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REPORT ON
INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
POND 6
J.M. STUART ELECTRIC GENERATING STATION
ABERDEEN, OHIO

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Dayton Power & Light Company
Aberdeen, Ohio

File No. 40373-347
October 2016

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

12 October 2016
File No. 40373-347

Dayton Power & Light Company
P.O. Box 468
Aberdeen, Ohio 45101

Attention: Mr. Craig Spangler
Leader, Commodities

Subject: Initial Periodic Structural Stability Assessment
Pond 6
J.M. Stuart Electric Generating Station
Aberdeen, Ohio

Mr. Spangler:

Enclosed please find our report on the Initial Periodic Structural Stability Assessment for the Dayton Power & Light Company (DP&L) Pond 6 Coal Combustion Residuals (CCR) surface impoundment located at J.M. Stuart Electric Generating Station in Aberdeen, Ohio.

This work was performed by Haley & Aldrich, Inc. (Haley & Aldrich) on behalf of DP&L in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(d).

The scope of our work consisted of the following: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Pond 6 surface impoundment; 2) visit the site to observe Pond 6; 3) evaluate whether the design, construction, operation, and maintenance of Pond 6 are consistent with recognized and generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our assessment including recommendations.

Thank you for inviting us to complete this assessment and please feel free to contact us if you wish to discuss the contents of the report.

Sincerely yours,
HALEY & ALDRICH, INC.

Steven F. Putrich, P.E.
Vice President

Enclosures

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1. General

1.1 AUTHORITY

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Dayton Power & Light Company (DP&L) to perform the Initial Periodic Structural Stability Assessment for the DP&L Pond 6 Coal Combustion Residuals (CCR) surface impoundment located at J.M. Stuart Electric Generating Station (JMSS) in Aberdeen, Ohio. This work was completed in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(d).

1.2 PURPOSE OF STRUCTURAL STABILITY ASSESSMENT

The purpose of this Initial Structural Stability Assessment was to document whether the design, construction, operation, and maintenance of Pond 6 are consistent with recognized and generally accepted good engineering practices.

The scope of our work consisted of the following: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Pond 6 surface impoundment; 2) visit the site to observe Pond 6; 3) evaluate whether the design, construction, operation, and maintenance of Pond 6 are consistent with recognized and generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our evaluation, including recommendations.

2. Description and Operation of Pond 6

2.1 DESCRIPTION OF POND 6

Pond 6 is a Coal Combustion Residuals (CCR) surface impoundment surrounded on the east and south sides by above-grade earthen embankments and incised on the north and west sides. The impoundment is separated from Pond 7 by an interior dike between the two ponds. Pond 6 was originally designed by Ebasco Services and constructed in the mid to late 1970s.

After filling the pond with CCR, the eastern two-thirds of Pond 6 re-excavated to El. 523 around 1980. Also in 1980, seepage was observed exiting the east exterior slope of Pond 6 following an earthquake in August 1980. In their September 23, 1980 report (Reference 1), Bowser-Morner recommended that a 3-ft thick drainage blanket be placed on the exterior slope.

In 2010, the east exterior slope was regraded to its current configuration of 3H:1V and seeded with grass seed.

The pond currently receives ash sluicing water from Ponds 3A, 7 and 10, as well as coal storage area drainage, and Landfill 11 storm water, contact water and leachate.

The original pond has an area of 36.7 acres at the crest and an embankment length of approximately 3,400 feet. The impoundment has a volume of 1,390 acre-feet to the crest and a maximum embankment height of 31 feet. The western half of the pond is filled and occupies 18.6 acres, while the eastern half of the pond is liquid filled with an operating area of 18.1 acres.

Outlet works for Pond 6 consist of a concrete open channel with adjustable weirs which conveys water to a treatment building for pH adjustment and sampling. After pH adjustment, treated water is directed to Pond 7A through a 4-ft diameter corrugated metal pipe (CMP) for final polishing before flowing to a drop inlet sluiceway for final discharge to the Ohio River through NPDES Outfall 013.

An emergency overflow structure/skimmer exists adjacent to the east interior slope of Pond 6. The overflow structure consists of a 60-in. diameter steel vertical standpipe which transitions to a 36-in. lined CMP. Flow from the emergency overflow is conveyed via the 36-in. CMP to the Pond 7A drop inlet sluiceway described above for final discharge through Outfall 013.

2.2 OPERATION, MAINTENANCE AND INSPECTION

Pond 6 is operated, maintained and inspected by DP&L personnel in accordance with DP&L's "Operation Maintenance and Inspection (OM&I) Manual" dated April 2014 (Reference 7).

DP&L has developed impoundment inspection forms and DP&L personnel are conducting 7-day inspections of the Pond 6 in accordance with EPA's Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257.83. In addition, the OM&I manual calls for annual visual inspections and semi-annual operational inspections to be performed by DP&L personnel, as well as inspections following heavy rain events. Five-year inspections are performed by Ohio Department of Natural Resources Dam Safety personnel.

Maintenance of the impoundment includes regular mowing of grass, seeding of thinly vegetated areas, control of woody growth, repair of erosion and riprap as needed, backfilling of animal burrows, and lubrication and inspection of pond drain mechanisms.

Operation includes regulating and monitoring wastewater discharge from the power plant to Pond 6, regulating water levels in the pond, regulating flow from Pond 6 to the treatment building, and adjusting pH of the water before it flows to Pond 7A.

3. Structural Stability Assessment

3.1 REVIEW OF EXISTING INFORMATION

For this assessment, Haley & Aldrich reviewed multiple sources of information which are listed in Appendix A including: 1) report on the Initial Annual Inspection performed by DP&L in accordance with 40 CFR §257.83, dated December 21, 2015, 2) previous impoundment inspection reports by ODNR, CHA (on behalf of EPA), CEC, and DP&L, 3) OM& I manual, 4) Emergency Action Plan, 5) topographic plans and aerial photos, 6) construction drawings, 7) subsurface information, 8) geotechnical laboratory test results, 9) slope stability evaluations, 10) correspondence, and 11) a variety of other information in addition to verbal information provided by DP&L during our assessment. Our review included, but was not limited to the references listed in Appendix A.

3.2 SITE VISIT AND FIELD OBSERVATIONS

On 18 March 2016, Haley & Aldrich visited J.M. Stuart Station to observe conditions at Pond 6, and to meet with DP&L personnel to discuss operations and maintenance of the impoundment. Prior to the site visit, we reviewed previous inspection reports including the above-referenced Initial Annual Inspection Report by DP&L, and several previous inspection reports listed in Appendix A.

3.3 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 visited the site to observe Pond 6. Based on our review of available information and observations during our 18 March 2016 site visit, we have concluded the following in accordance with 40 CFR §257.73(d):

1. *§257.73(d)(1)(i): Stable foundations and abutments.*

   Based on our review of available subsurface information, construction records, design reports, impoundment inspection reports, engineering reports, construction drawings, geotechnical test results, and observations during our 18 March 2016 site visit, Pond 6 was judged to have stable foundations. The Pond 6 embankments have not exhibited signs of excessive settlement, instability or other signs of inadequate foundation support.

2. *§257.73(d)(1)(ii): Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown.*

   The Pond 6 east exterior slope is well vegetated with grass and was judged to have adequate slope protection. The other sides of Pond 6 do not have exterior slopes (i.e., incised to the north, filled to the west, and interior berm between Ponds 6 and 7 to the south).

The Pond 6 east interior slope is protected by a combination of concrete rubble and riprap, providing adequate protection against wave action and erosion. The other three sides do not have slope protection and are exhibiting erosion rills on the slope face and beaching erosion at the water line. Regular maintenance of the unprotected slope will be required unless protection is installed on these slopes.

3. *<u>§257.73(d)(1)(iii):</u> Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.*

   Several test borings were drilled in the Pond 6 east embankment during previous field investigations. Cohesive fill within the embankment was generally described as stiff to hard brown and gray SILT to silty CLAY, with varying amounts of sand and gravel and rock fragments. Non-cohesive fill in the embankment was generally described as medium dense brown fine to coarse SAND with varying amounts of gravel, silt and clay.

   Although no construction records were available for Pond 6 for our review, the stiffness of the cohesive fill and density of the non-cohesive fill support DP&L verbal reports that the embankment soils were compacted during construction as part of the initial plant construction phase.

4. *<u>§257.73(d)(1)(iv):</u> Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms of slope protection.*

   At the time of our 18 March 2016 site visit, the grass on the Pond 6 exterior slope was generally less than 6 inches in height. As indicated above, the other sides of Pond 6 do not have exterior slopes.

5. *<u>§257.73(d)(1)(v)(A):</u> Spillway Erosion Protection – All spillways must be either: (1) Of non-erodible construction and designed to carry sustained flows; or (2) Earth- of grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.*

   The primary spillway in Pond 6 consists of a concrete outlet structure with adjustable weirs as described in 3.3.7 below. The structure was judged to be in good condition with no evidence of degradation or erosion.

6. *<u>§257.73(d)(1)(v)(B):</u> Spillway Capacity – The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a: (1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or (2) 1000-year flood for a significant hazard potential CCR surface impoundment; or (3) 100-year flood for a low hazard potential CCR surface impoundment.*

   The primary spillway at Pond 6 is located in the northeast corner of the impoundment and overflows to the pH treatment building. Ultimately, the water exiting Pond 6 through the primary spillway is directed to the Ohio River after pH adjustment and final settling has occurred in Pond 7A.

   In addition, an emergency spillway is located adjacent to the east interior slope, and discharges to the Ohio River (when necessary). Because the impoundment was classified as Significant Hazard Potential, the capacities of the spillways were analyzed using the 1,000-year rainfall event

(Reference 14) in conjunction with HydroCAD v10.0. The spillways were found to have adequate capacity to convey the 1,000-year rainfall event without overtopping the impoundment berm.

7. *<u>§257.73(d)(1)(vi):</u> Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.*

   The concrete primary spillway located in the northeast corner of the pond was judged to be in good condition, exhibiting relatively minor pitting of the concrete and surface rust on some metal components.

   Flow from the pH treatment building is conveyed to Pond 7A through a 4-ft diameter CMP. A condition survey of this pipe was performed in 2015 by Consulting Services Incorporated using a robotic video camera. The video survey indicated the pipe was in good condition.

   The emergency overflow structure adjacent to the east interior slope consists of a 60-in. diameter steel vertical standpipe which transitions to a 36-in. lined CMP. Flow from the emergency overflow is conveyed via the 36-in. CMP to the Pond 7A drop inlet sluiceway described above for final discharge through Outfall 013. The vertical standpipe and underflow baffle are showing signs of corrosion but are considered to be in serviceable condition.

8. *<u>§257.73(d)(1)(vii):</u> For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.*

   The Pond 6 east embankment slopes downward from the crest to the exterior toe of slope which is at approximately El. 500. However, a topographic ridge exists at El. 524 between the Ohio River and the exterior toe of slope, limiting the potential for inundation of the east slope at river levels below El. 524. One small pipe penetrates the ridge to drain excess stormwater from within the isolated wetland watershed area. A limited volume of water would backflow through this pipe from the Ohio River during an extreme flood event.

   Based on information obtained from the National Oceanic and Atmospheric Administration (NOAA), the highest river level recorded in over 100 years of measurements in the vicinity of J.M. Stuart Station was El. 526 in 1937. The 500-year BFE in this area along the Ohio River is approximately El. 523 per the FEMA FIS for Adams County, Ohio.

   Based on the above information, the possibility of inundation from the Ohio River impacting the stability of the east embankment of Pond 6 is low. The other three sides of Pond 6 are incised or bounded by the interior dike between Ponds 6 and 7.

9. *<u>§257.73(d)(2):</u> Identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures.*

   Based on observations of Pond 6 during our 18 March 2016 site visit, as well as our review of available subsurface information, impoundment inspection reports, construction records, design

reports, geotechnical test results and other information, we did not identify any structural stability deficiencies in Pond 6.

4. Conclusions/Certification

Based on our review of the information provided to us and observations during our 18 March 2016 site visit, it is our opinion that the design, construction, operation, and maintenance of Pond 6 at J.M. Stuart Station is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded in Pond 6.

Professional Engineer Certification

I certify that the Periodic Structural Stability Assessment for DP&L's Pond 6 at the J.M. Stuart Electric Generating Station was conducted in accordance with the requirements of §257.73(d) of the USEPA's Final CCR Rule.

Signed: _____
Consulting Engineer

Print Name: Steven F. Putrich
Ohio License No.: 67329
Title: Vice President
Company: Haley & Aldrich, Inc.

Professional Engineer's Seal and date:

TOPO SOURCE: USGS TOPOGRAPHIC MAPS
RUSSELLVILLE, DECATUR, WEST UNION, MAYSVILLE EAST, MAYSVILLE WEST , MANCHESTER ISLANDS - OHIO
MAYS LICK, ORANGEBURG, TOLLESBORO - KENTUCKY QUADRANGLES (2013)

HALEY ALDRICH

DAYTON POWER & LIGHT COMPANY
J. M. STUART GENERATING STATION
745 U.S. ROUTE 52
ABERDEEN, OHIO

POND 6
PROJECT LOCUS

APPROXIMATE SCALE: 1" = 10 000'
OCTOBER 2016

FIGURE 1

LUCAS, ANDY Printed: 6/17/2016 10:00 AM Layout: PROJECT LOCUS
G:\40373_DP&L\CAD-JMSS\GLOBAL\FIGURES\STRUCTURAL STABILITY ASSESSMENT\POND 6\40373_FIG-1-PROJECT LOCUS.DWG

LEGEND

- EXISTING PROPERTY LINE
- EXISTING PROCESS PIPES
- EXISTING STORMWATER PIPES
- EXISTING GRAVEL ROAD
- NORMAL OPERATING WATER
- APPROXIMATE POND 6 BOUNDARY
- TYPICAL OPERATING WATER LEVEL

NOTES

1. AERIAL IMAGERY PROVIDED BY GOOGLE EARTH PRO. PHOTO TAKEN ON 4 APRIL 2016.

0 200
SCALE IN FEET

HALEY ALDRICH

DAYTON POWER & LIGHT COMPANY
J.M. STUART STATION
ABERDEEN, OHIO

POND 6
SITE PLAN

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 2

LUCAS, ANDY Printed: 6/17/2016 10:08 AM Layout: SITE PLAN
G:\40373_DP&L\CAD-JMSS\GLOBAL\FIGURES\STRUCTURAL STABILITY ASSESSMENT\POND 6\40373_FIG-2_SITE PLAN.DWG

APPENDIX A

References

References

1. Bowser-Morner Testing Laboratories, Inc., “Seepage Problem in the East Dike of Ash Pit #6 at the J.M. Stuart Electric Generating Station,” dated September 24, 1980.

2. BBC&M Engineering, Inc., “Ponds 3A, 5, 6 & 7 Slope Stability Investigation, J.M. Stuart Station,” dated May 28, 2010.

3. Civil & Environmental Consultants, Inc., “Coal Ash Impoundment Inspection Report, DP&L J.M. Stuart Station,” dated April 30, 2009.

4. CHA, “Assessment of Dam Safety, Coal Combustion Surface Impoundment (Task 3) Final Report,” dated March 26, 2010.

5. Dayton Power & Light Company, “J.M. Stuart Station Ash Pond 6 Annual Inspection,” dated December 21, 2015.

6. Dayton Power & Light Company - Various weekly, monthly and annual impoundment inspection reports – Various dates

7. Dayton Power & Light Company, “Operation Maintenance and Inspection Manual, Ash Impoundment Dike, Stuart Electric Generating Station - Pond 3A, 5, 6, 7 & 10,” dated April 8, 2014.

8. Dayton Power & Light Company, “Emergency Action Plan - Pond 3A, 5, 6, 7 & 10,” dated May 2013.

9. Ebasco – Drawing No. 300-12-1020A, entitled “Site General Grading – SH1 (Continued),” dated 5 May 1972.

10. Ebasco – Various construction drawings, various dates from 1972 to 1984.

11. Headwaters, Drawing entitled “Stuart Pond 6 Downstream Dam as Surveyed on 9-01-10 by Headwaters,” dated 8 September 2010.

12. Ohio Department of Natural Resources, “Dam Safety Inspection Report – J.M. Stuart Station Ash Pond 6,” dated October 28, 2009.

13. Ohio Department of Natural Resources, “Dam Safety Inspection Report – J.M. Stuart Station Ash Pond 6,” dated June 27, 2013.

14. US Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, “NOAA Atlas 14 Point Precipitation Frequency Estimates: OH,” dated August 27, 2014.