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April 13, 2018

Tennessee Valley Authority  
1101 Market Street  
Chattanooga, TN 37402

**Closure and Post Closure Plan  
Main Ash Pond  
EPA Final CCR Rule  
TVA Bull Run Fossil Plant  
Clinton, Tennessee**

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**1.0 PURPOSE**

This letter documents AECOM's certification of the closure and post-closure plan for the TVA Bull Run Fossil Plant's Main Ash Pond.

**2.0 CLOSURE AND POST-CLOSURE PLAN**

The Closure Plan describes the steps necessary to close the Main Ash Pond at any time during the life of the Main Ash Pond, and is subject to the requirements described in 40 CFR §257.102(b). The Post-Closure Plan describes the monitoring and maintenance activities to be performed during the post-closure period of the Main Ash Pond, and is subject to the requirements of 40 CFR §257.104(d).

**3.0 SUMMARY OF FINDINGS**

The attached closure and post-closure plan demonstrates compliance with the requirements set forth in 40 CFR §§ 257.102(b) and 257.104(d).

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#### 4.0 CERTIFICATION

I, Thomas Kovacic PE, being a Professional Engineer in good standing in the State of Tennessee, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;
2. that the information contained herein is accurate as of the date of my signature below;
3. that the closure plan for the TVA Bull Run Fossil Plant's Main Ash Pond meet(s) the requirements described in 40 CFR 257.102(b) and
4. that the post-closure plan for the TVA Bull Run Fossil Plant's Main Ash Pond meet(s) the requirements of 40 CFR 257.104(d).

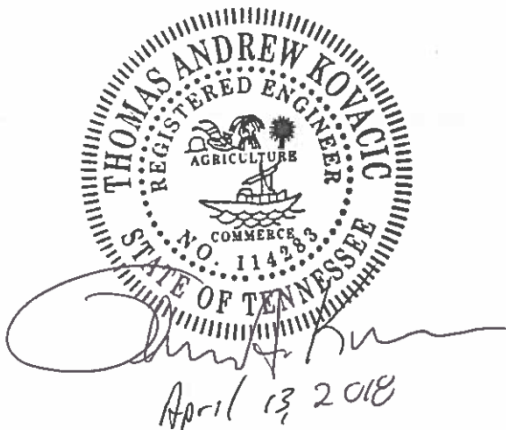
SIGNATURE \_\_\_\_\_

DATE 4-13-2018

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ATTACHMENTS: Closure (40 CFR 257.102(b)(1)) and Post-Closure Plan (40 CFR 257.104(d)(1)) for Coal Combustion Residuals (CCR)



**COAL COMBUSTION PRODUCT DISPOSAL PROGRAM**  
**Tennessee Valley Authority – Bull Run Fossil Plant (BRF)**  
**Main Ash Pond**  
**Anderson County, Tennessee**

**CLOSURE (40 CFR 257.102(b)(1)) AND  
POST-CLOSURE PLAN ((40 CFR 257.104(d)(1))  
FOR COAL COMBUSTION RESIDUALS (CCR)  
INACTIVE SURFACE IMPOUNDMENT**

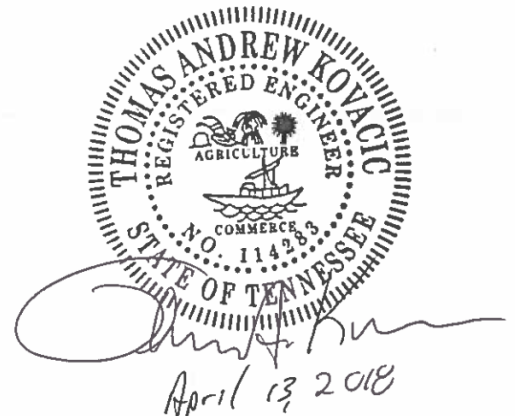
Prepared for



Tennessee Valley Authority  
1101 Market Street  
Chattanooga, TN 37402-2801

April 13, 2018

Prepared by





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## 1.0 Introduction

This Coal Combustion Residual (CCR) Rule closure and post-closure plan is conceptual and is subject to the completion of all necessary environmental reviews. It describes the CCR closure and post-closure activities at the TVA Bull Run Fossil Plant (BRF) to demonstrate that Main Ash Pond will be closed and maintained in accordance with the CCR closure and post-closure requirements of 40 CFR §§257.102 and 104, respectively.

## 2.0 Written Closure Plan - 40 CFR § 257.102(b)(1)

**40 CFR § 257.102(b)(1).** *Written Closure Plan – (1) Content of the Plan. The owner or operator of a CCR unit must prepare a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the CCR unit consistent with recognized and generally accepted good engineering practices. The written closure plan must include, at a minimum, the information specified in paragraphs (b)(1)(i) through (vi) of this section.*

- (i) A narrative description of how the CCR unit will be closed in accordance with this section.*
- (ii) If closure of the CCR unit will be accomplished through the removal of CCR from the CCR unit, a description of the procedures to remove the CCR and decontaminate the CCR unit in accordance with paragraph (c) of this section.*
- (iii) If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with paragraph (d) of this section, and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in paragraph (d) of this section.*
- (iv) An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit.*
- (v) An estimate of the largest area of the CCR unit ever requiring a final cover as required by paragraph (d) of this section at any time during the CCR unit's active life.*
- (vi) A schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR unit, including identification of major milestones such as coordinating and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phase of CCR surface impoundment closure, or installation of the final cover system, and the estimate timeframes to complete each step or phase of CCR unit closure.*



## 2.1 Closure Activities- § 257.102(b)(1)(i)

The BRF Main Ash Pond is proposed to be closed and repurposed as Process Water Basin 2 (PWB2). See **Exhibit 1** in **Appendix A** for the BRF Closure Schematics. For the portion of the pond that will be repurposed as PWB2, the CCR will be removed down to one foot below the original grade of the Main Ash Pond. The remaining portion of the Main Ash Pond will be closed in place. Closure activities include, but are not limited to, decanting water, subgrade preparation, excavation and regrading of material, liner placement, final cover system installation, and site remediation.

Final Closure of Main Ash Pond is anticipated to include the following general tasks:

- Installing erosion and sediment controls;
- Begin decanting the Main Ash Pond;
- Removal, staging, drying, and disposal of CCR from within the proposed footprint of PWB2 to the Dry Fly Ash Stack Lateral Expansion (landfill);
- Reconstruction of the subgrade of the proposed PWB2 using clean structural fill;
- Re-grading of existing CCR material from within the remaining Main Ash Pond as necessary to achieve the design grades;
- Installation of drainage layer and liner system within PWB2;
- Installation of liner system over the regraded portion of the Main Ash Pond;
- Installation of permanent storm water control structures;
- Erosion protection with the establishment of vegetation, placement of riprap, or other alternate erosion protection meeting the requirements of the Rule.

## 2.2 Closure Type/Closure in Place - § 257.102(b)(1)(iii)

The closure of Main Ash Pond, which will be repurposed as PWB2, will be accomplished by closure in place. However, the CCR below the footprint of the proposed PWB2 will be removed down to one foot below the original grade of the Main Ash Pond. PWB2 will be lined, and the synthetic liner system will be continuous through the entire closure of the Main Ash Pond, acting as a component of the barrier cap beyond the footprint of PWB2. The final cover system and closure design elements will meet the CCR closure in-place performance standards described in **Section 2.8**.

## 2.3 Maximum CCR Inventory - § 257.102(b)(1)(iv)

The estimated maximum inventory of CCR ever in the Main Ash Pond is approximately 972,500 CY of accumulated solids. A majority of the CCR will be removed from the bottom of Main Ash Pond and disposed of at the permitted landfill.

Wet sluicing activities ceased in 2015 at BRF. Therefore, no additional CCR will accumulate in the impoundment.



## 2.4 Largest Area Requiring Final Cover - § 257.102(b)(1)(v)

The estimated largest area requiring a final cover of the Main Ash Pond is approximately 30 acres.

## 2.5 Schedule of Closure Activities - § 257.102(b)(1)(vi)

The following sequential steps are necessary to complete the closure activities of 40 CFR 257.102 and their estimated scheduled completion dates are provided in **Table 1: Schedule of Closure Activities**. The closure schedule is subject to change due to contractor availability, subsurface conditions, weather, equipment, and available material resources.

Table 1: Schedule of Closure Activities

	<b>Closure Activity</b>	<b>Estimated Date</b>
1.	Preliminary Planning, Design, and Regulatory Agency Permitting	In Progress
2.	Decanting, Subgrade Stabilization, and Mass Grading	2019
3.	Final Cover Installation	2020
4.	Completion of closure	2020
5.	Completion of post-closure period	2050

## 2.6 Estimated Year of Closure Completion- § 257.102(b)(1)(vi)

The estimated year for completion of all closure activities is 2020.

## 2.7 Request for Time Extension

If estimated that the time required to complete closure will exceed the regulatory timeframes, site-specific information, factors and considerations will be provided to support any time extensions.

## 2.8 Performance Standards: CCR Closure In-Place - 40 CFR § 257.102(d)(1)

**40 CFR § 257.102(d)(1).** Closure performance standard when leaving CCR in place –

- (1) The owner or operator of a CCR unit must ensure that, at a minimum, the CCR unit is closed in a manner that will:





- (i) 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;*
- (ii) Preclude the probability of future impoundment of water, sediment, or slurry;*
- (iii) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;*
- (iv) Minimize the need for further maintenance of the CCR unit; and*
- (v) Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.*

### **2.8.1 Control of Infiltration and Releases - § 257.102(d)(1)(i)**

TVA will control, minimize or eliminate, to the 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, through the following measures:

- 1) Installation of a final cover system that minimizes infiltration. Design specifications of the final cover system are described in **Section 2.10.2**.
- 2) Using appropriate erosion and sediment control.
- 3) Surface grading described in **Section 2.8.2**.

For the portion of the closed Main Ash Pond that will be converted into PWB2, the liner system will include a subsurface drainage layer, a geocomposite clay liner, and a 60-mil geomembrane liner protected by a stone cover. All of the CCR below the footprint of the pond will be removed, and the subgrade will be reconstructed using clean structural fill. The liner system for PWB2 will create an impermeable barrier between the pond floor and the subgrade underneath.

### **2.9 Prevention of Future Impoundment of Water, Sediment, or Slurry – § 257.102(d)(1)(ii)**

A portion of the closed Main Ash Pond will be converted into PWB2. TVA will preclude the probability of future impoundment of water, sediment, or slurry at the closed Main Ash Pond outside of the limits of PWB2 through the following measures:

- 1) Final Cover System: The final cover system will be designed to shed surface water to the proposed PWB2. The cover system will include an impermeable 60-mil LLDPE geomembrane liner with 2 feet of soil and vegetative cover. A geocomposite drainage layer will be incorporated into the liner system, and will daylight into the proposed PWB2.



- 2) Underdrain System: A subsurface underdrain system will be incorporated into the liner system under PWB2 to promote drainage underneath the liner during periodic maintenance and during construction of PWB2.
- 3) Storm water Management: PWB2 will be designed to manage storm water for all events up to and including the 1000-year, 24-hour storm.

### **2.9.1 Slope Stability Measures - § 257.102(d)(1)(iii)**

TVA will include measures that reduce risk of sloughing or movement of the final cover system during the closure and post-closure period, including:

- 1) The impoundment will be decanted and actively dewatered during construction to improve slope stability.
- 2) Moisture conditioning and compaction of the subgrade to provide a stable and competent base for the construction of the PWB2 subgrade and the final cover system will be performed prior to liner system and final cover installation.
- 3) The closed Main Ash Pond and PWB2 will be designed and graded to prevent sloughing or movement of the final cover system during closure and post-closure period by the selection of cover materials with adequate internal and interface shear strength to provide cover system stability.

### **2.9.2 CCR Unit Maintenance - § 257.102(d)(1)(iv)**

The design and construction of the final system will minimize the need for further maintenance of the CCR unit.

The final cover system will be vegetated at the dry portion of the closed Main Ash Pond, and PWB2 will use protective stone cover to minimize erosion and future maintenance requirements. The existing weir within the Main Ash Pond, which consists of a concrete weir, will be replaced with a cast-in-place concrete overflow structure with stoplogs. The weir structure will be set on a spread footing within the splitter dike. The footings of the overflow structure will be placed on a bed of compacted ash and No. 57 stone with geogrid placed every foot of depth within the bedding material.

### **2.9.3 Completion of Closure - § 257.102(d)(1)(v)**

Closure will be completed in the shortest amount of time practical, consistent with recognized and generally accepted good engineering practices.

## **2.10 Drainage and Stabilization of Surface Impoundments - § 257.102(d)(2)**

**40 CFR § 257.102(d)(2).** *Drainage and stabilization of CCR surface impoundments.*



*The owner or operator of a CCR surface impoundment or any lateral expansion of a CCR surface impoundment must meet the requirements of paragraphs (d)(2)(i) and (ii) of this section prior to installing the final cover system required under paragraph (d)(3) of this section.*

- (i) Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.*
- (ii) Remaining wastes must be stabilized sufficient to support the final cover system.*

Prior to installation of a final cover system to a CCR surface impoundment:

- Free liquids will be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues; and
- Remaining wastes will be stabilized sufficient to support the final cover system.
- In PWB2, the subgrade will be reconstructed using clean, compacted structural fill prior to installing the subsurface drainage layer and liner system.

## **2.11 Final Cover System Design (or Alternative) - § 257.102(d)(3)**

**40 CFR § 257.102(d)(3).** *Final cover system. If a CCR unit is closed by leaving CCR in place, the owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and at a minimum, meets the requirements of paragraph (d)(3)(i) of this section, or the requirements of the alternative final cover system specified in paragraph (d)(3)(ii) of this section.*

- (i) The final cover system must be designed and constructed to meet the criteria in paragraphs (d)(3)(i)(A) through (D) of this section. The design of the final cover system must be included in the written closure plan required by paragraph (b) of this section.*
  - (A) The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than  $1 \times 10^{-5}$  cm/sec, whichever is less.*
  - (B) The infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material.*
  - (C) The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.*
  - (D) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.*
- (ii) The owner or operator may select an alternative final cover system design, provided the alternative final cover system is designed and constructed to meet the criteria in*

*paragraphs (d)(3)(ii)(A) through (C) of this section. The design of the final cover system must be included in the written closure plan required by paragraph (b) of this section.*

*(A) The design of the final cover system must include an infiltration layer that provides an equivalent reduction in infiltration as the infiltration layer specified in paragraphs (d)(3)(i)(A) and (B) of this section.*

*(B) The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in paragraph (d)(3)(i)(C) of this section..*

*(C) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.*

### **2.11.1 Final Cover System Design Standards - § 257.102(d)(3)(i)**

An alternative final cover system is proposed for the closure of this facility. Additional information on the alternative final cover system is included in section 2.11.2.

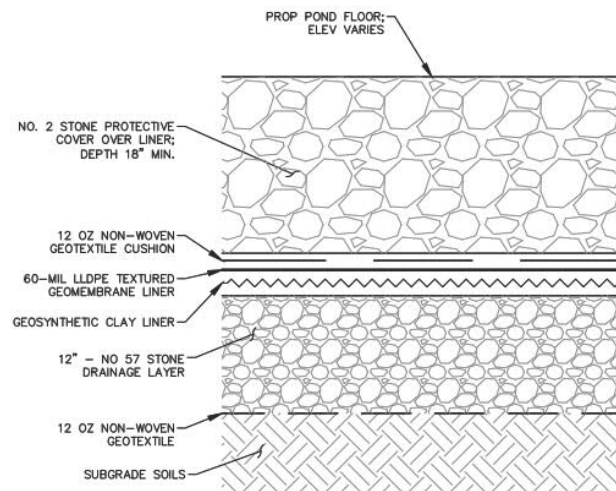
### **2.11.2 Alternative Final Cover System Design - § 257.102(d)(3)(ii)**

For the dry portion of the closure of the Main Ash Pond, a liner system consisting of a 60-mil geomembrane liner, overlain by a geocomposite drainage layer, 2 feet of soil, and a vegetative cover will be used.

An alternative final cover system has been proposed for PWB2 to minimize infiltration and erosion. The final cover system consists of the following elements:

- No. 57 stone drainage layer
- Geosynthetics: A 60-mil linear low density polyethylene (LLDPE) geomembrane will serve as the impermeable layer. The permeability of this geomembrane is significantly less than  $1 \times 10^{-5}$  cm/s. A geotextile may be employed below the drainage layer and above the geomembrane to minimize constructability concerns. A geosynthetic clay liner will be placed above the drainage layer;
- Protective cover: A No. 2 protective stone layer will be placed above the geosynthetics to act as a protective cover.

**Figure 1** provides an illustration of the Alternative 1 Final Cover.



**Figure 1: Alternative 1 Final Cover**

The proposed final cover system in Figure 1 is recommended for placement within the PWB2, as the impoundment will be constructed to treat Plant process water and storm water. A vegetative cover system is not feasible for this area.

**2.11.3 Methods and Procedures for Installation of Final Cover - § 257.102(b)(1)(iii)**

As required by 40 CFR §257.102(b)(1)(iii), the following methods and procedures will be used in the installation of the final cover.

After the completion of decanting, drying, and stabilization if necessary, the existing subgrade will be graded and compacted to provide a stable and competent base for the final cover system in the impoundment. CCR material within the design grades of PWB2 will be removed and disposed of in the permitted landfill. The subgrade of PWB2 will be re-constructed with clean structural fill, placed in 8-inch loose lifts and compacted to 95% of the maximum dry density and within 3% of the optimum moisture content.

Upon reaching design subgrades, the final cover system will be installed. The final grades can be found in **Exhibit 1** located in **Appendix A**.

**2.11.4 Professional Engineer Certification - § 257.102(d)(3)(iii)**

**40 CFR § 257.102(d)(3)(iii).** *The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the design of the final cover system meets the requirements of this section.*



A professional engineer will provide a written certification stating that the design of the final cover system meets the requirements of 40 CFR §257.102. The certification will be included in the facility's notification of intent to close Main Ash Pond, as per 40 CFR §257.102(g).

### 3.0 Written Post-Closure Plan - 40 CFR § 257.104(d)(1)

**40 CFR § 257.104(d)(1).** *Written Post-Closure Care Plan. (1) Content of the plan. The owner or operator of a CCR unit must prepare a written post-closure plan that includes at a minimum, the information specified in paragraph (d)(1)(i) through (iii) of this section.*

- (i) A description of the monitoring and maintenance activities required in paragraph (b) of this section for the CCR unit, and the frequency at which these activities will be performed;*
- (ii) The name, address, telephone number, and email address of the person or office to contact about the facility during the post-closure care period;*
- (iii) A description of the planned uses of the property during the post-closure period. Post-closure use of the property shall not disturb the integrity of the final cover, liner(s), or any other component of the containment system, or the function of the monitoring system unless necessary to comply with the requirements in this subpart. Any other disturbance is allowed if the owner or operator of the CCR unit demonstrates that disturbance of the final cover, liner, or other component of the containment system, including any removal of CCR, will not increase the potential threat to human health or the environment. The demonstration must be certified by a qualified professional engineer, and notification shall be provided to the State Director that the demonstration has been placed in the operating record and on the owner's or operator's publicly accessible internet site.*

### 3.1 Monitoring and Maintenance Activities - § 257.104(d)(1)(i)

**40 CFR § 257.104(b).** *Post-closure care maintenance requirements. Following closure of the CCR unit, the owner or operator must conduct post-closure care for the CCR unit, which must consist of at least the following:*

- (1) Maintaining the integrity and effectiveness of the final cover system, including making repairs to the final cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover;*
- (2) If the CCR unit is subject to the design criteria under 40 CFR §257.70, maintaining the integrity and effectiveness of the leachate collection and removal system and operating the leachate collection and removal system in accordance with the requirements of 40 CFR §257.70; and*





*(3) Maintaining the groundwater monitoring system and monitoring the groundwater in accordance with the requirements of 40 CFR §257.90 through 257.98.*

In accordance with 40 CFR §257.104(d)(1)(i), post-closure care for the closed Main Ash Pond will address the following systems as required under 40 CFR §257.104(b), along with the frequencies for the identified monitoring and maintenance activities:

- Final cover system;
- Underdrain water collection and removal system; and
- Groundwater monitoring system.

### **3.1.1 Final Cover System - § 257.104(b)(1)**

TVA will maintain the integrity and effectiveness of the final cover system, and make repairs as necessary to correct the effects of settlement, subsidence, erosion, and other events, and prevent run-on and run-off from eroding or otherwise damaging the final cover. The final cover will be maintained by inspection and corrective measures.

### **3.1.2 Leachate Collection and Removal System - § 257.104(b)(2)**

No leachate collection and removal system is associated with the closure of Main Ash Pond and/or the construction of PWB2. An underdrain water collection system will be installed within PWB2 to keep the subgrade immediately below the liner system dry during the liner installation and to handle any subsurface water during periodic maintenance. Subsurface water will be drained towards sumps, where a sideslope riser with a pumping system will be used to manage water. Multiple sumps and sideslope riser/pumps will be installed.

### **3.1.3 Groundwater Monitoring System - § 257.104(b)(3).**

The groundwater monitoring system will be designed and maintained in accordance with the CCR Rule, 40 CFR §257.90 through 98.

All monitoring devices, including groundwater wells, will be maintained throughout the active life and post-closure period of PWB2.

## **3.2 Contact Information - § 257.104(d)(1)(ii)**

The following contact information is provided for the Bull Run Fossil Plant for the post-closure period:

Owner: Tennessee Valley Authority, as agent for the United States of America  
Contact: Civil Projects & CCP Management, Strategy and Engineering



1101 Market Street  
Chattanooga, TN 37402-2801

Phone: 844-342-0012

Email: [tvainfo@tva.com](mailto:tvainfo@tva.com)

### **3.3 Planned Uses - § 257.104(d)(1)(iii)**

The planned use of a portion of the Main Ash Pond during the post-closure period is a process water basin, known as Process Water Basin 2. The remaining area of the Main Ash Pond will be lined with a geomembrane and closed in place.

Post-closure use of the property will not disturb the integrity of the final cover, liner(s), or any other component of the containment system, or the function of the monitoring systems, unless necessary to comply with the requirements of the CCR Rule under 40 CFR §257.

Any other disturbance is allowed if the owner or operator of the CCR unit demonstrates that disturbance of the final cover, liner, or other component of the containment system, including any removal of CCR, will not increase the potential threat to human health or the environment. The demonstration must be certified by a qualified professional engineer, and notification shall be provided to the State Director that the demonstration has been placed in the operating record and on the owner's or operator's publicly accessible internet site.

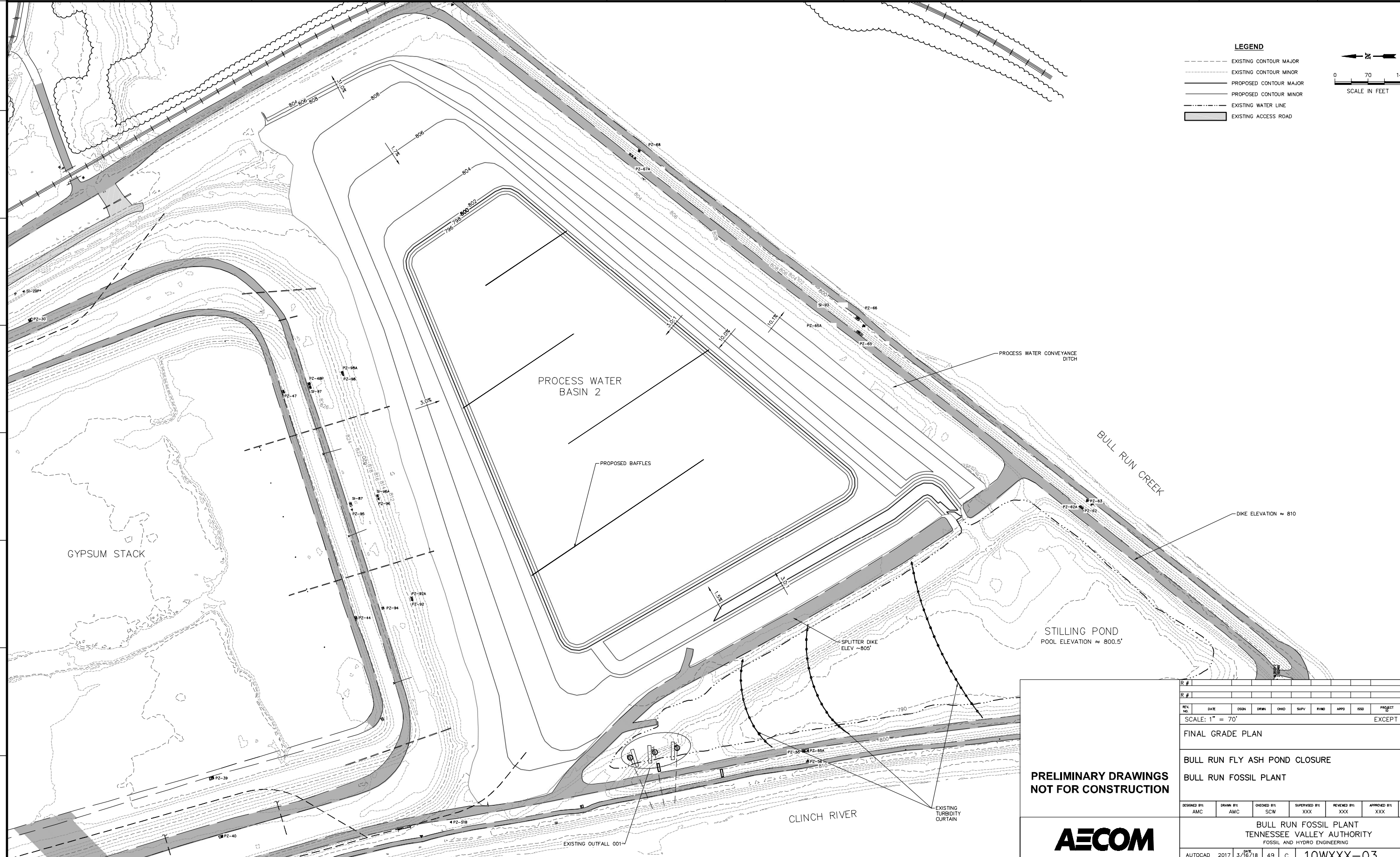


# APPENDIX A

**LEGEND**

- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- EXISTING WATER LINE
- █ EXISTING ACCESS ROAD

0 70 140  
SCALE IN FEET



R #										DISCIPLINE
R #										INTERFACE
REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RYND	APPR	PROJCT	AS CONST	75
SCALE: 1" = 70'										EXCEPT AS NOTED
FINAL GRADE PLAN										
BULL RUN FLY ASH POND CLOSURE										
BULL RUN FOSSIL PLANT										
DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:				
AMC	AMC	SCW	XXX	XXX	XXX	XXX				
BULL RUN FOSSIL PLANT										
TENNESSEE VALLEY AUTHORITY										
FOSSIL AND HYDRO ENGINEERING										
AUTOCAD	2017	3/16/18	49	C	10WXXX-03	R	A			

**PRELIMINARY DRAWINGS  
NOT FOR CONSTRUCTION**



AECOM	A
TASK COMPLETED BY:	REV. NO.

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