

# **2017 Annual Dam and Dike Inspection Report**

**Clinch River Ash Pond 1A/1B**

**Clinch River  
Appalachian Power Company  
Carbo, Virginia**

**Inspection Date: November 7-8, 2017**

**Report Prepared: December 1, 2017**

Prepared for: Appalachian Power Company – Clinch River Plant

Prepared by: American Electric Power Service Corporation

1 Riverside Plaza  
Columbus, OH 43215



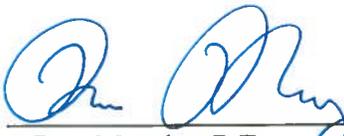
Document ID: GERS-17-065

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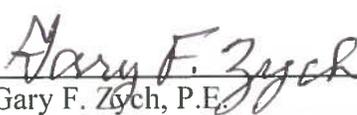
Clinch River Plant

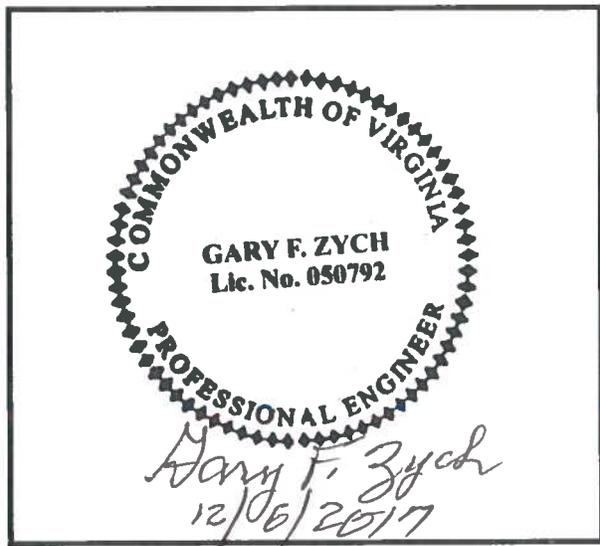
Ash Pond 1A/1B Dam

Document Number: GERS-17-065

PREPARED BY  DATE 12/1/2017  
Dan Murphy, P.E.

REVIEWED BY  DATE 12/6/2017  
Daniel Pizzino, P.E.

APPROVED BY  DATE 12/6/2017  
Gary F. Zych, P.E.  
Manager – AEP Geotechnical Engineering



I certify to the best of my knowledge, information and belief the information contained in this report meets the requirements of 40 CFR § 257.83 (b).

1.0 INTRODUCTION .....	4
2.0 DESCRIPTION OF IMPOUNDMENT .....	4
Facility Location Description .....	4
Description of Ash Pond 1A/1B .....	4
Embankment Configuration.....	4
Construction and Operational History .....	5
Surface Water Control .....	6
3.0 REVIEW OF AVAILABLE INFORMATION (257.83(b)(1)(i)) .....	6
4.0 INSPECTION .....	6
4.1    CHANGES IN GEOMETRY OF IMPOUNDING STRUCTURE (257.83(b)(2)(i))	6
4.2    ASSESSMENT OF RECENT INSTRUMENTATION DATA (257.83(b)(2)(ii)) .....	7
4.3    CHARACTERISTICS OF IMPOUNDED MATERIAL (257.83(b)(2)(iii, iv, v)) .....	8
4.4    DEFINITIONS OF VISUAL OBSERVATIONS AND DEFICIENCIES .....	8
4.5    SUMMARY OF VISUAL OBSERVATIONS.....	10
5.0 SUMMARY OF FINDINGS .....	11
5.1 MAINTENANCE ITEMS .....	11
5.2 MONITORING ITEMS.....	12
5.3 DEFICINCIES (257.83(b)(2)(vi)) .....	12
CONCLUSIONS.....	13

APPENDIX A:       INSPECTION PHOTOGRAPHS

APPENDIX B:       SITE MAP

## **1.0 INTRODUCTION**

This report was prepared by AEP- Geotechnical Engineering Services (GES) section, in part, to fulfill requirements of 40 CFR 257.83(b) for the CCR impoundments and to provide the Clinch River Plant an evaluation of the Ash Pond 1A/1B Dam.

The 2017 inspection of designated CCR Surface Impoundments at the Clinch River Plant was performed by Mr. Dan Murphy, P.E. In addition, Mr. Daniel Pizzino, P.E. of GES was present during the inspection. This report was prepared by Mr. Dan Murphy, P.E. and serves as a summary of the inspection and an assessment of the general conditions of the facility.

Ms. Karen Gilmer and Mr. Lyle Hartsock of the Clinch River Plant were the facility contacts for the inspection. The inspection was performed on November 7-8, 2017. Weather conditions were mostly cloudy with periods of light rain. Temperatures were in the mid 50's. About 0.25 inches of rain had fallen in the general area over the 7 days leading up to the date of the inspection.

## **2.0 DESCRIPTION OF IMPOUNDMENT**

The following section provides background information for the Clinch River Plant Ash Pond 1A/ 1B Dam.

### **Facility Location Description**

The Clinch River Plant is located in Russell County, Virginia approximately 2.5 miles southwest of Cleveland, Virginia and approximately 6.5 miles northeast of St. Paul, Virginia. The Ash Pond 1A/1B Dam is located about 0.25 miles north of the Clinch River Plant.

### **Description of Ash Pond 1A/1B**

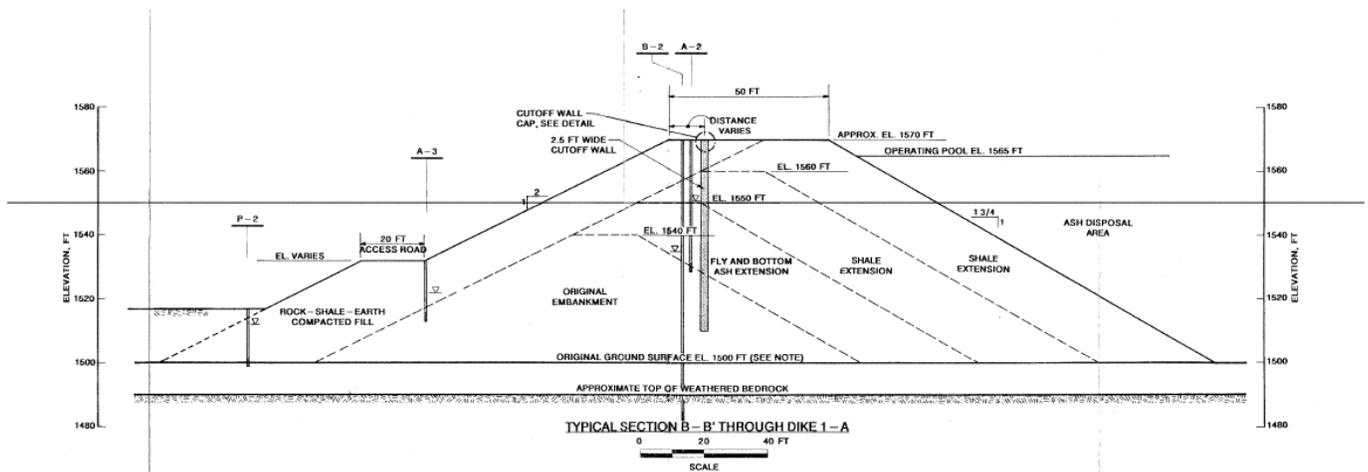
The following section will discuss the embankment configuration, construction and operational history, and surface water control associated with the Ash Pond 1A/1B Dam.

### **Embankment Configuration**

The Ash Pond 1A/1B embankment has a maximum height of approximately 40 feet (notch on northern end) with a length of roughly 3,150 feet. The embankment is constructed of soil (silty clay with shale/sandstone fragments), fly ash, bottom ash, and shale/rock fill on with a downstream slope of 2.0 H: 1 V (2.0 feet horizontal, 1 foot vertical) and an upstream slope of 1.75 H: 1V. The Ash Pond 1A/1B experienced 3 upstream raisings over its operational history. A 1,500 foot long section of Dump's Creek was re-routed during the original construction of the Ash Pond 1A/1B Dam. The width of the crest is roughly 35 feet wide, and portions of the embankment have a 20-foot wide bench on the downstream slope which carries an access road leading up to the crest. There is a splitter dike separating Pond 1A and 1B. A 2.5-foot wide, 65-

foot deep, 2,150-foot long cement-bentonite-fly ash slurry wall was designed and constructed in 1990. The slurry wall penetrated the various materials used for the upstream raising and was keyed into the original embankment, except at the ends of the dam where it was keyed 1 to 2 feet into the shallow, fractured, bedrock.

The majority of the downstream slope has an inverted filter that was constructed in 2006-2009. A toe drain system with a single stage drainage media runs along the downstream toe. The toe drain system was retrofitted to drain into an existing manhole; as a result, a seepage pump station exists near the center of the dam. Seepage is lifted out of the manhole and drains by gravity into the reclaim pond, near the southern end of the Ash Pond 1A/1B Dam.



Typical cross section taken from AEP Drawing SK-CL-62290A.

### Construction and Operational History

An abbreviated bullet point list of the construction and operational history of Ash Pond 1A/1B is included below:

- Original embankment construction completed in 1964. Designed by Casagrande Consultants.
- A splitter dike creating Ash Pond 1A and Ash Pond 1B built – Unknown year
- Upstream raising number 1 – Crest Elevation 1550 – Unknown year
- Upstream raising number 2 – Crest Elevation 1560 – Unknown year
- Upstream raising number 3- Crest Elevation 1570 – 1971
- Upstream raising number 4 – Crest Elevation 1580 - 1976
- Toe drain construction-1988
- First application of an inverted filter blanket-1984
- Slurry trench construction completed-1990
  
- Northern end of the toe drain system repaired-1991

- Inverted filter blanket installed on the downstream – 2006 through 2009.
- Diversion channel constructed -2015
- Principal spillway grouted shut due to increased infiltration/seepage at joints 2016
  - Temporary emergency spillway constructed at the very left end of the dam.
- Pond 1 closure project began in 2017 and is scheduled to be complete in 2018.

### **Surface Water Control**

The water surface level was previously controlled by a principal spillway riser/discharge pipe structure near the northern end of Ash Pond 1A. As part of the closure project, the principal spillway was partially removed and partially abandoned in place. The riser structure was demolished and removed and subterranean sections of the 36-inch-diameter concrete discharge pipe were abandoned in place by grout placement.

Storm water runoff is generally diverted around the Ash Pond 1A/1B area by means of two diversion channels. The southern diversion channel consists of grouted riprap channel and a concrete chute/ stilling basin.

The Pond 1B Upper and Lower diversion channels are being constructed as part of the closure project and have been proposed to be lined with riprap for erosion protection. Sections of the Pond 1B Upper and Lower Diversion Channels will also have gabion mattresses installed at the completion of the pond closure project.

### **3.0 REVIEW OF AVAILABLE INFORMATION (257.83(b)(1)(i))**

A review of available information regarding the status and condition of the Ash Pond 1A/1B Dam, which include files available, such as design and construction information, 7-day and 30-day inspection reports, previous dam safety inspection reports and pond closure plans. Based on the review of the data there were no signs of actual or potential structural weakness or adverse conditions.

### **4.0 INSPECTION**

#### **4.1 CHANGES IN GEOMETRY OF IMPOUNDING STRUCTURE (257.83(b)(2)(i))**

Since the 2016 Inspection, the Ash Pond 1 Closure Project has lowered the crest of the dike to elevation 1540 at the far northern end of the embankment as part of the pond closure project. Free water within the pond area has been removed, the top surface of the ash material has been regraded and a 30-mil PVC liner has been placed on top of the ash material within the pond area. The crest of the dam was lowered to provide positive drainage for the capped/covered ash in the former pond area. A soil cover layer was in the process of being placed over the 30-mil PVC liner during this inspection.

#### 4.2 ASSESSMENT OF RECENT INSTRUMENTATION DATA (257.83(b)(2)(ii))

In general, the pond closure project appears to have the reduced seepage quantities as measured by the V-notch weirs. The maximum value record by each V-notch weir since the 2016 Inspection by AEP is listed in the table below. The location of each instrument is shown in Appendix B.

V-Notch Weir Id	Maximum Reading since 2016 Inspection (Seepage in Gallons per Minute)	Date of Reading
3	6	8/10/2017 & 9/7/2017
4	12	5/10/2017
5	6	9/7/2017
6	0	Multiple Dates
5a	less than 2	Multiple Dates

In general, the piezometer data indicates no significant changes in the phreatic surface. As a result of the pond closure project, several of the piezometers have been abandoned. The table below identifies the piezometers which are to remain in place after the pond closure project, and includes the maximum values recorded by each instrument since the 2016 Annual Inspection by AEP. Piezometers which are representative of specific cross sections through the dam have been grouped together by color. The location of these piezometers is shown in Appendix B.

Piezometer ID	Maximum Reading since 2016 Inspection (Water surface elevation)	Date of Reading
P-0908S	1546.74	5/18/2017
A-2R	1546.44	5/18/2017
A-3	1518.81	5/18/2017
P-0909	1512.66	9/7/2017
P-0904	1546.38	5/18/2017
MW-0914	1530.84	5/18/2017
P-0906	1509.06	8/10/2017
P-5	1511.73	5/18/2017
P-0901S	1528.35	8/10/2017
P-0902	1510.45	5/18/2017
P-6	1510.16	8/10/2017

### 4.3 CHARACTERISTICS OF IMPOUNDED MATERIAL (257.83(b) (2) (iii, IV, v))

As part of the Ash Pond 1 Closure Project, all free water within the pond area has been removed. Ash Pond 1A/1B is no longer receiving CCR materials.

<b>IMPOUNDMENT CHARACTERISTICS</b>	
<b>Pond 1A/1B</b>	
Approximate <b>Minimum</b> depth of impounded water since last annual inspection	0 feet
Approximate <b>Maximum</b> depth of impounded water since last annual inspection	15 ± feet
Approximate <b>Present</b> depth of impounded water at the time of the inspection	0 feet
Approximate <b>Minimum</b> depth of CCR since last annual inspection	40 ft. (El. 1540)
Approximate <b>Maximum</b> depth of CCR since last annual inspection	70 ft. (El. 1570)
Approximate <b>Present</b> depth of CCR at the time of the inspection	Varies between 40 & 70 feet. <sup>1</sup>
Storage Capacity of impounding structure at the time of the inspection	500 ac-ft. at Top of Dam El. 1540 (notch at North End) <sup>2</sup>
Approximate volume of impounded water at the time of the inspection	0 ac-ft.
Approximate volume of CCR at the time of the inspection	500 ac-ft.

1. The depth of CCR material in the impoundment varies as a result of intentional contouring of the ash surface to promote surface runoff as part of the pond closure project.
2. The values in the table above assume that the 1570 contour encompasses a plan view area of 22.5 acres and the interior surfaces of the pond slope at a uniform rate of 2H: 1V.

### 4.4 DEFINITIONS OF VISUAL OBSERVATIONS AND DEFICIENCIES

This summary of the visual observations uses terms to describe the general appearance or condition of an observed item, activity or structure. The meaning of these terms is as follows:

- Good:** A condition or activity that is generally better or slightly better than what is minimally expected or anticipated from a design or maintenance point of view.
- Fair/Satisfactory:** A condition or activity that generally meets what is minimally expected or anticipated from a design or maintenance point of view.
- Poor:** A condition or activity that is generally below what is minimally expected or anticipated from a design or maintenance point of view.
- Minor:** A reference to an observed item (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is below what is normal or desired, but which is not currently causing concern from a structure safety or stability point of view.
- Significant:** A reference to an observed item (e.g. erosion, seepage, vegetation, etc.) where the current maintenance program has neglected to improve the condition. Usually conditions that have been identified in the previous inspections, but have not been corrected.
- Excessive:** A reference to an observed item (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is above or worse than what is normal or desired, and which may have affected the ability of the observer to properly evaluate the structure or particular area being observed or which may be a concern from a structure safety or stability point of view.

This document also uses the definition of a “deficiency” as referenced in the CCR rule section §257.83(b) (5) Inspection Requirements for CCR Surface Impoundments. This definition has been assembled using the CCR rule preamble as well as guidance from MSHA, “Qualifications for Impoundment Inspection” CI-31, 2004. These guidance documents further elaborate on the definition of deficiency. Items not defined by deficiency are considered maintenance or items to be monitored.

A “deficiency” is some evidence that a dam has developed a problem that could impact the structural integrity of the dam. There are four general categories of deficiencies. These four categories are described below:

#### 1. Uncontrolled Seepage

Uncontrolled seepage is seepage that is not behaving as the design engineer has intended. An example of uncontrolled seepage is seepage that comes through or around the embankment and is not picked up and safely carried off by a drain. Seepage that is collected by a drain can still be uncontrolled if it is not safely collected and transported. Seepage that is not clear and is turbid would also be considered as uncontrolled. Seepage that is unable to be measured and/or observe it is considered uncontrolled seepage.

Note: Wet or soft areas are not considered as uncontrolled seepage, but can lead to this type of deficiency. These areas should be monitored more frequently.

2. Displacement of the Embankment

Displacement of the embankment is large scale movement of part of the dam. Common signs of displacement are cracks, scraps, bulges, depressions, sinkholes and slides.

3. Blockage of Control Features

Blockage of Control Features is the restriction of flow at spillways, decant or pipe spillways, or drains.

4. Erosion

Erosion is the gradual movement of surface material by water, wind or ice. Erosion is considered a deficiency when it is more than a minor routine maintenance item.

#### **4.5 SUMMARY OF VISUAL OBSERVATIONS**

Results of the visual inspection performed on November 7, 2017 are summarized below. References to left and right are made as if one is standing on the crest of the dam and facing downstream.

1. In general, there were no signs of slope instabilities, uncontrolled seepage, and excessive erosion. Vegetation appeared to be overall well-maintained. The vertical alignment of the crest appeared level.
2. Sediments have accumulated downstream of Weir box #5-A, preventing the “free fall” conditions. Sediments have accumulated at the outlet of the toe drain system, near the reclaim pond, obscuring the toe drain pipe. At both locations, the sediment accumulation has not obstructed the flow.
3. A 6-inch-diameter corrugated plastic pipe was observed to have sediments accumulating at the outlet.
4. Some brush/woody vegetation was observed on the right abutment, within 25 feet of the dam embankment.
5. A soft, saturated area with rough dimensions of 4’ by 20’ near the northwestern corner of the reclaim pond was observed. This area has been identified in previous inspections and has, at times in previous inspections, contained small boils, with clear discharge. This area drains into a small swale connected to Weir Box #5 to facilitate detailing monitoring of flow rates.
6. The inlets of two culverts underneath of access roads were observed to be obstructed by gravel/rock.
7. There was an erosion rill, about 6 inches deep on the upstream face of the reclaim pond. There were areas with displaced riprap/ exposed filter fabric on the upstream face of the reclaim pond.

8. The right toe drain pipe was observed to have mineralization developing at the outlet of the toe drain pipe at the seepage pump station manhole. The thickness of the mineralization was observed to be about  $\frac{3}{4}$  of the pipe diameter.
9. The 18-inch-diameter transite pipe previously for storm water conveyance, located in the splitter dike between Ash Pond 1A and Ash Pond 1B, has been abandoned via grout placement. This pipe connects to a 24-inch-diameter concrete pipe and outlet on the northern bank of Dump's creek. A trickle flow of iron stained water was observed discharging from the 24-inch-diameter concrete pipe.
10. At the time of the inspection, the pond closure construction was underway. The PVC liner has been installed over the entire footprint of the pond area, and the soil cover was in the process of being placed on top of the PVC liner.
11. Two springs were observed upstream of the pond area. One spring was located near the southwestern corner of Ash Pond 1A and was observed to be flowing at roughly 1 gallon per minute. The second spring was observed upstream of Ash Pond 1B, near Station 5+50 of the alignment of the Ash Pond 1B Lower Diversion Channel and was observed to be trickling water.
12. A notch at elevation 1540 has been cut into the crest of the dam at the northern end of the dam per the pond closure grading plan. The 48-inch-diameter HDPE pipe near the northern of Ash Pond 1B has been installed as part of the pond closure project.
13. The former principal spillway has been demolished, except for sections of a 36-inch-diameter concrete pipe which has been abandoned via grout placement.
14. The left toe drain pipe was observed to have minor mineralization occurring at the outlet and was considered to be free draining.

## **5.0 SUMMARY OF FINDINGS**

The following are remedial actions, general maintenance items and monitoring requirements that are recommended as a result of the inspection. Refer to the inspection photographs in Appendix A for illustration of maintenance items.

### **5.1 MAINTENANCE ITEMS**

Assistance or guidance with the implementation of these items can be provided by AEPSC Civil Engineering & Geotechnical Services:

1. Remove the mineralization accumulation from the right toe drain pipe at the seepage pump station to ensure free draining conditions exist at the toe drain outlet. See Observation #7 in Appendix A.
2. Remove the obstructions from the culverts underneath access roads along the downstream toe to permit the passage of storm water runoff. See Observation #5 in Appendix A.
3. Remove the sediment accumulation from the 6-inch-diameter corrugated plastic pipe near the northwest corner of the reclaim pond. See Observation #2 in Appendix A.
4. Remove the sediment accumulation from the toe drain outlet near the northeast corner of the reclaim pond. See Observation #1 in Appendix A.
5. Remove the sediment accumulation downstream of V-Notch Weir #5A to create a small “free fall”. See Observation #1 in Appendix A.
6. Repair the erosion rills on the upstream face of the reclaim pond. Replace riprap in the areas missing riprap. See Observation #6 in Appendix A.
7. Remove the brush/woody vegetation on the right abutment, within 25-feet of the embankment dam. See Observation #3 in Appendix A.

## **5.2 MONITORING ITEMS**

1. Monitor the soft, wet area near the northwest corner of the reclaim pond for any signs of muddy seepage or increased flow rates. This wet area has been identified in previous inspections. See Observation #4 in Appendix A.
2. Monitor the outlet of the 24-inch-diameter RCP on the north bank of Dump’s Creek for any signs of increases in flow rates. See Observation #8 in Appendix A.

## **5.3 DEFICINCIES (257.83(b)(2)(vi))**

At Ash Pond 1A/1B, there were no signs of structural weakness or disruptive conditions that were observed at the time of the inspection that would require additional investigation or remedial action. There were no deficiencies noted during this inspection or during any of the periodic 7-day or 30-day inspections. A deficiency is defined as either 1) uncontrolled seepage, 2) displacement of the embankment, 3) blockage of control features, or 4) erosion, more than minor maintenance. If any of these conditions occur before the next annual inspection contact AEP Geotechnical Engineering immediately.

## **CONCLUSIONS**

Based on the visual inspection, the overall condition of the Ash Pond 1A/1B appears to be operating as designed. Inspection and monitoring activities being performed by the Plant and AEPSC Civil Engineering & Geotechnical Services should continue. The pond closure project should continue. There is no evidence of distress that would indicate the possibility of immediate sliding, slope instability, settlement, misalignment or cracking of the ash pond embankments. As such it is concluded that the dam and dikes are performing as designed.

If you have any questions with regard to this report, please do not hesitate to contact Dan Murphy at (614) 716-2279 (Audinet-200-2279).

**APPENDIX A: INSPECTION PHOTOGRAPHS**

# AEP GES Dam and Dike Inspection

Plant Name:

Observation #:

Unit:

Date:

Observation:

Location:

Photo #1



Photo #2



Recommendations:

# AEP GES Dam and Dike Inspection

Plant Name: Clinch River

Observation #: 2

Unit: Pond1

Date: November 8, 2017

Observation: Obstructed pipe outlet, circled in red.

Location: Reclaim Pond

Photo #1



Photo #2

Recommendations: Remove the mineralization/ accumulated sediment from the outlet of the drain pipe circled in red.

# AEP GES Dam and Dike Inspection

Plant Name:

Observation #:

Unit:

Date:

Observation:

Location:

Photo #1

Photo #2



Approximate Limit  
of Embankment

Recommendations:

# AEP GES Dam and Dike Inspection

Plant Name:

Observation #:

Unit:

Date:

Observation:

Location:

Photo #1



Photo #2

Recommendations:

# AEP GES Dam and Dike Inspection

Plant Name:

Observation #:

Unit:

Date:

Observation:

Location:

Photo #1



Photo #2



Recommendations:

# AEP GES Dam and Dike Inspection

Plant Name:

Observation #:

Unit:

Date:

Observation:

Location:

Photo #1



Photo #2



Recommendations:

# AEP GES Dam and Dike Inspection

Plant Name:

Observation #:

Unit:

Date:

Observation:

Location:

Photo #1

Photo #2



Recommendations:

# AEP GES Dam and Dike Inspection

Plant Name:

Observation #:

Unit:

Date:

Observation:

Location:

Photo #1

Photo #2



Recommendations:

# AEP GES Dam and Dike Inspection

Plant Name:

Observation #:

Unit:

Date:

Observation:

Location:

Photo #1



Photo #2



Recommendations:

APPENDIX B: SITE MAP

