

2018

Killen Station Ash Pond Annual Inspection

ODNR File No.: 8533-001



Prepared by:
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Date: December 21, 2018

Purpose

I have conducted the following annual inspection in compliance of the Federal CCR Rule, 40 CFR Part 257 and Ohio Department of Natural Resources ORC 1501.062.

Statement of Qualifications

I am a practicing Civil/Geotechnical Professional Engineer registered in the State of Ohio employed by the AES Ohio Generation, LLC. I am experienced in the design, maintenance and operation of earthen dams and impoundments.

Review of Impoundment Documentation [§ 257.83(b)(1)(i)]

Design, History, and Operation of the Facility

The Killen Ash Impoundment is an off-stream, partially-incised, upland reservoir designed and constructed for the storage of coal combustion ash from the Killen Station generating unit and treatment of other plant waste waters. It is bordered on the north by U.S. Route 52, west by the cooling tower, switchyard, and coal storage area, south by the Ohio River and east by agricultural lands. The dam has an overall length of 14,009.6 feet. The height of earthen dam ranges from 21.0 to 77.0 feet, based on the lowest elevation point on the downstream toe. The crest is 15 feet in width. Both upstream and downstream slopes are 2.5 horizontal to 1 vertical (2.5H:1V). The original design bottom of pond is at elevation 498 feet and the crest at elevation 573 feet. This pond is divided into two basins one primarily for the containment of bottom ash and one primarily for the settlement of fly ash. The upper portion of the upstream slopes of the dam is protected from erosion with filter fabric and riprap.

Water from the bottom ash portion flows into the fly ash portion through a concrete channel equipped with steel channel stop logs to control water elevation. There is a second outlet from the bottom ash basin which returns water to the plant for process use. This is as an 8-foot diameter riser (pump station intake tower) by 58.5-foot high reinforced concrete overflow structure with a 36-inch diameter ductile iron pipe inside of a 72-inch corrugated metal pipe (CMP) outlet with invert at elevation 511.0 feet. The elevation of the overflow section cannot be adjusted and remains at 565.0 feet. A 36-inch stainless steel sluice gate at the concrete overflow structure is provided to shut off flow from this impoundment to the plant when necessary. The primary discharge structure from the fly ash portion of the pond is a concrete weir with a metal underflow baffle which discharges through a four-foot square vertical riser connected to a 36-inch ductile iron pipe which outlets into a concrete energy dissipation structure. This outlet structure also is equipped with a sluice gate which can be used to lower the pond level but cannot be used to drain the pond.

The Killen Electric generating Station stopped operating on May 31, 2018. This impoundment continues to receive waste water from the plant but is not expected to receive additional CCR material.

Periodic Inspections

A thorough review of the CCR Unit 7-Day Inspections was conducted. Inspections indicated difficulties in mowing due to excessive rainfall and some rutting from vehicle and equipment traffic. These periodic inspections do not indicate any structural weakness or concerns.

Previous Structural Assessments

Original design calculations and documents were reviewed from the Final Engineering Report prepared by Ebasco Services. Other previous structural assessments reviewed include: Civil Environmental Consultants in 2009, Report on Initial Safety Factor Assessment, Ash Pond, Killen Electric Generating Station, Manchester, Ohio by Haley & Aldrich 2016, and Dam Safety Inspection

Report from the Ohio Department of Natural Resources, Division of Water Resources, Dam Safety Program performed in 2013, and Report on Initial Safety Factor Assessment, Ash Pond, Killen Electric Generating Station, Manchester, Ohio by Haley & Aldrich 2016. ODNR performed a 5-year inspection in 2018 but has not yet provided the report.

Visual Inspection of Impoundment [§ 257.83(b)(1)(ii)]

The ash pond dam is in good structural condition based on the visual inspection. The water level in the fly ash pond had been lowered to approximately 11½ feet below the crest. Areas on the east dam and north dam were damp and soft. These areas have been noted to be damp on previous inspections. Rutting was noted in several areas along the toe of the dam from vehicular traffic. Upstream slope stone erosion protection is in place but current water level appears to be near the bottom of the stone protection. No indication of erosion in this area at this time.

Changes in Geometry [§ 257.83(b)(2)(i)]

There were no changes to the upstream face of the dam. There were no changes to the geometry of the downstream face of the dam pond or other indications of structural weakness. Slopes have no indication of deformation or other indicators of instability.

Instrumentation [§ 257.83(b)(2)(ii)]

These ponds are equipped with a staff gauge mounted on the primary outlet and eight piezometers around the perimeter. Review of staff gauge readings and piezometers levels show little change through the year with the exception that some piezometers do fluctuate with changes in the river level.

Structural Weakness [§ 257.83(b)(2)(vi)]

No indication was found of an actual or potential structural weakness of the CCR unit or any existing condition that was disrupting or had the potential to disrupt the operation and safety of the CCR unit and appurtenant structures.

Other Changes [§ 257.83(b)(2)(vii)]

No changes were found to the CCR unit which could adversely affect the stability or operation of the impounding structure since the previous annual inspection. The water level in the fly ash pond has been lowered to the level of the drain valve which is approximately eleven and a half feet below the dam crest.

Visual Inspection of Hydraulic Structures [§ 257.83(b)(1)(iii)]

This pond contains three hydraulic structures. All three structures were found to be in good condition with no indication of deterioration. Outlet pipes for the two structures which discharge water show no signs of leaking or problems.

Design drawings indicate that there was a temporary drain from the impoundment during construction which was grouted closed. The discharge of this pipe has long since been buried in river deposits; however, no seepage or soft ground was discovered at or around the location of the discharge point for this pipe.

Water and Material Depths and Volumes

[§ 257.83(b)(2)(iii), § 257.83(b)(2)(iv), § 257.83(b)(2)(v)]

Physical Parameters of Impoundment		
Depth of water (fly ash)	62	Feet
Depth of water (bottom ash)	60	Feet
Minimum depth of water	63.0	Feet
Maximum depth of water	71	Feet
Elevation of water (fly ash pond)	560	Feet (review of weekly inspection reports show normal fluctuation of the depth/water level)
Storage Capacity	21,600,000	Cubic Yards, Crest Full Volume
Volume of water	12,500,000	Cubic Yards
Volume of CCR	7,821,000	Cubic Yards

Appendix A

CCR Rule Requirements for Impoundment Annual Inspections

257.83 (b) Annual inspections by a qualified professional engineer.

- (1) If the existing or new CCR surface impoundment or any lateral expansion of the CCR surface impoundment is subject to the periodic structural stability assessment requirements under § 257.73(d) or § 257.74(d), the CCR unit must additionally be inspected on a periodic basis by a qualified professional engineer to ensure that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards. The inspection must, at a minimum, include:
 - (i) A review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (e.g., CCR unit design and construction information required by §§ 257.73(c)(1) and 257.74(c)(1), previous periodic structural stability assessments required under §§ 257.73(d) and 257.74(d), the results of inspections by a qualified person, and results of previous annual inspections);
 - (ii) A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit and appurtenant structures; and
 - (iii) A visual inspection of any hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit for structural integrity and continued safe and reliable operation.
- (2) Inspection report. The qualified professional engineer must prepare a report following each inspection that addresses the following:
 - (i) Any changes in geometry of the impounding structure since the previous annual inspection;
 - (ii) The location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection;
 - (iii) The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection;
 - (iv) The storage capacity of the impounding structure at the time of the inspection;
 - (v) The approximate volume of the impounded water and CCR at the time of the inspection;
 - (vi) Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures; and
 - (vii) Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.

Appendix B

Reference Documents Reviewed

- ❖ Operation Maintenance and Inspection Manual
- ❖ Emergency Action Plan
- ❖ Pond Design Manual
- ❖ Previous inspection reports
 - Weekly inspection sheets
 - ODNR 2013
 - GZA 2011
 - CEC 2009
 - Pullman Outlet Structure Inspection 2013
 - Report on Initial Safety Factor Assessment, Ash Pond, Killen Electric Generating Station, Manchester, Ohio by Haley & Adrich 2016
- ❖ Drawings
 - 400-12-1021
 - 400-12-1022
 - 400-12-1080
 - 400-12-1081
 - 400-12-1082
 - 400-12-1083
 - 400-12-1084
 - 400-12-1085
 - 400-12-2167
 - SK 3848 CH-192

Appendix C
Inspection Check List

Dam Field Inspection Report

DAM/IMPOUNDMENT ANNUAL FIELD INSPECTION FORM

Unit Name: Killen Ash Pond

ODNR File No.: 8533-001

CCR Unit

ACTION

ODNR Hazard Classification: I II III IV N/A

Impoundment Type: Incised Upland Lake

Inspection Date(s): November 2018

Weather/Surface Conditions During Inspection: Overcast, recent rain has left the ground saturated

Freeboard: 4.5 feet

NONE
 MONITOR
 MAINTENANCE
 ENGINEER

UPSTREAM SLOPE Gradient: Horizontal: 2.5 Vertical: 1 (est. meas.)

VEGETATION

Trees:
 DESCRIPTION AND LOCATION:
 Brush:
 DESCRIPTION AND LOCATION:
 Ground Cover:
 DESCRIPTION: Stone shoreline protection
 CONDITION: Upstream slopes are rock covered and vegetation virtually non-existent.

SLOPE PROTECTION

TYPE or NONE: riprap
 DESCRIPTION: C/D size stone near the water line. No 2 stone above this level in some areas.
 CONDITION: In the fly ash pond the water level is near or below the riprap in some areas.

EROSION:

DESCRIPTION AND LOCATION: No erosion at this time but the slope should be monitored for erosion below the riprap in areas noted above.

INSTABILITIES: (SLIDES, CRACKS, BULGES, etc.)

SLIDES/SLOUGHS:
 DESCRIPTION AND LOCATION:
 CRACKS:
 DESCRIPTION AND LOCATION:
 BULGES:
 DESCRIPTION AND LOCATION:
 OTHER:
 DESCRIPTION AND LOCATION:

OTHER (rodent burrows, ruts, etc.)

DESCRIPTION AND LOCATION:
 DESCRIPTION AND LOCATION:
 DESCRIPTION AND LOCATION:
 DESCRIPTION AND LOCATION:

CREST Length: 14,009.6' Width: 15' (est. meas.)

GROUND COVER:

DESCRIPTION: Stone aggregate
 CONDITION: Good condition

EROSION

DESCRIPTION AND LOCATION:

INSTABILITIES: (SLIDES, CRACKS, BULGES, etc.)

CRACKS:
 DESCRIPTION AND LOCATION:
 RUTS:

	ACTION			
	NONE	MONITOR	MAINTENANCE	ENGINEER
DESCRIPTION AND LOCATION: POT HOLES:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION: OTHER	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION: MONITORING INSTRUMENTATION:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION: Settlement monuments located along the crest. CONDITION: Monuments are in good condition.				
ALIGNMENT:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CONDITION: No indication of movement of pond dam.				
OTHER (rodent burrows, ruts, etc.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DOWNSTREAM SLOPE Gradient: Horizontal: 2.5 Vertical: 1 (est. meas.)				
VEGETATION	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Brush:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ground Cover:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION: Grass				
CONDITION: Grass cover has improved since the previous inspection and is in good condition.				
EROSION	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION: None noted				
INSTABILITIES: (SLIDES, CRACKS, BULGES, etc.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SLIDES/SLOUGHS:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CRACKS:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BULGES	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OTHER	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION:				
SEEPAGE/WET AREA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION: Many areas are damp to saturated near the toe of the dam. 2018 has had significantly above average rainfall which likely attributes to this condition. Further monitoring is recommended particularly on the east side (station 56 to 59). These areas have developed some ruts from mowing and other equipment traffic. No saturated areas appear to have flowing water.				
EMBANKMENT DRAINS:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION: Newly added. No history to compare. CONDITION: Drains are in good condition with little flow.				

	ACTION			
	NONE	MONITOR	MAINTENANCE	ENGINEER
MONITORING INSTRUMENTATION: DESCRIPTION: 8 Piezometers are located around the perimeter of the dam. CONDITION: Piezometers are in good condition with new metal protective covers and locked.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OTHER: (rodent burrows, ruts, etc.) DESCRIPTION AND LOCATION: DESCRIPTION AND LOCATION: DESCRIPTION AND LOCATION: DESCRIPTION AND LOCATION:	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
HYDRAULIC STRUCTURES				
STRUCTURE: Bottom ash inlet to plant DESCRIPTION: Concrete riser with ductile iron discharge piping. Metal grating walk bridge to structure				
INLET DESCRIPTION: 8' diameter structure with anti -vortex plate and sluice gate shut-off valve. CONDITION: structure is in good condition OBSTRUCTION NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CONDUIT DESCRIPTION: Ductile iron pipe inside corrugated metal pipe with access way for inspection CONDITION: pipe is in good condition with no evidence of leaks. SEEPAGE NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OUTLET DESCRIPTION: Piping carries water to various locations in the plant and was not inspected. CONDITION: No reported issues from the plant. EROSION NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRUCTURE: Overflow structure from bottom ash basin to flyash basin DESCRIPTION: Concrete channel with steel channel stop-logs.				
INLET DESCRIPTION: Concrete bottom and wing walls CONDITION: Good condition with little deterioration OBSTRUCTION NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES: A large pipe has been run through the structure but is not impacting flow.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CONDUIT DESCRIPTION: Concrete channel. CONDITION: Good condition with little deterioration SEEPAGE NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OUTLET DESCRIPTION: Concrete bottom and wing walls CONDITION: Good condition with little deterioration EROSION NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRUCTURE: Principal Outlet from fly ash basin DESCRIPTION: Concrete weir box with vertical riser and ductile iron outlet pipe to concrete outlet structure.				
INLET DESCRIPTION: Concrete weir with metal underflow baffle. Contains a sluice gate valve to by-pass weir and lower pond level and a discharge valve. Discharge valve is locked in the open position CONDITION: Good condition with little deterioration Water level is now below the underflow baffle. OBSTRUCTION NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ACTION

	NONE	MONITOR	MAINTENANCE	ENGINEER
<p>CONDUIT</p> <p>DESCRIPTION: Vertical concrete riser connected to 3' dia. ductile iron pipe. Ductile pipe is inside a 6' corrugated metal pipe to allow for inspection.</p> <p>CONDITION: Good condition with no visible deterioration.</p> <p>SEEPAGE NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>OUTLET</p> <p>DESCRIPTION: Large concrete energy dissipation structure.</p> <p>CONDITION: good condition</p> <p>EROSION NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<hr/>				
STRUCTURE:				
DESCRIPTION: Construction drain - Pressure grouted with cement sand grout and abandoned.				
<p>INLET</p> <p>DESCRIPTION: 30" CMP riser</p> <p>CONDITION:</p> <p>OBSTRUCTION NOTED: (<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO) DESCRIBE IF YES:</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>CONDUIT</p> <p>DESCRIPTION: 24" CMP</p> <p>CONDITION:</p> <p>SEEPAGE NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>OUTLET</p> <p>DESCRIPTION: Outlet is buried beneath river deposits. There is no indication of seepage or erosion in the area.</p> <p>CONDITION:</p> <p>EROSION NOTED: (<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO) DESCRIBE IF YES:</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix D

CCR Unit Maintenance Recommendations

1. Ensure vegetation is maintained. Some weekly inspections noted that grass needed to be cut.

Continued Monitoring

1. Monitor seep areas along the east and north dam.
2. Monitor the upstream slope for erosion below the riprap.