HALEY ALDRICH

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REPORT ON

PERIODIC STRUCTURAL STABILITY ASSESSMENT
BOTTOM ASH SETTLING AREA
JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Evergy Kansas Central, Inc.
St. Marys, Kansas

File No. 129778-047
October 2021

Executive Summary

This report summarizes the results of the Periodic Structural Stability Assessment conducted by Haley & Aldrich, Inc. (Haley & Aldrich) for the Bottom Ash Settling Area coal combustion residuals (CCR) surface impoundment at the Jeffrey Energy Center in St. Marys, Kansas. This work was completed in accordance with the US Environmental Protection Agency's (EPA's) CCR Rule effective 19 October 2015 including subsequent revisions, specifically Code of Federal Regulations Title 40 (40 CFR) §257.73(d). The Initial Structural Stability Assessment for the Bottom Ash Settling Area was completed in 2016 and uploaded to Evergy's CCR compliance website. This periodic assessment has been completed to meet the requirements of §257.73(f)(3) to update the Structural Stability Assessment every five (5) years.

Impoundment Inspection Assessment and Recommendations

Based on conditions observed during our visual inspection of the impoundment, discussions with site personnel and a review of available documents, issues (i.e., potential deficiencies) and deficiencies are noted in **Section 3.1** with corresponding recommendations in **Section 3.2**. A summary of the deficiencies and recommendations is provided below.

Assessment:

- Potential animal habitat located at the downstream slope of the north embankment at the east side above culvert pipe outlet.
- Erosion around downstream end of outlet pipe.
- The outlet pipe was inspected by Ace Pipe Cleaning on 17 August 2021 and was primarily graded as being in fair/moderate condition or better. Three isolated locations were noted as having structural conditions rated as either poor (needing immediate attention in the near future) or immediate attention needed.

Recommendations:

- Animal habitat – Remove the animal and fill in the hole. Add material or slope protection measures if necessary to restore slope integrity.
- Steep slopes at outlet pipe – Provide slope protection to prevent further erosion in reconstructed areas (the unit closure means and methods may be considered in how this is effectively resolved).
- Ace Pipe Inspection – Address the structural deficiencies of the outlet pipe through appropriate measures (e.g., pipe removal, pipe slip-lining, grouting pipe in place if the outlet is no longer required, etc.). Further evaluation may be warranted to support remedy options.

Structural Stability Assessment

In accordance with 40 CFR §257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

Haley & Aldrich reviewed the information provided to us and inspected the Bottom Ash Settling Area as described in **Section 2.1**. Based on our review of the information and observations during our inspection, we have concluded our findings in **Section 4** in accordance with 40 CFR §257.73(d).

Limitations

The assessment of the general condition of the surface impoundment is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report. In reviewing this report, it should be realized that the described condition of the impoundment is based on observations of field conditions at the time of inspection, a report of the outlet condition as provided by Ace Pipe Cleaning, Inc., along with other data available to the inspection team. It is important to note that the condition of an impoundment depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the present condition of the impoundment will continue to represent its condition at some point in the future.

Certification

I certify that this Periodic Structural Stability Assessment for Evergy's Bottom Ash Settling Area at the Jeffrey Energy Center was conducted in accordance with the requirements of §257.73(d) of the USEPA's CCR Rule. The unit is designed, constructed, operated, and maintained consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded.

Signed: _____
Consulting Engineer

Print Name: Steven F. Putrich
Kansas License No.: 24363
Title: Project Principal
Company: Haley & Aldrich, Inc.

Professional Engineer's Seal:

Steven F. Putrich Digitally signed by Steven F. Putrich Date: 2021.10.04 14:20:56 -04'00'

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1. Description of Project

1.1 GENERAL

1.1.1 Authority

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Evergy Kansas Central, Inc. (Evergy) to perform the Periodic Structural Stability Assessment for the Bottom Ash Settling Area located at the Jeffrey Energy Center (JEC) near St. Marys, Kansas. This work was completed in accordance with the US Environmental Protection Agency's (EPA's) CCR Rule effective 19 October 2015 including subsequent revisions, specifically Code of Federal Regulations Title 40 (40 CFR) §257.73(d).

This report summarizes the results of our Periodic Structural Stability Assessment for the Bottom Ash Settling Area, including our 22 July 2021 visual inspection of the unit.

1.1.2 Purpose of Work

The purpose of this assessment was to document whether the design, construction, operation, and maintenance of the Bottom Ash Settling Area is consistent with recognized and generally accepted good engineering practices. The visual inspection is intended to identify signs of distress or malfunction of the surface impoundment, should they exist. This report summarizes those findings and notes conditions observed that are disrupting or have the potential to disrupt the operation and safety of the surface impoundment.

The investigation is divided into four parts: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Bottom Ash Settling Area and appurtenant structures; 2) perform a visual inspection of the impoundment; 3) evaluate whether the design, construction, operation, and maintenance of the surface impoundment are consistent with generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our evaluation of the impoundment, including recommendations and remedial actions, if required.

1.1.3 Definitions

To provide the reader a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix B. Many of these terms may be included in this report. The terms are presented under common categories associated with dams and surface impoundments which include: 1) orientation; 2) dam components; 3) hazard potential classification; and 4) miscellaneous.

1.2 DESCRIPTION OF PROJECT

1.2.1 Location

The Bottom Ash Settling Area is located at the JEC in St. Marys, Kansas. The site is located approximately 7 mi. northwest of the commercial and residential center of town. The Bottom Ash Settling Area is adjacent to the power plant, which is located at North latitude 39° 17.2' and West longitude 96° 7.7', as

shown on Figure 1, Project Locus. The surface impoundment is accessed from the plant site along a gravel access road.

1.2.2 Owner/Operator

The Bottom Ash Settling Area is owned and maintained by Evergy.

1.2.3 Purpose of the Impoundment

The JEC was originally commissioned in 1978 and currently consists of three separate coal-fired units. As part of plant operations, the Bottom Ash Settling Area was constructed in the 1980s for the purpose of storing CCR consisting primarily of bottom ash and boiler slag. The unit has initiated closure; no free water was observed during the site visit.

1.2.4 Description of the Impoundment and Appurtenances

This surface impoundment is within the Kansas Department of Health and the Environment (KDHE) issued solid waste permit No. 359. The surface impoundment is understood to be constructed on native soils and bedrock consisting of shale residual soil, and shale and limestone bedrock. The embankment is up to approximately 42 ft in height and according to records, was constructed using a mixture of fly ash and bottom ash. We understand the impoundment was a non-engineered structure and minimal information related to the original design and construction was available.

Embankments (referred to herein as berms) exist along the west and north sides of the impoundment. For the purposes of this report, these berms are hereinafter referred to as the "west berm" and the "north berm." The limits of the west and north berms are shown on Figure 2. Small earthen berms have been added on the east side of the BASA to direct surface water around the unit.

The west berm is approximately 800 ft in length and has a maximum height of approximately 42 ft. The berm extends across a natural valley, tying into existing grades at its south end and transitioning into the north berm at its north end.

A drainage channel is located on the west (downslope toe) of the north berm. The north berm is approximately 750 ft in length and ranges in height from about 20 ft where it abuts the west berm, decreasing in height until tying into existing grades at its east end.

In the past, bottom ash and boiler slag from the plant was mixed with water and the slurry was sluiced from the plant to the Bottom Ash Settling Area. The slurry discharged into the impoundment via pipes located at the northeastern end of the impoundment. Present day, the Bottom Ash Settling Area is being unwatered as part of the closure process . As a result, no flows are being discharged into the impoundment.

The downstream slope of the west and north berms generally ranges from approximately 1 horizontal to 1 vertical (1H:1V) to 3H:1V. The downstream slope of the west berm is primarily covered with riprap across the face of the slope. On the south end where the riprap ends, the west berm is unvegetated in some areas and vegetated in other areas by tall grasses and scrub brush. The downstream slope of the north berm is generally vegetated with tall grasses and bushes along the slope. Small, woody vegetation exist along the bank of the drainage channel (exterior to the unit footprint).

Any water that might accumulate would drain from the impoundment area via a 24-in. diameter CMP vertical riser pipe which transitions to a visible 36-inch horizontal CMP at the bottom of the unit which discharges from the west downstream toe area of the west berm. No water was present within the unit at the time of the inspection.

Based on observations during our previous inspection and site visit and our review of available site plans, the Bottom Ash Settling Area no longer receives water (other than direct precipitation) or sluiced ash.

1.2.5 Operations and Maintenance

The impoundment is operated and maintained by JEC personnel and/or Evergy's contractors. Due to the impoundment no longer receiving CCR, operation of the impoundment is currently limited to unwatering.

There is a written operation and maintenance plan for the Bottom Ash Settling Area titled "Industrial Landfill, St Marys, Kansas, Operations Plan, KDHE Permit #359" which was last updated in February 2016. Maintenance of the impoundment includes regular cutting and spraying of vegetation from the downstream slope and removal of woody vegetation as needed from the upstream slope.

1.3 PERTINENT ENGINEERING DATA

1.3.1 Reservoir

The Bottom Ash Settling Area has a surface area of approximately 5.8 acres based on the area contained within the El. 1237.75 (normal pool) contour line.

As stated in 2020 annual inspection completed by Aptim and dated 13 January 2021, the impounded CCR and water volume is estimated to be approximately 441,000 cy, and the total storage capacity is estimated to be approximately 534,000 cy.

1.3.2 Discharges at the Impoundment Site

There was no water in the Bottom Ash Settling Area; however, water from the discharge pipe can flow from the unit via a 36-inch CMP to an unlined open channel.

1.3.3 Elevations and Impoundment Parameters

Relevant elevations and impoundment parameters are as follows:

A.	Crest Elevation of West and North Berms	El. 1241.6 minimum, El. 1243 typical
B.	Normal Pool Elevation	N/A (unit is unwatering)
C.	Intake Type	Vertical Riser Pipe (24-in. dia.)
D.	Intake Elevation	El. 1237.75
E.	Upstream Water at Time of Inspection	N/A (unit is unwatering)
F.	Low Point along Toe of Berms	Approx. El. 1200
G.	Outlet Type	Steel Pipe (36-in. dia.)
H.	Outlet Pipe Invert Elevation	El. 1205.56

1.3.4 Design and Construction Records

The Bottom Ash Settling Area berms were constructed in the 1980s to create a sedimentation and storage basin for bottom ash/CCRs. We understand the impoundment was a non-engineered structure and has little documented design and construction information. Available documentation on the 2012 vertical expansion included a written scope or work and sketch of proposed modifications to the vertical riser pipe/crest of impoundment berm.

1.3.5 Previous Inspection Reports

The Initial Structural Stability Assessment was completed by Haley & Aldrich in 2016 and is available on Evergy's CCR compliance website. Similarly, subsequent annual PE inspections have been completed and are available on Evergy's CCR compliance website. Additionally, Evergy performs weekly internal inspections on the Bottom Ash Settling Area.

2. Inspection

2.1 VISUAL INSPECTION

On 22 July 2021, Haley & Aldrich conducted a visual inspection of the Bottom Ash Settling Area west and north berms. The inspection was performed by Andy Lucas, P.E. and Matthew Krakora, EIT of Haley & Aldrich. JD Schlegel (Evergy) was also in attendance for the inspection.

The following paragraphs describe the conditions observed on the west and north berms during the inspection. A copy of the Inspection Checklist is included Appendix A.

2.1.1 General Findings

2.1.1.1 *West and North Upstream Slopes*

At the time of the inspection the upstream slope was generally covered by impounded CCR in the impoundment which facilitates the interior drainage ditch. As discussed above, Evergy has begun the process for closing the pond by cutting off flows to the impoundment and allowing it to unwater. At the time of inspection no water was visible on the surface, but an undetermined volume of bottom ash material was still saturated.

The upstream slopes of the west and north berms were generally unvegetated but includes areas vegetated by tall grass and brush. It is unclear whether the upstream slopes were covered in impounded ash.

No signs of instability (i.e., slides, sloughs, scarps) or unusual movements were observed. In addition, no significant erosion, animal burrows, or signs of distress were observed.

2.1.1.2 *West and North Berm Crest*

The crest of the west and north berms consists of an access road that is approximately 40 ft in width. The elevation of the crest is typically at El. 1243 but is as low as El. 1241.6, and as high as El. 1245 at the far south and east ends of the berms. The crest surface is hard and in good condition, exhibiting no rutting, soft spots, depressions, settlement, surface cracking, or signs of horizontal movement or misalignment. The surface of the crest is unvegetated and shows no signs of erosion or animal burrows.

2.1.1.3 *West and North Downstream Slopes*

West Berm Downstream Slope

Specific observations regarding the west downstream slope are discussed below:

- Possible Previous Seeps – The west berm downstream slope exhibited seep conditions along the toe of slope at the center portion of the berm. The potential seep conditions were approximately 30 ft wide along the toe of slope. No running water was observed exiting the seeps, however, the surface contained dense and tall vegetation making it difficult to view the ground. No evidence of movement of coal ash particles from within the berm was observed (i.e., internal erosion).
- Eroded Drainage Channel at Downstream Area Near Toe of Slope – A channel exists at the downstream area near the toe of slope at the south end of the west berm, which displays erosion that has caused the displacement of riprap lining and exposed the underlying geotextile. The erosion is caused by surface water runoff from upland areas to the south of the impoundment. At the south end of the berm, the channel has eroded through the riprap and in some spots through the geotextile. A 24-in. concrete pipe discharges into the channel a few hundred feet north of the beginning of the ditch. We understand the pipe carries flow from the settling pond about once per month for a period of about 8 hrs. Concrete debris exists in the ditch where the 24-in. pipe discharges.
- Vegetation – Large areas exist on the west downstream slope where the ground is devoid of vegetation and riprap. Other areas are vegetated with a variety of grasses and scrub brush that are generally 2 to 3 ft. in height.
- Erosion – Erosion rills exist in portions of the west downstream slope. The erosion rills generally ranged in depth from about 4 to 8 in.

During inspection of the west downstream slope, no signs of slides, scarps, unusual movements, sinkholes, or animal burrows were observed.

North Berm Downstream Slope

- Drainage Channel at Toe of Slope – A drainage channel exists along the toe of the north downstream slope. We understand this drainage channel functions as a bypass, periodically receiving water that the plant has pumped from its on-site make-up water.
- Potential Animal Habitat – An apparent animal habitat was found at the drainage channel at the toe of slope of the north berm downstream slope during the visual inspection. The habitat was located above the culvert pipe entering the drainage channel at the east side of the northern embankment.
- Vegetation – The north berm downstream slope is vegetated with grass, bushes, and small, woody vegetation adjacent to the drainage channel and exterior to the unit footprint. Vegetation on the slope did not appear to be regularly cut. We understand the woody vegetation along the bank of the drainage channel were left in place in response to prior Army Corps of Engineers requirements.

During inspection of the north downstream slope, no signs of slides, scarps, unusual movements, sinkholes, or animal burrows were observed.

2.1.1.4 *Intake and Outlet Works*

Water is drained from the impoundment via a 24-in. diameter CMP vertical riser pipe. The vertical riser pipe was not visible at the time of the inspection due to dense vegetation. However, at the time of the inspection, the riser pipe was not flowing with water as the impoundment is being unwatered in the process for closure.

Flow from the vertical riser pipe is directed to a horizontal outlet pipe that penetrates the west berm and discharges at the downstream toe of the berm. The end of the outlet pipe is visible and appears to consist of a 36-in. diameter steel pipe. At the time of the inspection, there we no obvious signs of seepage around the outlet pipe, sinkholes, or other signs of instability in the vicinity of the pipe. Erosion was observed adjacent to the downstream end of the outlet pipe. The slope was nearly vertical, and riprap had been dislodged.

Ace Pipe Cleaning inspected the vertical riser pipe and horizontal outlet pipe on 17 August 2021. Haley & Aldrich reviewed the pictures, videos, and associated ratings as part of this assessment. During the pipe inspection, there were cracks and three structural conditions rated as either poor (needing immediate attention in the near future) or immediate attention needed.

2.1.1.5 *Downstream Area*

The downstream areas beyond the west and north toe of slope are generally lined with heavy vegetation and the ground surface was not readily observable at the time of the inspection. However, based on the limited visibility, no obvious signs of seeps, springs, soft spots, foundation seepage, or instability were observed.

2.2 CARETAKER INTERVIEW

On the day of the inspection, Haley & Aldrich met with Evergy personnel familiar with the operations, maintenance, and construction of the Bottom Ash Settling Area. Information provided by Evergy personnel has been incorporated into this report.

2.3 OPERATION AND MAINTENANCE PROCEDURES

The impoundment is operated and maintained by JEC personnel and their contractors. Due to the impoundment no longer receiving CCR, operation of the impoundment is currently limited to unwatering.

Maintenance of the impoundment includes regular cutting of vegetation from the downstream slope and removal of woody vegetation as needed from the upstream slope.

JEC personnel are currently performing and documenting 7-day and 30-day inspections in accordance with 40 CFR §257.83(a).

3. Impoundment Inspection Assessment and Recommendations

3.1 ASSESSMENT

Based on conditions observed during our visual inspection of the impoundment, discussions with site personnel and a review of available documents, the following issues (i.e., potential deficiencies) and deficiencies were noted:

1. Issues

- Erosion rills on the upstream side of the north and west embankments. It is unclear whether the erosion is in embankment or the impounded ash within the unit
- Vegetation sparse on the upstream sides of the north and west embankments. It is unclear whether the vegetation is in the embankment or the impounded ash within the unit.
- Vegetation observed to be greater than 6-in. high in need of mowing/weed-eating along upstream slopes of north and west embankments. It is unclear whether the vegetation is in the embankment or the impounded ash within the unit.
- Cattails growing downstream slope of west embankment indicative of possible past seepage. No active seepage was observed.
- Erosion rills on the downstream slope along the north and west embankments.
- Downstream slope riprap area on the west embankment has a location with exposed geotextile.
- Areas without vegetation or other slope protection along downstream slope of north berm.
- Areas with vegetation observed to be greater than 6-in. high in need of mowing/weed-eating along downstream slope of north berm and in downstream area (within approximately 0-50-ft. of the toe of slope of the west embankment south of the riprap).
- Drainage channel at the downstream area and within approximately 0-50-ft. of the toe of slope of the west embankment south of the riprap: the channel riprap has eroded to expose the geotextile underlying the riprap. The geotextile has begun to tear in numerous locations over the length.

2. Deficiencies

- Potential animal habitat located at the downstream slope of the north embankment at the east side above culvert pipe outlet.
- Erosion around downstream end of outlet pipe.
- The outlet pipe was inspected by Ace Pipe Cleaning on 17 August 2021 and was primarily graded as being in fair/moderate condition or better. Three isolated locations were noted as having structural conditions rated as either poor (needing immediate attention in the near future) or immediate attention needed.

3.2 RECOMMENDATIONS

Haley & Aldrich recommends the following actions:

1. Issues

    - Erosion rills – Monitor erosion rills on upstream slopes. If erosion extends into embankment or roadway, repair as necessary
    - Unvegetated areas on upstream slopes – Monitor areas and provide some form of slope protection on unvegetated areas of the slope to achieve performance standards as necessary.
    - Tall vegetation – Monitor vegetative growth. Mow/weed-eat vegetation and maintain at the required maximum height per the regulations as necessary. Maintain in a manner to reduce and control woody vegetation.
    - Seeps –Continue to monitor and document the condition of the seeps and determine if evaluations or long term measures are needed.
    - Erosion rills – Monitor erosion and fill erosion rills on downstream slope as necessary.
    - Riprap erosion – Monitor erosion and add additional riprap material in locations where geotextile is exposed as necessary.
    - Unvegetated areas on downstream slopes – Monitor areas for erosion and provide some form of slope protection on unvegetated areas of the slope to achieve performance standards as necessary.
    - Tall vegetation – Monitor and cut vegetation and maintain the required maximum height per the regulations as necessary. Maintain in a manner to reduce and control woody vegetation.
    - Eroded drainage channel – Monitor erosion in drainage channel. Where the geotextile has been ripped, regrade to uniform slope, replace geotextile, and add additional riprap (or equivalent protection) to prevent further erosion as necessary.

2. Deficiencies

    - Animal habitat – Remove the animal and fill in the hole. Add material or slope protection measures if necessary to restore slope integrity.
    - Steep slopes at outlet pipe – Provide slope protection to prevent further erosion in reconstructed areas (the unit closure means and methods may be considered in how this is effectively resolved).
    - Ace Pipe Inspection – Address the structural deficiencies of the outlet pipe through appropriate measures (e.g., pipe removal, pipe slip-lining, grouting pipe in place if the outlet is no longer required, etc.). Further evaluation may be warranted to support remedy options.

4. Structural Stability Assessment

In accordance with 40 CFR §257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

Haley & Aldrich reviewed the information provided to us and inspected the Bottom Ash Settling Area as described above. Based on our review of the information and observations during our inspection, we have concluded the following in accordance with 40 CFR §257.73(d):

1. §257.73(d)(1)(i) – Stable Foundations and Abutments:

   As part of their 2009 engineering evaluation, Black & Veatch drilled five test borings in the west berm of the Bottom Ash Settling Area. The test borings, designated B-1, B-1A, B-2, B-3, and B-3A, ranged in depth from 20 to 61-ft. below the top of the berm. The borings encountered very dense bottom ash fill which ranged in thickness from approximately 21 to 29-ft. at the boring locations. Underlying the bottom ash fill was shale residual soil, and shale and limestone bedrock. Based on our review of the boring logs and observations during our inspection, it is our opinion that the shale and limestone provide stable foundations and abutments for the surface impoundment.

   We note that the Initial Safety Factor Assessment required by the CCR Rule related to modeling stability was completed in 2016 and uploaded to Evergy's CCR compliance website. It should be noted that Evergy has initiated closure on the BASA.

2. §257.73(d)(1)(ii) – Adequate Slope Protection:

   Erosion protection on the downstream slope of the west embankment consist of primarily riprap with the southern end containing sparse vegetation made up of a variety of tall grasses and scrub brush. The riprap protection was added in late 2016, after the Initial Structural Stability Assessment. Erosion protection on the downstream slope of the north embankment consists of vegetation comprised of a variety of tall grasses, scrub brush and bushes. Patches exist on these slopes where the ground is devoid of vegetation or other erosion protection. As a result, erosion rills, typically about 6 in. deep, exist on portions of the north downstream slope. The lack of vegetation or other slope protection on portions of the downstream slope do not appear to present a berm stability problem but will remain an ongoing maintenance issue dependent on the method and timeframe of unit closure, if not addressed.

   A potential seep (indicated by the growth of cattails) was observed on the downstream slope of the west embankment. No stagnant or running water was observed at the location. The slope appeared stable (i.e. no evidence of movement of berm material). Evergy is monitoring this area potential future seepage and instability at least every seven days.

   It is unclear whether the upstream slope of the embankment was observed during inspection, as it may have been covered with impounded ash. If bottom ash covers the upstream slopes of the impoundment, it is adequate against any (minimal) wave action that would be expected for this

unit. Evergy should continue to monitor the upstream slope for additional or expanding areas of erosion. There was no free water in the impoundment during the inspection.

3. §257.73(d)(1)(iii) – Dikes Mechanically Compacted:

   Although records on the construction of the Bottom Ash Settling Area are not available, the borings performed by Black & Veatch indicate the bottom ash fill at the boring locations typically has SPT N-values greater than 50, indicating very dense material. Based on these N-values, it is likely the berm fill was mechanically compacted during construction.

4. §257.73(d)(1)(iv) – Height of Vegetation:

   At the time of our impoundment inspection, portions of the west and north downstream slopes were vegetated by tall grasses, scrub brush and bushes that were up to several feet high.

5. §257.73(d)(1)(v)(A) – Spillway Cover:

   The Bottom Ash Settling Area does not have an emergency spillway. The spillway was designed for water to exit the impoundment through a 24-in. diameter CMP vertical riser intake pipe. Therefore, a discussion of spillway cover is not applicable. Details of the riser pipe are discussed below.

6. §257.73(d)(1)(v)(B) – Spillway Capacity:

   The spillway capacity for the impoundment was modeled in the Initial Inflow Flood Control Plan, which was uploaded to Evergy's CCR compliance website in 2016. The Periodic Inflow Control Plan will be modeled and calculated in accordance with §257.82 Hydrologic and Hydraulic Capacity Requirements for CCR Surface Impoundments under a separate cover. Haley & Aldrich notes that the unit has initiated closure, had no visible water during the inspection, nor was water was entering or leaving the unit during the inspection.

7. §257.73(d)(1)(vi) – Hydraulic Structures Underlying or Passing Through Embankment:

   Only limited portions of the intake and outlet structures were visible during our inspection, however, Evergy contracted with Ace Pipe Cleaning, Inc. (Ace) to complete a visual inspection via camera. The top of the 24-in. diameter CMP vertical riser intake pipe was not visible during the inspection due to dense vegetation at the inlet around the trash rack. Regarding the 36-in. steel outlet pipe, the pipe is buried below the berm and only the downstream end of the pipe is visible. The visible portion of the pipe appeared sound and during our inspection, we observed no signs that would indicate seepage or internal erosion along the length of the pipe where it penetrates the west berm. The camera inspection report by Ace Pipe Cleaning dated 17 August 2021 indicated that the majority of the outlet pipe was graded to be in fair or moderate condition, not requiring attention immediately or in near future. Three isolated locations were noted as having structural conditions rated as either poor (needing immediate attention in the near future) or immediate attention needed. Depending on the closure methodology of the BASA (i.e., closure in place or closure by removal), Evergy should take appropriate remedial actions to address the concerns noted in Ace Pipe Cleaning's assessment.

8. §257.73(d)(1)(vii) – Inundation of Downstream Slopes:

   There is no possibility of the downstream slopes being inundated, therefore this condition is not applicable.

9. §257.73(d)(2) – Deficiencies and Recommendations:

   See **Section 3** of this report for a discussion of issues, deficiencies, and corresponding recommendations. A summary of the deficiencies and recommendations is provided below.

Assessment:

- Potential animal habitat located at the downstream slope of the north embankment at the east side above culvert pipe outlet.
- Erosion around downstream end of outlet pipe.
- The outlet pipe was inspected by Ace Pipe Cleaning on 17 August 2021 and was primarily graded as being in fair/moderate condition or better. Three isolated locations were noted as having structural conditions rated as either poor (needing immediate attention in the near future) or immediate attention needed.

Recommendations:

- Animal habitat – Remove the animal and fill in the hole. Add material or slope protection measures if necessary to restore slope integrity.
- Steep slopes at outlet pipe – Provide slope protection to prevent further erosion in reconstructed areas (the unit closure means and methods may be considered in how this is effectively resolved).
- Ace Pipe Inspection – Address the structural deficiencies of the outlet pipe through appropriate measures (e.g., pipe removal, pipe slip-lining, grouting pipe in place if the outlet is no longer required, etc.). Further evaluation may be warranted to support remedy options.

5. References

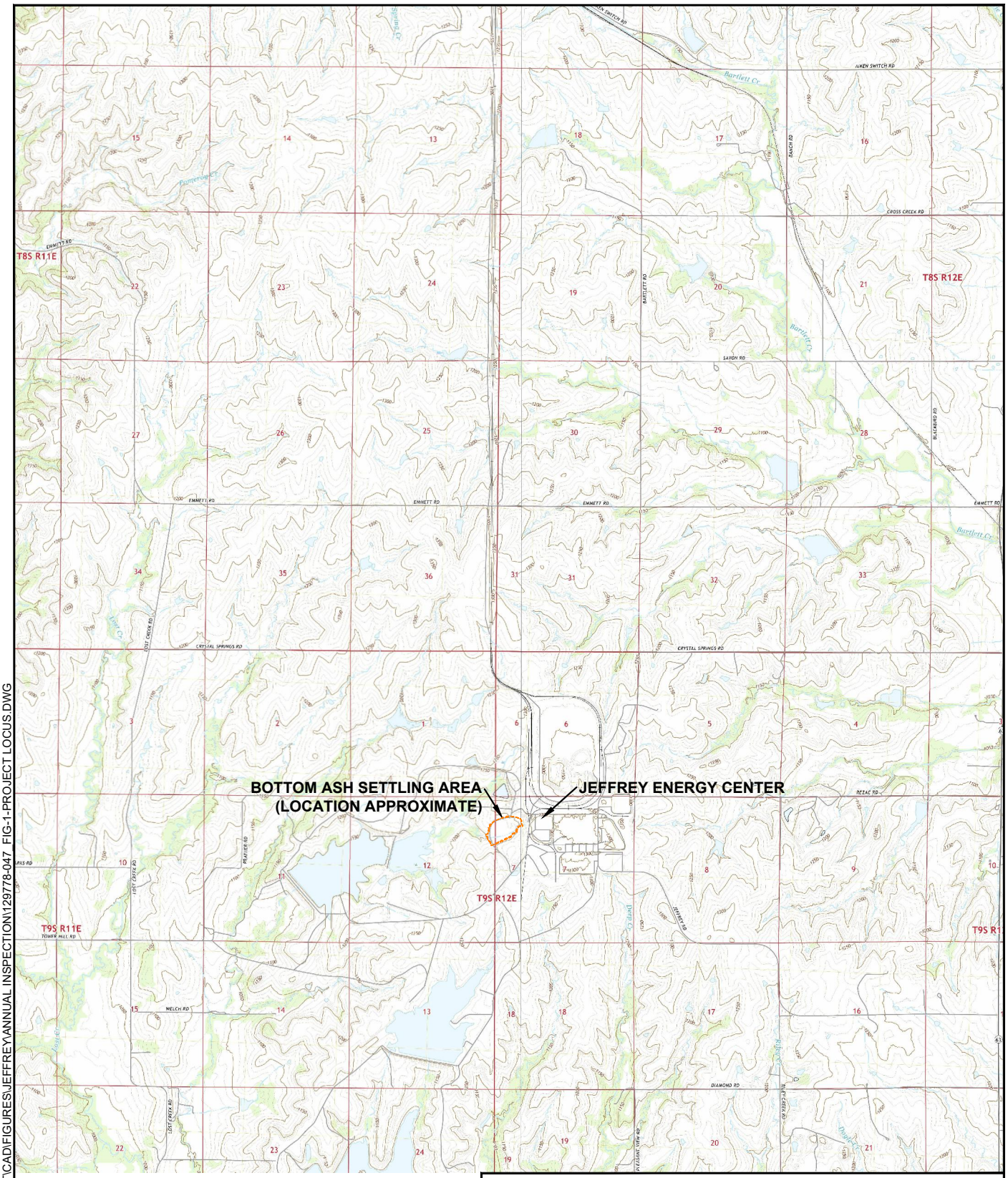
1. Black & Veatch, “Jeffrey Energy Center Dams - Bottom Ash Settling Berm Inspection and Engineering Evaluation,” dated December 2009.

2. Burns & McDonnell Engineering Company, Inc., “Final Permit Update Documents,” dated August 2009.

3. GEI Consultants, Inc., “Coal Ash Impoundment – Specific Site Assessment Report – Westar Energy,” dated September 2009.

4. Professional Engineering Consultants, “Bottom Ash Settling Area Volume Exhibit,” dated 3 June 2011.

5. Professional Engineering Consultants, “Westar Energy Jeffrey Energy Center Plat of Survey,” dated August 2010.



MAPSOURCE: USGS
LACLEDE, KANSAS
EMMETT, KANSAS
2018

EVERGY SERVICES, INC.
JEFFREY ENERGY CENTER
ST. MARYS, KS

BOTTOM ASH SETTLING AREA SITE LOCUS

APPROXIMATE SCALE: 1" = 5000'
SEPTEMBER 2021

FIGURE 1

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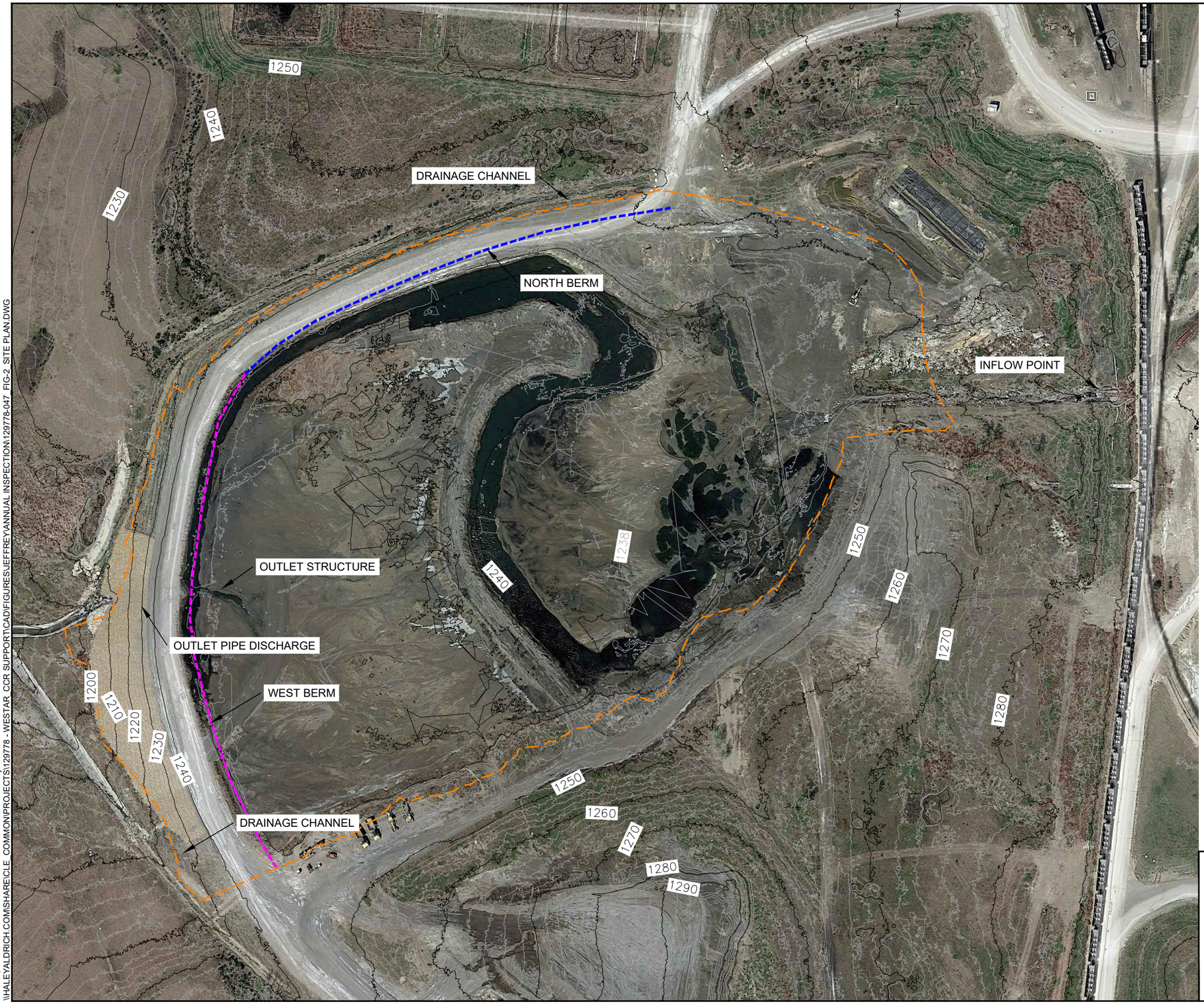

LEGEND

- APPROXIMATE LIMITS OF BOTTOM ASH SETTLING AREA
- APPROXIMATE EXTENTS OF NORTH BERM
- APPROXIMATE EXTENTS OF WEST BERM

NOTES

1. AERIAL IMAGERY PROVIDED BY GOOGLE EARTH PRO. PHOTO TAKEN APRIL 2019.
2. APPROXIMATE LIMITS OF IMPOUNDMENT BASED ON 1242 CONTOUR FROM 1964 USGS TOPO, VISUAL LIMITS OF ASH ACCORDING TO 2019 GOOGLE EARTH PRO AERIAL IMAGERY, AND APPROXIMATE TOE OF DAM DETERMINED BY 2014 PEC SURVEY.
3. EXISTING TOPOGRAPHY, PROVIDED BY EVERGY BASED ON 2018 SURVEY DATA.

N

0 150 300

SCALE IN FEET

HALEY ALDRICH

EVERGY SERVICES, INC.
JEFFREY ENERGY CENTER
ST. MARYS, KS

BOTTOM ASH SETTLING AREA SITE PLAN

SCALE: AS SHOWN
SEPTEMBER 2021

FIGURE 2

APPENDIX A

Inspection Checklist

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: Bottom Ash Settling Area

STATE ID #: KDHE Permit #359

REGISTERED: (YES/NO) No

NID ID #: N/A

STATE SIZE CLASSIFICATION: N/A

STATE HAZARD CLASSIFICATION: Low

CHANGE IN HAZARD CLASSIFICATION REQUESTED?: (YES/NO)

DAM LOCATION INFORMATION

CITY/TOWN: St. Marys

COUNTY/STATE: Pottawatomie / Kansas

DAM LOCATION: (street address if known) 25903 Jeffrey Rd. St. Marys, Kansas

ALTERNATE DAM NAME: N/A

USGS QUAD.: Emmett, KS & Laclede, KS

LAT.: 39°17.2' N

LONG.: 96°7.7' W

DRAINAGE BASIN: N/A

RIVER:

IMPOUNDMENT NAME(S): Bottom Ash Settling Area

GENERAL DAM INFORMATION

TYPE OF DAM: Earthen Incised and Bermed

OVERALL LENGTH (FT): Approx. 1,550

PURPOSE OF DAM: Sedimentation and Storage Basin

NORMAL POOL STORAGE (ACRE-FT): 988

YEAR BUILT: 1980's

MAXIMUM POOL STORAGE (ACRE-FT): 988

STRUCTURAL HEIGHT (FT): 42

EL. NORMAL POOL (FT): 1239.5

HYDRAULIC HEIGHT (FT): 39.5

EL. MAXIMUM POOL (FT): 1241.6 (minimum crest elevation)

RESERVOIR SURFACE AREA (ACRES): 16.16

WINTER DRAWDOWN (FT BELOW NORMAL POOL) 0.0

PUBLIC ROAD ON CREST: No

DRAWDOWN VOL. (AC-FT) 0.0

PUBLIC BRIDGE OVER SPILLWA No

NAME OF DAM: Bottom Ash Settling Area | STATE ID #: KDHE Permit #359

INSPECTION DATE: July 22, 2021 | NID ID #: N/A

INSPECTION SUMMARY

DATE OF INSPECTION: July 22, 2021 | DATE OF PREVIOUS INSPECTION: December 2, 2020

TEMPERATURE/WEATHER: Sunny, 74 | ARMY CORPS PHASE I: No (YES/NO) | If YES, date

CONSULTANT: Haley & Aldrich, Inc. | PREVIOUS ALT. PHASE I: No (YES/NO) | If YES, date

BENCHMARK/DATUM: NAVD88

OVERALL PHYSICAL CONDITION OF DAM: Satisfactory | DATE OF LAST REHABILITATION: N/A

SPILLWAY CAPACITY: N/A

EL. POOL DURING INSP.: N/A (Impoundment Dewatering) | EL. TAILWATER DURING INSP.: (N/A) Impoundmen Dewatering

PERSONS PRESENT AT INSPECTION

NAME	TITLE/POSITION	REPRESENTING
Andy Lucas	Senior Engineer	Haley & Aldrich, Inc.
Matthew Krakora	Staff Engineer	Haley & Aldrich, Inc.
JD Schlegel	Environmental Coordinator	Evergy - Jeffrey Energy Center

NAME OF DAM:	Bottom Ash Settling Area	STATE ID #:	KDHE Permit #359
INSPECTION DATE:	July 22, 2021	NID ID #:	N/A

OWNER:	ORGANIZATION	Evergy - Jeffrey Energy Center	CARETAKER:	ORGANIZATION	Evergy - Jeffrey Energy Center
	NAME/TITLE	Jay Martin		NAME/TITLE	Jay Martin
	STREET	25903 Jeffrey Road		STREET	25903 Jeffrey Road
	TOWN, STATE, ZIP	St. Marys, Kansas 66536		TOWN, STATE, ZIP	St. Marys, Kansas 66536
	PHONE	(816) 652-1365		PHONE	(816) 652-1365
	EMERGENCY PH. #	(913) 223-2213		EMERGENCY PH. #	(913) 223-2213
	FAX			FAX	
	EMAIL	jay.martin@evergy.com		EMAIL	jay.martin@evergy.com
	OWNER TYPE	Private			

PRIMARY SPILLWAY TYPE	24" dia. Steel Riser Pipe		
SPILLWAY LENGTH (FT)	N/A	SPILLWAY CAPACITY (CFS)	N/A
AUXILIARY SPILLWAY TYPE	N/A	AUX. SPILLWAY CAPACITY (CFS)	N/A
NUMBER OF OUTLETS	One	OUTLET(S) CAPACITY (CFS)	Unknown
TYPE OF OUTLETS	One decant	TOTAL DISCHARGE CAPACITY (CFS)	Unknown
DRAINAGE AREA (SQ MI)	0.17	SPILLWAY DESIGN FLOOD (PERIOD/CFS)	Unknown
HAS DAM BEEN BREACHED OR OVERTOPPED? (YES/NO):	No	IF YES, PROVIDE DATE(S)	
FISH LADDER (LIST TYPE IF PRESENT)	No		
DOES CREST SUPPORT PUBLIC ROAD? (YES/NO)	No	IF YES, ROAD NAME:	
PUBLIC BRIDGE WITHIN 50' OF DAM? (YES/NO):	No	IF YES, ROAD/BRIDGE NAME:	
		MHD BRIDGE NO. (IF APPLICABLE)	

NAME OF DAM: Bottom Ash Settling Area STATE ID #: KDHE Permit #359

INSPECTION DATE: July 22, 2021 NID ID #: N/A

EMBANKMENT (U/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	None observed	X		
	2. SLOPE PROTECTION TYPE AND COND.	None, exposed ash	X		
	3. SINKHOLE/ANIMAL BURROWS	None observed	X		
	4. EMB.-ABUTMENT CONTACT	N/A	X		
	5. EROSION	Erosion rills along bank		X	
	6. UNUSUAL MOVEMENT	None observed	X		
	7. VEGETATION (PRESENCE/CONDITION)	Areas vegetated by grasses and brush up to 2 ft tall, while other areas unvegetated			X

ADDITIONAL COMMENTS: Slope steeper than 3:1 in portions of upstream and downstream embankments

NAME OF DAM: Bottom Ash Settling Area STATE ID #: KDHE Permit #359

INSPECTION DATE: July 22, 2021 NID ID #: N/A

EMBANKMENT (CREST)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Bottom Ash	X		
	2. SURFACE CRACKING	None observed	X		
	3. SINKHOLES, ANIMAL BURROWS	None observed	X		
	4. VERTICAL ALIGNMENT (DEPRESSIONS	None observed	X		
	5. HORIZONTAL ALIGNMENT	None observed	X		
	6. RUTS AND/OR PUDDLES	None observed	X		
	7. VEGETATION (PRESENCE/CONDITION)	None observed	X		
	8. ABUTMENT CONTACT	N/A	X		

ADDITIONAL COMMENTS: Surface is in good condition (hard/dry material)

NAME OF DAM: Bottom Ash Settling Area STATE ID #: KDHE Permit #359

INSPECTION DATE: Juy 22, 201 NID ID #: N/A

EMBANKMENT (D/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None observed	X		
	2. SEEPAGE	Cattails observed in southern portion of west berm. No water present		X	
	3. SLIDE, SLOUGH, SCARP	None observed	X		
	4. EMB.-ABUTMENT CONTACT	N/A	X		
	5. SINKHOLE/ANIMAL BURROWS	Possible animal habitat at culvert pipe on downstream side of north embankment			X
	6. EROSION	Erosion rills along areas without vegetation or rip-rap. Erosion at outlet pipe penetration. Erosion within drainage channels.			X
	7. UNUSUAL MOVEMENT	Deeply eroded drainage channel at south end of west berm due to high rate of storm water runoff.	X		
	8. VEGETATION (PRESENCE/CONDITION)	None observed (within rip-rap areas)	X		
		Vegetation coverage patchy along berm with grasses up to 3 ft tall			X

ADDITIONAL COMMENTS: Geotextile exposed along berm in rip-rap area. Add additional stone to cover.
Geotextile exposed in stormwater drainage ditches. Add additional stone. In areas where geotextile is torn, remove and replace like and kind.

NAME OF DAM: Bottom Ash Settling Area STATE ID #: KDHE Permit #359

INSPECTION DATE: July 22, 2021 NID ID #: N/A

PRIMARY SPILLWAY

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	24" dia steel riser pipe	X		
	WEIR TYPE	24" dia steel riser pipe	X		
	SPILLWAY CONDITION	Fair. Worn and dent at outlet side.			X
	TRAINING WALLS	None observed	X		
	SPILLWAY CONTROLS AND CONDITION	None observed	X		
	UNUSUAL MOVEMENT	None observed	X		
	APPROACH AREA	Fair. Heavy grass and shrub coverage.	X		
	DISCHARGE AREA	Fair. Erosion occuring around outlet area.			X
	DEBRIS	Brush present at inlet side.			X
	WATER LEVEL AT TIME OF INSPECTION	N/A (Impoundment Dewatering)	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Bottom Ash Settling Area STATE ID #: KDHE Permit #359

INSPECTION DATE: July 22, 2021 NID ID #: N/A

OUTLET WORKS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE				
	INTAKE STRUCTURE				
	TRASHRACK				
	PRIMARY CLOSURE	N/A	X		
	SECONDARY CLOSURE	N/A	X		
	CONDUIT	N/A	X		
	OUTLET STRUCTURE/HEADWALL				
	EROSION ALONG TOE OF DAM				
	SEEPAGE/LEAKAGE				
	DEBRIS/BLOCKAGE				
	UNUSUAL MOVEMENT				
	DOWNSTREAM AREA				
	MISCELLANEOUS				

ADDITIONAL COMMENTS:

NAME OF DAM: Bottom Ash Settling Area STATE ID #: KDHE Permit #359

INSPECTION DATE: July 22, 2021 NID ID #: N/A

DOWNSTREAM AREA

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	1. ABUTMENT LEAKAGE	N/A			
	2. FOUNDATION SEEPAGE	None observed	X		
	3. SLIDE, SLOUGH, SCARP	None observed	X		
	4. WEIRS	N/A	X		
	5. DRAINAGE SYSTEM	N/A	X		
	6. INSTRUMENTATION	N/A	X		
	7. VEGETATION	Heavy vegetation downstream of berms and within drainage channels. Ground surface not all visible.			X
	8. ACCESSIBILITY	Difficult in areas due to rip-rap and dense vegetation		X	
	9. DOWNSTREAM HAZARD DESCRIPTION	Downstream hazard is minimal. No occuped structures, only Bottom Ash Pond and Lake.	X		
	10. DATE OF LAST EAP UPDATE	N/A			

ADDITIONAL COMMENTS:

NAME OF DAM: Bottom Ash Settling Area STATE ID #: KDHE Permit #359

INSPECTION DATE: July 22, 2021 NID ID #: N/A

INSTRUMENTATION

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	Piezometers observed along downstream area	X		
	2. OBSERVATION WELLS	Wells observed along downstream area	X		
	3. STAFF GAGE AND RECORDER	None observed	X		
	4. WEIRS	None observed	X		
	5. INCLINOMETERS	None observed	X		
	6. SURVEY MONUMENTS	None observed	X		
	7. DRAINS	None observed	X		
	8. FREQUENCY OF READINGS	Quarterly	X		
	9. LOCATION OF READINGS	Evergy's operating record	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Bottom Ash Settling Area STATE ID #: KDHE Permit #359

INSPECTION DATE: NID ID #: N/A

UNDERLYING HYDRAULIC STRUCTURES/PIPES

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
UNDERLYING HYDRAULIC STRUCTURES /PIPES	TYPE	36-in. diameter CMP	X		
	INLET	24-in. diameter CMP vertical riser	X		
	CONDUIT	Unable to be inspected during site visit	X		
	OUTLET STRUCTURE/HEADWALL	Fair	X		
	EROSION ALONG STRUCTURE	At downstream end of horizontal pipe		X	
	SEEPAGE/LEAKAGE	None observed	X		
	DEBRIS/BLOCKAGE	None observed	X		
	UNUSUAL MOVEMENT	None observed	X		
	DOWNSTREAM AREA	None observed	X		
	MISCELLANEOUS				

ADDITIONAL COMMENTS: Only upstream end of vertical riser and downstream end of horizontal pipe inspected during site visit.
Ace Pipe Cleaning performed inspection on 17 August 2021.

Note: Use additional sheets for additional outlets.

APPENDIX B

Definitions

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to Kansas State Rule 10 CSR 22 Dam and Reservoir Safety or other reference published by the Department of Natural Resources, the U.S. Army Corps of Engineers, the Federal Energy Regulatory Commission, the Department of the Interior Bureau of Reclamation, or the Federal Emergency Management Agency.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate there from including but not be limited to spillways; reservoirs and their rims; low level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

Size Classification

Large – structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate – structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small – structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional – structure less than 6 feet in height and having a storage capacity of less than 15 acre-feet.

Hazard Classification
(In the event the impoundment should fail, the following would occur):

Less Than Low Hazard Potential - Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

Low Hazard Potential - Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

Significant Hazard Potential - Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

High Hazard Potential - Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

General

EAP – Emergency Action Plan - Shall mean a predetermined plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam break.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. On million U.S. gallons = 3.068 acre feet

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Condition Rating

Unsafe - Major structural, operational, and maintenance deficiencies exist under normal operating conditions.

Poor - Significant structural, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

Fair - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

Good - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.