

2017

Killen Station Ash Pond Annual Inspection

ODNR File No.: 8533-001



Prepared by:
John Hendrix, PE



Date: December 21, 2017

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.

Periodic Inspections

A thorough review of monthly and weekly facility inspections was conducted. Monthly inspections were conducted through September 2015. Weekly inspections were conducted from October 2015 through the present. 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, Dam Safety Inspection Report from the Ohio Department of Natural Resources, Division of Water Resources, Dam Safety Program performed in 2013 and received in 2017, and Report on Initial Safety Factor Assessment, Ash Pond, Killen Electric Generating Station, Manchester, Ohio by Haley & Aldrich 2016

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

The ash pond dam is in good structural condition based on the visual inspection. Maintenance items were noted during the field inspection. During the inspection damp or saturated areas were noted generally near the toe at stations 25 to 40, 58, 63, 112. A drainage feature and monitoring basin was added at the seep at station 88 to facilitate monitoring of seepage. Seepage was limited to a slow drip. These areas have been noted to be damp on previous inspections. Rutting was noted from mowing operations near stations 25 and 90 which may be resulting from a change in mowing contractor and equipment. Upstream slope stone erosion protection is in good condition and does not show any indication of movement or degradation.

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

There were no changes to the upstream face of the dam. Rock erosion protection is in place and in good condition around the perimeter of the pond. 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 affect the stability or operation of the impounding structure since the previous annual inspection.

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	70.5	Feet
Minimum depth of water	63.0	Feet
Maximum depth of water	71	Feet

Elevation of water	568.5	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	11,970,000	Cubic Yards
Volume of CCR	7,960,000	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 inspections reports
 - Weekly/monthly 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): Nov./Dec. 2017

Weather/Surface Conditions During Inspection: mostly cool and dry.

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: A concern was raised in the latest ODNR inspection that stone was displaced. Ongoing inspections indicate that the riprap is in place and stable.

EROSION:

DESCRIPTION AND LOCATION:

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 but regrading to form a crown would be beneficial

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 in good condition. Cover for SM 3 was repaired during 2017.				
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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ground Cover:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION: Grass CONDITION: Grass cover is sparse near the crest in the vicinity of station 4 and the toe near station 11. More overseeding in spring 2017 and more frequent mowing has reduced the crown vetch and improved thickness of the grass in areas previously dominated by crown vetch and other broadleaf weeds. Two additional areas were found at the crest near station 4 and the toe near station 11. Recommend overseeding these areas in late winter 2018 Several additional areas were seeded fall of 2017 and should be monitored during the coming year.				
EROSION	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION AND LOCATION: Erosion was repaired and old style bench drains eliminated at stations 1 and 4+50. Eroded bench drain at station 132+50 was repaired.				
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:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	ACTION			
	NONE	MONITOR	MAINTENANCE	ENGINEER
SEEPAGE/WET AREA DESCRIPTION AND LOCATION: Many areas on the north side continue to be damp and saturated. Station 56 to 59 at the toe is damp with wet indicative vegetation as observed previously. Improvements were made at station 80 in the V and at station 88 at the toe no standing water was previously observed.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EMBANKMENT DRAINS: DESCRIPTION: Newly added. No history to compare. CONDITION:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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 fly ash 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"/>

ACTION

NONE
MONITOR
MAINTENANCE
ENGINEER

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 bypass weir and lower pond level and a discharge valve. Discharge valve is locked in the open position

CONDITION: Good condition with little deterioration

OBSTRUCTION NOTED: (YES NO) DESCRIBE IF YES:

CONDUIT

DESCRIPTION: Vertical concrete riser connected to 3' dia. ductile iron pipe. Ductile pipe is inside a 6' corrugated metal pipe to allow for inspection.

CONDITION: Good condition with no visible deterioration.

SEEPAGE NOTED: (YES NO) DESCRIBE IF YES:

OUTLET

DESCRIPTION: Large concrete energy dissipation structure.

CONDITION: good condition

EROSION NOTED: (YES NO) DESCRIBE IF YES:

STRUCTURE:

DESCRIPTION: Construction drain - Pressure grouted with cement sand grout and abandoned.

INLET

DESCRIPTION: 30" CMP riser

CONDITION:

OBSTRUCTION NOTED: (YES NO) DESCRIBE IF YES: This drain was permanently grouted closed.

CONDUIT

DESCRIPTION: 24" CMP

CONDITION:

SEEPAGE NOTED: (YES NO) DESCRIBE IF YES:

OUTLET

DESCRIPTION: Outlet is buried beneath river deposits. There is no indication of seepage or erosion in the area.

CONDITION:

EROSION NOTED: (YES NO) DESCRIBE IF YES:

Appendix D

CCR Unit Maintenance Recommendations

1. Overseed crest area at station 4 and toe at station 11
2. Regrade and survey crest road. ODNR report indicated that there had been settlement. Investigation revealed that the difference was a change from the NAVD 29 to NAVD 88
3. Ensure vegetation is maintained. Vegetation between 103 and 107 near the toe historically had not been well maintained. This area was cleared and reseeded late in 2017. Some weekly inspections noted that grass needed to be cut.

Continued Monitoring

1. Maintenance activity led to reseeding several areas along the toe of the dam. Monitor reseeded areas to ensure that a suitable stand of grass is established.
2. Inspection basins were added at the seep location near station 88. Monitor the inspection basins for changes to the flow.
3. Evidence of beaver activity was noted on several weekly reports and has been noted that beaver have made attempts to construct a dam downstream of the bottom basin outlet into the fly ash basin. Monitor and remove any beaver dams.
4. Monitor riprap placement in the vicinity of the northeast bend in the dam as reported in the latest ODNR inspection report received in 2017. There has been no apparent change since 2010 when riprap was last added to this area.