



Closure Plan Jeffrey Energy Center Fly Ash Landfill Area 2

Prepared for:

Evergy Kansas Central, Inc.

Jeffrey Energy Center

St. Mary's, Kansas

Prepared by:

Evergy Environmental Services (Revision 0)

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Plan Review/Amendment Log §257.102(b)(3)

Date of Review	Reviewer Name	Amendment Required (YES/NO)	Sections Amended and Reason
November 2021 (original version)	Jay Martin (Evergy, Inc.)	N/A	Original

1.0 INTRODUCTION

Evergy, Inc. (Evergy) has prepared the following Closure Plan (Plan) for the Fly Ash Landfill Area 2 (Unit) located at the Jeffrey Energy Center (JEC) in St. Mary's, Kansas. JEC is a coal-fired power plant that has been in operation since 1980.

The Fly Ash Landfill Area 2 has been deemed to be a regulated coal combustion residuals (CCR) unit by the United States Environmental Protection Agency (USEPA) through the Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (CCR Rule) 40 CFR §257 and §261.

This Plan details the closure requirements outlined in §257.102(b) for CCR units closed in place. The criteria for conducting the closure care of the Unit are detailed in Section 2.0. Additionally, the following Plan details the necessary steps to close the Unit at any point in during the active life, based on recognized and good engineering practices.

2.0 REGULATORY OVERVIEW OF CCR CLOSURE PLAN REQUIREMENTS

On April 17, 2015, USEPA published the CCR Rule under Subtitle D of the Resource Conservation and Recovery Act (RCRA) as 40 CFR Part §257 and §261. The purpose of the CCR Rule is to regulate the management of CCR in regulated CCR units for landfill and surface impoundments. The Fly Ash Landfill Area 2 has been deemed to be a regulated CCR unit at JEC.

Section 257.102(b) of the CCR Rule requires owners or operators of CCR landfills and surface impoundments to prepare a Plan describing the closure of the unit and schedule for implementation of the Plan. The following citations from the CCR Rule are applicable for the Unit as discussed in this Plan:

§257.102(b)(1) stipulates:

(b) 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 that discusses how the CCR unit will be closed in accordance with this section. (See Section 4.1)*
- (ii) If closure of the CCR unit will be accomplished through 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. (N/A)*
- (iii) If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system, designed and methods and procedures to be used to install the final cover will achieve performance standards specified in 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 achieves the performance standards specified in paragraph (d) of this section. (See Section 4.2 & 5.0)*
- (iv) An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit. (See Section 3.4)*
- (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. (See Section 3.5)*
- (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 with and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phases of CCR surface impoundment closure, or installation of the final cover system, and the estimated timeframes to complete each step or phase of CCR unit closure. When preparing the written closure plan, if the owner or operator of a CCR unit estimates that the time required to complete closure will exceed the timeframes specified in paragraph (f)(1) of this section, the written closure plan must include the site-specific information, factors and considerations that would support any time extension sought under paragraph (f)(2) of this section. (See Section 6.0)*

Moreover, the final cover system has been planned in accordance with the following requirements of §257.102(d)(3), which stipulates:

“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 paragraphs (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 include 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 permeability no greater than 1×10^{-5} cm/sec, whichever is less. (Section 4.2)*
 - (B) *The infiltration of liquids through the CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material. (Section 4.2)*
 - (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. (Section 4.2.3)*
 - (D) *The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence” (Section 4.3)*

An outline of the closure performance standards for closure of units where CCR material will be left in place is described in §257.102(d)(1), which stipulates:

“The owner or operator of a CCR unit must ensure that, at a minimum, the CCR unit is closed in a manner than 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; (Section 5.1)*
- (ii) *Precludes the probability of future impoundment of water, sediment, or slurry; (Section 5.2)*
- (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; (Section 5.3)*
- (iv) *Minimize the need for further maintenance of the CCR unit; and (Section 5.4)*
- (v) *Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.” (Section 5.5)*

A written certification is provided in Section 8.0 from a qualified professional engineer in the State of Kansas, to certify that this Plan meets the requirements of the CCR Rule.

3.0 JEC FLY ASH LANDFILL AREA 2 OVERVIEW

3.1 Location, Topography, and Description

The Fly Ash Landfill Area 2 will be utilized for the disposal of fly ash and economizer ash (CCR material), although smaller amounts of other CCR such as FGD gypsum and bottom ash may also be disposed. The closure of the Unit will be accomplished by leaving the CCR material in place and covering the CCR material with an engineered cap. The following Plan was developed to satisfy the CCR Rule requirements for in-place closure §257.102(b)(1)(iii).

The Fly Ash Landfill Area 2 is located in St. Mary's Kansas, approximately 4.5 miles west of Highway 63. The Unit is bounded to the south by the closed Bottom Ash Pond and to the west by the Fly Ash Landfill. Undeveloped property owned by Evergy bounds the Unit to the North and East.

The Fly Ash Landfill Area 2 constructed as of the end of 2021 consists of approximately 14.46 acres of disposal area. A total area of 54.2 acres has been permitted for disposal for this unit. The area consists of ravines and berms in the northern, western, and southern portions. The central portion of the unit is generally flat with a slight slope from northwest to southwest. The topography varies across the Fly Ash Landfill Area 2 ranging in elevations from 1,171 to 1,260.53 feet mean sea level (ft MSL).

JEC has been designated as a critical habitat by the Kansas Department of Wildlife, Parks, and Tourism for the endangered avian species, Least Tern. The Least Terns currently nest in various locations on the Fly Ash Area Landfill. Due to the similarity of the material to be disposed within Fly Ash Area 2 Landfill, it is possible this Unit will be utilized as critical habitat. Evergy will work closely with the U.S. Fish & Wildlife Service and/or the Kansas Department of Wildlife, Parks and Tourism, Ecological Services Section on protection of the Least Tern during unit closure(s).

3.2 Existing Solid Waste Regulatory Permits and Consents

Evergy was previously granted an Industrial Landfill Permit at JEC by the Kansas Department of Health and Environment – Bureau of Waste management (KDHE-BWM) for the Unit through Permit No. 0359, in accordance with Kansas Statutes Annotated (KSA) 65-3407. KDHE modified the solid waste permit, per K.A.R. 28-29-6a, in response to the CCR Rule to include all on-site CCR waste materials management units as disposal areas under the existing solid waste permit for JEC. The current Industrial Landfill Permit was approved on December 11, 2021.

3.3 Fly Ash Generation, Recycling, and Disposal

Fly ash has been generated at JEC since operations began in 1980. Fly ash is removed from the combustion gas stream in an electrostatic precipitator. Fly ash removed is typically a fine, spherical particle ranging in diameter from 0.5 to 100 microns and it can be used as a soil or aggregate stabilization agent. The color of fly ash typically varies from black to cream and is composed of silica, alumina, iron oxide, lime, and trace elements. The fly ash that is generated at JEC has historically been recycled, landfilled, or beneficially used. Recycled fly ash rates depend on the market demand and can affect the life of the Fly Ash Area Landfill due to the variability in the amount of recycled material. Disposal rates therefore vary based on recycling opportunities, which vary between years.

3.4 Maximum Volume Estimate (§257.102(b)(1)(iv))

The maximum volume ever on site as of the date of this plan is zero. The final cover envelop has not yet been designed. Evergy expects the maximum amount of CCR ever in the unit will be at least 2.2 million cubic yards based on an area of 54.2 acres.

3.5 Largest Area Requiring Final Cover (§257.102(b)(1)(v))

The largest area of the unit requiring final cover at any time during the CCR unit's operating period is the total area of the disposal area, which is estimated at 14.46 acres.

4.0 CLOSURE PLAN (§257.102(b)(1))

This Plan has been prepared in accordance with requirements of the CCR Rule and includes a written certification in Section 7.0 from a qualified Professional Engineer for the State of Kansas.

4.1 Narrative Description (§257.102(b)(1)(i) and (ii))

Closure of the Fly Ash Area 2 Landfill will be accomplished by leaving the CCR material in place. The method of closure has been designed to minimize maintenance, leachate generation, control run-on and run-off, and ensure the protection of human health and the environment. Closure of the Fly Ash Landfill Area 2 will also follow Construction Quality Assurance (CQA) procedures to ensure the final cover is designed, constructed, and installed in accordance with recognized standards and accepted good engineering practices as detailed in the following sections.

4.2 Final Cover and Subgrade Overview (§257.102(b)(1)(iii) and §257.102(d)(3)(i))

The final cover has been designed to meet the following objectives:

- Minimize the potential post-closure infiltration of liquids into the waste;
- Minimize the potential for releases of CCR material, leachate, or contaminated runoff to the ground or surface waters or the atmosphere;
- Provide long-term slope stability to prevent sloughing or movement of the final cover system during the closure and post-closure period; and
- Minimize the need for further maintenance of the CCR unit.

The final cover will be installed on top of a minimum of a stable, smooth subgrade layer of compacted and graded fly ash or compacted clay. The top slope of the final cover for the Fly Ash Area Landfill Area 2 will be a minimum of one percent from an approximate elevation of 1,260 ft MSL, with the exterior slopes constructed at a minimum 4H:1V slope. The positive drainage will minimize the potential for the infiltration of liquids into the CCR material. The final cover of the Unit will be constructed to the final grades depicted in the closure plan design documents to be submitted to the – Bureau of Waste management (KDHE-BWM) at a later time. The final cover is comprised of the following layers, from bottom to top:

- A 40-mil Liner Low Density Polyethylene (LLDPE) geomembrane (or equivalent) infiltration layer;
- A geocomposite drainage layer; and
- A minimum 18-inch vegetated erosion control layer.

The final cover system will meet the requirements of §257.102(d)(3)(i) and have a minimum permeability matching that of the underlying liner system, which is a geosynthetic clay liner (GCL) overlain by textured, High Density Polyethylene (HDPE) geomembrane. An alternate final cover may be used in lieu of the final cover system described above depending on the availability of materials and an acceptable design, and KDHE approval, in which case this plan will be amended.

4.2.1 Subgrade Construction

Prior to construction of the final cover for the Fly Ash Area Landfill Area 2, a subgrade will be prepared and used to support the final cover system. The subgrade will be compacted, then graded and smoothed to ensure a stable, uniform surface.

After the grading and completion of the subgrade, the area will be inspected to ensure the working surface is smooth and free from sharp objects or abrupt changes in grade, and proper sloping allowed for drainage. Upon inspection, the area will be surveyed on a minimum of a 100-foot grid prior to the commencement of the installation of the final cover.

4.2.2 Infiltration Layer

A minimum 40-mil textured LLDPE geomembrane (or equivalent) will be installed at the Fly Ash Landfill Area 2 to serve as the infiltration layer. This layer will prevent infiltration of moisture through the final cover into the CCR material.

4.2.3 Erosion Control Layer

A minimum 18-inch erosion control layer will be located above the infiltration layer and will be comprised of soils capable of sustaining native vegetation. After placement, the soil will be seeded to promote the establishment of a healthy stand of vegetation. The vegetation will assist minimizing the infiltration of surface waters and effects of erosion on the final cover.

4.3 Construction Methods and Procedures (§257.102(b)(1)(iii) and §257.102(d)(3)(i))

4.3.1 Construction Methods

CCR material and/or earthen material will be added and graded to achieve final design subgrade slopes and grades using appropriate earthmoving equipment. In the event closure is required before the landfill is filled to capacity, the unit will be brought to grade using CCR material and/or earthen material to achieve revised design grades. The geomembrane cover will be installed over a subgrade of earthen and/or CCR material, followed by the geocomposite drainage layer. Elevations will be surveyed on a 100-ft grid before and after construction of the 18" erosion control layer. Earthen material will then be placed over the infiltration layer to create a minimum 18" erosion layer that will be capable of sustaining native plant growth. The final cover surface will be fertilized, mulched, and seeded to achieve a healthy stand of grass. A discussion of how this system meets the performance standards of 40 CFR 257.102 (d) is provided in Section 5.

4.3.2 Stability

Minimal CCR material consolidation is anticipated due to material dewatering, the physical characteristics of the fly ash material deposited, the CCR material being vibrated and/or compacted during placement, and because most settlement will have occurred shortly after placement. Detailed stability analyses will be completed prior to initial landfill construction using the materials expected to be used. Stability issues are not expected for this unit.

5.0 CLOSURE PERFORMANCE STANDARDS

5.1 Minimization of Liquid Infiltration into CCR Material Mass (§257.102(d)(1)(i))

As detailed above, the final cover system for the Unit will include an infiltration layer consisting of a geomembrane and an erosion control layer. The geomembrane will minimize the potential infiltration of water into the CCR material.

The fill material and final cover system will assist in enhancing run-off and evapotranspiration and will minimize the contact between the surface water and the CCR material. This will minimize the infiltration of water, as required by the performance standard.

5.2 Preclusion of Future Impoundment of Water, Sediment, or Slurry (§257.102(d)(1)(ii))

The closure design of the Unit will include graded slopes and designed surface water features to control run-off and run-on, which precludes the future impoundment of water, sediment, or slurry. No plant-related water will be directed into the unit. Therefore, the closure design is in compliance with the required performance standard.

5.3 Measures to Maintain Slope Stability (§257.102(d)(1)(iii))

Run-off will be collected and controlled in erodible areas, such as the side slopes and top slope, to maintain slope stability of the final cover. The run-off controls and shallow slopes will prevent erosion, movement, and sloughing of the final cover system. Final cover stability will also be maintained by limiting unit access to the public. The primary material disposed in this unit is fly ash, so little to no settlement is expected. Therefore, the closure design is in compliance with the required performance standard.

5.4 Design to Minimize Ongoing Maintenance (§257.102(d)(1)(iv))

The incorporation of slope stability and erosion control measures will minimize the need for significant on-going maintenance on the Unit final cover. The design will minimize the requirement for larger ongoing maintenance of the Unit cover. Therefore, the closure design is in compliance with the required performance standard.

5.5 Timely Completion - Engineering Good Practices (§257.102(d)(1)(v))

Although this is a large project, the design should allow completion of the final cover construction within six months of commencing final closure activities. Therefore, the closure design is in compliance with the required performance standard. Closure extensions are allowed if necessary, per 40 CFR 257.102(f)(2).

6.0 CLOSURE ACTIVITY SCHEDULE (§257.102(b)(1)(vi))

Landfill areas are typically closed out as the landfill is constructed and filled. The size of area and time of year closure construction takes place will vary; therefore, closure construction schedules will vary. The schedule provided in this section is therefore a general estimation for the last stage of landfill final closure.

6.1 Commencement of Closure

Commencement of final closure has occurred if placement of waste in the Unit has ceased and any of the following actions or activities has been completed (40 CFR 257.102(e)(3)):

- (i) Steps necessary to implement this Plan;
- (ii) Submittal of a completed application for any required state or agency permit or permit modification; or
- (iii) Steps necessary to comply with any state or other agency standards that are a prerequisite, or are otherwise applicable, to initiating or completing the closure.

6.2 Closure Schedule

The milestones and the associated timeframes in this section are initial estimates. Some of the activities associated with the milestones will overlap.

Table 1: Estimated Closure Schedule

Written Closure Plan	October 2021
Notification of Intent to Close Placed in Operating Record	No later than the date closure of the CCR unit is initiated. Closure will commence per applicable timeframes, as stipulated in 40 CFR 257.102(e) ¹
Initiation of Closure / Coordinating with and obtaining necessary approvals and permits from other agencies	Month 0 – 1
Mobilization	Month 1 – 3
Installation of the final cover system	Month 1 – 6
Month all closure activities for the CCR unit will be completed	Month 3 – 6 ²
<p>Notes:</p> <ol style="list-style-type: none"> 1. Initiation of Closure may be extended for multiple two-year periods in accordance with 40 CFR 257.102 (e) (2) (ii) and (iii). 2. Final closure of CCR landfills must be completed within six months of commencing closure unless a demonstration is placed in the operating record document (40 CFR 257.102 (f) (2) (ii)). 	

7.0 AMENDMENT OF CCR CLOSURE PLAN (§257.102(b)(1))

The owner or operator may amend the initial or any subsequent written Plan developed pursuant to 40 CFR 257.102(b)(1) at any time.

The written closure must be amended at least 60 days prior to a planned change in the operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the need to revise an existing written Plan. If a written Plan is revised after closure activities have commenced for a CCR unit, the current written Plan must be amended no later than 30 days following the triggering event.

A written certification from a qualified professional engineer that the initial and any amendment of the written Plan meets the requirements of §257.102(b) must be obtained.

Plan changes will be documented using the Revision History which prefaces this Plan. Changes to this Plan will be certified by a Qualified Professional Engineer.

8.0 PROFESSIONAL ENGINEER CERTIFICATION (§257.102(b)(4))

The undersigned registered professional engineer is familiar with the CCR Rule requirements of §257.102 of the CCR Rule and has visited and examined JEC or has supervised examination of JEC by appropriately qualified personnel. The undersigned registered professional engineer attests that this CCR Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards and meets the requirements of §257.102, and that this Plan is adequate for JEC's facility. This certification was prepared as required by §257.102(b)(4).

Name of Professional Engineer: W. Jay Martin, P.E.

Company: Evergy Kansas Central, Inc.

Professional Engineer Seal:

