were used to evaluate whether individual seeps were likely associated with the Landfill.

Riverbank seeps were identified at sixteen discrete locations in the vicinity of Sebree Station. Seeps were recorded at locations on both the east and west banks of the river over two miles upstream of the landfill footprint and over 1.5 miles downstream of the landfill footprint. Some seeps appeared to potentially be associated with a surface water drainage feature, such as RS-11 where there appears to be a beaver pond beyond the riverbank, but most emanated from otherwise nondescript sections of riverbank. Some of the seeps resulted in a green discoloration of the riverbank, but most had orange staining.

Of the seven seeps tested, only three, RS-05, RS-07, and RS-08 as illustrated on Figure 1 in **Appendix A**, were found to have similar chemistry to leachate generated by the Green Landfill. These seeps did not differ greatly from the majority of the other riverbank seeps in that they were broadly seeping from the bank sediments and had a general orange discoloration, except that RS-07 had a some relatively discrete seepage points emanating from a few feet higher on the bank and RS-08 appeared to be emanating from on top of bedrock outcropping on the river bank. Seeps RS-05 and RS-07 are located near the center of the Landfill between monitoring wells MW-2 and MW-3A. This is the same area in which seeps have been observed higher on the slope between the river and the perimeter road, suggesting that they have a similar origin. Seep RS-08 is located adjacent to the South Sediment Basin and appears to be tied to that surface water feature. The approximate vertical position of the river seep locations relative to the Green Landfill are shown on **Figure 4**. It should be noted that the seep designated RS-06, located between RS-05 and RS-07, is likely to be of similar character and origin but was not generating enough flow to be sampled at the time of the survey.

The analytical results from the July 2018 river seep samples were compared to Kentucky Water Quality criteria for warm water aquatic habitat identified in 401 KAR 10:031 Section 6. Where there are no Kentucky Water Quality criteria for a specific constituent, the USEPA Region 4 surface water screening values were utilized for comparison. It should be noted that the Region 4 screening values are not compliance criteria, but rather values used to determine whether further evaluation is warranted. Samples from RS-05, -07 and -08 were found to exceed the 600 milligrams per liter (mg/L) limit for chloride. RS-05 also exceeded the current criteria for cadmium (0.00029 mg/L) and lead (0.0036 mg/L), but Kentucky has introduced a new cadmium criterion that may bring RS-05 back into compliance. Follow-up sampling conducted in December 2018 by the Kentucky Division of Water (KDoW) and BREC confirmed the exceedance of the chloride criteria. Accordingly, this parameter (chloride) is regarded as the primary COC for non-groundwater releases at the Unit requiring corrective action. Addressing the river seeps was included as a stipulation in the Agreed Order signed between BREC and the KDWM.

The analytical results for the river seep samples are summarized in **Appendix A**. Presented in parallel with the river seep results are deep in-stream river samples that were collected immediately adjacent to the river seeps to characterize the river water quality that is most likely to be impacted by seepage. The

deep samples were collected within 1 foot of the riverbed within 3 to 5 feet of the water line. None of the river sample results exceed the water quality or screening criteria suggesting that the identified river seeps are not impacting the Green River.

Additional data regarding the river seeps is provided in the *Assessment of Corrective Measures Non-Groundwater Release Under the CCR Rule, Green Station CCR Landfill* (AECOM June 28, 2019).

In April 2019, inspection of the Landfill site by the KDWM and KDoW identified an area of seepage outside the perimeter road on the northwest side of the Landfill (see **Figure 2**). This seepage (herein identified as the NW Seep) is adjacent to a tributary ditch that flows eastward to an unnamed outfall which has a KPDES discharge permit. The outfall was sampled by KDoW and BREC on April 2, 2019. A sample from this seep area (identified as sample 023) was collected by BREC personnel on April 11, 2019. The results indicated that the seep sample exceeded Kentucky Warm Water Aquatic Habitat criteria for Chronic Exposure for chloride and cadmium. As a result, this area was identified for corrective action. Addressing this seep area was included as a stipulation in the Agreed Order signed between BREC and the KDWM.

Photo 1: Bedrock outcrop located west of the NW Seep as observed on April 2, 2019.

The NW Seep appears to emanate from a horizon in or above a natural limestone ledge adjacent to the ditch. This conclusion is based on the observation of natural springs of groundwater upstream from the seep that clearly flows from fractures in the ledge. A series of three soil borings drilled between the landfill and the NW Seep area in May 2019 further suggest the seepage is controlled by this feature. **Figure 7** provides a cross-section illustrating the sequence of geologic materials present within the NW seep area as interpreted using the currently available data.

2.3.4.2 Perimeter Seeps

During the July 2018 investigation of Green River seeps, the area inside the Landfill perimeter road was also inspected for seeps. Four areas of perimeter seepage were identified (see **Figure 2**): along the west side of the landfill (LS-01), the southwest corner (LS-04), the south end adjacent to the South Sediment Basin (LS03), and the east side north of MW-2 vicinity (LS02). LS-01, LS-02 LS-03, and LS-04 are directed to the South Sediment Basin, which is pumped to the Northeast Sediment Basin and then further to the Green surface impoundment and eventually discharged to the Green River under KPDES permitted outfall #001.

Samples of a select set of these perimeter seeps were collected in July 2018 and tested for the Appendix III, Appendix IV, and general chemistry parameters. As previously noted, these seeps do not directly discharge to surface waters, but they may have the potential to influence groundwater and other non-groundwater releases. As such, they will be addressed by future corrective action to manage those potentials (see Section 4).

Additional data regarding the perimeter seeps is provided in the *Assessment of Corrective Measures Non-Groundwater Release Under the CCR Rule, Green Station CCR Landfill* (AECOM June 28,2019).

2.3.5 Constituents of Concern

Groundwater analytical data obtained from groundwater sampling events performed at the Unit through 2019 are summarized in **Appendix B**. A summary of the statistical evaluation conducted on the Appendix III and Assessment Appendix IV parameters for the Green Landfill is provided in **Appendix C**. Combined, these data indicate that the only COC detected at SSLs above its GWPS in groundwater at the Unit is lithium. Lithium has been detected at SSLs in the wells MW-4, MW-5, and MW-6 surrounding the South Sediment Basin and in MW-3A located north (downstream on the Green River) of MW-4.

Chloride is regarded as the primary COC for non-groundwater releases at the Unit requiring corrective action. Although there have been Appendix IV (Part 257) constituents detected in the surface seeps identified within the perimeter footprint of the landfill, these seeps are contained within a KPDES permitted discharge area that are monitored routinely to ensure compliance with applicable surface water quality standards.

2.3.6 Impacted Media

Both groundwater and surface water have been identified as impacted media of concern requiring corrective measures at the Unit.

2.3.7 Distribution of COCs

Groundwater sampling was performed at the Unit most recently in April 2020. Laboratory analytical data from the April 2020 sampling event is provided in **Appendix D**. The additional lithium data collected during this event are summarized below in **Table 4**.

Table 4. Green Landfill - April 2020 Lithium Analytical Results

Monitoring Well (Date)	Parameter
	Lithium GWPS 0.04 (mg/L)
MW-1	0.03
MW-2	0.007
MW-3A	0.68
MW-4	0.82
MW-5	0.38
MW-6	0.05

Figure 9 illustrates the distribution of COCs and other groundwater quality constituents in groundwater at the Unit. This distribution of COCs in groundwater suggests that impacts to groundwater likely originate from two primary source area. Impacts observed at MW-4, MW-5 and MW-6 likely originated as infiltration from the South Sediment Basin where storm water and landfill seepage accumulate on the south side of the landfill before being pumped to the Green Surface Impoundment. Data from characterization well MW-104 indicate that MW-3A may be effectively separated from the South Sediment Basin by a buried valley in the bedrock aquifer where groundwater does not appear to be impacted. This suggests that the impact observed at MW-3A may have instead originated from a different source, potentially from localized landfill seepage, which is now captured by the Deep Seep Collection Trench (see Section 2.4). It is possible that the MW-3A impact originates from the western end of the South Sediment Basin, but there is currently no feasible means of directly tracing that potential under the footprint of the landfill. It is, however, possible to evaluate this potential by monitoring MW-3A over time after the South Sediment Basin is rehabilitated as is currently planned (see Section 4). Ongoing monitoring of MW-3A also has the potential to demonstrate whether the landfill seepage intercepted by the Deep Seep Collection Trench is the source of impact.

2.3.8 Potential Receptors/Exposure Pathways

Contact with water (e.g., shallow groundwater or surface water) impacted by COCs at levels above GWPS or Water Quality Criteria is regarded as the potential pathway for exposure of potential receptors. Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Unit, thus limiting the potential receptors to the surface water, i.e., the Green River and its tributary, Groves Creek. The potential pathways to these receptors include seepage of water from the Unit through manmade and natural hydraulic conduits.

Other potential exposure pathways (e.g., soil or vapor) are not considered a risk as the CCR material is isolated in the Unit. This isolation prevents direct access by individuals that might result in direct contact or ingestion. In addition, the inherent non-volatile nature of the Unit-specific COCs eliminates the potential for a complete vapor pathway (i.e., vapor intrusion to indoor air).

2.4 Interim Corrective Measures

In September and October 2019, BREC initiated design and construction of two containment systems intended as an interim corrective measure to reduce and prevent non-groundwater releases at the Unit from reaching the Green River. The containment systems are identified as the Deep Seep Collection Trench (also known as the Eastern Collection Trench) and the Northwest Seep Collection Trench.

No formal interim corrective measures have been performed at the Green Landfill to address groundwater impacts. However, the interim corrective measures for known non-groundwater releases completed at the Unit are expected to benefit corrective action for groundwater impacts. The compatibility of those corrective measures with potential groundwater remedies is currently being evaluated as part of the Unit's assessment monitoring and will continued to be evaluated in the future as part of systematic performance reviews (see Section 5.2).

2.4.1 Deep Seep Collection Trench

BREC began construction of the Deep Seep Collection Trench on October 7, 2019. The installation of four partially overlapping trenches and corresponding individual sumps was completed on November 11, 2019. This completion allowed removal of collected seepage using temporary pumping and piping until the permanent system components were completed.

The Deep Seep Collection Trench is located on the eastern side of the landfill, adjacent to the Green River. This collection system consists of 1,065 lineal feet of perforated (HDPE) pipe and four (4) stainless steel sumps. The HDPE perforated pipe is surrounded by a washed river gravel, with profiles set at a 0.5% slope toward the associated pumping (sump) station. Each section of HDPE pipe overlaps at the sump interconnection to prevent seepage bypass and to ensure all deep seeps are properly captured. Each sump was set at an elevation of 352 ft., amsl. The approximate vertical position of the

Photo 2: Installation of the Deep Seep Collection Trench in October 2019.

Deep Seep Collection Trench relative to the Green Landfill is shown on **Figure 4**. The location of the trench in plan view is provided on **Figure 10**.

The electrical and mechanical portion of the project that allows the system to become fully automated was finalized on May 29, 2020.

2.4.2 Northwest Seep Collection Trench

Photo 3: Installation of the Northwest Seep Collection Trench in September 2019.

BREC began construction of the Northwest Seep Collection Trench on September 3, 2019. The construction of the collection trench was completed on January 22, 2020. The system is located in the northwest corner of the landfill and consists of 357 lineal feet of HDPE perforated pipe within the primary collection trench installed at an elevation of 391.4 ft, amsl. The HDPE perforated pipe is surrounded by a washed river gravel, with profiles set at a 0.5% slope toward the associated pumping (sump) station. Since the installation of the primary trench, BREC has installed two relay stations to ensure all possible seeps are captured and pumped to a permitted KPDES outfall. The Northwest Seep Collection Trench is configured to pump the incoming flow to a target manhole, which is located on the northeast corner of the landfill. The target manhole subsequently discharges to KPDES permitted outfall #009. The approximate vertical position of the Northwest Seep Collection Trench relative to the Green Landfill is shown on **Figure 7**. The location of the trench in plan view is provided on **Figure 10**.

2.5 Assessment of Corrective Measures Summary

2.5.1 Assessment of Corrective Measures for Groundwater Impacts

In June 2019, BREC performed an ACM for the Unit to identify remedial alternatives to address groundwater impacts. Title 40 CFR Section 257.96(c) requires that the ACM include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
2) The time required to begin and complete the remedy; and
3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

As part of the groundwater ACM, several potential corrective measures technologies were evaluated to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented below in **Table 5**.

Table 5 – Potential Corrective Measures Options for Groundwater Impacts

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established Corrective Action Objectives (CAOs).
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection mode)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a standalone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing offsite migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations increase implementation difficulty with scale.
Ex-situ Treatment (Physical, Chemical or Biological)	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.

Potentially Applicable Technology	Status	Description/Overview
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies any single technology may not be utilized.

Preliminary assembly of corrective measures alternatives was performed based on site-specific and regional geology and groundwater conditions. For the Unit, six corrective measures alternatives were developed from this list of applicable corrective measures technologies during the ACM screening process:

- Alternative #1 – No Action and Groundwater Monitoring
- Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- Alternative #3 – CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #4 – CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #5 – CiP, Other Source Control, ICs, and Groundwater Monitoring

The assembly of corrective measures alternatives presented in the ACM was considered preliminary and subject to revision following additional evaluation during the remedy selection process and/or following comment from the regulatory community and public. Further evaluation of the alternatives is discussed in the following sections.

2.5.2 Assessment of Corrective Measures for Non-Groundwater Impacts

Pursuant to Title 40 of the Code of Federal Regulations (CFR) parts 257.90(d) and 257.84(b)(5), BREC initiated design of containment systems intended to reduce and prevent non-groundwater releases from reaching the Green River as an interim corrective measure. Plans for these measures were submitted to the KDWM for review and comment in 2019. KDWM conditionally approved the interim corrective measures for implementation at the Unit and they were constructed in 2019 and 2020 (see Section 2.4).

In June 2019, BREC performed an ACM to evaluate whether additional remedial measures, that would be supplemental to the ICMs already planned, were warranted to address non-groundwater releases. Several potential corrective measures technologies were evaluated in order to identify which ones could be carried forward as components of corrective measure alternatives for non-groundwater releases, if required. The results of the corrective measures technology evaluation are presented below in **Table 6**.

Table 6 – Potential Corrective Measures Options for Non-Groundwater Impacts

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as stand-alone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.

Potentially Applicable Technology	Status	Description/Overview
Hydraulic Containment	Retained	Hydraulic containment in the form of pumping of vertical or horizontal wells would potentially be used to provide spot control of seepage if the interim corrective measures are unable to fully capture the seepage.
Physical Containment	Retained	Physical containment in the form of a cutoff wall would potentially be used to re-direct or otherwise intercept seepage that was not adequately captured by the interim corrective measures.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment is retained as a potential supplement to the interim corrective measures in the event that discharge via the station's KPDES permit is not possible.
In-situ Physical/Chemical Treatment	Retained	In-situ treatment is retained in the form of spot treatment or fixation of seepage areas in the event that the interim corrective measures do not adequately address all seepage areas.
Permeable Reactive Barriers (PRB)	Retained	The use of PRBs is retained in the form of a reactive cell in the event that interim measures result in seepage concentrations that require pre-treatment in-situ prior to discharge.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater releases is being implemented as interim corrective measures but is retained in the event that interim measures need to be evaluated for expansion.

The ICMs implemented at the Unit in 2019 were designed to address river seepage and divert it to KPDES outfalls, eliminating any potential exposure to public health or the environment. During ACM development, it was anticipated that the ICMs would meet the CAOs by effectively eliminating any future river seepage through source control, and as a result, no supplemental remedies were considered warranted. Data collected at the Unit since installation of the ICMs suggests that the CAOs are being met and in compliance with the conditions of the Agreed Order.

Performance monitoring is ongoing and will continue to be performed in the future to demonstrate source control and evaluate the ability of the ICMs to meet the CAO. The ICMs implemented at the Unit in 2019 and 2020 are considered the final remedy for non-groundwater releases and are expected to benefit corrective action as a whole for the Unit. As a result, no separate remedy selection report is currently being developed for non-groundwater releases. If warranted based on performance monitoring results, additional evaluation of the non-groundwater corrective measures will be performed consistent with 40 CFR 257.98(b).

3. Corrective Measure Evaluation

To address the remedy selection requirement under 40 CFR Part 257.97, a corrective measure evaluation was performed to address groundwater impacts at the Unit. Currently, no separate corrective measure evaluation is planned for non-groundwater releases, as the ICMs implemented at the Unit in 2019 and 2020 are considered the final remedy for non-groundwater releases. The discussion included below details the evaluation performed to address groundwater impacts at the Unit.

3.1 Corrective Action Objectives

Corrective Action Objectives (CAOs) for the Unit were identified during the groundwater ACM completed for the Unit in June 2019. CAOs are overall descriptions of what remedial action is expected to accomplish at a given site. CAOs also provide a basis for evaluating the performance of a corrective measure. Title 40 CFR Section 257.97 (b) outlines the CAOs for corrective measures under the CCR Rule as follows:

(1) Be protective of human health and the environment;

(2) Attain the GWPS as specified pursuant to Section 257.95(h);

(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment;

(4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;

(5) Comply with standards for management of wastes as specified in Section 257.98(d). [note: this statute refences all applicable requirements under the Resource Conservation and Recovery Act (RCRA)].

The corrective measure alternative selected for the Unit must ultimately demonstrate attainment of the CAOs. Compliance with the CAOs will be a primary factor in determining the effectiveness of the corrective measure alternative selected for the Unit during future systematic performance reviews.

Each of the CAOs have been adopted as Threshold Criteria (see Section 3.3.1 below) for evaluating potential corrective measures in alignment with 40 CFR Part 257.97 (b).

3.2 Corrective Measures Alternatives Assembly

The groundwater ACM performed for the Unit in June 2019 identified a total of six (6) corrective measures alternatives to be carried forward into the remedy selection process. In December 2019, BREC provided a *Semi-annual Remedy Selection Progress Report* (AECOM, December 2019) as required under 40 CFR 257.97(a). As part of this submittal, two (2) corrective measures alternatives were eliminated from further consideration, including:

- Alternative #1 (No Action and Groundwater Monitoring) – This alternative does not control or remove COCs from the environment and therefore does not achieve the RAOs.
- Alternative #2b – (CbR, ICs, and Groundwater Monitoring) – Implementing a CbR approach is considered cost prohibitive. In addition, any CbR approach would require relocating waste to an existing disposal unit or construction of a new waste disposal unit, which does not align with the one of the fundamental goals of RCRA (conserving energy and natural resources).

Four (4) potential corrective measures alternatives have been identified by BREC as viable options to address lithium impacts in groundwater and non-groundwater releases at the Unit, including:

- Alternative #2a (Alt 2a): CiP, ICs, and Groundwater Monitoring

- Alternative #3 (Alt 3): CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #4 (Alt 4): CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #5 (Alt 5): CiP, Other Source Control, ICs, and Groundwater Monitoring

Each of the remining 4 corrective measures alternatives was evaluated against the threshold, balancing, and modifying criteria as discussed below.

3.3 Corrective Measures Criteria Evaluation

40 CFR Part 257.97(a) outlines the criteria for evaluating corrective measures under the Federal CCR Rule. Although not specifically stated as such, these criteria mirror the criteria outlined for the National Oil and Hazardous Substance Contingency Plan, more commonly referred to as the National Contingency Plan (NCP), established under 40 CFR 300. 40 CFR 300.430 identifies 9 criteria for evaluating remedial alternatives which are further divided into 3 categories:

1) Threshold Criteria;
2) Balancing Criteria, and
3) Modifying Criteria.

These criteria were utilized by BREC to evaluate the potential corrective measures alternatives for the Unit. Each of the remaining 4 corrective measures alternatives was evaluated against each other and scored on a scale from 1 to 4 (1 being lowest and 4 being highest). Where multiple corrective measures alternatives were considered equal with respect to a given criteria, the available points were combined and divided equally. The results of analysis performed to evaluate each of the corrective measures alternative is discussed below and summarized in **Appendix E**.

3.3.1 Threshold Criteria Evaluation

Title 40 CFR Part 257.97 (b) outlines the threshold criteria (also viewed as CAOs) for evaluating corrective measures under the CCR Rule, and these criteria were presented in Section 3.1 above. The results of the threshold criteria evaluation are summarized below in **Table 7**.

Table 7. Threshold Criteria Evaluation Summary

40 CFR 257.97 Reference	Alternative 2a	Alternative 3	Alternative 4	Alternative 5
(b)(1)	1	3	3	3
(b)(2)	1	3.5	2	3.5
(b)(3)	1	3	2	4
(b)(4)	1	3	2	4
(b)(5)	2.5	2.5	2.5	2.5

Further detail regarding how threshold criteria were evaluated in provided on Table E-2 in **Appendix E**.

3.3.2 Balancing Criteria Evaluation

Title 40 CFR Section 257.97 (c) outlines the balancing criteria for evaluating corrective measures under the CCR Rule as follows:

1) The long and short-term effectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on a 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.

The results of the threshold criteria evaluation are summarized below in **Table 8**.

Table 8. Balancing Criteria Evaluation Summary

40 CFR 257.97 Reference	Alternative 2a	Alternative 3	Alternative 4	Alternative 5
(c)(1)(i)	1	4	3	2
(c)(1)(ii)	1	3.5	3.5	2
(c)(1)(iii)	1	2.5	2.5	4
(c)(1)(iv)	1	3	2	4
(c)(1)(v)	1	3	2	4
(c)(1)(vi)	1	3	2	4
(c)(1)(vii)	1	3	2	4
(c)(1)(viii)	4	2	1	3
(c)(2)(i)	1	3	2	4
(c)(2)(ii)	1	4	3	2
(c)(3)(i)	4	2	1	3
(c)(3)(ii)	4	2	1	3
(c)(3)(iii)	2.5	2.5	2.5	2.5
(c)(3)(iv)	4	2	1	3

(c)(3)(v)	1	2	3	4

Further detail regarding how threshold criteria were evaluated in provided on Table E-3 in **Appendix E**.

3.3.3 Modifying Criteria Evaluation

Title 40 CFR Section 257.97 (c) defines modifying criteria as “the degree to which community concerns are addressed by a potential remedy(s)”. Given that an Agreed Order was signed between BREC and the KDWM for the Unit, the modifying criteria were expanded as part of this evaluation to include separate criteria for state and community acceptance (40 CFR 300.430 divides modifying criteria into two categories).

The results of the modifying criteria evaluation are summarized below in **Table 9**.

Table 9. Modifying Criteria Evaluation Summary

40 CFR 257.97 Reference	Alternative 2a	Alternative 3	Alternative 4	Alternative 5
NA - state acceptance	1	3.5	3.5	2
(c)(4)	1	3.5	3.5	2

Further detail regarding how threshold criteria were evaluated in provided on Table E-4 in **Appendix E**.

3.3.4 Corrective Measures Alternative Evaluation Summary

The cumulative scoring of the criteria evaluation is summarized below in **Table 10**.

Table 10. Cumulative Criteria Evaluation Scoring Summary

40 CFR 257.97 Reference	Alternative 2a	Alternative 3	Alternative 4	Alternative 5
Total Score	37	63.5	50	**69.5**

Further detail regarding the cumulative scoring criteria is provided on Table E-1 in **Appendix E**. Alternative 5 scored highest of all the alternatives during the evaluation.

4. Remedy Selection

In alignment with the scoring completed as part of the corrective measure evaluation (see **Appendix E**), BREC has selected Alternative #5 (CiP, Other Source Control, ICs, and Groundwater Monitoring) as the remedy to address groundwater and non-groundwater impacts at the Unit. A description of each corrective measure technology incorporated into the selected remedy is provided below.

4.1 Closure in Place

In adherence with the BREC's permit conditions, the Site will continue to operate as a solid waste disposal facility through its life cycle and will be closed in accordance with the requirements of the permit. The current life cycle estimates for the Green Landfill predict that the Unit will reach capacity in approximately 2041. Source control through landfill closure will include installation of final cover that will prevent infiltration and contribute to groundwater quality restoration.

4.2 Source Control

To comply with the Agreed Order signed by BREC and KDWM for the Unit, additional source control measures will be implemented in 2020 and 2021 to reduce/eliminate the downward migration of COC into groundwater. As currently planned, theses measure will include the following:

- Landfill perimeter collection trenches; and
- Removal of CCR material from the South Sediment Basin.

Interim corrective measures for the perimeter seeps are being planned in a phased approach. The first step is to divert the seepage to the Northeast Sediment Basin which is routed to the KPDES outfall of the Green Surface Impoundment. Removing the seeps from stormwater channels will prevent mixing with impounded stormwater. The use of the South Sediment Basin requires that CCR materials be removed so that the seepage does not have the potential to impact groundwater. Corrective measures for the South Sediment Basin will involve the removal of any residual CCR material and creation of two lined sump areas, one on the east end to collect the South and East perimeter seeps and one on the west end to collect Southwest corner perimeter seeps. Additionally, perimeter seeps on the north side of the landfill will be similarly controlled but will be directly routed to the collector sump on the north side of the landfill.

Design of the additional source control remedies is currently being performed by BREC. A draft design package will be provided to KDWM as part of a separate submittal to comply with the conditions of Agreed Order #18-3-0138. The implementation schedule for source control measures is discussed in Section 5.

4.3 Institutional Controls

The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of the remedy for the Unit.

4.4 Groundwater Monitoring

Assessment monitoring is expected to continue at the Unit until the CAOs have been met.

5. Remedy Implementation Schedule

5.1 Schedule Evaluation Factors

The schedule for remedy implementation is provided in **Appendix F**. 40 CFR Part 257.97(d) outlines the factors that must be considered in specifying a schedule to remedial implementation at a CCR unit as follows.

1) Extent and nature of contamination, as determined by the characterization required under § 257.95(g);
2) Reasonable probabilities of remedial technologies in achieving compliance with the groundwater protection standards established under § 257.95(h) and other objectives of the remedy;
3) Availability of treatment or disposal capacity for CCR managed during implementation of the remedy;
4) Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy;
5) Resource value of the aquifer including:
    i. Current and future uses;
    ii. Proximity and withdraw rate of users;
    iii. Groundwater quantity and quality;
    iv. The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to CCR constituents;
    v. The hydrogeologic characteristic of the facility and surrounding land;
    vi. The availability of alternative water supplies; and
6) Other relevant factors.

Each of these factors was consider by BREC as part of the remedy selection process as described below.

5.1.1 Nature and Extent of Contamination

The data obtained during characterization monitoring performed at the Unit under 40 CFR Part 257.95(g) indicates that the extent of groundwater and non-groundwater impacts is confined to Sebree Station. Source control measures implemented to date will ensure that non-groundwater releases are captured and will not migrate beyond the functional perimeter of the Unit and the property controlled by BREC.

Assessment monitoring will continue at the Unit to confirm that the nature and extent of contamination is defined and progressing in accordance with the CAOs.

5.1.2 Compliance Probability

Implementation of the selected remedy is expected to have a high probability of meeting the CAOs. There is firm evidence of a relatively direct connection between infiltration of co-mingled leachate and stormwater at the South Sediment Basin and the observed impact to monitoring wells MW-4, -5, and -6. Consequently, removal of that infiltration by the planned corrective measures (excavating CCR from the South Sediment Basin and containing leachate in a series of sumps and piped conveyance) is expected to have a direct influence on groundwater quality. The time required to achieve GWPSs at the affected wells has not been modeled but is expected to be on the order of one to five years if the remedy is implemented as planned.

Impacts observed at MW-3A may be tied to the nearby non-groundwater release captured by the Deep Seep Collection Trench, in which case, the time to achieve CAOs may be relatively quick now that the

seepage is being hydraulically controlled. However, there are unknowns regarding the nature of how lithium is transported to that well location. Those uncertainties cannot be evaluated given the physical constraints of the site (proximity of the landfill to the river), so the time frame required to meet CAOs cannot be predicted until additional Assessment monitoring data are available.

5.1.3 CCR Treatment and Disposal Capacity

Wastes generated by the groundwater corrective measures activities will include residual CCR content removed from the South Sediment Basin and seepage collected from the perimeter seepage controls. Wastes generated by the non-groundwater corrective measures activities will be seepage collected from the Deep Seep Collection Trench and the Northwest Seep Collection Trench.

The solids (dredged material from the South Sediment Basin) will be interred in the Landfill as allowed under the existing solid waste permit. The Landfill has sufficient capacity for this one-time waste stream volume. The liquid wastes will be managed under the KPDES permit for the station.

5.1.4 Exposure Risk

As detailed in Section 2.3.8, there is no data to suggest that human health and the environment are currently being exposed to COC emanating from the Unit. This condition is not expected to change prior to implementation of the remedy but will continue to be evaluated through Assessment monitoring and systematic performance reviews.

5.1.5 Aquifer Resource Value

Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Unit. This is not expected to change in the future but will be re-examined during future performance reviews. Therefore, the significance of aquifer resource value is not considered pertinent to this evaluation or the resulting schedule.

5.1.6 Other Relevant Factors

Within Exhibit 4 of the Agreed Order, a milestone schedule was provided for groundwater corrective action. Although the milestone schedule has been adjusted due to the work conditions imposed by the COVID-19 pandemic, which includes holding the public meeting at an earlier date, BREC has moved forward with the activities required in the Agreed Order.

5.2 Performance Review

Source control measures are viewed as the remedial component likely to have the most significant short- and long-term benefit on reducing groundwater and non-groundwater impacts at the Unit. As such, evaluating the performance of source control measures constructed at the Unit should be evaluated through systematic review.

Although not specifically mandated under the CCR Rule, five-year reviews are generally required by the regulatory agency under corrective action programs (i.e. CERCLA) when hazardous substances remain at a site above levels that permit unlimited use and unrestricted exposure. Five-year reviews provide an opportunity to evaluate the implementation and performance of a remedy to determine whether it remains protective of human health and the environment. Generally, reviews take place five years following the start of corrective action and are repeated every succeeding five years so long as future uses remain restricted. BREC will perform a five-year review to evaluate compliance with the CAOs and evaluate the effectiveness of the remedy selected for the Unit five years after construction completion (approximately 2026).

6. References

AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Green Station CCR Landfill, Webster County, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Green Station CCR Landfill, Webster County, Kentucky.

AECOM, 2019. Assessment of Corrective Measures Under the CCR Rule; Green Station CCR Landfill, Green Station, Webster County, Kentucky.

AECOM, 2019. Assessment of Corrective Measures, Non-Groundwater Releases Under the CCR Rule; Green Station CCR Landfill, Green Station, Webster County, Kentucky.

AECOM, 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report, Sebree Generating Station, Henderson and Webster Counties Kentucky.

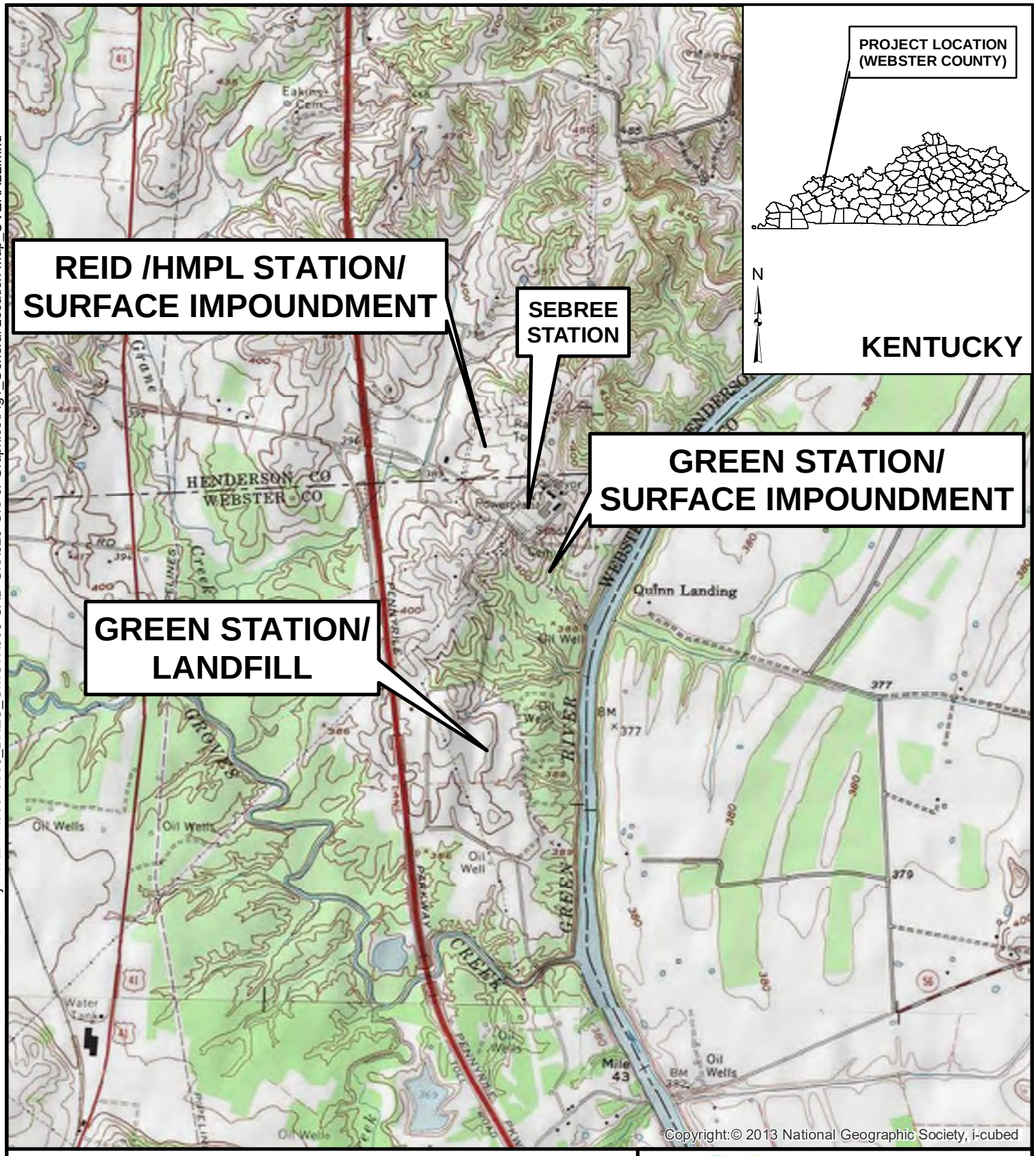
Associated Engineers 2016. Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan.

Fairer, G.M., Geologic Map of the Robards Quadrangle, Henderson and Webster Counties, Kentucky, U.S. Geological Survey, 1973.

USEPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

USEPA, 40 CFR Part 257. [EPA–HQ–OLEM–2017–0286; FRL–9973–31–OLEM]. RIN–2050–AG88. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Minimum Criteria (Phase One); Proposed Rule. Federal Register / Vol. 83, No. 51 / Thursday, March 15, 2018 / Proposed Rules.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

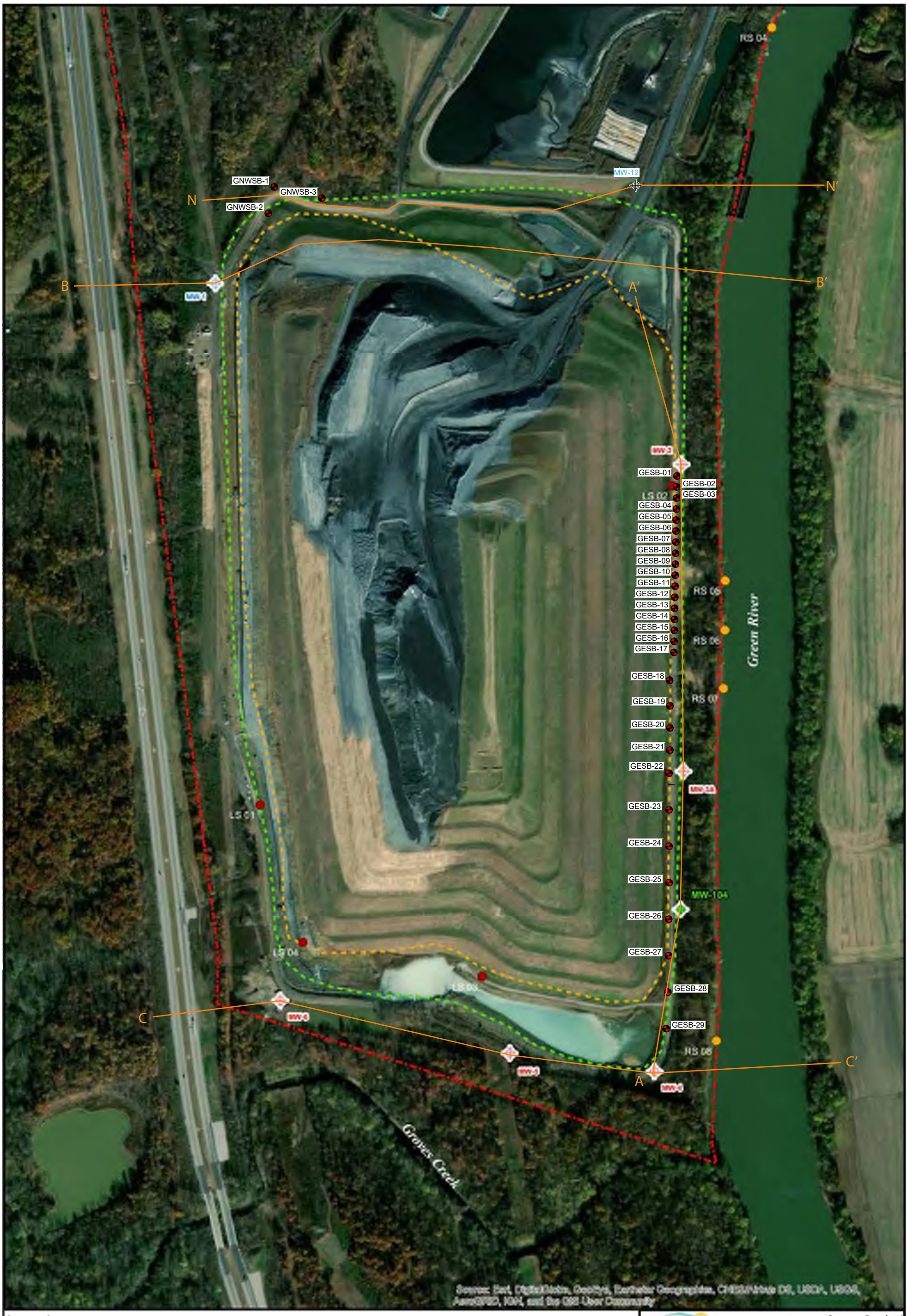
N

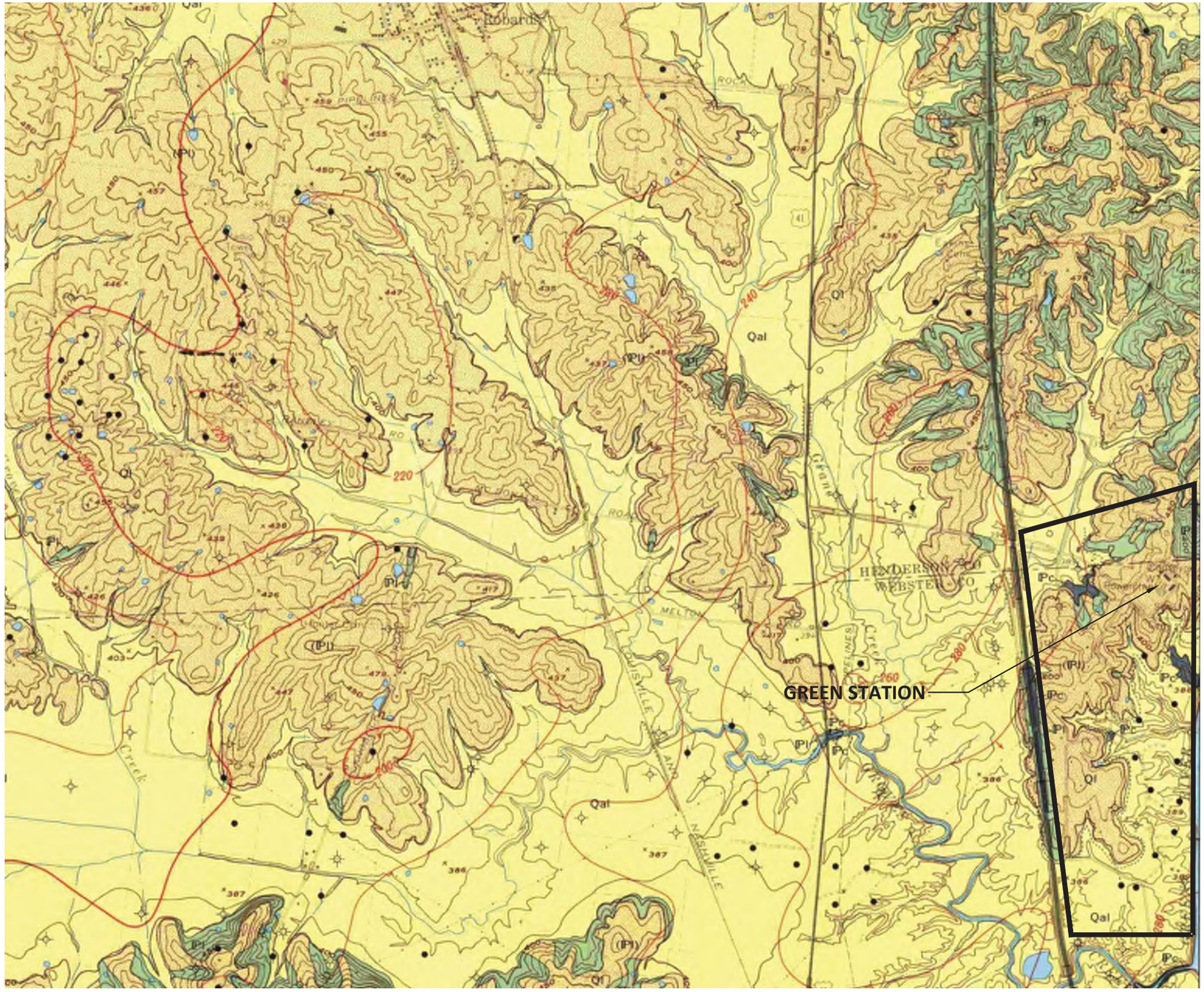
Big Rivers ELECTRIC CORPORATION

Sebree Station
Webster County, Kentucky

FIGURE 1
GENERAL LOCATION MAP

DATE: 1/8/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60579938	


RS 04
MW-12
GNWSB-1
GNWSB-3
GNWSB-2
N
N′
B
B′
A′
MW-3
GESB-01
GESB-02
GESB-03
LS 02
GESB-04
GESB-05
GESB-06
GESB-07
GESB-08
GESB-09
GESB-10
GESB-11
GESB-12
GESB-13
GESB-14
GESB-15
GESB-16
GESB-17
RS 05
RS 06
RS 07
Green River
GESB-18
GESB-19
GESB-20
GESB-21
GESB-22
MW-3A
GESB-23
GESB-24
GESB-25
MW-104
GESB-26
LS 01
LS 04
LS 03
GESB-27
GESB-28
GESB-29
RS 08
C
C′
A
MW-6
MW-5
MW-4
Groves Creek
Legend
Property Line
KAR Permit Area
CCR Fill Area
Downgradient CCR Monitoring Well
Upgradient CCR Monitoring Well
Characterization Well
A A′
Transect Line
GESB-01
Seeps Investigation Borings
Landfill Seep Sample
River Seep Sample
0 400 800
Feet
N
Big Rivers
Green Station
Webster County, Kentucky
FIGURE 2
WELL LOCATION MAP
DATE:06/04/2019
SCALE: 1IN = 300 FEET
CREATED BY: DAS
JOB NO. 60602364



SCALE 1:24 000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

DATUM IS MEAN SEA LEVEL

EXPLANATION

Pleistocene and Holocene

Qal — Alluvium

Pleistocene

Ql — Loess

Adapted in part from soil map of Henderson County (Converse and Cox, 1967)

QUATERNARY

Upper Pennsylvanian

Pl — Lisman Formation

m, base of Madisonville Limestone Member

Middle Pennsylvanian

Pc — Carbondale Formation

PENNSYLVANIAN

Formation symbols enclosed in parentheses where units concealed by mapped surficial deposits

Contact or key bed

Dashed where inferred; dotted where concealed. Triangles indicate selected localities where contacts were well exposed at time of mapping

Strike and dip of beds

200

Structure contours

Drawn on base of No. 9 coal bed; projected where contoured horizon is missing. Arrows indicate direction of dip. Contour interval 20 feet

Outline of area where No. 9 coal bed is missing

DRILL HOLES FROM WHICH SUBSURFACE STRUCTURAL DATA WERE OBTAINED, AS OF JANUARY 1, 1971

Dry hole

Oil well

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 3
SITE GEOLOGIC MAP
(KENTUCKY GEOLOGICAL SURVEY)

DATE: 05/21/2019	SCALE: AS SHOWN
CREATED BY: DAS	
JOB NO. 60602364	

S
A

N
A'

South Pond Extent

Historical "Bottom Ash" Pond Extent

MW-4* GESB-29 P-3* GESB-28 B-8* GESB-27 GESB-26 GESB-25 MW-104 GESB-24 GESB-23 B-6 B-5* MW-3A* GESB-22 GESB-21 GESB-20 GESB-19 P-6* Sump A Sump B GESB-18 B-4 GESB-17 GESB-16 GESB-15 GESB-14 GESB-13 GESB-12 GESB-11 Sump C GESB-09 Sump D GESB-08 GESB-07 GESB-06 GESB-05 GESB-04 GESB-03 GESB-02 GESB-01 MW-2 B-2* P-9

AVERAGE ROAD LEVEL

08 07 06 05

FEET, MSL

430 420 410 400 390 380 370 360 350 340 330 320 310

0 500 1000 1500 2000 2500 3000 3500

FEET

(Vertical Exaggeration = 20x)

Bedrock Lithologies:

- Sandstone
- Shale
- Interbedded Sandstone and Shale
- Interbedded Shale and Sandstone

Unconsolidated Materials:

- Silty Clay
- Fill

- Collection Area
- River Seep (projected) (07)
- APROX. RIVER LEVEL
- Sump
- Potentiometric Surface
- 11/11/2019 - 11/12/2019
- Boring (*Projected)
- MW-2 — Well ID
  - Riser
  - Screen

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 4
CROSS SECTION A - A'
East (River) Side of Ash Pile

DATE: 05/01/2020	SCALE: AS SHOWN
CREATED BY: ALY	JOB NO. 60619283

W
B

B′
E

Fly Ash (Landfill)

Pennyrile Parkway

MW-1
P-7*
B-1*
P-8*
P-9*
B-2*
MW-2*

North Settling Basin

Green River

FEET, MSL

430
420
410
400
390
380
370
360
350
340
330
320
310

0
500
1000
1500
2000
2500
3000
3500

FEET

Bedrock Lithologies:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale
- Interbedded Shale and Sandstone

Unconsolidated Materials:

- Silty Clay
- Fill

Potentiometric Surface

11/11/2019 - 11/12/2019

Boring
(*Projected)

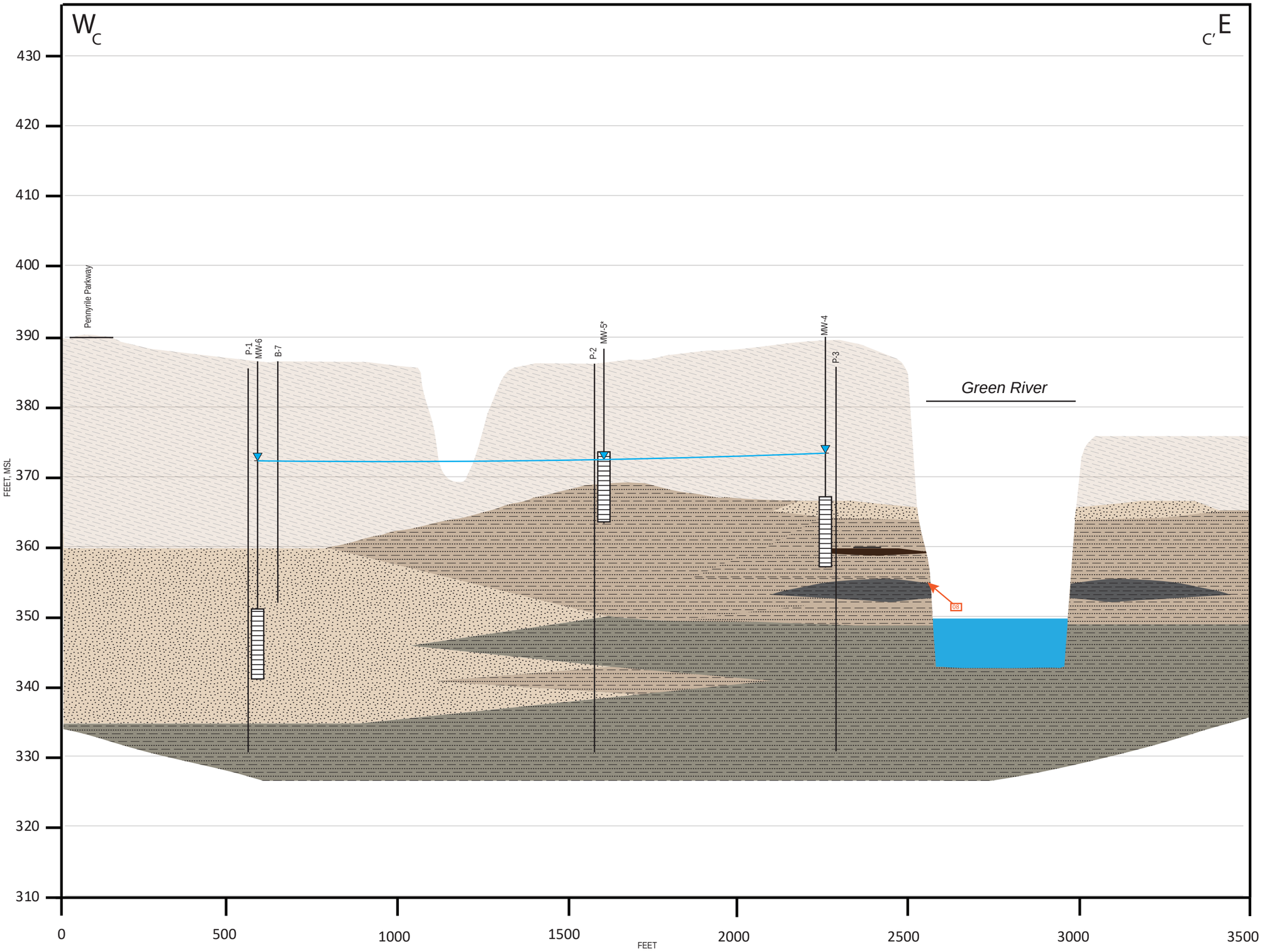
MW-2— Well ID
Riser
Screen

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 5
CROSS SECTION B - B'
North Side of Ash Pile

DATE: 05/01/2020	SCALE: AS SHOWN
CREATED BY: ALY	JOB NO. 60619283



Bedrock Lithologies:

- Sandstone
- Shale
- Interbedded Sandstone and Shale
- Interbedded Shale and Sandstone

Unconsolidated Materials:

- Silty Clay
- Fill

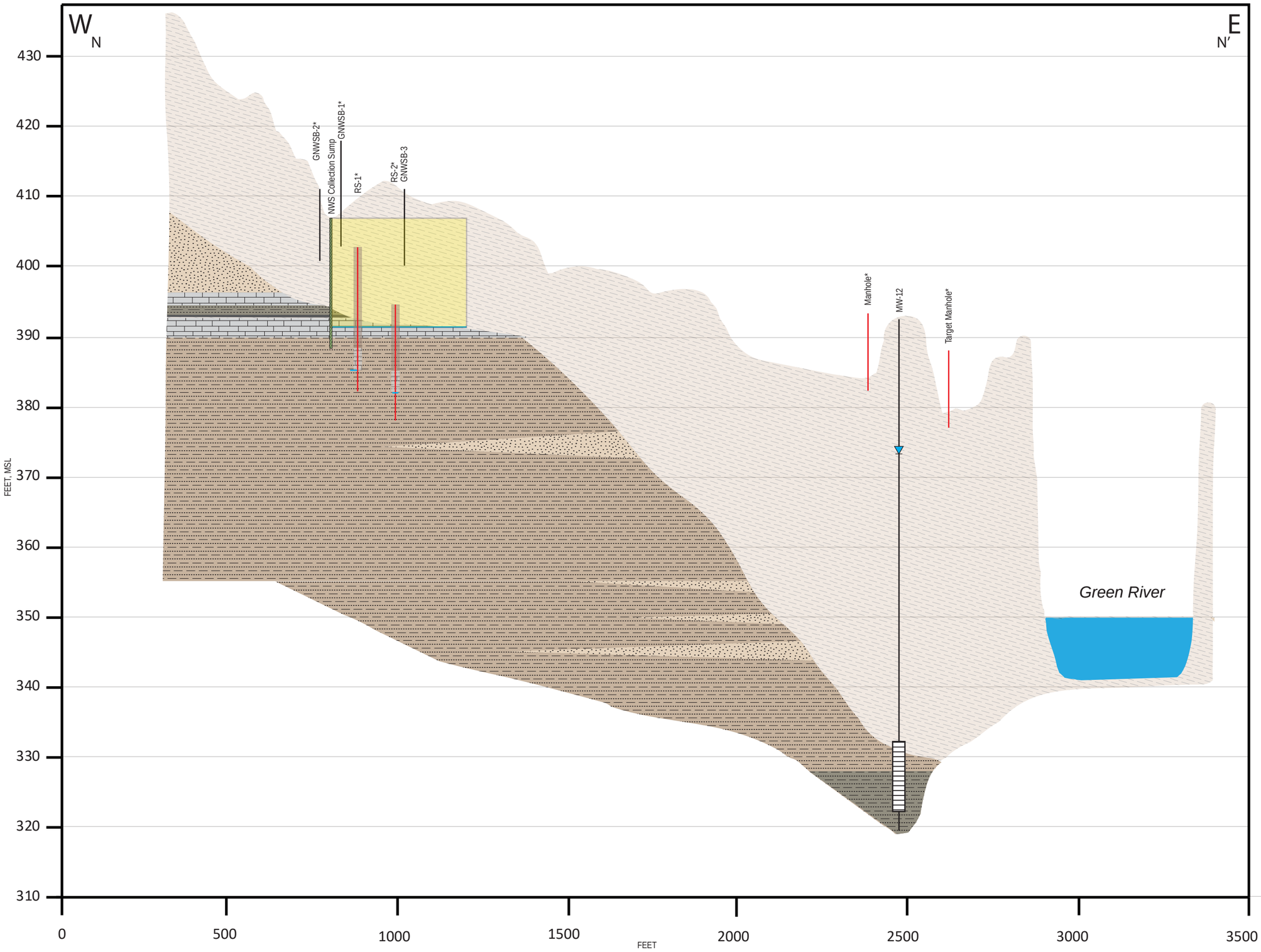
- River Seep (projected)
- Potentiometric Surface
- 11/11/2019 - 11/12/2019
- Boring (*Projected)
- MW-4 — Well ID
  - Riser
  - Screen

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 6
CROSS SECTION C - C'
South Side of Ash Pile

DATE: 05/01/2020	SCALE: AS SHOWN
CREATED BY: ALY	JOB NO. 60619283



Bedrock Lithologies:

- Sandstone
- Shale
- Limestone
- Interbedded Sandstone and Shale
- Interbedded Shale and Sandstone

Unconsolidated Materials:

- Silty Clay
- Fill

Collection Area — Sump

Boring (*Projected)

MW-12 — Well ID
Riser
Screen

Relay Station

RS-1*
Horizontal Pipe — Transparent Lithology is projected. Perceived dip is a result of localized slumping towards the creek.

* Projected

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 7
CROSS SECTION N - N'
North Side of Ash Pile

DATE: 05/01/2020	SCALE: AS SHOWN
CREATED BY: ALY	JOB NO. 60619283

MW-1
403.71

MW-12
373.39

MW-2
376.13

MW-3A
374.40

MW-4
373.43

MW-5
372.56

MW-6
372.55

400
395
390
385
380
375

Green River

Groves Creek

bing

Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Water Table Contour (Dashed where Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 373.43 Groundwater Elevation (Feet, MSL) Measured April 7, 2020
- NM - not measured

0 400 800
Feet

N

Big Rivers Electric Corporation

Green Station Landfill
Webster County, Kentucky

FIGURE 8
POTENTIOMETRIC SURFACE MAP
APRIL 7, 2020

DATE: 4/20/2020	SCALE: 1IN = 400 FEET
CREATED BY: TMJ	
JOB NO. 60579938	

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MW-1				
APPENDIX III	**GWPS**	**4/22/2019**	**9/30/2019**	**4/6/2020**
Boron	NA	1.73	1.68	1.69
Calcium	NA	32.1	29.1	27.7
Chloride	NA	6.41	7.5	6.5
Fluoride	4	0.521	0.6	0.5
Sulfate	NA	35.1	19	21
pH (SU)	NA	7.87	7.79	7.50
Total Dissolved Solids	NA	568	444	488
APPENDIX IV				
Antimony	0.006	0.000254	<0.005	<0.005
Arsenic	0.01	0.00167	0.0005	0.0019
Barium	2	0.0862	0.091	0.087
Beryllium	0.004	0.000533	<0.0200	<0.0020
Cadmium	0.005	0.000299	<0.0010	<0.0010
Chromium	0.1	0.00354	<0.0020	0.0011
Cobalt	0.006	0.000571	<0.004	<0.004
Fluoride	4	0.521	0.6	0.5
Lead	0.015	0.000279	<0.002	<0.002
Lithium	0.040	0.0295	<0.20	0.03
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	0.00105	<0.01	<0.01
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.689	0.000	0.808
Selenium	0.05	0.00105	<0.003	<0.003
Thallium	0.002	0.000498	0.0001	0.0001

MW-2				
APPENDIX III	**GWPS**	**4/23/2019**	**10/1/2019**	**4/7/2020**
Boron	NA	0.101	<1.00	<0.10
Calcium	NA	156	166	145
Chloride	NA	144	108	120
Fluoride	4	0.193	0.3	0.2
Sulfate	NA	105	79	85
pH (SU)	NA	7.15	7.39	7.22
Total Dissolved Solids	NA	918	930	806
APPENDIX IV				
Antimony	0.006	0.0000670	<0.005	<0.005
Arsenic	0.01	0.00738	**0.0129**	0.0033
Barium	2	0.362	0.380	0.238
Beryllium	0.004	0.000281	<0.0200	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00122	<0.0020	<0.0020
Cobalt	0.006	0.00382	<0.004	<0.004
Fluoride	4	0.193	0.3	0.2
Lead	0.015	<0.0000675	<0.002	<0.002
Lithium	0.040	<0.00959	<0.20	0.007
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	0.00210	0.003	0.002
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.391	0.97	0.529
Selenium	0.05	<0.000348	<0.003	<0.003
Thallium	0.002	0.0000800	<0.0020	<0.0020

MW-3A				
APPENDIX III	**GWPS**	**4/23/2019**	**10/1/2019**	**4/7/2020**
Boron	NA	0.259	<1.00	0.26
Calcium	NA	411	490	425
Chloride	NA	1850	4570	3220
Fluoride	4	0.387	0.4	0.5
Sulfate	NA	1080	1680	1840
pH (SU)	NA	7.23	7.33	7.07
Total Dissolved Solids	NA	4250	6900	5860
APPENDIX IV				
Antimony	0.006	0.000102	<0.005	<0.005
Arsenic	0.01	0.000575	<0.0100	<0.0010
Barium	2	0.0474	0.051	0.042
Beryllium	0.004	0.000199	<0.0200	<0.0020
Cadmium	0.005	0.000164	<0.0010	0.0001
Chromium	0.1	0.00168	<0.0020	<0.0020
Cobalt	0.006	0.000243	**0.008**	<0.004
Fluoride	4	0.387	0.4	0.5
Lead	0.015	0.000137	<0.002	<0.002
Lithium	0.040	**0.678**	**0.79**	**0.68**
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	<0.000873	<0.10	<0.01
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.641	0.873	1.06
Selenium	0.05	0.00103	<0.030	<0.003
Thallium	0.002	0.000860	<0.0020	<0.0020

MW-104				
APPENDIX III	**GWPS**	**3/29/2019**	**4/10/2019**	**10/25/2019**
Boron	NA	0.188	0.271	<1.00
Calcium	NA	465	502	505
Chloride	NA	1430	1430	1610
Fluoride	4	<0.0100	0.323	0.4
Sulfate	NA	2870	2880	2440
pH (SU)	NA	6.88	6.99	7.03
Total Dissolved Solids	NA	6990	6690	7330
APPENDIX IV				
Antimony	0.006	0.000091	0.000119	<0.005
Arsenic	0.01	0.00221	0.00208	0.0039
Barium	2	0.0243	0.0216	0.030
Beryllium	0.004	<0.000102	<0.000102	<0.0200
Cadmium	0.005	<0.000152	<0.000152	0.0004
Chromium	0.1	0.00471	0.00360	0.0066
Cobalt	0.006	0.00594	0.00522	**0.011**
Fluoride	4	<0.0100	0.3230	0.4
Lead	0.015	0.00105	0.000233	0.003
Lithium	0.040	0.0281	0.0286	0.02
Mercury	0.002	<0.101	<0.101	<0.0005
Molybdenum	0.1	0.00147	0.00104	0.005
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.776	0.319	1.646
Selenium	0.05	<0.000348	<0.000348	<0.003
Thallium	0.002	<0.0000360	<0.0000360	<0.0020

MW-6				
APPENDIX III	**GWPS**	**4/22/2019**	**9/30/2019**	**4/6/2020**
Boron	NA	0.194	<1.00	0.19
Calcium	NA	421	431	458
Chloride	NA	142	230	181
Fluoride	4	0.409	0.5	0.4
Sulfate	NA	2200	3830	4650
pH (SU)	NA	6.86	7.15	6.76
Total Dissolved Solids	NA	4780	4830	4610
APPENDIX IV				
Antimony	0.006	0.0000920	<0.005	<0.005
Arsenic	0.01	0.000722	<0.0100	<0.0010
Barium	2	0.0128	0.010	0.011
Beryllium	0.004	<0.000102	<0.0200	<0.002
Cadmium	0.005	<0.000152	<0.0010	0.0001
Chromium	0.1	0.00196	<0.000020	<0.0020
Cobalt	0.006	0.000276	<0.004	<0.004
Fluoride	4	0.409	0.5	0.4
Lead	0.015	<0.0000675	<0.002	<0.002
Lithium	0.040	**0.0633**	**0.05**	**0.05**
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	0.000972	<0.10	<0.01
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.450	1.246	0.744
Selenium	0.05	0.00110	<0.003	<0.003
Thallium	0.002	0.0000610	<0.0020	<0.0020

MW-5				
APPENDIX III	**GWPS**	**4/22/2019**	**9/30/2019**	**4/7/2020**
Boron	NA	0.271	<1.00	0.25
Calcium	NA	446	476	464
Chloride	NA	931	1500	1860
Fluoride	4	0.128	0.2	0.2
Sulfate	NA	1800	2990	3720
pH (SU)	NA	7.15	7.41	6.94
Total Dissolved Solids	NA	4360	5320	4960
APPENDIX IV				
Antimony	0.006	0.0000700	<0.005	<0.005
Arsenic	0.01	0.000424	<0.0100	<0.0010
Barium	2	0.0167	0.016	0.014
Beryllium	0.004	<0.000102	<0.0200	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00159	0.0033	<0.0020
Cobalt	0.006	0.000288	<0.004	<0.004
Fluoride	4	0.128	0.2	0.2
Lead	0.015	0.0000860	<0.002	<0.002
Lithium	0.040	**0.434**	**0.40**	**0.38**
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	<0.000873	<0.10	<0.01
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.945	1.098	1.48
Selenium	0.05	0.000624	<0.003	<0.003
Thallium	0.002	0.0000890	<0.0020	<0.0020

MW-4				
APPENDIX III	**GWPS**	**4/22/2019**	**10/1/2019**	**4/7/2020**
Boron	NA	1.25	1.75	0.83
Calcium	NA	730	690	464
Chloride	NA	1510	1910	1560
Fluoride	4	0.102	0.2	0.2
Sulfate	NA	1440	2490	4000
pH (SU)	NA	7.26	7.36	7.10
Total Dissolved Solids	NA	4840	4820	5120
APPENDIX IV				
Antimony	0.006	0.0000360	<0.005	<0.005
Arsenic	0.01	0.000445	<0.0100	<0.0010
Barium	2	0.0308	0.029	0.022
Beryllium	0.004	<0.000102	<0.0200	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00110	<0.0020	0.0008
Cobalt	0.006	0.000415	<0.004	<0.004
Fluoride	4	0.102	0.2	0.2
Lead	0.015	<0.0000675	<0.002	<0.002
Lithium	0.040	**1.73**	<0.20	**0.82**
Mercury	0.002	0.000825	0.0004	0.0003
Molybdenum	0.1	<0.000873	<0.10	0.002
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	1.66	1.255	1.26
Selenium	0.05	0.00211	<0.003	0.023
Thallium	0.002	0.0000410	<0.0020	<0.0020

MW-1 MW-2 MW-3A MW-104 MW-6 MW-5 MW-4

bing

Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well

All results listed in milligrams per liter (mg/L) unless otherwise noted.
Yellow highlighted values indicate GWPS exceedance.
Orange highlighted analyte indicate SSL above GWPS.
SSL = Statistically Significant Level
GWPS = Groundwater Protection Standard
NA = Not Applicable
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter

0 400 800
Feet

N

BigRivers

Green Landfill
Webster County, Kentucky

FIGURE 9.
GROUNDWATER CONDITIONS MAP
2019-2020 ANALYTICAL RESULTS

DATE: 5/13/2020	SCALE: 1IN = 300 FEET
CREATED BY: SEL	
JOB NO. 60619283	

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MW-1
MW-2
MW-3A
MW-104
MW-6
MW-5
MW-4
Green River
Groves Creek
bing
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Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well
- Northwest Seep Collection Trench
- Deep Seep Collection Trench

0 400 800
Feet

N

Big Rivers Electric Corporation

Green Landfill
Webster County, Kentucky

FIGURE 10
SEEP COLLECTION TRENCH
LOCATION MAP

DATE: 05/14/2020	SCALE: 1IN = 300 FEET
CREATED BY: SEL	
JOB NO. 60626688	

Appendix A
July 2018 River and Seep Sampling and Analysis Data

TABLE 1

CCR ANALYTICAL SUMMARY
RIVER SEEP AND RIVER SAMPLE EVALUATION

JULY 2018

BIG RIVERS ELECTRIC CORPORATION
GREEN STATION LANDFILL
WEBSTER COUNTY, KENTUCKY

Field Parameters	PRIMARY MCL and CCR LIMITS	Water Quality Criteria (mg/L) Human Health: Domestic Water Supply Source	Human Health: Fish	Warm Water Aquatic Habitat: Acute	Warm Water Aquatic Habitat: Chronic	River Seep-14-71318 Lat 37.661126 Long -87.4894	River Seep-12-71318 Lat 37.61732 Long -87.4936	RiverSeep-16-71318 Lat 37.62167 Long -87.4967	River 01A 71218 Lat 37.64610 Long -87.5059	River 01B 71218 Lat 37.64610 Long -87.5059	RiverSeep-08-71318 Lat 37.62860 Long -87.5003	RiverSeep-07-71218 Lat 37.63299 Long -87.5003	River 02A 71218 Lat 37.63303 Long -87.5002	River 02B 71218 Lat 37.63303 Long -87.5002	RiverSeep-05-71218 Lat 37.63433 Long -87.5003	River 03A 71218 Lat 37.63433 Long -87.5002	River 03B 71218 Lat 37.63433 Long -87.5002	River 04A 71218 Lat 37.63789 Long -87.5004	River 04B 71218 Lat 37.63789 Long -87.5004	River-Seep-04-71218 Lat 37.64122 Long -87.4997
pH (Field Measurement) SU	NA					7.54	7.37	7.46	7.94	7.94	7.09	7.27	7.91	7.91	6.92	7.94	7.94	7.86	7.86	5.13
pH (Lab Measurement) SU	NA					8.14	8.00	8.40	7.64	7.62	8.16	8.01	7.45	7.50	7.95	7.50	7.51	7.52	7.53	5.26
Conductivity (µmhos/cm)	NA					1207	226.2	654	268	268	7674	7715	267.7	267.7	6174	262.2	262.2	265.1	265.1	2545
Temperature (°F)	NA					88.34	84.0	91.58	82.9	82.9	70.52	79.7	84.2	84.2	94.28	84.2	84.2	82.6	82.6	71.6
Oxidation-Reduction Potential (m	NA					-92	-98	-48	131	131	29	-123	98	98	-137	133	133	133	133	125
APPENDIX III CONSTITUENTS																				
Boron	NA					0.0694 J	0.0379 J	0.0321 J	0.0281 J	0.0252 J	0.510 J	1.46	0.0323 J	0.0322 J	0.853 J	0.0251 J	0.0235 J	0.0229 J	0.0234 J	2.19
Calcium	NA					171	21.1	93.8	31.8	33.2	801	1120	32.8	35.8	916	34.8	32.6	32.9	34.5	460
Chloride	NA	250	-	1200	600	22.7	32.7	23.2	4.58 B	4.52 B	2040	1990	6.75 B	6.69 B	1670	5.33 B	5.59 B	4.83 B	4.75 B	189
Fluoride	4 mg/L	4	-	-	-	0.144 J	0.0803 J	0.177 J	0.111 J	0.105 J	0.0915 J	0.102 J	0.0958 J	0.0979 J	0.0795 J	0.100 J	0.0954 J	0.0948 J	0.0945 J	0.239 J F1
Sulfate	NA	250	-	-	-	159 B	16.1 B	26.5 B	28.5	28.3	1440 B	1480 B	30.6	30.1	1170 B	28.8	28.9	28.6	28.6	1310 B
Total Dissolved Solids	NA	250	-	-	-	790	157	504	169	161	5310	6080	173	170	5140	175	170	174	156	2130
APPENDIX IV CONSTITUENTS																				
Antimony	0.006 mg/L	0.0056	0.64	-	-	0.000312 J	0.000499 J	0.000270 J	0.000591 JB	0.000476 JB	0.00141 J	ND	0.00276 B	0.00106 JB	0.000366 J	0.000571 JB	0.000514 JB	0.000504 JB	0.000360 JB	0.000200 J
Arsenic	0.01 mg/L	0.01	-	0.340	0.150	0.0173	0.00467 J	0.0247	0.00124 J	0.00137 J	0.000404 J	0.00182 J	0.00131 J	0.00135 J	0.0192	0.00126 J	0.00131 J	0.00118 J	0.00109 J	0.00188 J
Barium	2 mg/L	1	-	-	-	0.242	0.0757 J	0.190 J	0.0330 J	0.0374 J	0.0443 J	0.0605 J	0.0350 J	0.0396 J	0.718	0.0366 J	0.0362 J	0.0382 J	0.0402 J	0.0384 J
Beryllium	0.004 mg/L	0.004	-	-	-	0.000497 J	0.000145 J	0.000211 J	ND	ND	ND	ND	ND	ND	0.000545 J	ND	ND	ND	ND	0.00372
Cadmium	0.005 mg/L	0.005	-	0.00235	0.00029	0.000312 J	0.000183 J	0.000196 J	ND	ND	ND	ND	ND	ND	0.000563 J	ND	ND	ND	ND	0.00307
Chromium	0.1 mg/L	0.1	-	-	-	0.00969	0.00200 J	0.00383	0.000676 J	0.00143 J	0.000560 J	0.000340 J	0.00111 J	0.00155 J	0.0124	0.00112 J	0.00119 J	0.00134 J	0.00105 J	0.00386
Cobalt	0.006 mg/L					0.0125	0.00581	0.00613	0.000401 J	0.000623 J	0.000691 J	0.0218	0.000730 J	0.000937 J	0.0327	0.000934 J	0.000800 J	0.000841 J	0.000738 J	0.0447
Fluoride	4 mg/L	4	-	-	-	0.144 J	0.0803 J	0.177 J	0.111 J	0.105 J	0.0915 J	0.102 J	0.0958 J	0.0979 J	0.0795 J	0.100 J	0.0954 J	0.0948 J	0.0945 J	0.239 J F1
Lead	0.015 mg/L	0.015	-	0.092	0.0036	0.0109	0.00221 J	0.00521	0.000994 JB	0.00600 B	0.000769 J	0.000523 J	0.00125 JB	0.00199 JB	0.0104	0.00115 JB	0.00166 JB	0.00141 JB	0.00147 JB	0.00507
Lithium	0.040 mg/L					0.0126 J	ND	ND	ND	ND	1.80	0.772	ND	ND	0.340	ND	ND	ND	ND	0.0209 J
Mercury	0.002 mg/L	0.002	0.000051	0.0014	0.00077	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Molybdenum	0.1 mg/L					0.00550 J	0.000948 J	0.00878 J	0.00217 J	0.00130 J	0.00296 J	0.00219 J	0.00222 J	0.00145 J	0.00442 J	0.00105 J	0.00103 J	0.00101 J	0.000981 J	ND
Radium 226 / Radium 228	5 pCi/L	5 pCi/L				NS	1.17	NS	0.417	0.249 U	1.31	1.4	0.554	0.735	7.64	0.404 U	0.391 U	0.544	0.423 U	1.48
Selenium	0.05 mg/L	0.17	4.2	-	0.005	0.000582 J	ND	0.000906 J	ND	ND F2	ND	ND	0.000423 J	0.000636 J	0.00121 J	ND	ND	0.000402 J	ND	0.00216 J
Thallium	0.002 mg/L	0.00024	0.00047	-	-	0.000126 J	ND	ND	0.0000500 J	ND	ND	ND	ND	ND	0.000164 J	ND	ND	ND	ND	ND
IONIC CONSTITUENTS																				
Total Alkalinity	NA					443	38.2	393	85.6	85.6	174	87.7	85.7	85.8	229	86.1	86.4	80.9	85.8	ND
Hardness (as mg/L of CaCO3)**	NA					578	74	318	106	110	3198	3010	108	117	2608	115	108	109	114	1411
Magnesium	NA					36.6	5.20	20.3	6.41	6.62	291	51.8	6.32	6.76	77.8	6.87	6.41	6.45	6.73	63.6
Potassium	NA					4.96	2.37	4.85	2.68	2.91	125	262	3.01	3.65	285	3.06	2.87	2.85	2.95	9.51
Sodium	NA					18.5	5.52	26.7	3.79	3.95	274	277	3.98	4.63	285	4.64	4.01	3.87	4.02	42.1

*All results listed in milligrams per liter (mg/L) unless otherwise noted by the Maximum Contaminant Level (MCL)
NA = Not available
pCi/L = picoCuries per Liter
SU = Standards units
µmhos/cm = microSiems per centimeter
°F = Degrees Fahrenheit
mV = millivolts
ND = Not detected above the Method Detection Limit
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
NM = Not measured
U = Result is less than the sample detection limit

Note: River "A" samples collected from surface
River "B" samples collected <1 foot above river bed

** The water hardness is using American degree equivalent to mg/L.
Water hardness(mg/L) = Ca(mg/L)×2.497 + Mg(mg/L)×4.118

Constituent	KY Acute Warm Water Habitat Equation	Hardness (mg/L $CaCO_3$)	Hardness** (mg/L $CaCO_3$)
		50	110
		Criterion (ug/L)	Criterion (ug/L)
Cadmium	Criterion = e(1.0166 (ln Hard*)-3.924)	1.05	2.35
Lead	Criterion = e(1.273 (ln Hard*)-1.460)	34	92

Constituent	KY Chronic Warm Water Habitat Equation	Hardness (mg/L $CaCO_3$)	Hardness** (mg/L $CaCO_3$)
		50	110
		Criterion (ug/L)	Criterion (ug/L)
Cadmium	Criterion = e(0.7409 (ln Hard*)-4.719)	0.16	0.29
Lead	Criterion = e(1.273 (ln Hard*)-4.705)	1.3	3.6

*Hard = Hardness as mg/L $CaCO_3$ **Average hardness concentration from collected River Samples (7/12/18)

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Legend

- Pond Sample
- River Seep Sample
- River Sample
- Downgradient Monitoring Well
- Upgradient Monitoring Well

0 1,450 2,900

Feet

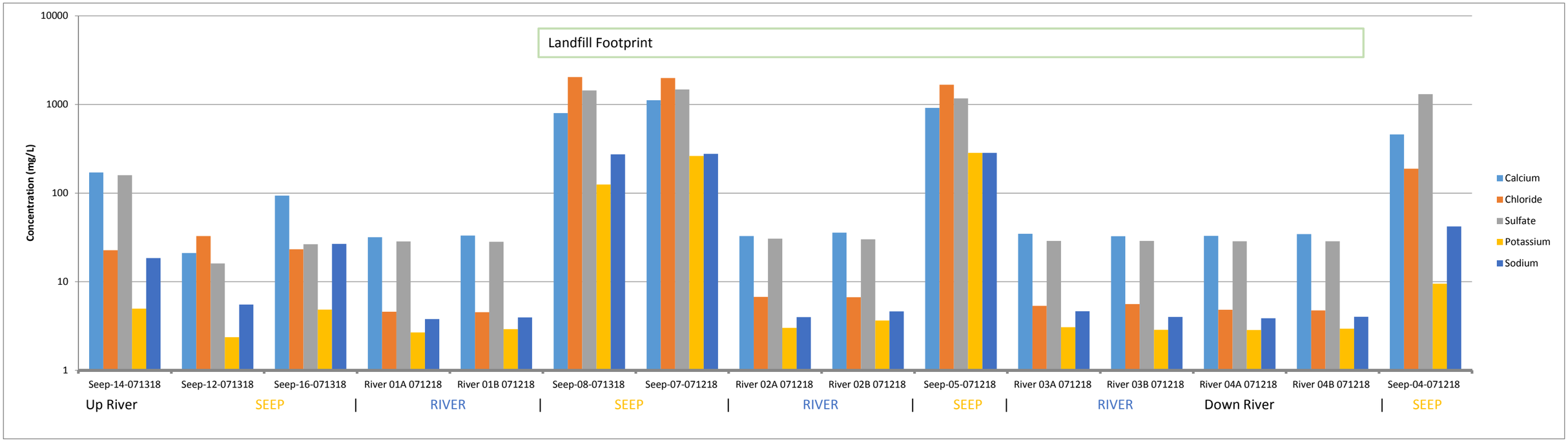
N

Big Rivers Electric Corporation

Green Station Landfill
Webster County, Kentucky

FIGURE 1
RIVER AND SEEP
SAMPLING LOCATIONS

DATE: 9/6/2018	SCALE: 1IN = 1800 FEET
CREATED BY: MRH	
JOB NO. 60579938	



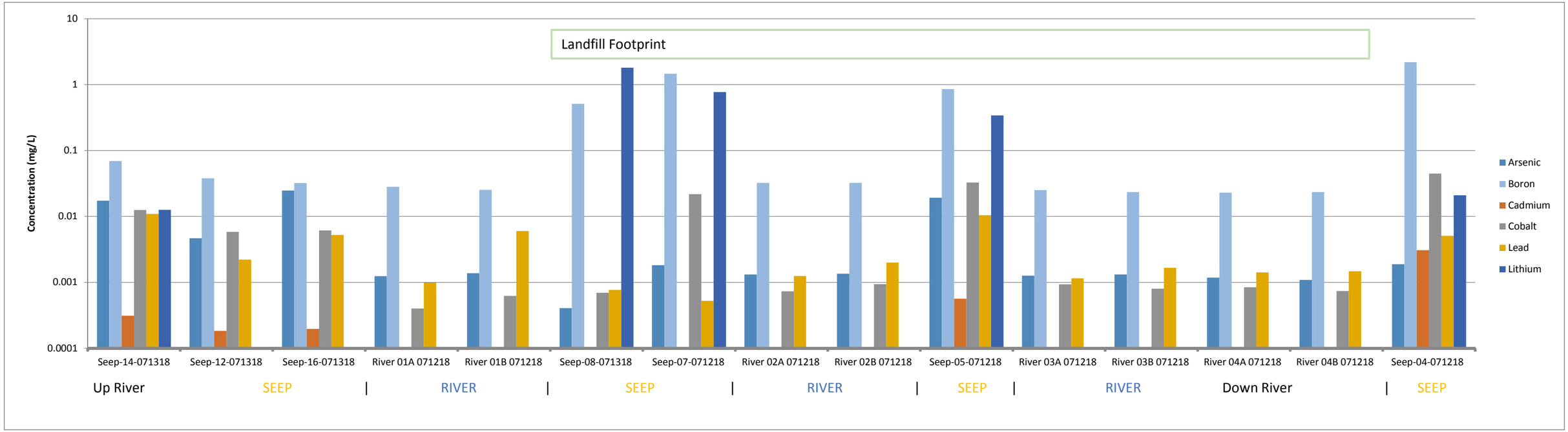


FIGURE 2
CCR ANALYTICAL SUMMARY - GREEN STATION LANDFILL
RIVER SEEP AND RIVER SAMPLE EVALUATION, JULY 2018

8/30/2018

Appendix B
Green Landfill Analytical Summary Tables

GREEN LANDFILL ANALYTICAL SUMMARY TABLES

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-1

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																									
			3/26/2016		5/23/2016		8/18/2016		10/26/2016		2/1/2017		5/2/2017		8/7/2017		9/5/2017		10/5/2017		6/4/2018		7/10/2018		9/28/2018		4/22/2019		9/30/2019	
			Baseline Events																		Assessment		Re-Sampling		Assessment				
Boron	0.08		1.67		1.49		2.25		1.70		1.71	J	1.68		1.85	B	1.79		1.92				1.41		1.94	B	1.73	B	1.68	D2 M4
Calcium	0.5		29.1		31.8	B	33.0		30.9		20.8		28.1		27.1		29.9	B	26.4				26.5		28.5	B	32.1		29.1	D2
Chloride	3		9.03	JB	0.501	JB	6.60	B	6.02	B	5.56	B F1	5.30	B	5.12	B F1	5.71	B	4.07	F1 B			6.34	B	6.17	B	6.41	B F1	7.5	
Fluoride	1		ND	J	ND	JB	ND	J	ND	JB	ND	J F1	ND	JB	ND	J F1	ND	J	ND	J F1			ND	J	ND	JB	0.521	J	0.6	
Sulfate	5		25.2		22.8	JB	22.9		20.7	B	28.4		24.0	B	25.3	B	23.4		24.9	JB			23.5		22.5	B	35.1	B F1	19	
pH (SU)	0.10		7.39		7.24		7.57		7.19		7.63		7.54		7.45		7.48		7.63				7.08		8.43		7.87		7.79	H3
Total Dissolved Solids	10		598		588		585		585		605		630		614		627		636				585		616		568	B	444	H1
APPENDIX IV CONSTITUENTS																														
Antimony	0.002	0.006 mg/L	ND		ND	J	ND	B	ND		ND		ND	JB	0.00297	B	ND	JB			ND	JB	ND	J	NA		0.000254	JB	ND	M1 V1 U
Arsenic	0.005	0.01 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J F1	ND	JB			ND	JB	ND	J	ND	JB	0.00167	JB	0.0005	V1 J
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J F1	ND	J			ND	JB	ND	J	ND	J	0.0862	J	0.091	D2
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		0.000533	J	ND	D2 U
Cadmium	0.001	0.005 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		0.000299	J	ND	VI U
Chromimum	0.003	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND	J			ND	JB	ND		NA		0.00354	B	ND	U
Cobalt	0.005	0.006 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			ND	JB	ND	J	NA		0.000571	J	ND	U
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J F1	ND	JB	ND	J F1	ND	J			ND	J	ND	J	ND	JB	0.521	J	0.6	
Lead	0.005	0.015 mg/L	ND	J	ND	J	ND	J	ND		ND		ND		ND		ND	J			ND		ND	J	NA		0.000279	J	ND	V1 U
Lithium	0.05	0.040 mg/L	0.0293	J	0.0317	J	0.0326	J	0.0286	J	0.0342	J	0.0396	J	0.0314	J	0.0315	J			0.0319	J	0.0298	J	0.0279	J	0.0295	J	ND	D2 M3 U
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		ND		ND		ND	V1 U
Molybdenum	0.01	0.1 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND				ND	J	ND	J	NA		0.00105	J	ND	U
Radium 226	1	5 pCi/L	1.05		1.02		0.676		1.02		0.694		0.666		0.491		0.601				1.92		0.882		0.905		0.689		0.782	
Radium 228																													0.733	
Selenium	0.01	0.05 mg/L	ND		ND		ND		ND		ND		ND		ND	J	ND				ND		ND		NA		0.00105	J	ND	U
Thallium	0.001	0.002 mg/L	ND		ND	J	ND		ND	J	ND		ND		ND	J	ND				ND		ND		NA		0.000498	J	0.0001	V1 J

*All results listed in milligrams per liter (mg/L) unless otherwise noted by the Maximum Contaminant Level (MCL)
GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D2 = Sample required dilution due to matrix interference
H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
M3 = The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable
M4 = The analysis of the spike sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-2

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																					
			3/26/2016		5/23/2016		8/18/2016		11/14/2016		2/1/2017		5/2/2017		8/8/2017		9/7/2017		10/6/2017		6/5/2018		7/11/2018		9/28/2018		4/23/2019		10/1/2019	
			Baseline Events																		Assessment		Re-Sampling		Assessment			
Boron	0.08		ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J	0.113	JB	ND	JB	ND	J			ND	J	0.0630	JB	0.101	JB	ND	D2 U
Calcium	0.5		119		116	B	140		140	B	126		152		154		121		150				155		165	B	156		166	D1
Chloride	3		126	B	125	B	129	B	133		142	B	129	B	145	B	136	B	129	B			154	B	159	B	144		108	D
Fluoride	1		ND	J	ND		ND	J	ND	JB F1	ND	J	ND	JB	ND	JB	ND	JB F1	ND	J			ND	J	ND	JB	0.193	J	0.3	
Sulfate	5		80.0		84.5	J	85.5	J	90.1		89.8		83.2		92.0	JB	90.8		88.6	JB			107		108	B	105		79.0	D
pH (SU)	0.10		6.81		6.59		6.7		6.78		7.12		7.04		6.77		6.69		6.86		6.64		6.40		7.02		7.15		7.39	H3
Total Dissolved Solids	10		764		780		830		880		862		918		913		818		970				884		937		918	B	930	H1
APPENDIX IV CONSTITUENTS																														
Antimony	0.002	0.006 mg/L	ND		ND	J	ND	JB	ND	JB	ND		ND	JB	ND	B	ND	JB			ND	JB	ND	J	NA		0.0000670	JB	ND	V1 U
Arsenic	0.005	0.01 mg/L	0.00703	J	0.00633		0.0110		0.0159		0.0462		0.00755		0.0381		0.00527				0.0327	B	0.0119		0.0211	B	0.00738	B	0.0129	D2
Barium	0.2	2 mg/L	ND	J	ND	J	0.280		0.319		0.347		0.332		0.308		ND	J			0.369		0.323		0.367		0.362		0.380	D2
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		0.000281	J	ND	D2 U
Cadmium	0.001	0.005 mg/L	ND	J	ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	V1 U
Chromimum	0.003	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND	JB	ND		NA		0.00122	JB	ND	D2 U
Cobalt	0.005	0.006 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	J			ND	JB	ND	J	NA		0.00382	J	ND	D2 U
Fluoride	1	4 mg/L	ND	J	ND		ND	J	ND	JB F1	ND	J	ND	JB	ND	JB	ND	JB F1			ND	J	ND	J	ND	JB	0.193	J	0.3	
Lead	0.005	0.015 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND	J	NA		ND		ND	V1 U
Lithium	0.05	0.040 mg/L	ND	J	ND		ND		ND		ND	J	ND	J	ND	JB	ND				ND		ND		ND		ND		ND	D2 VI U
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		ND		ND		ND	V1 U
Molybdenum	0.01	0.1 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	JB	ND	JB			ND	J	ND	J	NA		0.00210	J	0.003	J
Radium 226	1	5 pCi/L	0.533		ND		0.46		ND		0.856		0.73		0.968		0.537				1.18		0.733		0.803		0.391		0.136	
Radium 228																													0.834	
Selenium	0.01	0.05 mg/L	ND		ND		ND		ND	JB	ND		ND		ND	JB	ND				ND		ND		NA		ND		ND	U
Thallium	0.001	0.002 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND		ND		NA		0.0000800	J	ND	V1 U

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GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
F1 = MS and/or MSD Recovery is outside acceptance limits.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-3A

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																					
			3/26/2016		5/23/2016		8/18/2016		11/14/2016		2/1/2017		5/2/2017		8/8/2017		9/6/2017		10/6/2017		6/5/2018		7/11/2018		9/28/2018		4/23/2019		10/1/2019	
			Baseline Events																		Assessment		Re-Sampling		Assessment			
Boron	0.08		0.145		0.135	J	0.279	J	0.213	J	0.235	JB	0.232	J	0.304	JB	0.376	J	0.313				0.177	J	0.257	JB	0.259	JB	ND	D2 U
Calcium	0.5		431		322	B	362		365	B	327		420		421		438	B	408				469		447	B	411		490	D1
Chloride	3		2630	HB	3070		2150	B	2150	B	2220	B	2120	B	1790	B	2270	B	1870	B			2180	B	2040	B	1850		4570	D
Fluoride	1		ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND		3.16		ND	J			ND	J	ND	JB	0.387	J	0.4	
Sulfate	5		1330		1330		1190		1660		1080		1030	B	942		1130		1030	B			1010		1130	B	1080		1680	D
pH (SU)	0.10		6.92		6.86		6.95		6.75		7.17		7.11		6.81		6.9		6.95		6.84		6.55		7.98		7.23		7.33	H3
Total Dissolved Solids	10		4440		5010		4170		4450		4270		5170		5010		5020		5300				4540		4940		4250	B	6900	H1
APPENDIX IV CONSTITUENTS																														
Antimony	0.002	0.006 mg/L	ND		ND	J	ND	JB	ND	JB	ND		ND	JB	ND	JB	ND	JB			ND	JB	ND		NA		0.000102	JB	ND	V1 U
Arsenic	0.005	0.01 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	JB			ND	JB	ND	J	ND	JB	0.000575	JB	ND	D2 U
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			ND	J	ND	J	ND	J	0.0474	J	0.051	D2 U
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		0.000199	J	ND	D2 U
Cadmium	0.001	0.005 mg/L	ND	J	ND	J	ND		ND		ND	J	ND	J	ND		ND				ND	J	ND	J	NA		0.000164	J	ND	V1 U
Chromimum	0.003	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND	J			ND	JB	ND		NA		0.00168	JB	ND	D2 U
Cobalt	0.005	0.006 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			ND	JB	ND	J	NA		0.000243	J	0.008	
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND		3.16				ND	J	ND	J	ND	JB	0.387	J	0.4	
Lead	0.005	0.015 mg/L	ND	J	ND		ND		ND		ND		ND		ND	J	ND	J			ND		ND	J	NA		0.000137	J	ND	V1 U
Lithium	0.05	0.040 mg/L	0.669		0.516		0.648		0.677		0.689		0.746		0.767		0.762				0.699		0.790		0.766		0.678		0.79	D1
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		ND		ND		ND	V1 U
Molybdenum	0.01	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	D2 U
Radium 226	1	5 pCi/L	1.38		0.386		0.472		1.15		1.15		0.923		1.53		1.03				1.18		1.43		1.21		0.641		0.139	
Radium 228																													0.734	
Selenium	0.01	0.05 mg/L	ND		ND		ND	J	ND	JB	ND		ND		ND		ND				ND	J	ND		NA		0.00103	J	ND	D2 U
Thallium	0.001	0.002 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND	J			ND		ND		NA		0.000860	J	ND	V1 U

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V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-4

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																					
			3/29/2016		5/23/2016		8/18/2016		10/26/2016		2/1/2017		5/2/2017		8/8/2017		9/7/2017		10/6/2017		6/5/2018		7/11/2018		9/28/2018		4/22/2019		10/1/2019	
			Baseline Events																		Assessment		Re-Sampling				Assessment			
Boron	0.08		0.602		0.498	J	1.58		1.7		1.54	B	2.09		2.51	B	2.87	B	1.36				0.751	J	1.33	B	1.25	B	1.75	D2
Calcium	0.5		660		386	B	464		558		591		774		743		739		828				822		722	B	730		690	D1
Chloride	3		1450	B	939	B	952	B	1000	B	1420	B	1320	B	1360	B	1880	B	1730	B			1430	B	1310	B	1510		1910	D
Fluoride	1		ND	J	ND		ND	J	ND	JB	ND	J	1.06	B	ND		ND	JB	ND	J			ND	J	ND	JB	0.102	J	0.2	
Sulfate	5		1830		1640		1420		1420	B	1620		1430	B	1600	B	2020		1590	B			1460		1400	B	1440		2490	D
pH (SU)	0.10		6.36		6.83		7.08		6.61		7.28		7.1		6.84		6.64		6.93		6.86		6.58		8.06		7.26		7.36	H3
Total Dissolved Solids	10		3700		4250		3440		3250		4420		4550		4890		4700	H	6220				4880		5170		4840	B	4820	H1
APPENDIX IV CONSTITUENTS																														
Antimony	0.002	0.006 mg/L	ND		ND	J	ND	JB	ND		ND		ND	JB	ND	JB	ND	JB			ND	JB	ND		NA		0.0000360	JB	ND	V1 U
Arsenic	0.005	0.01 mg/L	ND		ND	J	ND	J	ND		ND	J	ND	J	ND	J	ND	JB			ND	JB	ND	J	ND	JB	0.000445	JB	ND	D2 U
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	J	ND	J	ND	JB			ND	J	ND	J	ND	J	0.0308	JB	0.029	D2 J
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	D2 U
Cadmium	0.001	0.005 mg/L	ND	J	ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	V1 U
Chromimum	0.003	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND	JB	ND		NA		0.00110	JB	ND	D2 U
Cobalt	0.005	0.006 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND	JB	ND	J	NA		0.000415	J	ND	U
Fluoride	1	4 mg/L	ND		ND		ND	J	ND	JB	ND	J	ND	B	ND		ND	JB			ND	J	ND	J	ND	JB	0.102	J	0.2	
Lead	0.005	0.015 mg/L	ND	J	ND	J	ND		ND		ND		ND		ND		ND				ND		ND	J	NA		ND		ND	V1 U
Lithium	0.05	0.040 mg/L	1.39		0.838		1.13		1.25		1.35		1.59		1.77		1.66				1.81		1.91		1.81		1.73		ND	D2 V1 U
Mercury	0.0002	0.002 mg/L	0.00027		0.000224		ND	J	0.000248		0.000302		0.000717		0.000825		0.000485				0.000824		0.000832		0.000680		0.000825		0.0004	V1 J
Molybdenum	0.01	0.1 mg/L	ND	J	ND	J	ND		ND		ND	J	ND		ND		ND				ND		ND		NA		ND		ND	D2 U
Radium 226	1	5 pCi/L	1.26		0.592		ND		0.536		1.22		1.43		1.94		1.19				1.62		2.00		1.51		1.66		0.451	
Radium 228																													0.804	
Selenium	0.01	0.05 mg/L	ND	J	ND	J	ND	J	ND		ND	J	ND		ND		ND	J			ND	J	ND		NA		0.00211	J	ND	U
Thallium	0.001	0.002 mg/L	ND		ND		ND		ND	J	ND		ND		ND		ND				ND		ND		NA		0.0000410	J	ND	V1 U

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D2 = Sample required dilution due to matrix interference
H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-5

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																			
			3/29/2016	5/23/2016	8/18/2016	10/26/2016	2/1/2017	5/2/2017	8/7/2017	9/7/2017	10/6/2017	6/5/2018	7/11/2018	9/28/2018	4/22/2019	9/30/2019
			Baseline Events									Assessment	Re-Sampling	Assessment		
Boron	0.08		0.217	0.0896 J	0.216 J	0.214 J	0.222 JB	0.241 J	0.257 JB	0.276 B	0.262		0.207 J	0.263 JB	0.271 JB	ND D2 U
Calcium	0.5		452	189 B	374	399	335	464	423	407 B	383		469	441 B	446	476 D1
Chloride	3		1630 B	521	688 B	755 B	734 B	722 B	945 B	779 B	608 B		941 B	1140 B	931	1500 D
Fluoride	1		ND J	ND	ND J	ND	ND J	ND JB	ND	3.69	ND J		ND J	ND JB	0.128 J	0.2
Sulfate	5		1760 HB	876	1780	1740 B	1880	1760 B	2060 B	1920	1600 B		1800	1890 B	1800	2990 D
pH (SU)	0.10		6.76	6.74	6.99	6.61	7.14	7.44	6.87	7.13	7.06	6.88	6.40	7.99	7.15	7.41 H3
Total Dissolved Solids	10		4210	1660	3470	3610	3680	4250	4130	4120	4390		4100	4540	4360 B	5320 H1
APPENDIX IV CONSTITUENTS																
Antimony	0.002	0.006 mg/L	ND	ND J	ND JB	ND	ND	ND JB	ND JB	ND JB		ND JB	ND	NA	0.0000700 JB	ND V1 U
Arsenic	0.005	0.01 mg/L	ND	ND J	ND JB	ND J	ND J	ND J	ND J	ND JB		ND JB	ND J	ND JB	0.000424 JB	ND D2 U
Barium	0.2	2 mg/L	ND J	ND J	ND J	ND J	ND J	ND J	ND J	ND J		ND J	ND J	ND J	0.0167 J	0.016 D2 J
Beryllium	0.002	0.004 mg/L	ND	ND	ND J	ND	ND	ND	ND	ND		ND	ND	NA	ND	ND D2 U
Cadmium	0.001	0.005 mg/L	ND J	ND	ND	ND	ND	ND	ND	ND		ND	ND	NA	ND	ND V1 U
Chromimum	0.003	0.1 mg/L	ND	ND J	ND	ND	ND J	ND J	ND	ND J		0.00363 B	ND	NA	0.00159 JB	0.0033
Cobalt	0.005	0.006 mg/L	ND	ND J	ND J	ND J	ND	ND J	ND	ND J		ND JB	ND J	NA	0.000288 J	ND U
Fluoride	1	4 mg/L	ND J	ND	ND J	ND	ND J	ND	ND	3.69		ND J	ND J	ND JB	0.128 J	0.2
Lead	0.005	0.015 mg/L	ND J	ND J	ND	ND	ND	ND	ND	ND		ND J	ND J	NA	0.0000860 J	ND V1 U
Lithium	0.05	0.040 mg/L	0.521	0.136	0.305	0.325	0.368	0.415	0.405	0.353		0.459	0.481	0.425	0.434	0.40 D1
Mercury	0.0002	0.002 mg/L	ND	ND	ND	ND	ND	ND	0.00351	ND		ND	ND	ND	ND	ND V1 U
Molybdenum	0.01	0.1 mg/L	ND	ND J	ND	ND	ND	ND	ND	ND		ND	ND	NA	ND	ND D2 U
Radium 226	1	5 pCi/L	1.16	0.736	0.959	0.957	0.765	0.888	1.54	0.773		0.862	1.42	1.37	0.945	0.368
Radium 228																0.730
Selenium	0.01	0.05 mg/L	ND	ND	ND	ND	ND J	ND J	ND	ND		ND J	ND	NA	0.000624 J	ND U
Thallium	0.001	0.002 mg/L	ND	ND	ND J	ND J	ND	ND J	ND	ND J		ND J	ND	NA	0.0000890 J	ND V1 U

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pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
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H = Sample was prepped or analyzed beyond the specified holding time
D1 = Sample required dilution due to high concentration of target analyte
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H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-6

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE																					
			3/29/2016		5/23/2016		8/18/2016		10/26/2016		2/1/2017		5/2/2017		8/7/2017		9/5/2017		10/5/2017		6/4/2018		7/10/2018		9/28/2018		4/22/2019		9/30/2019	
			Baseline Events																		Assessment		Re-Sampling				Assessment			
Boron	0.08		0.156		0.137	J	0.193	J	0.168	J	0.173	B	0.179	J	0.167	JB	0.199	J	0.178				0.155	J	0.196	JB	0.194	JB	ND	D2 U
Calcium	0.5		467		374	B	373		400		320		415		365		382	B	376				386		356	B	421		431	D1
Chloride	3		167	B	149	B	136	JB	150	B	125	B	129	B	128	B	123	B	138	B			147	B	142	B	142		230	D
Fluoride	1		ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND		ND	J	ND	J			ND	J	ND	JB	0.409	J	0.5	
Sulfate	5		2250	HB	3340		2550		2610	B	2700		2600	B	2820	B	2490		2700	B			2120		2420		2200		3830	D
pH (SU)	0.10		6.66		6.65		6.96		6.6		6.92		6.97		6.76		6.95		6.86				6.50		7.94		6.86		7.15	H3
Total Dissolved Solids	10		4060		4280		4350		4470		4720		4700		4830		4890		4910				4500		4820		4780	B	4830	H1
APPENDIX IV CONSTITUENTS																														
Antimony	0.002	0.006 mg/L	ND		ND	J	ND	JB	ND		ND		ND	JB	ND	JB	ND	JB			ND	JB	ND		NA		0.0000920	JB	ND	V1 U
Arsenic	0.005	0.01 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	JB			ND	JB	ND	J	ND	JB	0.000722	JB	ND	V1 U
Barium	0.2	2 mg/L	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			ND	J	ND	J	ND	J	0.0128	J	0.010	D2 J
Beryllium	0.002	0.004 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	D2 U
Cadmium	0.001	0.005 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		NA		ND		ND	V1 U
Chromimum	0.003	0.1 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND	J			ND	JB	ND		NA		0.00196	JB	ND	U
Cobalt	0.005	0.006 mg/L	ND		ND	J	ND	J	ND	J	ND	J	ND	J	ND	J	ND	J			ND	JB	ND	J	NA		0.000276	J	ND	U
Fluoride	1	4 mg/L	ND	J	ND	J	ND	J	ND	JB	ND	J	ND	JB	ND		ND	J			ND	J	ND	J	ND	JB	0.409	J	0.5	
Lead	0.005	0.015 mg/L	ND	J	ND	J	ND		ND		ND		ND		ND		ND				ND		ND	J	NA		ND		ND	V1 U
Lithium	0.05	0.040 mg/L	0.0475	J	0.0527		0.0555		0.0524		0.0607		0.0724		0.0589		0.0554				0.0650		0.0592		0.0558		0.0633		0.05	D2 V1 J
Mercury	0.0002	0.002 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND		ND		ND		ND		ND	V1 U
Molybdenum	0.01	0.1 mg/L	ND	J	ND	J	ND	J	ND	B	ND	J	ND	J	ND	J	ND	J			ND	J	ND	J	NA		0.000972	J	ND	D2 U
Radium 226	1	5 pCi/L	0.741		0.386		ND		0.751		ND		ND		0.462		ND				0.392		0.532		ND	U	0.450		0.548	
Radium 228																													0.698	
Selenium	0.01	0.05 mg/L	ND		ND		ND		ND		ND		ND		ND		ND				ND	J	ND		NA		0.00110	J	ND	U
Thallium	0.001	0.002 mg/L	ND		ND	J	ND		ND		ND		ND		ND		ND				ND		ND		NA		0.0000610	J	ND	V1 U

*All results listed in milligrams per liter (mg/L) unless otherwise noted by the Maximum Contaminant Level (MCL)
GWPS = Groundwater Protection Standard
NA = Not Analyzed
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J or U = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
H = Sample was prepped or analyzed beyond the specified holding time
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
H1 = Sample analysis performed pasts holding time
H3 = Sample received and analyzed past holding time
U = Target analyte was analyzed for, but was below detection limit
V1 = CCV recovery was above method acceptance limits. This target analyte not detected in the sample

GREEN LANDFILL - CCR ANALYTICAL SUMMARY
MW-104

APPENDIX III CONSTITUENTS	Detection Limit	GWPS	DATE					
			3/29/2019		4/10/2019		10/25/2019	
			Characterization					
Boron	0.08		0.1880	JB	0.2710	JB	ND	D2, U
Calcium	0.5		465	B	502		505	D1
Chloride	3		1430		1430	B	1610	D
Fluoride	1		ND		0.3230	JB	0.4	
Sulfate	5		2870		2880	B	2440	D
pH (Field Measurement)	0.10		6.88		6.99		6.86	
Total Dissolved Solids	10		6990		6690		7330	
APPENDIX IV CONSTITUENTS								
Antimony	0.002	0.006 mg/L	0.0001	JB	0.0001	JB	ND	U
Arsenic	0.005	0.01 mg/L	0.0022	J	0.0021	J	0.0039	
Barium	0.2	2 mg/L	0.0243	J	0.0216	JB	0.030	
Beryllium	0.002	0.004 mg/L	ND		ND		ND	U
Cadmium	0.001	0.005 mg/L	ND		ND		0.0004	J
Chromium	0.003	0.1 mg/L	0.0047	B	0.0036		0.0066	
Cobalt	0.005	0.006 mg/L	0.0059	B	0.0052		0.011	
Fluoride	1	4 mg/L	ND		0.3230	JB	0.4	
Lead	0.005	0.015 mg/L	0.0011	J	0.0002	J	0.003	
Lithium	0.05	0.040 mg/L	0.0281	J	0.0286	J	0.02	
Mercury	0.0002	0.002 mg/L	ND		ND	^	ND	U
Molybdenum	0.01	0.1 mg/L	0.0015	J	0.0010	J	0.005	J
Radium 226	1	5 pCi/L	0.7760		0.3190	U	0.126	
Radium 228							1.52	
Selenium	0.01	0.05 mg/L	ND		ND		ND	U
Thallium	0.001	0.002 mg/L	ND		ND		ND	U

*All results listed in milligrams per liter (mg/L) unless otherwise noted by the Maximum Contaminant Level (MCL)
GWPS = Groundwater Protection Standard
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
B = Compound was found in the blank and sample.
D1 = Sample required dilution due to high concentration of target analyte
D2 = Sample required dilution due to matrix interference
U = Target analyte was analyzed for, but was below detection limit

Appendix C
Green Landfill Statistical Procedures and Results

1.0 GREEN LANDFILL STATISTICAL PROCEDURES AND RESULTS

The Appendix III and IV groundwater quality data for the Green Landfill were evaluated using an interwell approach that statistically compared constituent concentrations at downgradient compliance monitoring wells to those present at a background monitoring well. For the Green Landfill, monitoring well MW-1 is designated as the background well because it is located upgradient, whereas monitoring wells MW-2, MW-3A, MW-4, MW-5, and MW-6 are designated as compliance wells because they are located downgradient.

The statistical analyses were performed in accordance with the U.S. Environmental Protection Agency's Final CCR Rule 40 CFR Parts 257.93(f), 257.93(g), and 257.93(h) and the Groundwater Monitoring System and Statistical Methods Certification. Prediction limits (i.e., parametric or nonparametric) with 1 of 2 retesting were developed for each constituent based on the frequency of non-detect values and whether the background data for that constituent exhibited a normal, lognormal, or nonparametric distribution. For the statistical analysis, non-detect values were represented as one-half the detection limit. No outliers were identified in the background data. Analytical data from the background monitoring wells collected between March 2016 and October 2019 were used to develop an upper prediction limit (UPL) for the Appendix III and IV background data at 95 percent confidence. Data from the downgradient monitoring wells for the same time period were compared to the UPL to identify statistically significant increases (SSIs) over background. Mann-Kendall trend analysis was used to identify statistically significant increasing trends for constituents with SSIs. ProUCL Version 5.1 was used to store the data and run the statistical analyses. The results of the analyses, including the UPLs, are provided in **Tables C1** and **C2**.

The statistical analysis results indicate that Appendix III constituents calcium, chloride, sulfate, and total dissolved solids (TDS) at monitoring wells MW-2, MW-3A, MW-4, MW-5, and MW-6 have SSIs over background (**Table C3**) that were confirmed by subsequent sampling events. Boron, fluoride, and pH did not have any verified SSIs over background. pH at MW-6 had a verified SSI below the background lower prediction limit (LPL). Based on these results, assessment monitoring was conducted at the landfill. Statistical analysis of the April and October 2019 Appendix IV assessment monitoring results indicate that arsenic and barium at monitoring well MW-2, lithium at monitoring wells MW-3A, MW-4, MW-5, and MW-6, and mercury at monitoring well MW-4 have verified SSIs over background (**Table C4**).

The Appendix IV constituents with SSIs were further evaluated to determine whether they are present at statistically significant levels (SSLs) over the groundwater protection standards (GWPS) by calculating the lower confidence limit at 95% confidence (95LCL) for each well and constituent identified as a SSI using the baseline, detection, and assessment monitoring results collected to date. For a constituent to be present at a SSL over the GWPS, its 95LCL must be greater than the GWPS. **Table C5** provides a summary of the 95LCLs and GWPS for arsenic, barium, lithium, and mercury at monitoring wells MW-2, MW-3A, MW-4, MW-5, and MW-6. The results indicate that lithium at monitoring wells MW-3A, MW-4, MW-5, and MW-6 (yellow highlight) is present as a SSL above the GWPS. The LCLs for the remaining wells and constituents (arsenic, barium, and mercury) are less than the GWPS and thus are not considered SSLs.

Table C1. Well MW-1 Appendix III Constituents Background Upper Prediction Limits

Parameter (Units)	Number of Samples	Percent Non-detects	Normal or Lognormal Distribution?	Statistical Test	Background Limit
Boron (mg/L)	13	0	Yes/Yes	Parametric	2.122
Calcium (mg/L)	13	0	Yes/Yes	Parametric	35
Chloride (mg/L)	13	0	Yes/No	Parametric	9.3
Fluoride (mg/L)	13	0	No/No	Nonparametric	0.89
pH (std units)	13	0	Yes/Yes	Parametric	6.99/7.93
Sulfate (mg/L)	13	0	Yes/Yes	Parametric	33
TDS (mg/L)	13	0	No/No	Nonparametric	636

Note: pH has both a lower prediction limit (LPL) and upper prediction limit (UPL); all other constituents are represented as UPLs

Table C2. Well MW-1 Appendix IV Constituents Background Upper Prediction Limits

Parameter (Units)	Number of Samples	Percent Non-detects	Normal or Lognormal Distribution?	Statistical Test	Background Limit
Antimony (mg/L)	13	31	No/No	Nonparametric	0.003
Arsenic (mg/L)	12	0	No/No	Nonparametric	0.0026
Barium (mg/L)	12	0	Yes/Yes	Parametric	0.098
Beryllium (mg/L)	12	92	No/No	Nonparametric	0.002
Cadmium (mg/L)	12	92	No/No	Nonparametric	0.001
Chromium (mg/L)	12	62	Yes/Yes	Parametric	0.0024
Cobalt (mg/L)	12	8	Yes/Yes	Parametric	0.0014
Fluoride (mg/L)	13	0	No/No	Nonparametric	0.89
Lead (mg/L)	13	46	Yes/No	Parametric	0.0003
Lithium (mg/L)	12	8	Yes/Yes	Parametric	0.037
Mercury (mg/L)	13	100	No/No	Nonparametric	0.0002
Molybdenum (mg/L)	13	31	No/No	Nonparametric	0.01
Ra-226+228 (pCi/L)	12	0	No/Yes	Parametric	1.74
Selenium (mg/L)	12	85	No/No	Nonparametric	0.01
Thallium (mg/L)	13	61	No/No	Nonparametric	0.0006

Note: The UPL for constituents with 100 percent nondetects (Be, Cd, and Hg) is established as the maximum laboratory analytical reporting limit.

Table C3. Big Rivers Green Landfill Appendix III SSI Summary

Well	Location	B	Ca	Cl	F	pH (LPL/UPL)		SO4	TDS
MW-1	Upgradient	P	P	P	NP	P	P	P	NP
MW-2	Downgradient								
MW-3A	Downgradient								
MW-4	Downgradient								
MW-5	Downgradient								
MW-6	Downgradient								

Notes:

SSIs determined using interwell prediction limits; MW-8 is upgradient background well

P = parametric prediction limit; NP = nonparametric prediction limit

Less than or equal to background upper prediction limit (UPL) or greater than lower prediction limit (LPL) for pH

Statistically significant increase (SSI) over background UPL or below background LPL for pH

Table C4. Big Rivers Green Landfill Appendix IV SSI Summary

Well	Location	Sb	As	Ba	Be	Cd	Cr	Co	F	Pb	Li	Hg	Mo	Ra-226+228	Se	Tl
MW-1	Upgradient	NP	Np	P	NP	NP	P	P	NP	Pb	P	NP	NP	P	NP	NP
MW-2	Downgradient															
MW-3A	Downgradient															
MW-4	Downgradient															
MW-5	Downgradient															
MW-6	Downgradient															

Notes:

SSIs determined using interwell prediction limits; MW-8 is upgradient background well

P = parametric prediction limit; NP = nonparametric prediction limit

Less than or equal to background upper prediction limit (UPL) or greater than lower prediction limit (LPL) for pH

Statistically significant increase (SSI) over background UPL or below background LPL for pH

Table C5. Summary of LCLs and GWPS for Arsenic, Barium, Lithium, and Mercury

Well	Parameter	95%LCL (mg/L)	GWPS (mg/L)
MW-2	Arsenic	0.008	0.01
MW-2	Barium	0.25	2.0
MW-3A	Lithium	**0.65**	0.04
MW-3A	Mercury	0.0001	0.002
MW-4	Lithium	**1.04**	0.04
MW-5	Lithium	**0.32**	0.04
MW-6	Lithium	**0.055**	0.04

95%LCL = lower confidence limit at 95% confidence. Yellow highlighted results exhibit a statistically significant level (SSL) above the GWPS.

Appendix D
Green Landfill – April 2020 Groundwater Analytical Data

Pace Analytical Services, LLC
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Madisonville, KY 42431
270.821.7375
www.pacelabs.com

Certificate of Analysis
0041376

Chad Phillips
Big Rivers Electric Corporation Reid/Green Station
PO Box 24
Henderson KY, 42419

Customer ID: 44-102032
Report Printed: 04/30/2020 14:59

Project Name:	Green Landfill Semiannual Groundwater	Workorder:	0041376

Dear Chad Phillips

Enclosed are the analytical results for samples received at one of our laboratories on 04/07/2020 15:49.

Pace Analytical Services LLC Kentucky is a commercial laboratory accredited by various state and national authorities, including Indiana, Kentucky, Tennessee, and Virginia's National Environmental Laboratory Accreditation Program (NELAP). With the NELAP accreditation, applicable test results are certified to meet the requirements of the National Environmental Laboratory Accreditation Program.

If you have any questions concerning this report please contact the individual listed below.

Please note that this certificate of analysis may not be reproduced without the written consent of Pace Analytical Services, LLC Kentucky.

#460210 Madisonville, KY
#460293 Pikeville, KY

Rob Whittington, Project Manager

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Pace Analytical Services, LLC
P.O. Box 907
Madisonville, KY 42431
270.821.7375
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SAMPLE SUMMARY

Lab ID	Client Sample ID/Alias	Matrix	Date Collected	Date Received	Sampled By
0041376-01	MW1/	Groundwater	04/06/2020 13:05	04/07/2020 15:49	Phillip Hill
0041376-02	MW2/	Groundwater	04/07/2020 11:40	04/07/2020 15:49	Phillip Hill
0041376-03	MW3A/	Groundwater	04/07/2020 13:55	04/07/2020 15:49	Phillip Hill
0041376-04	MW4/	Groundwater	04/07/2020 09:55	04/07/2020 15:49	Phillip Hill
0041376-05	MW5/	Groundwater	04/07/2020 10:10	04/07/2020 15:49	Phillip Hill
0041376-06	MW6/	Groundwater	04/06/2020 14:20	04/07/2020 15:49	Phillip Hill
0041376-07	DUPLICATE/	Groundwater	04/07/2020 10:20	04/07/2020 15:49	Phillip Hill
0041376-08	FIELD BLANK/	Water	04/07/2020 11:50	04/07/2020 15:49	Phillip Hill

LabNumber	Measurement	Value
0041376-01	Field Conductance	867
	Field pH	7.22
	Field Temp (C)	18.23
0041376-02	Field Conductance	1590
	Field pH	6.92
	Field Temp (C)	16.86
0041376-03	Field Conductance	8090
	Field pH	6.92
	Field Temp (C)	16.86
0041376-04	Field Conductance	6770
	Field pH	6.70
	Field Temp (C)	16.47
0041376-05	Field Conductance	6250
	Field pH	6.77
	Field Temp (C)	14.85
0041376-06	Field Conductance	5010
	Field pH	6.36
	Field Temp (C)	20.50
0041376-07	Field Conductance	6770
	Field pH	6.70
	Field Temp (C)	16.47

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Madisonville, KY 42431
270.821.7375
www.pacelabs.com

ANALYTICAL RESULTS

Lab Sample ID: **0041376-01**
Description: **MW1**

Sample Collection Date Time: 04/06/2020 13:05
Sample Received Date Time: 04/07/2020 15:49

Metals by SW846 6000 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Antimony	ND	U	mg/L	0.005	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Arsenic	**0.0019**		mg/L	0.0010	0.0004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Barium	**0.087**		mg/L	0.004	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Beryllium	ND	U	mg/L	0.0020	0.0010	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Boron	**1.69**	D1, M3	mg/L	1.00	1.00	SW846 6010 B	04/09/2020 07:40	04/12/2020 16:42	DMH
Cadmium	ND	U	mg/L	0.0010	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Calcium	**27.7**	D1, M3	mg/L	4.00	1.30	SW846 6010 B	04/09/2020 07:40	04/12/2020 16:42	DMH
Chromium	**0.0011**	J	mg/L	0.0020	0.0006	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Cobalt	ND	U	mg/L	0.004	0.004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Copper	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Iron	**1.57**		mg/L	0.100	0.050	SW846 6010 B	04/09/2020 07:40	04/12/2020 16:39	DMH
Lead	ND	U	mg/L	0.002	0.0005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Lithium	**0.03**		mg/L	0.02	0.005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Mercury	ND	U	mg/L	0.0005	0.0002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Molybdenum	ND	U	mg/L	0.01	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Selenium	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH
Sodium	**206**	D1, M3	mg/L	26.0	10.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 16:46	DMH
Thallium	**0.0001**	J	mg/L	0.0020	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:13	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chemical Oxygen Demand	ND	U	mg/L	8	8	HACH 8000	04/10/2020 13:13	04/10/2020 13:13	ALT
Specific Conductance (Lab)	**962**		umhos/cm	1	1	2510 B-2011	04/09/2020 15:52	04/09/2020 15:52	JLW
pH (Lab)	**7.50**	H3	Std. Units	0.10	0.10	4500-H+ B-2000	04/09/2020 16:14	04/09/2020 16:14	GAT
Total Dissolved Solids	**488**		mg/L	50	50	2540 C-2011	04/13/2020 10:14	04/14/2020 12:26	MAG
Total Organic Carbon	**1.0**		mg/L	0.5		5310 C-2011	04/14/2020 10:27	04/14/2020 10:27	HMF

Subcontracted Analyses

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Radium-226	**0.340**	_Sub	pCi/L			EPA 903.1	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium-228	**0.468**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium	**0.808**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	**6.5**		mg/L	2.0	1.3	SW846 9056	04/16/2020 00:56	04/16/2020 00:56	CSC
Fluoride	**0.5**		mg/L	0.2	0.1	SW846 9056	04/16/2020 00:56	04/16/2020 00:56	CSC
Sulfate	**21**		mg/L	1	0.5	SW846 9056	04/16/2020 00:56	04/16/2020 00:56	CSC

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ANALYTICAL RESULTS

Lab Sample ID: **0041376-02**
Description: **MW2**

Sample Collection Date Time: 04/07/2020 11:40
Sample Received Date Time: 04/07/2020 15:49

Metals by SW846 6000 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Antimony	ND	U	mg/L	0.005	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Arsenic	**0.0033**		mg/L	0.0010	0.0004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Barium	**0.238**		mg/L	0.004	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Beryllium	ND	U	mg/L	0.0020	0.0010	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Boron	ND	U	mg/L	0.10	0.10	SW846 6010 B	04/09/2020 07:40	04/12/2020 16:49	DMH
Cadmium	ND	U	mg/L	0.0010	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Calcium	**145**	D1	mg/L	40.0	13.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 16:55	DMH
Chromium	ND	U	mg/L	0.0020	0.0006	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Cobalt	ND	U	mg/L	0.004	0.004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Copper	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Iron	**0.459**		mg/L	0.100	0.050	SW846 6010 B	04/09/2020 07:40	04/12/2020 16:49	DMH
Lead	ND	U	mg/L	0.002	0.0005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Lithium	**0.007**	J	mg/L	0.02	0.005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Mercury	ND	U	mg/L	0.0005	0.0002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Molybdenum	**0.002**	J	mg/L	0.01	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Selenium	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH
Sodium	**66.5**	D1	mg/L	26.0	10.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 16:55	DMH
Thallium	ND	U	mg/L	0.0020	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:16	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chemical Oxygen Demand	**12**		mg/L	8	8	HACH 8000	04/10/2020 13:13	04/10/2020 13:13	ALT
Specific Conductance (Lab)	**1530**		umhos/cm	1	1	2510 B-2011	04/09/2020 15:53	04/09/2020 15:53	JLW
pH (Lab)	**7.22**	H3	Std. Units	0.10	0.10	4500-H+ B-2000	04/09/2020 16:15	04/09/2020 16:15	CML
Total Dissolved Solids	**806**		mg/L	50	50	2540 C-2011	04/13/2020 10:18	04/14/2020 12:26	MAG
Total Organic Carbon	**1.0**		mg/L	0.5		5310 C-2011	04/14/2020 10:48	04/14/2020 10:48	HMF

Subcontracted Analyses

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Radium-226	**0.513**	_Sub	pCi/L			EPA 903.1	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium-228	**0.016**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium	**0.529**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	**120**	D	mg/L	100	64.0	SW846 9056	04/16/2020 01:29	04/16/2020 01:29	CSC
Fluoride	**0.2**		mg/L	0.2	0.1	SW846 9056	04/16/2020 01:12	04/16/2020 01:12	CSC
Sulfate	**85**	D	mg/L	50	25	SW846 9056	04/16/2020 01:29	04/16/2020 01:29	CSC

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ANALYTICAL RESULTS

Lab Sample ID: **0041376-03**
Description: **MW3A**

Sample Collection Date Time: 04/07/2020 13:55
Sample Received Date Time: 04/07/2020 15:49

Metals by SW846 6000 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Antimony	ND	U	mg/L	0.005	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Arsenic	ND	U	mg/L	0.0010	0.0004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Barium	**0.042**		mg/L	0.004	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Beryllium	ND	U	mg/L	0.0020	0.0010	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Boron	**0.26**		mg/L	0.10	0.10	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:11	DMH
Cadmium	**0.0001**	J	mg/L	0.0010	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Calcium	**425**	D1	mg/L	40.0	13.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:17	DMH
Chromium	ND	U	mg/L	0.0020	0.0006	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Cobalt	ND	U	mg/L	0.004	0.004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Copper	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Iron	ND	U	mg/L	0.100	0.050	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:11	DMH
Lead	ND	U	mg/L	0.002	0.0005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Lithium	**0.68**		mg/L	0.02	0.005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Mercury	ND	U	mg/L	0.0005	0.0002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Molybdenum	ND	U	mg/L	0.01	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Selenium	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH
Sodium	**352**	D1	mg/L	26.0	10.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:17	DMH
Thallium	ND	U	mg/L	0.0020	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:20	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chemical Oxygen Demand	**160**		mg/L	8	8	HACH 8000	04/10/2020 13:14	04/10/2020 13:14	ALT
Specific Conductance (Lab)	**7660**		umhos/cm	1	1	2510 B-2011	04/09/2020 15:54	04/09/2020 15:54	JLW
pH (Lab)	**7.07**	H3	Std. Units	0.10	0.10	4500-H+ B-2000	04/09/2020 16:16	04/09/2020 16:16	CML
Total Dissolved Solids	**5860**		mg/L	50	50	2540 C-2011	04/13/2020 10:22	04/14/2020 12:26	MAG
Total Organic Carbon	ND	U	mg/L	0.5		5310 C-2011	04/14/2020 12:15	04/14/2020 12:15	HMF

Subcontracted Analyses

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Radium-226	**0.603**	_Sub	pCi/L			EPA 903.1	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium-228	**0.460**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium	**1.06**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	**3220**	D	mg/L	200	128	SW846 9056	04/16/2020 02:02	04/16/2020 02:02	CSC
Fluoride	**0.5**		mg/L	0.2	0.1	SW846 9056	04/16/2020 01:45	04/16/2020 01:45	CSC
Sulfate	**1840**	D	mg/L	100	50	SW846 9056	04/16/2020 02:02	04/16/2020 02:02	CSC

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ANALYTICAL RESULTS

Lab Sample ID: **0041376-04**
Description: **MW4**

Sample Collection Date Time: 04/07/2020 09:55
Sample Received Date Time: 04/07/2020 15:49

Metals by SW846 6000 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Antimony	ND	U	mg/L	0.005	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Arsenic	ND	U	mg/L	0.0010	0.0004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Barium	**0.022**		mg/L	0.004	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Beryllium	ND	U	mg/L	0.0020	0.0010	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Boron	**0.83**		mg/L	0.10	0.10	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:20	DMH
Cadmium	ND	U	mg/L	0.0010	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Calcium	**464**	D1	mg/L	40.0	13.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:27	DMH
Chromium	**0.0008**	J	mg/L	0.0020	0.0006	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Cobalt	ND	U	mg/L	0.004	0.004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Copper	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Iron	ND	U	mg/L	0.100	0.050	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:20	DMH
Lead	ND	U	mg/L	0.002	0.0005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Lithium	**0.82**		mg/L	0.02	0.005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Mercury	**0.0003**	J	mg/L	0.0005	0.0002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Molybdenum	**0.002**	J	mg/L	0.01	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Selenium	**0.023**		mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH
Sodium	**433**	D1	mg/L	26.0	10.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:27	DMH
Thallium	ND	U	mg/L	0.0020	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:24	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chemical Oxygen Demand	**44**		mg/L	8	8	HACH 8000	04/10/2020 13:14	04/10/2020 13:14	ALT
Specific Conductance (Lab)	**6460**		umhos/cm	1	1	2510 B-2011	04/09/2020 15:55	04/09/2020 15:55	JLW
pH (Lab)	**7.10**	H3	Std. Units	0.10	0.10	4500-H+ B-2000	04/09/2020 16:17	04/09/2020 16:17	CML
Total Dissolved Solids	**5120**		mg/L	50	50	2540 C-2011	04/13/2020 10:26	04/14/2020 12:26	MAG
Total Organic Carbon	**0.6**		mg/L	0.5		5310 C-2011	04/14/2020 12:37	04/14/2020 12:37	HMF

Subcontracted Analyses

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Radium-226	**0.476**	_Sub	pCi/L			EPA 903.1	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium-228	**0.787**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium	**1.26**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	**1560**	D	mg/L	200	128	SW846 9056	04/16/2020 02:34	04/16/2020 02:34	CSC
Fluoride	**0.2**		mg/L	0.2	0.1	SW846 9056	04/16/2020 02:18	04/16/2020 02:18	CSC
Sulfate	**4000**	D	mg/L	100	50	SW846 9056	04/16/2020 02:34	04/16/2020 02:34	CSC

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ANALYTICAL RESULTS

Lab Sample ID: **0041376-05**
Description: **MW5**

Sample Collection Date Time: 04/07/2020 10:10
Sample Received Date Time: 04/07/2020 15:49

Metals by SW846 6000 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Antimony	ND	U	mg/L	0.005	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Arsenic	ND	U	mg/L	0.0010	0.0004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Barium	**0.014**		mg/L	0.004	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Beryllium	ND	U	mg/L	0.0020	0.0010	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Boron	**0.25**		mg/L	0.10	0.10	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:30	DMH
Cadmium	ND	U	mg/L	0.0010	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Calcium	**464**	D1	mg/L	40.0	13.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:36	DMH
Chromium	ND	U	mg/L	0.0020	0.0006	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Cobalt	ND	U	mg/L	0.004	0.004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Copper	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Iron	ND	U	mg/L	0.100	0.050	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:30	DMH
Lead	ND	U	mg/L	0.002	0.0005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Lithium	**0.38**		mg/L	0.02	0.005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Mercury	ND	U	mg/L	0.0005	0.0002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Molybdenum	ND	U	mg/L	0.01	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Selenium	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH
Sodium	**217**	D1	mg/L	26.0	10.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:36	DMH
Thallium	ND	U	mg/L	0.0020	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:28	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chemical Oxygen Demand	**463**		mg/L	8	8	HACH 8000	04/10/2020 13:14	04/10/2020 13:14	ALT
Specific Conductance (Lab)	**5950**		umhos/cm	1	1	2510 B-2011	04/09/2020 15:56	04/09/2020 15:56	JLW
pH (Lab)	**6.94**	H3	Std. Units	0.10	0.10	4500-H+ B-2000	04/09/2020 16:18	04/09/2020 16:18	CML
Total Dissolved Solids	**4960**		mg/L	50	50	2540 C-2011	04/13/2020 10:30	04/14/2020 12:26	MAG
Total Organic Carbon	**0.6**		mg/L	0.5		5310 C-2011	04/16/2020 21:48	04/16/2020 21:48	HMF

Subcontracted Analyses

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Radium-226	**0.302**	_Sub	pCi/L			EPA 903.1	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium-228	**1.18**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium	**1.48**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	**1860**	D	mg/L	200	128	SW846 9056	04/16/2020 03:07	04/16/2020 03:07	CSC
Fluoride	**0.2**		mg/L	0.2	0.1	SW846 9056	04/16/2020 02:51	04/16/2020 02:51	CSC
Sulfate	**3720**	D	mg/L	100	50	SW846 9056	04/16/2020 03:07	04/16/2020 03:07	CSC

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ANALYTICAL RESULTS

Lab Sample ID: **0041376-06**
Description: **MW6**

Sample Collection Date Time: 04/06/2020 14:20
Sample Received Date Time: 04/07/2020 15:49

Metals by SW846 6000 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Antimony	ND	U	mg/L	0.005	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Arsenic	ND	U	mg/L	0.0010	0.0004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Barium	**0.011**		mg/L	0.004	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Beryllium	ND	U	mg/L	0.0020	0.0010	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Boron	**0.19**		mg/L	0.10	0.10	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:49	DMH
Cadmium	**0.0001**	J	mg/L	0.0010	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Calcium	**458**	D1	mg/L	40.0	13.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:55	DMH
Chromium	ND	U	mg/L	0.0020	0.0006	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Cobalt	ND	U	mg/L	0.004	0.004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Copper	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Iron	**0.078**	J	mg/L	0.100	0.050	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:49	DMH
Lead	ND	U	mg/L	0.002	0.0005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Lithium	**0.05**		mg/L	0.02	0.005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Mercury	ND	U	mg/L	0.0005	0.0002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Molybdenum	ND	U	mg/L	0.01	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Selenium	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH
Sodium	**435**	D1	mg/L	26.0	10.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:55	DMH
Thallium	ND	U	mg/L	0.0020	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:32	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chemical Oxygen Demand	**22**		mg/L	8	8	HACH 8000	04/10/2020 13:14	04/10/2020 13:14	ALT
Specific Conductance (Lab)	**4960**		umhos/cm	1	1	2510 B-2011	04/09/2020 15:57	04/09/2020 15:57	JLW
pH (Lab)	**6.76**	H3	Std. Units	0.10	0.10	4500-H+ B-2000	04/09/2020 16:19	04/09/2020 16:19	CML
Total Dissolved Solids	**4610**		mg/L	50	50	2540 C-2011	04/13/2020 10:34	04/14/2020 12:26	MAG
Total Organic Carbon	**2.0**		mg/L	0.5		5310 C-2011	04/16/2020 22:11	04/16/2020 22:11	HMF

Subcontracted Analyses

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Radium-226	**0.061**	_Sub	pCi/L			EPA 903.1	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium-228	**0.683**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium	**0.744**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	**181**	D	mg/L	100	64.0	SW846 9056	04/16/2020 04:13	04/16/2020 04:13	CSC
Fluoride	**0.4**		mg/L	0.2	0.1	SW846 9056	04/16/2020 03:57	04/16/2020 03:57	CSC
Sulfate	**4650**	D	mg/L	100	50	SW846 9056	04/16/2020 12:57	04/16/2020 12:57	CSC

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ANALYTICAL RESULTS

Lab Sample ID: **0041376-07**
Description: **DUPLICATE**

Sample Collection Date Time: 04/07/2020 10:20
Sample Received Date Time: 04/07/2020 15:49

Metals by SW846 6000 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Antimony	ND	U	mg/L	0.005	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Arsenic	ND	U	mg/L	0.0010	0.0004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Barium	**0.022**		mg/L	0.004	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Beryllium	ND	U	mg/L	0.0020	0.0010	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Boron	**0.86**		mg/L	0.10	0.10	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:58	DMH
Cadmium	ND	U	mg/L	0.0010	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Calcium	**503**	D1	mg/L	40.0	13.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 18:05	DMH
Chromium	**0.0009**	J	mg/L	0.0020	0.0006	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Cobalt	ND	U	mg/L	0.004	0.004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Copper	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Iron	ND	U	mg/L	0.100	0.050	SW846 6010 B	04/09/2020 07:40	04/12/2020 17:58	DMH
Lead	ND	U	mg/L	0.002	0.0005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Lithium	**0.84**		mg/L	0.02	0.005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Mercury	**0.0003**	J	mg/L	0.0005	0.0002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Molybdenum	**0.003**	J	mg/L	0.01	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Selenium	**0.025**		mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH
Sodium	**468**	D1	mg/L	26.0	10.0	SW846 6010 B	04/09/2020 07:40	04/12/2020 18:05	DMH
Thallium	ND	U	mg/L	0.0020	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:36	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chemical Oxygen Demand	**62**		mg/L	8	8	HACH 8000	04/10/2020 13:14	04/10/2020 13:14	ALT
Specific Conductance (Lab)	**6410**		umhos/cm	1	1	2510 B-2011	04/09/2020 15:58	04/09/2020 15:58	JLW
pH (Lab)	**7.12**	H3	Std. Units	0.10	0.10	4500-H+ B-2000	04/09/2020 16:20	04/09/2020 16:20	CML
Total Dissolved Solids	**4700**		mg/L	50	50	2540 C-2011	04/13/2020 10:38	04/14/2020 12:26	MAG
Total Organic Carbon	**0.8**		mg/L	0.5		5310 C-2011	04/16/2020 22:34	04/16/2020 22:34	HMF

Subcontracted Analyses

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Radium-226	**0.371**	_Sub	pCi/L			EPA 903.1	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium-228	**1.10**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium	**1.47**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	**1480**	D	mg/L	100	64.0	SW846 9056	04/21/2020 14:14	04/21/2020 14:14	CSC
Fluoride	**0.2**		mg/L	0.2	0.1	SW846 9056	04/16/2020 04:46	04/16/2020 04:46	CSC
Sulfate	**4050**	D	mg/L	100	50	SW846 9056	04/23/2020 12:44	04/23/2020 12:44	CSC

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ANALYTICAL RESULTS

Lab Sample ID: **0041376-08**
Description: **FIELD BLANK**

Sample Collection Date Time: 04/07/2020 11:50
Sample Received Date Time: 04/07/2020 15:49

Metals by SW846 6000 Series Methods

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Antimony	ND	U	mg/L	0.005	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Arsenic	ND	U	mg/L	0.0010	0.0004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Barium	ND	U	mg/L	0.004	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Beryllium	ND	U	mg/L	0.0020	0.0010	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Boron	ND	U	mg/L	0.10	0.10	SW846 6010 B	04/09/2020 07:40	04/12/2020 18:08	DMH
Cadmium	ND	U	mg/L	0.0010	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Calcium	ND	U	mg/L	0.40	0.13	SW846 6010 B	04/09/2020 07:40	04/12/2020 18:08	DMH
Chromium	ND	U	mg/L	0.0020	0.0006	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Cobalt	ND	U	mg/L	0.004	0.004	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Copper	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Iron	ND	U	mg/L	0.100	0.050	SW846 6010 B	04/09/2020 07:40	04/12/2020 18:08	DMH
Lead	ND	U	mg/L	0.002	0.0005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Lithium	ND	U	mg/L	0.02	0.005	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Mercury	ND	U	mg/L	0.0005	0.0002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Molybdenum	ND	U	mg/L	0.01	0.002	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Selenium	ND	U	mg/L	0.003	0.001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH
Sodium	ND	U	mg/L	0.26	0.10	SW846 6010 B	04/09/2020 07:40	04/12/2020 18:08	DMH
Thallium	ND	U	mg/L	0.0020	0.0001	SW846-6020 A	04/09/2020 07:40	04/12/2020 16:55	DMH

Conventional Chemistry Analyses Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chemical Oxygen Demand	ND	U	mg/L	8	8	HACH 8000	04/10/2020 13:15	04/10/2020 13:15	ALT
Specific Conductance (Lab)	**8**		umhos/cm	1	1	2510 B-2011	04/09/2020 15:59	04/09/2020 15:59	JLW
pH (Lab)	**7.62**	H3	Std. Units	0.10	0.10	4500-H+ B-2000	04/09/2020 16:21	04/09/2020 16:21	CML
Total Dissolved Solids	ND	U	mg/L	50	50	2540 C-2011	04/13/2020 10:42	04/14/2020 12:26	MAG
Total Organic Carbon	ND	U	mg/L	0.5		5310 C-2011	04/16/2020 22:57	04/16/2020 22:57	HMF

Subcontracted Analyses

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Radium-226	**0.224**	_Sub	pCi/L			EPA 903.1	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium-228	**0.262**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW
Radium	**0.486**	_Sub	pCi/L			EPA 904.0 Radium Sum Calc	04/30/2020 14:07	04/30/2020 14:09	RCW

Ion Chromatography Madisonville

Analyte	Result	Flag	Units	MRL	MDL	Method	Prepared	Analyzed	Analyst
Chloride	ND	M1, U	mg/L	2.0	1.3	SW846 9056	04/16/2020 05:03	04/16/2020 05:03	CSC
Fluoride	ND	M1, U	mg/L	0.2	0.1	SW846 9056	04/16/2020 05:03	04/16/2020 05:03	CSC
Sulfate	ND	M1, U	mg/L	1	0.5	SW846 9056	04/16/2020 05:03	04/16/2020 05:03	CSC

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Notes for work order 0041376

- Samples collected by MMLI personnel are done so in accordance with procedures set forth in MMLI field services SOPs.
- Results contained in this report are only representative of the samples received.
- MMLI does not provide interpretation of these results unless otherwise stated.
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identification based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.

Qualifiers

_Sub	See subcontractors report.
D	Results reported from dilution.
D1	Sample required dilution due to high concentration of target analyte.
D2	Sample required dilution due to matrix interference.
H3	Sample received and analyzed past holding time.
J	Estimated value.
M1	Matrix spike recovery was high; the method control sample recovery was acceptable.
M3	The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable.
U	Target analyte was analyzed for, but was below detection limit (the value associated with the qualifier is the laboratory method detection limit in our LIMS system).

Standard Qualifiers/Acronymns

MDL	Method Detection Limit
MRL	Minimum Reporting Limit
ND	Not Detected
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
% Rec	Percent Recovery
RPD	Relative Percent Difference
>	Greater than
<	Less than

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Metals by SW846 6000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B015276 - EPA 200.2										
Blank (B015276-BLK1)										
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 16:05										
Molybdenum	ND	0.01	mg/L							U
Antimony	ND	0.005	mg/L							U
Mercury	ND	0.0005	mg/L							U
Arsenic	ND	0.0010	mg/L							U
Barium	ND	0.004	mg/L							U
Beryllium	ND	0.0020	mg/L							U
Cadmium	ND	0.0010	mg/L							U
Chromium	ND	0.0020	mg/L							U
Cobalt	ND	0.004	mg/L							U
Copper	ND	0.003	mg/L							U
Lead	ND	0.002	mg/L							U
Lithium	ND	0.02	mg/L							U
Selenium	ND	0.003	mg/L							U
Thallium	ND	0.0020	mg/L							U
Blank (B015276-BLK2)										
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 16:33										
Boron	ND	0.10	mg/L							U
Calcium	ND	0.40	mg/L							U
Iron	ND	0.100	mg/L							U
Sodium	ND	0.26	mg/L							U
LCS (B015276-BS1)										
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 16:09										
Molybdenum	0.07	0.01	mg/L	0.0625		105	85-115			
Antimony	0.068	0.005	mg/L	0.0625		109	85-115			
Mercury	0.0025	0.0005	mg/L	0.00250		98.3	85-115			
Arsenic	0.0645	0.0010	mg/L	0.0625		103	85-115			
Barium	0.062	0.004	mg/L	0.0625		99.5	85-115			
Beryllium	0.0613	0.0020	mg/L	0.0625		98.1	85-115			
Cadmium	0.0621	0.0010	mg/L	0.0625		99.4	85-115			
Chromium	0.0641	0.0020	mg/L	0.0625		103	85-115			
Cobalt	0.064	0.004	mg/L	0.0625		102	85-115			
Copper	0.060	0.003	mg/L	0.0625		95.6	85-115			
Lead	0.062	0.002	mg/L	0.0625		98.7	85-115			
Lithium	0.06	0.02	mg/L	0.0625		96.9	85-115			
Selenium	0.065	0.003	mg/L	0.0625		104	85-115			
Thallium	0.0632	0.0020	mg/L	0.0625		101	85-115			

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Metals by SW846 6000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B015276 - EPA 200.2										
LCS (B015276-BS2)										
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 16:36										
Boron	0.12	0.10	mg/L	0.125		94.1	85-115			
Calcium	5.92	0.40	mg/L	6.25		94.8	85-115			
Iron	6.27	0.100	mg/L	6.25		100	85-115			
Sodium	6.12	0.26	mg/L	6.25		97.9	85-115			
Matrix Spike (B015276-MS1)	**Source: 0041376-01**									
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 16:59										
Molybdenum	0.06	0.01	mg/L	0.0625	ND	102	80-120			
Antimony	0.066	0.005	mg/L	0.0625	ND	106	80-120			
Mercury	0.0023	0.0005	mg/L	0.00250	ND	93.6	80-120			
Arsenic	0.0634	0.0010	mg/L	0.0625	0.0019	98.3	80-120			
Barium	0.150	0.004	mg/L	0.0625	0.087	101	80-120			
Beryllium	0.0547	0.0020	mg/L	0.0625	ND	87.4	80-120			
Cadmium	0.0562	0.0010	mg/L	0.0625	ND	89.9	80-120			
Chromium	0.0656	0.0020	mg/L	0.0625	0.0011	103	80-120			
Cobalt	0.063	0.004	mg/L	0.0625	ND	101	80-120			
Copper	0.056	0.003	mg/L	0.0625	ND	89.6	80-120			
Lead	0.056	0.002	mg/L	0.0625	ND	90.2	80-120			
Lithium	0.09	0.02	mg/L	0.0625	0.03	95.1	80-120			
Selenium	0.055	0.003	mg/L	0.0625	ND	88.1	80-120			
Thallium	0.0579	0.0020	mg/L	0.0625	0.0001	92.5	80-120			
Matrix Spike (B015276-MS2)	**Source: 0041376-01**									
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 16:58										
Boron	1.85	1.00	mg/L	0.125	1.69	132	80-120			D2, M3
Calcium	34.4	4.00	mg/L	6.25	27.7	106	80-120			D2
Iron	7.68	1.00	mg/L	6.25	1.57	97.8	80-120			D2
Sodium	205	2.60	mg/L	6.25	206	NR	80-120			D2, M3
Matrix Spike Dup (B015276-MSD1)	**Source: 0041376-01**									
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 17:03										
Antimony	0.071	0.005	mg/L	0.0625	ND	114	80-120	7.69	20	
Mercury	0.0025	0.0005	mg/L	0.00250	ND	99.2	80-120	5.81	20	
Molybdenum	0.07	0.01	mg/L	0.0625	ND	107	80-120	4.09	20	
Arsenic	0.0677	0.0010	mg/L	0.0625	0.0019	105	80-120	6.64	20	
Barium	0.157	0.004	mg/L	0.0625	0.087	111	80-120	4.16	20	
Beryllium	0.0585	0.0020	mg/L	0.0625	ND	93.6	80-120	6.82	20	
Cadmium	0.0610	0.0010	mg/L	0.0625	ND	97.6	80-120	8.15	20	
Chromium	0.0684	0.0020	mg/L	0.0625	0.0011	108	80-120	4.12	20	
Cobalt	0.066	0.004	mg/L	0.0625	ND	106	80-120	4.34	20	
Copper	0.059	0.003	mg/L	0.0625	ND	94.0	80-120	4.78	20	
Lead	0.061	0.002	mg/L	0.0625	ND	97.1	80-120	7.36	20	
Lithium	0.09	0.02	mg/L	0.0625	0.03	98.1	80-120	2.10	20	
Selenium	0.061	0.003	mg/L	0.0625	ND	97.1	80-120	9.79	20	
Thallium	0.0613	0.0020	mg/L	0.0625	0.0001	97.8	80-120	5.64	20	

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Metals by SW846 6000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B015276 - EPA 200.2										
Matrix Spike Dup (B015276-MSD2)	**Source: 0041376-01**									
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 18:11										
Boron	1.80	1.00	mg/L	0.125	1.69	88.6	80-120	2.95	20	D2
Calcium	35.3	4.00	mg/L	6.25	27.7	121	80-120	2.64	20	D2, M3
Iron	8.28	1.00	mg/L	6.25	1.57	107	80-120	7.50	20	D2
Sodium	208	2.60	mg/L	6.25	206	23.5	80-120	1.56	20	D2, M3
Post Spike (B015276-PS1)	**Source: 0041376-01**									
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 17:06										
Antimony	65.3		ug/L	62.5	0.087	104	75-125			
Mercury	2.49		ug/L	2.50	0.0595	97.1	75-125			
Molybdenum	62.9		ug/L	62.5	1.02	99.0	75-125			
Arsenic	63.0		ug/L	62.5	1.92	97.7	75-125			
Barium	153		ug/L	62.5	87.2	105	75-125			
Beryllium	55.2		ug/L	62.5	-0.0177	88.4	75-125			
Cadmium	57.4		ug/L	62.5	0.0329	91.8	75-125			
Chromium	63.2		ug/L	62.5	1.10	99.4	75-125			
Cobalt	61.3		ug/L	62.5	0.695	96.9	75-125			
Copper	54.1		ug/L	62.5	-2.87	86.6	75-125			
Lead	56.6		ug/L	62.5	0.013	90.6	75-115			
Lithium	85.9		ug/L	62.5	28.0	92.7	75-125			
Selenium	56.3		ug/L	62.5	0.072	89.9	75-125			
Thallium	57.4		ug/L	62.5	0.118	91.7	75-125			
Post Spike (B015276-PS2)	**Source: 0041376-01**									
Prepared: 4/9/2020 7:40, Analyzed: 4/12/2020 18:14										
Boron	1820		ug/L	125	1690	107	75-125			D2
Calcium	33800		ug/L	6250	27700	96.6	75-125			D2
Iron	7590		ug/L	6250	1570	96.4	75-125			D2
Sodium	202000		ug/L	6250	206000	NR	75-125			D2, M3

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B015432 - Default Prep Wet Chem										
Blank (B015432-BLK1)										
Prepared: 4/14/2020 1:48, Analyzed: 4/14/2020 1:48										
Total Organic Carbon	ND	0.5	mg/L							U
LCS (B015432-BS1)										
Prepared: 4/14/2020 2:09, Analyzed: 4/14/2020 2:09										
Total Organic Carbon	4.8	0.5	mg/L	5.00		95.5	80-120			
Duplicate (B015432-DUP1)	**Source: 0040539-01**									
Prepared: 4/14/2020 7:34, Analyzed: 4/14/2020 7:34										
Total Organic Carbon	2.0	0.5	mg/L		2.0			1.22	25	
Duplicate (B015432-DUP2)	**Source: 0041286-01**									
Prepared: 4/14/2020 12:59, Analyzed: 4/14/2020 12:59										
Total Organic Carbon	1.1	0.5	mg/L		1.1			5.36	25	
Matrix Spike (B015432-MS1)	**Source: 0040539-02**									
Prepared: 4/14/2020 7:55, Analyzed: 4/14/2020 7:55										
Total Organic Carbon	3.6	0.5	mg/L	2.50	1.1	102	80-120			
Matrix Spike (B015432-MS2)	**Source: 0041286-02**									
Prepared: 4/14/2020 13:20, Analyzed: 4/14/2020 13:20										
Total Organic Carbon	5.9	0.5	mg/L	5.00	0.9	100	80-120			
Batch B015433 - Default Prep Wet Chem										
Blank (B015433-BLK2)										
Prepared: 4/16/2020 20:16, Analyzed: 4/16/2020 20:16										
Total Organic Carbon	ND	0.5	mg/L							U
LCS (B015433-BS2)										
Prepared: 4/16/2020 20:39, Analyzed: 4/16/2020 20:39										
Total Organic Carbon	4.9	0.5	mg/L	5.00		98.4	80-120			
Duplicate (B015433-DUP1)	**Source: 0041409-01**									
Prepared: 4/14/2020 23:44, Analyzed: 4/14/2020 23:44										
Total Organic Carbon	1.0	0.5	mg/L		1.0			2.11	25	

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Conventional Chemistry Analyses Madisonville - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B015433 - Default Prep Wet Chem										
Duplicate (B015433-DUP3) **Source: 0042383-01**										
Prepared: 4/15/2020 12:23, Analyzed: 4/15/2020 12:23										
Total Organic Carbon	2.2	0.5	mg/L		2.2			1.81	25	
Matrix Spike (B015433-MS1) **Source: 0041409-02**										
Prepared: 4/15/2020 0:07, Analyzed: 4/15/2020 0:07										
Total Organic Carbon	3.4	0.5	mg/L	2.50	0.9	99.6	80-120			
Matrix Spike (B015433-MS3) **Source: 0042383-02RE1**										
Prepared: 4/15/2020 12:46, Analyzed: 4/15/2020 12:46										
Total Organic Carbon	6.4	0.5	mg/L	5.00	1.4	101	80-120			
Batch B015469 - Default Prep Wet Chem										
LCS (B015469-BS1)										
Prepared: 4/9/2020 16:08, Analyzed: 4/9/2020 16:08										
pH (Lab)	7.98		Std. Units	8.00		99.8	98.8-101.2			
LCS (B015469-BS2)										
Prepared: 4/9/2020 16:26, Analyzed: 4/9/2020 16:26										
pH (Lab)	8.04		Std. Units	8.00		100	98.8-101.2			
Duplicate (B015469-DUP1) **Source: 0041388-02**										
Prepared: 4/9/2020 16:24, Analyzed: 4/9/2020 16:24										
pH (Lab)	7.29	0.10	Std. Units		7.27			0.275	10	
Duplicate (B015469-DUP2) **Source: 0060028-01**										
Prepared: 4/9/2020 16:34, Analyzed: 4/9/2020 16:34										
pH (Lab)	7.77	0.10	Std. Units		7.76			0.129	10	
Batch B015470 - Default Prep Wet Chem										
Blank (B015470-BLK1)										
Prepared: 4/9/2020 15:46, Analyzed: 4/9/2020 15:46										
Specific Conductance (Lab)	ND	1	umhos/cm							U

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Conventional Chemistry Analyses Madisonville - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B015470 - Default Prep Wet Chem										
LCS (B015470-BS1)										
Prepared: 4/9/2020 15:47, Analyzed: 4/9/2020 15:47										
Specific Conductance (Lab)	1410		umhos/cm	1410		99.9	80-120			
Duplicate (B015470-DUP1)	**Source: 0042630-01**									
Prepared: 4/9/2020 16:02, Analyzed: 4/9/2020 16:02										
Specific Conductance (Lab)	202	1	umhos/cm		202			0.148	1.24	
Batch B015517 - Default Prep Wet Chem										
Blank (B015517-BLK1)										
Prepared: 4/10/2020 13:09, Analyzed: 4/10/2020 13:09										
Chemical Oxygen Demand	ND	8	mg/L							U
LCS (B015517-BS1)										
Prepared: 4/10/2020 13:09, Analyzed: 4/10/2020 13:09										
Chemical Oxygen Demand	116	8	mg/L	125		93.0	90-110			
Duplicate (B015517-DUP1)	**Source: 0041376-01**									
Prepared: 4/10/2020 13:18, Analyzed: 4/10/2020 13:18										
Chemical Oxygen Demand	ND	8	mg/L		ND				25	U
Matrix Spike (B015517-MS1)	**Source: 0041376-01**									
Prepared: 4/10/2020 13:18, Analyzed: 4/10/2020 13:18										
Chemical Oxygen Demand	262	8	mg/L	250	ND	105	90-110			
Matrix Spike Dup (B015517-MSD1)	**Source: 0041376-01**									
Prepared: 4/10/2020 13:18, Analyzed: 4/10/2020 13:18										
Chemical Oxygen Demand	256	8	mg/L	250	ND	102	90-110	2.46	10	
Batch B016032 - Default Prep Wet Chem										
Blank (B016032-BLK1)										
Prepared: 4/13/2020 9:34, Analyzed: 4/14/2020 12:26										
Total Dissolved Solids	ND	25	mg/L							U

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270.821.7375
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Conventional Chemistry Analyses Madisonville - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B016032 - Default Prep Wet Chem										
LCS (B016032-BS1)										
Prepared: 4/13/2020 9:38, Analyzed: 4/14/2020 12:26										
Total Dissolved Solids	1480	25	mg/L	1500		98.7	80-120			
Duplicate (B016032-DUP1) **Source: 0040819-01**										
Prepared: 4/13/2020 10:50, Analyzed: 4/14/2020 12:26										
Total Dissolved Solids	206	50	mg/L		226			9.26	10	
Duplicate (B016032-DUP2) **Source: 0041376-08**										
Prepared: 4/13/2020 10:54, Analyzed: 4/14/2020 12:26										
Total Dissolved Solids	ND	50	mg/L		ND				10	U

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Ion Chromatography Madisonville - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B016360 - Default Prep IC										
Blank (B016360-BLK1)										
Prepared: 4/16/2020 0:39, Analyzed: 4/16/2020 0:39										
Chloride	ND	2.0	mg/L							U
Fluoride	ND	0.2	mg/L							U
Sulfate	ND	1	mg/L							U
LCS (B016360-BS1)										
Prepared: 4/16/2020 0:23, Analyzed: 4/16/2020 0:23										
Fluoride	9.5		mg/L	10.0		95.0	90-110			
Chloride	9.5		mg/L	10.0		94.9	90-110			
Sulfate	10		mg/L	10.0		98.1	90-110			
Matrix Spike (B016360-MS1) **Source: 0041376-08**										
Prepared: 4/16/2020 5:20, Analyzed: 4/16/2020 5:20										
Fluoride	13.2		mg/L	10.0	0.0	132	75-125			M1
Chloride	13.1		mg/L	10.0	0.1	130	75-125			M1
Sulfate	14		mg/L	10.0	0.1	139	75-125			M1
Matrix Spike Dup (B016360-MSD1) **Source: 0041376-08**										
Prepared: 4/16/2020 5:37, Analyzed: 4/16/2020 5:37										
Chloride	12.3		mg/L	10.0	0.1	122	75-125	6.11	15	
Fluoride	12.5		mg/L	10.0	0.0	125	75-125	5.37	15	
Sulfate	13		mg/L	10.0	0.1	125	75-125	10.7	15	
Batch B016418 - Default Prep IC										
Blank (B016418-BLK1)										
Prepared: 4/16/2020 12:41, Analyzed: 4/16/2020 12:41										
Sulfate	ND	1	mg/L							U
LCS (B016418-BS1)										
Prepared: 4/16/2020 12:24, Analyzed: 4/16/2020 12:24										
Sulfate	10		mg/L	10.0		98.8	90-110			

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Ion Chromatography Madisonville - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B016418 - Default Prep IC										
Matrix Spike (B016418-MS1) **Source: 0043228-02**										
Prepared: 4/16/2020 14:36, Analyzed: 4/16/2020 14:36										
Sulfate	30		mg/L	10.0	17	121	75-125			
Matrix Spike Dup (B016418-MSD1) **Source: 0043228-02**										
Prepared: 4/16/2020 14:52, Analyzed: 4/16/2020 14:52										
Sulfate	30		mg/L	10.0	17	130	75-125	2.87	15	M1

Certified Analyses included in this Report

Analyte	Certifications
2510 B-2011 in Water	
Specific Conductance (Lab)	KY Drinking Water Mdv (00030)
2540 C-2011 in Water	
Total Dissolved Solids	KY Drinking Water Mdv (00030)
4500-H+ B-2000 in Water	
pH (Lab)	KY Drinking Water Mdv (00030) TN Drinking Water (02819)
5310 C-2011 in Water	
Total Organic Carbon	KY Drinking Water Mdv (00030)
HACH 8000 in Water	
Chemical Oxygen Demand	KY Wastewater Mdv (00030)
SW846 6010 B in Water	

Sample Acceptance Checklist for Work Order 0041376

Shipped By: Client

Temperature: 1.90° Celcius

Condition	
Check if Custody Seals are Present/Intact	☐
Check if Custody Signatures are Present	☑
Check if Collector Signature Present	☑
Check if bottles are intact	☑
Check if bottles are correct	☑
Check if bottles have sufficient volume	☑
Check if samples received on ice	☑
Check if VOA headspace is acceptable	☐
Check if samples received in holding time.	☑
Check if samples are preserved properly	☑

Pace Analytical Services LLC Kentucky
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Chain of Custody

Scheduled for: 04/01/2020

Client: Big Rivers Electric Corporation Reid/Green Station

Project: Green Landfill Semiannual Groundwater

Report To:
Big Rivers Electric Corporation Reid/Green Station
Chad Phillips
PO Box 24
Henderson, KY 42419
Phone: (270) 844-6000
PWS ID#:
State: KY

Invoice To:
Big Rivers Electric Corporation Reid/Green Station
Chad Phillips
PO Box 24
Henderson, KY 42419
PO#:
Quote#

Please Print Legibly

Collected by (Signature): *required information*

Compliance Monitoring? Yes ✓ No

Samples Chlorinated? Yes No

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date ____ Start time ____ End Date ____ End Time ____ Temp (oC) ____

Effluent: Start Date ____ Start time ____ End Date ____ End Time ____ Temp (oC) ____

MMLI USE ONLY **Workorder # 0041376**

Sample ID#	Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-01 A	4/6/20	1305	Plastic 500mL pH<2 w/HNO3	1	MW1	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-01 B	4/6/20	1305	Plastic 500mL pH<2 w/HNO3	1	MW1	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-01 C	4/6/20	1305	Plastic 1L	1	MW1	g / c	pH (Lab) Conductivity (Lab) TDS Sulfate 9056 Chloride 9056 Fluoride 9056

Preservation Check Performed by: CLH

Field data collected by: Phillie Hill Date (mm/dd/yy) 4/6/20 Time (24 hr) 1305

pH 7.22 Cond ~~umho~~ mS/cm 0.867 Res Cl (mg/L) ____ Tot Cl (mg/L) ____ Free Cl (mg/L) ____

Temp (oC) 18.23 or (oF) ____ Static Water Level ____ DO (mg/L) ____ Turb. (NTU) ____

Flow (MGD) ____ or (CFS) ____ or (g/min) ____

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
		4/7/20	1443
	(1.9°)	4-7-20	1549

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Collected by (Signature): *required information*

Compliance Monitoring? Yes ✓ No

Samples Chlorinated? Yes ___ No ___

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Influent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

Effluent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

MMLI USE ONLY ***required information***

Workorder # 0041376

Sample ID#	Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-01 D	4/6/20	1305	Plastic 500mL pH<2 w/H2SO4 **Preservation Check: pH :** ✓	1	MW1	g / c	COD TOC
0041376-01 E	4/6/20	1305	Plastic 1L pH<2 w/HNO3 Rad 226 (Sub) **Preservation Check: pH :** ✓	1	MW1	g / c	Radium 226 (sub)
0041376-01 F	4/6/20	1305	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) **Preservation Check: pH :** ✓	1	MW1	g / c	Radium 228 (sub)
0041376-01 G	4/6/20	1305	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) **Preservation Check: pH :** ✓	1	MW1	g / c	Radium 228 (sub)
0041376-01 H	4/6/20	1305	AG 250mL pH<2 w/H2SO4 **Preservation Check: pH :** ✓	1	MW1	g / c	TOC

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) ___ Time (24 hr) ___

pH 7.22 Cond ~~(umho)~~ 0.867 Res Cl (mg/L) ___ Tot Cl (mg/L) ___ Free Cl (mg/L) ___

Temp (oC) 18.23 or (oF) ___ Static Water Level ___ DO (mg/L) ___ Turb. (NTU) ___

Flow (MGD) ___ or (CFS) ___ or (g/min) ___

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
		4/7/20	1443
		4-7-20	1549

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Collected by (Signature): *required information*

Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

Effluent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

MMLI USE ONLY **Workorder # 0041376**

Sample ID#	Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-02 A	4/7/20	1140	Plastic 500mL pH<2 w/HNO3	1	MW2	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-02 B	4/7/20	1140	Plastic 500mL pH<2 w/HNO3	1	MW2	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-02 C	4/7/20	1140	Plastic 1L	1	MW2	g / c	pH (Lab) Conductivity (Lab) TDS Sulfate 9056 Chloride 9056 Fluoride 9056
0041376-02 D	4/7/20	1140	Plastic 500mL pH<2 w/H2SO4	1	MW2	g / c	COD TOC
			Preservation Check: pH : ✓				

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 1140

pH 6.92 Cond ~~(umho)~~ 1.59 Res Cl (mg/L) ___ Tot Cl (mg/L) ___ Free Cl (mg/L) ___

Temp (oC) 1686 or (oF) ___ Static Water Level ___ DO (mg/L) ___ Turb. (NTU) ___

Flow (MGD) ___ , or (CFS) ___ or (g/min) ___

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
		4/7/20	1443
		4-7-20	1549

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Chain of Custody

Scheduled for: 04/01/2020

Client: Big Rivers Electric Corporation Reid/Green Station

Project: Green Landfill Semiannual Groundwater

Report To:
Big Rivers Electric Corporation Reid/Green Station
Chad Phillips
PO Box 24
Henderson, KY 42419
Phone: (270) 844-6000
PWS ID#:
State: KY

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Big Rivers Electric Corporation Reid/Green Station
Chad Phillips
PO Box 24
Henderson, KY 42419
PO#: _____
Quote# _____

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Collected by (Signature): _____ *required information*

Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date _____ Start time _____ End Date _____ End Time _____ Temp (oC) _____

Effluent: Start Date _____ Start time _____ End Date _____ End Time _____ Temp (oC) _____

MMLI USE ONLY Workorder # 0041376 Sample ID#	*required information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-02 E	4/7/20	1140	Plastic 1L pH<2 w/HNO3 Rad 226 (Sub) **Preservation Check: pH :** ✓	1	MW2	g / c	Radium 226 (sub)
0041376-02 F	4/7/20	1140	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) **Preservation Check: pH :** ✓	1	MW2	g / c	Radium 228 (sub)
0041376-02 G	4/7/20	1140	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) **Preservation Check: pH :** ✓	1	MW2	g / c	Radium 228 (sub)
0041376-02 H	4/7/20	1140	AG 250mL pH<2 w/H2SO4 **Preservation Check: pH :** ✓	1	MW2	g / c	TOC
0041376-03 A	4/7/20	1355	Plastic 500mL pH<2 w/HNO3 **Preservation Check: pH :** ✓	1	MW3A	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 1140

pH 6.92 Cond (umho) 1.59 Res Cl (mg/L) _____ Tot Cl (mg/L) _____ Free Cl (mg/L) _____

Temp (oC) 16.84 or (oF) _____ Static Water Level _____ DO (mg/L) _____ Turb. (NTU) _____

Flow (MGD) _____ or (CFS) _____ or (g/min) _____

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
		4/7/20	1443
		4-7-20	1549

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Pace Analytical Services LLC Kentucky
P.O. Box 907
Madisonville, KY 42431

Chain of Custody

Scheduled for: 04/01/2020

Client: Big Rivers Electric Corporation Reid/Green Station

Project: Green Landfill Semiannual Groundwater

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Chad Phillips
PO Box 24
Henderson, KY 42419
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PWS ID#:
State: KY

Invoice To:
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Chad Phillips
PO Box 24
Henderson, KY 42419
PO#:
Quote#

Please Print Legibly

Collected by (Signature): *required information*

Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

Effluent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

MMLI USE ONLY **Workorder # 0041376**

Sample ID#	Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-03 B	4/7/20	1355	Plastic 500mL pH<2 w/HNO3	1	MW3A	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-03 C	4/7/20	1355	Plastic 1L	1	MW3A	g / c	pH (Lab) Conductivity (Lab) TDS Sulfate 9056 Chloride 9056 Fluoride 9056
0041376-03 D	4/7/20	1355	Plastic 500mL pH<2 w/H2SO4	1	MW3A	g / c	COD TOC
			Preservation Check: pH : ✓				
0041376-03 E	4/7/20	1355	Plastic 1L pH<2 w/HNO3 Rad 226 (Sub)	1	MW3A	g / c	Radium 226 (sub)
			Preservation Check: pH : ✓				
0041376-03 F	4/7/20	1355	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub)	1	MW3A	g / c	Radium 228 (sub)
			Preservation Check: pH : ✓				

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 1355

pH 6.86 Cond (~~umho~~) 8.09 Res Cl (mg/L) ___ Tot Cl (mg/L) ___ Free Cl (mg/L) ___

Temp (oC) 16.32 or (oF) ___ Static Water Level ___ DO (mg/L) ___ Turb. (NTU) ___

Flow (MGD) ___ or (CFS) ___ or (g/min) ___

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
		4/7/20	1443
		4-7-20	1549

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Chain of Custody

Scheduled for: 04/01/2020

Client: Big Rivers Electric Corporation Reid/Green Station

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State: KY

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Chad Phillips
PO Box 24
Henderson, KY 42419
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Please Print Legibly

Collected by (Signature): *required information*

Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

Effluent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

MMLI USE ONLY Workorder # 0041376 Sample ID#	*required information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-03 G	4/7/20	1155	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) Preservation Check: pH : ✓	1	MW3A	g / c	Radium 228 (sub)
0041376-03 H	4/7/20	1355	AG 250mL pH<2 w/H2SO4 Preservation Check: pH : ✓	1	MW3A	g / c	TOC
0041376-04 A	4/7/20	955	Plastic 500mL pH<2 w/HNO3	1	MW4	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B

Preservation Check: pH : ✓

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) ___ Time (24 hr) ___

pH 6.86 Cond (~~umho~~) 8.09 Res Cl (mg/L) ___ Tot Cl (mg/L) ___ Free Cl (mg/L) ___

Temp (oC) 16.32 or (oF) ___ Static Water Level ___ DO (mg/L) ___ Turb. (NTU) ___

Flow (MGD) ___ or (CFS) ___ or (g/min) ___

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
		4/7/20	1443
		4-7-20	1549

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Collected by (Signature): *required information*

Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

Effluent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

MMLI USE ONLY Workorder # 0041376 Sample ID#	*required information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-04 B	4/7/20	955	Plastic 500mL pH<2 w/HNO3	1	MW4	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-04 C	4/7/20	955	Plastic 1L	1	MW4	g / c	pH (Lab) Conductivity (Lab) TDS Sulfate 9056 Chloride 9056 Fluoride 9056
0041376-04 D	4/7/20	955	Plastic 500mL pH<2 w/H2SO4	1	MW4	g / c	COD TOC
			Preservation Check: pH : ✓				
0041376-04 E	4/7/20	955	Plastic 1L pH<2 w/HNO3 Rad 226 (Sub)	1	MW4	g / c	Radium 226 (sub)
			Preservation Check: pH : ✓				
0041376-04 F	4/7/20	955	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub)	1	MW4	g / c	Radium 228 (sub)
			Preservation Check: pH : ✓				

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 955

pH 6.70 Cond ~~(umho)~~ 6.77 Res Cl (mg/L) ___ Tot Cl (mg/L) ___ Free Cl (mg/L) ___

Temp (oC) 16.47 or (oF) ___ Static Water Level ___ DO (mg/L) ___ Turb. (NTU) ___

Flow (MGD) ___ or (CFS) ___ or (g/min) ___

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
		4/7/20	1443
		4-7-20	1549

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Pace Analytical Services LLC Kentucky
P.O. Box 907
Madisonville, KY 42431

Chain of Custody

Scheduled for: 04/01/2020

Client: Big Rivers Electric Corporation Reid/Green Station

Project: Green Landfill Semiannual Groundwater

Report To:
Big Rivers Electric Corporation Reid/Green Station
Chad Phillips
PO Box 24
Henderson, KY 42419
Phone: (270) 844-6000
PWS ID#:
State: KY

Invoice To:
Big Rivers Electric Corporation Reid/Green Station
Chad Phillips
PO Box 24
Henderson, KY 42419
PO#: _____
Quote# _____

Please Print Legibly

Collected by (Signature): _____ *required information*

Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date _____ Start time _____ End Date _____ End Time _____ Temp (oC) _____

Effluent: Start Date _____ Start time _____ End Date _____ End Time _____ Temp (oC) _____

MMLI USE ONLY Workorder # 0041376 Sample ID#	*required Information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-04 G	4/7/20	955	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) **Preservation Check: pH :** ✓	1	MW4	g / c	Radium 228 (sub)
0041376-04 H	4/7/20	955	AG 250mL pH<2 w/H2SO4 **Preservation Check: pH :** ✓	1	MW4	g / c	TOC
0041376-05 A	4/7/20	1010	Plastic 500mL pH<2 w/HNO3	1	MW5	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B

Preservation Check: pH : ✓

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 955

pH 6.70 Cond ~~(umho)~~ 6.77 Res Cl (mg/L) _____ Tot Cl (mg/L) _____ Free Cl (mg/L) _____

Temp (oC) 16.47 or (oF) _____ Static Water Level _____ DO (mg/L) _____ Turb. (NTU) _____

Flow (MGD) _____ or (CFS) _____ or (g/min) _____

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
		4/7/20	1443
		4-7-20	1549

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Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date _____ Start time _____ End Date _____ End Time _____ Temp (oC) _____

Effluent: Start Date _____ Start time _____ End Date _____ End Time _____ Temp (oC) _____

MMLI USE ONLY Workorder # 0041376 Sample ID#	*required information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-05 B	4/7/20	1010	Plastic 500mL pH<2 w/HNO3	1	MW5	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-05 C	4/7/20	1010	Plastic 1L	1	MW5	g / c	pH (Lab) Conductivity (Lab) TDS Sulfate 9056 Chloride 9056 Fluoride 9056
0041376-05 D	4/7/20	1010	Plastic 500mL pH<2 w/H2SO4	1	MW5	g / c	COD TOC
			Preservation Check: pH : ✓				
0041376-05 E	4/7/20	1010	Plastic 1L pH<2 w/HNO3 Rad 226 (Sub)	1	MW5	g / c	Radium 226 (sub)
			Preservation Check: pH : ✓				
0041376-05 F	4/7/20	1010	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub)	1	MW5	g / c	Radium 228 (sub)
			Preservation Check: pH : ✓				

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 1010

pH 6.77 ~~Cond (umho)~~ 6.25 Res Cl (mg/L) _____ Tot Cl (mg/L) _____ Free Cl (mg/L) _____

Temp (oC) 14.85 or (oF) _____ Static Water Level _____ DO (mg/L) _____ Turb. (NTU) _____

Flow (MGD) _____ or (CFS) _____ or (g/min) _____

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
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Collected by (Signature): *required information*

Compliance Monitoring? Yes ✓ No

Samples Chlorinated? Yes No

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date ____ Start time ____ End Date ____ End Time ____ Temp (oC) ____

Effluent: Start Date ____ Start time ____ End Date ____ End Time ____ Temp (oC) ____

MMLI USE ONLY Workorder # 0041376 Sample ID#	*required information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-05 G	4/7/20	1010	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) Preservation Check: pH : ~	1	MW5	g / c	Radium 228 (sub)
0041376-05 H	4/7/20	1010	AG 250mL pH<2 w/H2SO4 Preservation Check: pH : ✓	1	MW5	g / c	TOC
0041376-06 A	4/6/20	1420	Plastic 500mL pH<2 w/HNO3	1	MW6	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B

Preservation Check: pH : ✓

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 1010

pH 6.77 Cond (~~umho~~) 6.25 Res Cl (mg/L) ____ Tot Cl (mg/L) ____ Free Cl (mg/L) ____

Temp (oC) 14.85 or (oF) ____ Static Water Level ____ DO (mg/L) ____ Turb. (NTU) ____

Flow (MGD) ____ or (CFS) ____ or (g/min) ____

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
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Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

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Effluent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

MMLI USE ONLY Workorder # 0041376 Sample ID#	*required information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-06 B	4/6/20	1420	Plastic 500mL pH<2 w/HNO3	1	MW6	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-06 C	4/6/20	1420	Plastic 1L	1	MW6	g / c	pH (Lab) Conductivity (Lab) TDS Sulfate 9056 Chloride 9056 Fluoride 9056
0041376-06 D	4/6/20	1420	Plastic 500mL pH<2 w/H2SO4	1	MW6	g / c	COD TOC
			Preservation Check: pH : ✓				
0041376-06 E	4/6/20	1420	Plastic 1L pH<2 w/HNO3 Rad 226 (Sub)	1	MW6	g / c	Radium 226 (sub)
			Preservation Check: pH : ✓				
0041376-06 F	4/6/20	1420	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub)	1	MW6	g / c	Radium 228 (sub)
			Preservation Check: pH : ✓				

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/6/20 Time (24 hr) 1420

pH 6.76 Cond ~~(umho)~~ 5.01 Res Cl (mg/L) ___ Tot Cl (mg/L) ___ Free Cl (mg/L) ___

Temp (oC) 20.50 or (oF) ___ Static Water Level ___ DO (mg/L) ___ Turb. (NTU) ___

Flow (MGD) ___ or (CFS) ___ or (g/min) ___

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
		4/7/20	1443
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Henderson, KY 42419
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Please Print Legibly

Collected by (Signature): *required information*

Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

Effluent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

MMLI USE ONLY Workorder # 0041376 Sample ID#	*required information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-06 G	4/6/20	1420	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) **Preservation Check: pH :** ✓	1	MW6	g / c	Radium 228 (sub)
0041376-06 H	4/6/20	1420	AG 250mL pH<2 w/H2SO4 **Preservation Check: pH :** ✓	1	MW6	g / c	TOC
0041376-07 A	4/7/20	1020	Plastic 500mL pH<2 w/HNO3 **Preservation Check: pH :** ✓	1	DUPLICATE	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/6/20 Time (24 hr) 1420

pH 6.36 Cond ~~(umho)~~ 5.01 Res Cl (mg/L) ___ Tot Cl (mg/L) ___ Free Cl (mg/L) ___

Temp (oC) 20.50 or (oF) ___ Static Water Level ___ DO (mg/L) ___ Turb. (NTU) ___

Flow (MGD) ___ or (CFS) ___ or (g/min) ___

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
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Compliance Monitoring? Yes L No ___

Samples Chlorinated? Yes ___ No ___

*For composite samples please indicate begin time, end time and temp(oC) at end time below:

Influent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

Effluent: Start Date ___ Start time ___ End Date ___ End Time ___ Temp (oC) ___

MMLI USE ONLY Workorder # 0041376 Sample ID#	*required information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-07 B	4/7/20	1020	Plastic 500mL pH<2 w/HNO3	1	DUPLICATE	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-07 C	4/7/20	1020	Plastic 1L	1	DUPLICATE	g / c	pH (Lab) Conductivity (Lab) TDS Sulfate 9056 Chloride 9056 Fluoride 9056
0041376-07 D	4/7/20	1020	Plastic 500mL pH<2 w/H2SO4	1	DUPLICATE	g / c	COD TOC
			Preservation Check: pH : ✓				
0041376-07 E	4/7/20	1020	Plastic 1L pH<2 w/HNO3 Rad 226 (Sub)	1	DUPLICATE	g / c	Radium 226 (sub)
			Preservation Check: pH : ✓				
0041376-07 F	4/7/20	1020	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub)	1	DUPLICATE	g / c	Radium 228 (sub)
			Preservation Check: pH : ✓				

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 1020

pH 6.70 Cond ~~(umho)~~ 677 Res Cl (mg/L) ___ Tot Cl (mg/L) ___ Free Cl (mg/L) ___

Temp (oC) 16.47 or (oF) ___ Static Water Level ___ DO (mg/L) ___ Turb. (NTU) ___

Flow (MGD) ___ or (CFS) ___ or (g/min) ___

Relinquished by: (Signature)	Received by: (Signature)	Date (mm/dd/yy)	Time (24 hr)
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Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

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MMLI USE ONLY **Workorder # 0041376**

Sample ID#	Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-07 G	4/7/20	1020	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) Preservation Check: pH : ✓	1	DUPLICATE	g / c	Radium 228 (sub)
0041376-07 H	4/7/20	1020	AG 250mL pH<2 w/H2SO4 Preservation Check: pH : ✓	1	DUPLICATE	g / c	TOC
0041376-08 A	4/7/20	1150	Plastic 500mL pH<2 w/HNO3	1	FIELD BLANK	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B

Preservation Check: pH : ✓

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 1020

pH 6.70 Cond ~~(umho)~~ 6.77 Res Cl (mg/L) ___ Tot Cl (mg/L) ___ Free Cl (mg/L) ___

Temp (oC) 16.47 or (oF) ___ Static Water Level ___ DO (mg/L) ___ Turb. (NTU) ___

Flow (MGD) ___ or (CFS) ___ or (g/min) ___

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Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

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MMLI USE ONLY Workorder # 0041376 Sample ID#	*required information* Date (mm/dd/yy):	Collection Time (24 hr):	Bottle and Preservative	Containers	Sample Description	Composite	Sample Analysis Requested
0041376-08 B	4/7/20	1150	Plastic 500mL pH<2 w/HNO3	1	FIELD BLANK	g / c	Beryllium Tot 6020 Cadmium Tot 6020 Calcium Tot 6010B Barium Tot 6020 Chromium Tot 6020 Cobalt Tot 6020 Arsenic Tot 6020 Boron Tot 6010B Copper Tot 6020 Antimony Tot 6020 Lead Tot 6020 Lithium Tot 6020 Mercury Tot 6020 Molybdenum Tot 6020 Sodium Tot 6010B
			Preservation Check: pH : ✓				
0041376-08 C	4/7/20	1150	Plastic 1L	1	FIELD BLANK	g / c	pH (Lab) Conductivity (Lab) TDS Sulfate 9056 Chloride 9056 Fluoride 9056
0041376-08 D	4/7/20	1150	Plastic 500mL pH<2 w/H2SO4	1	FIELD BLANK	g / c	COD TOC
			Preservation Check: pH : ✓				
0041376-08 E	4/7/20	1150	Plastic 1L pH<2 w/HNO3 Rad 226 (Sub)	1	FIELD BLANK	g / c	Radium 226 (sub)
			Preservation Check: pH : ✓				
0041376-08 F	4/7/20	1150	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub)	1	FIELD BLANK	g / c	Radium 228 (sub)
			Preservation Check: pH : ✓				

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 1150

pH _____ Cond (umho) _____ Res Cl (mg/L) _____ Tot Cl (mg/L) _____ Free Cl (mg/L) _____

Temp (oC) _____ or (oF) _____ Static Water Level _____ DO (mg/L) _____ Turb. (NTU) _____

Flow (MGD) _____ or (CFS) _____ or (g/min) _____

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Collected by (Signature): _____
required information

Compliance Monitoring? Yes ✓ No ___

Samples Chlorinated? Yes ___ No ___

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Effluent: Start Date _____ Start time _____ End Date _____ End Time _____ Temp (oC) _____

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0041376-08 G	4/7/20	1150	Plastic 1L pH<2 w/HNO3 Rad 228 (Sub) Preservation Check: pH : ✓	1	FIELD BLANK	g / c	Radium 228 (sub)
0041376-08 H	4/7/20	1150	AG 250mL pH<2 w/H2SO4 Preservation Check: pH : ✓	1	FIELD BLANK	g / c	TOC
			HNO3 Preservation Check: pH : ____	1			Be 6020 Cadmium Tot 6020 Cadmium Tot 60105 Cadmium Tot Co 6020 Cobalt Tot 6020 Lead Tot Fe 6020 Iron Tot Pb 6020 Lead Tot 6020 Antimony Tl 6020 Thallium Tot 6020 Metals 6020 Selenium Tot 6010B

Preservation Check Performed by: CLH

Field data collected by: Phillip Hill Date (mm/dd/yy) 4/7/20 Time (24 hr) 1150

pH _____ Cond (umho) _____ Res Cl (mg/L) _____ Tot Cl (mg/L) _____ Free Cl (mg/L) _____

Temp (oC) _____ or (oF) _____ Static Water Level _____ DO (mg/L) _____ Turb. (NTU) _____

Flow (MGD) _____ or (CFS) _____ or (g/min) _____

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		4/7/20	1443
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Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

April 30, 2020

Rob Whittington
Pace Analytical Madisonville
825 Industrial Rd
Madisonville, KY 42431

RE: Project: 41376
Pace Project No.: 30358430

Dear Rob Whittington:

Enclosed are the analytical results for sample(s) received by the laboratory on April 10, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Greensburg

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Carin A. Ferris

Carin Ferris
carin.ferris@pacelabs.com
724-850-5615
Project Manager

Enclosures

cc: Doug Wolfe, Pace Analytical Madisonville

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project: 41376
Pace Project No.: 30358430

Pace Analytical Services Pennsylvania
1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Florida: Cert E871149 SEKS WET
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: 41376
Pace Project No.: 30358430

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30358430001	**0041376-01**	Water	04/06/20 13:05	04/10/20 09:15
30358430002	**0041376-02**	Water	04/07/20 11:40	04/10/20 09:15
30358430003	**0041376-03**	Water	04/07/20 13:55	04/10/20 09:15
30358430004	**0041376-04**	Water	04/07/20 09:55	04/10/20 09:15
30358430005	**0041376-05**	Water	04/07/20 10:10	04/10/20 09:15
30358430006	**0041376-06**	Water	04/06/20 14:20	04/10/20 09:15
30358430007	**0041376-07**	Water	04/07/20 10:20	04/10/20 09:15
30358430008	**0041376-08**	Water	04/07/20 11:50	04/10/20 09:15

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: 41376
Pace Project No.: 30358430

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30358430001	**0041376-01**	EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
30358430002	**0041376-02**	EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
30358430003	**0041376-03**	EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
30358430004	**0041376-04**	EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
30358430005	**0041376-05**	EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
30358430006	**0041376-06**	EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
30358430007	**0041376-07**	EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
30358430008	**0041376-08**	EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA

PASI-PA = Pace Analytical Services - Greensburg

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 41376
Pace Project No.: 30358430

Sample: 0041376-01 **Lab ID: 30358430001** Collected: 04/06/20 13:05 Received: 04/10/20 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Sample collection dates and times were not present on the sample containers.
• Upon receipt at the laboratory, 5 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Radium-226	EPA 903.1	**0.340 ± 0.473 (0.799) C:NA T:94%**	pCi/L	04/30/20 11:27	13982-63-3	
		Pace Analytical Services - Greensburg				
Radium-228	EPA 904.0	**0.468 ± 0.409 (0.828) C:72% T:87%**	pCi/L	04/28/20 11:04	15262-20-1	
		Pace Analytical Services - Greensburg				
Total Radium	Total Radium Calculation	**0.808 ± 0.882 (1.63)**	pCi/L	04/30/20 14:19	7440-14-4	

Sample: 0041376-02 **Lab ID: 30358430002** Collected: 04/07/20 11:40 Received: 04/10/20 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Sample collection dates and times were not present on the sample containers.
• Upon receipt at the laboratory, 5 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Radium-226	EPA 903.1	**0.513 ± 0.402 (0.472) C:NA T:88%**	pCi/L	04/30/20 11:27	13982-63-3	
		Pace Analytical Services - Greensburg				
Radium-228	EPA 904.0	**0.0161 ± 0.343 (0.794) C:70% T:88%**	pCi/L	04/28/20 11:04	15262-20-1	
		Pace Analytical Services - Greensburg				
Total Radium	Total Radium Calculation	**0.529 ± 0.745 (1.27)**	pCi/L	04/30/20 14:19	7440-14-4	

Sample: 0041376-03 **Lab ID: 30358430003** Collected: 04/07/20 13:55 Received: 04/10/20 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Sample collection dates and times were not present on the sample containers.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Radium-226	EPA 903.1	**0.603 ± 0.577 (0.878) C:NA T:77%**	pCi/L	04/30/20 11:27	13982-63-3	
		Pace Analytical Services - Greensburg				
Radium-228	EPA 904.0	**0.460 ± 0.444 (0.914) C:68% T:85%**	pCi/L	04/28/20 11:04	15262-20-1	
		Pace Analytical Services - Greensburg				
Total Radium	Total Radium Calculation	**1.06 ± 1.02 (1.79)**	pCi/L	04/30/20 14:19	7440-14-4	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 41376
Pace Project No.: 30358430

Sample: 0041376-04 **Lab ID: 30358430004** Collected: 04/07/20 09:55 Received: 04/10/20 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Sample collection dates and times were not present on the sample containers.
• Upon receipt at the laboratory, 5 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Radium-226	EPA 903.1	**0.476 ± 0.455 (0.693) C:NA T:95%**	pCi/L	04/30/20 11:27	13982-63-3	
		Pace Analytical Services - Greensburg				
Radium-228	EPA 904.0	**0.787 ± 0.428 (0.770) C:74% T:84%**	pCi/L	04/28/20 11:04	15262-20-1	
		Pace Analytical Services - Greensburg				
Total Radium	Total Radium Calculation	**1.26 ± 0.883 (1.46)**	pCi/L	04/30/20 14:19	7440-14-4	

Sample: 0041376-05 **Lab ID: 30358430005** Collected: 04/07/20 10:10 Received: 04/10/20 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Sample collection dates and times were not present on the sample containers.
• Upon receipt at the laboratory, 5 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Radium-226	EPA 903.1	**0.302 ± 0.371 (0.605) C:NA T:95%**	pCi/L	04/30/20 11:27	13982-63-3	
		Pace Analytical Services - Greensburg				
Radium-228	EPA 904.0	**1.18 ± 0.498 (0.824) C:71% T:90%**	pCi/L	04/28/20 11:05	15262-20-1	
		Pace Analytical Services - Greensburg				
Total Radium	Total Radium Calculation	**1.48 ± 0.869 (1.43)**	pCi/L	04/30/20 14:19	7440-14-4	

Sample: 0041376-06 **Lab ID: 30358430006** Collected: 04/06/20 14:20 Received: 04/10/20 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Sample collection dates and times were not present on the sample containers.
• Upon receipt at the laboratory, 5 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Radium-226	EPA 903.1	**0.0612 ± 0.279 (0.166) C:NA T:90%**	pCi/L	04/30/20 11:27	13982-63-3	
		Pace Analytical Services - Greensburg				
Radium-228	EPA 904.0	**0.683 ± 0.478 (0.939) C:68% T:88%**	pCi/L	04/28/20 11:05	15262-20-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 41376
Pace Project No.: 30358430

Sample: 0041376-06 **Lab ID: 30358430006** Collected: 04/06/20 14:20 Received: 04/10/20 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Sample collection dates and times were not present on the sample containers.
• Upon receipt at the laboratory, 5 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Total Radium	Total Radium Calculation	**0.744 ± 0.757 (1.11)**	pCi/L	04/30/20 14:19	7440-14-4	

Sample: 0041376-07 **Lab ID: 30358430007** Collected: 04/07/20 10:20 Received: 04/10/20 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Sample collection dates and times were not present on the sample containers.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Radium-226	EPA 903.1	**0.371 ± 0.345 (0.455) C:NA T:83%**	pCi/L	04/30/20 11:27	13982-63-3	
		Pace Analytical Services - Greensburg				
Radium-228	EPA 904.0	**1.10 ± 0.486 (0.817) C:74% T:84%**	pCi/L	04/28/20 11:05	15262-20-1	
		Pace Analytical Services - Greensburg				
Total Radium	Total Radium Calculation	**1.47 ± 0.831 (1.27)**	pCi/L	04/30/20 14:19	7440-14-4	

Sample: 0041376-08 **Lab ID: 30358430008** Collected: 04/07/20 11:50 Received: 04/10/20 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • Upon receipt at the laboratory, 5 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Radium-226	EPA 903.1	**0.224 ± 0.515 (0.933) C:NA T:94%**	pCi/L	04/30/20 11:40	13982-63-3	
		Pace Analytical Services - Greensburg				
Radium-228	EPA 904.0	**0.262 ± 0.427 (0.928) C:74% T:84%**	pCi/L	04/28/20 11:05	15262-20-1	
		Pace Analytical Services - Greensburg				
Total Radium	Total Radium Calculation	**0.486 ± 0.942 (1.86)**	pCi/L	04/30/20 14:19	7440-14-4	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 41376
Pace Project No.: 30358430

QC Batch: 392089 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 30358430001, 30358430002, 30358430003, 30358430004, 30358430005, 30358430006, 30358430007, 30358430008

METHOD BLANK: 1898525 Matrix: Water
Associated Lab Samples: 30358430001, 30358430002, 30358430003, 30358430004, 30358430005, 30358430006, 30358430007, 30358430008

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.230 ± 0.329 (0.705) C:78% T:76%	pCi/L	04/28/20 11:05	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 41376
Pace Project No.: 30358430

QC Batch: 392088 Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 30358430001, 30358430002, 30358430003, 30358430004, 30358430005, 30358430006, 30358430007, 30358430008

METHOD BLANK: 1898523 Matrix: Water
Associated Lab Samples: 30358430001, 30358430002, 30358430003, 30358430004, 30358430005, 30358430006, 30358430007, 30358430008

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.176 ± 0.366 (0.660) C:NA T:95%	pCi/L	04/30/20 11:27	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project: 41376
Pace Project No.: 30358430

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: For Safe Drinking Water Act (SDWA) analyses, the reported Unc. Is the calculated Count Uncertainty (95% confidence interval) using a coverage factor of 1.96. For all other matrices (non-SDWA), the reported Unc. is the calculated Expanded Uncertainty (aka Combined Standard Uncertainty, CSU), reported at the 95% confidence interval using a coverage factor of 1.96.

Gamma Spec: The Unc. reported for all gamma-spectroscopy analyses (EPA 901.1), is the calculated Expanded Uncertainty (CSU) at the 95.4% confidence interval, using a coverage factor of 2.0.

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

SAMPLE QUALIFIERS

Sample: 30358430007

[2] Upon receipt at the laboratory, 5 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Sample: 30358430008

[1] Sample collection dates and times were not present on the sample containers.

Chain of Custody

Pace Analytical

Workorder: 41376 Workorder Name: Green Landfill Semiannual Owner Received Date: 4/7/2020 Results Requested By:

Report To:	Subcontract To:	Requested Analysis

McCoy & McCoy Labs
P.O. Box 907
Madisonville, KY 42409
270-821-7375
r.whittington@mccoylabs.com

Pace Analytical Services LLC Greensburg PA
1638 Rosey Town Rd Suite 2,3,4
Greensburg, PA 15601
(724) 850-5615

WO# : 30358430

30358430

Item	Sample ID	Sample Type	Collect Date/Time	Lab ID	Matrix ~~Drinking~~	Preserved Containers					EPA 903.1	EPA 904.0 Radium Sum Calc												LAB USE ONLY
1																								
2	0041376-01		04/06/20 13:05	IR44-McCoy	Water						X	X												01
3	0041376-02		04/07/20 11:40	IR44-McCoy	Water						X	X												02
4	0041376-03		04/07/20 13:55	IR44-McCoy	Water						X	X												03
5	0041376-04		04/07/20 09:55	IR44-McCoy	Water						X	X												04
6	0041376-05		04/07/20 10:10	IR44-McCoy	Water						X	X												05
7	0041376-06		04/06/20 14:20	IR44-McCoy	Water						X	X												06
8	0041376-07		04/07/20 10:20	IR44-McCoy	Water						X	X												07
9	0041376-08		04/07/20 11:50	IR44-McCoy	Water						X	X												08
10																								

Transfers	Released By	Date/Time	Reveived By	Date/Time	Comments
1			Kelli Rund	4/10/2020 0915	
2					
3					

Cooler Temperature on Receipt 4.7 °C | **Custody Seal Y or (N)** | **Received on Ice (Y) or N** | **Sample Intact (Y) or N**

***In order to maintain client confidentiality, location/name of the sampling site, sampler's name and signature may not be provided on this COC
This chain of custody is considered complete as is since this information is available in the owner laboratory.

SUBCONTRACT ORDER

Pace Analytical Services, LLC Kentucky

0041376

30358430

SENDING LABORATORY:

Pace Analytical Services, LLC Kentucky
PO BOX 907
Madisonville, KY 42431
Phone: (270) 821-7375
Fax: 844-270-7904
Project Manager: Rob Whittington

RECEIVING LABORATORY:

Pace Analytical Services LLC Greensburg PA
1638 Rosey Town Rd Suite 2,3,4
Greensburg, PA 15601
Phone :(724) 850-5615
Fax:

Please return shipping cooler to return address on shipping label.

Analysis		Expires	Laboratory ID	Comments
Sample ID: 0041376-01	**Water**	**Sampled:04/06/2020 13:05**	**Specific Method**	
Radium 228 (sub)		10/03/2020 13:05	EPA 904.0 Radium Sum C	
Radium Total (sub)		10/03/2020 13:05	EPA 904.0 Radium Sum C	
Radium 226 (sub)		10/03/2020 13:05	EPA 903.1	
Sample ID: 0041376-02	**Water**	**Sampled:04/07/2020 11:40**	**Specific Method**	
Radium 226 (sub)		10/04/2020 11:40	EPA 903.1	
Radium 228 (sub)		10/04/2020 11:40	EPA 904.0 Radium Sum C	
Radium Total (sub)		10/04/2020 11:40	EPA 904.0 Radium Sum C	
Sample ID: 0041376-03	**Water**	**Sampled:04/07/2020 13:55**	**Specific Method**	
Radium Total (sub)		10/04/2020 13:55	EPA 904.0 Radium Sum C	
Radium 226 (sub)		10/04/2020 13:55	EPA 903.1	
Radium 228 (sub)		10/04/2020 13:55	EPA 904.0 Radium Sum C	
Sample ID: 0041376-04	**Water**	**Sampled:04/07/2020 09:55**	**Specific Method**	
Radium 226 (sub)		10/04/2020 09:55	EPA 903.1	
Radium 228 (sub)		10/04/2020 09:55	EPA 904.0 Radium Sum C	
Radium Total (sub)		10/04/2020 09:55	EPA 904.0 Radium Sum C	
Sample ID: 0041376-05	**Water**	**Sampled:04/07/2020 10:10**	**Specific Method**	
Radium 228 (sub)		10/04/2020 10:10	EPA 904.0 Radium Sum C	
Radium Total (sub)		10/04/2020 10:10	EPA 904.0 Radium Sum C	
Radium 226 (sub)		10/04/2020 10:10	EPA 903.1	
Sample ID: 0041376-06	**Water**	**Sampled:04/06/2020 14:20**	**Specific Method**	
Radium 226 (sub)		10/03/2020 14:20	EPA 903.1	
Radium 228 (sub)		10/03/2020 14:20	EPA 904.0 Radium Sum C	
Radium Total (sub)		10/03/2020 14:20	EPA 904.0 Radium Sum C	

Released By	Date	Received By	Date
[signature]	04.09.20		
Released By	Date	Received By	Date

SUBCONTRACT ORDER

Pace Analytical Services, LLC Kentucky # 30350450

0041376

Analysis		Expires	Laboratory ID	Comments
Sample ID: 0041376-07	**Water**	**Sampled:04/07/2020 10:20**	**Specific Method**	
Radium 226 (sub)		10/04/2020 10:20	EPA 903.1	
Radium 228 (sub)		10/04/2020 10:20	EPA 904.0 Radium Sum C	
Radium Total (sub)		10/04/2020 10:20	EPA 904.0 Radium Sum C	
Sample ID: 0041376-08	**Water**	**Sampled:04/07/2020 11:50**	**Specific Method**	
Radium Total (sub)		10/04/2020 11:50	EPA 904.0 Radium Sum C	
Radium 226 (sub)		10/04/2020 11:50	EPA 903.1	
Radium 228 (sub)		10/04/2020 11:50	EPA 904.0 Radium Sum C	

Released By	Date	Received By	Date
[signature]	04.09.20		
Released By	Date	Received By	Date

Sample Custody

30350430

By Nancy Yeager

Printed 04/09/2020 09:05

Lab ID	Container	Cooler	Last Own	Departme	Location	Home Locat	Status	Dispositio	Custody Date
0041376-01	Plastic 1L pH<2 w/HNO3 Rad 226 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-01	Plastic 1L pH<2 w/HNO3 Rad 228 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-02	Plastic 1L pH<2 w/HNO3 Rad 226 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-02	Plastic 1L pH<2 w/HNO3 Rad 228 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-03	Plastic 1L pH<2 w/HNO3 Rad 226 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-03	Plastic 1L pH<2 w/HNO3 Rad 228 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-04	Plastic 1L pH<2 w/HNO3 Rad 226 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-04	Plastic 1L pH<2 w/HNO3 Rad 228 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-05	Plastic 1L pH<2 w/HNO3 Rad 226 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-05	Plastic 1L pH<2 w/HNO3 Rad 228 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-06	Plastic 1L pH<2 w/HNO3 Rad 226 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-06	Plastic 1L pH<2 w/HNO3 Rad 228 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-07	Plastic 1L pH<2 w/HNO3 Rad 226 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-07	Plastic 1L pH<2 w/HNO3 Rad 228 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-08	Plastic 1L pH<2 w/HNO3 Rad 226 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05
0041376-08	Plastic 1L pH<2 w/HNO3 Rad 228 (Beta)	Default Cooler	NDY	Wet Chem	In-Transit		Batched Active (Out)		04/09/2020 09:05

Relinquished By	Date	Received By	Date
Relinquished By	Date	Received By	Date

Pittsburgh Lab Sample Condition Upon Receipt

Pace Analytical

Client Name: McCoy & McCoy Project # # 30358430

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Label BLM
LIMS Login BLM

Tracking #: 110733861178

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Thermometer Used 11 Type of Ice: (Wet) Blue None

Cooler Temperature Observed Temp 5.1 °c Correction Factor: -0.4 °c Final Temp: 4.7 °c

Temp should be above freezing to 6°C

pH paper Lot# 10D0391 Date and initials of person examining contents: NMR 4/10/2020

Comments:	Yes	No	N/A	
Chain of Custody Present:	✓			1.
Chain of Custody Filled Out:	✓			2.
Chain of Custody Relinquished:	✓			3.
Sampler Name & Signature on COC:		✓		4.
Sample Labels match COC: -Includes date/time/ID Matrix: WT		✓		5. no date & time on labels
Samples Arrived within Hold Time:	✓			6.
Short Hold Time Analysis (<72hr remaining):		✓		7.
Rush Turn Around Time Requested:		✓		8.
Sufficient Volume:	✓			9.
Correct Containers Used: -Pace Containers Used:	✓ ✓			10.
Containers Intact:	✓			11.
Orthophosphate field filtered			✓	12.
Hex Cr Aqueous sample field filtered			✓	13.
Organic Samples checked for dechlorination:			✓	14.
Filtered volume received for Dissolved tests			✓	15.
All containers have been checked for preservation, exceptions: VOA, coliform, TOC, O&G, Phenolics, Radon, Non-aqueous matrix	✓			16. added 5.0mL HNO_3 to each sample
All containers meet method preservation requirements.		✓		Initial when completed: NMR Date/time of preservation: 4/10/2020 1610
				Lot # of added preservative: DL20-0362
Headspace in VOA Vials (>6mm):			✓	17.
Trip Blank Present:		✓		18.
Trip Blank Custody Seals Present			✓	
Rad Samples Screened < 0.5 mrem/hr	✓			Initial when completed: NMR Date: 4/10/2020

Client Notification/ Resolution:

Person Contacted: _____ Date/Time: _____ Contacted By: _____

Comments/ Resolution: _____

☐ **A check in this box indicates that additional information has been stored in ereports.**

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

Appendix E
Remedy Selection Evaluation Criteria

TABLE E-1. Summary of Evaluation Criteria
Groundwater Remedy Selection
Big Rivers Electric Corporation - Green Landfill

40 CFR 257.97 Reference	Corrective Measure Evaluation Criteria under 40 CFR 257.97	Corrective Measure Alternative			
		Alt 2a	Alt 3	Alt 4	Alt 5
	Threshold Criteria				
(b)(1)	Be protective of human health and the environment	1	3	3	3
(b)(2)	Attain the Groundwater Protection Standards	1	3.5	2	3.5
(b)(3)	Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment	1	3	2	4
(b)(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	1	3	2	4
(b)(5)	Comply with standards for management of wastes as specified in Section 257.98(d)	2.5	2.5	2.5	2.5
	Balancing Criteria				
(c)(1)	The long and short-term effectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on a consideration of the following:				
(c)(1)(i)	Magnitude of reduction of existing risks	1	4	3	2
(c)(1)(ii)	Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy	1	3.5	3.5	2
(c)(1)(iii)	The type and degree of long-term management required, including monitoring, operation, and maintenance	1	2.5	2.5	4
(c)(1)(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	1	3	2	4
(c)(1)(v)	Time until full protection is achieved	1	3	2	4
(c)(1)(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;	1	3	2	4
(c)(1)(vii)	Long-term reliability of the engineering and institutional controls	1	3	2	4
(c)(1)(viii)	Potential need for replacement of the remedy	4	2	1	3
(c)(2)	The effectiveness of the remedy in controlling the source to reduce further releases based on consideration of the following factors:				
(c)(2)(i)	The extent to which containment practices will reduce further releases	1	3	2	4
(c)(2)(ii)	The extent to which treatment technologies may be used	1	4	3	2
(c)(3)	The ease or difficulty of implementing a potential remedy(s) based on consideration of the following types of factors				
(c)(3)(i)	Degree of difficulty associated with constructing the technology	4	2	1	3
(c)(3)(ii)	Expected operational reliability of the technologies	4	2	1	3
(c)(3)(iii)	Need to coordinate with and obtain necessary approvals and permits from other agencies	2.5	2.5	2.5	2.5
(c)(3)(iv)	Availability of necessary equipment and specialists	4	2	1	3
(c)(3)(v)	Available capacity and location of needed treatment, storage, and disposal services	1	2	3	4
	Modifying Criteria				
(c)(4)	The degree to which community concerns are addressed by a potential remedy(s)				
NA (Agreed Order)	State Acceptance	1	3.5	3.5	2
(c)(4)	Community Acceptance	1	3.5	3.5	2
	Total Score =	**37**	**63.5**	**50**	**69.5**

TABLE E-2. Threshold Criteria Evaluation
Groundwater Remedy Selection
Big Rivers Electric Corporation - Green Landfill

40 CFR 257.97 Reference	Corrective Measure Evaluation Criteria under 40 CFR 257.97	Corrective Measure Alternative				Benefit Analysis
		Alt 2a	Alt 3	Alt 4	Alt 5	
Threshold Criteria						
(b)(1)	Be protective of human health and the environment (HH&E)	1	3	3	3	All 4 alternatives are expected to be protective of HH&E. **Alt 2a** is considered to be the minimum corrective action that would be required to achieve the CAOs, with the other 3 alternatives building to some degree upon Alt 2a. However Alt 2a relies upon natural attenuation to achieve and ultimately meet the CAOs and therefore has been scored lower for this criteria. The other 3 alternatives are expected to be protective of HH&E to the same degree and have been scored equally.
(b)(2)	Attain the Groundwater Protection Standards (GWPS)	1	3.5	2	3.5	All 4 alternatives are expected to meet the GWPS, however the time frame for attainment is expected to vary based upon the degree to which the alternative employs an active component and how long the active component will take to design and implement. **Alt 2a** employs no active remedial component and has been scored lowest. Implementation of other source control measures (included with Alt 3 and Alt 5) is viewed as the corrective measure likely to provide a benefit in the shortest time frame. Addition of hydraulic/physical containment technologies combined with ex-situ treatment associated with **Alt 3** and **Alt 4** will required additional engineering and pilot testing, likely extending the time required for implementation. **Alt 4** would require enhanced engineering and testing compared to **Alt 3** so it was ranked lower than **Alt 3**. The **Alt 3** and **Alt 5** alternatives are likely to attain the GWPS in the shortest time frame and have been scored highest.
(b)(3)	Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment	1	3	2	4	All 4 alternatives are expected to reduce or eliminate further releases of Appendix IV constituents. Alt 2a is considered to be the minimum corrective action that would be required to achieve the CAOs, with the other 3 alternatives building to some degree upon Alt 2a. However Alt 2a relies upon natural attenuation to achieve ultimately meet the CAOs and therefore has been scored lowest for this criteria. Alt 3 and Alt 4 incorporate active remedial components to remove COCs from the environment. Given that Alt 3 and Alt 4 incorporate an ex-situ component, both represent slightly higher potential for furthers releases into the environment compared with Alt 5. Given that Alt 3 contains a source control component it scores higher than Alt 4. Alt 5 will prevent further releases by removing source material from the South Sediment Basin and is not seen to represent as much of a environmental risk via a release to surface water receptors as Alt 3 and Alt 4.
(b)(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	1	3	2	4	All 4 alternatives are expected to remove contamination from the environment. Alt 2a employs no active remedial component and has been scored lowest of all. Both Alt 3 and Alt 4 incorporate an active remedial component to remove COCs from the environment, but incorporate engineering and ex-situ components, representing a slight probability of impacting sensitive ecosystems and have been scored lower compared to Alt 5. Both Alt 3 and Alt 5 incorporate removing source material from the South Sediment Basin and other source control measures, in addition to addressing groundwater impacts. Due to the lack of an ex-situ component, Alt 5 has been scored highest of all.
(b)(5)	Comply with standards for management of wastes as specified in Section 257.98(d) [See Notes]	2.5	2.5	2.5	2.5	All 4 alternatives are expected to comply with waste management standards to the same degree and have been scored equally.
	SUBTOTALS	**6.5**	**15**	**11.5**	**17**	

notes:

1) Alternative #2a (A2a): CiP, ICs, and Groundwater Monitoring
2) Alternative #3 (A3): CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring
3) Alternative #4 (A4): CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
4) Alternative #5 (A5): CiP, Other Source Control, ICs, and Groundwater Monitoring
5) Ranking scores range from 1 to 4; 1 = lowest ranking score; 4 = highest ranking score
6) When alternatives are all equivalent the ranking is assigned as the average value of all possible ranking (i.e., (1+2+3+4)/4 = 2.5)

TABLE E-3. Balancing Criteria Evaluation
Groundwater Remedy Selection
Big Rivers Electric Corporation - Green Landfill

40 CFR 257.97 Reference	Corrective Measure Evaluation Criteria under 40 CFR 257.97	Corrective Measure Alternative Alt 2a	Alt 3	Alt 4	Alt 5	Benefit Analysis
	Balancing Criteria					
(c)(1)	The long and short-term effectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on a consideration of the following:					
(c)(1)(i)	Magnitude of reduction of existing risks	1	4	3	2	All 4 alternatives are expected to result in a reduction of existing risks. Alt 2a is considered to be the minimum corrective action that would be required to achieve the CAOs, with the other 3 alternatives building to some degree upon Alt 2a. However Alt 2a relies upon natural attenuation to ultimately achieve the CAOs and therefore has been scored lowest for this criteria. Alt 3 and Alt 4 incorporate an active remedial component to remove COCs from the environment, which is considered to be effective at reducing existing risks. Given that Alt 4 incorporates an ex-situ component, it does represent slightly higher existing risk than Alt 3. Alt 5 on itis own provides for some reduction of existing risks by removing source material from the South Sediment Basin, but scores lower than Alt 3 and Alt 4.
(c)(1)(ii)	Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy [See Note]	1	3.5	3.5	2	All 4 alternatives are expected to result in a reduction of residual risks due to further releases but allow for CCR to remain in place indefinitely. **Alt 2a** employs no active component for containing further releases and has been scored lowest of all. **Alt 3** will reduce further releases due to the hydraulic containment provided by a groundwater extraction system and the ability of treatment to remove COCs from the environment. **Alt 4** will reduce further releases due to the implementation of physical containment and treatment of groundwater to remove COCs from the environment. **Alt 5** would also reduce further releases to the environment, but due to the uncertainty with regard to the impacts observed at MW-3A scored slightly lower. **Alt 3** and **Alt 4** are considered to be equal with regard to this criteria.
(c)(1)(iii)	The type and degree of long-term management required, including monitoring, operation, and maintenance [See Note]	1	2.5	2.5	4	**Alt 2a** will only achieve the established CAO at the end of the Unit operational lifecycle after cap construction, which estimated to be at least 100 years after CiP construction. As a result, **Alt 2a** will require the most long-term management and has been scored lowest of all. Although the source control component included with **Alt 5** will require some longer term maintenance, both **Alt 3** and **Alt 4** incorporate treatment components requiring considerable expenditure of resources and energy during construction, implementation, and long-term operation. Therefore, **Alt 5** has been scored highest of all the alternatives. **Alt 3** and **Alt 4** are considered to be equal with regard to this criteria.
(c)(1)(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	1	3	2	4	All 4 alternatives contain some level of short-term risk. Alt 2a employs no active remedial component and has been scored lowest of all. Given that Alt 3 and Alt 4 incorporate an ex-situ component, both represent slightly higher potential for furthes releases into the environment compared with Alt 5. Given that Alt 3 contains a source control component it scores higher than Alt 4. Alt 5 does require removing source material from the South Sediment Basin but is not seen to represent as much risk to the environment during excavation compared to Alt 3 and Alt 4.
(c)(1)(v)	Time until full protection is achieved	1	3	2	4	Alt 2a will achieve the established CAO at the end of the Unit operational lifecycle after cap construction, which would hault source loading to groundwater, and further allow unimpacted groundwater to flush through the aquifer. The time period for attainment of Alt 2a is estimated to be at least 100 years after CiP construction. Alt 3 would attain the established CAO for the Unit after hydraulic containment eliminates the offsite migration of impacted groundwater, thereby eliminating the exposure pathway. The time period for attainment is relatively short (i.e., <30 years). In the long term, Alt 3 will maintain compliance with the established CAO after cap construction at the end of the Unit operational lifecycle, and removing sourcce material of the South Sediment Basin which will end the source loading to groundwater, as unimpacted groundwater flushes through the aquifer. Alt 4 would attain the established CAO for the landfill after physical containment and extraction eliminates the offsite migration of impacted groundwater, thereby eliminating the exposure pathway. The time period for attainment is based on construction of the grout curtain and groundwater extraction system and is expected to be protracted. In the long term, Alt 4 will maintain compliance with the established CAO after cap construction at the end of the Unit operational lifecycle, which will end the source loading to the groundwater, as unimpacted groundwater flushes through the aquifer. Alt 5 would attain the established CAO for the Unit after removing sourcce material from the South Sediment Basin which will end the source loading to groundwater, as unimpacted groundwater flushes through the aquifer, thereby eliminating the exposure pathway. The time period for attainment via Alt 5 is relatively short. In the long term, Alt 5 will maintain compliance with the established CAO after cap construction at the end of the Unit operational lifecycle. Alt 5 has been scored higher than Alt 3, as design of the source control measures is underway as required by the AO.

TABLE E-3. Balancing Criteria Evaluation
Groundwater Remedy Selection
Big Rivers Electric Corporation - Green Landfill

40 CFR 257.97 Reference	Corrective Measure Evaluation Criteria under 40 CFR 257.97	Corrective Measure Alternative Alt 2a	Alt 3	Alt 4	Alt 5	Benefit Analysis
Balancing Criteria						
(c)(1)(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;	1	3	2	4	All 4 alternatives allow for CCR to remain in place indefinitely. Alt 2a employs no active remedial component and has been scored lowest of all. Given that Alt 3 and Alt 4 incorporate an ex-situ component, both represent slightly higher potential for furthers releases into the environment compared with Alt 5. Given that Alt 3 contains a source control component it scores higher than Alt 4. Alt 5 does require removing source material from the South Sediment Basin but is not seen to represent as much risk to the environment during excavation compared to Alt 3 and Alt 4.
(c)(1)(vii)	Long-term reliability of the engineering and institutional controls	1	3	2	4	All 4 alternatives incorporate institutional controls. **Alt 2a** is considered to be the minimum corrective action that would be required to achieve the CAOs, relying upon natural attenuation to achieve ultimately meet the CAOs and therefore has been scored lowest for this criteria. Given that **Alt 3 and Alt 4** incorporate an engineering component, both represent slightly higher reliability concerns compared with **Alt 5**. Given that **Alt 3** contains a source control component it scores higher than **Alt 4**.
(c)(1)(viii)	Potential need for replacement of the remedy	4	2	1	3	With the exception of **Alt 2a**, each alternative employs treatment technologies. **Alt 2a** employs no active remedial component requiring replacement, and has been scored highest of all. Both **Alt 3** and **Alt 4** incorporate an active remedial component to remove COCs from the environment, including engineering and ex-situ components, and have been scored lower than **Alt 5**. **Alt 3** incorporates source control measures, and has been scored higher than **Alt 4**.
(c)(2)	The effectiveness of the remedy in controlling the source to reduce further releases based on consideration of the following factors:					
(c)(2)(i)	The extent to which containment practices will reduce further releases	1	3	2	4	All 4 alternatives are expected to reduce or eliminate further releases of Appendix IV constituents. Alt 2a is considered to be the minimum corrective action that would be required to achieve the CAOs, with the other 3 alternatives building to some degree upon Alt 2a. However Alt 2a relies upon natural attenuation to achieve ultimately meet the CAOs and therefore has been scored lowest for this criteria. Alt 3 and Alt 4 incorporate active remedial components to remove COCs from the environment. Given that Alt 3 and Alt 4 incorporate an Ex-Situ component, both represent slightly higher potential for furthers releases into the environment than Alt 5. Given that Alt 3 contains a source control component it scores higher than Alt 4. Alt 5 will prevent further releases by removing source material from the South Sediment Basin and is not seen to represent as much risk to the environment as Alt 3 and Alt 4.
(c)(2)(ii)	The extent to which treatment technologies may be used	1	4	3	2	With the exception of **Alt 2a**, each alternative employs treatment technologies. **Alt 2a** employs no active remedial component and has been scored lowest of all. Both **Alt 3** and **Alt 4** incorporate an active remedial component to remove COCs from the environment, including engineering and ex-situ components, and have been scored higher than **Alt 5**. **Alt 3** incorporates source control measures, and has been scored highest of all.
(c)(3)	The ease or difficulty of implementing a potential remedy(s) based on consideration of the following types of factors					
(c)(3)(i)	Degree of difficulty associated with constructing the technology	4	2	1	3	With the exception of Alt 2a, each alternative employs treatment technologies. Alt 2a employs no active remedial component and has been scored highest of all. Alt 3 would pose some challenges to the installation and operation of the extraction wells. The proximity to the river will require substantially higher extraction rates in order to provide hydraulic containment. The proximity to the river may pose accessibility issues and result in inflated costs. Alt 4 would be very difficult to implement and is expected to pose some challenges with respect to the installation of the grout curtain and extraction system along the perimeter of the Landfill. The proximity to the river may pose accessibility issues and result in inflated costs. Trenching equipment may be able to meet the depth required for an effective Physical Containment barrier. Alt 4 has been scored lowest of all options with regard to the criteria. Draining and lining the South Sediment Basin requires nominal engineering and construction efforts. Both Alt 3 and Alt 4 incorporate an active remedial component to remove COCs from the environment, including engineering and ex-situ components, and have been scored lower than Alt 5.
(c)(3)(ii)	Expected operational reliability of the technologies	4	2	1	3	With the exception of **Alt 2a**, each alternative employs treatment technologies. **Alt 2a** employs no active remedial component requiring operation, and has been scored highest of all. Both **Alt 3** and **Alt 4** incorporate an active remedial component to remove COCs from the environment, including engineering and ex-situ components, and have been scored lower than **Alt 5**. **Alt 3** incorporates source control measures, and has been scored higher than **Alt 4**.
(c)(3)(iii)	Need to coordinate with and obtain necessary approvals and permits from other agencies [See Note]	2.5	2.5	2.5	2.5	All 4 alternatives are expected to require permitting and approval from KDWM to the same degree and have been scored equally.

TABLE E-3. Balancing Criteria Evaluation
Groundwater Remedy Selection
Big Rivers Electric Corporation - Green Landfill

40 CFR 257.97 Reference	Corrective Measure Evaluation Criteria under 40 CFR 257.97	Corrective Measure Alternative Alt 2a	Alt 3	Alt 4	Alt 5	Benefit Analysis
Balancing Criteria						
(c)(3)(iv)	Availability of necessary equipment and specialists	4	2	1	3	With the exception of **Alt 2a**, each alternative employs treatment technologies. **Alt 2a** employs no active remedial component requiring operation, and has been scored highest of all. Both **Alt 3** and **Alt 4** incorporate an active remedial component to remove COCs from the environment, including engineering and ex-situ components, and have been scored lower than **Alt 5**. **Alt 4** would be very difficult to implement and is expected to pose some challenges with respect to the installation of the grout curtain and extraction system along the perimeter of the Landfill. **Alt 4** is expected to require the most equipment and specialists and has been scored lowest of all.
(c)(3)(v)	Available capacity and location of needed treatment, storage, and disposal services	1	2	3	4	With the exception of **Alt 2a**, each alternative employs treatment technologies. **Alt 2a** employs no active remedial component requiring operation, and has been scored lowest of all. Both **Alt 3** and **Alt 4** incorporate an active remedial component to remove COCs from the environment, including engineering and ex-situ components, and have been scored lower than **Alt 5** due to the need for treatment. **Alt 3** is expected to require the most treatment requirements and has been scored lower than **Alt 4**.
	SUBTOTALS	**28.5**	**41.5**	**31.5**	**48.5**	

notes:

1) Alternative #2a (A2a): CiP, ICs, and Groundwater Monitoring
2) Alternative #3 (A3): CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring
3) Alternative #4 (A4): CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
4) Alternative #5 (A5): CiP, Other Source Control, ICs, and Groundwater Monitoring
5) Ranking scores range from 1 to 4; 1 = lowest ranking score; 4 = highest ranking score
6) When alternatives are all equivalent the ranking is assigned as the average value of all possible ranking (i.e., (1+2+3+4)/4 = 2.5)

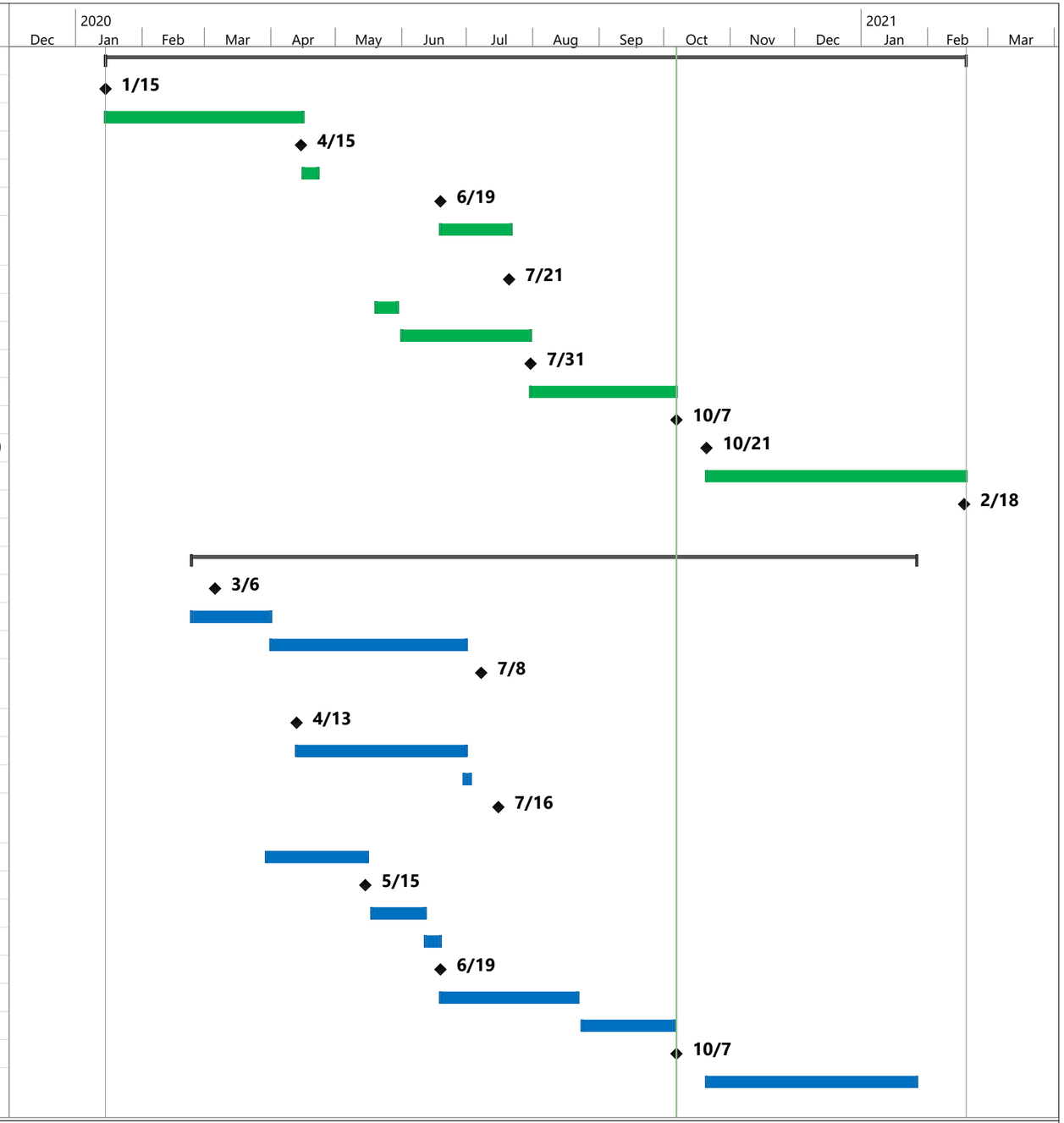
TABLE E-4. Modifying Criteria Evaluation
Groundwater Remedy Selection
Big Rivers Electric Corporation - Green Landfill

40 CFR 257.97 Reference	Corrective Measure Evaluation Criteria under 40 CFR 257.97	Corrective Measure Alternative Alt 2a	Alt 3	Alt 4	Alt 5	Benefit Analysis
Modifying Criteria						
(c)(4)	The degree to which community concerns are addressed by a potential remedy(s)					
NA (Agreed Order)	State Acceptance [See Notes]	1	3.5	3.5	2	**Alt 2a** is expected to be met with limited state acceptance due to the protracted remedy time frame. **Alt 3** and **Alt 4** will both minimize the potential impacts to the receptors upon implementation of the extraction system, and the potential for permitting would be relatively straightforward following the completion of the design, thus increasing the regulatory acceptance of the overall remedy. **Alt 5** is expected to receive moderate acceptance from the state with respect to additional control of other potential sources of groundwater contamination.
(c)(4)	Community Acceptance [See Notes]	1	3.5	3.5	2	**Alt 2a** is expected to be met with limited community acceptance due to the protracted remedy time frame. **Alt 3** leaves waste in place but provides for active, short-term effective measures that would likely meet with moderate acceptance from the community. **Alt 4** would likely meet with moderate acceptance from the community with respect to the established CAO and the addition of the grout curtain and extraction system; however, the remedy timeframe and the discharge of treated groundwater may be an issue. **Alt 5** would potentially meet with limited acceptance from the community due to the remedy time frame, which will be complete only after completion of the Landfill's operational lifecycle. However **Alt 5** is expected to be more acceptable to the community compared to **Alt 2a** due to the inclusion of an active corrective measure component.
	SUBTOTALS	**2**	**7**	**7**	**4**	

notes:
1) Alternative #2a (A2a): CiP, ICs, and Groundwater Monitoring
2) Alternative #3 (A3): CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring
3) Alternative #4 (A4): CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
4) Alternative #5 (A5): CiP, Other Source Control, ICs, and Groundwater Monitoring
5) Ranking scores range from 1 to 4; 1 = lowest ranking score; 4 = highest ranking score
6) When alternatives are all equivalent the ranking is assigned as the average value of all possible ranking (i.e., (1+2+3+4)/4 = 2.5)

Appendix F
Remedy Implementation Schedule

ID	Task Mode	Task Name	Start	Finish
1		**Green Landfill - Perimeter Seepage Control Design**	**Wed 1/15/20**	**Thu 2/18/21**
2		AEC-000: Purchase Order Received by AECOM	Wed 1/15/20	Wed 1/15/20
3		AEC-010: Develop 60% Civil Design	Wed 1/15/20	Wed 4/15/20
4		AEC-40: Submit 60% Draft Civil Design and Specifications	Wed 4/15/20	Wed 4/15/20
5		CLI-10: Client Review of 60% Civil Design	Thu 4/16/20	Wed 4/22/20
6		AEC-020: Submit Perimeter Seepage Design to Agency	Fri 6/19/20	Fri 6/19/20
7		AEC-30: Develop 90% Draft Civil Design and Specifications	Fri 6/19/20	Tue 7/21/20
8		AEC-40: Submit 90% Draft Civil Design and Specifications	Tue 7/21/20	Tue 7/21/20
9		CLI-020: Prepare Bid Documents	Wed 5/20/20	Fri 5/29/20
10		CLI-030: Bid Period	Mon 6/1/20	Thu 7/30/20
11		CLI-040: Bids Due	Fri 7/31/20	Fri 7/31/20
12		CLI-050: Negotiate Award	Fri 7/31/20	Tue 10/6/20
13		CLI-060: Award Contract	Wed 10/7/20	Wed 10/7/20
14		CLI-070: Construction Start	Wed 10/21/20	Wed 10/21/20
15		CLI-080: Construction	Wed 10/21/20	Thu 2/18/21
16		CLI-090: Construction Complete	Thu 2/18/21	Thu 2/18/21
17				
18		**Green Landfill - Groundwater Remedy Selection**	**Mon 2/24/20**	**Tue 1/26/21**
19		1: Receive Big Rivers concurrence on tasks/schedule	Fri 3/6/20	Fri 3/6/20
20		2: Data Gap Evaluation	Mon 2/24/20	Tue 3/31/20
21		3: Preparation for Public Meeting	Wed 4/1/20	Tue 6/30/20
22		4: Notice for Public Meeting in local newspaper and on BREC CCR website	Wed 7/8/20	Wed 7/8/20
23		5: Submit PowerPoint Presentation for client review	Mon 4/13/20	Mon 4/13/20
24		6: Client review of PowerPoint Presentation	Mon 4/13/20	Tue 6/30/20
25		7: Revise PowerPoint Presentation	Tue 6/30/20	Thu 7/2/20
26		8: Public Meeting to present ACM results (40 CFR 257.96(e))	Thu 7/16/20	Thu 7/16/20
27		9: Develop Final Remedy Selection Report (FRSR)	Mon 3/30/20	Fri 5/15/20
28		10: Submit FRSR for client review	Fri 5/15/20	Fri 5/15/20
29		11: Client review of FRSR	Mon 5/18/20	Thu 6/11/20
30		12: Incorporate client comments in FRSR	Fri 6/12/20	Thu 6/18/20
31		13: Submit FRSR for KDEP Review	Fri 6/19/20	Fri 6/19/20
32		14: KDEP Review of FRSR	Fri 6/19/20	Fri 8/21/20
33		15: Address KDEP comments on FRSR	Mon 8/24/20	Mon 10/5/20
34		16: Post Final FRSR to CCR Website	Wed 10/7/20	Wed 10/7/20
35		17: Groundwater Remedy Implementation (within 90 days of selecting a remedy under 40 CFR 257.97)	Wed 10/21/20	Tue 1/26/21



Project: Green LF_Peri Seep+GW
Date: Wed 10/7/20

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

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Semi-Annual Remedy Selection Progress Report

Reid/HMP&L Surface Impoundment
Sebree Generating Station
Webster County, Kentucky

Prepared for:

Big Rivers Electric Corporation
Sebree Generating Station
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June 2020

Quality information

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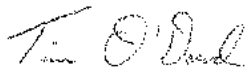			
Timothy P. O'Dowd, PG	Dennis P. Connair, PG	Joseph B. Suhre	Dennis P. Connair, PG
Project Manager	Principal Geologist	Principal Engineer	Principal Geologist

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	June 2020				

Distribution List

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	1	Big Rivers Electric Corporation

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1. Introduction

In accordance with provisions of the United States Environmental Protection Agency's (USEPA) coal combustion residual (CCR) rule, Title 40 of the Code of Federal Regulations (CFR) Part 257.97, Big Rivers Electric Cooperation (BREC) is in the process of selecting a remedy for groundwater impacts at the Reid/Henderson Municipal Power & Light (Reid/HMP&L) Surface Impoundment (the Unit) at the Sebree Generating Station located in Webster County, Robards, Kentucky **(Figure 1)**.

Assessment monitoring results indicate the presence of lithium at a Statistically Significant Level (SSL) above the Ground Water Protection Standard (GWPS) in one monitoring well (MW-10) at the Unit. A map illustrating the site with location of all program monitoring wells is presented as **Figure 2**.

In response to the SSL exceedance, BREC evaluated the nature and extent of groundwater impacts as required by Title 40 CFR Part 257.95(g) for characterization monitoring. In addition, BREC performed an Assessment of Corrective Measures (ACM), to identify applicable remedial technologies to address lithium impacts in groundwater pursuant to Tile 40 CFR Part 257.96. A notice of ACM initiation dated January 14, 2019 was posted to BREC's publicly-accessible CCR reporting website. A report summarizing the results of the ACM (AECOM, June 2019) was posted to BREC's publicly-accessible CCR reporting website on June 14, 2019.

Title 40 CFR Part 257.97(a) requires that progress reports be prepared on a semi-annual basis describing progress made in selecting and designing a remedy. The first semi-annual *Remedy Selection Progress Report* (AECOM, December 2019) was posted to BREC's publicly-accessible CCR reporting website on December 9, 2019. In alignment with the CCR rule requirement, the following sections included within this semi-annual progress report provide an overview of BREC's activities previously performed, currently underway, and planned in the future to select a remedy that meets the requirement of Title 40 CFR Part 257.97 (b) as follows:

(1) Be protective of human health and the environment;

(2) Attain the GWPS as specified pursuant to Section 257.95(h);

(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment;

(4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;

(5) Comply with standards for management of wastes as specified in Section 257.98(d).

2. Site Background

2.1 Site Description

BREC operates the Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/HMP&L Station. BREC owns Green and Reid Stations, while the City of Henderson owns HMP&L Station 2. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (see **Figure 1**). Reid Unit 1 (65 Megawatts [MW]) began commercial operation in 1966 and is scheduled to be retired in 2020 pending regulatory approval from the Kentucky Public Service Commission and Rural Utilities Service. The Reid Combustion Turbine (65 MW) was commercialized in 1976. HMP&L Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974 respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (250 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Reid/HMP&L Station Surface Impoundment is illustrated in **Figure 2**. The Surface Impoundment has been in place for more than 40 years and was used previously for the placement of CCR material. As stated in the published CCR monitoring well network certification, available on the BREC website, the Reid/HMP&L Station Surface Impoundment is a combined incised/dike earthen embankment structure. It is diked on the west, south and east sides, while the north side is incised. The south dike has the greatest height, reaching approximately 20 feet. Most of the central portion of the south dike was constructed on a subdued ridge.

2.2 Groundwater Investigation Summary

Monitoring wells were installed around the perimeter of the Unit in December 2015 prior to the implementation of the CCR Rule. These wells meet the requirements of Title 40 CFR Part 257.90 of the CCR Rule for installation of a groundwater monitoring system. Under these requirements monitoring wells must adequately represent the quality of background groundwater and groundwater representing the downgradient waste boundary. The existing wells are located along the perimeter of the footprint for the Unit. One upgradient monitoring well (MW-7) and three downgradient monitoring wells (MW-8, MW-9, and MW-10) were installed adjacent to the Unit to determine the general direction of groundwater movement and to monitor groundwater impacts. The monitoring wells were installed in the uppermost saturated portion of the sandstone bedrock aquifer.

Nine rounds of Baseline groundwater sampling for Appendix III constituents was conducted between March 2016 and October 2017. Statistical evaluation of Appendix III constituents monitored for Detection monitoring indicated that statistically significant increases (SSIs) over background have occurred, and therefore, Assessment monitoring was triggered. Detection monitoring activities and data are presented in the annual reports that have been prepared to date (AECOM 2018, 2019, and 2020).

As part of Assessment monitoring, upgradient and downgradient wells for the Unit were sampled for Appendix IV constituents in April, July, and September 2018. GWPS were established for the Appendix IV constituents occurring at SSIs (lithium only), and statistical evaluation of the lithium concentrations indicated exceedances of GWPSs at SSLs, as detailed in **Table 1** below

Table 1 – Reid/HMP&L Surface Impoundment Constituents of Concern

Monitoring Well (Date)	Parameter Lithium GWPS 0.04 (mg/L)
MW-10 (Apr 2018)	**0.694**
MW-10 (Jul 2018)	**0.630**
MW-10 (Sep 2018)	**0.570**

GWPSs are the greater of the site-specific background concentrations, the USEPA primary drinking water standard maximum contaminant limits (MCL), or GWPS provided in 40 CFR 257.95(3)(h)(2)

An additional characterization well, MW-110, was subsequently installed to estimate the downgradient extent of impacted groundwater. Sample collection for Appendix III and IV parameters took place in March and April 2019. The analytical results for lithium in MW-110 were below the GWPS. The additional characterization data are summarized in **Table 2** below.

Table 2 – Reid/HMP&L Surface Impoundment Characterization Sample Results

Monitoring Well (Date)	Parameter Lithium GWPS 0.04 (mg/L)
MW-110 (March 2019)	0.0299
MW-110 (April 2019)	0.0303

The results from both characterization sampling events helped to confirm the downgradient (southwestern) extent of COC impacts above GWPS at the Unit.

Semi-annual Assessment monitoring continued at the Unit in 2019 and 2020 in accordance with 40 CFR Part 257.95.

2.3 Conceptual Site Model

Development and refinement of a Conceptual Site Model (CSM) is necessary to support remedy selection for the Unit. A CSM is based on a set of working hypotheses regarding how contaminants of concern (COCs) entered the environment at a site, how they were and continue to be transported to various media, what the potential routes of exposure are, and who may be exposed, including both human and ecological receptors. As such, the CSM is a “living” model. As new data become available or site conditions change, a CSM should be evaluated and updated as necessary.

The CSM for the Unit was first provided in the June 2019 ACM for the Unit (AECOM 2019). The CSM presents the physical setting of the Unit (adjacent to the Green River), the unconsolidated and bedrock geologic strata underlying the Unit, the occurrence and movement of groundwater, the distribution of COCs in groundwater, and the potential receptors (or lack thereof) for impacted groundwater. These elements are described in detail below and have been updated with new information for this report as appropriate.

2.3.1 Physical Setting

The Unit is located within the Interior Low Plateaus physiographic province. The province is part of the Interior Plains division of the United States. Characteristic features of the province include unglaciated

rolling limestone plains with alluvial valleys and entrenched rivers and streams. Several large rivers are in the region, including the Green, Ohio, Kentucky, Tennessee, and the Cumberland Rivers. The geology underlying the Unit consists of unconsolidated materials, including loess and alluvial deposits, underlain by Upper to Middle Pennsylvanian-age clastic and carbonate bedrock consisting primarily of sandstone and shale. The unconsolidated materials also include fill, silty and clayey residuum, and minor amounts of sandy, clayey channel fill alluvium.

The Unit is located on upland area near the west bank of the Green River. The uppermost edge of the earthen embankment is situated at an elevation of approximately 429 feet above mean sea level (amsl). Although the Green River is located less than 0.5 miles from the site, the structure does not extend significantly into the floodplain. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands (Associated Engineers 2016, Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan). The immediate watershed that drains to the unit, and in which the unit is considered to be located, is unnamed and 25.45 acres in size. The unnamed watershed discharges from the Unit outflow structure and is routed, under a Kentucky Pollution Discharge and Elimination System permit, to the Green River.

2.3.2 Geology

The Unit lies in the Western Kentucky Coalfields section, characterized by rolling uplands underlain by coal-bearing bedrock of the Pennsylvanian Period. Near the Unit, maximum topographic relief is on the order of 80 feet. The geologic quadrangle (Geologic map of the Robards quadrangle, Henderson and Webster Counties, Kentucky, 1973) for the area published by the Kentucky Geologic Survey (KGS) shows the surficial material in portions of the western half of the Unit to be unconsolidated loess representing the Pleistocene geologic epoch. The loess consists of sandy and clayey silt. Underlying the loess deposits and exposed at the surface on the eastern half of the Unit are broadly distributed Pleistocene and Holocene alluvium deposits consisting of intermixed and interlensing clay, silt, sand, and gravel. In close proximity to the Unit, the alluvium is generally a low permeability unit that forms terraces along the Green River at elevations of roughly 380 and 395 ft., amsl. The unconsolidated surficial materials range from approximately 24 feet (MW-7) to 47 feet (MW-110) in thickness surrounding the Unit.

The unconsolidated materials are underlain by bedrock of the Upper Pennsylvanian Shelburn Formation [formerly identified as the Lisman Formation (Fairer, 1973)] and the Middle Pennsylvanian Carbondale Formation. At the base of the Shelburn Formation is the Providence Limestone Member, consisting of two distinct limestone beds separated by a sandy shale. The member is exposed in a streambed near the northwest corner of the Unit but is absent beneath much of the Unit footprint due to erosional channeling. The underlying Carbondale Formation consists of cyclic sequences of sandstones, shales, siltstones and coals. The Carbondale sediments were deposited in a fluvial-deltaic system. As a result of this depositional environment, the lithologic units of the Carbondale tend to be lenticular bodies rather than continuous sheet-like strata. Gradational and abrupt horizontal changes in lithology are often encountered.

2.3.3 Groundwater Hydrogeology

For purposes of compliance with the CCR Rule groundwater monitoring requirements, the interbedded sandstone and shale of the Carbondale Formation is considered the uppermost aquifer underlying the Unit. The uppermost aquifer is hydraulically confined and first encountered at an elevation of approximately 425 ft., amsl at the northeast end (at MW-7), and 388 ft. amsl at the west end of the Unit (at MW-9).

Groundwater elevation data collected in October 2019 are summarized on **Table 3** below. These data were utilized to construct a piezometric surface map illustrating groundwater flow conditions for the uppermost aquifer (see **Figure 3**). Flow direction beneath the Unit is to the southwest towards an unnamed tributary to Groves Creek located west-southwest of the impoundment.

Table 3. Reid/HMP&L Surface Impoundment – October 2019 Groundwater Elevation Data

Monitoring Well	Top of Casing Elevation (ft) [1]	Depth to Groundwater (ft)	Groundwater Elevation (ft, amsl)
MW-7	444.43	18.59	425.84
MW-8	394.29	5.20	389.09
MW-9	395.40	7.35	388.05
MW-10	422.27	33.28	388.99

1 Reference elevation of monitoring wells surveyed by Associated Engineers, Inc., Madisonville, Kentucky, January 2015. Survey coordinates were based on the Kentucky State Plane, Kentucky Southern Zone, NAD27 datum.

Slug tests were performed between April 24, 2019 and April 25, 2019 at monitoring wells MW-10, and MW-110 to assess the hydraulic characteristics of the uppermost aquifer. The estimated hydraulic conductivity of the monitoring wells tested ranged from 3×10^{-6} to 5×10^{-4} centimeters per second (cm/sec).

Although previous site-specific investigations have noted the presence of perched zones of saturation in the overlying unconsolidated materials, these discontinuous zones do not qualify as an uppermost aquifer under the CCR Rule because they do not produce usable quantities of groundwater.

2.3.4 Constituents of Concern

Current groundwater analytical data and statistical analysis indicate that the only COC detected at SSLs above its GWPS in groundwater at the Unit is lithium. Lithium has been detected at SSLs in the monitoring well MW-10 southwest of the Unit.

2.3.5 Impacted Media

Groundwater is the single impacted media of concern identified as requiring corrective measures at the Unit.

2.3.6 Distribution of COCs

Groundwater sampling was performed at the Unit most recently in April 2020. The additional lithium data collected during this event are summarized below in **Table 4**.

Table 4. Reid/HMP&L Surface Impoundment - April 2020 Lithium Analytical Results

Monitoring Well (Date)	Parameter
	Lithium GWPS 0.04 (mg/L)
MW-7	0.007
MW-8	0.03
MW-9	0.01
MW-10	0.49
MW-110	0.02

Figure 4 illustrates the distribution of COCs and other groundwater quality constituents in groundwater at the Unit. This distribution of COCs in groundwater suggests that impacts to groundwater likely originate as seepage from beneath the surface impoundment, however there is currently no feasible means of directly tracing that potential under the footprint of the Unit.

2.3.7 Potential Receptors/Exposure Pathways

Contact with water (e.g., shallow groundwater or surface water) impacted by COCs at levels above GWPS or Water Quality Criteria is regarded as the potential pathway for exposure of potential receptors. Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Unit, thus limiting the potential receptors to the surface water, i.e., the Green River and its tributary, Groves Creek. The pathways to these receptors include seepage of water from the Unit through manmade and natural hydraulic conduits.

Other potential exposure pathways (e.g., soil or vapor) are not considered complete as the CCR material is isolated in the Unit. This isolation prevents direct access by individuals that might result in direct contact or ingestion. In addition, the inherent non-volatile nature of the Unit-specific COCs eliminates the potential for a complete vapor pathway (i.e., vapor intrusion to indoor air).

2.4 Interim Corrective Measures

No interim corrective measures have been performed at the Unit for groundwater impacts.

2.5 Assessment of Corrective Measures Summary

In June 2019, BREC performed an ACM for the Unit to identify remedial alternatives to address groundwater impacts. Title 40 CFR Part 257.96(c) requires that the ACM include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
2) The time required to begin and complete the remedy; and
3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

As part of the groundwater ACM, several potential corrective measures technologies were evaluated to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented below in **Table 5**.

Table 5 – Potential Corrective Measures Options for Groundwater Impacts

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenants, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.

Potentially Applicable Technology	Status	Description/Overview
Groundwater Monitoring (Assessment and Detection modes)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a stand-alone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing off-site migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations may increase implementation difficulty with scale.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies any single technology may not be utilized.

Preliminary assembly of corrective measures alternatives was performed based on site-specific and regional geology and groundwater conditions. For the Reid/HMP&L Station Surface Impoundment, five corrective measures alternatives were developed from this list of applicable corrective measures technologies:

- Alternative #1 – No Action, and Groundwater Monitoring

- Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- Alternative #3 – CiP, ICs, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, and Groundwater Monitoring
- Alternative #4 – CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

The assembly of corrective measures alternatives presented in the ACM was considered preliminary and subject to revision following additional evaluation during the remedy selection process and/or following comment from the regulatory community and public. Further evaluation of the alternatives is discussed in the following sections.

3. Remedy Selection Progress

The ACM performed for the Unit in June 2019 identified a total of five (5) corrective measures alternatives to be carried forward into the remedy selection process. In December 2019, BREC provided a *Semi-annual Remedy Selection Progress Report* (AECOM, December 2019) as required under 40 CFR Part 257.97(a). As part of this submittal, two (2) corrective measures alternatives were eliminated from further consideration, including:

- Alternative #1 (No Action and Groundwater Monitoring) – This alternative does not control or remove COCs from the environment and therefore does not achieve the RAOs.
- Alternative #2b – (CbR, ICs, and Groundwater Monitoring) – Implementing a CbR approach is considered cost prohibitive. In addition, any CbR approach would require relocating waste to an existing disposal unit or construction of a new waste disposal unit, which does not align with the one of the fundamental goals of RCRA (conserving energy and natural resources).

Three (3) potential corrective measures alternatives have been identified by BREC as viable options to address lithium impacts in groundwater at the Unit, including:

- Alternative #2a: CiP, ICs, and Groundwater Monitoring
- Alternative #3: CiP, ICs, Hydraulic Containment, Ex-Situ Treatment, and Groundwater Monitoring
- Alternative #4: CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

Each of the remaining 3 corrective measures alternatives is discussed in more detail below.

3.1 Potential Corrective Action Alternatives

3.1.1 Alternative #2a – CiP, ICs, and Groundwater Monitoring

Alternative #2a as currently envisioned would employ a combination of three corrective measures technologies:

- CiP source control, which consists of planned Reid/HMP&L Surface Impoundment closure activities;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater monitoring (Assessment) to document the effectiveness of the corrective measures.

Alternative #2a is recommended for further evaluation.

3.1.2 Alternative #3 – CiP, ICs, Hydraulic Containment, Ex-Situ Treatment, and Groundwater Monitoring

Alternative #3 builds on Alternative #2a to also include the addition of Hydraulic Containment and Ex-Situ Treatment of groundwater:

- CiP source control, which consists of planned Surface Impoundment closure activities;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes;
- Hydraulic Containment using one or more vertical wells designed to prevent the movement of impacted groundwater past the limits of the unit to the downgradient groundwater environment and potential points of exposure;

- Ex-Situ Treatment of groundwater extracted for hydraulic containment, which involves above-ground physical/chemical treatment methods and/or permitted discharge until the CAOs are achieved;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater Monitoring (Assessment mode) to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection-mode monitoring and ultimately to cessation of corrective measures.

Alternative #3 is recommended for further evaluation.

3.1.3 Alternative #4 – CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

Alternative #4 consists of BREC's planned unit closure activities, physical containment of impacted groundwater via installation of a funnel-gate system, and ex-situ treatment of contained groundwater via an extraction well installed at the containment gate. Impacted groundwater would be contained by grout curtain constructed in a funnel-and-gate arrangement that directs the flow of groundwater to an extraction point. The grout curtain would be installed by drilling two lines of grout injection points that extend northwestward and northeastward from the southeast corner of the unit. The length of each limb of the barrier would be 500 feet, and the target depth would be approximately 325 ft-amsl. A single extraction well would be installed at the "gate" with a screened interval of 50 to 100 ft-bgs and a pumping capacity of up to 20 gpm. Groundwater will be pumped and conveyed to an existing surface water impoundment at the Sebree Station, which will allow for compliance with discharge permits through an established NPDES outfall.

CiP via ash stabilization and capping would control the source of COCs and thereby reduce contaminant loading to the extraction system. Concentrations downgradient of the physical barrier would be expected to decrease over time through several natural attenuation mechanisms including advection, dilution, and dispersion. Groundwater Monitoring (Assessment) would continue to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection monitoring and ultimately closure.

Alternative #4 is recommended for further evaluation.

3.2 Remedy Evaluation

Currently BREC considers the (3) potential corrective action alternatives as viable options to address groundwater impacts at the Unit, including:

- Alternative #2a;
- Alternative #3; and
- Alternative #4

To evaluate each alternative, additional data collection will likely be required. BREC is currently evaluating data collection needs in the following areas to assist with remedy selection:

1) Nature and Extent – groundwater trends, influence of non-groundwater remedies, etc.
2) Physical Characteristics – available data on the physical characteristics of the landfill and retention pond
3) Performance Modeling – data needed to develop digital models demonstrating the effectiveness of potential alternatives
4) Engineering – feasibility, cost estimates, etc.

BREC is working to establish a comprehensive list of data collection needs to proceed forward with remedy evaluation and anticipates providing additional data in future semi-annual remedy selection progress reports.

3.3 Public Meeting

At the beginning of 2020, BREC had initiated preparation to conduct a public meeting to discuss the results of the Groundwater ACM as required by 40 CFR 257.96(e). However, due to the onset of the COVID-19 pandemic, BREC has been prevented from holding the public meeting so far in 2020. BREC plans to hold a public meeting once the mass gathering restrictions related to COVID-19 are lifted in Kentucky.

4. Conclusion

Additional updates regarding remedy selection, including any additional corrective measures being considered, will be presented twice a year in future remedy selection progress reports. Once sufficient data has been collected to select an effective comprehensive remedy for the Unit, a public meeting will be held 30 days prior to formal remedy selection, followed by a detailed Remedy Selection Report describing the remedy and proposed schedule for implementation.

If needed, the next remedy selection progress report for the Unit is expected in December 2020.

5. References

AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Sebree Generating Station, Webster County, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Sebree Generating Station, Webster County, Kentucky.

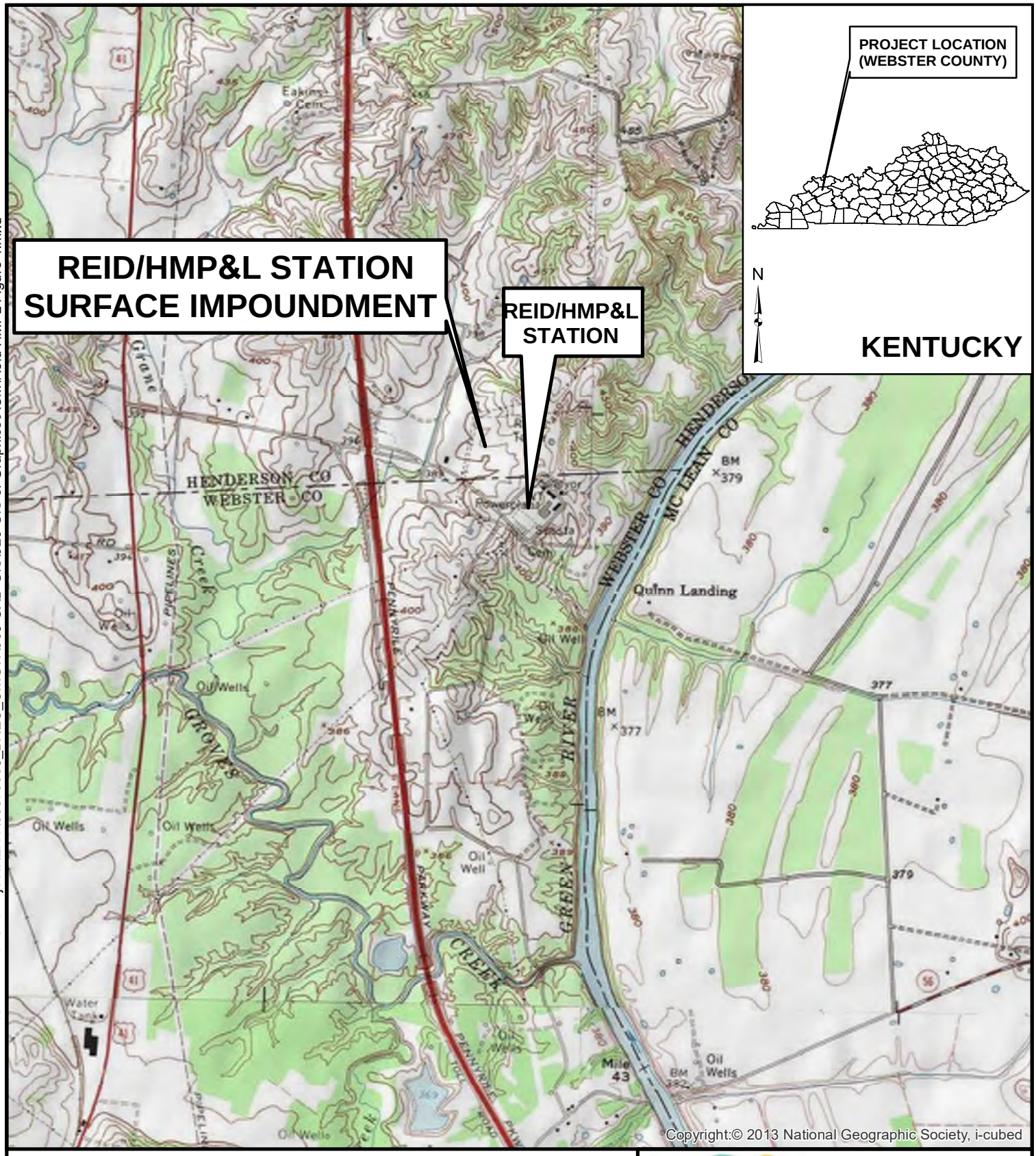
AECOM, 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report, Sebree Generating Station, Henderson and Webster Counties Kentucky.

Associated Engineers 2016. Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan.

EPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

Fairer, G.M., Geologic Map of the Robards Quadrangle, Henderson and Webster Counties, Kentucky, U.S. Geological Survey, 1973.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

N

Big Rivers ELECTRIC CORPORATION

Reid/HMPL Station
Webster County, Kentucky

FIGURE 1
SITE LOCATION MAP

DATE: 4/30/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60602365	

Document Path: G:\Cincinnati\DCS\Projects\ENV\60579939_BREC_RedGW\900-CAD-GIS\920-GIS or Graphics\Reid_HMPL_Ch_Rpt_Fig2.mxd

Legend

- Unit Boundary
- Property Line
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well

0 300 600

Feet

N

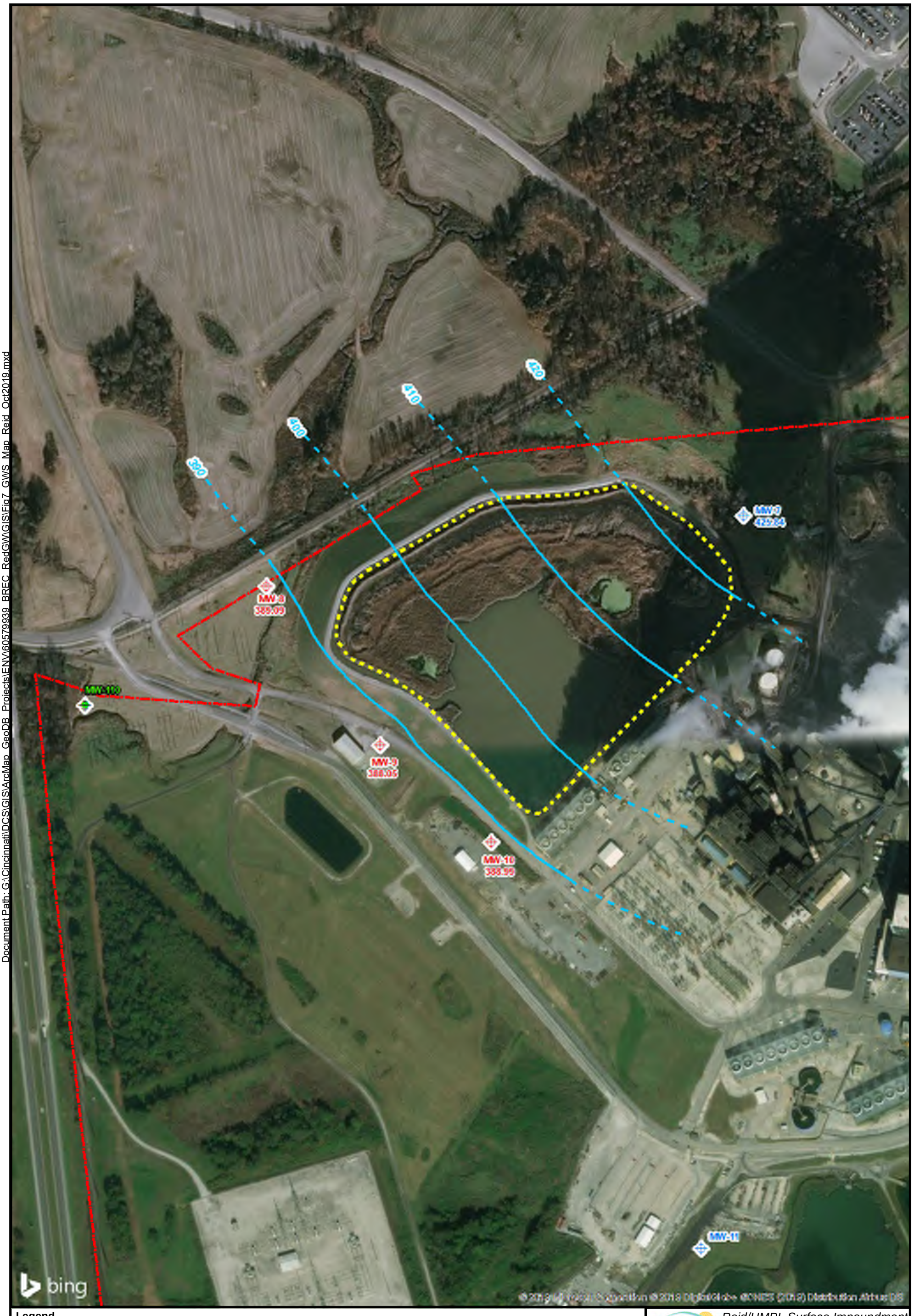
BigRivers

Reid/HMPL Station
Webster County, Kentucky

FIGURE 2
WELL LOCATION MAP

DATE: 12/9/2019	SCALE: 1IN = 200 FEET
CREATED BY: ALW	
JOB NO. 60602365	

Document Path: G:\Cincinnati\DCS\GIS\ArcMap_GeoDB_Projects\ENV\60579939_BREC_RedGW\GIS\Fig7_GWS_Map_Reid_Oct2019.mxd



Legend

- Proposed Assessment Well
- Downgradient Monitoring Well
- Upgradient Monitoring Well
- Unit Boundary
- Property Line
- Water Table Contour (Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 389.09 Groundwater Elevation (Feet, MSL) Measured October 16, 2019

0 300 600
Feet

N

Big Rivers

Reid/HMPL Surface Impoundment
Webster County, Kentucky

FIGURE 3
GROUNDWATER SURFACE MAP
OCTOBER 2019

DATE: 12/11/2019	SCALE: 1IN = 200 FEET
CREATED BY: BAW	
JOB NO. 60579939	

Document Path: G:\Cincinnati\DCS\Projects\ENV\60579939 BREC RedGW\900-CAD-GIS\920-GIS or Graphics\Fig6 GW Mon Reid.mxd

MW-8

APPENDIX III	GWPS	5/2/2019	10/17/2019	4/16/2020
Boron	NA	1.41	1.49	1.56
Calcium	NA	272	267	292
Chloride	NA	57.2	49.5	47.3
Fluoride	4	0.370	0.4	0.4
Sulfate	NA	1220	1240	1130
pH (SU)	NA	7.25	7.92	6.78
Total Dissolved Solids	NA	2090	2200	1930
APPENDIX IV				
Antimony	0.006	0.000205	<0.005	<0.005
Arsenic	0.01	0.000438	<0.0010	<0.0010
Barium	2	0.0188	0.016	0.017
Beryllium	0.004	<0.000102	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00320	<0.0020	<0.0020
Cobalt	0.006	0.000141	<0.004	<0.004
Fluoride	4	0.370	0.4	0.4
Lead	0.015	0.000104	<0.002	<0.002
Lithium	0.040	0.0370	0.03	0.03
Mercury	0.002	<0.101	<0.0005	<0.0005
Molybdenum	0.1	0.0146	0.01	0.01
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	1.43	2.504	1.93
Selenium	0.05	0.000634	<0.003	<0.003
Thallium	0.002	0.0000470	<0.0020	<0.0020

MW-9

APPENDIX III	GWPS	5/2/2019	10/17/2019	4/16/2020
Boron	NA	0.307	<1.00	0.32
Calcium	NA	68.6	66.8	71.2
Chloride	NA	21.8	17.6	22.8
Fluoride	4	0.223	0.2	0.3
Sulfate	NA	0.223	<1	<1
pH (SU)	NA	7.41	7.67	7.04
Total Dissolved Solids	NA	355	392	320
APPENDIX IV				
Antimony	0.006	0.000192	<0.005	<0.005
Arsenic	0.01	0.000563	<0.0010	<0.0010
Barium	2	1.03	0.763	1.06
Beryllium	0.004	<0.000102	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00316	<0.0020	<0.0020
Cobalt	0.006	0.0000550	<0.004	<0.004
Fluoride	4	0.223	0.2	0.3
Lead	0.015	0.0000760	<0.002	<0.002
Lithium	0.040	0.0141	0.009	0.01
Mercury	0.002	<0.101	<0.0005	<0.0005
Molybdenum	0.1	<0.000873	<0.01	<0.01
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	2.32	2.32	2.90
Selenium	0.05	<0.000348	<0.003	<0.003
Thallium	0.002	<0.0000360	<0.0020	<0.0020

MW-7

APPENDIX III	GWPS	5/2/2019	10/16/2019	4/16/2020
Boron	NA	0.309	<1.00	0.34
Calcium	NA	46.1	44.4	45.7
Chloride	NA	4.94	4.7	4.1
Fluoride	4	0.255	0.3	0.3
Sulfate	NA	16.8	19	15
pH (SU)	NA	7.46	7.65	6.86
Total Dissolved Solids	NA	271	228	1930
APPENDIX IV				
Antimony	0.006	0.0000760	<0.005	<0.005
Arsenic	0.01	0.00116	0.0014	0.0025
Barium	2	0.0824	0.062	0.087
Beryllium	0.004	<0.000102	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00136	<0.0020	<0.0020
Cobalt	0.006	0.000158	<0.004	<0.004
Fluoride	4	0.255	0.3	0.3
Lead	0.015	0.0000730	<0.002	<0.002
Lithium	0.040	<0.00959	0.008	0.007
Mercury	0.002	<0.101	<0.0005	<0.0005
Molybdenum	0.1	0.00442	0.01	0.006
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	0.698	0.444	1.833
Selenium	0.05	<0.000348	<0.003	<0.003
Thallium	0.002	<0.0000360	<0.0020	<0.0020

MW-110

APPENDIX III	GWPS	3/29/2019	4/10/2019	10/24/2019	4/17/2020
Boron	NA	0.484	0.496	<1.00	0.54
Calcium	NA	176	178	204	181
Chloride	NA	26.0	30.4	30.0	22.1
Fluoride	4	0.279	0.255	0.3	0.3
Sulfate	NA	563	596	568	460
pH (SU)	NA	7.25	7.50	7.33	7.17
Total Dissolved Solids	NA	1170	1200	1270	1150
APPENDIX IV					
Antimony	0.006	0.000240	0.000204	<0.005	<0.005
Arsenic	0.01	0.00534	0.00238	<0.0010	0.0012
Barium	2	0.118	0.107	0.065	0.065
Beryllium	0.004	0.000716	0.000314	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.0180	0.0115	0.0010	0.0047
Cobalt	0.006	**0.00911**	0.00384	<0.004	<0.004
Fluoride	4	0.279	0.255	0.3	0.3
Lead	0.015	0.00661	0.00399	<0.002	0.002
Lithium	0.040	0.0299	0.0303	0.02	0.02
Mercury	0.002	<0.101	<0.101	<0.0005	0.0002
Molybdenum	0.1	0.00153	0.00120	<0.01	<0.01
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	1.84	1.93	0.922	1.371
Selenium	0.05	<0.000348	<0.000348	<0.003	<0.003
Thallium	0.002	0.000112	0.0000640	<0.0020	<0.0020

MW-10

APPENDIX III	GWPS	5/2/2019	10/17/2019	4/16/2020
Boron	NA	0.498	<1.00	0.54
Calcium	NA	19.5	9.76	12.5
Chloride	NA	26.6	25.7	21.5
Fluoride	4	0.570	0.6	0.5
Sulfate	NA	114	80	58
pH (SU)	NA	9.15	9.24	8.87
Total Dissolved Solids	NA	642	568	466
APPENDIX IV				
Antimony	0.006	0.0000580	<0.005	<0.005
Arsenic	0.01	0.00254	0.0022	0.0019
Barium	2	0.100	0.077	0.093
Beryllium	0.004	<0.000102	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00299	0.0006	<0.0020
Cobalt	0.006	0.000685	<0.004	<0.004
Fluoride	4	0.570	0.6	0.5
Lead	0.015	0.000671	<0.002	<0.002
Lithium	0.040	**0.574**	**0.51**	**0.49**
Mercury	0.002	<0.101	0.0002	0.0002
Molybdenum	0.1	0.00797	0.007	0.006
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	0.205	0.837	1.24
Selenium	0.05	<0.000348	<0.003	<0.003
Thallium	0.002	<0.0000360	<0.0020	<0.0020

MW-8 MW-9 MW-7 MW-110 MW-10 MW-11

bing

Legend

- Unit Boundary
- Property Line
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Proposed Characterization Well

All results listed in milligrams per liter (mg/L) unless otherwise noted.
Yellow highlighted values indicate GWPS exceedance.
Orange highlighted analyte indicate SSL above GWPS.
SSL = Statistically Significant Level
GWPS = Groundwater Protection Standard
NA = Not Applicable
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter

0 300 600
Feet

N

Big Rivers

Reid/HMPL Surface Impoundment
Webster County, Kentucky

FIGURE 4
GROUNDWATER CONDITIONS MAP
2019-2020 ANALYTICAL RESULTS

DATE: 6/10/2020	SCALE: 1IN = 200 FEET
CREATED BY: SEL	
JOB NO. 60619822	

AECOM
525 Vine Street
Cincinnati, OH 45202
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Semi-Annual Remedy Selection Progress Report

Green Landfill
Sebree Station
Webster County, Kentucky

Prepared for:

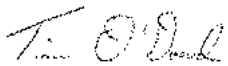
Big Rivers Electric Corporation
Sebree Generating Station
9000 Highway 2096
Robards, KY 42452

Prepared by:

AECOM Technical Services
525 Vine Street, Suite 1800
Cincinnati, Ohio 45202

June 8, 2020

Quality information

Prepared by	Checked by	Verified by	Approved by
			
Timothy P. O'Dowd, PG	Dennis P. Connair, PG	Joseph B. Suhre	Dennis P. Connair, PG
Project Manager	Principal Geologist	Principal Engineer	Principal Geologist

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	6-4-20				
2	6-8-20				

Distribution List

# Hard Copies	PDF Required	Association / Company Name
	1	Big Rivers Electric Corporation

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Figures

Tables

1. Introduction

In accordance with provisions of the United States Environmental Protection Agency's (USEPA) coal combustion residual (CCR) rule, Title 40 of the Code of Federal Regulations (CFR) Part 257.97, Big Rivers Electric Cooperation (BREC) is in the process of selecting a remedy for groundwater impacts at the Green Station CCR Landfill (the Unit) at the Sebree Generating Station located in Webster County, Robards, Kentucky **(Figure 1)**.

Assessment monitoring results indicate the presence of lithium at a Statistically Significant Level (SSL) above the Ground Water Protection Standard (GWPS) in four monitoring wells (MW-3A, MW-4, MW-5, and MW-6) at the Unit. A map illustrating the site with location of all program monitoring wells is presented as **Figure 2**.

In response to the SSL exceedance, BREC evaluated the nature and extent of groundwater impacts as required by Title 40 CFR Part 257.95(g) for characterization monitoring. In addition, BREC performed an Assessment of Corrective Measures (ACM), to identify applicable remedial technologies to address lithium impacts in groundwater pursuant to Tile 40 CFR Part 257.96. A notice of ACM initiation dated January 14, 2019 was posted to BREC's publicly-accessible CCR reporting website. A report summarizing the results of the ACM (AECOM, June 2019) was posted to BREC's publicly-accessible CCR reporting website on June 14, 2019.

Title 40 CFR Part 257.97(a) requires that progress reports be prepared on a semi-annual basis describing progress made in selecting and designing a remedy. The first semi-annual *Remedy Selection Progress Report* (AECOM, December 2019) was posted to BREC's publicly-accessible CCR reporting website on December 9, 2019. In alignment with the CCR rule requirement, the following sections included within this semi-annual progress report provide an overview of BREC's activities previously performed, currently underway, and planned in the future to select a remedy that meets the requirement of Title 40 CFR Section 257.97 (b) as follows:

(1) Be protective of human health and the environment;

(2) Attain the GWPS as specified pursuant to Section 257.95(h);

(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment;

(4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;

(5) Comply with standards for management of wastes as specified in Section 257.98(d).

2. Site Background

2.1 Site Description

BREC owns and operates Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/Henderson Municipal Power & Light (HMP&L) Station. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (see **Figure 1**). Reid Unit 1 (66 Megawatts [MW]) began commercial operation in 1966 and is scheduled to be retired in 2020 pending regulatory approval from the Kentucky Public Service Commission and Rural Utilities Service. The Reid Combustion Turbine (72 MW) was commercialized in 1976. HMP&L Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974 respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (250 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Green Landfill is illustrated on **Figure 1**. The Green Landfill is located directly south of Sebree Station, situated south of the Green Station CCR Surface Impoundment. The Green Landfill is a Kentucky permitted landfill (Permit No. SW11700007) that currently receives special waste generated by burning coal (CCRs) from Green Stations. The Reid and HMP&L stations historically disposed special waste in the Green Landfill. The landfill began receiving CCR wastes in 1980. The current Green Landfill footprint is approximately 170 acres.

As stated in the published CCR monitoring well network certification, available on the BREC website (http://www.bigrivers.com/), the original ground surface within the landfill footprint was irregular and the dominant features were small stream valleys draining towards the Green River, which is located just east of the landfill; and towards Groves Creek, which is located just south of the landfill. There was also historic oil and gas production at and in the immediate vicinity of the Green Landfill. A review of the records from the Kentucky Geological Survey (KGS) showed that at or immediately adjacent to the Site, there were a number of dry exploratory oil/gas exploration holes, oil production wells, one gas production well, and one secondary recovery injection well. There were also former brine ponds at the Site. Most of these wells were abandoned in accordance with applicable regulations by BREC in 1997 and 1998. The last existing oil well was decommissioned in 2019.

2.2 Groundwater Investigation Summary

Monitoring wells were installed at the Unit beginning in November 1996 prior to the implementation of the CCR Rule. However, the existing wells meet the requirements of Title 40 CFR Section 257.90 of the CCR Rule for installation of a groundwater monitoring system. These regulations require that monitoring wells adequately represent the quality of background groundwater and groundwater representing the downgradient waste boundary. The existing wells are located along the perimeter of the landfill footprint. One upgradient monitoring well (MW-1) and five downgradient monitoring wells (MW-2, MW-3A, MW-4, MW-5 and MW-6) were installed at the Unit to determine the general direction of groundwater movement and to monitor groundwater impacts. One additional characterization monitoring well (MW-104) was installed downgradient of the Unit in 2018. All monitoring wells were installed in the uppermost saturated portion of the sandstone bedrock aquifer. A map illustrating the location of all program monitoring wells is presented as **Figure 2**.

Nine rounds of Baseline groundwater sampling for Appendix III constituents were conducted between March 2016 and October 2017. Statistical evaluation for Detection monitoring indicated that statistically significant increases (SSIs) over background had occurred, and therefore, Assessment monitoring was triggered. Detection monitoring activities and data are presented in the annual reports that have been prepared to date, (AECOM 2018, 2019, and 2020).

As part of Assessment monitoring, upgradient and downgradient wells for the Unit were sampled for Appendix IV constituents in June, July, and September 2018. GWPSs were established for the Appendix

IV constituents occurring at SSIs (lithium only), and statistical evaluation of the lithium concentrations indicated exceedances of GWPSs at SSLs, as detailed in **Table 1** below.

Table 1. Green Landfill Constituents of Concern

Monitoring Well (Date)	Parameter Lithium GWPS 0.04 (mg/L)
MW-3A (Jun 2018)	**0.699**
MW-3A (Jul 2018)	**0.790**
MW-3A (Sep 2018)	**0.766**
MW-4 (Jun 2018)	**1.81**
MW-4 (Jul 2018)	**1.91**
MW-4(Sep 2018)	**1.81**
MW-5(Jun 2018)	**0.459**
MW-5 (Jul 2018)	**0.481**
MW-5 (Sep 2018)	**0.425**
MW-6 (Jun 2018)	**0.0650**
MW-6 (Jul 2018)	**0.0590**
MW-6 (Sep 2018)	**0.0558**

GWPSs are the greater of the site-specific background concentrations, the USEPA primary drinking water standard maximum contaminant limits (MCL), or GWPS provided in 40 CFR 257.95(3)(h)(2)

An additional characterization well, MW-104, was subsequently installed to estimate the downgradient extent of impacted groundwater. Sample collection from MW-104 for Appendix III and IV parameters took place in March and April 2019. The analytical results for lithium were below the GWPS. The additional characterization data are summarized in **Table 2** below.

Table 2. Green Landfill -2019 Characterization Sample Results

Monitoring Well (Date)	Parameter
	Lithium GWPS 0.04 [a] (mg/L)
MW-104 (March 2019)	0.0281
MW-104 (April 2019)	0.0288

a The Upper Prediction Limit for lithium was calculated as 0.008 mg/L.

The results from both characterization sampling events helped to confirm the downgradient (southwestern) extent of constituent of concern (COC) impacts above GWPS at the Unit. However, it should be stated that downgradient characterization is limited due to the presence of the Green River immediately adjacent to the Unit.

Semi-annual Assessment monitoring continued at the Unit in 2019 and 2020 in accordance with 40 CFR 257.95.

2.3 Conceptual Site Model

Development and refinement of a Conceptual Site Model (CSM) is necessary to support remedy selection for the Unit. A CSM is based on a set of working hypotheses regarding how contaminants of concern (COCs) entered the environment at a site, how they were and continue to be transported to various media, what the potential routes of exposure are, and who may be exposed, including both human and ecological receptors. As such, the CSM is a "living" model. As new data become available or site conditions change, a CSM should be evaluated and updated as necessary.

The CSM for the Unit was first provided in the June 2019 ACM for the Unit (AECOM 2019). The CSM presents the physical setting of the Unit (adjacent to the Green River), the unconsolidated and bedrock geologic strata underlying the Unit, the occurrence and movement of groundwater, the distribution of COCs in groundwater, and the potential receptors (or lack thereof) for impacted groundwater. These elements are described in detail below and have been updated with new information for this report as appropriate.

2.3.1 Physical Setting

The Unit is located within the Interior Low Plateaus physiographic province. The province is part of the Interior Plains division of the United States. Characteristic features of the province include unglaciated rolling limestone plains with alluvial valleys and entrenched rivers and streams. Several large rivers are in the region, including the Green, Ohio, Kentucky, Tennessee, and the Cumberland Rivers. The geology underlying the Unit consists of unconsolidated materials, including loess and alluvial deposits, underlain by Upper to Middle Pennsylvanian-age clastic and carbonate bedrock consisting primarily of sandstone and shale. The unconsolidated materials also include fill, silty and clayey residuum, and minor amounts of sandy, clayey channel fill alluvium.

The Unit is located on an upland adjacent to the west bank of the Green River at an elevation of approximately 436 feet, above mean sea level [ft., amsl] (at the north end of the landfill) and 397 ft., amsl (at the south end of the landfill), with a maximum elevation of 608 ft., amsl at the landfill crest. Precipitation falling within the Green Landfill is directed to ponds on the north and south sides of the Unit and then to the river under Kentucky Pollution Discharge and Elimination System (KPDES) permit No. KY0001929. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands (Associated Engineers 2016, Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan).

2.3.2 Geology

The Unit lies in the Western Kentucky Coalfields section, characterized by rolling uplands underlain by coal-bearing bedrock of the Pennsylvanian Period. Near the Unit, maximum topographic relief is on the order of 80 feet. The geologic quadrangle (Geologic map of the Robards quadrangle, Henderson and Webster Counties, Kentucky, 1973) for the area published by the Kentucky Geologic Survey (KGS) shows the surficial material in portions of the western half of the Unit to be unconsolidated loess representing the Pleistocene geologic epoch. The loess consists of sandy and clayey silt. Underlying the loess deposits and exposed at the surface on the eastern half of the Unit are broadly distributed Pleistocene and Holocene alluvium deposits consisting of intermixed and interlensing clay, silt, sand, and gravel. In close proximity to the Unit, the alluvium is generally a low permeability unit that forms terraces along the Green River at elevations of roughly 380 and 395 ft., amsl. The unconsolidated surficial materials range from approximately 10 feet (MW-5) to 52 feet (MW-104) in thickness surrounding the Unit. **Figure 3** provides an excerpt from the geologic quadrangle for the immediate area surrounding the Unit.

The unconsolidated materials are underlain by bedrock of the Upper Pennsylvanian Shelburn Formation [formerly identified as the Lisman Formation (Fairer, 1973)] and the Middle Pennsylvanian Carbondale Formation. At the base of the Shelburn Formation is the Providence Limestone Member, consisting of two distinct limestone beds separated by a sandy shale. The member is exposed in a streambed near the

northwest corner of the Unit but is absent beneath much of the Unit footprint due to erosional channeling. The underlying Carbondale Formation consists of cyclic sequences of sandstones, shales, siltstones and coals. The Carbondale sediments were deposited in a fluvial-deltaic system. As a result of this depositional environment, the lithologic units of the Carbondale tend to be lenticular bodies rather than continuous sheet-like strata. Gradational and abrupt horizontal changes in lithology are often encountered.

2.3.3 Groundwater Hydrogeology

For purposes of compliance with the CCR Rule groundwater monitoring requirements, the interbedded sandstone and shale of the Carbondale Formation is considered the uppermost aquifer underlying the Unit. The uppermost aquifer is hydraulically confined and first encountered at an elevation of approximately 401 ft., amsl at the northwest end of the landfill, and 367 ft., amsl at the southeast end of the landfill (AECOM, 2019).

Groundwater elevation data collected in April 2020 are summarized on **Table 3** below. These data were utilized to construct a piezometric surface map illustrating groundwater flow conditions for the uppermost aquifer (see **Figure 3**). Overall groundwater flow beneath the footprint of the Unit is to the east towards the Green River and south-southeast towards Groves Creek.

Table 3. Green Landfill -April 2020 Groundwater Elevation Data

Monitoring Well	Top of Casing Elevation (ft) [1]	Depth to Groundwater (ft)	Groundwater Elevation (ft, amsl)
MW-1	423.23	19.52	403.71
MW-2	392.37	16.24	376.13
MW-3A	386.48	12.08	374.40
MW-4	391.33	17.90	373.43
MW-5	390.18	17.62	372.56
MW-6	388.17	15.62	372.55
MW-12 [2]	395.54	22.15	373.39

1 Reference elevation of monitoring wells surveyed by Fuller, Mossbarger, Scott and May, Civil Engineers, Inc., Lexington, Kentucky, December 1996, December 1999. Survey coordinates were based on the Kentucky State Plane, Kentucky Southern Zone, NAD27 datum.
2. MW-12 is utilized for collection of piezometric data only and is not part of the CCR monitoring well network for the Green Landfill.

Slug tests were performed on April 25, 2019 at monitoring wells MW-3A, MW-4, MW-6, and MW-104 to assess the hydraulic characteristics of the uppermost aquifer. The estimated hydraulic conductivity of the monitoring wells tested ranged from 2×10^{-5} to 3×10^{-3} centimeters per second (cm/sec).

Although previous site-specific investigations have noted the presence of perched zones of saturation in the overlying unconsolidated materials, these discontinuous zones do not qualify as an uppermost aquifer under the CCR Rule because they do not produce usable quantities of groundwater.

2.3.4 Constituents of Concern

Current groundwater analytical data and statistical analysis indicate that the only COC detected at SSLs above its GWPS in groundwater at the Unit is lithium. Lithium has been detected at SSLs in the wells MW-4, MW-5, and MW-6 surrounding the South Pond and in MW-3A located north (downstream on the Green River) of MW-4.

2.3.5 Impacted Media

Both groundwater and surface water have been identified as impacted media of concern requiring corrective measures at the Unit.

2.3.6 Distribution of COCs

Groundwater sampling was performed at the Unit most recently in April 2020. The additional lithium data collected during this event are summarized below in **Table 4**.

Table 4. Green Landfill - April 2020 Lithium Analytical Results

Monitoring Well (Date)	Parameter
	Lithium GWPS 0.04 (mg/L)
MW-1	0.03
MW-2	0.007
MW-3A	0.68
MW-4	0.82
MW-5	0.38
MW-6	0.05

Figure 4 illustrates the distribution of COCs and other groundwater quality constituents in groundwater at the Unit. This distribution of COCs in groundwater suggests that impacts to groundwater likely originate from two primary source area. Impacts observed at MW-4, MW-5 and MW-6 likely originated as infiltration from the South Pond where storm water and landfill seepage accumulate on the south side of the landfill before being pumped to the Green Surface Impoundment. Data from characterization well MW-104 indicate that MW-3A may be effectively separated from the South Pond by a buried valley in the bedrock aquifer where groundwater does not appear to be impacted. This suggests that the impact observed at MW-3A may have instead originated from a different source, potentially from localized landfill seepage, which is now captured by the Deep Seep Collection Trench (see Section 2.4). It is possible that the MW-3A impact originates from the western end of the South Pond, but there is currently no feasible means of directly tracing that potential under the footprint of the landfill. It is, however, possible to evaluate this potential by monitoring MW-3A over time after the South Pond is rehabilitated as is currently planned. Ongoing monitoring of MW-3A also has the potential to demonstrate whether the landfill seepage intercepted by the Deep Seep Collection Trench is the source of impact.

2.3.7 Potential Receptors/Exposure Pathways

Contact with water (e.g., shallow groundwater or surface water) impacted by COCs at levels above GWPS or Water Quality Criteria is regarded as the potential pathway for exposure of potential receptors. Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Unit, thus limiting the potential receptors to the surface water, i.e., the Green River and its tributary, Groves Creek. The pathways to these receptors include seepage of water from the Unit through manmade and natural hydraulic conduits.

Other potential exposure pathways (e.g., soil or vapor) are not considered complete as the CCR material is isolated in the Unit. This isolation prevents direct access by individuals that might result in direct contact or ingestion. In addition, the inherent non-volatile nature of the Unit-specific COCs eliminates the potential for a complete vapor pathway (i.e., vapor intrusion to indoor air).

2.4 Interim Corrective Measures

In September and October 2019 BREC initiated design and construction of two containment systems intended as an interim corrective measure to reduce and prevent non-groundwater releases at the Unit from reaching the Green River. The containment systems are identified as the Deep Seep Collection Trench (also known as the Eastern Collection Trench) and the Northwest Seep Collection Trench.

No formal interim corrective measures have been performed at the Green Landfill to address groundwater impacts. However, the interim corrective measures for known non-groundwater releases completed at the Unit are expected to benefit corrective action for groundwater impacts. The compatibility of those corrective measures with potential groundwater remedies is currently being evaluated as part of the Unit's assessment monitoring and will continued to be evaluated in the future as part of systematic performance reviews (see Section 5.2).

2.4.1 Deep Seep Collection Trench

BREC began construction of the Deep Seep Collection Trench on October 7, 2019. The installation of four partially overlapping trenches and an individual sump was completed on November 11, 2019. This completion allowed removal of collected seepage using temporary pumping and piping until the permanent system components were completed. The system became fully operational on May 29, 2020.

The Deep Seep Collection Trench is located on the eastern side of the landfill, adjacent to the Green River. This collection system consists of 1,065 lineal feet of perforated (HDPE) pipe and four (4) stainless steel sumps. The HDPE perforated pipe is surrounded by a washed river gravel, with profiles set at a 0.5% slope toward the associated pumping (sump) station. Each section of HDPE pipe overlaps at the sump interconnection to prevent seepage bypass and to ensure all deep seeps are properly captured. Each sump was set at an elevation of 352 ft., amsl.

Liquids collected within the Deep Seep Collection Trench are conveyed to a series of pumping stations/ponds that eventually discharge to the plant's main KPDES Outfall (#001).

2.4.2 Northwest Seep Collection Trench

BREC began construction of the Northwest Seep Collection Trench on September 3, 2019. The construction of the collection trench was completed on January 22, 2020. The system is located in the northwest corner of the landfill and consists of 357 lineal feet of HDPE perforated pipe within the primary collection trench installed at an elevation of 391.4 ft, amsl. The HDPE perforated pipe is surrounded by a washed river gravel, with profiles set at a 0.5% slope toward the associated pumping (sump) station. Since the installation of the primary trench, BREC has installed two relay stations to ensure all possible seeps are captured and pumped to a permitted KPDES outfall. The Northwest Seep Collection Trench is configured to pump the incoming flow to a target manhole, which is located on the northeast corner of the landfill. The target manhole subsequently discharges to KPDES permitted outfall #009.

2.5 Assessment of Corrective Measures Summary

In June 2019, BREC performed an ACM for the Unit to identify remedial alternatives to address groundwater impacts. Title 40 CFR Section 257.96(c) requires that the ACM include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
2) The time required to begin and complete the remedy; and
3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

As part of the groundwater ACM, several potential corrective measures technologies were evaluated to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented below in **Table 5**.

Table 5 – Potential Corrective Measures Options for Groundwater Impacts

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established Corrective Action Objectives (CAOs).
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection mode)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a standalone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing offsite migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations increase implementation difficulty with scale.
Ex-situ Treatment (Physical, Chemical or Biological)	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.

Potentially Applicable Technology	Status	Description/Overview
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies any single technology may not be utilized.

Preliminary assembly of corrective measures alternatives was performed based on site-specific and regional geology and groundwater conditions. For the Unit, six corrective measures alternatives were developed from this list of applicable corrective measures technologies during the ACM screening process:

- Alternative #1 – No Action and Groundwater Monitoring
- Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- Alternative #3 – CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #4 – CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #5 – CiP, Other Source Control, ICs, and Groundwater Monitoring

The assembly of corrective measures alternatives presented in the ACM was considered preliminary and subject to revision following additional evaluation during the remedy selection process and/or following comment from the regulatory community and public. Further evaluation of the alternatives is discussed in the following sections.

3. Remedy Selection Progress

The groundwater ACM performed for the Unit in June 2019 identified a total of six (6) corrective measures alternatives to be carried forward into the remedy selection process. In December 2019, BREC provided a *Semi-annual Remedy Selection Progress Report* (AECOM, December 2019) as required under 40 CFR 257.97(a). As part of this submittal, two (2) corrective measures alternatives were eliminated from further consideration, including:

- Alternative #1 (No Action and Groundwater Monitoring) – This alternative does not control or remove COCs from the environment and therefore does not achieve the RAOs.
- Alternative #2b – (CbR, ICs, and Groundwater Monitoring) – Implementing a CbR approach is considered cost prohibitive. In addition, any CbR approach would require relocating waste to an existing disposal unit or construction of a new waste disposal unit, which does not align with the one of the fundamental goals of RCRA (conserving energy and natural resources).

Four (4) potential corrective measures alternatives have been identified by BREC as viable options to address lithium impacts in groundwater and non-groundwater releases at the Unit, including:

- Alternative #2a: CiP, ICs, and Groundwater Monitoring
- Alternative #3: CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #4: CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #5: CiP, Other Source Control, ICs, and Groundwater Monitoring

Each of the remaining 4 corrective measures alternatives is discussed in more detail below.

3.1 Potential Corrective Action Alternatives

3.1.1 Alternative #2a – CiP, ICs, and Groundwater Monitoring

Alternative #2a as currently envisioned would employ a combination of three corrective measures technologies:

- CiP source control, which consists of which consists of routine cover management during landfill operation, and planned closure activities for the Green Landfill;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater monitoring (Assessment) to document the effectiveness of the corrective measures.

Alternative #2a is recommended for further evaluation.

3.1.2 Alternative #3 – CiP, ICs, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, and Groundwater Monitoring

Alternative #3 as currently envisioned would build upon Alternative #2a to also include the addition of hydraulic containment, using vertical groundwater recovery wells, other source control (i.e., rehabilitation of the South Pond, and managing existing non-groundwater seeps), and ex-situ treatment of groundwater, which involves above-ground physical/chemical treatment methods and/or permitted discharge until CAOs are achieved.

Alternative #3 is recommended for further evaluation.

3.1.3 Alternative #4 – CiP, ICs, Physical Containment (Funnel-Gate), Permeable Reactive Barrier, and Groundwater Monitoring

Alternative #4 as currently envisioned would consist of CiP (BREC's planned unit closure activities), physical containment of impacted groundwater via installation of a grout curtain with an extraction well at the gate, and ex-situ treatment of extracted groundwater by physical/chemical treatment methods and/or permitted discharge.

Alternative #4 is recommended for further evaluation.

3.1.4 Alternative #5 – CiP, ICs, Other Source Control, and Groundwater Monitoring

Alternative #5 is similar to Alternative #2a except for the addition of other source control, in the form of draining and lining the South Pond and managing existing non-groundwater seeps.

Alternative #5 is recommended for further evaluation.

3.2 Remedy Evaluation

Currently BREC considers four (4) potential corrective action alternatives as viable options to address groundwater impacts at the Unit, including:

- Alternative #2a;
- Alternative #3;
- Alternative #4; and
- Alternative #5.

To evaluate each alternative, additional data collection will likely be required. BREC is currently evaluating data collection needs in the following areas to assist with remedy selection:

1) Nature and Extent – groundwater trends, influence of non-groundwater remedies, etc.
2) Physical Characteristics – available data on the physical characteristics of the landfill and retention pond
3) Performance Modeling – data needed to develop digital models demonstrating the effectiveness of potential alternatives
4) Engineering – feasibility, cost estimates, etc.

BREC is working to establish a comprehensive list of data collection needs to proceed forward with remedy evaluation and anticipates providing additional data in future semi-annual remedy selection progress reports.

In Fall 2019, BREC constructed a series of collection trenches around the perimeter of the Unit to address non-groundwater releases. The 2020 groundwater monitoring program will assist in evaluating the success of the non-groundwater release remedies and provide relevant and important information to be considered in the final groundwater remedy selection.

3.3 Public Meeting

At the beginning of 2020, BREC had initiated preparation to conduct a public meeting to discuss the results of the Groundwater ACM as required by 40 CFR 257.96(e). However, due to the onset of the COVID-19 pandemic, BREC has been prevented from holding the public meeting so far in 2020. BREC plans to hold a public meeting once the mass gathering restrictions related to COVID-19 are lifted in Kentucky.

4. Conclusion

Additional updates regarding remedy selection, including any additional corrective measures being considered, will be presented twice a year in future remedy selection progress reports. Once sufficient data has been collected to select an effective comprehensive remedy for the Unit, a public meeting will be held 30 days prior to formal remedy selection, followed by a detailed Remedy Selection Report describing the remedy and proposed schedule for implementation.

If needed, the next remedy selection progress report for the Unit is expected in December 2020.

5. References

AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Green Station CCR Landfill, Webster County, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Green Station CCR Landfill, Webster County, Kentucky.

AECOM, 2019. Assessment of Corrective Measures Under the CCR Rule; Green Station CCR Landfill, Green Station, Webster County, Kentucky.

AECOM, 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report, Sebree Generating Station, Henderson and Webster Counties Kentucky.

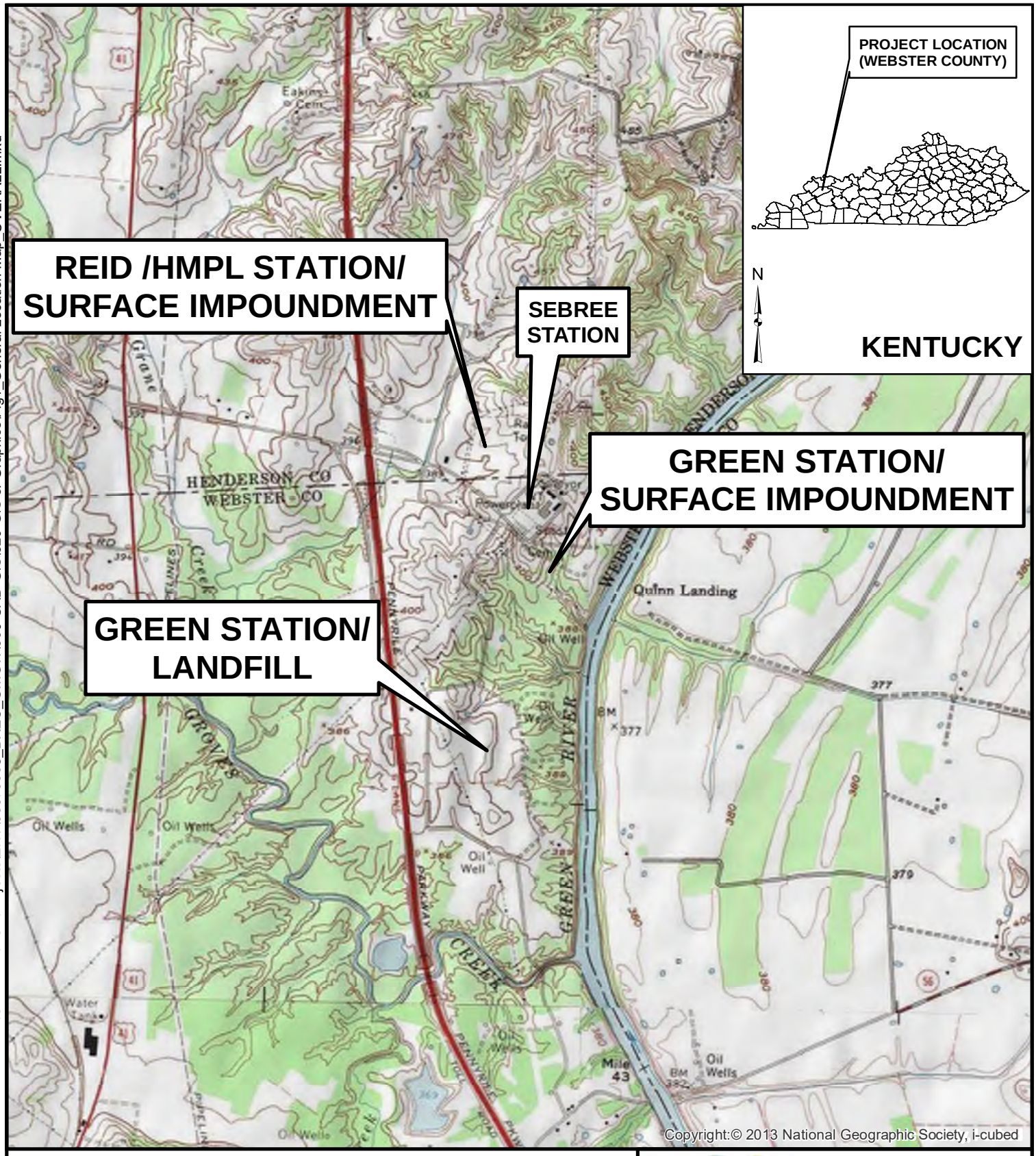
Associated Engineers 2016. Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan.

Fairer, G.M., Geologic Map of the Robards Quadrangle, Henderson and Webster Counties, Kentucky, U.S. Geological Survey, 1973.

USEPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

USEPA, 40 CFR Part 257. [EPA–HQ–OLEM–2017–0286; FRL–9973–31–OLEM]. RIN–2050–AG88. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Minimum Criteria (Phase One); Proposed Rule. Federal Register / Vol. 83, No. 51 / Thursday, March 15, 2018 / Proposed Rules.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

N

Big Rivers ELECTRIC CORPORATION

Sebree Station
Webster County, Kentucky

FIGURE 1
GENERAL LOCATION MAP

DATE: 1/8/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60579938	

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MW-1
MW-2
MW-3A
MW-104
MW-6
MW-5
MW-4
Green River
Groves Creek
bing
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Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well

0 400 800
Feet

N

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 2
WELL LOCATION MAP

DATE: 12/9/2019	SCALE: 1IN = 300 FEET
CREATED BY: ALW	
JOB NO. 60602364	

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MW-1
403.71

MW-12
373.39

MW-2
376.13

MW-3A
374.40

MW-4
373.43

MW-5
372.56

MW-6
372.55

400

395

390

385

380

375

375

Green River

Groves Creek

bing

Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Water Table Contour (Dashed where Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 373.43 Groundwater Elevation (Feet, MSL) Measured April 7, 2020
- NM - not measured

0 400 800
Feet

N

Big Rivers Electric Corporation

Green Station Landfill
Webster County, Kentucky

FIGURE 3
POTENTIOMETRIC SURFACE MAP
APRIL 7, 2020

DATE: 4/20/2020	SCALE: 1IN = 400 FEET
CREATED BY: TMJ	
JOB NO. 60579938	

MW-1				
APPENDIX III	**GWPS**	**4/22/2019**	**9/30/2019**	**4/6/2020**
Boron	NA	1.73	1.68	1.69
Calcium	NA	32.1	29.1	27.7
Chloride	NA	6.41	7.5	6.5
Fluoride	4	0.521	0.6	0.5
Sulfate	NA	35.1	19	21
pH (SU)	NA	7.87	7.79	7.50
Total Dissolved Solids	NA	568	444	488
APPENDIX IV				
Antimony	0.006	0.000254	<0.005	<0.005
Arsenic	0.01	0.00167	0.0005	0.0019
Barium	2	0.0862	0.091	0.087
Beryllium	0.004	0.000533	<0.0200	<0.0020
Cadmium	0.005	0.000299	<0.0010	<0.0010
Chromium	0.1	0.00354	<0.0020	0.0011
Cobalt	0.006	0.000571	<0.004	<0.004
Fluoride	4	0.521	0.6	0.5
Lead	0.015	0.000279	<0.002	<0.002
Lithium	0.040	0.0295	<0.20	0.03
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	0.00105	<0.01	<0.01
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.689	0.000	0.808
Selenium	0.05	0.00105	<0.003	<0.003
Thallium	0.002	0.000498	0.0001	0.0001

MW-2				
APPENDIX III	**GWPS**	**4/23/2019**	**10/1/2019**	**4/7/2020**
Boron	NA	0.101	<1.00	<0.10
Calcium	NA	156	166	145
Chloride	NA	144	108	120
Fluoride	4	0.193	0.3	0.2
Sulfate	NA	105	79	85
pH (SU)	NA	7.15	7.39	7.22
Total Dissolved Solids	NA	918	930	806
APPENDIX IV				
Antimony	0.006	0.0000670	<0.005	<0.005
Arsenic	0.01	0.00738	**0.0129**	0.0033
Barium	2	0.362	0.380	0.238
Beryllium	0.004	0.000281	<0.0200	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00122	<0.0020	<0.0020
Cobalt	0.006	0.00382	<0.004	<0.004
Fluoride	4	0.193	0.3	0.2
Lead	0.015	<0.0000675	<0.002	<0.002
Lithium	0.040	<0.00959	<0.20	0.007
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	0.00210	0.003	0.002
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.391	0.97	0.529
Selenium	0.05	<0.000348	<0.003	<0.003
Thallium	0.002	0.0000800	<0.0020	<0.0020

MW-3A				
APPENDIX III	**GWPS**	**4/23/2019**	**10/1/2019**	**4/7/2020**
Boron	NA	0.259	<1.00	0.26
Calcium	NA	411	490	425
Chloride	NA	1850	4570	3220
Fluoride	4	0.387	0.4	0.5
Sulfate	NA	1080	1680	1840
pH (SU)	NA	7.23	7.33	7.07
Total Dissolved Solids	NA	4250	6900	5860
APPENDIX IV				
Antimony	0.006	0.000102	<0.005	<0.005
Arsenic	0.01	0.000575	<0.0100	<0.0010
Barium	2	0.0474	0.051	0.042
Beryllium	0.004	0.000199	<0.0200	<0.0020
Cadmium	0.005	0.000164	<0.0010	0.0001
Chromium	0.1	0.00168	<0.0020	<0.0020
Cobalt	0.006	0.000243	**0.008**	<0.004
Fluoride	4	0.387	0.4	0.5
Lead	0.015	0.000137	<0.002	<0.002
Lithium	0.040	**0.678**	**0.79**	**0.68**
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	<0.000873	<0.10	<0.01
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.641	0.873	1.06
Selenium	0.05	0.00103	<0.030	<0.003
Thallium	0.002	0.000860	<0.0020	<0.0020

MW-104				
APPENDIX III	**GWPS**	**3/29/2019**	**4/10/2019**	**10/25/2019**
Boron	NA	0.188	0.271	<1.00
Calcium	NA	465	502	505
Chloride	NA	1430	1430	1610
Fluoride	4	<0.0100	0.323	0.4
Sulfate	NA	2870	2880	2440
pH (SU)	NA	6.88	6.99	7.03
Total Dissolved Solids	NA	6990	6690	7330
APPENDIX IV				
Antimony	0.006	0.000091	0.000119	<0.005
Arsenic	0.01	0.00221	0.00208	0.0039
Barium	2	0.0243	0.0216	0.030
Beryllium	0.004	<0.000102	<0.000102	<0.0200
Cadmium	0.005	<0.000152	<0.000152	0.0004
Chromium	0.1	0.00471	0.00360	0.0066
Cobalt	0.006	0.00594	0.00522	**0.011**
Fluoride	4	<0.0100	0.3230	0.4
Lead	0.015	0.00105	0.000233	0.003
Lithium	0.040	0.0281	0.0286	0.02
Mercury	0.002	<0.101	<0.101	<0.0005
Molybdenum	0.1	0.00147	0.00104	0.005
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.776	0.319	1.646
Selenium	0.05	<0.000348	<0.000348	<0.003
Thallium	0.002	<0.0000360	<0.0000360	<0.0020

MW-6				
APPENDIX III	**GWPS**	**4/22/2019**	**9/30/2019**	**4/6/2020**
Boron	NA	0.194	<1.00	0.19
Calcium	NA	421	431	458
Chloride	NA	142	230	181
Fluoride	4	0.409	0.5	0.4
Sulfate	NA	2200	3830	4650
pH (SU)	NA	6.86	7.15	6.76
Total Dissolved Solids	NA	4780	4830	4610
APPENDIX IV				
Antimony	0.006	0.0000920	<0.005	<0.005
Arsenic	0.01	0.000722	<0.0100	<0.0010
Barium	2	0.0128	0.010	0.011
Beryllium	0.004	<0.000102	<0.0200	<0.002
Cadmium	0.005	<0.000152	<0.0010	0.0001
Chromium	0.1	0.00196	<0.000020	<0.0020
Cobalt	0.006	0.000276	<0.004	<0.004
Fluoride	4	0.409	0.5	0.4
Lead	0.015	<0.0000675	<0.002	<0.002
Lithium	0.040	**0.0633**	**0.05**	**0.05**
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	0.000972	<0.10	<0.01
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.450	1.246	0.744
Selenium	0.05	0.00110	<0.003	<0.003
Thallium	0.002	0.0000610	<0.0020	<0.0020

MW-5				
APPENDIX III	**GWPS**	**4/22/2019**	**9/30/2019**	**4/7/2020**
Boron	NA	0.271	<1.00	0.25
Calcium	NA	446	476	464
Chloride	NA	931	1500	1860
Fluoride	4	0.128	0.2	0.2
Sulfate	NA	1800	2990	3720
pH (SU)	NA	7.15	7.41	6.94
Total Dissolved Solids	NA	4360	5320	4960
APPENDIX IV				
Antimony	0.006	0.0000700	<0.005	<0.005
Arsenic	0.01	0.000424	<0.0100	<0.0010
Barium	2	0.0167	0.016	0.014
Beryllium	0.004	<0.000102	<0.0200	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00159	0.0033	<0.0020
Cobalt	0.006	0.000288	<0.004	<0.004
Fluoride	4	0.128	0.2	0.2
Lead	0.015	0.0000860	<0.002	<0.002
Lithium	0.040	**0.434**	**0.40**	**0.38**
Mercury	0.002	<0.000100	<0.0005	<0.0005
Molybdenum	0.1	<0.000873	<0.10	<0.01
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	0.945	1.098	1.48
Selenium	0.05	0.000624	<0.003	<0.003
Thallium	0.002	0.0000890	<0.0020	<0.0020

MW-4				
APPENDIX III	**GWPS**	**4/22/2019**	**10/1/2019**	**4/7/2020**
Boron	NA	1.25	1.75	0.83
Calcium	NA	730	690	464
Chloride	NA	1510	1910	1560
Fluoride	4	0.102	0.2	0.2
Sulfate	NA	1440	2490	4000
pH (SU)	NA	7.26	7.36	7.10
Total Dissolved Solids	NA	4840	4820	5120
APPENDIX IV				
Antimony	0.006	0.0000360	<0.005	<0.005
Arsenic	0.01	0.000445	<0.0100	<0.0010
Barium	2	0.0308	0.029	0.022
Beryllium	0.004	<0.000102	<0.0200	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00110	<0.0020	0.0008
Cobalt	0.006	0.000415	<0.004	<0.004
Fluoride	4	0.102	0.2	0.2
Lead	0.015	<0.0000675	<0.002	<0.002
Lithium	0.040	**1.73**	<0.20	**0.82**
Mercury	0.002	0.000825	0.0004	0.0003
Molybdenum	0.1	<0.000873	<0.10	0.002
Radium 226 (pCi/L) + Radium 228 (pCi/L)	5 pCi/L	1.66	1.255	1.26
Selenium	0.05	0.00211	<0.003	0.023
Thallium	0.002	0.0000410	<0.0020	<0.0020

MW-1 MW-2 MW-3A MW-104 MW-6 MW-5 MW-4

bing

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Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well

All results listed in milligrams per liter (mg/L) unless otherwise noted.
Yellow highlighted values indicate GWPS exceedance.
Orange highlighted analyte indicate SSL above GWPS.
SSL = Statistically Significant Level
GWPS = Groundwater Protection Standard
NA = Not Applicable
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter

0 400 800
Feet

N

Big Rivers

Green Landfill
Webster County, Kentucky

FIGURE 4
GROUNDWATER CONDITIONS MAP
2019-2020 ANALYTICAL RESULTS

DATE: 5/13/2020	SCALE: 1IN = 300 FEET
CREATED BY: SEL	
JOB NO. 60619283	

AECOM
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REMEDY SELECTION PROGRESS REPORT

GREEN LANDFILL
SEBREE STATION
WEBSTER COUNTY, KENTUCKY

December 9, 2019

Prepared For:

Big Rivers Electric Corporation
Sebree Generating Station
9000 Highway 2096
Robards, KY 42452

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Project No.: 60619283

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1.0 INTRODUCTION

In accordance with provisions of the United States Environmental Protection Agency's (USEPA) coal combustion residual (CCR) rule, Title 40 of the Code of Federal Regulations (CFR) Section 257.97, Big Rivers Electric Cooperation (BREC) is in the process of selecting a remedy for groundwater impacts at the Green Station CCR Landfill (the Unit) at the Sebree Generating Station located in Webster County, Robards, Kentucky **(Figure 1)**.

Assessment monitoring results indicate the presence of lithium at a Statistically Significant Level (SSL) above the Ground Water Protection Standard (GWPS) in four monitoring wells (MW-3A, MW-4, MW-5, and MW-6) at the Unit. A map illustrating the site with location of all program monitoring wells is presented as **Figure 2**.

In response to the SSL exceedance, BREC evaluated the nature and extent of groundwater impacts as required by Title 40 CFR Section 257.95(g) for characterization monitoring. In addition, BREC performed an Assessment of Corrective Measures (ACM), to identify applicable remedial technologies to address lithium impacts in groundwater pursuant to Tile 40 CFR Section 257.96. A notice of ACM initiation dated January 14, 2019 was posted to BREC's publicly-accessible CCR reporting website. A report summarizing the results of the ACM (AECOM, June 2019) was posted to BREC's publicly-accessible CCR reporting website on June 14, 2019.

Title 40 CFR Section 257.97(a) requires that progress reports be prepared on a semi-annual basis describing progress made in selecting and designing a remedy. The following sections provide an overview of BREC's activities previously performed, currently underway, and planned in the future to select a remedy that meets the requirement of Title 40 CFR Section 257.97 (b) as follows:

(1) Be protective of human health and the environment;

(2) Attain the GWPS as specified pursuant to Section 257.95(h);

(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment;

(4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;

(5) Comply with standards for management of wastes as specified in Section 257.98(d).

2.0 SITE BACKGROUND

2.1 Site Description

BREC owns and operates Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/Henderson Municipal Power & Light (HMP&L) Station. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (see **Figure 1**). Reid Unit 1 (66 Megawatts [MW]) began commercial operation in 1966 and it will be converted from coal to natural gas in the future. The Reid Combustion Turbine (72 MW) was commercialized in 1976. HMP&L Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974 respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (242 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Green Landfill is illustrated on **Figure 1**. The Green Landfill is located directly south of Sebree Station, situated south of the Green Station CCR Surface Impoundment. The Green Landfill is a Kentucky permitted landfill (Permit No. SW11700007) that receives special wastes generated by burning coal (CCRs) from Green and Reid/HMP&L Stations. The landfill began receiving CCR wastes in 1980. The current Green Landfill footprint is approximately 170 acres.

As stated in the published CCR monitoring well network certification, available on the BREC website (http://www.bigrivers.com/), the original ground surface within the landfill footprint was irregular and the dominant features were small stream valleys draining towards the Green River, which is located just east of the landfill; and towards Groves Creek, which is located just south of the landfill. There was also historic oil and gas production at and in the immediate vicinity of the Green Landfill. A review of the records from the Kentucky Geological Survey (KGS) showed that at or immediately adjacent to the Site, there were a number of dry exploratory oil/gas exploration holes, oil production wells, one gas production well, and one secondary recovery injection well. There were also former brine ponds at the Site. Most of these wells were abandoned in accordance with applicable regulations by BREC in 1997 and 1998. The last existing oil well was decommissioned in 2019.

2.2 Groundwater Investigation Summary

Monitoring wells were installed at the Unit beginning in November 1996 prior to the implementation of the CCR Rule. However, the existing wells meet the requirements of Title 40 CFR Section 257.90 of the CCR Rule for installation of a groundwater monitoring system. These requirements are that wells must adequately represent the quality of background groundwater and groundwater representing the downgradient waste boundary. The existing wells are located along the perimeter of the landfill footprint (**Figure 2**). One upgradient monitoring well (MW-1) and five downgradient monitoring wells (MW-2, MW-3A, MW-4, MW-5 and MW-6) were installed at the Unit to determine the general direction of groundwater movement and to monitor groundwater impacts. The monitoring wells were installed in the uppermost saturated portion of the sandstone bedrock aquifer.

Nine rounds of Baseline groundwater sampling for Appendix III constituents were conducted between March 2016 and October 2017. Statistical evaluation for Detection monitoring indicated that SSIs over background had occurred, and therefore, Assessment monitoring was triggered. Detection monitoring activities and data are presented in the annual reports that have been prepared to date, (AECOM 2018 and 2019).

As part of Assessment monitoring, upgradient and downgradient wells for the Unit were sampled for Appendix IV constituents in June, July, and September 2018. GWPS were established for Assessment

monitoring of the Appendix IV constituents, and statistical evaluation indicated exceedances of GWPSs at SSLs, as detailed in **Table 1** below.

Table 1 Green Station CCR Landfill Constituents of Concern

Monitoring Well (Date)	Parameter
	Lithium GWPS 0.04 (mg/L)
MW-3A (Jun 2018)	**0.699**
MW-3A (Jul 2018)	**0.790**
MW-3A (Sep 2018)	**0.766**
MW-4 (Jun 2018)	**1.81**
MW-4 (Jul 2018)	**1.91**
MW-4(Sep 2018)	**1.81**
MW-5(Jun 2018)	**0.459**
MW-5 (Jul 2018)	**0.481**
MW-5 (Sep 2018)	**0.425**
MW-6 (Jun 2018)	**0.0650**
MW-6 (Jul 2018)	**0.0590**
MW-6 (Sep 2018)	**0.0558**

GWPSs are the greater of the site-specific background concentrations, the USEPA primary drinking water standard maximum contaminant limits (MCL), or GWPS provided in 40 CFR 257.95(3)(h)(2)

An additional characterization well, MW-104, was subsequently installed to estimate the downgradient extent of impacted groundwater. Sample collection for Appendix III and IV parameters took place in March and April 2019. The analytical results for lithium were below the GWPS. The additional characterization data are summarized in **Table 2** below.

Table 2 – Green Station CCR Landfill Characterization Sample Results

Monitoring Well (Date)	Parameter
	Lithium UPL 0.008 GWPS 0.04 (mg/L)
MW-104 (March 2019)	0.0281
MW-104 (April 2019)	0.0288

The results from both characterization sampling events helped to confirm the downgradient (southwestern) extent of COC impacts above GWPS at the Green Landfill. However, downgradient characterization is limited due to the presence of the Green River immediately adjacent to the Unit.

2.3 Conceptual Site Model

A Conceptual Site Model (CSM) has been developed to support the remedy selection process for groundwater corrective action at the Unit.

2.3.1 Physical Setting

The Unit is located within the Interior Low Plateaus physiographic province. The province is part of the Interior Plains division of the United States. Characteristic features of the province include unglaciated rolling limestone plains with alluvial valleys and entrenched rivers and streams. Several large rivers are in the region, including the Green, the Ohio, the Kentucky, the Tennessee, and the Cumberland Rivers. The geology underlying the Unit consists of unconsolidated materials, including loess and alluvial deposits, underlain by Upper to Middle Pennsylvanian-age clastics and carbonates consisting primarily of sandstone and shale. The unconsolidated material also include fill, silty and clayey residuum, and minor amounts of sandy, clayey channel fill alluvium.

The Unit is located on an upland adjacent to the west bank of the Green River at an elevation of approximately 436 feet, above mean sea level [ft., amsl] (at the north end of the landfill) and 397 ft., amsl (at the south end of the landfill), with a maximum elevation of 608 ft., amsl at the landfill crest. Precipitation falling within the Green Landfill is directed to ponds on the north and south sides of the Unit and then to the river under Kentucky Pollution Discharge and Elimination System permit. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands (Associated Engineers 2016, Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan). The Unit does not have a leachate collection and management system, although systems are being constructed as part of Interim Corrective Measures for non-groundwater impacts.

2.3.2 Geology

The Unit lies in the Western Kentucky Coalfields section, characterized by rolling uplands underlain by coal-bearing bedrock of the Pennsylvanian Period. Near the Unit, maximum topographic relief is on the order of 80 feet. The geologic quadrangle (Geologic map of the Robards quadrangle, Henderson and Webster Counties, Kentucky, 1973) for the area published by the Kentucky Geologic Survey (KGS) shows the surficial material in portions of the western half of the Unit to be unconsolidated loess representing the Pleistocene geologic epoch. The loess consists of sandy and clayey silt. Underlying the loess deposits and exposed at the surface on the eastern half of the Unit are broadly distributed Pleistocene and Holocene alluvium deposits consisting of intermixed and interlensing clay, silt, sand, and gravel. In close proximity to the Unit, the alluvium is generally a low permeability unit that forms terraces along the Green River at elevations of roughly 380 and 395 ft., amsl. The unconsolidated surficial materials range from approximately 10 feet (MW-5) to 52 feet (MW-104) in thickness surrounding the Unit.

The unconsolidated materials are underlain by bedrock of the Upper Pennsylvanian Shelburn Formation [formerly identified as the Lisman Formation (Fairer, 1973)] and the Middle Pennsylvanian Carbondale Formation. At the base of the Shelburn Formation is the Providence Limestone Member, consisting of two distinct limestone beds separated by a sandy shale. The member is exposed in a streambed near the northwest corner of the Unit but is absent over much of the Unit footprint due to erosional channeling. The underlying Carbondale Formation consists of cyclic sequences of sandstones, shales, siltstones and coals. The Carbondale sediments were deposited in a fluvial-deltaic system. As a result of this depositional environment, the lithologic units of the Carbondale tend to be lenticular bodies rather than continuous sheet-like strata. Gradational and abrupt horizontal changes in lithology are often encountered.

2.3.3 Hydrogeology

For purposes of compliance with the CCR Rule groundwater monitoring requirements, the interbedded sandstone and shale of the Carbondale Formation is considered the uppermost aquifer underlying the Unit. The uppermost aquifer is hydraulically confined and first encountered at an elevation of approximately 401 ft., amsl at the northwest end of the landfill, and 367 ft., amsl at the southeast end of the landfill (AECOM, 2019). Flow direction beneath the Unit is typically southeast towards the Green River.

Slug tests were performed on April 25, 2019 at monitoring wells MW-3A, MW-4, MW-6, and MW-104 to assess the hydraulic characteristics of the uppermost aquifer. The estimated hydraulic conductivity of the monitoring wells tested ranged from $2x10^{-5}$ to $3x10^{-3}$ centimeters per second (cm/sec).

Although previous site-specific investigations have noted the presence of perched zones of saturation in the overlying unconsolidated materials, these discontinuous zones do not qualify as an uppermost aquifer under the CCR Rule because they do not produce usable quantities of groundwater.

2.3.4 Constituents of Concern (COC)

As discussed above, a single Appendix IV COC (lithium) was detected at concentrations exceeding GWPS in multiple monitoring well locations. As a result, the corrective measure evaluation is confined to the area between and adjacent to the wells in which the exceedances were identified (MW-3A, MW-4, MW-5, and MW-6).

2.3.5 Potential Receptors/Exposure Pathways

Contact with water (e.g., shallow groundwater or surface water) impacted by COCs at levels above GWPS is regarded as the potential pathway for exposure of potential receptors. Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Unit, thus limiting the potential receptors to the surface water, i.e., the Green River and its tributary, Groves Creek. The pathways to these receptors include seepage of water from the Unit through manmade and natural hydraulic barriers.

Other potential exposure pathways (e.g., soil or vapor) are not considered complete as the CCR material is isolated in the Unit. This isolation prevents direct access by individuals that might result in direct contact or ingestion. In addition, the inherent non-volatile nature of the unit-specific COCs eliminates the potential for a complete vapor pathway (i.e., vapor intrusion to indoor air).

2.4 Interim Corrective Measures

No formal interim corrective measures have been performed at the Green Landfill for groundwater, but corrective measures for known non-groundwater releases are underway. The compatibility of those corrective measures with potential groundwater remedies is being evaluated as part of the remedy selection process.

2.5 Assessment of Corrective Measures Summary

Title 40 CFR Section 257.96(c) requires that the ACM include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
2) The time required to begin and complete the remedy; and
3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

Several potential corrective measures technologies were evaluated to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented in **Table 3** below.

Table 3 – Potential Corrective Measures Options Technology Description/Overview

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established Corrective Action Objectives (CAOs).
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenant, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection mode)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a standalone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing offsite migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations increase implementation difficulty with scale.

Potentially Applicable Technology	Status	Description/Overview
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies any single technology may not be utilized.

Preliminary assembly of corrective measures alternatives was performed based on site-specific and regional geology and groundwater conditions. For the Unit, six corrective measures alternatives were developed from this list of applicable corrective measures technologies:

- Alternative #1 – No Action and Groundwater Monitoring
- Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- Alternative #3 – CiP, Hydraulic Containment, Other Source Control (consisting of seepage collection and treatment), Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #4 – CiP, Physical Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring
- Alternative #5 – CiP, Other Source Control, ICs, and Groundwater Monitoring

The assembly of corrective measures alternatives presented in the ACM is considered preliminary and could be revised at a later date following detailed analysis during the remedy selection process and/or following comment from the regulatory community and public.

3.0 REMEDY SELECTION PROGRESS

Six corrective measure alternatives were identified during the ACM process for potential implementation at the Unit to address groundwater impacts. Each corrective measure alternative consists of one or more corrective measures technologies assembled into a strategy for the groundwater remedy. Each alternative is discussed in more detail below.

3.1 Potential Corrective Action Alternatives

3.1.1 Alternative #1 – No Action and Groundwater Monitoring

Alternative #1 consists of taking no action to address groundwater impacts at the Unit. Under the No Action alternative, no corrective action would be implemented to remove, control, mitigate, or minimize exposure to impacted groundwater. The No Action alternative establishes a baseline or reference point against which each of the corrective measure alternatives is compared.

Since Alternative #1 would not attain the CAOs for the Unit, this alternative would not likely be acceptable to stakeholders. Therefore, Alternative #1 is not recommended for further consideration.

3.1.2 Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring

Alternative #2a as currently envisioned would employ a combination of three corrective measures technologies:

- CiP source control, which consists of which consists of routine cover management during landfill operation, and planned closure activities for the Green Landfill;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater monitoring (Assessment) to document the effectiveness of the corrective measures.

Alternative #2a is recommended for further evaluation.

3.1.3 Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring

Alternative #2b as currently envisioned would be similar to Alternative #2a except that CiP is replaced by CbR, which consists of excavation and removal of the Unit. Given that Alternative #2b is likely cost prohibitive, this alternative is not recommended for further consideration.

3.1.4 Alternative #3 – CiP, ICs, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, and Groundwater Monitoring

Alternative #3 as currently envisioned would build upon Alternative #2a to also include the addition of hydraulic containment, using vertical groundwater recovery wells, other source control (i.e., draining and lining the South Pond, and managing existing non-groundwater seeps), and ex-situ treatment of groundwater, which involves above-ground physical/chemical treatment methods and/or permitted discharge until CAOs are achieved.

Alternative #3 is recommended for further evaluation.

3.1.5 Alternative #4 – CiP, ICs, Physical Containment (Funnel-Gate), Permeable Reactive Barrier, and Groundwater Monitoring

Alternative #4 as currently envisioned would consist of CiP (BREC's planned unit closure activities), physical containment of impacted groundwater via installation of a grout curtain with an extraction well at the gate, and ex-situ treatment of extracted groundwater by physical/chemical treatment methods and/or permitted discharge.

Alternative #4 is recommended for further evaluation.

3.1.6 Alternative #5 – CiP, ICs, Other Source Control, and Groundwater Monitoring

Alternative #5 is similar to Alternative #2a except for the addition of other source control, in the form of draining and lining the South Pond and managing existing non-groundwater seeps.

Alternative #5 is recommended for further evaluation.

3.2 Remedy Evaluation

Currently BREC considers four (4) potential corrective action alternatives as viable options to address groundwater impacts at the Unit, including:

- Alternative #2a;
- Alternative #3;
- Alternative #4; and
- Alternative #5.

To evaluate each alternative, additional data collection will likely be required. BREC is currently evaluating data collection needs in the following areas to assist with remedy selection:

1) Nature and Extent – groundwater trends, influence of non-groundwater remedies, etc.
2) Physical Characteristics – available data on the physical characteristics of the landfill and retention pond
3) Performance Modeling – data needed to develop digital models demonstrating the effectiveness of potential alternatives
4) Engineering – feasibility, cost estimates, etc.

BREC is working to establish a comprehensive list of data collection needs to proceed forward with remedy evaluation and anticipates providing additional data in future semi-annual remedy selection progress reports.

In Fall 2019, BREC constructed a series of collection trenches around the perimeter of the Unit to address non-groundwater releases. The 2020 groundwater monitoring program will assist in evaluating the success of the non-groundwater release remedies and provide relevant and important information to be considered in the final groundwater remedy selection.

4.0 CONCLUSION

Additional updates regarding remedy selection, including any additional corrective measures being considered, will be presented twice a year in future remedy selection progress reports. Once sufficient data has been collected to select an effective comprehensive remedy for the Unit, a public meeting will be held 30 days prior to formal remedy selection, followed by a detailed Remedy Selection Report describing the remedy and proposed schedule for implementation.

If needed, the next remedy selection progress report for the Unit is expected in June 2020.

5.0 REFERENCES

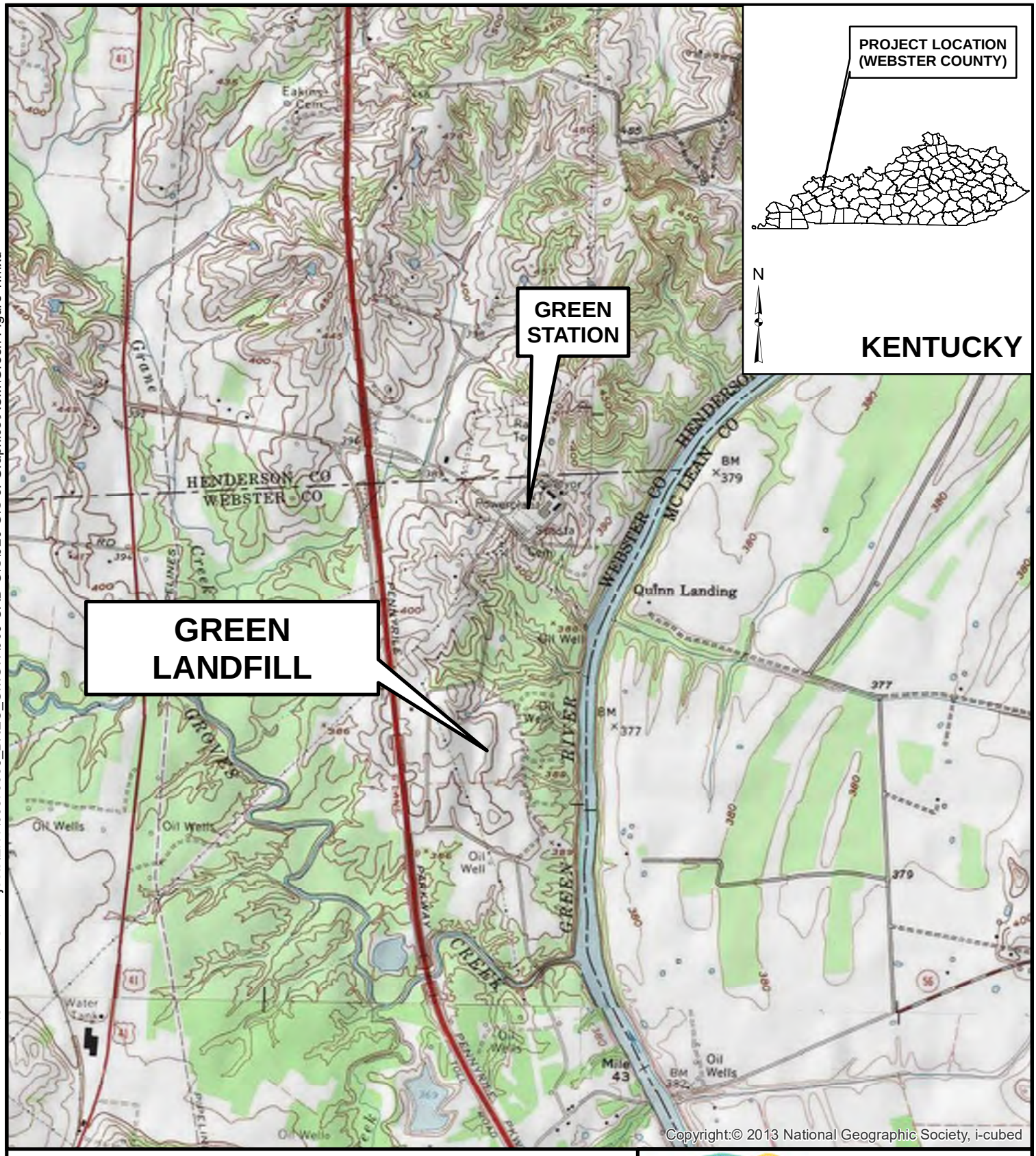
AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Green Station CCR Landfill, Webster County, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Green Station CCR Landfill, Webster County, Kentucky.

EPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

Fairer, G.M., Geologic Map of the Robards Quadrangle, Henderson and Webster Counties, Kentucky, U.S. Geological Survey, 1973.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

N

Big Rivers ELECTRIC CORPORATION

Green Station
Webster County, Kentucky

FIGURE 1
SITE LOCATION MAP

DATE: 4/30/2019	SCALE: 1IN = 2,000 FEET
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JOB NO. 60602364	

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MW-1
MW-2
MW-3A
MW-104
MW-6
MW-5
MW-4
Green River
Groves Creek
bing
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Legend

- Property Line
- KAR Permit Area
- CCR Fill Area
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well

0 400 800
Feet

N

Big Rivers

Green Station
Webster County, Kentucky

FIGURE 2
WELL LOCATION MAP

DATE: 12/9/2019	SCALE: 1IN = 300 FEET
CREATED BY: ALW	
JOB NO. 60602364	

ATTACHMENT 9 – AGREED ORDER

COMMONWEALTH OF KENTUCKY
ENERGY AND ENVIRONMENT CABINET
DIVISION OF WASTE MANAGEMENT
Permit No. SW11700007
AI No. 4196
FILE NO. 18-3-0138

IN RE: R.D. GREEN LANDFILL

BIG RIVERS ELECTRIC CORPORATION
201 3rd Street
P.O. Box 24
Henderson, KY 42420

Facility/Violation Location:
Big Rivers Electric Corp. – Sebree Station
9000 Highway 2096
Robards, KY 42452

AGREED ORDER

* * * * * * * * * * * *

WHEREAS, the parties to this Agreed Order, the Energy and Environment Cabinet (hereinafter "Cabinet") and Big Rivers Electric Corporation (hereinafter "BREC"), state:

STATEMENTS OF FACT

1. The Cabinet is charged with the statutory duty of enforcing KRS Chapter 224, and the regulations promulgated pursuant thereto.

2. KRS 224.50-760 governs the disposal of special waste, including utility wastes. The Cabinet promulgated regulations at 401 KAR Chapters 45 and 46 to implement its duty to regulate the disposal of special wastes.

3. In 2015, the United States Environmental Protection Agency ("EPA") promulgated 40 CFR 257.50 – 257.107 establishing national standards to govern the location, design,

construction and operation of landfills and surface impoundments for the disposal of utility wastes known as coal combustion residuals ("CCR") (hereinafter "Federal CCR Rule"). As promulgated, the Federal CCR Rule is self-implementing. In 2017, the Cabinet promulgated 401 KAR 46:110 to incorporate the federal standards into Kentucky regulations. 401 KAR 46:110 Sections 5 and 8 incorporate inspection, control, assessment, and corrective action requirements set forth in 40 CFR 257.81, 257.84, and 257.90 that apply to surface run-off and unauthorized surface releases from existing CCR landfills. Under the Federal CCR Rule, existing CCR landfills, as defined at 40 CFR 257.53, were authorized to continue operation without installing leachate collection systems. 80 Fed. Reg. 21302, 21370 (April 17, 2015).

4. BREC owns and operates Sebree Station, an electric power generating station located in Henderson and Webster Counties, Kentucky (the "Facility"). BREC owns and operates a special waste landfill at the Facility for the disposal of utility wastes including CCR (hereinafter the "Green Landfill") generated at Sebree Station. The site has been assigned AI ID No. 4196. To operate the Green Landfill the Cabinet's Division of Waste Management, Solid Waste Branch (DWM), issued BREC Special Waste Permit No. SW11700007 pursuant to 401 KAR Chapter 45. Operating authorization was received on September 13, 1987.

5. Green Landfill is an existing CCR landfill under the Federal CCR Rule and is therefore subject to the operating criteria and corrective action standards of 401 KAR 46:110, that incorporate the 40 CFR Part 257 standards. Those standards apply independent of the terms of the 401 KAR Chapter 45 permit.

6. BREC holds Kentucky Pollution Discharge Elimination System ("KPDES") Permit No. KY0001929 issued by the Cabinet's Division of Water ("DOW") on June 15, 2018

(hereinafter "KPDES Permit") regulating discharges from point sources at the Facility into Waters of the Commonwealth pursuant to 401 KAR 5:055. Outfalls 001, 009, 012 and 014 are controlled by sedimentation basins and are authorized to discharge CCR landfill runoff and leachate from the Green Landfill.

7. In June 2017, authorized representatives of DWM conducted an inspection of the Green Landfill and observed leachate outbreaks and leachate flowing in unlined ditches from the landfill toward the sedimentation basins at Outfalls 012 and 014. Additionally, surface seeps were identified by DWM along the eastern side of the Green Landfill on the natural ground slope between the haul road and the Green River that, if not controlled, have the potential to flow to the Green River.

8. On or about July 12 and 13, 2018, BREC conducted water sampling along the Green River to determine whether any seeps or other impacts to the surface water could be attributed to leachate outbreaks from the Green Landfill. Results from in-river samples and a majority of seep samples generally fell within regulatory limits.

9. On or about December 10, 2018, DWM and BREC conducted a joint leachate and sampling event of four (4) locations adjacent to the Green Landfill. Sampling results produced by both DWM and BREC indicated chlorides were present in elevated levels at all four sampling locations. An inspection report detailing the sampling event was issued on May 20, 2019.

10. On April 2, 2019, DWM and DOW conducted a joint inspection of the Green Landfill and observed seepage and stormwater from below the northwestern side of the landfill flowing in an unlined ditch toward the Green River. Analysis of the seepage and stormwater indicates it contains CCR-related constituents but the concentrations did not exceed Kentucky's water quality standards.

11. On May 2, 2019, DOW issued a Notice of Violation ("NOV") to BREC for an unpermitted discharge based upon the April 2, 2019 inspection. The remedial measures required that the discharge be added to the KPDES permit for the facility and addressed through the best management practices required under the permit. BREC responded to the NOV in July 2019 and submitted a KPDES permit modification application for the stormwater runoff in the culvert identified during the April 2, 2019 inspection.

12. On May 20, 2019, DWM issued an NOV to BREC for the seep identified during the April 2, 2019 inspection. The remedial measures required that BREC address the seep pursuant to 401 KAR 46:110. BREC responded to the NOV on July 30, 2019 and identified its remedial measures.

13. BREC and DWM met on several occasions in 2017, 2018, and 2019 to discuss BREC's leachate management activities and remedial plans at the Facility. BREC noted that it had implemented procedures for control of leachate outbreaks and had authorized a consulting firm to evaluate and design remedies for the seeps on the northwestern side of the Green Landfill and those located below the eastern side of the landfill along the bank of the Green River. BREC revised its run-off plan for leachate that is required by 40 CFR 257.81 and has developed standard operating procedures ("SOPs") for leachate outbreaks that are intended to ensure compliance with 40 CFR 257.81, 257.84(b)(5), and 257.90(d), as incorporated in 401 KAR 46:110, and KPDES permit requirements for leachate management.

14. The Cabinet and BREC acknowledge that EPA is in the process of reconsidering the scope and applicability of response requirements for non-groundwater releases from CCR landfills. Any final amendments to those standards will automatically become effective under 401 KAR 46:110 due to the federal standards being incorporated by reference, and in such an event

the SOPs set forth in this Agreed Order would be subject to change or amendment. The Cabinet is also in the process of developing amended regulations at 401 KAR Chapter 46 to address procedures for permitting for groundwater and non-groundwater release corrective action at CCR units, which, when effective, will apply to the Green Landfill and may, as appropriate, result in BREC's reconsideration of the remedies implemented under this Agreed Order.

15. The Cabinet asserts that improved leachate and seep management is necessary to ensure compliance with surface water standards, as reflected in the Facility's KPDES permit, to prevent degradation of the waters of the Commonwealth from uncontrolled surface seeps, and to reduce the risk of impacts to groundwater. As set forth herein, the parties have agreed upon remedial measures intended to ensure leachate and seeps are managed at the Green Landfill in a manner to comply with the facility's KPDES permit, the special waste landfill permit, and applicable CCR landfill regulations as incorporated at 401 KAR 46:110 Section 8 for non-groundwater releases.

16. To arrive at the terms of this Agreed Order, BREC provided DWM with its leachate SOPs, and the remedial assessment design plans and schedules for the surface seeps along the slopes below the Green Landfill. The Cabinet reviewed the plans and determined the proposed SOPs and BREC's remedial assessment plans and milestones for completing remedial measures for the seeps to be acceptable response actions to address concerns for potential operational deficiencies and releases associated with the leachate outbreaks and seeps. While negotiating this Agreed Order, BREC initiated contracting of the engineered containment controls developed as remedies under 40 CFR 257.90(d) and 257.84(b)(5) that are intended to reduce and prevent impacts from the Green Landfill surface seeps to the Green River based upon the design plans that were submitted to the Cabinet for review and comment. BREC is now proceeding with

construction of those remedial projects. The construction schedule and post construction performance monitoring for those projects are set forth in Exhibits 2 and 3.

17. In January 2019, BREC posted a notice on its CCR Rule compliance website that it had commenced an assessment of corrective measures (ACM) for lithium, a CCR constituent, detected in groundwater beneath the Green Landfill. That notice also stated that BREC had initiated an ACM for the non-groundwater release surface seeps. Both ACMs have been completed and were posted to BREC's CCR Rule compliance website in July 2019.

18. Based upon the leachate and seep management plan commitments and projects, this Agreed Order resolves the DWM and DOW NOVs and concerns of potential deficiencies related to seep and leachate outbreak non-groundwater release response protocols and remedial measures. This Agreed Order also provides the process, as set out in Exhibit 4, for BREC to complete the evaluation of groundwater corrective action remedies at the Green Landfill pursuant to 401 KAR 46:110 and to obtain Cabinet review and comment of the corrective action remedy design, schedule for implementation, and post-construction performance monitoring.

19. Big Rivers neither admits nor denies the assertions of the Cabinet set forth above, but agrees to resolve the DWM and DOW claims regarding non-groundwater leachate releases and seeps at Green Landfill through the development and implementation of remedial measures set forth herein to address any threat or potential threat to human health and the environment associated with management of CCR and leachate at its Facility, to ensure compliance with 401 KAR 46:110 and the Federal CCR Rule as incorporated thereby for non-groundwater and groundwater releases.

NOW THEREFORE, in the interest of settling all civil claims and controversies involving the alleged deficiencies described above, the parties hereby consent to the entry of this Agreed Order and agree as follows:

REMEDIAL MEASURES

20. BREC shall implement the SOPs set forth in Exhibit 1 to address leachate and seep releases to the surface at the Green Landfill. The SOPs, which have been incorporated into BREC's run on and run off control plans on its CCR Rule compliance website, may be amended as circumstances warrant with written notice provided thirty days (30) in advance to Director of DWM, 300 Sower Blvd., 2nd Floor, Frankfort, KY 40601.

21. BREC shall construct and operate the remedial measures set forth in Exhibits 2 and 3 for the surface seeps along and below the northwestern and eastern sides of Green Landfill to prevent uncontrolled migration of the surface seeps to the Green River. On or about August 23 and September 19, 2019, BREC provided notice to DWM that it was commencing construction of the projects as specified in Exhibits 2 and 3. BREC shall provide written notice to the Solid Waste Branch Manager five (5) business days prior to commencing additional construction projects and within five (5) business days of completing construction of the projects as set forth in Exhibits 2 and 3. For purposes of this section, written notice may be sent to the Solid Waste Branch Manager, 300 Sower Blvd., 1st Floor, Frankfort, KY 40601, and/or electronic mail directed to Danny Anderson, PE, at Danny.Anderson@ky.gov or his successor or designee.

22. BREC may request an amendment of the accepted seep remedial action plans and schedules set forth in Exhibits 2 and 3 in writing sent to the Directors of DWM and the Division of Enforcement at 300 Sower Blvd., 3rd Floor, Frankfort, KY 40601. The request shall state the reasons therefore and include any proposed changes to plans and specifications. The Cabinet shall

review proposed amendments and may, in whole or part, 1) approve or 2) disapprove and provide comments identifying deficiencies. If granted, the Amended Exhibit(s) shall not affect any provision of this Agreed Order unless expressly provided for in the amendment. Amendment under this section does not require an amendment request pursuant to paragraph 32 below.

23. BREC shall follow the process and schedule set out in Exhibit 4 in selecting and implementing a corrective action remedy for the statistically significant increase in lithium in groundwater referenced in its CCR Rule compliance website notification.

PENALTIES

24. BREC shall pay the Cabinet a civil penalty in the amount of twenty thousand dollars ($20,000) for the violations alleged above. The amount of the civil penalty shall be due no later than thirty (30) days after this Agreed Order is entered by the Secretary or his designee.

STIPULATED PENALTIES

25. BREC shall pay the Cabinet a stipulated penalty in the amount of five hundred ($500) per day, within fifteen (15) days of mailing of written notice from the Cabinet for failure to timely meet any remedial milestones required by Exhibits 2 and 3 to this Agreed Order. This penalty is in addition to, and not in lieu of, any other penalty the Cabinet could assess. The Cabinet may, in its discretion, waive stipulated penalties that would otherwise be due.

26. Within fifteen (15) days of receipt of written demand for payment of a stipulated penalty, BREC shall submit payment of the stipulated penalty. The stipulated penalties are in addition to and not in lieu of, any other penalty that could be assessed. The payment of stipulated penalties shall not alter in any way BREC's obligation to complete the performance of the actions described in this Agreed Order.

27. If BREC believes the request for payment of a stipulated penalty is erroneous or contrary to law, BREC may request a hearing in accordance with KRS 224.10-420(2). The request for hearing does not excuse timely payment of the penalty. If an order is entered pursuant to KRS 224.10-440 that excuses payment, the Cabinet will refund the payment. Failure to make timely payment shall constitute an additional violation.

28. Payment of civil and any stipulated penalties shall be by cashier's check, certified check, or money order, made payable to "Kentucky State Treasurer" and sent to the attention of Director, Division of Enforcement, Department for Environmental Protection, 300 Sower Blvd., Frankfort, Kentucky 40601.

MISCELLANEOUS PROVISIONS

29. This Agreed Order only resolves those claims, NOVs, and alleged deficiencies specifically described above. Other than those matters resolved by entry of this Agreed Order nothing contained herein shall be construed to waive or to limit any remedy or cause of action by the Cabinet based on statutes or regulations under its jurisdiction and BREC reserves its defenses thereto. The Cabinet expressly reserves its right at any time to issue administrative orders and to take any other action it deems necessary that is not inconsistent with this Agreed Order, including the right to order all necessary remedial measures, assess penalties for violations, or recover all response costs incurred, and BREC reserves its defenses thereto.

30. This Agreed Order shall not prevent the Cabinet from issuing, reissuing, renewing, modifying, revoking, suspending, denying, terminating, or reopening any permit to BREC. BREC reserves its defenses thereto, except that BREC shall not use this Agreed Order as a defense to those permitting actions.

31. BREC waives its right to any hearing on the matters resolved herein. However,

failure by BREC to comply strictly with any or all of the terms of this Agreed Order shall be grounds for the Cabinet to seek enforcement of this Agreed Order in Franklin Circuit Court and to pursue any other appropriate administrative or judicial action under KRS Chapter 224 and the regulations promulgated pursuant thereto.

32. The Agreed Order may not be amended except by a written order of the Cabinet's Secretary or his designee. BREC may request an amendment by writing the Director of Division of Enforcement at 300 Sower Blvd., Frankfort, Kentucky 40601 and stating the reasons for the request. If granted, the amended Agreed Order shall not affect any provision of this Agreed Order unless expressly provided in the amended Agreed Order. The Cabinet and BREC agree that the obligations of this Agreed Order may be modified by final promulgation of EPA's Federal CCR Rule reconsideration rule setting requirements for addressing surface releases, including leachate management at existing CCR landfills, and agree obligations of this Agreed Order shall be superseded and amended by any such final rule, or the Cabinet's amendment of its regulations at 401 KAR Chapter 46, to the extent such rules are inconsistent with this Agreed Order.

33. Unless otherwise stated in this Agreed Order, all submittals required of BREC by this Agreed Order shall be sent to: Director, Division of Enforcement, 300 Sower Blvd., Frankfort, Kentucky 40601.

34. The Cabinet does not, by its consent to the entry of this Agreed Order, warrant or aver in any manner that BREC's complete compliance with this Agreed Order will result in compliance with the provisions of KRS Chapter 224; 401 KAR Chapters 30, 45, and 46; or the Federal CCR Rule. Notwithstanding the Cabinet's review and approval of any plans formulated pursuant to this Agreed Order, BREC shall remain solely responsible for compliance with the

terms of KRS Chapter 224; 401 KAR Chapters 30, 45, and 46; or the Federal CCR Rule, this Agreed Order and any permit and compliance schedule requirements.

35. BREC shall give notice of this Agreed Order to any purchaser, lessee or successor in interest prior to the transfer of ownership and/or operation of any part of its now-existing facility occurring prior to termination of this Agreed Order, shall notify the Cabinet that such notice has been given, and shall follow all statutory and regulatory requirements for a transfer. Whether or not a transfer takes place, BREC shall remain fully responsible for payment of all stipulated penalties and response costs and for performance of all remedial measures identified in this Agreed Order.

36. The Cabinet agrees to allow the performance of the above-listed remedial measures by BREC to satisfy its obligations to the Cabinet generated by the alleged deficiencies described above.

37. The Cabinet and BREC agree that the remedial measures agreed to herein are facility-specific and designed to comply with the statutes and regulations cited herein. This Agreed Order applies specifically and exclusively to the unique facility referenced herein and is inapplicable to any other site or facility.

38. This Agreed Order shall be of no force and effect unless and until it is entered by the Secretary or his designee as evidenced by his signature thereon.

TERMINATION

39. This Agreed Order shall terminate upon BREC's completion of all requirements described in this Agreed Order. BREC may submit written notice to the Cabinet when it believes all requirements have been performed. The Cabinet will notify BREC in writing of whether it intends to agree with or object to termination. The Cabinet reserves its right to enforce this Agreed

Order, and BREC reserves its right to file a petition for hearing pursuant to KRS 224.10-420(2) contesting the Cabinet's determination.

AGREED TO BY:

Mike W. Chambliss, Vice President System Operations
Big Rivers Electric Corporation

12-6-2019
Date

HAVE SEEN:

Jack Bender, Attorney for Big Rivers Electric Corporation
Dinsmore & Shohl LLP

12/6/2019
Date

APPROVAL RECOMMENDED BY:

Michael Kroeger, Director
Division of Enforcement — Date 12/6/19

Jon Maybriar, Director
Division of Waste Management — Date 12-6-19

John G. Horne, II, Executive Director
Office of Legal Services — Date 12/6/19

ORDER

Wherefore, the foregoing Agreed Order is entered as the final Order of the Energy and Environment Cabinet this 6th day of December, 2019.

ENERGY AND ENVIRONMENT CABINET

R. BRUCE SCOTT, DEPUTY SECRETARY
ENERGY AND ENVIRONMENT CABINET

CERTIFICATE OF SERVICE

I hereby certify that a true and accurate copy of the foregoing **AGREED ORDER** was mailed, postage prepaid, to the following this 11th day of December, 2019.

Hon. Jack Bender
Dinsmore & Shohl LLP
Lexington Financial Center
250 West Main Street
Suite 1400
Lexington, KY 40507

and mailed, messenger to:

Daniel Cleveland
Office of Legal Services
300 Sower BLVD, 3rd Floor

Michael Kroeger, Director
Division of Enforcement
300 Sower BLVD, 3rd Floor

Paige Tabb
DOCKET COORDINATOR

DWM
BGO
SH

Exhibit 1

Leachate Management Standard Operating Procedures

Green Landfill and Green Surface Impoundment

Subject: Surface Seep and Leachate Outbreaks Repair

To ensure compliance with 40 CFR 257 Subpart D and 401 KAR Chapters 45 and 46, the following procedure will be utilized for identification and repair of seeps and leachate outbreaks at CCR landfills and surface impoundments. For purposes of this SOP, a leachate outbreak is wastewater/seepage flowing directly from the covered CCR that has passed through or emerged from solid waste and contains soluble, suspended or miscible materials removed from such wastes. Seeps are flows that emerge from the ground immediately below the actual waste disposal area and that may contain leachate that is mixed with water from saturated soils or surface water infiltration.

- An inspection by a qualified person will be conducted once per week to identify any seeps and leachate outbreaks at CCR landfills and CCR surface impoundments. The inspection will include the entire perimeter of both the Green Landfill and Green Surface Impoundment as weather conditions allow at the time of the inspection. The weather conditions at the time of the inspection must be documented on the inspection form.
- Identified seeps and leachate outbreaks must be located and documented by Global Positioning Satellite (GPS) and digital photography.
- Identified seeps and leachate outbreaks must be quantified as to the amount of standing or flowing water in gallons per minute. Measurements or estimates of the impacted area in square feet must be included. Other information relevant to remediation of the outbreak or seep shall be included on the BREC inspection form.
- All information fields on the BREC inspection form shall be completed.
- Categorize the seep or leachate outbreak into one of three categories:
    - Category 1 – Leachate/seep flow is contained within a drainage ditch and pond system that flows to a KPDES permitted outfall and the outbreak or seep is readily repairable by removing the impacted area and replacing the cover dirt with compacted clay, seeded and mulched, when the soil conditions are not too wet to preclude typical construction activities or the ambient temperature is not too low to preclude typical construction activities. For purposes of this determination, readily repairable is an outbreak or seep that can reasonably be believed to be remediated by removing the impacted area and replacing the cover with compacted clay. This determination requires the judgment of the inspector based upon the size, flow, and any repeat history of the outbreak or seep. For any area where there is no visible flow and no rutting/erosion of the soil from prior flow(s),but only saturated soil, then such an area will not be

identified as a seep/leachate outbreak but will be identified and recorded as "saturated soil" in the log and monitored during subsequent weekly inspections.
    - Category 2 – Leachate/seep is contained within a drainage ditch and pond system that flows to a KPDES permitted outfall but requires further investigation and evaluation prior to any attempt at remediation or if initial remediation efforts prove to be unsuccessful.
    - Category 3 – Leachate/seep is not contained within the KPDES permitted ditch and pond system. Any areas of leachate/seep discharges that are identified must be remediated, contained or routed to the KPDES permitted ditch and pond system if the seep displays a visible flow. Actions must begin immediately to prevent an unpermitted point source discharge to a water of the United States by remediating the outbreak or seep.
- Steps to take if a Category 1 seep/leachate outbreak reappears:
    - If a Category 1 seep/leachate outbreak reappears more than 30 days after a previous repair and the flow from the seep/leachate outbreak has been reduced or the extent of the impact is reduced from the initial identification of the seep/leachate outbreak, then Big Rivers may classify the reappearance of the seep/leachate outbreak as a Category 1 seep/leachate outbreak and commence repairs per the Agreed Order (excavate, compact, seed, and mulch.)
    - For any area where there is no visible flow and no rutting/erosion of the soil from prior flow(s), but only saturated soil, then such an area will not be identified as a seep/leachate outbreak but will be identified and recorded as "saturated soil" in the log and monitored during subsequent weekly inspections.
    - Seeps/leachate outbreaks that reappear less than 30 days after a repair or that reappear at a later date with increased flow or impact area will be classified as a Category 2.
- Collect water samples for constituents listed in Table 1. A water sample will only be collected for analysis when a sufficient amount of water is flowing on the surface to collect a sample without disturbing the underlying soil. Samples will be collected once for each categorization unless there are visual changes such as color in the leachate. Seep/leachate water samples will be collected once when identified as a Category 1 and again if reclassified as a Category 2. The analysis will be performed by a laboratory certified in the State of Kentucky. The analysis must contain the chain of custody and complete analysis with QA/QC results. Results will be maintained in the Landfill operating log on-site.
- Place categorized information in the Landfill operating log.
- Corrective actions for readily repairable seeps and leachate outbreaks must begin as soon as reasonably feasible with consideration given to inclement weather patterns and soil moisture conditions.
- Remediation areas outside the KPDES permitted ditch and pond system must include the installation of sedimentation controls as found in the Storm Water Pollution Prevention Plan/Best Management Plan guidance document published by the Kentucky Division of Water. Water samples from seeps containing a visible flow shall be taken for impacted

areas outside the KPDES permitted ditch and pond system and analyzed for the constituents found in Table 1.

- Cover soil and/or special waste removed during the remediation process must be placed in an active area of a CCR landfill or reused during the remediation of the unit if practicable.
- Replacement soil must be compacted, seeded and mulched.
- Environmental Services shall evaluate and determine remediation plans for a Category 2 seep/leachate outbreak that is deemed not readily repairable based upon flow and landfill conditions. Until remediation occurs, the seep/leachate flow shall be visually monitored, conveyed to a KPDES permitted outfall, and treated as necessary to ensure compliance with KPDES discharge limits and applicable water quality standards in the receiving stream. Remediation activities required for a Category 2 outbreak will be sent to the Division of Waste Management, 300 Sower Boulevard, Frankfort, Kentucky 40601 within five (5) business days of finalizing the report.
- Category 3 seeps displaying a visual flow will be reported to the Kentucky Division of Water – Surface Water Permits Branch in Frankfort, Kentucky and the Madisonville Field Office consistent with the Section 2.12 reporting provisions of the KPDES permit for leachate/seep outbreaks. Category 3 seeps with a visual flow will also be reported to the Kentucky Division of Waste Management – Field Operations Branch in Frankfort, Kentucky and the Madisonville Field Office. Reporting of the seeps shall occur as soon as feasible after discovery of such a seep, but no later than ten (10) days after discovery. Environmental Services shall evaluate and determine remediation plans for a Category 3 seep that is deemed not readily repairable based upon flow and landfill conditions.

These protocols shall be followed at CCR units subject to the federal CCR Rule and 401 KAR Chapter 46.

- Table 1
    - From 40 CFR 257 App. III
        - Boron
        - Calcium
        - Chloride
        - Fluoride
        - pH
        - Sulfate
        - Total Dissolved Solids
    - From 40 CFR 257 App. IV
        - Antimony
        - Arsenic
        - Barium
        - Beryllium
        - Cadmium
        - Chromium
        - Cobalt

        - Fluoride
        - Lead
        - Lithium
        - Mercury
        - Molybdenum
        - Selenium
        - Thallium
        - Radium 226 and 228 combined
    - From 401 KAR 45:160
        - *Chemical Oxygen Demand
        - *Total Organic Carbon
        - *Specific Conductance
        - *Copper
        - *Nickel
        - *Zinc
        - *Iron
        - *Sodium
        - *Magnesium
        - *Potassium
        - *Bicarbonate
        - *Carbonate

Exhibit 2

Northwestern Seep Collection Trench Remedy Construction Schedule

Green Station Existing CCR Landfill

Construction Schedule

1. BREC shall initiate construction of the Northwestern Seep Collection Project (the "Project") consistent with the design plans previously reviewed by DWM no later than 90 days after entry of the Agreed Order. Notice of initiation of construction shall be provided to the Director of DWM a minimum of five (5) days prior to on-site construction activities. For purposes of this paragraph, initiation of construction occurs when earthmoving activities are commenced on the trench, and shall not include mobilization of equipment to the site, initial access work, or staging of materials. BREC agrees to provide such notice even if construction is initiated before entry of this Agreed Order.

2. BREC shall complete construction of the Project within 270 days of entry of the Agreed Order. Notice of completion of construction shall be provided to the Director of DWM within 30 days following completion of construction of the collection trench and ancillary facilities to support its operation. The notice shall conform to 40 CFR 257.98(e).

Post-construction Performance Monitoring

1. BREC shall implement a post-construction performance monitoring program as follows.
    a. The Northwestern seep shall be inspected quarterly and any flow conditions in the collection system and at the subject seep shall be recorded in the inspection log.
    b. Any visibly flowing seeps shall be sampled and analyzed for the constituents listed in the seep/leachate SOP (Exhibit 1) as needed to evaluate whether impact (above permit levels) is present or absent.
    c. A report on the operation of the collection system during each calendar quarter shall be submitted to the Director of DWM. The report shall be submitted within 30 days of the end of each calendar quarter, and placed in the landfill operating record. The report shall report on the effectiveness of the remedy.
    d. A final report on the completion of the remedy shall be submitted to the Director of DWM and placed in the operating record consistent with 40 CFR 257.98(e) for review and comment by DWM. The final report will be submitted to DWM within 60 days following the completion of four (4) consecutive quarters without identifying seepage in the targeted Northwestern seep collection area.
    e. The collection system shall be operated until seepage at the surface is not observed for four consecutive quarters and seepage into the collection system diminishes below levels that can result in a non-groundwater release. Prior to ceasing operation and reporting, concurrence shall be obtained in writing from DWM.

Exhibit 3

Eastern Seep Collection Trench Remedy Construction and Post-Construction Schedule

Green Station Existing CCR Landfill

Construction Schedule

1. BREC shall initiate construction of the Eastern Seep Collection Project (the "Project") consistent with the design plans previously reviewed by DWM no later than 120 days after entry of the Agreed Order. Notice of initiation of construction shall be provided to the Director of DWM a minimum of five (5) days prior to on-site construction activities. For purposes of this paragraph, initiation of construction occurs when earthmoving activities are commenced on the trench, and shall not include mobilization of equipment to the site, initial access work, or staging of materials. BREC agrees to provide such notice even if construction is initiated before entry of this Agreed Order.

2. BREC shall complete construction of the Project within 365 days of entry of the Agreed Order. Notice of completion of construction shall be provided to the Director of DWM within 30 days following completion of construction of the collection trench and ancillary facilities to support its operation. The notice shall conform to 40 CFR 257.98(e).

Post-construction Performance Monitoring

1. BREC shall implement a post-construction performance monitoring program as follows.
    a. The Eastern river bank seeps and collection system shall be inspected quarterly for operational conditions and for indications of continuing seepage flow. Any visibly flowing seeps shall be sampled and analyzed for the constituents listed in the seep/leachate SOP (Exhibit 1) unless prior concentrations of constituents are demonstrated to be below the applicable Water Quality Criteria.
    b. A report on the operation of the collection system during each calendar quarter shall be submitted to the Director of DWM. The quarterly system operation and seep inspection monitoring data shall be included in the report. The report shall be submitted within 30 days after the end of each calendar quarter, and placed in the operating record. The report shall address the effectiveness of the remedy.
    c. A final report on the completion of the remedy shall be submitted to the Director of DWM and placed in the operating record consistent with 40 CFR 257.98(e) for review and comment by DWM. The final report will be submitted to DWM within 60 days following the completion of four (4) consecutive quarters without identifying a flowing seep in the targeted Eastern river bank seep collection area. The final report will be placed in the operating record 30 days after approval from DWM.
    d. The collection system shall be operated until seepage at the surface is not observed for four consecutive quarters and seepage into the collection system diminishes below levels that can result in a non-groundwater release. Prior to ceasing operation and reporting, concurrence shall be obtained in writing from DWM.

Exhibit 4

Groundwater Corrective Action Remedy Selection Process

Green Station Existing CCR Landfill

Selection of Remedy

1. BREC shall conduct the public meeting required by 40 CFR 257.96(e) and 401 KAR 46:110 Section 8 regarding the groundwater and supplemental non-groundwater assessment of corrective measures within 180 days of entry of this Agreed Order. Public notice of the meeting shall be posted on BREC's CCR Rule compliance website and published in the Henderson Gleaner newspaper seven (7) to twenty-one (21) days prior to the meeting. The publication shall state the time, place and purpose of the public meeting and that the assessment of corrective measures is available for review on the BREC CCR Rule compliance website. At the public meeting, BREC shall reference the remedy selection process as set forth in this Agreed Order.
2. BREC shall evaluate the comments from the public meeting and other factors as required by 40 CFR 257.97 and 401 KAR 46:110 Section 8 and prepare a draft groundwater remedy selection report for submittal to DWM for a 30 day review and comment period. The draft report shall be submitted to DWM within 90 days following the public meeting, unless DWM approves a longer period in order for BREC to complete is evaluation.
3. BREC shall select the final groundwater corrective action remedy as soon as feasible after receipt of any DWM comments on the proposed remedy during the DWM review period.
4. The final groundwater and supplemental non-groundwater corrective action remedy selection reports shall be posted to BREC's CCR Rule compliance website in accordance with 40 CFR 257.97 and 257.107.

Design and Construction of Remedy

1. BREC shall design and construct the selected groundwater remedy and conduct post-construction performance monitoring pursuant to the implementation schedule set forth in the final corrective action remedy selection report.

ATTACHMENT 10 - REMEDY SELECTION REPORTS FOR REID/HMP&L POND

Semi-Annual Remedy Selection Progress Report

Reid/HMP&L Surface Impoundment
Sebree Generating Station
Webster County, Kentucky

Prepared for:

Big Rivers Electric Corporation
Sebree Generating Station
9000 Highway 2096
Robards, KY 42452

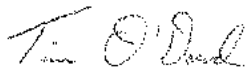
Prepared by:

AECOM Technical Services
525 Vine Street, Suite 1800
Cincinnati, Ohio 45202

AECOM PN 60619822

June 2020

Quality information

Prepared by	Checked by	Verified by	Approved by
			
Timothy P. O'Dowd, PG	Dennis P. Connair, PG	Joseph B. Suhre	Dennis P. Connair, PG
Project Manager	Principal Geologist	Principal Engineer	Principal Geologist

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	June 2020				

Distribution List

# Hard Copies	PDF Required	Association / Company Name
	1	Big Rivers Electric Corporation

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Figures

Tables

1. Introduction

In accordance with provisions of the United States Environmental Protection Agency's (USEPA) coal combustion residual (CCR) rule, Title 40 of the Code of Federal Regulations (CFR) Part 257.97, Big Rivers Electric Cooperation (BREC) is in the process of selecting a remedy for groundwater impacts at the Reid/Henderson Municipal Power & Light (Reid/HMP&L) Surface Impoundment (the Unit) at the Sebree Generating Station located in Webster County, Robards, Kentucky **(Figure 1)**.

Assessment monitoring results indicate the presence of lithium at a Statistically Significant Level (SSL) above the Ground Water Protection Standard (GWPS) in one monitoring well (MW-10) at the Unit. A map illustrating the site with location of all program monitoring wells is presented as **Figure 2**.

In response to the SSL exceedance, BREC evaluated the nature and extent of groundwater impacts as required by Title 40 CFR Part 257.95(g) for characterization monitoring. In addition, BREC performed an Assessment of Corrective Measures (ACM), to identify applicable remedial technologies to address lithium impacts in groundwater pursuant to Tile 40 CFR Part 257.96. A notice of ACM initiation dated January 14, 2019 was posted to BREC's publicly-accessible CCR reporting website. A report summarizing the results of the ACM (AECOM, June 2019) was posted to BREC's publicly-accessible CCR reporting website on June 14, 2019.

Title 40 CFR Part 257.97(a) requires that progress reports be prepared on a semi-annual basis describing progress made in selecting and designing a remedy. The first semi-annual *Remedy Selection Progress Report* (AECOM, December 2019) was posted to BREC's publicly-accessible CCR reporting website on December 9, 2019. In alignment with the CCR rule requirement, the following sections included within this semi-annual progress report provide an overview of BREC's activities previously performed, currently underway, and planned in the future to select a remedy that meets the requirement of Title 40 CFR Part 257.97 (b) as follows:

(1) Be protective of human health and the environment;

(2) Attain the GWPS as specified pursuant to Section 257.95(h);

(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment;

(4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;

(5) Comply with standards for management of wastes as specified in Section 257.98(d).

2. Site Background

2.1 Site Description

BREC operates the Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/HMP&L Station. BREC owns Green and Reid Stations, while the City of Henderson owns HMP&L Station 2. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (see **Figure 1**). Reid Unit 1 (65 Megawatts [MW]) began commercial operation in 1966 and is scheduled to be retired in 2020 pending regulatory approval from the Kentucky Public Service Commission and Rural Utilities Service. The Reid Combustion Turbine (65 MW) was commercialized in 1976. HMP&L Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974 respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (250 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Reid/HMP&L Station Surface Impoundment is illustrated in **Figure 2**. The Surface Impoundment has been in place for more than 40 years and was used previously for the placement of CCR material. As stated in the published CCR monitoring well network certification, available on the BREC website, the Reid/HMP&L Station Surface Impoundment is a combined incised/dike earthen embankment structure. It is diked on the west, south and east sides, while the north side is incised. The south dike has the greatest height, reaching approximately 20 feet. Most of the central portion of the south dike was constructed on a subdued ridge.

2.2 Groundwater Investigation Summary

Monitoring wells were installed around the perimeter of the Unit in December 2015 prior to the implementation of the CCR Rule. These wells meet the requirements of Title 40 CFR Part 257.90 of the CCR Rule for installation of a groundwater monitoring system. Under these requirements monitoring wells must adequately represent the quality of background groundwater and groundwater representing the downgradient waste boundary. The existing wells are located along the perimeter of the footprint for the Unit. One upgradient monitoring well (MW-7) and three downgradient monitoring wells (MW-8, MW-9, and MW-10) were installed adjacent to the Unit to determine the general direction of groundwater movement and to monitor groundwater impacts. The monitoring wells were installed in the uppermost saturated portion of the sandstone bedrock aquifer.

Nine rounds of Baseline groundwater sampling for Appendix III constituents was conducted between March 2016 and October 2017. Statistical evaluation of Appendix III constituents monitored for Detection monitoring indicated that statistically significant increases (SSIs) over background have occurred, and therefore, Assessment monitoring was triggered. Detection monitoring activities and data are presented in the annual reports that have been prepared to date (AECOM 2018, 2019, and 2020).

As part of Assessment monitoring, upgradient and downgradient wells for the Unit were sampled for Appendix IV constituents in April, July, and September 2018. GWPS were established for the Appendix IV constituents occurring at SSIs (lithium only), and statistical evaluation of the lithium concentrations indicated exceedances of GWPSs at SSLs, as detailed in **Table 1** below

Table 1 – Reid/HMP&L Surface Impoundment Constituents of Concern

Monitoring Well (Date)	Parameter Lithium GWPS 0.04 (mg/L)
MW-10 (Apr 2018)	**0.694**
MW-10 (Jul 2018)	**0.630**
MW-10 (Sep 2018)	**0.570**

GWPSs are the greater of the site-specific background concentrations, the USEPA primary drinking water standard maximum contaminant limits (MCL), or GWPS provided in 40 CFR 257.95(3)(h)(2)

An additional characterization well, MW-110, was subsequently installed to estimate the downgradient extent of impacted groundwater. Sample collection for Appendix III and IV parameters took place in March and April 2019. The analytical results for lithium in MW-110 were below the GWPS. The additional characterization data are summarized in **Table 2** below.

Table 2 – Reid/HMP&L Surface Impoundment Characterization Sample Results

Monitoring Well (Date)	Parameter Lithium GWPS 0.04 (mg/L)
MW-110 (March 2019)	0.0299
MW-110 (April 2019)	0.0303

The results from both characterization sampling events helped to confirm the downgradient (southwestern) extent of COC impacts above GWPS at the Unit.

Semi-annual Assessment monitoring continued at the Unit in 2019 and 2020 in accordance with 40 CFR Part 257.95.

2.3 Conceptual Site Model

Development and refinement of a Conceptual Site Model (CSM) is necessary to support remedy selection for the Unit. A CSM is based on a set of working hypotheses regarding how contaminants of concern (COCs) entered the environment at a site, how they were and continue to be transported to various media, what the potential routes of exposure are, and who may be exposed, including both human and ecological receptors. As such, the CSM is a “living” model. As new data become available or site conditions change, a CSM should be evaluated and updated as necessary.

The CSM for the Unit was first provided in the June 2019 ACM for the Unit (AECOM 2019). The CSM presents the physical setting of the Unit (adjacent to the Green River), the unconsolidated and bedrock geologic strata underlying the Unit, the occurrence and movement of groundwater, the distribution of COCs in groundwater, and the potential receptors (or lack thereof) for impacted groundwater. These elements are described in detail below and have been updated with new information for this report as appropriate.

2.3.1 Physical Setting

The Unit is located within the Interior Low Plateaus physiographic province. The province is part of the Interior Plains division of the United States. Characteristic features of the province include unglaciated

rolling limestone plains with alluvial valleys and entrenched rivers and streams. Several large rivers are in the region, including the Green, Ohio, Kentucky, Tennessee, and the Cumberland Rivers. The geology underlying the Unit consists of unconsolidated materials, including loess and alluvial deposits, underlain by Upper to Middle Pennsylvanian-age clastic and carbonate bedrock consisting primarily of sandstone and shale. The unconsolidated materials also include fill, silty and clayey residuum, and minor amounts of sandy, clayey channel fill alluvium.

The Unit is located on upland area near the west bank of the Green River. The uppermost edge of the earthen embankment is situated at an elevation of approximately 429 feet above mean sea level (amsl). Although the Green River is located less than 0.5 miles from the site, the structure does not extend significantly into the floodplain. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands (Associated Engineers 2016, Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan). The immediate watershed that drains to the unit, and in which the unit is considered to be located, is unnamed and 25.45 acres in size. The unnamed watershed discharges from the Unit outflow structure and is routed, under a Kentucky Pollution Discharge and Elimination System permit, to the Green River.

2.3.2 Geology

The Unit lies in the Western Kentucky Coalfields section, characterized by rolling uplands underlain by coal-bearing bedrock of the Pennsylvanian Period. Near the Unit, maximum topographic relief is on the order of 80 feet. The geologic quadrangle (Geologic map of the Robards quadrangle, Henderson and Webster Counties, Kentucky, 1973) for the area published by the Kentucky Geologic Survey (KGS) shows the surficial material in portions of the western half of the Unit to be unconsolidated loess representing the Pleistocene geologic epoch. The loess consists of sandy and clayey silt. Underlying the loess deposits and exposed at the surface on the eastern half of the Unit are broadly distributed Pleistocene and Holocene alluvium deposits consisting of intermixed and interlensing clay, silt, sand, and gravel. In close proximity to the Unit, the alluvium is generally a low permeability unit that forms terraces along the Green River at elevations of roughly 380 and 395 ft., amsl. The unconsolidated surficial materials range from approximately 24 feet (MW-7) to 47 feet (MW-110) in thickness surrounding the Unit.

The unconsolidated materials are underlain by bedrock of the Upper Pennsylvanian Shelburn Formation [formerly identified as the Lisman Formation (Fairer, 1973)] and the Middle Pennsylvanian Carbondale Formation. At the base of the Shelburn Formation is the Providence Limestone Member, consisting of two distinct limestone beds separated by a sandy shale. The member is exposed in a streambed near the northwest corner of the Unit but is absent beneath much of the Unit footprint due to erosional channeling. The underlying Carbondale Formation consists of cyclic sequences of sandstones, shales, siltstones and coals. The Carbondale sediments were deposited in a fluvial-deltaic system. As a result of this depositional environment, the lithologic units of the Carbondale tend to be lenticular bodies rather than continuous sheet-like strata. Gradational and abrupt horizontal changes in lithology are often encountered.

2.3.3 Groundwater Hydrogeology

For purposes of compliance with the CCR Rule groundwater monitoring requirements, the interbedded sandstone and shale of the Carbondale Formation is considered the uppermost aquifer underlying the Unit. The uppermost aquifer is hydraulically confined and first encountered at an elevation of approximately 425 ft., amsl at the northeast end (at MW-7), and 388 ft. amsl at the west end of the Unit (at MW-9).

Groundwater elevation data collected in October 2019 are summarized on **Table 3** below. These data were utilized to construct a piezometric surface map illustrating groundwater flow conditions for the uppermost aquifer (see **Figure 3**). Flow direction beneath the Unit is to the southwest towards an unnamed tributary to Groves Creek located west-southwest of the impoundment.

Table 3. Reid/HMP&L Surface Impoundment – October 2019 Groundwater Elevation Data

Monitoring Well	Top of Casing Elevation (ft) [1]	Depth to Groundwater (ft)	Groundwater Elevation (ft, amsl)
MW-7	444.43	18.59	425.84
MW-8	394.29	5.20	389.09
MW-9	395.40	7.35	388.05
MW-10	422.27	33.28	388.99

1 Reference elevation of monitoring wells surveyed by Associated Engineers, Inc., Madisonville, Kentucky, January 2015. Survey coordinates were based on the Kentucky State Plane, Kentucky Southern Zone, NAD27 datum.

Slug tests were performed between April 24, 2019 and April 25, 2019 at monitoring wells MW-10, and MW-110 to assess the hydraulic characteristics of the uppermost aquifer. The estimated hydraulic conductivity of the monitoring wells tested ranged from 3×10^{-6} to 5×10^{-4} centimeters per second (cm/sec).

Although previous site-specific investigations have noted the presence of perched zones of saturation in the overlying unconsolidated materials, these discontinuous zones do not qualify as an uppermost aquifer under the CCR Rule because they do not produce usable quantities of groundwater.

2.3.4 Constituents of Concern

Current groundwater analytical data and statistical analysis indicate that the only COC detected at SSLs above its GWPS in groundwater at the Unit is lithium. Lithium has been detected at SSLs in the monitoring well MW-10 southwest of the Unit.

2.3.5 Impacted Media

Groundwater is the single impacted media of concern identified as requiring corrective measures at the Unit.

2.3.6 Distribution of COCs

Groundwater sampling was performed at the Unit most recently in April 2020. The additional lithium data collected during this event are summarized below in **Table 4**.

Table 4. Reid/HMP&L Surface Impoundment - April 2020 Lithium Analytical Results

Monitoring Well (Date)	Parameter
	Lithium GWPS 0.04 (mg/L)
MW-7	0.007
MW-8	0.03
MW-9	0.01
MW-10	0.49
MW-110	0.02

Figure 4 illustrates the distribution of COCs and other groundwater quality constituents in groundwater at the Unit. This distribution of COCs in groundwater suggests that impacts to groundwater likely originate as seepage from beneath the surface impoundment, however there is currently no feasible means of directly tracing that potential under the footprint of the Unit.

2.3.7 Potential Receptors/Exposure Pathways

Contact with water (e.g., shallow groundwater or surface water) impacted by COCs at levels above GWPS or Water Quality Criteria is regarded as the potential pathway for exposure of potential receptors. Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Unit, thus limiting the potential receptors to the surface water, i.e., the Green River and its tributary, Groves Creek. The pathways to these receptors include seepage of water from the Unit through manmade and natural hydraulic conduits.

Other potential exposure pathways (e.g., soil or vapor) are not considered complete as the CCR material is isolated in the Unit. This isolation prevents direct access by individuals that might result in direct contact or ingestion. In addition, the inherent non-volatile nature of the Unit-specific COCs eliminates the potential for a complete vapor pathway (i.e., vapor intrusion to indoor air).

2.4 Interim Corrective Measures

No interim corrective measures have been performed at the Unit for groundwater impacts.

2.5 Assessment of Corrective Measures Summary

In June 2019, BREC performed an ACM for the Unit to identify remedial alternatives to address groundwater impacts. Title 40 CFR Part 257.96(c) requires that the ACM include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
2) The time required to begin and complete the remedy; and
3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

As part of the groundwater ACM, several potential corrective measures technologies were evaluated to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented below in **Table 5**.

Table 5 – Potential Corrective Measures Options for Groundwater Impacts

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenants, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.

Potentially Applicable Technology	Status	Description/Overview
Groundwater Monitoring (Assessment and Detection modes)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a stand-alone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing off-site migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations may increase implementation difficulty with scale.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies any single technology may not be utilized.

Preliminary assembly of corrective measures alternatives was performed based on site-specific and regional geology and groundwater conditions. For the Reid/HMP&L Station Surface Impoundment, five corrective measures alternatives were developed from this list of applicable corrective measures technologies:

- Alternative #1 – No Action, and Groundwater Monitoring

- Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- Alternative #3 – CiP, ICs, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, and Groundwater Monitoring
- Alternative #4 – CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

The assembly of corrective measures alternatives presented in the ACM was considered preliminary and subject to revision following additional evaluation during the remedy selection process and/or following comment from the regulatory community and public. Further evaluation of the alternatives is discussed in the following sections.

3. Remedy Selection Progress

The ACM performed for the Unit in June 2019 identified a total of five (5) corrective measures alternatives to be carried forward into the remedy selection process. In December 2019, BREC provided a *Semi-annual Remedy Selection Progress Report* (AECOM, December 2019) as required under 40 CFR Part 257.97(a). As part of this submittal, two (2) corrective measures alternatives were eliminated from further consideration, including:

- Alternative #1 (No Action and Groundwater Monitoring) – This alternative does not control or remove COCs from the environment and therefore does not achieve the RAOs.
- Alternative #2b – (CbR, ICs, and Groundwater Monitoring) – Implementing a CbR approach is considered cost prohibitive. In addition, any CbR approach would require relocating waste to an existing disposal unit or construction of a new waste disposal unit, which does not align with the one of the fundamental goals of RCRA (conserving energy and natural resources).

Three (3) potential corrective measures alternatives have been identified by BREC as viable options to address lithium impacts in groundwater at the Unit, including:

- Alternative #2a: CiP, ICs, and Groundwater Monitoring
- Alternative #3: CiP, ICs, Hydraulic Containment, Ex-Situ Treatment, and Groundwater Monitoring
- Alternative #4: CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

Each of the remaining 3 corrective measures alternatives is discussed in more detail below.

3.1 Potential Corrective Action Alternatives

3.1.1 Alternative #2a – CiP, ICs, and Groundwater Monitoring

Alternative #2a as currently envisioned would employ a combination of three corrective measures technologies:

- CiP source control, which consists of planned Reid/HMP&L Surface Impoundment closure activities;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater monitoring (Assessment) to document the effectiveness of the corrective measures.

Alternative #2a is recommended for further evaluation.

3.1.2 Alternative #3 – CiP, ICs, Hydraulic Containment, Ex-Situ Treatment, and Groundwater Monitoring

Alternative #3 builds on Alternative #2a to also include the addition of Hydraulic Containment and Ex-Situ Treatment of groundwater:

- CiP source control, which consists of planned Surface Impoundment closure activities;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes;
- Hydraulic Containment using one or more vertical wells designed to prevent the movement of impacted groundwater past the limits of the unit to the downgradient groundwater environment and potential points of exposure;

- Ex-Situ Treatment of groundwater extracted for hydraulic containment, which involves above-ground physical/chemical treatment methods and/or permitted discharge until the CAOs are achieved;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater Monitoring (Assessment mode) to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection-mode monitoring and ultimately to cessation of corrective measures.

Alternative #3 is recommended for further evaluation.

3.1.3 Alternative #4 – CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

Alternative #4 consists of BREC's planned unit closure activities, physical containment of impacted groundwater via installation of a funnel-gate system, and ex-situ treatment of contained groundwater via an extraction well installed at the containment gate. Impacted groundwater would be contained by grout curtain constructed in a funnel-and-gate arrangement that directs the flow of groundwater to an extraction point. The grout curtain would be installed by drilling two lines of grout injection points that extend northwestward and northeastward from the southeast corner of the unit. The length of each limb of the barrier would be 500 feet, and the target depth would be approximately 325 ft-amsl. A single extraction well would be installed at the "gate" with a screened interval of 50 to 100 ft-bgs and a pumping capacity of up to 20 gpm. Groundwater will be pumped and conveyed to an existing surface water impoundment at the Sebree Station, which will allow for compliance with discharge permits through an established NPDES outfall.

CiP via ash stabilization and capping would control the source of COCs and thereby reduce contaminant loading to the extraction system. Concentrations downgradient of the physical barrier would be expected to decrease over time through several natural attenuation mechanisms including advection, dilution, and dispersion. Groundwater Monitoring (Assessment) would continue to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection monitoring and ultimately closure.

Alternative #4 is recommended for further evaluation.

3.2 Remedy Evaluation

Currently BREC considers the (3) potential corrective action alternatives as viable options to address groundwater impacts at the Unit, including:

- Alternative #2a;
- Alternative #3; and
- Alternative #4

To evaluate each alternative, additional data collection will likely be required. BREC is currently evaluating data collection needs in the following areas to assist with remedy selection:

1) Nature and Extent – groundwater trends, influence of non-groundwater remedies, etc.
2) Physical Characteristics – available data on the physical characteristics of the landfill and retention pond
3) Performance Modeling – data needed to develop digital models demonstrating the effectiveness of potential alternatives
4) Engineering – feasibility, cost estimates, etc.

BREC is working to establish a comprehensive list of data collection needs to proceed forward with remedy evaluation and anticipates providing additional data in future semi-annual remedy selection progress reports.

3.3 Public Meeting

At the beginning of 2020, BREC had initiated preparation to conduct a public meeting to discuss the results of the Groundwater ACM as required by 40 CFR 257.96(e). However, due to the onset of the COVID-19 pandemic, BREC has been prevented from holding the public meeting so far in 2020. BREC plans to hold a public meeting once the mass gathering restrictions related to COVID-19 are lifted in Kentucky.

4. Conclusion

Additional updates regarding remedy selection, including any additional corrective measures being considered, will be presented twice a year in future remedy selection progress reports. Once sufficient data has been collected to select an effective comprehensive remedy for the Unit, a public meeting will be held 30 days prior to formal remedy selection, followed by a detailed Remedy Selection Report describing the remedy and proposed schedule for implementation.

If needed, the next remedy selection progress report for the Unit is expected in December 2020.

5. References

AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Sebree Generating Station, Webster County, Kentucky.

AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Sebree Generating Station, Webster County, Kentucky.

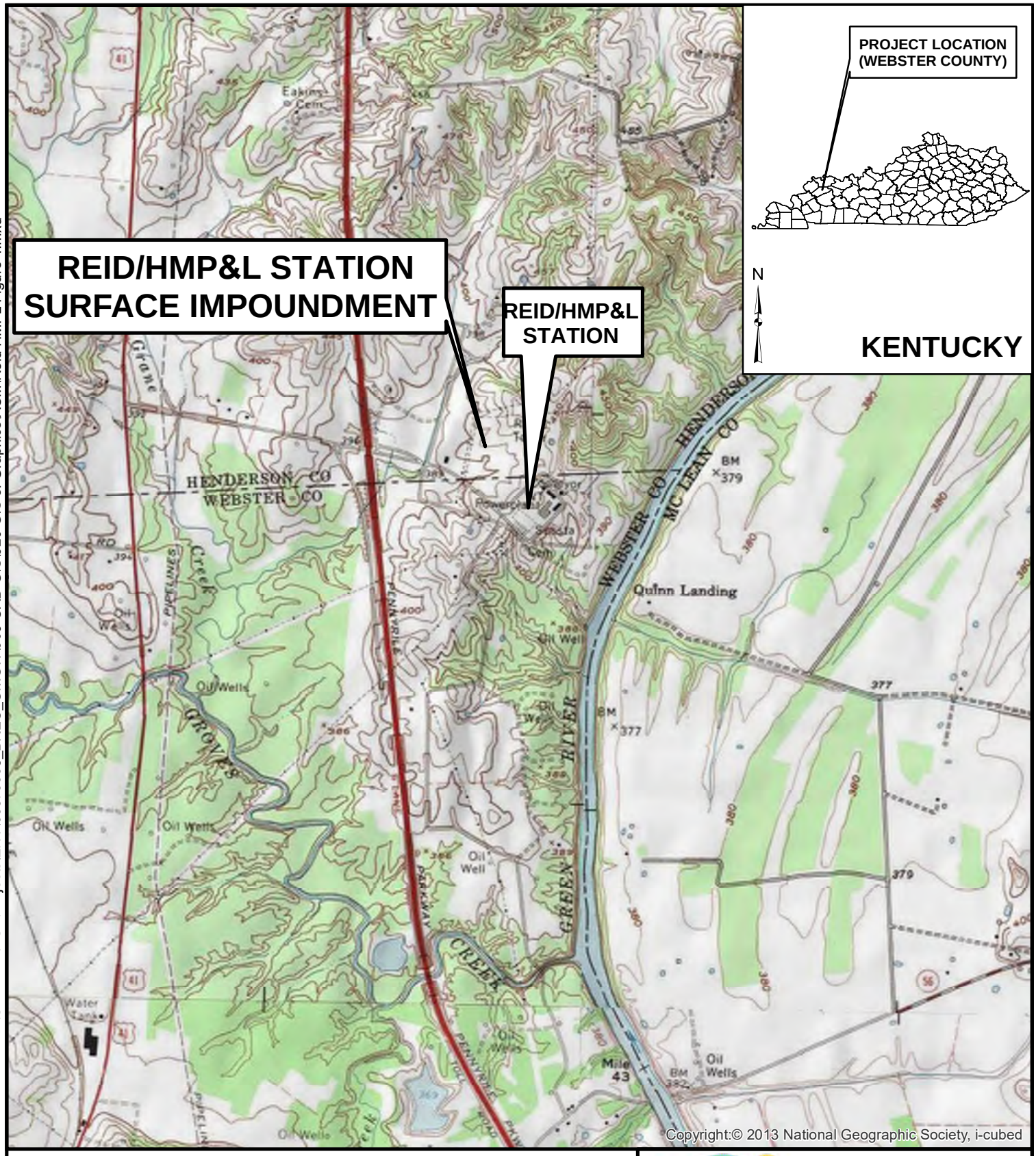
AECOM, 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report, Sebree Generating Station, Henderson and Webster Counties Kentucky.

Associated Engineers 2016. Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan.

EPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

Fairer, G.M., Geologic Map of the Robards Quadrangle, Henderson and Webster Counties, Kentucky, U.S. Geological Survey, 1973.

Figures



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

N

Big Rivers Electric Corporation

Reid/HMPL Station
Webster County, Kentucky

FIGURE 1
SITE LOCATION MAP

DATE: 4/30/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60602365	

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Legend

- Unit Boundary
- Property Line
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well

0 300 600

Feet

N

BigRivers

Reid/HMPL Station
Webster County, Kentucky

FIGURE 2
WELL LOCATION MAP

DATE: 12/9/2019	SCALE: 1IN = 200 FEET
CREATED BY: ALW	
JOB NO. 60602365	

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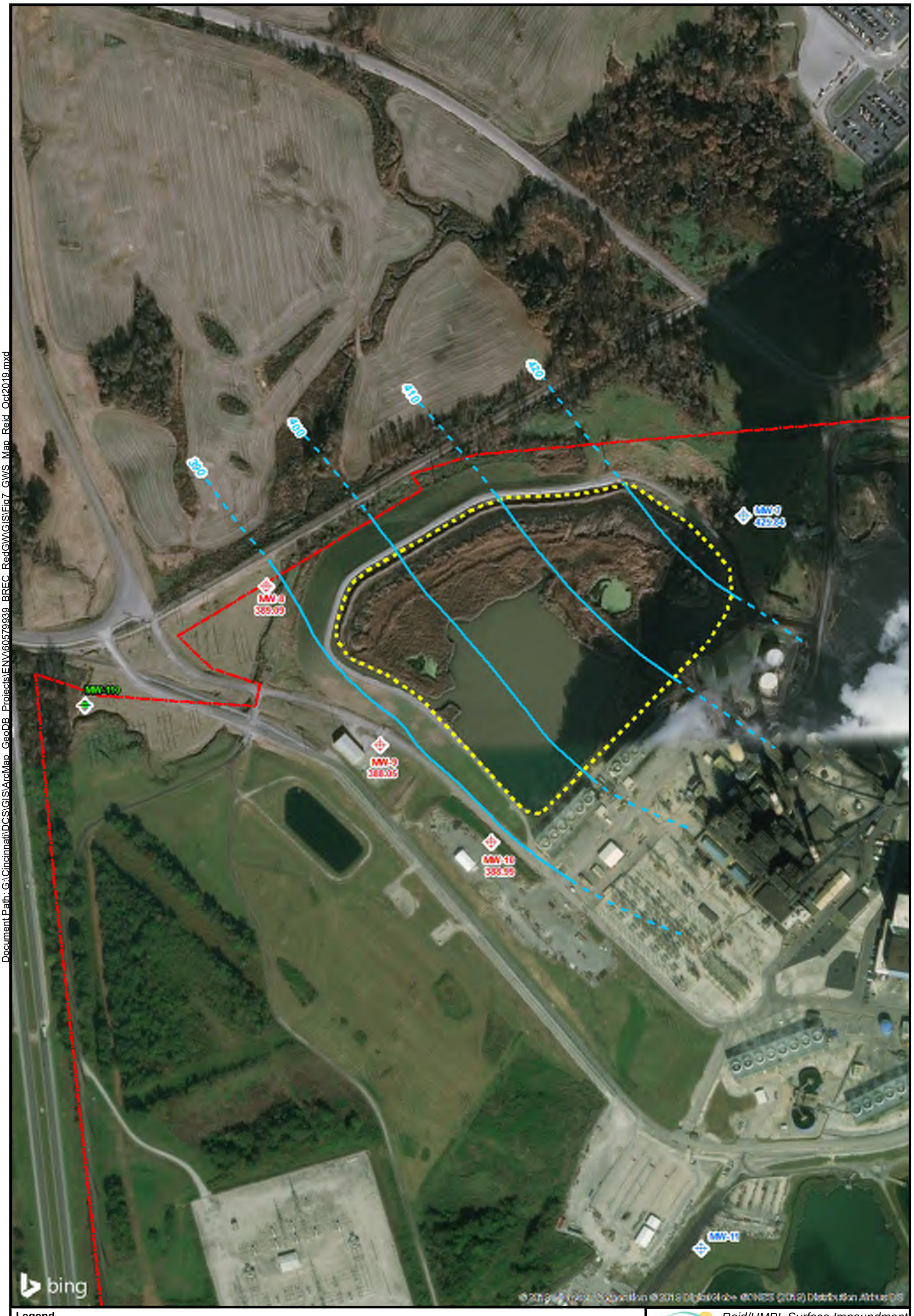

Legend

- Proposed Assessment Well
- Downgradient Monitoring Well
- Upgradient Monitoring Well
- Unit Boundary
- Property Line
- Water Table Contour (Inferred from Available Monitoring Data)
- Groundwater Flow Direction
- 389.09 Groundwater Elevation (Feet, MSL) Measured October 16, 2019

0 300 600
Feet

N

Big Rivers

Reid/HMPL Surface Impoundment
Webster County, Kentucky

FIGURE 3
GROUNDWATER SURFACE MAP
OCTOBER 2019

DATE: 12/11/2019	SCALE: 1IN = 200 FEET
CREATED BY: BAW	
JOB NO. 60579939	

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MW-8

APPENDIX III	GWPS	5/2/2019	10/17/2019	4/16/2020
Boron	NA	1.41	1.49	1.56
Calcium	NA	272	267	292
Chloride	NA	57.2	49.5	47.3
Fluoride	4	0.370	0.4	0.4
Sulfate	NA	1220	1240	1130
pH (SU)	NA	7.25	7.92	6.78
Total Dissolved Solids	NA	2090	2200	1930
APPENDIX IV				
Antimony	0.006	0.000205	<0.005	<0.005
Arsenic	0.01	0.000438	<0.0010	<0.0010
Barium	2	0.0188	0.016	0.017
Beryllium	0.004	<0.000102	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00320	<0.0020	<0.0020
Cobalt	0.006	0.000141	<0.004	<0.004
Fluoride	4	0.370	0.4	0.4
Lead	0.015	0.000104	<0.002	<0.002
Lithium	0.040	0.0370	0.03	0.03
Mercury	0.002	<0.101	<0.0005	<0.0005
Molybdenum	0.1	0.0146	0.01	0.01
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	1.43	2.504	1.93
Selenium	0.05	0.000634	<0.003	<0.003
Thallium	0.002	0.0000470	<0.0020	<0.0020

MW-9

APPENDIX III	GWPS	5/2/2019	10/17/2019	4/16/2020
Boron	NA	0.307	<1.00	0.32
Calcium	NA	68.6	66.8	71.2
Chloride	NA	21.8	17.6	22.8
Fluoride	4	0.223	0.2	0.3
Sulfate	NA	0.223	<1	<1
pH (SU)	NA	7.41	7.67	7.04
Total Dissolved Solids	NA	355	392	320
APPENDIX IV				
Antimony	0.006	0.000192	<0.005	<0.005
Arsenic	0.01	0.000563	<0.0010	<0.0010
Barium	2	1.03	0.763	1.06
Beryllium	0.004	<0.000102	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00316	<0.0020	<0.0020
Cobalt	0.006	0.0000550	<0.004	<0.004
Fluoride	4	0.223	0.2	0.3
Lead	0.015	0.0000760	<0.002	<0.002
Lithium	0.040	0.0141	0.009	0.01
Mercury	0.002	<0.101	<0.0005	<0.0005
Molybdenum	0.1	<0.000873	<0.01	<0.01
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	2.32	2.32	2.90
Selenium	0.05	<0.000348	<0.003	<0.003
Thallium	0.002	<0.0000360	<0.0020	<0.0020

MW-7

APPENDIX III	GWPS	5/2/2019	10/16/2019	4/16/2020
Boron	NA	0.309	<1.00	0.34
Calcium	NA	46.1	44.4	45.7
Chloride	NA	4.94	4.7	4.1
Fluoride	4	0.255	0.3	0.3
Sulfate	NA	16.8	19	15
pH (SU)	NA	7.46	7.65	6.86
Total Dissolved Solids	NA	271	228	1930
APPENDIX IV				
Antimony	0.006	0.0000760	<0.005	<0.005
Arsenic	0.01	0.00116	0.0014	0.0025
Barium	2	0.0824	0.062	0.087
Beryllium	0.004	<0.000102	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00136	<0.0020	<0.0020
Cobalt	0.006	0.000158	<0.004	<0.004
Fluoride	4	0.255	0.3	0.3
Lead	0.015	0.0000730	<0.002	<0.002
Lithium	0.040	<0.00959	0.008	0.007
Mercury	0.002	<0.101	<0.0005	<0.0005
Molybdenum	0.1	0.00442	0.01	0.006
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	0.698	0.444	1.833
Selenium	0.05	<0.000348	<0.003	<0.003
Thallium	0.002	<0.0000360	<0.0020	<0.0020

MW-110

APPENDIX III	GWPS	3/29/2019	4/10/2019	10/24/2019	4/17/2020
Boron	NA	0.484	0.496	<1.00	0.54
Calcium	NA	176	178	204	181
Chloride	NA	26.0	30.4	30.0	22.1
Fluoride	4	0.279	0.255	0.3	0.3
Sulfate	NA	563	596	568	460
pH (SU)	NA	7.25	7.50	7.33	7.17
Total Dissolved Solids	NA	1170	1200	1270	1150
APPENDIX IV					
Antimony	0.006	0.000240	0.000204	<0.005	<0.005
Arsenic	0.01	0.00534	0.00238	<0.0010	0.0012
Barium	2	0.118	0.107	0.065	0.065
Beryllium	0.004	0.000716	0.000314	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.0180	0.0115	0.0010	0.0047
Cobalt	0.006	**0.00911**	0.00384	<0.004	<0.004
Fluoride	4	0.279	0.255	0.3	0.3
Lead	0.015	0.00661	0.00399	<0.002	0.002
Lithium	0.040	0.0299	0.0303	0.02	0.02
Mercury	0.002	<0.101	<0.101	<0.0005	0.0002
Molybdenum	0.1	0.00153	0.00120	<0.01	<0.01
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	1.84	1.93	0.922	1.371
Selenium	0.05	<0.000348	<0.000348	<0.003	<0.003
Thallium	0.002	0.000112	0.0000640	<0.0020	<0.0020

MW-10

APPENDIX III	GWPS	5/2/2019	10/17/2019	4/16/2020
Boron	NA	0.498	<1.00	0.54
Calcium	NA	19.5	9.76	12.5
Chloride	NA	26.6	25.7	21.5
Fluoride	4	0.570	0.6	0.5
Sulfate	NA	114	80	58
pH (SU)	NA	9.15	9.24	8.87
Total Dissolved Solids	NA	642	568	466
APPENDIX IV				
Antimony	0.006	0.0000580	<0.005	<0.005
Arsenic	0.01	0.00254	0.0022	0.0019
Barium	2	0.100	0.077	0.093
Beryllium	0.004	<0.000102	<0.0020	<0.0020
Cadmium	0.005	<0.000152	<0.0010	<0.0010
Chromium	0.1	0.00299	0.0006	<0.0020
Cobalt	0.006	0.000685	<0.004	<0.004
Fluoride	4	0.570	0.6	0.5
Lead	0.015	0.000671	<0.002	<0.002
Lithium	0.040	**0.574**	**0.51**	**0.49**
Mercury	0.002	<0.101	0.0002	0.0002
Molybdenum	0.1	0.00797	0.007	0.006
Radium 226 (pCi/L) / Radium 228 (pCi/L)	5 pCi/L	0.205	0.837	1.24
Selenium	0.05	<0.000348	<0.003	<0.003
Thallium	0.002	<0.0000360	<0.0020	<0.0020

MW-8 MW-9 MW-7 MW-110 MW-10 MW-11

bing

Legend

- Unit Boundary
- Property Line
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Proposed Characterization Well

All results listed in milligrams per liter (mg/L) unless otherwise noted.
Yellow highlighted values indicate GWPS exceedance.
Orange highlighted analyte indicate SSL above GWPS.
SSL = Statistically Significant Level
GWPS = Groundwater Protection Standard
NA = Not Applicable
ND = Not Detected at or above Method Detection Limit
pCi/L = picoCuries per Liter

0 300 600
Feet

N

Big Rivers

Reid/HMPL Surface Impoundment
Webster County, Kentucky

FIGURE 4
GROUNDWATER CONDITIONS MAP
2019-2020 ANALYTICAL RESULTS

DATE: 6/10/2020	SCALE: 1IN = 200 FEET
CREATED BY: SEL	
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REMEDY SELECTION PROGRESS REPORT

REID/HMP&L SURFACE IMPOUNDMENT
SEBREE GENERATING STATION
WEBSTER COUNTY, KENTUCKY

December 9, 2019

Prepared For:

Big Rivers Electric Corporation
Sebree Generating Station
9000 Highway 2096
Robards, KY 42452

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Project No.: 60619822

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1.0 INTRODUCTION

In accordance with provisions of the United States Environmental Protection Agency's (USEPA) coal combustion residual (CCR) rule, Title 40 of the Code of Federal Regulations (CFR) Section 257.97, Big Rivers Electric Cooperation (BREC) is in the process of selecting a remedy for groundwater impacts at the Reid/Henderson Municipal Power & Light (Reid/HMP&L) Surface Impoundment (the Unit) at the Sebree Generating Station located in Webster County, Robards, Kentucky **(Figure 1)**.

Assessment monitoring results indicate the presence of lithium at a Statistically Significant Level (SSL) above the Ground Water Protection Standard (GWPS) in one monitoring well (MW-10) at the Unit. A map illustrating the site with location of all program monitoring wells is presented as **Figure 2**.

In response to the SSL exceedance, BREC evaluated the nature and extent of groundwater impacts as required by Title 40 CFR Section 257.95(g) for characterization monitoring. In addition, BREC performed an Assessment of Corrective Measures (ACM), to identify applicable remedial technologies to address lithium impacts in groundwater pursuant to Tile 40 CFR Section 257.96. A notice of ACM initiation dated January 14, 2019 was posted to BREC's publicly-accessible CCR reporting website. A report summarizing the results of the ACM (AECOM, June 2019) was posted to BREC's publicly-accessible CCR reporting website on June 14, 2019.

Title 40 CFR Section 257.97(a) requires that progress reports be prepared on a semi-annual basis describing progress made in selecting and designing a remedy. The following sections provide an overview of BREC's activities previously performed, currently underway, and planned in the future to select a remedy that meets the requirement of Title 40 CFR Section 257.97 (b) as follows:

(1) Be protective of human health and the environment;

(2) Attain the GWPS as specified pursuant to Section 257.95(h);

(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment;

(4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;

(5) Comply with standards for management of wastes as specified in Section 257.98(d).

2.0 SITE BACKGROUND

2.1 Site Description

BREC operates the Sebree Station, which is a coal-fired power generating facility located on the Green River northeast of Sebree, Kentucky. Sebree Station is composed of Green Station and Reid/HMP&L Station. BREC owns Green and Reid Stations, while the City of Henderson owns HMP&L Station 2. The Sebree Station is bounded by Interstate-69 to the west and the Green River to the east (see **Figure 1**). Reid Unit 1 (66 Megawatts) began commercial operation in 1966 and it will be converted from coal to natural gas in the future. The Reid Combustion Turbine (72 MW) was commercialized in 1976. HMP&L Station 2, Units 1 (167 MW) and 2 (168 MW) began commercial operation in 1973 and 1974 respectively. Both HMP&L units were retired as of February 1, 2019. Green Station Units 1 (242 MW) and 2 (242 MW) began commercial operation in 1979 and 1981, respectively.

The location of the Reid/HMP&L Station Surface Impoundment is illustrated in **Figure 2**. The Surface Impoundment has been in place for more than 40 years and is used for the placement of CCR material. As stated in the published CCR monitoring well network certification, available on the BREC website, the Reid/HMP&L Station Surface Impoundment is a combined incised/dike earthen embankment structure. It is diked on the west, south and east sides, while the north side is incised. The south dike has the greatest height, reaching approximately 20 feet. Most of the central portion of the south dike was constructed on a subdued ridge.

2.2 Groundwater Investigation Summary

Monitoring wells were installed around the perimeter of the Unit in December 2015 prior to the implementation of the CCR Rule. These wells meet the requirements of §257.90 of the CCR Rule for installation of a groundwater monitoring system. Under these requirements monitoring wells must adequately represent the quality of background groundwater and groundwater representing the downgradient waste boundary. The existing wells are located along the perimeter of the footprint for the Unit. One upgradient monitoring well (MW-7) and three downgradient monitoring wells (MW-8, MW-9, and MW-10) were installed adjacent to the Unit to determine the general direction of groundwater movement and to monitor groundwater impacts. The monitoring wells were installed in the uppermost saturated portion of the sandstone bedrock aquifer.

Nine rounds of Baseline groundwater sampling was conducted between March 2016 and October 2017. Statistical evaluation of Appendix III constituents monitored for Detection monitoring indicated that statistically significant increases (SSIs) over background have occurred, and therefore, Assessment monitoring was triggered. Detection monitoring activities and data are presented in the annual reports that have been prepared to date (AECOM 2018 and 2019).

As part of Assessment monitoring, upgradient and downgradient wells for the Unit were sampled for Appendix IV constituents in April, July, and September 2018. GWPS were established for Assessment monitoring of the Appendix IV constituents, and statistical evaluation indicated exceedances of GWPSs at SSLs, as detailed in **Table 1** below.

Table 1 – Reid/HMP&L Surface Impoundment Constituents of Concern

Monitoring Well (Date)	Parameter
	Lithium GWPS 0.04 (mg/L)
MW-10 (Apr 2018)	**0.694**
MW-10 (Jul 2018)	**0.630**
MW-10 (Sep 2018)	**0.570**

GWPSs are the greater of the site-specific background concentrations, the USEPA primary drinking water standard maximum contaminant limits (MCL), or GWPS provided in 40 CFR 257.95(3)(h)(2)

An additional characterization well, MW-110, was subsequently installed to estimate the downgradient extent of impacted groundwater. Sample collection for Appendix III and IV parameters took place in March and April 2019. The analytical results for lithium in MW-110 were below the GWPS. The additional characterization data are summarized in **Table 2** below.

Table 2 – Reid/HMP&L Surface Impoundment Characterization Sample Results

Monitoring Well (Date)	Parameter
	Lithium GWPS 0.04 (mg/L)
MW-110 (March 2019)	0.0299
MW-110 (April 2019)	0.0303

The results from both characterization sampling events helped to confirm the downgradient (southwestern) extent of COC impacts above GWPS at the Unit.

2.3 Conceptual Site Model

A Conceptual Site Model (CSM) has been developed to support the remedy selection process for groundwater corrective action at the Unit.

2.3.1 Physical Setting

The Unit is located within the Interior Low Plateaus physiographic province. The province is part of the Interior Plains division of the United States. Characteristic features of the province include unglaciated rolling limestone plains with alluvial valleys and entrenched rivers and streams. Several large rivers are in the region, including the Green, the Ohio, the Kentucky, the Tennessee, and the Cumberland Rivers. The geology underlying the Unit consists of unconsolidated materials, including loess and alluvial deposits, underlain by Upper to Middle Pennsylvanian-age clastics and carbonates consisting primarily of sandstone and shale. The unconsolidated materials also include fill, silty and clayey residuum, and minor amounts of sandy, and clayey channel fill alluvium.

The Unit is located on upland area near the west bank of the Green River. The uppermost edge of the earthen embankment is situated at an elevation of approximately 429 feet above mean sea level (amsl). Although the Green River is located less than 0.5 miles from the site, the structure does not extend significantly into the floodplain. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands (Associated Engineers 2016, Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan). The immediate watershed that drains to the unit, and in which the unit is considered to be located, is unnamed and 25.45 acres in size. The unnamed watershed discharges from the Unit outflow structure and is routed, under a Kentucky Pollution Discharge and Elimination System permit, to the Green River.

2.3.2 Geology

The Unit lies in the Western Kentucky Coalfields section of the Interior Low Plateaus physiographic province, characterized by rolling uplands underlain by coal-bearing bedrock of the Pennsylvanian Period. Near the Unit, maximum topographic relief is on the order of 80 feet. The geologic quadrangle (Geologic map of the Robards quadrangle, Henderson and Webster Counties, Kentucky, 1973) for the area published by the Kentucky Geologic Survey (KGS) shows the surficial material in portions of the western half of the Unit to be unconsolidated loess representing the Pleistocene geologic epoch. The loess consists of sandy and clayey silt. Underlying the loess deposits in places are broadly distributed Pleistocene and Holocene alluvium deposits consisting of intermixed and interlensing clay, silt, sand, and gravel. In close proximity to the Unit, the alluvium is generally a low permeability unit that forms terraces along the Green River at elevations of roughly 380 and 395 ft., amsl. The unconsolidated surficial materials range from approximately 24 feet (MW-7) to 47 feet (MW-110) in thickness surrounding the Unit.

The unconsolidated materials are underlain by bedrock of the Upper Pennsylvanian Shelburn Formation [formerly identified as the Lisman Formation (Fairer, 1973)] and the Middle Pennsylvanian Carbondale Formation. At the base of the Shelburn Formation is the Providence Limestone Member, consisting of two distinct limestone beds separated by a sandy shale, but this member is absent in much of the area due to erosional channeling. The underlying Carbondale Formation consists of cyclic sequences of sandstones, shales, siltstones and coals. The Carbondale sediments were deposited in a fluvial-deltaic system. As a result of this depositional environment, the lithologic units of the Carbondale tend to be lenticular bodies rather than continuous sheet-like strata. Gradational and abrupt horizontal changes in lithology are often encountered.

2.3.3 Hydrogeology

For purposes of compliance with the CCR Rule groundwater monitoring requirements, the interbedded sandstone and shale of the Carbondale Formation is considered the uppermost aquifer underlying the Unit. The uppermost aquifer is hydraulically confined and first encountered at an elevation of approximately 413.4 ft., amsl at the northeast end (at MW-7), and 341.6 ft. amsl at the west end of the Unit (at MW-8). Flow direction beneath the Unit is typically to the southwest towards an unnamed tributary to Groves Creek located west/southwest of the impoundment.

Slug tests were performed between April 24, 2019 and April 25, 2019 at monitoring wells MW-10, and MW-110 to assess the hydraulic characteristics of the uppermost aquifer. The estimated hydraulic conductivity of the monitoring wells tested ranged from 3×10^{-6} to 5×10^{-4} centimeters per second (cm/sec).

Although previous site-specific investigations have noted the presence of perched zones of saturation in the overlying unconsolidated materials, these discontinuous zones do not qualify as an uppermost aquifer under the CCR Rule because they do not produce usable quantities of groundwater.

2.3.4 Constituents of Concern (COC)

As discussed above, a single Appendix IV COC (lithium) was detected at concentrations exceeding GWPS in one monitoring well location (MW-10). As a result, the corrective measure evaluation is confined to the area adjacent to this monitoring well.

2.3.5 Potential Receptors/Exposure Pathways

Contact with water (e.g., shallow groundwater or surface water) impacted by COCs at levels above GWPS is regarded as the potential pathway for exposure of potential receptors. Based on data published by KGS, there are no known groundwater wells used for drinking water within a 1-mile radius of the Unit, thus limiting the potential receptors to the surface water, i.e., the Green River and its tributary, Groves Creek. The pathways to these receptors include seepage of water from the Unit through manmade and natural hydraulic barriers.

Other potential exposure pathways (e.g., soil or vapor) are not considered complete as the CCR material is isolated in the Unit. This isolation prevents direct access by individuals that might result in direct contact or ingestion. In addition, the inherent non-volatile nature of the unit-specific COCs eliminates the potential for a complete vapor pathway (i.e., vapor intrusion to indoor air).

2.4 Interim Corrective Measures

No interim corrective measures have been performed at the Unit for groundwater impacts.

2.5 Assessment of Corrective Measures Summary

Title 40 CFR Section 257.96(c) requires that the ACM include an analysis of the effectiveness of potential corrective measures in meeting the objectives for remedies identified under Section 257.97(b), by addressing at least the following:

1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
2) The time required to begin and complete the remedy; and
3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

Several potential corrective measures technologies were evaluated to identify which ones could be carried forward as components of corrective measures alternatives. The results of the corrective measures technology evaluation are presented in **Table 3** below.

Table 3 – Potential Corrective Measures Options Technology Description/Overview

Potentially Applicable Technology	Status	Description/Overview
No Action	Not retained as standalone technology, but carried forward for baseline comparisons	This technology has been included in the preliminary evaluation/screening but is not retained because it will not meet the established CAOs.
Institutional Controls (ICs)	Retained as supplement to corrective measures alternatives	The use of ICs (i.e., Environmental Covenants, groundwater use restrictions, etc.) is retained as a useful technology. However, it is noted the ICs are not anticipated to be used as a stand-alone technology. Environmental Covenants, groundwater use restrictions, etc., are expected to be combined with other applicable technologies as part of corrective measures alternatives.
Groundwater Monitoring (Assessment and Detection modes)	Retained as supplement to corrective measures alternatives	The use of groundwater monitoring (Assessment and/or Detection modes as appropriate) when combined with other applicable technologies as part of any proposed corrective measures alternative is retained to address the CAO and to track the effectiveness of the overall remedy. However, it is not retained as a stand-alone technology.
Hydraulic Containment	Retained	The use of hydraulic containment is retained because it is an effective means of preventing off-site migration of soluble contaminants. Hydraulic containment requires management and potential ex-situ treatment of extracted groundwater, so it is not a stand-alone technology. The CSM will guide the design of any groundwater extraction system to optimize the total discharge of groundwater needed to provide hydraulic containment.
Physical Containment	Retained	The use of physical containment is retained because it can be an effective means of managing groundwater flow. Physical containment often requires pairing with hydraulic containment and/or in-situ treatment (funnel and gate style) to manage the flux of groundwater flow into the system. The CSM will guide the design of any physical barrier system, but technology limitations may increase implementation difficulty with scale.
Ex-situ Physical/Chemical/Biological Treatment	Retained	Ex-situ treatment technologies are retained as a way of removing contaminants from extracted groundwater from a hydraulic containment system. Ex-situ treatment may be paired with wastewater treatment, non-groundwater release treatment systems, or with permitted discharge to manage groundwater contamination. The CSM and data gaps investigations will guide the design of any ex-situ treatment.
Closure in Place (CiP) (of the regulated unit)	Retained	The use of CiP as a source control technology and is amenable with respect to CAO attainment.

Potentially Applicable Technology	Status	Description/Overview
Closure by Removal (CbR) (of the regulated unit)	Retained	The use of CbR as a source control technology is amenable with respect to CAO attainment.
Other Source Control Technologies	Retained	Control of source area non-groundwater related releases. For the purposes of this groundwater ACM, management of non-groundwater releases are not included in the alternatives evaluation. Engineering measures, including leachate collection, lining of trenches and/or ponds, and other isolation methods are regarded as part of closure technologies selected by other means.

Note: Technologies that were retained may be used as components of a corrective action alternative, but when evaluated in conjunction with other available technologies any single technology may not be utilized.

Preliminary assembly of corrective measures alternatives was performed based on site-specific and regional geology and groundwater conditions. For the Reid/HMP&L Station Surface Impoundment, five corrective measures alternatives were developed from this list of applicable corrective measures technologies:

- Alternative #1 – No Action, and Groundwater Monitoring
- Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring
- Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring
- Alternative #3 – CiP, ICs, Hydraulic Containment, Other Source Control, Ex-Situ Treatment, and Groundwater Monitoring
- Alternative #4 – CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

The assembly of corrective measures alternatives presented in the ACM is considered preliminary and could be revised at a later date following detailed analysis during the remedy selection process and/or following comment from the regulatory community and public.

3.0 REMEDY SELECTION PROGRESS

Five corrective measure alternatives were identified during the ACM process for potential implementation at the Unit to address groundwater impacts. Each corrective measure alternative consists of one or more corrective measures technologies assembled into a strategy for the groundwater remedy. Each alternative is discussed in more detail below.

3.1 Potential Corrective Action Alternatives

3.1.1 Alternative #1 – No Action and Groundwater Monitoring

Alternative #1 consists of taking no action to address groundwater impacts at the Unit. Under the No Action alternative, no corrective action would be implemented to remove, control, mitigate, or minimize exposure to impacted groundwater. The No Action alternative establishes a baseline or reference point against which each of the corrective measure alternatives is compared.

Since Alternative #1 would not attain the CAOs for the Unit, this alternative would not likely be acceptable to stakeholders. Therefore, Alternative #1 is not recommended for further consideration.

3.1.2 Alternative #2a – Closure in Place (CiP), Institutional Controls (ICs), and Groundwater Monitoring

Alternative #2a as currently envisioned would employ a combination of three corrective measures technologies:

- CiP source control, which consists of planned Reid/HMP&L Surface Impoundment closure activities;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater monitoring (Assessment) to document the effectiveness of the corrective measures.

Alternative #2a is recommended for further evaluation.

3.1.3 Alternative #2b – Closure by Removal (CbR), ICs, and Groundwater Monitoring

Alternative #2b as currently envisioned would be similar to Alternative #2a except that CiP is replaced by CbR, which consists of excavation and removal of the Unit. Given that Alternative #2b is likely cost prohibitive, this alternative is not recommended for further consideration.

3.1.4 Alternative #3 – CiP, Hydraulic Containment, Ex-Situ Treatment, ICs, and Groundwater Monitoring

Alternative #3 builds on Alternative #2a to also include the addition of Hydraulic Containment and Ex-Situ Treatment of groundwater:

- CiP source control, which consists of planned Surface Impoundment closure activities;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes;

- Hydraulic Containment using one or more vertical wells designed to prevent the movement of impacted groundwater past the limits of the unit to the downgradient groundwater environment and potential points of exposure;
- Ex-Situ Treatment of groundwater extracted for hydraulic containment, which involves above-ground physical/chemical treatment methods and/or permitted discharge until the CAOs are achieved;
- Implementation of ICs designed to restrict the property to industrial use and to prohibit groundwater use for potable purposes; and
- Groundwater Monitoring (Assessment mode) to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection-mode monitoring and ultimately to cessation of corrective measures.

Alternative #3 is recommended for further evaluation.

3.1.5 Alternative #4 – CiP, ICs, Physical Containment, Ex-Situ Treatment, and Groundwater Monitoring

Alternative #4 consists of BREC's planned unit closure activities, physical containment of impacted groundwater via installation of a funnel-gate system, and ex-situ treatment of contained groundwater via an extraction well installed at the containment gate. Impacted groundwater would be contained by grout curtain constructed in a funnel-and-gate arrangement that directs the flow of groundwater to an extraction point. The grout curtain would be installed by drilling two lines of grout injection points that extend northwestward and northeastward from the southeast corner of the unit. The length of each limb of the barrier would be 500 feet, and the target depth would be approximately 325 ft-amsl. A single extraction well would be installed at the "gate" with a screened interval of 50 to 100 ft-bgs and a pumping capacity of up to 20 gpm. Groundwater will be pumped and conveyed to an existing surface water impoundment at the Sebree Station, which will allow for compliance with discharge permits through an established NPDES outfall.

CiP via ash stabilization and capping would control the source of COCs and thereby reduce contaminant loading to the extraction system. Concentrations downgradient of the physical barrier would be expected to decrease over time through several natural attenuation mechanisms including advection, dilution, and dispersion. Groundwater Monitoring (Assessment) would continue to track the effectiveness of the corrective measures and to identify conditions that allow the return to Detection monitoring and ultimately

Alternative #4 is recommended for further evaluation.

3.2 Remedy Evaluation

Currently BREC considers three (3) potential corrective action alternatives as viable options to address groundwater impacts at the Unit, including:

- Alternative #2a;
- Alternative #3; and
- Alternative #4;

To evaluate each alternative, additional data collection will likely be required. BREC is currently evaluating data collection needs in the following areas to assist with remedy selection:

1) Nature and Extent – groundwater trends, influence of non-groundwater remedies, etc.

2) Physical Characteristics – available data on the physical characteristics of the landfill and retention pond
3) Performance Modeling – data needed to develop digital models demonstrating the effectiveness of potential alternatives
4) Engineering – feasibility, cost estimates, etc.

BREC is working to establish a comprehensive list of data collection needs to proceed forward with remedy evaluation and anticipates providing additional data in future semi-annual remedy selection progress reports.

4.0 CONCLUSION

Additional updates regarding remedy selection, including any additional corrective measures being considered, will be presented twice a year in future remedy selection progress reports. Once sufficient data has been collected to select an effective comprehensive remedy for the Unit, a public meeting will be held 30 days prior to formal remedy selection, followed by a detailed Remedy Selection Report describing the remedy and proposed schedule for implementation.

If needed, the next remedy selection progress report for the Unit is expected in June 2020.

5.0 REFERENCES

AECOM, 2018. Annual Groundwater Monitoring and Corrective Action Report, 2016-2017; Reid/HMP&L Station Surface Impoundment, Webster County, Kentucky.

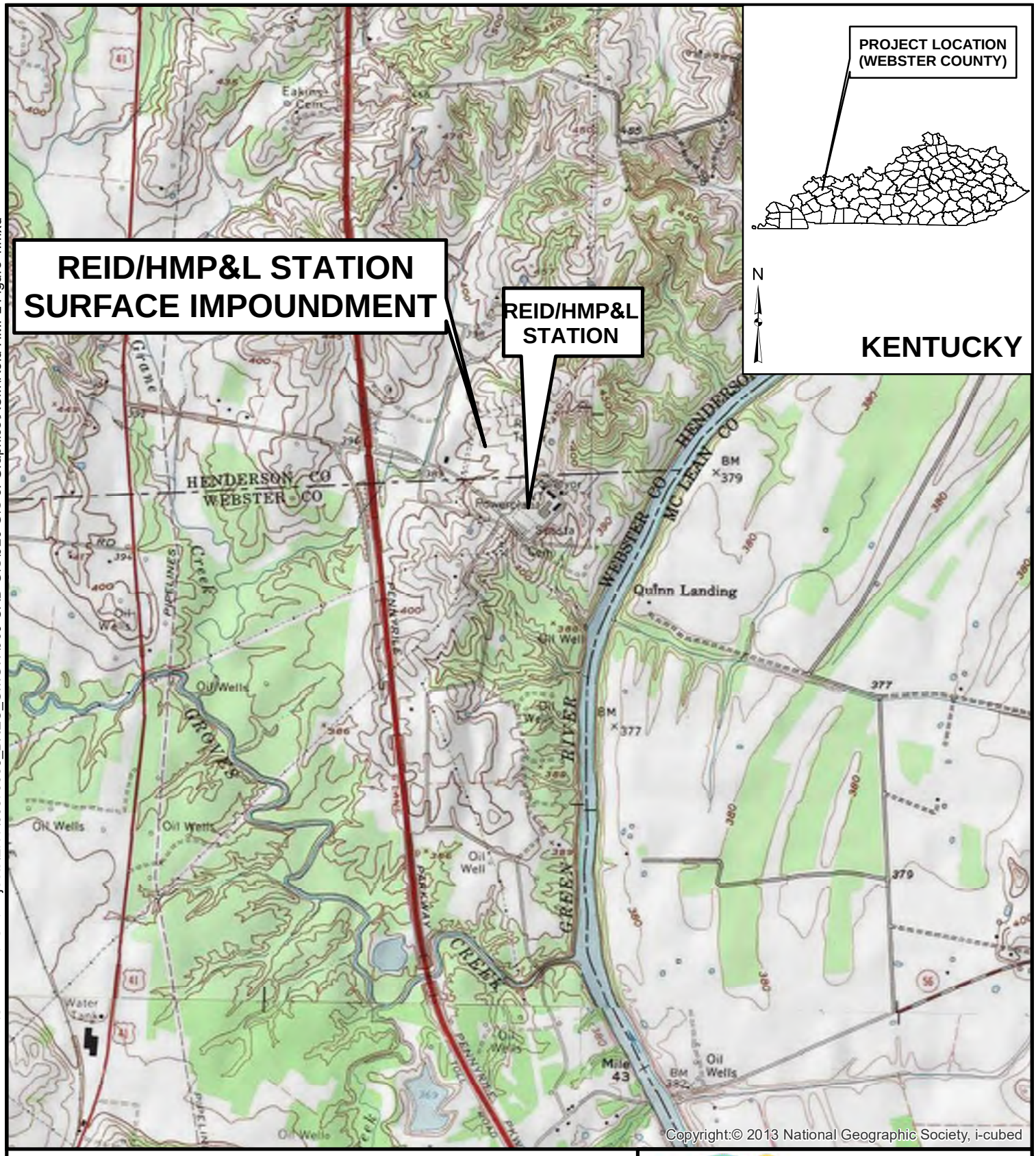
AECOM, 2019. Annual Groundwater Monitoring and Corrective Action Report, 2018; Reid/HMP&L Station Surface Impoundment, Webster County, Kentucky.

Associated Engineers 2016. Hydrologic and Hydraulic Capacity Assessment and Initial Inflow Design Flood Control System Plan.

EPA, 40 CFR Part 257. [EPA–HQ–RCRA–2015–0331; FRL–9928–44–OSWER]. RIN–2050–AE81. Technical Amendments to the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities—Correction of the Effective Date. Federal Register / Vol. 80, No. 127 / Thursday, July 2, 2015 / Rules and Regulations.

Fairer, G.M., Geologic Map of the Robards Quadrangle, Henderson and Webster Counties, Kentucky, U.S. Geological Survey, 1973.

Figures



Document Path: G:\Cincinnati\DCS\Projects\ENV\60579938_BREC_GrnGW\900-CAD-GIS\920-GIS or Graphics\ACM\Reid HMPL Figure 1.mxd

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROBARDS QUADRANGLE
DELAWARE QUADRANGLE
(FROM ARCGIS ONLINE Copyright:© 2011 National Geographic Society, i-cubed)

0 2,000 4,000 Feet

N

Big Rivers Electric Corporation

Reid/HMPL Station
Webster County, Kentucky

FIGURE 1
SITE LOCATION MAP

DATE: 4/30/2019	SCALE: 1IN = 2,000 FEET
CREATED BY: ALW	
JOB NO. 60602365	

Document Path: G:\Cincinnati\DCS\Projects\ENV\60579939_BREC_RedGW\900-CAD-GIS\920-GIS or Graphics\Reid_HMPL_Ch_Rpt_Fig2.mxd

Legend

- Unit Boundary
- Property Line
- Downgradient CCR Monitoring Well
- Upgradient CCR Monitoring Well
- Characterization Well

0 300 600

Feet

N

BigRivers

Reid/HMPL Station
Webster County, Kentucky

FIGURE 2
WELL LOCATION MAP

DATE: 12/9/2019	SCALE: 1IN = 200 FEET
CREATED BY: ALW	
JOB NO. 60602365	

ATTACHMENT 11 - STRUCTURAL STABILITY ASSESSMENT (OCTOBER 2016)

Green Station CCR Surface Impoundment

Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Structural Stability Assessment

October 11, 2016

Prepared By:

ASSOCIATED ENGINEERS, INC.
2740 North Main St. • Madisonville, KY 42431
Phone: (270) 821-7732 • Fax: (270) 821-7789

Project ID: 160028A

Big Rivers Electric Corporation
Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Structural Stability Assessment

CCR Surface Impoundment Information

Name:	Green Station CCR Surface Impoundment
Operator:	Sebree Generating Station
Address:	9000 Highway 2096 Robards, Kentucky 42452
CCR Unit Identification Number:	Kentucky State Dam Inventory System ID No. 0980

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

As part of the § 257.73 Structural integrity criteria for existing CCR surface impoundments requirements, an owner or operator of an existing CCR surface impoundment must no later than October 17, 2016:

Conduct initial structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:

1. Stable foundations and abutments;

2. Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;

3. Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;

4. Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms

of slope protection;

5. A single spillway or a combination of spillways configured as specified in the final rule. The combined capacity of all spillways must be designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in the final rule and all spillways must be either of non-erodible construction and designed to carry sustained flows; or earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected. The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or 1000-year flood for a significant hazard potential CCR surface impoundment; or 100-year flood for a low hazard potential CCR surface impoundment;

6. Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure; and

7. For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

From: VI. Development of the Final Rule - Technical Requirements

In order to ensure the proper upkeep and operation of the CCR unit, the owner or operator must demonstrate that the CCR surface impoundment has been designed, constructed, operated and maintained to provide structural stability. Specifically, the final rule requires the owner or operator to demonstrate that the design, construction, operation, and maintenance of the CCR surface impoundment is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and water that can be impounded therein. Specifically, the final rule focuses on the critical structural aspects of the CCR surface impoundment that EPA identified in the proposed rule, and identifies the minimum elements that a professional engineer must provide engineering details on or otherwise address. Consistent with the proposal, these demonstrations must be certified by a qualified professional engineer.

In addition to implementing adequate slope protection against erosion, which is a structural stability requirement applicable to all CCR units, the owner or operator of a CCR surface impoundment exceeding the specified size threshold (height of five feet or more and a storage volume of 20 acre-feet or more; or a height of 20 feet or more) must demonstrate that the unit, including any vertical and lateral expansions, is constructed with ‘‘stable foundations and abutments.’’ A stable foundation is an essential element of surface impoundment construction and prevents differential settlement of the embankment which can result in adverse internal stresses with the embankment cross-section.

Consistent with general engineering construction methodologies, the structural stability assessment also requires the owner or operator to determine whether the CCR surface impoundment has been mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit. Compaction of a dike or embankment is considered essential, as the compaction of soils leads to an increase in density and subsequently strength. Soil mechanics theory has established that the density of a soil corresponds to the moisture content and strength of the soil. The rule requires the owner or operator make this determination for all dikes of a CCR surface impoundment.

The owner or operator must also design, construct, operate, and maintain the CCR surface impoundment spillway or spillways with appropriate material so as to prevent the degradation of the spillway, as well as to ensure that the CCR surface impoundment has adequate spillway capacity to manage the outflow from a specific inflow design flood. In addition, a demonstration must be made that the CCR surface impoundment has been designed, constructed, operated, and maintained with inflow design flood controls and/or spillway capacity to manage peak discharge during and following inflow design floods. This demonstration is required to ensure the CCR surface impoundments will have adequate hydrologic and hydraulic capacity to prevent such failures as overtopping and excessive internal seepage and erosion. Spillways must be designed to withstand discharge from the inflow design flood without losing their structural form and leading to discharge issues, such as erosion or overtopping of the embankment. This requirement is covered in more detail in the hydrologic and hydraulic capacity requirements for CCR surface impoundments section of this rule.

EPA is not requiring a facility to include any demonstration relating to the potential for rapid, or sudden, drawdown loading condition. Rapid or sudden drawdown is a condition in earthen embankments in which the embankment becomes saturated through seepage in an extended high pool elevation in the reservoir. A threat to the embankment emerges when the reservoir pool is drawn down or lowered at a rate significantly higher than the excess poor water pressure within the embankment can diminish. Typically, rapid drawdown scenarios are considered for embankments with reservoirs used for water supply and management, emergency reservoirs, or agricultural supply, in which the reservoir is rapidly discharged from the structure.

A second consideration regarding rapid drawdown, however, is the rapid drawdown of a water body adjacent to the slope of the CCR surface impoundment which may periodically inundate the slope. Many CCR surface impoundments are located in areas in which the downstream slope of the CCR surface impoundment runs down to a lake, stream, or river. In such instances, rapid drawdown must be considered for the stability of the downstream slope of the embankment in the event of a rapid drawdown in the lake, stream, or river pool elevation or stage. Because the water ponded against the downstream slope of the CCR surface impoundment provides a stabilizing load on the slope of the CCR surface impoundment, the rapid or gradual loss of this stabilizing force must be considered in the analysis of the CCR surface impoundment. The rule, therefore, requires that existing and new CCR surface impoundments and any lateral expansions of such units with a downstream slope that can be inundated by an adjacent water body, such as rivers, streams, or lakes, be

constructed with downstream slopes that will maintain structural integrity in events of low pool or rapid drawdown of the adjacent water body. This ensures that the structural integrity of the downstream slope of the CCR surface impoundment will be maintained, even though the conditions of an adjacent surface water body may be outside the owner or operator's control.

Description of Impoundment

An aerial photo of the CCR unit is provided as Attachment A and an excerpt from U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps showing the location of the CCR unit is provided as Attachment B.

The CCR unit has been in place for 40 plus years and is used for the placement of coal combustion residual material; currently slurried bottom ash. The immediate watershed that drains to the CCR unit, and in which the CCR unit is considered to be located, is unnamed and 54.13 acres in size. The unnamed watershed discharges from the CCR impoundment outflow structure and is routed to the Green River.

The CCR unit is a combined incised/earthen embankment structure. Embankments form the west, south and east sides of the impoundment and the north side is incised. The Green River is located approximately 400 feet east of the structure. Due to surface relief, only the toe area of the south dike is potentially subject to flooding. The predominant features were small stream valleys draining eastward to the Green River. Most of the central portion of the south dike was constructed on a subdued ridge. The toe of the outboard slope intersected a lower drainage area. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands.

The west dike is generally less than five feet in height and the south dike reaches a maximum height of 19.5 feet. The east dike reaches a maximum height of approximately eight feet and is buttressed with a secondary parallel embankment that serves as a 40-foot wide roadway. The Burns and Roe, Inc. Engineering and Consultants June 30, 1978 site grading plans show the original construction layout and ground contours for the impoundment site. Bottom ash has been placed above the normal pool along the inboard side, essentially creating reclaimed land

Depth of impounded water and CCR is 16 feet and 46 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 394 feet and 408 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

The remaining storage capacity is approximately 172,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the

maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

The approximate volume of impounded water and CCR is 981,000 cubic yards (approximate water volume is 172,000 cubic yards and approximate CCR volume is 809,000 cubic yards). This volume was calculated based on the maximum storage capacity, the current amount of CCR stored in the facility based on the most recent bathymetric survey, and the best available as-built data for the structure construction prior to placement of CCR.

The impoundment discharge consists of two corrugated steel pipes, each 24 inches in diameter. The pipe intakes are through a concrete common headwall collection structure with a variable height steel debris deflector on each pipe intake.

Results of the Initial Structural Stability Assessment

The initial structural stability assessment has been completed and documents whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. Slope stability analyses were performed using Rocscience Inc. Slide geotechnical software. Slide provides numerical tools to analyze the stability of embankments using limit equilibrium methods.

The assessment documents whether the CCR unit has been designed, constructed, operated, and maintained with:

1. Stable foundations and abutments;

   The 2015 Annual Inspection indicates that the Green CCR impoundment exhibits stable foundations and abutments. No related deficiencies were observed during the annual inspection.

2. Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;

   The 2015 Annual Inspection indicates the Green CCR impoundment exhibits mostly adequate slope protection from erosion, wave action and any effects if sudden drawdown could occur. No related deficiencies were observed during the annual inspection.

3. Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;

   Quality assurance and/or testing reports describing the compaction methods and results during embankment construction are not available. A geotechnical exploration was performed to meet the requirements of 40 CFR §257.73(e); the exploration included Standard Penetration Testing (SPT) and acquisition of undisturbed soil samples. Based

on the field results and laboratory analyses, the materials within the embankment are sufficient to withstand the anticipated loading conditions.

4. Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms of slope protection;

   The 2015 Annual Inspection indicates the Green CCR impoundment embankment exhibits vegetation mostly greater a height of six inches above the slope of the dike. The Utility Solid Waste Activities Group, et al. has petitioned the USEPA to remand this requirement from the final rule because it is not practical and in remanding the provision, there is no reasonable probability of adverse effects on human health or the environment. USEPA has agreed that the requirement should be remanded.

5. A single spillway or a combination of spillways configured as specified in the final rule. The combined capacity of all spillways must be designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in the final rule and all spillways must be either of non-erodible construction and designed to carry sustained flows; or earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected. The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or 1000-year flood for a significant hazard potential CCR surface impoundment; or 100-year flood for a low hazard potential CCR surface impoundment;

   The impoundment has a single spillway structure. The spillway is comprised of two 30-inch corrugated metal pipes with a dual-pipe concrete headwall. The impoundment was analyzed for a 1000-year/24-hour storm event using SCS methodologies and a Type II rainfall distribution. Precipitation depth during the design storm was acquired from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Point Precipitation Frequency Estimates database. Based on the analysis, the spillway structure can manage the flow from the design storm without overtopping the embankment. The analysis was based on the current impoundment configuration, storm water flows, process water flows, and contents volume.

6. Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure; and

   The 2015 Annual Inspection indicates the hydraulic structures underlying the base of the Green impoundment or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure. No related deficiencies were observed during the annual inspection.

7. For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

   Due to the configuration and location of the impoundment, stability is not anticipated to be significantly affected by low river pool conditions. Although a portion of the downstream slope of the impoundment embankment is located below the 100-year flood elevation of the Green River and may experience encroachment of the adjacent water body during a flood event, stability is not anticipated to be affected by sudden drawdown. A rapid drawdown analysis was completed to assess the downstream slope of the impoundment during such an event and the analysis resulted in an acceptable factor of safety demonstrating that the slope will maintain structural stability during a sudden drawdown.

Sources of Information

Geotechnical and other information provided by Associated Engineers, Inc.

Engineering design drawings and other information provided by Big Rivers Electric Corporation

United States Geological Survey U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps

Professional Engineer Certification [Per 40 CFR § 257.73]
Green CCR Impoundment Initial Structural Stability Assessment

I hereby certify that myself or an agent under my review has prepared this Initial Structural Stability Assessment (Assessment), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Assessment has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.73. To the best of my knowledge and belief, the information contained in this Assessment is true, complete, and accurate.

David A. Lamb, P.E.

State of Kentucky License No. 17822

Date: 10/11/16

Attachment A. Aerial Photo of the Green CCR Surface Impoundment

Attachment B. Topographic Map showing the Green CCR Surface Impoundment

Big Rivers
ELECTRIC CORPORATION
Your Touchstone Energy® Cooperative

Green Station CCR Surface Impoundment

Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

October 11, 2016

Prepared By:

ASSOCIATED ENGINEERS, INC.
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Phone: (270) 821-7732 • Fax: (270) 821-7789

Project ID: 160028A

Big Rivers Electric Corporation
Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

CCR Surface Impoundment Information

Name:	Green Station CCR Surface Impoundment
Operator:	Sebree Generating Station
Address:	9000 Highway 2096 Robards, Kentucky 42452
CCR Unit Identification Number:	Kentucky State Dam Inventory System ID No. 0980

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

As part of the § 257.73 Structural integrity criteria for existing CCR surface impoundments requirements, an owner or operator of an existing CCR surface impoundment must no later than October 17, 2016:

> Conduct an initial safety factor assessment for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified below for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations, documenting whether the CCR unit achieves the following minimum factors of safety:
>
> 1. The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
>
> 2. The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
>
> 3. The calculated seismic factor of safety must equal or exceed 1.00.

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

From: VI. Development of the Final Rule - Technical Requirements

General Safety Factor Assessment Considerations

Generally accepted engineering methodologies specify that the determination of the structural stability factors of safety specified above is to be calculated by the qualified professional engineer using conventional analysis procedures or, if necessary, special analysis procedures. Conventional analysis procedures include, but are not limited to, limit equilibrium methods of slope stability analysis, whereas, special analysis procedures include, but are not limited to, finite element methods, finite difference methods, three-dimensional methods, or probabilistic methods. Whichever methodology is used to determine the factors of safety of the CCR surface impoundment, the qualified professional engineer must document the methodology used, as well as the basis for using that methodology, and the analysis must be supported by appropriate engineering calculations.

The Calculated Static Factor of Safety Under the Long-Term, Maximum Storage Pool Loading Condition

It is generally accepted practice to analyze the stability of the downstream slope of the dam embankment for steady-state seepage (or steady seepage) conditions with the reservoir at its normal operating pool elevation (usually the spillway crest elevation) since this is the loading condition the embankment will experience most. This condition is called steady seepage with maximum storage pool. The maximum storage pool loading is the maximum water level that can be maintained that will result in the full development of a steady-state seepage condition. Maximum storage pool loading conditions need to be calculated to ensure that the CCR surface impoundment can withstand a maximum expected pool elevation with full development of saturation in the embankment under long-term loading. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum storage pool loading condition meet or exceed 1.5.

The Calculated Static Factor of Safety Under the Maximum Surcharge Pool Loading Condition

The maximum surcharge pool loading condition is calculated to evaluate the effect of a raised level (e.g., flood surcharge) on the stability of the downstream slope. This ensures that the CCR surface impoundment can withstand a temporary rise in pool elevation above the maximum storage pool elevation for which the CCR surface impoundment may normally be subject under inflow design flood stage, for a short-term until the inflow design flood is passed through the CCR surface impoundment. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum surcharge pool loading condition meet or exceed 1.4.

The Calculated Seismic Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold must meet a seismic factor of safety equal to or greater than 1.0. All CCR surface

impoundments must also be capable of withstanding a design earthquake without damage to the foundation or embankment that would cause a discharge of its contents. To further support the location criteria established in this rule, CCR surface impoundments and any lateral expansion exceeding a specific height and/or volume threshold must be assessed under seismic loading conditions for a seismic loading event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years, based on the USGS seismic hazard maps for seismic events with this return period for the region where the CCR unit is located. EPA chose the 2% exceedance probability in 50 years event based on its common use in seismic design criteria throughout engineering.

The Calculated Liquefaction Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold and have been determined to contain soils susceptible to liquefaction must meet a liquefaction factor of safety equal to or greater than 1.20. A prudent engineering analysis of structural stability also includes a liquefaction potential analysis and analysis of post-liquefaction static factors of safety. As discussed previously, liquefaction is a phenomenon which typically occurs in loose, saturated or partially-saturated soils in which the effective stress of the soils reduces to zero, corresponding to a total loss of shear strength of the soil. The most common occurrence of liquefaction is in loose soils, typically sands. The liquefaction FOS determination in the final rule is used to determine if a CCR unit would remain stable if the soils of the embankment of the CCR unit were to experience liquefaction. Liquefaction analysis is only necessary in instances where CCR surface impoundments show, through representative soil sampling, construction documentation, or anecdotal evidence from personnel with knowledge of the CCR unit's construction, that soils of the embankment are susceptible to liquefaction.

Failure To Demonstrate Minimum Safety Factors or Failure To Complete a Timely Safety Factor Assessment

As previously discussed, the rule requires an owner or operator to document that the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified in the rule. For any CCR surface impoundment that does not meet these requirements, the owner or operator must either take any engineering measure necessary to ensure that the unit meets the requirements by the rule's deadlines, or cease placement of CCR and non-CCR waste into the unit and initiate closure of such CCR unit as provided in section 257.102 within six months. Similarly, if an owner or operator fails to complete the initial safety factor assessment or any subsequent periodic factor safety assessment by the deadlines established in the rule, the owner or operator must cease placing CCR and non-CCR waste into the unit and initiate closure within six months.

Description of Impoundment

An aerial photo of the CCR unit is provided as Attachment A and an excerpt from U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps showing the location of the CCR unit is provided as Attachment B.

The CCR unit has been in place for 40 plus years The CCR unit operator has general maintenance and repair procedures in place as they determine necessary. There are no known occurrences of structural instability of the CCR unit.

The CCR unit has been in place for 40 plus years. The CCR unit is used for the placement of coal combustion residual material; currently slurried bottom ash. The immediate watershed that drains to the CCR unit, and in which the CCR unit is considered to be located, is unnamed and 54.13 acres in size. The unnamed watershed discharges from the CCR impoundment outflow structure and is routed to the Green River.

The CCR unit is a combined incised/earthen embankment structure. Embankments form the west, south and east sides of the impoundment and the north side is incised. The Green River is located approximately 400 feet east of the structure. Due to surface relief, only the toe area of the south dike is potentially subject to flooding. The predominant features were small stream valleys draining eastward to the Green River. Most of the central portion of the south dike was constructed on a subdued ridge. The toe of the outboard slope intersected a lower drainage area. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands.

The west dike is generally less than five feet in height and the south dike reaches a maximum height of 19.5 feet. The east dike reaches a maximum height of approximately eight feet and is buttressed with a secondary parallel embankment that serves as a 40-foot wide roadway. The Burns and Roe, Inc. Engineering and Consultants June 30, 1978 site grading plans show the original construction layout and ground contours for the impoundment site. Bottom ash has been placed above the normal pool along the inboard side, essentially creating reclaimed land

Depth of impounded water and CCR is 16 feet and 46 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 394 feet and 408 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

The remaining storage capacity is approximately 172,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

The approximate volume of impounded water and CCR is 981,000 cubic yards (approximate water volume is 172,000 cubic yards and approximate CCR volume is 809,000 cubic yards). This volume was calculated based on the maximum storage capacity, the current amount of CCR stored in the facility based on the most recent bathymetric survey, and the best available as-built data for the structure construction prior to placement of CCR.

The impoundment discharge consists of two corrugated steel pipes, each 30 inches in diameter. The pipe intakes are through a concrete common headwall collection structure with a variable height steel debris deflector on each pipe intake.

Calculated Safety Factors

Results of the initial safety factor assessment for the critical cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments are supported by appropriate engineering calculations.

The safety factor analysis was conducted using the Rocscience Inc. Slide geotechnical software by evaluating four cross sections along the embankment. Slide provides numerical tools to analyze the stability of embankments using limit equilibrium methods. At each cross section, drilling, surveying, laboratory testing, and a slope stability analysis were performed. Based on the four analysis scenarios, the lowest factor of safety for all scenarios was not found at a single cross section; therefore, the results listed below are the lowest factor of safety realized from all analyzed cross sections for each scenario. The safety factor assessments are supported by appropriate engineering calculations and the Slide modeling results for the Green CCR impoundment are attached to this report.

1. The calculated static factor of safety under the long-term, maximum storage pool loading condition equals: 1.800

2. The calculated static factor of safety under the maximum surcharge pool loading condition equals: 1.800

3. The calculated seismic factor of safety equals: 1.002

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety equals: 1.800

Sources of Information

Geotechnical and other information provided by Associated Engineers, Inc.

Engineering design drawings and other information provided by Big Rivers Electric Corporation

United States Geological Survey U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps

Professional Engineer Certification [Per 40 CFR § 257.73]
Green CCR Impoundment Initial Safety Factor Assessment

I hereby certify that myself or an agent under my review has prepared this Initial Safety Factor Assessment (Assessment), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Assessment has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.73. To the best of my knowledge and belief, the information contained in this Assessment is true, complete, and accurate.

David A. Lamb P.E.

David A. Lamb P.E.
State of Kentucky License No. 17822

Date: 10/11/16

Attachment A. Aerial Photo of the Green CCR Surface Impoundment

Attachment B. Topographic Map showing the Green CCR Surface Impoundment

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-1
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-1 Long-Term Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc
Date Created: 9/5/2016, 3:43:18 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean Clay (CL)	Sandy Lean Clay With Gravel (CL) (Dam)
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	134.3	135.4	137.69
Cohesion [psf]	316.8	403.2	820.8	72
Friction Angle [deg]	24.3	30.2	24.6	27.4
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	379.185
31.955	379.172
36.551	377.695
50.832	376.221
54.305	375.6
58.684	376.406
70.171	377.906
76.996	378.317
84.12	378.983

85.7592	379.391
140.9	382.48
170.48	393.92

External Boundary

X	Y
0	349.5
55	349.6
77	352.7
153.14	361.4
170.48	362.8
170.48	366.698
170.48	369.698
170.48	374.816
170.48	376.396
170.48	393.967
161.556	396.809
153.137	396.9
143.057	396.719
119.757	389.859
96.35	382.029
84.12	378.983
76.996	378.317
70.171	377.906
58.684	376.406
54.305	375.6
50.832	376.221
36.551	377.695
20.651	382.805
0	391.212
0	374.3
0	355.7
0	353.7

Material Boundary

X	Y
0	353.7
55	353.7
77	356.8
153	364.9

170.48	366.698

Material Boundary

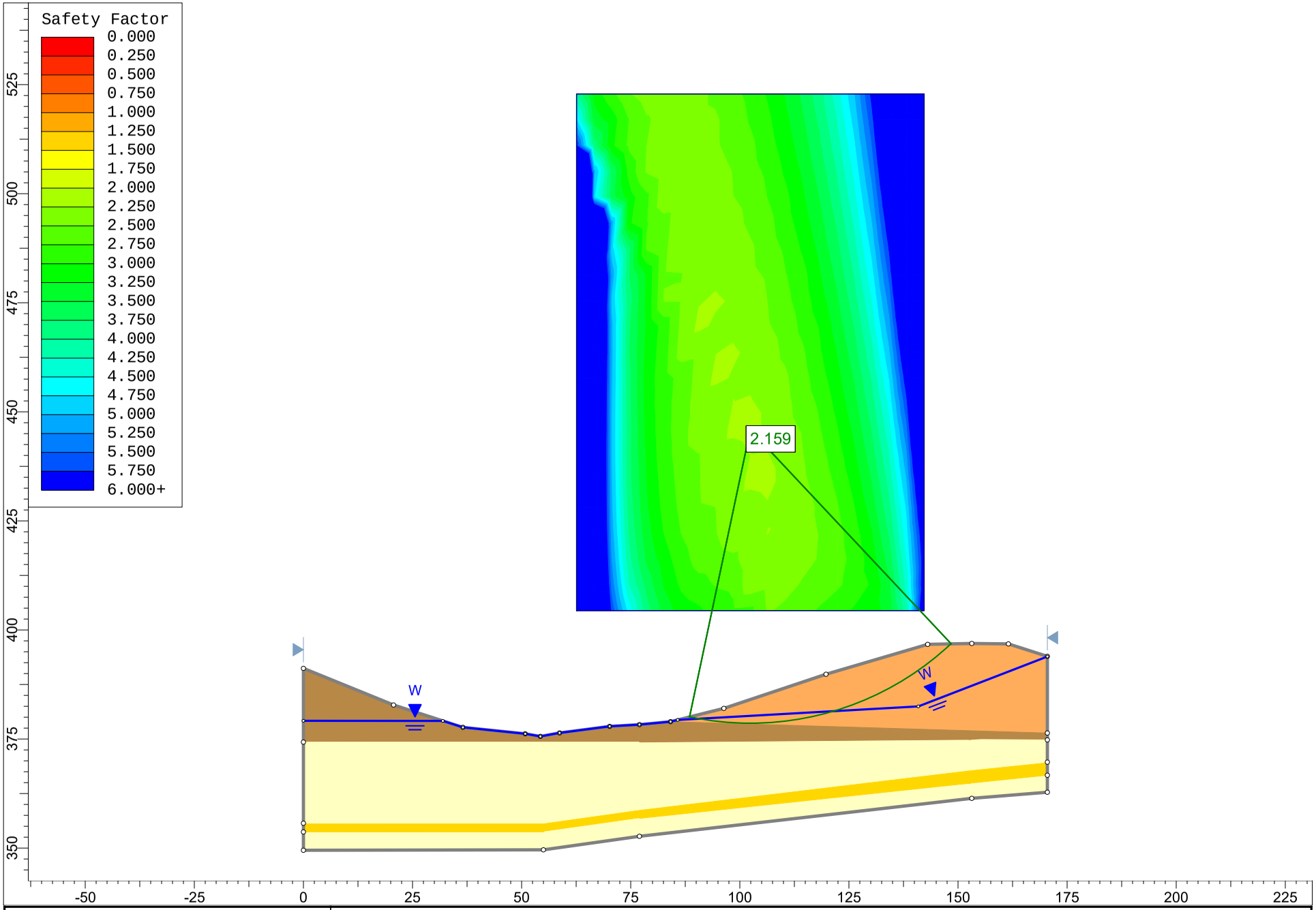
X	Y
0	355.7
55	355.7
77	358.8
153	367.9
170.48	369.698

Material Boundary

X	Y
0	374.3
77	374.3
153	374.9
170.48	374.816

Material Boundary

X	Y
84.12	378.983
153	376.9
170.48	376.396



	Project	BREC Green Station CCR Surface Impoundment	
	Analysis Description	Cross Section GR-1 Long-Term Maximum Storage Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:43:18 PM		File Name GR-1.slim

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-1 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-1 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc
Date Created: 9/5/2016, 3:43:18 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean clay (CL)	Sandy lean clay With Gravel (CL) (Dam)
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	134.3	135.4	137.69
Cohesion [psf]	316.8	403.2	820.8	72
Friction Angle [deg]	24.3	30.2	24.6	27.4
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	379.185
31.955	379.172
36.551	377.695
50.832	376.221
54.305	375.6
58.684	376.406
70.171	377.906
76.996	378.317
84.12	378.983

85.7592	379.391
140.9	382.48
165.719	395.483
170.48	395.48

External Boundary

X	Y
0	349.5
55	349.6
77	352.7
153.14	361.4
170.48	362.8
170.48	366.698
170.48	369.698
170.48	374.816
170.48	376.396
170.48	393.967
161.556	396.809
153.137	396.9
143.057	396.719
119.757	389.859
96.35	382.029
84.12	378.983
76.996	378.317
70.171	377.906
58.684	376.406
54.305	375.6
50.832	376.221
36.551	377.695
20.651	382.805
0	391.212
0	374.3
0	355.7
0	353.7

Material Boundary

X	Y
0	353.7
55	353.7
77	356.8

153	364.9
170.48	366.698

Material Boundary

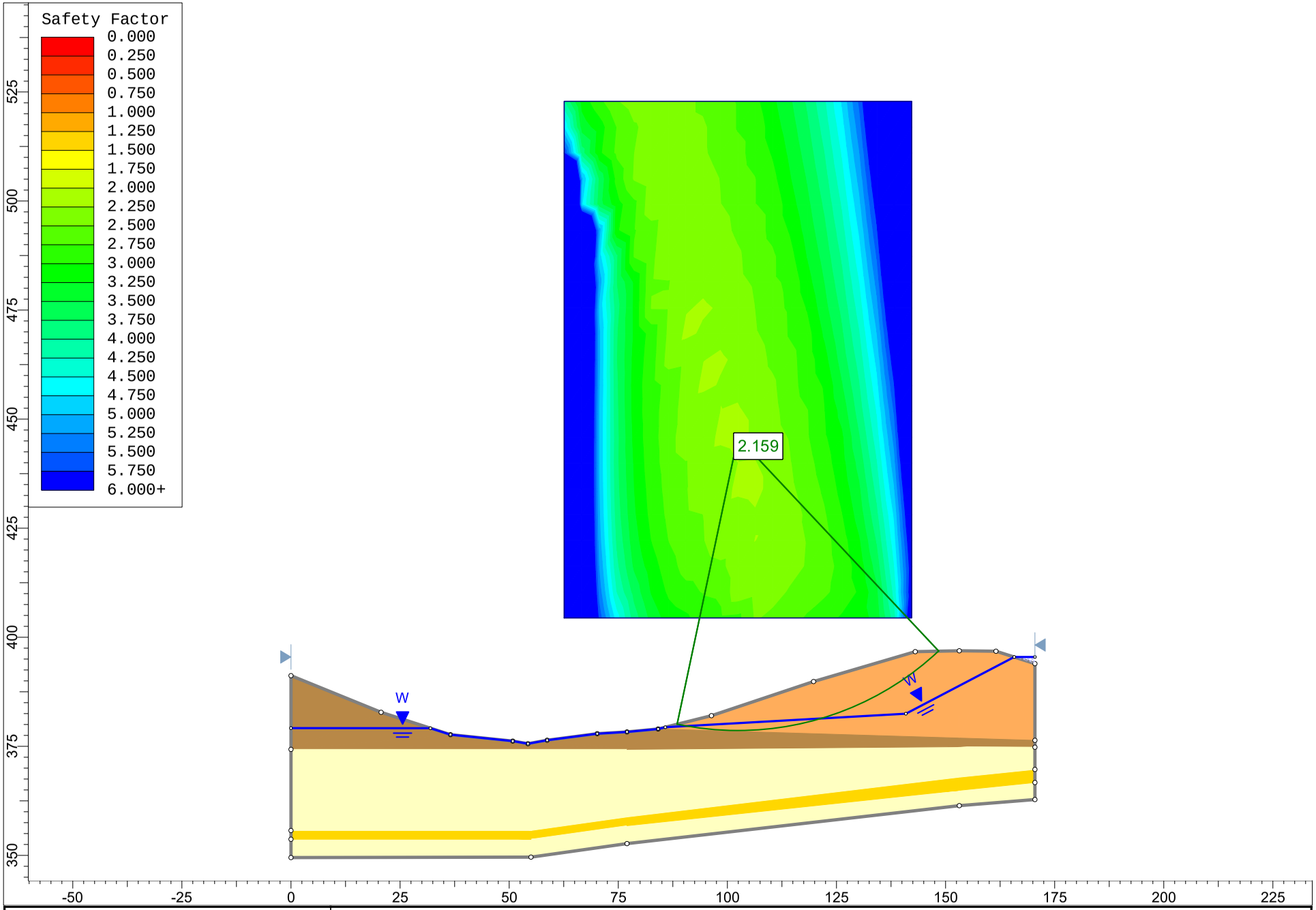
X	Y
0	355.7
55	355.7
77	358.8
153	367.9
170.48	369.698

Material Boundary

X	Y
0	374.3
77	374.3
153	374.9
170.48	374.816

Material Boundary

X	Y
84.12	378.983
153	376.9
170.48	376.396



	Project	BREC Green Station CCR Surface Impoundment	
	Analysis Description	Cross Section GR-1 Maximum Surcharge Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:43:18 PM		File Name GR-1 Surcharge.slim

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-1 Seis
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-1 Seismic Loading Condition
Company: Associated Engineers, Inc
Date Created: 9/5/2016, 3:43:18 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2364

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean clay (CL)	Sandy Lean Clay With Gravel (CL) (Dam)
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	134.3	135.4	137.69
Cohesion [psf]	316.8	403.2	820.8	72
Friction Angle [deg]	24.3	30.2	24.6	27.4
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	379.185
31.955	379.172
36.551	377.695
50.832	376.221
54.305	375.6

58.684	376.406
70.171	377.906
76.996	378.317
84.12	378.983
85.7592	379.391
140.9	382.48
170.48	393.92

External Boundary

X	Y
0	349.5
55	349.6
77	352.7
153.14	361.4
170.48	362.8
170.48	366.698
170.48	369.698
170.48	374.816
170.48	376.396
170.48	393.967
161.556	396.809
153.137	396.9
143.057	396.719
119.757	389.859
96.35	382.029
84.12	378.983
76.996	378.317
70.171	377.906
58.684	376.406
54.305	375.6
50.832	376.221
36.551	377.695
20.651	382.805
0	391.212
0	374.3
0	355.7
0	353.7

Material Boundary

X	Y

0	353.7
55	353.7
77	356.8
153	364.9
170.48	366.698

Material Boundary

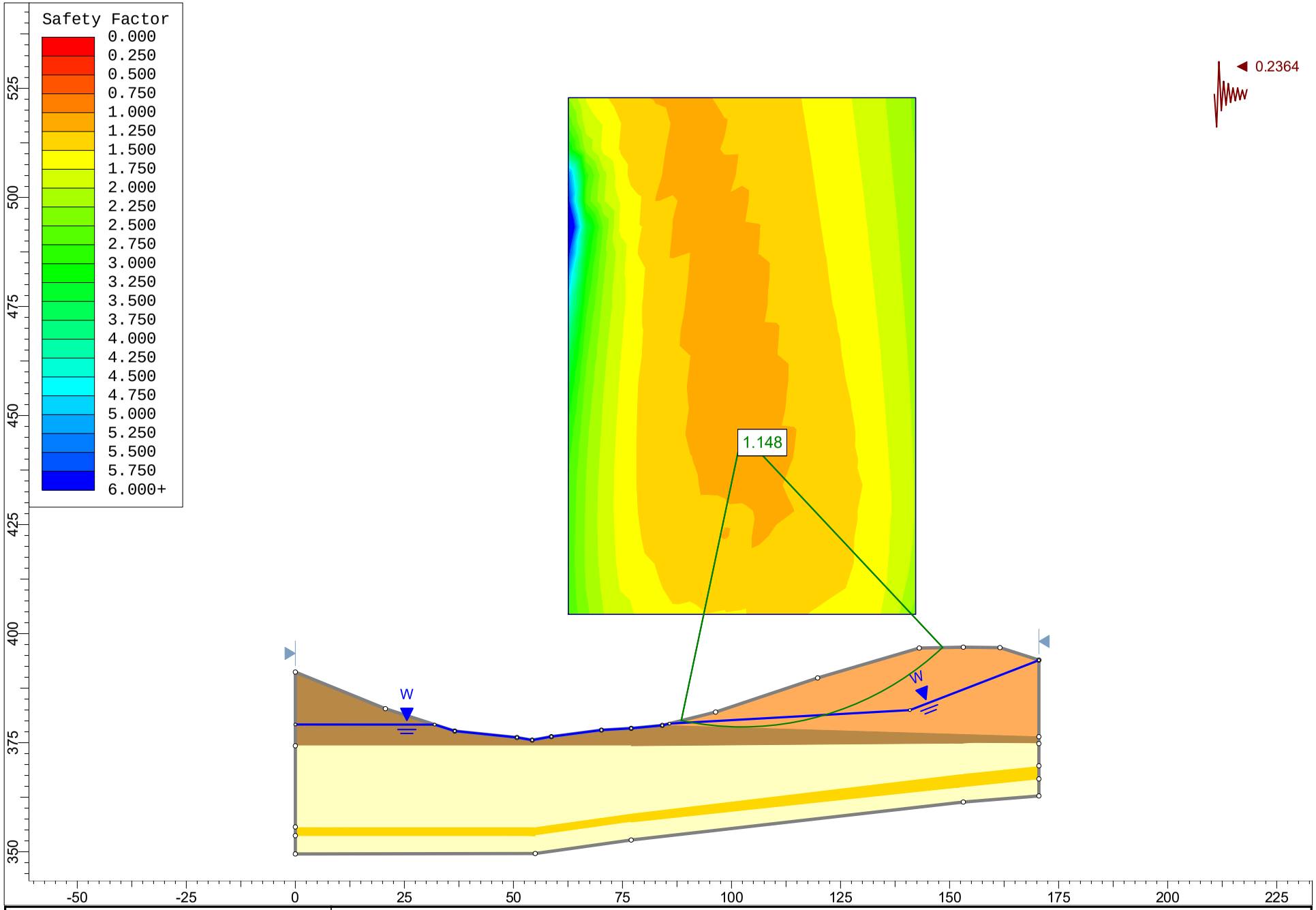
X	Y
0	355.7
55	355.7
77	358.8
153	367.9
170.48	369.698

Material Boundary

X	Y
0	374.3
77	374.3
153	374.9
170.48	374.816

Material Boundary

X	Y
84.12	378.983
153	376.9
170.48	376.396



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-1 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc
Date	9/5/2016, 3:43:18 PM		File Name GR-1 Seis.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	33	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37
27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2

128.457	393.92
130	393.92

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116
42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

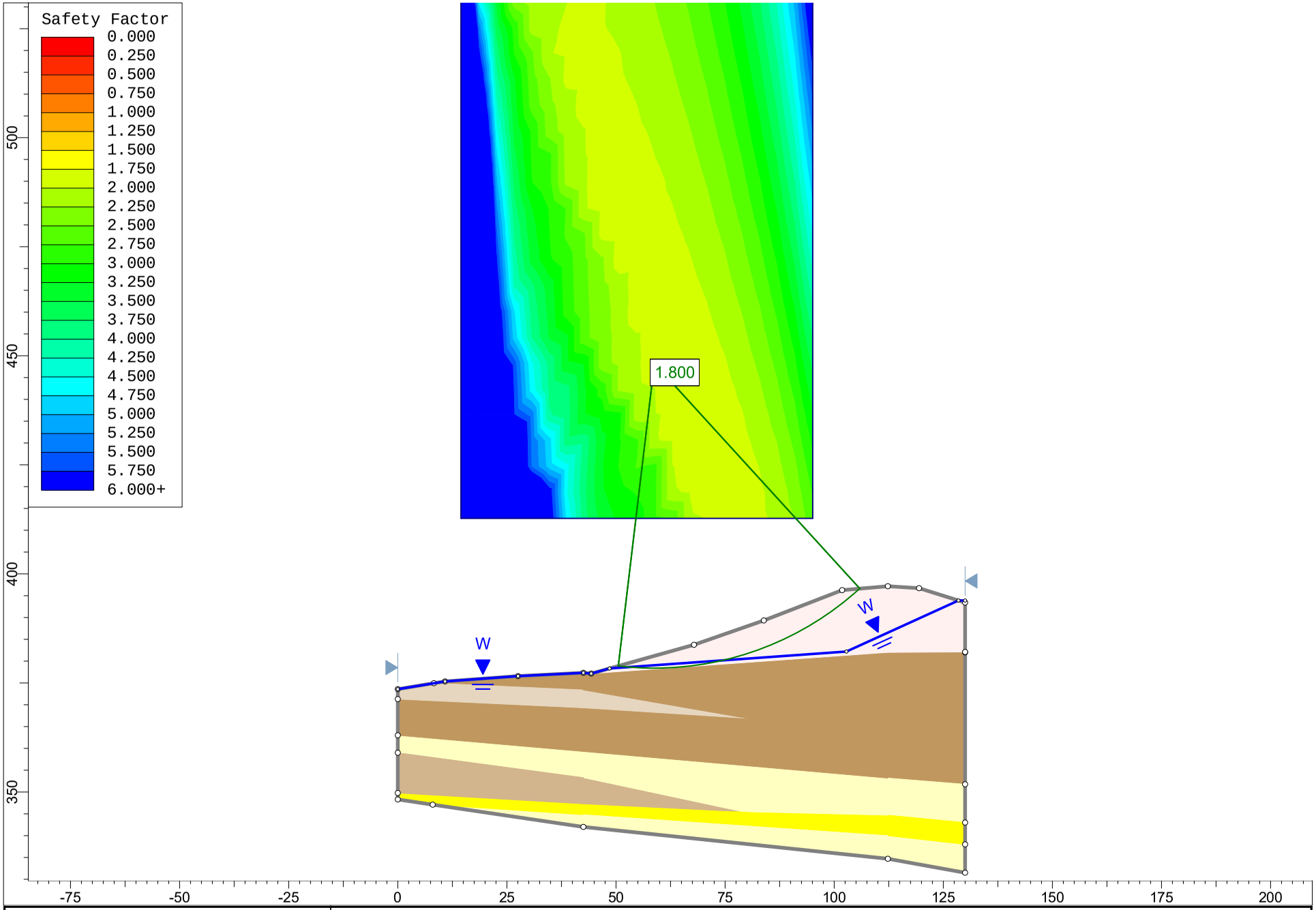
X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1



	Project	BREC Green Station CCR Surface Impoundment	
	Analysis Description	Cross Section GR-2 Maximum Storage Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:56:57 PM		File Name GR-2.slim

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	33	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37
27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2

123.45	395.483
130	395.48

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116
42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

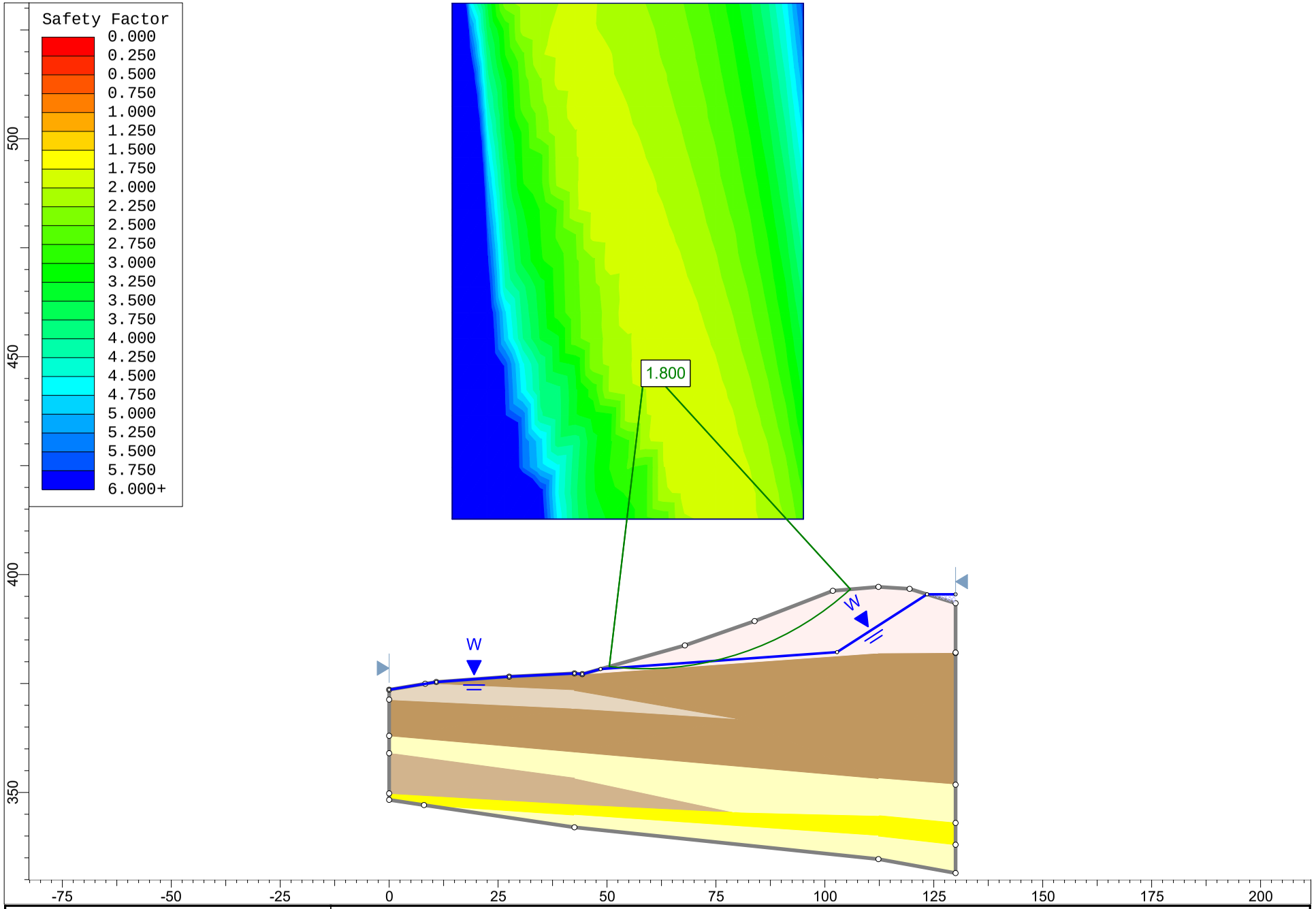
X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-2 Maximum Surcharge Pool Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 3:56:57 PM		File Name GR-2 Surcharge.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2 Seis 2
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Seismic Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2364

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	33	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37

27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2
128.457	393.92
130	393.92

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116

42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

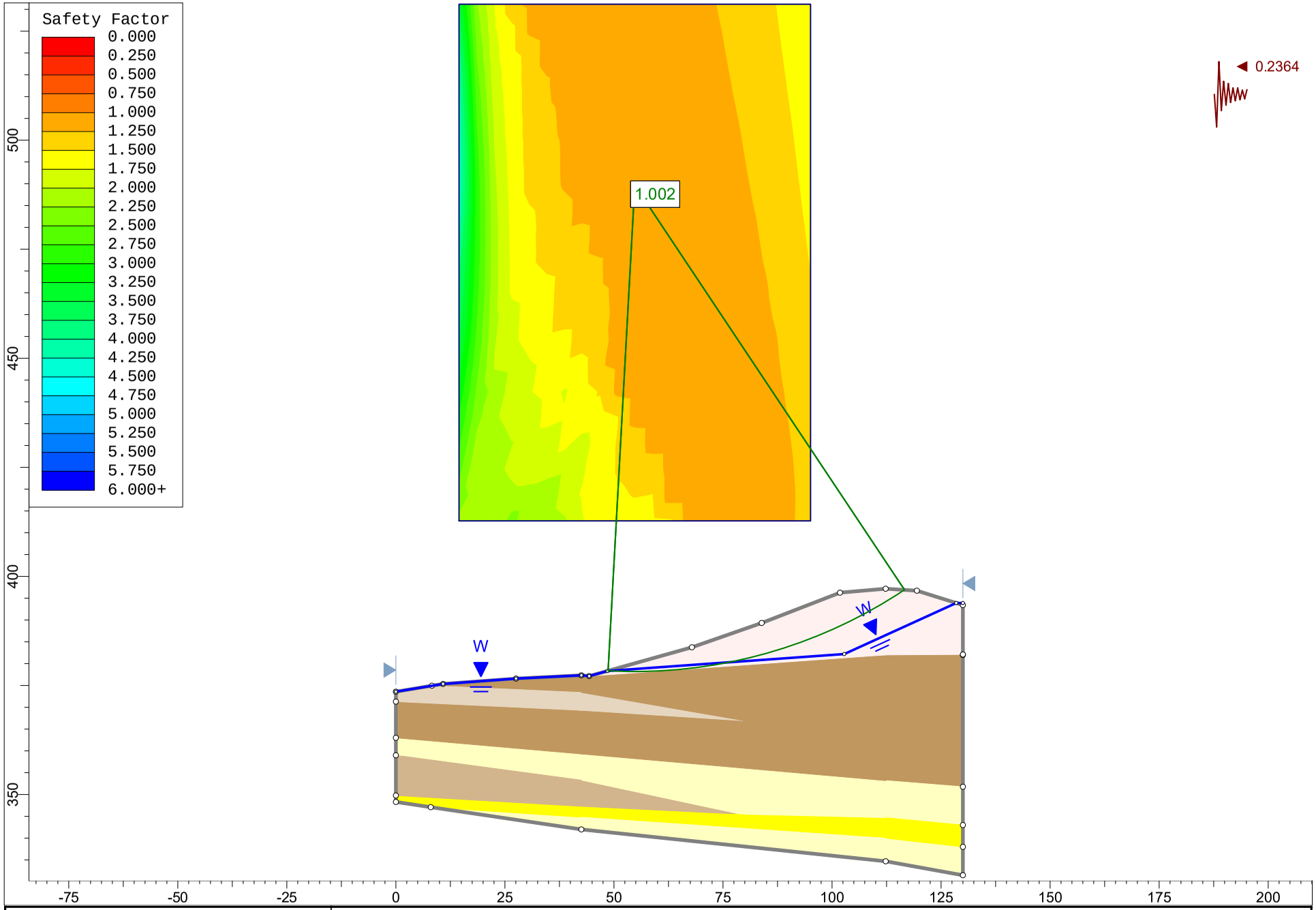
Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1

	Project: BREC Green Station CCR Surface Impoundment		
	Analysis Description: Cross Section GR-2 Seismic Loading Condition		
	Drawn By:	Scale:	Company: Associated Engineers, Inc.
SLIDE 6.039	Date: 9/5/2016, 3:56:57 PM		File Name: GR-2 Seis 2.slim



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-2 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 3:56:57 PM		File Name GR-2 Seis 2.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2 Liq
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Liquefaction Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	0	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37
27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2

128.457	393.92
130	393.92

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116
42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

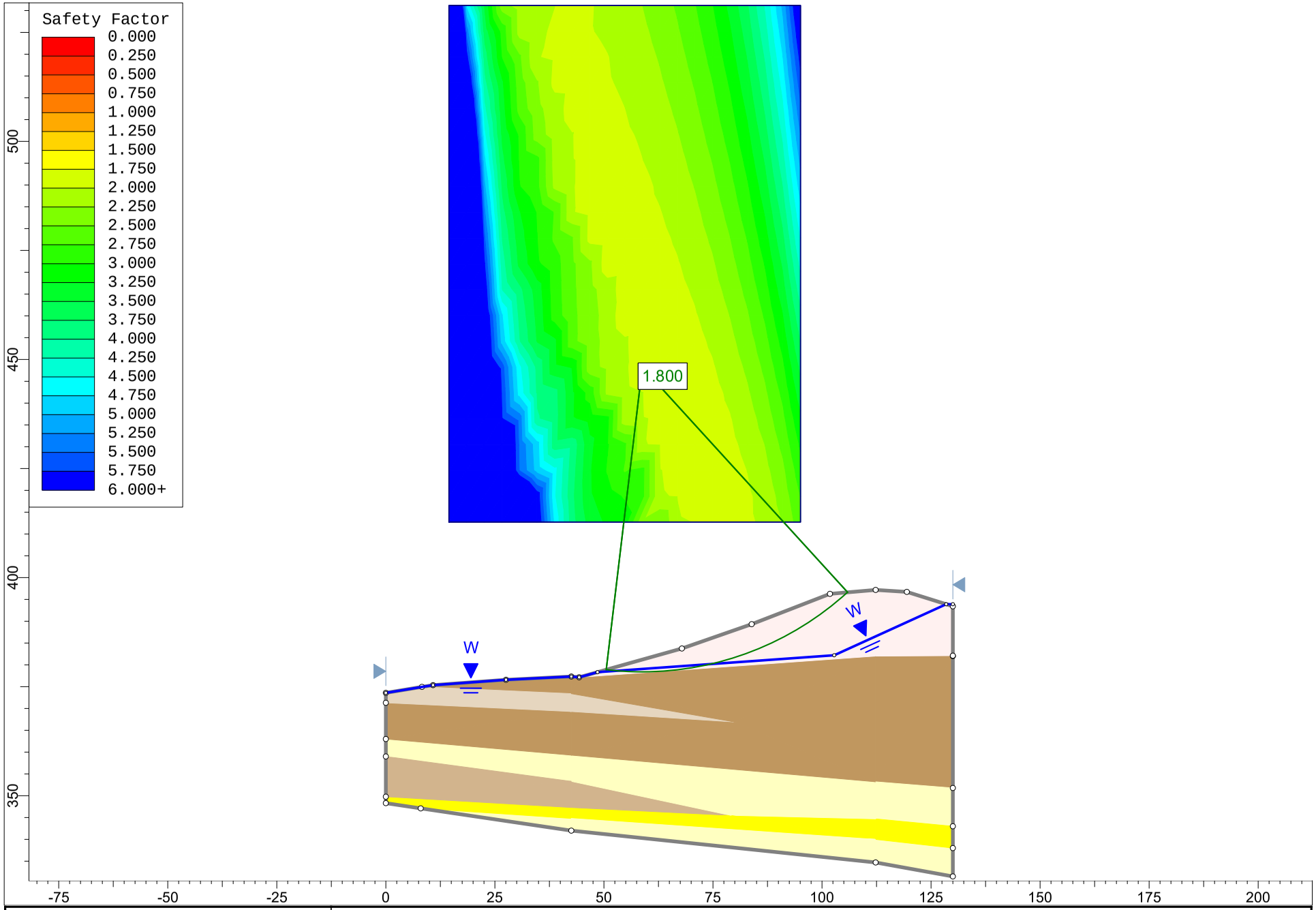
X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-2 Liquefaction Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 3:56:57 PM		File Name GR-2 Liq.slim

SLIDEINTERPRET 6.039

Reid/HMPL Station CCR Surface Impoundment

Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

October 11, 2016

Prepared By:

ASSOCIATED ENGINEERS, INC.
2740 North Main St. • Madisonville, KY 42431
Phone: (270) 821-7732 • Fax: (270) 821-7789

Project ID: 160027A

Big Rivers Electric Corporation
Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

CCR Surface Impoundment Information

Name:	Reid/HMPL Station CCR Surface Impoundment
Operator:	Sebree Generating Station
Address:	9000 Highway 2096 Robards, Kentucky 42452
CCR Unit Identification Number:	Kentucky State Dam Inventory System ID No. 0855

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

As part of the § 257.73 Structural integrity criteria for existing CCR surface impoundments requirements, an owner or operator of an existing CCR surface impoundment must no later than October 17, 2016:

> Conduct an initial safety factor assessment for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified below for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations, documenting whether the CCR unit achieves the following minimum factors of safety:
>
> 1. The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
>
> 2. The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
>
> 3. The calculated seismic factor of safety must equal or exceed 1.00.

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

From: VI. Development of the Final Rule - Technical Requirements

General Safety Factor Assessment Considerations

Generally accepted engineering methodologies specify that the determination of the structural stability factors of safety specified above is to be calculated by the qualified professional engineer using conventional analysis procedures or, if necessary, special analysis procedures. Conventional analysis procedures include, but are not limited to, limit equilibrium methods of slope stability analysis, whereas, special analysis procedures include, but are not limited to, finite element methods, finite difference methods, three-dimensional methods, or probabilistic methods. Whichever methodology is used to determine the factors of safety of the CCR surface impoundment, the qualified professional engineer must document the methodology used, as well as the basis for using that methodology, and the analysis must be supported by appropriate engineering calculations.

The Calculated Static Factor of Safety Under the Long-Term, Maximum Storage Pool Loading Condition

It is generally accepted practice to analyze the stability of the downstream slope of the dam embankment for steady-state seepage (or steady seepage) conditions with the reservoir at its normal operating pool elevation (usually the spillway crest elevation) since this is the loading condition the embankment will experience most. This condition is called steady seepage with maximum storage pool. The maximum storage pool loading is the maximum water level that can be maintained that will result in the full development of a steady-state seepage condition. Maximum storage pool loading conditions need to be calculated to ensure that the CCR surface impoundment can withstand a maximum expected pool elevation with full development of saturation in the embankment under long-term loading. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum storage pool loading condition meet or exceed 1.5.

The Calculated Static Factor of Safety Under the Maximum Surcharge Pool Loading Condition

The maximum surcharge pool loading condition is calculated to evaluate the effect of a raised level (e.g., flood surcharge) on the stability of the downstream slope. This ensures that the CCR surface impoundment can withstand a temporary rise in pool elevation above the maximum storage pool elevation for which the CCR surface impoundment may normally be subject under inflow design flood stage, for a short-term until the inflow design flood is passed through the CCR surface impoundment. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum surcharge pool loading condition meet or exceed 1.4.

The Calculated Seismic Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold must meet a seismic factor of safety equal to or greater than 1.0. All CCR surface impoundments must also be capable of withstanding a design earthquake without damage to

the foundation or embankment that would cause a discharge of its contents. To further support the location criteria established in this rule, CCR surface impoundments and any lateral expansion exceeding a specific height and/or volume threshold must be assessed under seismic loading conditions for a seismic loading event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years, based on the USGS seismic hazard maps for seismic events with this return period for the region where the CCR unit is located. EPA chose the 2% exceedance probability in 50 years event based on its common use in seismic design criteria throughout engineering.

The Calculated Liquefaction Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold and have been determined to contain soils susceptible to liquefaction must meet a liquefaction factor of safety equal to or greater than 1.20. A prudent engineering analysis of structural stability also includes a liquefaction potential analysis and analysis of post-liquefaction static factors of safety. As discussed previously, liquefaction is a phenomenon which typically occurs in loose, saturated or partially-saturated soils in which the effective stress of the soils reduces to zero, corresponding to a total loss of shear strength of the soil. The most common occurrence of liquefaction is in loose soils, typically sands. The liquefaction FOS determination in the final rule is used to determine if a CCR unit would remain stable if the soils of the embankment of the CCR unit were to experience liquefaction. Liquefaction analysis is only necessary in instances where CCR surface impoundments show, through representative soil sampling, construction documentation, or anecdotal evidence from personnel with knowledge of the CCR unit's construction, that soils of the embankment are susceptible to liquefaction.

Failure To Demonstrate Minimum Safety Factors or Failure To Complete a Timely Safety Factor Assessment

As previously discussed, the rule requires an owner or operator to document that the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified in the rule. For any CCR surface impoundment that does not meet these requirements, the owner or operator must either take any engineering measure necessary to ensure that the unit meets the requirements by the rule's deadlines, or cease placement of CCR and non-CCR waste into the unit and initiate closure of such CCR unit as provided in section 257.102 within six months. Similarly, if an owner or operator fails to complete the initial safety factor assessment or any subsequent periodic factor safety assessment by the deadlines established in the rule, the owner or operator must cease placing CCR and non-CCR waste into the unit and initiate closure within six months.

Description of Impoundment

An aerial photo of the CCR unit is provided as Attachment A and an excerpt from U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps showing the location of the CCR unit is provided as Attachment B.

The CCR unit has been in place for 40 plus years The CCR unit operator has general maintenance and repair procedures in place as they determine necessary. There are no known occurrences of structural instability of the CCR unit.

The CCR unit is used for the placement of coal combustion residual material; currently slurried bottom ash. The immediate watershed that drains to the CCR unit, and in which the CCR unit is considered to be located, is unnamed and 25.45 acres in size. The unnamed watershed discharges from the CCR impoundment outflow structure and is routed to the Green River.

The CCR unit is a combined incised/earthen embankment structure. Embankments form the west, south and east sides of the impoundment and the north side is incised. The original terrain on which the pond was constructed generally sloped toward the west. Although the Green River is located less than 0.5 miles from the site, the structure does not extend significantly into the floodplain. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands.

The embankment reaches its greatest relief of approximately 42 feet on the west side. The Burns & McDonnell Engineering Co. October 8, 1971 design drawings show the inboard slope and central core portion of the dike to be constructed of compacted soil fill and the outboard slope to be consisted of sand fill. A sand blanket drain was designed for the outboard third of the base of the dike for the majority of the length and the plans show a crushed limestone drainage layer with a minimum thickness of 18 inches topped with a minimum six inches thick sand layer which extends across the entire width of the dike cross section in the southwest corner. The plans also show a cut-off trench in the original ground below dike crest and extending for the entire length of the dike.

Depth of impounded water and CCR is 16 feet and 39 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 426 feet and 440 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

The remaining storage capacity is approximately 85,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

The approximate volume of impounded water and CCR is 767,000 cubic yards (approximate water volume is 85,000 cubic yards and approximate CCR volume is 682,000 cubic yards). This volume was calculated based on the maximum storage capacity, the current amount of CCR stored in the facility based on the most recent bathymetric survey, and the best available as-built data for the structure construction prior to placement of CCR.
The impoundment discharge consists of a rectangular concrete drop structure with a variable

height steel debris skimmer. The pool elevation can be controlled by adding or removing stop logs. The discharge structure connects to a 24-inch diameter smooth walled metal pipe underground conveyance.

Calculated Safety Factors

Results of the initial safety factor assessment for the critical cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments are supported by appropriate engineering calculations.

The safety factor analysis was conducted using the Rocscience Inc. Slide geotechnical software by evaluating four cross sections along the embankment. Slide provides numerical tools to analyze the stability of embankments using limit equilibrium methods. At each cross section, drilling, surveying, laboratory testing, and a slope stability analysis were performed. Based on the four analysis scenarios, the lowest factor of safety for all scenarios was not found at a single cross section; therefore, the results listed below are the lowest factor of safety realized from all analyzed cross sections for each scenario. The safety factor assessments are supported by appropriate engineering calculations and the Slide modeling results for the Reid/HMPL CCR impoundment are attached to this report.

1. The calculated static factor of safety under the long-term, maximum storage pool loading condition equals: 2.053

2. The calculated static factor of safety under the maximum surcharge pool loading condition equals: 2.052

3. The calculated seismic factor of safety equals: 1.075

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety equals: 1.585

Sources of Information

Geotechnical and other information provided by Associated Engineers, Inc.

Engineering design drawings and other information provided by Big Rivers Electric Corporation

United States Geological Survey U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps

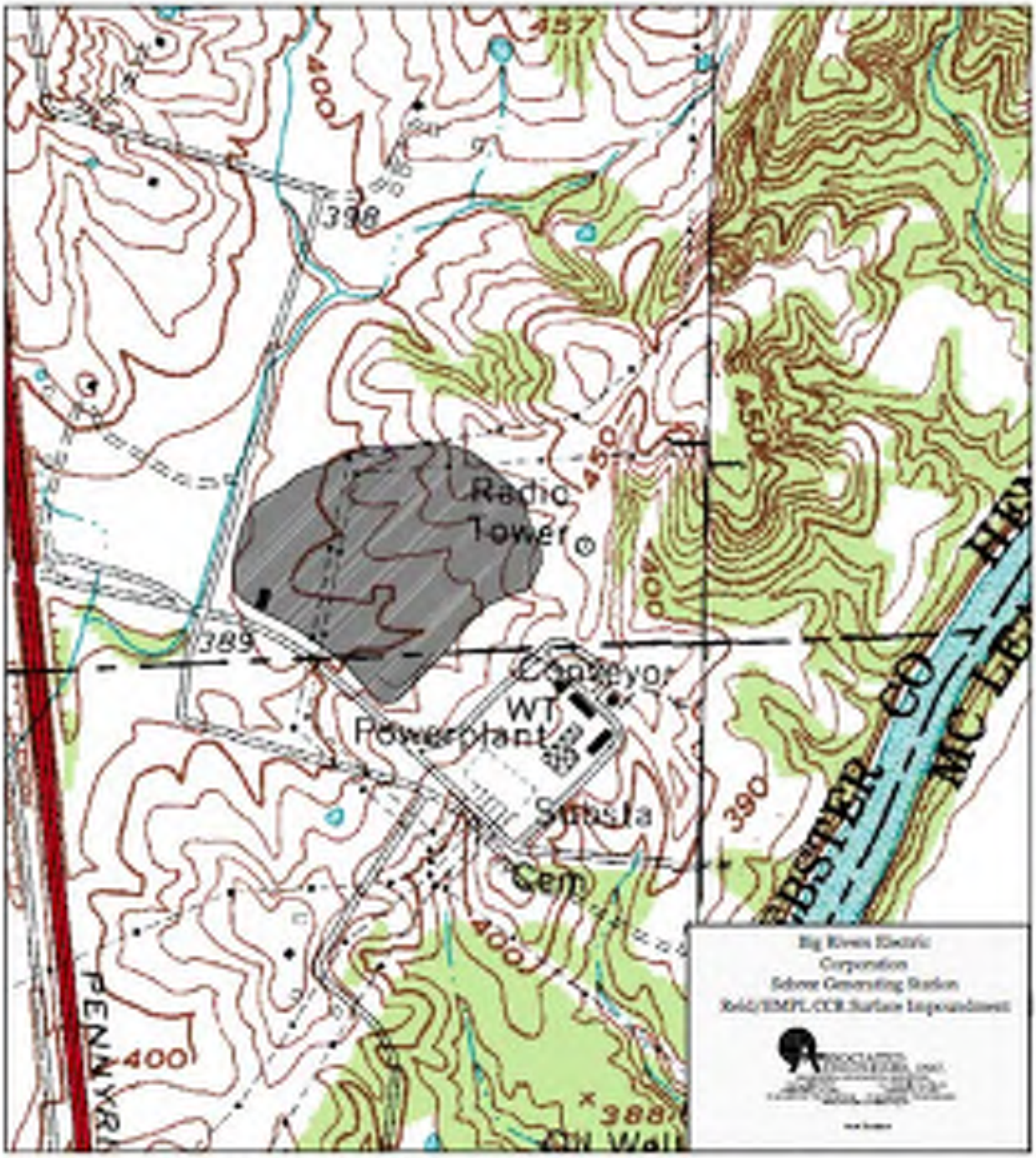
Professional Engineer Certification [Per 40 CFR § 257.73]
Reid/HMPL CCR Impoundment Initial Safety Factor Assessment

I hereby certify that myself or an agent under my review has prepared this Initial Safety Factor Assessment (Assessment), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Assessment has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.73. To the best of my knowledge and belief, the information contained in this Assessment is true, complete, and accurate.

David A. Lamb, P.E.
State of Kentucky License No. 17822

Date: 10/11/16

Attachment A. Aerial Photo of the Reid/HMPL CCR Surface Impoundment



Attachment B. Topographic Map showing the Reid/HMPL CCR Surface Impoundment

Slide Analysis Information

Big Rivers Electric Corporation

Project Summary

File Name: RH-1
Last saved with Slide version: 6.039
Project Title: Big Rivers Electric Corporation
Analysis: Reid/HMPL Pond RH-1 Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 2:31:54 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Lean Clay (CL)	Lean Clay (CL), Silty	Silt With Sand (ML)	Silty Clay (CL-ML)	Lean Clay (CL) 2	Sandy Lean Clay (Dam)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	126	123	125.8	129.7	134.6	125.8
Cohesion [psf]	120	72	72	72	200	14.4	14.4	220
Friction Angle [deg]	32.3	30.4	30.4	31	33.7	28.7	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material (Dam)	Silty Sand (SM)	Sandy Lean Clay (CL) 2
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	130	124.6
Cohesion [psf]	200	0	740
Friction Angle [deg]	30	33	23.2
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

List Of Coordinates

Water Table

X	Y
0	392.5
30.9	392.24
85.846	396.532

153	397.3
187.5	416.24
197.467	426.28
210	426.28

External Boundary

X	Y
0	371.5
43.37	372.6
180.89	373.8
210	374.1
210	381.6
210	384.6
210	388.7
210	395.8
210	397.8
210	419.644
206.306	421.6
198.751	425.6
191.136	429.632
180.794	429.579
169.909	425.6
148.327	417.711
116.257	406.72
99.1875	401.002
91.5524	398.444
85.846	396.532
83.24	397.044
77.457	398.595
71.748	398.856
47.962	398.89
43.367	398.519
32.528	396.852
18.716	394.794
0	395.066
0	393.5
0	392.5
0	384.5
0	381.5
0	372

Material Boundary

X	Y

0	372
43.3	375.5
140	381.6
180.9	381.6
210	381.6

Material Boundary

X	Y
0	381.5
43.3	381.5
140	381.6

Material Boundary

X	Y
0	384.5
43.3	384.5
102.292	384.543
180	384.6
210	384.6

Material Boundary

X	Y
0	392.5
43.3	392.5
102.672	391.249
180.9	389.6
210	388.7

Material Boundary

X	Y
0	393.5
43.3	393.5
180.9	395.6
210	395.8

Material Boundary

X	Y
85.846	396.532
153	397.3
180.9	397.6

210	397.8

Material Boundary

X	Y
99.1875	401.002
153	401.5
153	401.333
153	401.333
153	397.3

Material Boundary

X	Y
153	401.333
171.018	419.644
172.943	421.6
176.879	425.6
180.794	429.579

Material Boundary

X	Y
180.9	425.6
198.751	425.6

Material Boundary

X	Y
172.943	421.6
180.9	421.6

Material Boundary

X	Y
180.9	421.6
206.306	421.6

Material Boundary

X	Y
171.018	419.644
210	419.644
180.9	419.6

Material Boundary

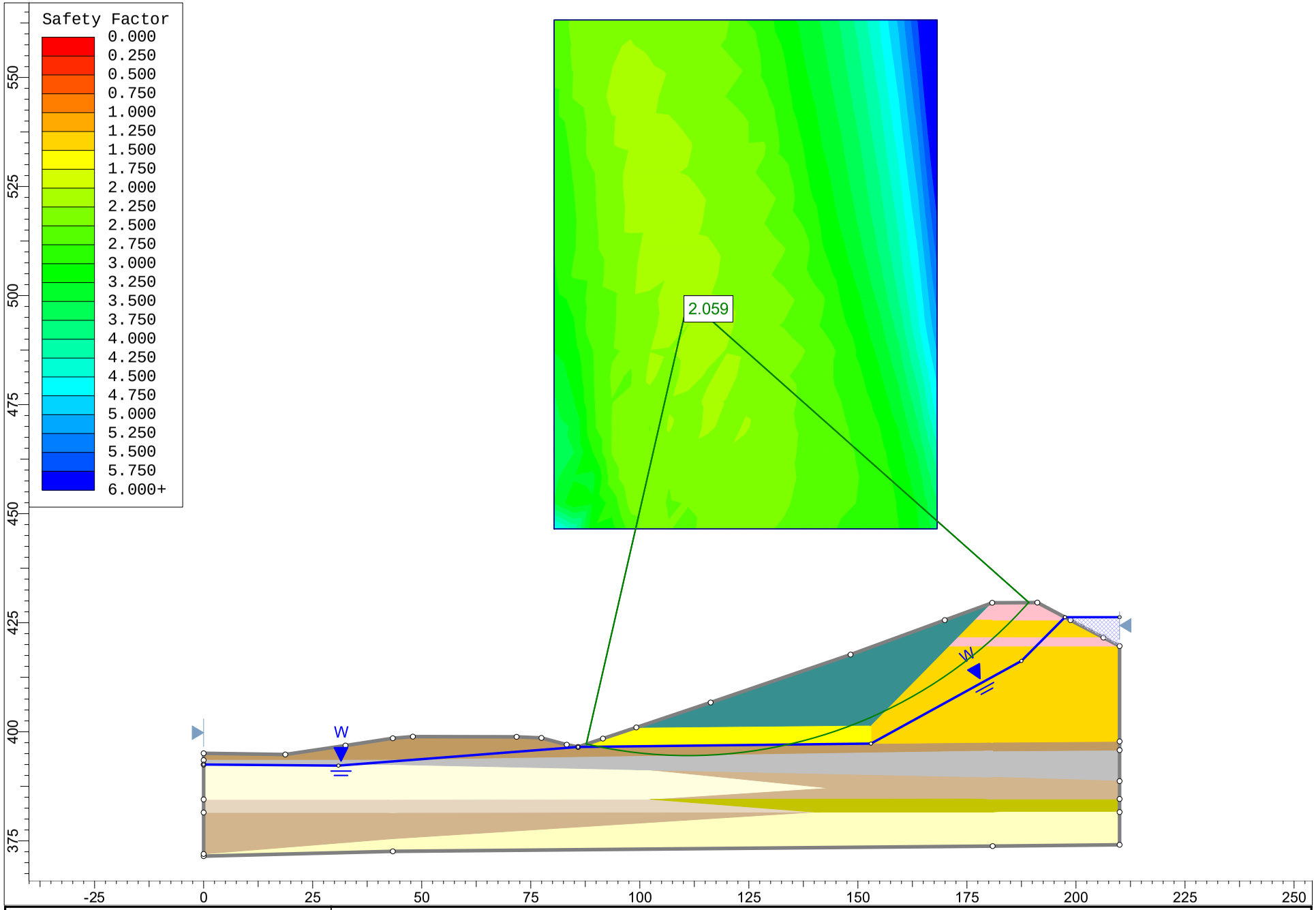
X	Y
102.292	384.543
140	381.6

Material Boundary

X	Y
102.292	384.543
142.735	387.164
102.672	391.249

Material Boundary

X	Y
176.879	425.6
180.9	425.6



Project	Big Rivers Electric Corporation		
Analysis Description	Reid/HMPL Pond RH-1 Maximum Storage Pool Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 2:31:54 PM		File Name RH-1.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-1 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-1 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 2:31:54 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Lean Clay (CL)	Lean Clay (CL), Silty	Silt With Sand (ML)	Silty Clay (CL-ML)	Lean Clay (CL) 2	Sandy Lean Clay (Dam)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	126	123	125.8	129.7	134.6	125.8
Cohesion [psf]	120	72	72	72	200	14.4	14.4	220
Friction Angle [deg]	32.3	30.4	30.4	31	33.7	28.7	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material (Dam)	Silty Sand (SM)	Sandy Lean Clay (CL) 2
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	130	124.6
Cohesion [psf]	200	0	740
Friction Angle [deg]	30	33	23.2
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

List Of Coordinates

Water Table

X	Y
0	392.5
30.9	392.24
85.846	396.532

153	397.3
187.5	416.24
194.956	427.61
210	427.61

External Boundary

X	Y
0	371.5
43.37	372.6
180.89	373.8
210	374.1
210	381.6
210	384.6
210	388.7
210	395.8
210	397.8
210	419.644
206.306	421.6
198.751	425.6
191.136	429.632
180.794	429.579
169.909	425.6
148.327	417.711
116.257	406.72
99.1875	401.002
91.5524	398.444
85.846	396.532
83.24	397.044
77.457	398.595
71.748	398.856
47.962	398.89
43.367	398.519
32.528	396.852
18.716	394.794
0	395.066
0	393.5
0	392.5
0	384.5
0	381.5
0	372

Material Boundary

X	Y

0	372
43.3	375.5
140	381.6
180.9	381.6
210	381.6

Material Boundary

X	Y
0	381.5
43.3	381.5
140	381.6

Material Boundary

X	Y
0	384.5
43.3	384.5
102.292	384.543
180	384.6
210	384.6

Material Boundary

X	Y
0	392.5
43.3	392.5
102.672	391.249
180.9	389.6
210	388.7

Material Boundary

X	Y
0	393.5
43.3	393.5
180.9	395.6
210	395.8

Material Boundary

X	Y
85.846	396.532
153	397.3
180.9	397.6

210	397.8

Material Boundary

X	Y
99.1875	401.002
153	401.5
153	401.333
153	401.333
153	397.3

Material Boundary

X	Y
153	401.333
171.018	419.644
172.943	421.6
176.879	425.6
180.794	429.579

Material Boundary

X	Y
180.9	425.6
198.751	425.6

Material Boundary

X	Y
172.943	421.6
180.9	421.6

Material Boundary

X	Y
180.9	421.6
206.306	421.6

Material Boundary

X	Y
171.018	419.644
210	419.644
180.9	419.6

Material Boundary

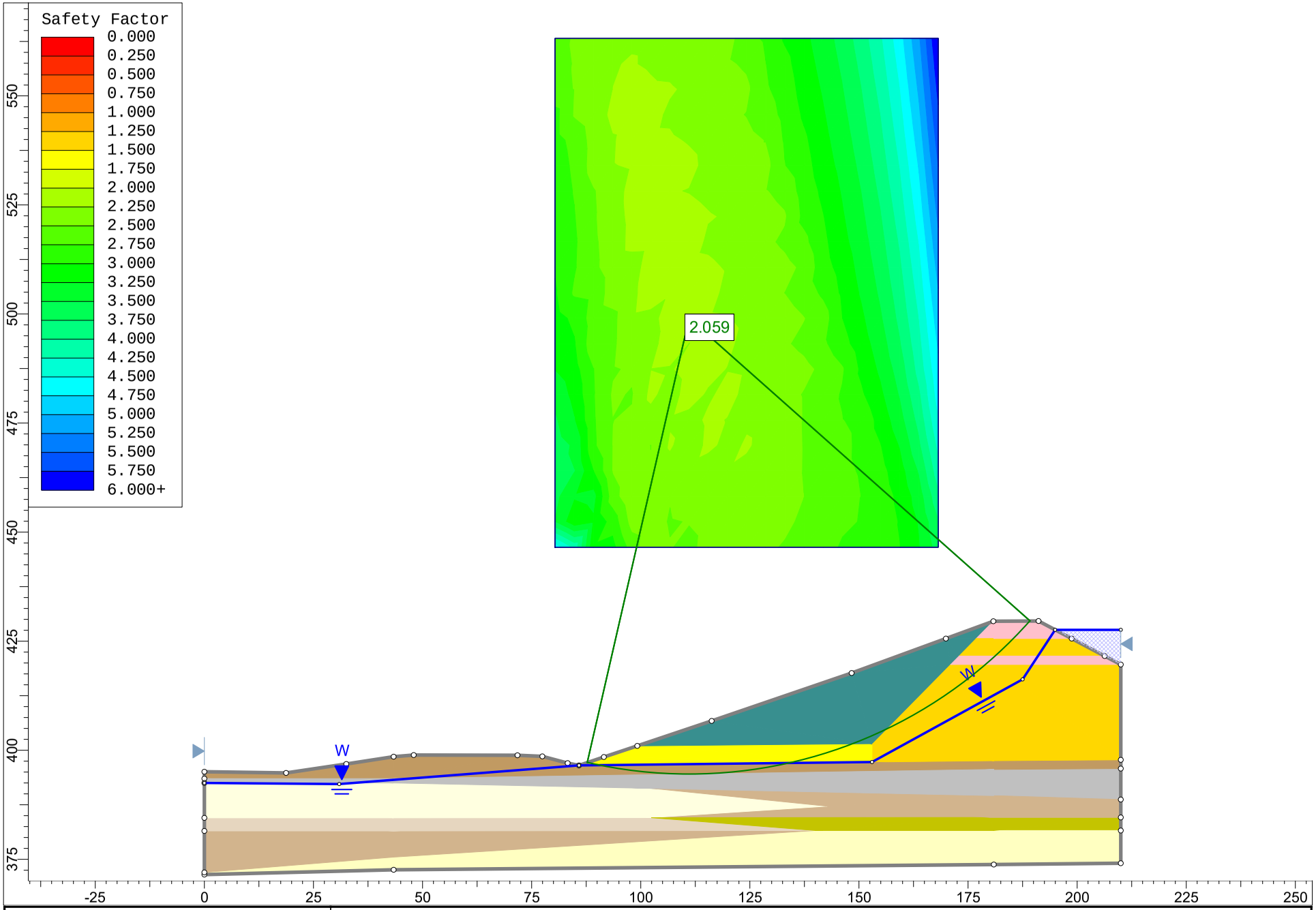
X	Y
102.292	384.543
140	381.6

Material Boundary

X	Y
102.292	384.543
142.735	387.164
102.672	391.249

Material Boundary

X	Y
176.879	425.6
180.9	425.6



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-1 Maximum Surcharge Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 2:31:54 PM		File Name RH-1 Surcharge.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-1 Seis
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-1 Seismic Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 2:31:54 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2377

Material Properties

Property	Sandy Lean Clay (CL)	Lean Clay (CL)	Lean Clay (CL), Silty	Silt With Sand (ML)	Silty Clay (CL-ML)	Lean Clay (CL) 2	Sandy Lean Clay (Dam)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	126	123	125.8	129.7	134.6	125.8
Cohesion [psf]	120	72	72	72	200	14.4	14.4	220
Friction Angle [deg]	32.3	30.4	30.4	31	33.7	28.7	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material (Dam)	Silty Sand (SM)	Sandy Lean Clay (CL) 2
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	130	124.6
Cohesion [psf]	200	0	740
Friction Angle [deg]	30	33	23.2
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

List Of Coordinates

Water Table

X	Y
0	392.5
30.9	392.24
85.846	396.532
153	397.3
187.5	416.24
197.467	426.28
210	426.28

External Boundary

X	Y
0	371.5
43.37	372.6
180.89	373.8
210	374.1
210	381.6
210	384.6
210	388.7
210	395.8
210	397.8
210	419.644
206.306	421.6
198.751	425.6
191.136	429.632
180.794	429.579
169.909	425.6
148.327	417.711
116.257	406.72
99.1875	401.002
91.5524	398.444
85.846	396.532
83.24	397.044
77.457	398.595
71.748	398.856
47.962	398.89
43.367	398.519
32.528	396.852
18.716	394.794
0	395.066
0	393.5
0	392.5
0	384.5

0	381.5
0	372

Material Boundary

X	Y
0	372
43.3	375.5
140	381.6
180.9	381.6
210	381.6

Material Boundary

X	Y
0	381.5
43.3	381.5
140	381.6

Material Boundary

X	Y
0	384.5
43.3	384.5
102.292	384.543
180	384.6
210	384.6

Material Boundary

X	Y
0	392.5
43.3	392.5
102.672	391.249
180.9	389.6
210	388.7

Material Boundary

X	Y
0	393.5
43.3	393.5
180.9	395.6
210	395.8

Material Boundary

X	Y
85.846	396.532
153	397.3
180.9	397.6
210	397.8

Material Boundary

X	Y
99.1875	401.002
153	401.5
153	401.333
153	401.333
153	397.3

Material Boundary

X	Y
153	401.333
171.018	419.644
172.943	421.6
176.879	425.6
180.794	429.579

Material Boundary

X	Y
180.9	425.6
198.751	425.6

Material Boundary

X	Y
172.943	421.6
180.9	421.6

Material Boundary

X	Y
180.9	421.6
206.306	421.6

Material Boundary

X	Y
171.018	419.644
210	419.644
180.9	419.6

Material Boundary

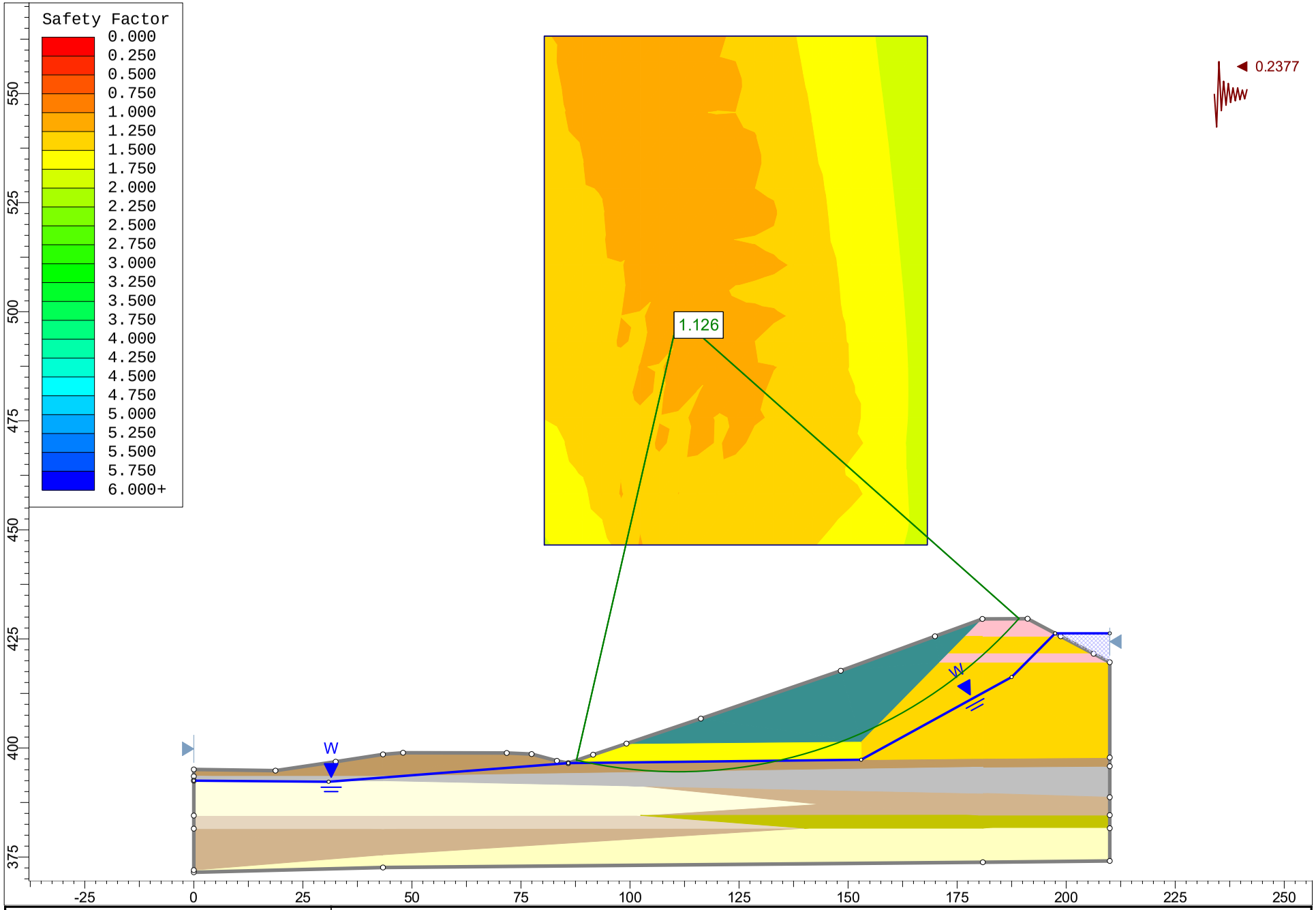
X	Y
102.292	384.543
140	381.6

Material Boundary

X	Y
102.292	384.543
142.735	387.164
102.672	391.249

Material Boundary

X	Y
176.879	425.6
180.9	425.6



Project	BREC Reid/HMPL Station CCR Surface Impoundment		
Analysis Description	Cross Section RH-1 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 2:31:54 PM		File Name RH-1 Seis.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-1 Seis Liq
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-1 Liquefaction Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 2:31:54 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Lean Clay (CL)	Lean Clay (CL), Silty	Silt With Sand (ML)	Silty Clay (CL-ML)	Lean Clay (CL) 2	Sandy Lean Clay (Dam)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	126	123	125.8	129.7	134.6	125.8
Cohesion [psf]	120	72	72	0	200	14.4	14.4	220
Friction Angle [deg]	32.3	30.4	30.4	0	33.7	28.7	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material (Dam)	Silty Sand (SM)	Sandy Lean Clay (CL) 2
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	130	124.6
Cohesion [psf]	200	0	740
Friction Angle [deg]	30	33	23.2
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

List Of Coordinates

Water Table

X	Y
0	392.5
30.9	392.24
85.846	396.532

153	397.3
187.5	416.24
197.467	426.28
210	426.28

External Boundary

X	Y
0	371.5
43.37	372.6
180.89	373.8
210	374.1
210	381.6
210	384.6
210	388.7
210	395.8
210	397.8
210	419.644
206.306	421.6
198.751	425.6
191.136	429.632
180.794	429.579
169.909	425.6
148.327	417.711
116.257	406.72
99.1875	401.002
91.5524	398.444
85.846	396.532
83.24	397.044
77.457	398.595
71.748	398.856
47.962	398.89
43.367	398.519
32.528	396.852
18.716	394.794
0	395.066
0	393.5
0	392.5
0	384.5
0	381.5
0	372

Material Boundary

X	Y

0	372
43.3	375.5
140	381.6
180.9	381.6
210	381.6

Material Boundary

X	Y
0	381.5
43.3	381.5
140	381.6

Material Boundary

X	Y
0	384.5
43.3	384.5
102.292	384.543
180	384.6
210	384.6

Material Boundary

X	Y
0	392.5
43.3	392.5
102.672	391.249
180.9	389.6
210	388.7

Material Boundary

X	Y
0	393.5
43.3	393.5
180.9	395.6
210	395.8

Material Boundary

X	Y
85.846	396.532
153	397.3
180.9	397.6

210	397.8

Material Boundary

X	Y
99.1875	401.002
153	401.5
153	401.333
153	401.333
153	397.3

Material Boundary

X	Y
153	401.333
171.018	419.644
172.943	421.6
176.879	425.6
180.794	429.579

Material Boundary

X	Y
180.9	425.6
198.751	425.6

Material Boundary

X	Y
172.943	421.6
180.9	421.6

Material Boundary

X	Y
180.9	421.6
206.306	421.6

Material Boundary

X	Y
171.018	419.644
210	419.644
180.9	419.6

Material Boundary

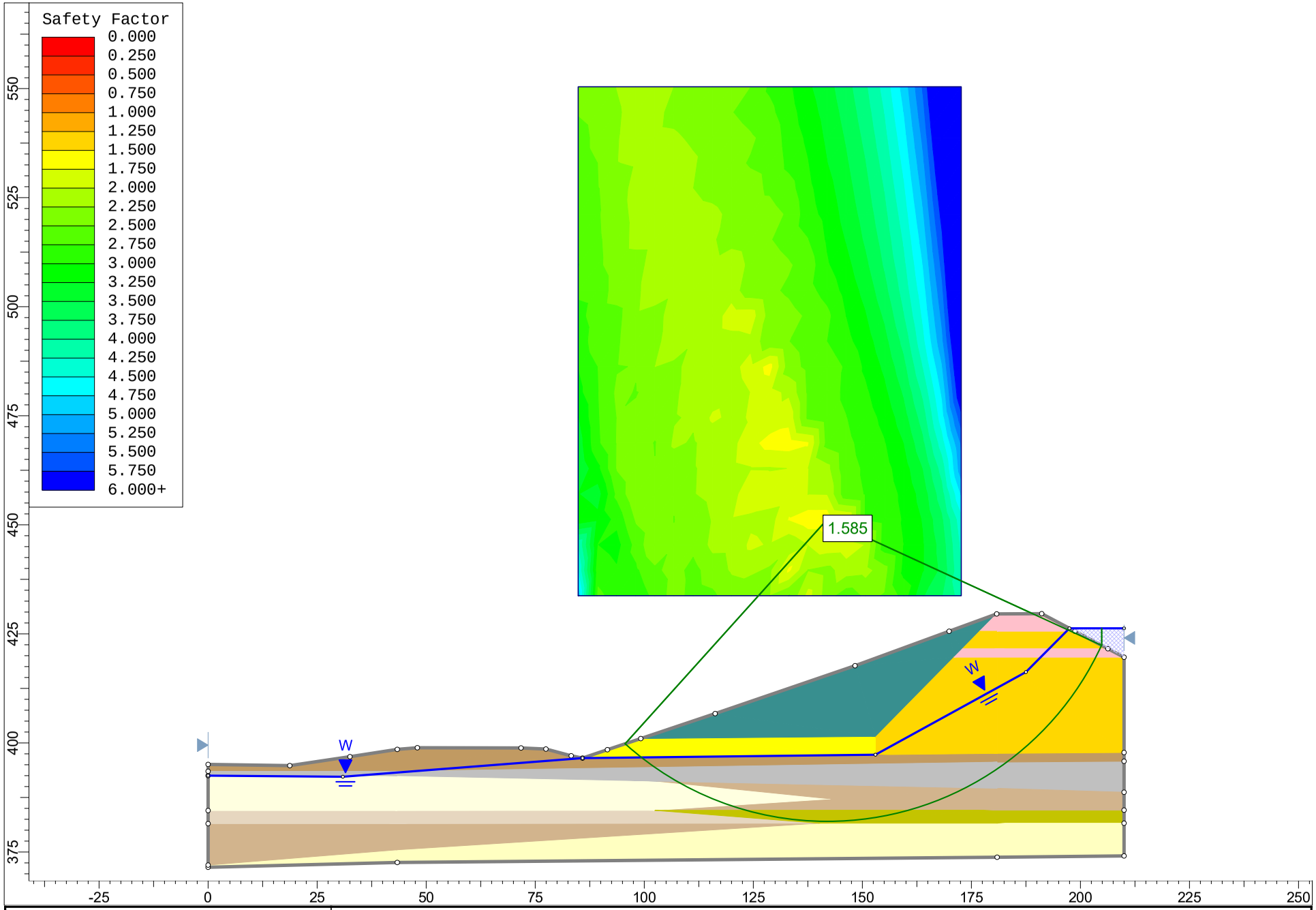
X	Y
102.292	384.543
140	381.6

Material Boundary

X	Y
102.292	384.543
142.735	387.164
102.672	391.249

Material Boundary

X	Y
176.879	425.6
180.9	425.6



Project	BREC Reid/HMPL Station CCR Surface Impoundment		
Analysis Description	Cross Section RH-1 Liquefaction Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 2:31:54 PM		File Name RH-1 Seis Liq.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-2
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-2 Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:14:15 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean Clay (CL)	Granular Fill	Silty Sand (SC)	Lean Clay (CL) (Dam)	Lean clay With Sand (Dam)	Sandy Lean Clay (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	125.5	129.7	132	130	125.8	133.5	134.6
Cohesion [psf]	120	0	14.4	0	0	220	260	14.4
Friction Angle [deg]	32.3	33.7	28.7	31	33	30.4	30.6	33.3
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material	Sandy Lean Clay 2
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	125.8
Cohesion [psf]	200	80
Friction Angle [deg]	30	29.6
Water Surface	Water Table	Water Table
Hu Value	1	1

List Of Coordinates

Water Table

X	Y
0	391.358

87.066	391.358
166.755	395.192
170.864	397.272
208.5	416.24
219.309	426.28
230	426.28

External Boundary

X	Y
6.548e-013	364.6
45.37	364.6
208.52	387.9
230	390.5
230	395.894
230	397.852
230	398.726
230	401.3
230	409.9
230	412.9
230	418.69
230	420.43
224.631	423.368
223.845	423.798
220.564	425.593
214.627	428.842
208.516	429.175
202.208	429.134
186.355	423.878
183.639	422.977
179.243	421.45
160.601	414.973
154.822	412.965
142.317	408.632
132.449	405.213
123.342	402.058
100.934	395.448
92.3437	392.915
90.2895	392.309
87.066	391.358
79.843	393.667
75.206	394.003
51.068	393.78
45.366	393.402
32.987	392.813

0	393.493
0	377.4
0	370.4

Material Boundary

X	Y
0	370.4
45.4	370.4
100.5	377.5
45.4	377.4
0	377.4

Material Boundary

X	Y
87.066	391.358
68	389.6
87.5	389
96.6043	389.467
205.063	395.024
208.5	395.2
230	395.894

Material Boundary

X	Y
87.066	391.358
208.5	397.2
230	397.852

Material Boundary

X	Y
90.2895	392.309
208.5	398
230	398.726

Material Boundary

X	Y
208.5	425.2
220.564	425.593

Material Boundary

X	Y
208.5	423.2
223.845	423.798

Material Boundary

X	Y
208.5	400.7
230	401.3

Material Boundary

X	Y
92.3437	392.915
155.8	395.9
170.864	397.272
208.5	400.7

Material Boundary

X	Y
170.864	397.272
181.19	407.768
184.264	410.894
189.983	416.707
195.612	422.429
197.704	424.555
202.208	429.134

Material Boundary

X	Y
197.704	424.555
208.5	425.2

Material Boundary

X	Y
195.612	422.429
208.5	423.2

Material Boundary

X	Y
181.19	407.768

208.5	409.2
230	409.9

Material Boundary

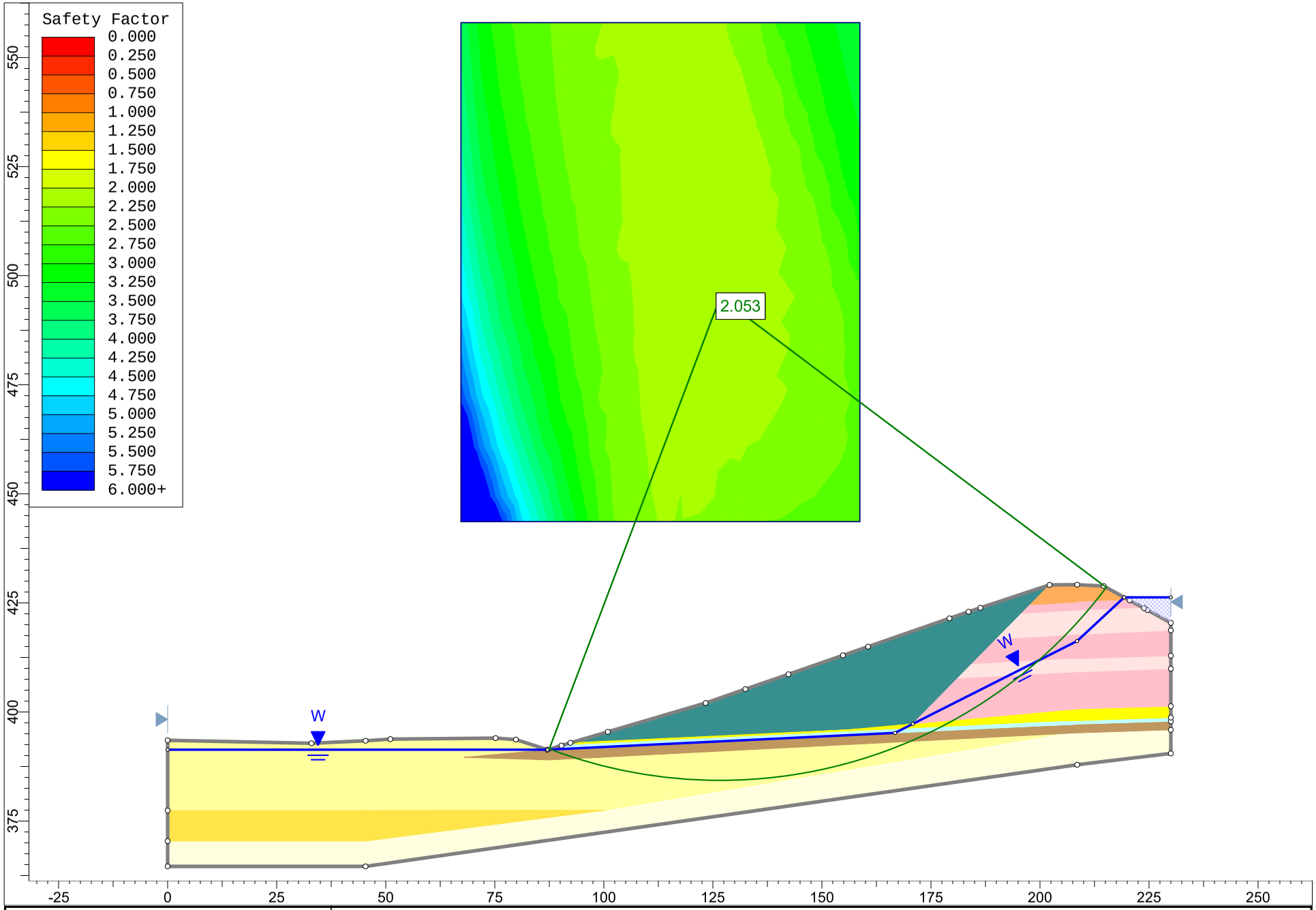
X	Y
184.264	410.894
208.5	412.2
230	412.9

Material Boundary

X	Y
189.983	416.707
208.5	417.8
230	418.69

Material Boundary

X	Y
100.5	377.5
205.063	395.024



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-2 Maximum Storage Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:14:15 PM		File Name RH-2.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-2 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-2 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:14:15 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean Clay (CL)	Granular Fill	Silty Sand (SC)	Lean Clay (CL) (Dam)	Lean clay With Sand (Dam)	Sandy Lean Clay (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	125.5	129.7	132	130	125.8	133.5	134.6
Cohesion [psf]	120	0	14.4	0	0	220	260	14.4
Friction Angle [deg]	32.3	33.7	28.7	31	33	30.4	30.6	33.3
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material	Sandy Lean Clay 2
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	125.8
Cohesion [psf]	200	80
Friction Angle [deg]	30	29.6
Water Surface	Water Table	Water Table
Hu Value	1	1

List Of Coordinates

Water Table

X	Y
0	391.358

87.066	391.358
166.755	395.192
170.864	397.272
208.5	416.24
216.878	427.61
230	427.61

External Boundary

X	Y
6.548e-013	364.6
45.37	364.6
208.52	387.9
230	390.5
230	395.894
230	397.852
230	398.726
230	401.3
230	409.9
230	412.9
230	418.69
230	420.43
224.631	423.368
223.845	423.798
220.564	425.593
214.627	428.842
208.516	429.175
202.208	429.134
186.355	423.878
183.639	422.977
179.243	421.45
160.601	414.973
154.822	412.965
142.317	408.632
132.449	405.213
123.342	402.058
100.934	395.448
92.3437	392.915
90.2895	392.309
87.066	391.358
79.843	393.667
75.206	394.003
51.068	393.78
45.366	393.402
32.987	392.813

0	393.493
0	377.4
0	370.4

Material Boundary

X	Y
0	370.4
45.4	370.4
100.5	377.5
45.4	377.4
0	377.4

Material Boundary

X	Y
87.066	391.358
68	389.6
87.5	389
96.6043	389.467
205.063	395.024
208.5	395.2
230	395.894

Material Boundary

X	Y
87.066	391.358
208.5	397.2
230	397.852

Material Boundary

X	Y
90.2895	392.309
208.5	398
230	398.726

Material Boundary

X	Y
208.5	425.2
220.564	425.593

Material Boundary

X	Y
208.5	423.2
223.845	423.798

Material Boundary

X	Y
208.5	400.7
230	401.3

Material Boundary

X	Y
92.3437	392.915
155.8	395.9
170.864	397.272
208.5	400.7

Material Boundary

X	Y
170.864	397.272
181.19	407.768
184.264	410.894
189.983	416.707
195.612	422.429
197.704	424.555
202.208	429.134

Material Boundary

X	Y
197.704	424.555
208.5	425.2

Material Boundary

X	Y
195.612	422.429
208.5	423.2

Material Boundary

X	Y
181.19	407.768

208.5	409.2
230	409.9

Material Boundary

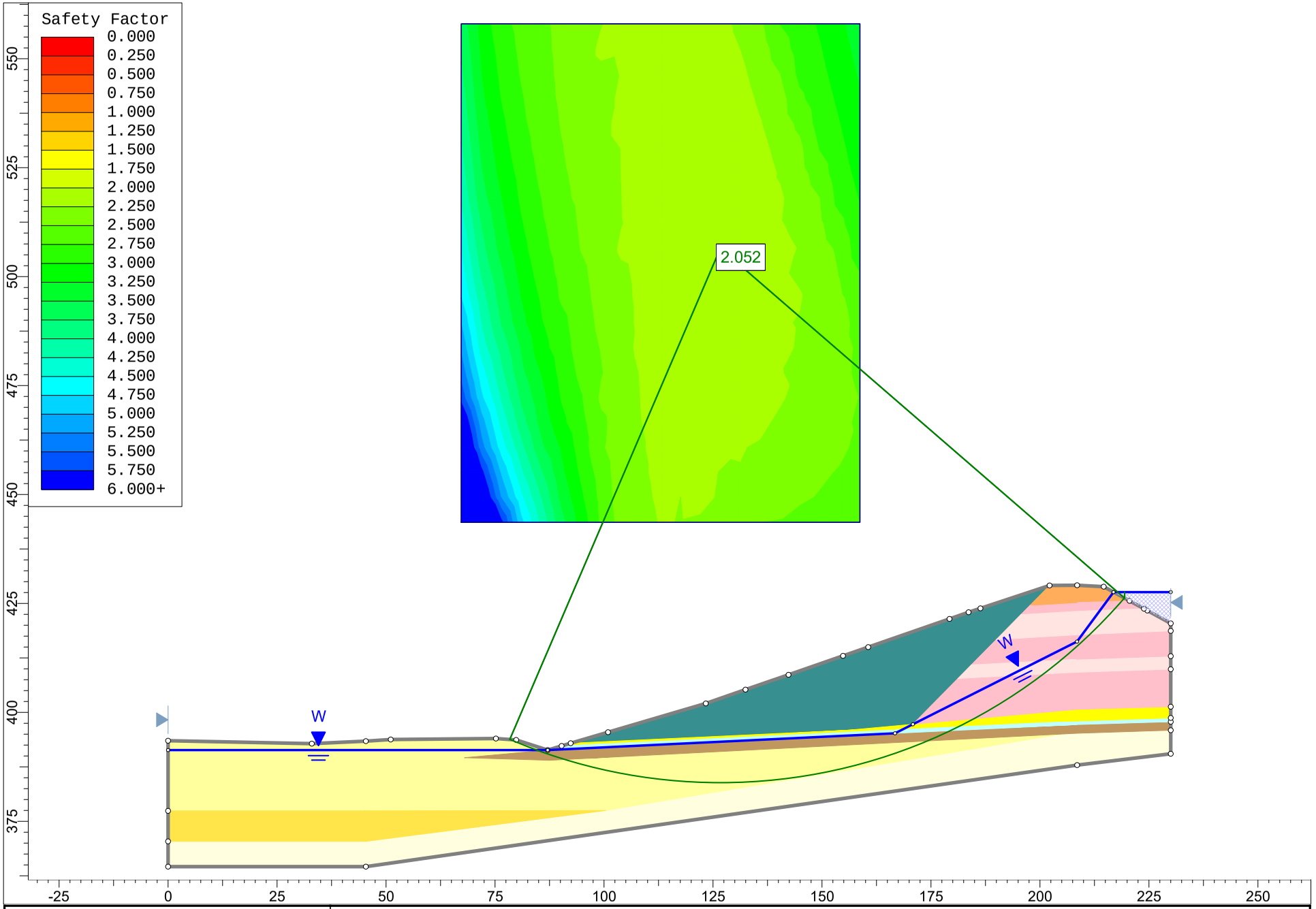
X	Y
184.264	410.894
208.5	412.2
230	412.9

Material Boundary

X	Y
189.983	416.707
208.5	417.8
230	418.69

Material Boundary

X	Y
100.5	377.5
205.063	395.024



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-2 Maximum Surcharge Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:14:15 PM		File Name RH-2 Surcharge.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-2 Seis
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-2 Seismic Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:14:15 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2377

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean Clay (CL)	Granular Fill	Silty Sand (SC)	Lean Clay (CL) (Dam)	Lean clay With Sand (Dam)	Sandy Lean Clay (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	125.5	129.7	132	130	125.8	133.5	134.6
Cohesion [psf]	120	0	14.4	0	0	220	260	14.4
Friction Angle [deg]	32.3	33.7	28.7	31	33	30.4	30.6	33.3
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material	Sandy Lean Clay 2
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	125.8
Cohesion [psf]	200	80
Friction Angle [deg]	30	29.6
Water Surface	Water Table	Water Table
Hu Value	1	1

List Of Coordinates

Water Table

X	Y
0	391.358
87.066	391.358
166.755	395.192
170.864	397.272
208.5	416.24
219.309	426.28
230	426.28

External Boundary

X	Y
6.548e-013	364.6
45.37	364.6
208.52	387.9
230	390.5
230	395.894
230	397.852
230	398.726
230	401.3
230	409.9
230	412.9
230	418.69
230	420.43
224.631	423.368
223.845	423.798
220.564	425.593
214.627	428.842
208.516	429.175
202.208	429.134
186.355	423.878
183.639	422.977
179.243	421.45
160.601	414.973
154.822	412.965
142.317	408.632
132.449	405.213
123.342	402.058
100.934	395.448
92.3437	392.915
90.2895	392.309
87.066	391.358
79.843	393.667

75.206	394.003
51.068	393.78
45.366	393.402
32.987	392.813
0	393.493
0	377.4
0	370.4

Material Boundary

X	Y
0	370.4
45.4	370.4
100.5	377.5
45.4	377.4
0	377.4

Material Boundary

X	Y
87.066	391.358
68	389.6
87.5	389
96.6043	389.467
205.063	395.024
208.5	395.2
230	395.894

Material Boundary

X	Y
87.066	391.358
208.5	397.2
230	397.852

Material Boundary

X	Y
90.2895	392.309
208.5	398
230	398.726

Material Boundary

X	Y

208.5	425.2
220.564	425.593

Material Boundary

X	Y
208.5	423.2
223.845	423.798

Material Boundary

X	Y
208.5	400.7
230	401.3

Material Boundary

X	Y
92.3437	392.915
155.8	395.9
170.864	397.272
208.5	400.7

Material Boundary

X	Y
170.864	397.272
181.19	407.768
184.264	410.894
189.983	416.707
195.612	422.429
197.704	424.555
202.208	429.134

Material Boundary

X	Y
197.704	424.555
208.5	425.2

Material Boundary

X	Y
195.612	422.429
208.5	423.2

Material Boundary

X	Y
181.19	407.768
208.5	409.2
230	409.9

Material Boundary

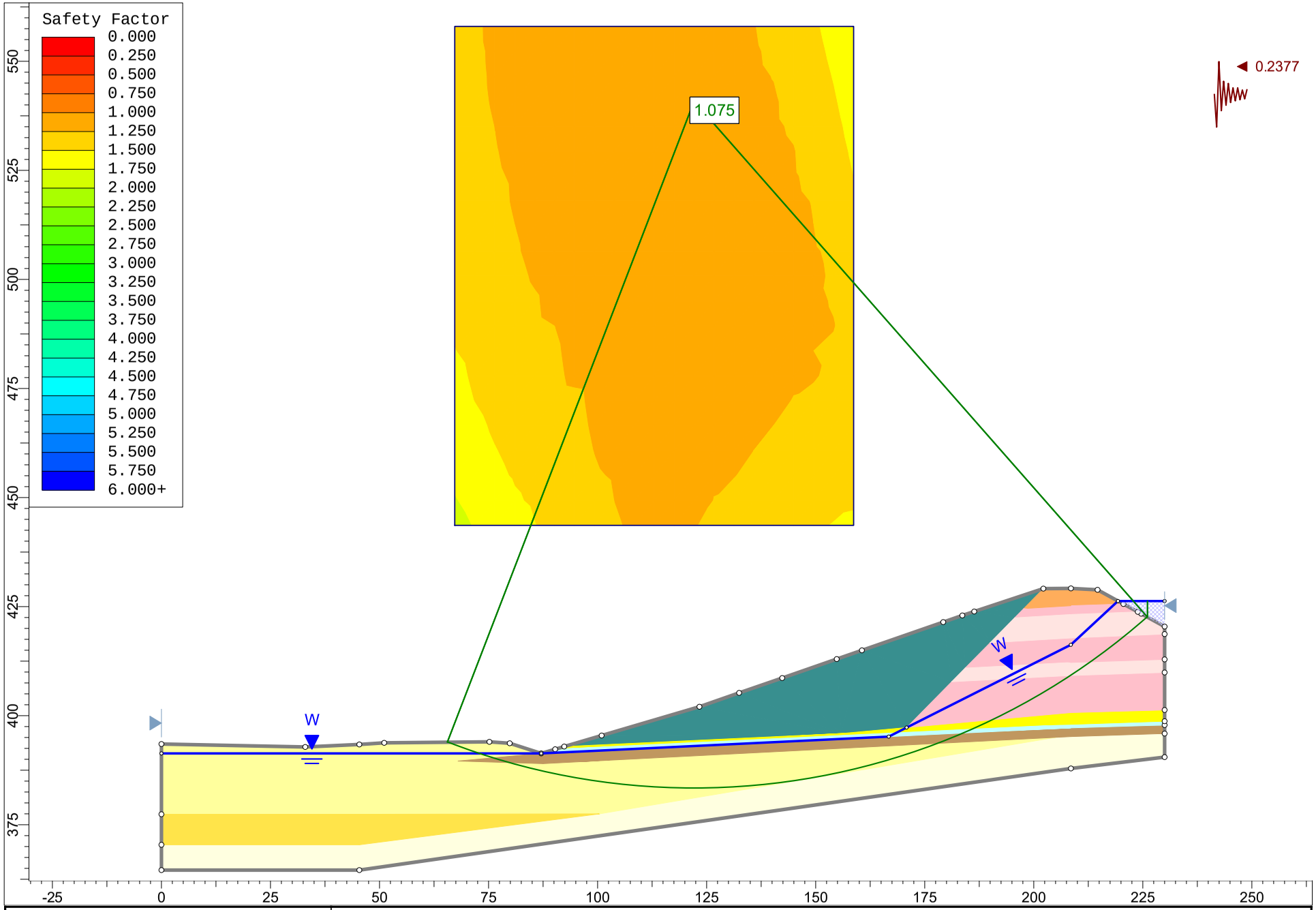
X	Y
184.264	410.894
208.5	412.2
230	412.9

Material Boundary

X	Y
189.983	416.707
208.5	417.8
230	418.69

Material Boundary

X	Y
100.5	377.5
205.063	395.024



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-2 Seismic Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:14:15 PM		File Name RH-2 Seis.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-3
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-3 Maximum Storage Pool Loading Conditon
Company: Associated Engineers, Inc.
Date Created: 8/29/2016, 2:56:23 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116

Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay	Lean Clay	Silty Clay (CL-ML)	Granular Fill and Lean Clay	Outslope Material (Dam)	Lean Clay with Sand (CL) (Dam)	Sandy Lean Clay (CL)(Dike)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	125.8	132	128	133.5	134.6	125.8
Cohesion [psf]	120	72	200	0	200	260	14.4	220
Friction Angle [deg]	32.3	30.4	33.7	31	30	30.6	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Lean Clay (CL) 2
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	129.7
Cohesion [psf]	14.4
Friction Angle [deg]	28.7
Water Surface	Water Table
Hu Value	1

List Of Coordinates

Water Table

X	Y
-1.11022e-016	380.175
75.344	380.175
77.002	383.846
82.5127	384.456
217.136	388.922
221.8	391.3
267.7	412.21
276.537	426.277
285	426.28

External Boundary

X	Y
276.537	426.277
270.621	429.244
264.923	429.374
259.45	429.143
250.06	425.382
237.754	421.038
216.209	413.372
187.674	403.549
156.481	394.047
133.994	390.347
132.225	390.139
106.149	387.073
82.5127	384.456
77.002	383.846
75.344	380.175
68.53	380.645
67.51	383.799
59.536	386.037
0	385.411
0	383.8
1.38778e-017	375.3
0	371.5
0	366.9
0	359.5
40	359.5
132.2	367
172.029	370.145
265	377.7
285	378.7
285	383.6
285	390.6

285	393.6
285	396.6
285	399.6
285	422.033

Material Boundary

X	Y
0	366.9
40	366.9
132.2	371.3
201	376.8
172.029	370.145

Material Boundary

X	Y
1.38778e-017	375.3
40	375.3
132.2	378.3
265	383.4
285	383.6

Material Boundary

X	Y
82.5127	384.456
132.2	386.3
265	390.4
285	390.6

Material Boundary

X	Y
0	383.8
40	383.8
67.51	383.799

Material Boundary

X	Y
106.149	387.073
132.2	388.3
221.8	391.3
265	393.4

285	393.6

Material Boundary

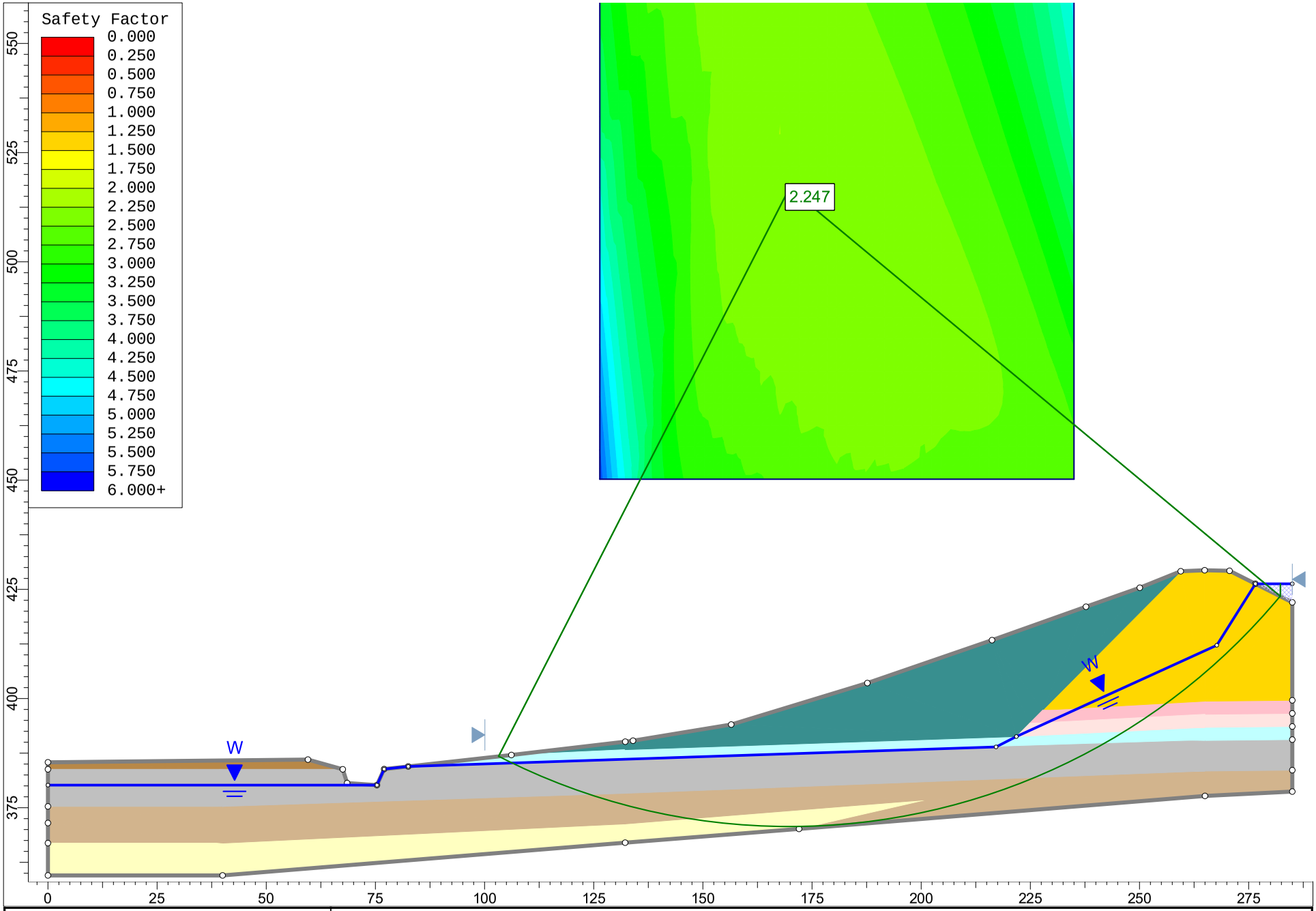
X	Y
221.8	391.3
224.786	394.301
227.81	397.341
259.45	429.143

Material Boundary

X	Y
224.786	394.301
265	396.4
285	396.6

Material Boundary

X	Y
227.81	397.341
265	399.4
285	399.6



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-3 Maximum Storage Pool Loading Conditon	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
	Date 8/29/2016, 2:56:23 PM		File Name RH-3.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impooundment

Project Summary

File Name: RH-3 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impooundment
Analysis: Cross Section RH-3 Maximum Surcharge Pool Loading Conditon
Company: Associated Engineers, Inc.
Date Created: 8/29/2016, 2:56:23 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116

Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay	Lean Clay	Silty Clay (CL-ML)	Granular Fill and Lean Clay	Outslope Material (Dam)	Lean Clay with Sand (CL) (Dam)	Sandy Lean Clay (CL)(Dike)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	125.8	132	128	133.5	134.6	125.8
Cohesion [psf]	120	72	200	0	200	260	14.4	220
Friction Angle [deg]	32.3	30.4	33.7	31	30	30.6	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Lean Clay (CL) 2
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	129.7
Cohesion [psf]	14.4
Friction Angle [deg]	28.7
Water Surface	Water Table
Hu Value	1

List Of Coordinates

Water Table

Project	BREC Reid/HMPL Station CCR Surface Impoundment
Analysis Description	Cross Section RH-3 Maximum Surcharge Pool Loading Conditon
Drawn By	Scale
Company	Associated Engineers, Inc.
Date	8/29/2016, 2:56:23 PM
File Name	RH-3 Surcharge.slim

X	Y
-1.11022e-016	380.175
75.344	380.175
77.002	383.846
82.5127	384.456
217.136	388.922
221.8	391.3
267.7	412.21
273.872	427.613
285	427.61

External Boundary

X	Y
276.537	426.277
270.621	429.244
264.923	429.374
259.45	429.143
250.06	425.382
237.754	421.038
216.209	413.372
187.674	403.549
156.481	394.047
133.994	390.347
132.225	390.139
106.149	387.073
82.5127	384.456
77.002	383.846
75.344	380.175
68.53	380.645
67.51	383.799
59.536	386.037
0	385.411
0	383.8
1.38778e-017	375.3
0	371.5
0	366.9
0	359.5
40	359.5
132.2	367
172.029	370.145
265	377.7
285	378.7
285	383.6
285	390.6

285	393.6
285	396.6
285	399.6
285	422.033

Material Boundary

X	Y
0	366.9
40	366.9
132.2	371.3
201	376.8
172.029	370.145

Material Boundary

X	Y
1.38778e-017	375.3
40	375.3
132.2	378.3
265	383.4
285	383.6

Material Boundary

X	Y
82.5127	384.456
132.2	386.3
265	390.4
285	390.6

Material Boundary

X	Y
0	383.8
40	383.8
67.51	383.799

Material Boundary

X	Y
106.149	387.073
132.2	388.3
221.8	391.3
265	393.4

285	393.6

Material Boundary

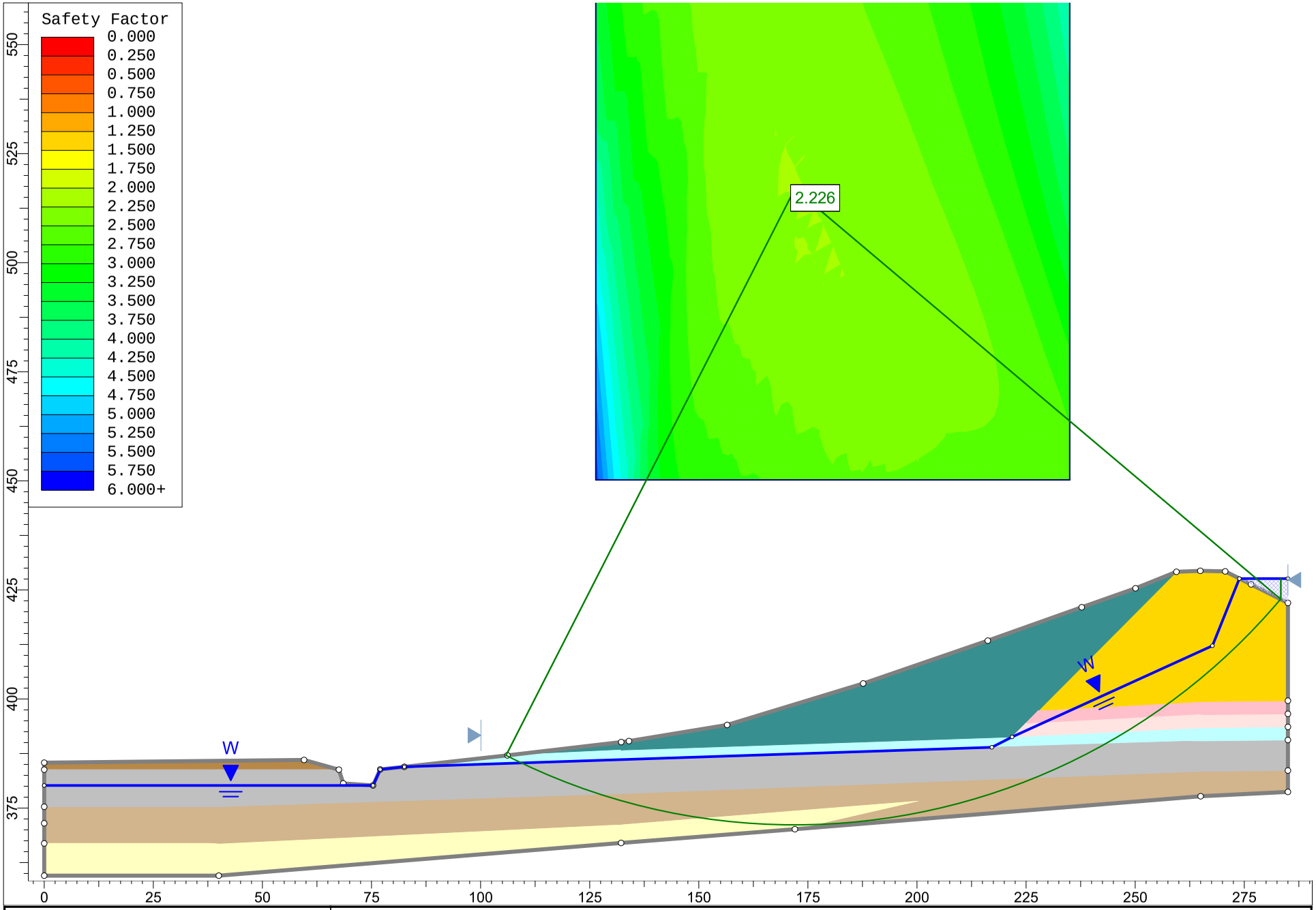
X	Y
221.8	391.3
224.786	394.301
227.81	397.341
259.45	429.143

Material Boundary

X	Y
224.786	394.301
265	396.4
285	396.6

Material Boundary

X	Y
227.81	397.341
265	399.4
285	399.6



Project	BREC Reid/HMPL Station CCR Surface Impoundment		
Analysis Description	Cross Section RH-3 Maximum Surcharge Pool Loading Conditon		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	8/29/2016, 2:56:23 PM		File Name RH-3 Surcharge.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-3 Seis
Slide Modeler Version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-3 Seismic Loading Conditon
Company: Associated Engineers, Inc.
Date Created: 8/29/2016, 2:56:23 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular

Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2377

Material Properties

Property	Sandy Lean Clay	Lean Clay	Silty Clay (CL-ML)	Granular Fill and Lean Clay	Outslope Material (Dam)	Lean Clay with Sand (CL) (Dam)	Sandy Lean Clay (CL)(Dike)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	125.8	132	128	133.5	134.6	125.8
Cohesion [psf]	120	72	200	0	200	260	14.4	220
Friction Angle [deg]	32.3	30.4	33.7	31	30	30.6	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Lean Clay (CL) 2
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	129.7
Cohesion [psf]	14.4
Friction Angle [deg]	28.7
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 1.146920
Center: 169.832, 521.855
Radius: 150.630
Left Slip Surface Endpoint: 103.229, 386.750
Right Slip Surface Endpoint: 283.359, 422.856
Left Slope Intercept: 103.229 386.750
Right Slope Intercept: 283.359 426.279
Resisting Moment=4.1388e+007 lb-ft
Driving Moment=3.60862e+007 lb-ft

Total Slice Area=4300.6 ft2

Valid / Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 27798
Number of Invalid Surfaces: 813

Error Codes:

Error Code -103 reported for 812 surfaces
Error Code -108 reported for 1 surface

Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.14692

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.9517	339.413	Granular Fill and Lean Clay	0	31	80.4502	92.27	153.563	0	153.563
2	9.38923	5181.12	Silty Clay (CL-ML)	200	33.7	558.746	640.837	789.603	128.596	661.007
3	9.38923	10797.8	Silty Clay (CL-ML)	200	33.7	784.082	899.279	1423.39	374.861	1048.53
4	8.05892	13218.6	Lean Clay	72	30.4	715.465	820.581	1841.85	565.927	1275.92
5	8.05892	16561.5	Lean Clay	72	30.4	847.784	972.34	2244.15	709.561	1534.59
6	8.05892	19639.6	Lean Clay	72	30.4	970.425	1113	2598.53	824.191	1774.34
7	7.11739	19518.9	Sandy Lean Clay	120	32.3	1191.41	1366.45	2878.89	907.191	1971.7
8	7.11739	21628	Sandy Lean Clay	120	32.3	1296.89	1487.43	3125.23	962.17	2163.06
9	7.11739	23899.4	Sandy Lean Clay	120	32.3	1421.59	1630.45	3385.29	995.992	2389.3
10	7.11739	25852.9	Sandy Lean Clay	120	32.3	1527.15	1751.52	3589.6	1008.79	2580.81
11	7.97951	30912.3	Lean Clay	72	30.4	1474.5	1691.13	3758.42	998.688	2759.74
12	7.97951	32613.8	Lean Clay	72	30.4	1555.8	1784.38	3881.46	962.77	2918.69
13	7.97951	34074	Lean Clay	72	30.4	1630.67	1870.25	3964.78	899.728	3065.05
14	7.97951	35060.3	Lean Clay	72	30.4	1686.13	1933.86	3982.32	808.85	3173.47
15	7.97951	35547.6	Lean Clay	72	30.4	1722.09	1975.1	3932.9	689.137	3243.76
16	7.97951	35611.6	Lean Clay	72	30.4	1688.19	1936.22	3846.3	668.812	3177.49
17	8.30823	36828.4	Silty Clay (CL-ML)	200	33.7	1874.3	2149.67	3621.62	698.224	2923.4
18	8.30823	36298.1	Silty Clay (CL-ML)	200	33.7	1786.34	2048.79	3462.85	690.709	2772.14
19	4.95864	21118.6	Granular Fill and Lean Clay	0	31	1451.21	1664.42	3429.39	659.333	2770.06
20	5.12784	21134.1	Lean Clay with Sand (CL) (Dam)	260	30.6	1539.33	1765.49	3159.94	614.305	2545.64
21	4.73463	18862	Lean Clay (CL) (Dam)	220	30.4	1443.82	1655.95	3001.55	554.028	2447.52
22	6.60985	24515	Sandy Lean Clay (CL)(Dike)	14.4	33.3	1310.13	1502.61	2725.55	459.958	2265.59
23	6.60985	20127.3	Sandy Lean Clay (CL)(Dike)	14.4	33.3	1061.56	1217.53	2150.92	319.337	1831.59

24	6.60985	13526.4	Sandy Lean Clay (CL)(Dike)	14.4	33.3	565.291	648.343	1510.28	545.202	965.081
25	6.60985	5362.88	Sandy Lean Clay (CL)(Dike)	14.4	33.3	141.118	161.851	659.69	435.217	224.473

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.14692

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	103.229	386.75	0	0	0
2	106.18	385.335	374.121	0	0
3	115.57	381.338	7543.64	0	0
4	124.959	378.064	16998.2	0	0
5	133.018	375.793	23804.5	0	0
6	141.077	373.995	30733.8	0	0
7	149.136	372.654	37371.2	0	0
8	156.253	371.839	43557.5	0	0
9	163.37	371.364	49129.3	0	0
10	170.488	371.227	54029.8	0	0
11	177.605	371.426	58037.4	0	0
12	185.585	372.051	60103.9	0	0
13	193.564	373.107	60668.5	0	0
14	201.544	374.601	59653.7	0	0
15	209.523	376.549	57017.3	0	0
16	217.503	378.968	52794.3	0	0
17	225.482	381.882	46588	0	0
18	233.79	385.478	40381	0	0
19	242.099	389.693	31998	0	0
20	247.057	392.528	24451.6	0	0
21	252.185	395.731	17198.2	0	0
22	256.92	398.953	9880.41	0	0
23	263.53	403.914	-811.059	0	0
24	270.139	409.482	-10555.3	0	0
25	276.749	415.751	-19503.3	0	0
26	283.359	422.856	365.715	0	0

List Of Coordinates

Water Table

X	Y
-1.11022e-016	380.175
75.344	380.175
77.002	383.846
82.5127	384.456
217.136	388.922
221.8	391.3
267.7	412.21
276.537	426.277

285	426.28

External Boundary

X	Y
276.537	426.277
270.621	429.244
264.923	429.374
259.45	429.143
250.06	425.382
237.754	421.038
216.209	413.372
187.674	403.549
156.481	394.047
133.994	390.347
132.225	390.139
106.149	387.073
82.5127	384.456
77.002	383.846
75.344	380.175
68.53	380.645
67.51	383.799
59.536	386.037
0	385.411
0	383.8
1.38778e-017	375.3
0	371.5
0	366.9
0	359.5
40	359.5
132.2	367
172.029	370.145
265	377.7
285	378.7
285	383.6
285	390.6
285	393.6
285	396.6
285	399.6
285	422.033

Material Boundary

X	Y
0	366.9
40	366.9
132.2	371.3
201	376.8
172.029	370.145

Material Boundary

X	Y
1.38778e-017	375.3
40	375.3
132.2	378.3
265	383.4
285	383.6

Material Boundary

X	Y
82.5127	384.456
132.2	386.3
265	390.4
285	390.6

Material Boundary

X	Y
0	383.8
40	383.8
67.51	383.799

Material Boundary

X	Y
106.149	387.073
132.2	388.3
221.8	391.3
265	393.4
285	393.6

Material Boundary

X	Y
221.8	391.3
224.786	394.301
227.81	397.341
259.45	429.143

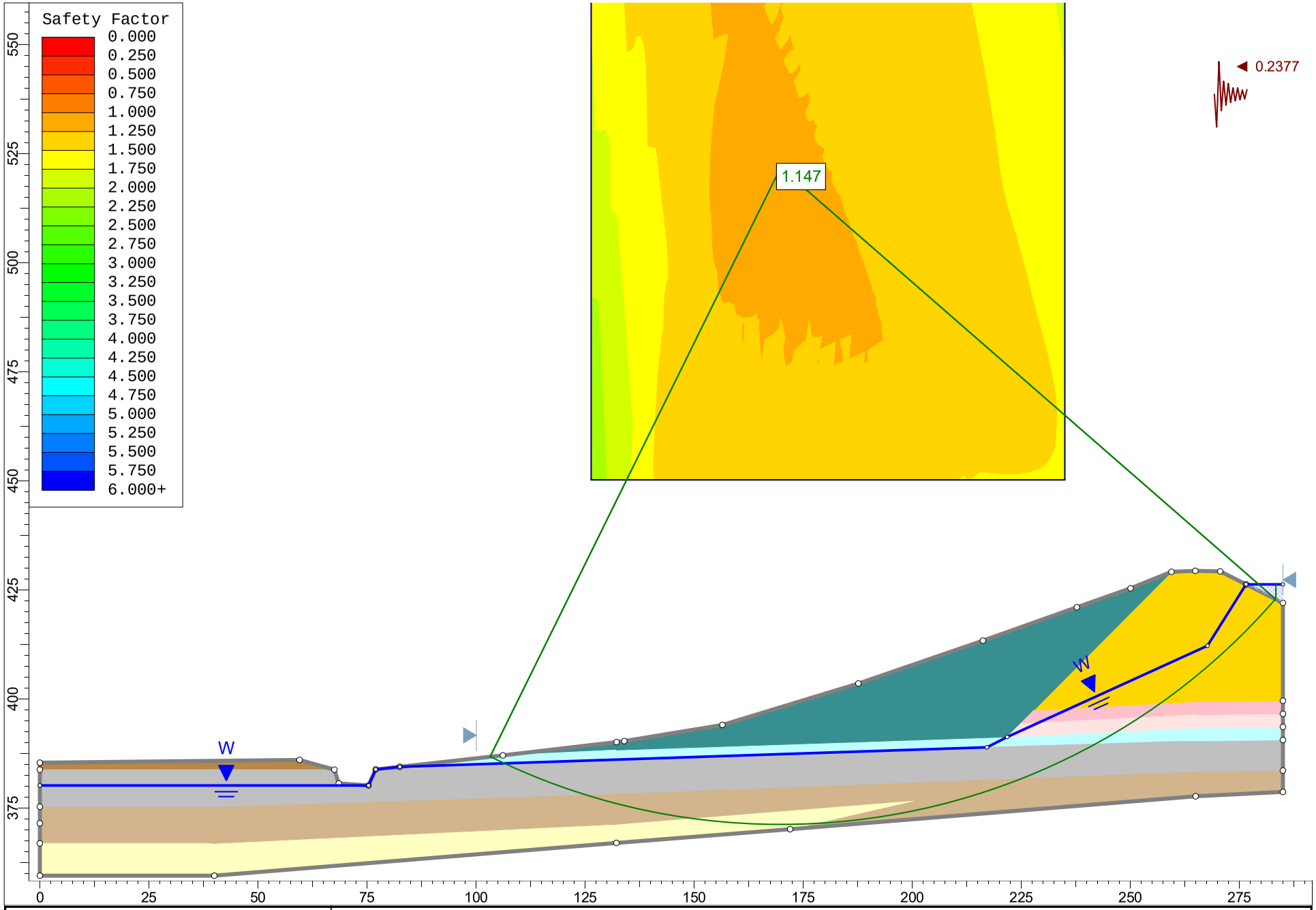
Material Boundary

X	Y
224.786	394.301
265	396.4
285	396.6

Material Boundary

X	Y

227.81	397.341
265	399.4
285	399.6



	Project: BREC Reid/HMPL Station CCR Surface Impoundment		
	Analysis Description: Cross Section RH-3 Seismic Loading Conditon		
	Drawn By:	Scale: 1:360	Company: Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date: 8/29/2016, 2:56:23 PM		File Name: RH-3 Seis.slim

Slide Analysis Information

BREC Reid HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-4
Last saved with Slide version: 6.039
Project Title: BREC Reid HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-4 Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/4/2016, 12:09:41 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116

Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Lean Clay (CL)	Silty Clay (CL-ML)	Lean Clay With Sand (CL) (Dam)	Lean Clay (CL) (Dam)	Silty Sand (SM)	Outslope Material (Dam)	Lean Clay (CL) (1)	Lean Clay (CL)/Clayey Sand (SC)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	134.1	125.8	133.5	125.8	130	128	129.7	125.8
Cohesion [psf]	72	200	260	220	0	200	14.4	80
Friction Angle [deg]	30.4	33.7	30.6	30.4	33	30	28.7	29.6
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
2.77556e-017	393.033
55.19	393.033
71.2842	395.917
141	397
151.1	397
185.3	405.78
200.877	426.28
215	426.28

External Boundary

X	Y
215	418.777
213.982	419.318
205.956	423.582
196.055	428.841
189.723	429.373
183.027	428.888
164.711	421.366
139.268	413.482
115.733	405.895
88.257	398.958
75.6909	396.706
71.2842	395.917
55.19	393.033
31.267	393.626
21.125	395.865
0	405.212
2.77556e-017	393.033
0	375.2
70.69	375.4
189.72	377.7
215	377.9
215	385.1
215	398.2
215	409.5

Material Boundary

X	Y
141	400
141	397
145.463	397
151.1	397
163.168	409.053
173.086	418.959
177.455	423.323
183.027	428.888

Material Boundary

X	Y
163.168	409.053
189.8	409.4

215	409.5

Material Boundary

X	Y
151.1	397
189.8	398
215	398.2

Material Boundary

X	Y
141	397
70.7	392.8
36.8	391
70.7	389.5
79.6711	389.266
189.8	386.4
215	385.1

Material Boundary

X	Y
71.2842	395.917
141	397

Material Boundary

X	Y
88.257	398.958
141	400

Material Boundary

X	Y
173.086	418.959
189.8	419.1

Material Boundary

X	Y
189.8	419.1
213.982	419.318

Material Boundary

X	Y
177.455	423.323
189.8	423.4

Material Boundary

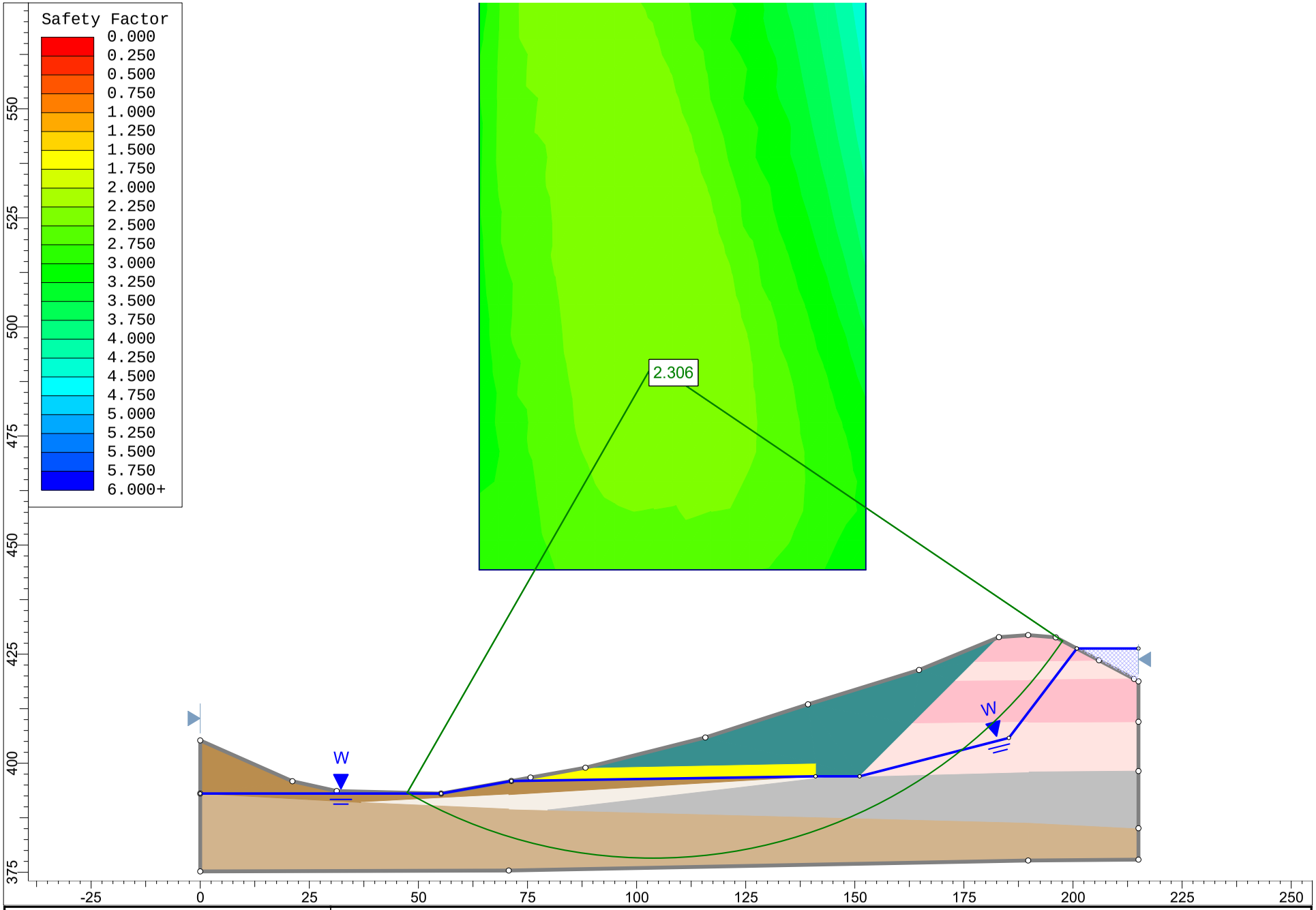
X	Y
189.8	423.4
205.956	423.582

Material Boundary

X	Y
2.77556e-017	393.033
36.8	391

Material Boundary

X	Y
79.6711	389.266
145.463	397



Project	BREC Reid HMPL Station CCR Surface Impoundment		
Analysis Description	Cross Section RH-4 Maximum Storage Pool Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/4/2016, 12:09:41 PM		File Name RH-4.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-4 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-4 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/4/2016, 12:09:41 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116

Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Lean Clay (CL)	Silty Clay (CL-ML)	Lean Clay With Sand (CL) (Dam)	Lean Clay (CL) (Dam)	Silty Sand (SM)	Outslope Material (Dam)	Lean Clay (CL) (1)	Lean Clay (CL)/Clayey Sand (SC)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	134.1	125.8	133.5	125.8	130	128	129.7	125.8
Cohesion [psf]	72	200	260	220	0	200	14.4	80
Friction Angle [deg]	30.4	33.7	30.6	30.4	33	30	28.7	29.6
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
2.77556e-017	393.033
55.19	393.033
71.2842	395.917
141	397
151.1	397
185.3	405.78
198.372	427.61
215	427.61

External Boundary

X	Y
215	418.777
213.982	419.318
205.956	423.582
196.055	428.841
189.723	429.373
183.027	428.888
164.711	421.366
139.268	413.482
115.733	405.895
88.257	398.958
75.6909	396.706
71.2842	395.917
55.19	393.033
31.267	393.626
21.125	395.865
0	405.212
2.77556e-017	393.033
0	375.2
70.69	375.4
189.72	377.7
215	377.9
215	385.1
215	398.2
215	409.5

Material Boundary

X	Y
141	400
141	397
145.463	397
151.1	397
163.168	409.053
173.086	418.959
177.455	423.323
183.027	428.888

Material Boundary

X	Y
163.168	409.053
189.8	409.4

215	409.5

Material Boundary

X	Y
151.1	397
189.8	398
215	398.2

Material Boundary

X	Y
141	397
70.7	392.8
36.8	391
70.7	389.5
79.6711	389.266
189.8	386.4
215	385.1

Material Boundary

X	Y
71.2842	395.917
141	397

Material Boundary

X	Y
88.257	398.958
141	400

Material Boundary

X	Y
173.086	418.959
189.8	419.1

Material Boundary

X	Y
189.8	419.1
213.982	419.318

Material Boundary

X	Y
177.455	423.323
189.8	423.4

Material Boundary

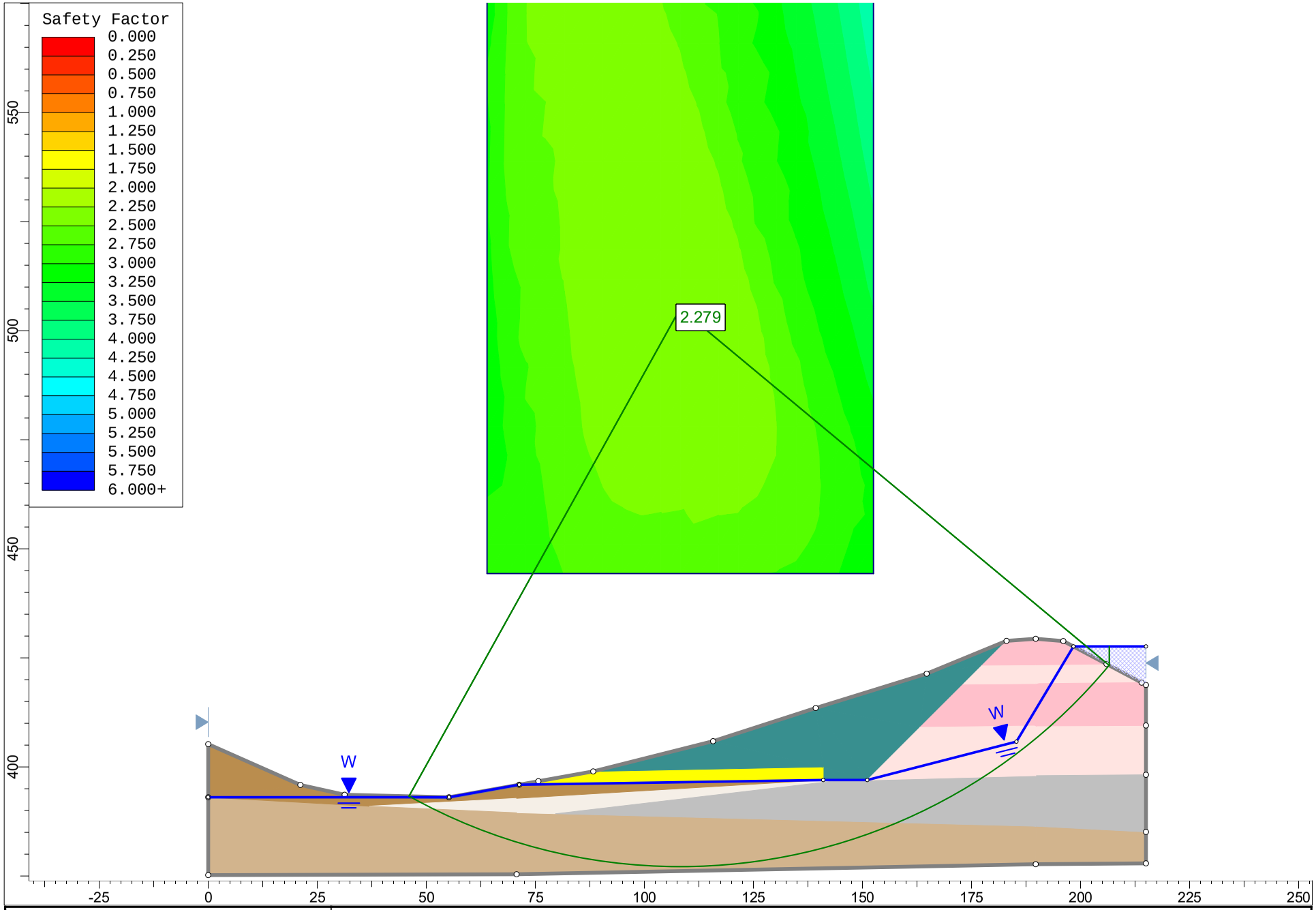
X	Y
189.8	423.4
205.956	423.582

Material Boundary

X	Y
2.77556e-017	393.033
36.8	391

Material Boundary

X	Y
79.6711	389.266
145.463	397



	Project	BREC Reid/HMPL Station CCR Surface Impoundment		
	Analysis Description	Cross Section RH-4 Maximum Surcharge Pool Loading Condition		
	Drawn By		Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date	9/4/2016, 12:09:41 PM		File Name RH-4 Surcharge.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-4 Seis 2
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-4 Seismic Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/4/2016, 12:09:41 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116

Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2377

Material Properties

Property	Lean clay	Silty clay	Lean Clay with sand (dike)	Lean clay (dike)	Silty sand (SM)	Sandy wedge	Lean clay OG	Lean clay with sand
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	134.1	125.8	133.5	125.8	130	130	129.7	125.8
Cohesion [psf]	72	200	260	220	0	200	14.4	80
Friction Angle [deg]	30.4	33.7	30.6	30.4	33	30	28.7	29.6
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
2.77556e-017	393.033
55.19	393.033
71.2842	395.917
141	397
151.1	397
185.3	405.78
200.877	426.28
215	426.28

External Boundary

X	Y
215	418.777
213.982	419.318
205.956	423.582
196.055	428.841
189.723	429.373
183.027	428.888
164.711	421.366
139.268	413.482
115.733	405.895
88.257	398.958
75.6909	396.706
71.2842	395.917
55.19	393.033
31.267	393.626
21.125	395.865
0	405.212
2.77556e-017	393.033
0	375.2
70.69	375.4
189.72	377.7
215	377.9
215	385.1
215	398.2
215	409.5

Material Boundary

X	Y
141	400
141	397
145.463	397
151.1	397
163.168	409.053
173.086	418.959
177.455	423.323
183.027	428.888

Material Boundary

X	Y
163.168	409.053

189.8	409.4
215	409.5

Material Boundary

X	Y
151.1	397
189.8	398
215	398.2

Material Boundary

X	Y
141	397
70.7	392.8
36.8	391
70.7	389.5
79.6711	389.266
189.8	386.4
215	385.1

Material Boundary

X	Y
71.2842	395.917
141	397

Material Boundary

X	Y
88.257	398.958
141	400

Material Boundary

X	Y
173.086	418.959
189.8	419.1

Material Boundary

X	Y
189.8	419.1
213.982	419.318

Material Boundary

X	Y
177.455	423.323
189.8	423.4

Material Boundary

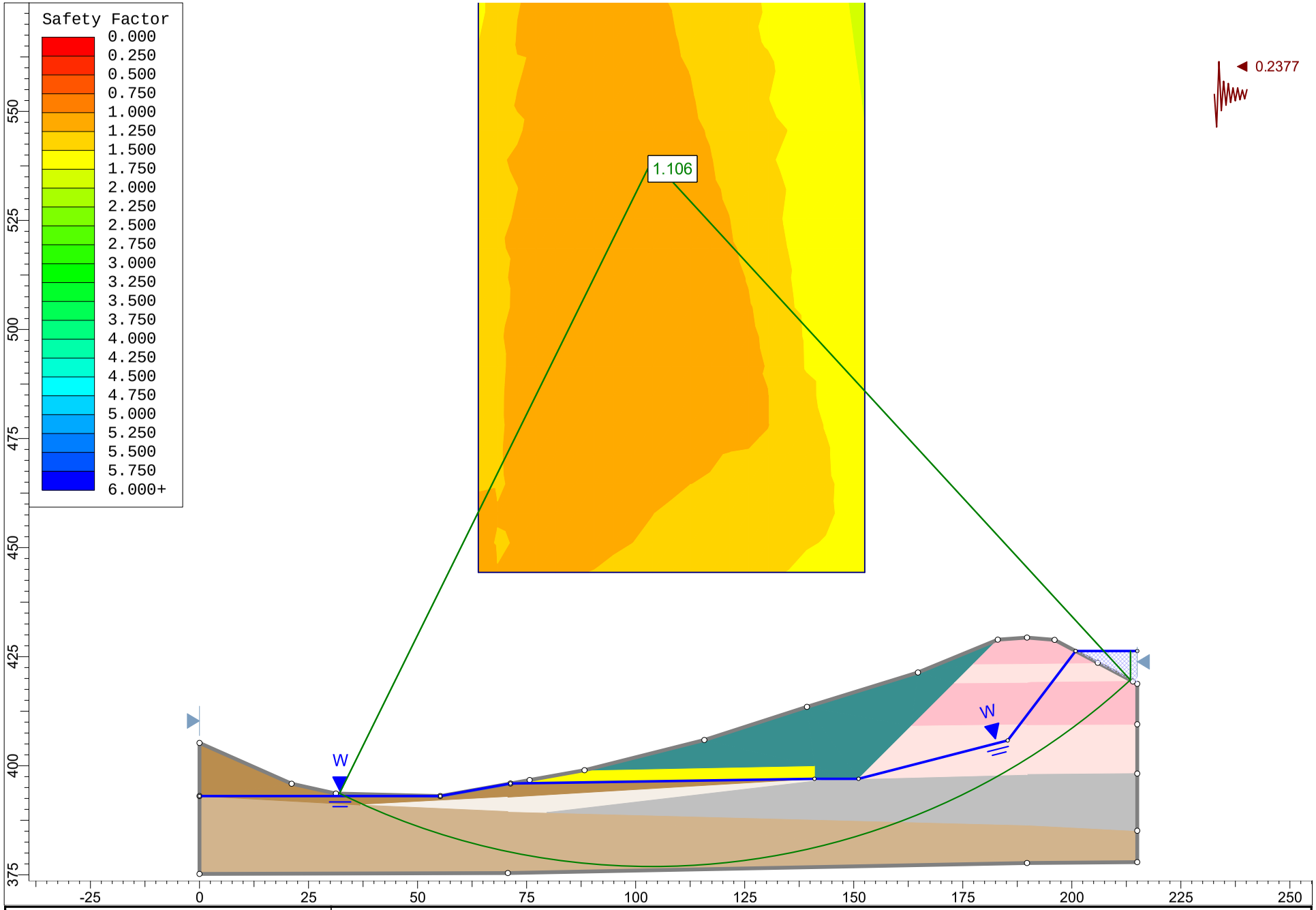
X	Y
189.8	423.4
205.956	423.582

Material Boundary

X	Y
2.77556e-017	393.033
36.8	391

Material Boundary

X	Y
79.6711	389.266
145.463	397



Project	BREC Reid/HMPL Station CCR Surface Impoundment		
Analysis Description	Cross Section RH-4 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/4/2016, 12:09:41 PM		File Name RH-4 Seis 2.slim

SLIDEINTERPRET 6.039

ATTACHMENT 12 - SAFETY FACTOR ASSESSMENT (OCTOBER 2016)

Big Rivers
ELECTRIC CORPORATION
Your Touchstone Energy® Cooperative

Green Station CCR Surface Impoundment

Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

October 11, 2016

Prepared By:

ASSOCIATED ENGINEERS, INC.
2740 North Main St. • Madisonville, KY 42431
Phone: (270) 821-7732 • Fax: (270) 821-7789

Project ID: 160028A

Big Rivers Electric Corporation
Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

CCR Surface Impoundment Information

Name:	Green Station CCR Surface Impoundment
Operator:	Sebree Generating Station
Address:	9000 Highway 2096 Robards, Kentucky 42452
CCR Unit Identification Number:	Kentucky State Dam Inventory System ID No. 0980

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

As part of the § 257.73 Structural integrity criteria for existing CCR surface impoundments requirements, an owner or operator of an existing CCR surface impoundment must no later than October 17, 2016:

> Conduct an initial safety factor assessment for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified below for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations, documenting whether the CCR unit achieves the following minimum factors of safety:
>
> 1. The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
>
> 2. The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
>
> 3. The calculated seismic factor of safety must equal or exceed 1.00.

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

From: VI. Development of the Final Rule - Technical Requirements

General Safety Factor Assessment Considerations

Generally accepted engineering methodologies specify that the determination of the structural stability factors of safety specified above is to be calculated by the qualified professional engineer using conventional analysis procedures or, if necessary, special analysis procedures. Conventional analysis procedures include, but are not limited to, limit equilibrium methods of slope stability analysis, whereas, special analysis procedures include, but are not limited to, finite element methods, finite difference methods, three-dimensional methods, or probabilistic methods. Whichever methodology is used to determine the factors of safety of the CCR surface impoundment, the qualified professional engineer must document the methodology used, as well as the basis for using that methodology, and the analysis must be supported by appropriate engineering calculations.

The Calculated Static Factor of Safety Under the Long-Term, Maximum Storage Pool Loading Condition

It is generally accepted practice to analyze the stability of the downstream slope of the dam embankment for steady-state seepage (or steady seepage) conditions with the reservoir at its normal operating pool elevation (usually the spillway crest elevation) since this is the loading condition the embankment will experience most. This condition is called steady seepage with maximum storage pool. The maximum storage pool loading is the maximum water level that can be maintained that will result in the full development of a steady-state seepage condition. Maximum storage pool loading conditions need to be calculated to ensure that the CCR surface impoundment can withstand a maximum expected pool elevation with full development of saturation in the embankment under long-term loading. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum storage pool loading condition meet or exceed 1.5.

The Calculated Static Factor of Safety Under the Maximum Surcharge Pool Loading Condition

The maximum surcharge pool loading condition is calculated to evaluate the effect of a raised level (e.g., flood surcharge) on the stability of the downstream slope. This ensures that the CCR surface impoundment can withstand a temporary rise in pool elevation above the maximum storage pool elevation for which the CCR surface impoundment may normally be subject under inflow design flood stage, for a short-term until the inflow design flood is passed through the CCR surface impoundment. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum surcharge pool loading condition meet or exceed 1.4.

The Calculated Seismic Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold must meet a seismic factor of safety equal to or greater than 1.0. All CCR surface

impoundments must also be capable of withstanding a design earthquake without damage to the foundation or embankment that would cause a discharge of its contents. To further support the location criteria established in this rule, CCR surface impoundments and any lateral expansion exceeding a specific height and/or volume threshold must be assessed under seismic loading conditions for a seismic loading event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years, based on the USGS seismic hazard maps for seismic events with this return period for the region where the CCR unit is located. EPA chose the 2% exceedance probability in 50 years event based on its common use in seismic design criteria throughout engineering.

The Calculated Liquefaction Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold and have been determined to contain soils susceptible to liquefaction must meet a liquefaction factor of safety equal to or greater than 1.20. A prudent engineering analysis of structural stability also includes a liquefaction potential analysis and analysis of post-liquefaction static factors of safety. As discussed previously, liquefaction is a phenomenon which typically occurs in loose, saturated or partially-saturated soils in which the effective stress of the soils reduces to zero, corresponding to a total loss of shear strength of the soil. The most common occurrence of liquefaction is in loose soils, typically sands. The liquefaction FOS determination in the final rule is used to determine if a CCR unit would remain stable if the soils of the embankment of the CCR unit were to experience liquefaction. Liquefaction analysis is only necessary in instances where CCR surface impoundments show, through representative soil sampling, construction documentation, or anecdotal evidence from personnel with knowledge of the CCR unit's construction, that soils of the embankment are susceptible to liquefaction.

Failure To Demonstrate Minimum Safety Factors or Failure To Complete a Timely Safety Factor Assessment

As previously discussed, the rule requires an owner or operator to document that the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified in the rule. For any CCR surface impoundment that does not meet these requirements, the owner or operator must either take any engineering measure necessary to ensure that the unit meets the requirements by the rule's deadlines, or cease placement of CCR and non-CCR waste into the unit and initiate closure of such CCR unit as provided in section 257.102 within six months. Similarly, if an owner or operator fails to complete the initial safety factor assessment or any subsequent periodic factor safety assessment by the deadlines established in the rule, the owner or operator must cease placing CCR and non-CCR waste into the unit and initiate closure within six months.

Description of Impoundment

An aerial photo of the CCR unit is provided as Attachment A and an excerpt from U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps showing the location of the CCR unit is provided as Attachment B.

The CCR unit has been in place for 40 plus years The CCR unit operator has general maintenance and repair procedures in place as they determine necessary. There are no known occurrences of structural instability of the CCR unit.

The CCR unit has been in place for 40 plus years. The CCR unit is used for the placement of coal combustion residual material; currently slurried bottom ash. The immediate watershed that drains to the CCR unit, and in which the CCR unit is considered to be located, is unnamed and 54.13 acres in size. The unnamed watershed discharges from the CCR impoundment outflow structure and is routed to the Green River.

The CCR unit is a combined incised/earthen embankment structure. Embankments form the west, south and east sides of the impoundment and the north side is incised. The Green River is located approximately 400 feet east of the structure. Due to surface relief, only the toe area of the south dike is potentially subject to flooding. The predominant features were small stream valleys draining eastward to the Green River. Most of the central portion of the south dike was constructed on a subdued ridge. The toe of the outboard slope intersected a lower drainage area. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands.

The west dike is generally less than five feet in height and the south dike reaches a maximum height of 19.5 feet. The east dike reaches a maximum height of approximately eight feet and is buttressed with a secondary parallel embankment that serves as a 40-foot wide roadway. The Burns and Roe, Inc. Engineering and Consultants June 30, 1978 site grading plans show the original construction layout and ground contours for the impoundment site. Bottom ash has been placed above the normal pool along the inboard side, essentially creating reclaimed land

Depth of impounded water and CCR is 16 feet and 46 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 394 feet and 408 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

The remaining storage capacity is approximately 172,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

The approximate volume of impounded water and CCR is 981,000 cubic yards (approximate water volume is 172,000 cubic yards and approximate CCR volume is 809,000 cubic yards). This volume was calculated based on the maximum storage capacity, the current amount of CCR stored in the facility based on the most recent bathymetric survey, and the best available as-built data for the structure construction prior to placement of CCR.

The impoundment discharge consists of two corrugated steel pipes, each 30 inches in diameter. The pipe intakes are through a concrete common headwall collection structure with a variable height steel debris deflector on each pipe intake.

Calculated Safety Factors

Results of the initial safety factor assessment for the critical cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments are supported by appropriate engineering calculations.

The safety factor analysis was conducted using the Rocscience Inc. Slide geotechnical software by evaluating four cross sections along the embankment. Slide provides numerical tools to analyze the stability of embankments using limit equilibrium methods. At each cross section, drilling, surveying, laboratory testing, and a slope stability analysis were performed. Based on the four analysis scenarios, the lowest factor of safety for all scenarios was not found at a single cross section; therefore, the results listed below are the lowest factor of safety realized from all analyzed cross sections for each scenario. The safety factor assessments are supported by appropriate engineering calculations and the Slide modeling results for the Green CCR impoundment are attached to this report.

1. The calculated static factor of safety under the long-term, maximum storage pool loading condition equals: 1.800

2. The calculated static factor of safety under the maximum surcharge pool loading condition equals: 1.800

3. The calculated seismic factor of safety equals: 1.002

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety equals: 1.800

Sources of Information

Geotechnical and other information provided by Associated Engineers, Inc.

Engineering design drawings and other information provided by Big Rivers Electric Corporation

United States Geological Survey U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps

Professional Engineer Certification [Per 40 CFR § 257.73]
Green CCR Impoundment Initial Safety Factor Assessment

I hereby certify that myself or an agent under my review has prepared this Initial Safety Factor Assessment (Assessment), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Assessment has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.73. To the best of my knowledge and belief, the information contained in this Assessment is true, complete, and accurate.

David A. Lamb P.E.

David A. Lamb P.E.
State of Kentucky License No. 17822

Date: 10/11/16

Attachment A. Aerial Photo of the Green CCR Surface Impoundment

Attachment B. Topographic Map showing the Green CCR Surface Impoundment

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-1
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-1 Long-Term Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc
Date Created: 9/5/2016, 3:43:18 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean Clay (CL)	Sandy Lean Clay With Gravel (CL) (Dam)
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	134.3	135.4	137.69
Cohesion [psf]	316.8	403.2	820.8	72
Friction Angle [deg]	24.3	30.2	24.6	27.4
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	379.185
31.955	379.172
36.551	377.695
50.832	376.221
54.305	375.6
58.684	376.406
70.171	377.906
76.996	378.317
84.12	378.983

85.7592	379.391
140.9	382.48
170.48	393.92

External Boundary

X	Y
0	349.5
55	349.6
77	352.7
153.14	361.4
170.48	362.8
170.48	366.698
170.48	369.698
170.48	374.816
170.48	376.396
170.48	393.967
161.556	396.809
153.137	396.9
143.057	396.719
119.757	389.859
96.35	382.029
84.12	378.983
76.996	378.317
70.171	377.906
58.684	376.406
54.305	375.6
50.832	376.221
36.551	377.695
20.651	382.805
0	391.212
0	374.3
0	355.7
0	353.7

Material Boundary

X	Y
0	353.7
55	353.7
77	356.8
153	364.9

170.48	366.698

Material Boundary

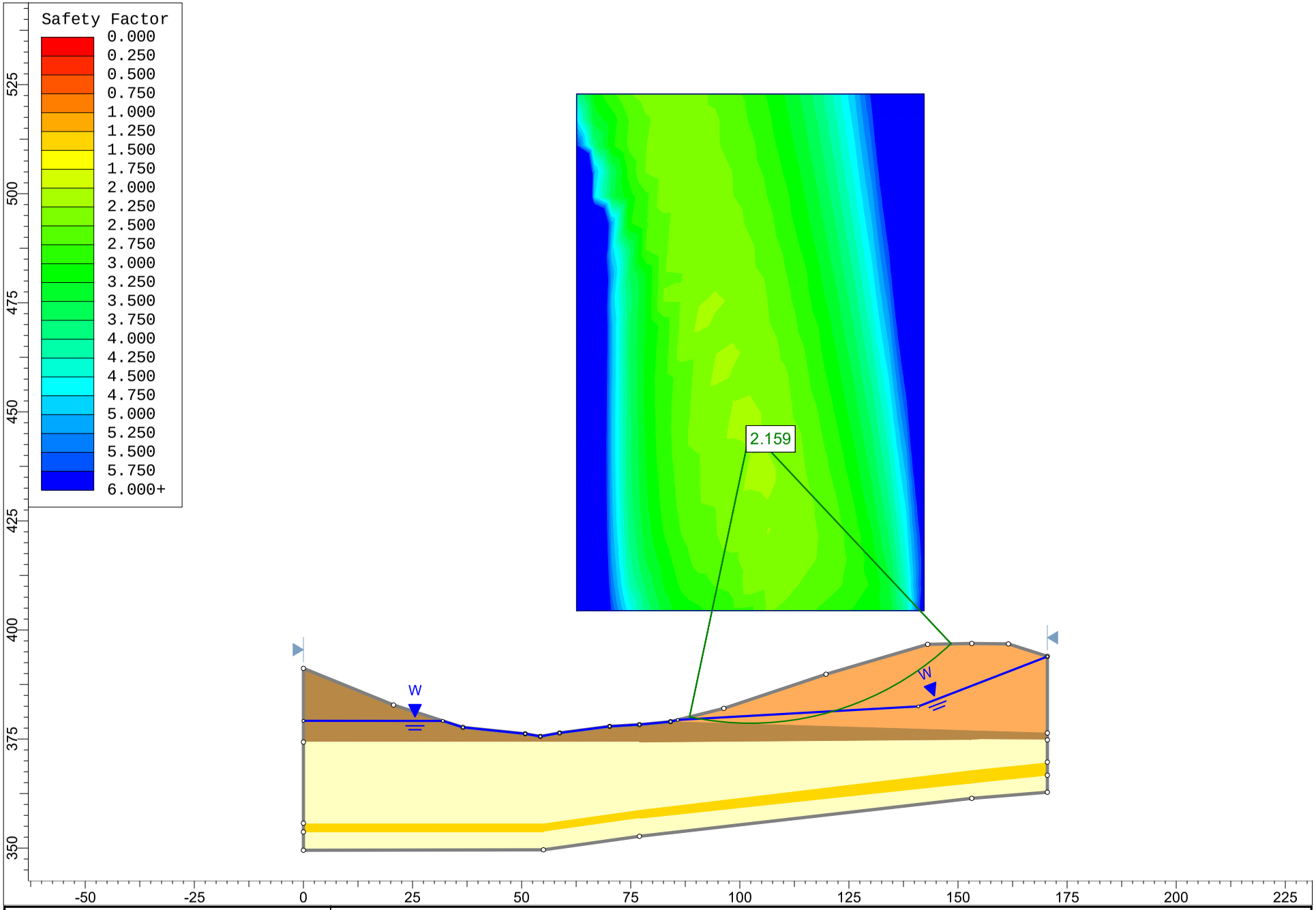
X	Y
0	355.7
55	355.7
77	358.8
153	367.9
170.48	369.698

Material Boundary

X	Y
0	374.3
77	374.3
153	374.9
170.48	374.816

Material Boundary

X	Y
84.12	378.983
153	376.9
170.48	376.396



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	Analysis Description	Cross Section GR-1 Long-Term Maximum Storage Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:43:18 PM		File Name GR-1.slim

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-1 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-1 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc
Date Created: 9/5/2016, 3:43:18 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean clay (CL)	Sandy lean clay With Gravel (CL) (Dam)
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	134.3	135.4	137.69
Cohesion [psf]	316.8	403.2	820.8	72
Friction Angle [deg]	24.3	30.2	24.6	27.4
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	379.185
31.955	379.172
36.551	377.695
50.832	376.221
54.305	375.6
58.684	376.406
70.171	377.906
76.996	378.317
84.12	378.983

85.7592	379.391
140.9	382.48
165.719	395.483
170.48	395.48

External Boundary

X	Y
0	349.5
55	349.6
77	352.7
153.14	361.4
170.48	362.8
170.48	366.698
170.48	369.698
170.48	374.816
170.48	376.396
170.48	393.967
161.556	396.809
153.137	396.9
143.057	396.719
119.757	389.859
96.35	382.029
84.12	378.983
76.996	378.317
70.171	377.906
58.684	376.406
54.305	375.6
50.832	376.221
36.551	377.695
20.651	382.805
0	391.212
0	374.3
0	355.7
0	353.7

Material Boundary

X	Y
0	353.7
55	353.7
77	356.8

153	364.9
170.48	366.698

Material Boundary

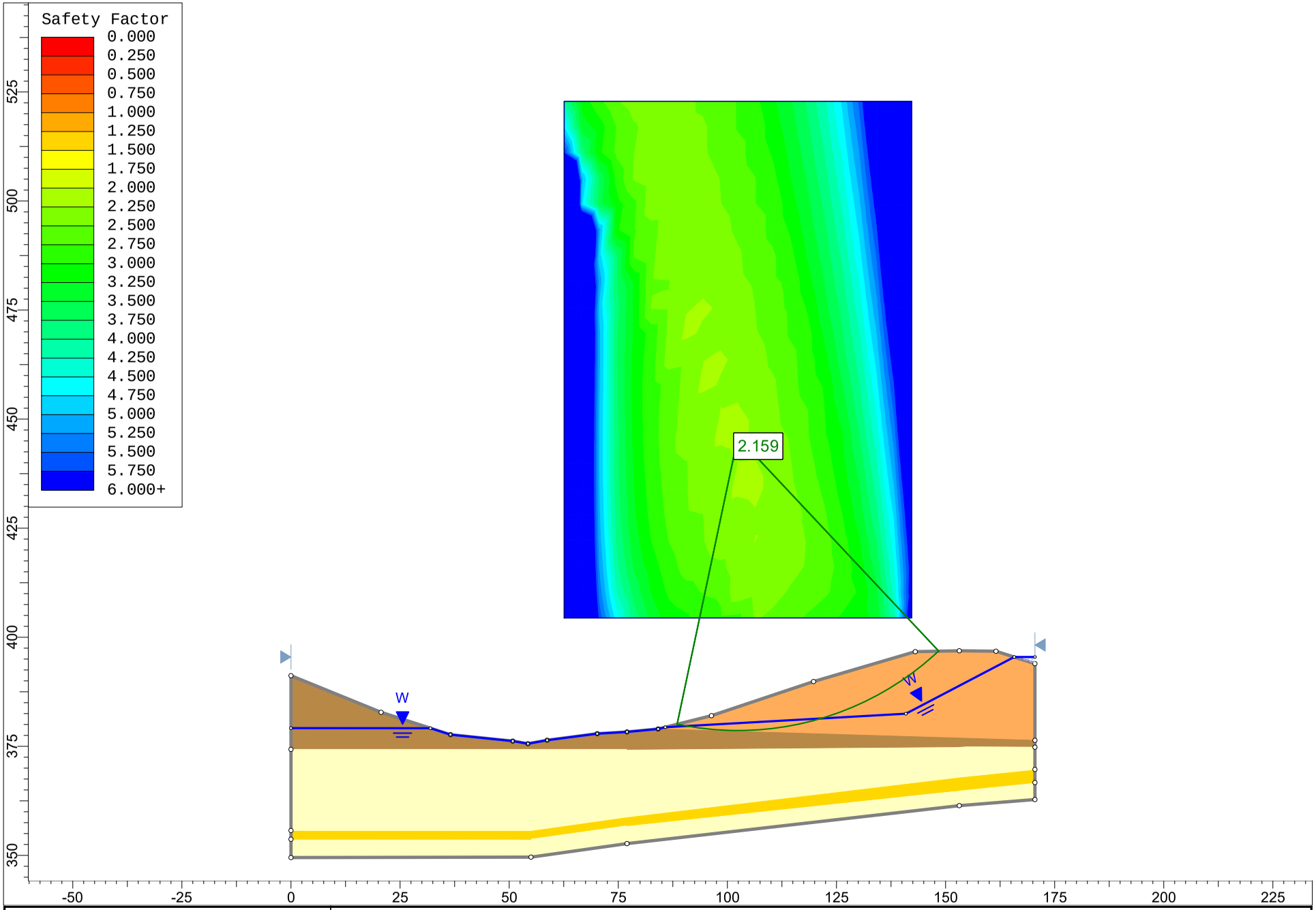
X	Y
0	355.7
55	355.7
77	358.8
153	367.9
170.48	369.698

Material Boundary

X	Y
0	374.3
77	374.3
153	374.9
170.48	374.816

Material Boundary

X	Y
84.12	378.983
153	376.9
170.48	376.396



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	Analysis Description	Cross Section GR-1 Maximum Surcharge Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:43:18 PM		File Name GR-1 Surcharge.slim

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-1 Seis
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-1 Seismic Loading Condition
Company: Associated Engineers, Inc
Date Created: 9/5/2016, 3:43:18 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2364

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean clay (CL)	Sandy Lean Clay With Gravel (CL) (Dam)
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	134.3	135.4	137.69
Cohesion [psf]	316.8	403.2	820.8	72
Friction Angle [deg]	24.3	30.2	24.6	27.4
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	379.185
31.955	379.172
36.551	377.695
50.832	376.221
54.305	375.6

58.684	376.406
70.171	377.906
76.996	378.317
84.12	378.983
85.7592	379.391
140.9	382.48
170.48	393.92

External Boundary

X	Y
0	349.5
55	349.6
77	352.7
153.14	361.4
170.48	362.8
170.48	366.698
170.48	369.698
170.48	374.816
170.48	376.396
170.48	393.967
161.556	396.809
153.137	396.9
143.057	396.719
119.757	389.859
96.35	382.029
84.12	378.983
76.996	378.317
70.171	377.906
58.684	376.406
54.305	375.6
50.832	376.221
36.551	377.695
20.651	382.805
0	391.212
0	374.3
0	355.7
0	353.7

Material Boundary

X	Y

0	353.7
55	353.7
77	356.8
153	364.9
170.48	366.698

Material Boundary

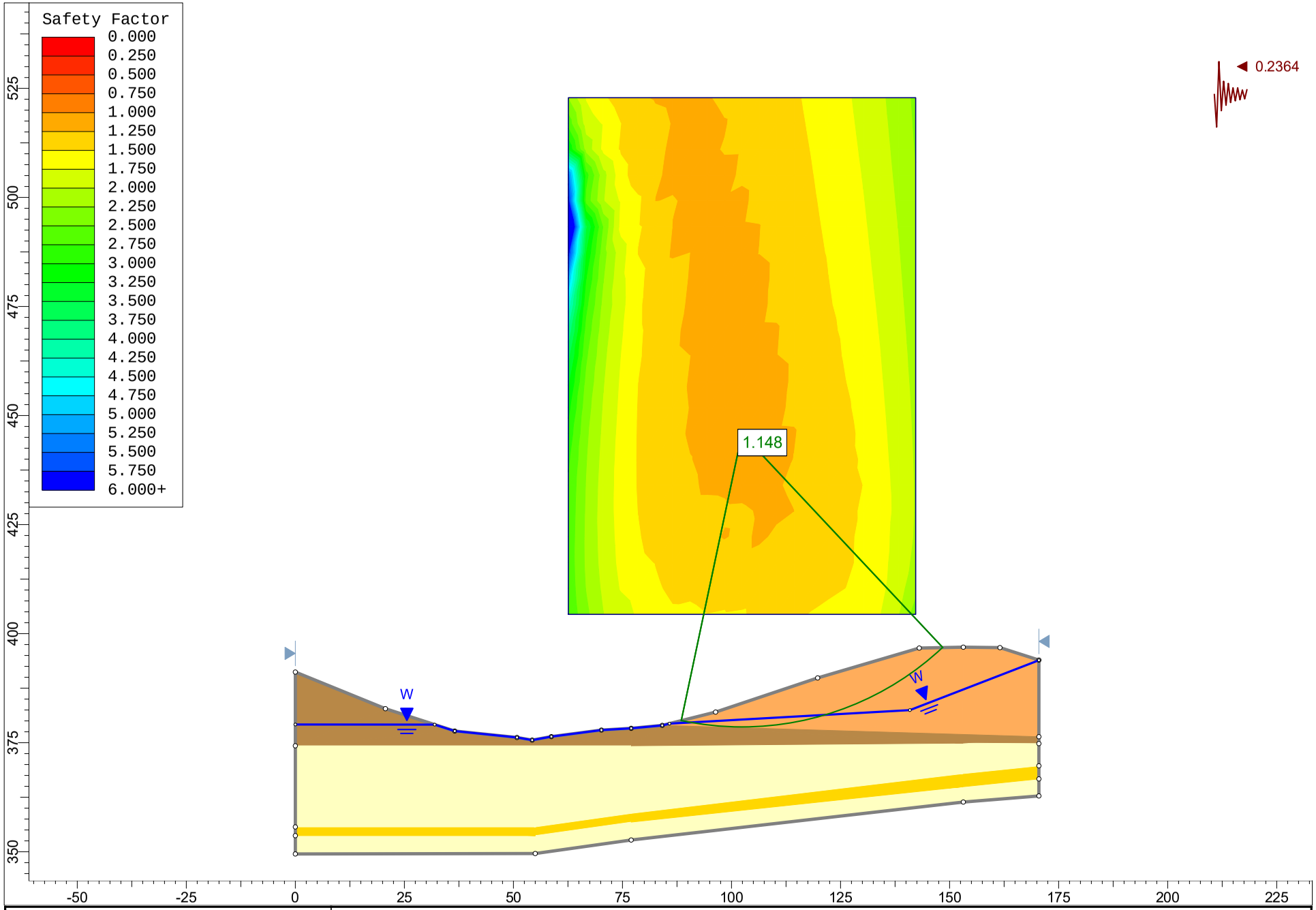
X	Y
0	355.7
55	355.7
77	358.8
153	367.9
170.48	369.698

Material Boundary

X	Y
0	374.3
77	374.3
153	374.9
170.48	374.816

Material Boundary

X	Y
84.12	378.983
153	376.9
170.48	376.396



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-1 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc
Date	9/5/2016, 3:43:18 PM		File Name GR-1 Seis.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	33	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37
27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2

128.457	393.92
130	393.92

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116
42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

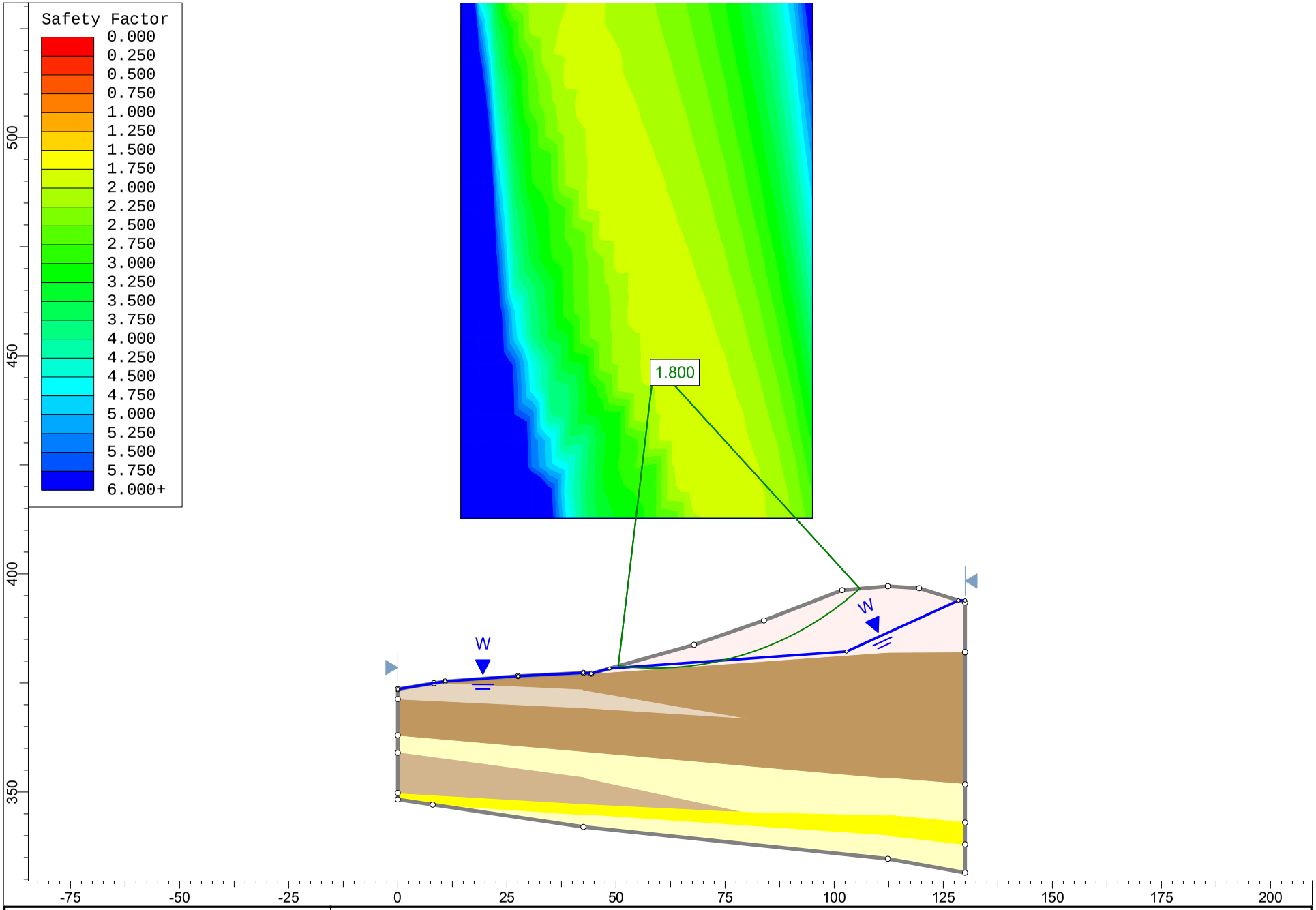
X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1



	Project	BREC Green Station CCR Surface Impoundment	
	Analysis Description	Cross Section GR-2 Maximum Storage Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:56:57 PM		File Name GR-2.slim

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	33	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37
27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2

123.45	395.483
130	395.48

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116
42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

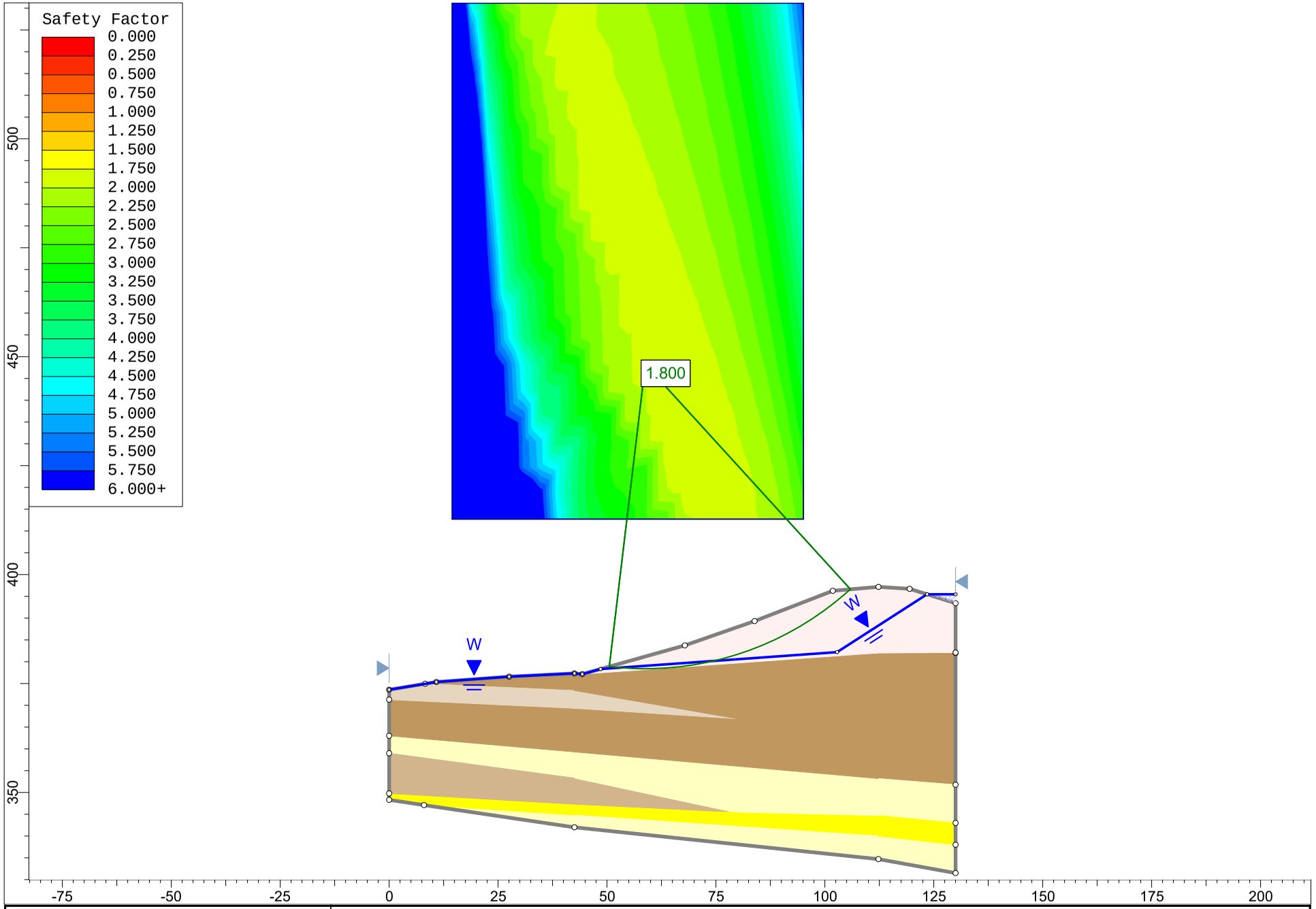
X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-2 Maximum Surcharge Pool Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 3:56:57 PM		File Name GR-2 Surcharge.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2 Seis 2
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Seismic Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2364

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	33	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37

27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2
128.457	393.92
130	393.92

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116

42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

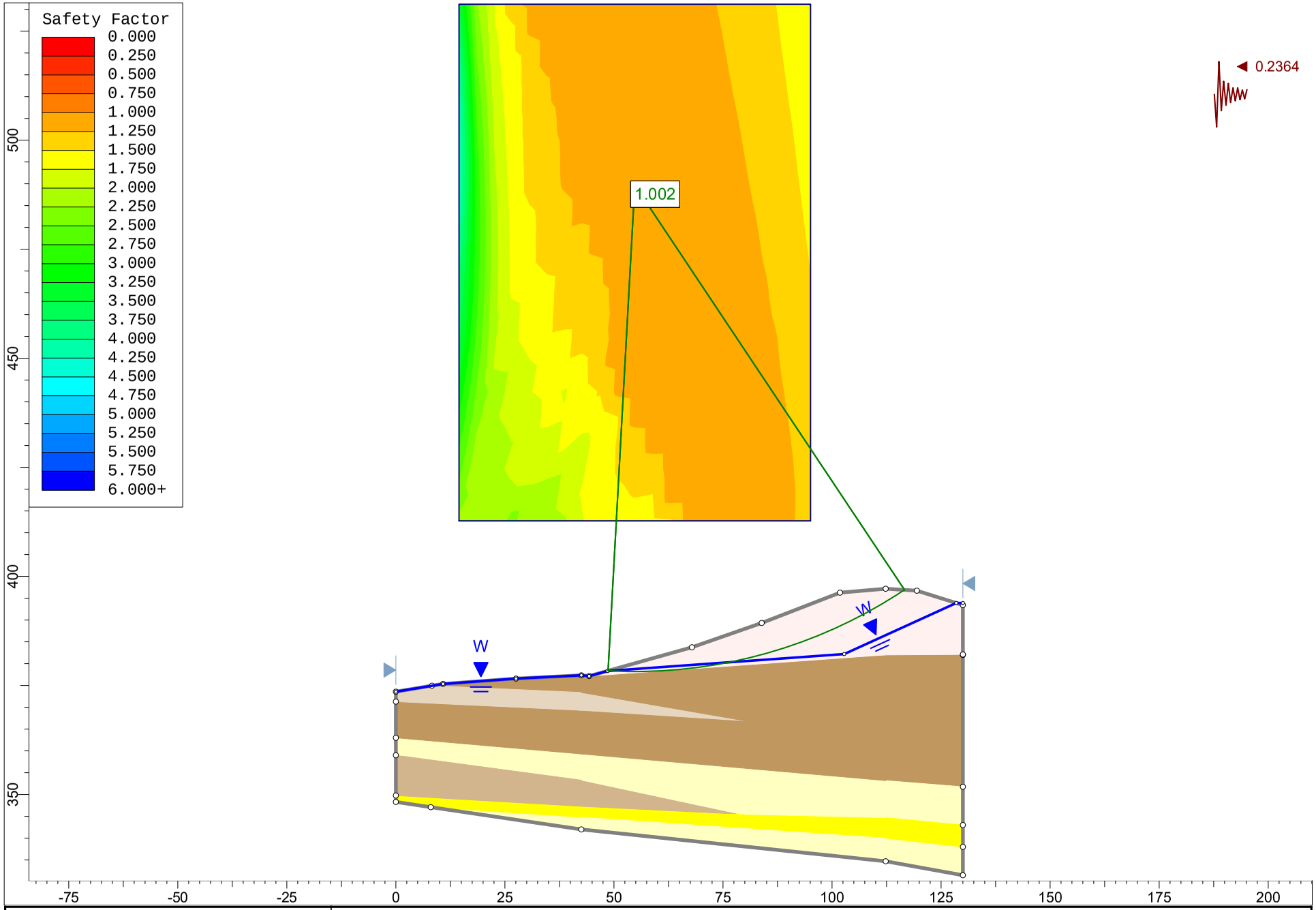
Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1

	Project: BREC Green Station CCR Surface Impoundment		
	Analysis Description: Cross Section GR-2 Seismic Loading Condition		
	Drawn By:	Scale:	Company: Associated Engineers, Inc.
SLIDE 6.039	Date: 9/5/2016, 3:56:57 PM		File Name: GR-2 Seis 2.slim



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-2 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 3:56:57 PM		File Name GR-2 Seis 2.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2 Liq
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Liquefaction Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	0	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37
27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2

128.457	393.92
130	393.92

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116
42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

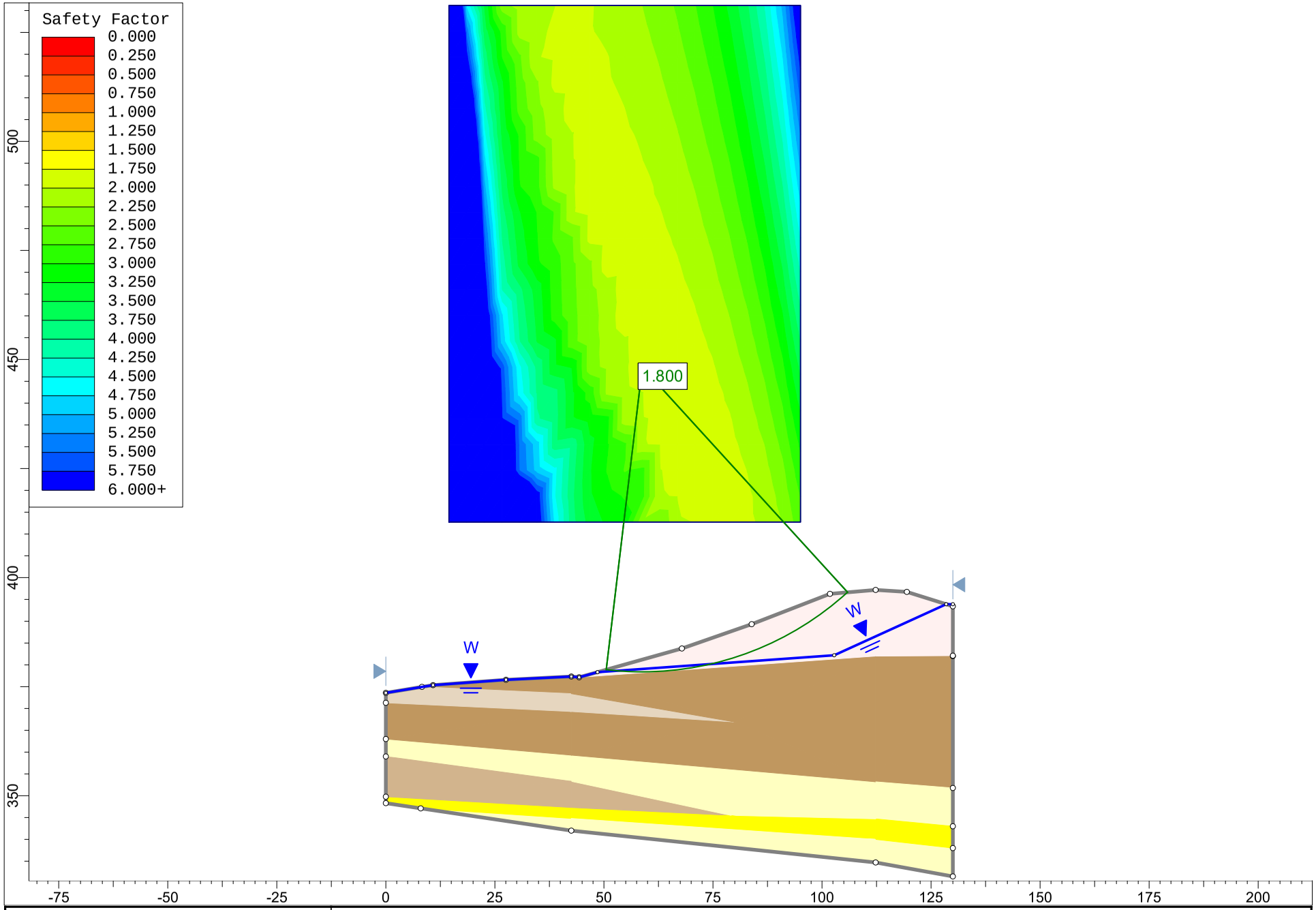
X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-2 Liquefaction Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 3:56:57 PM		File Name GR-2 Liq.slim

SLIDEINTERPRET 6.039

Big Rivers
ELECTRIC CORPORATION
Your Touchstone Energy® Cooperative

Green Station CCR Surface Impoundment

Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

October 11, 2016

Prepared By:

ASSOCIATED ENGINEERS, INC.
2740 North Main St. • Madisonville, KY 42431
Phone: (270) 821-7732 • Fax: (270) 821-7789

Project ID: 160028A

Big Rivers Electric Corporation
Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

CCR Surface Impoundment Information

Name:	Green Station CCR Surface Impoundment
Operator:	Sebree Generating Station
Address:	9000 Highway 2096 Robards, Kentucky 42452
CCR Unit Identification Number:	Kentucky State Dam Inventory System ID No. 0980

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

As part of the § 257.73 Structural integrity criteria for existing CCR surface impoundments requirements, an owner or operator of an existing CCR surface impoundment must no later than October 17, 2016:

> Conduct an initial safety factor assessment for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified below for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations, documenting whether the CCR unit achieves the following minimum factors of safety:
>
> 1. The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
>
> 2. The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
>
> 3. The calculated seismic factor of safety must equal or exceed 1.00.

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

From: VI. Development of the Final Rule - Technical Requirements

General Safety Factor Assessment Considerations

Generally accepted engineering methodologies specify that the determination of the structural stability factors of safety specified above is to be calculated by the qualified professional engineer using conventional analysis procedures or, if necessary, special analysis procedures. Conventional analysis procedures include, but are not limited to, limit equilibrium methods of slope stability analysis, whereas, special analysis procedures include, but are not limited to, finite element methods, finite difference methods, three-dimensional methods, or probabilistic methods. Whichever methodology is used to determine the factors of safety of the CCR surface impoundment, the qualified professional engineer must document the methodology used, as well as the basis for using that methodology, and the analysis must be supported by appropriate engineering calculations.

The Calculated Static Factor of Safety Under the Long-Term, Maximum Storage Pool Loading Condition

It is generally accepted practice to analyze the stability of the downstream slope of the dam embankment for steady-state seepage (or steady seepage) conditions with the reservoir at its normal operating pool elevation (usually the spillway crest elevation) since this is the loading condition the embankment will experience most. This condition is called steady seepage with maximum storage pool. The maximum storage pool loading is the maximum water level that can be maintained that will result in the full development of a steady-state seepage condition. Maximum storage pool loading conditions need to be calculated to ensure that the CCR surface impoundment can withstand a maximum expected pool elevation with full development of saturation in the embankment under long-term loading. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum storage pool loading condition meet or exceed 1.5.

The Calculated Static Factor of Safety Under the Maximum Surcharge Pool Loading Condition

The maximum surcharge pool loading condition is calculated to evaluate the effect of a raised level (e.g., flood surcharge) on the stability of the downstream slope. This ensures that the CCR surface impoundment can withstand a temporary rise in pool elevation above the maximum storage pool elevation for which the CCR surface impoundment may normally be subject under inflow design flood stage, for a short-term until the inflow design flood is passed through the CCR surface impoundment. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum surcharge pool loading condition meet or exceed 1.4.

The Calculated Seismic Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold must meet a seismic factor of safety equal to or greater than 1.0. All CCR surface

impoundments must also be capable of withstanding a design earthquake without damage to the foundation or embankment that would cause a discharge of its contents. To further support the location criteria established in this rule, CCR surface impoundments and any lateral expansion exceeding a specific height and/or volume threshold must be assessed under seismic loading conditions for a seismic loading event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years, based on the USGS seismic hazard maps for seismic events with this return period for the region where the CCR unit is located. EPA chose the 2% exceedance probability in 50 years event based on its common use in seismic design criteria throughout engineering.

The Calculated Liquefaction Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold and have been determined to contain soils susceptible to liquefaction must meet a liquefaction factor of safety equal to or greater than 1.20. A prudent engineering analysis of structural stability also includes a liquefaction potential analysis and analysis of post-liquefaction static factors of safety. As discussed previously, liquefaction is a phenomenon which typically occurs in loose, saturated or partially-saturated soils in which the effective stress of the soils reduces to zero, corresponding to a total loss of shear strength of the soil. The most common occurrence of liquefaction is in loose soils, typically sands. The liquefaction FOS determination in the final rule is used to determine if a CCR unit would remain stable if the soils of the embankment of the CCR unit were to experience liquefaction. Liquefaction analysis is only necessary in instances where CCR surface impoundments show, through representative soil sampling, construction documentation, or anecdotal evidence from personnel with knowledge of the CCR unit's construction, that soils of the embankment are susceptible to liquefaction.

Failure To Demonstrate Minimum Safety Factors or Failure To Complete a Timely Safety Factor Assessment

As previously discussed, the rule requires an owner or operator to document that the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified in the rule. For any CCR surface impoundment that does not meet these requirements, the owner or operator must either take any engineering measure necessary to ensure that the unit meets the requirements by the rule's deadlines, or cease placement of CCR and non-CCR waste into the unit and initiate closure of such CCR unit as provided in section 257.102 within six months. Similarly, if an owner or operator fails to complete the initial safety factor assessment or any subsequent periodic factor safety assessment by the deadlines established in the rule, the owner or operator must cease placing CCR and non-CCR waste into the unit and initiate closure within six months.

Description of Impoundment

An aerial photo of the CCR unit is provided as Attachment A and an excerpt from U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps showing the location of the CCR unit is provided as Attachment B.

The CCR unit has been in place for 40 plus years The CCR unit operator has general maintenance and repair procedures in place as they determine necessary. There are no known occurrences of structural instability of the CCR unit.

The CCR unit has been in place for 40 plus years. The CCR unit is used for the placement of coal combustion residual material; currently slurried bottom ash. The immediate watershed that drains to the CCR unit, and in which the CCR unit is considered to be located, is unnamed and 54.13 acres in size. The unnamed watershed discharges from the CCR impoundment outflow structure and is routed to the Green River.

The CCR unit is a combined incised/earthen embankment structure. Embankments form the west, south and east sides of the impoundment and the north side is incised. The Green River is located approximately 400 feet east of the structure. Due to surface relief, only the toe area of the south dike is potentially subject to flooding. The predominant features were small stream valleys draining eastward to the Green River. Most of the central portion of the south dike was constructed on a subdued ridge. The toe of the outboard slope intersected a lower drainage area. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands.

The west dike is generally less than five feet in height and the south dike reaches a maximum height of 19.5 feet. The east dike reaches a maximum height of approximately eight feet and is buttressed with a secondary parallel embankment that serves as a 40-foot wide roadway. The Burns and Roe, Inc. Engineering and Consultants June 30, 1978 site grading plans show the original construction layout and ground contours for the impoundment site. Bottom ash has been placed above the normal pool along the inboard side, essentially creating reclaimed land

Depth of impounded water and CCR is 16 feet and 46 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 394 feet and 408 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

The remaining storage capacity is approximately 172,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

The approximate volume of impounded water and CCR is 981,000 cubic yards (approximate water volume is 172,000 cubic yards and approximate CCR volume is 809,000 cubic yards). This volume was calculated based on the maximum storage capacity, the current amount of CCR stored in the facility based on the most recent bathymetric survey, and the best available as-built data for the structure construction prior to placement of CCR.

The impoundment discharge consists of two corrugated steel pipes, each 30 inches in diameter. The pipe intakes are through a concrete common headwall collection structure with a variable height steel debris deflector on each pipe intake.

Calculated Safety Factors

Results of the initial safety factor assessment for the critical cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments are supported by appropriate engineering calculations.

The safety factor analysis was conducted using the Rocscience Inc. Slide geotechnical software by evaluating four cross sections along the embankment. Slide provides numerical tools to analyze the stability of embankments using limit equilibrium methods. At each cross section, drilling, surveying, laboratory testing, and a slope stability analysis were performed. Based on the four analysis scenarios, the lowest factor of safety for all scenarios was not found at a single cross section; therefore, the results listed below are the lowest factor of safety realized from all analyzed cross sections for each scenario. The safety factor assessments are supported by appropriate engineering calculations and the Slide modeling results for the Green CCR impoundment are attached to this report.

1. The calculated static factor of safety under the long-term, maximum storage pool loading condition equals: 1.800

2. The calculated static factor of safety under the maximum surcharge pool loading condition equals: 1.800

3. The calculated seismic factor of safety equals: 1.002

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety equals: 1.800

Sources of Information

Geotechnical and other information provided by Associated Engineers, Inc.

Engineering design drawings and other information provided by Big Rivers Electric Corporation

United States Geological Survey U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps

Professional Engineer Certification [Per 40 CFR § 257.73]
Green CCR Impoundment Initial Safety Factor Assessment

I hereby certify that myself or an agent under my review has prepared this Initial Safety Factor Assessment (Assessment), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Assessment has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.73. To the best of my knowledge and belief, the information contained in this Assessment is true, complete, and accurate.

David A. Lamb P.E.

David A. Lamb P.E.
State of Kentucky License No. 17822

Date: 10/11/16

Attachment A. Aerial Photo of the Green CCR Surface Impoundment

Attachment B. Topographic Map showing the Green CCR Surface Impoundment

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-1
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-1 Long-Term Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc
Date Created: 9/5/2016, 3:43:18 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean Clay (CL)	Sandy Lean Clay With Gravel (CL) (Dam)
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	134.3	135.4	137.69
Cohesion [psf]	316.8	403.2	820.8	72
Friction Angle [deg]	24.3	30.2	24.6	27.4
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	379.185
31.955	379.172
36.551	377.695
50.832	376.221
54.305	375.6
58.684	376.406
70.171	377.906
76.996	378.317
84.12	378.983

85.7592	379.391
140.9	382.48
170.48	393.92

External Boundary

X	Y
0	349.5
55	349.6
77	352.7
153.14	361.4
170.48	362.8
170.48	366.698
170.48	369.698
170.48	374.816
170.48	376.396
170.48	393.967
161.556	396.809
153.137	396.9
143.057	396.719
119.757	389.859
96.35	382.029
84.12	378.983
76.996	378.317
70.171	377.906
58.684	376.406
54.305	375.6
50.832	376.221
36.551	377.695
20.651	382.805
0	391.212
0	374.3
0	355.7
0	353.7

Material Boundary

X	Y
0	353.7
55	353.7
77	356.8
153	364.9

170.48	366.698

Material Boundary

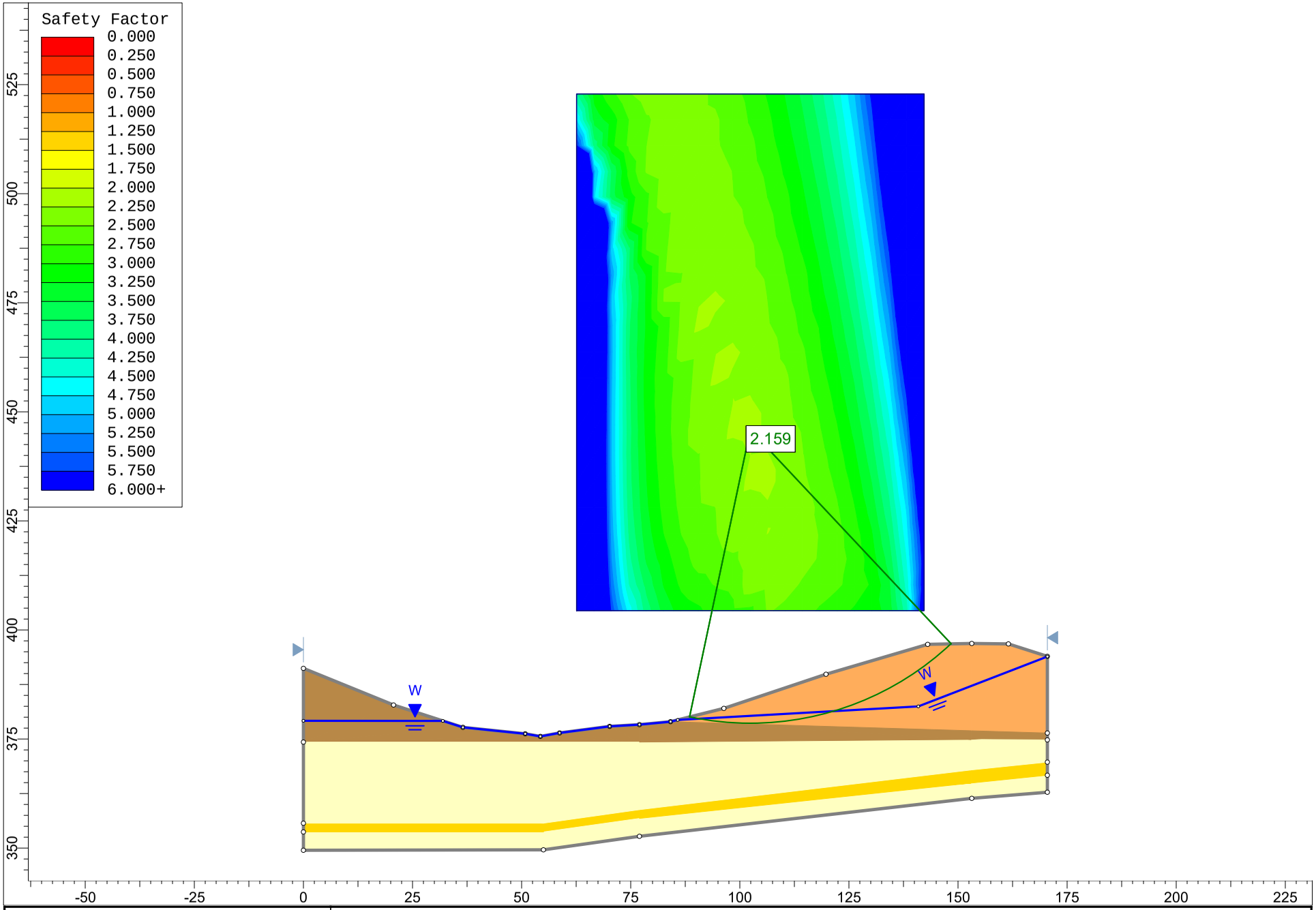
X	Y
0	355.7
55	355.7
77	358.8
153	367.9
170.48	369.698

Material Boundary

X	Y
0	374.3
77	374.3
153	374.9
170.48	374.816

Material Boundary

X	Y
84.12	378.983
153	376.9
170.48	376.396



	Project	BREC Green Station CCR Surface Impoundment	
	Analysis Description	Cross Section GR-1 Long-Term Maximum Storage Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:43:18 PM		File Name GR-1.slim

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-1 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-1 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc
Date Created: 9/5/2016, 3:43:18 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean clay (CL)	Sandy lean clay With Gravel (CL) (Dam)
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	134.3	135.4	137.69
Cohesion [psf]	316.8	403.2	820.8	72
Friction Angle [deg]	24.3	30.2	24.6	27.4
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	379.185
31.955	379.172
36.551	377.695
50.832	376.221
54.305	375.6
58.684	376.406
70.171	377.906
76.996	378.317
84.12	378.983

85.7592	379.391
140.9	382.48
165.719	395.483
170.48	395.48

External Boundary

X	Y
0	349.5
55	349.6
77	352.7
153.14	361.4
170.48	362.8
170.48	366.698
170.48	369.698
170.48	374.816
170.48	376.396
170.48	393.967
161.556	396.809
153.137	396.9
143.057	396.719
119.757	389.859
96.35	382.029
84.12	378.983
76.996	378.317
70.171	377.906
58.684	376.406
54.305	375.6
50.832	376.221
36.551	377.695
20.651	382.805
0	391.212
0	374.3
0	355.7
0	353.7

Material Boundary

X	Y
0	353.7
55	353.7
77	356.8

153	364.9
170.48	366.698

Material Boundary

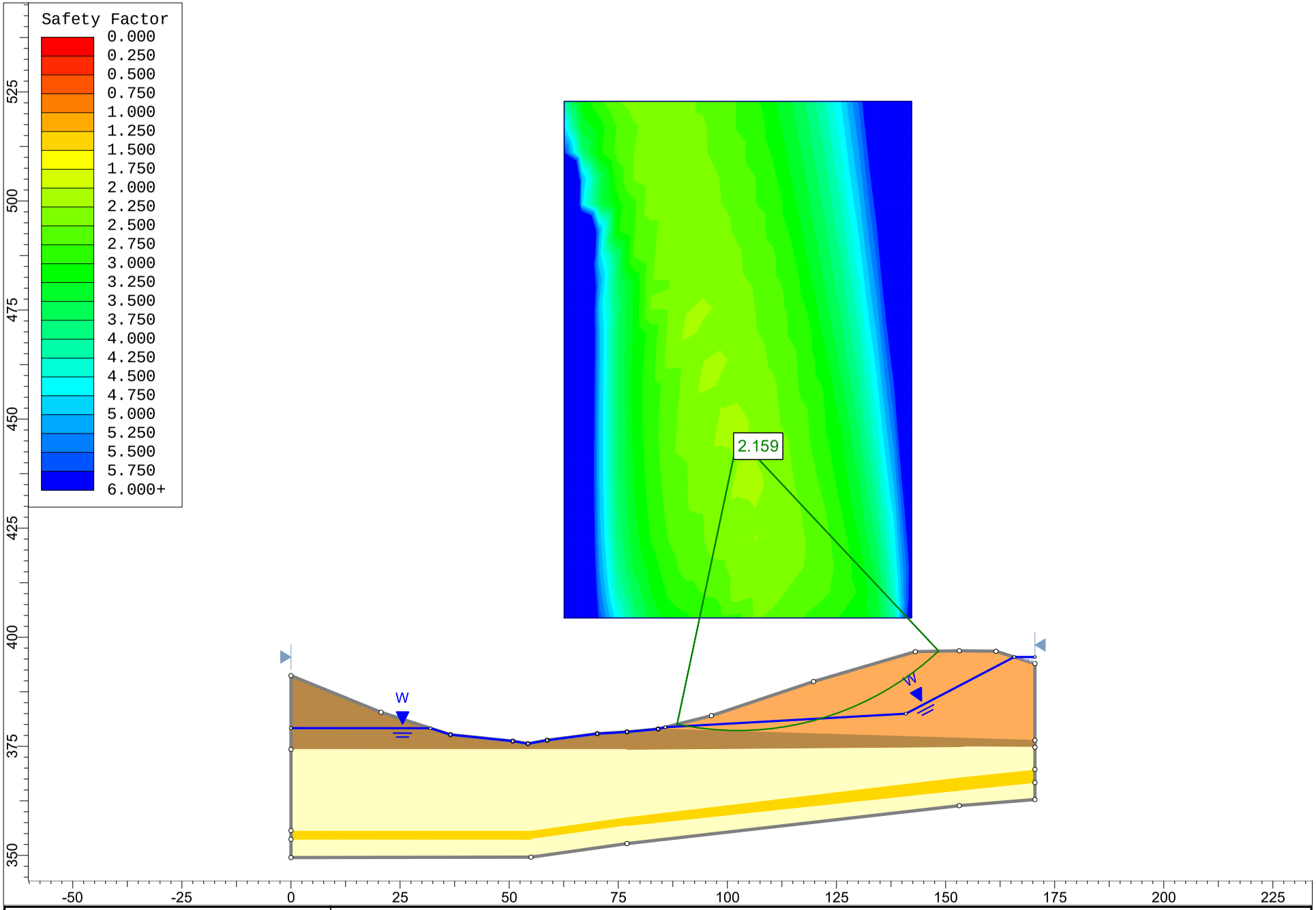
X	Y
0	355.7
55	355.7
77	358.8
153	367.9
170.48	369.698

Material Boundary

X	Y
0	374.3
77	374.3
153	374.9
170.48	374.816

Material Boundary

X	Y
84.12	378.983
153	376.9
170.48	376.396



	Project	BREC Green Station CCR Surface Impoundment	
	Analysis Description	Cross Section GR-1 Maximum Surcharge Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:43:18 PM		File Name GR-1 Surcharge.slim

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-1 Seis
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-1 Seismic Loading Condition
Company: Associated Engineers, Inc
Date Created: 9/5/2016, 3:43:18 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2364

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean clay (CL)	Sandy Lean Clay With Gravel (CL) (Dam)
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	134.3	135.4	137.69
Cohesion [psf]	316.8	403.2	820.8	72
Friction Angle [deg]	24.3	30.2	24.6	27.4
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	379.185
31.955	379.172
36.551	377.695
50.832	376.221
54.305	375.6

58.684	376.406
70.171	377.906
76.996	378.317
84.12	378.983
85.7592	379.391
140.9	382.48
170.48	393.92

External Boundary

X	Y
0	349.5
55	349.6
77	352.7
153.14	361.4
170.48	362.8
170.48	366.698
170.48	369.698
170.48	374.816
170.48	376.396
170.48	393.967
161.556	396.809
153.137	396.9
143.057	396.719
119.757	389.859
96.35	382.029
84.12	378.983
76.996	378.317
70.171	377.906
58.684	376.406
54.305	375.6
50.832	376.221
36.551	377.695
20.651	382.805
0	391.212
0	374.3
0	355.7
0	353.7

Material Boundary

X	Y

0	353.7
55	353.7
77	356.8
153	364.9
170.48	366.698

Material Boundary

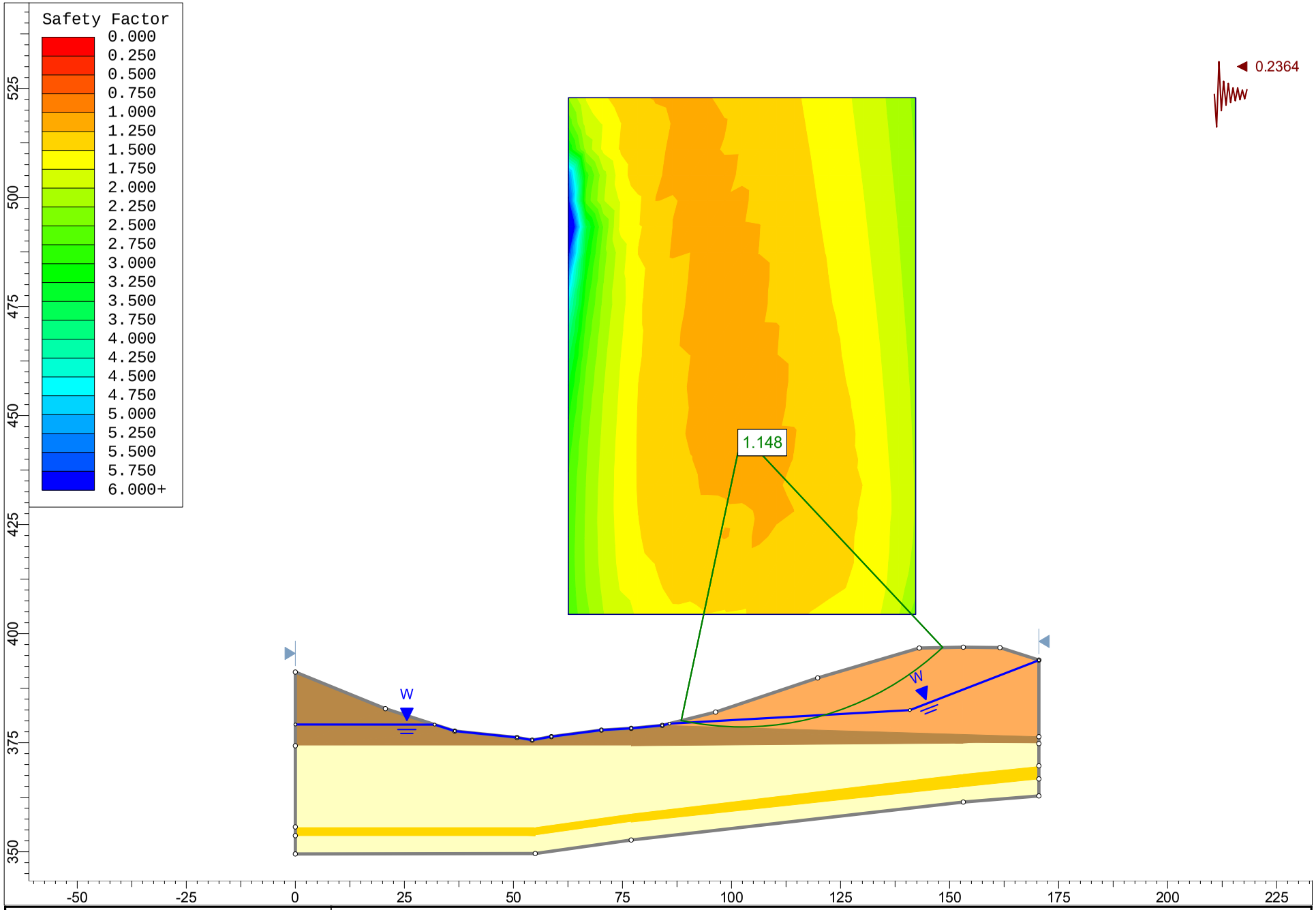
X	Y
0	355.7
55	355.7
77	358.8
153	367.9
170.48	369.698

Material Boundary

X	Y
0	374.3
77	374.3
153	374.9
170.48	374.816

Material Boundary

X	Y
84.12	378.983
153	376.9
170.48	376.396



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-1 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc
Date	9/5/2016, 3:43:18 PM		File Name GR-1 Seis.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	33	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37
27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2

128.457	393.92
130	393.92

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116
42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

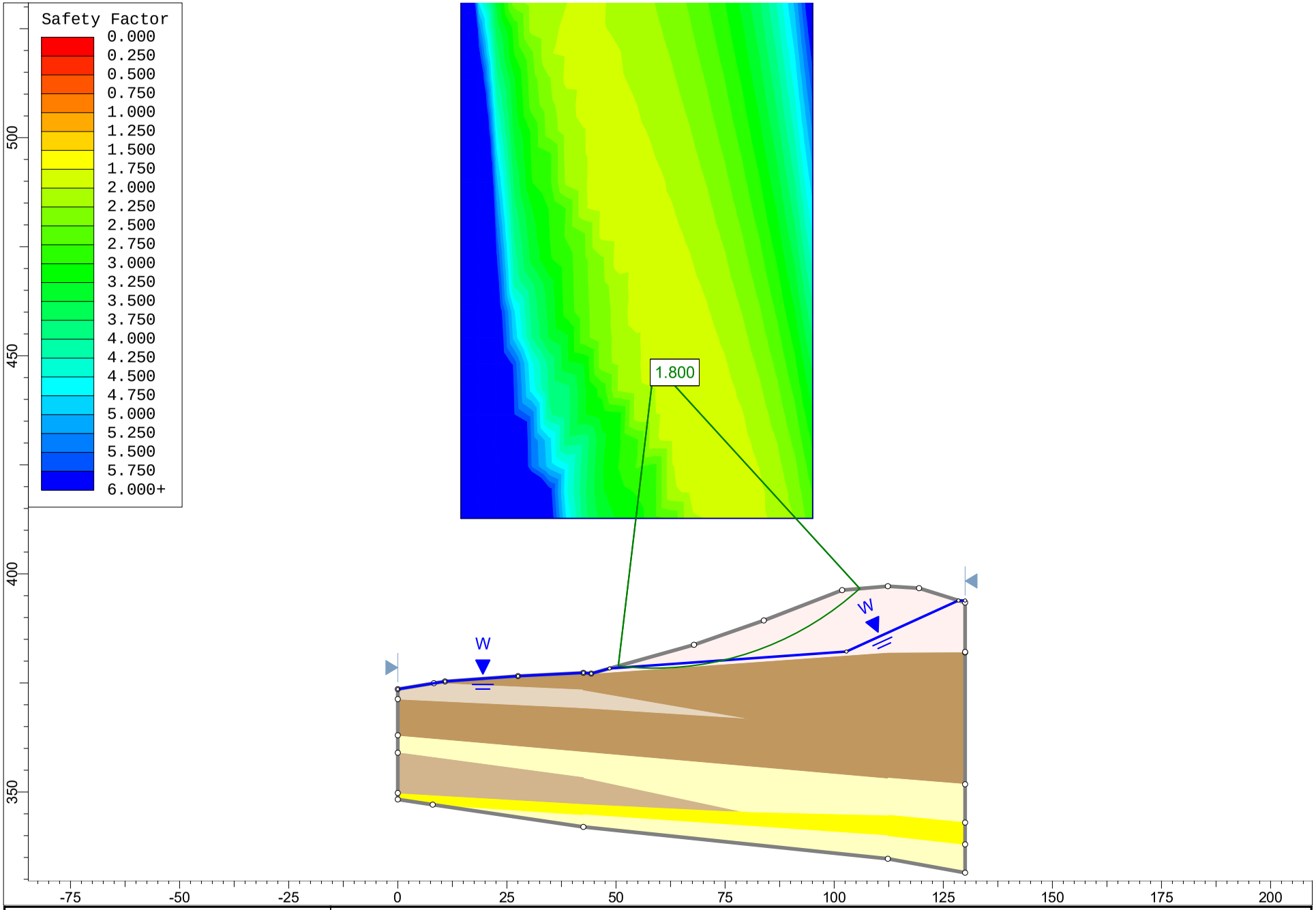
X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1



	Project	BREC Green Station CCR Surface Impoundment	
	Analysis Description	Cross Section GR-2 Maximum Storage Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:56:57 PM		File Name GR-2.slim

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	33	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37
27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2

123.45	395.483
130	395.48

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116
42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

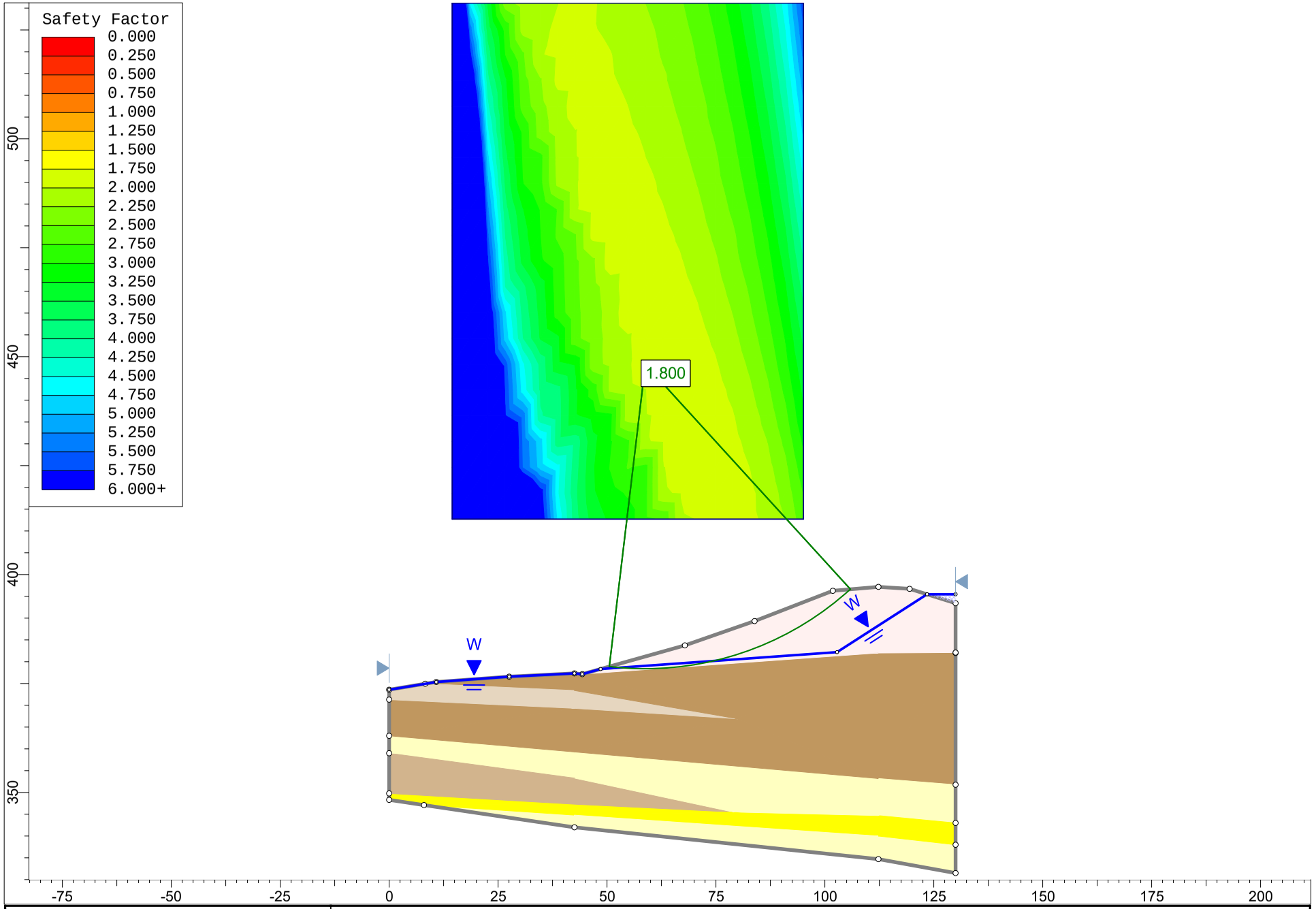
X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-2 Maximum Surcharge Pool Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 3:56:57 PM		File Name GR-2 Surcharge.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2 Seis 2
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Seismic Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2364

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	33	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37

27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2
128.457	393.92
130	393.92

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116

42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

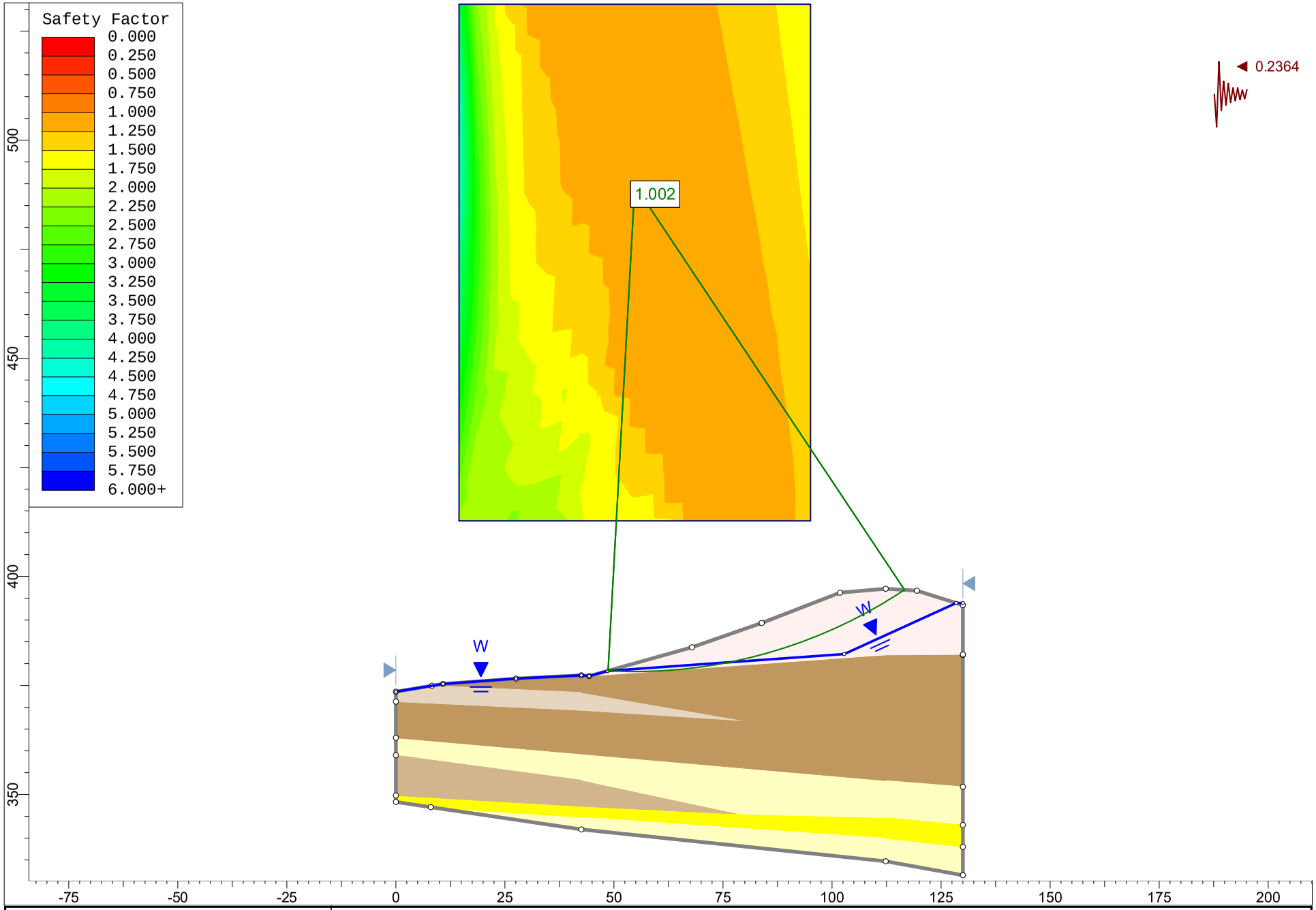
Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1

	Project: BREC Green Station CCR Surface Impoundment		
	Analysis Description: Cross Section GR-2 Seismic Loading Condition		
	Drawn By:	Scale:	Company: Associated Engineers, Inc.
SLIDE 6.039	Date: 9/5/2016, 3:56:57 PM		File Name: GR-2 Seis 2.slim



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-2 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 3:56:57 PM		File Name GR-2 Seis 2.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Green Station CCR Surface Impoundment

Project Summary

File Name: GR-2 Liq
Last saved with Slide version: 6.039
Project Title: BREC Green Station CCR Surface Impoundment
Analysis: Cross Section GR-2 Liquefaction Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:56:57 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Poorly Graded Sand With Silt (SP-SM)	Lean Clay with Sand (CL)	Lean clay (CL)	Lean Clay With Sand 2	Lean clay With Sand (Dam)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128.1	126	131.9	135.4	126.6	140.6
Cohesion [psf]	316.8	0	374	820.8	0	72
Friction Angle [deg]	24.3	0	27.7	24.6	30.8	24.1
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
0	373.571
10.818	375.37
27.54	376.571
42.515	377.335
44.31	377.146
48.515	378.327
102.8	382.2

128.457	393.92
130	393.92

External Boundary

X	Y
3.298e-013	348.3
7.98633	347.116
42.51	342
112.29	334.7
130	331.5
130	338
130	343
130	351.773
130	382.006
130	382.1
130	393.439
119.451	396.731
112.288	397.189
101.806	396.285
83.858	389.332
67.857	383.758
44.31	377.146
42.515	377.335
27.54	376.571
10.818	375.37
8.27071	374.946
0	373.571
0	371.3
0	363
0	359
3.10558e-013	349.774

Material Boundary

X	Y
7.98633	347.116
42.5	344.8
112.2	340
130	338

Material Boundary

X	Y
3.10558e-013	349.774
42.5	347.3
79	345.5
112.2	344.7
130	343

Material Boundary

X	Y
0	359
42.5	353.3
79	345.5

Material Boundary

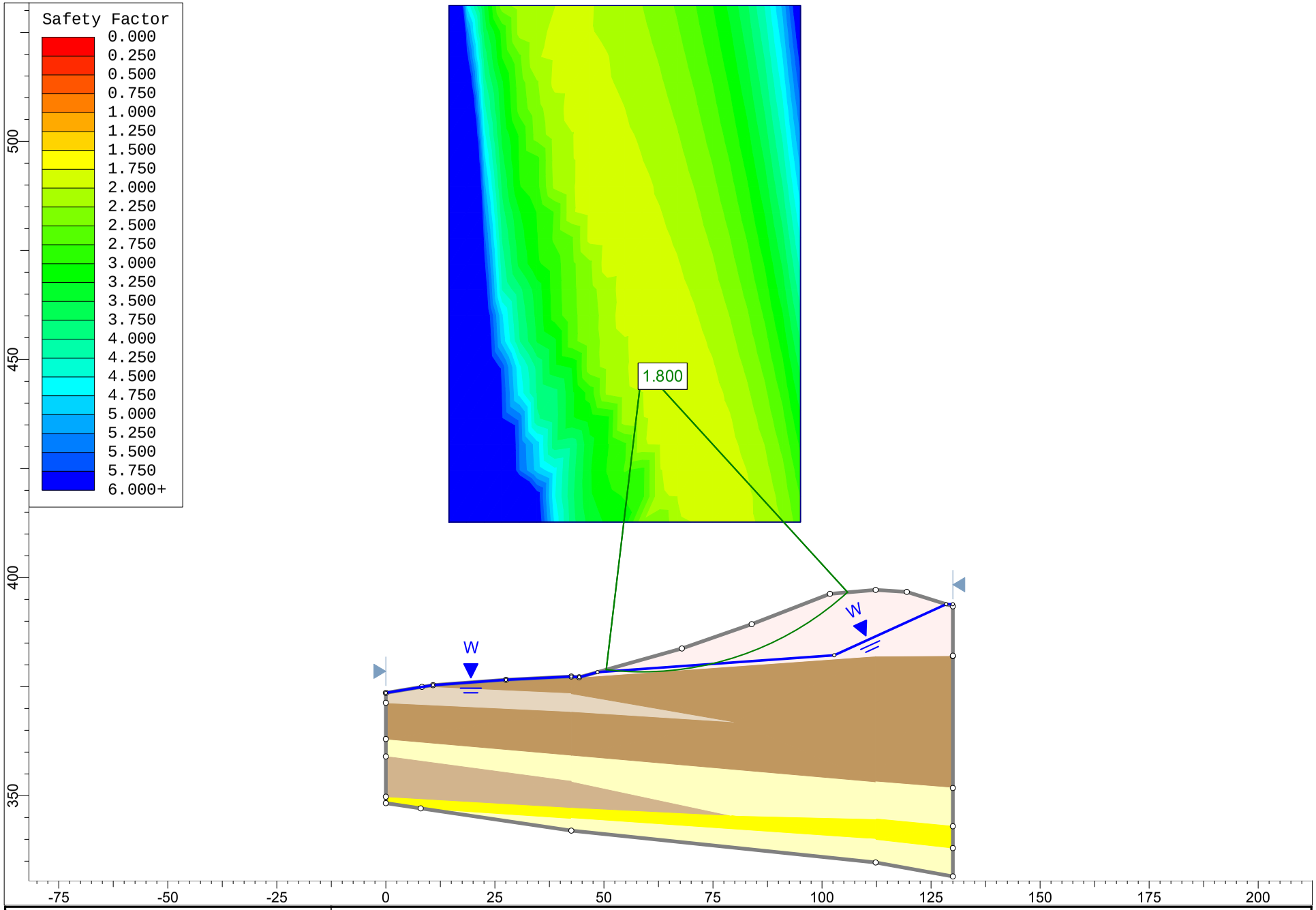
X	Y
0	363
42.5	359.3
112.2	353.2
130	351.773

Material Boundary

X	Y
0	371.3
42.5	369.3
80	366.9
42.5	373.4
8.27071	374.946

Material Boundary

X	Y
44.31	377.146
112.2	382
130	382.1



Project	BREC Green Station CCR Surface Impoundment		
Analysis Description	Cross Section GR-2 Liquefaction Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 3:56:57 PM		File Name GR-2 Liq.slim

SLIDEINTERPRET 6.039

Reid/HMPL Station CCR Surface Impoundment

Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

October 11, 2016

Prepared By:

ASSOCIATED ENGINEERS, INC.
2740 North Main St. • Madisonville, KY 42431
Phone: (270) 821-7732 • Fax: (270) 821-7789

Project ID: 160027A

Big Rivers Electric Corporation
Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
Initial Safety Factor Assessment

CCR Surface Impoundment Information

Name:	Reid/HMPL Station CCR Surface Impoundment
Operator:	Sebree Generating Station
Address:	9000 Highway 2096 Robards, Kentucky 42452
CCR Unit Identification Number:	Kentucky State Dam Inventory System ID No. 0855

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

As part of the § 257.73 Structural integrity criteria for existing CCR surface impoundments requirements, an owner or operator of an existing CCR surface impoundment must no later than October 17, 2016:

> Conduct an initial safety factor assessment for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified below for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations, documenting whether the CCR unit achieves the following minimum factors of safety:
>
> 1. The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
>
> 2. The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
>
> 3. The calculated seismic factor of safety must equal or exceed 1.00.

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

From: VI. Development of the Final Rule - Technical Requirements

General Safety Factor Assessment Considerations

Generally accepted engineering methodologies specify that the determination of the structural stability factors of safety specified above is to be calculated by the qualified professional engineer using conventional analysis procedures or, if necessary, special analysis procedures. Conventional analysis procedures include, but are not limited to, limit equilibrium methods of slope stability analysis, whereas, special analysis procedures include, but are not limited to, finite element methods, finite difference methods, three-dimensional methods, or probabilistic methods. Whichever methodology is used to determine the factors of safety of the CCR surface impoundment, the qualified professional engineer must document the methodology used, as well as the basis for using that methodology, and the analysis must be supported by appropriate engineering calculations.

The Calculated Static Factor of Safety Under the Long-Term, Maximum Storage Pool Loading Condition

It is generally accepted practice to analyze the stability of the downstream slope of the dam embankment for steady-state seepage (or steady seepage) conditions with the reservoir at its normal operating pool elevation (usually the spillway crest elevation) since this is the loading condition the embankment will experience most. This condition is called steady seepage with maximum storage pool. The maximum storage pool loading is the maximum water level that can be maintained that will result in the full development of a steady-state seepage condition. Maximum storage pool loading conditions need to be calculated to ensure that the CCR surface impoundment can withstand a maximum expected pool elevation with full development of saturation in the embankment under long-term loading. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum storage pool loading condition meet or exceed 1.5.

The Calculated Static Factor of Safety Under the Maximum Surcharge Pool Loading Condition

The maximum surcharge pool loading condition is calculated to evaluate the effect of a raised level (e.g., flood surcharge) on the stability of the downstream slope. This ensures that the CCR surface impoundment can withstand a temporary rise in pool elevation above the maximum storage pool elevation for which the CCR surface impoundment may normally be subject under inflow design flood stage, for a short-term until the inflow design flood is passed through the CCR surface impoundment. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum surcharge pool loading condition meet or exceed 1.4.

The Calculated Seismic Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold must meet a seismic factor of safety equal to or greater than 1.0. All CCR surface impoundments must also be capable of withstanding a design earthquake without damage to

the foundation or embankment that would cause a discharge of its contents. To further support the location criteria established in this rule, CCR surface impoundments and any lateral expansion exceeding a specific height and/or volume threshold must be assessed under seismic loading conditions for a seismic loading event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years, based on the USGS seismic hazard maps for seismic events with this return period for the region where the CCR unit is located. EPA chose the 2% exceedance probability in 50 years event based on its common use in seismic design criteria throughout engineering.

The Calculated Liquefaction Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold and have been determined to contain soils susceptible to liquefaction must meet a liquefaction factor of safety equal to or greater than 1.20. A prudent engineering analysis of structural stability also includes a liquefaction potential analysis and analysis of post-liquefaction static factors of safety. As discussed previously, liquefaction is a phenomenon which typically occurs in loose, saturated or partially-saturated soils in which the effective stress of the soils reduces to zero, corresponding to a total loss of shear strength of the soil. The most common occurrence of liquefaction is in loose soils, typically sands. The liquefaction FOS determination in the final rule is used to determine if a CCR unit would remain stable if the soils of the embankment of the CCR unit were to experience liquefaction. Liquefaction analysis is only necessary in instances where CCR surface impoundments show, through representative soil sampling, construction documentation, or anecdotal evidence from personnel with knowledge of the CCR unit's construction, that soils of the embankment are susceptible to liquefaction.

Failure To Demonstrate Minimum Safety Factors or Failure To Complete a Timely Safety Factor Assessment

As previously discussed, the rule requires an owner or operator to document that the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified in the rule. For any CCR surface impoundment that does not meet these requirements, the owner or operator must either take any engineering measure necessary to ensure that the unit meets the requirements by the rule's deadlines, or cease placement of CCR and non-CCR waste into the unit and initiate closure of such CCR unit as provided in section 257.102 within six months. Similarly, if an owner or operator fails to complete the initial safety factor assessment or any subsequent periodic factor safety assessment by the deadlines established in the rule, the owner or operator must cease placing CCR and non-CCR waste into the unit and initiate closure within six months.

Description of Impoundment

An aerial photo of the CCR unit is provided as Attachment A and an excerpt from U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps showing the location of the CCR unit is provided as Attachment B.

The CCR unit has been in place for 40 plus years The CCR unit operator has general maintenance and repair procedures in place as they determine necessary. There are no known occurrences of structural instability of the CCR unit.

The CCR unit is used for the placement of coal combustion residual material; currently slurried bottom ash. The immediate watershed that drains to the CCR unit, and in which the CCR unit is considered to be located, is unnamed and 25.45 acres in size. The unnamed watershed discharges from the CCR impoundment outflow structure and is routed to the Green River.

The CCR unit is a combined incised/earthen embankment structure. Embankments form the west, south and east sides of the impoundment and the north side is incised. The original terrain on which the pond was constructed generally sloped toward the west. Although the Green River is located less than 0.5 miles from the site, the structure does not extend significantly into the floodplain. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands.

The embankment reaches its greatest relief of approximately 42 feet on the west side. The Burns & McDonnell Engineering Co. October 8, 1971 design drawings show the inboard slope and central core portion of the dike to be constructed of compacted soil fill and the outboard slope to be consisted of sand fill. A sand blanket drain was designed for the outboard third of the base of the dike for the majority of the length and the plans show a crushed limestone drainage layer with a minimum thickness of 18 inches topped with a minimum six inches thick sand layer which extends across the entire width of the dike cross section in the southwest corner. The plans also show a cut-off trench in the original ground below dike crest and extending for the entire length of the dike.

Depth of impounded water and CCR is 16 feet and 39 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 426 feet and 440 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

The remaining storage capacity is approximately 85,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

The approximate volume of impounded water and CCR is 767,000 cubic yards (approximate water volume is 85,000 cubic yards and approximate CCR volume is 682,000 cubic yards). This volume was calculated based on the maximum storage capacity, the current amount of CCR stored in the facility based on the most recent bathymetric survey, and the best available as-built data for the structure construction prior to placement of CCR.
The impoundment discharge consists of a rectangular concrete drop structure with a variable

height steel debris skimmer. The pool elevation can be controlled by adding or removing stop logs. The discharge structure connects to a 24-inch diameter smooth walled metal pipe underground conveyance.

Calculated Safety Factors

Results of the initial safety factor assessment for the critical cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments are supported by appropriate engineering calculations.

The safety factor analysis was conducted using the Rocscience Inc. Slide geotechnical software by evaluating four cross sections along the embankment. Slide provides numerical tools to analyze the stability of embankments using limit equilibrium methods. At each cross section, drilling, surveying, laboratory testing, and a slope stability analysis were performed. Based on the four analysis scenarios, the lowest factor of safety for all scenarios was not found at a single cross section; therefore, the results listed below are the lowest factor of safety realized from all analyzed cross sections for each scenario. The safety factor assessments are supported by appropriate engineering calculations and the Slide modeling results for the Reid/HMPL CCR impoundment are attached to this report.

1. The calculated static factor of safety under the long-term, maximum storage pool loading condition equals: 2.053

2. The calculated static factor of safety under the maximum surcharge pool loading condition equals: 2.052

3. The calculated seismic factor of safety equals: 1.075

4. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety equals: 1.585

Sources of Information

Geotechnical and other information provided by Associated Engineers, Inc.

Engineering design drawings and other information provided by Big Rivers Electric Corporation

United States Geological Survey U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps

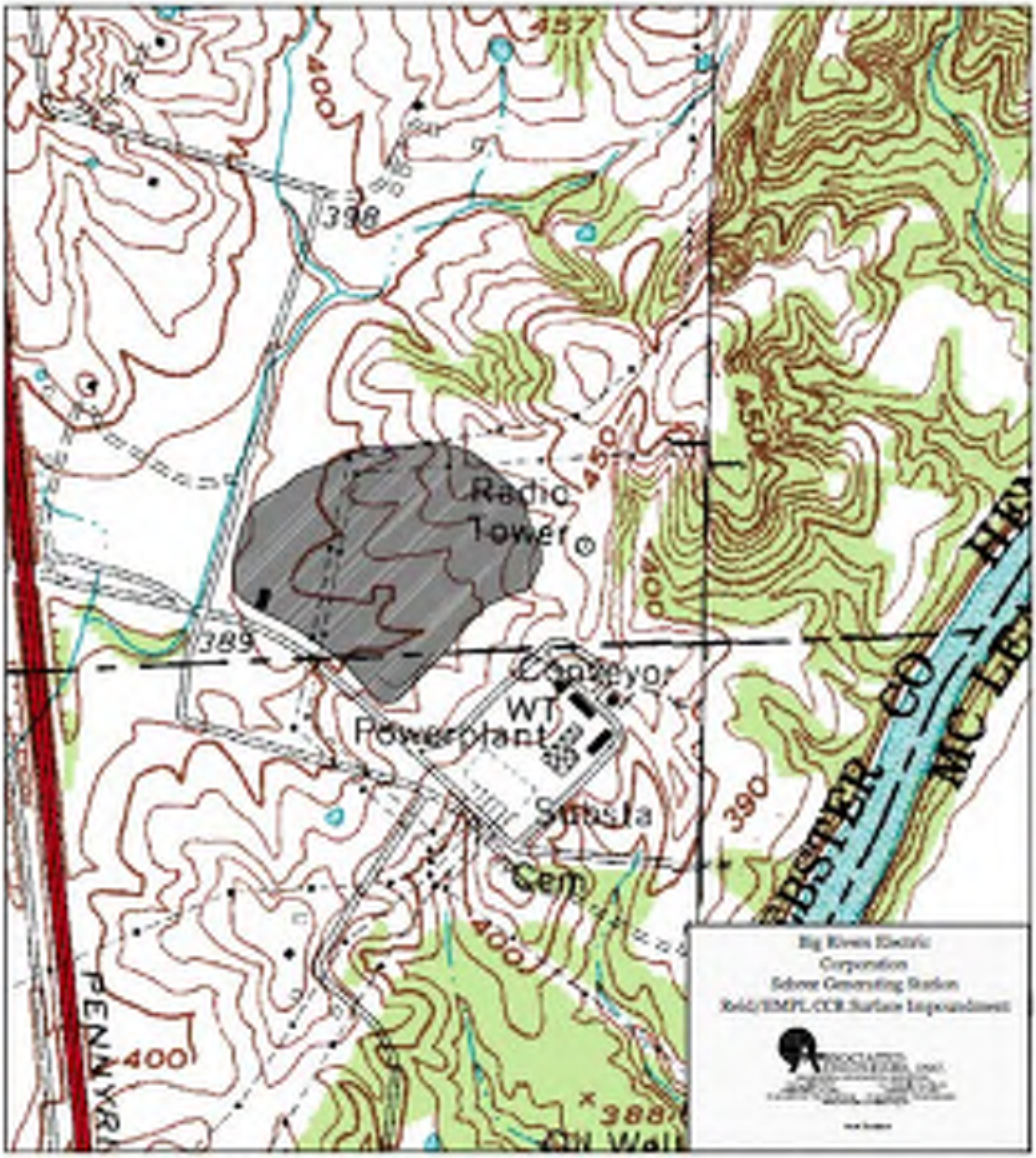
Professional Engineer Certification [Per 40 CFR § 257.73]
Reid/HMPL CCR Impoundment Initial Safety Factor Assessment

I hereby certify that myself or an agent under my review has prepared this Initial Safety Factor Assessment (Assessment), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Assessment has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.73. To the best of my knowledge and belief, the information contained in this Assessment is true, complete, and accurate.

David A. Lamb, P.E.
State of Kentucky License No. 17822

Date: 10/11/16

Attachment A. Aerial Photo of the Reid/HMPL CCR Surface Impoundment



Attachment B. Topographic Map showing the Reid/HMPL CCR Surface Impoundment

Slide Analysis Information

Big Rivers Electric Corporation

Project Summary

File Name: RH-1
Last saved with Slide version: 6.039
Project Title: Big Rivers Electric Corporation
Analysis: Reid/HMPL Pond RH-1 Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 2:31:54 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Lean Clay (CL)	Lean Clay (CL), Silty	Silt With Sand (ML)	Silty Clay (CL-ML)	Lean Clay (CL) 2	Sandy Lean Clay (Dam)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	126	123	125.8	129.7	134.6	125.8
Cohesion [psf]	120	72	72	72	200	14.4	14.4	220
Friction Angle [deg]	32.3	30.4	30.4	31	33.7	28.7	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material (Dam)	Silty Sand (SM)	Sandy Lean Clay (CL) 2
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	130	124.6
Cohesion [psf]	200	0	740
Friction Angle [deg]	30	33	23.2
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

List Of Coordinates

Water Table

X	Y
0	392.5
30.9	392.24
85.846	396.532

153	397.3
187.5	416.24
197.467	426.28
210	426.28

External Boundary

X	Y
0	371.5
43.37	372.6
180.89	373.8
210	374.1
210	381.6
210	384.6
210	388.7
210	395.8
210	397.8
210	419.644
206.306	421.6
198.751	425.6
191.136	429.632
180.794	429.579
169.909	425.6
148.327	417.711
116.257	406.72
99.1875	401.002
91.5524	398.444
85.846	396.532
83.24	397.044
77.457	398.595
71.748	398.856
47.962	398.89
43.367	398.519
32.528	396.852
18.716	394.794
0	395.066
0	393.5
0	392.5
0	384.5
0	381.5
0	372

Material Boundary

X	Y

0	372
43.3	375.5
140	381.6
180.9	381.6
210	381.6

Material Boundary

X	Y
0	381.5
43.3	381.5
140	381.6

Material Boundary

X	Y
0	384.5
43.3	384.5
102.292	384.543
180	384.6
210	384.6

Material Boundary

X	Y
0	392.5
43.3	392.5
102.672	391.249
180.9	389.6
210	388.7

Material Boundary

X	Y
0	393.5
43.3	393.5
180.9	395.6
210	395.8

Material Boundary

X	Y
85.846	396.532
153	397.3
180.9	397.6

210	397.8

Material Boundary

X	Y
99.1875	401.002
153	401.5
153	401.333
153	401.333
153	397.3

Material Boundary

X	Y
153	401.333
171.018	419.644
172.943	421.6
176.879	425.6
180.794	429.579

Material Boundary

X	Y
180.9	425.6
198.751	425.6

Material Boundary

X	Y
172.943	421.6
180.9	421.6

Material Boundary

X	Y
180.9	421.6
206.306	421.6

Material Boundary

X	Y
171.018	419.644
210	419.644
180.9	419.6

Material Boundary

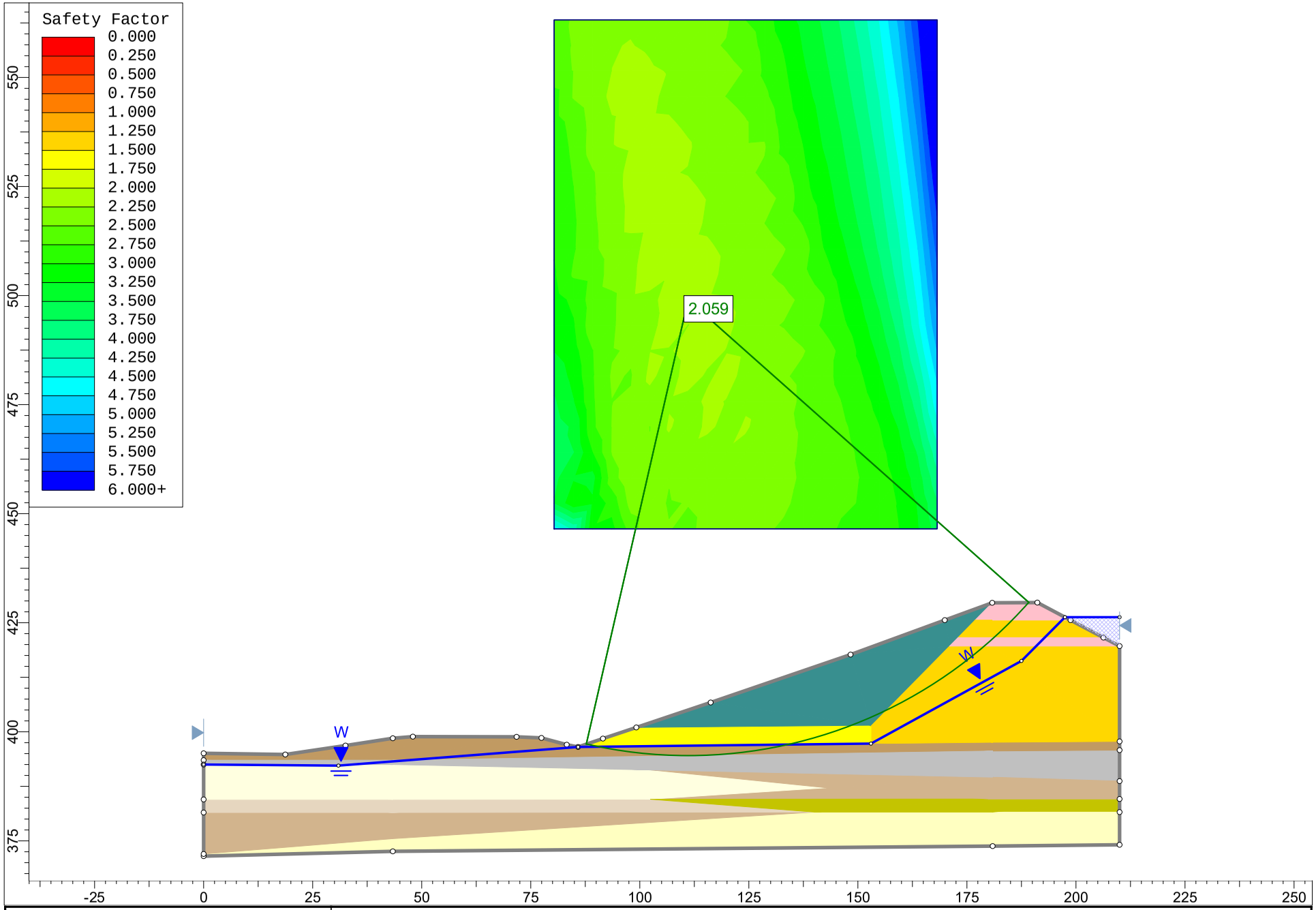
X	Y
102.292	384.543
140	381.6

Material Boundary

X	Y
102.292	384.543
142.735	387.164
102.672	391.249

Material Boundary

X	Y
176.879	425.6
180.9	425.6



Project	Big Rivers Electric Corporation		
Analysis Description	Reid/HMPL Pond RH-1 Maximum Storage Pool Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 2:31:54 PM		File Name RH-1.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-1 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-1 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 2:31:54 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Lean Clay (CL)	Lean Clay (CL), Silty	Silt With Sand (ML)	Silty Clay (CL-ML)	Lean Clay (CL) 2	Sandy Lean Clay (Dam)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	126	123	125.8	129.7	134.6	125.8
Cohesion [psf]	120	72	72	72	200	14.4	14.4	220
Friction Angle [deg]	32.3	30.4	30.4	31	33.7	28.7	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material (Dam)	Silty Sand (SM)	Sandy Lean Clay (CL) 2
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	130	124.6
Cohesion [psf]	200	0	740
Friction Angle [deg]	30	33	23.2
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

List Of Coordinates

Water Table

X	Y
0	392.5
30.9	392.24
85.846	396.532

153	397.3
187.5	416.24
194.956	427.61
210	427.61

External Boundary

X	Y
0	371.5
43.37	372.6
180.89	373.8
210	374.1
210	381.6
210	384.6
210	388.7
210	395.8
210	397.8
210	419.644
206.306	421.6
198.751	425.6
191.136	429.632
180.794	429.579
169.909	425.6
148.327	417.711
116.257	406.72
99.1875	401.002
91.5524	398.444
85.846	396.532
83.24	397.044
77.457	398.595
71.748	398.856
47.962	398.89
43.367	398.519
32.528	396.852
18.716	394.794
0	395.066
0	393.5
0	392.5
0	384.5
0	381.5
0	372

Material Boundary

X	Y

0	372
43.3	375.5
140	381.6
180.9	381.6
210	381.6

Material Boundary

X	Y
0	381.5
43.3	381.5
140	381.6

Material Boundary

X	Y
0	384.5
43.3	384.5
102.292	384.543
180	384.6
210	384.6

Material Boundary

X	Y
0	392.5
43.3	392.5
102.672	391.249
180.9	389.6
210	388.7

Material Boundary

X	Y
0	393.5
43.3	393.5
180.9	395.6
210	395.8

Material Boundary

X	Y
85.846	396.532
153	397.3
180.9	397.6

210	397.8

Material Boundary

X	Y
99.1875	401.002
153	401.5
153	401.333
153	401.333
153	397.3

Material Boundary

X	Y
153	401.333
171.018	419.644
172.943	421.6
176.879	425.6
180.794	429.579

Material Boundary

X	Y
180.9	425.6
198.751	425.6

Material Boundary

X	Y
172.943	421.6
180.9	421.6

Material Boundary

X	Y
180.9	421.6
206.306	421.6

Material Boundary

X	Y
171.018	419.644
210	419.644
180.9	419.6

Material Boundary

X	Y
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140	381.6

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X	Y
102.292	384.543
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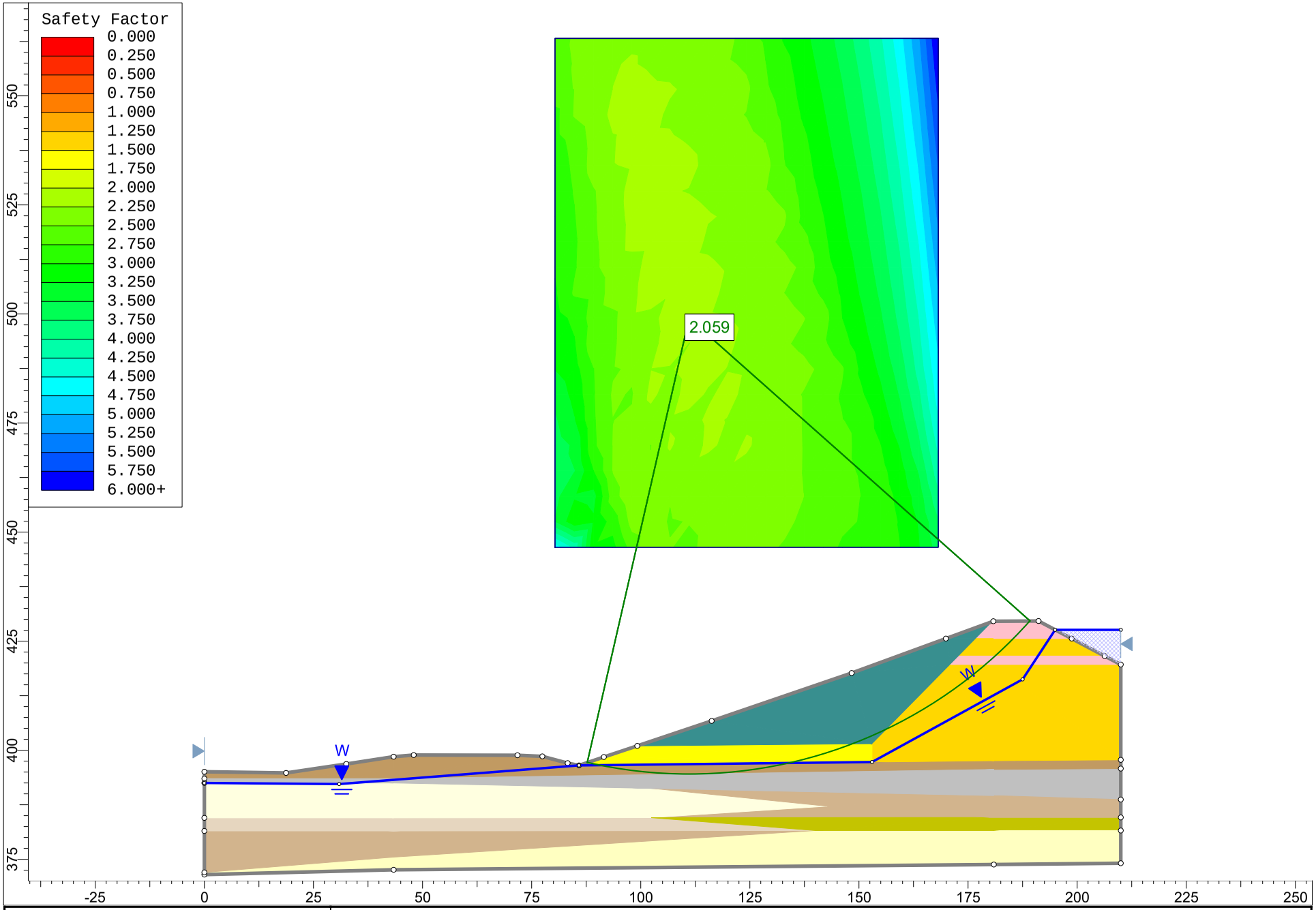
102.672	391.249

Material Boundary

X	Y
176.879	425.6
180.9	425.6



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-1 Maximum Surcharge Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 2:31:54 PM		File Name RH-1 Surcharge.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-1 Seis
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-1 Seismic Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 2:31:54 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2377

Material Properties

Property	Sandy Lean Clay (CL)	Lean Clay (CL)	Lean Clay (CL), Silty	Silt With Sand (ML)	Silty Clay (CL-ML)	Lean Clay (CL) 2	Sandy Lean Clay (Dam)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	126	123	125.8	129.7	134.6	125.8
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Friction Angle [deg]	32.3	30.4	30.4	31	33.7	28.7	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material (Dam)	Silty Sand (SM)	Sandy Lean Clay (CL) 2
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	130	124.6
Cohesion [psf]	200	0	740
Friction Angle [deg]	30	33	23.2
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

List Of Coordinates

Water Table

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210	397.8
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77.457	398.595
71.748	398.856
47.962	398.89
43.367	398.519
32.528	396.852
18.716	394.794
0	395.066
0	393.5
0	392.5
0	384.5

0	381.5
0	372

Material Boundary

X	Y
0	372
43.3	375.5
140	381.6
180.9	381.6
210	381.6

Material Boundary

X	Y
0	381.5
43.3	381.5
140	381.6

Material Boundary

X	Y
0	384.5
43.3	384.5
102.292	384.543
180	384.6
210	384.6

Material Boundary

X	Y
0	392.5
43.3	392.5
102.672	391.249
180.9	389.6
210	388.7

Material Boundary

X	Y
0	393.5
43.3	393.5
180.9	395.6
210	395.8

Material Boundary

X	Y
85.846	396.532
153	397.3
180.9	397.6
210	397.8

Material Boundary

X	Y
99.1875	401.002
153	401.5
153	401.333
153	401.333
153	397.3

Material Boundary

X	Y
153	401.333
171.018	419.644
172.943	421.6
176.879	425.6
180.794	429.579

Material Boundary

X	Y
180.9	425.6
198.751	425.6

Material Boundary

X	Y
172.943	421.6
180.9	421.6

Material Boundary

X	Y
180.9	421.6
206.306	421.6

Material Boundary

X	Y
171.018	419.644
210	419.644
180.9	419.6

Material Boundary

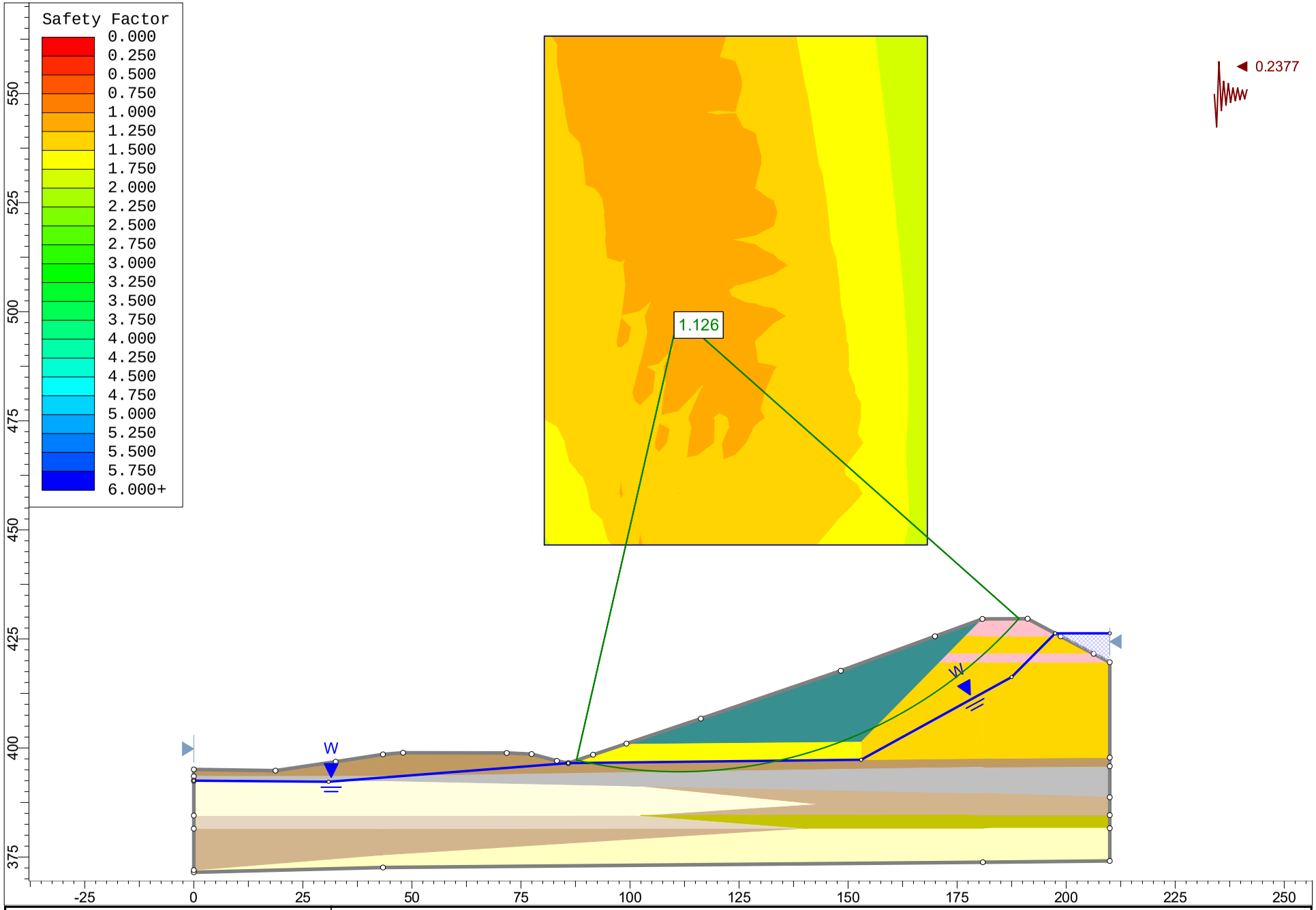
X	Y
102.292	384.543
140	381.6

Material Boundary

X	Y
102.292	384.543
142.735	387.164
102.672	391.249

Material Boundary

X	Y
176.879	425.6
180.9	425.6



Project	BREC Reid/HMPL Station CCR Surface Impoundment		
Analysis Description	Cross Section RH-1 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 2:31:54 PM		File Name RH-1 Seis.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-1 Seis Liq
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-1 Liquefaction Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 2:31:54 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Lean Clay (CL)	Lean Clay (CL), Silty	Silt With Sand (ML)	Silty Clay (CL-ML)	Lean Clay (CL) 2	Sandy Lean Clay (Dam)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	126	123	125.8	129.7	134.6	125.8
Cohesion [psf]	120	72	72	0	200	14.4	14.4	220
Friction Angle [deg]	32.3	30.4	30.4	0	33.7	28.7	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material (Dam)	Silty Sand (SM)	Sandy Lean Clay (CL) 2
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	130	124.6
Cohesion [psf]	200	0	740
Friction Angle [deg]	30	33	23.2
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

List Of Coordinates

Water Table

X	Y
0	392.5
30.9	392.24
85.846	396.532

153	397.3
187.5	416.24
197.467	426.28
210	426.28

External Boundary

X	Y
0	371.5
43.37	372.6
180.89	373.8
210	374.1
210	381.6
210	384.6
210	388.7
210	395.8
210	397.8
210	419.644
206.306	421.6
198.751	425.6
191.136	429.632
180.794	429.579
169.909	425.6
148.327	417.711
116.257	406.72
99.1875	401.002
91.5524	398.444
85.846	396.532
83.24	397.044
77.457	398.595
71.748	398.856
47.962	398.89
43.367	398.519
32.528	396.852
18.716	394.794
0	395.066
0	393.5
0	392.5
0	384.5
0	381.5
0	372

Material Boundary

X	Y

0	372
43.3	375.5
140	381.6
180.9	381.6
210	381.6

Material Boundary

X	Y
0	381.5
43.3	381.5
140	381.6

Material Boundary

X	Y
0	384.5
43.3	384.5
102.292	384.543
180	384.6
210	384.6

Material Boundary

X	Y
0	392.5
43.3	392.5
102.672	391.249
180.9	389.6
210	388.7

Material Boundary

X	Y
0	393.5
43.3	393.5
180.9	395.6
210	395.8

Material Boundary

X	Y
85.846	396.532
153	397.3
180.9	397.6

210	397.8

Material Boundary

X	Y
99.1875	401.002
153	401.5
153	401.333
153	401.333
153	397.3

Material Boundary

X	Y
153	401.333
171.018	419.644
172.943	421.6
176.879	425.6
180.794	429.579

Material Boundary

X	Y
180.9	425.6
198.751	425.6

Material Boundary

X	Y
172.943	421.6
180.9	421.6

Material Boundary

X	Y
180.9	421.6
206.306	421.6

Material Boundary

X	Y
171.018	419.644
210	419.644
180.9	419.6

Material Boundary

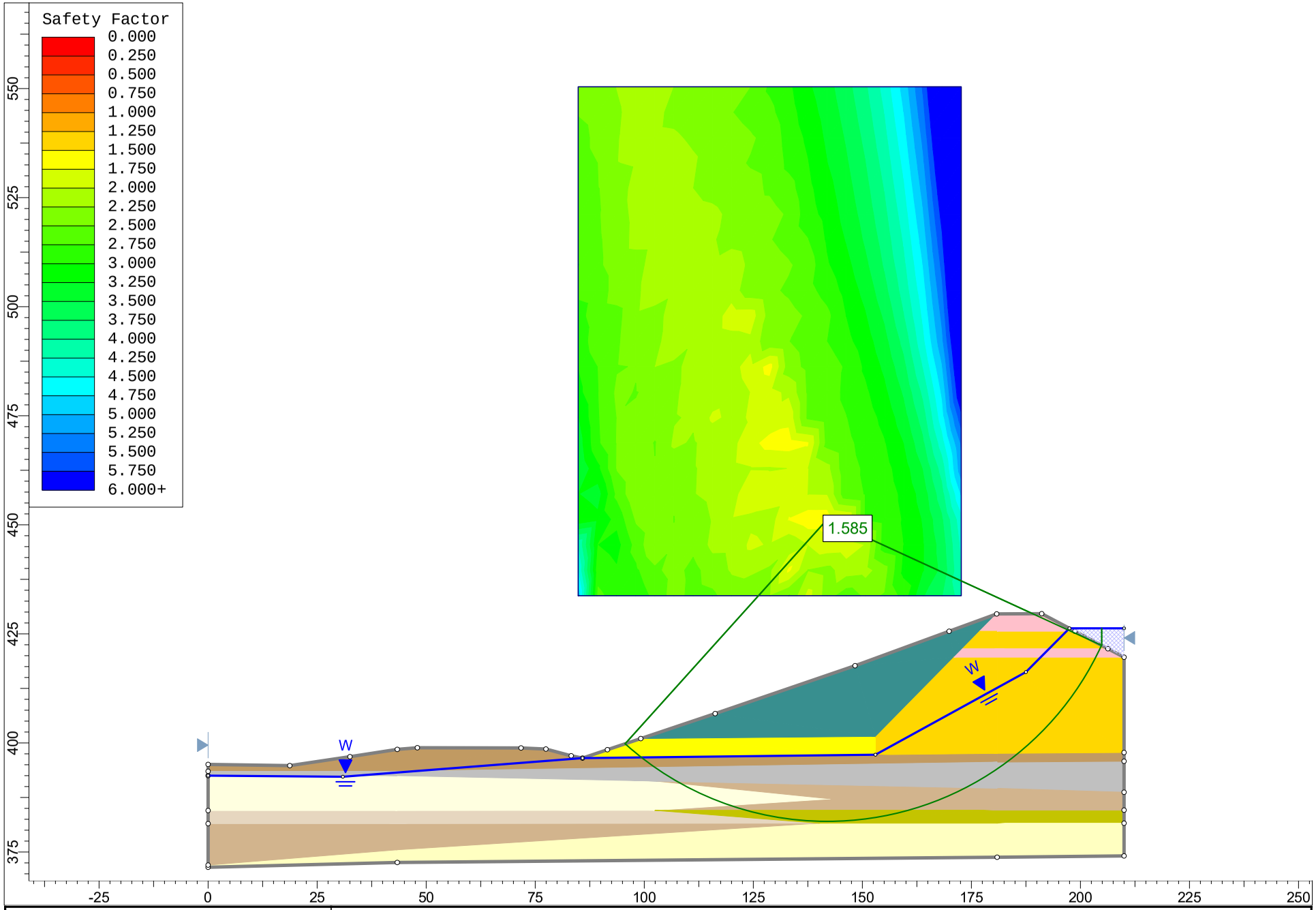
X	Y
102.292	384.543
140	381.6

Material Boundary

X	Y
102.292	384.543
142.735	387.164
102.672	391.249

Material Boundary

X	Y
176.879	425.6
180.9	425.6



Project	BREC Reid/HMPL Station CCR Surface Impoundment		
Analysis Description	Cross Section RH-1 Liquefaction Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/5/2016, 2:31:54 PM		File Name RH-1 Seis Liq.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-2
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-2 Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:14:15 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean Clay (CL)	Granular Fill	Silty Sand (SC)	Lean Clay (CL) (Dam)	Lean clay With Sand (Dam)	Sandy Lean Clay (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	125.5	129.7	132	130	125.8	133.5	134.6
Cohesion [psf]	120	0	14.4	0	0	220	260	14.4
Friction Angle [deg]	32.3	33.7	28.7	31	33	30.4	30.6	33.3
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material	Sandy Lean Clay 2
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	125.8
Cohesion [psf]	200	80
Friction Angle [deg]	30	29.6
Water Surface	Water Table	Water Table
Hu Value	1	1

List Of Coordinates

Water Table

X	Y
0	391.358

87.066	391.358
166.755	395.192
170.864	397.272
208.5	416.24
219.309	426.28
230	426.28

External Boundary

X	Y
6.548e-013	364.6
45.37	364.6
208.52	387.9
230	390.5
230	395.894
230	397.852
230	398.726
230	401.3
230	409.9
230	412.9
230	418.69
230	420.43
224.631	423.368
223.845	423.798
220.564	425.593
214.627	428.842
208.516	429.175
202.208	429.134
186.355	423.878
183.639	422.977
179.243	421.45
160.601	414.973
154.822	412.965
142.317	408.632
132.449	405.213
123.342	402.058
100.934	395.448
92.3437	392.915
90.2895	392.309
87.066	391.358
79.843	393.667
75.206	394.003
51.068	393.78
45.366	393.402
32.987	392.813

0	393.493
0	377.4
0	370.4

Material Boundary

X	Y
0	370.4
45.4	370.4
100.5	377.5
45.4	377.4
0	377.4

Material Boundary

X	Y
87.066	391.358
68	389.6
87.5	389
96.6043	389.467
205.063	395.024
208.5	395.2
230	395.894

Material Boundary

X	Y
87.066	391.358
208.5	397.2
230	397.852

Material Boundary

X	Y
90.2895	392.309
208.5	398
230	398.726

Material Boundary

X	Y
208.5	425.2
220.564	425.593

Material Boundary

X	Y
208.5	423.2
223.845	423.798

Material Boundary

X	Y
208.5	400.7
230	401.3

Material Boundary

X	Y
92.3437	392.915
155.8	395.9
170.864	397.272
208.5	400.7

Material Boundary

X	Y
170.864	397.272
181.19	407.768
184.264	410.894
189.983	416.707
195.612	422.429
197.704	424.555
202.208	429.134

Material Boundary

X	Y
197.704	424.555
208.5	425.2

Material Boundary

X	Y
195.612	422.429
208.5	423.2

Material Boundary

X	Y
181.19	407.768

208.5	409.2
230	409.9

Material Boundary

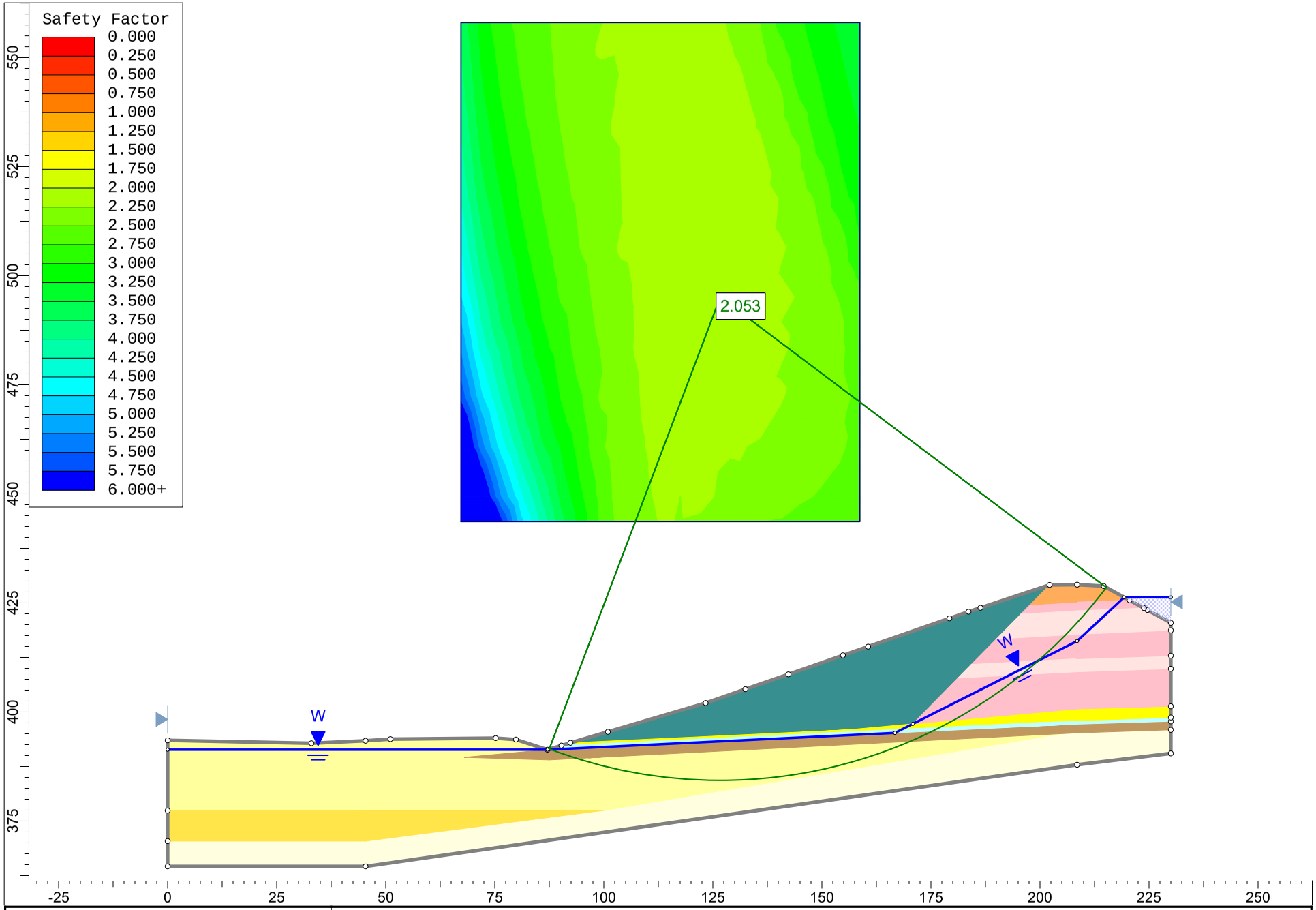
X	Y
184.264	410.894
208.5	412.2
230	412.9

Material Boundary

X	Y
189.983	416.707
208.5	417.8
230	418.69

Material Boundary

X	Y
100.5	377.5
205.063	395.024



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-2 Maximum Storage Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:14:15 PM		File Name RH-2.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-2 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-2 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:14:15 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean Clay (CL)	Granular Fill	Silty Sand (SC)	Lean Clay (CL) (Dam)	Lean clay With Sand (Dam)	Sandy Lean Clay (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	125.5	129.7	132	130	125.8	133.5	134.6
Cohesion [psf]	120	0	14.4	0	0	220	260	14.4
Friction Angle [deg]	32.3	33.7	28.7	31	33	30.4	30.6	33.3
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material	Sandy Lean Clay 2
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	125.8
Cohesion [psf]	200	80
Friction Angle [deg]	30	29.6
Water Surface	Water Table	Water Table
Hu Value	1	1

List Of Coordinates

Water Table

X	Y
0	391.358

87.066	391.358
166.755	395.192
170.864	397.272
208.5	416.24
216.878	427.61
230	427.61

External Boundary

X	Y
6.548e-013	364.6
45.37	364.6
208.52	387.9
230	390.5
230	395.894
230	397.852
230	398.726
230	401.3
230	409.9
230	412.9
230	418.69
230	420.43
224.631	423.368
223.845	423.798
220.564	425.593
214.627	428.842
208.516	429.175
202.208	429.134
186.355	423.878
183.639	422.977
179.243	421.45
160.601	414.973
154.822	412.965
142.317	408.632
132.449	405.213
123.342	402.058
100.934	395.448
92.3437	392.915
90.2895	392.309
87.066	391.358
79.843	393.667
75.206	394.003
51.068	393.78
45.366	393.402
32.987	392.813

0	393.493
0	377.4
0	370.4

Material Boundary

X	Y
0	370.4
45.4	370.4
100.5	377.5
45.4	377.4
0	377.4

Material Boundary

X	Y
87.066	391.358
68	389.6
87.5	389
96.6043	389.467
205.063	395.024
208.5	395.2
230	395.894

Material Boundary

X	Y
87.066	391.358
208.5	397.2
230	397.852

Material Boundary

X	Y
90.2895	392.309
208.5	398
230	398.726

Material Boundary

X	Y
208.5	425.2
220.564	425.593

Material Boundary

X	Y
208.5	423.2
223.845	423.798

Material Boundary

X	Y
208.5	400.7
230	401.3

Material Boundary

X	Y
92.3437	392.915
155.8	395.9
170.864	397.272
208.5	400.7

Material Boundary

X	Y
170.864	397.272
181.19	407.768
184.264	410.894
189.983	416.707
195.612	422.429
197.704	424.555
202.208	429.134

Material Boundary

X	Y
197.704	424.555
208.5	425.2

Material Boundary

X	Y
195.612	422.429
208.5	423.2

Material Boundary

X	Y
181.19	407.768

208.5	409.2
230	409.9

Material Boundary

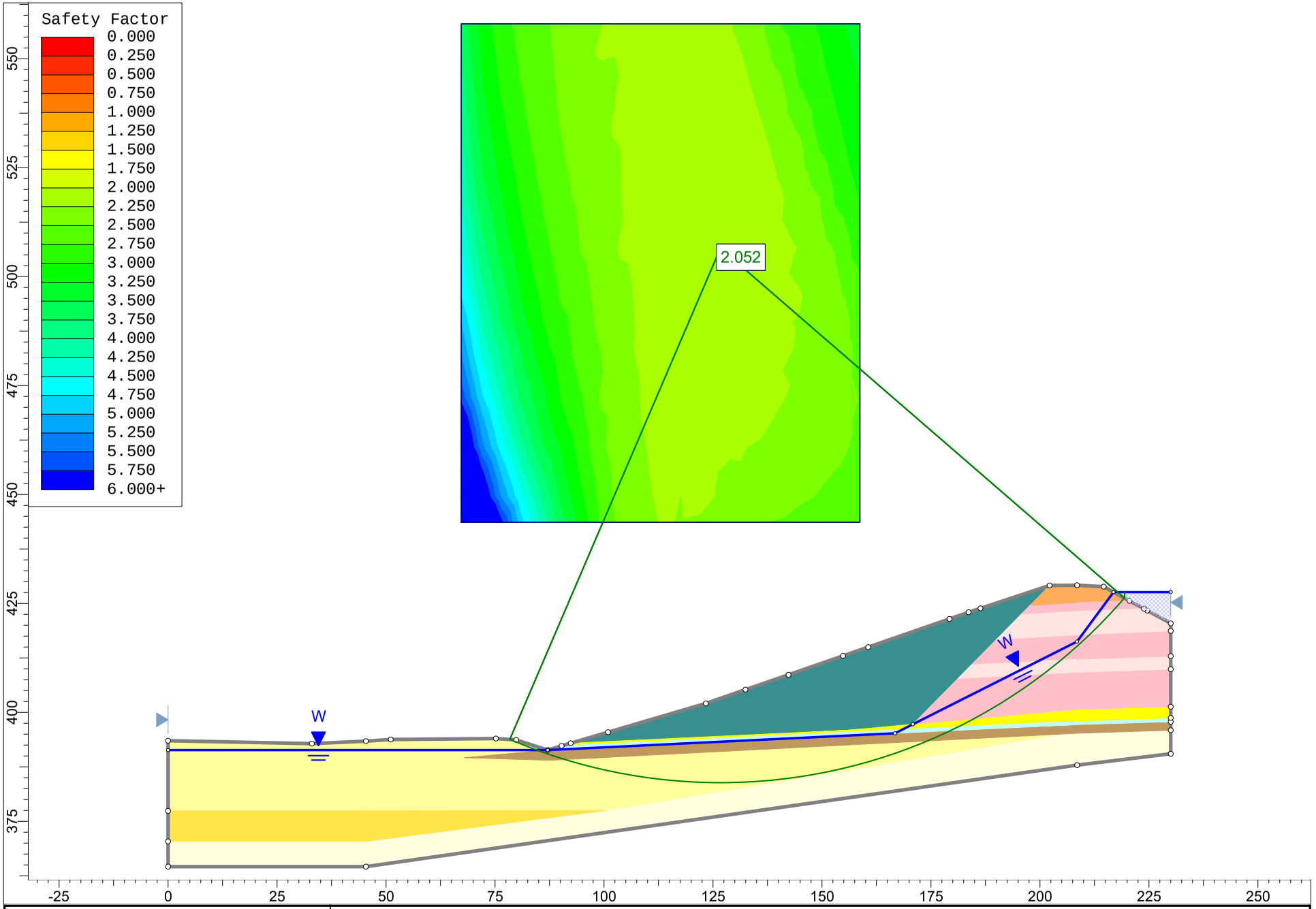
X	Y
184.264	410.894
208.5	412.2
230	412.9

Material Boundary

X	Y
189.983	416.707
208.5	417.8
230	418.69

Material Boundary

X	Y
100.5	377.5
205.063	395.024



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-2 Maximum Surcharge Pool Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:14:15 PM		File Name RH-2 Surcharge.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-2 Seis
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-2 Seismic Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/5/2016, 3:14:15 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified
Janbu simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2377

Material Properties

Property	Sandy Lean Clay (CL)	Clayey Sand (SC)	Lean Clay (CL)	Granular Fill	Silty Sand (SC)	Lean Clay (CL) (Dam)	Lean clay With Sand (Dam)	Sandy Lean Clay (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	125.5	129.7	132	130	125.8	133.5	134.6
Cohesion [psf]	120	0	14.4	0	0	220	260	14.4
Friction Angle [deg]	32.3	33.7	28.7	31	33	30.4	30.6	33.3
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Outslope Material	Sandy Lean Clay 2
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	128	125.8
Cohesion [psf]	200	80
Friction Angle [deg]	30	29.6
Water Surface	Water Table	Water Table
Hu Value	1	1

List Of Coordinates

Water Table

X	Y
0	391.358
87.066	391.358
166.755	395.192
170.864	397.272
208.5	416.24
219.309	426.28
230	426.28

External Boundary

X	Y
6.548e-013	364.6
45.37	364.6
208.52	387.9
230	390.5
230	395.894
230	397.852
230	398.726
230	401.3
230	409.9
230	412.9
230	418.69
230	420.43
224.631	423.368
223.845	423.798
220.564	425.593
214.627	428.842
208.516	429.175
202.208	429.134
186.355	423.878
183.639	422.977
179.243	421.45
160.601	414.973
154.822	412.965
142.317	408.632
132.449	405.213
123.342	402.058
100.934	395.448
92.3437	392.915
90.2895	392.309
87.066	391.358
79.843	393.667

75.206	394.003
51.068	393.78
45.366	393.402
32.987	392.813
0	393.493
0	377.4
0	370.4

Material Boundary

X	Y
0	370.4
45.4	370.4
100.5	377.5
45.4	377.4
0	377.4

Material Boundary

X	Y
87.066	391.358
68	389.6
87.5	389
96.6043	389.467
205.063	395.024
208.5	395.2
230	395.894

Material Boundary

X	Y
87.066	391.358
208.5	397.2
230	397.852

Material Boundary

X	Y
90.2895	392.309
208.5	398
230	398.726

Material Boundary

X	Y

208.5	425.2
220.564	425.593

Material Boundary

X	Y
208.5	423.2
223.845	423.798

Material Boundary

X	Y
208.5	400.7
230	401.3

Material Boundary

X	Y
92.3437	392.915
155.8	395.9
170.864	397.272
208.5	400.7

Material Boundary

X	Y
170.864	397.272
181.19	407.768
184.264	410.894
189.983	416.707
195.612	422.429
197.704	424.555
202.208	429.134

Material Boundary

X	Y
197.704	424.555
208.5	425.2

Material Boundary

X	Y
195.612	422.429
208.5	423.2

Material Boundary

X	Y
181.19	407.768
208.5	409.2
230	409.9

Material Boundary

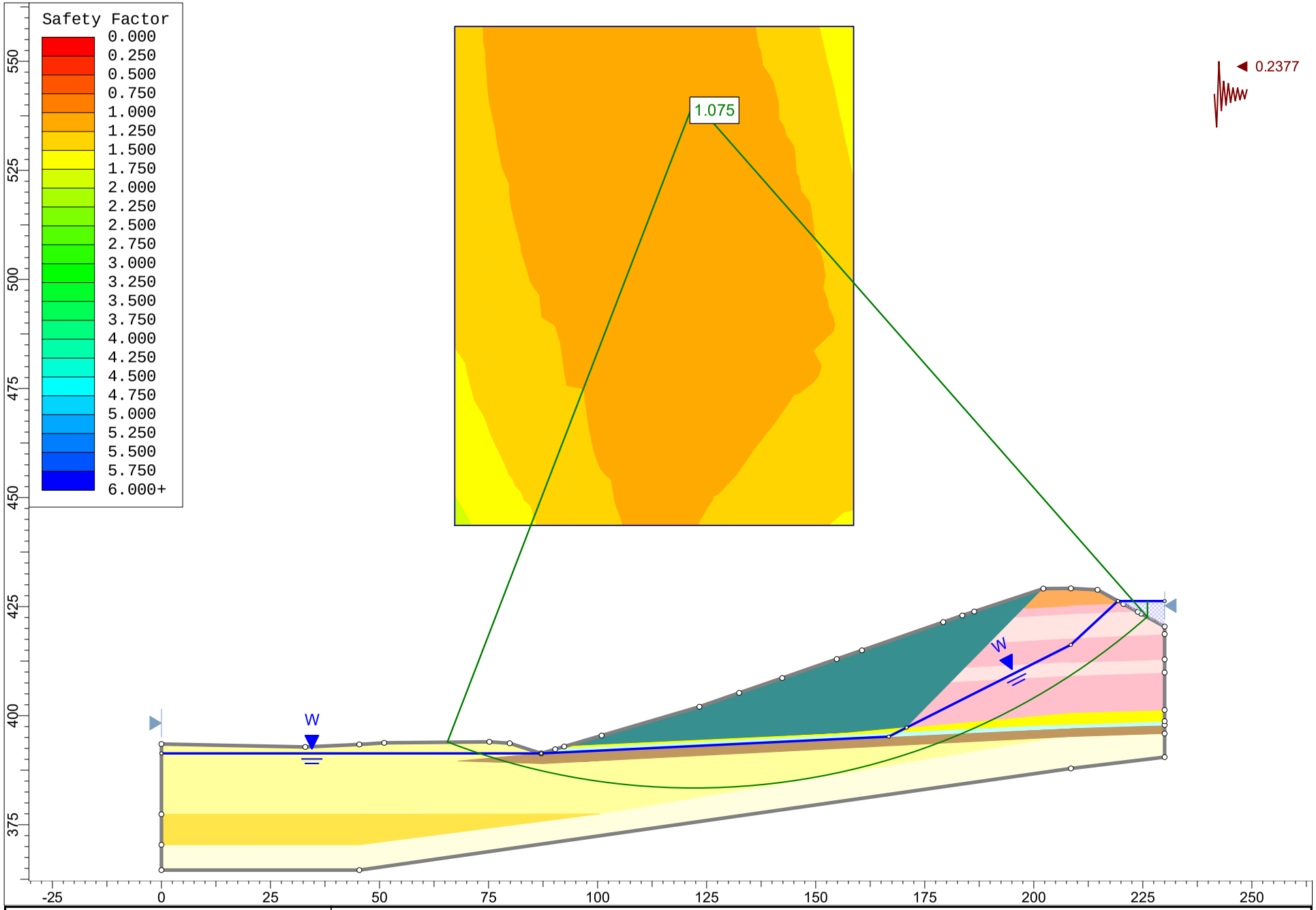
X	Y
184.264	410.894
208.5	412.2
230	412.9

Material Boundary

X	Y
189.983	416.707
208.5	417.8
230	418.69

Material Boundary

X	Y
100.5	377.5
205.063	395.024



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-2 Seismic Loading Condition	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date 9/5/2016, 3:14:15 PM		File Name RH-2 Seis.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-3
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-3 Maximum Storage Pool Loading Conditon
Company: Associated Engineers, Inc.
Date Created: 8/29/2016, 2:56:23 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116

Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay	Lean Clay	Silty Clay (CL-ML)	Granular Fill and Lean Clay	Outslope Material (Dam)	Lean Clay with Sand (CL) (Dam)	Sandy Lean Clay (CL)(Dike)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	125.8	132	128	133.5	134.6	125.8
Cohesion [psf]	120	72	200	0	200	260	14.4	220
Friction Angle [deg]	32.3	30.4	33.7	31	30	30.6	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Lean Clay (CL) 2
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	129.7
Cohesion [psf]	14.4
Friction Angle [deg]	28.7
Water Surface	Water Table
Hu Value	1

List Of Coordinates

Water Table

X	Y
-1.11022e-016	380.175
75.344	380.175
77.002	383.846
82.5127	384.456
217.136	388.922
221.8	391.3
267.7	412.21
276.537	426.277
285	426.28

External Boundary

X	Y
276.537	426.277
270.621	429.244
264.923	429.374
259.45	429.143
250.06	425.382
237.754	421.038
216.209	413.372
187.674	403.549
156.481	394.047
133.994	390.347
132.225	390.139
106.149	387.073
82.5127	384.456
77.002	383.846
75.344	380.175
68.53	380.645
67.51	383.799
59.536	386.037
0	385.411
0	383.8
1.38778e-017	375.3
0	371.5
0	366.9
0	359.5
40	359.5
132.2	367
172.029	370.145
265	377.7
285	378.7
285	383.6
285	390.6

285	393.6
285	396.6
285	399.6
285	422.033

Material Boundary

X	Y
0	366.9
40	366.9
132.2	371.3
201	376.8
172.029	370.145

Material Boundary

X	Y
1.38778e-017	375.3
40	375.3
132.2	378.3
265	383.4
285	383.6

Material Boundary

X	Y
82.5127	384.456
132.2	386.3
265	390.4
285	390.6

Material Boundary

X	Y
0	383.8
40	383.8
67.51	383.799

Material Boundary

X	Y
106.149	387.073
132.2	388.3
221.8	391.3
265	393.4

285	393.6

Material Boundary

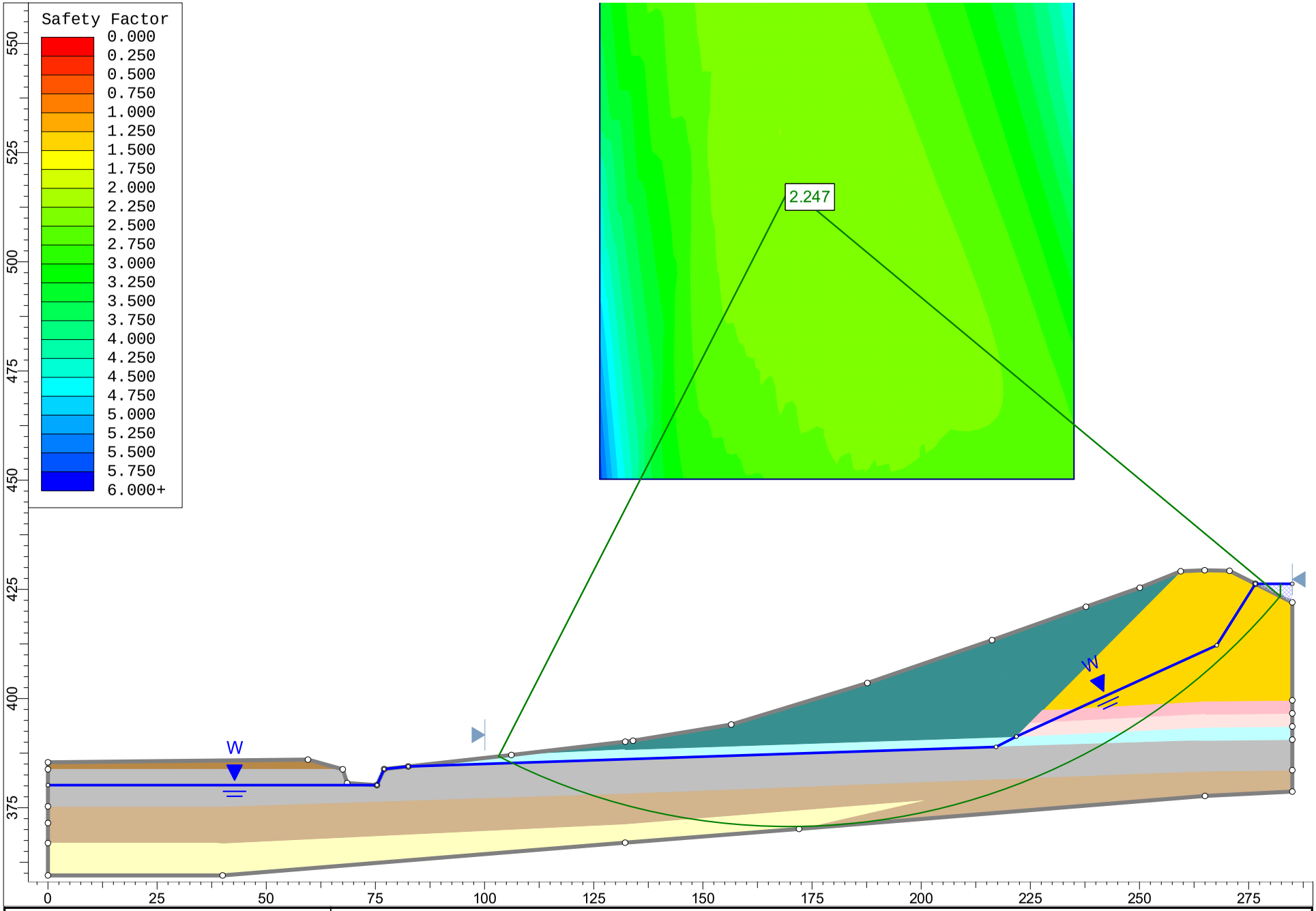
X	Y
221.8	391.3
224.786	394.301
227.81	397.341
259.45	429.143

Material Boundary

X	Y
224.786	394.301
265	396.4
285	396.6

Material Boundary

X	Y
227.81	397.341
265	399.4
285	399.6



	Project	BREC Reid/HMPL Station CCR Surface Impoundment	
	Analysis Description	Cross Section RH-3 Maximum Storage Pool Loading Conditon	
	Drawn By	Scale 1:360	Company Associated Engineers, Inc.
	Date 8/29/2016, 2:56:23 PM		File Name RH-3.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impooundment

Project Summary

File Name: RH-3 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impooundment
Analysis: Cross Section RH-3 Maximum Surcharge Pool Loading Conditon
Company: Associated Engineers, Inc.
Date Created: 8/29/2016, 2:56:23 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116

Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Sandy Lean Clay	Lean Clay	Silty Clay (CL-ML)	Granular Fill and Lean Clay	Outslope Material (Dam)	Lean Clay with Sand (CL) (Dam)	Sandy Lean Clay (CL)(Dike)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	125.8	132	128	133.5	134.6	125.8
Cohesion [psf]	120	72	200	0	200	260	14.4	220
Friction Angle [deg]	32.3	30.4	33.7	31	30	30.6	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Lean Clay (CL) 2
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	129.7
Cohesion [psf]	14.4
Friction Angle [deg]	28.7
Water Surface	Water Table
Hu Value	1

List Of Coordinates

Water Table

Project	BREC Reid/HMPL Station CCR Surface Impoundment
Analysis Description	Cross Section RH-3 Maximum Surcharge Pool Loading Conditon
Drawn By	Scale
Company	Associated Engineers, Inc.
Date	8/29/2016, 2:56:23 PM
File Name	RH-3 Surcharge.slim

X	Y
-1.11022e-016	380.175
75.344	380.175
77.002	383.846
82.5127	384.456
217.136	388.922
221.8	391.3
267.7	412.21
273.872	427.613
285	427.61

External Boundary

X	Y
276.537	426.277
270.621	429.244
264.923	429.374
259.45	429.143
250.06	425.382
237.754	421.038
216.209	413.372
187.674	403.549
156.481	394.047
133.994	390.347
132.225	390.139
106.149	387.073
82.5127	384.456
77.002	383.846
75.344	380.175
68.53	380.645
67.51	383.799
59.536	386.037
0	385.411
0	383.8
1.38778e-017	375.3
0	371.5
0	366.9
0	359.5
40	359.5
132.2	367
172.029	370.145
265	377.7
285	378.7
285	383.6
285	390.6

285	393.6
285	396.6
285	399.6
285	422.033

Material Boundary

X	Y
0	366.9
40	366.9
132.2	371.3
201	376.8
172.029	370.145

Material Boundary

X	Y
1.38778e-017	375.3
40	375.3
132.2	378.3
265	383.4
285	383.6

Material Boundary

X	Y
82.5127	384.456
132.2	386.3
265	390.4
285	390.6

Material Boundary

X	Y
0	383.8
40	383.8
67.51	383.799

Material Boundary

X	Y
106.149	387.073
132.2	388.3
221.8	391.3
265	393.4

285	393.6

Material Boundary

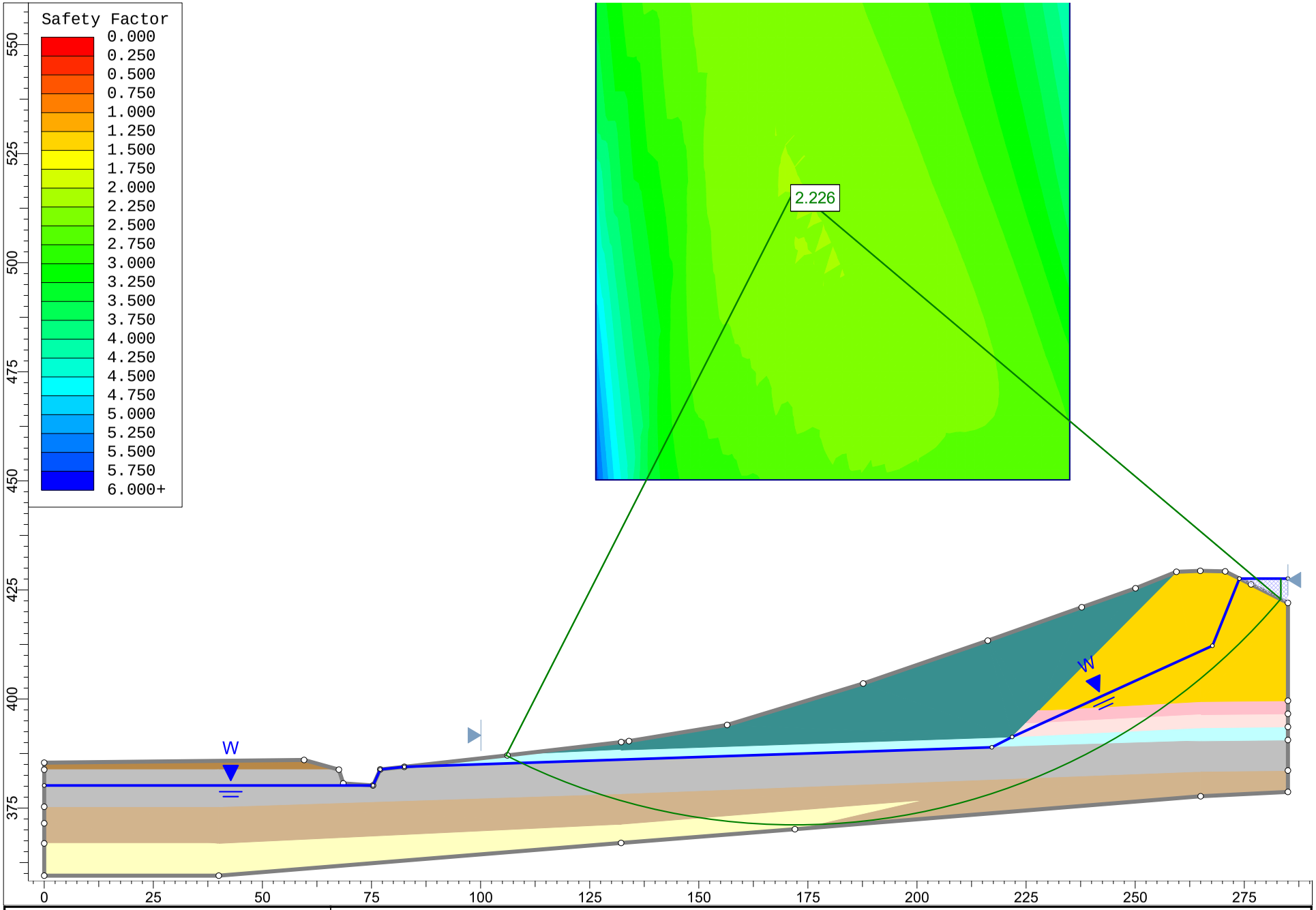
X	Y
221.8	391.3
224.786	394.301
227.81	397.341
259.45	429.143

Material Boundary

X	Y
224.786	394.301
265	396.4
285	396.6

Material Boundary

X	Y
227.81	397.341
265	399.4
285	399.6



Project	BREC Reid/HMPL Station CCR Surface Impoundment		
Analysis Description	Cross Section RH-3 Maximum Surcharge Pool Loading Conditon		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	8/29/2016, 2:56:23 PM		File Name RH-3 Surcharge.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-3 Seis
Slide Modeler Version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-3 Seismic Loading Conditon
Company: Associated Engineers, Inc.
Date Created: 8/29/2016, 2:56:23 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular

Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2377

Material Properties

Property	Sandy Lean Clay	Lean Clay	Silty Clay (CL-ML)	Granular Fill and Lean Clay	Outslope Material (Dam)	Lean Clay with Sand (CL) (Dam)	Sandy Lean Clay (CL)(Dike)	Lean Clay (CL) (Dam)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	132.7	134.1	125.8	132	128	133.5	134.6	125.8
Cohesion [psf]	120	72	200	0	200	260	14.4	220
Friction Angle [deg]	32.3	30.4	33.7	31	30	30.6	33.3	30.4
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

Property	Lean Clay (CL) 2
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	129.7
Cohesion [psf]	14.4
Friction Angle [deg]	28.7
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS: 1.146920
Center: 169.832, 521.855
Radius: 150.630
Left Slip Surface Endpoint: 103.229, 386.750
Right Slip Surface Endpoint: 283.359, 422.856
Left Slope Intercept: 103.229 386.750
Right Slope Intercept: 283.359 426.279
Resisting Moment=4.1388e+007 lb-ft
Driving Moment=3.60862e+007 lb-ft

Total Slice Area=4300.6 ft2

Valid / Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 27798
Number of Invalid Surfaces: 813

Error Codes:

Error Code -103 reported for 812 surfaces
Error Code -108 reported for 1 surface

Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

Slice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.14692

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.9517	339.413	Granular Fill and Lean Clay	0	31	80.4502	92.27	153.563	0	153.563
2	9.38923	5181.12	Silty Clay (CL-ML)	200	33.7	558.746	640.837	789.603	128.596	661.007
3	9.38923	10797.8	Silty Clay (CL-ML)	200	33.7	784.082	899.279	1423.39	374.861	1048.53
4	8.05892	13218.6	Lean Clay	72	30.4	715.465	820.581	1841.85	565.927	1275.92
5	8.05892	16561.5	Lean Clay	72	30.4	847.784	972.34	2244.15	709.561	1534.59
6	8.05892	19639.6	Lean Clay	72	30.4	970.425	1113	2598.53	824.191	1774.34
7	7.11739	19518.9	Sandy Lean Clay	120	32.3	1191.41	1366.45	2878.89	907.191	1971.7
8	7.11739	21628	Sandy Lean Clay	120	32.3	1296.89	1487.43	3125.23	962.17	2163.06
9	7.11739	23899.4	Sandy Lean Clay	120	32.3	1421.59	1630.45	3385.29	995.992	2389.3
10	7.11739	25852.9	Sandy Lean Clay	120	32.3	1527.15	1751.52	3589.6	1008.79	2580.81
11	7.97951	30912.3	Lean Clay	72	30.4	1474.5	1691.13	3758.42	998.688	2759.74
12	7.97951	32613.8	Lean Clay	72	30.4	1555.8	1784.38	3881.46	962.77	2918.69
13	7.97951	34074	Lean Clay	72	30.4	1630.67	1870.25	3964.78	899.728	3065.05
14	7.97951	35060.3	Lean Clay	72	30.4	1686.13	1933.86	3982.32	808.85	3173.47
15	7.97951	35547.6	Lean Clay	72	30.4	1722.09	1975.1	3932.9	689.137	3243.76
16	7.97951	35611.6	Lean Clay	72	30.4	1688.19	1936.22	3846.3	668.812	3177.49
17	8.30823	36828.4	Silty Clay (CL-ML)	200	33.7	1874.3	2149.67	3621.62	698.224	2923.4
18	8.30823	36298.1	Silty Clay (CL-ML)	200	33.7	1786.34	2048.79	3462.85	690.709	2772.14
19	4.95864	21118.6	Granular Fill and Lean Clay	0	31	1451.21	1664.42	3429.39	659.333	2770.06
20	5.12784	21134.1	Lean Clay with Sand (CL) (Dam)	260	30.6	1539.33	1765.49	3159.94	614.305	2545.64
21	4.73463	18862	Lean Clay (CL) (Dam)	220	30.4	1443.82	1655.95	3001.55	554.028	2447.52
22	6.60985	24515	Sandy Lean Clay (CL)(Dike)	14.4	33.3	1310.13	1502.61	2725.55	459.958	2265.59
23	6.60985	20127.3	Sandy Lean Clay (CL)(Dike)	14.4	33.3	1061.56	1217.53	2150.92	319.337	1831.59

24	6.60985	13526.4	Sandy Lean Clay (CL)(Dike)	14.4	33.3	565.291	648.343	1510.28	545.202	965.081
25	6.60985	5362.88	Sandy Lean Clay (CL)(Dike)	14.4	33.3	141.118	161.851	659.69	435.217	224.473

Interslice Data

Global Minimum Query (bishop simplified) - Safety Factor: 1.14692

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	103.229	386.75	0	0	0
2	106.18	385.335	374.121	0	0
3	115.57	381.338	7543.64	0	0
4	124.959	378.064	16998.2	0	0
5	133.018	375.793	23804.5	0	0
6	141.077	373.995	30733.8	0	0
7	149.136	372.654	37371.2	0	0
8	156.253	371.839	43557.5	0	0
9	163.37	371.364	49129.3	0	0
10	170.488	371.227	54029.8	0	0
11	177.605	371.426	58037.4	0	0
12	185.585	372.051	60103.9	0	0
13	193.564	373.107	60668.5	0	0
14	201.544	374.601	59653.7	0	0
15	209.523	376.549	57017.3	0	0
16	217.503	378.968	52794.3	0	0
17	225.482	381.882	46588	0	0
18	233.79	385.478	40381	0	0
19	242.099	389.693	31998	0	0
20	247.057	392.528	24451.6	0	0
21	252.185	395.731	17198.2	0	0
22	256.92	398.953	9880.41	0	0
23	263.53	403.914	-811.059	0	0
24	270.139	409.482	-10555.3	0	0
25	276.749	415.751	-19503.3	0	0
26	283.359	422.856	365.715	0	0

List Of Coordinates

Water Table

X	Y
-1.11022e-016	380.175
75.344	380.175
77.002	383.846
82.5127	384.456
217.136	388.922
221.8	391.3
267.7	412.21
276.537	426.277

285	426.28

External Boundary

X	Y
276.537	426.277
270.621	429.244
264.923	429.374
259.45	429.143
250.06	425.382
237.754	421.038
216.209	413.372
187.674	403.549
156.481	394.047
133.994	390.347
132.225	390.139
106.149	387.073
82.5127	384.456
77.002	383.846
75.344	380.175
68.53	380.645
67.51	383.799
59.536	386.037
0	385.411
0	383.8
1.38778e-017	375.3
0	371.5
0	366.9
0	359.5
40	359.5
132.2	367
172.029	370.145
265	377.7
285	378.7
285	383.6
285	390.6
285	393.6
285	396.6
285	399.6
285	422.033

Material Boundary

X	Y
0	366.9
40	366.9
132.2	371.3
201	376.8
172.029	370.145

Material Boundary

X	Y
1.38778e-017	375.3
40	375.3
132.2	378.3
265	383.4
285	383.6

Material Boundary

X	Y
82.5127	384.456
132.2	386.3
265	390.4
285	390.6

Material Boundary

X	Y
0	383.8
40	383.8
67.51	383.799

Material Boundary

X	Y
106.149	387.073
132.2	388.3
221.8	391.3
265	393.4
285	393.6

Material Boundary

X	Y
221.8	391.3
224.786	394.301
227.81	397.341
259.45	429.143

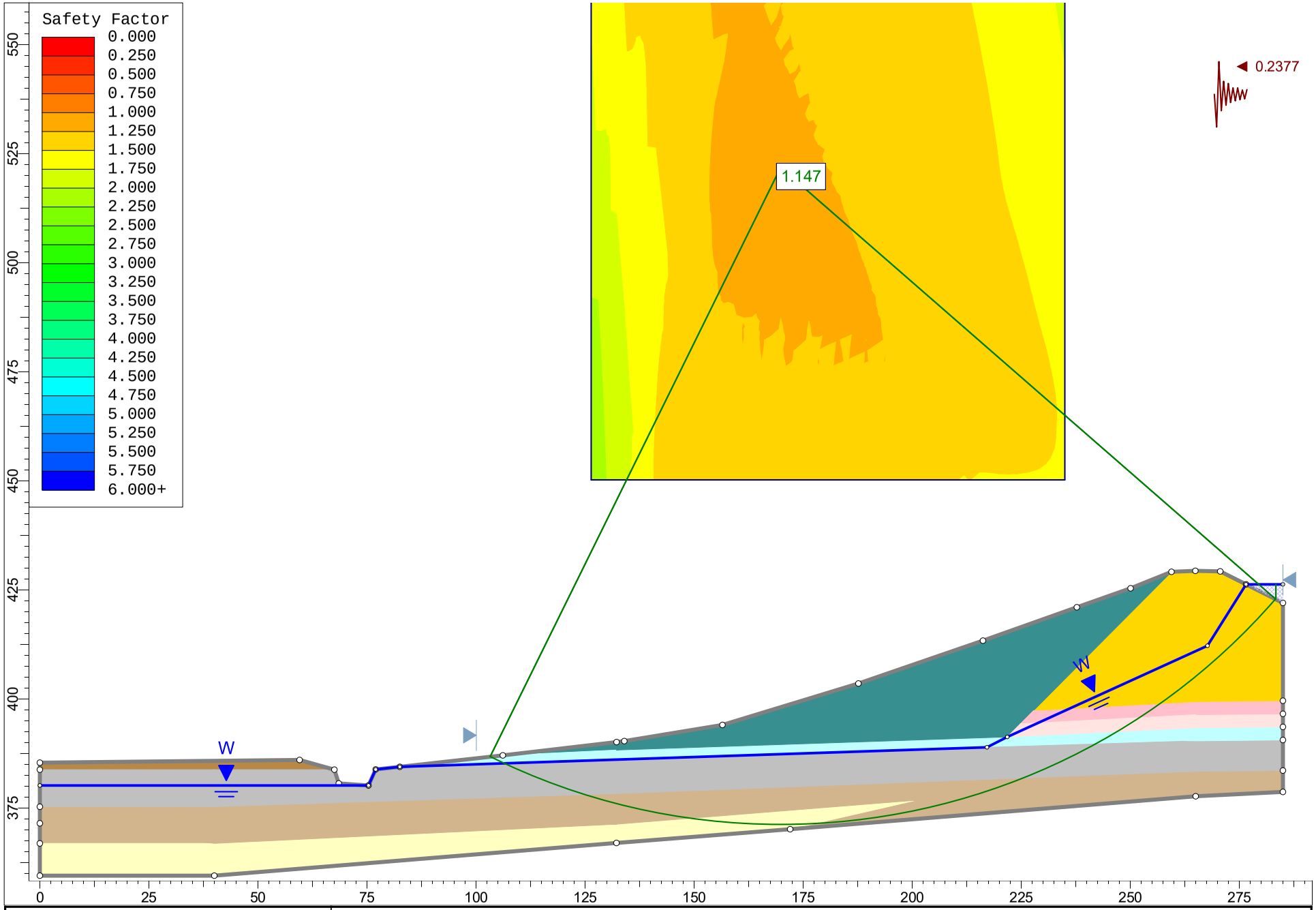
Material Boundary

X	Y
224.786	394.301
265	396.4
285	396.6

Material Boundary

X	Y

227.81	397.341
265	399.4
285	399.6



	Project: BREC Reid/HMPL Station CCR Surface Impoundment		
	Analysis Description: Cross Section RH-3 Seismic Loading Conditon		
	Drawn By:	Scale: 1:360	Company: Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date: 8/29/2016, 2:56:23 PM		File Name: RH-3 Seis.slim

Slide Analysis Information

BREC Reid HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-4
Last saved with Slide version: 6.039
Project Title: BREC Reid HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-4 Maximum Storage Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/4/2016, 12:09:41 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116

Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Lean Clay (CL)	Silty Clay (CL-ML)	Lean Clay With Sand (CL) (Dam)	Lean Clay (CL) (Dam)	Silty Sand (SM)	Outslope Material (Dam)	Lean Clay (CL) (1)	Lean Clay (CL)/Clayey Sand (SC)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	134.1	125.8	133.5	125.8	130	128	129.7	125.8
Cohesion [psf]	72	200	260	220	0	200	14.4	80
Friction Angle [deg]	30.4	33.7	30.6	30.4	33	30	28.7	29.6
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1	1	1	1	1

List Of Coordinates

Water Table

X	Y
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55.19	393.033
71.2842	395.917
141	397
151.1	397
185.3	405.78
200.877	426.28
215	426.28

External Boundary

X	Y
215	418.777
213.982	419.318
205.956	423.582
196.055	428.841
189.723	429.373
183.027	428.888
164.711	421.366
139.268	413.482
115.733	405.895
88.257	398.958
75.6909	396.706
71.2842	395.917
55.19	393.033
31.267	393.626
21.125	395.865
0	405.212
2.77556e-017	393.033
0	375.2
70.69	375.4
189.72	377.7
215	377.9
215	385.1
215	398.2
215	409.5

Material Boundary

X	Y
141	400
141	397
145.463	397
151.1	397
163.168	409.053
173.086	418.959
177.455	423.323
183.027	428.888

Material Boundary

X	Y
163.168	409.053
189.8	409.4

215	409.5

Material Boundary

X	Y
151.1	397
189.8	398
215	398.2

Material Boundary

X	Y
141	397
70.7	392.8
36.8	391
70.7	389.5
79.6711	389.266
189.8	386.4
215	385.1

Material Boundary

X	Y
71.2842	395.917
141	397

Material Boundary

X	Y
88.257	398.958
141	400

Material Boundary

X	Y
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189.8	419.1

Material Boundary

X	Y
189.8	419.1
213.982	419.318

Material Boundary

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189.8	423.4

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189.8	423.4
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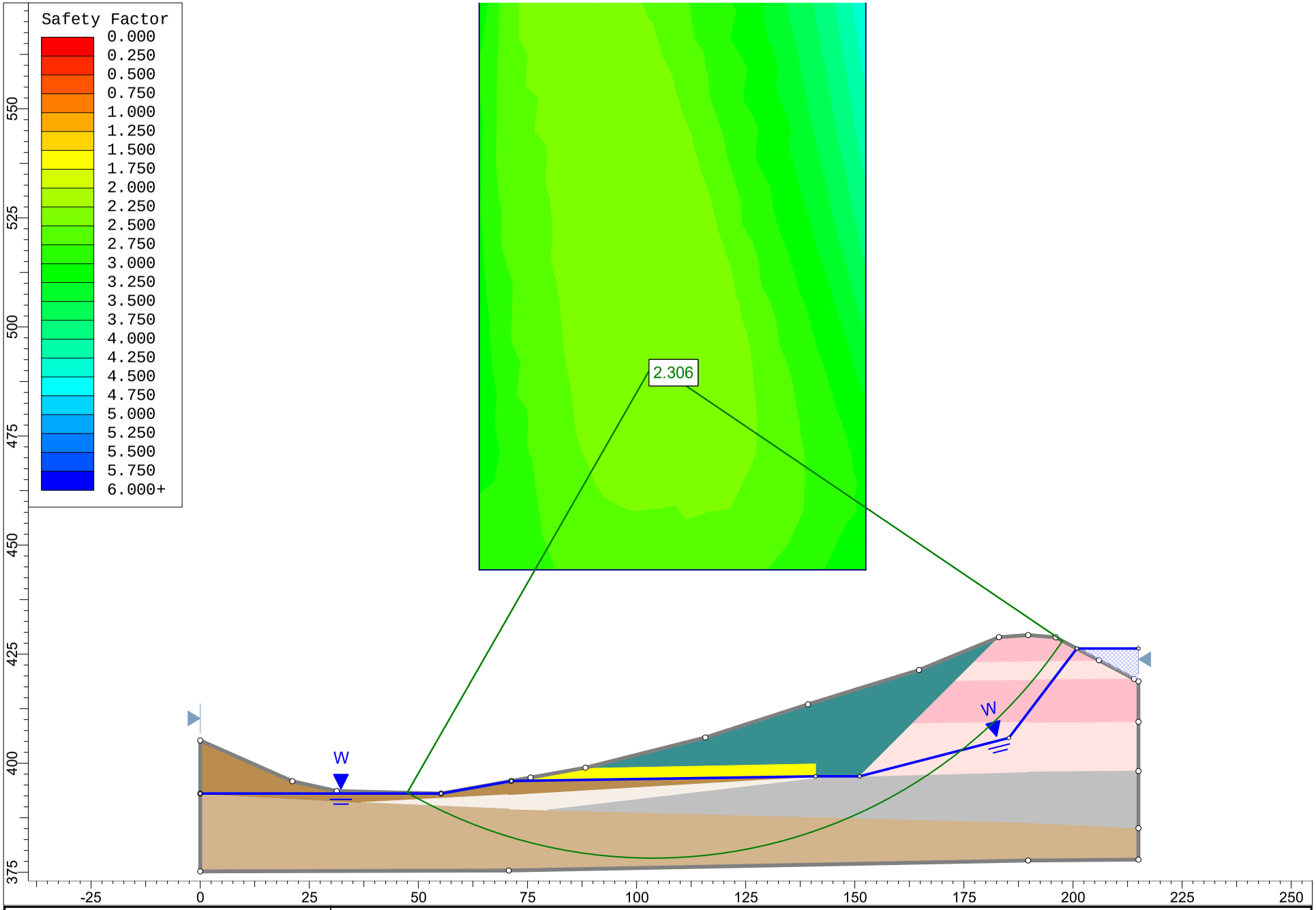
Material Boundary

X	Y
2.77556e-017	393.033
36.8	391

Material Boundary

X	Y
79.6711	389.266
145.463	397



Project	BREC Reid HMPL Station CCR Surface Impoundment		
Analysis Description	Cross Section RH-4 Maximum Storage Pool Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/4/2016, 12:09:41 PM		File Name RH-4.slim

SLIDEINTERPRET 6.039

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

File Name: RH-4 Surcharge
Last saved with Slide version: 6.039
Project Title: BREC Reid/HMPL Station CCR Surface Impoundment
Analysis: Cross Section RH-4 Maximum Surcharge Pool Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/4/2016, 12:09:41 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116

Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	Lean Clay (CL)	Silty Clay (CL-ML)	Lean Clay With Sand (CL) (Dam)	Lean Clay (CL) (Dam)	Silty Sand (SM)	Outslope Material (Dam)	Lean Clay (CL) (1)	Lean Clay (CL)/Clayey Sand (SC)
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Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	134.1	125.8	133.5	125.8	130	128	129.7	125.8
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55.19	393.033
71.2842	395.917
141	397
151.1	397
185.3	405.78
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External Boundary

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213.982	419.318
205.956	423.582
196.055	428.841
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183.027	428.888
164.711	421.366
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0	375.2
70.69	375.4
189.72	377.7
215	377.9
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Material Boundary

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Material Boundary

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Material Boundary

X	Y
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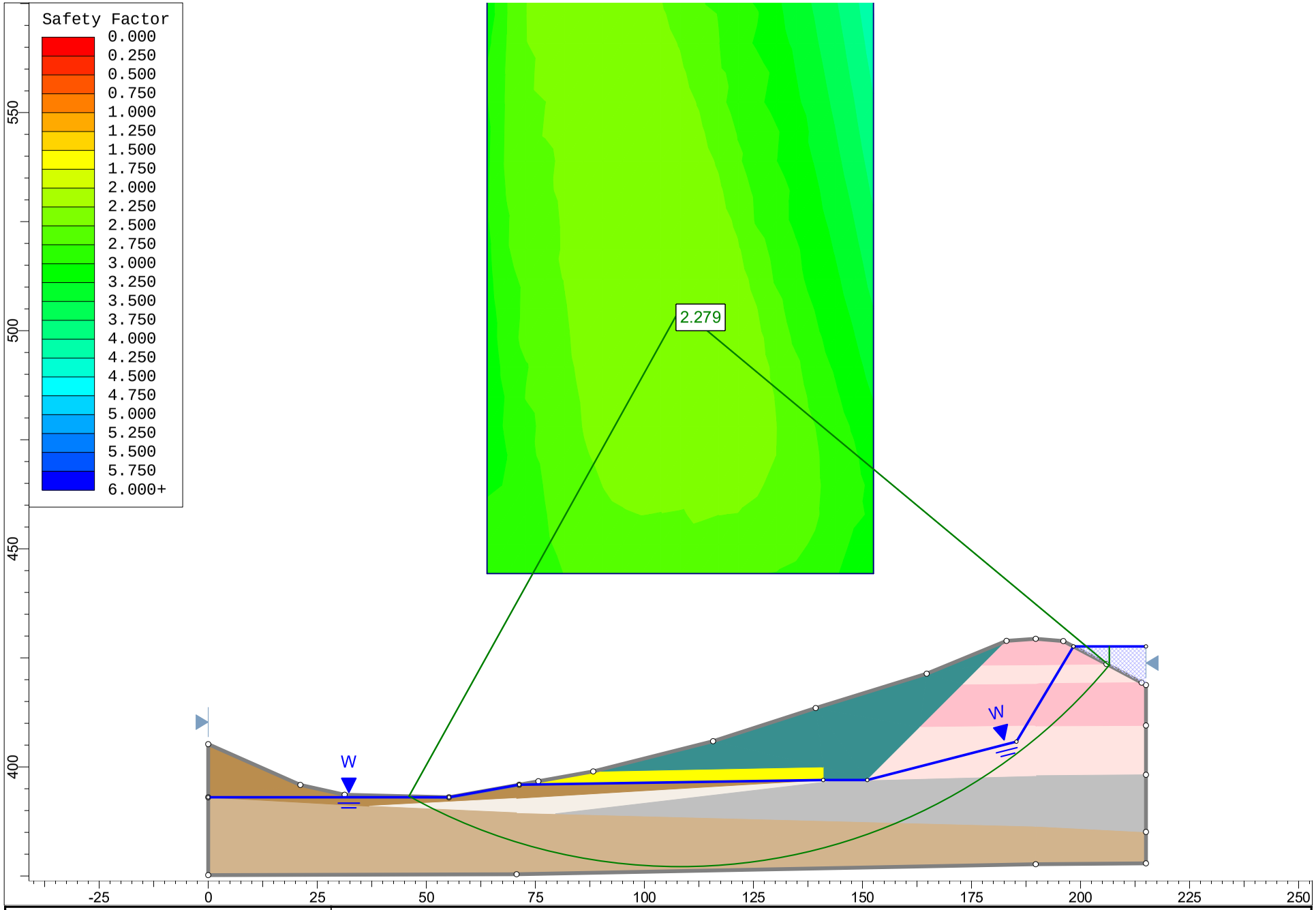

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	Analysis Description	Cross Section RH-4 Maximum Surcharge Pool Loading Condition		
	Drawn By		Scale 1:360	Company Associated Engineers, Inc.
SLIDEINTERPRET 6.039	Date	9/4/2016, 12:09:41 PM		File Name RH-4 Surcharge.slim

Slide Analysis Information

BREC Reid/HMPL Station CCR Surface Impoundment

Project Summary

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Last saved with Slide version: 6.039
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Analysis: Cross Section RH-4 Seismic Loading Condition
Company: Associated Engineers, Inc.
Date Created: 9/4/2016, 12:09:41 PM

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

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Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

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Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.2377

Material Properties

Property	Lean clay	Silty clay	Lean Clay with sand (dike)	Lean clay (dike)	Silty sand (SM)	Sandy wedge	Lean clay OG	Lean clay with sand
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	134.1	125.8	133.5	125.8	130	130	129.7	125.8
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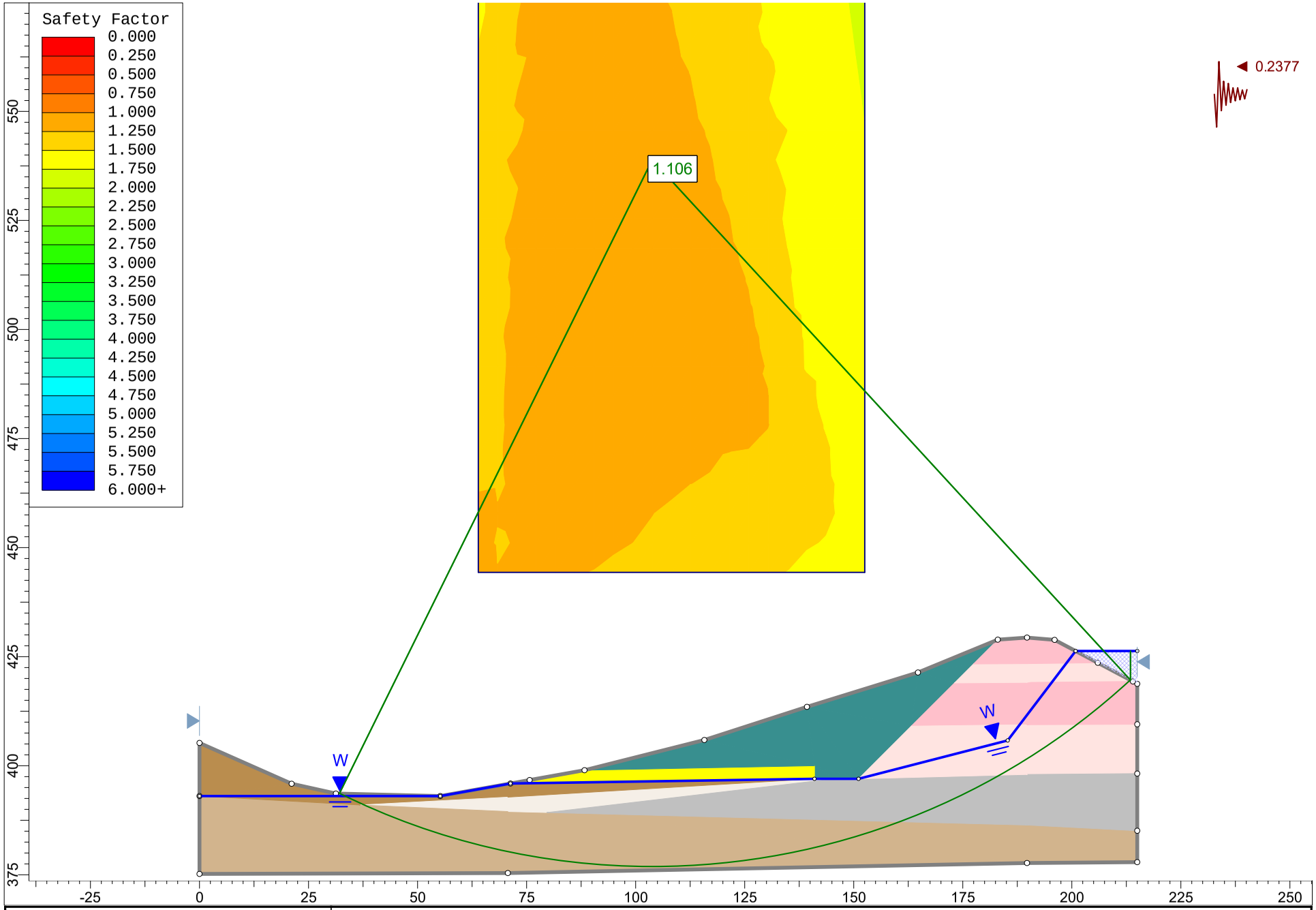

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Analysis Description	Cross Section RH-4 Seismic Loading Condition		
Drawn By		Scale 1:360	Company Associated Engineers, Inc.
Date	9/4/2016, 12:09:41 PM		File Name RH-4 Seis 2.slim

SLIDEINTERPRET 6.039

ATTACHMENT 13 - CLOSURE PLAN

Closure Plan for the Green Station CCR Surface Impoundment

Big Rivers Electric Corporation

Robert D. Green Generating Station

Coal Combustion Residual Rule Compliance

Closure Plan for the Green Station CCR Surface Impoundment

Prepared for

Big Rivers Electric Corporation
Robert D. Green Generating Station
Roberts, Kentucky

Revision 2
11/24/2020

Prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

.

INDEX AND CERTIFICATION

Big Rivers Electric Corporation
Closure Plan for the Green Station CCR Surface Impoundment

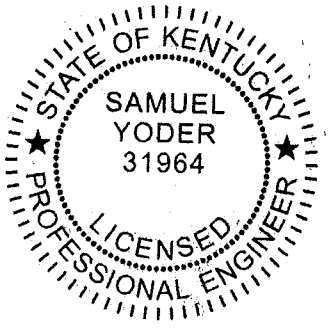
Report Index

Certification

I hereby certify, as a Professional Engineer in the State of Kentucky, that the information in this document was assembled under my direct supervisory control. This report is not intended or represented to be suitable for reuse by Big Rivers Electric Corporation or others without specific verification or adaptation by the Engineer.

Samuel Yoder, P.E. Kentucky License #31964

Date: 11/24/2020



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LIST OF FIGURES

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
BREC	Big Rivers Electric Corporation
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
cm/sec	centimeters per second
EPA	Environmental Protection Agency
FGD	Flue Gas Desulfurization
RCRA	Resource Conservation and Recovery Act
USACE	United State Army Corps of Engineers
U.S.C.	United States Code
WMB	Water Mass Balance

1.0 INTRODUCTION

On April 17, 2015, the Environmental Protection Agency (EPA) issued the final version of the federal Coal Combustion Residuals (CCR) Rule to regulate the disposal of coal combustion residual materials generated at coal-fired units. The rule is administered as part of the Resource Conservation and Recovery Act (RCRA, 42 United States Code [U.S.C.] §6901 et seq.), using the Subtitle D approach.

Big Rivers Electric Corporation (BREC) is subject to the CCR Rule and as such must develop a Closure Plan per 40 Code of Federal Regulations (CFR) §257.102. This document serves as BREC's Closure Plan for the Green Station (Green) CCR Surface Impoundment (Ash Pond).

According to §257.102(b)(1), the Closure Plan must contain the following:

- A description of how the CCR unit will be closed.
  - For in-place closure: A description of the final cover system, the methods for installing the final cover system, and the methods for achieving compliance with the standards outlined in §257.102(d).
  - For closure by removal: A description of the procedures to remove the CCR and decontaminate the CCR unit as outlined in §257.102(c).
- An estimate of the maximum amount of material ever stored in the CCR unit over its active life.
- An estimate of the largest area of the CCR unit ever requiring a final cover as required by §257.102(d) at any time during the CCR unit's active life.
- A schedule for completing closure activities, including the anticipated year of closure and major milestones for permitting and construction activities.

The seal on this report certifies that this document meets the requirements of 40 CFR §257.102(b). This closure plan is in addition to, not in place of, any other applicable site permits, environmental standards, or work safety practices.

2.0 DETAILS OF CLOSURE

2.1 Impoundment Description

Green is a coal-fueled electric generating station near Robards, Kentucky. The plant consists of Unit 1 and Unit 2 which are respectively 250MW and 242MW (gross) units commercialized in 1979 and 1981 respectively. Units 1 and 2 burn a blend of bituminous coal (pulverized). The plant utilizes the Ash Pond to manage the CCR and non-CCR wastestreams. The Ash Pond was constructed when the plant was built and has been in service for the life of the plant. The CCR wastestreams that are managed in the Ash Pond include sluiced bottom ash, economizer ash and Flue Gas Desulfurization (FGD) wastewater. All fly ash is now handled dry. The various non-CCR wastewaters routed to the Ash Pond originate from the Unit 1 and 2 boiler sumps, metal cleaning wastes, clarifier blowdown, bottom ash hopper seal water, miscellaneous drains including roof drains, landfill leachate, and various stormwater sources. A site plan is included in Appendix A.

2.1.1 CCR Inventory and Extent

Depth of impounded water and CCR is 3 feet and 18 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 396 feet and 400 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (October 2018) flight derived topographic contours and bathymetric survey data.

The remaining storage capacity is approximately 230,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

The approximate volume of CCR currently stored in the Ash Pond is 1,000,000 cubic yards. The maximum storage capacity is 1,230,000 cubic yards. This volume was calculated based on the most recent bathymetric survey, and the best available as-built data for the construction prior to placement of CCR.

2.2 Closure Method

The CCR Rule allows for CCR Units to be closed through removal of CCR or by leaving CCR material in-place. BREC intends to close the existing Ash Pond using a hybrid approach by consolidating CCR material (approximately 1 million cubic yards) within the existing Ash Pond area. The CCR material would be consolidated along the south side of the existing pond, where it will be capped with a CCR compliant system. This area accounts for approximately 16 acres that will require a final cover.

The remaining 10 acres will be closed by removal of CCR. This area will then be used as a water mass balance pond (WMB) for processing and holding of landfill leachate and stormwater.

To facilitate construction of the new water mass balance (WMB) pond and the pond closure, the existing non-CCR wastestreams will need to be managed. The pond water level will be lowered as much as feasible after ceasing the receipt of CCR and the permanent cessation of the coal-fired boilers and prior to the construction contractor coming on site. When the construction contractor begins construction, the remaining non-CCR wastestreams (essentially site stormwater and landfill leachate after the boilers cease coal-fired operations) will be managed using a series of temporary berms, ditches, and pumps to divert site stormwater to other locations. This will likely require KPDES permit modifications following the permanent cessation of the coal-fired boilers operation and the remediation of the coal pile to discharge water from the existing coal pile runoff pond to the Green River. Alternatively, the Contractor may choose to maintain a small portion of the current Ash Pond footprint to continue to receive these flows and pump them through a temporary treatment system to the existing outfall structure. The sequencing of construction and means and methods for the water management will be determined by the construction contractor once a contract is finalized with BREC.

While managing the incoming stormwater and leachate flows, the Contractor will initiate grading and relocating CCR material for the WMB pond and pond closure and continue dewatering and removing the interstitial water in the CCR material (with drainage ditches or potentially an engineered dewatering system) so that the consolidated CCR material is stabilized to allow for the closure in place to be performed in phases to meet the performance standards as required by §257.102(d). The discharge will be directed to the KPDES permitted Outfall #009 (the Ash Pond outfall), with temporary treatment systems installed if required by the permit. As grading is completed in certain areas, the contractor will begin forming a 10-acre WMB Pond to treat remaining process and stormwater flows from Green prior to discharge. The approximate volume of CCR in the ash pond is 1,000,000 cubic yards. Approximately 400,000 cubic yards will be removed for the WMB pond construction. The Contractor will remove the CCR material from the portion of the impoundment that will receive the new WMB pond berm and begin placing fill for the new berm. While this fill is placed in lifts, the Contractor will continue removing CCR from the WMB portion of the pond and compacting it on the outside of the berm in the portion of the pond to be capped in place.

In addition to the new berm, the work for the WMB construction may consist of the installation of a HDPE geomembrane liner, 12-inches of protective cover material, and 18-inches of riprap for the pond side slopes. This liner system will be finalized during detailed design and permitting for the WMB Pond.

Concurrent to the WMB Pond lining work, the contractor will begin placing the final cover system over the closed in place CCR material.

When the grading is complete and the WMB is in service the remaining stormwater and non-CCR wastestreams (landfill leachate) will be rerouted to the new pond and will continue to discharge through the existing KPDES outlet. The contractor will then finalize construction by seeding and stabilizing all disturbed areas.

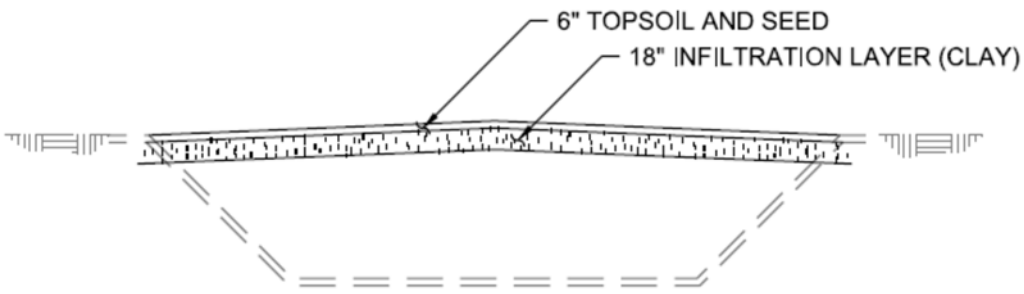
2.2.1 Final Cover System

Pursuant to §257.102(d)(3)(i), the final cover system must be designed and constructed to meet the following criteria:

- Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than $1x10^{-5}$ centimeters per second (cm/sec), whichever is less.
- The infiltration of liquids through the closed CCR unit must be minimized by use of an infiltration layer that contains a minimum of 18 inches of earthen material.
- The erosion of the final cover system must be minimized by use of an erosion layer that contains a minimum of six inches of earthen material capable of sustaining native plant growth.
- The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.
- The owner or operator may select an alternative final cover system design, provided the alternative final cover system meets the above requirements.

The typical final cover system will consist of an 18-inch thick, earthen (clay) infiltration layer with a 6-inch thick topsoil erosion layer capable of sustaining native plant growth. A cross section of the typical final cover system is shown in Figure 2-1.

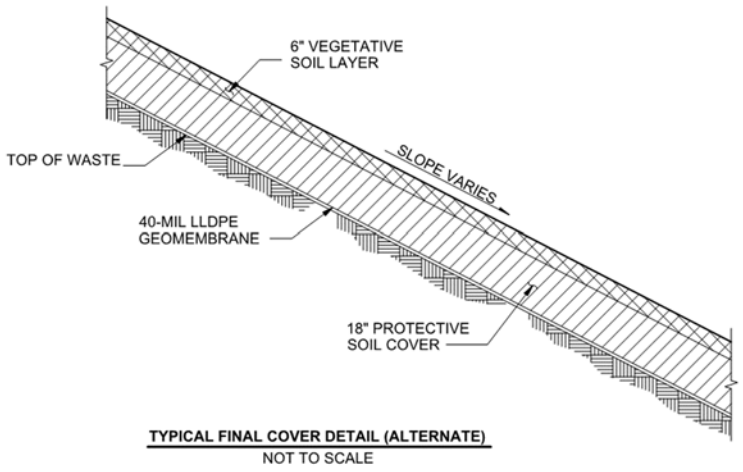
Figure 2-1: Typical Final Cover System



Because the Ash Pond bottom was not constructed to meet low permeability specifications, the cover system will be designed to meet the permeability limit of 1 x 10^{-5} cm/sec noted in the CCR Rule. The required permeability value will be achieved using clay with properties meeting the developed specification criteria. The infiltration layer will be constructed according to proper quality control methods.

An alternative final cover system may be utilized in lieu of the above described typical final cover system, over the Ash Pond (see Figure 2-2). This alternative system uses a geomembrane component to achieve the minimum permeability requirements of the CCR Rule, rather than relying on the permeability of the 18-inches of infiltration material.

Figure 2-2: Typical Alternative Final Cover System



2.2.1.1 Geometry and Stormwater Management

The geometry and stormwater management controls of the closed impoundment will allow the CCR unit to meet the following requirements as outlined in §257.102(d) of the CCR Rule:

- Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere.
- Prevent future impoundment of water.
- Provide for slope stability to protect against sloughing or movement of the final cover system.

The final closure system grade will slope at a minimum of 2.0 percent over the capped Ash Pond surface to prevent the collection of standing water and limit the velocity of storm water runoff to reduce the

potential for soil erosion. Intermediate swales will be utilized with a minimum slope of 2.0 percent, as appropriate, to limit the maximum overland flow distance, thereby limiting the chance for ponding water, as well as limiting the infiltration of run-off. The intermediate swales will collect area runoff and convey it to the WMB Pond which will discharge through an KPDES permitted outlet.

The period for greatest soil erosion will be immediately after placement of the topsoil material before vegetation is established. Manufactured erosion control products, as well as a seed mix containing quick-growth seed varieties, will aid in minimizing erosion during this timeframe.

2.2.1.2 Integrity of the Final Cover

Settling and subsidence of the final cover system is expected to be minimal. Settlement would potentially be caused by consolidation of the CCR material or underlying natural subsoils under new loads from construction activities; however, this settlement will likely occur during site grading activities and is expected to be minimal after the cover is installed. CCR material will be placed in a controlled manner to minimize post-construction installation settlement. The underlying natural subsoils at the site are not prone to long-term settlement.

2.2.2 Final Cover Schedule

According to §257.101 of the CCR Rule, closure of the existing impoundment must commence no later than 6 months following the date on which a closure event is triggered, or no later than 30 days following the last known receipt of CCR or non-CCR wastewater by the impoundment. The current schedule is for BREC to cease sending CCR to the Ash Pond in the late spring of 2022. BREC intends to prepare design drawings, obtain the appropriate permits and award the contract for closure prior to removing the pond from service so that closure can commence within 30 days.

The estimated closure schedule is as follows:

Mobilization	June 2022
Pond Dewatering	June 2022 – August 2022
Cut/Fill and Removal of CCR	August 2022 – May 2023
Winter Shutdown	December 2022 – March 2023
Install final cover system	May 2023 – July 2023
WMB Construction	May 2023 – August 2023
Topsoil and Seeding	August 2023 – September 2023
Deadline to complete closure	October 17, 2023

2.2.2.1 Closure Completion

The CCR Rule does not define "closure complete" for CCR units. For the purposes of this Closure Plan, closure of the impoundment is considered complete when the final cover system is installed, and the applicable construction completion documentation is finalized.

Within 30 days of completion of closure of the impoundment, BREC must prepare a notification of closure of the impoundment and place it in the facility's CCR Operating Record and on BREC's CCR public website. This notification shall include certification by a qualified professional engineer in the State of Kentucky verifying that closure has been completed in accordance with this Closure Plan and the requirements of §257.102. Additionally, BREC must record a notation on the deed to the property following completion of closure of the impoundment in accordance with §257.102(i). The purpose of this notation is to inform any potential future owner of the property of the previous use of the land, and that the land is restricted by post-closure care requirements.

3.0 REVISIONS AND AMENDMENTS

The initial Closure Plan was placed in the CCR Operating Record on October 11, 2016. If the Closure Plan is revised, the written Closure Plan will be amended no later than 30 days following the triggering event. Additionally, the written Closure Plan will be amended at least 60 days prior to a planned change in the operation of the Impoundment, or no later than 60 days after an unanticipated event. The initial Closure Plan and any amendment will be certified by a qualified professional engineer in the State of Kentucky for meeting the requirements of §257.102 of the CCR Rule. All amendments and revisions must be placed on the CCR public website within a reasonable amount of time following placement in the facility's CCR Operating Record. A record of revisions made to this document is included in Section 4.0 of this document.

4.0 RECORD OF REVISIONS AND UPDATES

Date	Revisions Made	By Whom
10/11/2016	Initial Issue	Associated Engineers, Inc.
09/13/2017	Revision 1	Associated Engineers, Inc.
11/24/2020	Revision 2 – Updated schedule and added detail to closure method	Burns & McDonnell

APPENDIX A – SITE PLAN

NORTH

0 200' 400'
SCALE IN FEET

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
A	09/11/20	MDB	ETT	ISSUED FOR OWNER REVIEW

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400

designed M. BLEYTHING | detailed J. RIDDER

Big Rivers ELECTRIC CORPORATION
Your Touchstone Energy® Cooperative
ROBERT D. GREEN STATION
WEBSTER COUNTY, KENTUCKY

BREC GREEN STATION
CCR & ELG COMPLIANCE PROJECT
ASH POND CLOSURE SITE PLAN

project 126878 | contract
drawing SK-C001 | rev. A
sheet of sheets
file 126878SK-C001.DGN

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Scale For Microfilming
Millimeters
Inches

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